Tallgrass Prairie Center's Restoration Guide

- Fourth in a Series

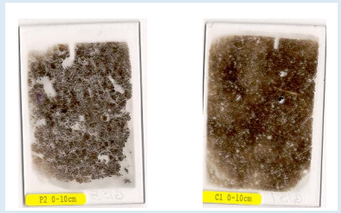
Recognizing and Appreciating Tallgrass Prairie Remnants

What is a prairie remnant?

Prairie remnants are fragments of the original prairie landscape with their native plant communities still intact. Typically, this means soils were never plowed, graded, or buried by fill. Original prairie is meant to imply that populations of species have persisted or regenerated themselves on site through time (i.e., not planted by people as in prairie reconstruction). Some sites may have had brief soil disturbance in the past, for example, grading to create railroad beds in the 1800s, or fields that were cultivated for brief periods then abandoned. The key point is that some component of the original native vegetation remains, either having persisted on site or naturally re-colonized from surrounding original prairie still present after the disturbance.

Why are prairie remnants important?

Remnants are islands of biodiversity remaining after large-scale conversion of the prairie ecosystem. Remnants are repositories of biological, ecological, and cultural values, and deserve preservation and management. They may contain once common animal and plant species now threatened with extinction, or harbor rare populations of species with unique genetic traits and adaptations. Remnants are benchmarks against which to measure the success of modern day prairie restorations, providing a reference point for species composition, ecosystem functions, and soil health. The untilled soils of remnants are the "gold" standards of soil fertility and structure. Ultimately, prairie reconstruction would not be possible without the seed sources and ecological information that remnant prairies offer. The greatest threat to small remnants is continued isolation from gene flow and their vulnerability to disturbance from surrounding land use activities or misguided management within the remnant. Buffering, reconnecting, and restoring prairie on the scale of landscape is critical if native remnant tallgrass prairie is to be preserved as a viable ecosystem well into the future.



Porosity comparison of healthy native prairie soil (left), and compacted farmed soil (right). Image courtesy of Dr. Lee Burras, ISU.

Some species, whether animal or plant, like this federally endangered prairie fringed-orchid (left), exist only in remnant prairie, which cannot be replaced.

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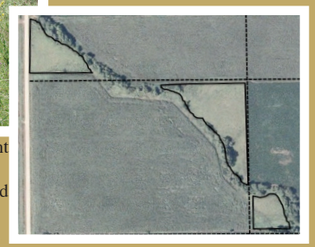
Where do remnants persist?

Surprisingly, remnants do persist in the highly fragmented and intensely farmed landscape of the modern Midwest. Leopold, in first half of the 1900's, observed that prairie plants were "content with any roadside, rocky knoll, or sandy hillside not needed for cow and plow" (Callicott and Freyfogle 1999). These remain likely places to look for remnant prairie, today. Prairie also persist in early transportation corridors (i.e., rights-of-way) for roads and railroads, and recovering pastures if not too heavily grazed. Prairie may persist in out-of-the-way corners of farm fields cut off by creeks or otherwise inaccessible to tillage equipment and protected from herbicide drift. Historic old-settler cemeteries, established on prominent hilltops and fenced from grazing may harbor remnant prairie. Many of these sites have been mowed at times in the past but recovered when mowing ceased, or the prairie plants survived in the surrounding fence line. A few are preserved as prairie and maintained by volunteers and county or state resource managers.

Formerly grazed, prairie persist on steep slopes and thin soils at Blackmun Prairie (above). A patch of prairie in a pioneer cemetery in Ida county (right).

Aerial photographs, particularly infrared, can help pinpoint likely areas to field check for prairie remnants. Knowledge of the vigor and density of vegetation and time of year of the photo is key to interpreting the red colors of infrared aerial photography. The red tone of color infrared aerial photographs is usually associated with live vegetation. Very intense reds indicate dense vegetation growing vigorously at the time the photograph was taken. In any case, it's critical to field check potential sites. In Iowa, aerial photographs, including historical, black and white, and infrared, are available from the Iowa Geographic Map Server at http://cairo.gis.iastate.edu/. Aerial photographs are also available at local natural resources conservation service (NRCS) offices.

Infrared aerial photo of Hayden Prairie State Preserve outlined in yellow. Note darker burned area (SW 40 acres square portion and triangular portion center east side).



Series of three high quality remnant prairies (solid outlines) protected from plowing by creek (just beyond trees in photo above) and conjectured property lines (dashed lines).

Until the mid-1900s, prairie hay was prized as high-quality forage for workhorses, and typically harvested once in mid-summer each year. Most prairie hay meadows were lost with the widespread mechanization of farming after World War II. A few hayed prairies remain in areas that were too wet, rocky, or small to row-crop, or where the landowner preserved the practice as a cultural tradition. Awareness of where remnants are likely to persist on the landscape, experience recognizing native plants, and aerial photo interpretation skills are all useful tools in locating remnants. Perhaps the most effective method, however, is to seek out local knowledge from landowners, hunters, and native plant enthusiasts familiar with the area of interest.

> ***"Just as the barbarians burned the libraries which explained the origins of human culture, so have we plowed under the prairie plants which explain the origins of our prairie empire."*** *~Aldo Leopold*
>
> *(For the Health of the Land: Previously Unpublished Essays and Other Writings)*

Are all remnants the same?

No two remnants are alike. Some may be wet prairie, while others may be dry prairie, or anywhere in between. Likewise, many other types

remnant native plant communities exist, including wetlands (fens, bogs, seeps, sedge meadows, etc.) and woodlands (forest, open woodlands, savannas).

Native Species Diversity

One important measure of remnant quality is the number of native species present. Ecologists refer to the number of species present on a site as species richness. A site with 80 plant species has greater species richness than a site with 20 plant species. The types of species present and their abundance and distribution are also important considerations of quality.

Prior Land Use History

Information about prior land use at a site may be gleaned from the current or past landowner, local residents, or state or federal agencies. Historic aerial or landscape photographs can add valuable insight into land use history. Original land survey records from the 1800s may indicate whether an area was considered prairie, savanna (categorized variably as 'woodland', 'open/oak woods', 'timber'), or wetland at the time of the survey. This information can be used to guide restoration efforts.

Other Factors Affecting Remnant Quality/Management

Other factors that may affect the remnant's quality and management include the size and shape of the remnant, distance and connectivity to other remnants, and land-use surrounding the remnant (Saunders et al. 1991). The smaller the remnant, the greater the impact external forces (invasive species, herbicide drift, nutrient and water influx) will have on the quality and long-term survival of the remnant. Larger remnants are likely to have greater diversity because they are more likely to encompass different types of habitat, yet high-quality remnants as small as 10 acres (4 ha) may possess most of the local diversity present in a much larger prairie (Robertson et al. 1997). The size of a remnant also determines the potential population size of a species. Larger populations tend to have greater levels of genetic diversity, and thus may be more resilient (adaptive) to environmental stressors and more resistant to extinction (Gilpin and Soule 1986). There is also evidence that seed viability increases with larger populations, possibly because they attract more pollinators and/or are more genetically diverse (Menges 1991). Mitigating these negative impacts to small isolated remnants by modifying surrounding land use will enhance the quality of the remnant areas being preserved.

Exotic and Invasive Species

The presence of exotic (non-native) or invasive species will influence longterm management cost and strategies. Weed species in the first category are considered invasive. Invasive species will lower the remnant's quality over time and can present significant challenges to long-term restoration and management of the site. Applying no management to the site means losing the remnant plant community to the invasive species, yet control methods used on invasive species may in themselves be detrimental to the remnant.

Invasive: weed species that out compete native species and threaten to destroy native plant communities
Persistent: weed species that occur regularly in prairie but are not likely to significantly change native species composition
Opportunistic: weed species that would probably be eliminated with proper management practices

High-quality remnant areas most susceptible to invasion should be given higher priority for management.

Common weedy species of tallgrass prairie

Invasive		Persistent		Opportunistic	
Common Name	***Scientific Name***	**Common Name**	***Scientific Name***	**Common Name**	***Scientific Name***
Canada thistle	*Cirsium arvense*	Smooth brome	*Bromus inermis*	Chicory	*Cichorium intybus*
Crown vetch	*Cronilla varia*	Musk thistle	*Carduus nutans*	Bull thistle	*Cirsium vulgare*
Queen Anne's Lace	*Daucus carota*	Oxeye daisy	*Chrysanthemum leucanthemum*	Smooth sumac	*Rhus glabra*
Cut-leaved teasel	*Dipsacus laciniatus*	Tall fescue	*Festuca arundinacea*	Common mullein	*Verbascum thapsus*
Common teasel	*Dipsacus sylvestris*	White sweet clover	*Melilotus alba*	Conmmon ragweed	*Ambrosia artemisiifolia*
Leafy spurge	*Euphorbia esula*	Yellow sweet clover	*Melilotus officinalis*	Giant Ragweed	*Ambrosia trifida*
Sericia lespedeza	*Lespedez cuneata*	Wild parsnip	*Pastinaca sativa*		
Purple loosestrife	*Lythum salicaria*	Kentucky bluegrass	*Poa pratensis*		
Pampasgrass	*Miscanthus sacchariflorus*	Multiflora rose	*Rosa multiflora*		
Reed canary grass	*Phalaris arundinaceae*	Poison Ivy	*Toxicodendron radicans*		
Buckthorn	*Rhamnus cathartica*	Red clover	*Trifolium pratense*		

Native Plant Identication Resources:

- **Grasses of Iowa.** ***www.eeob.iastate.edu/research/iowagrasses/index.html***
- **Illinois Wildflowers.** ***www.illinoiswildflowers.info/index.htm.*** © 2002-2006 John Hilty
- **Kansas Wildflowers and Grasses.** ***www.lib.ksu.edu/wildflower/***
- **USDA Plants National Database**. ***www,plants.usda.gov/***
- ***An illustrated guide to Iowa prairie plants. 1999.*** Christiansen P, and M. Muller. U. Iowa Press. Iowa City, Iowa. 237p.
- ***Wildflowers of the Tallgrass Prairie, the Upper Midwest.*** 1989 Runkel, S. and D. Roosa. Iowa State University Press, Ames, IA.

Prairie Restoration Resources:

- ***The Tallgrass Prairie Center Guide to Prairie Restoration in the Upper Midwest***. 2010. Smith, D.,Williams, D., Houseal, G., Henderson, K. U. of Iowa Press. 293 pages.
- ***A Practical Guide to Prairie Restoration***. 2001. Kurtz, C. U. of Iowa Press, 56 pages.
- ***The Tallgrass Restoration Handbook.*** 1997. Packard and Mutel, Eds. Society of Ecological Restoration. Island Press. 463 pages
- ***Plant Iowa Natives*** www.plantiowanatives.com

Literature Cited:
- Callicott, J.B. and E.T. Freyfogle. For the Health of the Land: Previously Unpublished Essays and Other Writings. Island Press, 1999.
- Gilpin, M. E., and M. E. Soule. 1986. Minimum viable populations: process of species extinctions. Pages 19-34 in M. E. Soule, editor. Conservation biology: the science of scarcity and diversity. Sinauer, Sunderland, Massachusetts, USA.
- Menges. 1991. Seed germination percentage increases with population size in a fragmented prairie species. Conservation Biology 5:185-164.
- Saunders DA, Hobbs RJ, Margules CR. 1991. Biological Consequences of Ecosystem Fragmentation: A Review. Conservation Biology, 5:1, March 1991.

Assessing Remnant Quality

Assessment gives a measure of the quality of a remnant, which guides and prioritizes long term management objectives. Major influences of quality are native species diversity, (particularly the presence of conservative specie, i.e., those most sensitive to disturbance); prior management history of the site (grazing, overseeding, tiling, grading, etc.); and the presence of exotic or invasive species that pose an immediate threat to the remnant. There are three main objectives of remnant assessment: 1) to determine appropriate management

Remnant Prairie Quality Indicators

Factor	Low Quality	High Quality
native species diversity	low	high
presence of conservative species	absent	present
soil profile	disturbed	undisturbed
past site history	high impact	low impact
invasive species	abundant	few/absent
exotic species	abundant	few/absent
aggressive woody species	dominant	minimal

strategies for the site (i.e., Do No Harm), 2) to monitor the recovery of the remnant in response to management activities, and 3) to prioritize resources for acquisition, preservation, rehabilitation and management of remnant sites. If natural areas are to be compared, inventories of consistent scope and precision must be conducted. A thorough plant inventory requires at least monthly surveys throughout the growing season. Factors that will affect the total number of species identified include the skills of the observer(s), the number of observers, and the amount of time spent surveying the site. It is important to apply equal effort toward each inventory so that meaningful comparisons can be made between sites.

Think you have a remnant and wondering who to call? Contact your County Conservation Board, Iowa Department of Natural Resources field office, or Natural Resources Conservation Service field office. They can direct you to resources to help properly manage, restore, and maintain these priceless fragments of Iowa's biological and cultural heritage.