

Marsh and Aquatic Angiosperms
of Iowa

E.O. Beal

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G. W. MARTIN, *Editor*

MARSH AND AQUATIC ANGIOSPERMS OF IOWA

MONOCOTYLEDONS

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DICOTYLEDONS

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THE MARSH AND AQUATIC ANGIOSPERMS OF IOWA

The flora of Iowa, composed of about 1900 species of vascular plants, is commonly divided into two ecological associations, the true prairie and the oak-hickory forest (Weaver and Clements, 1938). Within these associations many plant communities exist, of which the best known are the agriculturally important uplands. Less well known are the communities encompassing the flora of our lakes, ponds, streams and adjacent swampy or boggy areas. The texts by Fassett (1940) and Muenscher (1944) include most of the plants of these areas but, due to the large area to which they apply, are somewhat complex and lack the specific detail possible in a paper dealing with a circumscribed area the size of Iowa. Frequent reference to the "marsh and aquatic" plants may also be found in many local, county, state and regional floristic, monographic, and ecological studies but the information is generally too widely scattered to be of practical value. The bibliography, although not intended as a complete list of the literature, contains references to many of these studies. It is the hope of the present authors that this paper may partially fill that gap in our knowledge of the flora of Iowa and serve as a simple and compact aid to any person having an interest in the flora of the areas considered.

As may be readily ascertained by a survey of the literature cited in the bibliography, no two authors are in agreement as to what constitutes "marsh and aquatic" habitats or what species should be included in a study of the subject. The selection of species here included has been made on the basis of limited field work on the part of the authors, personal communication with interested botanists, habitat information on herbarium sheets, and comparative examination of works such as Fassett (1940), Moyle and Hotchkiss (1945) and Muenscher (1944). The last was used almost exclusively in limiting the Monocotyledons. In certain cases where misidentifications might easily occur closely related species that are not strictly aquatic have been included.

Without attempting a critical analysis, it may be worth while to examine briefly some of the factors which influence the distribution of vascular plants in Iowa.

Basic and quite inextricably associated with several other factors is the geology of the state. Glaciation is particularly important in this

regard. The four glacial ice sheets which invaded Iowa brought with them great quantities of debris which, together with interglacial loess deposits, mantles most of the state to depths of several hundred feet at the present time. In this study, the last of the ice sheets to invade Iowa, the Wisconsin glacier, is of greatest importance. Recent work on this period of geological history reveals that this ice sheet invaded in four separate substages, namely the Iowan, the Tazwell, the Cary and the Mankato (Ruhe, 1950). The Iowan and more recent Tazwell ice sheets covered most of the northern half of Iowa and drift deposits from these ice sheets are exposed in that area except where covered by later glacial activity. For simplicity, this area will be referred to by its older name, the Iowan drift sheet, in later references.

Following the deposition of the Iowan drift sheet, large quantities of loess were deposited on the debris left by the preceding ice sheets. This loess is the surface material over much of the state at present.

The Cary and more recent Mankato ice sheets covered the north-central part of the state and left the irregular topography of morainal hills and swampy plains that is typical of the Iowa Great Lakes Region. This region and, to a lesser extent, the Iowan drift are particularly important in this study because of the relatively uneroded surface with many kettleholes, bogs, fens, swamps and lakes. A majority of the specimens examined have been collected from these areas.

In geologically mature southern and western Iowa, the well drained and often rugged topography has left few natural marsh or aquatic habitats, a fact well demonstrated by many of the accompanying distribution maps. Recent intensive collecting by Fay (1953) has indicated that future work will fill some of the large gaps in these areas.

The drainage of Iowa is accomplished by two major river systems, the Mississippi and its tributaries in the eastern two-thirds of the state and the Missouri and its tributaries in the west and southwest.

The climate of Iowa is that of a typical mid-continental, prairie state with rather extreme variations in temperature being encountered. Average January temperatures range from 14° F. in the north to 24° F. in the extreme southeastern corner of the state. The July average ranges from 72° F. in the north to 76° F. in the southeastern and southwestern corners of the state. The growing season ranges from 140 to 170 days, the average being 158 days.

To supplement the keys and annotated check-list, maps of plant distribution have been prepared from the data taken from the labels of plant specimens identified and annotated by the authors. Except

where noted otherwise, these specimens are now on file in either the Herbarium of Iowa State College or the Herbarium of the State University of Iowa. In future reference to these herbaria, the abbreviations ISC and IA will be used for the respective institutions. In cases where very few specimens of a species exist, a complete list of the specimens examined is included in the annotated catalogue.

A map indicating the known distribution within the state has been prepared for each of the 224 species included in this study. Within the limits of available space, a dot has been placed on the map to represent each collection. Solid dots have been placed as accurately as possible on the site of the collection and where no other records for the county exist, open circles have been placed in the center of the county to represent a specimen with no specific locality information given. In the Monocotyledons crosses have been used to designate reports which could not be substantiated by specimens on file in the previously mentioned herbaria.

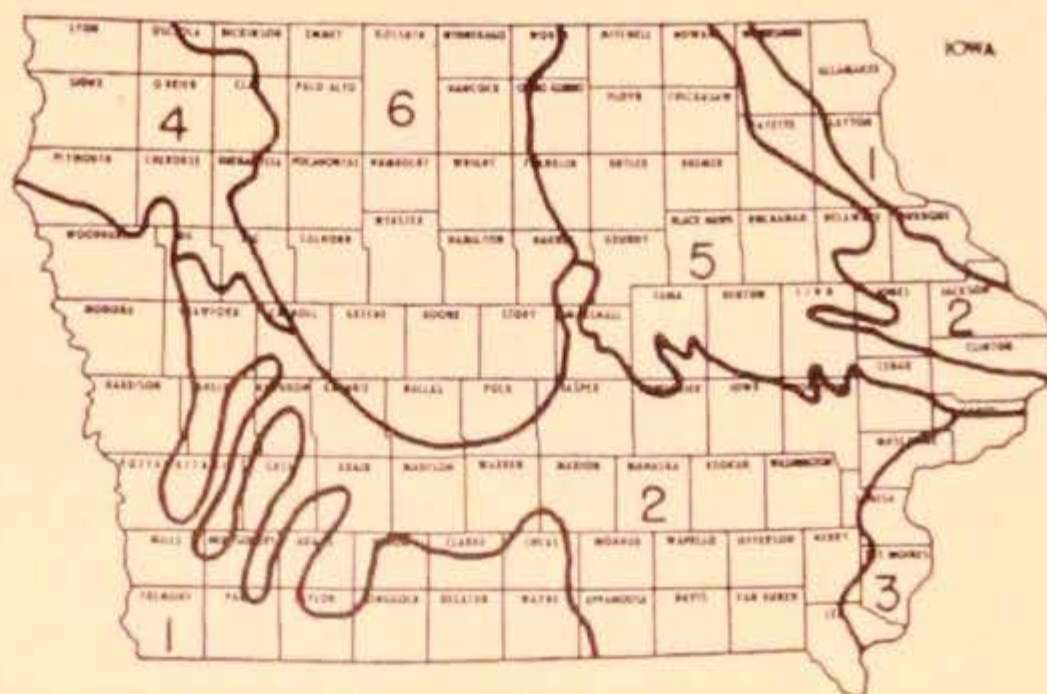
The plant families treated in this study are arranged in the order in which they appear in the eighth edition of *Gray's Manual of Botany* (Fernald, 1950) and except where a supplementary reference has been included, the nomenclature is that of the same manual or of Gleason (1952).

Among the many to whom the authors are indebted for help in the preparation of this paper, special acknowledgement is due to Dr. R. W. Pohl, Curator of the Herbarium, Iowa State College, under whose direction Mr. Monson prepared the section on the Dicotyledons; and to Dr. R. F. Thorne, Curator of the Herbarium, State University of Iowa, under whose direction Mr. Beal prepared the section on the Monocotyledons.

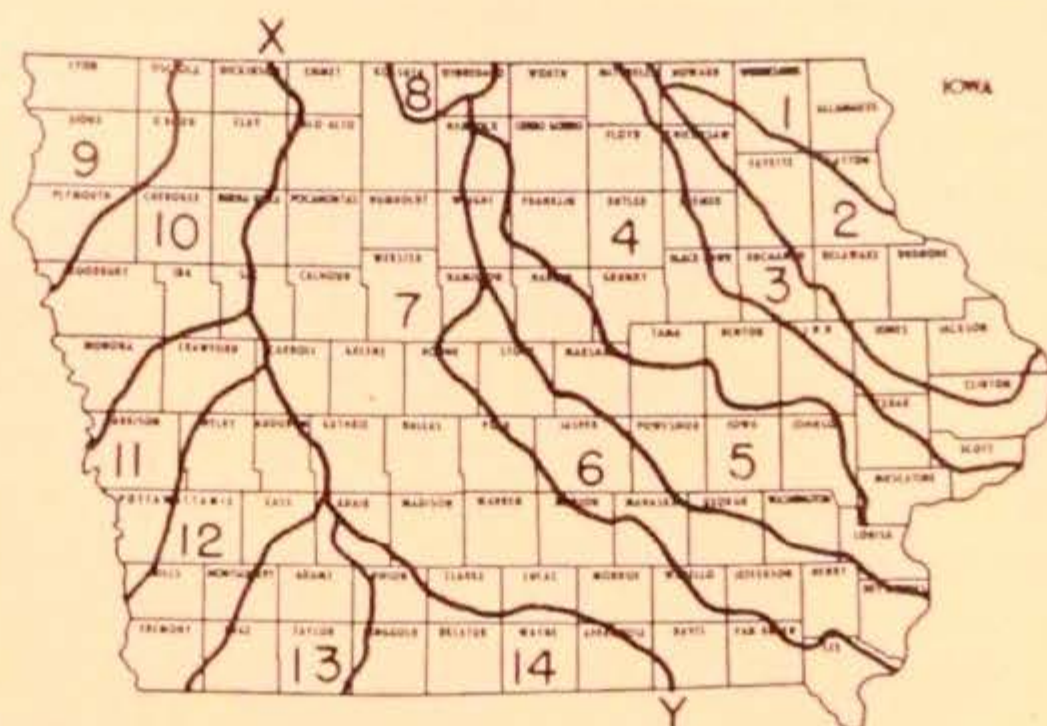
MAP I. Glaciation. Adapted from Kay and others (1944) and Ruhe (1950). 1. Nebraskan drift. 2. Kansan drift. 3. Illinoian drift. 4. Iowan and Tazwell drifts. 5. Iowan drift. 6. Mankato and Cary drifts.

MAP II. Drainage. Adapted from Kay and others (1944). 1. Upper Iowa and Yellow Rivers. 2. Maquoketa and Turkey Rivers. 3. Wapsipinicon River. 4. Cedar River. 5. Iowa River. 6. Skunk River. 7. Des Moines River. 8. Blue Earth River. 9. Floyd and Rock Rivers. 10. Little Sioux River. 11. Boyer River. 12. Nishnabotna River. 13. Nodaway and Platte Rivers. 14. Grand and Chariton Rivers. X—Y. The divide between the Mississippi River drainage on the east and the Missouri River on the west.

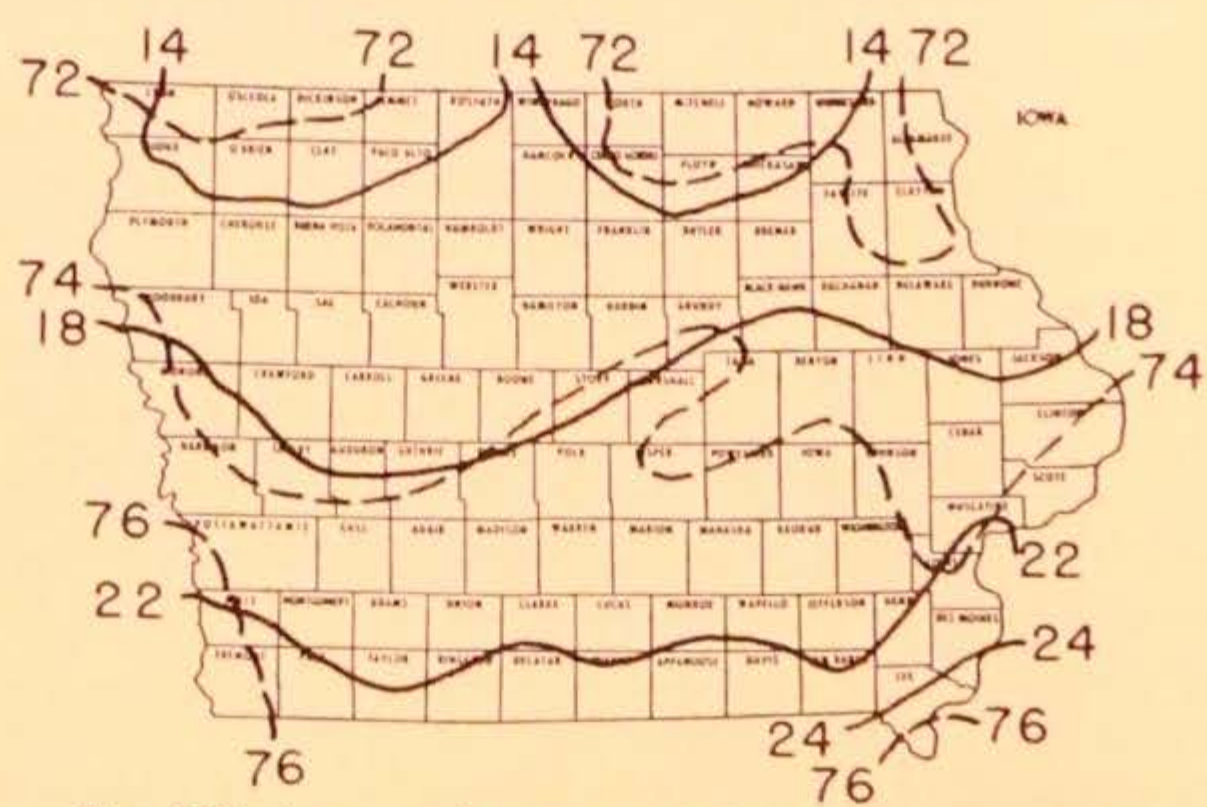
MAP III. Average January and July Temperatures. Adapted from Reed (1941). The continuous lines are isotherms connecting places of the same average January temperatures. The dotted lines are isotherms connecting places of the same average July temperatures.



Map I Glaciation



Map II Drainage



Map III Average January and July Temperatures

MARSH AND AQUATIC ANGIOSPERMS OF IOWA

KEY TO THE SUBCLASSES

1. Leaves parallel-veined; vascular bundles of the stem scattered (the Duckweeds, Lemnaceae, are stemless and freely float on the water surface) ----- MONOCOTYLEDONS p. 7
1. Leaves net-veined; vascular bundles of the stem in a ring ----- DICOTYLEDONS p. 53

MONOCOTYLEDONS

KEY TO THE FAMILIES

1. Individual plants minute, 10 mm. or less in length, consisting of a green frond and rootlets or of a frond only; freely floating, often aggregated in small rosettes or mats ----- LEMNACEAE p. 45
1. Individual plants larger, roots and stem present ----- 2
 2. Plants submersed, stem and leaves weak, supported by the water ----- 3
 2. Plants emersed, part or all of the stem and leaves normally protruding from the water, stem self supporting; or plants of wet soil ----- 9
3. Leaves or pedicels whorled on an elongate axis ----- 4
3. Leaves or pedicels not whorled ----- 5
 4. Plants with whorled leaves on an elongate stem; flowers axillary, long stalked or floating free; perianth evident, white ----- HYDROCHARITACEAE p. 23
 4. Plants with whorled pedicels, the upper flowers usually staminate ----- ALISMACEAE p. 20
5. Flowers clustered in leaf axils or in spikes; perianth absent or much modified ----- 6
5. Flowers solitary in leaf axils or in sparse racemes ----- 7
 6. Fruit short stalked, axillary, beaked and with a row of teeth down one side; leaves mostly opposite ----- ZANNICHELLIACEAE p. 17
 6. Fruit sessile, in spikes; leaves on the lower part of the stem alternate, the upper opposite ----- POTAMOGETONACEAE p. 11
7. Leaves opposite (the stem usually branching from the axil of one of the pair); flowers axillary, sessile; perianth much reduced ----- NAJADACEAE p. 19
7. Leaves alternate; stem elongate or very short ----- 8
 8. Stem elongate; leaves cauline; perianth yellow ----- PONTEDERIACEAE p. 49
 8. Stem very short; leaves basal, long and ribbon-like; perianth white; flowers very long stalked or floating free ----- HYDROCHARITACEAE p. 23
9. Flowers borne in the axils of regularly imbricated, dry scales; base of the leaf sheathing the stem; sheath either open or closed ----- 10

9. Flowers not borne in the axils of regularly imbricated, dry scales (the perianth of the flowers of the Juncaceae is dry and scale-like but definitely consists of three sepals and three petals) ----- 11
10. Scales subtending the flowers paired; stem often hollow, with numerous nodes; perianth reduced to minute scales (lodicules); cauline leaves two ranked; sheath often open; fruit a grain ----- GRAMINEAE p. 24
10. Scales subtending the flowers solitary; stem often solid, nodes soft or absent; cauline leaves three ranked if present; sheath often closed; fruit an achene ----- CYPERACEAE p. 31
11. Upper portion of the inflorescence composed of staminate flowers; the lower flowers either perfect or pistillate ----- 12
11. Upper and lower flowers of the inflorescence similar and perfect ----- 14
12. Flowers borne on whorled pedicels; perianth obvious; leaves with expanded blades or spongy phyllodia ----- ALISMATACEAE p. 20
12. Flowers clustered in dense heads or spikes; leaves linear, many times longer than broad ----- 13
13. The flowers compacted into dense spikes on a common axis, the upper staminate, the lower pistillate ----- TYPHACEAE p. 8
13. The flowers in dense heads, the lower pistillate and bur-like; the inflorescence branched or simple ----- SPARGANIACEAE p. 9
14. Flowers crowded on a soft, fleshy axis (spadix) ----- ARACEAE p. 44
14. Flowers not crowded on a spadix ----- 15
15. Leaves with expanded blades, the lateral margins not parallel; blades ovate to narrowly elliptical, usually with cordate or lobed bases ----- 16
15. Leaves linear to setaceous ----- 17
16. Inflorescence a raceme with whorled pedicels; perianth white ----- ALISMATACEAE p. 20
16. Inflorescence a spike or a few flowered raceme, rarely a solitary flower, pedicels not whorled; perianth blue or yellow ----- PONTEDERIACEAE p. 49
17. Blades 5 mm. or less in width; flowers less than 1 cm. in length, inconspicuous ----- 18
17. Blades more than 5 mm. in width; flowers large and showy ----- IRIDACEAE p. 52
18. Leaves without expanded blades, setaceous, without hard cross-partitions; inflorescence a spike-like or few flowered raceme; perianth herbaceous, greenish ----- JUNCAGINACEAE p. 19
18. Leaves with linear blades, or terete with hard cross-partitions; inflorescence cymose with clustered flowers; perianth chaff-like ----- JUNCACEAE p. 49

TYPHACEAE

1. *Typha* L. (Cat-tail)

1. Pollen grains simple; pistillate and staminate portions of the spike usually separated; pistillate flowers with subtending bracts; leaves convex on the back, 0.3-1 cm. broad ----- 1. *T. angustifolia*

1. Pollen grains in tetrads; pistillate and staminate portions of the spike usually confluent; pistillate flowers without subtending bracts; leaves flattened, 0.5-2.5 cm. broad ----- 2. *T. latifolia*

1. *T. angustifolia* L. (Narrow-leaved Cat-tail) Map 1

Marshes, sloughs, drainage ditches and lake margins throughout Iowa except in the southeast; frequent. Chiefly in the central and eastern states.

2. *T. latifolia* L. (Common Cat-tail) Map 2

Ditches, marshes, sloughs, shallow ponds and lake margins throughout Iowa; common. Widespread in the United States.

An investigation by Fassett & Calhoun (1952) indicates that *T. angustifolia* and *T. latifolia* may not be distinct in some localities. Since little difficulty in separating the two species was encountered in the specimens examined for this study, they are treated as separate species. Future work may show the natural relationship of the members of this taxon more precisely.

SPARGANIACEAE

1. *Sparganium* L. (Bur-reed)

1. Pistils with two stigmas; mature achenes obpyramidal, truncate at the summit ----- 3. *S. eurycarpum*
1. Pistils with one stigma; mature achenes fusiform and confluent with the elongate style ----- 2
2. At least one pistillate head supra-axillary, stalked or sessile ----- 2. *S. chlorocarpum*
2. All pistillate heads axillary, stalked or sessile, or borne on axillary branches ----- 1. *S. americanum*

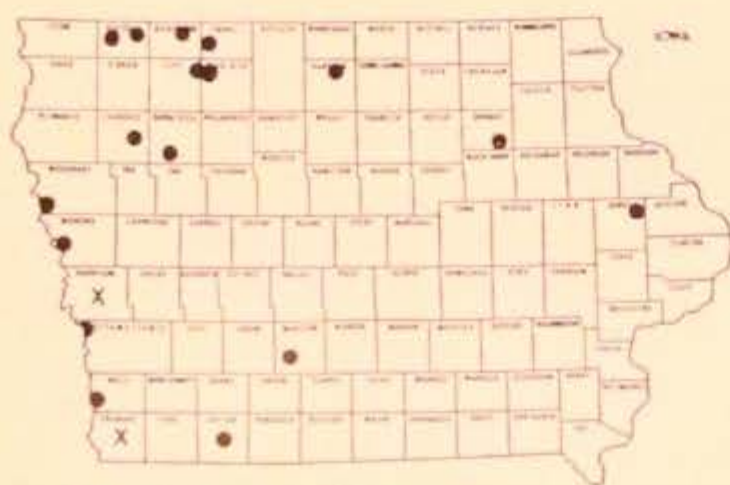
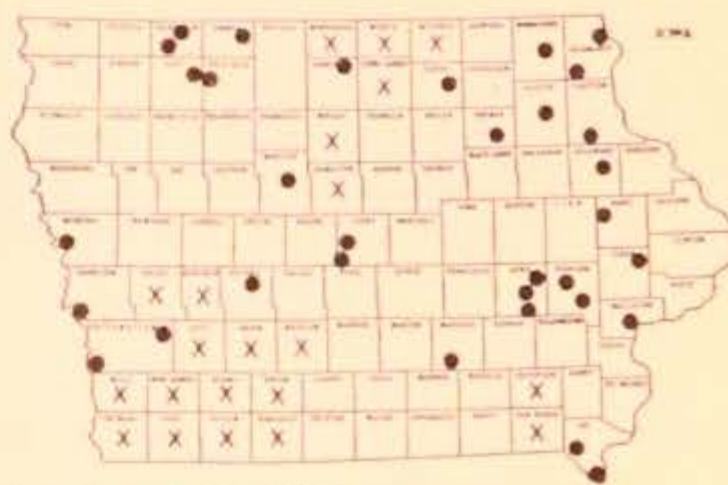
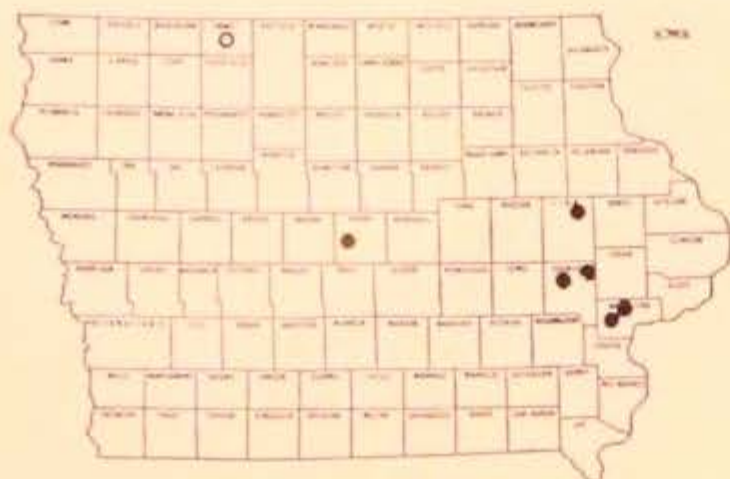
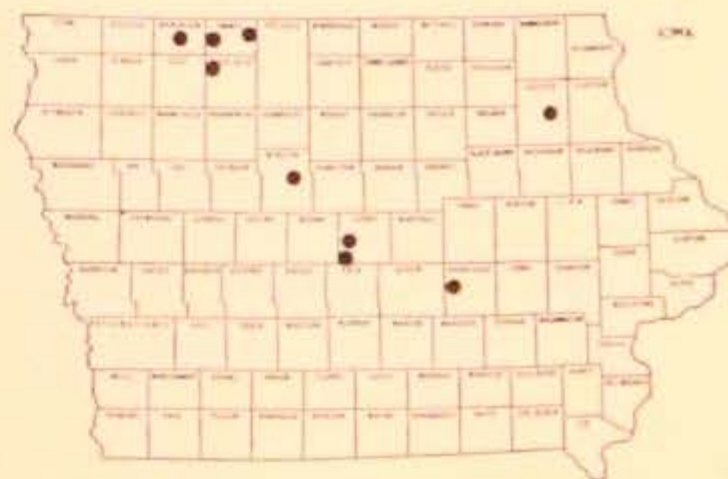
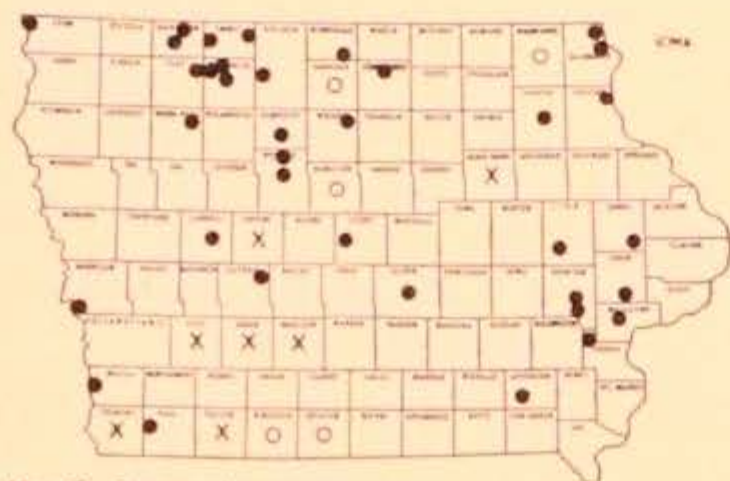
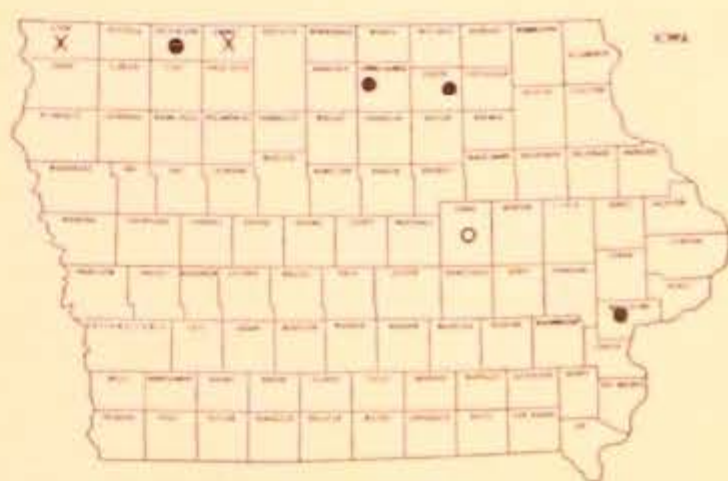
1. *S. americanum* Nutt. Map 3

S. androcladum (Engelm.) Morong

Shallow ponds and lake margins; infrequent. Common throughout the eastern portion of the United States.

Emmet Co.: R. I. Cratty, Sept. 1898 (Herbarium of Grinnell College). Johnson Co.: Swan Lake, R. F. Thorne 10469, Oct. 1950 (IA); Desiccated pond, Cedar Twp., S. 12, R. F. Thorne 13665, Sept. 26, 1953 (IA). Linn Co.: Coggon Bog, E. O. Beal 367, July 13, 1953 (IA). Muscatine Co.: Cedar River region, F. Reppert, June 1894 (IA); Wilton, A. S. Hitchcock, 1889 (ISC); Pontederia pond north-east of Bayfield, B. Shimek, June 1894 (IA). Story Co.: Ames, A. S. Hitchcock, 1889 (ISC).

Since the characteristics of *S. androcladum*, as given by Fernald (1950) and Gleason (1952), do not seem to clearly distinguish the

Map 1. *Typha angustifolia*Map 2. *Typha latifolia*Map 3. *Sparganium americanum*Map 4. *Sparganium chlorocarpum*Map 5. *Sparganium eurycarpum*Map 6. *Potamogeton amplifolius*Map 7. *Potamogeton berchtoldii*Map 8. *Potamogeton crispus*

Iowa specimens from *S. americanum*, the former taxon is reduced to synonymy.

2. *S. chlorocarpum* Rydb.

Map 4

S. acaule Rydb.

Wet ditches, bogs, marshes, shallow ponds, sloughs and lake margins of central and northern Iowa; frequent. Chiefly in the north-eastern states.

3. *S. curycarpum* Rydb.

Map 5

Wet ditches, bogs, marshes, shallow ponds, sloughs and lake margins throughout Iowa; common. Widespread throughout the United States except in the south.

POTAMOGETONACEAE

1. *Potamogeton* L. (Pondweed)

1. All leaves narrowly linear or setaceous, submersed 2
1. All or at least the upper (floating) leaves not linear but ovate to narrowly elliptical 9
 2. Leaves setaceous, septate by straight cross-partitions; leaf base and stipule fused to form an elongate, firm sheath.....12. *P. pectinatus*
 2. Leaves flat, not septate; leaf base and stipule not fused..... 3
3. Stem flat, 0.7-3 mm. broad; leaves 2-5 mm. broad with numerous (up to 35) fine and 3 major veins; leaf tips abruptly pointed...19. *P. zosteriformis*
3. Stem filiform, slender; leaves with fewer veins (1-9) 4
 4. Stipules not connate, the margins often enclosing the stem but not united (this may be determined by careful dissection of the stipule surrounding a young leaf); the pair of basal glands at base of the leaf minute; lacunae bordering midrib well developed..... 5
 4. Stipules connate, forming a closed tube around the stem at first but often splitting with age 6
5. Leaves up to 3 mm. wide, with blunt or obtuse tips; fruit usually present2. *P. berchtoldii*
5. Leaves 0.5 mm. or less wide, with acute tips; plants sterile....18. *P. caseyi*
6. Fruit with an undulate dorsal keel; leaves without basal glands, lateral veins joining the midrib at different points below the tip or evanescent6. *P. foliosus*
6. Fruit rounded on the back; leaves usually with a pair of basal glands 7
7. Leaves with two or three pairs of lateral veins and frequent transverse connections; tip rounded and minutely cuspidate, basal glands large, 0.3-0.6 mm. broad; stipules strongly fibrous, whitish; fruit with a dorsal keel and obscure lateral keels7. *P. friesii*
7. Leaves with one (rarely two) pair of lateral veins; basal glands minute or absent; fruit without lateral keels 8
8. Stipules strongly fibrous, becoming whitish; leaves often revolute,

- with acute to attenuate tips; winter buds covered with strongly fibrous, white stipules; fruit with only a rounded dorsal keel ----- 17. *P. strictifolius*
8. Stipules not strongly fibrous, delicate; winter buds covered with scarious stipules; fruit rounded on the back ----- 14. *P. pusillus*
9. Leaves sessile, with clasping, cordate bases; no specialized floating leaves present ----- 10
9. Leaves on the upper part of the stem with definite petioles ----- 12
10. Margins of leaves sharply serrulate ----- 3. *P. crispus*
10. Margins of leaves not serrulate ----- 11
11. Leaves with cucullate tips (shaped like the bow of a boat), entire, 1-2.5 dm. long; stipules conspicuous, rigid, usually persistent; fruit 4-5 mm. long, with a strong dorsal keel ----- 13. *P. praelongus*
11. Leaves not cucullate at apex; stipules soon disintegrating into white fibers; fruit 2-4 mm. long, not or but slightly keeled ----- 15. *P. richardsonii*
12. Base of the leaf fused to the stipule for at least $\frac{1}{3}$ of the length of the stipule; fruit with an undulate to dentate dorsal keel, minute beak and an evident, spiral embryo ----- 13
12. Base of the leaf free from the stipule ----- 14
13. Fruit with a prominent dorsal keel and a pair of low, lateral keels; fused portion of the stipule equaling about $\frac{1}{3}$ to $\frac{1}{2}$ the length of the stipule ----- 4. *P. diversifolius*
13. Fruit with only a dorsal keel, the sides rounded; fused portion of the stipule equaling about $\frac{1}{2}$ to $\frac{3}{4}$ the length of the stipule ----- 16. *P. spirillus*
14. Submersed leaves slenderly linear to sub-terete, 2mm. or less wide ----- 15
14. Submersed leaves more than 2 mm. wide ----- 16
15. Floating leaves usually cordate and attached to the long petioles by an abrupt joint, 4-12 cm. long, 2.5-6.5 cm. broad, 13-37 nerved; submersed leaves firm, 0.8-2 mm. wide ----- 10. *P. natans*
15. Floating leaves elliptic to ovate or obovate, up to 1.5 cm. long and 8 mm. wide, 5-9 nerved; 0.5 mm. or less wide, linear, delicate; stipules delicate, not connate, up to 12 mm. long ----- 18. *P. vaseyi*
16. Submersed leaves sessile, ribbon-like, 0.2-1.5 cm. wide ----- 17
16. Submersed leaves with definite petioles, or if sessile, the blades broad, never linear ----- 18
17. Midrib of submersed leaves bordered by conspicuous bands of reticulate lacunae ----- 5. *P. epihydrus*
17. Midrib of submersed leaves not bordered by reticulate lacunae; submersed leaves narrowly elliptical ----- 8. *P. gramineus*
18. Floating leaves with 30-51 nerves ----- 1. *P. amplifolius*
18. Floating leaves with 9-29 nerves ----- 19
19. Submersed leaves with petioles up to 13 cm. long, acute but without a sharply pointed tip; endodermal cells equally thickened on all sides (see Ogden, 1943) ----- 11. *P. nodosus*
19. Submersed leaves sessile or on petioles rarely as long as 4 cm., tips sharply pointed; endodermal cells with thin outer walls ----- 9. *P. illinoensis*

1. *P. amplifolius* Tuckerm. Map 6

Permanent lakes and slow streams in the northeastern half of Iowa; infrequent. Chiefly in the central and eastern states.

2. *P. berchtoldii* Fieber Map 7

P. pusillus of Gray's Manual ed. 7 and New Britton and Brown Illustrated Flora in part, not L.

Sluggish streams and shallow water of ponds and lakes of northwestern Iowa; rare. Chiefly in the central and eastern states.

Clay Co.: Dewey's Pasture north of Mud Lake, Lake Twp. S. 25, R. F. Thorne 13199, Aug. 5, 1953 (IA). Dickinson Co.: Lake Okoboji, first pond west of school house, B. Shimek, July 1915 (IA); Manhattan Pond, Lakeville Twp., NE $\frac{1}{4}$ S. 14, R. F. Thorne 13015, July 16, 1953 (IA). Palo Alto Co.: Silver Lake, Lake Twp., A. Hayden 8641, Aug. 1940 (ISC).

3. *P. crispus* L. Map 8

Known in Iowa only from the Mississippi River in northeastern Iowa; rare. An introduced species that has become naturalized in small lakes, sluggish streams and polluted bays in the central and northeastern states.

Allamakee Co.: Mississippi River near State Fisheries Building, I. E. Snead, Aug. 1944 (ISC).

4. *P. diversifolius* Raf. Map 9

P. dimorphus of Gray's Manual ed. 7 in part, not Raf.

Small ponds of southern Iowa, also collected from Cerro Gordo Co.; infrequent. Chiefly in the southern, central and eastern states.

5. *P. epiphydrus* Raf. Map 10

Ponds, sloughs and streams of northern and eastern Iowa; infrequent. Chiefly in the northcentral, northeastern and northwestern states.

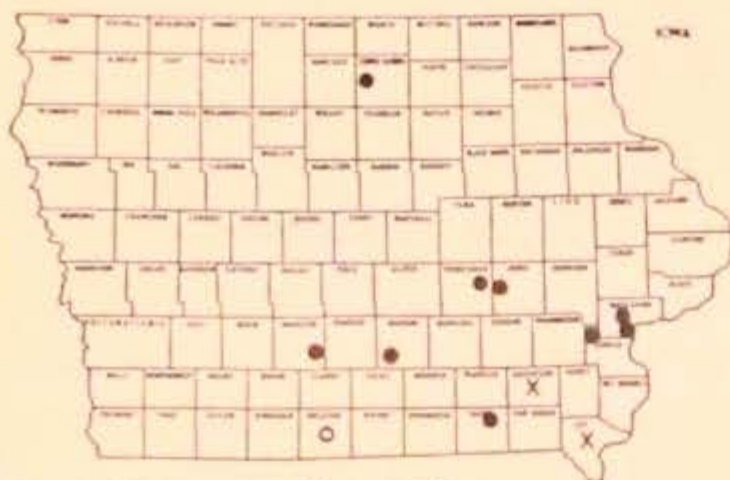
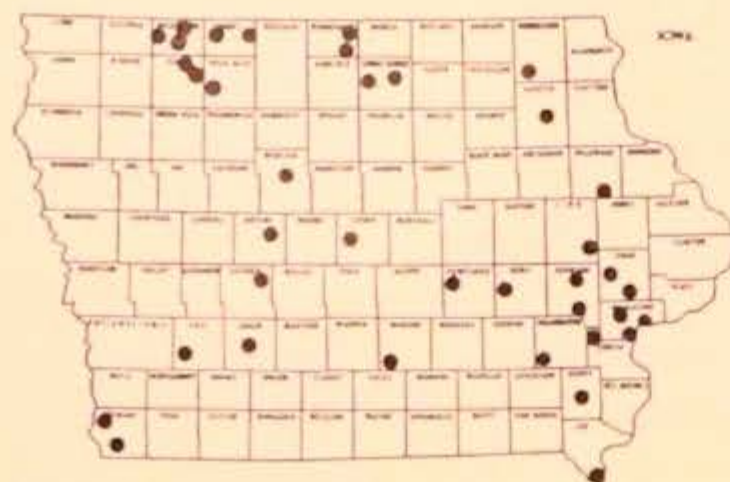
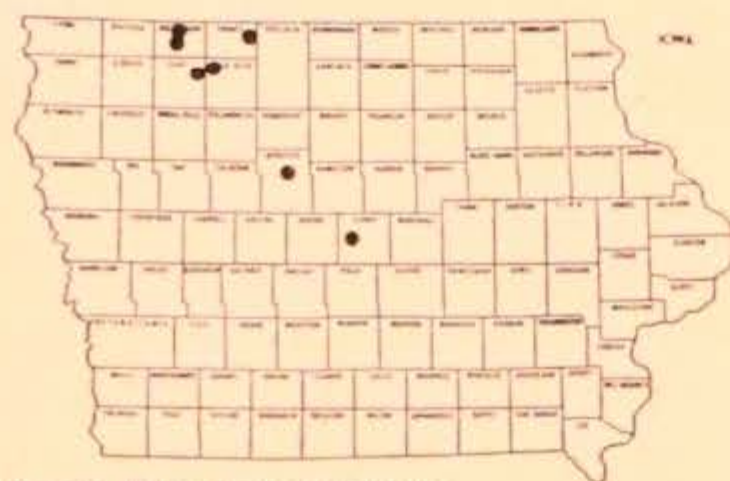
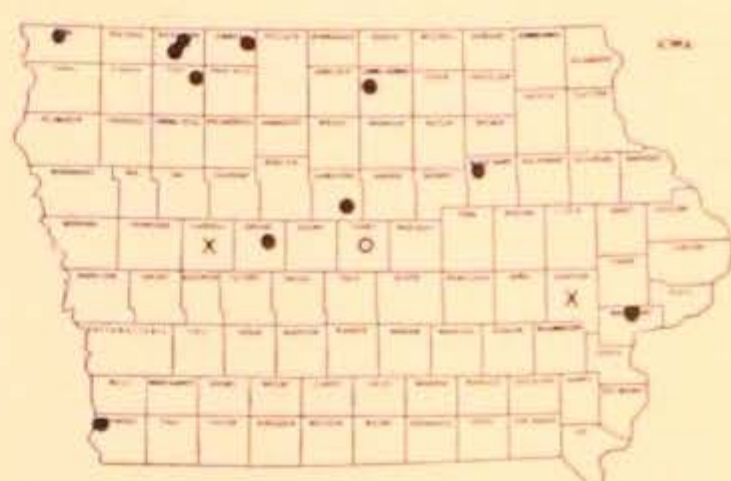
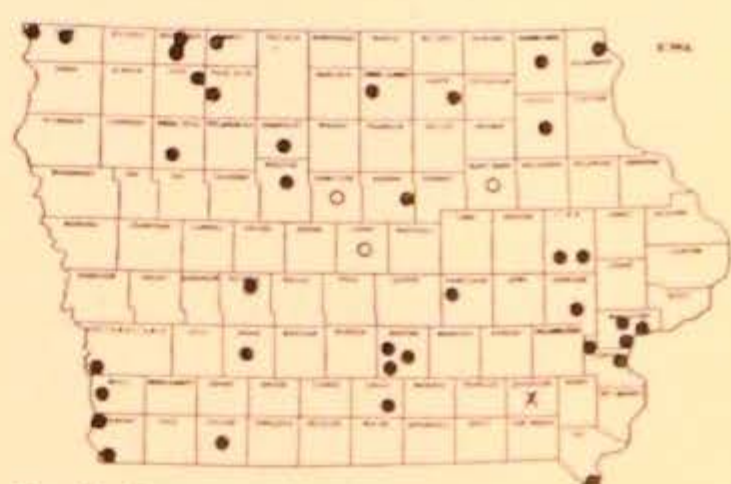
Fayette Co.: Fayette, B. Fink, July 1894 (ISC). Hancock Co.: Forest City, pond $\frac{3}{4}$ mile south of the B. C. R. & N. Depot, Cratty, Aug. 1896 (IA). Muscatine Co.: Ponds and sloughs along the Cedar River, F. Reppert 738, June 1894 (IA). Winnebago Co.: Forest City, R. I. Cratty, Aug. 1896 (ISC).

6. *P. foliosus* Raf. Map 11

Ponds, sloughs, rivers and lakes throughout Iowa; common. Widespread in the United States.

7. *P. friesii* Rupr. Map 12

Permanent bodies of water in northwestern Iowa; infrequent. Chiefly in the northcentral and northeastern states.

Map 9. *Potamogeton diversifolius*Map 10. *Potamogeton epiphydrus*Map 11. *Potamogeton foliosus*Map 12. *Potamogeton friesii*Map 13. *Potamogeton gramineus*Map 14. *Potamogeton illinoensis*Map 15. *Potamogeton natans*Map 16. *Potamogeton nodosus*

8. *P. gramineus* L.

Map 13

P. heterophyllus sensu most auth., not Schreb.

Grassy marshes, sloughs, ponds and lakes of central and northern Iowa; infrequent. Widespread across the northern United States.

9. *P. illinoensis* Morong

Map 14

P. angustifolius C. & S.*P. lucens* of Am. Auth., not L.

Sloughs, permanent ponds and lakes throughout Iowa; frequent. Widespread in the United States.

The procedure for distinguishing between this species and *P. nodosus* Poir. on the shape of the endodermal cells is given by Ogden (1943).

10. *P. natans* L.

Map 15

Sloughs and lakes of northern and eastern Iowa; infrequent. Chiefly in the northern states.

11. *P. nodosus* Poir.

Map 16

P. americanus C. & S.*P. lonchites* Tuckerm.*P. fluitans* Koch

Ponds, sloughs, lakes and rivers throughout Iowa; common. Widespread in the United States.

12. *P. pectinatus* L.

Map 17

P. interruptus of Gray's Manual ed. 7.

Sloughs and lakes throughout Iowa; common. Widespread in the United States.

13. *P. praelongus* Wulfen

Map 18

Open water of northern lakes; infrequent. Chiefly in the northern United States.

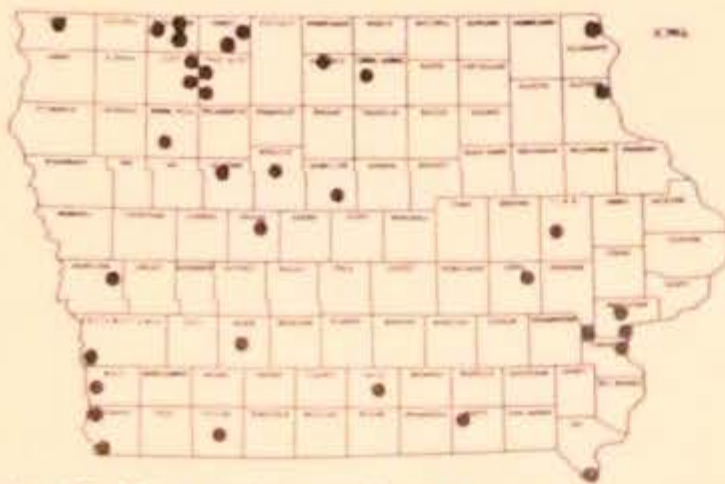
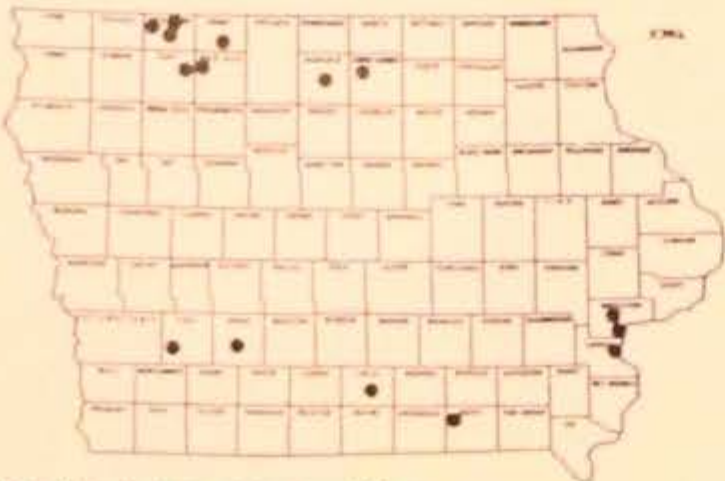
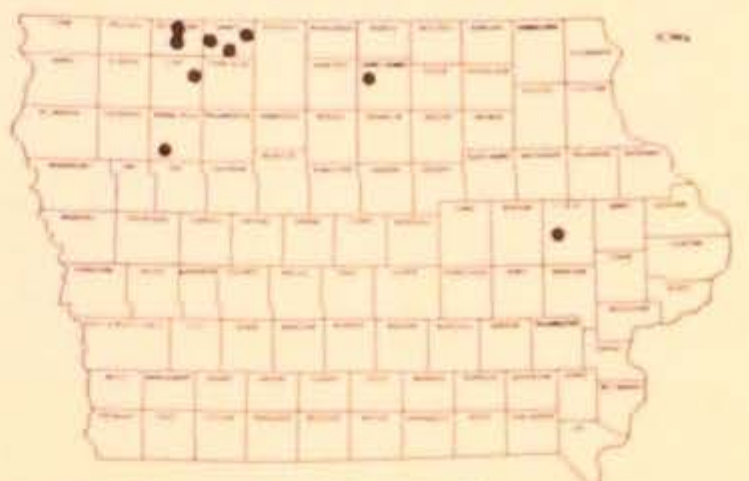
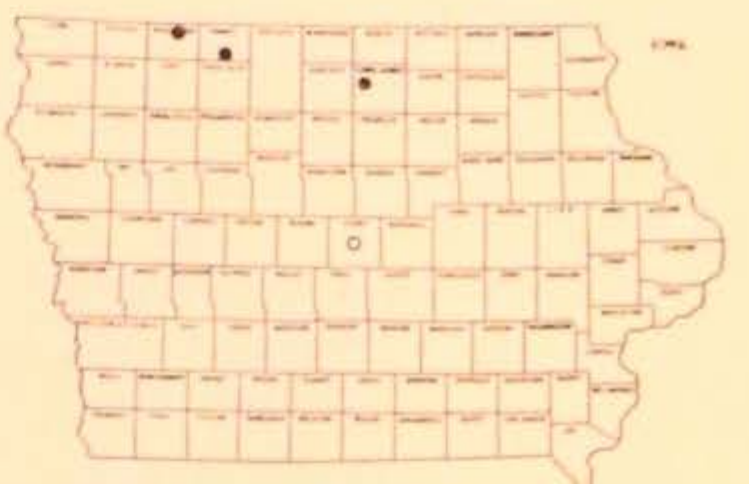
Cerro Gordo Co.: Clear Lake, J. C. Arthur, July 1874 (ISC). Dickinson Co.: East Okoboji, B. Shimek, July 1918 (IA); Miller's Bay of West Okoboji, R. F. Thorne 9848, Aug. 1950 (IA); Spirit Lake, A. S. Hitchcock, July 1885 (ISC). Emmet Co.: Iowa Lake, R. I. Cratty, Aug. 1895 (ISC).

14. *P. pusillus* L.

Map 19

P. panormitanus Biv.*P. pusillus* var. *capitatus* of Gray's Manual ed. 7.

Sloughs and lakes throughout Iowa; frequent. Widespread in the United States.

Map 17. *Potamogeton pectinatus*Map 18. *Potamogeton praelongus*Map 19. *Potamogeton pusillus*Map 20. *Potamogeton richardsonii*Map 21. *Potamogeton spirillus*Map 22. *Potamogeton strictifolius*Map 23. *Potamogeton vaseyi*Map 24. *Potamogeton zosteriformis*

15. *P. richardsonii* (Ar. Benn.) Rydb. Map 20

Chiefly in the lakes of northern Iowa; frequent. Widespread in the northern states.

16. *P. spirillus* Tuckerm. Map 21

P. dimorphus of Gray's Manual ed. 7 in part, not Raf.

Ponds and shallow water of lakes in northern Iowa; rare. Chiefly in the northcentral and northeastern states.

Hancock Co.: Near Forest City, B. Shimek, July 1896 (IA). Winnebago Co.: Pond north of Forest City, R. I. Cratty, Aug. 1896 (IA).

17. *P. strictifolius* Ar. Benn. Map 22

Lakes of northern and central Iowa; rare. Chiefly in the northcentral and eastern states.

Cerro Gordo Co.: Clear Lake, B. Shimek, July 1896 (IA). Dickinson Co.: Spirit Lake, A. S. Hitchcock, July 1885 (ISC). Emmet Co.: High Lake, B. O. Wolden, Sept. 1917 (ISC). Story Co.: Mud Lake, A. S. Hitchcock, June 1886 (ISC).

18. *P. vaseyi* Robbins Map 23

Shallow water of marshes in eastern Iowa; rare. Chiefly in the northcentral and northeastern states.

Linn Co.: Coggon Bog, two and one half miles south of Coggon, R. F. Thorne 10852, July 19, 1952, 12285, June 8, 1953 (IA); Coggon Bog, E. O. Beal 356, July 13, 1953 (IA). Louisa Co.: Shallow water of Conesville Marsh, Oakland Twp., S. 11, R. F. Thorne 10677a, June 13, 1952 (IA).

19. *P. zosteriformis* Fern. Map 24

P. compressus of Am. Auth., not L.

P. zosterifolius of Am. Auth., not Schum.

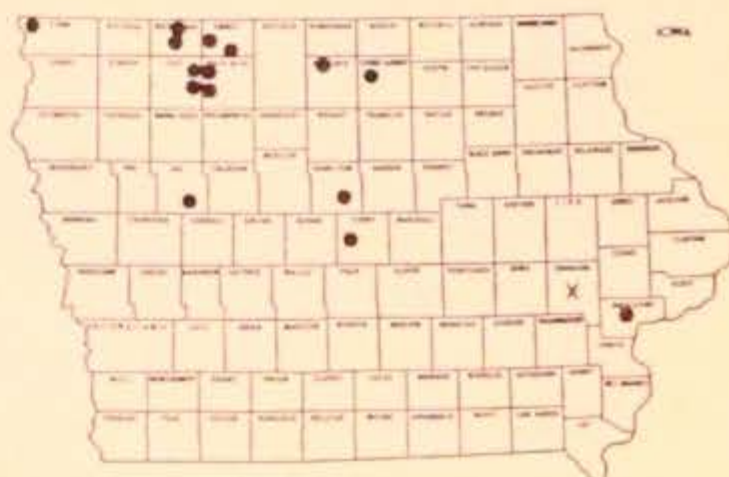
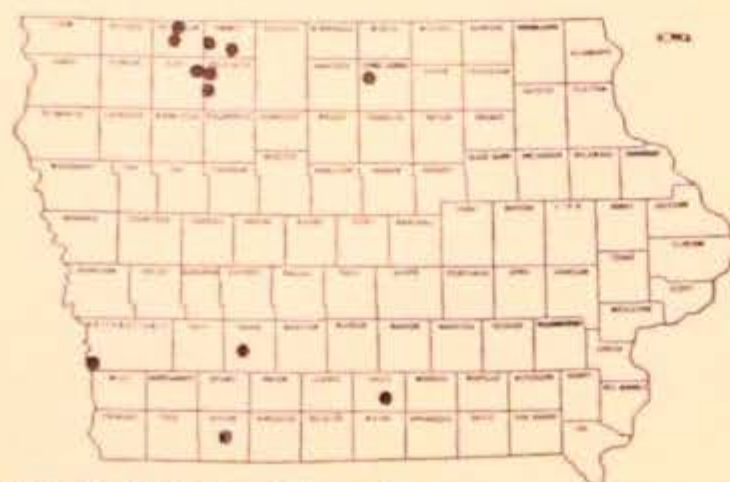
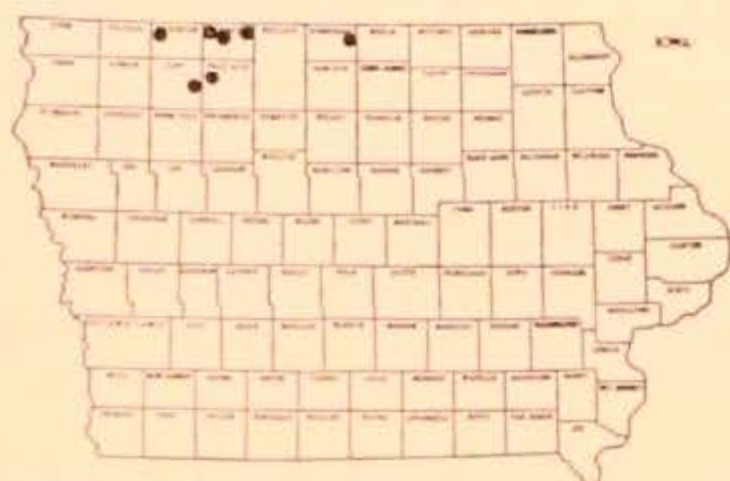
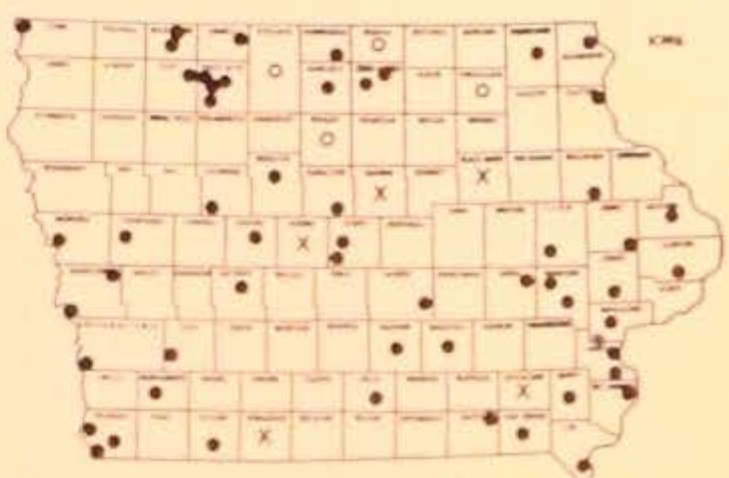
Sloughs, ponds, rivers and lakes throughout Iowa; frequent. Widespread in the northern states.

ZANNICHELLIACEAE

1. *Zannichellia* L.

1. *Z. palustris* L. (Horned Pondweed) Map 25

Sloughs, streams, ponds and lakes of northwestern, central and southeastern Iowa; frequent. Widespread in the United States.

Map 25. *Zannichellia palustris*Map 26. *Najas flexilis*Map 27. *Najas guadalupensis*Map 28. *Scheuchzeria palustris*Map 29. *Triglochin maritima*Map 30. *Triglochin palustris*Map 31. *Alisma gramineum*Map 32. *Alisma subcordatum*

NAJADACEAE**1. Najas L. (Naiad)**

1. Fruits lustrous, 2-3.5 mm. long; style 1-2 mm. long; seed coat finely reticulate with 30-50 rows of inconspicuous areolae; leaves with in-rolling margins and recurving, lanceolate tips-----1. *N. flexilis*
1. Fruits dull, 1.5-2.5 mm. long; style 0.1-0.8 mm. long; seed coat coarsely reticulate with 10-30 rows of areolae; leaves flattened, tip merely acute -----2. *N. guadalupensis*

1. *N. flexilis* (Willd.) Rostk. & Schmidt Map 26

Shallow water of sloughs, ponds and lakes of northwestern, central and southeastern Iowa; frequent. Widespread in the northern United States.

2. *N. guadalupensis* (Spreng.) Magnus Map 27

Chiefly in the lakes of northern Iowa but local in southern Iowa; infrequent. Widespread in the southern, central and northeastern states.

JUNCAGINACEAE

1. Leaves alternate on an erect stem; flowers few, white, in a loose raceme, subtended by bracts -----1. *Scheuchzeria*
1. Leaves all basal; flowers numerous, borne in a long spike-like raceme, bractless -----2. *Triglochin*

1. Scheuchzeria L.1. *S. palustris* L. Map 28

Known in Iowa only from the bogs of Emmet County; rare. Chiefly in the northcentral and northeastern states.

Emmet Co.: Armstrong, R. I. Cratty, 1884 (ISC & IA).

2. Triglochin L. (Arrow-grass)

1. Fruit with 6 carpels (rarely 3), ovoid, about twice as long as broad; plants stout -----1. *T. maritima*
1. Fruit with 3 carpels, clavate, three or more times as long as thick; plants slender -----2. *T. palustris*

1. *T. maritima* L. Map 29

Hanging bogs and calcareous fens of northwestern Iowa; infrequent. Chiefly in the western and northern states.

Clay Co.: Hanging bog, Logan Twp., S. 16, A. Hayden 8033, Aug. 1937 (ISC). Dickinson Co.: Silver Lake Fen, R. F. Thorne 9794, Aug. 1950, 12489, June 17, 1953 (IA). Emmet Co.: Four miles east of Estherville, J. Fults 2917, Sept. 1934 (ISC); Four miles north of

Estherville, A. Hayden 727, Sept. 1934 (ISC); Armstrong, R. I. Cratty, Aug. 1883 (IA); Fen along Des Moines River, Emmet Twp., S. 21, R. F. Thorne 13082, July 25, 1952 (IA). Palo Alto Co.: Marsh around cold spring, Highland Twp., S. 24, A. Hayden 723, June 1936 (ISC). Winnebago Co.: Peat bog one mile south of Lake Mills, Center Twp., NE $\frac{1}{4}$ S. 15, R. F. Thorne 11068, Aug. 21, 1952 (IA).

2. *T. palustris* L.

Map 30

Fens of northwestern Iowa; infrequent. Chiefly in the northeastern states but local in the Rocky Mountain states.

Clay Co.: Dickens, bogs along creek, Barnes and Miller, July 1895 (ISC & IA). Dickinson Co.: Silver Lake Fen, Silver Lake Twp., NW $\frac{1}{4}$ S. 32, R. F. Thorne 10813, July 12, 1952 (IA). Emmet Co.: Hanging bog four miles north of Estherville, A. Hayden 726, Sept. 1934 (ISC); Fen along Des Moines River, Emmet Twp., S. 21, R. F. Thorne 13081, July 25, 1953 (IA). Palo Alto Co.: Hillside spring one mile northeast of Graettinger, A. Hayden 8916, Aug. 1940 (ISC); Springy hillside three miles south of Lost Island Lake, A. Hayden 7430, July 1935 (ISC); Fen near overpass on highway four and one half miles east of Ruthven, R. F. Thorne 13588, Aug. 20, 1953 (IA).

ALISMATACEAE

1. Carpels attached to the receptacle in a ring with the style on the ventral margin; flowers all perfect, stamens 6.....1. *Alisma*
1. Carpels in dense heads on convex receptacles.....2
2. All flowers of the inflorescence perfect; carpels plump; head and achenes appearing bur-like when mature; plants annual....2. *Echinodorus*
2. All of the upper flowers staminate (rarely pistillate), never perfect; carpels flattened; leaf blades sagittate, lanceolate, or linear; perennials.....3. *Sagittaria*

1. *Alisma* L. (Water-plantain)

1. Scape shorter than the leaves; leaf blades linear to elliptical, tapering to the base; peduncles and pedicels somewhat recurved.....1. *A. gramineum*
1. Scape overtopping the leaves; leaves cordate to rounded at the base, with ovate to elliptical blades; peduncle and pedicels erect....2. *A. subcordatum*
1. *A. gramineum* K. C. Gmel. Map 31

Known in Iowa only from Linn County; rare. Chiefly in the northern United States.

Linn Co.: Chain Lakes, S. Pattee, Sept. 1948 (IA).

2. *A. subcordatum* Raf.

Map 32

A. parviflorum Pursh

A. plantago-aquatica of authors, not L.

Muddy borders and shallow water of ponds, sloughs, rivers and lakes throughout Iowa; common. Widespread in the United States.

2. *Echinodorus* Richard

1. *E. rostratus* (Nutt.) Engelm. (Burhead) Map 33

E. cordifolius of Gray's Manual ed. 7 and New Britton and Brown Illustrated Flora, not Griseb.

Ponds and rivers of western and southeastern Iowa; infrequent. Chiefly in the lower Mississippi Valley.

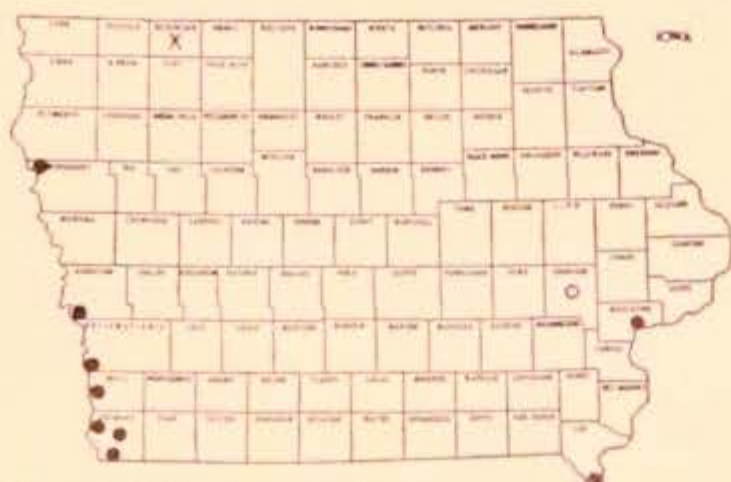
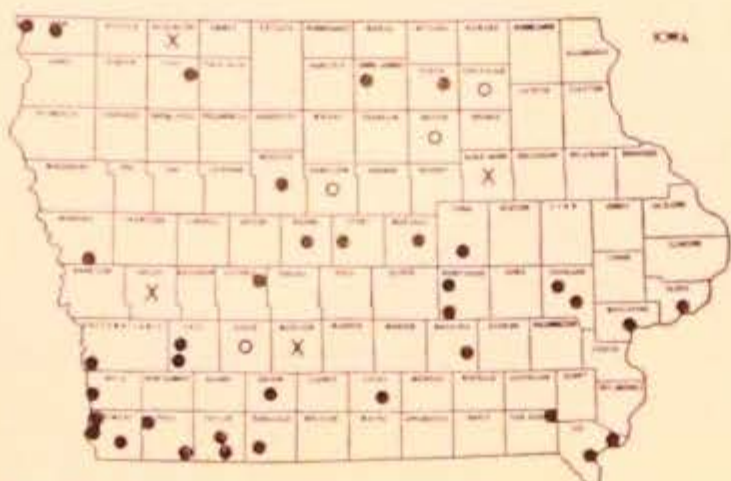
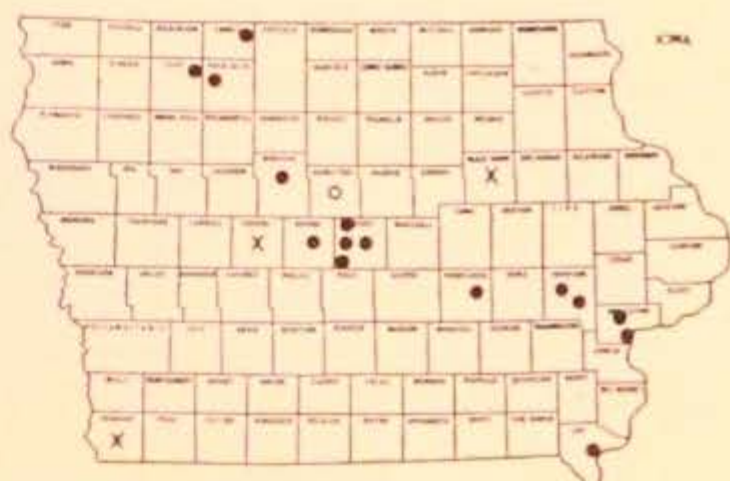
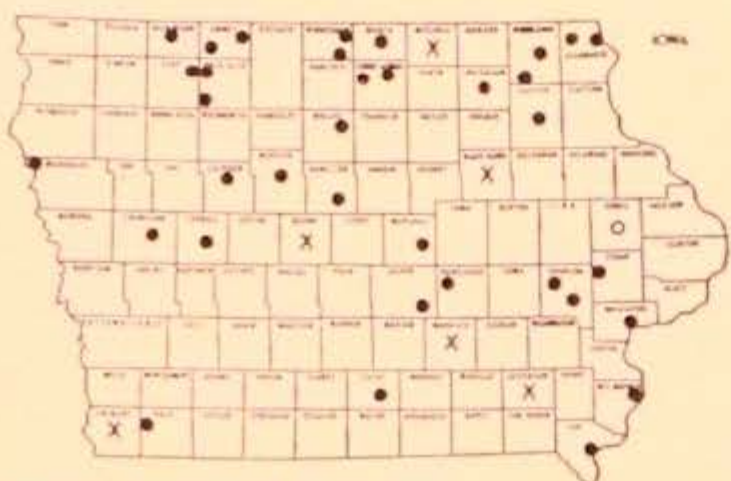
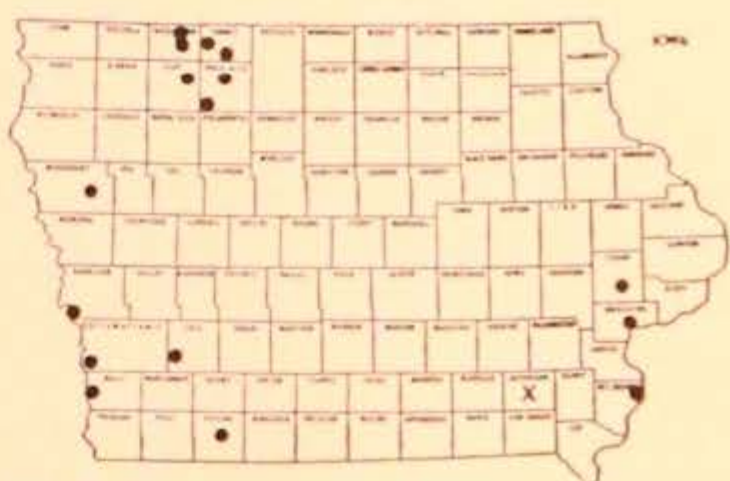
E. cordifolius (L.) Griseb. has been reported (as *E. radicans*) by Cratty (1933) as occurring in Iowa but this report is not substantiated by the specimens examined.

3. *Sagittaria* L. (Arrowhead)

- | | |
|--|----------------------------|
| 1. Lower flowers perfect, with 9-15 stamens; peduncles thickened and soft, often reflexed; sepals appressed against the mature fruit | 5. <i>S. montevidensis</i> |
| 1. Lower flowers pistillate (rarely all flowers staminate); peduncles not thickened; sepals spreading or reflexed in fruit | 2 |
| 2. Leaf blades normally elliptical to linear, without basal lobes | 3 |
| 2. Leaf blades normally sagittate or hastate | 4 |
| 3. Lowest whorl of flowers sessile or nearly so; scapes weak, often bending at the lowest whorl; leaves linear to elliptical | 6. <i>S. rigida</i> |
| 3. Lowest whorl of flowers pediceled; leaves represented either by spongy phyllodia or elliptical blades; achenes 1.5-3 mm. long, with the beak 0.1-0.6 mm. long | 3. <i>S. graminea</i> |
| 4. Lowest whorl of flowers sessile or nearly so; scapes weak; lobes of leaves narrow, acuminate, recurving; main portion of the leaves elliptical | 6. <i>S. rigida</i> |
| 4. Lowest whorl of flowers pediceled | 5 |
| 5. Bracts thin, sub-scarious, ovate, mostly obtuse; pedicels of staminate flowers slightly longer than those of the pistillate flowers; achenes with a definitely lateral style | 4. <i>S. latifolia</i> |
| 5. Bracts lanceolate, acute; achene with vertical or ascending style base | 6 |
| 6. Achene with an ascending beak 0.5-1.5 mm. long; mature heads depressed; bracts firm, often as long as the pedicels of the pistillate flowers | 2. <i>S. engelmanniana</i> |
| 6. Achene with an erect beak 0.2-0.4 mm. long, terminating the strongly rounded ventral margin; mature heads not depressed; bracts sub-membranous, usually much shorter than the pistillate pedicels | 1. <i>S. cuneata</i> |

1. *S. cuneata* Sheldon Map 34

Low ground, marshes, sloughs, ponds and muddy lake margins throughout the northeastern half of Iowa; frequent. Chiefly in the northern states.

Map 33. *Echinodorus rostratus*Map 34. *Sagittaria cuneata*Map 35. *Sagittaria engelmanniana*Map 36. *Sagittaria graminea*Map 37. *Sagittaria latifolia*Map 38. *Sagittaria montevidensis*Map 39. *Sagittaria rigida*Map 40. *Elodea canadensis*

2. *S. engelmanniana* J. G. Smith Map 35*S. brevirostra* Mackenz. and Bush*S. latifolia* in part of most Iowa Auth., not Willd.

Wet ground, ditches, marshes, sloughs, lake and river margins throughout Iowa; common. Chiefly in the midwestern and eastern states.

3. *S. graminea* Michx. Map 36*S. cristata* Engelm.

Sloughs, ponds and lake shores of northwestern, central and southeastern Iowa; frequent. Widespread throughout the eastern half of the United States.

Plants collected by R. I. Cratty near Armstrong, Emmet Co. in 1891 are of the form designated as *S. cristata* by Fernald (1950) but are at present treated as a form of *S. graminea* by Gleason (1952).

4. *S. latifolia* Willd. (Duck-potato) Map 37

Low ground, sloughs, shallow ponds and muddy borders of lakes and streams throughout Iowa; common. Widespread in the United States.

5. *S. montevidensis* Cham. & Schlecht. Map 38*Lophotocarpus calycinus* (Engelm.) J. G. Smith.

Marshes and lake shores of western and southeastern Iowa; frequent. Chiefly in the central states.

6. *S. rigida* Pursh Map 39*S. heterophylla* Pursh, not Shreb.

Ponds, sloughs and muddy borders of lakes and rivers throughout the northeastern half of Iowa; frequent. Chiefly in the north-central and northeastern states.

HYDROCHARITACEAE

- | | |
|--|-----------------------|
| 1. Stem elongate; leaves whorled, less than 2 cm. long; plants rooted but easily broken and often found floating | 1. <i>Elodea</i> |
| 1. Stem short; leaves basal, long and ribbon-like; plants rooted in soil; pistillate flowers very long stalked, stalk becoming spiral in fruit; staminate flowers released and floating free | 2. <i>Vallisneria</i> |

1. *Elodea* Michx. (Waterweed)

- | | |
|---|-------------------------|
| 1. Leaves elliptical to oblong, usually densely imbricated at the growing tips, mostly 1-5 mm. wide; staminate flowers borne in stalked, axillary spathes and not liberated | 1. <i>E. canadensis</i> |
| 1. Leaves linear, acute, not densely imbricated at the growing tips, 1.5 mm. or less wide; staminate flowers borne in sessile spathes and liberated to float free | 2. <i>E. nuttallii</i> |

1. *E. canadensis* Michx. Map 40
Anacharis canadensis (Michx.) Planch.
E. iowensis Wylie
E. planchonii Caspary
 Sloughs and lakes of northern Iowa; frequent. Chiefly in the northern and western states.
2. *E. nuttallii* (Planch.) St. John Map 41
Anacharis nuttallii Planch.
A. occidentalis (Pursh) St. John
E. occidentalis (Pursh) Viet.
E. canadensis of Ia. Auth. in part, not Michx.
 Sloughs, ponds, slow streams and lakes throughout Iowa except in the northwest; frequent. Chiefly in the northern states except in the west.

2. Vallisneria L.

1. *V. americana* Michx. (Tape-grass, Eel-grass) Map 42
V. spiralis of Gray's Manual ed. 7, not L.
 Lakes of northern and southeastern Iowa; infrequent. Widespread in the central and eastern states.

GRAMINEAE

- | | |
|---|-----------------------|
| 1. Spikelets with few to many fertile flowers..... | 2 |
| 1. Spikelets with one fertile flower..... | 4 |
| 2. Plants 1.5-4 meters tall; leaves firm, with overlapping sheaths; culms thick, hard, arising from tough rhizomes; panicle large and plumose; rachilla with long silky hairs | 8. <i>Phragmites</i> |
| 2. Plants 2 meters or less in height; rhizomes soft; rachilla without long hairs | 3 |
| 3. Callus of spikelets hairy; lemmas erose at apex; ovary hairy at summit | 9. <i>Scolochloa</i> |
| 3. Callus of spikelets glabrous; lemmas entire; ovary glabrous..... | 5. <i>Glyceria</i> |
| 4. Spikelets imbricated laterally on one side of the panicle branches..... | 5 |
| 4. Spikelets not appearing lateral, but borne on all sides of the branches.. | 8 |
| 5. Awns of the spikelets 1 cm. or more in length, arising from the palea and lemma; second glume short awned; leaf sheaths generally hairy | 4. <i>Echinochloa</i> |
| 5. Awns not longer than 0.7 cm. (unless arising from the second glume), or absent | 6 |
| 6. Branches of the inflorescence bearing one row of overlapping, flattened spikelets; margins of spikelets with numerous sharp spines | 6. <i>Leersia</i> |
| 6. Branches bearing two rows of spikelets..... | 7 |

7. Spikelets 3 mm. or less long, inflated but laterally compressed, the glumes equal in length; plant an annual-----2. *Beckmannia*
7. Spikelets 7-18 mm. long, with unequal glumes; plant a perennial--10. *Spartina*
8. Inflorescence dense and appearing spike-like, not obviously branched; the lemmas awned from below the middle; spikelets readily detached from the central axis and falling entire----1. *Alopecurus*
8. Inflorescence a panicle with open or appressed branches-----9
9. Florets with copious callus hairs; leaves narrow, 0.2-0.8 cm. wide -----3. *Calamagrostis*
9. Florets without copious callus hairs; leaves usually broader, 0.3-3 cm. wide -----10
10. Upper portion of the inflorescence with awned, pistillate spikelets borne upon upwardly thickened pedicels; lower portion of the inflorescence staminate, the spikelets often purplish; leaves 0.3-5 cm. wide -----11. *Zizania*
10. Upper and lower spikelets similar; the inflorescence a compact panicle; spikelets consisting of one fertile floret subtended by two small, scale-like, sterile lemmas; glumes exceeding the floret; leaves 0.6-2 cm. wide -----7. *Phalaris*

1. *Alopecurus* L. (Foxtail)

1. Awns barely, if at all exerted, the inflorescence appearing smooth -----1. *A. aequalis*
1. Awns exerted beyond the spikelets 2 mm. or more, giving the inflorescence a soft hairy appearance; anthers 0.3-0.6 mm. long; plant an annual -----2. *A. carolinianus*

1. *A. aequalis* Sobol.

Map 43

A. aristulatus Michx.*A. fulvus* Sm.*A. geniculatus* var. *aristulatus* Torr.

Wet ground, marshes, shallow ponds and lake margins throughout Iowa; common. Widespread in the United States except in the south.

2. *A. carolinianus* Walt.

Map 44

A. geniculatus of Ia. Auth., not L.*A. ramosus* Poir.

Wet ground, ditches and pond margins of southern and western Iowa; infrequent. Chiefly in the southwestern, midwestern and north-eastern states.

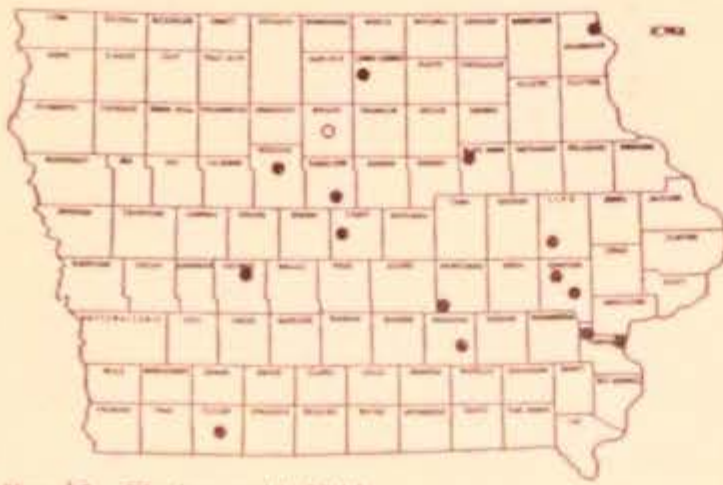
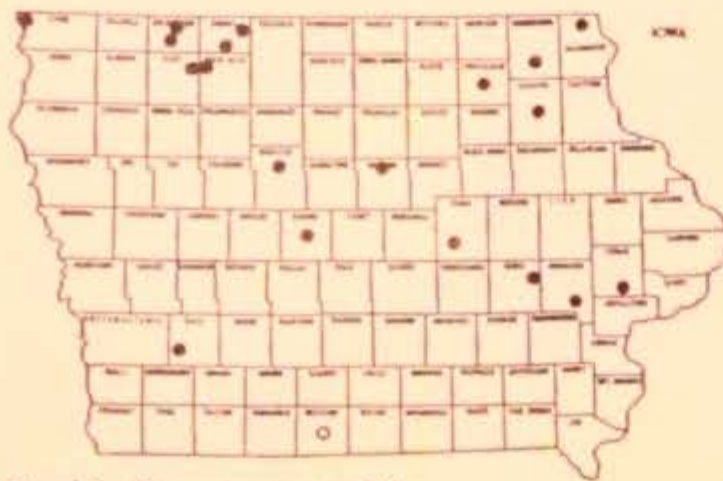
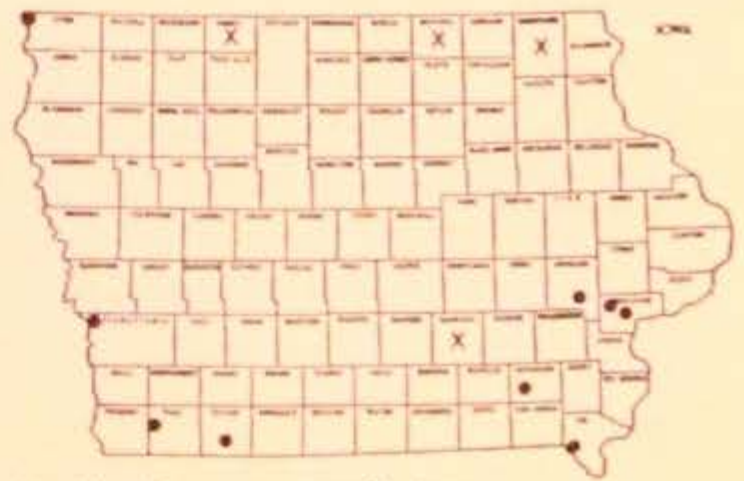
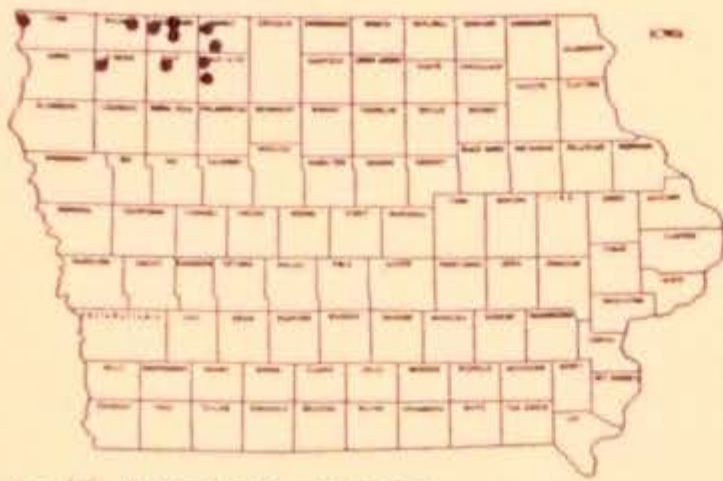
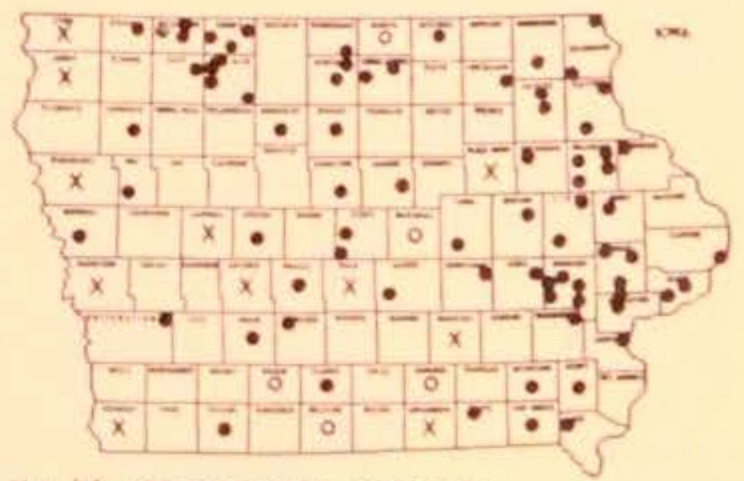
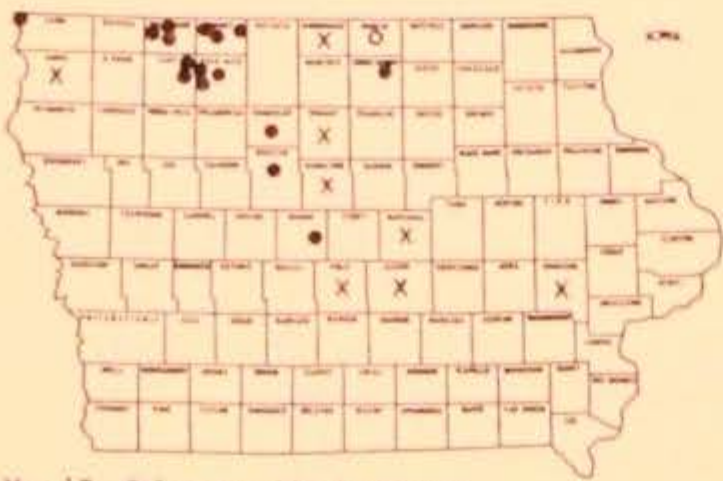
2. *Beckmannia* Host

1. *B. syzigachne* (Steud.) Fern. (Slough Grass)

Map 45

B. crucaeformis of Am. Auth., not Host

Wet ground, marshes, shallow ponds, lake borders and river margins in northwestern Iowa; frequent. Chiefly in the northcentral and western states.

Map 41. *Elodea nuttallii*Map 42. *Vallisneria spiralis*Map 43. *Alopecurus aequalis*Map 44. *Alopecurus carolinianus*Map 45. *Beckmannia syzigachne*Map 46. *Calamagrostis canadensis*Map 47. *Calamagrostis inexplorata*Map 48. *Echinochloa walteri*

3. Calamagrostis Adans.

1. Lemma membranous, usually glabrous; inflorescence open-----1. *C. canadensis*
 1. Lemma firm, scabrous; inflorescence mostly appressed and
 dense -----2. *C. inexpansa*
1. *C. canadensis* (Michx.) Nutt. (Bluejoint) Map 46
C. macouniana Vasey

Low places, wet meadows, marshes, sloughs and along rivers and lake margins throughout Iowa; common. Widespread in the United States.

2. *C. inexpansa* Gray (Northern Reedgrass) Map 47
C. hyperborea of Am. Auth. in part, not Lange

Low ground, wet prairies, hanging bogs, marshes, sloughs, river and lake margins of northern and central Iowa; frequent. Widespread in the United States except in the south.

4. Echinochloa Beauv.

1. *E. walteri* (Pursh) Nash Map 48
Panicum walteri Pursh

Shallow water of eastern Iowa; rare. Widespread in the central and eastern states.

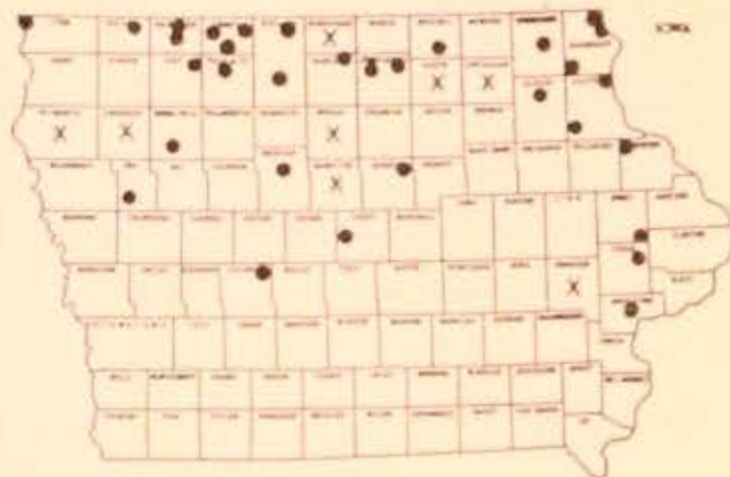
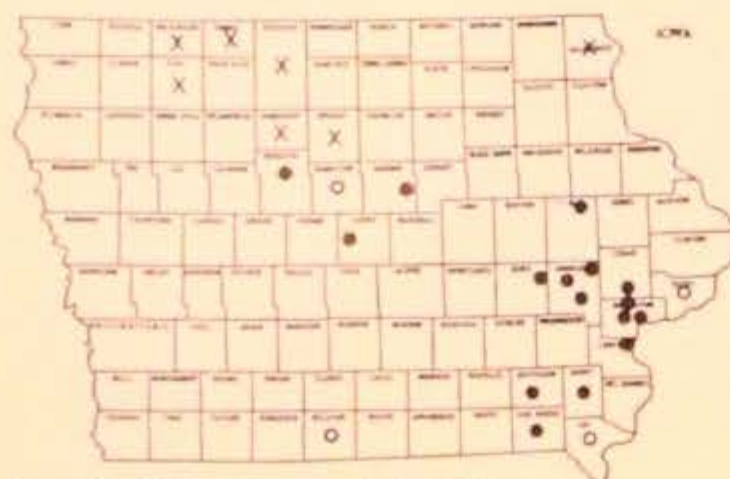
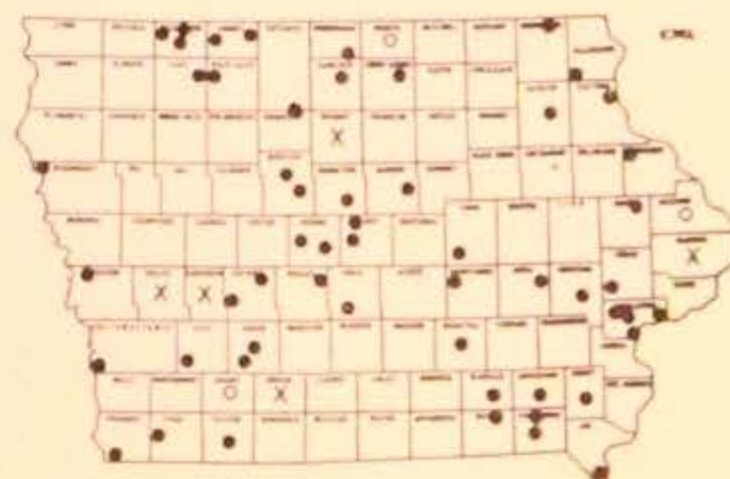
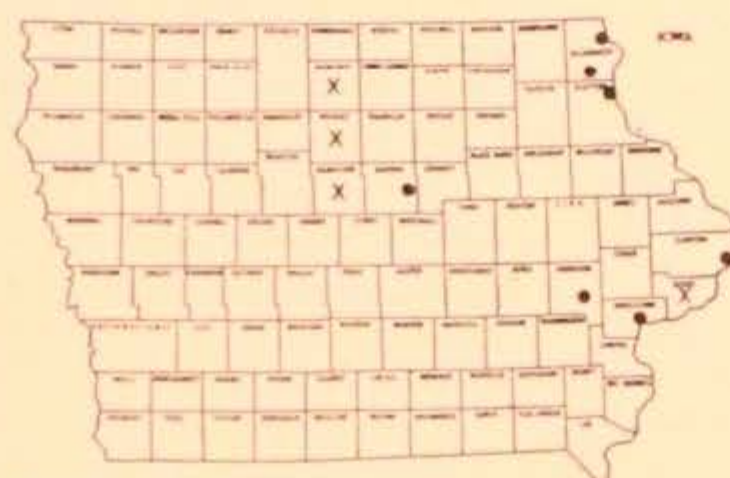
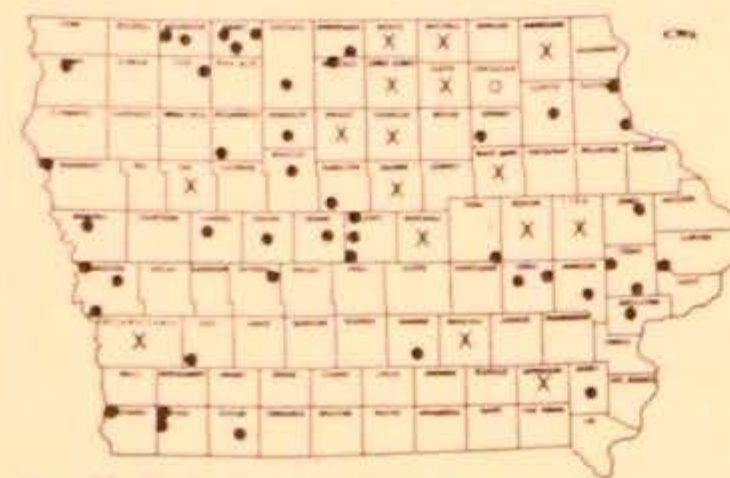
Des Moines Co.: Elevated knob in "middle" of almost dry Ray Lake, Huron Twp., R. Davidson 1691, Sept. 16, 1953 (IA). Linn Co.: Cedar Rapids, A. S. Hitchcock, 188? (ISC).

5. Glyceria R. Br. (Manna Grass)

1. Spikelets 1-2.5 cm. long; panicle erect, ascending; leaf sheaths
 compressed ----- 2
 1. Spikelets less than 0.8 cm. in length; panicle often nodding and
 spreading; sheaths terete ----- 3
 2. Lemma glabrous between the nerves; spikelets along the inflor-
 escence branches on slender pedicels; leaves 2-5 mm. wide-----1. *G. borealis*
 2. Lemma scabrous between the nerves; spikelets along the inflor-
 escence branches sessile or on short, upwardly thickened pedicels;
 leaves 2-12 mm. wide -----3. *G. septentrionalis*
 3. First glume less than 1 mm. long; spikelets 3-4 mm. long-----4. *G. striata*
 3. First glume 1 mm. or more in length; spikelets 5-6 mm. long, often
 purplish -----2. *G. grandis*
1. *G. borealis* (Nash) Batch. Map 49

Marshes, sloughs and ponds of northern Iowa; infrequent. Chiefly in the northern states.

2. *G. grandis* S. Wats. Map 50
G. americana Pammel

Map 49. *Glyceria borealis*Map 50. *Glyceria grandis*Map 51. *Glyceria septentrionalis*Map 52. *Glyceria striata*Map 53. *Leersia lenticularis*Map 54. *Leersia oryzoides*Map 55. *Phalaris arundinacea*Map 56. *Phragmites communis*

G. arundinacea Kunth

Panicularia americana Mac. M.

Marshes, sloughs, hanging bogs, ponds, and river and lake margins throughout Iowa except in the south; common. Widespread in the northern states.

3. *G. septentrionalis* Hitchc.

Map 51

G. fluitans of Pammel et al, not R. Br.

Wet ground, ditches, pond and stream margins of central and southeastern Iowa; frequent. Widespread in the central and eastern states.

4. *G. striata* (Lam.) Hitchc.

Map 52

G. nervata (Willd.) Trin.

Moist ground, wet meadows, marshes, bogs, sloughs, lake and river margins throughout Iowa; common. Widespread in the United States.

6. *Leersia* Sw.

1. Spikelets oval, 3-5 mm. wide, closely overlapping-----1. *L. lenticularis*

1. Spikelets oblong, 2 mm. or less wide, loosely overlapping-----2. *L. oryzoides*

1. *L. lenticularis* Michx. (Catchfly Grass)

Map 53

Low places, sloughs, hanging bogs, ponds, lake and river margins of eastern Iowa; infrequent. Chiefly in the southern states and northward along the Mississippi Valley.

2. *L. oryzoides* (L.) Sw. (Rice Cutgrass)

Map 54

Wet places, sloughs, bogs, lake and river margins throughout Iowa; common. Chiefly in the eastern and central states.

7. *Phalaris* L.

1. *P. arundinacea* L. (Reed Canary Grass)

Map 55

Low ground, ditches, marshes, sloughs and pond margins throughout Iowa; common. Widespread in the United States except in the south.

8. *Phragmites* Trin.

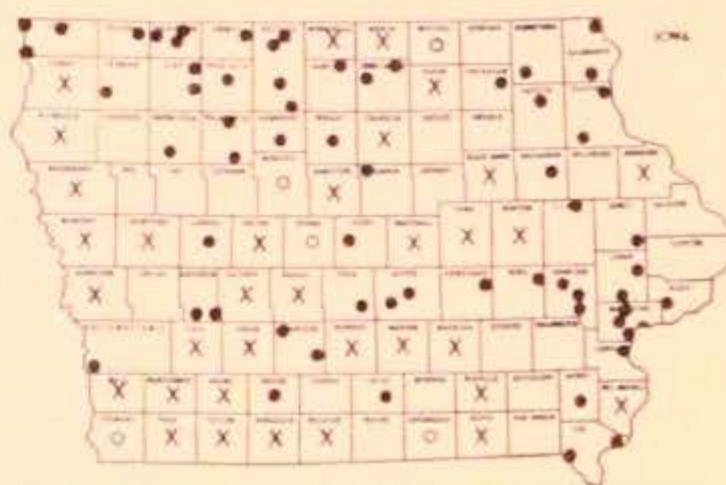
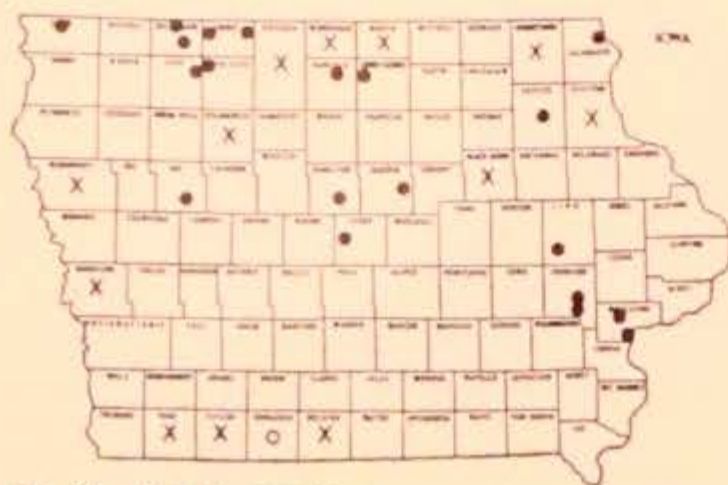
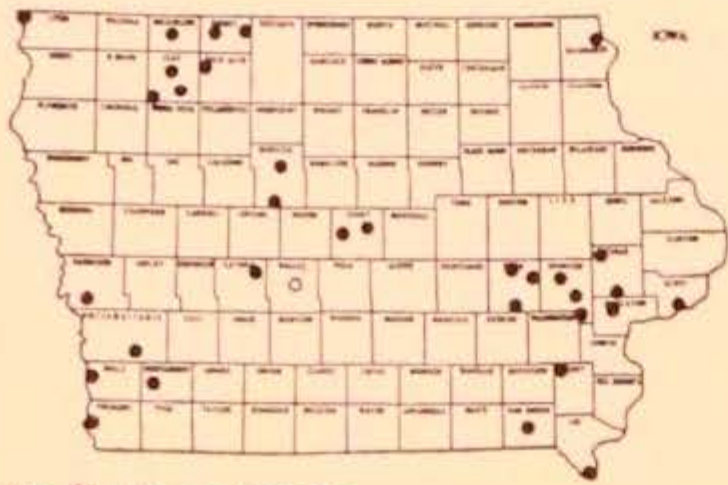
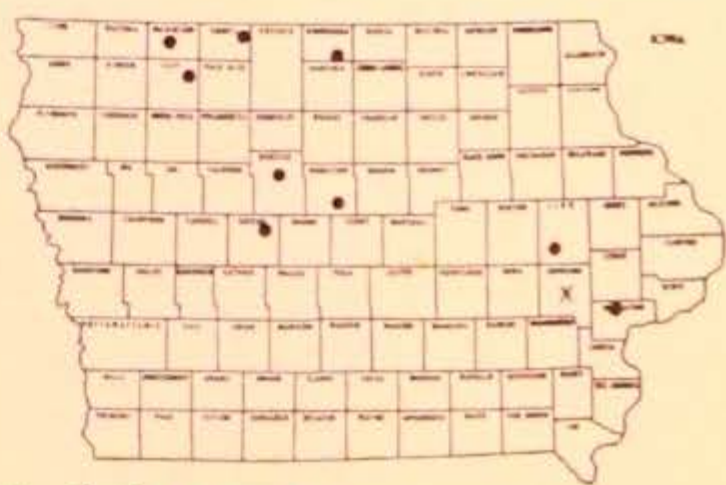
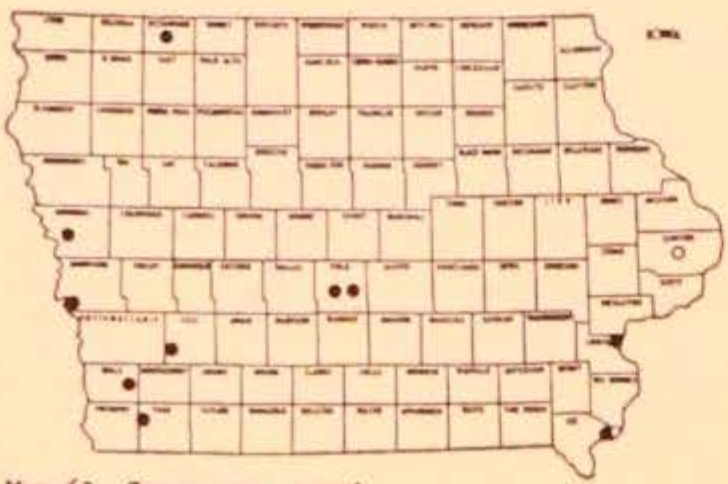
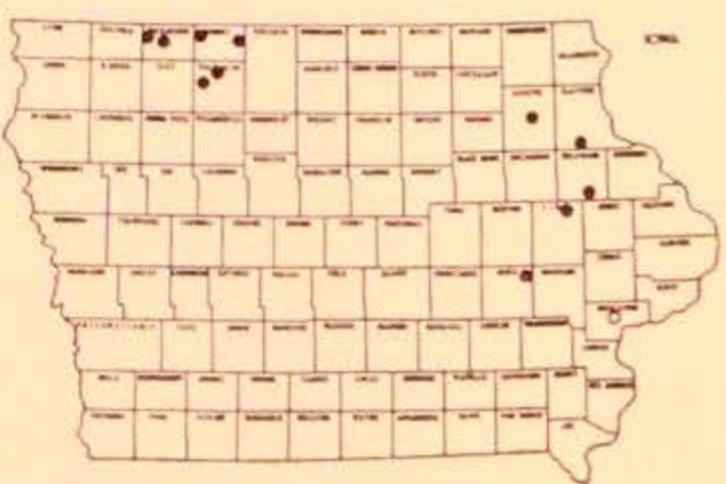
1. *P. communis* Trin. (Reed)

Map 56

P. maxima sensu Chiovenda

P. phragmites Karst.

Sloughs, hanging bogs, shallow ponds and lake margins throughout Iowa; common. Widespread in the United States except in the southeastern states.

Map 57. *Scolochloa festuacea*Map 58. *Spartina pectinata*Map 59. *Zizania aquatica*Map 60. *Carex aquatilis*Map 61. *Carex atherodes*Map 62. *Carex comosa*Map 63. *Carex crus-corvi*Map 64. *Carex interior*

9. *Scolochloa* Link

1. *S. festucacea* (Willd.) Link (Spangle-top) Map 57
Fluminea festucacea (Willd.) Hitchc.

Marshes and sloughs of northwestern Iowa; infrequent. Chiefly in the Dakotas, Minnesota, Nebraska and Iowa.

10. *Spartina* Schreb.

1. *S. pectinata* Link (Cord Grass, Slough Grass) Map 58
S. cynosuroides of some Ia. Auth., not Roth
S. michauxiana Hitchc.

Low prairies, sloughs, bogs, shallow ponds and stream margins throughout the state; common. Widespread in the United States.

11. *Zizania* L.

1. *Z. aquatica* L. (Wild-rice) Map 59
Z. palustris of Gray's Manual ed. 7, not L.

Marshes, sloughs, ponds, shallow water of lakes and river margins throughout the state; common. Chiefly in the central and eastern states.

CYPERACEAE

1. Apex of leaf sheath with tufted, white hairs; achene naked, white, bony, transversely wrinkled; spikelets in an interrupted spike; leaves 2 mm. or less wide ----- 7. *Scleria*
1. Apex of leaf sheath without tufted, white hairs ----- 2
 2. Achene enclosed in a sac (perigynium) ----- 1. *Carex*
 2. Achene not enclosed in a perigynium, but usually subtended by bristles ----- 3
3. Spikelets solitary, terminal, without involueral bracts; leaves reduced to sheaths ----- 3. *Eleocharis*
3. Spikelets few to many (rarely solitary); inflorescence subtended by 1- many bracts, or arising from the upper sheaths of a leafy culm ----- 4
 4. The spikelets 1-2 flowered; the inflorescence with a terminal and an axillary fascicle of spikelets; culms capillary; leaves narrowly linear to setaceous; achene with a lanceolate tubercle 0.8-1.6 mm. long ----- 5. *Rhynchospora*
 4. The spikelets few to many flowered ----- 5
5. Scales of the spikelets in two ranks; spikelets arising from the upper leaf sheaths; achenes flattened and beaked with a long, persistent style ----- 2. *Dulichium*
5. Scales of the spikelets in many ranks ----- 6
 6. Perianth bristles numerous, silky, white, long exserted in fruit ----- 4. *Eriophorum*
 6. Perianth bristles few or absent, not exserted in fruit, or if exserted, their color light brown, not silky white ----- 6. *Scirpus*

1. *Carex* L. (Sedge)

1. Perigynium densely hairy, inflated, up to 3 mm. long, with a minutely bidentate beak 7. *C. lasiocarpa*
1. Perigynium glabrous (rarely sparsely hispid) 2
2. Lateral spikelets pendulous on slender peduncles 3
2. Lateral spikelets erect or ascending, sessile or on short peduncles 4
3. Beaks of the perigynia 0.5 mm. or less in length; perigynia compressed-trigonous; stigmas 3 8. *C. limosa*
3. Beaks of the perigynia 2-4 mm. long; staminate spike solitary or none (often bearing pistillate flowers in the same spike); perigynia 5-7 mm. long, the teeth 1.2-2 mm. long 3. *C. comosa*
4. Terminal spikelet with pistillate flowers at the apex and staminate flowers at the base 5. *C. interior*
4. Terminal spikelet completely staminate or with pistillate flowers at the base 5
5. Beaks of the perigynia 5-9 mm. long, upwardly barbed, lanceolate, sometimes becoming two cleft at maturity, arising from a bulbous base; terminal flowers of some spikes staminate 4. *C. erus corvi*
5. Beaks of the perigynia 4 mm. or less in length; staminate flowers in terminal spikelets or the tips of the upper spikelets 6
6. Achenes lenticular; perigynia lenticular, not or only slightly inflated 7
6. Achenes trigonous; perigynia strongly nerved and inflated 8
7. Perigynia ovate, abruptly tipped with a minute, entire beak; scales blunt; base of culm soft and spongy 1. *C. aquatilis*
7. Perigynia tapering to an upwardly barbed beak; spikelets short and compacted into a cylindric head 3-7 cm. long 10. *C. sartwellii*
8. Perigynia thin walled, about 9-11 nerved, with strongly inflated bases; scales of the pistillate spikelets acute, rarely with upwardly barbed tips 9
8. Perigynia with firm walls, about 15-21 nerved, bases slightly inflated; scales of pistillate spikelets with the midrib extended as an upwardly barbed awn 10
9. Culms arising from a fleshy base; ligule of leaf sheath wider than long; leaves prominently septate-nodose upon drying 9. *C. rostrata*
9. Culms arising from a firm base; ligule of leaf sheath longer than wide 11. *C. vesicaria*
10. Teeth of the perigynia, usually two (sometimes three) in number, about 0.5 mm. long; perigynia inflated to the base of the teeth 6. *C. lacustris*
10. Teeth of the perigynia 1-3 mm. long, somewhat recurved; perigynia sometimes sparsely hispid; leaves and sheath glabrous to pubescent 2. *C. atherodes*

1. *C. aquatilis* Wahlenb.

Map 60

Low places, marshes, fens, sloughs and shallow ponds; rare. Chiefly in the northern states.

Dickinson Co.: Silver Lake fen, Silver Lake Twp., S. 32, R. F. Thorne 12487, June 17, 1953 (IA). Emmet Co.: Fen along Des Moines

River, Emmet Twp., S. 21, R. F. Thorne 13105, July 25, 1953 (IA).
Ida Co.: East of Arthur, B. Shimek, May 1929 (IA). Jefferson Co.:
City reservoir, Center Twp., S. 24, C. L. Gilly 278, May 1933 (ISC).
Winnebago Co.: East of Forest City, B. Shimek, July 1899 (IA).

2. *C. atherodes* Spreng. Map 61

C. laeviconica Dew.

Low ground, marshes, sloughs and lake margins throughout Iowa;
common. Chiefly in the central and northern states.

Since the characteristics of *C. laeviconica*, as given by Fernald
(1950) and Gleason (1952) do not clearly distinguish the Iowa speci-
mens from *C. atherodes*, the former taxon is reduced to synonymy.

3. *C. comosa* Boott Map 62

Marshes, sloughs and lake margins of northern and eastern Iowa;
infrequent. Chiefly in the northeastern states.

4. *C. crus-corvi* Shuttlw. Map 63

Wet ground, swamps and lake borders throughout Iowa except
in the northeast; infrequent. Chiefly in the Great Plains and Gulf
Coastal States.

5. *C. interior* Bailey Map 64

Low prairies, sloughs and fens of the "Lakes Region" and eastern
Iowa; infrequent. Chiefly in the central and northern states.

6. *C. lacustris* Willd. Map 65

Shallow water of marshes and sloughs throughout Iowa; frequent.
Chiefly in the midwestern and northeastern states.

7. *C. lasiocarpa* Ehrh. Map 66

C. filiformis of Gray's Manual ed. 7, not L.

C. lanuginosa Michx.

Low ground, marshes, sloughs, bogs, shallow ponds and lake mar-
gins throughout Iowa; common. Widely distributed in the United
States except in the southeast.

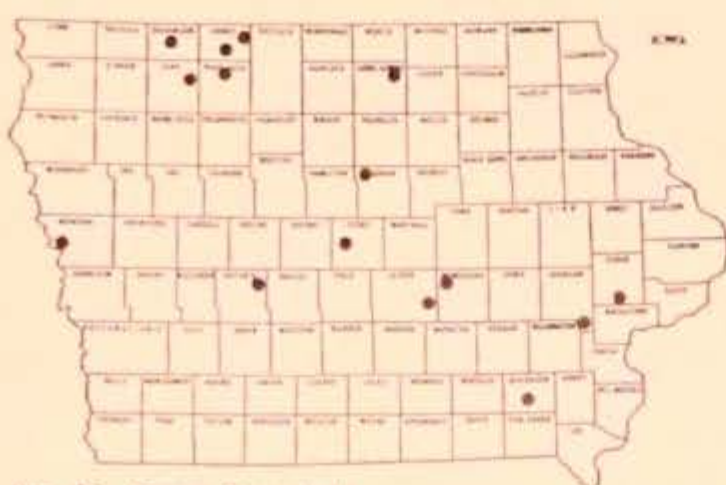
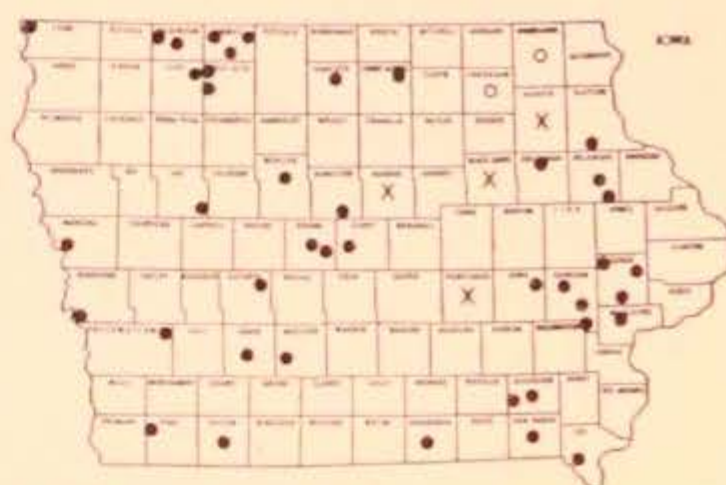
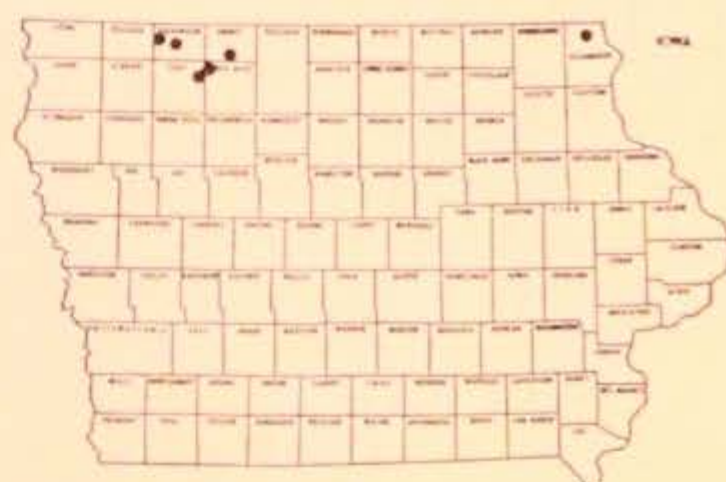
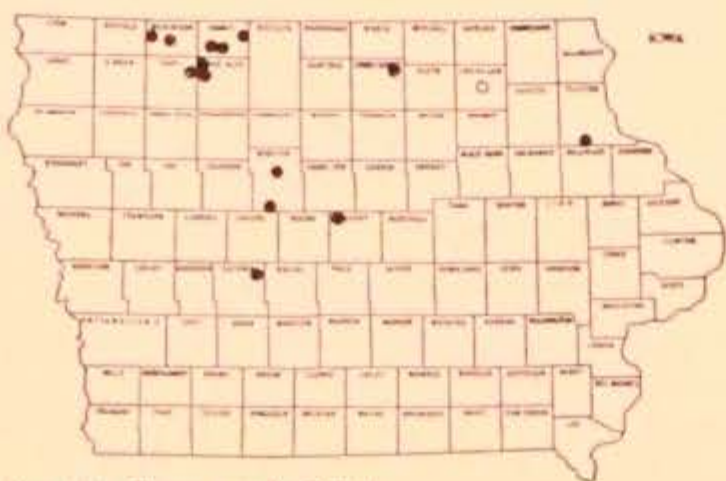
Since the characteristics of *C. lanuginosa*, as given by Fernald
(1950), do not clearly distinguish the Iowa specimens from *C.*
lasiocarpa, the former taxon is reduced to synonymy.

8. *C. limosa* L. Map 67

Bogs of Emmet County; rare. Chiefly in the northern states.
Emmet Co.: Armstrong, R. I. Cratty, June 1892 (IA).

9. *C. rostrata* Stokes Map 68

C. inflata sensu Rendle and Britten, not Huds.

Map 65. *Carex lacustris*Map 66. *Carex lasiocarpa*Map 67. *Carex linosa*Map 68. *Carex rostrata*Map 69. *Carex sartwellii*Map 70. *Carex vesicaria*Map 71. *Dulichium arundinaceum*Map 72. *Eleocharis acicularis*

C. inflata var. *utriculata* (Boott) Druce

C. utriculata Boott

Marshes and shallow water of northern Iowa; infrequent. Chiefly in the northern states.

Allamakee Co.: Upper Iowa River Valley, French Creek Twp., S. 11, A. Hayden 8281, June 1940 (ISC). Clay Co.: Lake Twp., S. 25, A. Hayden 600, June 1936 (ISC). Dickinson Co.: South of Miller's Bay Hotel, West Lake Okoboji, B. Shimek, July 1916 (IA); Marsh south of Miller's Bay, Lakeville Twp., S. 23, R. F. Thorne 12540, June 17, 1953 (IA); Manhattan Slough, Lakeville Twp., S. 14, R. F. Thorne 12496, June 17, 1953 (IA); Silver Lake fen, R. F. Thorne 10815, July 12, 1952 (IA). Emmet Co.: High Lake, B. O. Wolden 412, June 1922 (ISC). Palo Alto Co.: Mud Lake, A. Hayden 168, July 1934 (ISC).

10. *C. sartwellii* Dew.

Map 69

Low ground, marshes, sloughs, fens, bogs and shallow water of lakes of central and northern Iowa; frequent. Chiefly in the central and northern states.

11. *C. vesicaria* L.

Map 70

Wet meadows, marshes, sloughs, shallow ponds and along rivers throughout Iowa; frequent. Chiefly in the northern states.

2. *Dulichium* Pers.

1. *D. arundinaceum* (L.) Britt. (Three-way Sedge)

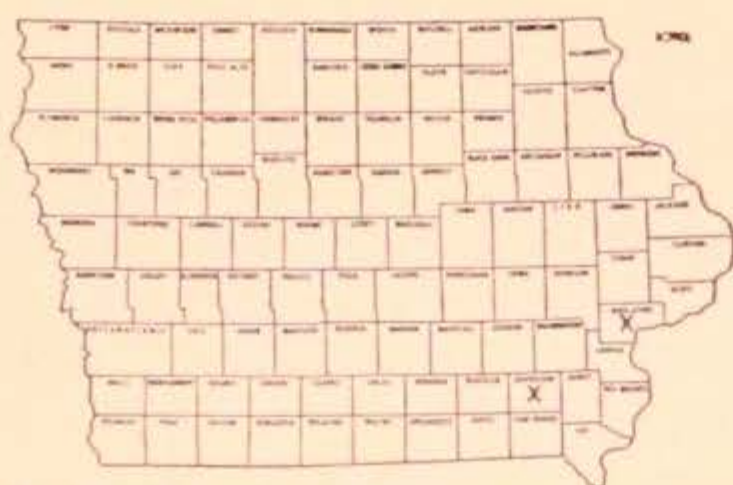
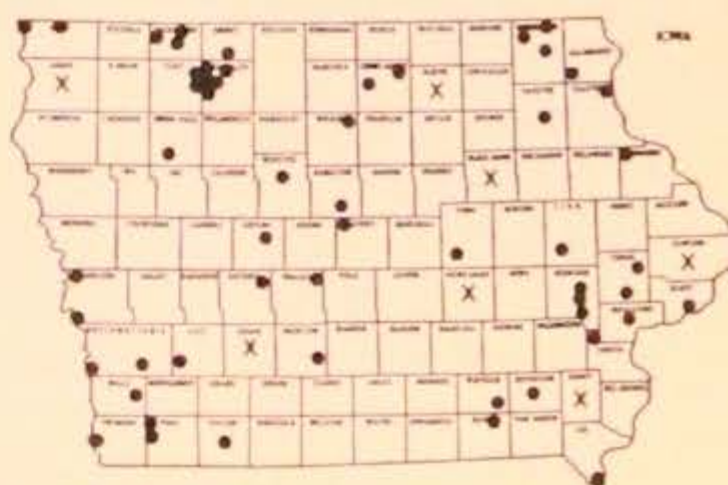
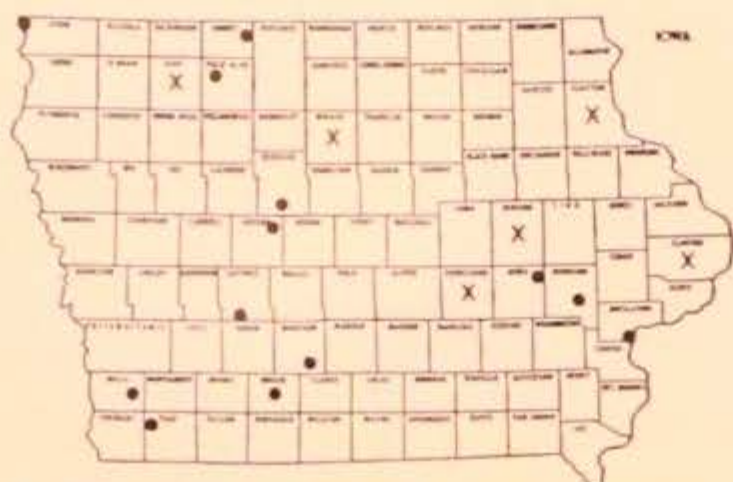
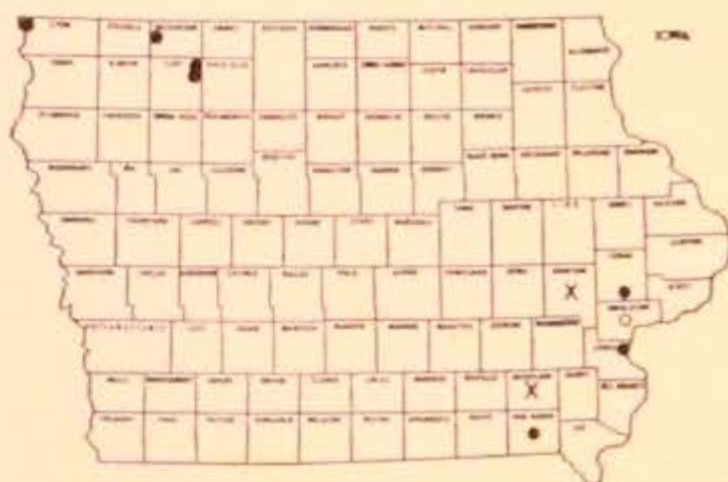
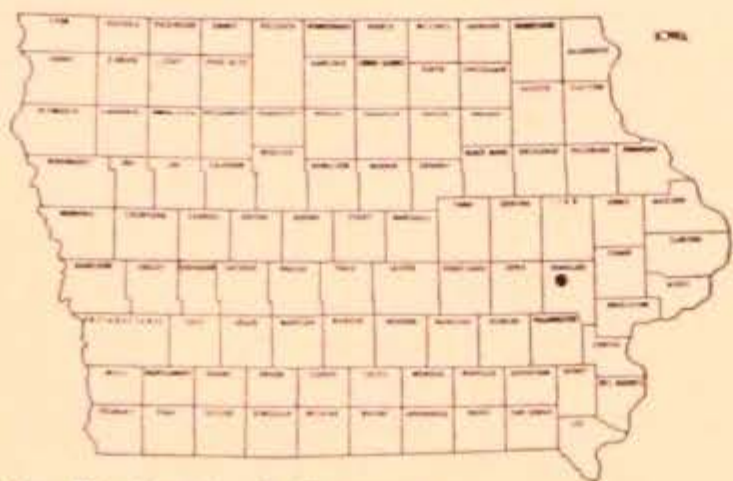
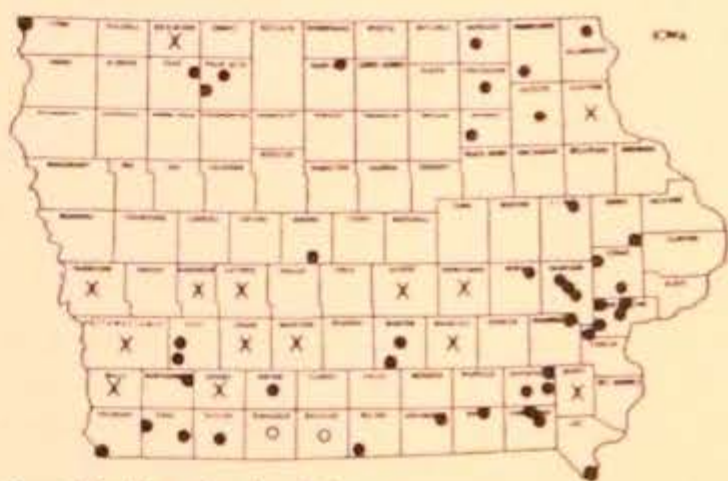
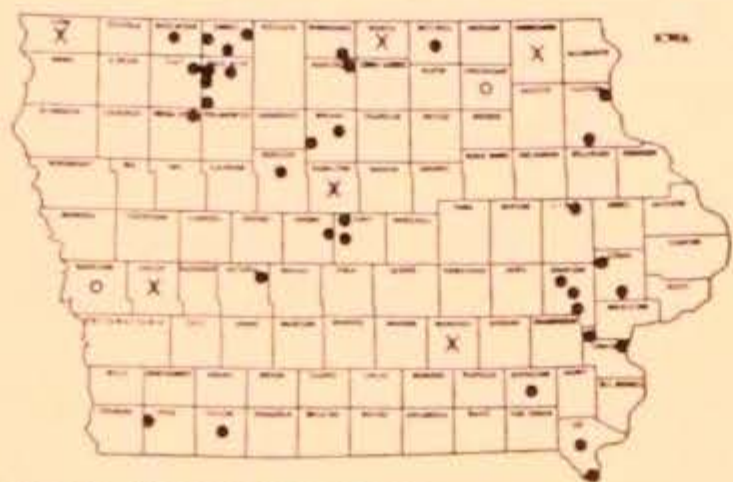
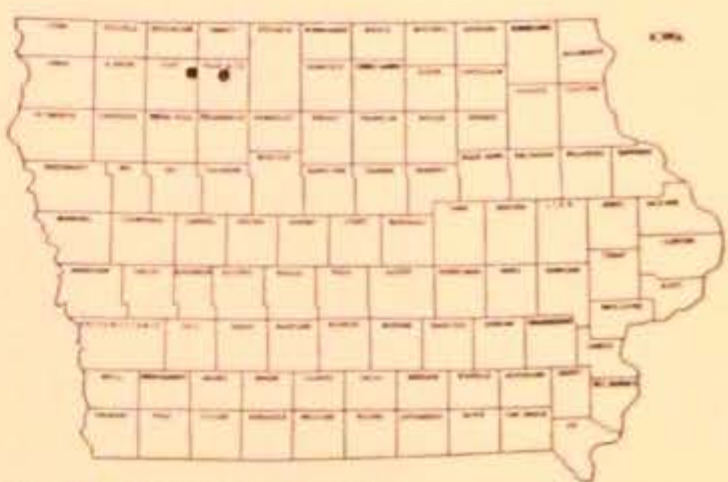
Map 71

Cyperus arundinaceus L.

Bogs and springy pond borders of the northeastern half of Iowa; frequent. Chiefly in the eastern and northern states.

3. *Eleocharis* R. Br. (Spike-rush)

- | | |
|---|--------------------------|
| 1. Tubercle nearly confluent with the summit of the achene; spikelets 2-9 flowered | 2 |
| 1. Tubercle sharply differentiated from the achene | 3 |
| 2. Spikelets 2-4 mm. long, the scales green to pale brown; achenes triangular, less than 1.5 mm. long | 9. <i>E. parvula</i> |
| 2. Spikelets 4-8 mm. long, the scales light brown; achenes triangular to plano-convex, longer than 1.5 mm. | 10. <i>E. pauciflora</i> |
| 3. Achene smooth | 4 |
| 3. Achene roughened by honey-comb reticulations or cross-striations | 9 |
| 4. Base of the tubercle at least $\frac{2}{3}$ as broad as the achene | 5 |
| 4. Base of the tubercle less than $\frac{1}{2}$ the width of the achene | 6 |
| 5. Bristles as long as, or longer than the achene; tubercle $\frac{1}{2}$ as long as broad, deltoid | 7. <i>E. obtusa</i> |

Map 73. *Eleocharis atropurpurea*Map 74. *Eleocharis calva*Map 75. *Eleocharis compressa*Map 76. *Eleocharis engelmannii*Map 77. *Eleocharis flavescens*Map 78. *Eleocharis obtusa*Map 79. *Eleocharis palustris*Map 80. *Eleocharis parvula*

5. Bristles shorter than the achene or absent; tubercle about $\frac{1}{4}$ as long as broad, depressed-deltoid 5. *E. engelmannii*
6. Culms tufted, not arising from red rhizomes; scales of spikelets with a prominent green midrib 7
6. Culms arising from red rhizomes 8
7. Achenes 0.8-1 mm. long, olive to brown, with a pointed greenish tubercle; bristles mostly over-topping the achene; leaf sheath with a loose, oblique summit 6. *E. flavescens*
7. Achenes 0.5 mm. long, lustrous black, with a flat tubercle; bristles shorter than the achene or absent; leaf sheaths with a close, oblique summit 2. *E. atropurpurea*
8. Sterile scales at base of spikelet two or three in number 8. *E. palustris*
8. Sterile scale at base of spikelet solitary, usually encircling the base of the spikelet; sheaths reddish to brown 3. *E. calva*
9. Achenes with longitudinal ridges and cross-striations; obscurely triangular, and appearing white; tubercle depressed; summit of sheaths loose and scarious 10
9. Achenes with honey-comb reticulations or glandular-roughened, bi-convex to sub-cylindric 11
10. Culms terete, capillary, dwarfed, less than 15 cm. in height; spikelets 2-3 ranked 1. *E. acicularis*
10. Culms flattened, not capillary, taller than 15 cm. 12. *E. wolffi*
11. Culms 4-5 angled, wiry; fertile scales with thin, scarious tips; achene deeply reticulate; tubercle depressed 11. *E. tenuis*
11. Culms flattened; at least the upper scales with bifid tips; achenes glandular-roughened; tubercle deltoid 4. *E. compressa*

1. *E. acicularis* (L.) R. & S.

Map 72

Shallow water or muddy shores of sloughs, ponds, lakes and rivers throughout Iowa; common. Widespread in the United States.

2. *E. atropurpurea* (Retz.) J. & C. Presl.

Map 73

Wet sandy soil of southeastern Iowa; rare. Chiefly in the southern states but extending northward to Colorado.

No specimens of this species have been examined, but it is included on the basis of specimens in the New York Botanical Garden, N. Y. and Parsons College, Fairfield, Ia., that have been examined by Gilly (1946).

Jefferson Co.: Center Twp., Mc. Donald 1206, Sept. 3, 1933. Muscatine Co.: Wet sand at Fruitland, Reppert, 1895?

3. *E. calva* Torr.

Map 74

Ditches, swales, bogs, sloughs and muddy shores of lakes and rivers throughout Iowa; common. Widespread in the United States.

4. *E. compressa* Sulliv.

Map 75

Wet ground, marshes, bogs, pond and river margins throughout Iowa; frequent. Chiefly in the central and eastern states.

5. *E. engelmannii* Steud. Map 76

E. obtusa var. *engelmannii* (Steud.) Gilly

Low ground, shallow ponds and lake margins of northwestern and southeastern Iowa; infrequent. Chiefly in the central and eastern states.

6. *E. flavescens* (Poir.) Urban var. *olivacea* (Torr.) Gl. Map 77

E. olivacea Torr.

Known in Iowa only from Johnson County; rare. Chiefly in the Great Lakes and Atlantic Coastal regions.

Johnson Co.: Swan Lake, R. F. Thorne 10466, Oct. 1950 (IA).

7. *E. obtusa* (Willd.) Schultes Map 78

Low ground, ditches, bogs, shallow ponds, lake and stream margins throughout Iowa; common. Chiefly in the eastern and central states.

8. *E. palustris* (L.) R. & S. Map 79

E. macrostachya Britt.

E. smallii Britt.

Low ground, ditches, marshes, sloughs, shallow ponds, lake and stream margins throughout Iowa; common. Chiefly in the northern states.

9. *E. parvula* (R. & S.) Link Map 80

E. coloradoensis (Britt.) Gilly

Lake shores and mud flats of northwestern Iowa; rare. Chiefly in the Atlantic Coastal Plain and locally inland to Minnesota.

Clay Co.: Round Lake, Freeman Twp., S. 3, A. Hayden 690, Aug. 1936 (ISC). Palo Alto Co.: Medium Lake, Freedom Twp., S. 8, A. Hayden 8291, Aug. 1940 (ISC).

10. *E. pauciflora* (Lightf.) Link Map 81

Scirpus pauciflorus Lightf.

Bogs and fens of northwestern Iowa; rare. Chiefly in the northeastern states.

Dickinson Co.: Silver Lake fen, R. F. Thorne 12965, July 9, 1953 (IA). Emmet Co.: Bog northwest of Estherville, B. O. Wolden, July 1931 (ISC); Fen (now tiled) along Des Moines River, Emmet Twp., S. 21, R. F. Thorne 13102, July 25, 1953 (IA).

11. *E. tenuis* (Willd.) Schultes Map 82

E. capitata var. *verrucosa* Svenson

Damp ground, marshes and bogs of scattered distribution in Iowa; infrequent. Chiefly in the northeastern and midwestern states.

12. *E. wolfii* Gray

Map 83

Wet prairies, shores and mud flats of Iowa; rare. Chiefly in the northcentral states.

Cedar Co.: Three miles south of Rochester, M. Fay 616, June 1950 (IA). Emmet Co.: R. I. Cratty, June 1886 (IA). Union Co.: Wet depression in lowland prairie, Douglas Twp., S. 28, M. Fay 3214, June 1952 (IA).

4. Eriophorum L. (Cotton-grass)

- | | |
|---|----------------------------|
| 1. Leaves wider than 1.5 mm., flattened below, blades longer than the sheaths; involueral bracts two or three, mostly longer than the inflorescence | 1. <i>E. angustifolium</i> |
| 1. Leaves 1.5 mm. or less in width, triangular channeled, blades shorter than the sheaths; involueral bract solitary, short | 2. <i>E. gracile</i> |

1. *E. angustifolium* Honckeney

Map 84

Wet meadows, marshes, sloughs, bogs, shallow ponds and river margins in the northeastern half of Iowa; frequent. Chiefly in the northern states.

2. *E. gracile* Koch

Map 85

Marshes, sloughs and river margins in the northcentral counties of Iowa; rare. Chiefly in the northern states.

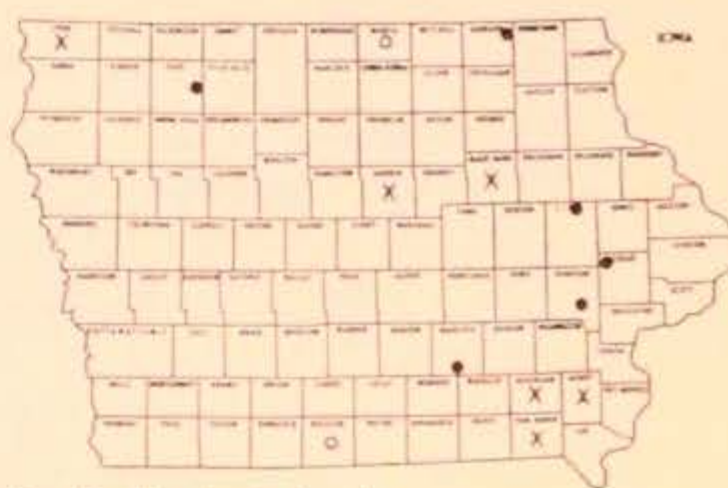
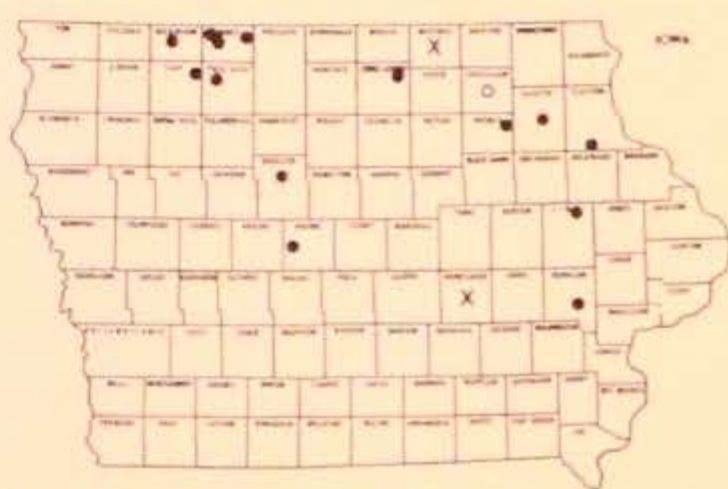
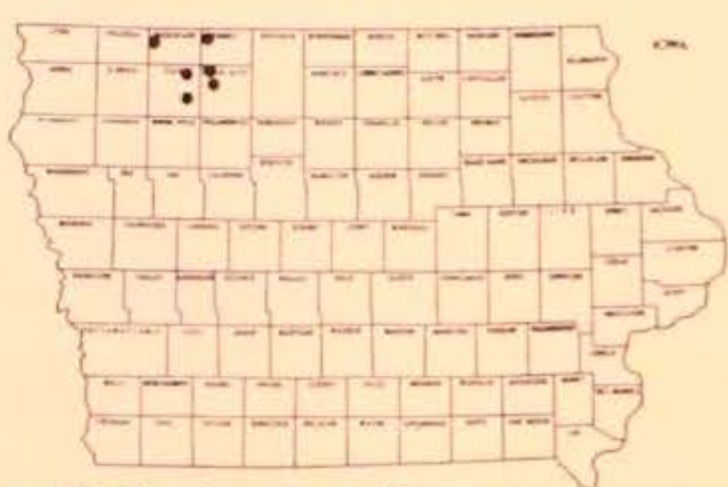
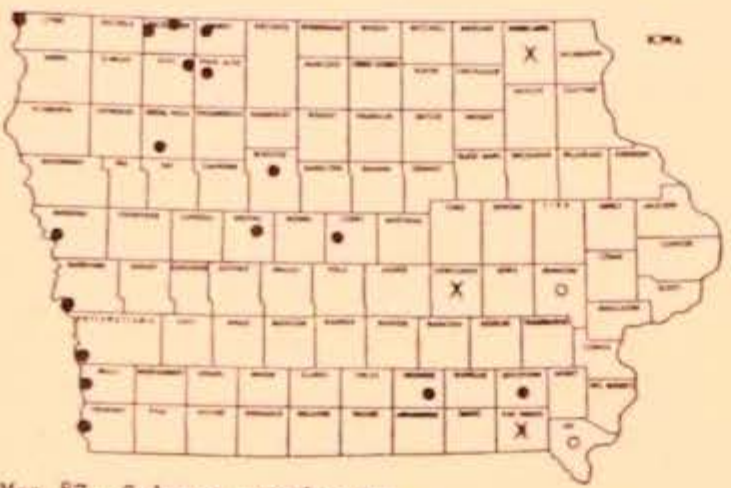
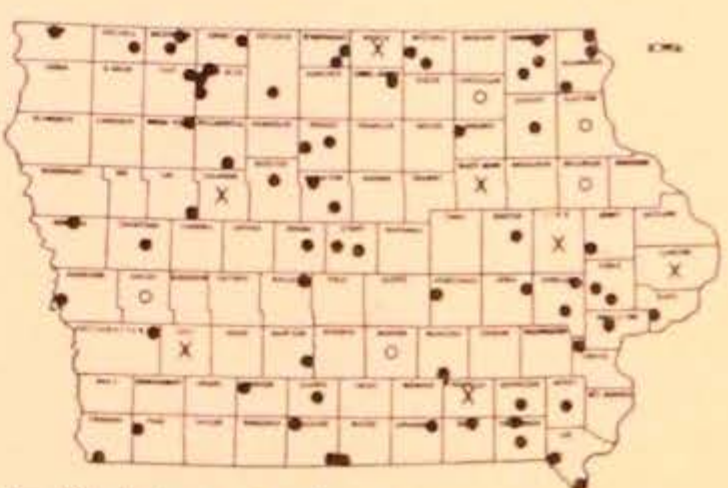
Cerro Gordo Co.: Buffalo Slough, T. 97 R. 20, S. 34, B. Shimek, June 1917 (IA). Emmet Co.: Armstrong, R. I. Cratty, June 1883 (ISC). Webster Co.: Crawford's Mill, O. M. Oleson, May 1905 (ISC).

5. Rhynchospora Vahl1. *R. capillacea* Torr. (Beaked-rush)

Map 86

Hanging bogs and calcareous fens of northwestern Iowa; infrequent. Chiefly in the northcentral and northeastern states.

Clay Co.: Along the Little Sioux, three miles west and five miles north of Ruthven, A. Hayden 7020, Sept. 1937 (ISC); Hanging bog, Logan Twp., S. 16, A. Hayden 8040, Sept. 1937 (ISC). Dickinson Co.: Silver Lake fen, W. A. Anderson, Aug. 1940 (IA); Silver Lake fen, Silver Lake Twp., S. 32, R. F. Thorne 13054, July 22, 1953 (IA). Emmet Co.: Hanging bog four miles north of Estherville, Emmet Twp., S. 21, A. Hayden 205, Sept. 1934 (ISC); Fen along Des Moines River, Emmet Twp., S. 21, R. F. Thorne 13098, July 25, 1953 (IA). Palo Alto Co.: Hanging bog east of Ruthven, Highland Twp., S. 24, W. A. Weber and A. Hayden 1144, Sept. 1938 (ISC); Hillside spring, Walnut Twp., S. 5, A. Hayden 8328, Sept. 1940 (ISC); Fen near

Map 81. *Eleocharis pauciflora*Map 82. *Eleocharis tenuis*Map 83. *Eleocharis wolfii*Map 84. *Eriophorum angustifolium*Map 85. *Eriophorum gracile*Map 86. *Rhynchospora capillacea*Map 87. *Scirpus americanus*Map 88. *Scirpus atrovirens*

overpass on highway, four and one half miles east of Ruthven, Sac Twp., R. F. Thorne 13590, Aug. 1953 (IA).

6. *Scirpus* L. (Bulrush)

- | | |
|---|----------------------------|
| 1. Major involueral bracts two or more, leaf-like; culms with leaves | 2 |
| 1. Major involueral bract solitary (sometimes two or three small scales present); leaves basal or absent | 6 |
| 2. Bristles soft, curled, not retrorsely barbed; achenes obscurely triangular | 3 |
| 2. Bristles retrorsely barbed; achenes triangular | 4 |
| 3. Involueral bracts longer than the inflorescence; bristles exerted in fruit, giving the spikelets a soft felt-like appearance | 3. <i>S. cyperinus</i> |
| 3. Involueral bracts much shorter than the inflorescence; bristles barely, if at all, exerted in fruit | 7. <i>S. lineatus</i> |
| 4. Spikelets 0.2-0.8 cm. long, in dense glomerules | 2. <i>S. atrovirens</i> |
| 4. Spikelets 1-4 cm. long | 5 |
| 5. Achenes strongly triangular; bristles 6, firm and persistent | 4. <i>S. fluviatilis</i> |
| 5. Achenes plano-convex to obscurely triangular; bristles none to six, weak and deciduous | 8. <i>S. maritimus</i> |
| 6. Inflorescence normally much branched | 7 |
| 6. Inflorescence sessile or nearly so, appearing lateral, the involueral bract stiffly erect and appearing to continue the culm | 8 |
| 7. Achenes triangular, twice as broad as thick, the persistent base of the style about 0.5 mm. long; spikelets 0.7-2.3 cm. long, solitary on the inflorescence branches; culms firm | 6. <i>S. heterochaetus</i> |
| 7. Achenes plano-convex, the persistent base of the style minute; some of the spikelets clustered at the tips of the inflorescence branches; culms soft to firm | 11. <i>S. validus</i> |
| 8. Culms terete or nearly so, tufted, without rhizomes | 9 |
| 8. Culms sharply triangular, arising from elongate rhizomes | 10 |
| 9. Achenes prominently transversely corrugated; scales of the spikelets awn tipped | 5. <i>S. hallii</i> |
| 9. Achenes smooth, scales of the spikelets blunt or minutely cuspidate | 9. <i>S. smithii</i> |
| 10. Leaf tips sharply pointed, achenes plano-convex or obscurely triangular, 2.5-3 mm. long | 1. <i>S. americanus</i> |
| 10. Leaf tips obliquely rounded; achenes sharply triangular, 3-4 mm. long, with a long, pointed tip | 10. <i>S. torreyi</i> |

1. *S. americanus* Pers.

Map 87

S. pungens Vahl.

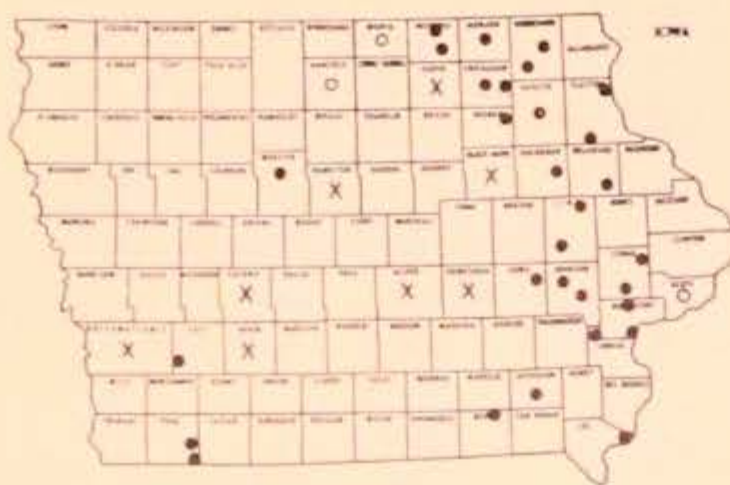
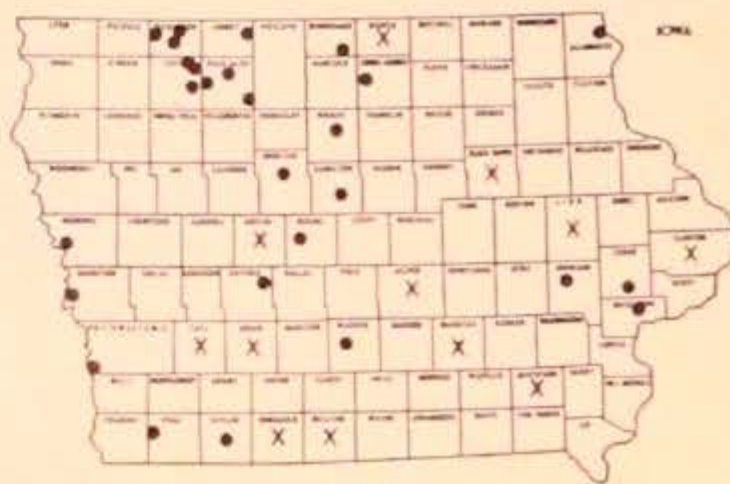
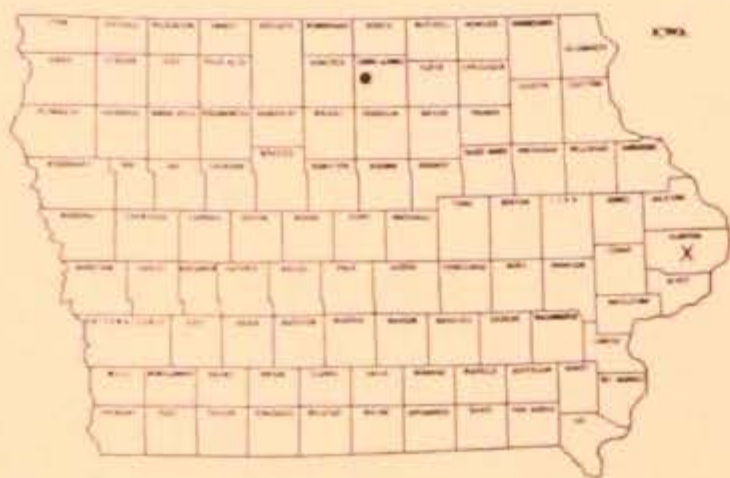
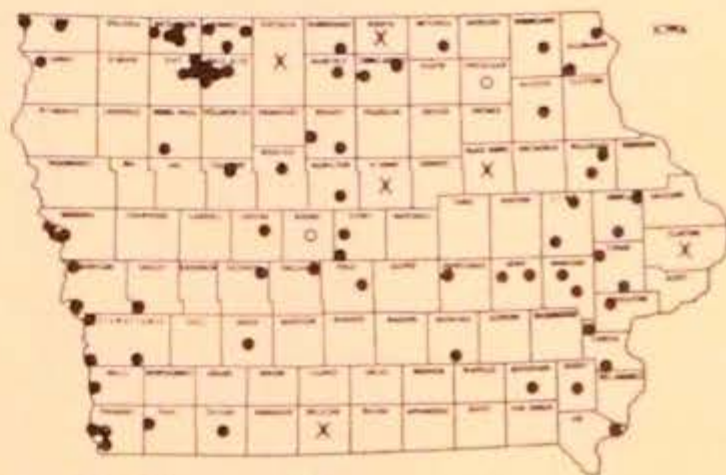
Wet sand, hanging bogs, fens, shallow water of lakes and stream margins throughout Iowa; frequent. Widespread in the United States.

2. *S. atrovirens* Willd.

Map 88

S. pallidus (Britt.) Fern.

Low ground, marshes, bogs, wet shores of lakes and streams

Map 89. *Scirpus cyperinus*Map 90. *Scirpus fluviatilis*Map 91. *Scirpus hallii*Map 92. *Scirpus heterochaetus*Map 93. *Scirpus lineatus*Map 94. *Scirpus maritimus*Map 95. *Scirpus smithii* ●
Scirpus torreyi XMap 96. *Scirpus validus*

throughout Iowa; common. Chiefly in central and eastern states except in the south.

3. *S. cyperinus* (L.) Kunth (Wool-grass) Map 89
Eriophorum cyperinum L.

Low ground, ditches, marshes, sloughs, bogs, lake borders and along streams throughout Iowa except in the northwest; common. Chiefly in the central and eastern states except in the south.

4. *S. fluviatilis* (Torr.) Gray Map 90

Low places, wet bottomlands, marshes, sloughs, bogs and shallow water of lakes throughout Iowa; common. Chiefly in the northern states.

5. *S. hallii* Gray Map 91
S. supinus var. *hallii* Gray

Wet soil of southeastern Iowa; rare. Chiefly in the Gulf Coastal states and very local in Mass., Ill. and Mo.

Muscatine Co.: F. Reppert (Davenport Public Museum).

6. *S. heterochaetus* Chase Map 92

Ditches, sloughs and shallow water of lakes throughout Iowa; infrequent. Chiefly in the northcentral states.

7. *S. lineatus* Michx. Map 93
Eriophorum lineatum (Michx.) Benth. & Hook.

Low places, ditches and marshes throughout Iowa except in the northwest; frequent. Chiefly in the lower Mississippi Valley and the northeastern states.

8. *S. maritimus* L. var. *paludosus* (A. Nels.) Gl. Map 94
S. paludosus A. Nels.

Wet sandy lake shores of northwestern Iowa; rare. Chiefly in states west of the Mississippi but local in New England.

Dickinson Co.: Silver Lake marsh, Martin L. Grant 8945, Aug. 11, 1948 (IA). Palo Alto Co.: Rush Lake, Booth Twp., S. 21, A. Hayden 3163, Aug. 1943 (ISC).

9. *S. smithii* Gray Map 95

Known in Iowa only from Cerro Gordo County; rare. Chiefly east of the Mississippi.

Cerro Gordo Co.: Swamp at Clear Lake, B. Shimek, 1912 (IA).

10. *S. torreyi* Olney Map 95

Rare in eastern Iowa. Chiefly in the northcentral and northeastern states.

No specimens of this species have been examined but it is included on the basis of a specimen in the Gray Herbarium, Cambridge, Mass. that has been examined by Gilly (1946).

Clinton Co.: Butler 3, July 10, 1878.

11. *S. validus* Vahl.

Map 96

S. acutus Muhl.

S. lacustris of many Am. Auth., not L.

S. occidentalis (S. Wats.) Chase

Low ground, marshes, sloughs, bogs, shallow ponds, lake and stream margins throughout Iowa; common. Widespread throughout the United States.

Since the characteristics of *S. acutus*, as given by Fernald (1950) and Gleason (1952), do not clearly distinguish the Iowa specimens from *S. validus*, the former taxon is reduced to synonymy.

7. *Scleria* Bergius

1. *S. verticillata* Muhl. (Nut-grass)

Map 97

Hanging bogs of Emmet County; rare. Chiefly in the northcentral and northeastern states.

Emmet Co.: Bog, Emmet Twp., B. O. Wolden, Aug. 1929 (ISC); Hanging bog, Emmet Twp., S. 28, B. O. Wolden & A. Hayden 220, Aug. 1934 (ISC); Hanging bog in Des Moines River Valley four miles north of Estherville, J. Fults, Sept. 1934 (ISC); Fen (now tiled) along Des Moines River, Emmet Twp., S. 21, R. F. Thorne 13097, July 25, 1953, 13442, Aug. 17, 1953 (IA).

ARACEAE

- | | |
|--|------------------------|
| 1. Spathe prominent, broad, subtending the inflorescence----- | 2 |
| 1. Spathe incomplete, narrow, reduced to a sheath or like the foliage leaves-- | 3 |
| 2. Spadix short-cylindric; spathe petaloid, pointed at the tip and white on the upper surface ----- | 2. <i>Calla</i> |
| 2. Spadix globose; spathe fleshy, yellowish-green and marked with purple, becoming brown with age; plant foul smelling---- | 4. <i>Symplocarpus</i> |
| 3. Spadix appearing lateral, the rigid, linear spathe continuing the culm; leaves alternate and sword-like ----- | 1. <i>Acorus</i> |
| 3. Spadix terminating the culm; spathe reduced to a sheath at the base of the culm; leaves basal and tongue-like ----- | 3. <i>Orontium</i> |

1. *Acorus* L.

1. *A. calamus* L. (Sweet Flag)

Map 98

Low ground, marshes, sloughs, bogs, shallow ponds and river bottomlands of the northeastern half of Iowa; common. Chiefly in the central and northeastern states.

2. Calla L.

1. *C. palustris* L. (Wild Calla) Map 99

Collected in Iowa only from Linn County; rare. Chiefly in the northeastern states.

Linn Co.: Swamp on Abby Creek, Bertram, G. Berry, June 1912 (IA).

3. Orontium L.

1. *O. aquaticum* L. (Golden Club) Map 100

Collected in Iowa only from Linn County; rare. Chiefly in the eastern and southern states.

Linn Co.: Prairie pond three miles from Troy Mills, G. Berry, June 1912 (IA).

4. Symplocarpus Salisb.

1. *S. foetidus* (L.) Nutt. (Skunk Cabbage) Map 101

Spathyema foetida (L.) Raf.

Damp ravines, marshes, woodland bogs and along streams of eastern Iowa; infrequent. Chiefly in the northcentral and northeastern states.

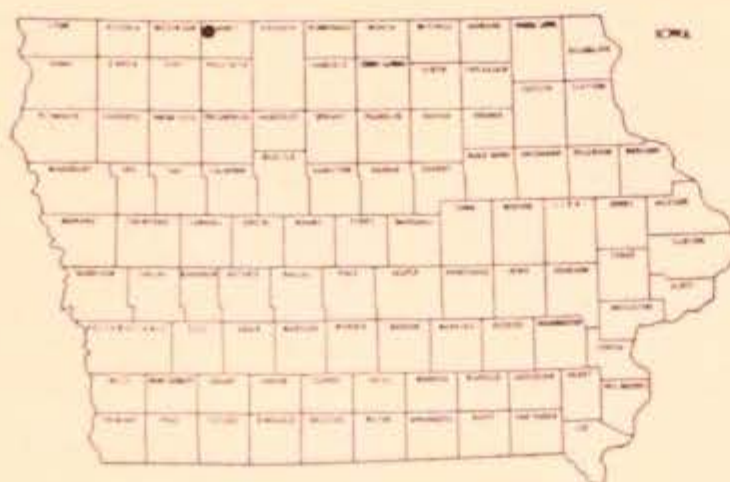
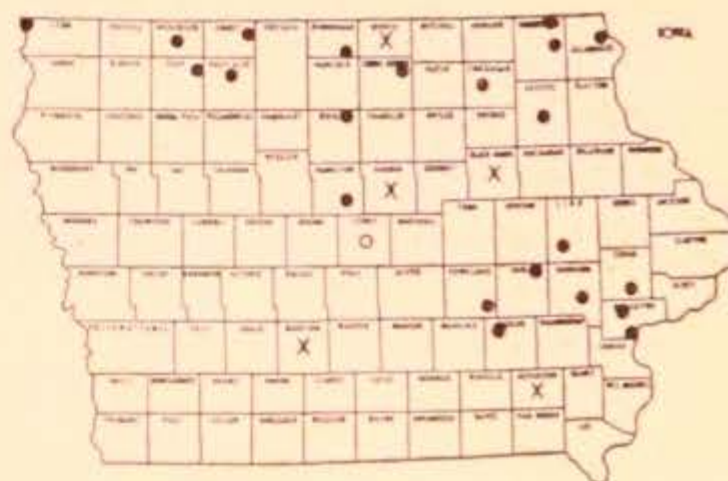
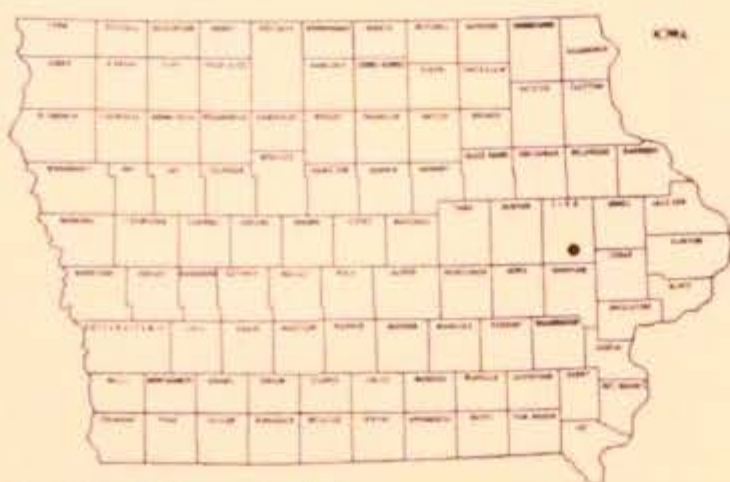
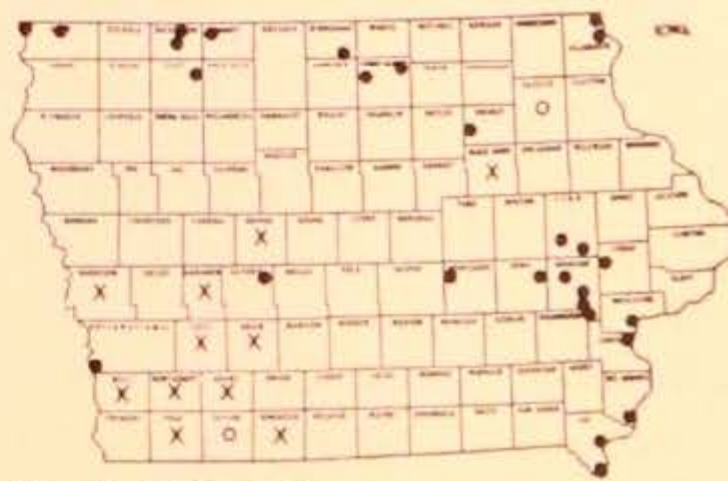
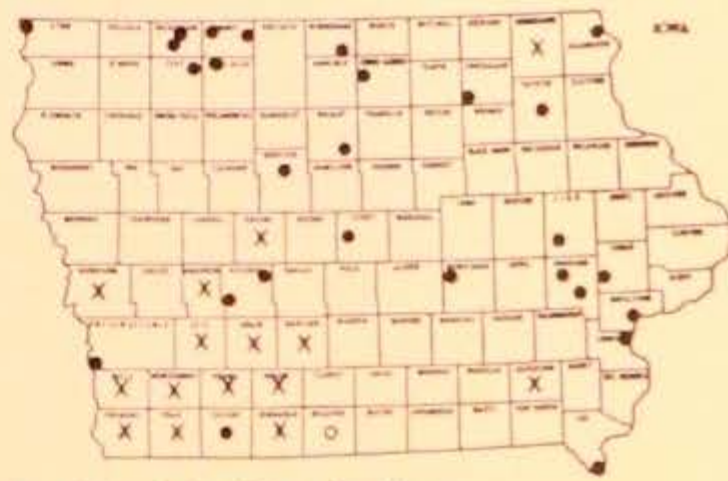
Fayette Co.: Waldens, B. Fink, April 1894 (ISC). Iowa Co.: North of Middle Amana, W. Easterly 858, July 1950 (IA). Linn Co.: Cedar Rapids, Lingerlonger District, M. Murley, April 1940 (ISC); Three miles northwest of Cedar Rapids, Clinton Twp., S. 11, A. Hayden 9823, April 1940 (ISC). Muscatine Co.: Bog northwest of Bayfield, B. Shimek, May 1911 (ISC). Winneshiek Co.: Decorah, April 1893 (ISC); One mile north of Freeport, Decorah Twp., S. 14, W. L. Tolstead, April 1934 (ISC); Ravine west of Hesper, M. Murley 649, April 1939 (ISC).

LEMNACEAE

- | | |
|--|---------------------|
| 1. Plants 1.5 mm. or less in length, without roots, proliferous from one funnel-shaped pouch | 3. <i>Wolffia</i> |
| 1. Plants 2-10 mm. in length; roots one to several; proliferous from two pouches | 2 |
| 2. Fronds with one root and no vascular tissue | 1. <i>Lemna</i> |
| 2. Fronds with several roots and axial vascular tissue, purplish below | 2. <i>Spirodela</i> |

1. Lemna L.

- | | |
|---|-----------------------|
| 1. Individual fronds 2-5 mm. in diameter, not stalked, often united into a tiny rosette | 1. <i>L. minor</i> |
| 1. Individual fronds 6-10 mm. long, stalked, connected and forming mats | 2. <i>L. trisulca</i> |

Map 97. *Scleria verticillata*Map 98. *Acorus calamus*Map 99. *Calla palustris*Map 100. *Orontium aquaticum*Map 101. *Symplocarpus foetidus*Map 102. *Lemna minor*Map 103. *Lemna trisulca*Map 104. *Spirodela polyrhiza*

1. *L. minor* L. (Duckweed) Map 102

Sloughs, ponds and still water of lakes throughout Iowa; common. Widespread in the United States.

2. *L. trisulca* L. (Star Duckweed) Map 103

Sloughs, ponds and shallow lakes throughout Iowa; frequent. Widespread in the United States except in the south.

2. *Spirodela* Schleid.

1. *S. polyrrhiza* (L.) Schleid. (Water-flaxseed) Map 104

Sloughs, ponds and still water of lakes and streams throughout Iowa; common. Widespread in the United States.

3. *Wolffia* Horkel (Water-meal)

1. Frond globose, loosely cellular, not brown dotted, floating just beneath the surface of the water-----1. *W. columbiana*

1. Frond flattened on the upper surface, brown dotted all over; floating with the flat surface level with the surface of the water-----2. *W. punctata*

1. *W. columbiana* Karst. Map 105

Sloughs, ponds and still water of lakes and sluggish streams. Rarely collected but probably common. Chiefly in the central and eastern states.

Dry herbarium specimens were not identifiable beyond question, therefore they have been indicated on the map as unconfirmed reports.

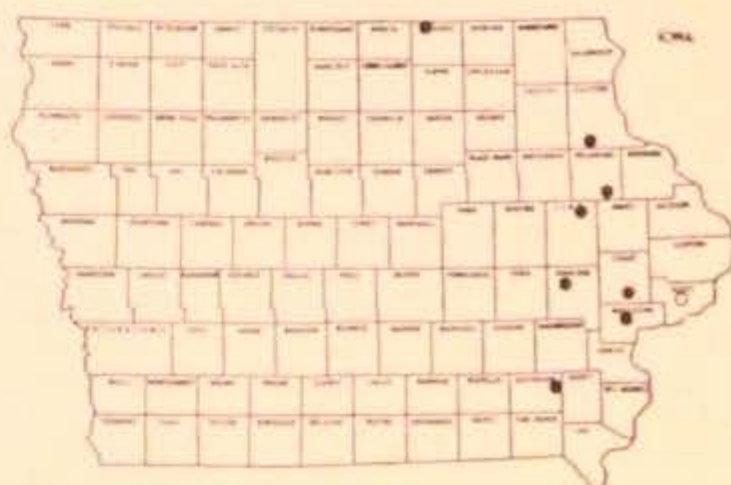
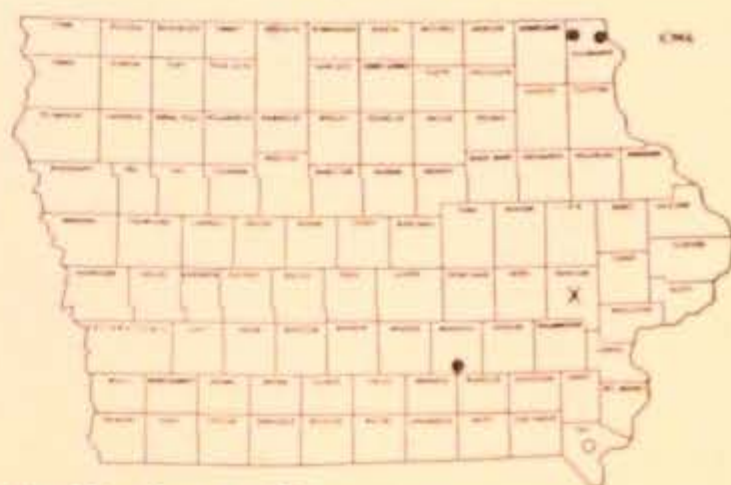
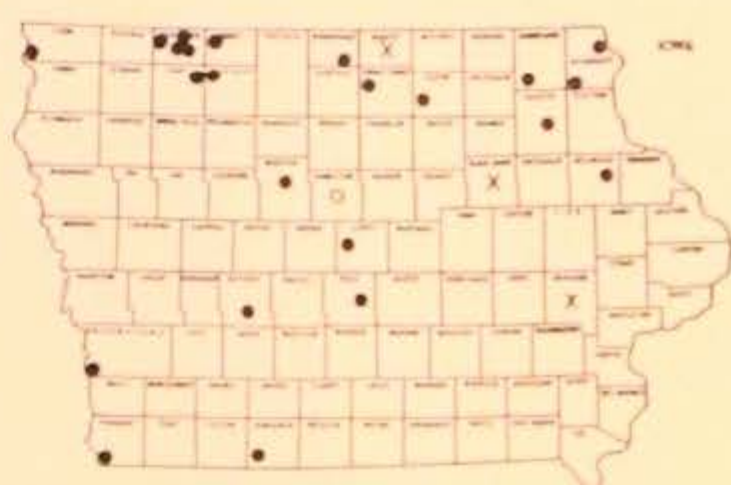
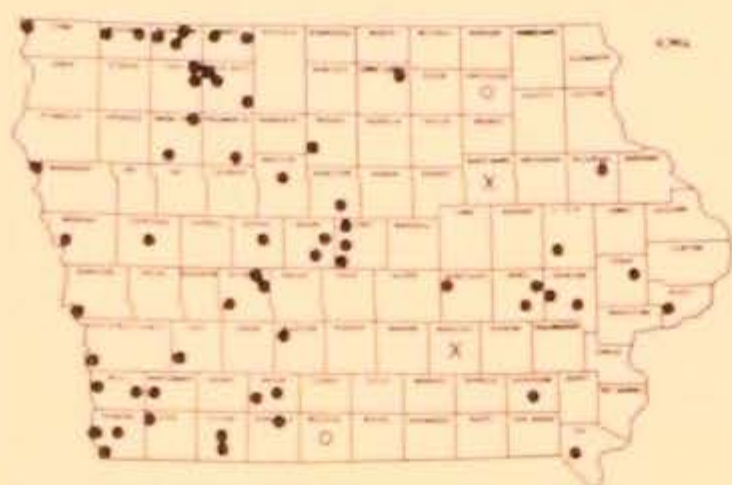
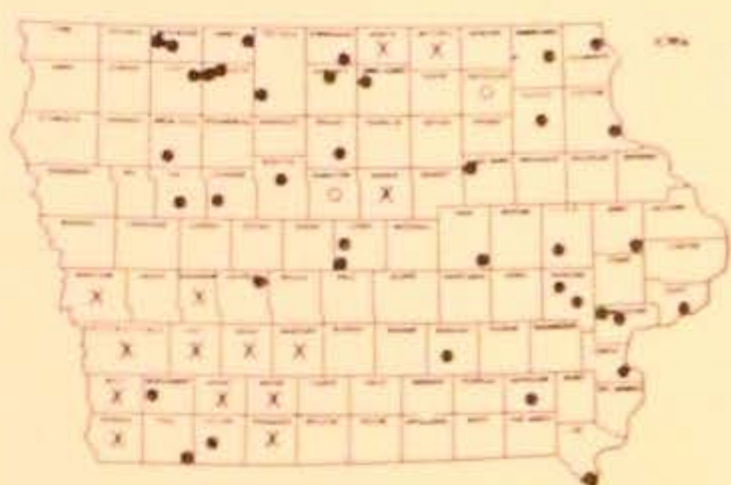
Dickinson Co.: West Okoboji Canal, R. E. Lee, Aug. 1932 (IA); West Okoboji Canal, E. O. Beal & A. Shook 71, 1950 (Herbarium of the Iowa Lakeside Laboratory). Johnson Co.: Slough six miles south of Iowa City, R. F. Thorne 10778, June 28, 1952 (IA). Muscatine Co.: Muscatine Slough, R. F. Thorne & E. O. Beal, Sept. 1951 (IA).

2. *W. punctata* Griseb. Map 106

Sloughs, ponds and still water of lakes and sluggish streams. Rarely collected but probably common. Chiefly in the eastern states.

Dry herbarium specimens were not identifiable beyond question, therefore they have been indicated on the map as unconfirmed reports.

Dickinson Co.: West Okoboji Canal south of Miller's Bay, E. O. Beal & A. Shook 71, 1950 (Herbarium of the Iowa Lakeside Laboratory). Johnson Co.: Slough two miles northeast of Hills, Pleasant Valley Twp., S. 11-14, R. F. Thorne 10778, June 28, 1952 (IA). Muscatine Co.: Muscatine Slough, R. F. Thorne & E. O. Beal, Sept. 1951 (IA).

Map 113. *Juncus balticus*Map 114. *Juncus canadensis*Map 115. *Juncus dudleyi*Map 116. *Juncus effusus*Map 117. *Juncus marginatus*Map 118. *Juncus nodosus*Map 119. *Juncus torreyi*Map 120. *Iris virginica*

2. Stamens 6; anthers at least twice the length of the filaments; culm without longitudinal furrows ----- 3. *J. balticus*
3. Leaves flat, without hard cross-partitions ----- 4
3. Leaves terete, with hard cross-partitions ----- 5
4. Flowers in close heads; sepals acute, petals ovate with broad hyaline margins and a green midrib ----- 7. *J. marginatus*
4. Flowers in few-flowered, loose heads or solitary; sepals and petals acute with narrow hyaline margins; auricles at tip of sheath cartilaginous, yellowish in color; small scales immediately below the flower (bracteoles) ovate, obtuse or acutish, not acuminate --- 5. *J. dudleyi*
5. Stamens 3 ----- 6
5. Stamens 6 ----- 7
6. Seeds long tailed at each end; mature fruit and perianth 3.8-5 mm. long ----- 4. *J. canadensis*
6. Seeds merely pointed at ends; perianth 2.5-3.5 mm. long, equaling the capsule; sepals acuminate ----- 1. *J. acuminatus*
7. Flowers in hemispherical heads; involueral bract shorter than the inflorescence; leaves slender, short ----- 2. *J. alpinus*
7. Flowers in spherical heads; involueral bract overtopping the inflorescence ----- 8
8. Heads 8-20 flowered, the flowers 3-4 mm. long ----- 8. *J. nodosus*
8. Heads 30-80 flowered, the flowers 4-5 mm. long ----- 9. *J. torreyi*

1. *J. acuminatus* Michx.

Map 111

Ditches, marshes, sloughs and shallow ponds of southeastern and southwestern Iowa; infrequent. Chiefly in the central and eastern states.

2. *J. alpinus* Vill.

Map 112

Calcareous fens and wet, sandy shores of western Iowa; rare. Chiefly in the northwestern states.

Dickinson Co.: Silver Lake fen, W. A. Anderson, Aug. 1942 (IA); Silver Lake fen, Silver Lake Twp., S. 32, R. F. Thorne 13060, July 22, 1953 (IA). Harrison Co.: Blair Bridge, B. Shimek, Aug. 1909 (IA).

3. *J. balticus* Willd.

Map 113

J. litorum Rydb.

Wet prairies, sloughs and lake margins throughout Iowa except in the southwest; frequent. Throughout the United States except in the south.

4. *J. canadensis* J. Gay

Map 114

Ditches, marshes, sloughs and shallow ponds of eastern Iowa; infrequent. Chiefly in the Atlantic Coastal and Mississippi Valley states.

5. *J. dudleyi* Wieg.

Map 115

Wet meadows, marshes, sloughs and muddy shores of ponds and lakes of northwestern, central and southeastern Iowa; frequent. Widespread throughout the United States except in the southeast.

6. *J. effusus* L.

Map 116

Wet places, sloughs and stream margins of eastern Iowa; infrequent. Chiefly in the northcentral and northeastern states.

Allamakee Co.: Lansing, I. E. Snead, July 1946 (ISC); Floodplain, French Creek Twp., S. 7, A. Hayden 9078, Sept. 1937 (ISC). Lee Co.: J. L. Fults, 1092, June 1931 (ISC). Mahaska Co.: Three miles north of Eddyville, D. W. Augustine 259, June 1938 (ISC).

7. *J. marginatus* Rostk.

Map 117

Marshes and ponds of Cedar and Muscatine Counties; rare. Chiefly in the central and eastern states.

Cedar Co.: Four miles south of Rochester and one mile east of the Cedar River, M. Fay 1295, Aug. 1950 (IA). Muscatine Co.: Pond margin, F. Reppert 862, July 1892 (IA).

8. *J. nodosus* L.

Map 118

Wet gravel, bogs, sloughs and lake margins throughout Iowa; common. Chiefly in the northern states.

The following specimens collected from the Silver Lake fen in Dickinson County appear to be hybrids between *J. alpinus* Vill. and *J. nodosus* L., both of which are found in the fen. This cross has been previously reported in Nfld. and in Gaspé Co., Que., by Fernald (1950), and has been termed X *J. nodosiformis* Fern.; W. A. Anderson, Aug. 1932 (IA); W. A. Anderson, Aug. 1940 (IA); W. A. Anderson 2041a, Aug. 1942 (IA); R. F. Thorne 9797, Aug. 1950 (IA); R. F. Thorne 13061, July 22, 1953 (IA).

9. *J. torreyi* Coville

Map 119

Wet places, bogs, sloughs and lake shores throughout Iowa; common. Widespread in the United States.

IRIDACEAE

I. *Iris* L.1. *I. virginica* L. (Blue Flag)

Map 120

I. versicolor of Ia. Auth., not L.

Moist thickets, ditches, wet prairies, marshes, sloughs, bogs, shallow ponds and marshy lake borders throughout Iowa; common. Chiefly in the central and eastern states.

Anderson (1928) considers the Northern Blue Flag, *I. versicolor* to be a more northern species and discusses the two species in detail.

DICOTYLEDONS

KEY TO THE FAMILIES

1. Flowers with calyx only or no perianth	2
1. Flowers with calyx and corolla	10
2. Flowers unisexual *	3
2. Flowers perfect or with some in each inflorescence perfect	4
3. Leaves whorled, cut into many filiform segments	CERATOPHYLLACEAE p. 59
3. Leaves opposite, entire	CALLITRICHACEAE p. 66
4. Leaves cut into many filiform segments	HALORAGACEAE p. 73
4. Leaves simple, not deeply cut or divided	5
5. Ovary superior	6
5. Ovary inferior	9
6. Nodes with tubular, membranous, sheathing stipules (ocrea)	POLYGONACEAE p. 55
6. Nodes without ocrea	7
7. Leaves opposite	LYTHRACEAE p. 67
7. Leaves alternate	8
8. Leaves lanceolate-elliptic, simple, tapering to petiole; flowers green, in helicoid racemes	SAXIFRAGACEAE p. 66
8. Leaves cordate, simple; flowers yellow, borne singly on pedicels at least 1 cm. long	RANUNCULACEAE p. 61
9. Leaves in whorls of 6 or more	HIPPURIDACEAE p. 74
9. Leaves opposite or alternate	ONAGRACEAE p. 69
10. Petals separate	11
10. Petals united	21
11. Flowers all unisexual	HALORAGACEAE p. 73
11. Flowers all or some in each inflorescence perfect	12
12. Ovary superior or not enclosed by the calyx tube	13
12. Ovary inferior or enclosed by calyx tube	18
13. Flowers hypogynous	14
13. Flowers perigynous or perianth and stamens inserted on or at base of an hypogynous disc	16
14. Leaves large, mostly more than 1 dm. broad, if smaller, than peltate; aquatics with entire floating or emergent leaves	NYMPHAEACEAE p. 59
14. Leaves smaller; marsh plants or if aquatic with ribbon-like or filiform leaf segments	15
15. Ovary 1; fruit a many-seeded, 2-valved silique; stamens 6; petals 4	CRUCIFERAE p. 65
15. Ovaries many; fruits achenes, borne on the surface of the receptacle	RANUNCULACEAE p. 61
16. Flowers irregular (zygomorphic)	BALSAMINACEAE p. 67
16. Flowers regular (actinomorphic)	17

17. Leaves simple, entire, basal; flowers borne on a long scape often bearing a single bract; petals creamy-white.....SAXIFRAGACEAE p. 66
17. Leaves compound, toothed; flowers in axillary inflorescences; petals purple.....ROSACEAE p. 66
18. Flowers in umbels; leaves pinnately compound.....UMBELLIFERAE p. 74
18. Flowers not in umbels; leaves simple, toothed or divided into filiform segments.....19
19. Aquatic; leaves whorled or scattered, divided into filiform segments.....HALORAGACEAE p. 73
19. Marsh or shore plants; leaves simple, not deeply cut or divided.....20
20. Leaves mostly alternate, entire or toothed; calyx tube enclosing and adnate to ovary.....ONAGRACEAE p. 73
20. Leaves opposite or whorled, entire; calyx tube enclosing but free from ovary.....LYTHRACEAE p. 67
21. Stamens more numerous than the lobes of the corolla.....MALVACEAE p. 67
21. Stamens not more numerous than the lobes of the corolla.....22
22. Stamens of same number as corolla lobes and opposite them.....PRIMULACEAE p. 75
22. Stamens alternate with corolla lobes or fewer.....23
23. Ovary superior.....24
23. Ovary inferior.....33
24. Corolla regular or nearly so.....25
24. Corolla irregular.....29
25. Flowers in umbels; fruit a follicle containing many seeds bearing long silky hairs; juice milky.....ASCLEPIADACEAE p. 77
25. Flowers single, racemed or clustered in axils of upper leaves; juice colorless.....26
26. Flowers clustered in axils of upper leaves; ovary 1, deeply 4-lobed.....LABIATAE p. 77
26. Flowers single or racemed; ovary not deeply 4-lobed.....27
27. Leaves compound, alternate, petioled.....GENTIANACEAE p. 75
27. Leaves simple, opposite, mostly sessile.....28
28. Corolla at least 2 cm. long; flowers single or in a cyme; stamens 4.....GENTIANACEAE p. 75
28. Corolla shorter; flowers in a long, open raceme; stamens 2.....SCROPHULARIACEAE p. 81
29. Ovary maturing into 2 or 4 1-seeded nutlets.....30
29. Ovary maturing into a several to many-seeded capsule.....31
30. Ovary forming 4 nutlets; flowers in elongate spikes or racemes.....LABIATAE p. 77
30. Ovary forming 2 nutlets; flowers in a dense, terminal, head-like spike subtended by numerous bracts.....VERBENACEAE p. 77
31. Aquatic; leaves divided into filiform segments, some or all segments bearing small bladder-like traps.....LENTIBULARIACEAE p. 85
31. Emergent or shore plants; leaves not as above.....32
32. Plants strongly stoloniferous and rhizomatous; leaves simple, entire, sessile or short petioled.....ACANTHACEAE p. 87
32. Plants not strongly stoloniferous; leaves

- various ----- SCROPHULARIACEAE p. 81
33. Flowers single in axils of leaves or bracts; fruit a many-seeded capsule ----- CAMPANULACEAE p. 87
33. Flowers in heads subtended by an involucre; fruit a 1-seeded achene ----- COMPOSITAE p. 87

POLYGONACEAE

1. Flowers distinctly pedicelled, in axillary whorls; sepals 6, the inner becoming enlarged to enclose the fruit, midribs often thickened ----- 1. *Rumex*
1. Flowers sessile or short pedicelled in spikes or racemes; sepals 6, all alike, often petaloid, midrib not becoming thickened ----- 2. *Polygonum*

1. *Rumex* L. (Dock)

1. Sepals with long teeth, at least near the base ----- 3. *R. maritimus* var. *fueginus*
1. Sepals entire or shallowly dentate ----- 2
2. Pedicels clavate, straight, deflexed; valves rhombic with a narrowed tip; leaves mostly 1-2 dm. long ----- 1. *R. verticillatus*
2. Pedicels filiform, curved or flexuous; valves orbicular; lower leaves 3-6 dm. long ----- 2. *R. orbiculatus*

1. *R. verticillatus* L. Map 121

Muddy shores, stream banks, and low places. Southeast Iowa; a species of the Lower Mississippi River embayment.

2. *R. orbiculatus* Gray Map 122

R. britannica of Gray's Manual, ed. 7, not L.

Bogs, swamps, stream banks, and lake shores into shallow water. Distribution limited mostly to the Mankato Lobe in the northern two tiers of counties.

3. *R. maritimus* L. var. *fueginus* (Phil.) Dusen Map 123

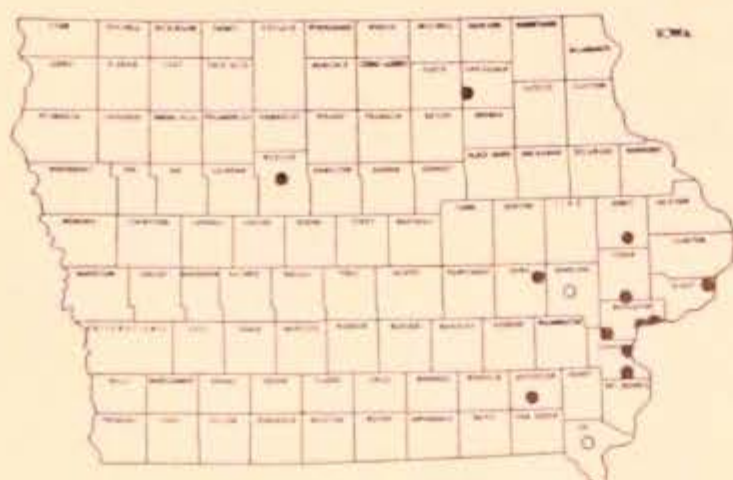
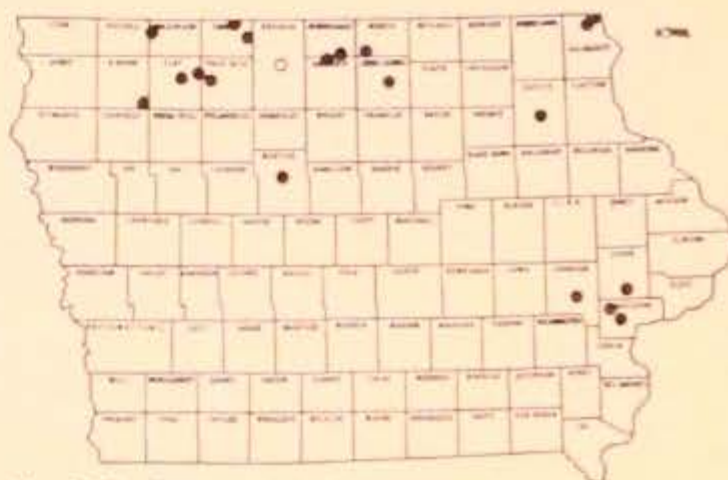
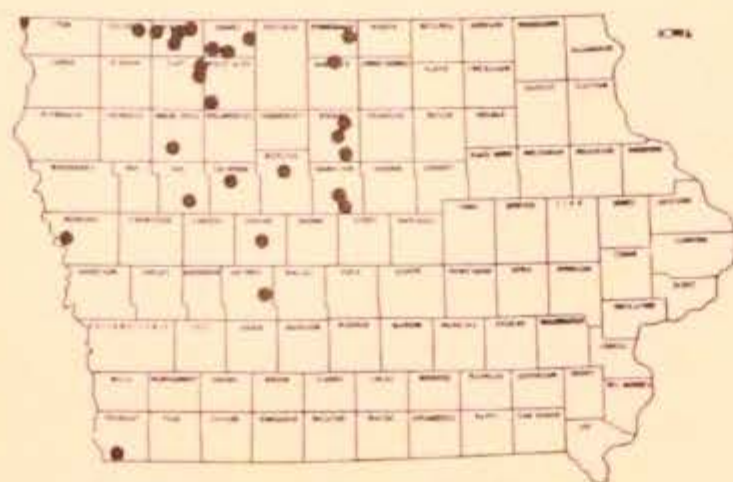
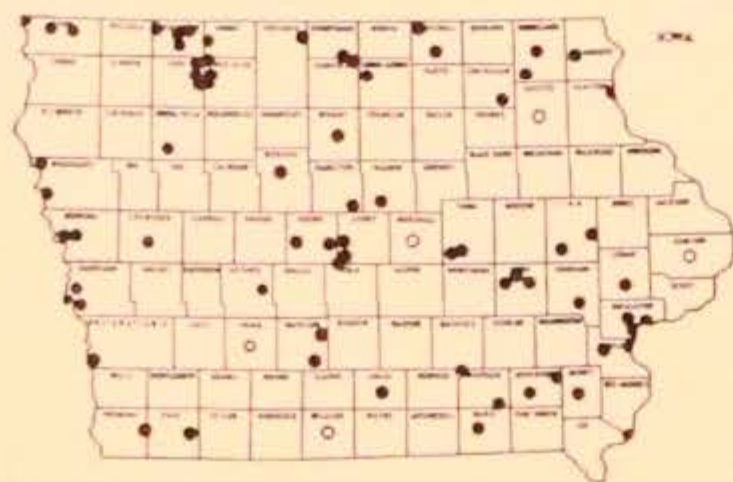
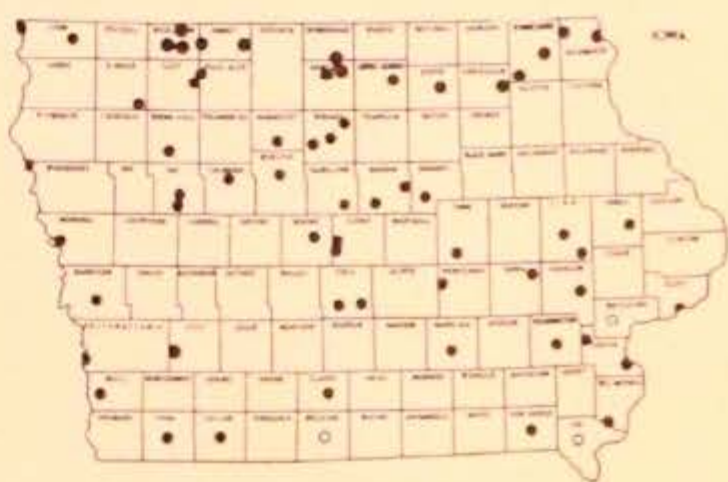
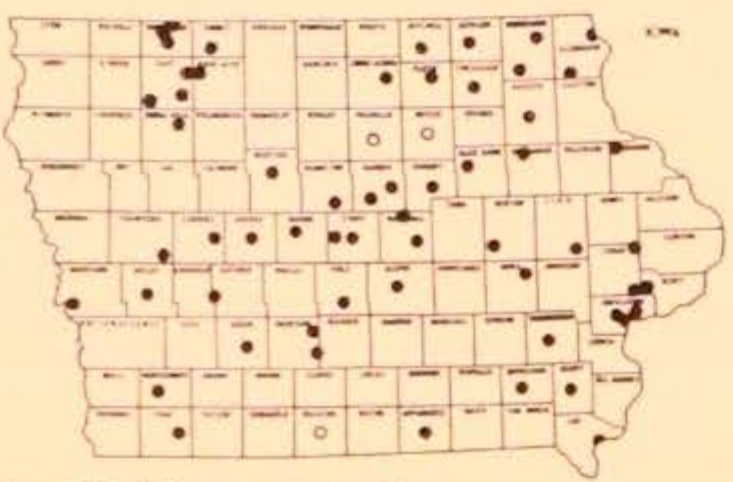
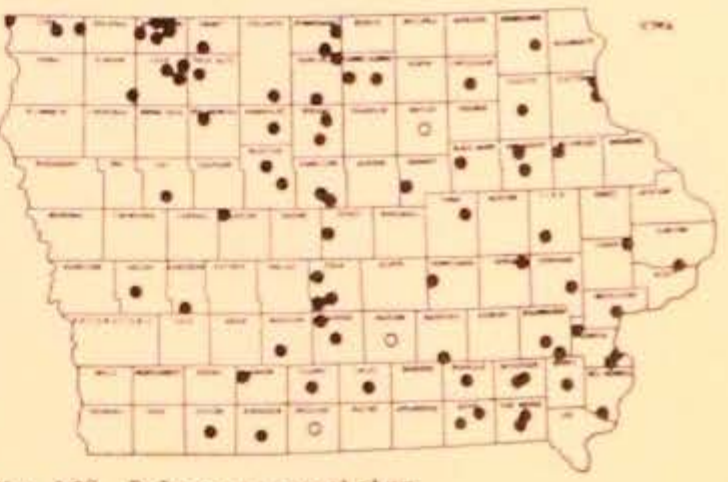
R. fueginus Phil.

R. persicarioides of Gray's Manual, ed. 7, not L.

Bogs, swamps, lake and pond shores. Collections mostly from the Mankato Lobe with a few additional stations along the Missouri River. Typical *R. maritimus* is European, introduced into the New England states.

2. *Polygonum* L. (Smartweed, Water Pepper)

1. Leaves sagittate; stem angles with strong recurved spines ----- 7. *P. sagittatum*
1. Leaves ovate to lanceolate; stems without spines ----- 2
2. Summit of ocrea bearing well developed cilia ----- 3
2. Summit of ocrea free from ciliation ----- 6
3. Ocrea expanded into an herbaceous flange ----- 1. *P. amphibium*
3. Ocrea cylindric, without herbaceous flange ----- 4
4. Sepals plain, not dotted with dark glands ----- 6. *P. hydropiperoides*

Map 121. *Rumex verticillatus*Map 122. *Rumex orbiculatus*Map 123. *Rumex maritimus* v. *fueginus*Map 124. *Polygonum amphibium*Map 125. *Polygonum coccineum*Map 126. *Polygonum lapathifolium*Map 127. *Polygonum hydropiper*Map 128. *Polygonum punctatum*

- 4. Sepals dotted with dark glands ----- 5
- 5. Achenes lustrous, smooth; calyx white; stem internodes mostly 3-8
em. long; leaves short petioled ----- 2. *P. punctatum*
- 5. Achenes dull, pitted; calyx greenish or with purple tips; stem inter-
nodes mostly 2-4 cm. long; leaves mostly sessile ----- 4. *P. hydropiper*
- 6. Annual, without elongate rootstocks or stolons; achenes
lenticular ----- 3. *P. lapathifolium*
- 6. Perennials with extensive creeping rhizomes or stolons; achenes
lenticular or triangular ----- 7
- 7. Aquatic; stems, branches and leaves floating ----- 8
- 7. Terrestrial; stems and branches ascending ----- 9
- 8. Peduncle glabrous; spikes thick, ellipsoid or ovoid, 1-4 cm. long,
1-2 cm. thick; ocreolae glabrous ----- 1. *P. amphibium*
- 8. Peduncle pubescent; spikes slenderly cylindric, 4-18 cm. long, 7-15
mm. thick; ocreolae pubescent ----- 2. *P. coccineum*
- 9. Ocrea with a broad, herbaceous flange at summit ----- 1. *P. amphibium*
- 9. Ocrea cylindric, without herbaceous flange ----- 10
- 10. Spike thick, ellipsoid or ovoid, 1-4 cm. long; 1-2 cm. thick; leaves
with short, harsh hairs less than 1 mm. long ----- 1. *P. amphibium*
- 10. Spike slenderly cylindric, 4-18 cm. long, 7-15 mm. thick; leaves
with longer, softer hairs ----- 2. *P. coccineum*

1. *P. amphibium* L.

Map 124

P. natans (Michx.) Eat.*P. hartwrightii* Gray

Ponds, shores, marshes, low ground, into 1-2 feet of water. A highly variable species, transition types from the aquatic to terrestrial forms often being found on the same rootstock. Most of our material appears to be forms of var. *stipulaceum* (Coleman) Fern. Mankato Lobe, southeast to the Mississippi River.

2. *P. coccineum* Muhl.

Map 125

P. muhlenbergii (Meisn.) S. Wats.

In 1-3 feet of water; on shores, marshes, and low places. Highly variable, plants growing in water often showing transition from aquatic to terrestrial forms on the same rootstock. Distinguished from *P. amphibium* by its longer, narrower spike and pubescent ocreolae. Widely distributed throughout the state.

3. *P. lapathifolium* L.

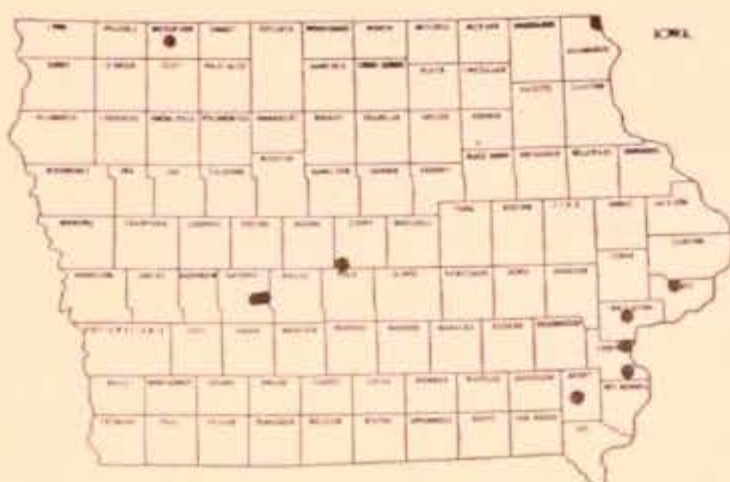
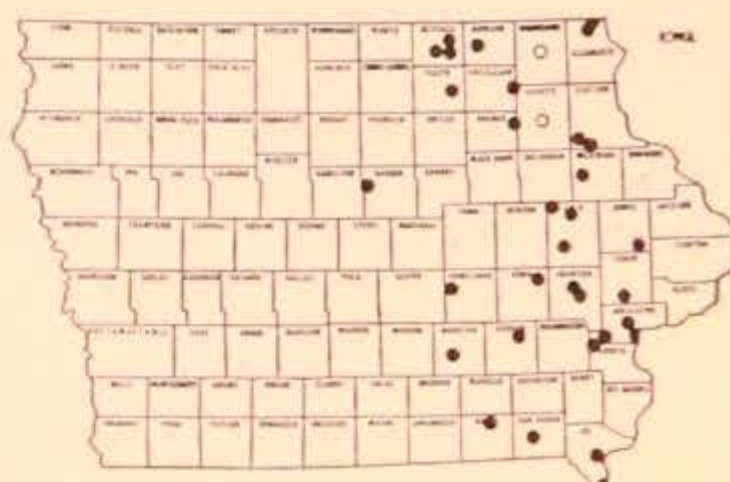
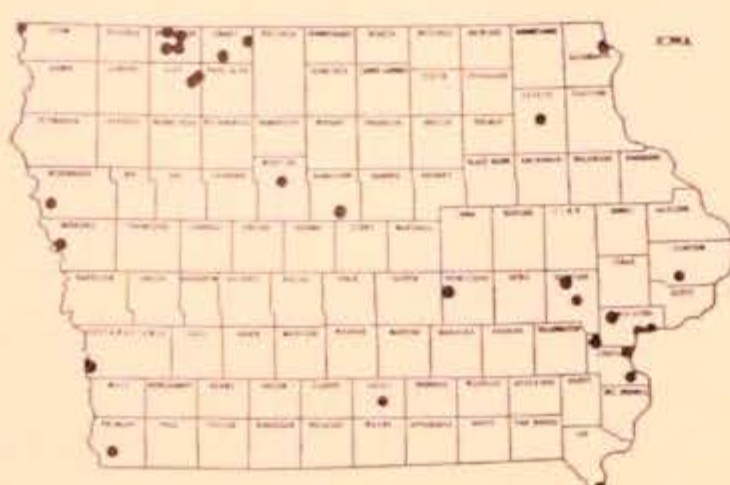
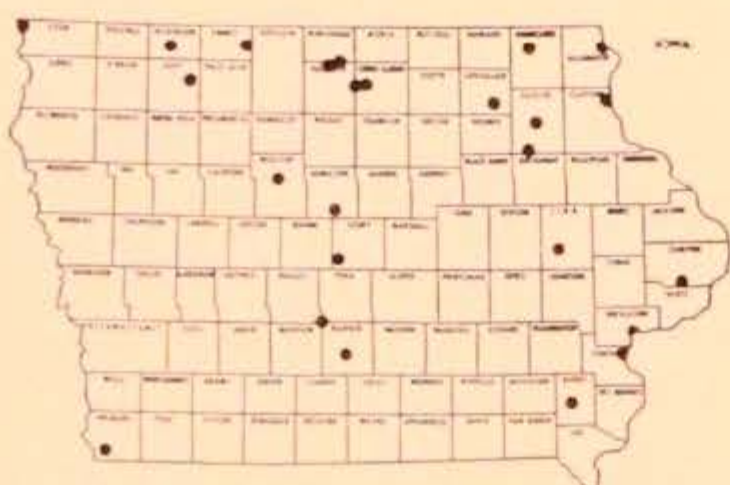
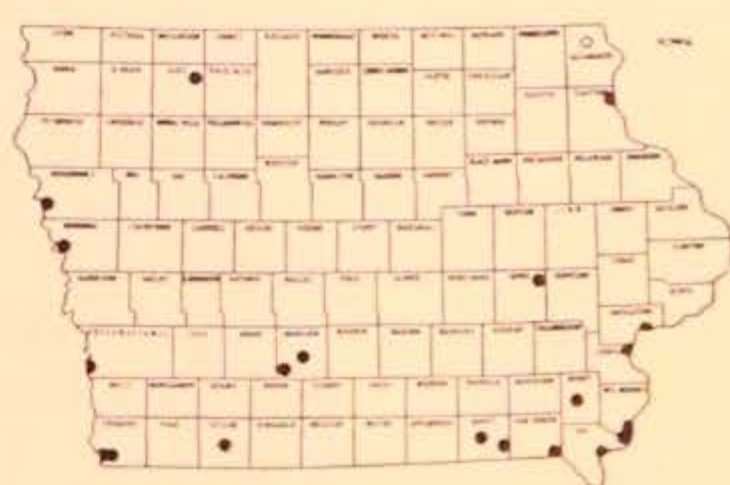
Map 126

Marshes and shores into shallow water; bottomlands and dried up pools. Widely distributed throughout the state.

4. *P. hydropiper* L.

Map 127

Swamps, ditches, bottomlands, lake shores into shallow water. Widely distributed throughout the state.

Map 129. *Polygonum hydropiperoides*Map 130. *Polygonum sagittatum*Map 131. *Ceratophyllum demersum*Map 132. *Nuphar advena*Map 133. *Nymphaea tuberosa*Map 134. *Nelumbo lutea*Map 135. *Brasenia schreberi*Map 136. *Ranunculus aquatilis* v. *capillaceus*

5. *P. punctatum* Ell. Map 128
P. acre HBK.

Boggy or swampy shores, flood plains, low fields. Widely distributed throughout the state.

6. *P. hydropiperoides* Michx. Map 129
 (Stanford, 1926)

Ponds and lake shores into water 2 feet in depth. Iowa reports of *P. opelousanum* Riddell have been referred to this species. Discontinuously distributed throughout the state.

7. *P. sagittatum* L. (Arrow-Leaved Tearthumb) Map 130

Swamps, bogs, lake and stream banks, and low ground. Widely distributed in the eastern third of the state.

CERATOPHYLLACEAE

1. *Ceratophyllum* L.

1. *C. demersum* L. (Coontail, Hornwort) Map 131

Lakes, ponds, and shores. Usually in several feet of water. Observed in depths of eight feet or more where water is clear. *C. echinatum* Gray has been reported from the state but no specimens of this species have been seen. Found in all parts of the state where proper habitat exists.

NYMPHAEACEAE

- | | |
|--|--------------------|
| 1. Leaves with basal sinus, petiole attached at base of sinus; carpels many, fused into a compound pistil with many seeds----- | 2 |
| 1. Leaves without basal sinus, peltate; carpels many, not united----- | 3 |
| 2. Flowers yellow; petals and stamens attached to receptacle below the ovary; veins strictly pinnate, little branched----- | 1. <i>Nuphar</i> |
| 2. Flowers white; petals and stamens attached to sides of ovary; veins mostly radiating from base of petiole, much branched-- | 2. <i>Nymphaea</i> |
| 3. Leaves 2-6 dm. in diameter, orbicular ----- | 3. <i>Nelumbo</i> |
| 3. Leaves 1 dm. or less in diameter, elliptic ----- | 4. <i>Brasenia</i> |

1. *Nuphar* Small

Nymphaea L. in part

Nymphaezanthus L. C. Richard

1. *N. advena* (Ait.) Ait. f. (Yellow Water Lily) Map 132

Lakes, ponds, and river oxbows. Not usually found in more than 3 feet of water. *N. variegatum* Engelm. has been reported for the state but all our specimens have been referred to *N. advena*. Northern and eastern Iowa, mostly in the Mississippi River drainage.

2. *Nymphaea* L.

Castalia Salisb.

1. *N. tuberosa* Paine (White Water Lily) Map 133

Lakes and ponds in 1-4 feet of water. Known to be cultivated in some areas and probably more extensively cultivated than suspected. The presence of *N. odorata* Ait. in Iowa has been reported but no specimens of the species were seen. Conard (1952) reports that he has not seen the species in the state. Most specimens are from the Mississippi River drainage but it has also been collected in Lyon and Fremont Counties along the Missouri River.

3. *Nelumbo* Adams.

1. *N. lutea* (Willd.) Pers. (American Lotus) Map 134

N. pentapetala Walt.

Natural and artificial lakes, embayments and oxbow lakes of the Mississippi and Missouri Rivers in water from 1-6 feet in depth. The natural distribution of this species in Iowa is rather uncertain. Speaker (1952) reports that in the early thirties he made several unsuccessful attempts at establishing the American Lotus in the Iowa Great Lakes region. Several bushels of seed gathered from the beds in the Upper Mississippi River near Lansing and McGregor were scarified on an emery wheel and planted in bays and slough areas adjacent to West Okoboji, Spirit, Lost Island, Trumbell, Blackhawk, and North Twin Lakes. Rose (1952) reports that W. E. Albert was active in similar work while he was head of the old State Fish and Game Department. Of these plantings, only one colony is known to exist at present. This colony covers several acres in Round Lake in northeast Clay Co. (Ada Hayden 3182, Aug. 8, 1943, ISC). Speaker also reports that the American Lotus was known from Blackhawk Lake in Sac Co. several years ago and he suggests that its natural distribution may have been more general in the past than it is at present.

The most extensive beds of *N. lutea* in Iowa are located in the Mississippi River near Dubuque, Lansing, and McGregor; in the Missouri River along Fremont and Mills Counties and especially at Forney's Lake. Inland the principal beds are found in Lily Lake in the Amana Colonies in Iowa Co. and in Round Lake in Clay Co. A colony established in Lake of Three Fires in Taylor Co., known to have flowered in 1949 (R. B. Moorman, Aug. 10, 1949, ISC) was found to be in a weak vegetative condition in 1951 (Paul H. Monson 306, Aug. 12, 1951, ISC).

4. Brasenia Schreb.1. *B. schreberi* Gmel. (Water Shield)

Map 135

Ponds and lake edges in shallow water. Discontinuously distributed over much of the state.

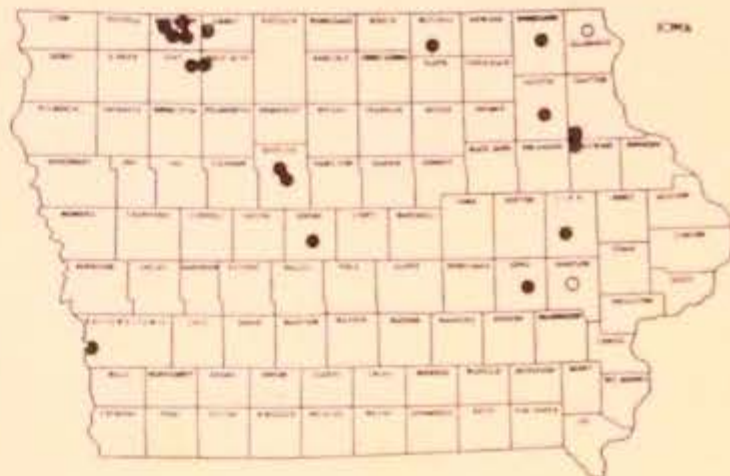
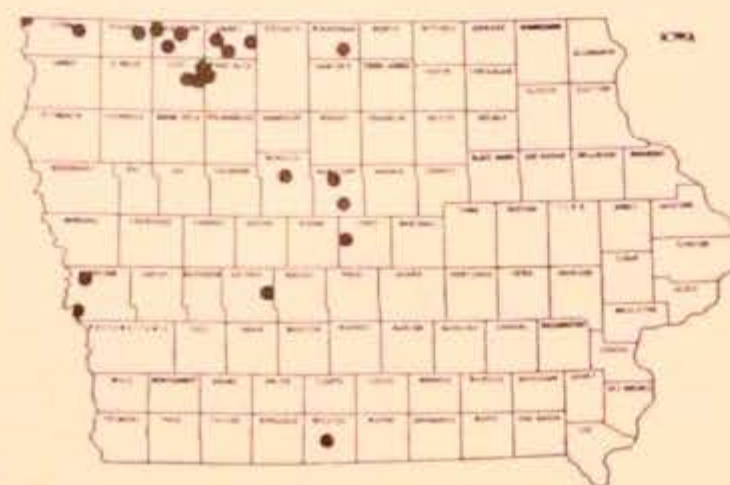
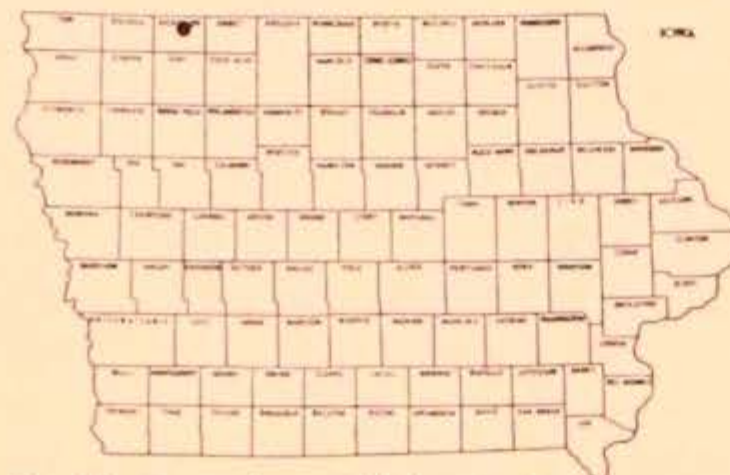
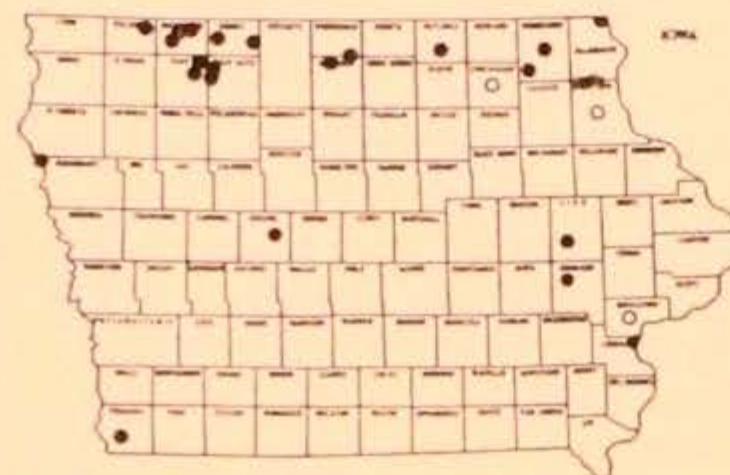
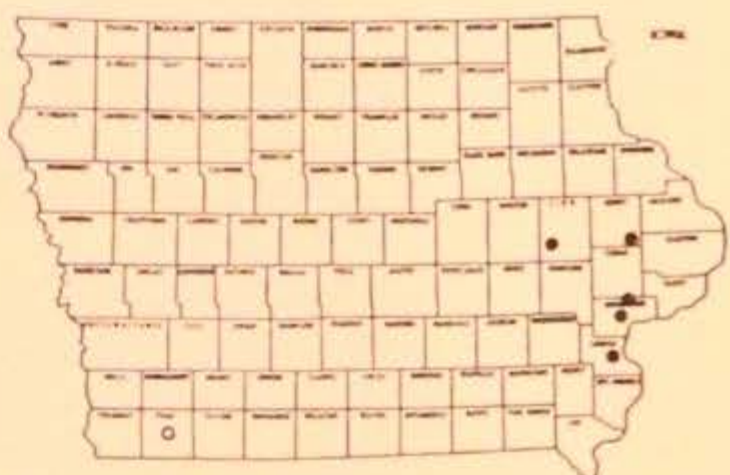
RANUNCULACEAE

- | | |
|---|----------------------|
| 1. Fruit a follicle containing many seeds; leaves entire or toothed, cordate; petals absent; sepals petaloid | 3. <i>Caltha</i> |
| 1. Fruit a 1-seeded achene; leaves various, at least the upper stem leaves usually deeply lobed or cut | 2 |
| 2. Sepals spurred at the base; leaves basal, entire; tufted plants; receptacle more than 10 times as long as broad | 2. <i>Myosurus</i> |
| 2. Sepals not spurred; stem leaves usually present, if not, the leaves cordate, shallowly lobed; receptacle stouter | 1. <i>Ranunculus</i> |

1. Ranunculus L. (Crowfoot, Buttercup)

(Benson, 1948)

- | | |
|--|--|
| 1. Plants submerged; leaves cut into many thread or ribbon-like divisions | 2 |
| 1. Plants on marshy shores or emergent in shallow water | 6 |
| 2. Leaf segments flat, ribbon-like; flowers yellow | 3 |
| 2. Leaf segments thread-like; flowers white | 4 |
| 3. Petals 6-17 mm. long; achene with corky-winged margins, 2.5-3.5 mm. long | 5. <i>R. flabellaris</i> |
| 3. Petals 3.5-5 mm. long; achene not winged, 1.5-2 mm. long | 6. <i>R. gmelini</i> var. <i>hookeri</i> |
| 4. Leaves with a distinct petiole; leaf segments weak, collapsing when removed from water; achene mostly beakless | 1. <i>R. aquatilis</i> var. <i>capillaceus</i> |
| 4. Leaves sessile or nearly so; leaf segments rigid, not collapsing when removed from water; achene with a prominent beak | 5 |
| 5. Achenes 8-30, usually about 15, each with beak about 1 mm. long | 3. <i>R. longirostris</i> |
| 5. Achenes 30-80, usually about 40, each with shorter beak | 2. <i>R. circinatus</i> var. <i>subrigidus</i> |
| 6. Leaves shallowly lobed, mostly or entirely basal; stem with filiform stolons | 4. <i>R. cymbalaria</i> |
| 6. Leaves deeply lobed | 7 |
| 7. Stem prostrate, creeping, or floating, rooting at the nodes; often with submerged leaves cut into ribbon-like divisions | 6. <i>R. gmelini</i> var. <i>hookeri</i> |
| 7. Stem erect, not rooting at nodes; never with finely divided submerged leaves | 8 |
| 8. Achenes 2-2.5 mm. long, excluding beak; stem hairy; leaf segments mostly acute | 8. <i>R. pennsylvanicus</i> |
| 8. Achenes 1-1.4 mm. long; stem glabrous; leaf segments mostly blunt or rounded | 7. <i>R. sceleratus</i> |

Map 137. *Ranunculus circinatus* v. *subrigidus*Map 138. *Ranunculus longirostris*Map 139. *Ranunculus cymbalaria*Map 140. *Ranunculus flabellaris*Map 141. *Ranunculus gmelini* v. *hookeri*Map 142. *Ranunculus sceleratus*Map 143. *Ranunculus pennsylvanicus*Map 144. *Myosurus minimus*

1. *R. aquatilis* L. var. *capillaceus* (Thuill.) DC. Prode. Map 136
R. tricophyllus Chaix.

Cold, flowing streams in "driftless" area. A highly variable European species with several North American varieties.

Allamakee Co.: Post Twp., cold, clear water of Yellow River, Thorne and Fay 12,256, Oct. 12, 1952 (IA). Clayton Co.: Giard Twp., S-14, Bloody Run Creek, Ada Hayden 8706, June 16, 1940 (ISC); Marquette, Bloody Run Creek, H. C. Fink and M. B. Hatfield, June 17, 1940 (ISC). Winneshiek Co.: Bear Creek, Shimek, June 20, 1903 (IA); mouth of Canoe Creek, Tolstead, May 29, 1934 (ISC).

2. *R. circinatus* Sibth. var. *subrigidus* (Drew) Benson Map 137
R. subrigidus Drew

Complex European species represented with us by one variety. Two Iowa collections.

Clay Co.: Freeman Twp., S-17, Ada Hayden 2066, June 16, 1936 (ISC). Lyon Co.: N.W. corner, Shimek, July, 1899 (IA).

3. *R. longirostris* Godr. Map 138

Lakes, ponds, and sloughs into water up to 5 feet in depth. Closely related to the preceding species and not always easily separable. Mostly confined to the Mankato Lobe, scattered in eastern counties.

4. *R. cymbalaria* Pursh Map 139

Low, wet ground around lakes, streams, bogs, and swamps. Largely confined to the Mankato Lobe and western Iowa.

5. *R. flabellaris* Raf. Map 140
R. delphinifolius Torr.

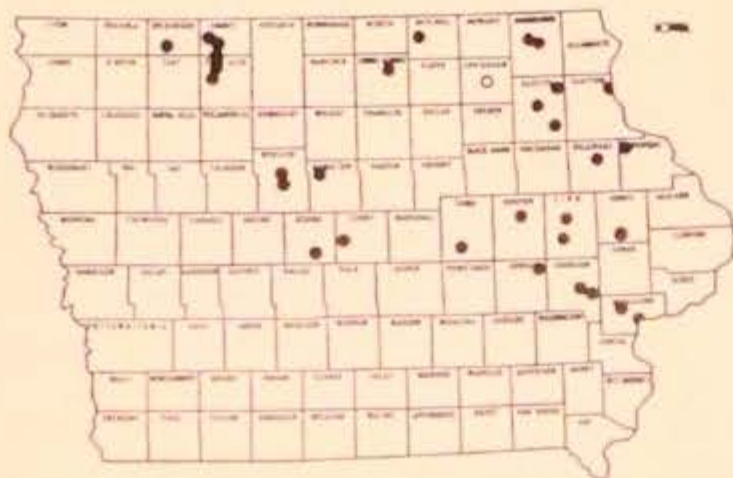
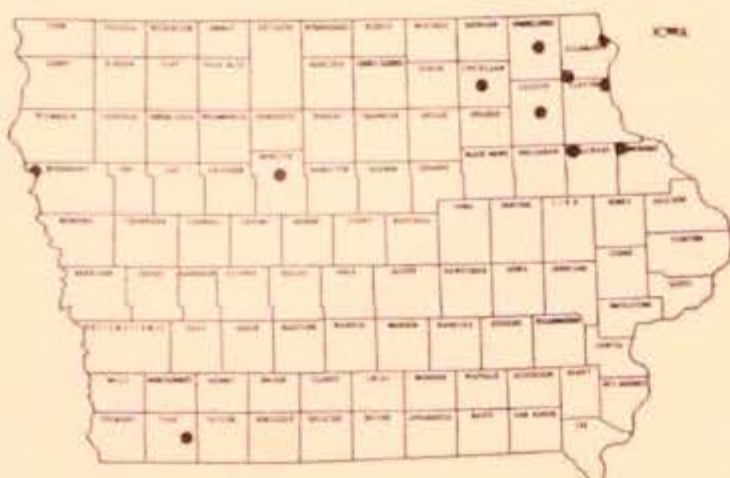
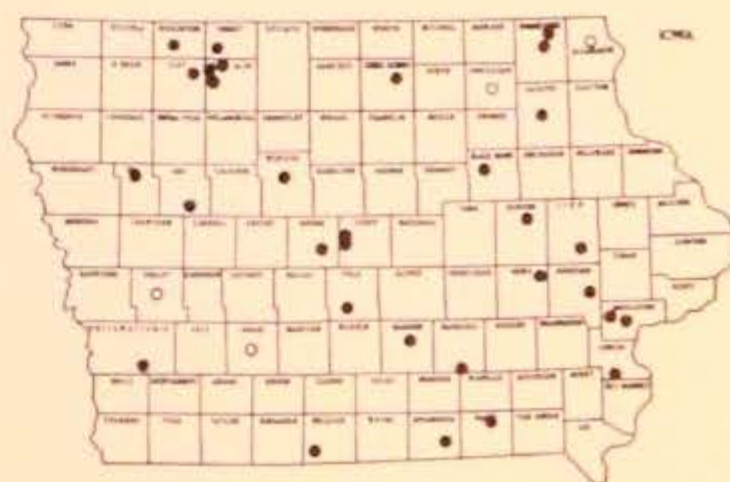
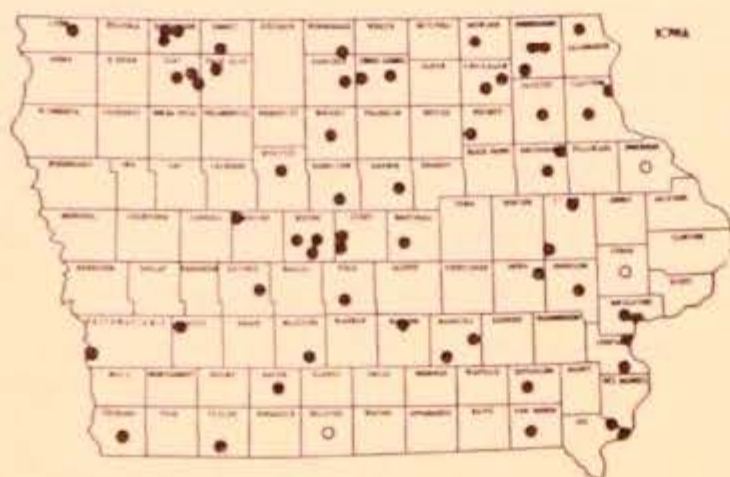
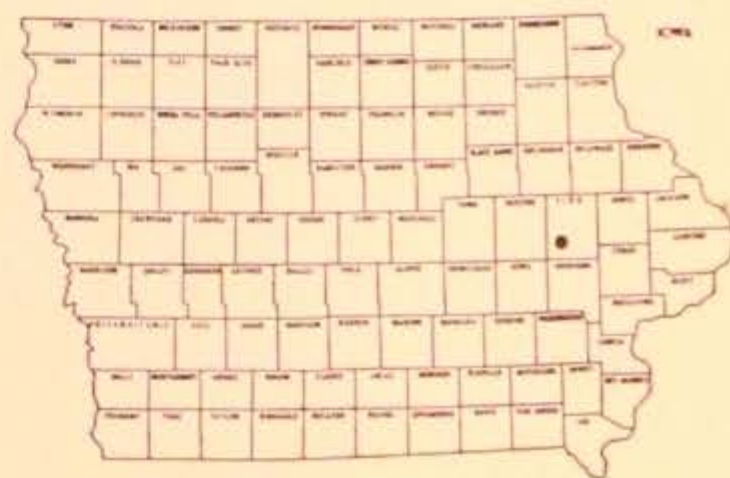
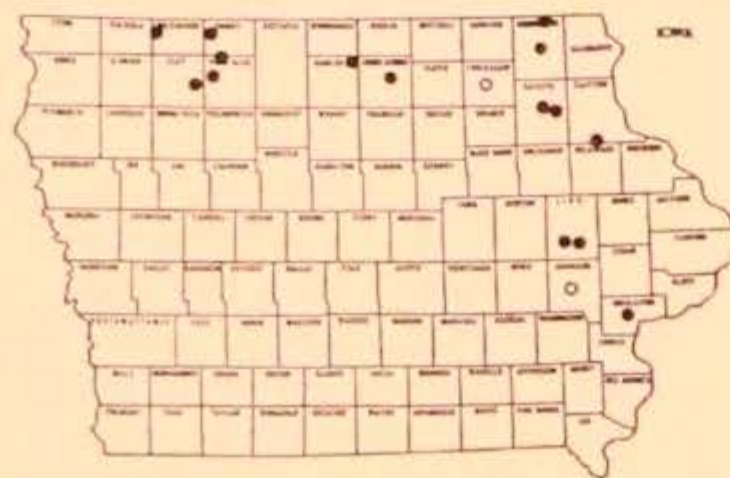
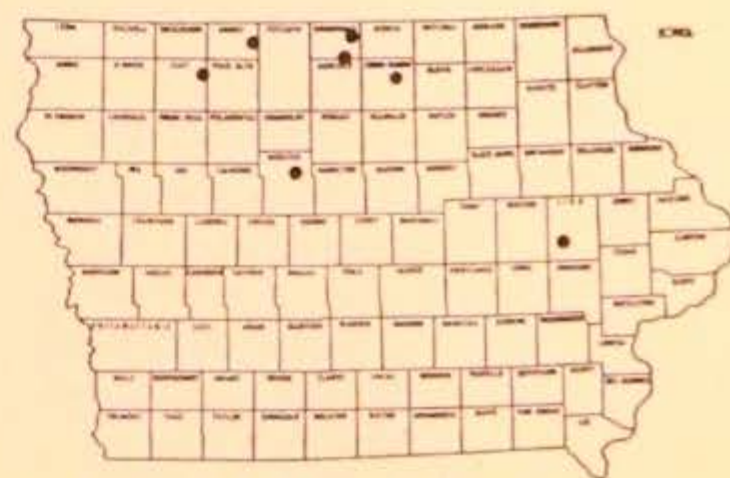
In shallow water and wet ground around small ponds, lakes, swamps, and bogs. Plants may be partially or completely emergent with corresponding changes in vegetative form. Mississippi River drainage; largely absent from Iowan drift areas.

6. *R. gmelini* DC. var. *hookeri* (D. Don) Benson Map 141
R. purshii Richards

Typical *R. gmelini* is largely Asiatic. One Iowa collection, Dickinson Co.: Spirit Lake, southeast shore, R. L. Cratty, July 21, 1920 (ISC).

7. *R. sceleratus* L. Map 142

Marshy places around lakes, swamps, bogs, and rivers. Observed rooting in shallow water. Mankato Lobe and southeast in drainage of Des Moines and Cedar Rivers.

Map 145. *Caltha palustris*Map 146. *Rorippa islandica*Map 147. *Nasturtium officinale*Map 148. *Cardamine bulbosa*Map 149. *Penthorum sedoides*Map 150. *Parnassia parviflora*Map 151. *Parnassia glauca*Map 152. *Potentilla palustris*

8. *R. pensylvanicus* L. f. Map 143

Marshes, swamps, bogs, wet places along rivers and creeks, and into shallow water. State wide distribution but most abundant in the northern counties of the Mississippi River drainage.

2. Myosurus L.1. *M. minimus* L. (Mousetail) Map 144

Low, wet places. A species of the Lower Mississippi River embayment. One western Iowa record exists (Page Co.: May 17, 1950, ISC). This specimen, although very inadequate has been retained in hope of obtaining additional data concerning the locality or of re-locating the area which represents a major westward extension for this species in Iowa.

3. Caltha L.1. *C. palustris* L. (Cowslip, Marsh Marigold) Map 145

Swampy places, bogs, stream banks, and low ground. Mississippi River drainage in the northern two-thirds of the state.

CRUCIFERAE

- | | |
|---|----------------------|
| 1. Flowers yellow; some leaves pinnatifid at least near the base----- | 1. <i>Rorippa</i> |
| 1. Flowers white; leaves mostly entire or divided into several entire, round or ovate leaflets ----- | 2 |
| 2. Aquatic; leaves compound or pinnately divided nearly to petiole into several ovate lobes; roots not bulbous----- | 2. <i>Nasturtium</i> |
| 2. Marsh or shore plant; leaves nearly entire, upper stem leaves elliptic-lanceolate, lower and basal leaves rounded-cordate; roots bulbous ----- | 3. <i>Cardamine</i> |

1. Rorippa Scop.1. *R. islandica* (Oeder) Borbas Map 146

R. palustris (L.) Bess.

Radicula palustris (L.) Moench

Low places, swamps, lake shores, stream banks, and into shallow water. Widely distributed throughout the state.

2. Nasturtium R. Br.1. *N. officinale* R. Br. (Water Cress) Map 147

Radicula nasturtium-aquaticum (L.) Britton and Rendle

Rorippa nasturtium-aquaticum (L.) Schinz and Thell.

Springs and spring-fed cold water creeks. Quite widely distributed but concentrated in northeastern counties.

3. Cardamine L.

1. *C. bulbosa* (Schreb.) BSP. Map 148

Swamps and wet places, springs and marshes. General distribution throughout the state. The majority of our collections are from the Des Moines and Cedar River drainage basins.

SAXIFRAGACEAE

1. Leaves serrate, along the stem; flowers numerous in a helicoid raceme; capsule 5-horned; plant strongly stoloniferous ----- 1. *Penthorum*
 1. Leaves entire, basal except for one small leaf on the flower stem; flowers single; capsule ovate, entire ----- 2. *Parnassia*

1. Penthorum L.

1. *P. sedoides* L. (Ditch Stonecrop) Map 149

Lake and swamp borders, bogs, wet ground, and into shallow water. General distribution throughout the state.

2. Parnassia L. (Bog Stars, Grass of Parnassus).

1. Petals less than 3 times as long as the calyx lobes; leaves membranaceous ----- 1. *P. parviflora*
 1. Petals more than 3 times as long as calyx lobes; leaves coriaceous -- 2. *P. glauca*
 1. *P. parviflora* DC. Map 150

One Iowa collection.

Linn Co.: Cedar Rapids, G. H. Berry, June 9, 1913 (IA).

2. *P. glauca* Raf. Map 151

P. caroliniana of Gray's Manual, ed. 7, and most authors, not Michx.

Calcareous fens, swamps, low ground, and lake shores. A conspicuous member of the flora in the fens of northwestern Iowa. Mississippi River drainage in the northern and eastern counties of the state.

ROSACEAE

1. Potentilla L.

1. *P. palustris* (L.) Scop. (Marsh Cinquefoil) Map 152

Swamps and bogs, wet ground or in water. Confined to the Mankato Lobe except for one station in Linn Co.

CALLITRICHACEAE

(Fassett, 1951)

1. Callitriche L. (Water Starwort)

1. Fruit longer than broad, narrowed to the base; carpels winged, at least at the summit ----- 1. *C. verna*

1. Fruit not as long as broad, rounded at base; carpels not winged ----- 2. *C. heterophylla*

1. *C. verna* L. Map 153
C. palustris L.

Springs, ponds, and lakes. Confined largely to the Mankato Lobe in the Iowa Great Lakes region.

2. *C. heterophylla* Pursh Map 154
Ponds.

Cedar Co.: Pioneer Twp., S-13, Mark Fay 417 (IA). Louisa Co.: Muscatine Island, Ferd. Reppert, June, 1897 (IA). Muscatine Co.: Lake Twp., slough near Saulsbury, Ferd. Reppert 781, June 25, 1894 (IA); east of Moscow, Shimek, June 28, 1917 (ISC). Palo Alto Co.: Highland Twp., S-24, Ada Hayden 5084, May 19, 1937 (ISC). Ringgold Co.: J. P. Anderson, June 3, 1905 (ISC).

BALSAMINACEAE

1. *Impatiens* L.

1. *I. capensis* Meerb. (Jewelweed, Touch-me-not) Map 155
I. biflora Walt.
I. fulva Nutt.

All situations where moist conditions prevail. Usually not in open places. *C. pallida* Nutt. may be encountered at times but is usually more typical of drier woodlands. Widespread in the Mississippi River drainage.

MALVACEAE

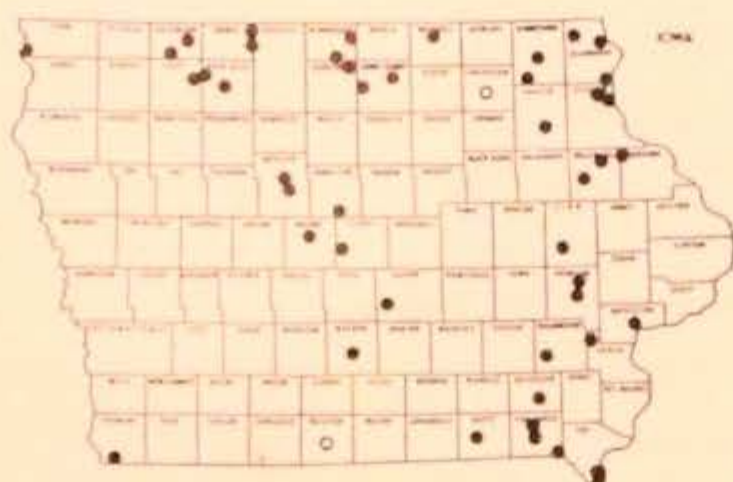
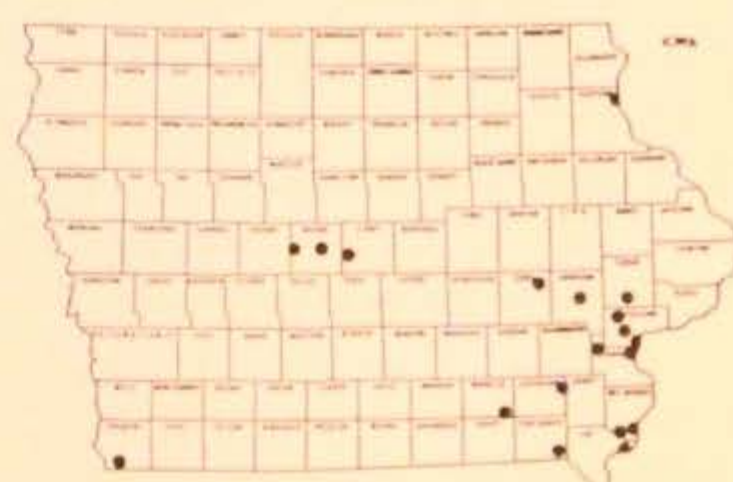
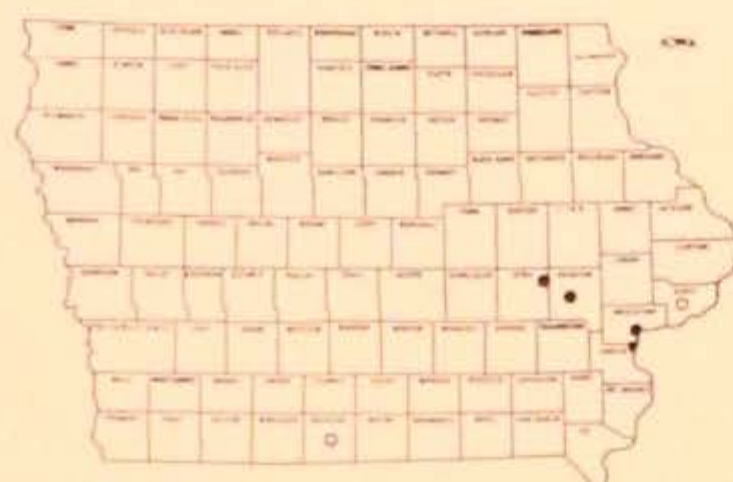
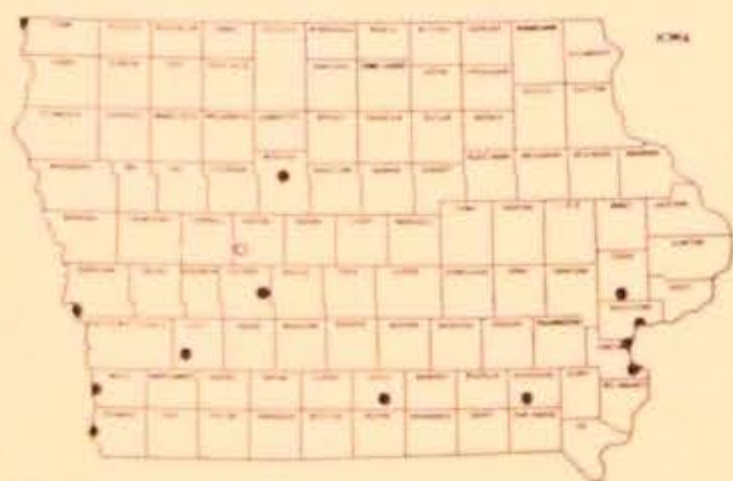
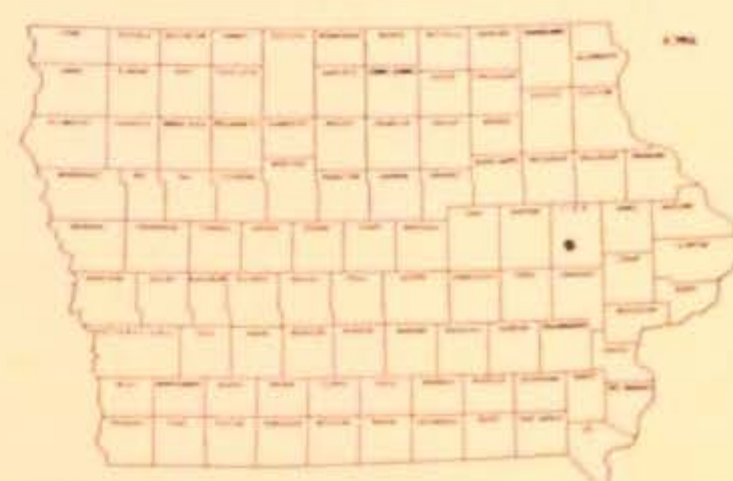
1. *Hibiscus* L.

1. *H. militaris* Cav. (Halberd-leaved Rose-mallow) Map 156

Swamps, marshes, ponds, river and stream banks. Collections from the southeast portion of Iowa are most numerous, others widely scattered.

LYTHRACEAE

1. Flowers always more than 4 at a node, leaves always opposite ----- 2
1. Flowers regularly 2 at a node, if more, then some leaves alternate ----- 3
2. Leaves lanceolate to narrowly-elliptic, petioled; flowers on definite pedicels in axillary inflorescences; plant woody ----- 4. *Decodon*
2. Leaves linear to linear-lanceolate, sessile, auricled; flowers sessile in axils of leaves; plant not woody ----- 3. *Ammannia*
3. Calyx tubular, several times longer than wide; at least some of the leaves alternate ----- 5. *Lythrum*

Map 153. *Callitriche verna*Map 154. *Callitriche heterophylla*Map 155. *Impatiens capensis*Map 156. *Hibiscus militaris*Map 157. *Peplis diandra*Map 158. *Rotula ramosior*Map 159. *Ammannia coccinea*Map 160. *Decodon verticillatus*

3. Calyx campanulate to globose, not much longer than broad; all leaves opposite ----- 4
4. Marsh or shore plant; leaves narrowed to a petiole; calyx with appendages alternating with the calyx lobes ----- 2. *Rotala*
4. Aquatic; leaves linear, not much narrowed at base; calyx without appendages ----- 1. *Peplis*

1. *Peplis* L.

1. *P. diandra* Nutt. (Water Purslane) Map 157
Didiplis diandra (Nutt.) Wood

Decatur Co.: J. P. Anderson, Aug. 10, 1899 (ISC). Iowa Co.: east of Homestead, Wm. Easterly 470, June 27, 1950 (IA). Johnson Co.: Clear Creek Twp., S-1, R. F. Thorne 10,739, June 23, 1952 (IA). Louisa Co.: Muscatine Island, Shimek and P. C. Meyers, Aug., 1897 (ISC). Muscatine Co.: Muscatine Slough, R. F. Thorne 10,926, Aug. 4, 1952 (IA). Scott Co.: Noel's station, Ferd. Reppert (IA).

2. *Rotala* L.

1. *R. ramosior* (L.) Koehne (Tooth Cup) Map 158

Lake shores, low, swampy places. This species, often confused with *Ammannia coccinea*, has not been extensively collected in Iowa. Except for one specimen from Palo Alto Co., all our collections are from southeastern Iowa.

3. *Ammannia* L.

1. *A. coccinea* Rothb. Map 159

Ponds, shores, low ground and into shallow water. Mostly southern and southeastern Iowa, absent from the Mankato Lobe and Iowan drift regions.

4. *Decodon* J. F. Gmel.

1. *D. verticillatus* (L.) Ell. (Water Willow) Map 160

Only one collection of this species exists. Linn Co.: Cedar Rapids, G. H. Berry, July 7, 1913 (IA).

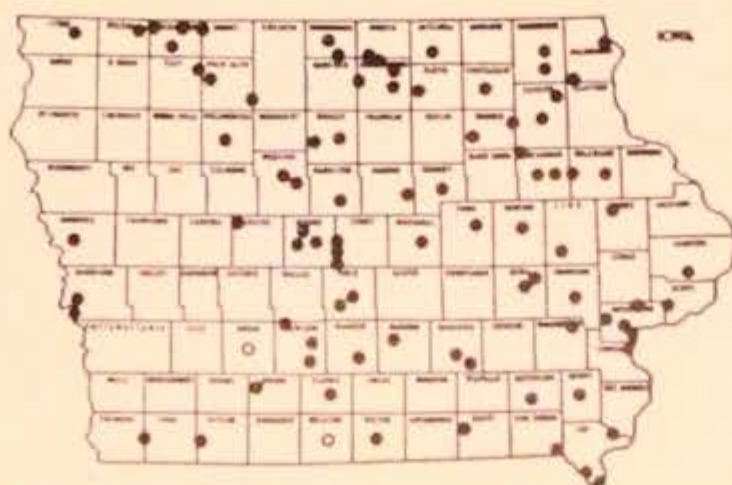
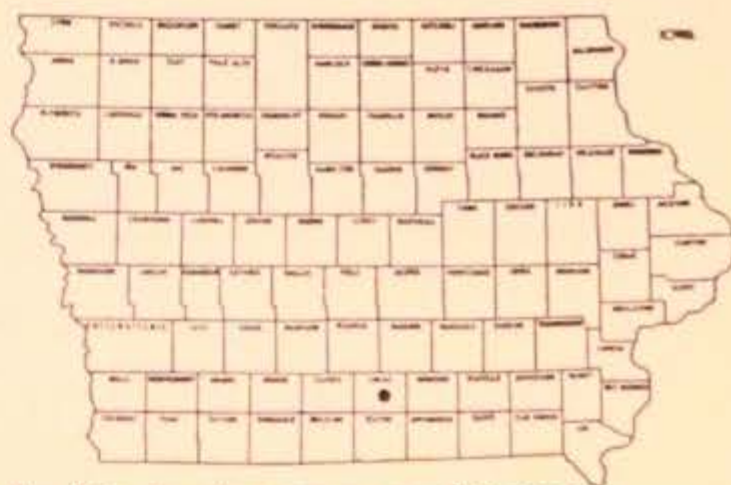
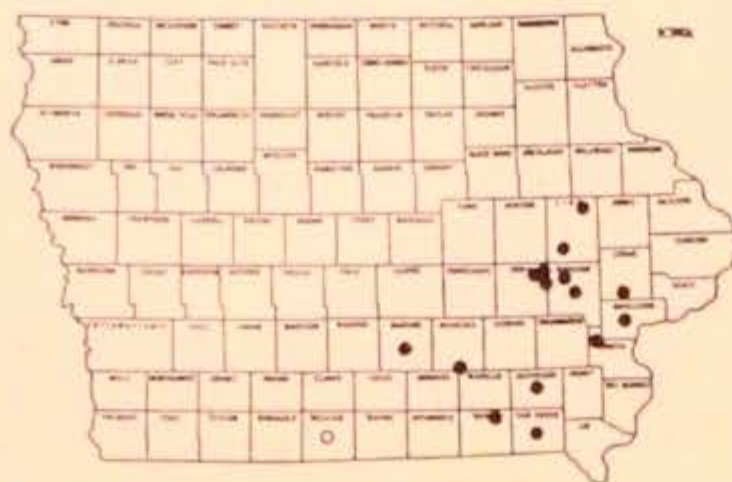
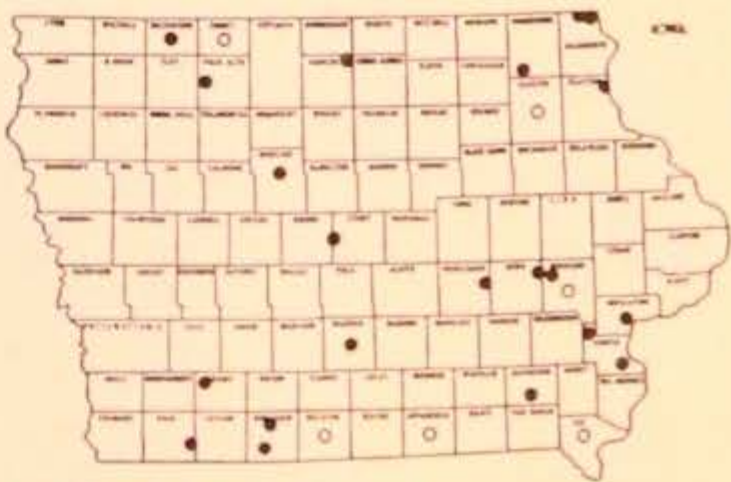
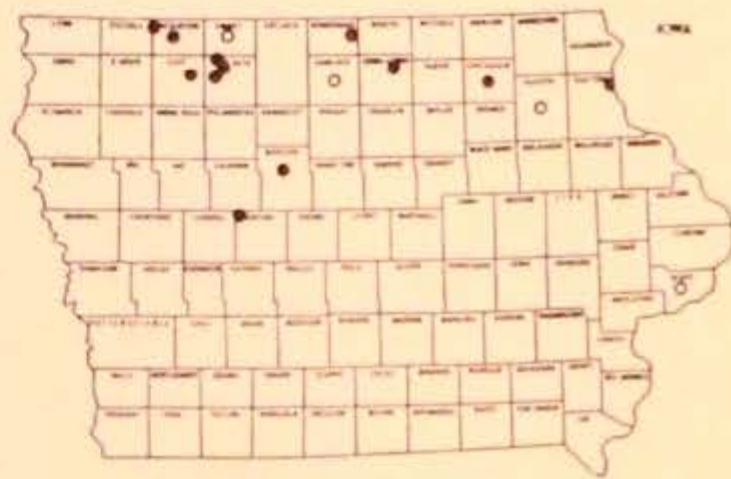
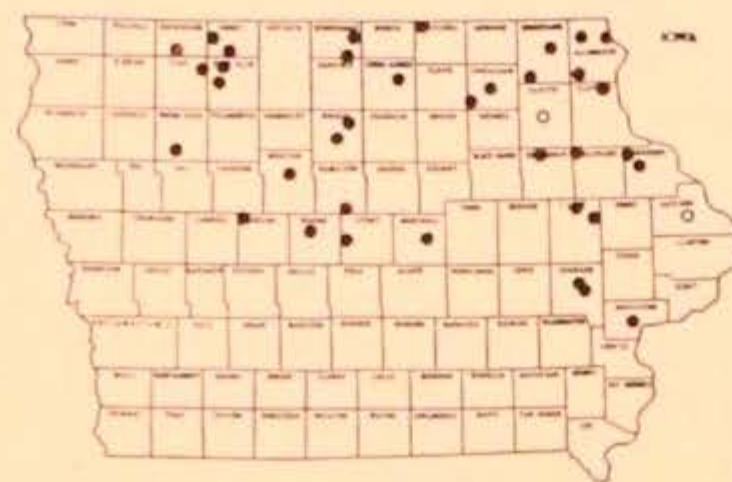
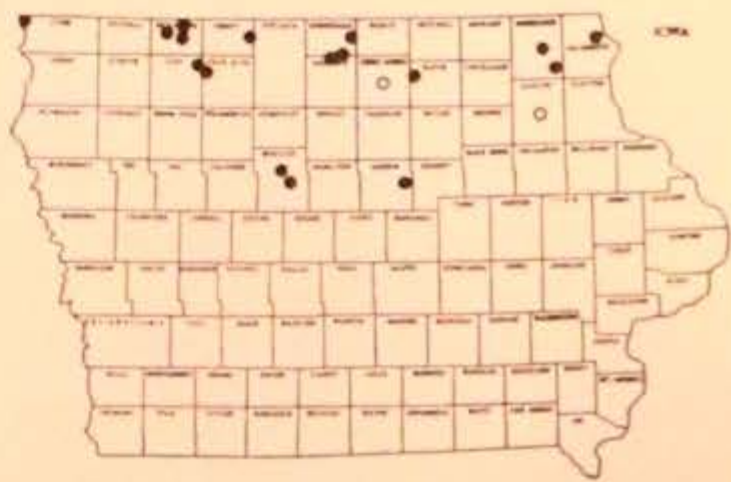
5. *Lythrum* L.

1. *L. alatum* Pursh (Loosestrife) Map 161

Low prairie, swamps, bogs, and shores. Distribution statewide but principally in the Mississippi River drainage.

ONAGRACEAE

1. Ovary cylindric, at least 3 times as long as broad ----- 2
1. Ovary campanulate, less than twice as long as broad ----- 2. *Ludwigia*

Map 161. *Lythrum alatum*Map 162. *Jussiaea repens* v. *glabrescens*Map 163. *Ludwigia alternifolia*Map 164. *Ludwigia polycarpa*Map 165. *Ludwigia palustris* v. *americana*Map 166. *Epilobium leptophyllum*Map 167. *Epilobium coloratum*Map 168. *Epilobium glandulosum*

2. Leaves long petioled, entire, spatulate to elliptic; seeds without hairs ----- 1. *Jussiaea*
2. Leaves sessile or on petiole less than 1 cm. long, serrate or entire (linear and involute in one species); seeds with a long tuft of hairs on summit ----- 3. *Epilobium*

1. *Jussiaea* L.

1. *J. repens* L. var. *glabrescens* Ktze. (Water Primrose) Map 162
J. diffusa of Gray's Manual, ed. 7, not Forsk.

Known only from Red Haw Hill Reservoir near Chariton where it reportedly forms rather extensive beds.

Lucas Co.: Lincoln Twp., S-28, 33, and 34, Red Haw Hill Lake, W. H. Lewis 16, Aug. 5, 1948 (ISC).

2. *Ludwigia* L.

1. Leaves opposite, spatulate ----- 3. *L. palustris* var. *americana*
1. Leaves alternate, lanceolate ----- 2
2. Flowers on a definite pedicel about as long as the capsule; roots tuberos ----- 1. *L. alternifolia*
2. Flowers sessile; roots not tuberos ----- 2. *L. polycarpa*
1. *L. alternifolia* L. (Seedbox) Map 163

Marshy places, ponds, and creek banks. Southeastern Iowa, inland along the Des Moines and Cedar Rivers.

2. *L. polycarpa* Short and Peter (False Loosestrife) Map 164

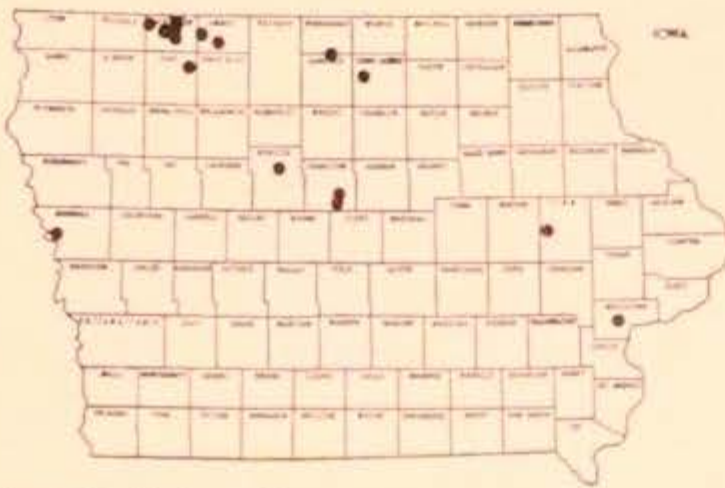
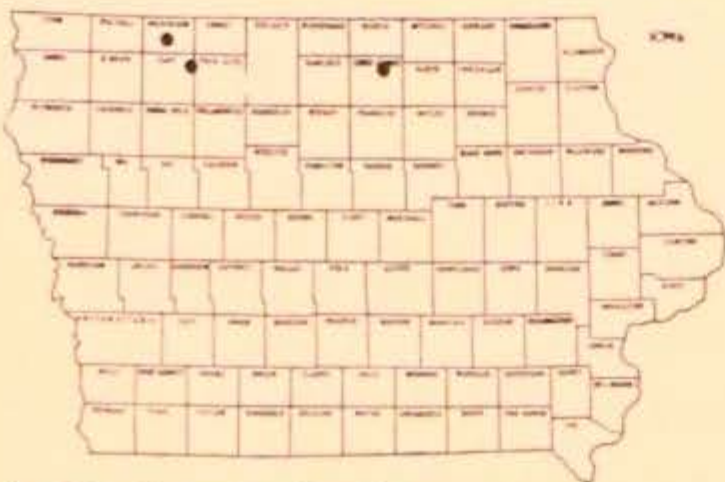
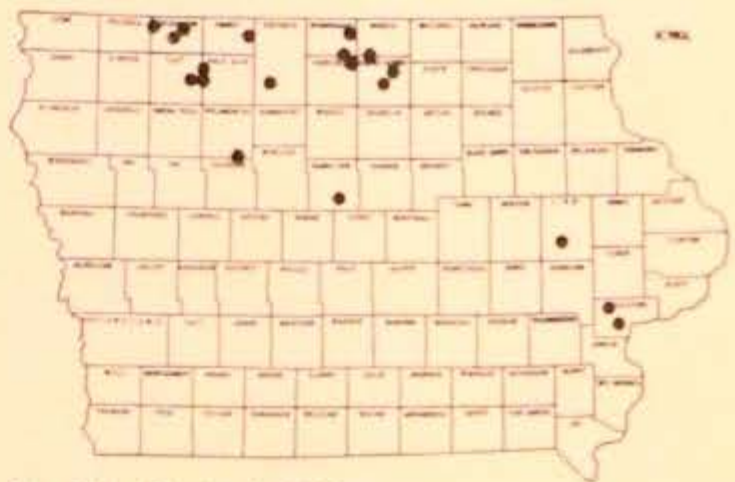
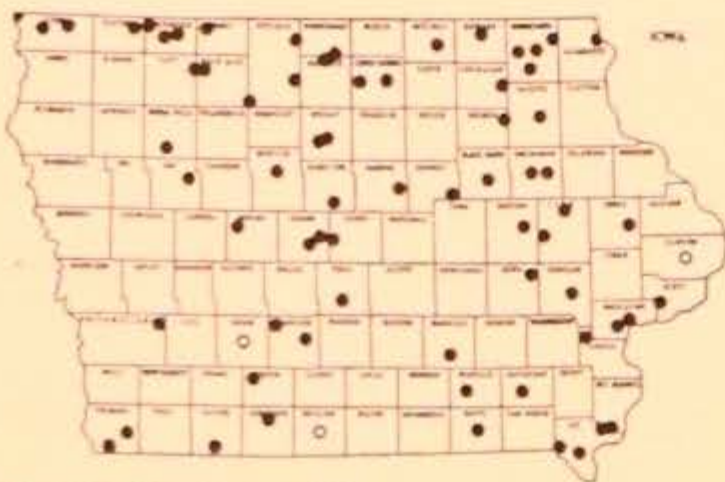
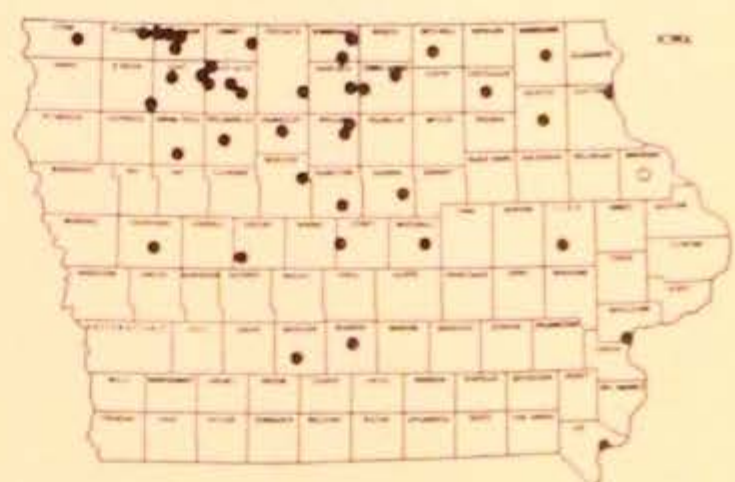
Ponds, swamps, and low, wet places. Distribution scattered, mostly in the Mississippi River drainage.

3. *L. palustris* (L.) Ell. var. *americana* (DC.) Fern. and Grise. Map 165
Isnardia palustris L.

Ponds, lakes in shallow water, and swamps. Typical *L. palustris* is a European species. Iowa collections are mostly from the southeastern corner of the state.

3. *Epilobium* L. (Willow Herb)

1. Leaves linear to linear-lanceolate, margins revolute ----- 1. *E. leptophyllum*
1. Leaves lanceolate to lance-ovate; margins not revolute ----- 2
2. Corolla cinnamon-colored; leaves lanceolate, tapering to short petiole ----- 2. *E. coloratum*
2. Corolla white; leaves lanceolate to ovate, strongly rounded to sessile base ----- 3. *E. glandulosum*
1. *E. leptophyllum* Raf. Map 166
E. densum of Gray's Manual, ed. 7, not Raf.
E. lineare of auth. not Muhl.

Map 169. *Myriophyllum exalbescent*Map 170. *Myriophyllum heterophyllum*Map 171. *Myriophyllum pinnatum*Map 172. *Proserpinaca palustris*Map 173. *Hippuris vulgaris*Map 174. *Cicuta bulbifera*Map 175. *Cicuta maculata*Map 176. *Sium suave*

Bogs, fens, marshy places, and lake shores. Most collections are from the area glaciated by the Mankato Lobe.

2. *E. coloratum* Biehler Map 167

Low places, swamps, bogs, and fens. Widely confused with *E. glandulosum* from which it is sometimes difficult to separate. The shape, size, and markings of the mature seeds provide the only reliable means of differentiation. Mankato Lobe and Iowan drift.

3. *E. glandulosum* Lehm. Map 168

E. adenocaulon Haussk.

Wet, marshy areas, swamps, and lake shores. Mostly from the Mankato Lobe, a few additional collections from northeastern Iowa.

HALORAGACEAE

1. Fruit quadrate or round; flower parts in 4's; leaves whorled or scattered ----- 1. *Myriophyllum*
1. Fruit triangular; flower parts in 3's; leaves alternate, the emergent ones several cm. long ----- 2. *Proserpinaca*

1. *Myriophyllum* L. (Water Milfoil)

1. At least some of the leaves scattered; fruit with 4 prominent, tuberculed ridges ----- 3. *M. pinnatum*
1. Leaves all whorled ----- 2
2. Floral bracts oblanceolate, lobed or toothed, mostly longer than the fruit ----- 2. *M. heterophyllum*
2. Floral bracts ovate, not lobed, not longer than the fruit ----- 1. *M. exalbescens*

1. *M. exalbescens* Fern. Map 169

M. spicatum of Amer. auth., not L.

Lakes and ponds in water up to 6 feet in depth, mostly in Mankato Lobe.

2. *M. heterophyllum* Michx. Map 170

Lakes and ponds into 2 feet of water. Collections mostly from the northern two tiers of counties in Mankato Lobe.

3. *M. pinnatum* (Walt.) BSP. Map 171

M. scabratum Michx.

Ponds and mud flats.

Decatur Co.: J. P. Anderson, Aug. 10, 1899 (ISC). Dubuque Co.: J. A. Anderson, June 26, 1900 (IA). Muscatine Co.: Muscatine, Ferd. Reppert 397, July, 1894 (IA); Muscatine, Ferd. Reppert, Sept., 1895 (IA). Ringgold Co.: J. P. Anderson, Aug. 17, 1898 (ISC); T. J. Fitzpatrick, Aug. 17, 1898 (ISC).

2. Proserpinaca L.

- 1.
- P. palustris*
- L. (Mermaid Weed)

Map 172

Ponds along the Cedar River.

Muscatine Co.: Lake Twp., Salisbury bridge, Ferd. Reppert 767, Aug., 1894 (IA).

HIPPURIDACEAE**1. Hippuris L.**

- 1.
- H. vulgaris*
- L. (Mare's Tail)

Map 173

Cerro Gordo Co.: Mason City, H. A. Anderson, May, 1903 (IA).
 Clay Co.: Lake Twp., S-25, Ada Hayden 10, 149, July 1935 (ISC);
 Lake Twp., S-25, Ada Hayden 779, June 25, 1936 (ISC). Dickinson
 Co.: Upper Gar Lake, Shimek, Aug. 26, 1916 (ISC). Lower Gar Lake,
 Shimek, July 8, 1918 (IA).

UMBELLIFERAE

- | | |
|---|------------------|
| 1. Stem leaves twice compound | 1. <i>Cicuta</i> |
| 1. Stem leaves once pinnately compound | 2 |
| 2. Leaflets evenly and closely serrate with acuminate teeth; stem
with several prominent, acute ridges; fruit conspicuously ribbed.... | 2. <i>Sium</i> |
| 2. Leaflets coarsely and unevenly toothed or lobed; stem mostly even-
ly ridged; fruit not conspicuously ribbed | 3. <i>Berula</i> |

1. Cicuta L. (Hemlock)

- | | |
|---|------------------------|
| 1. Bulblets present in axils of upper leaves; leaflets linear, often with
linear lobes; roots not fleshy | 1. <i>C. bulbifera</i> |
| 1. Bulblets not present; leaflets linear-lanceolate to broadly lanceolate;
roots tuberous-fleshy | 2. <i>C. maculata</i> |

- 1.
- C. bulbifera*
- L.

Map 174

Marshy places along lakes, ponds, and rivers. Confined mostly to
 the Mankato Lobe.

- 2.
- C. maculata*
- L. (Cowbane)

Map 175

Low ground from shallow water to above high water mark; toler-
 ant of considerable water level fluctuation. The tuberous roots contain
 a deadly poison. Distribution is state wide. The author's collections
 extended the known range to extreme northwestern Lyon County.

2. Sium L.

- 1.
- S. suave*
- Walt. (Water Parsnip)

Map 176

S. cicutaefolium Schrank

Low, wet ground, swamps, bogs, and shores into water up to 15

inches in depth. Collected principally in the Mankato Lobe, other collections scattered in the east and southeast.

3. *Berula* Hoffm.

1. *B. pusilla* (Nutt.) Fern. Map 177
B. erecta (Huds.) Coville

Springy ground of fens along the upper reaches of the Des Moines River. Confined to the Mankato Lobe.

Dickinson Co.: Silver Lake Fen, W. A. Anderson, Aug. 21, 1934 (IA); Silver Lake Fen, Fox 46, July 24, 1941 (IA). Emmet Co.: Des Moines River, B. C. Wolden 1130, Aug. 14, 1925 (ISC). Palo Alto Co.: Walnut Twp., S-34, Ada Hayden 10, 433a, June 23, 1936 (ISC).

PRIMULACEAE

1. *Lysimachia* L. (Loosestrife)

- | | |
|---|--------------------------|
| 1. Plants bearing black dots ----- | 2 |
| 1. Plants not bearing black dots ----- | 3 |
| 2. Flowers in an elongate, terminal raceme; dots on stem elongate;
stem round in cross section ----- | 1. <i>L. terrestris</i> |
| 2. Flowers in short axillary racemes; dots on stem round; stem
square ----- | 2. <i>L. thyrsiflora</i> |
| 3. Leaves lanceolate, 1 cm. or more wide, with flat margins, side veins
evident ----- | 3. <i>L. hybrida</i> |
| 3. Leaves linear-lanceolate with revolute margins, side veins
obscure ----- | 4. <i>L. quadriflora</i> |

1. *L. terrestris* (L.) BSP. (Swamp Candles) Map 178

Wet prairie, low ground, ditches, and ponds. Scattered in the northeastern fourth of the state.

2. *L. thyrsiflora* L. (Tufted Loosestrife) Map 179

Swamps and marshy places near lakes and springs. Mankato Lobe and scattered eastward in the Mississippi River drainage.

3. *L. hybrida* Michx. Map 180

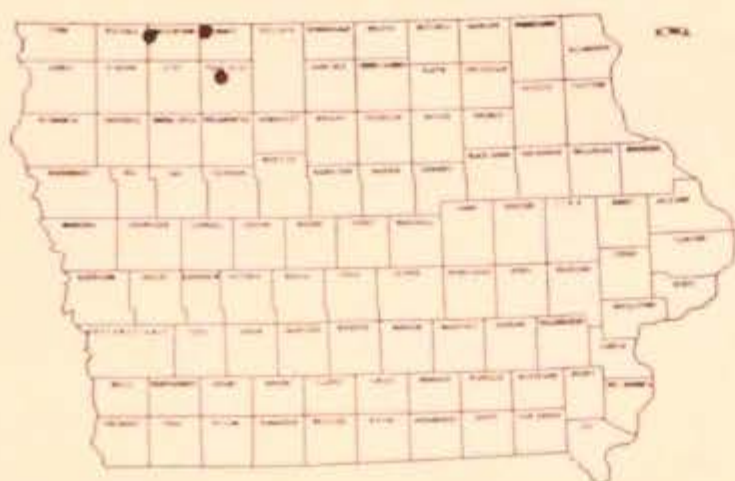
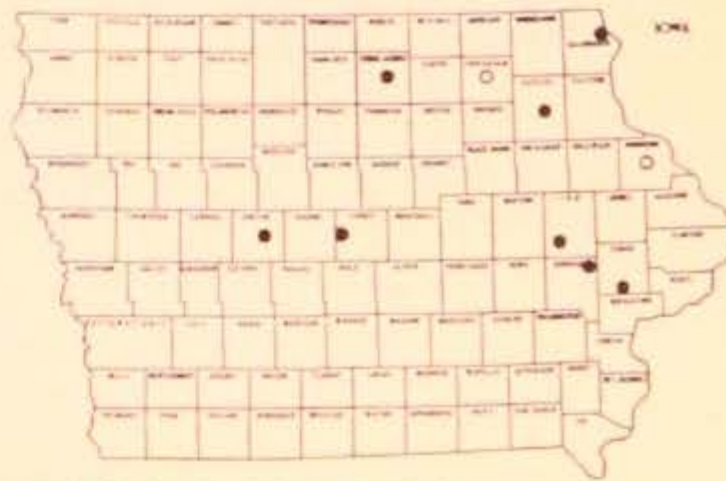
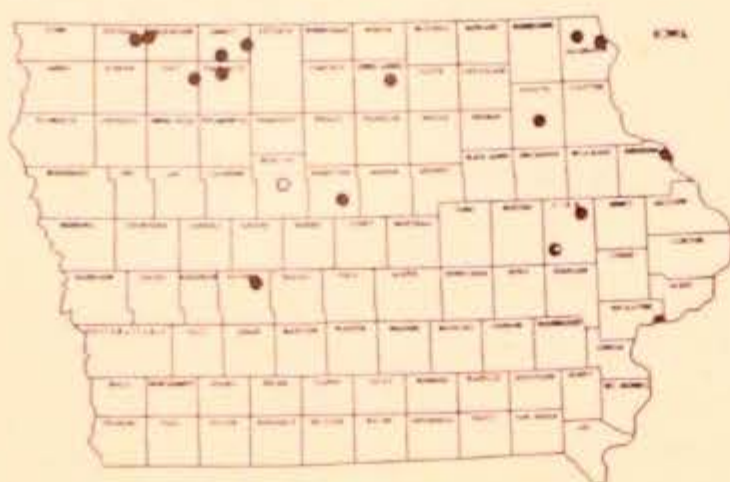
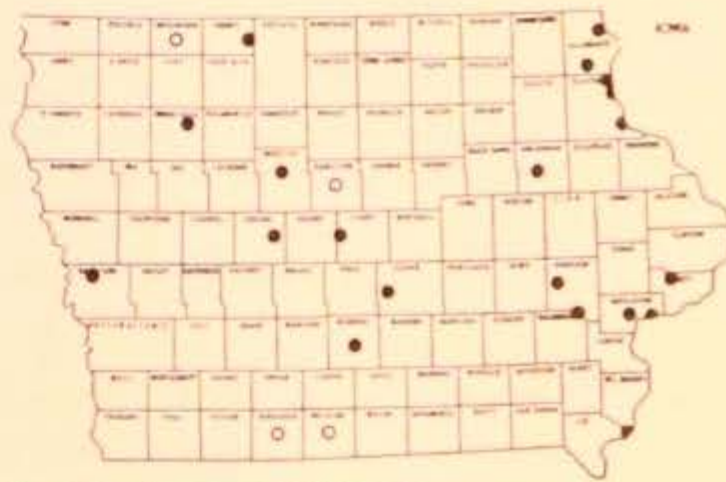
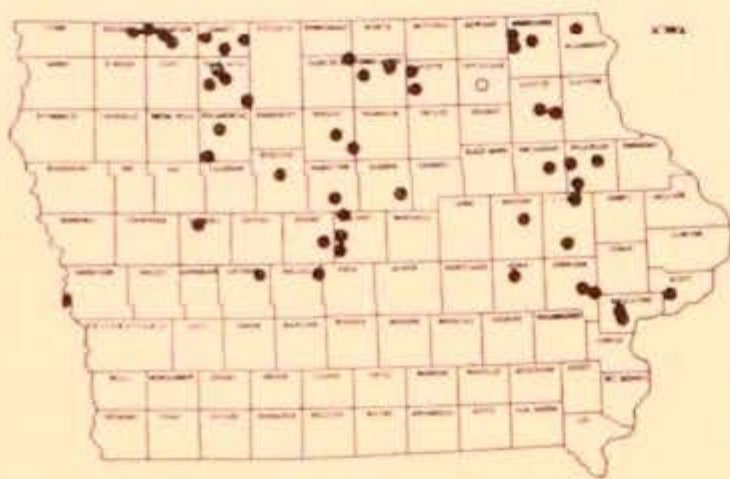
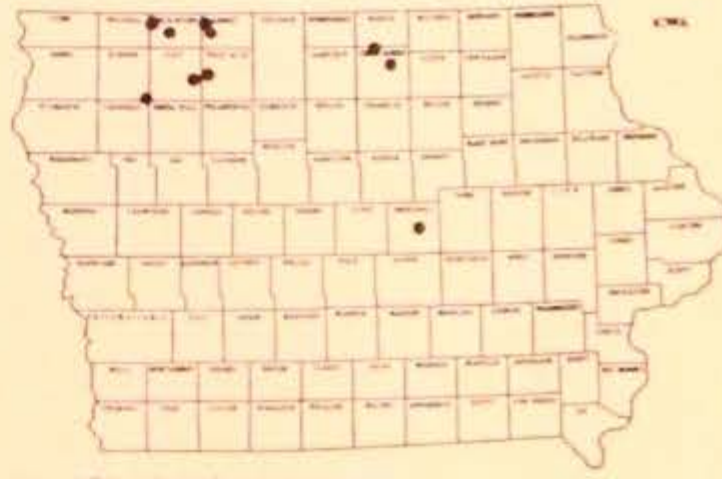
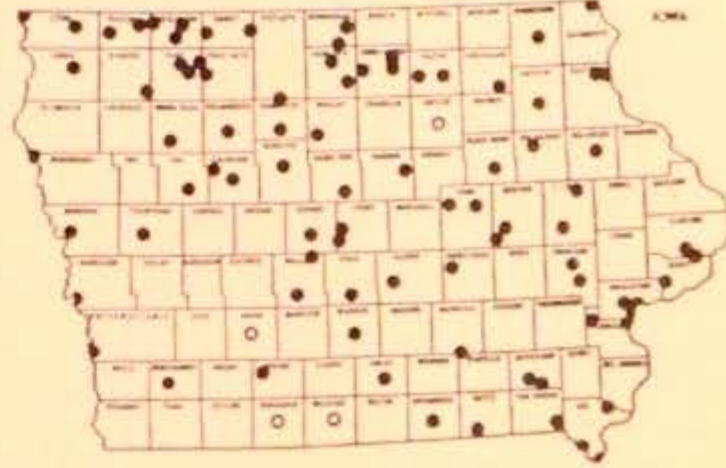
Low ground around lakes and rivers. Discontinuous distribution throughout the state.

4. *L. quadriflora* Sims Map 181

Low and marshy ground, bogs, and swamps. Mankato Lobe and Iowan drift regions, southeast along the Cedar and Iowa Rivers.

GENTIANACEAE

- | | |
|---|----------------------|
| 1. Leaves simple, opposite, sessile ----- | 1. <i>Gentiana</i> |
| 1. Leaves compound, alternate, petioled ----- | 2. <i>Menyanthes</i> |

Map 177. *Berula pusilla*Map 178. *Lysimachia terrestris*Map 179. *Lysimachia thyrsoflora*Map 180. *Lysimachia hybrida*Map 181. *Lysimachia quadriflora*Map 182. *Gentiana procera*Map 183. *Menyanthes trifoliata* v. *minor*Map 184. *Asclepias incarnata*

1. Gentiana L.

1. *G. procera* Holm. (Fringed Gentian) Map 182

Wet places. Commonly in association with *Parnassia* in the fens of the Iowa Great Lakes region. Distribution largely in the northern two tiers of counties in the Mankato Lobe.

2. Menyanthes L.

1. *M. trifoliata* L. var. *minor* Raf. (Buckbean) Map 183

Swamps and bogs, into 1-2 feet of water. Typical *M. trifoliata* is found in Eurasia and Pacific North America. Our collections of var. *minor* have been within the area of the Mankato Lobe, principally in the northern counties.

ASCLEPIADACEAE**1. Asclepias L.**

1. *A. incarnata* L. (Swamp Milkweed) Map 184

In all marshy and swampy situations. Sometimes in shallow water. Widely distributed throughout the state.

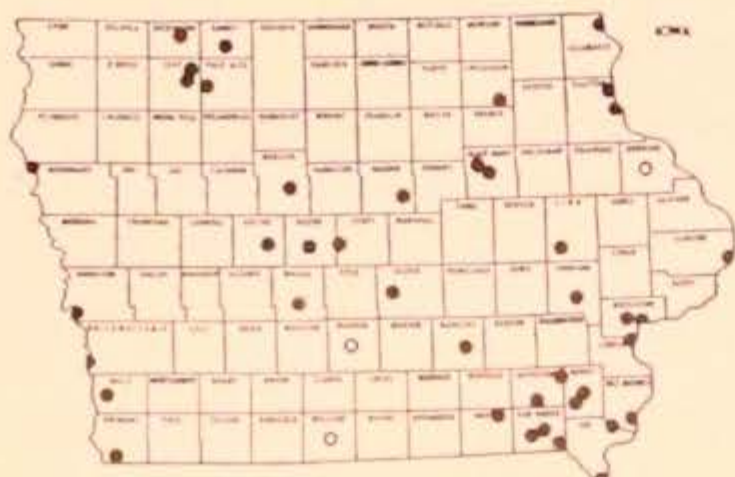
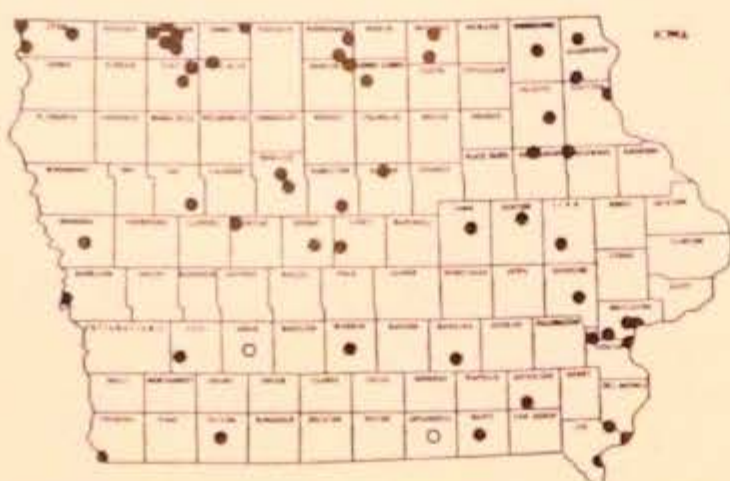
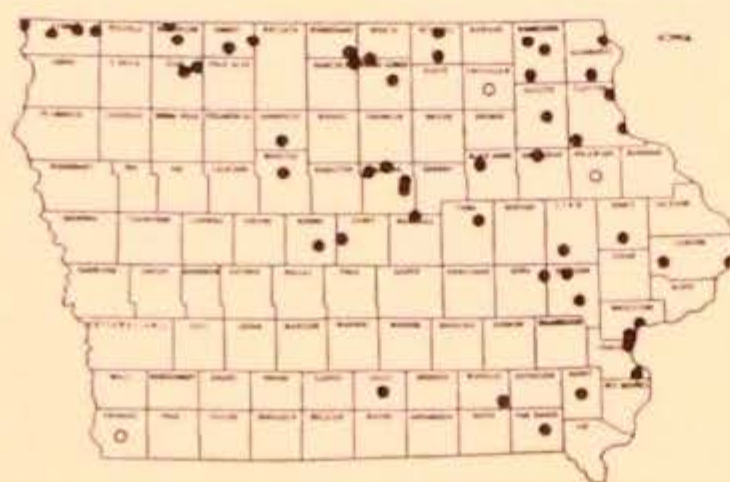
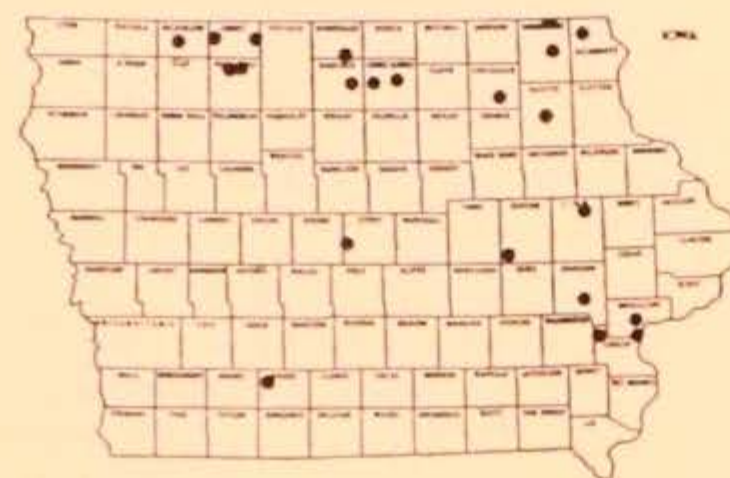
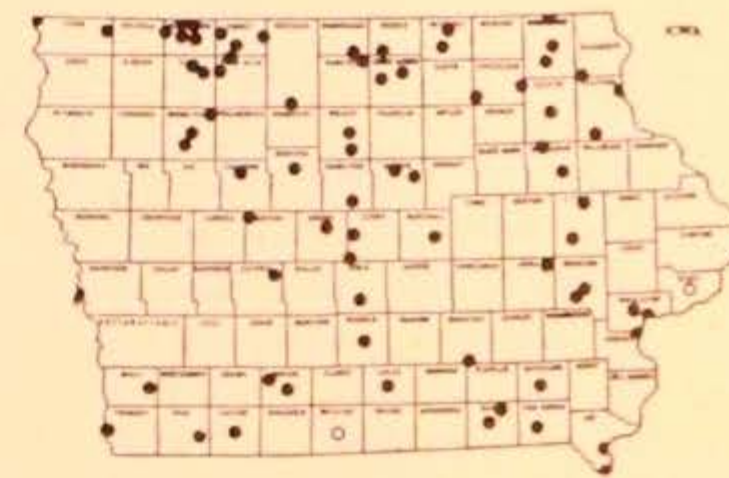
VERBENACEAE**1. Lippia L. (Fog Fruit)****Phyla Greene**

1. *L. lanceolata* Michx. var. *recognita* Fern. and Grise. Map 185

Low ground, wet soil, alluvial flats, lake shores, marshes, and stream banks. Typical *L. lanceolata* is restricted to the coast of southeastern United States. Collections of var. *recognita* are from the southeastern part of the state, north along the Mississippi, Cedar, Des Moines, and Missouri Rivers.

LABIATAE

- | | |
|--|-----------------------|
| 1. Corolla strongly 2-lipped, 1 cm. or more long (except <i>Scutellaria lateriflora</i>) | 2 |
| 1. Corolla regular, less than 1 cm. long | 4 |
| 2. Calyx 2-lipped, with a projection on the upper side | 2. <i>Scutellaria</i> |
| 2. Calyx more or less regular, without a projection on the upper side | 3 |
| 3. Leaves sessile; plants glabrous | 3. <i>Physostegia</i> |
| 3. Leaves petioled; plants pubescent with strongly divergent hairs and stipitate or sessile glands | 1. <i>Teucrium</i> |
| 4. Plants with strong mint odor; flowers pink-violet, rarely white; stamens 4 | 5. <i>Mentha</i> |
| 4. Plants without strong mint odor; flowers white; stamens 2 | 4. <i>Lycopus</i> |

Map 185. *Lippia lanceolata* v. *recognita*Map 186. *Teucrium occidentale*Map 187. *Scutellaria lateriflora*Map 188. *Scutellaria epilobiifolia*Map 189. *Physostegia parviflora*Map 190. *Lycopus virginicus*Map 191. *Lycopus uniflorus*Map 192. *Lycopus americanus*

1. Teucrium L.

1. *T. occidentale* Gray (Germander) Map 186

Wet shores and swamps. The majority of our collections are from the Mankato Lobe with scattered stations elsewhere. Absent from the southern third of the state. Often confused with the more mesophytic *T. canadense* L., a species in which the pubescence is closely appressed, felt-like, and without glands.

2. Scutellaria L. (Skullcap)

1. Leaves broadly ovate, on a definite petiole mostly more than 1 cm. long; corolla less than 1 cm. long; flowers in unilateral racemes in axils of reduced, leaf-like bracts ----- 1. *S. lateriflora*
 1. Leaves lanceolate-ovate, sessile or subsessile; corolla more than 1 cm. long; flowers in the axils of leaves ----- 2. *S. epilobiifolia*

1. *S. lateriflora* L. Map 187

Marshy shores, swamps, and bogs. Distribution is state wide.

2. *S. epilobiifolia* A. Hamilton Map 188

Prairie bogs, shores, and swamps. General distribution in the Mankato Lobe and in extreme eastern counties but largely absent from the Iowan drift region.

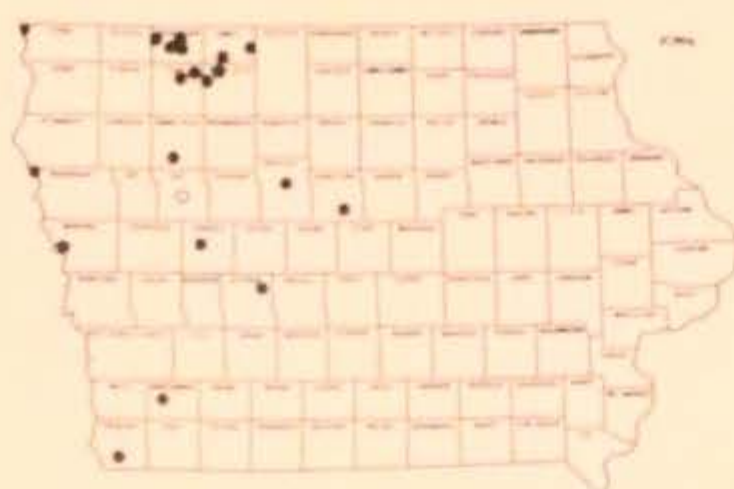
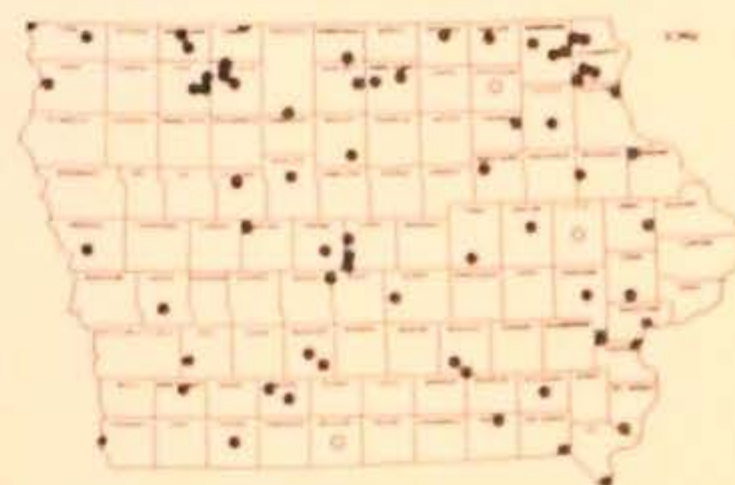
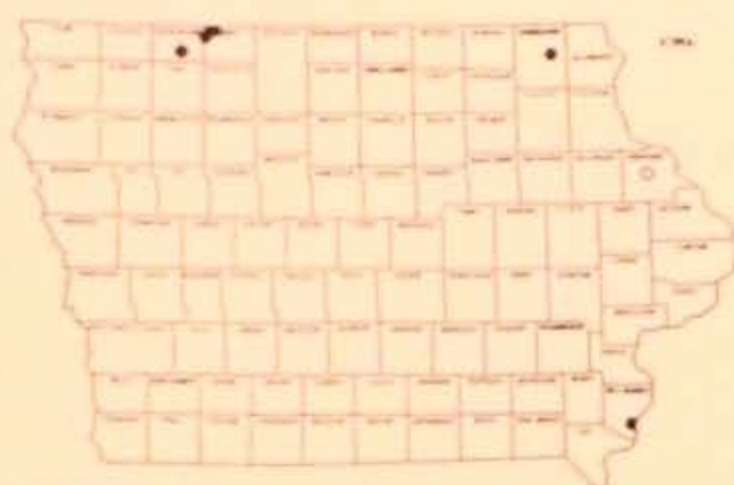
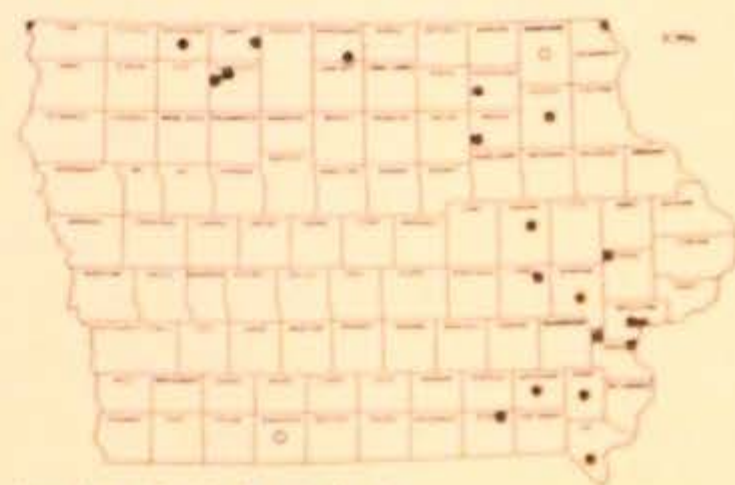
3. Physostegia Benth.

1. *P. parviflora* Nutt. (False Dragonhead) Map 189
Dracocephalum nuttallii Britt.

Low ground, swamps, marshes, and shores. The group of *P. parviflora* and *P. virginiana* is in need of considerable work to determine the true relationships. Distribution is general in the Mississippi River drainage.

4. Lycopus L. (Bugleweed, Water Horehound)

1. Calyx lobes shorter than or about equaling mature fruits, triangular ----- 2
 1. Calyx lobes longer than mature fruits, lanceolate, with a sharp tip ----- 3
 2. Stems not ending in tuber; leaves mostly petioled, the larger leaves mostly over 6 cm. long, with 10 or more teeth on a side; cluster of fruits very dense, hiding the calyx lobes ----- 1. *L. virginicus*
 2. Year-old stems ending in tuber, older stem often not tuberous; leaves mostly sessile, smaller, with 6-8 teeth on a side, larger leaves usually less than 5 cm. long; calyx lobes usually not hidden by mature fruits ----- 2. *L. uniflorus*
 3. Leaves mostly deeply lobed, petioled; stem not arising from tuberous base ----- 3. *L. americanus*
 3. Leaves serrate, sessile; stem from a tuberous base ----- 4. *L. asper*

Map 193. *Lycopodium asper*Map 194. *Mentha arvensis*Map 195. *Chelone glabra*Map 196. *Mimulus ringens*Map 197. *Mimulus glabratus* v. *fremontii*Map 198. *Gratiola neglecta*Map 199. *Gratiola virginiana*Map 200. *Bacopa retundifolia*

1. *L. virginicus* L. Map 190

Low places, springy prairie, and shores. Tolerant of a wide variety of habitats. Scattered distribution in the Mississippi River drainage.

2. *L. uniflorus* Michx. Map 191

Marshes, swamps, and low prairie. Distribution in the Mississippi River drainage, principally in the northern counties.

3. *L. americanus* Muhl. Map 192

Swamps, ditches, bogs, low places, lake shores, often into shallow water. Widely distributed in the Mississippi River drainage with fewer collections in western and southwestern Iowa.

4. *L. asper* Greene Map 193

L. lucidus var. *americanus* Gray

Wet situations into shallow water; bogs, swamps, and shores. Mankato Lobe in northern counties and along Missouri River.

5. *Mentha* L.

1. *M. arvensis* L. (Mint) Map 194

All wet habitats, from very shallow water to damp woods. Distribution mostly in the Mankato Lobe but scattered elsewhere except in south and southwest.

SCROPHULARIACEAE

- | | |
|--|-----------------------|
| 1. Flowers borne singly in the axils of leaves | 2 |
| 1. Flowers in open racemes or dense terminal or axillary spikes | 6 |
| 2. Leaves linear; less than 2 mm. wide; corolla pink-purple..... | 7. <i>Gerardia</i> |
| 2. Leaves lanceolate, elliptic or ovate, more than 2 mm. wide..... | 3 |
| 3. Calyx toothed, the teeth less than $\frac{1}{2}$ the length of the tube..... | 2. <i>Mimulus</i> |
| 3. Calyx divided to base of capsule | 4 |
| 4. Leaves spatulate to ovate; plant trailing, often rooting at the nodes | 4. <i>Bacopa</i> |
| 4. Leaves lanceolate to elliptic; plants erect..... | 5 |
| 5. Flowers purplish; capsule oblong, about twice as long as broad, broadest near the middle | 5. <i>Lindernia</i> |
| 5. Flowers yellowish or white; capsule globose, about as long as broad, broadest near the base | 3. <i>Gratiola</i> |
| 6. Flowers in open racemes; corolla less than 5 mm. long..... | 6. <i>Veronica</i> |
| 6. Flowers in dense spikes, corolla 1 cm. or more long..... | 7 |
| 7. Leaves shallowly lobed; corolla yellow | 8. <i>Pedicularis</i> |
| 7. Leaves serrate; corolla creamy-white, shading into darker colors above | 1. <i>Chelone</i> |

1. Chelone L.

1. *C. glabra* L. (Balmony, Turtlehead) Map 195

Swamps, marshes, shores, and river banks. Mississippi River drainage, mostly in the northeastern fourth of the state.

2. Mimulus L.

1. Stems erect, not rooting at nodes; flowers blue, leaves lanceolate-elliptic, sessile ----- 1. *M. ringens*
 1. Stems reclining, rooting at the nodes; flowers yellow; leaves orbicular, at least the lower ones petioled ----- 2. *M. glabratus* var. *fremontii*

1. *M. ringens* L. (Monkey Flower) Map 196

Swampy areas, along shores and in water up to 15 inches in depth, wet meadows and river banks. Distribution general throughout state.

2. *M. glabratus* HBK. var. *fremontii* (Benth.) Grant Map 197

Bogs, small streams, swamps, and wet places. Typical *M. glabratus* is found in southwestern United States and south into South America.

3. Gratiola L. (Hedge Hyssop)

1. Pedicels filiform, many times longer than capsule ----- 1. *G. neglecta*
 1. Pedicels thick, not much longer than the capsule ----- 2. *G. virginiana*

1. *G. neglecta* Torr. Map 198

G. virginiana of Gray's Manual, ed. 7, not L.

Moist soil, pond edges, and low prairie. Northern and eastern counties.

2. *G. virginiana* L. Map 199

G. sphacrocarpa Ell.

Decatur Co.: J. P. Anderson, June 28, 1900 (ISC). Muscatine Co.: R-3W, T-77N, S-2, 11, R. F. Thorne, Sept. 29, 1951 (IA); Lake Twp., S-7, NW $\frac{1}{4}$, R. F. Thorne 10,978, Aug. 9, 1952 (IA).

4. Bacopa Aubl.

1. *B. rotundifolia* (Michx.) Wettst. Map 200

Macuillamia rotundifolia Michx.

In ponds and wet depressions. Most collections are from the extreme southeast but we also have collections from Fremont and Lyon Counties.

5. Lindernia All. (False Pimpernel)**Hysanthes Raf.**

1. Pedicels equaling or only slightly exceeding their subtending leaves; mature capsule about as long as the calyx lobes; seeds mostly 3 times

as long as wide ----- 1. *L. dubia*

1. Pedicels all longer than the subtending leaves; mature capsule longer than the calyx lobes; seeds mostly about 2 times as long as wide -----

2. *L. anagallidea*

1. *L. dubia* (L.) Pennell

Map 201

Swampy shores, and low, wet ground. Generally though not abundantly collected throughout the entire state.

2. *L. anagallidea* (Michx.) Pennell

Map 202

Wet shores. Discontinuously distributed in northcentral and southeastern Iowa.

This species is often difficult to distinguish from the preceding. Several key characters are mentioned in the manuals, none of which seem to be entirely consistent. Mature capsules and seeds are absolutely necessary for complete identification.

6. *Veronica* L. (Speedwell)

(Pennell, 1935)

1. Leaves petioled ----- 2. *V. americana*

1. Leaves sessile ----- 2

2. Leaves linear-lanceolate; capsule much broader than long, strongly 2-lobed ----- 1. *V. scutellata*

2. Leaves lanceolate-elliptic-ovate; capsule about as broad as long; not strongly 2-lobed ----- 3

3. Racemes mostly with more than 30 flowers; capsule shorter than to about equaling the calyx lobes; about as long as wide, not notched ----- 3. *V. anagallis-aquatica*

3. Racemes mostly with less than 30 flowers; capsule longer than the calyx lobes, slightly wider than long, notched ----- 4. *V. connata*

1. *V. scutellata* L.

Map 203

Only one specimen of this species exists. Buchanan Co.: Muncey, C. E. Bessey, July, 1876 (ISC).

2. *V. americana* (Raf.) Schwein. (American Brooklime)

Map 204

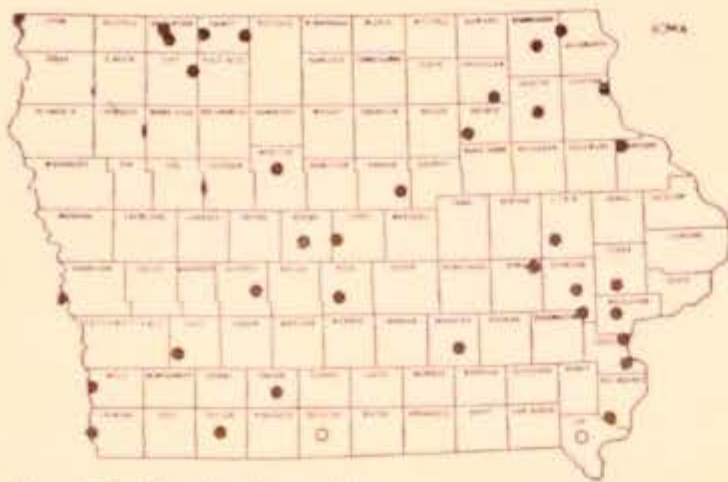
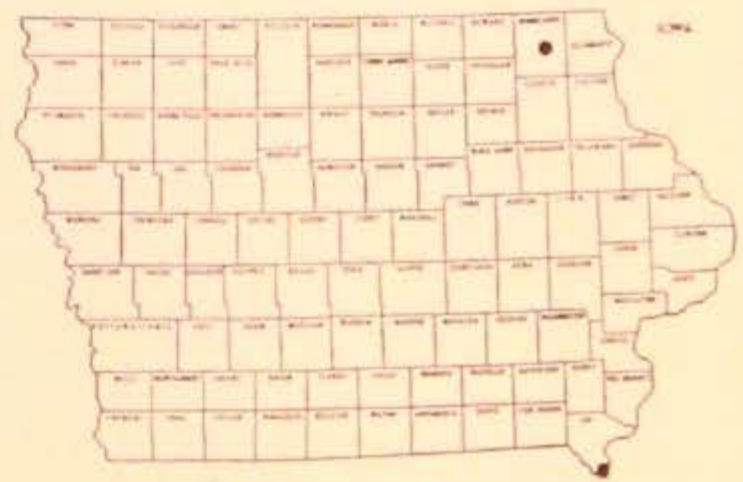
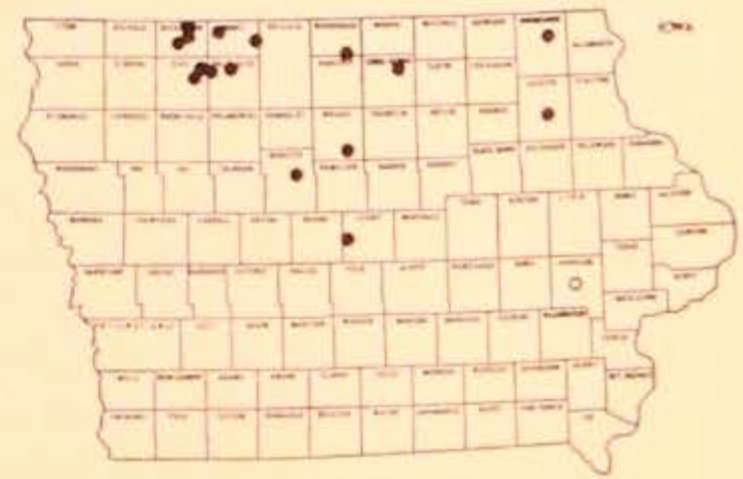
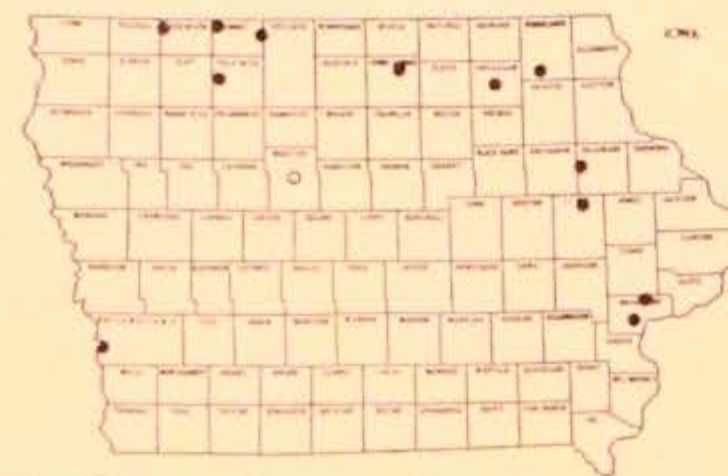
Known from Iowa by three collections.

Lee Co.: A. S. Hitchcock (ISC). Winneshiek Co.: Decorah, Fitzsimmons, June 13, 1895 (IA); Decorah, Shimek, Sept. 15, 1903 (IA).

3. *V. anagallis-aquatica* L.

Map 205

All of our several collections of this species are from northeast Iowa. The author collected this species in the vicinity of Decorah during the summer of 1951 from both cold, flowing water and a small, warm, nearly stagnant pool.

Map 201. *Lindernia dubia*Map 202. *Lindernia anagallidea*Map 203. *Veronica scutellata*Map 204. *Veronica americana*Map 205. *Veronica anagallis-aquatica*Map 206. *Veronica connata*Map 207. *Gerardia pauperula*Map 208. *Pedicularis lanceolata*

4. *V. connata* Raf. Map 206

V. comosa Richter

V. catenata Pennell

Springy areas and marshes. Distribution principally in the Mankato Lobe with scattered collections eastward.

7. *Gerardia* L.

1. *G. paupercula* (Gray) Britt. Map 207

Fens, swamps, and shores. Distribution scattered in the northern and eastern counties of the state.

8. *Pedicularis* L.

1. *P. lanceolata* Michx. (Lousewort) Map 208

Swamps, bogs, low ground, wet prairie, and fens. Mississippi River drainage in the north and east. South along the Cedar River in Muscatine Co.

LENTIBULARIACEAE

1. *Utricularia* L. (Bladderwort)

- | | |
|---|-------------------------|
| 1. Leaves filiform, without a midvein | 2 |
| 1. Leaves flat, with a midvein | 3 |
| 2. Scape stout, many flowered; bract not clasping | 1. <i>U. vulgaris</i> |
| 2. Scape slender, few flowered; bract clasping | 2. <i>U. gibba</i> |
| 3. Bladders and leaves on the same stems | 3. <i>U. minor</i> |
| 3. Bladders on stems separate from those bearing leaves | 4. <i>U. intermedia</i> |

1. *U. vulgaris* L. Map 209

U. macrorrhiza LeConte

In water up to 3 feet in depth; lakes, swamps, and river oxbows. Distribution general throughout the state.

2. *U. gibba* L. Map 210

Two Iowa Collections.

Johnson Co.: Swan Lake, R. F. Thorne 10,467, Oct. 1, 1950 (IA).

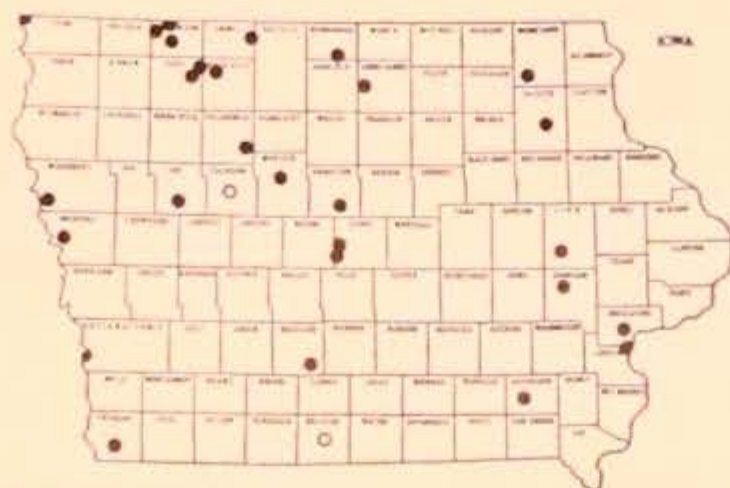
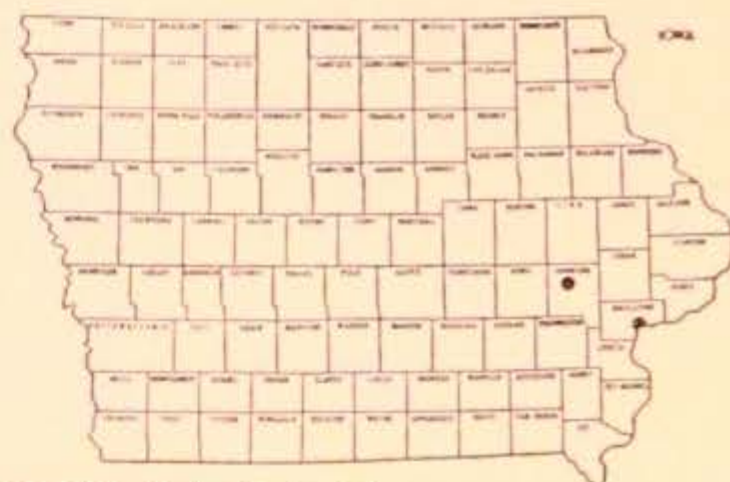
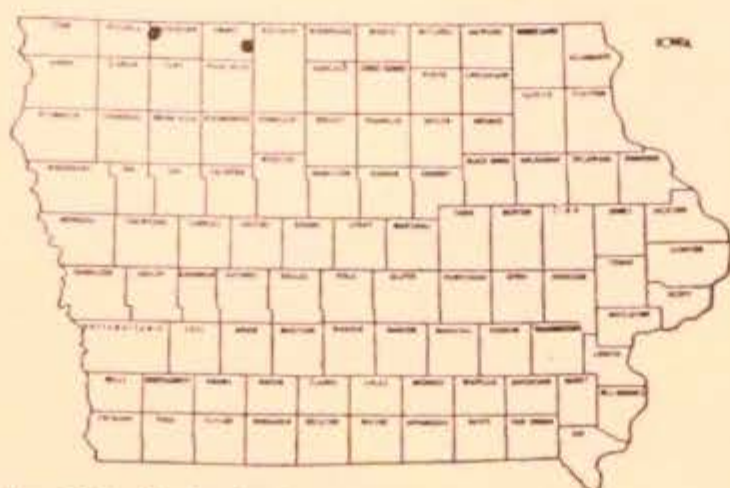
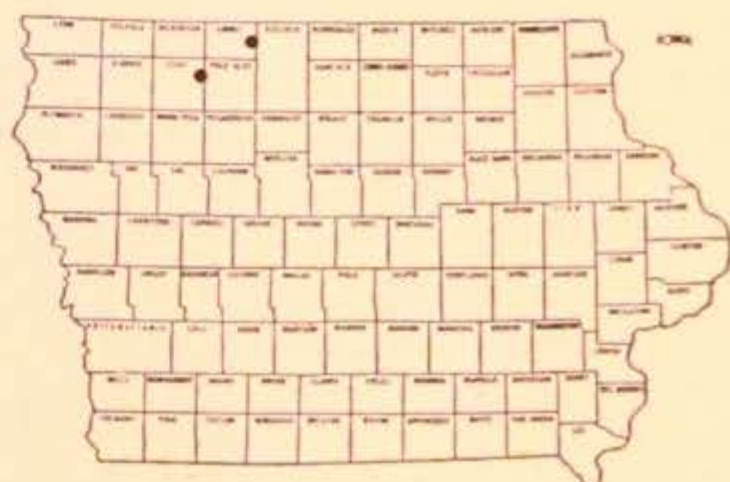
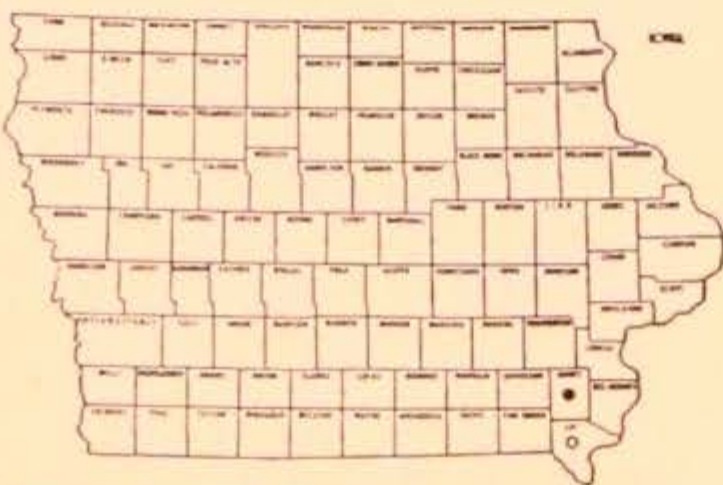
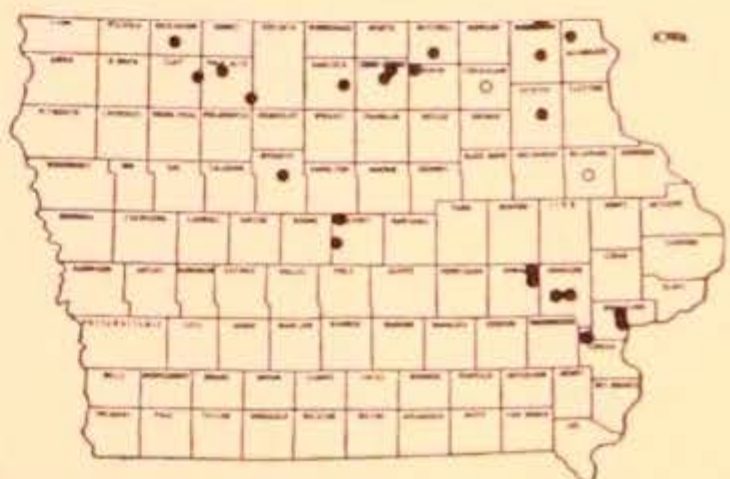
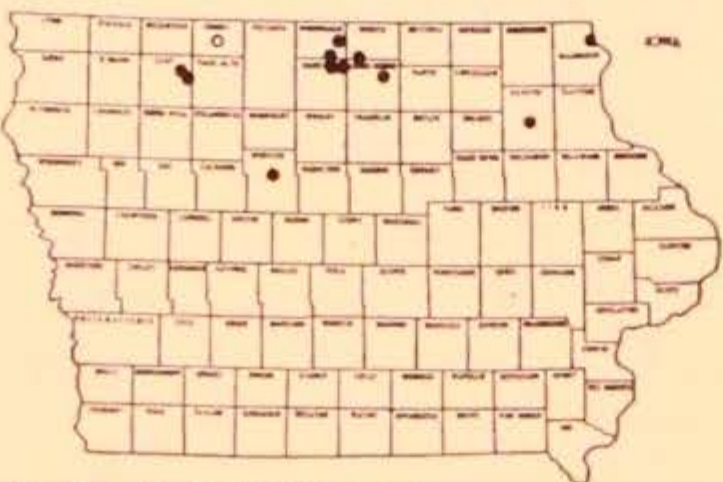
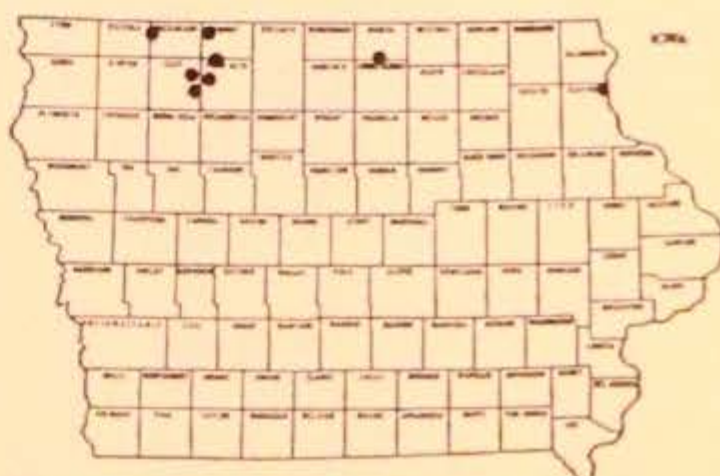
Muscatine Co.: Muscatine, Ferd. Reppert, Oct., 1878 (ISC).

3. *U. minor* L. Map 211

Dickinson Co.: Silver Lake, Shimek, Aug. 28, 1932 (IA); southwest corner of Silver Lake, Shimek, Aug. 7, 1933 (ISC). Emmet Co.: R-31W T-99 S-11, R. I. Cratty, May, 1880 (ISC).

4. *U. intermedia* Hayne. Map 212

Clay Co.: Freeman Twp. S-11, Ada Hayden 10,054, Sept. 2, 1935 (ISC); Ada Hayden 10,055, May 31, 1936 (ISC); Ada Hayden 9634,

Map 209. *Utricularia vulgaris*Map 210. *Utricularia gibba*Map 211. *Utricularia minor*Map 212. *Utricularia intermedia*Map 213. *Justicia americana*Map 214. *Campanula aparinoides*Map 215. *Campanula uliginosa*Map 216. *Lobelia kalmii*

July 23, 1939 (ISC). Emmet Co.: R. I. Cratty, 1878 (ISC); R. I. Cratty, July, 1881 (ISC).

ACANTHACEAE

1. *Justicia* L.*Dianthera* L.

1. *J. americana* (L.) Vahl. (Water Willow) Map 213

Henry Co.: Mt. Pleasant, J. H. Mills 617 (IA). Lee Co.: Jess L. Fuhs, July 1, 1931 (ISC).

CAMPANULACEAE

1. Corolla regular, with united petals shallowly and evenly lobed; anthers separate 1. *Campanula*

1. Corolla irregular, with united petals deeply and unevenly lobed; anthers united into a tube 2. *Lobelia*

1. *Campanula* L. (Bellflower)

1. Leaves mostly lanceolate; corolla 5-8 mm. long; flowering calyx 1.3-3.8 mm. long 1. *C. aparinoides*

1. Leaves mostly linear; corolla 1 cm. or more long; flowering calyx 3-6.7 mm. long 2. *C. uliginosa*

1. *C. aparinoides* Pursh Map 214

Marshes, wet meadows, moist hillsides, bogs, and springs. Sometimes hard to distinguish from *C. uliginosa*. Distribution principally in the Upper Mississippi River drainage. In southeastern Iowa only along the Cedar River.

2. *C. uliginosa* Rydb. Map 215

Wet meadows and creek banks. Distribution largely in the northern counties of the Mankato Lobe.

2. *Lobelia* L.

1. *L. kalmii* L. Map 216

Fens and boggy places. Distribution very restricted in the Iowa Great Lake region.

COMPOSITAE

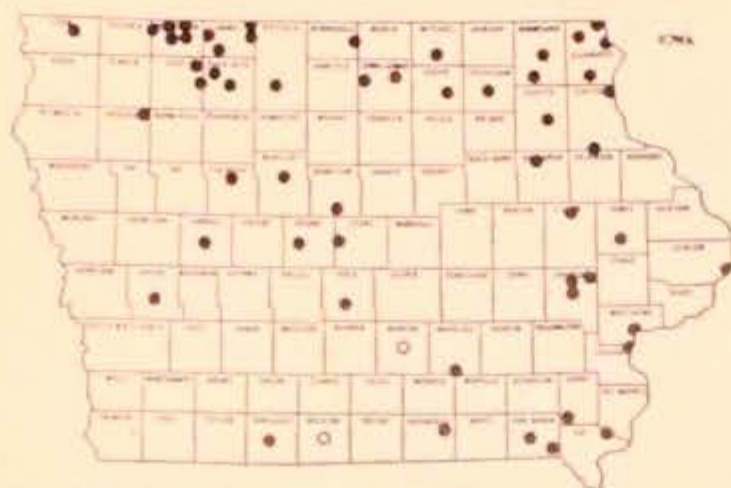
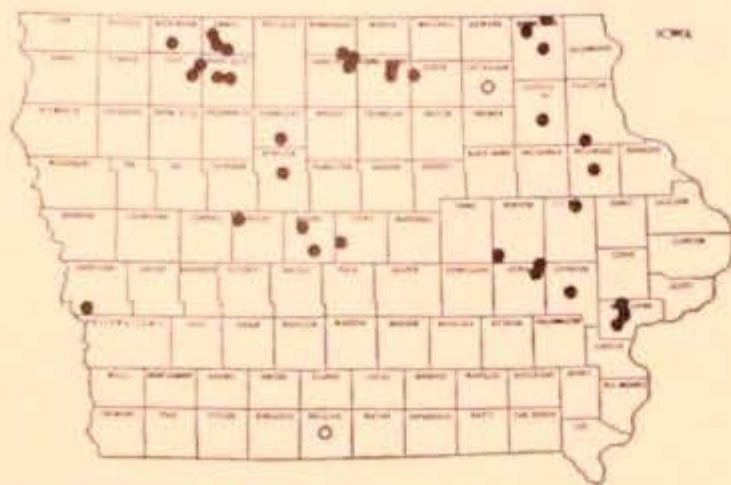
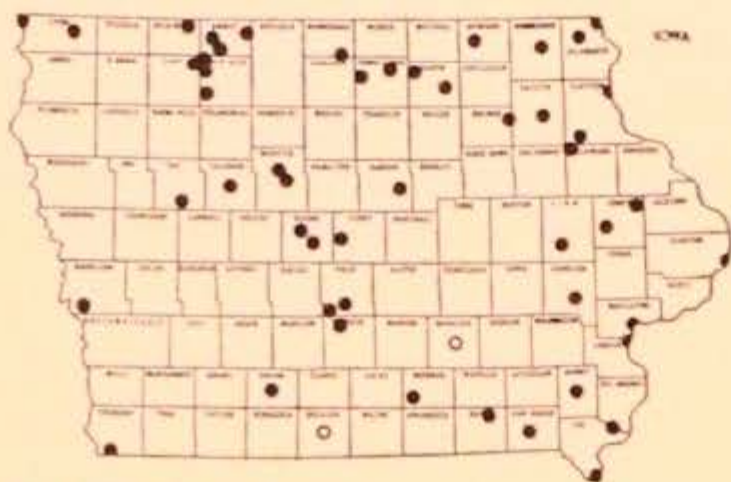
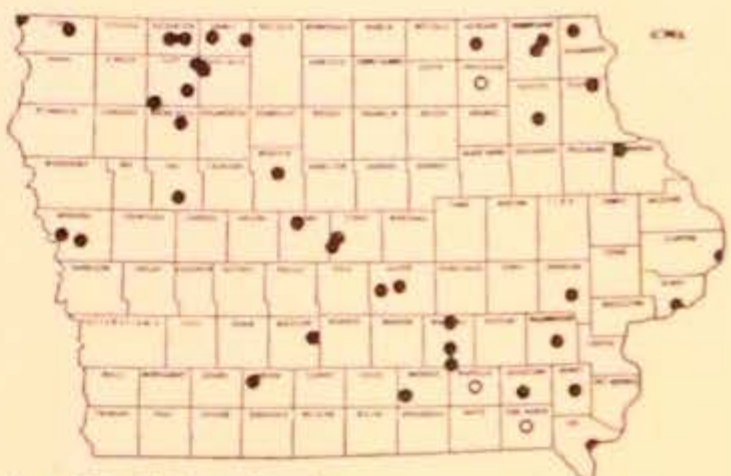
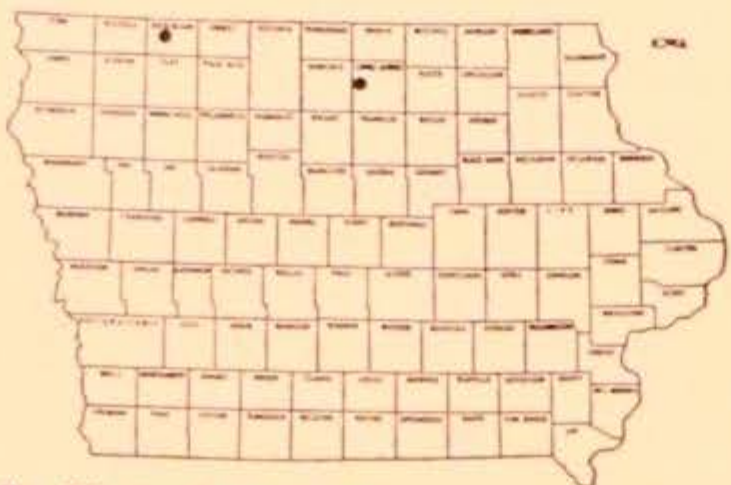
1. Plants with finely divided submerged leaves 5. *Megalodonta*

1. Plants without finely divided submerged leaves 2

2. Leaves opposite 3

2. Leaves alternate 4

3. Flowers yellow; pappus of 2 or 3 strong, barbed awns; leaves widest near the middle 4. *Bidens*

Map 217. *Eupatorium perfoliatum*Map 218. *Boltonia asteroides*Map 219. *Aster lucidulus*Map 220. *Aster umbellatus*Map 221. *Bidens cernua*Map 222. *Bidens frondosa*Map 223. *Megalodonta beckii*

3. Flowers white or purple; pappus of hairs; leaves widest at base, usually perfoliate ----- 1. *Eupatorium*
 4. Stem strongly corrugate; leaves sessile, mucronate; achene topped with few stout awns ----- 2. *Boltonia*
 4. Stem not corrugate; leaves sessile or short petioled, tapered to tip; achenes with pappus of fine hairs ----- 3. *Aster*

1. *Eupatorium* L.

1. *E. perfoliatum* L. (Thoroughwort, Boneset) Map 217

Swampy shore, bogs, marshes, and low prairie; collected in shallow water. Distribution general in the Mississippi River drainage with a few collections in western counties.

2. *Boltonia* L'Her.

(Cronquist, 1941)

1. *B. asteroides* (L.) L'Her. Map 218

Wet prairie, swamps, and flood plains; collected in water up to 2 feet in depth. Distribution general except for region of Iowan glaciation.

3. *Aster* L.

1. Leaves sessile, clasping; pappus single ----- 1. *A. lucidulus*
 1. Leaves tapering to a short petiole; pappus double ----- 2. *A. umbellatus*

1. *A. lucidulus* (Gray) Wieg. Map 219
 (Shinners, 1941).

Sloughs, swamps, wet prairie, and bogs. Not associated with lake shores. Widely distributed in the Mississippi River drainage.

2. *A. umbellatus* Mill. Map 220

Swamps, bogs, marshes, and low places. Widely distributed in the Mississippi River drainage.

4. *Bidens* L. (Sticktight, Beggars Tick)

1. Leaves simple, sessile, clasping, auriculate; achenes strongly winged, 4-awned ----- 1. *B. cernua*
 1. Leaves compound with 3 leaflets, petioled; achene not winged, 2-awned ----- 2. *B. frondosa*

1. *B. cernua* L. Map 221

Swamps, marshes, lake shores, stream banks, wet prairie, and bogs. Distribution state wide but most abundantly collected in the Mississippi River drainage.

2. *B. frondosa* L.

Map 222

Swamps, lake shores, bogs, stream banks, and low ground. Most collections are from the Des Moines River drainage and northeast. Absent from the region of the Iowan glaciation.

5. *Megalodonta* Greene1. *M. beckii* (Torr.) Greene (Water Marigold)

Map 223

Bidens beckii Torr.

Lakes, in water 2-5 feet deep. Known in Iowa by many collections from Miller's Bay of West Okoboji Lake in Dickinson Co. and from the west end of Clear Lake in Cerro Gordo Co.

LITERATURE CITED

- Anderson, E. L. The problem of species in the Northern Blue Flags, *Iris versicolor* L. and *I. virginica* L. Ann. Mo. Bot. Gard. 15: 241-352. 1928.
- Benson, Lyman. A treatise on the North American Ranunculi. Amer. Mid. Nat. 40: 1-264. 1948.
- Conard, H. S. Grinnell, Iowa. Information on the distribution of *Nymphaea* and *Nuphar* in Iowa. [Private communication.] 1952.
- Cratty, R. L. The Iowa flora. Iowa State College Jour. Sci. 7: 177-252. 1933.
- Cronquist, Arthur. Notes on the Compositae of the Northeastern United States; V. Astereae. Bull. Torr. Bot. Club 74: 149. 1947.
- Fay, M. J. The flora of southwestern Iowa. [Unpublished Ph. D. Thesis.] Iowa City. State Univ. of Iowa Library. 1953.
- Fassett, N. C. A manual of aquatic plants. 1st ed. N. Y. McGraw-Hill Book Co., Inc. 1940.
- . *Callitriche* in the New World. Rhod. 53: 137-155, 161-182, 185-194, 209-222. 1951.
- and B. Calhoun. Introgression between *Typha latifolia* & *T. angustifolia*. Evolution 6: 367-379. 1952.
- Fernald, M. L. Gray's manual of botany. 8th ed. N. Y. Amer. Book Co. 1950.
- Gilly, C. L. The Cyperaceae of Iowa. Iowa State College Jour. Sci. 21: 55-151. 1946.
- Gleason, Henry A. New Britton and Brown illustrated flora. Lancaster, Penna. Lancaster Press, Inc. 1952.
- Hayden, Ada. A botanical survey in the Iowa lake region of Clay and Palo Alto Counties. Iowa State College Jour. Sci. 17: 277-416. 1943.
- Kay, G. F. and others. The Pleistocene geology of Iowa. Des Moines. Iowa Geol. Sur. Spec. Report. 1944.
- Moyle, J. B. and Neil Hotchkiss. The aquatic and marsh vegetation of Minnesota and its value to waterfowl. St. Paul. Minn. Dept. Cons. Tech. Bul. 3. 1945.
- Muenschner, W. C. Aquatic plants of the United States. Ithaca, N. Y. Comstock Pub. Co., Inc. 1944.
- Ogden, E. C. The broad-leaved species of *Potamogeton* of North America north of Mexico. Rhod. 45: 57-105, 119-163, 171-214. 1943.
- Pennell, F. W. The Scrophulariaceae of eastern temperate North America. Phila. Acad. Nat. Sci. Monog. No. 1. 1935.
- Reed, C. D. Climate in Iowa. In Climate and Man., U. S. Dept. Agri. Washington. Yearbook of Agric. 1941: 862-872. 1941.
- Rose, E. T. Spirit Lake, Iowa. Information on the distribution of *Nelumbo* in Iowa. [Private communication.] 1952.

- Huber, H. V. Reclassification and correlation of the glacial drifts in northwestern Iowa and adjacent areas. [Unpublished Ph. D. Thesis.] Iowa City. State Univ. of Iowa Library. 1959.
- Shinnars, L. H. The genus *Aster* in Wisconsin. Amer. Mid. Nat. 20: 388-429 [esp. p. 414.] 1941.
- Speckert, E. H. Des Moines, Iowa. Information on the distribution of *Nelumbo* in Iowa. [Private communication.] 1952.
- Winniford, R. E. *Polyporus hydropiperoides* and *P. applanatus*. Mush. 25: 11-17, 27-29. 1926.
- Weaver, J. R. and F. E. Clements. Plant ecology. 2nd ed. N. Y. McGraw Hill Book Co., Inc. [esp. p. 481.] 1939.

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