

Prairie Dogs and Soil Impacts

Focal points

General:

- Much of the degradation of soils in the urban environments that have prairie dog colonies is the result of considerable human disturbance over long periods of time.
- The soil erosion we tend to see is often due to overgrazing by cattle, which has been well demonstrated by numerous studies (Schlesinger et al. 1990, Van Auken 2000, Reynolds et al. 2007). It is important to keep in mind that black-tailed prairie dogs prefer open patches of grassland, and will move into heavily grazed patches of grassland. This tends to cause the observer to blame the prairie dogs for the degraded state, when in fact the conditions were present prior the presence of prairie dogs.
- Prairie dogs and bison co-existed for thousands of years throughout the central grasslands of North America (Forrest 2005, Miller et al. 2007).
- Current research at Janos, Mexico by researchers at the University of New Mexico and University of Mexico (Davidson et al., unpublished data) involves an exclosure experiment where they are comparing grassland in areas where prairie dogs are present to where they have been removed. The effects of prairie dogs on soil stability (a measure of soil erosion) are measured for this study, which show absolutely no difference (statistically or even qualitatively) in soil stability where prairie dogs are absent versus where they are present over the 2 years (4 seasons) of the study.
- Prairie dog burrows act as aquifers that prevent water from eroding land while helping to cool it.

- Recent studies have shown that 'managed' grasses and forbs atop a prairie dog town are higher in protein and nitrogen and are favored for grazing by bison, elk, and pronghorn.
- a [Prairie dog] burrowing can be beneficial to the soil because mixing soil types and incorporating organic matter enhances soil formation. It also helps to increase soil aeration and decrease compaction.
- In short-grass prairies, the number of plant species, particularly forbs, increases because of the digging and scratching activities of prairie dogs that disturb the soil. These patches of bare soil provide excellent sites for annual forbs to become established. . . . Long-term use of an area by prairie dogs appears to promote buffalograss and grama grasses (Foster & Hygnstrom).
- Prairie dogs do more than just serve as prey, they also perform a valuable service for the prairie – they disturb it. In addition to digging up the soil, prairie dogs clip the vegetation around their burrows, enhancing nitrogen uptake by these plants. Natural disturbances are an important part of maintaining the prairie ecosystem (Kotliar, 2001).

Prairie Dogs, Cattle and Soil Impacts:

The overgrazed conditions that we see when both prairie dogs and cattle co-occur are largely due to cattle being confined to a fenced landscape that no longer reflects the large roaming herds that historically grazed the grasslands.

- Large ungulates are known to preferentially graze on prairie dog colonies because of the more nutritious forage (Whicker and Detling 1988, Miller et al. 2007). This is a counterintuitive phenomenon made logical by the prairie dog's penchant for clearing shrubs that cattle shun, while stimulating weeds they savor (Stolzenburg, 2004).
- Widespread soil erosion is largely caused by overgrazing by cattle, and prairie dogs are known to move into the overgrazed grassland patches.
- Prairie dogs from urban populations provide a key source of prairie dogs for grassland conservation and restoration.

- Like giant earthworms, their excavations were loosening and turning, fertilizing and aerating nearly six tons of hard-baked desert soils per acre, more than eight times the combined output of all kangaroo rats, badgers and other burrowing mammals of the grasslands (Stolzenburg, 2004).

Lethal Control:

- Efforts to simply eradicate prairie dogs from urban areas are short-sighted and do not contribute to the conservation of our native grassland ecosystems.
- Extermination efforts require 72 hours of poisoning to kill the animals. It is an extremely long, inhumane death, and is not something that should be condoned in a civil society. Additionally, extermination efforts indiscriminately kill not only prairie dogs but also other native wildlife.
- A model way to think about prairie restoration would be to utilize displaced urban prairie dog populations as a source to repopulate grassland areas being restored for prairie wildlife. In these restoration areas, animals can be released so they can repopulate areas where they were historically abundant, prior to mass extermination efforts and play their keystone role in grassland ecosystems, which is critical to maintaining grassland biodiversity.

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PRAIRIE DOGS ARE A KEYSTONE SPECIES OF THE GREAT PLAINS

By Nicole Rosmarino/Southern Plains Land Trust

Editor's note: (The following studies show unequivocally that prairie dogs are a keystone species of the Great Plains, that is, their presence – including their colonies, burrows structure and grazing habits– is central to the survival of a multitude of other wildlife)

Prairie Dogs as Prairie Restorationists:

Although there is tremendous documentation of the benefits that prairie dogs provide to wildlife species, both as a prey base and for creating extensive habitat for prairie creatures, it is also important to recognize that prairie dogs may help to redress the damage to the land caused by reckless humanity.

First, prairie dogs act as water conservationists. While humans have devastated the water features of the Great Plains –by damming up rivers and streams for crop and livestock agriculture, and by overgrazing of riparian areas by livestock– prairie dogs increase the ability of an arid region to conserve what little water falls from the sky. One author (Outwater 1996) has remarked on the extensive megapore system prairie dogs can provide for channeling precipitation into the water table. Imagine 100-700 million acres of these megapores diligently directing the scant Great Plains rainfall to underground storage. Imagine also what the reduction of those millions of acres to less than 700,000 acres might mean in terms of increased flooding (where there isn't meant to be flooding) and increased runoff in general.

In addition, prairie dog clipping and digging activities lead to decreases in transpiring leaf area, conservation of soil moisture, changes in soil physical properties, and the promotion of water infiltration to deeper soil depths. All of these factors probably account for the improved soil moisture availability and plant water status on prairie dog colonies (Day and Detling 1994). This improved water status and the higher ratio of green forage on colonies later in the season may explain preferential grazing by bison and antelope (Day and Detling 1994), and, of course, by domestic cattle. In other words, prairie dogs increase the ability of the soil and vegetation in the arid Great Plains to conserve the region's scant precipitation.

Prairie dogs might also redress some of the problems with overgrazing. For instance, prairie dogs can control noxious weeds and native invaders which proliferate on overgrazed rangeland. An example is prairie dog control of mesquite (Miller et al. 1996; Miller and Ceballos 1994). They remove pods and seeds and nip and strip bark from young seedlings, which contributes to seedling mortality. The extermination of the prairie dog may therefore explain the proliferation of honey

mesquite from the late 19th century ("Suffering From a Prairie-Dog Shortage," 1991). Where mesquite proliferates, prairie dogs could serve to control it.

Finally, prairie dogs may also reverse processes such as soil compaction caused by cattle grazing. For example, Ellison and Aldous (1952) provide an early report of the soil aeration effected by burrowing rodents. These rodents produce soil which is substantially softer and looser than soil in uncolonized areas. Such rodents consequently represent a range improvement, which can undo some negative effects on rangeland (e.g. soil compaction) that are caused by domestic cattle.

In the debate over whether or not prairie dogs are a keystone species of the Great Plains, there is no mention of the fact that all studies reviewed took place after prairie dogs had been reduced by 98% (by 1960). How can we assume wildlife has not made significant adjustments in the face of prairie dog scarcity? Our science may very well have totally missed important, close relationships between prairie dogs and a given bird, mammal, or what have you, only because that bird, mammal, or what have you flew or skittered off to greener pastures in the wake of guns and poisons.)

Many of the earlier studies (e.g. Reading/Miller/Whicker/Detling) have been very clear that the biodiversity contributions of prairie dog colonies should be perceived in terms of a grassland mosaic – e.g. a mix of colonized and uncolonized areas, colonized for different lengths of time. If one looks at biodiversity that way, it makes good sense to observe species near or flying over a prairie dog colony, as well as those species on a colony. Prairie dog colonies don't operate in isolation from uncolonized areas, so why should their value to biodiversity levels/associated wildlife be judged in isolation? Landscape-level dynamics should be judged at the landscape-level, not acre by acre.

PRAIRIE DOG ASSOCIATES/DOCUMENTED RELATIONSHIPS

1. Black-footed ferret. This species is an obligate associate of the prairie dogs (Russell et al. 1994). Black-footed ferrets depend on prairie dogs as a primary food source and upon their burrows for shelter from weather and predation. The ferret is completely dependent upon prairie dogs for survival (Henderson et al. 1969). Prairie dogs constitute about 90% of the ferret's diet.
2. Swift Fox. A major portion of the swift fox diet is prairie dogs (Uresk and Sharps 1986). Also of importance is the ability of prairie dogs to provide cover for swift fox. Swift foxes den on or within .8km of prairie dog colonies (Hillman and Sharps 1978).
3. Ferruginous Hawk. That the ferruginous hawk is closely associated with prairie dogs is apparent from research which suggests that ground squirrels and prairie dogs are the top food source for the ferruginous hawk (Olendorff 1993). In addition, researchers have reported the ferruginous hawk's relative abundance in areas with prairie dog acreage (Knowles and Knowles 1994; Cully 1991), and Canada has emphasized the importance of prairie dogs and burrowing mammals associated with prairie dog colonies in the recovery of ferruginous hawk populations (Canadian Ferruginous Hawk Recovery Plan 1994).
4. Mountain Plover. The mountain plover may be a prairie dog obligate (Knowles and Knowles 1994), and is, at minimum, highly dependent on prairie dogs for survival. Knowles and Knowles (1998) report that mountain plovers select prairie dog colonies for nesting, breeding and feeding. Other reports concur, showing, for example, that mountain plovers use prairie dog towns as nest sites (BLM 1979, cited in Clark et al. 1982), and they strongly prefer the short-cropped vegetation on

prairie dog towns (Knowles et al. 1982), which facilitates their insectivorous feeding (Olson 1985).

5. Burrowing Owl. Prairie dog colonies provide the burrowing owl with both shelter and increased prey abundance (Agnew et al. 1987). Consequently, the decline in prairie dog habitat causes declines in burrowing owl numbers (Knowles and Knowles 1994).

6. Golden Eagle. The golden eagle has long been described as an important prairie dog predator, with current predation probably “second only to badger predation” (Campbell and Clark 1981, 273). More recent reports echo the importance of the golden eagle as a prairie dog predator (Hanson 1993), with some researchers declaring that, in the Northern Great Plains, “wherever prairie dogs are found, golden eagles can also be found” (Knowles and Knowles 1994, 35). When golden eagles nest near prairie dog towns, prairie dogs comprise 50-62% of their diet (Tyus and Lockhart 1979).

7. Badger. Badgers are commonly associated with prairie dog colonies. Knowles and Knowles (1994) write “Generally, the more abundant prairie dogs are in an area, the greater the chances of encountering badgers.” According to Campbell and Clark (1981), badgers are possibly the most significant predator of prairie dogs. Lindzey (1982) concurs. 8. Coyote. Coyotes have been named as important predators of prairie dogs by some researchers (Tyler 1968; Koford 1958; Longhurst 1944; Sperry 1941).

9. Prairie Falcons. One researcher reported the majority of predation on prairie dogs was done by prairie falcons (Knowles 1982). Knowles and Knowles (1994) expect that, should good nesting habitat exist for prairie falcons near prairie dog towns, a significant portion of the falcons diets would be prairie dog.

10. Bison. The preference of bison (buffalo) for grazing, breeding, and resting in prairie dog towns has been demonstrated by other researchers (Whicker and Detling 1993; Coppock et al. 1983b). Even more interesting, Krueger (1986) found that bison and prairie dogs have a mutually positive relationship, as the foraging efficiency of prairie dogs increases in the presence of bison, and bison, in turn, prefer the vegetative conditions caused by prairie dogs.

11. Pronghorn. This ungulates preferentially grazes on prairie dog colonies, on account of the abundance of forbs that typify colonized areas (Whicker and Detling 1993; Krueger 1986; Wydeven and Dahlgren 1985). 12. Elk. This ungulate preferentially grazes on prairie dog colonies in the summer months (Wydeven and Dahlgren 1985).

13. Mule deer. This ungulate also preferentially grazes on prairie dog colonies (Foster and Hyngstrom, n.d.).

14. Horned Lark. This bird has been reported to be found in higher abundance on prairie dog colonies than in surrounding mixed-grass prairie (Agnew et al. 1986).

15. Mourning Dove. This bird has been reported to be found in higher abundance on prairie dog colonies than in surrounding mixed-grass prairie (Agnew et al. 1986; Clark et al. 1982).

16. Killdeer. This bird has been reported to be found in higher abundance on prairie dog colonies than in surrounding mixed-grass prairie (Agnew et al. 1986; Clark et al. 1982).

17. Barn Swallow. This bird has been reported to be found in higher abundance on prairie dog colonies than in surrounding mixed-grass prairie (Agnew et al. 1986).

18. Long-billed Curlew. Prairie dog colonies are reported to benefit this bird (Clark et al. 1982; BLM 1979).
19. Eastern Kingbird. Prairie dog colonies are reported to benefit this bird (Clark et al. 1982; BLM 1979).
20. Upland Sandpiper. Prairie dog colonies are reported to benefit this bird (Clark et al. 1982; BLM 1979).
21. McCown's Longspur. Prairie dog colonies are reported to provide nest sites for this bird (Clark et al. 1982; BLM 1979).
22. Snowy Owl. This bird has been documented utilizing prairie dog colonies in the winter months (Sharps and Uresk 1990).
23. Bald Eagle. This bird has been documented utilizing prairie dog colonies in the winter months (Sharps and Uresk 1990), as prairie dogs can provide a portion of this bird's diet (City of Boulder, CO, Open Space Dept. 1996).
24. Red-tailed Hawk. This bird has been documented utilizing prairie dog colonies in the spring, summer and fall months (Clark et al. 1982), as prairie dogs can provide a portion of this bird's diet (City of Boulder, CO, Open Space Dept. 1996).
25. Kestrel. This bird has been documented utilizing prairie dog colonies in the spring, summer and fall months (Clark et al. 1982).
26. Rough-legged Hawk. This bird has been documented utilizing prairie dog colonies in the spring, summer and fall months (Clark et al. 1982).
27. Harrier. This bird has been documented utilizing prairie dog colonies in the spring, summer and fall months (Clark et al. 1982), as prairie dogs can provide a portion of this bird's diet (City of Boulder, CO, Open Space Dept. 1996).

28. Short-eared Owl. This bird has been documented utilizing prairie dog colonies in the spring, summer and fall months (Clark et al. 1982).

29. Deer Mouse. This small mammal has been reported to be found in higher abundance on prairie dog colonies than in surrounding mixed-grass prairie (Agnew et al. 1986).

30. Northern Grasshopper Mouse. This small mammal has been reported to be found in higher abundance on prairie dog colonies than in surrounding mixed-grass prairie (Agnew et al. 1986).

31. Desert Cottontail. Prairie dogs enhance habitat for desert cottontails. In one study, no cottontails could be found prior to the establishment of a prairie dog town, but after the dogtowns were established, cottontails were present in densities of .81-1.33/ha on colony, in contrast with .03-.05/ha off-colony. (Hansen and Gold 1977).

32. Prairie rattlesnake. The greater abundance of small mammals in prairie dog colonies (Agnew et al. 1986), and the availability of prairie dog burrows for shelter, have been cited as factors for rattlesnakes to utilize prairie dog towns (Knowles and Knowles 1994).

33. Great Plains Toad. The greater availability and abundance of insects on prairie dog towns, and the availability of prairie dog burrows for shelter, have been cited as factors for this toad to utilize prairie dog towns (Knowles and Knowles 1994).

Our Prairie Parks in motion:

GPRC is creating the following Prairie Parks through our two social work programs Restoration Not Incarceration™ & Plains Youth InterACTION™

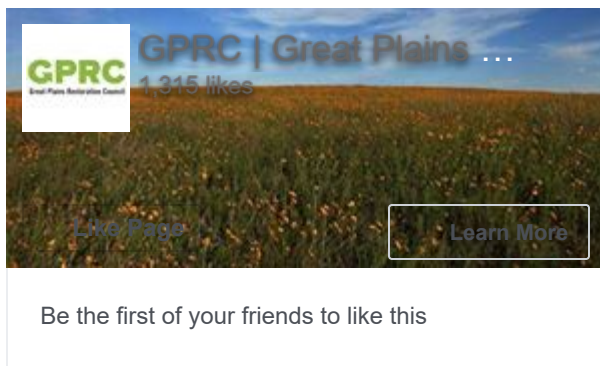
» Fort Worth Prairie Park, TX

» Esteban Park, Houston, TX

» Oglala Prairie Preserve Pine Ridge Indian Reservation, SD

» Galisteo Basin Preserve, Santa Fe County, NM (Completed)

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Contact Information

Great Plains Restoration Council

PO Box 1206

Fort Worth, TX 76101

832-598-GPRC(4772)

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Great Plains Restoration Council is a 501(c)3 non-profit Ecological Health organization that helps people take care of their own health through restoring and protecting native ecosystems, particularly damaged prairies, plains, and waters. GPRC teaches Ecological Health practices and principles around the country, as well as uses the literary arts and other media to broaden awareness and community engagement.

