Management of Sandhills rangelands for greater prairie-chickens

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Greater prairie-chickens fascinate landowners, hunters, and birders alike. Their colorful mating rituals decorate pastures, and their chicks add charm to meadows.

Many landowners want to learn more about managing pastures to increase the number of greater prairie-chickens. Some have a personal desire to conserve the species. Others recognize the fact that these native grouse offer income opportunities in the form of fee-hunting and ecotourism. The more information landowners have, the easier it will be to find these birds and make sure they flourish year after year.

A male greater prairie-chicken displays on a lek on private rangeland in the Sandhills of Nebraska. Photo by Larkin Powell.

Whatever your interest in greater prairie-chickens, learning more about this interesting species will help you maintain their habitat while you maintain your land.

About the Greater Prairie-Chicken

A species of prairie grouse historically found in the central part of North America, the greater prairie-chicken is a frequent attraction among birders and hunters alike. About one-and-a-half times the size of a football, these birds can be identified by their broad chests, brown and beige disorganized stripes, and orange marks above their eyes. Males are also noticeable for their black feather "ears," orange air sacs on their neck, and fanned tails that they display during their mating dance.

The mating dance of the male greater prairie-chickens is a special attraction. During this dance—known as "booming"—the males will flare their head feathers, stomp their feet, inflate their air sacs to show dominance, and produce long, low hums broken up by clucks, whines, and cackles. These sounds are known as "booming calls," and they can be heard from up to one-and-a-half miles away. During booming, males compete with other males for the centermost location of the breeding grounds, areas called "leks." Females will frequent these leks in their process of choosing a mate.

After mating occurs, roughly ¾ of the hens will choose their nesting site within about two miles of the booming grounds. A hen in the Nebraska Sandhills will lay about 10 eggs per nest. Depending upon the success or failure of their nests, females may mate up to four times within a single season.

Special Considerations for the Eastern Nebraska Sandhills

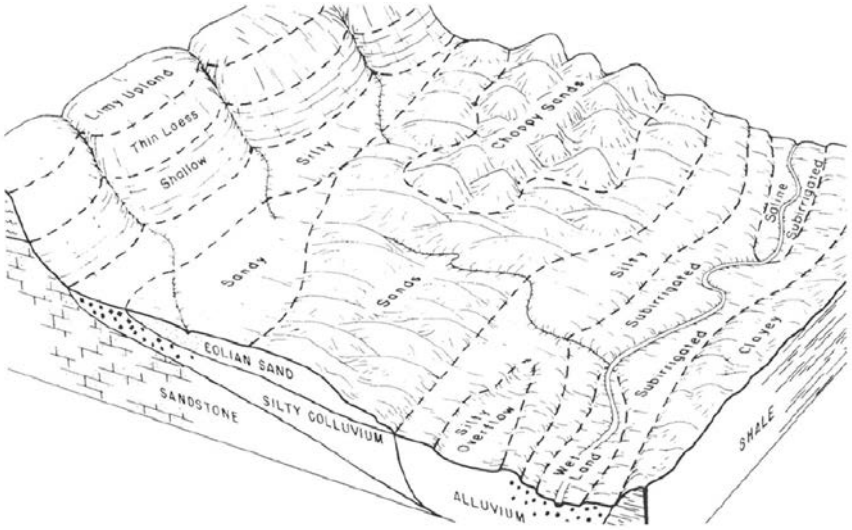
Greater prairie-chickens' territory ranges from central Illinois to eastern Colorado and from central Oklahoma to northeastern North Dakota. They mostly live in areas from eastern Kansas southwards into northeastern Oklahoma and from the Nebraska Sandhills northwards into South Dakota.

Most of the information provided for land management focuses on greater prairie-chickens in tall-grass prairie, but a lot of greater prairie-chickens breed, nest, and live within the more sparsely-vegetated lands of the Nebraska Sandhills. **Here, we outline the best means of managing this region to promote the success of this native year-round resident of the Nebraska Sandhills.**

Definition of Land Types

Due to the variety of terrains in the Nebraska Sandhills, it is important to first understand the types of land and vegetation that provide habitat for the greater prairie-chickens. The Sandhills region of Nebraska is one of the largest grass-stabilized sand dune areas in the world and is covered by a unique combination of plants found in tallgrass prairie, mixed prairie, and shortgrass prairie. The Nebraska Sandhills covers about 13 million acres and provides a wide variety of habitats, from low moisture dune tops to wetlands.

About 90% of the land area is made up of dune formations, or upland prairie. These uplands are covered by a variety of warm-season tallgrasses (such as prairie sandreed and sand bluestem) with a selection of mid- and shortgrasses (such as needleandthread and hairy grama). Broadleaf forbs (such as western ragweed) and shrubs (including leadplant) are also common. The land's natural characteristics and producers' grazing management affect the distribution and types of plants, resulting in patches of different plant densities and heights.



Position of ecological sites in the Sandhills of Nebraska in relation to one another and to topographic features. Figure from UNL EC150.

The ground water is at or near the soil surface in the lowlands between the dunes. The lowlands are generally flat and include subirrgated meadows and wetlands located at the headwaters of creeks, along creeks and rivers, or around lakes. Theses subirrigated and wetland sites are covered by a dense mixture of cool- and warm-season grasses and grass-like plants and, in places, woody plants such as willows. Vegetation on most subirrigated meadows is harvested for hay in July; regrowth is often grazed during the dormant season.

Upland Ecological Sites

Sands:

- Most common type of site in Sandhills.
- Features rolling hills, sandy soil, and slight-to-moderate-grade slopes.
- Surface layer is about 2-9 inches thick and remains dry for much of the year.
- Known for warm-season tallgrasses, native mid- and shortgrasses, forbs, and shrubs.
- Average Visual Obstruction Reading (VOR) >1.4 inches; patches/forb/shrub VOR >4.5 inches.

- Sometimes home to leks; often home to nests and brood rearing.

Sandy:

- Mostly level sites between hills or above meadows.
- Surface layer is about 3-10 inches thick and has loamy/fine sand.
- Vegetation includes warm-season tallgrasses, native mid- and shortgrasses, forbs, and shrubs, as well as some non-native grasses and shortgrasses.
- Average VOR >2.5 inches; patches/forb/shrub VOR >4.5 inches.
- Often include reseeded mixtures of tallgrass with a higher density than native prairie.
- Can be home to leks, nests, and brood rearing.

Choppy Sands:

- Steep hills with frequent erosion/blowouts.
- Surface layer is 2-9 inches thick, sandy-textured, and is very dry during most of the growing season.
- Vegetation similar to Sandy and Sands sites, but is sparser and less productive.
- Rarely home to leks, nests, or brood rearing.

Lowland Ecological Sites

Subirrigated:

- Flat areas near creeks, rivers, and lakes.
- Surface layer is 3-10 inches thick, silty or fine textured, and moist.
- Vegetation is generally dense and made up of tall non-native cool-season grasses and grass-like plants.
- Vegetation can be greatly affected by season and harvest management.
- Often home to leks; may be home to nests and broods, depending on the water levels, haying, and residual vegetation from previous years.

Wetlands:

- Nearly level areas where water table may be above or near the surface.
- Commonly near subirrigated areas.
- Surface layer is 3-24 inches thick and made of silty-clay loam or fine sand.
- Often features a layer of partially decayed plants.
- Vegetation includes dense stands of high-yielding grasses and grass-like plants.
- Not good habitat for leks, nests, or brood rearing.

Considerations for Lek Sites

The greater prairie-chickens generally mate in mid- to late April. As described above, greater prairie-chicken males perform a mating dance to attract a mate. These "booming" dances occur on specific land areas called "leks." Most males return to the same leks year after year.

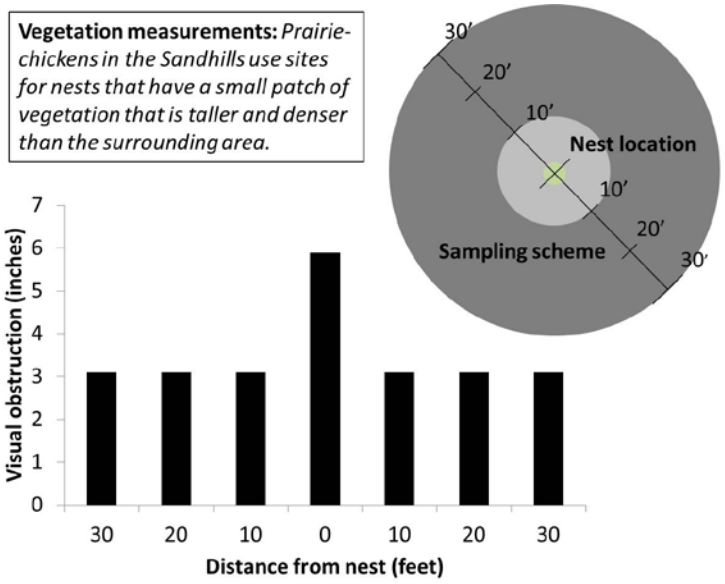
About ¾ of all leks can be found on subirrigated sites. Males choose areas on subirrigated sites where the vegetation has been kept short by haying and/or grazing practices—which makes it easier for females to see the bold display of colors and thereby select a mate.

When looking for booming grounds, check near windmills, hay meadows, or other places where vegetation is short and visibility is good. In late March and April, stand away from your vehicle on mornings that are less windy (<10 mph) and listen for noises that sound like someone blowing on a pop bottle. These booming sounds may carry for up to 1.5 miles.

Land management tips
To manage leks:

- Keep the vegetation short-cropped by haying and/or heavy grazing.
- Avoid daily disturbances to the lek. Ecotourism operations should take care to have guests arrive at a blind before dawn; persons exiting the blind should minimize disturbance.
- Consider removing large trees or poles in the immediate vicinity of the lek if predators commonly harass the booming birds.
- Maintain quality nesting habitats, especially within one mile of the lek. A lek will not form in areas without nearby nesting cover.

Considerations for Nest Sites
Prairie-chickens in the Sandhills are found almost entirely in grasslands used for livestock grazing. Different grazing strategies can change the types of plants in an area over time, which appears to play a valuable role in the birds' nesting habits. It is especially important to note that while greater prairie-chicken hens do not seem to choose their nest sites based upon the species of plant, they do seem to choose sites based upon the previous year's plant growth. Leaving some vegetation in pastures at the end of a growing season will help hens nest next spring.



Vegetation density (as measured by Visual Obstruction Reading, or VOR) near greater prairie-chicken nests during 2009-2011 in the eastern Sandhills of Nebraska. Sampling scheme is shown top right, with VOR sampled at the nest and 10, 20, and 30 feet from the nest in two directions.

Because nesting females are concerned with both their nest's survival *and* their own survival, nest sites for greater prairie-chickens in the eastern Nebraska Sandhills follow a certain logic. First, females use areas of the landscape near the lek for nesting so that they can return to the lek for mating if a nest fails. Researchers have followed radio-tagged hens to nests up to 12 miles from the lek, but long movements are rare. The majority of hens nest within 2 miles of the lek. Second, females need cover for nesting. Prairie-chickens find sites for nesting that have tall, dense vegetation with relatively high VOR as compared to surrounding areas (about 4.5 inches in upland pastures). These high VOR patches are generally less than 10 feet in diameter and are surrounded by shorter grasses with a VOR of about 2.5 inches. Researchers believe that these females choose such sites because they want to find protection for their nest in these denser clumps while still being able to see any coming predators.

Nests commonly are found on upland sites (especially *sands* or *sandy* sites). In grazed landscapes, hens appear to prefer dune tops in the sands ecological site, although nests also are commonly found in small sandy sites (<1 acre in size) or swales within larger sands sites. If the landscape surrounding the lek is mostly meadows where vegetation from the previous year is available, hens will occasionally choose such subirrigated meadows for nest sites. During wet years, birds will be especially likely to use uplands to avoid nest-flooding in lowlands. In contrast, birds may be more likely to select nest sites in meadows in a spring following drought because high grazing pressure during the drought would leave fewer plants in the upland sites. Nest sites may vary from area to area, but the themes of (1) diverse leftover cover from the previous year's vegetation and (2) locations near lek sites are the key to thinking about potential nesting habitats on your property.

The vegetation characteristics of nest sites are somewhat different from one ecological site to another. The patchiness preferred by hens for nests (relatively tall, dense patches less than ten feet across and surrounded by areas of closer-cropped vegetation) is common in lightly to moderately stocked pastures on *sands* and *sandy* sites. The small sandy areas preferred by hens have relatively dense cover; when hens nest in larger sandy sites that have been reseeded, these sites often include more standing dead vegetation and less shrub cover than other ecological sites. The few nests located in the *subirrigated* ecological sites tend to have more forb and shrub cover and less standing dead vegetation cover than other ecological sites. Subirrigated sites provide less appealing nesting habitat because of wet conditions in most years, and because of either the lack of cover on hayed/grazed subirrigated meadows or because of the uniformity of dense, tall cover on subirrigated meadows that are not periodically harvested.

Generally, less than half of prairie-chicken nests will hatch. This number changes from year to year, but predation of up to 60-80% of all nests is natural. Nest success is important for managing prairie-chickens because the success of nests and broods has the greatest influence on overall population numbers. Females may nest up to four times in a season.

Land management tips
Since grazing plays a key role in creating diversity in plant heights and densities, grazing management can have a huge impact on the success of greater prairie-chicken nests. Some key ideas to keep in mind:

- Stock upland Sandhill pastures at low-to-moderate rates to create different levels of VOR in these preferential nesting grounds.
- Avoid leaving excessive litter on the ground, since litter provides shelter to rodents, which increases the number of predators in nesting areas.
- Leave standing dead vegetation (dry forbs, bunches of dead grass) through the winter to help females choose their upcoming nests.
- Manage for clumps of plants – especially bluestems, rose and leadplant, since these bunchy plants are important nesting locations.
- Use rotational grazing at moderate stocking rates or patch-burn grazing to create a diversity of plant communities, densities and heights.
- Keep 30-50% of lands within one mile of leks as hospitable nesting grounds to help maintain and increase prairie-chicken populations.

Considerations for Brooding Sites

In successful nests, eggs generally hatch around the second week of June. Soon after the last egg hatches, the hen will leave the nest and lead her chicks across the landscape to feed on seeds and insects.

The most common causes of chick death are starvation, chilling and predation. Females adapt by choosing brooding sites with vegetation that is dense enough to provide shelter from the sun and predators but thin enough to allow chicks to move. While the density of forbs does not seem to be a major factor in brood site selection, areas with forbs improve the chances of chick survival because of the abundance of insects (food).

As with nesting, the different types of land have different qualities that appeal to prairie-chicken females with broods. Prairie-chicken females with broods are most commonly found on sands ecological sites and tend to choose areas with higher VOR (around 4 inches) and thicker litter cover than what is found in unselected areas. Females with broods seem to avoid lowlands – probably because of high plant density and the greater abundance of predators (especially snakes). When females with broods are found in subirrigated sites, the brood locations tend to have lower VOR and more bare ground than unselected subirrigated sites. Brood sites in reseeded areas of larger sandy sites have more warm-season grass cover and higher VOR than on other upland sites.

Land Management Tips:
While it is hard to control predators and impossible to control weather conditions, following special land management practices for brood rearing sites will help increase chick survival and greater prairie-chicken populations. Some key ideas to keep in mind:

- Graze upland sites so that they have a patchy VOR of about 4 inches.
- Use deferred rotational grazing at moderate stocking rates to create varied plant heights and densities.
- Consider using prescribed fire and grazing in such a way that the plant life is diverse and not uniformly dense.
- Remove smooth bromegrass from brooding sites, since this type of vegetation can cause chicks to get wet and freeze to death. Grow native bunch grasses and widely-spaced rhizomatous grasses instead to provide better habitat for chicks.

Habitat Management for Greater Prairie-Chickens
Land managers can take the steps found throughout this paper to improve habitat to help maintain or increase prairie-chicken populations.

Also, an important part of managing habitat and wildlife populations is to create a monitoring program. To create such a monitoring program, use the table (shown below) to track your prairie-chicken populations.

Populations should be checked at least once a year to see if there are changes in population. The most effective monitoring program is to keep track of the populations of each lek. Counting the number of males on each lek annually will let you see how land management in specific areas has an effect on chicken populations from year to year.

Here are some techniques to keep in mind:

- The number of males on a lek varies each day during the spring. Since leks are generally more stable during mid-March to mid-April, and since females visit leks during late March and early April, counting males during mid-March will help you to avoid counting females.
- A useful approach for counting males is to spend one morning (daybreak to 10:00 a.m.) listening for new leks and confirming that leks from previous years are still active.
- On the next morning, visit active leks and use binoculars or spotting scopes to count males from a distance of 200-300 yards away. Males are typically interested in their competitors on the leks and will not flush unless you get within 200 yards.
- At the end of your observations, walk closer to the lek and flush the birds to double-check your count. Some males will be motionless at the edge of the lek, so the flush improves your count. The birds will return as soon as you leave.

Taking time to check greater prairie-chicken numbers is an enjoyable way to see how the methods you use to manage your lands can help create a deeper relationship with the animals that live and breed in the landscape. You can have a great impact on this beautiful and interesting species.

Important Terms and Tools

Certain terms and tools can help you to understand and use the tips found in this publication.

***Brood*:** A collection of baby chicks. Places where baby chicks are reared are called "brooding sites."

***Forbs*:** Herbaceous broad-leaf plants that grow in meadows or prairies but are not grass. Common types in the Sandhills are western ragweed, cudweed sagewort, stiff sunflower, gromwells, annual sunflower, and prairie clovers. These plants can be sources of food and shelter, making them valuable to greater prairie-chickens.

***Litter Cover*:** Fallen plant material – like leaves and stems – that cover a land area.

***Predation*:** Hunting, specifically in terms of a natural predator killing and eating its prey. The most common predators of greater prairie-chicken nests are snakes, coyotes, skunks, raccoons, red foxes, badgers, crows, and ground squirrels. In the Sandhills, adult chickens often fall prey to coyotes, great horned owls, red-tailed hawks, northern goshawks, and northern harriers.

***Robel Pole*:** An inch-and-a-half wide stick that has markings about every two inches. To use a Robel Pole for measuring VOR (described below), place the pole vertically into the vegetation. Leaving the pole upright in the vegetation, walk five large steps away (four yards) and crouch until you are about three feet off the ground. Look at the pole. The highest mark on the pole that is completely covered by the vegetation is the VOR.

***Shrubs*:** Broad-leaf, woody plants with multiple stems. They are shorter than trees. The most common species in the Sandhills are leadplant, rose, and western sand cherry.

Visual Obstruction Reading (VOR): Gives the height and density of vegetation in a particular area. The VOR is a valuable tool for land managers; it lets managers keep track of and compare vegetation characteristics in different areas. In this paper, you will see VOR used to describe the nest site and brood site characteristics. You can get the VOR by using a Robel Pole (described above).

The proper use of a Robel Pole to measure Visual Obstruction Reading (VOR), a measure of grass density and biomass. Photo by Silka Kempema.

More Information

Visit the USGS management of greater prairie-chickens' site, a part of its series on grassland birds: http://www.npwrc.usgs.gov/resource/literatr/grasbird/gpch/gpch.htm

You will find more about prairie birds at UNL's Prairie Birds web site: http://snr.unl.edu/prairiebirds/papers.asp

Note: In the upcoming year, look for a new UNL Extension Circular on prairie-chicken management. The study that led to this project was funded by the Nebraska Game and Parks Commission with funds from the Federal Aid in Wildlife Restoration Act. We are grateful to William Vodehnal for guidance with our research. We could not have completed our research project without the private landowners who allowed us access to their lands and provided insight on prairie-chickens.

Prairie-Chicken Data Sheet

Property Owners: _____

		Number of Males Counted			
Booming Ground	Location Description	Year _____	Year _____	Year _____	Year _____
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					