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Iowa Prairie — An Endangered Ecosystem¹

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Prior to Euro-American settlement 85% of Iowa was occupied by prairie. Today less than 0.02% of pre-settlement prairie remains; a few small remnants are scattered across the original 30 million acres. Settlement of Iowa was rapid; most of the prairie was converted to cropland by the end of the 19th century. Since prairie preservation activities were initiated in the 1930's, a number of prairie remnants have been preserved by public and private agencies. Iowa needs to be surveyed and inventoried so that the significant remaining prairie remnants can be located and preserved. Recent prairie preservation efforts have been supplemented with prairie restoration and reconstruction projects.

INDEX DESCRIPTORS: Prairie, Iowa, Preservation, Pre-settlement, Settlement, Restoration, Reconstruction, Vegetation, Ecosystem, Endangered, Grassland.

PRE-SETTLEMENT IOWA PRAIRIE

Grass, wind and sky have dominated the Iowa landscape for thousands of years as Iowa is the only state that lies almost entirely within the region of the tall-grass prairie. The early history of prairies is obscure, but it is presumed that prairie development began in the Tertiary Period (Baker and VanZant, 1978). Pollen analyses by Lane (1941) indicate the presence of prairie in Iowa during one of the interglacial periods. Based on patterns of vegetation changes determined from the pollen record of the past 30,000 years, it can be inferred that during glacial and interglacial ages the vegetation of Iowa shifted between coniferous forests, deciduous forests and prairies (Baker, 1981). Vegetation changes in recent glacial and postglacial times can be more precisely delineated. Combining pollen analysis and radiocarbon dating, VanZant (1979) determined that in the Lake Okoboji region prairie vegetation became dominant approximately 9,000 years ago.

It is generally agreed that prior to settlement prairie occupied 85% of the state (Shimek, 1911; Hayden, 1945). Much of the Iowa prairie was relatively flat or rolling, but there were also loess-ridge prairies, sand prairies, hill-prairie openings and wet prairies. Shimek (1911) indicated that areas originally covered with a prairie flora in Iowa are of the following types: 1) The broad flat plains which characterize the Wisconsin drift and the Iowa surface as well as part of the eroded Kansas drift; 2) the rolling drift surface of a greater part of the Kansas area and the more or less distinct moraines bordering the Wisconsin and Iowa areas; 3) the rough loess ridges bordering the Missouri Valley presenting the most xerophytic conditions in the state; 4) the well-drained alluvial plains along the Missouri River and other large streams; 5) the prairie ridges or "oak openings" on the xeric hillsides in the well-dissected forested regions of northeastern Iowa; and 6) the sand-dune areas.

DEMISE OF IOWA PRAIRIE

The sheer size of the prairie ecosystem should have insured that large tracts would remain undisturbed. Today less than 0.02% of Iowa's prairie remains; a few small relict stands are scattered across the original 30 million acres. The culmination of 9 millennia of interaction was obliterated in less than a century and one-half. The fact that such a vast landscape is no longer present should qualify Iowa tall-grass

prairie as a rare or threatened, if not endangered, ecosystem.

In retrospect, it might be conjectured that the demise of the tall-grass prairie began in April 1832 with an ill-advised attempt by Chief Black Hawk and his tribe to return to their ancestral lands to maintain a vanishing way of life. Prior to that attempt the Iowa region was controlled by native Americans and was off-limits to all but a few Euro-American settlers who had gained their confidence. The last thin line of defense of the Iowa prairie crumbled 15 weeks later at the mouth of the Bad Axe River in Wisconsin when hundreds of Sauk men, women and children were forced into the Mississippi River at bayonet point and slaughtered.

The defeat of the Sauk at the Bad Axe Massacre expedited the "Black Hawk Purchase" so that on June 1, 1833 the first portion of the future state of Iowa was opened for agricultural settlement.

The rush of people began at once; eager settlers from Illinois, Indiana, Ohio, Kentucky, and Missouri jammed the trails or waited days to cross the Mississippi on hand-rowed ferries (Billington, 1960). During the next two decades, in response to population pressures, a series of cession treaties removed Indian title to the land. A Methodist circuit rider reported in 1839 that due to the "immense" tide of immigration "the country is full back to the Indian line and more are coming every day" (Houf, 1963). As federal border patrols opened each new cession, land hungry settlers rushed in to stake out farms. Billington (1960) suggests that the first "land rush" on the American frontier occurred in Iowa on April 30, 1843 when the eastern half of the Sauk and Fox Cession of 1842 was opened. The population influx initially began with people from neighboring states, but as news of this "land of plenty" spread in an ever-widening arc, settlers from eastern areas such as New York and New England were attracted to Iowa, as were European immigrants. The rapid influx of people is illustrated by population totals of 10,000 in 1836, 43,000 in 1840 and 192,000 in 1850.

Settlement followed the major river systems and their tributaries — the Mississippi River in eastern Iowa and the Missouri River in western Iowa. In selecting settlement sites the settlers commonly considered the following factors: 1) availability of wood for building, fencing and fuel; 2) a steady supply of good water and proximity of water-power for future mill sites; and 3) availability of well-drained land to till (Berry, 1927). The major waterways bounded by strips of rolling, forested land adjacent to prairie met these criteria. Bogue (1963) maintains that the presence of "timber" was the prime factor. Occupation of prairie land between the river valleys was slower due to a limited wood supply and lack of direct access to water transportation.

The leading edge of settlement moved rapidly in Iowa. In a particular area the frontier period lasted only 10-20 years. For example, a line delineating the settled eastern part of the state in 1840 would have passed through Ottumwa and Iowa City and reached the Mississippi in

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the vicinity of the present town of Guttenburg. Ten years later a diagonal from the northeast corner of the state to the southwest corner would have separated the settled southeast from the unsettled northwest. There were, however, several unsettled areas in the vicinity of Marshalltown and Oelwein (Goodwin, 1919). By 1860 a population of 675,000 was concentrated in eastern Iowa in the valleys of the Iowa, Cedar, Skunk, and Des Moines rivers. The line marking the limits of settlement cut across the northwest corner of the state.

By the time of the Civil War much of the well-drained mesic prairie of the state was being farmed. However, as late as 1870 interior counties between the Des Moines and Missouri rivers were still being settled. The wet prairies of northwest Iowa were the last to be put to the plow. In this part of the state settlement was retarded until sufficient tiling technology, capital and collective action were available for draining the land (Bogue, 1963; Swierenga, 1968). Drainage on a large scale began about 1888 (Berry, 1927). Each year thereafter an increasingly large acreage of wet prairie was brought into cultivation. Harter and Stewart (1930) conclude that the agricultural settlement of Iowa was completed by 1890 with an average of 15 people per square mile. It could be maintained that complete settlement occurred in 1900 when most Iowa counties reached their largest total of farm units (Bogue, 1963). In any event, by the turn of the century most of the Iowa prairie was being used for agricultural purposes and was close to extinction. Even the prairie slough, usually the last to go under the plow, was being lamented as becoming obsolete (Aldrich, 1903). Shimek (1911) noted that native prairie was fast disappearing and being replaced with artificial groves, cultivated crops and introduced weeds. According to Berry (1927) practically all of the wet prairies had been drained for cultivation by 1918 or 1920. Shimek (1925) reported that comparatively little native prairie remained in Iowa; a few unbroken tracts were scattered about the state, especially in the northwestern quarter, but even these were disturbed by pasturing and mowing.

The fertility of Iowa soil undoubtedly contributed to the demise of the prairie. The extent of the original prairie and the distribution of rich black soil correlate well. A study directed by Marbut (1934) classified approximately 26 million of Iowa land as Grade 1. Grade 1 correlates well in amount and distribution of soil type with the black fertile prairie soils. The black color is indicative of a high content of organic materials that have accumulated over time from a residue of prairie vegetation with extensive root systems. Ironically the prairie was initially thought to be sterile because it did not support trees. Atwater (1829), a long-term proponent of prairie fertility, disagreed with that opinion of the Iowa prairies: "We are often told by eastern scientific empirics who have seen them of the sterility of the soil where the prairies are, but the very reverse is the fact." Albert Lea (1836) was impressed by the agricultural productivity of the prairie soil. Many did not agree with these opinions and continued to choose forest land over prairie. Undoubtedly by the early 1840's many settlers were becoming aware of the fertility of the prairie soil. Many farmers began to bring the prairie under cultivation after 1840 (Bogue, 1963). However, as late as 1860, township population in Story county showed a marked agreement with accessibility of timber (Hewes, 1950). The choicest locations continued to be a judicious combination of both prairie and forest (Swierenga, 1968). The preference of settlers for at least some forest land on their property probably speaks to the utility of wood in their day-to-day living rather than to the lack of fertility of the prairie soil.

The plow is symbolic of the demise of Iowa prairie. The tough prairie sod was almost an insurmountable obstacle to the early prairie settlers. The extensive intertwined root systems of the prairie plants did not yield to the plows developed for turning the forest soils (Bogue, 1963). Much of the initial "prairie breaking" was done with massive unwieldy breaking plows pulled by several yokes of oxen and operated by custom crews (Coffin, 1902). Subsequent technological developments changed the problems of plowing prairie sod from a formidable ob-

stacle to a temporary inconvenience. John Deere invented the steel moldboard plow in 1837. It became readily available in the 1850's and large scale production was perfected in the 1860's with John Oliver's development of the process of making chilled iron plowshares (Bogue, 1963). This tool for breaking prairie proved to be very effective. The utilitarian beauty of the Deere plow has been compared with that of the Lancaster rifle (Madsen, 1972). In terms of efficiency it might better be compared with the Henry or Winchester repeating rifles. Madsen (1972) captures the essence of the Iowa prairie demise: "We spent our tall-grass prairie with a prodigal hand, and it probably had to be that way, for these are the richest farm soils in the world . . . tall-grass prairie is the most difficult of all native America to conserve . . . because it is the world's most valuable farm soil." It is almost incomprehensible that so vast an ecosystem could be eliminated in such a short span of time. Thirty million acres of prairie were converted to agricultural use in 70 years, an average rate of 4 million acres a year.

Apparently the Iowa settlers of the 19th century were not aware that an entire ecosystem was being obliterated. Perhaps there was just too much of it; abundance tends to create an impression of limitlessness. As is so often the case, a heritage is lost before its value is tallied or its passing noted. The very characteristics of the people that prompted them to leave a sheltered society to settle a new land contributed to the prairie's demise. Burdened with a daily struggle against an overwhelming prairie wilderness that could destroy much of civilization's gains, motivated by a need for personal accomplishment and ultimately justified by a utilitarian destiny to feed the world, the Iowa settlers plowed and planted the tall-grass prairie ecosystem into extinction.

IOWA PRAIRIE PRESERVATION

The passing of the prairie was hardly noticed and minimally lamented. Efforts to preserve it were not initiated until a century after the territory was opened for settlement. Suggestion of a prairie preserve was made in The Twenty Five Year Conservation Plan (Crane and Olcott, 1933). They recommended that such an area should "save the characteristic landscape, wild flowers and wild life of the native prairies." A decade later the Conservation Committee of the Iowa Academy of Science, chaired by Ada Hayden, provided the impetus to make that suggestion a reality. Hayden (1945) proposed a basis for the selection of prairie tracts that should be preserved. She recommended that such factors as soils, climate, topography, vegetation and geology be considered in preservation decisions. She specified that the state's varied topography, primary plant and animal communities, and soil types should be preserved. The following year the Conservation Committee Report (Hayden, 1946) contained a state-wide survey of 30 prairies grouped according to size, topography, soil type and floras. A supplementary recommendation by Riecken (1946) delineated the factors to be considered in preservation of soils and suggested types of areas to be preserved. The tracts of prairie reported in the survey totaled approximately 6,000 acres. The report included portions of a plan developed in 1934 under the direction of Shimek for a national preserve of two and one-half sections in the Little Sioux Valley. The proposed preserve was quite diverse including an upland and lowland prairie, a kettlehole, ridges, river floodplain and forest.

A number of prairie areas noted in the survey report, as well as others, have been preserved through actions of the Iowa Preserves Advisory Board, the Iowa Conservation Commission, the Iowa Chapter of Nature Conservancy and county conservation boards. Dean Roosa, State Ecologist, has been instrumental in initiating or expediting many of these preservation activities. In addition, some private citizens are preserving parcels of prairie. Table 1 contains a list of prairies presently being protected or preserved.

The efforts of Shimek, Hayden and others were instrumental in

IOWA'S ENDANGERED PRAIRIES

Table 1. Iowa prairies presently preserved or being protected

Name	Size		Ownership	County
	Acres	(ha)		
Bergman Prairie	100	(40)	Private	Dickinson
*Cayler Prairie	160	(65)	State Conservation Commission	Dickinson
*Clay Prairie	3	(1)	University of Northern Iowa	Butler
*Crossman Prairie	10	(4)	Nature Conservancy	Howard
*Dinesen Prairie	20	(8)	Private	Shelby
Dock Prairie	25	(10)	Private	Allamakee
*Doolittle Pothole Prairie	25	(10)	State Conservation Commission	Story
*Emmet County Prairie	200	(81)	State Conservation Commission	Emmet
*Freda Haffner Kettlehole	110	(45)	Nature Conservancy	Dickinson
*Gitchie Manitou	40	(16)	State Conservation Commission	Lyon
*Hayden Prairie	240	(100)	State Conservation Commission	Howard
*Kalsow Prairie	160	(65)	State Conservation Commission	Pocahontas
*Kish-Ke-Kosh Prairie	17	(7)	State Conservation Commission	Jasper
*Liska Stanek Prairie	20	(8)	Webster County Conserv. Comm.	Webster
Loess Hills Wildlife Area	200	(81)	State Conservation Commission	Monona
Lageschulte Prairie	4	(2)	Wartburg College	Bremer
Mark Sand Prairie	35	(14)	Private	Black Hawk
Ray Prairie	8	(3)	Private	Bremer
*Sheeder Prairie	25	(10)	State Conservation Commission	Guthrie
Siles Prairie	10	(4)	Private	Cherokee
Steele Prairie	200	(81)	Private	Cherokee
*Stinson Prairie	32	(13)	Kossuth County Conserv. Comm.	Kossuth
Turin Loess Hills Prairie	100	(40)	State Conservation Commission	Monona
Waubonsie State Park	50	(20)	State Conservation Commission	Fremont
Wearin Prairie	60	(24)	Private	Mills
*Williams Prairie	21	(9)	Nature Conservancy	Johnson

*Dedicated as a state preserve

prompting the state to preserve portions of its natural heritage. However, many fine areas were lost prior to the 1946 report, and many tracts listed in that report no longer exist. It is unfortunate that prairie preservation activities were not begun earlier and pursued with greater vigor. Each loss of a prairie remnant intensifies the need to preserve those which remain.

All remaining aspects of the natural diversity of Iowa prairie need to be recognized. The diversity of the Iowa prairie is reflected in its 1) landform regions, 2) soil associations, 3) topographic variations, 4) climatic zones, 5) hydrologic types, 6) geologic variations, and 7) plant and animal communities. To maintain this diversity the best representative prairie for each of these categories must be preserved. To achieve this goal the prairies of Iowa must be surveyed and inventoried.

In spite of the past destruction there may yet exist unlocated prairies of local, regional or statewide significance. For example, the loess hills of western Iowa comprise some of the state's most unusual terrain. The

vegetation has a greater affinity for the plains to the west than the tall-grass prairie to the east. This unique prairie-clothed landscape is of national, if not worldwide, significance since only in China does a similarly formed landscape exist. The prairie in this region has survived because it is too steep for cultivation. However, it is being encroached upon by woody vegetation and urban home builders espousing rural solitude. Unlike other prairie areas of the state, an opportunity still exists to preserve representative large segments of this unique prairie ecosystem. The Iowa Preserves Advisory Board has initiated a study of the loess hills; this effort needs to be expanded so that the region can be surveyed, inventoried, and portions of it preserved. Let us not neglect our last opportunity to preserve a significant segment of Iowa prairie landscape.

PRAIRIE RESTORATION AND RECONSTRUCTION PROJECTS

Prairie preservation has been supplemented within the last 10-15 years by efforts to reestablish prairies. The idea is not new in Iowa as noted by attempts to create an artificial prairie at Iowa Lakeside laboratory (Anderson, 1945). Activities fall into two categories, prairie reconstruction and prairie restoration. Frequently the native vegetation has been so obliterated that the area has to be completely reconstructed. In other areas, some native plants remain, and management practices can be utilized to enhance and supplement existing vegetation to restore the prairie. Two of the early proponents of prairie reconstruction in Iowa were Roger Landers, formerly of Iowa State University, and Paul Christiansen, Cornell College. Numerous prairie reconstruction projects are underway across the state and more are added each year. They range in size from a few square feet to many acres. One such project is located on the Parish Farm in Grundy County owned by the Iowa Academy of Science. A project on the campus of the University of Northern Iowa provides an opportunity to study the habitat changes that occur in prairie reconstruction. Difficulties encountered in prairie reconstruction tend to help develop an appreciation of the diversity and complexity of native prairie and of the need for its preservation.

SUMMARY

Iowa tall-grass prairie is an endangered ecosystem that must be preserved. Within 70 years after settlement virtually all of the vast prairie landscape was gone. Only scattered fragments of the 30 million acres of original Iowa prairie remain. Ironically, the fertile soil created by the tall-grass prairie caused its demise. As agricultural land use is intensified, the remaining prairie remnants must be preserved so that future generations can understand and appreciate Iowa's prairie heritage. Restoration and reconstruction projects can recreate an aspect of the prairie and can moderate stress on existing preserves, but they cannot duplicate the pre-settlement prairie. The few remaining fragments of native Iowa prairie cannot be permitted to be swept away by neglect or technological indifference.

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