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Plant Parasitic Fungi of Four Tallgrass Prairies of Northern Iowa: Distribution and Prevalence

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Throughout the 1980's, most intensively during the past five years, collections of fungal parasites of prairie plants have been made at various times of the growing season from four prairie preserves, Cayler, Freda Haffner Kettlehole, Hayden, and Stinson prairies, in northern Iowa. A total of 216 species of parasitic fungi were collected on 129 prairie plant hosts. Ninety-nine of the fungi were not previously documented from Iowa. Also, fungus species previously reported were found on 72 host species not included in earlier records.

INDEX DESCRIPTORS: fungal plant parasites, prairie plants, rusts, smuts

Native prairie plants and introduced cultivated plants share a common hazard, diseases caused by plant parasitic fungi. Because of the economic impact of these diseases on survival, growth and yield of cultivated plants, much information has accumulated about these fungi. However, little attention has been given to the diseases of native plants even though they may be equally significant to the health or survival of the host plants.

The limited information available on diseases of midwestern prairie plants has come from two regional treatments of fungal diseases on a wide variety of host plants. Gilman and Archer documented the Iowa parasitic fungi in 1929. This was followed by two supplements (Gilman; 1932, 1949). Trelease and Davis published a preliminary list of Wisconsin parasitic fungi in 1882, supplemented by an additional 27 short papers by Davis over the next 45 years. Greene continued the work on fungal parasites of native plants, including prairie plants, in Wisconsin from 1940 to 1968. His observations were reported in a series of papers in the American Midland Naturalist and the Transactions of the Wisconsin Academy of Science (e.g. Greene 1940; 1968).

At the turn of the century, prairies were still common natural features of the Iowa landscape. At the present, our prairie heritage consists of scattered small remnants. For successful maintenance of the original mix of prairie plants in these isolated prairies, we need all the information we can obtain about factors that will influence these prairies over time. The plant parasitic fungi may be a determining factor in the survival or successful growth and reproduction of individual plant species. If we are to consider how to minimize this hazard, we need to know what fungi are present now, their distribution among our remnant prairies, and their prevalence and status within individual prairies.

This report represents basic information on the fungi on specific host plants from four native prairie segments in northern Iowa: Hayden Prairie in Howard County, Stinson Prairie in Kossuth County, Freda Haffner Kettlehole and Cayler Prairies in Dickinson County.

MATERIALS AND METHODS

Throughout the 1980's, but most intensively during the last five years, collections of diseased prairie plants have been made throughout the growing seasons. Recently we have tried to visit each prairie three times each year — in early June, in late July, and in late August or early September. Different parasitic fungi are favored by the differing environmental conditions, particularly temperature and moisture, and by the stage of maturity of plant tissue at each of these times. Also, fruiting structures necessary to identify the fungi may be produced only at a particular time. Obviously, there are environmental differences among years and a long term schedule is necessary to encounter opportunity for the highly specific parasitic fungi to develop and to produce spores.

The four prairies in northern Iowa that are the source of the parasitic fungi discussed in this report share similar environmental parameters but are distinctive in their geologic features, soils and plant communities.

Stinson prairie is a 12.5 hectares (31 acre) prairie located in section 13, T95N, R30W, Kossuth County, Iowa about 8 kilometers (5 miles) west of Algona. It was purchased in 1969, owned and managed by the Kossuth County Conservation Board, and designated as a state preserve in 1971. Located on the edge of the Algona moraine of the Des Moines lobe of the Wisconsinan glaciation, the topography is gently rolling with lowland depressions which in certain years retain water throughout the growing season. The soils are classified in the Nicollet-Clarion-Webster association. Prior to purchase, the area was mowed on a regular basis for prairie hay. For its size it has a very diverse flora, with at least 175 species of plants (Glenn-Lewin, 1976; Crist, 1978). Some weedy species have invaded the moist swales and the area adjacent to the road and parking area. Seasonal mowing in the swale areas is used to control *Ambrosia trifida* L.

Cayler prairie is a 64.8 ha (160 ac) prairie in section 17, T98N, R37W, Dickinson County, Iowa about 5 km (3 mi) west of Iowa Lakeside Laboratory on Lake West Okoboji. It was purchased by the state in 1960, designated as a national natural landmark in 1966 and dedicated as a state preserve in 1971. Located on the western edge of the Wisconsinan drift area along the Altamont moraine, the topography consists of rolling hills and high gravelly ridges separated by lower poorly drained areas. The soils of the uplands are of Clarion and Storden, and the depressions are mostly Webster and Glencoe. Prior to acquisition, the area was annually hayed in August but was never grazed. Of the 265 total species recorded on the site, 46 non-native species have invaded areas near the road and sites previously associated with disturbance from haying or animal activities (Aikman and Thorne, 1956).

The Freda Haffner Preserve, a 44.5 ha (110 ac) tract purchased by the Nature Conservancy in 1972, and designated as a state preserve in 1976, is in Dickinson County, section 17, T99N, R37W, approximately 7 km (four and one half mi) northwest of Milford. The outstanding feature of the preserve is a kettlehole, a large depression formed by the melting of a huge block of glacial ice at the end of the last glaciation period. It is the largest kettlehole in the state and typical of the knob and kettle topography of this recently glaciated area. There may be open water or a fresh water marsh in the center of the kettlehole depending upon rainfall. The soil association on the preserve is of two types, Salida soils occupying the ridges and steep slopes and Terril soils on the lower slopes and low lying areas. The

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forty acres of prairie around the kettlehole has a flora of over 250 species in spite of being heavily pastured prior to purchase (Glenn-Lewin, 1980).

Hayden Prairie, a 97.1 ha (240 ac) native prairie located in Howard County, T100N, R13W, is approximately 8 km (5 mi) west of Lime Springs. The tract was purchased by the state in 1945, recognized as a registered natural landmark in 1966 and dedicated as a state preserve in 1968. Prior to 1945, it had been regularly cut for hay and occasionally pastured. Part of the southernmost 40 acres was also disturbed by cultivation. The soil types vary from Cresco loam on the uplands, Clyde silty clays on the lowlands and Floyd and Protivin loams on the intermediate slopes. Hayden prairie lies on the older Iowan surface and while the topography is gently rolling, the potholes associated with more recently glaciated areas are absent. One of the largest prairie preserves in Iowa, it contains about 215 plant species (Christiansen, 1969). Weedy species have invaded the mowed fire lanes, the areas adjacent to the road, and areas previously cultivated.

Iowa climate is classified as continental with warm summers and cold winters (Waite, 1978). White (1983) reported mean temperature ranges for the hottest and coolest months of (23-24C) and (− 8 to − 9C) respectively. The number of growing season days ranged from a low of 149 at Freda Haffner Kettlehole to a high of 156 days at Stinson. About half the annual precipitation occurs during the period May through August. Precipitation amounts averaged 800mm at Hayden, the easternmost site, 732mm at Stinson, and 709mm at Cayler and Kettlehole, the westernmost sites.

All four prairies are managed with controlled burning on a rotation plan for the specific prairie. Almost exclusively burning takes place on each of the sites in early spring prior to active plant growth. Burning has a dramatic effect on the incidence of parasitic fungi on prairie plants. Since fire destroys or significantly reduces fungal inoculum present on plant debris, areas recently burned have very low incidence of disease on host plants. Re-establishment of the plant parasitic fungi on host plants reaches pre-burn levels within two years following a fire (Shearer and Tiffany, 1989). Since so few fungi were found in burned prairie segments, collecting of parasitic fungi was almost exclusively confined to areas which were unburned that year.

Collections of parasitic fungi were made in a non-destructive manner. Whenever possible, plants were identified in the field and only diseased plant parts were collected. When host identification was not possible in the field, adequate material was collected for laboratory identification of the host and the fungal parasite.

Specimens with the necessary fungus fruiting structures and spores for identification of the fungus on a known host have been deposited in the Ada Hayden Herbarium — mycology section at Iowa State University. The information presented in this paper on hosts and fungus parasites is documented by these materials. Nomenclature for the host species and the fungal pathogens basically follows that of the index of fungi on plants and plant products in the United States (Farr et al., 1989) and Braun (1987) for the powdery mildews. References used for fungus identification are included in literature cited.

RESULTS AND DISCUSSION

During the study a total of 216 species of parasitic fungi were collected on 129 prairie plant species (Tables 1 and 2). Ninety-nine previously undocumented fungal parasites were found to be present. Also, fungus species previously reported were found on 72 host species not included in earlier records.

The distribution of a plant parasite reflects the geographical distribution of its host. *Partheniun integrifolium* L., *Saxifraga pensylvanica* L., *Polygala sanguinea* L., *Dodecatheon meadia* L., and *Bromus kalmii* A. Gray and their parasites are restricted to prairies in eastern Iowa, while *Pediomelum argophyllum* (Pursh) Grimes, *Pediomelum esculentum* (Pursh) Rydb., *Muhlenbergia cuspidata* (Nutt.) Rydb., and *Bouteloua gracilis* (H.B.K.) Lag. ex. Steud. and their parasites are restricted to prairies in western Iowa.

Fungal parasites which are of particular importance are those infecting endangered or threatened plants and special attention was accorded these species during the survey. Disease did not appear to be a significant problem on any listed prairie plants (Roosa et al, 1989). *Hendersonia*, a foliar pathogen, was recorded on *Platanthera praeclara* Sheviak & Bowles, white fringed prairie orchid, on Hayden Prairie. *Cercospora cypripedii* Ellis & Dearn. parasitized leaves of *Cypripedium candidum* Muhl., small white lady's slipper, on Stinson Prairie. Disease severity was extremely low and damage was limited to a few dark lesions on the leaves.

On each of the prairies examined, certain populations of plants showed acute disease symptoms. On Stinson Prairie, two pathogens appeared to have a significant impact on the host plant species. *Asclepias tuberosa* L. was infected with a leaf and stem blight caused by *Colletotrichum fusarioides* (Ellis & Kellm.) O'Gara. The stems of susceptible plants were girdled by fungal cankers. Flowering was not observed on the infected plants and early senescence was common. Weakened plants are not likely to survive for more than a few seasons.

A leaf parasite, *Parodiella hedysari* (Schwein.) Hughes on *Desmodium canadense* (L.) DC. produced masses of black mycelium and fruiting structures over the upper surface of the leaves. Photosynthetic potential of the plants was reduced and they were severely stunted. *D. canadense* is a common prairie species throughout Iowa, but the parasite was found only on Stinson during the survey. Although the parasite has a worldwide distribution on many legumes, in Iowa it has been infrequently recorded only on *Desmodium*. Prior to our study, *Parodiella* was documented by E.W.D. Holway at Decorah in 1884, by George W. Carver at Ames in 1892, and by Bohumel Shimek at Estherville in 1899.

Populations of *Panicum virgatum* L. on Freda Haffner Kettlehole and Cayler Prairies are impacted by the foliar pathogen *Elsinoë panici* Tiffany & Mathre. Leaf lesions reduce photosynthetic area and increase transpiration rates. Within a few years, severely infected plants die. While the parasite is widespread on native prairies throughout Iowa (Gable and Tiffany, 1987), it is highly variable in its pathogenicity on individual host populations. Commercially available varieties of *P. virgatum* seem to be resistant to the disease.

In western Iowa, *Sphacelotheca occidentalis* (Seym.) Clinton, an inflorescence smut, causes a degenerative disease on big bluestem, *Andropogon gerardii* Vitm. The pathogen, first reported in Nebraska by Dunleavy (1956), has been found in native stands of big bluestem in northwestern Iowa and on one occasion on Cedar Hills Sand Prairie in Black Hawk County. In native stands on Freda Haffner Kettlehole and Cayler, infected plants become increasingly stunted and die. The fungus seems to be seed borne and diseased plants are not uncommon on prairies planted with big bluestem varieties from Nebraska stock. These diseased plants do not show the extreme stunting common in diseased native populations of big bluestem.

Epichloe typhina (Pers.:Fr.) Tul., choke disease of grasses, is reported on over twenty species of grasses throughout temperate North America. It has been infrequently recorded on *Glyceria* and *Bouteloua* in Iowa. On Hayden Prairie, the parasite has become established in two widely separated populations of *Calamagrostis canadensis* (Michx.) Beauv. The initial mode of entry by the fungus is unknown but once established it becomes systemic in the host plant. An entire clone can become infected through vegetative propagation. On stems with a developing inflorescence, the fungus produces a fungal stroma around the stem and the inflorescence is aborted, thus infected plants never flower or produce seed.

One of the most unusual parasites collected during the study was *Dilophospora alopecuri* (Fr.:Fr.) Tul. on *C. canadensis* at Hayden Prairie. The fungus has an unusual distribution relationship of an association with the leaf galls caused by the nematode, *Subanguina calamagrostis*

Table 1. Host index of parasitic fungi on Iowa prairie plants. (c = Cayler Prairie, h = Hayden Prairie, k = Freda Haffner Kettlehole, s = Stinson Prairie)

Host taxon	Prairie
Apiaceae	
Cicuta maculata L.	
Cylindrosporium cicutae Ellis & Everh.	s
Septoria sii Rob. & Desm.	h,s
Eryngium yuccifolium Michx.	
Cylindrosporium eryngii Ellis & Kellm.	c,h,s,
Leptosphaeria sp.	h
Septoria eryngicola Oudem. & Sacc.	s
Oxypolis rigidior (L.) J.M. Coulter & J. Rose	
Septoria sii Rob. & Desm.	h
Zizia aurea (L.) W. Koch	
Ascochyta thaspii Ellis & Everh.	h
Cercospora ziziae Ellis & Everh.	c,h,k,s
Physoderma pluriannulatum (Berk. & Curt.) Karling	h
Apocynaceae	
Apocynum sibericum Jacq.	
Cylindrosporium apocyni Ellis & Everh.	h
Stagonospora apocyni (Peck) J.J. Davis	c,h,k,s
Asclepiadaceae	
Asclepias incarnata L.	
Colletotrichum gloeosporoides (Penz.) Penz. & Sacc.	s
Septoria asclepiadicola Ellis & Everh.	s
Stagonospora zonata J.J. Davis	c,s
Asclepias syriaca L.	
Cercospora clavata (Gerard) Cooke	c,s
Cercospora venturioides Peck	h,k,s
Puccinia chloridis Speg.	s
Puccinia seymouriana Arth.	h,k
Asclepias tuberosa L.	
Colletotrichum fusarioides (Ellis & Kellm.) O'Gara	s
Colletotrichum gloeosporoides (Penz.) Penz. & Sacc.	s
Asteraceae	
Ambrosia trifida L.	
Erysiphe cichoracearum DC.	s
Plasmopara halstedi (Farl.) Berl. & De Toni	k
Puccinia canaliculata (Schwein.) Lagerh.	k
Ambrosia sp.	
Erysiphe cichoracearum DC.	h
Artemisia ludoviciana Nutt.	
Nematostoma occidentalis (Ellis & Everh.) Barr	c,h,k,s
Phoma leveillei Borema & Bollen	k
Puccinia tanaceti DC.	c,h,k
Aster ericoides L.	
Coleosporium asterum (Diet.) Syd.	h
Puccinia cnici-oleracei Pers.	h,k
Aster laevis L.	
Ascochyta compositarum J.J. Davis	h
Coleosporium asterum (Diet.) Syd.	h
Entyloma compositarum Farl.	s
Mycosphaerella sp.	s
Septoria atropurpurea Peck	s
Aster oolentangiensis Ridd.	
Coleosporium asterum (Diet.) Syd.	h
Septoria sp.	h
Aster prenanthoides Muhl. ex Willd.	
Septoria atropurpurea Peck	s
Aster sericeus Venten.	
Erysiphe cichoracearum DC.	k
Puccinia stipae Arth.	s
Aster simplex Willd.	
Coleosporium asterum (Diet.) Syd.	h
Entyloma compositarum Farl.	s
Placosphaeria haydenii (Berk. & M.A. Curtis) Petr.	h,s
Puccinia cnici-oleracei Pers.	h
Septoria atropurpurea Peck	s
Septoria sp.	h
Aster sp.	
Ascochyta compositarum J.J. Davis	s
Coleosporium asterum (Diet.) Syd.	k
Entyloma compositarum Farl.	s
Erysiphe cichoracearum DC.	k
Placosphaeria haydenii (Berk. & M.A. Curtis) Petr.	s
Puccinia cnici-oleracei Pers.	c,k
Puccinia dioicae P. Magn.	s
Puccinia stipae Arth.	s
Septoria atropurpurea Peck	c,s
Septoria sp.	k
Bidens vulgata Greene	
Septocylindrium concomitans (Ellis & Holw.) Halst.	s
Bidens sp.	
Cercospora bidentis Tharp	k
Coreopsis palmata Nutt.	
Cercospora coreopsidis W.W. Ray	h,s.
Phyllosticta coreopsidis Green	c,k
Septoria coreopsidis J.J. Davis	c,h
Helianthus grosseserratus G. Martens	
Erysiphe cichoracearum DC.	c
Plasmopara halstedii (Farl.) Berl. & De Toni	h
Puccinia helianthi Schwein.	c,h,k,s
Septoria helianthi Ellis & Kellm.	h,s
Helianthus x laetiflorus Pers.	
Cercospora helianthi Schwein.	s
Erysiphe cichoracearum DC.	c,s
Puccinia helianthi Schwein.	c,h,k,s
Septoria helianthi Ellis & Kellm.	s
Helianthus tuberosus L.	
Entyloma polysporum (Peck) Farl.	c
Helianthus sp.	
Erysiphe cichoracearum DC.	s
Plasmopara halstedi (Farl.) Berl. & De Toni	s
Puccinia helianthi Schwein.	s
Heliopsis helianthoides (L.) Sweet	
Erysiphe cichoracearum DC.	h
Phyllosticta pitcheriana Fairm.	h
Puccinia helianthi Schwein.	s
Hieracium canadense Michx.	
Puccinia hieracii (Röhl.) H. Mart.	h
Sphaerellopsis filum (Biv.-Bern:Fr.) Berk.	h
Krigia biflora (Walter) S.F. Blake	
Puccinia dioicae P. Magn.	h
Lactuca ludoviciana (Nutt.) Ridd.	
Septoria lactucicola Ellis & Martin	c
Liatris aspera Michx.	
Septoria liatridis Ellis & J.J. Davis	c,h,k,s
Liatris punctata Hooke	
Phomopsis liatridis Green	c
Parthenium integrifolium L.	
Albugo tragopogonis (Pers.) S.F. Gray	h
Prenanthes racemosa Michx.	
Cercospora prenanthis Ellis & Kellm.	h
Septoria nabali Berk. & Curtis	h
Ratibida pinnata (Vent.) Barnh.	
Entyloma compositarum Farl.	c,h,k,s
Silphium laciniatum L.	
Plasmopara halstedi (Farl.) Berl. & De Toni	s
Uromyces silphii Arth.	h
Solidago canadensis L.	
Cercospora stromatica Ellis & J.J. Davis	c
Coleosporium asterum (Diet.) Syd.	c,h,k,s
Septoria virgaureae (Lib.) Desm.	c,k
Septoria sp.	h
Solidago graminifolia (L.) Salisb.	
Ascochyta compositarum J.J. Davis	h
Cercosporella virgaureae (Thuem.) Allesch.	s
Phyllachora solidaginis (Schwein.) Sacc.	h
Septoria fumosa Peck	h
Solidago missouriensis Nutt.	
Ascochyta compositarum J.J. Davis	h
Coleosporium asterum (Diet.) Syd.	h
Colletotrichum dematium (Pers.) Grove	s
Septoria sp.	h
Solidago nemoralis Aiton	
Coleosporium asterum (Diet.) Syd.	h
Puccinia grindeliae Peck	k
Solidago rigida L.	
Cercospora stromatica Ellis & J.J. Davis	k
Cercosporella virgaureae (Thuem.) Allesch.	s
Septoria fumosa Peck	k
Solidago speciosa Nutt.	
Coleosporium asterum (Diet.) Syd.	h
Septoria virgaureae (Lib.) Desm.	h
Solidago sp.	
Cercosporella virgaureae (Thuem.) Allesch.	s
Colletrotrichum dematium (Pers.) Grove	h

Host taxon	Prairie
Plasmopara halstedii (Farl.) Berl. & De Toni	h
Campanulaceae	
Campanula aparinoides Pursh	
Septoria campanulae (Lév.) Sacc.	s
Caprifoliaceae	
Sambucus canadensis L.	
Puccinia bolleyana Sacc.	h
Commelinaceae	
Tradescantia bracteata Small.	
Septoria tradescantiae (Ellis & Kellm.) J.J. Davis	s
Convolvulaceae	
Convolvulus arvensis L.	
Puccinia convolvuli Castagne	k
Convolvulus sepium L.	
Septoria convolvuli Desm.	h
Cornaceae	
Cornus racemosa Lam.	
Septoria cornicola Desm.	h
Cyperaceae	
Carex sp.	
Septoria sp	c,s
Scirpus sp.	
Puccinia angustata Peck	c
Equisetaceae	
Equisetum arvense L.	
Ramularia equiseti C. Massal	h
Titaeospora equiseti Desm.	s
Fabaceae	
Amorpha canescens Pursh	
Uropyxis amorphae (M.A. Curtis) J. Schröt.	h,s
Amphicarpaea bracteata (L.) Fern.	
Synchytrium decipiens (Farl.) Farl.	h,s
Astragalus canadensis L.	
Cercospora astragali Wor.	s
Erysiphe pisi DC.	c
Baptisia lactea (Raf.) Thieret	
Cercospora velutina Ellis & Kellm.	h,s
Marssonina baptisiae (Ellis & Everh.) Magn.	h
Baptisia bracteata Muhl. ex. Ell. var. *glabrescens* (Larisey) Isely	
Cerospora velutina Ellis & Kellm.	h,s
Dalea candida Willd.	
Uropyxis petalostemonis (Farl.) De Toni	s
Dalea purpurea Venten.	
Scopinella sp.	h,s
Desmodium canadense (L.) DC.	
Cerospora desmodiicola Atk.	s
Microsphaera diffusa Cooke & Peck	c,h
Parodiella hedysari (Schwein.) Hughes	s
Phyllosticta desmodii Ellis & Everh.	s
Ramularia desmodii Cooke	h,s
Sphaerellopsis filum (Biv.-Bern:Fr.) Berk.	s
Uromyces hedysari-paniculati (Schwein.) Farl.	c,h,s
Glycyrrhiza lepidota Pursh	
Uromyces glycyrrhizae Magn.	c
Lathyrus venosus Muhl. ex Willd.	
Peronospora trifoliorum de Bary	h
Uromyces fabae (Grev.) Fuckel	c,h,k
Lespedeza capitata Michx.	
Phyllachora lespedezae (Schwein.) Cooke	h
Uromyces lespedezae-procumbentis (Schwein.) M.A. Curt.	c,h
Pediomelum argophyllum (Pursh) Grimes	
Colletotrichum psoraleae (Peck) Arx	c,k,s
Uromyces psoralea Peck var. *argophyllae* (Seym.) Arth.	c,s
Pediomelum esculentum (Pursh) Rydb.	
Septoria sp.	s
Vicia americana Muhl.	
Uromyces coloradensis Ellis & Everh.	c
Uromyces fabae (Grev.) Fuckel	s
Gentianaceae	
Gentiana andrewsii Griseb.	
Asteromella andrewsii Petr.	h,s
Phyllosticta gentianicola (DC.) Ellis & Everh.	h
Iridaceae	
Iris virginica L. var. *schrevei (Small) E.S. And.*	
Colletotrichum dematium (Pers.) Grove	s
Iris sp.	
Cladosporium iridis (Fautrey & Roum.) De Vries	c
Lamiaceae	
Monarda fistulosa L.	
Erysiphe biocellata Ehrenb.	c,k,s
Puccinia menthae Pers.:Pers.	k,s
Ramularia brevipes Ellis & Everh.	s
Pycnanthemum virginianum (L.) Durand & Jacks.	
Puccinia menthae Pers.:Pers.	h,k,s
Stachys palustris L.	
Erysiphe biocellata Ehrenb.	k
Liliaceae	
Allium stellatum Nutt. ex Ker-Gawl.	
Cladosporium allii (Ellis & Mart.) Kirk & Crompton	s
Colletotrichum dematium (Pers.) Grove	s
Onagraceae	
Epilobium coloratum Biehler.	
Septoria epilobii West	s
Oenothera biennis L.	
Cercospora oenotherae Ellis & Everh.	s
Septoria oenotherae Westend.	k
Orchidaceae	
Cypripedium calceolus L.	
Cercospora cypripedii Ellis & Dearn.	h
Cypripedium candidum Muhl.	
Cercospora cypripedii Ellis & Dearn.	s
Platanthera praeclaea Sheviak & Bowles	
Hendersonia sp.	h
Poaceae	
Agropyron repens (L.) Beauv.	
Claviceps purpurea (Fr.:Fr.) Tul.	c
Agropyron trachycaulum (Link.) Malte.	
Claviceps purpurea (Fr.:Fr.) Tul.	s
Andropogon gerardii Vitm.	
Ascochyta agropyrina (Fairm.) Trott.	k
Colletotrichum graminicola (Ces.) G.W. Wils.	s
Phyllachora luteo-maculata (Schwein.) Orton	c,h,k,s
Puccinia andropogonis Schwein.	c,h,k,s
Sphacelotheca occidentalis (Seym.) Clinton	c,k
Stagonospora simplicior Sacc. & Briard	c,h,k,s
Stagonospora subseriata (Desm.) Sacc.	k
Bouteloua curtipendula (Michx.) A. Gray	
Stagonospora arenaria (Sacc.) Sacc.	c
Bouteloua gracilis (H.B.K.) Lag. ex Steud.	
Dinemasporium strigosum (Pers.:Fr.) Sacc.	k
Bromus kalmii A. Gray	
Puccinia coronata Corda	h
Calamagrostis canadensis (Michx.) Beauv.	
Ascochyta graminicola Sacc.	k
Claviceps purpurea (Fr.:Fr.) Tul.	k
Colletotrichum caudatum (Sacc.) Peck	h
Colletotrichum graminicola (Ces.) G.W. Wils.	h,k
Dilophospora alopecuri (Fr.:Fr.) Fr.	h,s
Epichloe typhina (Pers.:Fr.) Tul.	h
Hyalothyridium calamagrostidis Greene	c,k
Mycosphaerella greenei Tomilin	c,k
Paraphaeosphaeria michotii (Westend.) O. Eriksson	h
Phaeoseptoria calamagrostidis Sprague	c,s
Phyllachora graminis (Pers.:Fr.) Nitschke	c,h,k,s
Puccinia coronata Corda	h,s
Sclerotium rhizoides Auersw.	h,s
Septoria avenae Frank	c,s
Septoria calamagrostidis (Lib.) Sacc.	h
Septoria nodorum (Berk.) Berk.	h
Ustilago striiformis (Westend.) Niessl	h
Wojnowicia hirta Sacc.	h
Elymus canadensis L.	
Claviceps purpurea (Fr.:Fr.) Tul.	s
Phleospora graminearum Sprague & Hardison	s
Phyllachora graminis (Pers.:Fr.) Nitschke	h,k,s
Puccinia coronata Corda	h,s
Puccinia recondita Rob. & Desm.	c,s
Septoria agropyrina Lobik	c
Septoria elymi Ellis & Everh.	s
Stagonospora arenaria (Sacc.) Sacc.	h
Urocystis agropyri (Preuss) J. Schröt.	h
Elymus smithii (Rydb.) Gould	
Claviceps purpurea (Fr.:Fr.) Tul.	k
Phyllachora graminis (Pers.:Fr.)	

Host taxon	Prairie
Nitschke	k
Puccinia coronata Corda	k
Leersia oryzoides (L.) Sw.	
Leptosphaeria leersiana Sacc.	s
Pyricularia grisea (Cooke) Sacc.	s
Muhlenbergia cuspidata (Nutt.) Rydb.	
Phyllachora vulgata Theiss. & Syd.	c
Muhlenbergia glomerata (Willd.) Trin.	
Phaeoseptoria festucae Spr. var. *muhlenbergiae* Spr. & Puni.	h
Phyllachora vulgata Theiss. & Syd.	h
Muhlenbergia racemosa (Michx.) B.S.P.	
Phyllachora vulgata Theiss. & Syd.	k
Pleospora pellita (Fr.) Rab.	k
Muhlenbergia sp.	
Septoria mississippiensis Sprague	h
Panicum leibergii (Vaseu) Lans.-Scribn.	
Cercospora fusimaculans Atk.	s
Panicum scribnerianum Nash.	
Cerospora fusimaculans Atk.	c,h,k,s
Phyllachora punctum (Schwein.) Orton & Stevens	k
Stagonospora sp.	s
Panicum virgatum L.	
Colletotrichum graminicola (Ces.) G.W. Wils.	c,h,k,s
Elsinoë panici Tiffany & Mathre	c,k,s
Leptosphaeria orthogramma (Berk. & M.A. Curtis) Sacc.	h
Puccinia emaculata Schwein.	k,s
Sporochisma mirabile Berk. & Br.	h
Uromyces graminicola Burr.	h,k,s
Phalaris arundinacea L.	
Claviceps purpurea (Fr.:Fr.) Tul.	c
Stagonospora foliicola (Bres.) Bubak	k
Schizachyrium scoparium (Michx.) Nash.	
Collectotrichum caudatum (Sacc.) Peck	k
Colletotrichum graminicola (Ces.) G.W. Wils.	c,h
Phyllachora luteo-maculata (Schwein.) Orton	h
Pleospora pellita (Fr.) Rab.	k
Puccinia andropogonis Schwein.	h,k
Stagonospora simplicior Sacc. & Briard	c,k
Sorghastrum nutans (L.) Nash.	
Colletotrichum caudatum (Sacc. Peck	k,s
Pseudoseptoria donacis (Pass.) Sutton	k
Stagonospora simplicior Sacc. & Briard	c,k
Sporobolus asper (Michx.) Kunth	
Puccinia vilfae Arth. & Holw.	k
Sporobolus heterolepis (A.Gray) A. Gray	
Ascochyta sp.	s
Colletotrichum caudatum (Sacc.) Peck	c
Colletotrichum graminicola (Ces.) G.W. Wils.	c,h,k,s
Mycosphaerella sp.	c
Pseudoseptoria stromaticola (Baumler) Sutton	s
Pseudoseptoria donacis (Pass.) Sutton	k
Septoria andropogonis J.J. Davis var. *sporobolicola* Sprague	c,s
Stagonospora subseriata (Desm.) Sacc.	h
Spartina pectinata Link.	
Puccinia distichlidis Ellis & Everh.	h
Puccinia seymouriana Arth.	k,s
Puccinia sparganioides Ellis & Barth.	c,h
Uromyces acuminatus Arth.	h,s
Stipa spartea Trin.	
Ascochyta phleina Sprague	c
Colletotrichum caudatum (Sacc.) Peck	h,s
Lophodermium arundinaceum (Schrad.:Fr.) Chev.	c
Phleospora graminearum Sprague & Hardison	s
Puccinia stipae Arth.	c,k,s
Septoria andropogonis J.J. Davis var. *sporobolicola* Sprague	s
Sphaerellopsis filum (Biv.-Bern:Fr.) Berk.	k
Polemoniaceae	
Phlox pilosa L.	
Ascochyta phlogis Vogl. var. *phlogina* Fairm.	c
Cercospora omphacodes Ellis & Holw.	h,k,s
Septoria phlogis Sacc. & Spreg.	s
Uromyces acuminatus Arth.	h,s
Polygalaceae	
Polygala sanguinea L.	
Cercospora grisea Cooke & Ellis	h
Polygonaceae	
Polygonum convolvulus L.	
Puccinia polygoni-amphibii Pers.:Pers.	k
Polygonum coccineum Muhl. ex Willd.	
Puccinia polygoni-amphibii Pers.:Pers.	c,k,s
Sphaerellopsis filum (Biv.-Bern:Fr.) Berk.	c
Polygonum persicaria L.	
Puccinia polygoni-amphibii Pers.:Pers.	s
Primulaceae	
Dodecatheon meadia L.	
Mycosphaerella sp.	h
Septoria dodecatheonis J.J. Davis	h
Lysimachia ciliata L.	
Cercospora lysimachiae Ellis & Halst.	h,s
Pilidium concavum (Desm.) Höhn.	s
Phyllosticta steironematis Dearn. & House	h
Puccinia limosae Magn.	h,s
Ramularia lysimachiae Thuem.	s
Septoria conspicua Ellis & Martin	c,h,s
Lysimachia quadriflora Sims.	
Septoria conspicua Ellis & Martin	h,k
Ranunculaceae	
Anemone canadensis L.	
Phleospora anemones Ellis & Kellm.	s
Plasmopara pygmaea (Unger) J. Schröt.	h,s
Puccinia anemones-virginianae Schwein.	h
Ramularia didyma Unger	c,h,k,s
Anemone cylindrica Gray	
Phleospora anemones Ellis & Kellm.	c,k,s
Phyllosticta anemonicola (Sacc. & Syd.) F.A. Wolf	h
Puccinia anemones-virginianae Schwein	h,s
Septoria anemones Desm.	s
Anemone patens L.	
Ascochyta sp.	s
Septoria anemones Desm.	c
Tranzschelia anemones (Pers.:Pers.) Nannf.	s
Thalictrum dasycarpum Fisch.	
Ascochyta clematidina Thuem. var. *thalictri* J.J. Davis	h
Entyloma thalictri J. Schröt.	c,h,k,s
Septoria thalictri Ellis & Everh.	h
Rhamnaceae	
Ceanothus americanus L.	
Cercospora ceanothi Kellm. & Swingle	s
Coniothyrium sp.	k
Rosaceae	
Agrimonia striata Michx.	
Pucciniastrum agrimoniae (Dietel) Tranz.	c
Spahaerotheca macularis (Wallr.:Fr.) Lind	k
Fragaria virginiana Duchesne.	
Cercospora vexans Massal.	h,s
Diplocarpon earlianum (Ellis & Everh.) F.A. Wolf	h
Mycosphaerella fragariae (Tul.) Lindau	s
Peronospora fragariae Roze & Cornu	h
Phyllosticta fragaricola Desm. & Roberge.	h
Geum triflorum Pursh	
Cercospora gei Fuckel	h
Peronospora potentillae de Bary	h
Septoria gei Rob. & Desm.	h
Potentilla arguta Pursh	
Mycosphaerella sp.	s
Phyllosticta anserinae Tehon	c,h
Taphrina potentillae (Farl.) Johans.	c,s
Potentilla paradoxa Nutt.	
Phragmidium ivesiae Syd.	s
Sphaerotheca macularis (Wallr.:Fr.) Lind	s
Potentilla simplex Michx.	
Phragmidium ivesiae Syd.	h
Ramularia arvensis Sacc.	h
Prunus americana Marsh.	
Cercospora circumscissa Sacc.	k
Rosa arkansana Porter	
Cercospora rosicola Pass.	c,k,s
Discosia artocreas (Tode:Fr.) Fr.	s
Monochaetia sp.	c

Fungus taxon	Prairie
Phragmidium rosae-arkansanae Dietel	c,k,s
Phragmidium speciosum (Fr.) Cooke	c,s
Rosa blanda Ait.	
Phragmidium rosae-arkansanae Dietel	h
Phragmidium speciosum (Fr.) Cooke	h
Spirea alba DuRoi.	
Sporodesmium spiraecicola Cke.	h
Rubiaceae	
Galium boreale L.	
Melasmia galii Ellis & Everh.	c,h,k
Peronospora calotheca de Bary	h
Septoria cruciatae Rob.: Desm.	h
Galium obtusum Bigel.	
Hainesia borealis Ellis & Everh.	s
Leptotrochila repanda (Fr.) Karst	s
Melasmia galii Ellis & Everh.	s
Septoria cruciatae Rob.: Desm.	s
Salicaceae	
Populus tremuloides Michx.	
Marssonina populi (Lib.) Magn.	h
Salix humilis Marsh.	
Microsphaera sp.	h
Salix petiolaris Sm.	
Uncinula adunca (Wallr.:Fr.) Lév.	h
Santalaceae	
Comandra umbellata (L.) Nutt.	
Cercospora comandrae Ellis & Dearn.	s
Cercospora sp.	k
Puccinia andropogonis Schwein. var. *pustulata* (Curt.) Arth.	h,k,s
Saxifragaceae	
Heuchera richardsonii R. Br.	
Cercospora heucherae Ellis & G. Martin	c,h,k,s
Saxifraga pensylvanica L.	
Cercosporella saxifraga Rostr.	h
Septoria albicans Ellis & Everh.	h
Scrophulariaceae	
Veronicastrum virginicum (L.) Farw.	
Cercospora leptandrae J.J. Davis	h,s
Phoma exigua Desm.	h
Solanaceae	
Physalis heterophylla Nees	
Puccinia physalidis Peck	k
Verbenaceae	
Verbena hastata L.	
Erysiphe verbenae Schwein.	k
Septoria verbenae Rob.	k
Violaceae	
Viola sp.	
Cercospora violae Sacc.	s

(Wu) Bezeski, on leaves of *C. canadensis*. As the distinctive golden yellow linear galls on *C. canadensis* age, *D. alopecuri* pycnidia develop in the gall tissue. *D. alopecuri* has been reported to cause twisted malformed shoots on several grass species, not always associated with nematodes. The suggestion has been made that the distinctive spores of *D. alopecuri* with their claw-like appendages are dispersed by nematodes.

Plant parasites are important in the dynamics of the prairie ecosystem because they affect the health and viability of host plants. Plants reduced in vigor and size may be outcompeted by adjacent plants. Death of a host plant provides space for new plant recruitment, often by a different species. Diseased plants may produce fewer seeds or cease to reproduce altogether.

While fifty-nine species of prairie plants occurred in common on all of these four prairie sites, only eighteen fungal parasites on sixteen host species were documented at all four sites. An additional eighteen parasites occurred on seventeen host species on three of the sites. The apparent distribution patterns result from and are influenced by a number of important factors and/or events. Some, but not all, may be artifacts of collection documentation. A parasitic fungus species may be present on a site but not be observed due to seasonal timing of fungal development and of collection. The interaction of the fungus and host may be such that the host dies a short time after infection and thus diseased plants disappear. Also, even though the host plant survives, diseased tissue may be eliminated along with fungus propagules. For example, in the spring on young plants of *Calamagrostis canadensis, Sclerotium rhizoides* Auersw. may cause a rapid necrosis of young leaves. They disintegrate rapidly as small sclerotia develop on the dead drying leaves. Soon there is no obvious evidence of these events. Heteroecious rusts, which usually develop on their spermagonial-aecial hosts in the spring to early summer and on the uredial-telial hosts in mid-summer into fall, pose a special problem in field documentation. Often the lesions on the spermagonial-aecial hosts become necrotic and slough from the host plant, thus the rust would not be observed later in the growing season. Also such a heteroecious rust would not be developed on the uredial-telial host at early collection times. Finally, because environmental conditions influence disease development on a host plant, plants may remain relatively free of disease for one or a series of consecutive years.

Some fungi may be uncommon or rare just as some plant species are uncommon or rare. Even though a fungus may be listed as having a broad distribution, it may be very specific in its nutritional or environmental requirements. Few niches may be available in which it can survive. A small prairie remnant may not have the microhabitat necessary to support the parasite on the potential host plant.

Several events may have eliminated a parasite or a host from one of the small remnant prairies that we have today. Within natural plant populations, host response to fungal pathogenicity ranges from highly susceptible to resistant. By eliminating a susceptible host genotype on a prairie remnant, the parasite may also have eliminated itself. Long distances between prairie remnants could prevent a pathogen from finding the necessary susceptible host genotype.

Our observations over the past five years document the concept that distribution patterns of particular fungal species on individual prairie remnants are different. Some fungi are widespread and occur on every host plant on a site. Other fungi may develop only on a few individuals in one population even though the host is seemingly ubiquitous. This distribution is influenced by host and fungal genotype, but is in part dependent on spore dispersal. Many fungi produce spores which are easily dispersed by air currents, other fungal spores are dependent on rain, insect or other animal dispersal. Assuming a random distribution of fungi and differing spore dispersal abilities, many fungi may have been restricted by the original partitioning of the prairie when it was broken for cultivation.

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Table 2. Fungus index of parasitic fungi on Iowa prairie plants. (c = Cayler Prairie, h = Hayden Prairie, k = Freda Haffner Kettlehole, s = Stinson Prairie)

Fungus taxon	Prairie
Albugo tragopogonis (Pers.) S.F. Gray	
Parthenium integrifolium L.	h
Ascochyta agropyrina (Fairm.) Trott.	
Andropogon gerardii Vitm.	k
Ascochyta clematidina Thuem. var. *thalictri* J.J. Davis	
Thalictrum dasycarpum Fisch.	h
Ascochyta compositarum J.J. Davis	
Aster laevis L.	h
Aster sp.	s
Solidago graminifolia (L.) Salisb.	h
Solidago missouriensis Nutt.	h
Ascochyta graminicola Sacc.	
Calamagrostis canadensis (Michx.) Beauv.	k
Ascochyta phlogis Vogl. var. *phlogina* Fairm.	
Phlox pilosa L.	s
Ascochyta phleina Sprague	
Stipa spartea Trin.	c
Ascochyta thaspii Ellis & Everh.	
Zizia aurea (L.) W. Koch	h
Ascochyta sp.	
Anemone patens L.	s
Sporobolus heterolepis (A. Gray) A. Gray	s
Asteromella andrewsii Petr.	
Gentiana andrewsii Griseb.	h,s
Cercospora astragali Wor.	
Astragalus canadensis L.	s
Cercospora bidentis Tharp	
Bidens sp.	k
Cercospora ceanothi Kellm. & Swingle	
Ceanothus americanus L.	s
Cercospora circumscissa Sacc.	
Prunus americana Marsh.	k
Cercospora clavata (Gerard) Cooke	
Asclepias syriaca L.	c,s
Cercospora comandrae Ellis & Dearn.	
Comandra umbellata (L.) Nutt.	s
Cercospora coreopsidis W.W. Ray	
Coreopsis palmata Nutt.	h,s
Cercospora cypripedii Ellis & Dearn.	
Cypripedium calceolus L.	h
Cypripedium candidum Muhl.	s
Cercospora desmodiicola Atk.	
Desmodium canadense (L.) DC.	s
Cercospora fusimaculans Atk.	
Panicum leibergii (Vaseu) Lans.-Scribn.	s
Panicum scribnerianum Nash.	c,h,k,s
Cercospora gei Fuckel	
Geum triflorum Pursh	h
Cercospora grisea Cooke & Ellis	
Polygala sanguinea L.	h
Cercospora helianthi Schwein.	
Helianthus x laetiflorus Pers.	s
Cercospora heucherae Ellis & G. Martin	
Heuchera richardsonii R.Br.	c,h,k,s
Cercospora leptandrae J.J. Davis	
Veronicastrum virginicum (L.) Farw.	h,s
Cercospora lysimachiae Ellis & Halst.	
Lysimachia ciliata L.	h,s
Cercospora oenotherae Ellis & Everh.	
Oenotherea biennis L.	s
Cercospora omphacodes Ellis & Holw.	
Phlox pilosa L.	h,k,s
Cercospora prenanthis Ellis & Kellm.	
Prenanthes racemosa Michx.	h
Cercospora rosicola Pass.	
Rosa arkansana Porter	c,k,s
Cercospora stromatica Ellis & J.J. Davis	
Solidago canadensis L.	c
Solidago rigida L.	k
Cercospora velutina Ellis & Kellm.	
Baptisia lactea (Raf.) Thieret	h,s
Baptisia bracteata Muhl. ex Ell. var. *glabrescens* (Larisey) Isley	h,s
Cercospora venturioides Peck	
Asclepias syriaca L.	h,k,s
Cercospora vexans Massal.	
Fragaria virginiana Duchesne.	h,s
Cercospora violae Sacc.	
Viola sp.	s
Cercospora ziziae Ellis & Everh.	
Zizia aurea (L.) W. Koch	c,h,k,s
Cercospora sp.	
Comandra umbellata (L.) Nutt.	k
Cercosporella saxifraga Rostr.	
Saxifraga pensylvanica L.	h
Cercosporella virgaureae (Thuem.) Allesch.	
Solidago graminifolia (L.) Salisb.	s
Solidago rigida L.	s
Solidago sp.	s
Cladosporium allii (Ellis & Mart.) Kirk & Crompton	
Allium stellatum Nutt. ex Ker-Gawl.	s
Cladosporium iridis (Fautrey & Roum.) De Vries	
Iris sp.	c
Claviceps purpurea (Fr.:Fr.) Tul.	
Agropyron repens (L.) Beauv.	c
Agropyron trachycaulum (Link.) Malte.	s
Calamagrostis canadensis (Michx.) Beauv.	k
Elymus canadensis L.	s
Elymus smithii (Rydb.) Gould	k
Phalaris arundinacea L.	c
Coleosporium asterum (Diet.) Syd.	
Aster oolentangiensis Ridd.	h
Aster ericoides L.	h
Aster laevis L.	h
Aster simplex Willd.	h
Aster sp.	k
Solidago canadensis L.	c,h,k,s
Solidago missouriensis Nutt.	h
Solidago nemoralis Aiton	h
Solidago speciosa Nutt.	h
Colletotrichum caudatum (Sacc.) Peck	
Calamagrostis canadensis (Michx.) Beauv.	h
Sporobolus heterolepis (A. Gray) A. Gray	c
Schizachyrium scoparium (Michx.) Nash.	k
Sorghastrum nutans (L.) Nash.	k,s
Stipa spartea Trin.	h,s
Colletotrichum dematium (Pers.) Grove	
Allium stellatum Nutt. ex Ker-Gawl.	s
Iris virginica L. var. *schrevei* (Small) E.S. And.	s
Solidago missouriensis Nutt.	s
Solidago sp.	h
Colletotrichum fusarioides (Ellis & Kellm.) O'Gara	
Asclepias tuberosa L.	s
Colletotrichum gloeosporoides (Penz.) Penz. & Sacc.	
Asclepias incarnata L.	s
Asclepias tuberosa L.	s
Colletotrichum graminicola (Ces.) G.W. Wils.	
Andropogon gerardii Vitm.	s
Calamagrostis canadensis (Michx.) Beauv.	h,k
Panicum virgatum L.	c,h,k,s
Sporobolus heterolepis (A. Gary) A. Gray	c,h,k,s
Schizachyrium scoparium (Michx.) Nash.	c,h
Colletotrichum psoraleae (Peck) Arx	
Pediomelum argophyllum (Pursh) Grimes	c,k,s
Coniothyrium sp.	
Ceanothus americanus L.	k
Cylindrosporium apocyni Ellis & Everh.	
Apocynum sibericum Jacq.	h
Cylindrosporium cicutae Ellis & Everh.	
Cicuta maculata L.	s
Cylindrosporium eryngii Ellis & Kellm.	
Eryngium yuccifolium Michx.	c,h,s
Dilophospora alopecuri (Fr.:Fr.) Fr.	
Calamagrostis canadensis (Michx.) Beauv.	h,s
Dinemasporium strigosum (Pers.:Fr.) Sacc.	
Bouteloua gracilis (H.B.K.) Lag. ex Steud.	k
Diplocarpon earlianum (Ellis & Everh.) F.A. Wolf	
Fragaria virginiana Duchesne.	h
Discosia artocreas (Tode:Fr.) Fr.	
Rosa arkansana Porter	s
Elsinoë panici Tiffany & Mathre	
Panicum virgatum L.	c,k,s
Entyloma compositarum Farl.	
Aster laevis L.	s
Aster simplex Willd.	s
Aster sp.	s
Ratibida pinnata (Vent.) Barnh.	c,h,k,s
Entyloma polysporum (Peck) Farl.	
Helianthus tuberosus L.	c
Entyloma thalictri J. Schröt.	
Thalictrum dasycarpum Fisch.	c,h,k,s
Epichloe typhina (Pers.:Fr.) Tul.	
Calamagrostis canadensis (Michx.) Beauv.	h
Erysiphe biocellata Ehrenb.	
Monarda fistulosa L.	c,k,s

Fungus taxon	Prairie
Stachys palustris L.	k
Erysiphe cichoracearum DC.	
Ambrosia trifida L.	s
Ambrosia sp.	h
Aster sericeus Venten.	k
Aster sp.	k
Helianthus grosseserratus G. Martens	c
Helianthus x laetiflorus Pers.	c,s
Helianthus sp.	s
Heliopsis helianthoides (L.) Sweet	h
Erysiphe pisi DC.	
Astragalus canadensis L.	c
Erysiphe verbenae Schwein.	
Verbena hastata L.	k
Hainesia borealis Ellis & Everh.	
Galium obtusum Bigel.	s
Hendersonia sp.	
Platanthera praeclara Sheviak & Bowles	h
Hyalothyridium calamagrostidis Greene	
Calamagrostis canadensis (Michx.) Beauv.	c,k
Leptosphaeria leersiana Sacc.	
Leersia oryzoides (L.) Sw.	s
Leptosphaeria orthogramma (Berk. & M.A. Curtis) Sacc.	
Panicum virgatum L.	h
Leptosphaeria sp.	
Eryngium yuccifolium Michx.	h
Leptotrochila repanda (Fr.) Karst	
Galium obtusum Bigel.	s
Lophodermium arundinaceum (Schrad.:Fr.) Chev.	
Stipa spartea Trin.	c
Marssonina baptisiae (Ellis & Everh.) Magn.	
Baptisia lactea (Raf.) Thieret	h
Marssonina populi (Lib.) Magn.	
Populus tremuloides Michx.	h
Melasmia galii Ellis & Everh.	
Galium boreale L.	c,h,k
Galium obtusum Bigel.	s
Microsphaera diffusa Cooke & Peck	
Desmodium canadense (L.) DC.	c,h
Microsphaera sp.	
Salix humilis Marsh.	h
Monochaetia sp.	
Rosa arkansana Porter	c
Mycosphaerella fragariae (Tul.) Lindau	
Fragaria virginiana Duchesne.	s
Mycosphaerella greenei Tomilin	
Calamagrostis canadensis (Michx.) Beauv.	c,k
Mycosphaerella sp.	
Aster laevis L.	s
Dodecatheon meadia L.	h
Potentilla arguta Pursh	s
Sporobolus heterolepis (A. Gray) A. Gray	c
Nematostoma occidentalis (Ellis & Everh.) Barr	
Artemisia ludoviciana Nutt.	c,h,k,s
Paraphaeosphaeria michotii (Westend.) O. Eriksson	
Calamagrostis canadensis (Michx.) Beauv.	h
Parodiella hedysari (Schwein.) Hughes	
Desmodium canadense (L.) DC.	s
Peronospora calotheca de Bary	
Galium boreale L.	h
Peronospora fragariae Roze & Cornu	
Fragaria virginiana Duchesne.	h
Peronospora potentillae de Bary	
Geum triflorum Pursh	h
Peronospora trifoliorum de Bary	
Lathyrus venosus Muhl. ex Willd.	h
Phaeoseptoria calamagrostidis Sprague	
Calamagrostis canadensis (Michx.) Beauv.	c,s
Phaeoseptoria festucae Spr. var. *muhlenbergiae* Spr. & Puni.	
Muhlenbergia glomerata (Willd.) Trin.	h
Phleosopora anemones Ellis & Kellm.	
Anemone canadensis L.	s
Anemone cylindrica Gray	c,k,s
Phleospora graminearum Sprague & Hardison	
Elymus canadensis L.	s
Stipa spartea Trin.	s
Phomopsis liatridis Greene	
Liatris punctata Hooke	c
Phoma exigua Desm.	
Veronicastrum virginicum (L.) Farw.	h
Phoma leveillei Boerema & Bollen	
Artemisia ludoviciana Nutt.	k
Phragmidium ivesiae Syd.	
Potentilla paradoxa Nutt.	s
Potentilla simplex Michx.	h
Phragmidium rosae-arkansanae Dietel	
Rosa arkansana Porter	c,k,s
Rosa blanda Ait.	h
Phragmidium speciosum (Fr.) Cooke	
Rosa arkansana Porter	c,s
Rosa blanda Ait.	h
Phyllachora graminis (Pers.:Fr.) Nitschke	
Elymus smithii (Rydb.) Gould	k
Calamagrostis canadensis (Michx.) Beauv.	c,h,k,s
Elymus canadensis L.	h,k,s
Phyllachora lespedezae (Schwein.) Cooke	
Lespedeza capitata Michx.	h
Phyllachora luteo-maculata (Schwein.) Orton	
Andropogon gerardii Vitm.	c,h,k,s
Schizachyrium scoparium (Michx.) Nash.	h
Phyllachora punctum (Schwein.) Orton & Stevens	
Panicum scribnerianum Nash.	k
Phyllachora solidaginum (Schwein.) Sacc.	
Solidago graminifolia (L.) Salisb.	h
Phyllachora vulgata Theiss. & Syd.	
Muhlenbergia cuspidata (Nutt.) Rydb.	c
Muhlenbergia glomerata (Willd.) Trin.	h
Muhlenbergia racemosa (Michx.) B.S.P.	k
Phyllosticta anemonicola (Sacc. & Syd.) F.A. Wolf	
Anemone cylindrica Gray	h
Phyllosticta anserinae Tehon	
Potentilla arguta Pursh	c,h
Phyllosticta coreopsides Greene	
Coreopsis palmata Nutt.	c,k
Phyllosticta desmodii Ellis & Everh.	
Desmodium canadense (L.) DC.	s
Phyllosticta fragaricola Desm. & Roberge.	
Fragaria virginiana Duchesne.	h
Phyllosticta gentianicola (DC.) Ellis & Everh.	
Gentiana andrewsii Griseb.	h
Phyllosticta pitcheriana Fairm.	
Heliopsis helianthoides (L.) Sweet	h
Phyllosticta steironematis Dearn. & House	
Lysimachia ciliata L.	h
Phyllosticta sp.	
Geum triflorum Pursh	h
Physoderma pluriannulatum (Berk. & Curt.) Karling	
Zizia aurea (L.) W. Koch	h
Pilidium concavum (Desm.) Höhn.	
Lysimachia ciliata L.	s
Placosphaeria haydenii (Berk. & M.A. Curtis) Petr.	
Aster simplex Willd.	h,s
Aster sp.	s
Plasmopara halstedi (Farl.) Berl. & De Toni	
Ambrosia trifida L.	k
Helianthus grosseserratus G. Martens	h
Helianthus sp.	s
Silphium laciniatum L.	s
Solidago sp.	h
Plasmopara pygmaea (Unger) J. Schröt.	
Anemone canadensis L.	h,s
Pleospora pellita (Fr.) Rab.	
Muhlenbergia racemosa (Michx.) B.S.P.	k
Schizachyrium scoparium (Michx.) Nash.	k
Pseudoseptoria donacis (Pass.) Sutton	
Sporobolus heterolepis (A. Gray) A. Gray	k
Sorghastrum nutans (L.) Nash.	k
Pseudoseptoria stromaticola (Baumler) Sutton	
Sporobolus heterolepis (A. Gray) A. Gray	s
Puccinia andropogonis Schwein.	
Andropogon gerardii Vitm.	c,h,k,s
Schizachyrium scoparium (Michx.) Nash.	h,k
Puccinia andropogonis Schwein. var. *pustulata* (Curt.) Arth.	
Comandra umbellata (L.) Nutt.	h,k,s
Puccinia anemones-virginianae Schwein.	
Anemone canadensis L.	h
Anemone cylindrica Gray	h,s
Puccinia angustata Peck	
Scirpus sp.	c
Puccinia bolleyana Schwein.	
Sambucus canadensis L.	h
Puccinia canaliculata (Schwein.) Lagerh.	
Ambrosia trifida L.	k
Puccinia chloridis Speg.	
Asclepias syriaca L.	s
Puccinia cnici-oleracei Pers.	
Aster ericoides L.	h,k

Fungus taxon	Prairie
Aster simplex Willd.	h
Aster sp.	c,k
Puccinia convolvuli Castagne	
Convolvulus arvensis L.	k
Puccinia coronata Corda	
Elymus smithii (Rydb.) Gould	k
Bromus kalmii A. Gray	h
Calamagrostis canadensis (Michx.) Beauv.	h,s
Elymus canadensis L.	h,s
Puccinia distichlidis Ellis & Everh.	
Spartina pectinata Link.	h
Puccinia dioicae P. Magn.	
Aster sp.	s
Krigia biflora (Walt.) Blake	h
Puccinia emaculata Schwein.	
Panicum virgatum L.	k,s
Puccinia grindeliae Peck	
Solidago nemoralis Aiton	k
Puccinia helianthi Schwein.	
Helianthus grosseserratus G. Martens	c,h,k,s
Helianthus x *laetiflorus* Pers.	c,h,k,s
Helianthus sp.	s
Heliopsis helianthoides (L.) Sweet	s
Puccinia hieracii (Röhl.) H. Mart.	
Hieracium canadense Michx.	h
Puccinia limosae Magn.	
Lysimachia ciliata L.	h,s
Puccinia menthae Pers.:Pers.	
Monarda fistulosa L.	k,s
Pycnanthemum virginianum (L.) Durand & Jacks.	h,k,s
Puccinia physalidis Peck	
Physalis heterophylla Nees	k
Puccinia polygoni-amphibii Pers.:Pers.	
Polygonum coccineum Muhl. ex Willd.	c,k,s
Polygonum convolvulus L.	k
Polygonum persicaria L.	s
Puccinia recondita Rob. & Desm.	
Elymus canadensis L.	c,s
Puccinia seymouriana Arth.	
Asclepias syriaca L.	h,k
Spartina pectinata Link.	k,s
Puccinia sparganioides Ellis & Barth.	
Spartina pectinata Link.	c,h
Puccinia stipae Arth.	
Aster sericeus Venten.	s
Aster sp.	s
Stipa spartea Trin.	c,k,s
Puccinia tanaceti DC.	
Artemesia ludoviciana Nutt.	c,h,k
Puccinia vilfae Arth. & Holw.	
Sporobolus asper (Michx.) Kunth	k
Pucciniastrum agrimoniae (Dietel) Tranz.	
Agrimonia striata Michx.	c
Pyricularia grisea (Cooke) Sacc.	
Leersia oryzoides (L.) Sw.	s
Ramularia arvensis Sacc.	
Potentilla simplex Michx.	h
Ramularia brevipes Ellis & Everh.	
Monarda fistulosa L.	s
Ramularia desmodii Cooke	
Desmodium canadense (L.) DC.	h,s
Ramularia didyma Unger	
Anemone canadensis L.	c,h,k,s
Ramularia equiseti C. Massal	
Equisetum arvense L.	h
Ramularia lysimachiae Thuem.	
Lysimachia ciliata L.	s
Sclerotium rhizoides Auersw.	
Calamagrostis canadensis (Michx.) Beauv.	h,s
Scopinella sp.	
Dalea purpurea Venten.	h,s
Septocylindrium concomitans (Ellis & Holw.) Halst.	
Bidens vulgata Greene	s
Septoria andropogonis J.J. Davis var. *sporobolicola* Sprague	
Sporobolus heterolepsis (A. Gray) A. Gray	c,s
Stipa spartea Trin.	s
Septoria agropyrina Lobik	
Elymus canadensis L.	c
Septoria albicans Ellis & Everh.	
Saxifraga pensylvanica L.	h
Septoria anemones Desm.	
Anemone cylindrica Gray	s
Anemone patens L.	c
Septoria asclepiadicola Ellis & Everh.	
Asclepias incarnata L.	s
Septoria atropurpurea Peck	
Aster laevis L.	s
Aster prenanthoides Muhl. ex Willd.	s
Aster simplex Willd.	s
Aster sp.	c,s
Septoria avenae Frank	
Calamagrostis canadensis (Michx.) Beauv.	c,s
Septoria calamagrostidis (Lib.) Sacc.	
Calamagrostis canadensis (Michx.) Beauv.	h
Septoria campanulae (Lév.) Sacc.	
Campanula aparinoides Pursh	s
Septoria conspicua Ellis & G. Martin	
Lysimachia ciliata L.	c,h,s
Lysimachia quadriflora Sims.	h,k
Septoria convolvuli Desm.	
Convolvulus sepium L.	h
Septoria coreopsidis J.J. Davis	
Coreopsis palmata Nutt.	c,h
Septoria cornicola Desm.	
Cornus racemosa Lam.	h
Septoria cruciatae Rob.: Desm.	
Galium boreale L.	h
Galium obtusum Bigel.	s
Septoria dodecatheonis J.J. Davis	
Dodecatheon meadia L.	h
Septoria elymi Ellis & Everh.	
Elymus canadensis L.	s
Septoria epilobii West	
Epilobium coloratum Biehler.	s
Septoria eryngicola Oudem. & Sacc.	
Eryngium yuccifolium Michx.	s
Septoria fumosa Peck	
Solidago graminifolia (L.) Salisb.	h
Solidago rigida L.	k
Septoria gei Rob. & Desm.	
Geum triflorum Pursh	h
Septoria helianthi Ellis & Kellm.	
Helianthus grosseserratus G. Martens	h,s
Helianthus x laetiflorus Pers.	s
Helianthus sp.	h
Septoria lactucicola Ellis & Martin	
Lactuca ludoviciana (Nutt.) Ridd.	c
Septoria liatridis Ellis & J.J. Davis	
Liatris aspera Michx.	c,h,k,s
Septoria mississippiensis Sprague	
Muhlenbergia sp.	h
Septoria nabali Berk. & Curtis	
Prenanthes racemosa Michx.	h
Septoria nodorum (Berk.) Berk.	
Calamagrostis canadensis (Michx.) Beauv.	h
Septoria oenotherae Westend.	
Oenothera biennis L.	k
Septoria phlogis Sacc. & Speg.	
Phlox pilosa L.	s
Septoria sii Rob. & Desm.	
Cicuta maculata L.	h,s
Oxypolis rigidior (L.) J.M. Coulter & J. Rose	h
Septoria thalictri Ellis & Everh.	
Thalictrum dasycarpum Fisch.	h
Septoria tradescantiae (Ellis & Kellm.) J.J. Davis	
Tradescantia bracteata Small.	s
Septoria verbenae Rob.	
Verbena hastata L.	k
Septoria virgaureae (Lib.) Desm.	
Solidago canadensis L.	c,k
Solidago speciosa Nutt.	h
Septoria sp.	
Aster oolentangiensis Ridd.	h
Aster simplex Willd.	h
Aster sp.	k
Carex sp.	c,s
Pediomelum esculentum (Pursh) Rydb.	s
Solidago canadensis L.	h
Solidago missouriensis Nutt.	h
Sphacelotheca occidentalis (Seym.) Clinton	
Andropogon gerardii Vitm.	c,k
Sphaerellopsis filum (Biv.-Bern:Fr.) Berk.	
Desmodium canadense (L.) DC.	s
Hieracium canadense Michx.	h
Polygonum coccineum Muhl. ex Willd.	c
Stipa spartea Trin.	k
Sphaerotheca macularis (Wallr.:Fr.) Lind	
Agrimonia striata Michx.	k
Potentilla paradoxa Nutt.	s
Sporochisma mirabile Berk. & Br.	
Panicum virgatum L.	h
Sporodesmium spiraecicola Cke.	
Spirea alba DuRoi.	h
Stagonospora apocyni (Peck) J.J. Davis	
Apocynum sibericum Jacq.	c,h,k,s
Stagonospora arenaria (Sacc.) Sacc.	
Bouteloua curtipendula (Michx.) A. Gray	c
Elymus canadensis L.	h

Fungus taxon	Prairie
Stagonospora foliicola (Bres.) Bubak	
Phalaris arundinacea L.	k
Stagonospora simplicior Sacc. & Briard	
Andropogon gerardii Vitm.	c,h,k,s
Schizachyrium scoparium (Michx.) Nash.	c,k
Sorghastrum nutans (L.) Nash.	c,k
Stagonospora subseriata (Desm.) Sacc.	
Andropogon gerardii Vitm.	k
Sporobolus heterolepis (A. Gray) A. Gray	h
Stagonospora zonata J.J. Davis	
Asclepias incarnata L.	c,s
Stagonospora sp.	
Panicum scribnerianum Nash.	s
Synchytrium decipiens (Farl.) Farl.	
Amphicarpaea bracteata (L.) Fern.	h,s
Taphrina potentillae (Farl.) Johans.	
Potentilla arguta Pursh	c,s
Titaeospora equiseti Desm.	
Equisetum arvense L.	s
Tranzschelia anemones (Pers.:Pers.) Nannf.	
Anemone patens L.	s
Uncinula adunca (Wallr.:Fr.) Lév.	
Salix petiolaris Sm.	h
Urocystis agropyri (Preuss) J. Schröt.	
Elymus canadensis L.	h
Uromyces acuminatus Arth.	
Phlox pilosa L.	h,s
Spartina pectinata Link.	h,s
Uromyces coloradensis Ellis & Everh.	
Vicia americana Muhl.	c
Uromyces fabae (Grev.) Fuckel	
Lathyrus venosus Muhl. ex Willd.	c,h,k
Vicia americana Muhl.	s
Uromyces glycyrrhizae Magn.	
Glycyrrhiza lepidata Pursh	c
Uromyces graminicola Burr.	
Panicum virgatum L.	h,k,s
Uromyces hedysari-paniculati (Schwein.) Farl.	
Desmodium canadense (L.) DC.	c,h,s
Uromyces lespedezae-procumbentis (Schwein.) M.A. Curt.	
Lespedeza capitata Michx.	c,h
Uromyces psoralea Peck var. *argophyllae* (Seym.) Arth.	
Pediomelum argophyllum (Pursh) Grimes	c,s
Uromyces silphii Arth.	
Silphium laciniatum L.	h
Uropyxis amorphae (M.A. Curtis) J. Schröt.	
Amorpha canescens Pursh	h,s
Uropyxis petalostemonis (Farl.) De Toni	
Dalea candida Willd.	s
Ustilago striiformis (Westend.) Niessl	
Calamagrostis canadensis (Michx.) Beauv.	h
Wojnowicia hirta Sacc.	
Calamagrostis canadensis (Michx.) Beauv.	h

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