

Prairie Dog Poisoning in Northern Great Plains: An Analysis of Programs and Policies

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ABSTRACT / This paper describes the programs and policies regarding prairie dog control in the northern Great Plains states of Montana, South Dakota, and Wyoming. The poisoning programs of federal and state agencies are described, along with the statutes and legal mandates that shape agency management of prairie dogs. Current policies on National Grasslands and other federal lands typically limit prairie dogs to small percentages of available potential habitat, to the detriment of prairie dogs and associated species. State programs to assist landowners in prairie dog

control differ greatly, employing cost-share incentives (Wyoming) and regulatory fines (South Dakota) to encourage the poisoning of prairie dogs. Prairie dog control is not actively funded or practiced by state or county agencies in Montana. We document federal and state involvement in more than 1 million acres of prairie dog poisoning in the study area during 1978–1992. In combination with undocumented poisoning by private landowners, plague, and shooting, prairie dogs may be experiencing net regional declines, contributing to the disintegration of the prairie dog ecosystem. We recommend that Animal Damage Control operations concerning prairie dogs be terminated, on the basis that they duplicate state programs and are at cross purposes with federal wildlife management programs that seek to perpetuate and/or recover wildlife species that depend on the prairie dog ecosystem. We further recommend that federal range improvement funds be offered as subsidies for the integration of prairie dogs in range management, as opposed to funding prairie dog eradication programs.

The prairie dog (*Cynomys* spp.), a burrowing rodent of the Great Plains and intermountain basins of the eastern Rocky Mountains of North America, occurs from lower Saskatchewan to northern Chihuahua, Mexico (Anderson and others 1986). Prairie dogs live in discrete colonies of different sizes, up to thousands of hectares, spread over the landscape in varying proximity to one another. Colonies are readily identifiable by the conspicuous mounds of soil excavated by the prairie dogs' burrowing. The burrow systems provide a means for shelter and escape for the prairie dogs (Clark 1977).

Prairie dog burrowing activity creates conditions that result in high biodiversity within the grassland biome. Prairie dog excavations result in the movement and mixing of soil, which is richer in nitrogen, phos-

phorus, and organic matter than soils in adjacent grasslands (Sharps and Uresk 1990). Prairie dogs continuously clip the vegetation within and adjacent to colonies, which maintains the vegetation in a constant state of regrowth during the growing season. This young vegetation, higher in nutritional qualities than mature growth, attracts large herbivores, such as cattle, bison, and pronghorn (Sharps and Uresk 1990, Whicker and Detling 1993). Other species are attracted to prairie dog colonies because of the structural complexity created by the burrows and mounds and the heterogeneous vegetative composition caused by prairie dog grazing. Subsequently, many predatory birds and mammals are attracted to prairie dog colonies as foci of potential prey (Campbell and Clark 1981, Agnew and others 1986). Species richness increases as prairie dog colony size and regional colony density increase (Reading 1993).

Formerly, prairie dogs were abundant on the prairies of the continent. Merriam (1902) estimated that areas occupied by prairie dogs in the late 1900s totaled about 100,000,000 ha. A single colony 160 km wide and 400 km long was documented in Texas, while elsewhere colonies 100 km in diameter were not uncommon (An-

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derson and others 1986). Prairie dogs probably occurred in mosaic patterns across the landscape wherever they were not limited by topography and soils (see, e.g., Flath and Clark 1986) and may have been aided in their establishment by heavy grazing by large ungulates, primarily by bison and later by cattle.

Prairie dog distribution changed radically with the human settlement of the Great Plains. An early priority for these newcomers was eradication of prairie dogs and other ground-dwelling rodents (Clark and others 1986, Dunlap 1988). Through the use of strychnine baits and the plow, less than half of the original area inhabited by prairie dogs, about 40,000,000 ha, remained by the turn of the century (Nelson 1919, Anderson and others 1986). Increased involvement of federal and state governments in prairie dog poisoning in the early 1900s rapidly eliminated remaining prairie dogs from much of their former range. From 1916 to 1920, 13,000,000 ha of prairie dogs were poisoned under federally supervised programs (Bell 1921). By 1960, western rangelands contained only 2%–5% of the original prairie dog distribution (Anderson and others 1986), Miller and others 1994, Society for Conservation Biology 1994).

The prairie dog ecosystem has long been regarded as one of the significant ecological themes occurring within the Great Plains (Seton 1929, Society for Conservation Biology 1994). Prairie dogs are critical to the black-footed ferret (*Mustela nigripes*, Henderson and others 1969), mountain plover (*Charadrius montanus*, Knowles and others 1982), ferruginous hawk (*Buteo regalis*, Cully 1991), and swift fox (*Vulpes velox*, Uresk and Sharps 1986), which are either listed or currently considered for listing pursuant to the federal Endangered Species Act. The US Fish and Wildlife Service recently denied a petition to list the black-tailed prairie dog as a candidate species, while recognizing their importance as a keystone species. Despite the interest and importance of conserving the prairie dog, poisoning of prairie dogs continues to the present. Reductions in prairie dog numbers have been linked to declines in several vertebrate associates of prairie dogs (Anderson and others 1986, US Fish and Wildlife Service 1994), but little effort has been made to assess the impacts of control on prairie dogs and associated species. Any conservation plan for prairie dogs and species dependent on the prairie dog ecosystem must address how prairie dog control is practiced and what effects control is currently having on the prairie dog.

We attempted to identify the means and quantify the effects of poisoning programs by surveying public land managers and local pest control boards in three northern Great Plains states: Montana, South Dakota, and Wyoming. Poisoning programs are, for the most part, directed at the black-tailed prairie dog, *Cynomys ludovici-*

anus, the easternmost and most densely colonial member of *Cynomys*.

Poisoning Programs

Each state achieves prairie dog management through widely different approaches (Figure 1). Generally, poisoning involves participants at the federal, state, and local level, as well as technical and financial connections between all three levels of government and the private sector. Although some private sector control can be documented from technical assistance records of state and federal agencies, prairie dog control on private lands is essentially decoupled from oversight of any governmental entity and, therefore, from reliable accounting. Thus, most of our discussion focuses on governmental involvement in prairie dog poisoning.

Federal Prairie Dog Control

Federal agencies, including the US Forest Service (USFS), the US Bureau of Land Management (BLM), the US National Park Service (NPS), and the US Fish and Wildlife Service (USFWS) may become involved in prairie dog poisoning through their role as federal land managers. Other agencies, including the US Bureau of Indian Affairs (BIA) and the US Animal Damage Control division of the Animal, Plant and Health Inspection Service (APHIS ADC), fund or carry out poisoning as part of their agency mandates.

Forest Service. The US Forest Service manages land under the Multiple-Use-Sustained Yield Act of 1960 [MUSY, 16 United States Code (U.S.C.) § 528 et seq.] and the National Forest Management Act (NFMA, 16 U.S.C. § 1600 et seq.) for the primary uses of timber production, recreational rangeland grazing, watershed preservation, and fish and wildlife habitat. National grasslands, where most prairie dogs occur, are included under the national forest system [16 U.S.C. § 1609 (a)] and must apply all rules and regulations pertaining to the national forest system [36 Code of Federal Regulations (C.F.R.) § 213.3].

The US Forest Service animal damage management policy is to:

Conduct animal damage management activities when necessary to accomplish multiple-use objectives. Control animals when they: (1) threaten public health or safety; or (2) cause or threaten to cause damage to threatened or endangered animals or plants, other wildlife, permitted livestock, or other resources, on National Forest System lands or private property [US Forest Service 1991a].

In 1991, the US Forest Service signed a Memorandum of Understanding with the APHIS to: (1) delegate animal damage management responsibilities on national forest system lands; (2) establish general guidelines of field

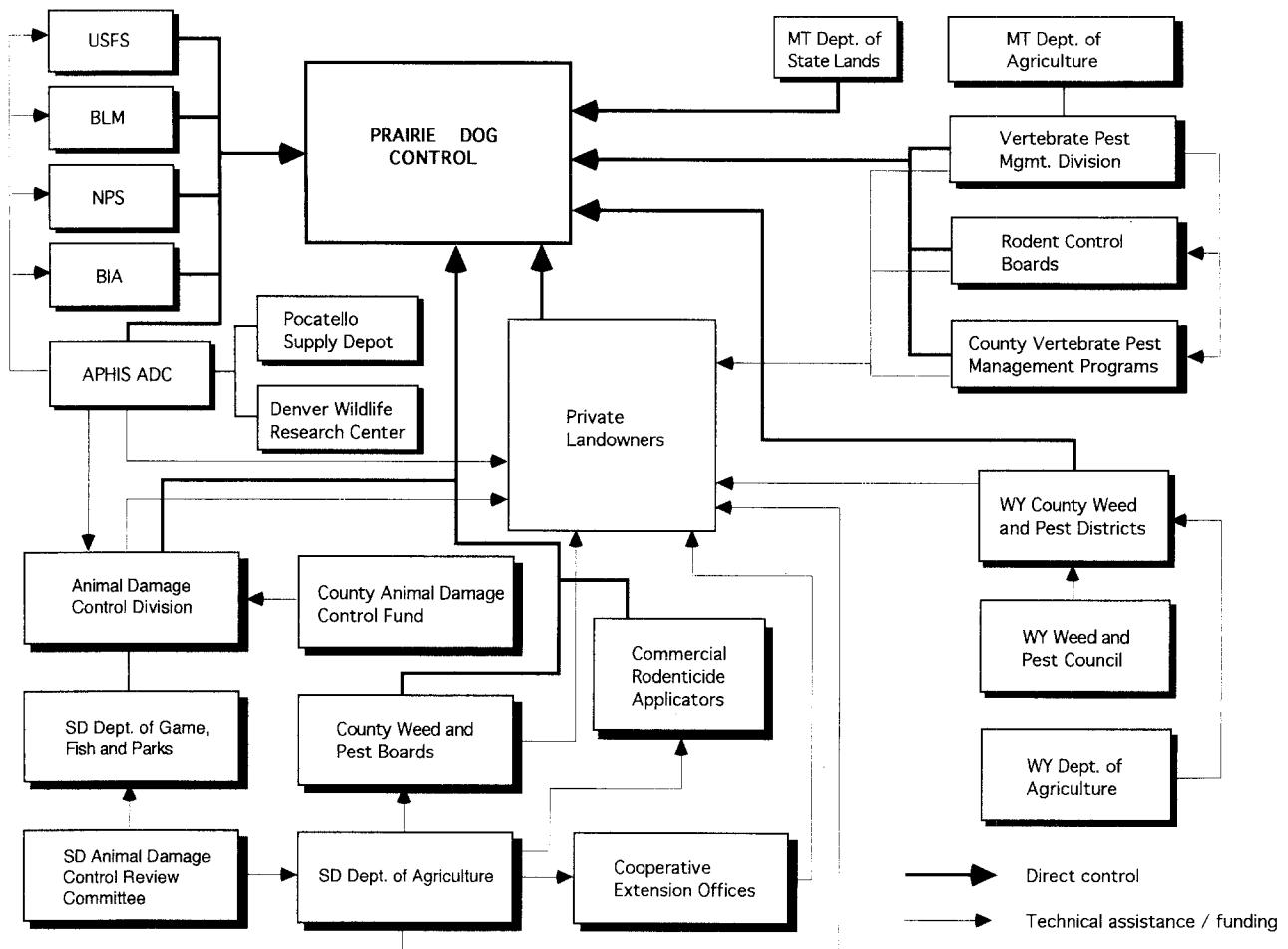


Figure 1. Organization of prairie dog control in the northern Great Plains.

operations; and (3) encourage cooperative interagency support (US Forest Service 1991b). The 1991 MOU and other sidebar agreements essentially grant APHIS ADC authority to make all decisions regarding animal damage management on the national forest lands (AFSEEE 1993).

US Forest Service's damage control policy is tempered, however, by the federal regulations implementing the NFMA (36 C.F.R. § 219.19). The NFMA requires the secretary of Agriculture to promulgate regulations that:

shall include...specifying guidelines for land management plans developed to achieve the goals for the program which...provide for diversity of plant and animal communities based on the suitability and capability of the specific land area...within multiple use objectives of [the] land management plan...[16 U.S.C. § 1604 (g) (3) (B)].

Under the NFMA regulations, "habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area." A "viable" population "shall be regarded as

one that has the estimated numbers and distribution of reproductive individuals to insure its continued existence" (36 C.F.R. § 219.19). Further, "[h]abitat determined to be critical for threatened and endangered species shall be identified, and measures shall be prescribed to prevent the destruction or adverse modification of such habitat" [36 C.F.R. § 219.19(a)(7)].

One authority on the NFMA has stated that the regulations require the US Forest Service "to treat the wildlife resource as a controlling co-equal factor in forest management" (Wilkinson and Anderson 1985). Prairie dogs, however, seldom receive such treatment in practice. For example, the Nebraska National Forest in South Dakota allows for a maximum of 7649 ha (18,900 ac) of prairie dogs (including treated and untreated colonies), comprising 3% of the 242,817 ha of available grasslands (US Forest Service 1989). Untreated prairie dogs will be allowed to reach a maximum of 3238 ha (8000 ac), approximately 1% of the potential habitat (US Forest Service 1989). The remainder of the grassland is man-

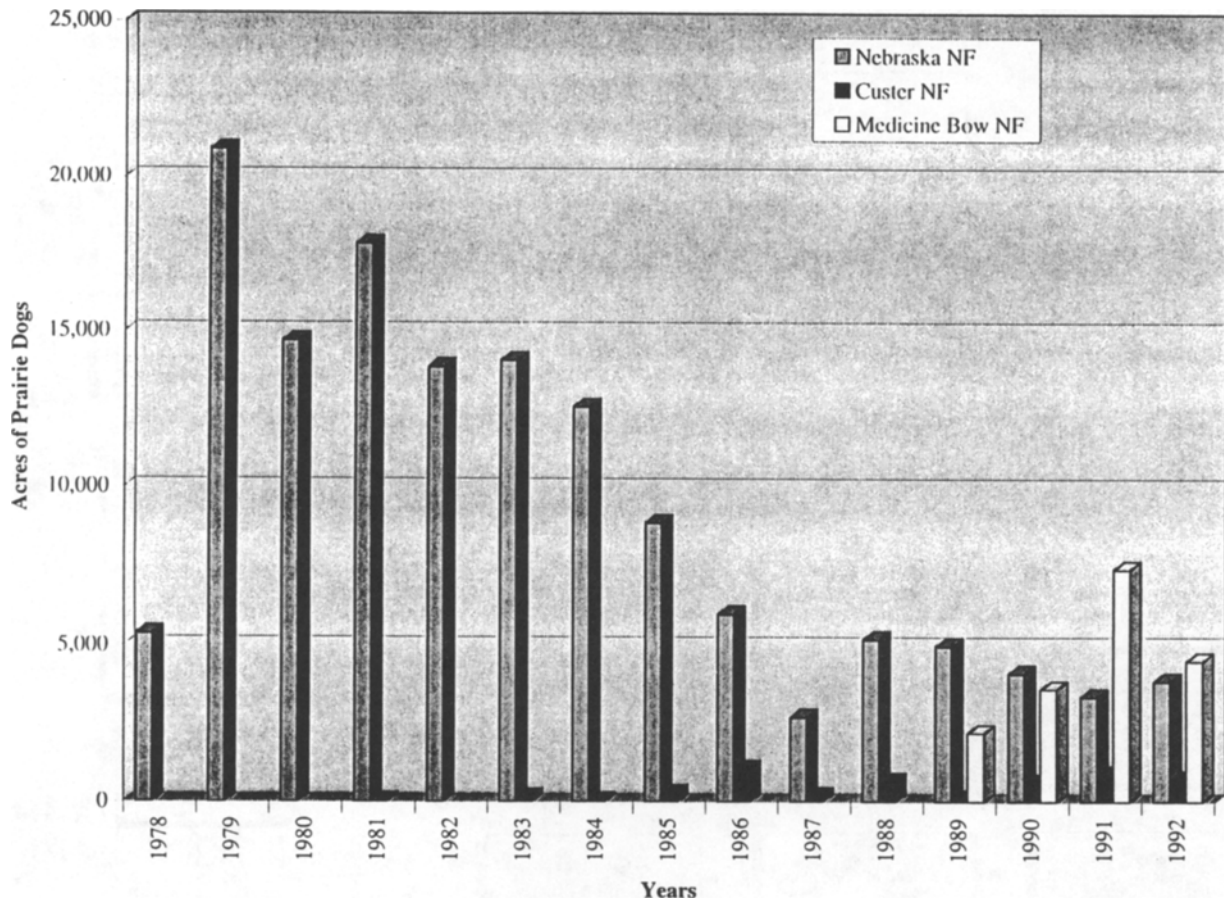


Figure 2. Acres of prairie dogs poisoned on federally managed National Grasslands (US Forest Service) in the Northern Great Plains, 1978–1992 (sources: Heiser 1993; U.S. Forest Service 1993).

aged for livestock grazing and other uses. Similarly, the Thunder Basin National Grassland in Wyoming, managed by the Medicine Bow National Forest, has determined it will maintain only 907 ha (2240 ac) of prairie dogs, less than 1% of the 153,784 ha of the grassland suitable for prairie dogs (US Forest Service 1981). The Custer National Forest, managing grasslands in South Dakota and North Dakota, has determined that only 1051 ha (2597 ac) of grasslands under its management, less than 0.3% of the 485,000 ha available, will be managed for prairie dogs (Knowles and Knowles 1994).

Meanwhile, poisoning on national forest managed lands in the northern Great Plains is in some cases substantial (Figure 2). The Nebraska National Forest poisoned 55,756 ha (137,772 ac) of prairie dogs from 1978 to 1992, at a cost of \$616,000 (US Forest Service 1992). This cost estimate includes, in some cases, administrative and survey costs and also includes funds contributed by grazing permittees. From 1989 to 1992, 7163 ha (17,700 ac) were poisoned on the Medicine Bow National Forest in Wyoming (Heiser 1993). The Custer

National Forest, which does not keep strict accounts of its poisoning activities, poisoned at least 1861 ha (4600 ac) from 1982 to 1992 (US Forest Service 1993).

Funding for prairie dog control on national forest system lands comes from several sources. The Thunder Basin National Grassland allocates conservation practice funds, derived from livestock grazing fees, for prairie dog control (Heiser 1993). Permittees typically contribute between 5% and 10% of the treatment costs on the grassland (Heiser 1993). In fiscal year (FY) 1992 the Thunder Basin National Grassland could not provide adequate funding for prairie dog control, so the Converse County Weed and Pest Control District paid for 80% of the control program on the grassland (Reichenbach 1993). Other national forests fund prairie dog control from general appropriated funds, conservation practice funds, and funds contributed by permittees (US Forest Service 1989).

National Park Service. The NPS Organic Act of 1916 directs the NPS to: "conserve the scenery and the natural and historic objects, and the wildlife therein and to

provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (16 U.S.C. § 1 et seq.). NPS biological resource management policy seeks "to perpetuate the native animal life...as part of the natural ecosystems of parks" (US NPS 1988). However, NPS management policy defines "animal or plant populations that interfere with the purposes of the park" as pests, which may be controlled

to prevent outbreaks of the pest from spreading to forests, trees, other plant communities, or animal populations outside the park...to preserve, maintain, or restore the historical integrity of cultural resources...to manage a human health hazard as defined by the Centers for Disease Control or to protect against a significant threat to public safety [US NPS 1988].

Prairie dogs are managed by the NPS under integrated pest management guidelines that direct managers to consider several options, including the use of rodenticides, for the management of problem prairie dogs. The use of rodenticides for prairie dog control requires approval by the regional and Washington offices, based on a review "of all other available options (e.g., mechanical, physical, biological, cultural, and regulatory) and a determination that these options are either not acceptable or not feasible" (US NPS 1988).

During 1982–1992 prairie dogs have been controlled by poisoning or shooting at four NPS units in the northern Great Plains: Badlands National Park, South Dakota (2195 ha; 5423 ac); Wind Cave National Park, South Dakota (778 ha; 1922 ac); Theodore Roosevelt National Park, North Dakota (trace amounts); and Devils Tower National Monument, Wyoming (trace amounts) (US NPS 1992). Prairie dog control efforts are funded out of the operations budget of the NPS and are not recorded as a separate line item (Cables 1993).

Bureau of Land Management. The BLM manages over 65 million hectares of rangeland in the western United States under authority of the Federal Land Policy and Management Act of 1976 (FLPMA, 43 U.S.C. § 1701 et seq.). BLM lands are managed under multiple-use and sustained-yield principles. There are approximately 22,000 grazing allotments on BLM lands (US GAO 1990).

BLM prairie dog management policy in Montana and the Dakotas is to maintain at least one area in each state that is capable of supporting a viable population of black-footed ferrets (US BLM 1983). In addition, certain prairie dog colonies are maintained as habitat for designated associated wildlife species and kept for public uses such as research, photography, and recreational shooting. Prairie dogs not serving these purposes may be controlled:

[w]here it has been documented through field investigation that prairie dogs cause unacceptable damage to public resources, such as soil

loss or destruction of vegetation, a variety of land treatments including prairie dog control will be considered for rehabilitating rangelands. Other treatments may include such practices as watershed improvements and manipulation of livestock grazing [US BLM 1983].

The Judith, Valley, and Phillips resource areas in Montana propose to maintain prairie dog acreage at 1988 levels (14,091 ac) (US BLM 1992a). Excess prairie dog acreage may be controlled at an estimated annual cost of \$3700–18,500 (US BLM 1992a). However, since 1983, documented prairie dog control efforts by the Montana State Office of the BLM total 149 ha (369 ac) poisoned in Phillips County, Montana (Connell 1993) and 26 ha (65 ac) in Butte County, South Dakota (US BLM 1992b).

In contrast, the Wyoming BLM has no state-level policy. Poisoning is left to the discretion of area managers (see, e.g., US BLM 1986). In FY 1988 the Newcastle Resource Area permitted control on 283 ha (700 ac) of BLM rangeland. The poisoning was conducted by local ranchers under technical supervision of APHIS ADC as part of a larger control effort that covered 785 ha (1940 ac) of state, federal, and private land (US APHIS ADC 1988). Virtually no poisoning occurs in the western half of the state, where BLM lands are occupied by the white-tailed prairie dog (see, e.g., US BLM 1986).

Bureau of Indian Affairs

The Bureau of Indian Affairs (BIA) has a trust responsibility to oversee management of Indian lands under authority of the Indian Reorganization Act of 1934. Under its trust responsibilities, the BIA is authorized to:

make rules and regulations... to restrict the number of livestock grazed on Indian range units to the estimated carrying capacity of such ranges, and to promulgate such other rules and regulations as may be necessary to protect the range from deterioration, to prevent soil erosion, to assure full utilization of the range and like purposes.

During 1980–1984, in response to a lawsuit brought by the American Farm Bureau, the BIA conducted one of the largest and most expensive prairie dog poisoning efforts in history at the Pine Ridge Indian Reservation in South Dakota. Congress appropriated approximately \$6.2 million for the poisoning of 185,600 ha (458,618 ac) of prairie dogs (Miller and others 1990), at a cost of about \$3.00/prairie dog killed (Sharps 1988). From 1985 to 1986 an additional 97,100 ha (240,000 ac) were retreated (Hanson 1988).

In 1991 Congress appropriated \$256,000 for prairie dog poisoning on the Cheyenne River and Rosebud Indian reservations in South Dakota (US BIA 1991). This effort was halted by a finding of the US Fish and Wildlife Service that the program would jeopardize the

black-footed ferret and by potential legal proceedings from the Defenders of Wildlife (US BIA 1992b). In response, the two reservations have adopted separate plans. The Rosebud Sioux plan will budget \$5.94 million for prairie dog control over a three- to five-year period (US BIA 1992b). The Cheyenne River Sioux plan, however, represents a significant break from past practices:

"Prairie Management Plan" is a proposed project based on Lakota cultural traditions and improved range management techniques which will result in restoration of the prairie ecosystem and the coexistence of prairie dogs and other wildlife species with livestock. Although the catalyst has been the matter of black-tailed prairie dogs... and black-footed ferrets, the project is directed at correcting a much broader problem—outmoded range management practices geared towards the single purpose of cattle production [US BIA 1992a].

As of this writing, the \$10.4 million Prairie Management Plan has not been funded (US BIA 1992b).

Approximately 3150 ha (7783 ac) of prairie dogs were poisoned on the Fort Belknap Reservation in Montana from 1978 to 1986 and about 1415 ha (3496 ac) on the Northern Cheyenne Reservation in Montana in 1984 (FaunaWest 1993). During 1992–1994 Congress appropriated approximately \$100,000/yr for the development of prairie dog ecosystem management plans and range improvements on each reservation (Knowles personal communication).

Funding for prairie dog control on Indian land is generally through direct congressional appropriation through the Department of Interior. In the 1990 appropriations bill, Congress directed the BIA to work cooperatively with the tribes and the US Fish and Wildlife Service to "avoid poisoning wherever possible" and develop prairie dog management plans that will not interfere with recovery efforts for the black-footed ferret (US BIA 1992a).

Animal and Plant Health Inspection Service; Division of Animal Damage Control. The Animal Damage Control division within the US Department of Agriculture's Animal and Plant Health Inspection Service (APHIS), derives its mandate from the 1931 Animal Damage Control Act, 7 U.S.C. § 426:

The Secretary of Agriculture is authorized and directed to conduct such investigations, experiments, and tests as he may deem necessary in order to determine, demonstrate, and promulgate the best methods of eradication, suppression, or bringing under control on national forests and other areas of the public domain as well as on State, Territory, or privately owned lands of... prairie dogs... and other animals injurious to agriculture, horticulture, forestry, animal husbandry, wild game animals, fur-bearing animals, and birds... and to conduct campaigns for the destruction or control of such animals: Provided, that in carrying out the provisions of this section the Secretary of Agriculture may cooperate with States, individuals, and public and private agencies, organizations, and institutions.

APHIS does not have a specific management policy regarding prairie dogs (Clay 1993). In practice, few

management options are routinely exercised or recommended by APHIS ADC other than the use of strychnine, zinc phosphide, aluminum phosphide, gas cartridges, quick-kill traps, or shooting on sight (US APHIS ADC 1994). APHIS ADC does not consider integrated pest management techniques, such as adjusting grazing regimes or selective planting to exclude prairie dogs, or biological control, such as encouraging raptors or other predators (US APHIS ADC 1994).

APHIS ADC responds to damage associated with prairie dogs through a combination of direct control and technical assistance. Technical assistance includes consultations, demonstrations of control techniques, public service announcements, technical assistance surveys, and the sale or distribution of poison bait (US APHIS ADC 1990, 1991). Direct control techniques include the use of zinc phosphide oats, sodium nitrate gas cartridges, aluminum phosphide tablets, and shooting (US APHIS ADC 1990, 1991). In addition to control activities coordinated through APHIS ADC state offices, APHIS ADC conducts research on prairie dog control methods at the Denver Wildlife Research Center in Colorado, and manufactures rodenticides at the Pocatello Supply Depot in Idaho (US APHIS ADC 1994).

Nationally, APHIS ADC used rodenticides to directly control 13,218 ha (32,663 ac) of prairie dogs in 1990, of which 3520 ha (8696 ac) were located in South Dakota (US APHIS ADC 1990). In 1991, prairie dogs were controlled on 11,000 ha (27,489 ac) with 3451 ha (8258 ac) in South Dakota (US APHIS ADC 1991). In the same two-year period, APHIS ADC nationally distributed 27,015 kg (59,432 lb) of zinc phosphide, 1,019,269 aluminum phosphide tablets, and 116,146 gas cartridges for prairie dog control by others (US APHIS ADC 1990, 1991). These rodenticides amount to approximately 1.2 times the amount of zinc phosphide, 5.5 times the number of aluminum phosphide tablets, and 70 times the number of gas cartridges used in direct control by APHIS ADC (US APHIS ADC 1990, 1991). Because these poisons are not tracked once sale is approved by a local APHIS ADC office, the number of hectares treated is unknown. Based on mean application rates of 0.83 lb/ac for zinc phosphide, 61 tablets/ac for aluminum phosphide, and 11.4 cartridges/ac for gas cartridges (from APHIS ADC direct control operations during 1990–1991), the rodenticides distributed by APHIS ADC would amount to an additional 30,700 ha (76,000 ac) treated over the same period.

The Pocatello Supply Depot sold 102,000 kg (224,880 lb) of zinc phosphide oats from 1988 to 1992 (Packhim personal communication). In 1991 the Pocatello Supply Depot sold approximately 30,000 lb more of poisoned oats than were used in both direct and indirect control efforts by APHIS ADC alone. Of the amounts distributed

by the Pocatello Supply Depot, 610 lb went to Montana in 1989 and 900 lb in 1990 (Handegard personal communication).

State Prairie Dog Control

Prairie dogs are defined as pests in Wyoming and Montana and as both pests and predators in South Dakota (Sharps and Uresk 1990). Beyond that common definition, however, the states have pursued very different courses in managing prairie dog poisoning programs, as can be seen in Figure 1. Further, accounting procedures vary from county to county within states, and few or no data are available on the number of hectares poisoned or the application rates used by private landowners to whom the poison is sold.

Wyoming. Under Wyoming Code (WC) 11-5-103, all federal, state, and private land in Wyoming is divided into county weed and pest districts that have the authority to control prairie dogs (WC 11-5-105). The districts are allowed to purchase and sell any agricultural pesticide that has been registered with the Department of Agriculture for weed and pest control (WC 11-5-107). The district board may cost share with landowners for the cost of agricultural pesticides (WC 11-5-108). Landowners must pay the full cost of rodenticide application unless a special management program (SMP) is designated. Districts are granted authority to make inspections of infested lands, and if necessary, issue a resolution that such land is infested and in need of treatment at the owner's expense. Noncompliant landowners may be fined \$50.00 a day, up to a maximum of \$2500.00. State and federal agencies owning lands within SMP areas are responsible for the total costs of treatment on those lands (WC 11-5-303).

Thirteen of the 23 counties surveyed in Wyoming maintain prairie dog poisoning programs. Of these, 11 provided data for this survey (see Acknowledgments for source material). During 1989–1992, county weed and pest districts spent approximately \$388,700 on prairie dog control in Wyoming. Most of this expenditure was subject to cost-sharing with private landowners, with county weed and pest districts providing 40%–80% of the costs. The actual cost to the weed and pest districts was approximately \$291,433 over this same period. Expenditures for indirect assistance (purchase of poisoned grain and aluminum phosphide tablets) for all 11 respondent counties ranged from \$36,500 to \$50,000 annually.

The bulk of funds for direct control in Wyoming in 1991 and 1992 were spent through an SMP established in northeast Campbell County, where 15,195 ha (37,547 ac) of state and private land and 4543 ha (11,225 ac) of federal land (Medicine Bow National Forest) were treated at a cost of approximately \$10.43/ha. An addi-

tional 2705 ha (6685 ac) were treated in Weston County in 1991, at a cost of \$8.82/ha.

Montana. Under Montana Code (MCA) 80-7-1101, the Montana Department of Agriculture (MDA) is given authority to suppress prairie dogs and other vertebrate pests. The vertebrate pest management division of the MDA provides technical assistance, publishes educational materials, performs field demonstrations, and conducts research on prairie dog control methods. County governments may establish vertebrate pest management programs in cooperation with the MDA (MCA 7-22-2502). Counties that establish vertebrate pest management programs must also create a county vertebrate pest management fund, which may consist of appropriations up to \$10,000 from the county general fund. However, no county vertebrate pest management programs have been established to date. Montana also allows establishment of rodent control districts and boards (MCA 7-22-2207), with powers to establish a rodent control mill levy and order inspection of infested lands and control of rodents. Again, no rodent control districts have been established.

The Montana Department of State Lands (DSL) currently requires lessees to bear the costs of black-footed ferret surveys and prairie dog control on infested state lands when the department determines that control operations are necessary (MT DSL 1991). Prior to the current policy, DSL controlled prairie dogs on 59 ha (146 ac) of state rangeland in Blaine County in 1990 (Wood 1990).

South Dakota. South Dakota landowners must control infestations of weeds or pests if such infestation is a menace to neighboring lands or the state (SDCL 38-22-16). Pests in any amount are sufficient for the Secretary of the Department of Agriculture to declare such land infested. If the landowner fails to rid the land of the infestation, the Department of Agriculture may issue a declaration of public nuisance and take action to remove the infestation. Landowners are required to pay all costs associated with removal (SDCL 38-22-17). The department maintains a list of approximately 25 private commercial rodenticide applicators (doggers) to carry out this work with respect to prairie dogs (Johnson personal communication). The department has cooperative agreements with county extension offices, coordinates the activities of county weed and pest boards, and regulates pesticide use in the state (Miller 1988). During 1985–1987, 26,768 ha (66,143 ac) were poisoned through the department (Tschetter 1988).

The South Dakota Department of Agriculture also manufactures zinc phosphide oats at its plant in Pierre. The plant provides bait for prairie dog control to county, state, and federal agencies in South Dakota and surrounding states. The plant sold 112,000 kg (246,300 lb)

of zinc phosphide oats during fiscal years 1989–1992 (Krsnak 1993), an average of 28,000 kg/yr (61,500 lb/yr).

The South Dakota Department of Game, Fish and Parks Animal Damage Control Division (SD ADC) also provides direct control and technical assistance for prairie dog control on private lands (SDCL 40-36-3). Unlike the Department of Agriculture, which controls prairie dogs on public and private land at their discretion, the SD ADC provides direct control only in situations where prairie dogs infest private land from uncontrolled public lands. Landowners do not pay for direct control services from the SD ADC until prairie dog control has been achieved on the public lands in question. The division also provides technical assistance to landowners in situations of infestation of 65 ha (160 ac) or more. Landowners are responsible for the costs of bait and labor. Funding for the SD ADC derives from a county levy on livestock, matched by wildlife funds from the Department of Game, Fish and Parks (Miller 1988). Through an agreement with APHIS ADC, the SD ADC receives 60% of their annual program costs, up to \$300,000 (Miller 1988). During 1985–1987, the South Dakota Department of Game, Fish and Parks directly controlled 6100 ha (15,073 ac) of prairie dogs (Tschetter 1988). During 1989–1992, the department poisoned prairie dogs on 1606 ha (3969 ac) and provided technical assistance for control efforts on 8321 ha (20,560 ac) (Miller 1993).

Discussion

Impacts of Poisoning

We found that there was state and federal involvement in 423,200 ha (1,045,524 ac) of prairie dog control in the northern Great Plains from 1978 through 1992 (Figure 3). This estimate does not include hectares poisoned through indirect assistance of state and federal agencies (such as supplying applicants with poison bait), strictly private control efforts, or illegal control on public lands. Of this total, approximately 68,211 ha (168,550 ac) were poisoned on USFS, NPS, and BLM lands during 1978–1992. Documented costs for control during this period exceed \$10,000,000, a rough accounting, which in some cases does not include administrative costs or the cost of applicant-supplied labor.

Although the total suggests substantial losses in prairie dog habitat, it is important to note that in many cases the figures cited may include retreatment of the same areas in subsequent years and does not account for expansion of prairie dogs from untreated areas. Thus, whether current poisoning programs are causing a net loss of prairie dogs in the northern Great Plains is not readily known. Prairie dog colonies exhibit a kind of logistic growth (Garret and others 1982, Reading

1993), expanding every year but more slowly as they mature, at a rate observed to range from as low as 2% annually for well-established colonies to as high as 70% for colonies expanding after heavy poisoning (Knowles and Knowles 1994). Using an expansion rate of 20%, an average rate of expansion for established colonies (Reading 1993), approximately 1530 ha of prairie dogs would have to be poisoned annually to keep prairie dogs at the Nebraska National Forest's objective of 7649 ha. Indeed, poisoning on the Nebraska National Forest has stabilized at around 1500 ha/yr during 1988–1992.

There is evidence, however, that poisoning programs are suppressing prairie dog numbers to levels that may be too low to support prairie dog community dynamics (Miller and others 1994). A number of prairie dog associates have reached critically low population numbers and may be on the threshold of extirpation (US Fish and Wildlife Service 1994). The fact that prairie dogs exhibit resilience to poisoning masks a number of important considerations—such as whether the consistent short-term recovery of prairie dogs is sustainable over the long term, whether remaining prairie dogs are viably integrated into prairie dog ecosystems, and how tenuous these populations are likely to be, given their size and degree of isolation—questions we do not address here (see Miller and others 1994). Taken together with plague (*Yersinia pestis*) and shooting, prairie dogs may well be experiencing net regional declines, to which poisoning programs contribute significantly. It is clear that federal lands are capable of sustaining much higher numbers of prairie dogs than they currently do. If the national forests in this survey allocated just 10% of their grasslands to prairie dogs, almost a 100-fold increase in current habitat levels could be achieved.

State Comparisons

Looking at programs by state provides some remarkable contrasts. During 1985–1987, 150,900 ha (372,855 ac) of prairie dogs were controlled by state and federal agencies in South Dakota (Tschetter 1988). By one estimate, South Dakota treated 536,000 ha (1,326,000 ac) of prairie dogs during 1980–1986, an average of 76,570 ha/yr during this period (Hanson 1988). Montana, with an estimated 40,000–50,000 ha of prairie dogs (Campbell 1989, Knowles and others 1994), poisoned less than 1% of its total annually. Although differences between the two states might be explained by value of rangeland, human population density, and cultural attitudes (tolerance), enlightened policies at the state and federal levels probably contribute significantly to prairie dog conservation in Montana. The majority of prairie dogs occurring in Montana occur on BLM lands (Campbell 1989), where a policy in place since 1983 recognizes

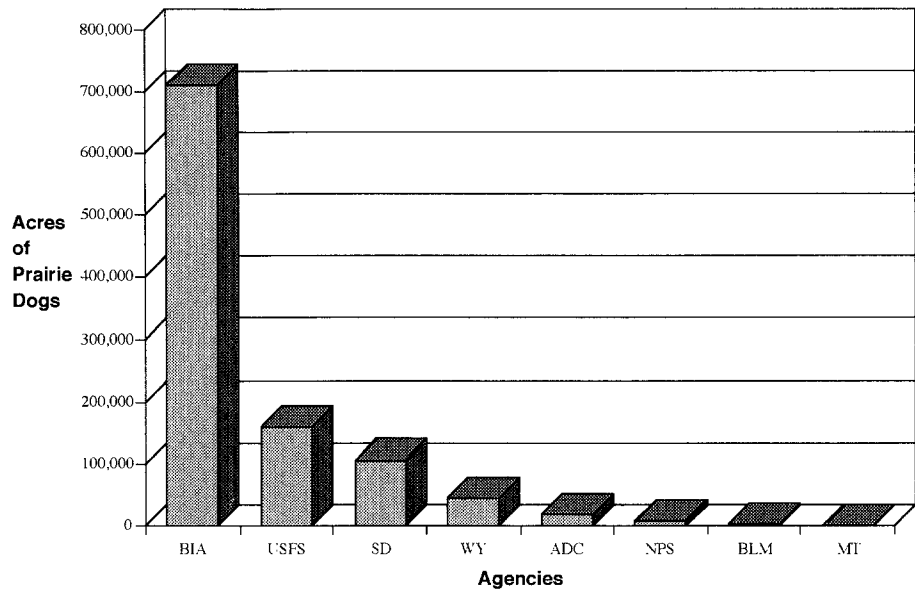


Figure 3. Acres of prairie dogs poisoned by agency.

that prairie dogs are a part of the natural landscape to be managed under the multiple-use mandates of the BLM (US BLM 1983). This places the burden of proof on lessees and others to justify poisoning. The opposite seems to hold in South Dakota, where prairie dogs are presumptive pests under state law.

This does not explain why Montana has no active poisoning infrastructure at the state level, as do South Dakota and Wyoming. Part of the answer may be that federal programs in the first half of the century virtually eliminated the prairie dog in Montana (Flath and Clark 1986), reducing the need to fund control programs at the state and county level. Whatever the reason, Montana stands in stark contrast to South Dakota and Wyoming, where the legal mechanisms for prairie dog control are funded and actively practiced.

The control programs of South Dakota and Wyoming differ in their fundamental approaches. Wyoming largely depends on incentives to landowners (subsidies) to control prairie dogs, while South Dakota uses regulatory disincentives (penalties) for failure to control prairie dogs. From the standpoint of controlling prairie dogs, it is not clear whether one model is more effective than the other. Both, to some degree, rely on self-motivated behavior of the farming and ranching community.

Some self-evident advantages of subsidized programs would necessarily include greater assurance that poisons were properly handled to avoid nontarget poisoning, better accounting practices, and higher integration with large-scale management objectives. Whether, in fact, any of these advantages are realized is unclear. The APHIS ADC program has had notorious failures in terms of regulating its field personnel

(Dunlap 1988). In the case of prairie dogs, the South Dakota Department of Agriculture and the APHIS ADC produce and distribute about 60 metric tons of poison annually, with virtually no requirements and no follow-up analysis of numbers of prairie dogs killed, areas treated, or other reporting. Moreover, it is clear that the duplication in government programs is unnecessary. The results of this survey indicate that state poisoning programs, whether based on incentives or disincentives, are capable of accomplishing prairie dog control without federal assistance. Arguably, a federal presence in prairie dog poisoning only provides a source of friction in federal policy on the plains as the federal government doles out poison with one hand and extols the virtues of endangered and threatened species recovery on the other. It is little wonder that a coherent policy to promote recovery of the prairie dog and its associates has yet to be articulated at the federal level. APHIS ADC operations with respect to prairie dog control are both expensive and duplicative and should be terminated.

As a final observation, Miller and others (1990) have suggested that federal funds currently used to poison prairie dogs be used instead to subsidize livestock growers to integrate prairie dogs in their management schemes. Our data suggest that in the northern Great Plains, this approach would have validity, especially for tribal lands under BIA trust authority. If funds are to be spent in range improvement projects on tribal lands, then it would be far preferable to provide funds to manage prairie dogs as part of the landscape, rather than fund costly eradication programs that result in destruction of the prairie dog and its community.

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