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Discovery of a Calcareous Fen Complex in Northwest Iowa

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Abstract. A list of seventy-one flowering plants characteristic of fens is presented. They represent the fen flora from a complex of twenty-seven previously unreported fens, or small, calcareous, springy marshes, bordering Dug-out Creek in Excelsior Township, Dickinson County, Iowa.

A fen is a calcareous, springy site frequently located on a hillside or in prairie. Cold, highly calcareous water seeps from the soil because of a high water table. Neutral to alkaline, the water is retained in small pools and miniature terraces because of poor drainage. Beneath the surface is a black, alkaline peat, which is a major feature in differentiating a fen from a bog. Bogs, by definition, are underlaid by an acid peat. Nevertheless, fens are sometimes termed "perched bogs" or "hanging bogs." Also, the term "fen" has long been used in a slightly different sense to describe the highly mineralized wetlands along the eastern coast of England.

This particular fen complex was discovered in July of 1961 while the senior author was studying at Iowa Lakeside Laboratory, on Lake Okoboji, Dickinson County. During a conversation with a local farmer about interesting plant communities in the area, the farmer spoke of an area which had a peculiar odor and quaked when walked upon. This sounded like a description of the Silver Lake Fen, but further questioning revealed that he had never been in that area and was describing a totally different location, a grazed, wild-grass pasture on the Frank Johnson farm.

More precisely, this fen complex is located in Sections 10 and 15 of Excelsior Township (T 99N, R 38W), Dickinson County, Iowa. Dickinson is the third county from the South Dakota boundary in the line of counties bordering Minnesota.

Macbride (1900) has described Dickinson County as "preeminently a county of lakes and well isolated kames" with drainage that is "imperfect, peculiar, pre-determined in an unusual way," the lakes being "almost the only natural features of the kind within the limits of the state." He points out that the topography is not the result of causes now at work in the locality, as no running water could cut valleys without outlets or create hills of such varied heights, sizes, and compositions. Rather, this was the work of two glaciers which passed over the area, the

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Kansan and the Wisconsin. The Wisconsin rested in this area, depositing soil and rubble. The last lobe of the glacier to visit the area was the Mankato lobe. The highly calcareous Wisconsin drift was left behind in broad, morainic hills overlying the Kansan drift of blue clay to a depth of 100 to 300 feet. The Kansan blue clay is exposed nowhere. The basic soils of the area are Pierce loam and Lamoure silty clay loam. (Stevenson, *et al.*, 1924).

The geological aspects and soil conditions are not peculiar to this area, but can be found in many places. However, the particular combinations of soils, topography, natural springs, and drainage have apparently made the area ideal for the formation of fens. Silver Lake fen is located only two miles north and one mile west. The Estherville fen, now drained, the Ruthven fen, and the Dickens fen are all located within a thirty-two-mile radius of the Excelsior fens.

The drainage from the fens and the surrounding hills flows into Dug-out Creek, a meandering stream, which has a constant source of water from a large spring in Section 8. During July and August of 1961 there was little or no water flowing from the above spring, but the creek in the fen area averaged 4 inches in depth and 4 feet in width. Macbride (1900) states, "The creek amid the hills serves to bring into connection and so drain, very imperfectly, a series of marshes; otherwise its valley is very narrow and its waters with every freshet are still digging away at the stubborn ridges which still rise on all sides largely unaffected everywhere to deflect the channel now this way, now that, to every point of the compass." This aptly describes Dug-out Creek and the fen area.

The water temperature in these fens on a warm, sunny day varied from 10° C. in the more rapidly flowing springs and below the surface of the muck to 32° C. in the standing pools. The temperature of the creek remained about 22° C.

Chemical tests were made using the Hach Portable Water Laboratory (Model DR-E1). The results obtained are listed below as maximums and minimums.

pH	6.7–8.3
Alkalinity total	220–620 ppm
Calcium hardness	385 620 ppm
Total hardness	515–770 ppm
Chloride	5 ppm
Iron	0.05–0.15 ppm
Nitrate	0.1–40 ppm
Nitrite	0.003–0.01 ppm
Silica	1.0–2.0 ppm
Sulfate	300–7,300 ppm
Phosphate (ortho)	0.25–0.7 ppm
Turbidity	20–30 ppm
Color	clear

Some of the fens in the complex have a distinctly sulphurous odor, while others do not. The plants collected frequently have lime concretions about their roots, and there are deposits of lime on the surface of the hummocks and encrusting the *Chara* abounding in the pools.

Because of the geologic and topographic conditions, a unique soil-vegetation ecology exists. Of the fens in Wisconsin it is said, "The fen is to be considered a hybrid community where the unusual combination of environmental factors has sorted out and retained suitably adapted species from each of the major formations as they passed by in postglacial time." (Curtis, 1959) Surrounding each fen is heavily grazed pasture. This pasture quite suddenly is replaced by hummocky, wet, somewhat springy ground. The knee-high vegetation surrounding each fen is not unique to fens, but is found generally in marshy areas. This marsh vegetation abruptly gives way to pools of water. The bottoms of the pools are grayish white with sulphur bacteria and *Chara.* Turfs of *Rhynchospora capillacea, Triglochin palustris, Triglochin maritima, Lobelia kalmii,* etc., surround the pools. These turfs support a man's weight, but they are very springy. Jumping on the turf visibly affects a radius of two meters. As at the Silver Lake fen, stepping into one of the pools means sinking to the knee in marl and black muck of decaying plant matter.

The cattle in the pasture seemingly shun the quaking fens except in the fall when moisture shortage limits the surrounding forage. At that time the cattle do invade the borders of the fens but seem to do little damage. Such plants as *Aster novae-angliae* are topped, but they then send out branches which flower profusely. This might limit the accumulation of organic matter, as does mowing in the English Wicken fens (Fuller, 1932, and Godwin, 1929).

Characteristic fen species found in the Excelsior fens are:

Carex aquatilis
Eleocharis tenuis
Epilobium densum
Eriophorum augustifolium
Galium trifidum
Gentiana procera
Gerardia paupercula
Juncus alpinus
Juncus nodosus
Juncus X nodosiformis
Lobelia kalmii
Muhlenbergia glomerata
Parnassia glauca
Rhynchospora capillacea
Scirpus americanus
Solidago riddellii
Triglochin maritima
Triglochin palustris
Utricularia minor

Other characteristic fen plants known from Iowa fens that might be expected but are not yet found in the Excelsior fens are listed below (Anderson, 1943). Those marked with "S" are found in the Silver Lake fen.

S *Berula pusilla* (Nutt.) Fern.
Carex prarisa Dew.
Carex sartwellii Dewey
S *Carex tetanica* Schkuhr
S *Cypripedium candidum* Muhl.
S *Eleocharis pauciflora* (Lightf.) Link
S *Habenaria hyperborea* (L.) R. Br.
S *Hierochloe odorata* (L.) Beauv.
S *Juncus balticus* Willd. var. *littoralis* Engelm.
S *Muhlenbergia asperifolia* (Nees & Meyen) Parodi
S *Muhlenbergia mexicana* (L.) Trin.
S *Phragmites communis* Trin.

S	*Potentilla anserina* L.		*Spiranthes romanzoffiana* Cham.
	Scleria verticillata Muhl.	S	*Zigadenus elegans* Pursh

Following is a list of plants found in the Excelsior fens. None of the plants from the surrounding prairie and pasture are listed. Those marked with "S" are also found in the Silver Lake fen; those with "W" in the Wisconsin fens.

Apiaceae		
Cicuta maculata L.	Spotted Cowbane	
Zizia aurea (L.) Fern.	Golden Alexander	W
Asclepiadaceae		
Asclepias incarnata L.	Swamp-milkweed	W
Asteraceae		
Aster novae-angliae L.	New England Aster	S
Aster umbellatus Mill.	Aster	WS
Cirsium altissimum (L.) Spreng.	Thistle	S
Eupatorium maculatum L.	Joe-Pye-Weed	WS
Eupatorium perfoliatum L.	Boneset	WS
Helenium autumnale L.	Sneezeweed	S
Helianthus grosseserratus Martens	Sunflower	
Silphium perfoliatum L.	Cup-plant	
Solidago riddellii Frank	Goldenrod	WS
Brassicaceae		
Cardamine bulbosa Schreb.	Spring-Cress	
Campanulaceae		
Campanula aparinoides Pursh	Marsh-Bellflower	
Lobelia kalmii L.	Lobelia	WS
Lobelia siphilitica L.	Great Blue Lobelia	S
Cyperaceae		
Carex aquatilis Wahlenb.	Sedge	
Carex hystricina Muhl.	Sedge	S
Carex interior Bailey	Sedge	S
Carex lanuginosa Michx.	Sedge	S
Carex rostrata Stokes	Sedge	S
Carex stricta Lam.	Sedge	
Carex vulpinoidea Michx.	Sedge	
Eleocharis calva Torr.	Spike-Rush	
Eleocharis tenuis Willd.	Spike-Rush	
Eriophorum angustifolium Honckeny	Cotton-Grass	
Rhynchspora capillacea Torr.	Beak-Rush	S
Scirpus americanus Pers.	Three-Square	S
Scirpus validus Vahl.	Soft-Stem Bulrush	S
Equisetaceae		
Equisetum arvense L.	Common Horsetail	W
Gentianaceae		
Gentiana procera Holm.	Fringed Gentian	WS
Juncaceae		
Juncus alpinus Vill.	Rush	S
Juncus dudleyi Wieg.	Rush	S
Juncus X *nodosiformis* Fern.	Rush	
Juncus nodosus L.	Rush	S
Juncus torreyi Coville	Rush	S
Juncaginaceae		
Triglochin maritima L.	Arrow-Grass	S
Triglochin palustris L.	Arrow-Grass	S
Laminaceae		
Lycopus americana Muhl.	Water-Horehound or Bugleweed	WS
Lycopus asper Greene	Water-Horehound or Bugleweed	S
Lycopus uniflorus Michx.	Bugleweed	W
Mentha arvensis L.	Mint	WS
Pycnanthemum virginianum (L.) Durand and Jackson	Mountain Mint or Basil	WS
Scutellaria epilobiifolia A. Hamilton	Common Skullcap	S
Stachys palustris L.	Woundwort	
Teucrium canadense L.	American Germander Wood-sage	
Lentibulariaceae		
Utricularia minor Chapm.	Bladderwort	S
Utricularia vulgaris L.	Bladderwort	S
Lythraceae		
Lythrum alatum Pursh	Loosetrife	
Orchidaceae		
Liparis loeselii (L.) Richard	Twayblade	S

Figure 1. An aerial view of Dug-out Creek in the Excelsior fens area.

Poaceae		
Beckmannia syzigachne (Stedd) Fern.	Slough-Grass	
Calamogrostis inexpansa Gray	Reed-Bentgrass	S
Glyceria grandis S. Wats.	Reed-Meadow Grass	
Glyceria striata (Lam.) Hitchc.	Manna-Grass	WS
Muhlenbergia glomerata (Willd.) Trin.	—	
Phalaris arundinacea L.	Canary Grass	
Spartina pectinata Link	Fresh-Water Cord-Grass, Slough-Grass	WS
Onagraceae		
Epilobium densum Raf.	Willow-Herb	S
Oenothera biennis L.	Evening Primrose	
Polygonaceae		
Rumex Schuttianus Gray	Water-dock, Sorrel	S

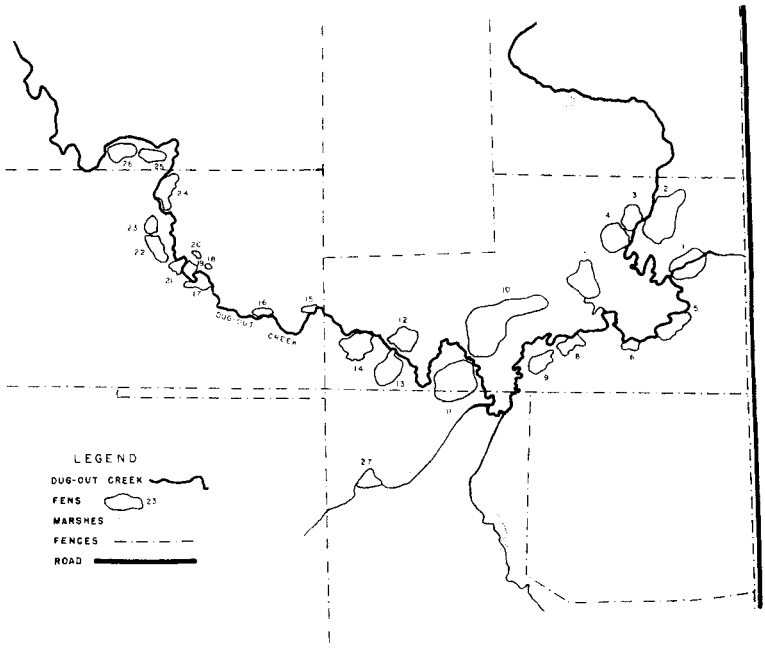

Figure 2. A line drawing of Dug-out Creek and the Excelsior fens. The twenty-seven fens are numbered.

Primulaceae		
Lysimachia quadriflora Sims	Loosestrife	
Lysimachia thyrsiflora	Tufted Lysimachia, Loosestrife	S
Ranunculaceae		
Ranunculus cymbalaria Pursh	Seaside Crowfoot	S
Ranunculus pensylvanicus L. f.	Bristly Crowfoot	
Rubiaceae		
Galium trifidum L.	Bedstraw	S
Saxifragaceae		
Parnassia glauca Raf.	Grass-of-Parnassus, Bog-Stars	WS
Scrophulariaceae		
Gerardia paupercula (Gray) Britt.	Gerardia	WS
Mimulus ringens L.	Monkey-Flower	
Pedicularis lanceolata Michx.	Lousewort or Wood-Betony	WS
Urticaceae		
Pilea fontana (Lunell) Rydb.	Clearweed	S
Violaceae		
Viola nephrophylla Greene	Violet	S

A visit to the Excelsior fens on December 29, 1961, revealed very little except that the fens were still springy beneath the eighteen-inch snow cover, while the ground around them was frozen solidly.

Further study will include all-seasons observation of the Excelsior fens and other fens known from the Iowa lakes region and a search for any others that might exist. The information about these fens will be correlated with that from other fens in this country and abroad.

Literature Cited

Anderson, W. A. 1943. A fen in Northwestern Iowa. Am. Midland Naturalist 29: 787-791.

Curtis, John T. 1959. The vegetation of Wisconsin. Univ. Wisconsin Press, Madison, Wisconsin. 657 pp.

Fuller, George D. 1932. Reviews Wicken Fen. Ecology 13: 86-87.

Godwin, H. 1929. The "sedge" and "litter" of Wicken Fen. Jour. Ecol. 17: 148-160.

Macbride, T. H. 1900. Geology of Osceola and Dickinson Counties. Iowa Geol. Surv. Rept., 1899. 10: 185-239.

Stevenson, W. H., *et al.* 1924. Soil Survey of Iowa, Dickinson County. Iowa Agricultural Experiment Station, Ames, Iowa. 72 pp.

The Vascular Flora of Cherokee County

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Abstract. This survey brings together the available information on the vascular flora of Cherokee County, Iowa, taking into consideration such things as: which species of vascular plants occur in the area, their relative frequencies, and the habitats in which these species exist. A general description of the area is included.

INTRODUCTION

This study of the vascular flora of Cherokee County is part of a comprehensive study of the plants of northwestern Iowa and will provide a portion of the information necessary for a flora of Iowa, to be published by Dr. R. F. Thorne at a later date.

The purpose of this study is to bring together all the available information on the vascular flora of Cherokee County, including such things as: which species of vascular plants occur in the area, their relative frequencies, and the habitats in which these species exist.

The major collecting was done throughout the growing seasons of 1956 and 1957, with additional trips being made in 1959 and 1960. The majority of the specimens were collected at eleven stations in the county, but there were occasional visits to other areas. In locating the various collecting stations the author utilized available soil, topographic and geologic maps.

LOCATION AND AREA

Cherokee County is located in the northwest corner of Iowa, in the third tier of counties from the Minnesota border and in the second tier of counties from the South Dakota border and the Big Sioux River. The county is bounded on the north by O'Brien County, on the south by Ida County, on the west by

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