pests (Reading et al. 2005; Chapter 17). We need programs that reward landowners for adopting practices that maintain colonies and promote positive values about prairie dogs. The changing of attitudes that have evolved over many generations will be an onerous task. Thus, even well-designed programs probably will require years before significant changes in attitudes occur. Wildlife managers should work with agricultural and ranching agencies to develop innovative programs that recognize the value of prairie dogs to the grassland ecosystem, but minimize interference with farming and ranching.

Summary of Review of Literature

- Many ranchers believe that prairie dogs compete with their livestock for forage, and that a horse or cow will break a leg after stepping into a prairie dog burrow. Many farmers worry that prairie dogs consume crops, that burrows drain fields of precious water, and that burrow-mounds damage farm equipment.
- Many state and federal agencies actively have tried to eliminate prairie dogs. These actions support the notion that the prairie dog is a pest.
- The petition to list the prairie dog as an endangered species (in 1998), and the subsequent designation as a candidate species for FLETWP (in 2000), probably promoted positive attitudes among some human stakeholders and negative attitudes among others. The later removal of the prairie dog from the candidate list (in 2004) probably has had similar mixed results on attitudes among human stakeholders.
- The conservation of prairie dog colonies and associated species such as black-footed ferrets, burrowing owls, and mountain plovers will require developing more positive attitudes and perceptions among key human stakeholders. Financial incentives for conserving prairie dogs perhaps provide the best hope for changing attitudes and perceptions.
- Wildlife managers should work with agricultural and ranching agencies to develop innovative programs that recognize the value of prairie dogs to the grassland ecosystem but minimize interference with farming and ranching.

CHAPTER 8

Past and Current Chemical Control of Prairie Dogs

Steve C. Forrest and James C. Luchsinger

Prairie dogs were once abundant throughout the Great Plains of North America. They numbered perhaps five billion individuals, and occupied about 30 million hectares (74 million acres) (Bailey 1905; Miller et al. 1994; Johnsgard 2005; Chapter 16). Some colony-sites had diameters of more than 100 kilometers (62 miles) (Messiter 1890; Knowles et al. 2002). Today's cumulative population size for prairie dogs is between 12.5 and 20 million adults and yearlings, less than 5% of their population size of 200 years ago (Chapter 16). Poisoning is a major reason for this steep decline of prairie dog populations. Other factors that have contributed to the decline include loss of habitat, recreational shooting, and plague (Chapters 10, 11, and 16).

In this chapter, we examine chemical control (i.e., poisoning) of prairie dogs, but we do not consider ethical and humane issues regarding control of wildlife in general, and poisoning of prairie dogs in particular. We start by examining how settlement of the western United States affected prairie dogs. We then document past and current levels of poisoning. We investigate the effect of environmental awareness of poisoning, and conclude by speculating on the future role of chemical control.

How Did Settlement of the Western United States Affect Prairie Dogs?

Because they often lack suitable rainfall and access to irrigation, the short- and mixed-grass prairies of the western United States were some of the last areas to

be settled. Early pioneers, seeing prairie dogs while traveling to more productive homesteads, often viewed them benignly:

> This interesting little animal . . . never fails to attract the attention of every traveler on the western prairies . . . an approach to one of their settlements is always hailed with delight. (Kennerly 1855, quoted in Oakes 2000)

Sympathy was rare, however, among later pioneers who settled amongst the prairie dogs, and who viewed the rodents as enemies of farming and ranching. Attempts to eliminate prairie dogs began as soon as settlement occurred (Clark et al. 1986b; Oakes 2000). Early methods of control were labor-intensive, and sometimes crude. Plowing was effective, for example, and led to significant loss of prairie dog habitat in states such as Kansas, where about two-thirds of the 13.4 million hectares (33.1 million acres) of suitable habitat changed to cropland after settlement (Choate et al. 1982). Other methods of killing included drowning, shooting, trapping, and poisoning with chemicals such as arsenic, strychnine, potassium cyanide, carbon bisulfide, and concoctions such as "Lee's Peerless Gopher Killer" (Lantz 1903; Edgar and Turnell 1978; Hubbard and Schmidt 1984).

America's farm population grew by 2.2 million from 1900 to 1910. In Montana, for example, cultivated land rose from 100,000 hectares (250,000 acres) in 1909 to 1.4 million hectares (3.5 million acres) in 1919 (Manning 1995). Concurrently, ranchers were fencing large areas of open range into pastures for grazing (Palmer 1901; Oakes 2000). Farmers and ranchers pressured state and federal agencies to eradicate prairie dogs (Lantz 1903; Burnett 1915). The resulting cooperation set the course for managing prairie dogs for the next 50 years.

Organized Chemical Control of Prairie Dogs

Starting in 1900, Texas was the first state to promote organized efforts to eliminate prairie dogs. As Palmer (1899, p. 65) described it:

> In Texas certain stock raisers in the Panhandle proposed to exterminate prairie dogs by means of a bill requiring landowners to destroy all the dogs on their property on or before August 1, 1900, under a penalty not exceeding $100 for each section of land on which the animals were allowed to remain.

The language of this bill and the severity of the penalty indicate that the intent was far-ranging extermination. The bill failed, however, partly due to opposition from owners of large ranches, who would have incurred substantial costs because they had so many prairie dogs to poison (Palmer 1899).

After Texas, other states also initiated programs to poison prairie dogs. The purpose of legislation in Kansas in 1901 was that ". . . nothing short of the entire extermination of the animals should satisfy a community or township" (Lantz 1903, p. 156). Colorado enacted and funded efforts to control prairie dogs with the Pest Inspection Acts of 1911 and 1915 (Gillette 1912; Burnett 1915). As in Texas and Kansas, the goal once again was far-ranging eradication (e.g., Silver 1919).

State programs had varied success. By 1911, prairie dogs were gone from 809,000 hectares (2 million acres) in Kansas (Lantz 1903; Nelson 1920; Choate et al. 1982). From 1903 through 1912, strychnine-treated grain deleted 91% of Colorado's prairie dogs; from 1912 through 1923, more poisoning killed an additional 31 million prairie dogs (Burnett 1919; Bell 1926; Clark 1989; Wuerthner 1997) (Figure 8.1).

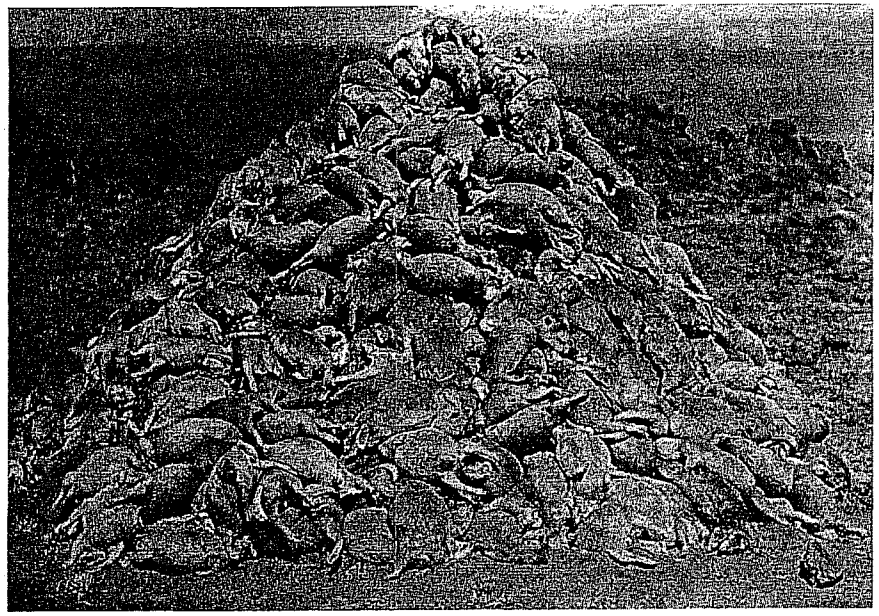


Figure 8.1. Prairie dogs killed by poisoning. This collection, from about 1917, resulted even though most poisoned individuals perish underground. Photo courtesy of United States National Archives.

What about federal involvement? In 1896, C. Hart Merriam, first chief of the Bureau of Biological Survey (BBS), bemoaned ". . . the pernicious effects of laws providing bounties for the destruction of mammals and birds" (Merriam 1896). By 1901, however, BBS was receiving hundreds of complaints from western farmers and ranchers, and Merriam recognized that reducing prairie dog populations could provide a mission, and therefore financial support, for BBS (Palmer 1901). Vernon Bailey, a BBS biologist who viewed prairie dogs as an impediment to economic development of the west, became the chief spokesman for the eradication of prairie dogs (Oakes 2000). By 1902, BBS reports described the prairie dog not merely as a species of economic impact, but as a "scourge" to be destroyed (Merriam 1902b). "The Prairie Dog of the Great Plains" (Merriam 1902a) was a "masterful piece of propaganda designed to expand the role of BBS in prairie dog eradication" (Oakes 2000).

The first years of the federal effort to control prairie dogs (1905–1915) involved demonstrating, and marshalling financial support for, different methods of poisoning (Oakes 2000). Starting in 1915, however, BBS's budget included funds specifically for the administration and implementation of eradication (Dunlap 1988; Miller et al. 1996). By 1918, BBS was cooperating with several states to conduct widespread poisoning of prairie dogs, ground squirrels, pocket gophers, and a host of other "economically injurious" species (Burnett 1919; Bell 1921). Thousands of people joined the war against prairie dogs (Merriam 1902b; Swenk 1915; Randall 1976a; Clark 1979) (Figure 8.2). New Mexico BBS agents felt that an aggressive campaign could finish the job of exterminating prairie dogs in the state by 1921 (Oakes 2000).

In 1931, Congress passed the Animal Damage Control Act, which sanctioned partnerships between Predatory Animal and Rodent Control (PARC, the division within BBS responsible for controlling prairie dogs) and states, individuals, and public and private agencies. Additional funding to poison prairie dogs became available through other federal programs during the 1930s (Oakes 2000).

The BBS kept detailed records of chemical control. South Dakota, for example, poisoned approximately 1.2 million hectares (3 million acres) of prairie dogs from 1915 to 1965. During the same period, Montana and Texas poisoned 3.4 and 3.8 million hectares (8.4 and 9.4 million acres), respectively. Arizona poisoned about 0.5 million hectares (1.2 million acres) from 1918 to 1922, and extirpated the prairie dog from the state by 1932 (Alexander 1932; Oakes 2000). Records for some states combined poisoning statistics for all species of prairie dogs, and occasionally with statistics for ground squirrels as well, so that data specifically for black-tailed prairie dogs are elusive. Wyoming, for


COOPERATIVE

RODENT-CONTROL CAMPAIGN

POCKET GOPHERS
GROUND SQUIRRELS
PRAIRIE DOGS and
JACK RABBITS

destroy valuable farm crops and forage

Insure against further losses by eradicating these pests before next spring

GET TOGETHER

Organize community or county clubs to enlist every landowner in drives against these pests and arrange for the preparation of

POISON

baits in advance of the field campaign. The Montana Extension Service and the Bureau of Biological Survey of the United States Department of Agriculture will

COOPERATE

by furnishing poison formulas, by demonstrating mixing and how best to distribute the bait, and by assisting in the organization of local campaigns

Consult nearest County Agricultural Agent, or write to the campaign leaders at the State College, Bozeman, Montana—

F. S. COOLEY,
Director of Extension,
State College of Montana.

—OR—

A. E. OMAN,
Biological Assistant,
Bureau of Biological Survey.

Figure 8.2. Montana poster from 1923 that urges participation in poisoning of prairie dogs. Photo courtesy of United States National Archives.

example, reported only combined statistics for white-tailed and black-tailed prairie dogs through 1965.

The total area across all states poisoned from 1915 to 1965 attributable exclusively to black-tailed prairie dogs was more than 12.1 million hectares (30 million acres) (Figure 8.3), and probably was more than 15 million hectares (37 million acres). The peak year was 1923, when poisoning affected 1.5 million hectares (3.7 million acres). Precise estimates for the cost of the war against prairie dogs are unavailable, but the cumulative cost over the years has been billions of dollars.

By 1960, prairie dogs probably inhabited less than 5% of their geographic range of the early 1800s (Berryman and Johnson 1973; Miller et al. 1994). Survivors persevered on lands with low productivity, in areas with poor access, and on scattered public lands (Anderson et al. 1986; Oakes 2000). Most colonies inhabited less than 10 hectares (25 acres), and only a few complexes (i.e., groups of nearby colonies) inhabited more than 2,500 hectares (6,200 acres) (Linder et al. 1972; Chapter 12). Victims of their own success, poisoning

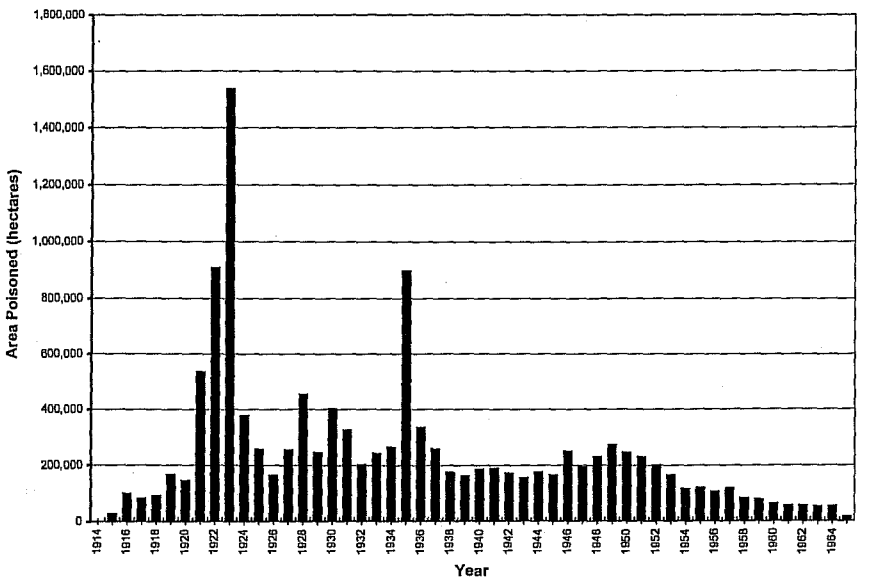


Figure 8.3. Area poisoned annually (by all methods) for elimination of black-tailed prairie dogs from 1915 to 1965 for all states except Wyoming, and including only the years 1918–1935 for New Mexico and 1921–1923 for Colorado. References: Progress reports and summary tables from USFWS and BBS for 1916–1939; state summaries from PARC for 1941–1967; statistical reports 1916–64, Record Group 22, United States National Archives.

programs started to wane. For the first time, federal agencies began to talk about "stabilizing" efforts to control prairie dogs (Berryman and Johnson 1973).

The Effect of Environmental Awareness on the Poisoning of Prairie Dogs

Despite widespread support, some resistance to federal poisoning of prairie dogs was evident from the outset (Jackson 1917; Silver 1919). Opposition usually did not result from concern for prairie dogs in particular or the environment in general, however. Rather, most opponents simply objected to the cost of poisoning, or wanted to avoid entanglements with government-sponsored programs (Oakes 2000). Some Native Americans resisted poisoning prairie dogs on religious grounds (Oakes 2000).

As programs for controlling rodents and predators expanded in the 1920s, some biologists began to question the notion of complete eradication. The American Society of Mammalogists testified before Congress in 1931 against fervid poisoning by BBS—but nothing changed regarding federal regulation of poisoning (Dunlap 1988).

Following World War II, renewed interest in the environment led to greater concern for conservation. The United States Fish and Wildlife Service (USFWS) was becoming increasingly sensitive to shifting public opinion. As one state director put it (Everett Mercer 1961, quoted in Oakes 2000):

> My efforts presently are directed toward seeing that extermination of prairie dogs in this state [New Mexico] will not finally be held by the public to have been brought about by the Bureau of Sport Fisheries and Wildlife [BSFW, a division of USFWS].

Rachel Carson's *Silent Spring* (1962) ". . . awakened the [general] public to the idea of the interdependence of man and other organisms with which he shares the earth" (Matthiessen 1987). Soon thereafter came the Leopold Report (1964), an influential critique of PARC. While conceding the occasional utility of toxicants to control prairie dogs, Leopold (1964) cautioned against excessive poisoning.

Discovery of black-footed ferrets in South Dakota occurred in 1964, just as USFWS was about to declare the species extinct (Miller et al. 1996). *Must They Die?* (McNulty 1971) publicized the ongoing poisoning of prairie dogs, and the disastrous consequences of such poisoning for ferrets. Many farmers and ranchers still wanted to eradicate prairie dogs (e.g., Carr 1973), but public sentiment was shifting toward responsible conservation.

Before and during World War II, the preferred toxicants for prairie dogs were carbon bisulphide and strychnine (Hansen 1993)(Table 8.1). After the war came Compound-1080, which is tasteless, extremely lethal, and highly effective (Atzert 1971). Both Compound-1080 and strychnine have undesirable consequences, however: nontarget animals die after consuming baits treated with either poison, and strychnine also kills scavengers that consume poisoned prairie dogs (Cain et al. 1972; Berryman and Johnson 1973). In 1972, President

Table 8.1. Toxicants formerly and currently used to eliminate prairie dogs. References: Lantz 1903; Matschke and Hegdal 1985; Uresk et al. 1986; Hyngstrom and Virchow 1994; USEPA 1996, 1998; unpublished records of BBS.

Poison	*Method of use*	*Period of use*	*Typical mortality (%)*	*Annual amount used (kilograms/ year)*	*Comments*
Strychnine	with grain	1880s–1988	83–90	495,000 (grain + strychnine, 1935)	Use limited by court injunction
Potassium cyanide/ calcium cyanide	with grain	1880s–1950s	Variable	Unknown	Replaced by more effective poisons
Carbon bisulphide	fumigant	1880s–1950s	Unknown	Unknown	Replaced by more effective fumigants
Compound-1080 (sodium fluoroacetate)	with grain	1940s–1990	98	47,000 (grain + 1080, 1963)	Prohibited for use as rodenticide by USEPA in 1990
Red squill	with grain	1950s–1960s	Unknown	5,000 (1959)	Replaced by more effective poisons
Aluminum phosphide/ magnesium phosphide	fumigant	1950s–present	85–95	2,700–4,000 (1987–1996)	Currently in use
Gas cartridges	fumigant	1950s–present	95	Unknown	Currently in use
Zinc phosphide	with grain	1976–present	95	25,000 (1990) 6,400 (2001)	Currently in use

Richard Nixon issued Executive Order 11643, which banned the use of toxicants on public lands or via federal programs (Nixon 1972; Berryman and Johnson 1973; Wagner 1988). Unfortunately for prairie dogs, Nixon's order applied only to federal lands and federal use of toxicants. Compound-1080 usage by states, cities, and individuals increased by a factor of 20 from 1972 through 1988. Usage of strychnine by non-federal agencies also increased from 1972 through 1988.

Other factors in the 1970s also affected the poisoning of prairie dogs. The Endangered Species Act of 1973 provided legal protection for the black-footed ferret and thereby kindled interest and concern for prairie dogs. Protection for ferrets included restrictions from the United States Environmental Protection Agency (USEPA) regarding use of certain toxicants for prairie dogs; some poisons, for example, were available only to certified applicators. Surveys for ferrets prior to poisoning prairie dogs became prerequisite when federal money or federal lands were involved. Surveys added "considerable costs to control operations" (Hansen 1993), and therefore discouraged poisoning. Efforts to save ferrets thus promoted, albeit indirectly, the conservation of prairie dogs.

Current Level of Chemical Control

Today, poisoning most often occurs when people perceive that prairie dogs are competing with domestic livestock for forage; interfering with agriculture; threatening human health via transmission of diseases such as plague and monkeypox; or interfering with the commercial development of land. Poisoning is most commonly cyclic, but occasionally continues for many consecutive years at the same colony-sites (Figure 8.4).

The effects of one-time or infrequent poisoning of prairie dogs are usually short-lived, because colonies frequently recover almost completely within only two to three years after a single poisoning (Chapter 9). These recoveries result because it is difficult to obtain 100% mortality in a single treatment. People dispensing poison inadvertently might miss certain sections of the target colony-site, for example, and certain prairie dogs avoid toxic bait for inexplicable reasons. Further, prairie dogs survive and reproduce well under the conditions of low population density and reduced competition that follow poisoning of some, but not all, colony residents (Knowles 1986a; Radcliffe 1992; Chapter 3). Systematic poisoning at the same colony-sites over time can effectively eliminate prairie dogs regionally, however, as it did in Arizona and southwest New Mexico (Alexander 1932; Oakes 2000).

Repeated poisoning also can lead to the decline of prairie dogs in another, more subtle way. In Kansas, for example, the total area inhabited by prairie dog

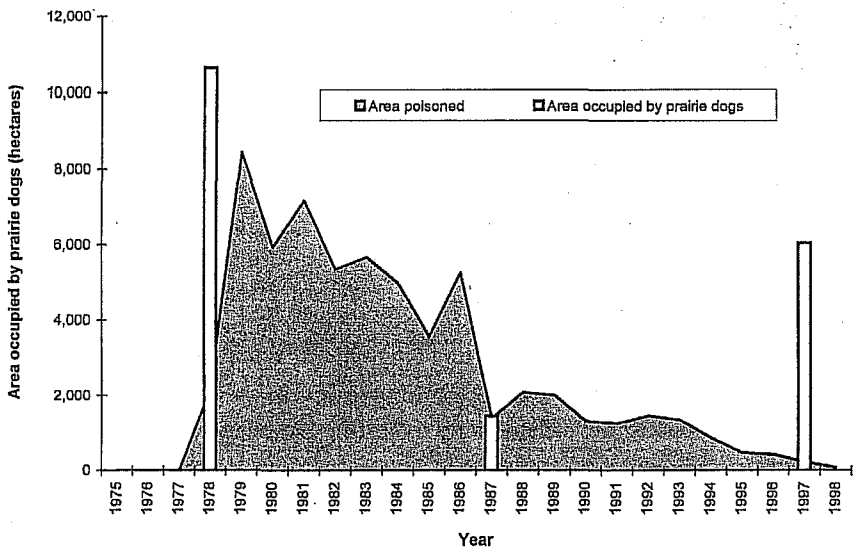


Figure 8.4. Area inhabited by prairie dogs versus area poisoned on the Buffalo Gap National Grassland, 1977–1997. References: M. Peterson, Supervisor, Nebraska National Forest, personal communication, 2005; USFS Annual Prairie Dog Control Reports, Fall River and Wall Ranger Districts, 1995–1998; G. Schenbeck, Nebraska National Forest, personal communication, 2005.

colonies declined by 19% between 1977 and 1991, but the number of colonies increased by 28% (Vanderhoof and Robel 1992). Plague was absent throughout most of Kansas in the 1980s and continues to be absent today (Chapter 11), so the decline in area inhabited by prairie dogs probably resulted mostly from poisoning. The pattern observed in Kansas is classic fragmentation: large colonies are broken up into more numerous, more isolated, smaller colonies. Fragmentation of this type increases the probability of local extinctions, because small, isolated colonies are vulnerable to random environmental variation, genetic drift, and inbreeding (Wilcox and Murphy 1985; Miller et al. 1996; Lomolino and Smith 2003; Chapter 2). As colonies disappear, the probability of extinction for remaining colonies increases because immigration—and hence the arrival of both new genetic variation and potential mates who are not close kin—becomes more unlikely as intercolonial distance increases (Garrett and Franklin 1988; Chapter 3).

Since 1973, the two most commonly used USEPA-approved toxicants are zinc phosphide (administered via oats or some other grain) and fumigants (administered via insertion into burrows); both toxicants can negatively impact nontarget species (Johnson and Fagerstone 1994; Chapter 9). Fumigants are of two types: tablets that release hydrogen phosphide (also called phosphine) as they dissolve in underground moisture, and gas cartridges that release carbon monoxide following ignition (Chapter 9). Wildlife Services (WS), a division of the Animal and Plant Health Inspection Service (APHIS) and called Animal Damage Control (ADC) before 1997, poisoned about 2.3 million burrow-entrances per year (i.e., 15,000–46,000 hectares [37,000–114,000 acres] per year) from 1990 through 2000 (Figures 8.5–8.7).

What Is the Future of Chemical Control?

For more than 100 years, poisoning has been the primary method for eradicating prairie dogs. The magnitude of today's poisoning is low relative to poisoning over the last century, however, due to simple numerics: because today's cumulative population size is less than 5% of the former population size, comparatively few prairie dogs are left to poison. Levels of poisoning should remain relatively low for the following reasons:

- Economic incentives might increase tolerance of prairie dogs on private lands and therefore discourage poisoning (Chapters 10, 14, 17, and 18).

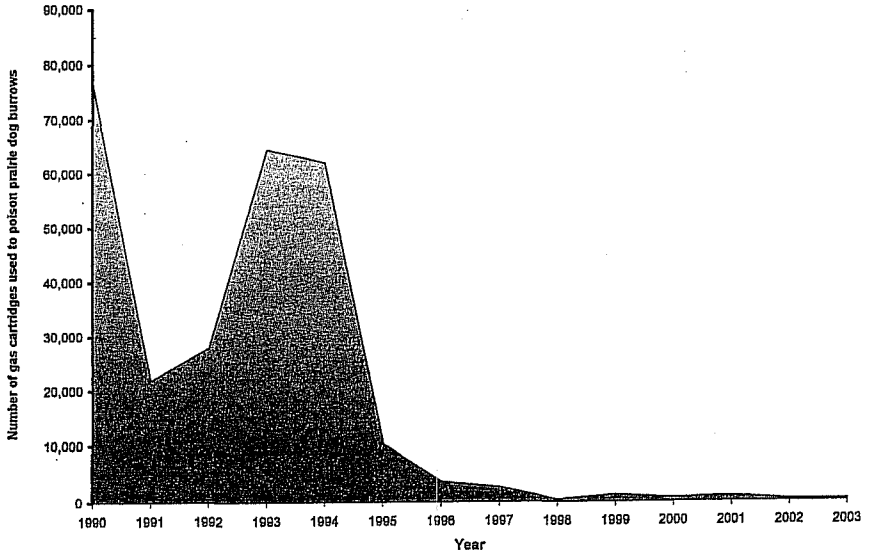


Figure 8.5. Number of gas cartridges (ignitable fumigants) used or distributed by WS to control black-tailed prairie dogs, 1990–2003. References: USDA 2003 and unpublished WS reports, 1990–1995.

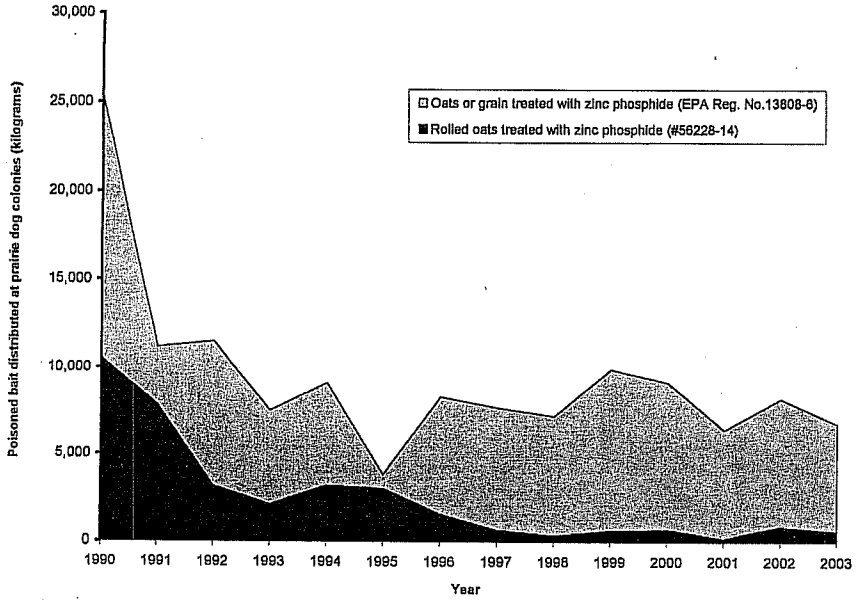


Figure 8.6. Amount of bait poisoned with zinc phosphide used or distributed by WS to control prairie dogs, 1990–2003. References: USDA 2003 and unpublished WS reports, 1990–1995.

- Federal and state lands probably will play a new, greater role in the conservation of prairie dogs and species that associate with them (Chapters 15 and 16), so that poisoning on these lands will be less likely.
- Better conservation of prairie dogs on federal and state lands should lead to fewer conflicts with agricultural and ranching operations on private lands, and consequently fewer requests for poisoning (Chapter 16).

Despite these trends regarding the magnitude of today's level of poisoning relative to levels of poisoning over the last century, poisoning on federal, state, and private lands has increased since August 2004 following the removal of the prairie dog from the candidate list for the Federal List of Endangered and Threatened Wildlife and Plants (FLETWP) (Chapters 12 and 18). The future of chemical control for the management of prairie dogs is thus hard to predict.

Besides prairie dogs, toxicants kill other animals that consume poisoned bait at colony-sites. Nontarget victims include granivorous (i.e., seed- and grain-eating) birds and insects, and also granivorous mammals such as various species of ground squirrels, chipmunks, and rabbits. In addition, scavengers sometimes die after consuming poisoned prairie dogs (Deisch et al. 1989;

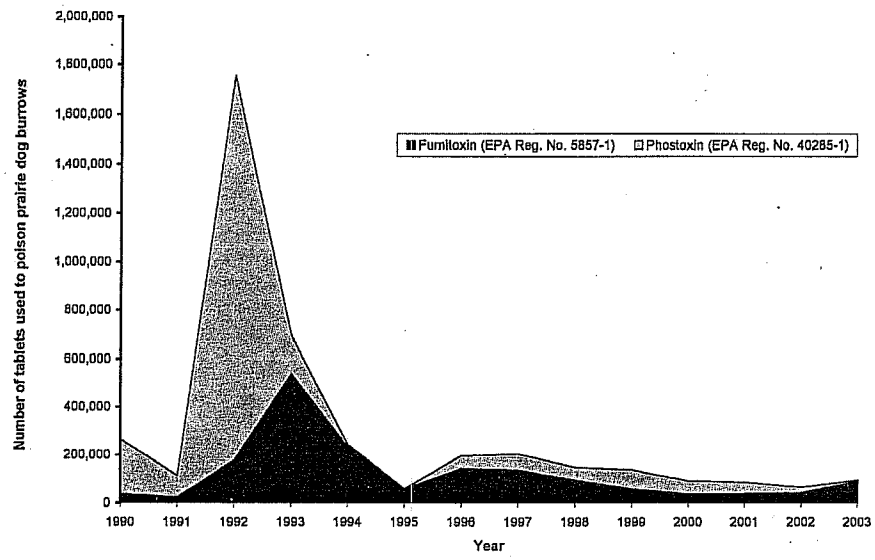


Figure 8.7. Number of aluminum phosphide tablets (fumigants) used or distributed by WS to control black-tailed prairie dogs, 1990–2003. Fumitoxin and Phostoxin are trade names for aluminum phosphide tablets. References: USDA 2003 and unpublished WS reports, 1990–1995.

Sharps and Uresk 1990; Johnson and Fagerstone 1994; Chapter 9). Further, fumigation kills not only prairie dogs, but also all other organisms within targeted burrows (Chapter 9). Finally, by removing prairie dogs, toxicants and fumigants adversely affect the many plants and animals that depend on prairie dogs for survival (Chapter 4). As for other animals sometimes regarded as pests (Woodroffe et al. 2005), poisoning should be the last resort for controlling today's prairie dogs.

Summary

- Early settlers of western North America considered prairie dogs as enemies of farming and ranching. Early methods for elimination included drowning, shooting, trapping, and poisoning with chemicals such as arsenic, strychnine, potassium cyanide, and carbon bisulfide.
- In 1900, Texas was the first state to organize efforts to eliminate prairie dogs. By the 1920s, federal programs to poison were operational in every state with prairie dogs.

- *Silent Spring* (1962), the Leopold Report (1964), and *Must They Die?* (1971) stirred opposition to the poisoning of prairie dogs. President Richard Nixon's Executive Order 11643 in 1972 slowed poisoning of prairie dogs on federal lands, as did protection of black-footed ferrets in 1973 via the Endangered Species Act.
- The effects of one-time or infrequent poisoning of prairie dogs are usually short-lived. Colonies commonly recover almost completely within only two to three years after a single poisoning—because it is difficult to obtain 100% mortality in a single treatment, and because prairie dogs survive and reproduce so well under the conditions of low population density and reduced competition that follow poisoning of some, but not all, colony residents.
- Since 1973, the two most commonly used USEPA-approved toxicants have been zinc phosphide (administered via oats or some other grain) and fumigants (administered via insertion into burrows).
- The magnitude of today's poisoning is low relative to poisoning over the last century due to simple numerics: because today's cumulative population size is less than 2% of the former population size, comparatively few prairie dogs are left for poisoning.
- Despite the trends regarding the magnitude of today's level of poisoning relative to levels over the last century, poisoning has increased over the last year following the removal of the prairie dog from the candidate list for FLETWP. The future of chemical control for the management of prairie dogs is thus hard to predict.
- Besides prairie dogs, toxicants kill other animals that consume poisoned bait at colony-sites. Further, fumigation kills not only prairie dogs, but also all other organisms within targeted burrows. Finally, by removing prairie dogs, toxicants and fumigants adversely affect the many plants and animals that depend on prairie dogs for survival. For these reasons, poisoning should be the last resort for controlling today's prairie dogs.

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CHAPTER 9

Methods and Economics of Managing Prairie Dogs

William F. Andelt

People have been managing prairie dogs for more than 100 years (Chapter 8). In this chapter I focus on the methods and economics of managing prairie dogs, but do not consider ethical and humane issues regarding various methods of elimination. First I summarize methods that do and do not work well. I then discuss how prairie dog colonies quickly repopulate after control. Finally, I investigate whether poisoning prairie dogs is worth the cost for farmers and ranchers, and then offer some recommendations.

Methods That Do Not Work Well for Managing Prairie Dogs or Are Too Expensive

Alteration of Habitat

Treatment with 2,4-D (a herbicide) reduces the number of forbs and shrubs at colony-sites, but evidently does not reduce body mass or numbers of prairie dogs (Fagerstone et al. 1977). Similarly, the following items do not significantly reduce numbers of prairie dogs (Knowles 1987): piles of logs or rocks; freshly cut ponderosa pines; telephone poles (to facilitate perching by predatory birds such as ferruginous hawks); and hay bales.

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At least fifty organizations are
working to conserve prairie dogs.

By volunteering their time, energy,
and professional expertise, members of these
groups repeatedly amaze me with their passionate
commitment to the long-term survival
of their, and my, favorite animal.

To these unsung heroes I dedicate
Conservation of the Black-Tailed Prairie Dog.