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Discovery of a Calcareous Fen Complex in Northwest Iowa

KARL E. HOLTE AND ROBERT F. THORNE¹

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.

Machride (1900) has described Dickinson County as "pre-eminently 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:

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

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

- 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 hystericina 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
Rhynchospora 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 epilobifolia 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

<i>Beckmannia syzigachne</i> (Stedd) Fern.	Slough-Grass	
<i>Calamagrostis inexpansa</i> Gray	Reed-Bentgrass	S
<i>Glyceria grandis</i> S. Wats.	Reed-Meadow Grass	
<i>Glyceria striata</i> (Lam.) Hitchc.	Manna-Grass	WS
<i>Muhlenbergia glomerata</i> (Willd.) Trin.	—	
<i>Phalaris arundinacea</i> L.	Canary Grass	
<i>Spartina pectinata</i> Link	Fresh-Water Cord-Grass, Slough-Grass	WS

Onagraceae

<i>Epilobium densum</i> Raf.	Willow-Herb	S
<i>Oenothera biennis</i> L.	Evening Primrose	

Polygonaceae

	Water-dock, Sorrel	S
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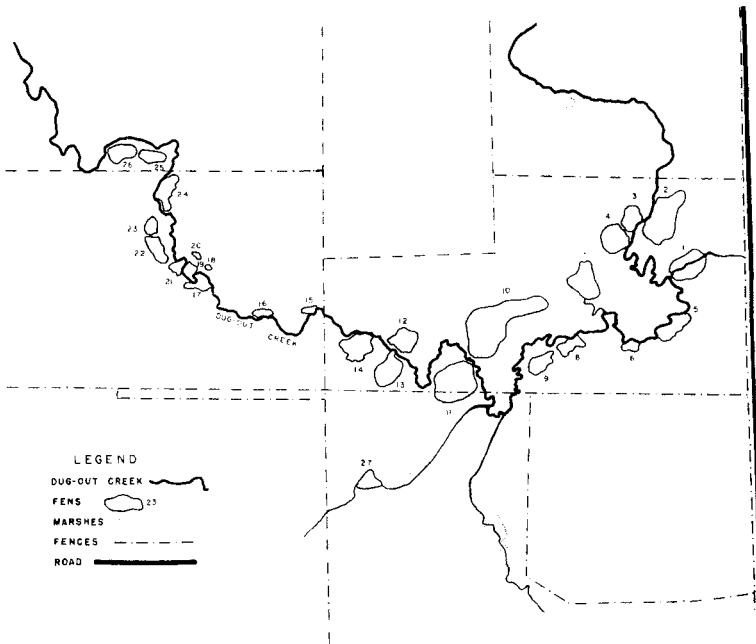


Figure 2. A line drawing of Dug-out Creek and the Excelsior fens. The twenty-seven fens are numbered.

Primulaceae

- Lysimachia quadriflora* Sims
- Lysimachia thyrsiflora*

- Loosestrife
- Tufted *Lysimachia*, Loosestrife S

Ranunculaceae

- Ranunculus cymbalaria* Pursh
- Ranunculus pensylvanicus* L. f.

- Seaside Crowfoot
- Bristly Crowfoot S

Rubiaceae

- Galium trifidum* L.

- Bedstraw S

Saxifragaceae

- Parnassia glauca* Raf.

- Grass-of-Parnassus, Bog-Stars WS

Scrophulariaceae

- Gerardia paupercula* (Gray) Britt.
- Mimulus ringens* L.
- Pedicularis lanceolata* Michx.

- Gerardia WS
- Monkey-Flower
- Louswort 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.

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The Vascular Flora of Cherokee County

JACK L. CARTER¹

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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