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# The Vascular Flora of Gitchie Manitou State Preserve, Lyon County, Iowa

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Gitchie Manitou State Preserve in Lyon Co., Iowa is unique for its relict prairie and quartzite flora. The vascular flora inventoried in 1974-1976 includes 328 species from 66 families. Seven plant communities are described: native prairie, plants of quartzite outcrops, secondary succession grassland, Jasper Pool woods, plants of Jasper Pool mudbank and littoral zone, Big Sioux River flood plain woodland, plants of disturbed areas. Species reported by others are noted and discussed.

INDEX DESCRIPTORS: Gitchie Manitou State Preserve, Iowa Flora, Sioux quartzite flora.

Gitchie Manitou State Preserve in Lyon County is a unique part of the Iowa Preserve system. It was included as a preserve because of its Sioux quartzite outcroppings and the associated flora. The Gitchie Manitou area has been owned by the state since 1916, was designated a State Preserve in 1926, and was dedicated into the New Preserve System in 1969.

Records of the flora at Gitchie Manitou go back to the 1900's (Shimek, 1898, 1900). More recently, Carter's (1960) study of the flora of northwestern Iowa included collections at Gitchie Manitou. However, no specific study has been made to document the flora of the preserve itself. Since the preserve has had many uses in the past, and recently much disturbance from littering and traffic, it was considered essential by the Iowa State Preserves Advisory Board and this author that a survey of the current flora be made.

## SITE DESCRIPTION

The Gitchie Manitou Preserve is a 37 hectare (91.3 acre) tract in extreme northwestern Lyon County, Iowa, sec. 11, T 100N, R 49W. It is bordered on the west and south by the Big Sioux River and on the north by South Dakota. Its eastern border is formed by a county road and a cultivated field. (Figures 1, 2.)

The topography of the preserve is gently rolling. The Big Sioux River drains the area. The most striking geological feature is the exposed Precambrian pink Sioux quartzite. This outcrop is the oldest in Iowa and is part of a larger system of outcrops extending from Mitchell, South Dakota to New Ulm, Minnesota (Koch, 1969).

The soils of the preserve are loams with various amounts of sand and silt. The parent material for most soil types in the preserve is alluvium or silty sediments, with prairie as the native vegetation.

The climate of northwestern Iowa is temperate continental. Weather fronts move from northwest to southeast, but winds during the growing season are from the south. It is the driest part of the state with a mean annual precipitation of 63.50 cm (25 inches) (Collins, 1974). During this study, the range of precipitation, as recorded at the Rock Rapids reporting station approximately 28.9 km (18 miles) east, was from a high of 75.8 cm (29.87 inches) in 1975 to a low of 34.49 cm (13.58 inches) in 1976. Precipitation in 1974 was intermediate with 42.20 cm (17.01 inches). The mean for 1974-1976 was 50.34 cm (19.82 inches) (USDC Climatological Data, 1973-1976).

The growing season, as defined by the number of frost-free days between the latest spring low of 0°C and the earliest fall low of 0°C, ranged from 120 days in 1974 to 147 days in 1975 (USDC Climatological Data, 1973-1976). The mean for the three years of this study was 137 days. This compares to 149 days in 1956 and 166 days in 1957 for the Rock Rapids reporting station (Carter, 1960). The long-term mean for Lyon County is 140 days (Collins, 1974).

Botanically and ecologically, the Gitchie Manitou Preserve is a relict of the true prairie which was described by Weaver and Clements (1938) as being dominated by *Stipa spartea* (Porcupine grass), *Sporobolus heterolepis* (Prairie dropseed), *Andropogon scoparius* (Little blue stem), and others. The true prairie extended from the great deciduous forest on the east to the mixed prairie of the western plains and from southern Manitoba on the north to mid-Texas on the south (Weaver, 1954). Transeau (1935) included northwestern Iowa in his discussion of the prairie peninsula. Because the Gitchie Manitou area includes several midgrasses and short grasses, especially on the quartzite, it might be classified as a transition from tall to mixed prairie (Weaver and Clements, 1938), or as an intermediate prairie due to local substrate conditions.

## HISTORY OF LAND USE IN THE PRESERVE

It is important to know the history of land use in order to interpret the present flora. Readily visible variations in the vegetation reflect different land uses in the preserve in the past. What follows is a description of the past since 1869.

Two private owners received deeds to government lots 1, 2, and 3 (sec. 11, T 100N, R 49W, Lyon County, Iowa) from the United States in 1869 and 1870. By 1916, the State of Iowa owned these lots. The northern part of approximately 19.10 hectares (47 acres), which includes the Sioux quartzite outcrops, became known as the Gitchie Manitou Park. In the 1920's the State of Iowa sold part of the area to private ownership. Two Iowa botanists, Drs. B. Shimek and L. H. Pammel, urged the preservation of this area rather than allowing the outcrops to be used for road building materials. Their concern was legitimate since much quarrying was being done in South Dakota and Minnesota for this same rock. The Gitchie Manitou area was described by Beyer and Wright in 1913 as "excellently adapted for road and concrete work" and "the 20 acres have no overburden" (Beyer and Wright, 1913). A few later transactions resulted in the State of Iowa owning the present 37 hectares. In 1926, the State Board of Control set aside the original north 19 hectares for "park and scientific purposes." A transfer was later made to the Board of Conservation (Koch, 1969).

Gitchie Manitou has had varied uses since the late 1800's when it was a settlement with a post office and land office called Gibraltar (Bruggemann and Lommen, personal communication). At that time the ledges of quartzite, near where the shelter now stands, were used to seat people for Sunday worship. The shallow rocky area in the Big Sioux River at the state line was used for a river crossing and was called the Rock Ford Crossing. Evidently, the settlement called Gibraltar was never well or long established. Quarrying for the hard quartzite was done in the east end of the north-19. The Jasper Pool is evidently an old quarry in part. A prison farm crew was briefly established to quarry rock there in the early 1900's. Evidences of their excavations can still be seen east of Jasper Pool (Bruggemann and Lommen, personal communication).

The land referred to in this paper as the secondary succession grass-

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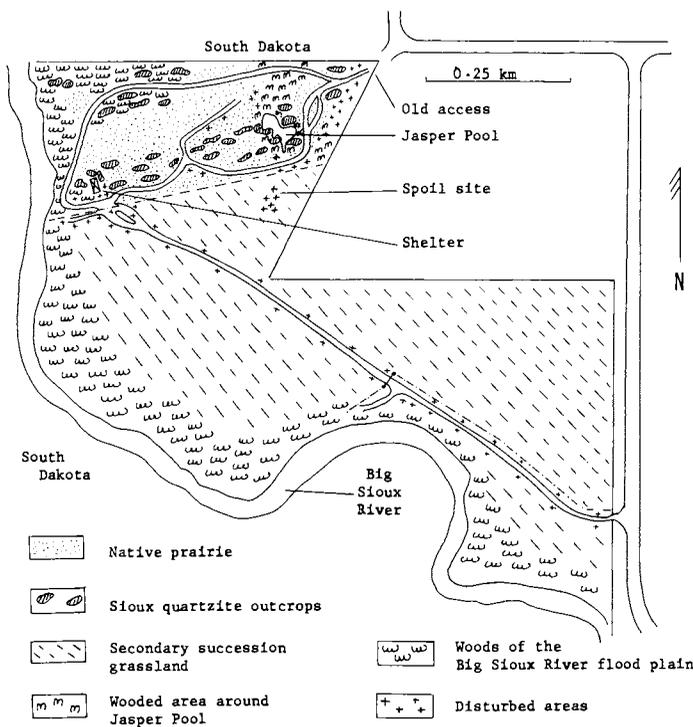


Figure 1. Plant communities of Gitchee Manitou State Preserve.

land was broken between 1870 and 1900. It was cropped until the 1940's in corn and oats.

Mr. A. Bruggemann hayed the north-19 as long as he served as caretaker of the park. Mr. Bruggemann's recollection is that he mowed up to a row of sumac on the north side of the park adjacent to the gravel road. Haying of the park was discontinued in 1941. It is his feeling that these sumac were planted there, no doubt, for their colorful autumn foliage. They have been invading the prairie since the early 1940's. During this time the park was also used for picnics with the northeast corner as the entrance. The shelter was constructed from Sioux quartzite in the 1930's by WPA workers.

In the early 1960's, the Jasper Pool was dredged to remove silt which entered during high waters. The dredging was also done to uncover springs in the pool. The dredge spoils were dumped south of the pool. This area is now distinct as a disturbed habitat showing secondary succession. The spoil soil is silty with many large quartzite boulders evident on the landscape. The spoil vegetation is dominated by *Ambrosia trifida* (Giant ragweed).

In the early 1960's, the northeast entrance was closed and a new public access was developed toward the south end of the preserve. The closing of the northeast access has eliminated some of the disturbance to this end of the preserve. The southern access was used until 1976 when it was closed to vehicular traffic, leaving only a walk-through gate. This has significantly reduced the amount of litter added to the preserve.

The cropland (secondary succession area) was sowed to hay in the early 1950's and was hayed for several years following this. Haying was discontinued on the secondary succession area in the early 1960's. The age of young trees which grew there, *Prunus americana* (Wild plum), *Ulmus pumila* (Siberian elm), and *Acer negundo* (Boxelder), determined by tree ring analysis in June, 1975, correlates well with this period of time.

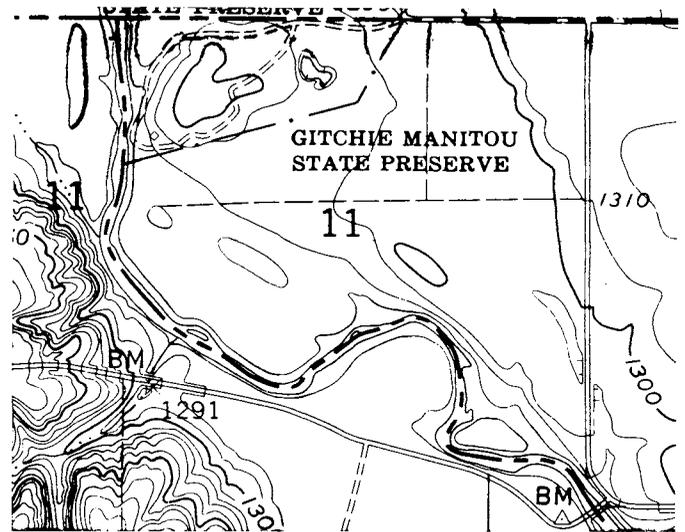


Figure 2. Topographic map of Gitchee Manitou State Preserve. (From the 1962 USGS Klondike and Brandon maps. See Fig. 1 for approximate scale.)

During the 1960's and 1970's, the north prairie and quartzite areas were mostly used for picnics and parties with much littering and some vehicular traffic, especially near the shelter, the Jasper Pool area, and the fishing access. One accidental fire burned part of the prairie north and west of the shelter in the late 1960's. Also during this time, occasional use was made by nature enthusiasts, hikers, scientists, and students, especially students and professors from the Iowa Lakeside Laboratory and nearby colleges.

Recent management of the preserve involved a controlled burn in May, 1975 and April, 1976. This was done to remove the inhibiting duff layer from the prairie, and encourage native prairie species, as well as to set back woody species which were invading the prairie and the secondary succession grassland.

**METHODS**

Collections were made during 26 collecting trips in the growing season of 1974, 1975, and 1976. Efforts were made to survey each community approximately every two weeks. Voucher specimens are deposited at Dordt College, Biology Dept., Sioux Center, Iowa. The nomenclature for division and class taxa follows Bold (1973). The family, generic, and specific taxa follow Gleason and Cronquist (1963). Manuals for select groups, such as Pohl (1966) for grasses and Gilly (1946) for sedges, were also used. The herbaria at Iowa Lakeside Laboratory and the University of Iowa were used for comparing specimens. The assignment of names to the plant communities was made after observing the local vegetation and topography.

**THE FLORA**

*Description of Plant Communities*

Seven plant communities were recognized (Fig. 1) as briefly described below.

1. Native prairie. The prairie on the north 19 hectares (47 acres) has many native grasses, legumes, and other forbs. The surface is gently rolling except for the Sioux quartzite which juts out in several places.

Plants which characterize this community are *Andropogon gerardi* (Tall bluestem), *Andropogon scoparius* (Little bluestem), *Bouteloua curtipendula* (Side oats grama), *Sporobolus heterolepis* (Prairie dropseed), *Sorghastrum nutans* (Indian grass), *Stipa spartea* (Porcupine grass), *Poa pratensis* (Kentucky blue grass), *Amorpha canescens* (Lead plant), *Lathyrus venosus* (Vetchling), *Lespedeza capitata* (Bush clover), *Petalostemum candidum* (White prairie clover), *P. purpureum* (Purple prairie clover), *Lithospermum canescens* (Hoary puccoon), *Monarda fistulosa* (Horse mint), *Anemone patens* (Pasque flower), *Viola pedatifida* (Prairie violet), *Sisyrinchium campestre* (Blue eyed grass), several *Solidago* spp. (Goldenrods), *Helianthus laetiflorus* (Sunflower), *Ratibida pinnata* (Coneflower), *Echinacea pallida* (Pale purple cone flower), *Aster ericoides* (Heath aster), *Equisetum* sp. (Scouring rush), and *Allium stellatum* (Wild onion).

2. Plants of Sioux quartzite outcrops. The flora of the quartzite outcrops consists of several lichens and mosses and, where soil depth allows, several kinds of vascular plants. Characteristic plants are *Opuntia fragilis* (Brittle cactus), *Chrysopsis villosa* (Golden aster), *Plantago patagonica* (Hairy plantain), *Portulaca oleracea* (Purslane), *Talinum parviflorum* (Fameflower), *Delphinium virescens* (Prairie larkspur), *Prunus pumila* (Sand cherry), *Selaginella rupestris* (Spikemoss), *Cyperus inflexus*, *Andropogon scoparius* (Little bluestem), and *Bouteloua gracilis* (Blue grama grass). Rock surfaces without soil are covered with lichens, except for some surfaces that are wind (or glacier) polished and some depressions that periodically are submerged after light rains.

3. Secondary succession grassland. Because the south part of the preserve has been plowed, cropped, and seeded into hayland, it is designated a secondary succession grassland. Its topography is gently rolling. *Bromus inermis* (Smooth brome) and *Poa pratensis* (Kentucky blue grass), both cool season grasses, are the dominant grasses. Woody species which are invading include *Acer negundo* (Boxelder), *Ulmus pumila* (Siberian elm), and *Prunus americana* (Wild plum). Other plants include *Carduus nutans* (Musk thistle), *Carduus acanthoides* (Plumeless thistle), *Melilotus alba* (White sweet clover), *M. officinalis* (Yellow sweet clover), *Asclepias syriaca* (Milkweed), *Artemisia absinthium* and *A. ludoviciana* (Sage), *Solidago* spp. (Goldenrods), *Artemisia campestris* (Wormwood), *Helianthus annuus* (Annual sunflower), and *Convolvulus arvensis* (Field bindweed).

4. Wooded area around Jasper Pool. The tree canopy around Jasper Pool provides the necessary cover for the shade-loving species under them and on the rocky cliffs. The trees and the pool provide a mesic oasis in an otherwise dry habitat. Perimeter trees and shrubs include *Quercus macrocarpa* (Bur oak), *Ulmus* spp. (Elms), *Fraxinus pennsylvanica* (Green ash), *Tilia americana* (Basswood), *Populus deltoides* (Cottonwood), *Prunus americana* (Wild plum), and *Euonymus atropurpureus* (Burning bush). Understory and shade-loving plants in this community are *Woodsia oregana* (Oregon woodsia), *Cystopteris fragilis* (Fragile fern), *Hydrophyllum virginianum* (Waterleaf), *Polygonatum biflorum* (Solomon's seal), *Rhus radicans* (Poison ivy), *Ribes americana* and *R. missouriense* (gooseberry), *Parthenocissus vitacea* (Virginia creeper), and *Smilax herbacea* (Carrion flower).

5. Plants of Jasper Pool mud bank and littoral zone. A fluctuating water supply provides habitat for several typical wetland plants. Included are *Carex* spp. (Sedges), *Scirpus* spp. (Rushes), *Glyceria grandis* (Manna grass), *Beckmannia syzigachne* (Slough grass), *Lycopus asper* (Water-horehound), *Bidens* spp. (Beggar's ticks), *Polygonum coccineum* (Water smartweed), *Sagittaria engelmanniana* (Arrowhead).

6. Wooded area along the Big Sioux River and flood plain. The flood plain is sometimes flooded with several feet of water (although not during this study). The vegetation is basically flood plain woods with weedy ground cover. Canopy trees include *Acer saccharinum* (Silver maple), *Acer negundo* (Boxelder), *Populus deltoides* (Cotton-

wood), *Salix amygdaloides* (Peach leaf willow), *Celtis occidentalis* (Hackberry), and *Ulmus americana* (American elm). Typical understory shrubs and vines are *Prunus virginiana* (Chokecherry), *P. americana* (Wild plum), *Rhus glabra* (Smooth sumac), *Rubus occidentalis* (Black raspberry), *Vitis riparia* (Riverbank grape), and *Parthenocissus vitacea* (Virginia creeper). Characteristic herbs and ground cover plants are *Viola papilionacea* (Meadow violet), *Glechoma hederacea* (Ground ivy), *Laportea canadensis* (Wood-nettle), *Geum canadense* (Avens), *Osmorhiza longistylis* (Sweet cicely), *Heracleum lanatum* (Cow parsnip), and *Ambrosia trifida* (Giant ragweed).

7. Plants of disturbed areas. Old vehicle trails and accesses, current roadways, quarrying sites, and rodent diggings support a distinctive vegetation. These disturbed areas are characterized by *Amaranthus* spp. (Pigweeds), *Kochia scoparia* (Summer cypress), *Salsola kali* (Russian thistle), *Carduus nutans* (Musk thistle), *Conyza canadensis* (Horseweed), *Helianthus annuus* (Annual sunflower), *Melilotus alba* (White sweet clover), *M. officinalis* (Yellow sweet clover), *Echinochloa crusgalli* (Barnyard grass), *Hordeum jubatum* (Foxtail barley), *Eragrostis ciliaris* (Stink grass), *Setaria viridis* (Green foxtail), *Descurainia pinnata* (Tansy mustard), and *Sisymbrium altissimum* (Tumbling mustard).

#### Checklist of Plants and Their Communities

The following is an alphabetic list of vascular plant species. Division and class taxa follow Bold (1973); family, generic, and specific taxa follow Gleason and Cronquist (1963). Parenthetically following the scientific binomial is the common name, if known. These follow Gleason and Cronquist (1963), Carter (1960), or Fernald (1950). The numerals following the common name indicate the community in which it was found. Community reference numerals in parenthesis designate a habitat overlap: (2,6) refers to an outcrop of quartzite in a wooded area. Outcrops are on open prairie unless so designated. An asterisk indicates that the taxon is not indigenous.

Communities and reference numbers used in the species list

1. Native prairie
2. Plants of Sioux quartzite outcrops
3. Secondary succession grassland
4. Wooded area around Jasper Pool
5. Plants of Jasper Pool mud bank and littoral zone
6. Wooded area along the Big Sioux River and flood plain
7. Plants of disturbed areas

#### MICROPHYLLOPHYTA: GLOSSOPSIDA

##### SELAGINELLACEAE (Selaginella Family)

*Selaginella rupestris* (L.) Spring. (Spikemoss) -2

#### ARTHROPHYTA: ARTHROPSIDA

##### EQUISETACEAE (Horsetail Family)

*Equisetum x ferrissii* Clute. (Ferriss' hybrid scouring rush) -1,3  
*Equisetum hyemale* L. (Scouring rush) -3

#### PTEROPHYTA: LEPTOSPORANGIODESIDA

##### POLYPODIACEAE (Polypody Family)

*Cystopteris fragilis* (L.) Bernh. (Fragile fern) -4  
*Woodsia oregana* D. C. Eat. (Oregon woodsia) -4

VASCULAR FLORA OF GITCHIE MANITOU STATE PRESERVE

CONIFEROPHYTA: CONIFEROPSIDA

CUPRESSACEAE (Cypress Family)

*Juniperus virginiana* L. (Red cedar) -4

ANTHOPHYTA: DICOTYLEDONAE

ACERACEAE (Maple Family)

*Acer negundo* L. (Boxelder) -3,4,6

*Acer saccharinum* L. (Silver maple) -4,6

AMARANTHACEAE (Amaranth Family)

*Amaranthus graecizans* L. (Prostrate pigweed) -7

\**Amaranthus retroflexus* L. (Pigweed) -7

*Amaranthus tamariscinus* (Nutt.) Wood. (Water hemp) -5

ANACARDIACEAE (Cashew Family)

*Rhus glabra* L. (Smooth sumac) -1,6

*Rhus radicans* L. (Poison ivy) -2,4,6

APOCYNACEAE (Dogbane Family)

*Apocynum sibiricum* Jacq. (Indian hemp) -4

ASCLEPIADACEAE (Milweed Family)

*Asclepias incarnata* L. (Swamp milkweed) -5

*Asclepias syriaca* L. (Common milkweed) -1,3

*Asclepias tuberosa* L. (Butterfly-weed) -3

*Asclepias verticillata* L. (Whorled milkweed) -1,3

BALSAMINACEAE (Touch-me-not Family)

*Impatiens biflora* Walt. (Jewel-weed) -6

BORAGINACEAE (Borage Family)

\**Lappula echinata* Gilib. (Beggar's lice) -(2,6)

*Lithospermum canescens* (Michx.) Lehm. (Hoary puccoon) -1

*Onosmodium molle* var. *occidentale* (Mack.) Johnst. (False gromwell) -1

CACTACEAE (Cactus Family)

*Opuntia fragilis* (Nutt.) Haw. (Brittle cactus) -2

CAMPANULACEAE (Harebell Family)

*Campanula americana* L. (Tall bellflower) -6

*Triodanis perfoliata* (L.) Nieuwl. (Venus' looking glass) -2,4

CAPRIFOLIACEAE (Honeysuckle Family)

*Symphoricarpos occidentalis* Hook. (Wolfberry) -1,3

CARYOPHYLLACEAE (Pink Family)

\**Cerastium viscosum* L. (Mouse-ear chickweed) -2,4

\**Lychnis alba* Mill. (White campion) -1

*Silene antirrhina* L. (Catchfly) -1,2,3

*Silene stellata* (L.) Ait.f. (Starry campion) -1

CELASTRACEAE (Staff-tree Family)

*Celastrus scandens* L. (Bittersweet) -6

*Euonymus atropurpureus* Jacq. (Burning bush) -4,6

CHENOPODIACEAE (Goosefoot Family)

*Chenopodium album* L. (Lamb's quarters) -3,7

\**Kochia scoparia* (L.) Schrader. (Summer cypress) -3,7

\**Salsola kali* L. (Russian thistle) -3,7

COMPOSITAE (Composite Family)

*Achillea millefolium* L. (Yarrow) -1

*Ambrosia artemisiifolia* L. (Small ragweed) -1,2,3,7

*Ambrosia psilostachya* DC. (Perennial ragweed) -1

*Ambrosia trifida* L. (Giant ragweed) -6,7

\**Arctium minus* Schk. (Common burdock) -6

\**Artemisia absinthium* L. (Wormwood) -3,6

*Artemisia biennis* Willd. (Wormwood) -6

*Artemisia campestris* L. (Wormwood) -6

*Artemisia ludoviciana* Nutt. (White sage) -1,3

*Aster ericoides* L. (Heath aster) -1,3

*Aster lucidulus* (Gray) Wieg. -5

*Aster oblongifolius* Nutt. -(1,2)

*Aster ontarionis* Wieg. -6

*Aster simplex* Willd. -(1,2),3

*Bidens cernua* L. (Bur marigold) -5

*Bidens frondosa* L. (Begger's ticks) -5

\**Carduus acanthoides* L. (Musk thistle) -7

\**Carduus nutans* L. (Nodding thistle) -3,7

*Chrysopsis villosa* (Pursh) Nutt. (Golden aster) -2

*Cirsium altissimum* (L.) Spreng. (Tall thistle) -4,6

\**Cirsium arvense* (L.) Scop. (Canada thistle) -5

*Cirsium discolor* (Muhl.) Spreng. (Thistle) -3,4

\**Cirsium vulgare* (Savi) Tenore. (Bull thistle) -1

*Conyza canadensis* (L.) Cronq. (Horseweed) -2,7

*Echinacea pallida* Nutt. (Pale purple coneflower) -1

*Erigeron philadelphicus* L. (Daisy fleabane) -5

*Erigeron strigosus* Muhl. (Fleabane) -1,3

*Eupatorium rugosum* Houtt. (White snakeroot) -6

*Grindelia squarrosa* (Pursh) Dunal. (Gum plant) -7

*Helianthus annuus* L. (Annual sunflower) -3,7

*Helianthus grosseserratus* Martens. (Saw-toothed sunflower) -3,5,7

*Helianthus laetiflorus* Pers. (Showy sunflower) -1

*Helianthus maximiliani* Schrader. -1

*Helianthus tuberosus* L. (Jerusalem artichoke) -3

*Heliopsis helianthoides* (L.) Sweet. (Ox-eye) -1,3

*Iva xanthifolia* Nutt. (Marsh elder) -7

*Kuhnia eupatorioides* L. (False boneset) -1,3

*Lactuca biennis* (Moench) Fern. -6

*Lactuca canadensis* L. (Wild lettuce) -5

*Lactuca floridana* (L.) Gaertn. (Blue lettuce) -3

\**Lactuca serriola* L. (Prickly lettuce) -5

*Liatris aspera* Michx. (Blazing star) -1

*Liatris punctata* Hook. (Blazing star) -1

*Lygodesmia juncea* (Pursh) D. Don. (Skeleton weed) -1

*Prenanthes aspera* Michx. (White lettuce) -(1,2)

*Ratibida columnifera* (Nutt.) Woot. & Standl. (Long-headed coneflower) -1,3

*Ratibida pinnata* (Vent.) Barnh. (Coneflower) -1

*Rudbeckia laciniata* L. (Tall coneflower) -6

*Senecio plattensis* Nutt. (Groundsel) -5

*Silphium perfoliatum* L. (Cup-plant) -3

*Solidago canadensis* L. (Tall goldenrod) -1,3,5

*Solidago gigantea* Ait. (Smooth goldenrod) -1,3

*Solidago gigantea* var. *serotina* (Kuntze) Cronq. -3,6

*Solidago missouriensis* Nutt. (Missouri goldenrod) -1,3

*Solidago nemoralis* Ait. (Grey goldenrod) -2

*Solidago rigida* L. (Stiff goldenrod) -1

*\*Sonchus uliginosus* Bieb. (Sow thistle) - (4,5)  
*\*Taraxacum officinale* Weber. (Common dandelion) -3,6,7  
*\*Tragopogon dubius* Scop. (Goat's beard) -1,3  
*Vernonia fasciculata* Michx. (Ironweed) -1,3  
*Xanthium strumarium* L. (Cocklebur) -6

## CONVOLVULACEAE (Morning Glory Family)

*\*Convolvulus arvensis* L. (Field bindweed) -3  
*Convolvulus sepium* L. (Hedge bindweed) -3,7  
*Cuscuta polygonorum* Engelm. (Dodder) -5

## CRASSULACEAE (Orpine Family)

*Penthorum sedoides* L. (Ditch stonecrop) -5

## CRUCIFERAE (Mustard Family)

*\*Capsella bursa-pastoris* (L.) Medic. (Shepherd's purse) -7  
*Descurainia pinnata* (Walt.) Britt. (Tansy mustard) -7  
*Draba reptans* (Lam.) Fern. -2  
*Hesperis matronalis* L. (Dame's rocket) -6  
*Lepidium densiflorum* Schrader. (Pepper-grass) -2,7  
*Rorippa islandica* (Oeder) Borbas. (Marsh-cress) -5  
*\*Sisymbrium altissimum* L. (Tumbling mustard) -7

## CUCURBITACEAE (Gourd Family)

*Echinocystis lobata* (Michx.) T. & G. (Wild cucumber) -6

## EUPHORBIACEAE (Spurge Family)

*Euphorbia corollata* L. (Flowering spurge) -5  
*Euphorbia dentata* Michx. - (1,4)  
*Euphorbia dictyosperma* Fisch. & Mey. (Spurge) -5  
*\*Euphorbia esula* L. (Leafy spurge) -3  
*Euphorbia heterophylla* L. (Wild poinsettia) - (2,6)

## FABACEAE (Bean Family)

*Amorpha canescens* Pursh. (Lead-plant) -1  
*Amorpha fruticosa* L. (False indigo) -1,4  
*Amorpha nana* Nutt. (Fragrant false indigo) -1  
*Astragalus crassicaarpus* Nutt. (Ground-plum) -1  
*Lathyrus venosus* Muhl. (Vetchling) -1  
*Lespedeza capitata* Michx. (Bush-clover) -1  
*\*Medicago falcata* L. (Yellow alfalfa) -3  
*\*Medicago lupulina* L. (Black medick) -7  
*\*Melilotus alba* Desr. (White sweet clover) -7  
*\*Melilotus officinalis* (L.) Lam. (Yellow sweet clover) -3,7  
*Petalostemum candidum* (Willd.) Michx. (White prairie clover) -1  
*Petalostemum purpureum* (Vent.) Rydb. (Purple prairie clover) -1  
*Psoralea argophylla* Pursh. (Scurf pea) -1  
*Psoralea esculenta* Pursh. (Prairie turnip) -1  
*Strophostyles leiosperma* (T. & G.) Piper. (Wild bean) -3  
*\*Trifolium pratense* L. (Red clover) -7  
*\*Trifolium repens* L. (White clover) - (1,7)  
*Vicia americana* Muhl. (Vetch) -1,3

## FAGACEAE (Beech Family)

*Quercus macrocarpa* Michx. (Bur-oak) -4,6

## FUMARIACEAE (Fumitory Family)

*Corydalis micrantha* (Engelm.) Gray. -2,4,7  
*Dicentra cucullaria* (L.) Bernh. (Dutchman's breeches) -6

## GENTIANACEAE (Gentian Family)

*Gentiana puberula* Michx. (Downy gentian) -1

## GERANIACEAE (Geranium Family)

*Geranium carolinanum* L. (Crane's bill) -1,2,4,5

## HYDROPHYLLACEAE (Waterleaf Family)

*Ellisia nyctelea* L. (Water pod) -6  
*Hydrophyllum virginianum* L. (Waterleaf) -4

## HYPERICACEAE (St. John's-wort Family)

*Hypericum majus* (Gray) Britt. (St. John's-wort) -5

## LABIATAE (Mint Family)

*Agastache nepetoides* (L.) Kuntze. (Giant hyssop) -6  
*\*Glechoma hederacea* L. (Ground-ivy) -6  
*Hedeoma hispida* Pursh. (Pennyroyal) -2  
*Lycopus americanus* Muhl. (Water-horehound) -5,6  
*Lycopus asper* Green. (Water-horehound) -6  
*Mentha arvensis* L. (Wild mint) -6  
*Monarda fistulosa* L. (Wild bergamot) -1,3  
*\*Nepeta cataria* L. (Catnip) -6,7  
*Scutellaria lateriflora* L. (Skullcap) -5,6

## MORACEAE (Mulberry Family)

*\*Cannabis sativa* L. (Hemp) -7  
*Humulus lupulus* L. (Hops) -3

## NYCTAGINACEAE (Four-o'clock Family)

*Mirabilis hirsuta* (Pursh) MacM. (Hairy umbrellawort) -1  
*Mirabilis nyctaginea* (Michx.) MacM. (Four o'clock) -1,2,3

## OLEACEAE (Olive Family)

*Fraxinus pennsylvanica* Marsh. (Green ash) -3,4,6

## ONAGRACEAE (Evening-primrose Family)

*Oenothera biennis* L. (Evening-primrose) -1,3  
*Oenothera serrulata* Nutt. (Evening-primrose) -1

## OXALIDACEAE (Wood-sorrel Family)

*Oxalis stricta* L. (Sorrel) -1,2,4  
*Oxalis violacea* L. (Violet wood-sorrel) -1

## PLANTAGINACEAE (Plantain Family)

*Plantago patagonica* Jacq. (Hairy plantain) -2  
*Plantago rugelii* Decne. (Plantain) -7

## POLEMONIACEAE (Phlox Family)

*Collomia linearis* Nutt. -4

## POLYGONACEAE (Smartweed Family)

*Polygonum aviculare* L. (Knotweed) -7  
*Polygonum coccineum* Muhl. (Water smartweed) -5  
*\*Polygonum convolvulus* L. (Black bindweed) -7  
*Polygonum erectum* L. (Knotweed) -7  
*\*Polygonum hydropiper* L. (Water pepper) -5  
*Polygonum lapathifolium* L. (Pale smartweed) -5  
*Polygonum pensylvanicum* L. (Pinkweed) -5,7  
*Polygonum punctatum* Ell. (Water smartweed) -5  
*Polygonum ramosissimum* Michx. (Bushy knotweed) -2

## VASCULAR FLORA OF GITCHIE MANITOU STATE PRESERVE

*Polygonum tenue* Michx. -2

\**Rumex crispus* L. (Sour dock) -3,5

*Rumex maritimus* L. (Golden dock) -5

*Rumex mexicanus* Meissn. (Dock) -5,7

*Rumex orbiculatus* Gray. (Great water dock) -6

## PORTULACACEAE (Purslane Family)

\**Portulaca oleracea* L. (Purslane) -2

*Talinum parviflorum* Nutt. (Fame flower) -2

## PRIMULACEAE (Primrose Family)

*Androsace occidentalis* Pursh. -2,7

*Lysimachia ciliata* L. (Fringed loosestrife) -6

## RANUNCULACEAE (Crowfoot Family)

*Anemone canadensis* L. (Prairie anemone) -1

*Anemone patens* L. (Pasque-flower) -1

*Aquilegia canadensis* L. (Columbine) -(1,6)

*Clematis virginiana* L. (Virgin's bower) -6

*Delphinium virescens* Nutt. (Larkspur) -1,2,4

*Ranunculus abortivus* L. (Small-flowered crowfoot) -4

*Ranunculus pensylvanicus* L. f. (Bristly crowfoot) -5

## RHAMNACEAE (Buckthorn Family)

\**Rhamnus frangula* L. (Buckthorn) -6

## ROSACEAE (Rose Family)

*Agrimonia striata* Michx. (Agrimony) -(1,2)

*Crataegus succulenta* Link. (Hawthorn) -4

*Geum canadense* Jacq. (Avens) -6

*Potentilla arguta* Pursh. (Prairie cinquefoil) -1,2

*Potentilla norvegica* L. (Rough cinquefoil) -1,3

*Potentilla rivalis* Nutt. (Cinquefoil) -5

*Prunus americana* Marsh. (Wild plum) -1,3,4,6

*Prunus pumila* L. (Sand-cherry) -2

*Prunus virginiana* L. (Choke-cherry) -1,3,4,6

*Rosa blanda* Ait. (Wood rose) -1,3,4

*Rosa carolina* L. (Pasture rose) -1

*Rosa suffulta* Greene. (Prairie rose) -1

*Rubus occidentalis* L. (Black raspberry) -6

## RUBIACEAE (Madder Family)

*Galium aparine* L. (Cleavers) -4,6

## SALICACEAE (Willow Family)

*Populus deltoides* Marsh. (Cottonwood) -4,6

*Salix amygdaloides* Anderss. (Peach-leaf willow) -4,6

*Salix rigida* Muhl. (Heart-leaved willow) -5

## SANTALACEAE (Sandal-wood Family)

*Comandra umbellata* (L.) Nutt. (Bastard toad-flax) -2

## SAXIFRAGACEAE (Saxifrage Family)

*Heuchera richardsonii* R. Br. (Alum root) -1,2

*Ribes americanum* Mill. (Wild black current) -4

*Ribes missouriense* Nutt. (Gooseberry) -3,4,6

## SCROPHULARIACEAE (Figwort Family)

*Gerardia tenuifolia* Vahl. -5

*Mimulus ringens* L. (Monkey flower) -5

*Penstemon gracilis* Nutt. (Beard-tongue) -1

*Penstemon grandiflorus* Nutt. -1

*Scrophularia lanceolata* Pursh. (Figwort) -1

\**Verbascum thapsus* L. (Mullein) -3

*Veronica peregrina* L. (Speedwell) -(2,4)

## SOLANACEAE (Nightshade Family)

*Physalis heterophylla* Nees. (Ground-cherry) -1,3,7

*Physalis virginiana* Mill. (Ground-cherry) -1,3

*Solanum nigrum* L. (Black nightshade) -7

*Solanum rostratum* Dunal. (Buffalo-bur) -7

## TILIACEAE (Linden Family)

*Tilia americana* L. (Basswood) -4

## ULMACEAE (Elm Family)

*Celtis occidentalis* L. (Hackberry) -4,6

*Ulmus americana* L. (American elm) -4,6

\**Ulmus pumila* L. (Siberian elm) -3

*Ulmus rubra* Muhl. (Red elm) -4,6

## UMBELLIFERAE (Parsley Family)

*Cicuta maculata* L. (Water-hemlock) -5

*Cryptotaenia canadensis* (L.) DC. (Honewort) -6

*Heracleum lanatum* Michx. (Cow-parsnip) -6

*Osmorhiza longistylis* (Torr.) DC. (Sweet cicely) -6

*Zizia aurea* (L.) Koch. (Golden Alexanders) -3,6

## URTICACEAE (Nettle Family)

*Laportea canadensis* (L.) Wedd. (Wood-nettle) -6

*Parietaria pensylvanica* Muhl. (Pellitory) -4

*Urtica dioica* L. (Stinging nettle) -3,7

## VERBENACEAE (Vervain Family)

*Phyla lanceolata* (Michx.) Green. (Fog-fruit) -6

*Verbena hastata* L. (Blue vervain) -5

*Verbena stricta* Vent. (Hoary vervain) -(1,7)

*Verbena urticifolia* L. (White vervain) -6

## VIOLACEAE (Violet Family)

*Viola papilionacea* Pursh. (Meadow violet) -4,6

*Viola pedatifida* G. Don. (Prairie violet) -1

*Viola sororia* Willd. (Woolly blue violet) -6

## VITACEAE (Grape Family)

*Parthenocissus vitaceae* (Kner.) Hitchc. (Virginia creeper) -4,6

*Vitis riparia* Michx. (Riverbank grape) -4,6

## ANTHOPHYTA: MONOCOTYLEDONAE

## ALLISMATACEAE (Water-plantain Family)

*Sagittaria engelmanniana* J. G. Smith. (Arrowhead) -5

## COMMELINACEAE (Spiderwort Family)

*Tradescantia bracteata* Small. (Spiderwort) -1,2,3

(Note: A white-flowered form of this species was also observed on quartzite in 1976.)

## CYPERACEAE (Sedge Family)

*Carex atherodes* Spreng. -5

*Carex bicknellii* Britt. -1  
*Carex brevior* (Dewey) Mackenzie. -1,2,3  
*Carex cristatella* Britt. -4  
*Carex cumulata* (Bailey) Mackenzie. -2  
*Carex eleocharis* Bailey. -2  
*Carex gravida* Bailey. -1,3,4,7  
*Carex haydenii* Dewey. -5  
*Carex laeviconica* Dewey. -3,5  
*Carex lasiocarpa* Ehrh. -2 (= *C. lanuginosa* Michx.)  
*Carex meadii* Dewey. -1  
*Carex molesta* Mackenzie. -3  
*Carex pennsylvanica* Lam. -1,4  
*Carex sprengelii* Dewey. -2(,6) (= *C. longirostris* Torr.)  
*Carex stricta* Lam. -5  
*Carex tribuloides* Wahl. -5  
*Carex vulpinoidea* Michx. -5  
*Cyperus erythrorhizos* Muhl. -5  
*Cyperus inflexus* Muhl. -2 (= *C. aristatus* Rottb.)  
*Eleocharis calva* Torr. (Spike-rush) -5 (= *E. erythropoda* Steud.)  
*Eleocharis compressa* Sulliv. -2  
*Scirpus atrovirens* Willd. (Bulrush) -5  
*Scirpus fluviatilis* (Torr.) Gray. (Bulrush) -5  
*Scirpus validus* Vahl. (Soft-stem bulrush) -5

## GRAMINEAE (Grass Family)

\**Agropyron cristatum* (L.) Gaertn. (Fairway crested wheat) -(1,7)  
 \**Agropyron repens* (L.) Beauv. (Quack grass) -1,3  
*Agropyron smithii* Rydb. (Western wheatgrass) -1  
*Agropyron trachycaulum* (Link.) Malte. -1  
*Agropyron trachycaulum* Var. *unilaterale* (Cassidy) Malte. -1  
*Agrostis hyemalis* var. *tenuis* (Tuckerm.) Gl. (Tickle grass) -2 (= *A. scabra* Willd.)  
*Alopecurus aequalis* Sobol. (Foxtail) -(2,5)  
*Andropogon gerardi* Vitm. (Tall bluestem) -1,3  
*Andropogon scoparius* Michx. (Little bluestem) -1,2  
*Aristida curtissii* (Gray) Nash. (Three-awn) -2  
*Beckmannia syzigachne* (Steud.) Fern. (Slough grass) -5  
*Bouteloua curtipendula* (Michx.) Torr. (Side-oats grama) -1  
*Bouteloua gracilis* (HBK.) Lag. (Blue grama) -1,2  
 \**Bromus inermis* Leyss. (Smooth brome) -1,3,7  
 \**Bromus japonicus* Thunb. (Japanese brome) -2,7  
 \**Bromus tectorum* L. (Downey chess) -3,7  
*Calamovilfa longifolia* (Hook) Scribn. (Sand reed grass) -1  
 \**Dactylis glomerata* L. (Orchard grass) -6  
 \**Echinochloa crusgalli* (L.) Beauv. (Barnyard grass) -3,7  
*Elymus canadensis* L. (Canadian rye grass) -1,3  
*Elymus macounii* Vasey. -7 (Also referred to as *X Agrohordeum macounii* (Vasey) Lepage. by Pohl)  
*Elymus virginicus* L. (Wild rye) -1,6  
 \**Eragrostis cilianensis* (All.) Link (Stink grass) -7  
*Eragrostis pectinacea* (Michx.) Nees. (Love grass) -7  
*Festuca obtusa* Biehler. -6  
*Festuca octoflora* Walt. (Slender fescue) -1,2,3  
*Glyceria grandis* S. Wats. (Manna grass) -5  
*Hordeum jubatum* L. (Foxtail barley) -3,7  
*Hordeum pusillum* Nutt. (Little barley) -2  
*Koeleria cristata* (L.) Pers. (June grass) -1  
*Muhlenbergia cuspidata* (Torr.) Rydb. (Muhly grass) -1  
*Muhlenbergia racemosa* (Michx.) BSP. (Muhly grass). -1,3  
*Panicum capillare* L. (Witch grass) -2,3,7  
*Panicum depauperatum* Muhl. -2  
*Panicum oligosanthes* Schult. -1,3  
*Panicum virgatum* L. (Switch grass) -1

*Panicum wilcoxianum* Vasey. -2  
*Phalaris arundinacea* L. (Reed canary grass) -3  
 \**Phleum pratense* L. (Timothy) -1  
 \**Poa compressa* L. (Canada bluegrass) -2  
*Poa palustris* L. (Fowl meadow-grass) -5  
 \**Poa pratensis* L. (Kentucky bluegrass) -1,3,6  
*Schedonnardus paniculatus* (Nutt.) Trel. (Tumble grass) -2  
 \**Setaria viridis* (L.) Beauv. (Green foxtail) -7  
*Sorghastrum nutans* (L.) Nash. (Indian grass) -1  
*Spartina pectinata* Link. (Cord grass) -1  
*Sphenopholis obtusata* (Michx.) Scribn. (Wedge grass) -5  
*Sporobolus asper* (Michx.) Kunth. (Dropseed) -3  
*Sporobolus cryptandrus* (Torr.) Gray. (Sand dropseed) -1,2,3,7  
*Sporobolus heterolepis* Gray. (Prairie dropseed) -1  
*Sporobolus vaginiflorus* (Torr.) Wood. (Dropseed) -2  
*Stipa spartea* Trin. (Porcupine grass) -1  
*Stipa viridula* Trin. (Feather bunch-grass) -1

## IRIDACEAE (Iris Family)

*Sisyrinchium campestre* Bickn. (Blue-eyed grass) -1

## JUNCACEAE (Rush Family)

*Juncus interior* Wieg. (Rush) -2,5

## LEMNACEAE (Duckweed Family)

*Lemna minor* L. (Duckweed) -5,6

## LILIACEAE (Lily Family)

*Allium canadense* L. (Wild onion) -2,4  
*Allium stellatum* Ker. (Wild onion) -1,2  
*Polygonatum biflorum* (Walt.) Ell. (Solomon's seal) -4,6  
*Smilacina stellata* (L.) Desf. (False Solomon's seal) -4  
*Smilax herbacea* L. (Carrion flower) -4

## SPARGANIACEAE (Bur-reed Family)

*Sparganium eurycarpum* Engelm. (Bur-reed) -5

## DISCUSSION

*Species Reported by Others*

The northwest part of Lyon County, with its Sioux quartzite outcrops, was first studied and collected by Shimek (1897; 1898; 1900). Carter (1960), in a compilation of the flora of northwestern Iowa, presented his collections and observations as well as those of others such as Shimek, Anderson, Hayden, Grant, and Thorne. Carter listed several plants from Gitche Manitou which were not found in this study. Several of these are Shimek's collections and have not been observed or reported since 1900.

Below is an alphabetical list of species reported by Carter but not found in this study. The superscript numbers in the list refer to later numbered annotations to explain or comment on select species or groups of species. It should also be noted that Shimek reported several species in his 1897-1900 publications which Carter (1960) did not include. I am assuming that these discrepancies reflect misidentifications by Shimek which Carter corrected or collections by Shimek that Carter could not verify from vouchers. These unverified taxa are not included here.

## PTEROPHYTA: LEPTOSPORANGIOPSIDA

## POLYPODIACEAE

*Athyrium filix-femina* (L.) Roth (= *A. angustum* (Willd.) Presl.)<sup>1,5</sup>

VASCULAR FLORA OF GITCHIE MANITOU STATE PRESERVE

MARSILEACEAE

*Marsilea mucronata* A. Br. (= *M. vestita* Hook. and Grev.)<sup>2</sup>

ANTHOPHYTA: DICOTYLEDONAE

AMARANTHACEAE

*Amaranthus albus* L.

BORAGINACEAE

*Lithospermum incisum* Lehm.<sup>3</sup>

CACTACEAE

*Opuntia compressa* (Salisb.) Macbr. (= *O. rafinesquii* Engelm.)<sup>4,5</sup>

CAPRIFOLIACEAE

*Sambucus canadensis* L.

CHENOPODIACEAE

*Chenopodium gigantospermum* Aellen (= *C. hybridum* L.)

*Chenopodium leptophyllum* Nutt.

COMPOSITAE

*Anthemis cotula* L.<sup>5</sup>

*Artemisia frigida* Willd.

*Aster sericeus* Vent.<sup>3</sup>

*Cirsium flodmanii* (Rydb.) Arthur

*Coreopsis palmata* Nutt.<sup>3</sup>

*Solidago speciosa* Nutt.<sup>5</sup>

CRUCIFERAE

*Arabis hirsuta* (L.) Scop.

*Descurainia sophia* (L.) Webb.

*Rorippa sinuata* (Nutt.) Hitchc.

EUPHORBIACEAE

*Acalypha rhomboidea* Raf.<sup>5</sup>

*Euphorbia glyptosperma* Englem.

*Euphorbia maculata* L.

FABACEAE

*Chamaecrista fasciculata* (Michx.) Greene (also *Caesalpinia*: *Cassia fasciculata* Michx.)<sup>3</sup>

*Lathyrus palustris* L.<sup>5</sup>

*Lotus americanus* (Nutt.) Bisch. (= *L. purshianus* Clem. & Clem.)<sup>5</sup>

LABIATEAE

*Isanthus brachiatus* (L.) BSP.

LINACEAE

*Linum sulcatum* Riddell.

LYTHRACEAE

*Ammannia coccinea* Rottb.<sup>5</sup>

MENISPERMACEAE

*Menispermum canadense* L.<sup>5</sup>

NYMPHAEACEAE

*Nuphar luteum* (L.) Sibth. & Sm.<sup>3,5,6</sup>

*Nymphaea tuberosa* Paine<sup>3,5,6</sup>

OROBANCHACEAE

*Orobanche ludoviciana* Nutt.<sup>5</sup>

POLYGALACEAE

*Polygala verticillata* L.<sup>5</sup>

POLYGONACEAE

*Polygonum scandens* L.

*Rumex altissimus* Wood.

RANUNCULACEAE

*Anemone caroliniana* Walt.

*Ranunculus circinatus* Sibth.<sup>5</sup>

*Thalictrum dasycarpum* Fisch. & Ave-Lall.<sup>5</sup>

ROSACEAE

*Fragaria virginiana* Duch.<sup>5</sup>

*Potentilla pensylvanica* L.

RUBIACEAE

*Galium obtusum* Bigel.<sup>5</sup>

SALICACEAE

*Salix humilis* Marsh.

SCROPHULARIACEAE

*Bacopa rotundifolia* (Michx.) Wettst.<sup>6</sup>

*Chaenorrhinum minus* (L.) Lange.

*Gerardia aspera* Dougl.<sup>5</sup>

*Gratiola neglecta* Torr.

*Lindernia dubia* (L.) Pennell.<sup>5</sup>

*Penstemon albidus* Nutt.

UMBELLIFERAE

*Lomatium orientale* C. & R.

VERBENACEAE

*Verbena simplex* Lehm.

VIOLACEAE

*Viola sagittata* Ait.

ANTHOPHYTA: MONOCOTYLEDONAE

ALISMACEAE

*Sagittaria latifolia* Willd.<sup>5,6</sup>

COMMELINACEAE

*Tradescantia ohiensis* Raf.<sup>3</sup>

CYPERACEAE

*Carex bebbii* Olney.

*Carex festucacea* Schk.

*Carex hystericina* Muhl.<sup>5</sup>

*Carex tetanica* Schk.  
*Cyperus acuminatus* Torr. & Hook.  
*Cyperus odoratus* L.<sup>5</sup>  
*Cyperus strigosus* L.  
*Eleocharis engelmannii* Steud. (= *E. ovata* (Roth) R. & S.)  
*Eleocharis obtusa* (Willd.) Schultes. (= *E. ovata* (Roth) R. & S.)  
*Scirpus americanus* Pers.<sup>5,6</sup>

## GRAMINEAE

*Agrostis palustris* Huds.  
*Agrostis perennans* (Walt.) Tuck.  
*Alopecurus carolinianus* Walt.  
*Bromus commutatus* Schrad. (= *B. racemosus* L.)  
*Buchloe dactyloides* (Nutt.) Engelm.<sup>7</sup>  
*Eragrostis hypnoides* (Lam.) BSP.  
*Leersia oryzoides* (L.) Sw.  
*Leersia virginica* Willd.  
*Panicum implicatum* Scribn.  
*Phragmites communis* Trin.<sup>3,6</sup>  
*Poa arida* Vasey.

## HYDROCHARITACEAE

*Anacharis canadensis* (Michx.) Rich.<sup>5,6</sup>

## JUNCACEAE

*Juncus torreyi* Cov.<sup>5</sup>

## LEMNACEAE

*Spirodela polyrhiza* (L.) Schleiden.<sup>5</sup>

## NAJADACEAE

*Najas flexilis* (Willd.) Rostk. & Schmidt.<sup>6</sup>

## PONTEDERIACEAE

*Heteranthera dubia* (Jacq.) MacM. (= *Zosterella dubia* (Jacq.) Small)<sup>5</sup>  
*Heteranthera limosa* (Sw.) Willd.<sup>6</sup>

## TYPHACEAE

*Typha latifolia* L.<sup>3,6</sup>

*Annotations and Comments on Plants Listed by Others*

1) Shimek (1900) described this as a "species of rocky, sometimes more or less shaded, banks." It is recorded *only* from a collection in NW corner of Lyon County in 1899.

2) This species is known in northwestern Lyon County from two collections, by Shimek in 1899 and in 1963 by Grant (Peck, 1976). It is evidently adventive in wet years and probably at the quartzite 1½ miles east of Gitchie Manitou (sec. 7, T 100N, R 48W).

3) These are all showy, easily recognized species. They were not found in this study and are believed to be locally extirpated.

4) Although Carter does not include this in his thesis, it is worth noting. Shimek reported it in 1900 from Pammel's study (1895). Pammel's data comes from Bandusia Wakefield's "colored sketches in her possession." It is probably misidentified. However, there appears to be two forms of *Opuntia fragilis* at Gitchie Manitou, one form has much flatter stems than typical *O. fragilis*. This is probably the source of the confusion.

5) These 27 species are reported from Shimek's collections prior to 1900 from the northwestern corner of Lyon County. Only three of them are reported from other sites in Lyon County: *Thalictrum dasycarpum*

was found by Carter (NE¼, sec. 9, T 98N, R 48W), *Nuphar luteum* and *Anacharis canadensis* were both found by Shimek in Rock Rapids in 1896 (Carter, 1960).

6) These aquatic or wetland species probably were originally found around Jasper Pool and may have been eliminated by the dredging operation.

7) *Buchloe dactyloides* was found at Gitchie Manitou in 1956 by Carter. I have not collected it at Gitchie Manitou, but have found it in the heavily grazed pasture on quartzite 1½ miles east of Gitchie Manitou during the very dry summer of 1976.

Several other factors may have caused some species to become locally extirpated; 1) the drought of the 1930's, 2) the recent dry years in Lyon County may have eliminated, suppressed, or resulted in production of depauperate, unrecognizable forms, and 3) the duff build-up could have caused local extinctions or suppression of prairie species. There is always the possibility that a given species may be opportunistic, being present only for a short period.

Finally, several species may have been overlooked in this study. Any additions to this flora should be brought to the attention of this author and the Iowa Preserves Board.

*Plants of Limited Distribution in Iowa*

Several members of the Gitchie Manitou flora are noted by Carter (1960) and Thorne (1956) as rare: *Woodsia organa*, *Selaginella rupestris*, *Opuntia fragilis*, *Triodanis perfoliata*, *Cerastium viscosum*, *Chrysopsis villosa*, *Geranium carolinianum*, *Colomia linearis*, *Polygonum tenue*, *Talinum parviflorum*, *Agrimonia striata*, *Prunus pumila*, *Gerardia tenuifolia*, *Penstemon gracilis*, *Veronica perigrina*, *Carex molesta*, *Eleocharis compressa*, *Aristida curtissii*, *Hordeum jubatum*, *Panicum depauperatum*, and *Schedonnardus paniculatus*. The designation "rare" is somewhat ambiguous and relative. In the case of some (*Opuntia fragilis* and *Talinum parviflorum*) the Gitchie Manitou Preserve is the principle site in Iowa because of its unique habitat and, hence, rare in Iowa. If only the Gitchie Manitou quartzite is considered, then these two plants are abundant and can be similarly found on Sioux quartzite in South Dakota and Minnesota (personal observation). Others (*Penstemon gracilis* and *Schedonnardus paniculatus*) are more common in western states, and Iowa may represent the eastern limit of their range (Pohl, 1966; Roosa and Eilers, 1978). Roosa and Eilers (1978) annotated a more defined listing of Iowa plants designating "rare" plants as presumed extirpated (PE) — known from previous records but not presently found, endangered (E) — known from three or fewer sites, threatened (T) — very limited distribution, and undetermined (U) — status unknown but survival in state's flora is of concern. Plants from this survey that are included in the report of Roosa and Eilers (1978) are as follows with the above letter designations denoting their status: *Woodsia oregana* (E), *Selaginella rupestris* (T), *Opuntia fragilis* (T), *Amorpha nana* (E), *Talinum parviflorum* (E), *Penstemon gracilis* (T), *Schedonnardus paniculatus* (E).

*Synopsis of Species and Their Community Presence by Family*

Species of families that are represented by four or more species are scored as to community presence (Table 1). This gives a synopsis of species composition in each community. The number of non-native species is indicated in parentheses and represents a part of the total in each category. Four families, Compositae, Fabaceae, Cyperaceae, and Gramineae, contain 47.4% of all the species. The number of non-native species in each community indicates the degree of successional stability or community openness to invading species. The communities which have (had) disturbance or are by definition disturbed, communities 3 and 7, have more than 19% introduced or non-native species present. Those communities which are more stable have less than 8% non-native species present, communities 1, 2, and 3. Communities 5 and 6 are intermediate with 9-13% non-native species which may reflect the

VASCULAR FLORA OF GITCHIE MANITOU STATE PRESERVE

Table 1. Community presence of species arranged by family. ( ) indicates the number of non-native species in that category.

	Prairie -1-	Quartzite -2-	Sec. Succ. Grassland -3-	J. Pool Woods -4-	J. Pool Littoral -5-	Big Sioux Flood Pln. -6-	Disturbed -7-	No. of species represented in family
Asclepiadaceae	2	-	3	-	1	-	-	4
Caryophyllaceae	3 (1)	2 (1)	1	1 (1)	-	-	-	4 (2)
Compositae	25 (2)	7	24 (4)	3 (1)	11 (3)	12 (3)	10 (3)	61 (10)
Cruciferae	-	2	-	-	1	1	4 (2)	7 (2)
Euphorbiaceae	1	1	1 (1)	1	2	1	-	5 (1)
Fabaceae	12 (1)	-	4 (2)	1	-	-	5 (5)	18 (6)
Labiatae	1	1	1	-	2	7 (2)	1 (1)	9 (2)
Polygonaceae	-	2	1 (1)	-	8 (2)	1	5 (1)	14 (3)
Ranunculaceae	4	1	-	2	1	2	-	7
Rosaceae	8	3	4	4	1	4	-	14
Scrophulariaceae	3	1	1 (1)	1	2	-	-	7 (1)
Solanaceae	2	-	2	-	-	-	3	4
Ulmaceae	-	-	1 (1)	3	-	3	-	4 (1)
Umbelliferae	-	-	1	-	1	4	-	5
Verbenaceae	1	-	-	-	1	2	1	4
Cyperaceae	5	7	3	3	11	1	1	24
Gramineae	27 (5)	15 (2)	15 (5)	-	5	4 (2)	12 (7)	53 (12)
Liliaceae	1	2	-	4	-	1	-	5
Other families	17	17 (2)	16 (1)	26	9	26 (2)	11 (4)	80 (8)
Totals	112 (9)	61 (5)	78 (16)	49 (2)	56 (5)	69 (9)	53 (23)	328 (48)

periodic changes in the water level and associated disturbance to the habitat. The native prairie shows the largest diversity of species present.

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