Vascular Flora of Arend's Kettle, Freda Haffner Kettlehole State Preserve, Dickinson County, Iowa

Edwin L. Freese
University of Northern Iowa

William J. Platt
Louisiana State University
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EDWIN L. FREESE¹ and WILLIAM J. PLATT

Department of Biology, University of Northern Iowa, Cedar Falls, IA 50613
and
Department of Botany, Louisiana State University, Baton Rouge, LA 70803

Arend's Kettle is a 5 ha glacial landform in Dickinson County, Iowa. The flora of this kettle was studied over two years prior to acquisition by the Nature Conservancy in 1973. The known vascular flora of Arend's Kettle as of 1973 consisted of 299 species, representing 177 genera and 59 families. The vegetation ranged from xeric short grass prairie along the rims of the kettle to mesic prairie along the middle and lower slopes. In the bottom of the kettle, there was a marsh/seasonal pond community that varied greatly in the amount of water present, depending on rainfall within the 30 ha drainage into the kettle. At the time of this study, cattle grazing was occurring in the kettle, and there was a prominent ruderal flora associated with trails running along the rim and down to the bottom of the kettle. The shoreline of the marsh also was frequently disturbed by cattle. One federally and state threatened species, Lespedeza leptostachya, prairie bush clover, and one state threatened species, Aeclepis lanuginosa, wooly milkweed, were present on the site. Two species were added to the Dickinson County flora.

INDEX DESCRIPTORS: Arend's Kettle, Freda Haffner Kettlehole State Preserve, Iowa flora, prairie, Lespedeza leptostachya, Aeclepis lanuginosa, Dickinson County.

Study Area

Arend's Kettle is in northwestern Iowa is widely known as an exemplary kettle (Salisbury and Knox 1969). This unique geological feature, about 5 hectares (12.4 acres) in size (Gerhardt 1940; Collins 1968), is located in the Freda Haffner Kettlehole State Preserve, a 44.5 ha preserve managed by the Iowa Chapter of The Nature Conservancy. This preserve is located in Dickinson County, Iowa, about 5 km west of West Lake Okoboji.

In this paper, we present a species list of vascular plants for Arend's Kettle that was compiled over two growing seasons just prior to acquisition by The Nature Conservancy in 1973. The preserve was grazed by cattle during the period of study. The cattle cropped the vegetation where they grazed, and they created trails running from the rims down to the marsh at the bottom of the kettle. The wet prairie and marsh at the bottom of the kettle were frequently disturbed by cattle coming down to drink and graze. Since 1973, grazing has ceased, and prescribed fires have been used for management of the preserve. The species list and general locations of species of plants within the preserve in the early 1970s thus should provide data useful in documenting changes occurring after establishment of this preserve.

RESULTS AND DISCUSSION

An annotated checklist of vascular plants collected from Arend's kettle is presented in Appendix I. Families, genera and species are listed alphabetically. Habitats refer to environmental conditions occurring along the slopes of the kettle. Relative frequency of occurrence was based on personal field observations and collections within each habitat. "Abundant" indicates occurring in large numbers or very evident. "Common" indicates many specimens or locations. "Frequent" indicates 11-20, and "infrequent" denotes 6-10 occurrences. A species was considered "rare" if only 1-5 locations were found. Flowering times were noted for most species and are indicated as that span of time over which flowers were observed in the field.

A total of 276 species and 173 genera, representing 57 families, were identified during our collections made in 1972 and 1973. Only...

¹Current Address: 513½ 2nd St., S.E., Waverly, Iowa 50677
one pteridophyte was collected. The monocots consisted of 13 families, 48 genera, and 83 species, while dicots consisted of 43 families, 121 genera, and 192 species. The four largest families are: Asteraceae, 51 species; Poaceae, 46 species; Fabaceae, 22 species; Cyperaceae, 17 species.

Three habitats present in the kettle included dry prairie rim, mesic slopes, and marsh. Typical short-grassland species occupied the kettle rim. The most abundant species included *Bouteloua gracilis*, *Poa pratensis*, *Schizachyrium scoparium*, *Amorpha canescens*, *Ambrosia artemisiifolia*, *Panicum praeecoxus*, *Achillea millefolium*, *Bouteloua hirsuta*, *Solidago missouriensis*, and *Carex brevior*. Other representative species were *Anemone patens*, *Echinacea pallida*, *Koeleria cristata*, *Psoralea esculenta*, *Aster serius*, *Allium stellatum*, and *Astragalus cristatus*. *Oxyporus lamberti* and *Androsace occidentalis* also occupied dry sandy knolls.

Tall grass prairie dominated the mesic slopes. Dominant grasses and composites included *Poa pratensis*, *Ambrosia artemisiifolia*, *Andropogon gerardii*, *Schizachyrium scoparium*, *Bouteloua curtipendula*, *Achillea millefolium*, *Solidago canadensis*, *Panicum praeecoxus*, *Stipa spartea*, *Panicum oligosanthes*, and *Cirsium andatum*. Other important species were *Verbenia stricta*, *Achipsis verticallata*, *Trifolium provensalis*, *Onosmodium molle*, *Dolus purpureus*, *Helipsis bolanthoides*, *Medicago lupulina*, *Liatigera incisa*, *Monarda fistulosa*, *Potentilla arguta*, and *Erigeron strigosus*. Many other typical tall grass species, for example, *Achipsis tuberosa*, *Carpornus americanus*, and *Bickiria eupatoria*, were present in lesser numbers.

The marsh contained two zones. The outer zone was a wet prairie that ranged from moist soil to standing water. Typical dominant species were *Glyceria grandis*, *Polygonum hydropiper*, *Lysimachia hybridra*, *Leontia oryzae*, *Iris versicolor*, *Ambrosia artemisiifolia*, *Carex meadii*, *Scutellaria latiflora*, *Menta arvensis*, *Alopecurus aequalis*, *Hedeoma hispida*, *Sparganium eurycarpum*, *Anenome patens*, *Echinacea pallida*, *Koeleria cristata*, *Psoralea esculenta*, *Androsace occidentalis* and *Cirsium arvense*. *Yellow flowered bladderwort*, *Heliopsis helianthoides*, *Medicago lupulus*, *Eleocharis macrostachya*, and *Sparganium eurycarpum* were the most abundant species. *Yellow flowered bladderwort*, *Heliopsis helianthoides*, *Medicago lupulus*, *Eleocharis macrostachya*, and *Sparganium eurycarpum* were the most abundant species. *Yellow flowered bladderwort*, *Heliopsis helianthoides*, *Medicago lupulus*, *Eleocharis macrostachya*, and *Sparganium eurycarpum* were the most abundant species. *Yellow flowered bladderwort*, *Heliopsis helianthoides*, *Medicago lupulus*, *Eleocharis macrostachya*, and *Sparganium eurycarpum* were the most abundant species. *Yellow flowered bladderwort*, *Heliopsis helianthoides*, *Medicago lupulus*, *Eleocharis macrostachya*, and *Sparganium eurycarpum* were the most abundant species. *Yellow flowered bladderwort*, *Heliopsis helianthoides*, *Medicago lupulus*, *Eleocharis macrostachya*, and *Sparganium eurycarpum* were the most abundant species. *Yellow flowered bladderwort*, *Heliopsis helianthoides*, *Medicago lupulus*, *Eleocharis macrostachya*, and *Sparganium eurycarpum* were the most abundant species.

The seasonal pond also supported a lush growth of submerged aquatic plants. *Potamogeton foliosus*, *Potamogeton pusillus*, *Gunniphylum demersum* and *Najas flexis* were the most abundant species. Yellow flowered bladderwort, *Utricularia vulgaris*, dotted the surface throughout the summer. Ruderal species were quite evident in the kettle. Common species were: most evident along the ridge top, descending the slopes at an angle allowing the use of the Freda Haffner Kettlehole for grazing of the marsh edges (Tpetla latifolia, *Scripus validus*, *Carex comensis*, *Carex sulphuroides*, and *Polygonum natans*). Some species are possibly misidentified (e.g., *Oxalis dilleni* and *Tradescantia subaspera*).

A search through the Iowa Lakeside Laboratory Herbarium revealed many specimens collected from Arend's kettle. One species, *Panicum philadelphicum* (Grant 85904) is listed as threatened in Iowa, but was not located in the current study. The earliest collected specimen from the kettle was *Agalinis (Gerardia) aspera* (B. Shimek, 1794, August 24, 1919).

*Lepeolza lipothecis*, *pennyroyal* bush clover, is listed as a threatened plant by the U.S. Department of Interior's endangered and threatened species listing (1987). Plants were located on the southeast slope. *Asclepias lampros*, *woolly milkweed*, is listed as threatened in Iowa. Scattered plants were present near the kettle rim.

Two new species were added to the Dickinson county flora: *Ambrosia occidentalis* and *Geum triflorum*. The most recent updates of the county flora were those of Martin L. Grant (1951, 1953). *Scirpus heterochaitus* was not reported by Grant, but was included in the Cayler Prairie flora by Aikman & Thorne (1956).

Van Der Valk and Davis (1976) conducted an ecological survey of the kettle marsh vegetation during the 1973 and 1975 growing seasons. Plants were sampled by clipping along two permanent transects located perpendicular to shoreline. They reported 30 species of vascular plants comprising 19 families and 26 genera. Of these 15 were monocots and 15 were dicots. Three species, *Buckannioll syzygiarum*, *Carex rostrata*, and *Polygonum cossinum*, were not located during our search. *Eleocaris palustris* also was collected and may be synonymous with *Eleocaris ortophaldea* (Gleason & Cronquist 1965) and *Eleocaris macrostachya* of Grant (1951, 1953). Differences in species composition of the flora in the kettle marsh between the 1970-1972 and 1973-1975 seasons may reflect marked year to year changes in water levels, as well as the timing of precipitation during the growing season.

ACKNOWLEDGEMENTS

We thank the Iowa Chapter of The Nature Conservancy for allowing the use of the Freda Haffner Kettlehole State Preserve for this study. Iowa Lakeside Laboratory and Dr. Richard V. Borberg provided logistic support for this study. Portions of this study were conducted with the assistance of MacBride Scholarships at Iowa Lakeside Laboratory. Dr. Larry J. Eilers and Michael Weis aided in identification of species. Also thanks to Glenn H. Crum who helped identify aquatic plants.

REFERENCES


Annotated Checklist of Vascular Plants
Arend's Kettle
Freda Haffner Preserve, Dickinson County, Iowa

**Division Pteridophyta**

**Equisetaceae (Horsetail Family)**

*Equisetum laevigatum* A. Br. Prairie scouring rush. Dry to mesic prairie; common; June.

**Division Spermatophyta**

**Class Angiospermae**

**Subclass Monocotyledoneae**

**Alismataceae**

*Eichhornia crassipes* Lam. Water hyacinth. Wet prairie to marsh; abundant; June-July.

**Commelinaceae**

*Bromus inermis* Leyss. Blue brome. Barren prairie; abundant; May-June.

**Juncaceae**

*Juncus arcticus* Michx. Arctic Sedge. Barren prairie; common; June.

**Liliaceae**

*Allium tricoccum* Nutt. Wild onion. Shallow marsh; common; June-August.

**Poaceae**

*Secale cereale* L. Rye. Common in meadows; common; June-August.

**Ranunculaceae**

*Anemone raddeana* Maxim. Common in wet meadows; common; June-August.

**Rutaceae**

*Prunus serotina* L. Crab apple. Common in mesic prairie; common; May.

**Solanaceae**

*Brugmansia suaveolens* L. Angel's trumpet. Occasional in mesic prairie; abundant; June.

**Taxaceae**

*Taxus brevifolia* Engelm. Western Hemlock. Barren prairie; common; June-August.

**Umbelliferae**

*Asclepias syriaca* L. Milkweed. Dry to mesic prairie; common; July-August.

**Vascularia (Water-plants Family)**

*Vallisneria americana* Michx. Tape-grass. Occasional; May.

*Hydrocharitaceae (Frog's-bit Family)**

*Vallisneria spiralis* L. Loose-bladed tape-grass. Common in wet meadows; common; June-August.

**Vernonaceae**

*Vernonia missurica* Michx. Missouri Ironweed. Common in mesic prairie; common; June.

**Zingiberaceae**


**Division Pteridophyta**

**Pteridaceae**

*Asplenium scolopendrium* L. False maidenhair fern. Common in mesic prairie; common; May-July.

**Polypodiaceae**

*Polypodium virginianum* L. Common false maidenhair fern. Common in mesic prairie; common; May.

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**Apolocyneae** (Dogbane Family)

*Apolocyne* spp. (American hempweed).

**Asclepiadaceae** (Milkweed Family)

*Asclepias tuberosa* L. Milkweed. Dry to mesic prairie; frequent; June-October.

**Asteraceae** (Composite Family)

*Chrysopsis** L. (Sunn) Heatle. Dried to mesic prairie; frequent; August-September.

**Compositae** (Saturn summit Family)

*smooth aster. Dry to mesic prairie; frequent; August-September.

**Compositae** (Hairy goldenrod. Dry to mesic prairie; frequent; August-September.

**Compositae** (Prairie lertuce. Dry to mesic prairie; frequent; August-September.

**Compositae** (Bistort Family)

*Eupatorium** L. (Bee). Disturbed prairie; frequent; May-September.

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**Compositae** (Aster Family)

*Solidago** L. (Bee). Disturbed prairie; frequent; May-September.
Astragalus crassicarpus Nutt. Ground-plum. Dry prairie; common; April-May.

Dalea candida Wild. White prairie clover. Dry to mesic prairie; frequent; June-July.

Dalea purpurea Ven. Purple prairie clover. Dry to mesic prairie; abundant; June-July.

Desmodium canadense (L.) DC. Showy tick-trefoil. Mesic prairie; frequent; July-August.

Lathyrus palustris L. Vetching. Mesic to wet prairie; frequent; June-September.

Lathyrus venosus Michx. Vetching. Mesic prairie; infrequent; June-July.

Lepidolaena capitata Michx. Round-headed bush clover. Mesic prairie; frequent; July-September.

Lepidolaena leptostachya Engelm. Prairie bush clover. Dry to mesic prairie; infrequent; July-September.

Medicago sativa L. Alfalfa. Dry to mesic prairie; infrequent; May-October.

Medicago lupulina L. Black medick. Dry to mesic prairie; common; March-November.

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Oenothera biennis L. Evening primrose. Dry to mesic prairie; common; March-November.

Psoralea oleracea L. Violet wood-sorrel. Dry to mesic prairie; frequent; April-June.

Rumex orbiculatus L. Water dock. Mesic to wet prairie; common; July-September.

Vicia americana Pursh. American clover. Mesic to wet prairie; frequent; May-July.

Gentianaceae (Gentian Family)

Gentiana pumila Lam. Prairie gentian. Dry to mesic prairie; frequent; August-October.

Hypericaceae (St. John's-wort Family)

Hypericum Faerox L. St. John's-wort. Wet prairie and marsh; common; July-September.

Lamiaceae (Mint Family)

Hedera canadensis L. Common saltwort. Dry prairie; infrequent.

Convolvulaceae (Morning Glory Family)

Cucurbita argophylla Pursh. Bumweed. Wet prairie and marsh; common; July-September.

Euphorbiaceae (Spurge Family)

Euphorbia dentata Michx. Toothed spurge. Dry to mesic prairie; frequent; June-September.

Euphorbia glycyphora Engelm. Spurge. Dry to mesic prairie; abundant; June-September.

Euphorbia maschalata L. Milk-parslane. Dry to mesic prairie; infrequent; June-September.

Fabaceae (Bean Family)

Amorpha canescens Pursh. Leadplant. Dry to mesic prairie; common; June-August.

Astragalus linearis Michx. False locoweed. Dry to mesic prairie; common; June-August.
Portulacaceae (Purslane Family)
*Portulaca oleracea* L. Purslane. Dry disturbed prairie; rare, June-October.
*Primulaceae* (Primrose Family)
*Androsace occidentalis* Pursh. Androsace. Dry, sandy prairie; rare (locally abundant); April.
*L. thyrsiflora* L. Tufted loosestrife. Marsh; frequent; May-June.
*Ranunculaceae* (CROWFOOT FAMILY)
*Anemone canadensis* L. Canada anemone. Dry to wet prairie; common; May-August.
*Anemone cylindrica* Gray. Thimbleweed. Dry to mesic prairie; common; June-August.
*Anemone patens* L. Pasque-flower. Dry to mesic prairie; common; March-April.
*Geum triflorum* (T. & G.) Britt. Yellow avens. Mesic to wet prairie; rare; May-June.
*Geum revolutum* L. Wild avens. Dry to mesic prairie; frequent; April-May.
*Salix amygdaloides* Bartram. Cottonwood. Common to dry disturbed prairie and marsh.
*Salix alba* L. Willows. Dry prairie; abundant; June-September.
*Penthorum delavayi* L. Ditch stonecrop. Marsh; common; July-September.
*Scrophulariaceae* (Figwort Family)
*Agalinis aequalis* Benth. Brittle purple gerardia. Dry to mesic prairie; infrequent; August-September.
*Agalinis tenuifolia* (Vahl.) Raf. Slender gerardia. Wet prairie and marsh; infrequent; August-October.

*Caesalpiniaceae* (Pineapple Family)
*Castilleja sessiliflora* Pursh. Downy painted cup. Dry prairie; common; May-July.
* Mimulus ringens* L. Square stemmed monkeyflower. Marsh; frequent; June-September.
*Scrophularia lanceolata* Pursh. Figwort. Mesic prairie; frequent; May-July.
*Veronicastrum virginicum* (L.) Farw. Culver’s root. Mesic prairie; frequent; June-August.
*Solanaceae* (Nightshade Family)
*Physalis heterophylla* Nees. Ground cherry. Dry to mesic prairie; common; June-September.
*Physalis pruinosa* L. Ground cherry. (Gerhardt 1940).
*Physalis virginiana* P. Mill. Virginia ground cherry. Dry to mesic prairie; common; June-August.
*Solanum americanum* P. Mill. Common nightshade. Dry to mesic prairie; infrequent; May-September.
*Ulmaceae* (Elm Family)
*Ulmus americana* L. American elm. Mesic prairie; frequent; June-September.

*Urticaceae* (Nettle Family)

*Violaceae* (Violet Family)
*Viola nephrophylla* Greene. Stemless blue violet. Mesic to wet prairie; common; May-July.
*Viola pedatifida* G. Don. Prairie violet. Dry to mesic prairie; common; April-June.

*Vitaceae* (Grape Family)
*Vitis riparia* Michx. Wild grape. Mesic prairie; rare.