SUMMARY OF BLACK-TAILED PRAIRIE DOG COLONY MAPPING EFFORTS AT FIVE COLONY COMPLEXES IN CENTRAL AND SOUTHEASTERN MONTANA

FINAL REPORT

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ABSTRACT: Prairie dog colonies were mapped at five large prairie dog complexes located in southeastern and central Montana during May and June 2012. These prairie dog complexes were identified as being greater than 5,000 acres of occupied prairie dog habitat from 2009 aerial photos. Landownership within these complexes was largely private, but Montana State and Federal (BLM, USUSFWS) lands were also present. These prairie dog complexes were identified as the Little Powder River Complex, Big Lake Complex, Custer County Complex, Musselshell County Complex, and Petroleum County Complex. Suspected plague epizootics had occurred, or were occurring, at all complexes except the Little Powder River Complex. Significant prairie dog poisoning activity was reported by landowners at the Little Powder River (Rozol reportedly used to control prairie dogs) and Custer County Complexes. At the Little Powder River Complex, 94 colonies were viewed from public roads and 72 colonies were mapped. Seven colonies were determined to be inactive, presumably from poisoning. A total of 2,886 acres of prairie dog occupied habitat was mapped. At the Big Lake Complex, 60 colonies were viewed from public roads and 30 colonies were mapped. Two colonies were determined to be inactive. A total of 2,302 acres of prairie dog occupied habitat was mapped. A plague epizootic appeared to have started in this complex in 2010, and prairie dogs were noted to decline in 2 colonies during this mapping effort. At the Custer County Complex, a total of 74 colonies were viewed from public roads and 56 were mapped. Five colonies were determined to be inactive. A total of 1,678 acres of prairie dog occupied habitat was mapped. The eastern portion of this complex showed significant reduction in prairie dogs from plague and poisoning since the 2009 aerial photos, while the impact of plaque in the western portion was much less. The Musselshell and Petroleum County Complexes were adjacent to each other and are treated as a single complex. In this complex, 30colonies were viewed from public roads and 19 were mapped. Two colonies were determined to be inactive. A total of 469 acres was mapped. Most colonies in this complex showed significant reduction in area since 2009, presumably from plague.

INTRODUCTION

The abundance and distribution of black-tailed prairie dogs (*Cynomys ludovicianus*) in Montana has been investigated since at least the early 1970s following Executive Order 11643 banning the use of Compound 1080 on Federal lands. Reasons for these investigations over the past 4 decades include: concern with the status of prairie dogs (too many and too few), concern with the conservation of prairie dog associated species, and search for large prairie dog complexes suitable for black-footed ferret (*Mustela nigripes*) reintroduction. During this time interval, various methods have been employed to assess prairie dog abundance.

Generally, acres of prairie dog occupied habitat are considered to be an indicator of prairie dog abundance. In the early 1900s, during the Montana homesteading period when prairie dog poisoning was in its early stages, generalized prairie dog colony size was noted on maps for southeastern Montana and the Fort Belknap Reservation (Flath and Clark 1986, Knowles et al. 2002). The first accurate mapping of prairie dog colonies in Montana on a limited scale was in 1964 on the Charles M. Russell National Wildlife when prairie dog control with Compound 1080 on the Refuge was stopped over concern for the black-footed ferret. At this time, there were very few colonies remaining and they were small enough that the length and width of colonies were measured with a chain and the total numbers of burrows in the colonies were counted.

During the 1970s and 1980s, acres of prairie dog occupied habitat were determined by taking aerial photos into the field and driving around the perimeter of a prairie dog colony while noting the location of the perimeter on the aerial photo (Burgess 1978, Knowles 1982). Once GPS became available in the 1990s, use of aerial photos was dropped in favor of using GPS. The method of mapping using GPS was similar to that described for aerial photos use, except the GPS unit recorded the location of the colony perimeter while driving in an all-terrain vehicle (ATV) along the colony perimeter.

Recently, resolution quality of aerial photos has greatly improved and for many prairie dog colonies it is possible to distinguish the colony perimeter on the aerial photo, making it possible to remotely map prairie dog colonies. The National Agricultural Imagery Program (NAIP), started in 2003, acquires aerial imagery of all the continental U.S. during the growing season at 3 year intervals (first NAIP cycle was 5 year intervals). NAIP is administered by the US Department of Agriculture's (USDA) Farm Service Agency (FSA), and NAIP photos are made available to the public and governmental agencies within 1 year of acquisition. By 2009, most photos taken for NAIP imagery were with digital sensors rather than film cameras.

A major advantage of using aerial photos for prairie dog colony mapping is that all colonies can be mapped independent of landownership. Disadvantages of this mapping technique is that aerial photos are one or more years old by the time they are used as a mapping tool, and the colony perimeter may be difficult to distinguish for some colonies. On the other hand, mapping prairie dog colonies on the ground with a GPS unit provides real time data where prairie dog activity levels may be assessed and observations can be made of prairie dog associated species. Disadvantages of ground based GPS mapping include: need to obtain permission to map prairie dog colonies located on private land; need to obtain permission to cross private land to access public land; and considerable time and expense involved with the actual mapping process.

Maxell et al. (2010) used 2005 and later, 2009, NAIP aerial photos to assess prairie dog abundance and distribution in Montana. The prairie dog range distribution in eastern Montana was broken into 400 square kilometer blocks. Each block was gridded on NAIP imagery into 400,000 1 hectare cells. Grid cells identified as having at least 1 prairie dog burrow inside the grid cell were coded as 1 and grid cells without evidence of prairie dogs were coded as 0. All grid cells coded with 0 were turned off, and the sum of continuous cells with visible prairie dog burrows yielded the outline of a colony and total area occupied by a colony.

Objectives of our prairie dog mapping effort were to:

1. Obtain comparative mapping data for prairie dog colonies at 5 prairie dog complexes that were mapped through 2009 NAIP aerial photos with the same colonies mapped on the ground with GPS in 2012.
2. Obtain an updated status of prairie dog activity in the NAIP mapped colonies, and to determine the relative use of each colony complex by prairie dog associated species.

This report summarizes the results of this comparative mapping effort at 5 Montana prairie dog colony complexes.

STUDY AREAS

Five large prairie dog colony complexes were used for this comparison mapping effort. Landownership within the colony complexes was primarily private, but Federal and State lands were also present. The colony complexes were located in southeastern and central Montana and all 5 complexes were determined to contain at least 5,000 acres of prairie dog inhabited land based on interpretation of 2009 NAIP imagery. The colony complexes were as follows: 1) Little Powder River Complex located either side of the Little Powder River about 20 miles south of Broadus in southeastern Montana, 2) Custer County Complex located about 20 miles northeast of Miles City in southeastern Montana, 3) Big Lake Complex located in northern Stillwater County about 30 miles northwest of Billings in central Montana, 4) Musselshell County Complex located about 10 miles north of Roundup in central Montana, and 5) Petroleum County Complex located about 20 miles northeast of Roundup in central Montana. The latter 2 complexes were immediately adjacent to each other and are treated as a single complex in this report.

Prairie dog colonies in the Little Powder River Complex primarily occurred along drainage bottomlands and benches of tributary drainages of the Little Powder River. Major drainages included Horse Creek, Belle Creek, Ranch Creek, and Wright Creek. Dominant vegetation in this area was western wheatgrass, blue grama, silver sagebrush, and big sagebrush. Additionally, cheatgrass was a common grass species and much of the rangeland in this area had been planted to crested wheatgrass. Upland areas included ponderosa pine and Rocky Mountain juniper dominated hills and buttes. The river bottom lands in this area were used for hay production with some upland and bottomland areas being cultivated for wheat production.

Prairie dog colonies in the Custer County Complex occurred along drainage bottomlands and benches of tributary drainages of the Yellowstone River. Major drainages included Sand Creek, Harris Creek, and Muster Creek. Much of this area contained badlands topography with eroding hills and buttes, and silty overflow sites in the valley bottoms. Dominant vegetation consisted of western wheatgrass, blue grama, big sagebrush, and silver sagebrush. Cheatgrass was common throughout the study area. Portions of the western half of this study area appeared to have been recently cultivated and planted to wheat.

Much of the Big Lake Complex occurred within the closed drainage basin of Big Lake. This area was rolling prairie dominated by western wheatgrass, blue grama, silver sagebrush, big sagebrush, and greasewood. Crested wheatgrass had been planted in many rangeland sites in this area. Prairie dog colonies occurred throughout the basin and adjacent areas. Although there was only limited agriculture within the Big Lake Basin, extensive areas of dryland wheat occurred on adjacent areas.

Prairie dog colonies in the Musselshell and Petroleum Counties Complexes occurred in rolling prairie. Dominant vegetation was western wheatgrass and big sagebrush. Crested wheatgrass was a common introduced grass species in this area, and cheatgrass was also present in most areas. Much of the prairie dog acreage in this complex was recently lost due to plague and the abandoned portions of these colonies were dominated by cheatgrass. There was only limited dryland agriculture within the complex boundaries, but one farmer reported to have recently broken 12,000 acres of native prairie for wheat production and he intended to break another 8,000 acres this summer. This was a recently acquired 44,000 acre tract of land and it appeared that most of the property would eventually be put into wheat production.

METHODS

Prairie dog colonies were mapped using Garmin 62s and Garmin etrex 20 GPS units. Each GPS unit contained a base map showing landownership and prairie dog colony boundaries based on the 2009 NAIP imagery. The GPS units were set to record points at 5-foot intervals. Prior to mapping a prairie dog colony, the track log was cleared and the colony was mapped using the area calculation function. The colony perimeter was driven with an ATV, or in some cases walked (small colonies or upon land owner request) while the GPS unit was recording points. The polygon formed by the prairie dog colony perimeter was closed by zooming to the 20-foot scale and matching the beginning and ending points. The outside active burrows were considered the colony boundary. We did not use the clip line as the colony boundary because prairie dogs are actively expanding the colonies out beyond the clip line in May and June. Our definition of a prairie dog colony was the land area continuously occupied by prairie dogs as indicated by regularly spaced active burrows and shorter vegetation. Frequently drainages and to a lesser extent steep ridges were not occupied by prairie dogs and they were not mapped as being part of a colony.

A field notebook was kept where we recorded the colony identification number (from the master list provided by MTFWP), colony area, estimated prairie dog density (high, moderate, or low), associated species observations and other notes of interests. The density estimate was based on a visual scan of the colony with binoculars. A low density colony had only scattered prairie dogs in a colony. Frequently family groups were absent due to selective removal of juveniles by recreational shooting. A count of prairie dogs in the view scape was generally less than 25 individuals. A high density colony had multiple family groups on mounds and a count of prairie dogs frequently exceeded 100. Moderate density was in between these 2 extremes. At the end of each day, polygons on the GPS unit were downloaded to a laptop computer using program DNRGarmin to create a shape file for each colony. In addition, the original polygon file was archived on the GPS unit. All prairie dog colony mapping took place during May and June 2012.

RESULTS AND DISCUSSION

Little Powder River Complex

Prairie dog colonies in the Little Powder River Complex were mapped from 12 May to 22 May 2012. Newly emerged juvenile prairie dog pups were above ground on 12 May, suggesting that breeding took place early March and that young were born in early April. Substantial above normal precipitation occurred in central and southeastern Montana in 2011 and this area had considerable standing dead plant litter present in May 2012. Prairie dog colonies were easily observed at a distance as bright green areas due to the lack of standing dead litter. If cattle were present in pastures with prairie dog colonies, there were generally groups of cattle grazing on the colonies. Dominant vegetation on many of these colonies was western wheatgrass.

A total of 94 prairie dog colonies were either mapped or viewed from public roads. Of the 94 colonies visited, we received landowner permission to access and map 72 colonies. These colonies totaled 2,886 acres with the average colony size being 40.1 acres. This was a minimum

size since 7 mapped colonies had portions that extended onto adjacent landownership where we did not have permission to map. NAIP estimated prairie dog acreage for this complex was 12,609 acres with the average colony size being 137 acres.

NAIP Imagery versus actual prairie dog acreage results and discussion

There were a considerable number of discrepancies between what we mapped as actual colony boundaries and what was displayed as colony boundaries on our GPS units from NAIP imagery. With only a few exceptions, NAIP imagery greatly overestimated prairie dog colony size and underestimated number of colonies. Of the 5 prairie dog colony complexes that we worked at, the Little Powder River Complex was the only complex where we could make accurate comparisons between actual boundaries and NAIP imagery boundaries (note: there was 3 year time lag between the 2 mapping efforts). The other 4 complexes had plague epizootics between the 2009 NAIP imagery and our 2012 mapping effort, which greatly impacted colony size. Even in the Little Powder River Complex, documented and suspected prairie dog poisoning had changed colony boundaries in many of the colonies. In this complex, we were able map 19 colonies where we were reasonably certain that there had been no poisoning and the entire colony occurred on land where we had permission to map.

Overall, the actual mapped acreages averaged about half (49.5%) of the NAIP imagery acreages (Table 1). There was a considerable range in discrepancies (17 to 91%) suggesting that there was not a simple correction factor that could be applied to NAIP imagery to obtain a corrected colony size. Colony 514 had the least difference between NAIP and mapped boundaries (91%), and it was reported to have been poisoned in 2007. At the time that NAIP imagery was acquired in 2009, there had only been 2 years of recovery from poisoning versus 5 years of recovery when mapped in 2012.

A common problem we observed with NAIP mapped colonies was that many of the drainages which crossed prairie dog colonies contained no prairie dog suitable habitat, but these drainages were included within the colony boundary. We also saw a similar situation with ridges, but with lesser frequency. When we mapped these colonies with GPS units, we did not include the uninhabited drainages and ridges within the colony, which resulted in a large NAIP mapped colony being mapped as a series of smaller colonies. In some cases, as many as 6 to 8 smaller distinct colonies were mapped on the ground with GPS. Table 1 compares the mapping results obtained by NAIP and GPS for these 19 colonies. In Table 1, to obtain a mapped acreage figure for colonies with multiple polygons, we totaled the acreages for all the colonies lying within the NAIP mapped colony boundary.

Another factor contributing to the overestimation of colony size was related to the actual NAIP mapping technique. NAIP photos were gridded into 1 hectare blocks. If only 1 prairie dog burrow was observed in a hectare block, the entire block was counted as being occupied by prairie dogs. By default, this method nearly always extends the colony boundary out beyond the actual boundary.

Another difference between the 2 mapping methods was that our GPS mapping closely followed the outer active burrows and there were considerable irregularities in the colony boundary whereas NAIP mapping only picked up boundary irregularities on a large scale and missed the small scale changes. Other issues that appeared to contribute to the exaggeration of colony size

in the NAIP imagery, were areas with northern pocket gopher (*Thomomys talpoides*) mounds or areas with harvester ant mounds that appeared to have been misidentified as prairie dog burrows. However, it should be noted that the NAIP mapping effort missed very few prairie dog occupied areas.

Based on 2009 NAIP imagery, the estimated prairie dog occupied area for the Little Powder River Complex was 12,609 acres with the average colony size at 137 acres. Our mapping data for 19 colonies showed an average overestimation of colony size by the NAIP mapping method by a factor of 2. A better estimate for this complex would be closer to 6,300 acres. However, there were 29 recently poisoned colonies that we were aware of, and we were able to map 7 of these poisoned colonies. The average GPS mapped acreage for poisoned colonies was 26% (range 5-48% of NAIP mapped) of the NAIP mapped acreage. In addition, there were 3 colonies (2 were known to have been poisoned) with no apparent activity; this would lower the average acreage of poisoned colonies mapped with GPS to 18% of the NAIP mapped acreage. When poisoning in this complex is taken into consideration, the actual prairie dog occupied area was probably considerably less than 6,300 acres of occupied prairie dog habitat.

Table 1. A comparison of prairie dog colony acreages as determined from 2009 NAIP aerial photos and acreages of the same colonies mapped with GPS in spring 2012 in the Little Powder River Complex.

Colony ID #	NAIP Acres	Mapped Acres	Mapped Acres as a Percentage of NAIP
467	32.1	5.5	17.1
472	69.1	48.2	69.7
475	81.5	26.7	32.8
484	27.2	15.6	57.3
500	642.5	399.0	62.1
508	61.8	32.1	51.2
514	229.8	208.3	90.6
515	126.0	68.7	54.5
518	86.4	55.5	64.2
519	84.5	46.0	54.4
527	27.2	9.8	36.2
528	313.8	181.4	57.8
559	79.1	27.6	34.8
560	116.1	72.6	62.5
583	22.2	6.1	27.5
584	24.7	7.3	29.5
597	496.7	270.6	54.5
601	24.7	10.8	43.7
604	98.8	30.9	41.1
TOTAL/AVERAGE	2642.2	1517.2	49.6

Prairie dog colony shooting observations and discussion

Prairie dog colonies in this complex showed a wide range of activity levels. Most prairie dog colonies not poisoned in this complex were subjected to intensive recreational shooting.

Colonies that received intensive shooting generally had prairie dogs distributed throughout the colony, but at low density and family groups with young pups sitting on the mounds were largely absent. High density prairie dog colonies with multiple family groups were only found in areas where vehicle access was blocked by one specific private landowner (C&C Cattle Company), or when topographic conditions were such that there was no easy vehicle access to the colony.

Recreational prairie dog shooting was observed at all the prairie dog complexes that we worked at. The Little Powder River Complex seemed to have shooters present each of the days that we worked in this area. One ranch conducted a guest ranch shooting program where shooters rented a cabin and paid to shoot prairie dogs. Shooters originating from this ranch were observed driving a utility vehicle with a rifle mounted on a hood turret. Another ranch in this complex reported in 2003 that they conducted fee shooting, but we did not speak directly with the rancher owner in 2012 so it was not clear how he managing his prairie dogs. One rancher joked that he only charged shooters for the prairie dogs that they missed while another rancher in this area did not permit prairie dog shooting. The C&C Cattle Company claimed that shooters in early May had illegally entered their property and shot an adult cow incidental to shooting prairie dogs. This ultimately led to C&C Cattle Co. employees trying to evict us from BLM land where they held a grazing lease (the ranch owner later apologized for this incident). Another landowner took us to colony 553 (NAIP imagery showed 49.4 acres in 2009 – because of the shooting we did not use this in the NAIP/GPS comparison data) located entirely on BLM land and stated that he had worked 3 years shooting at this colony to reduce it down to a few prairie dogs. We observed only 1 prairie dog at this colony and only mapped 3.9 acres of low density prairie occupied habitat.

Prairie dog colony poisoning observations and discussion

Generally, colonies noted as low density had been recently (past year) poisoned. A total of 29 colonies showed signs of recent poisoning, and 3 of these colonies were classified as inactive. Criteria which we used to determine if a colony had been poisoned were as follows: 1) Only a few (<10) prairie dogs remained in small colonies (<40 acres) or no prairie dogs were present, 2) for larger colonies, prairie dogs occurred in small scattered areas of activity, 3), parallel sets of ATV tracks through a colony indicating broadcast application of Rozol treated bait, and 4) landowner reports of poisoning.

Of the 5 complexes that we worked in, the Little Powder River Complex had by far the most poisoning activity and was the only complex where we did not suspect plague. Of the 94 colonies that we examined, we were reasonably certain that 29 colonies had received some kind of control activity with toxicants. Some of these poisoned colonies appeared to include BLM land such as Colony 495. Landowners reported using Phostoxin (aluminum phosphate tablets) to kill prairie dogs at 3 colonies. In one colony, workers walked in front of a tractor pulling a disk while throwing Phostoxin tablets down prairie dog burrows just prior to the burrow being closed by the disk. Colony 553 was reported poisoned in 2007 with zinc phosphide treated grain bait. Apparently, a professional rodent control operator from Wyoming visited this area of Montana and poisoned this and several other colonies. The landowner reported that in 2012 the colony was at least at the pre-treatment population level or greater which is consistent with other reports of population recovery of prairie dogs following control with zinc phosphide (Knowles 1986). Colony 576 was reported poisoned by a landowner during the past year, and examination of the colony showed that there were parallel sets of ATV tracks through the colony suggesting that the

poison had been broadcast spread. This technique is not effective with zinc phosphide. Although the rancher did not state which toxicant was being used to poison prairie dogs, another rancher said that the anticoagulant Rozol was being used in the area to poison prairie dogs. Broadcasting Rozol is also not a very effective means of prairie dog control and the level of control achieved at Colony 576 was highly variable.

During our work in the Little Powder River Complex, we found the skeletal remains of a golden eagle below a gumbo knob in Colony 528 that had been poisoned along the private land portion of the colony. This colony was located on the western edge of a large block of land where most of the colonies were poisoned. Based on information given to us from another rancher, Rozol was the toxicant used in much, if not all, of this poisoning. Although it was not possible to determine the cause of death for the eagle (it could have been shot just as easily as poisoned), its presence was significant since it is similar to what has been reported in Kansas where prairie dogs have been poisoned with Rozol (Williams 2009).

Recent history of this complex

We previously mapped prairie dog colonies in the Little Powder River Complex in September and October 2003 (Knowles 2004). At that time, landowner cooperation for access to prairie dog colonies was considered excellent which is in contrast to 2012 where access was probably only moderate to poor. Ranchers who granted us permission to map in 2003 refused to give permission in 2012, and the one rancher who denied permission to map in 2003 still denied permission to map in 2012. Issues that might account for this difference were: 1) the ongoing poisoning with Rozol as described above clearly had ranchers not wanting us on their land to document what was happening, 2) in 2003 we were contracted by BLM to map prairie dog colonies in range units and the landowners felt an obligation to permit mapping, 3) one landowner in 2012 was having land condemned by Montana Department of Transportation for a truck weigh station in front of his house and he stated that he was angry at Montana state government in general, and 4) the proposed bison reintroduction and shipment of Yellowstone National Park bison to Fort Peck Reservation also had ranchers angry (we heard this directly expressed from ranchers in the Custer County and Musselshell/Petroleum Counties Complexes).

In 2003, we conducted an aerial survey of the Little Powder River Complex after the ground mapping effort and it was noted then that large colonies observed from the air were actually mapped as a series of smaller colonies on the ground because of unoccupied drainages and otherwise unsuitable habitat (Knowles 2004). This was a similar problem noted with NAIP imagery mapping that was previously discussed.

In 2003, ranchers in Belle Creek reported that as late as 1995 there were very few prairie dogs in Belle and Horse Creeks (the same 2 drainages that most of our 2012 mapping took place), and that the low numbers was a result of an earlier plague epizootic. A state-wide mapping effort during 1996-98 found only a few colonies in this area which would support the ranchers' statements (FaunaWest 1998). One rancher told us that up through the 1970s there were no prairie dogs in the area (Marie Godfredson, pers. commun.). However, in 2003, 1 rancher stated that the current level (i.e. 2003) of prairie dogs in the Belle Creek drainage was nothing compared to the 1930s prior to government poisoning when the entire bottomlands and benches were occupied by prairie dogs. He recounted how the Federal government organized a prairie

dog control effort where most of the local residents formed lines and marched across the prairie dog colonies distributing poisoned grain bait (J. Jones pers. commun.)

In 2003, we found that prairie dogs in Buffalo Creek and 3-Bar Creek (just west of Biddle) had been poisoned. Some of the colonies had parallel sets of ATV tracks crossing them suggesting the bait or prebait had been broadcast. The level of control appeared to only to be moderate and without follow-up control complete recovery of the colonies was expected in a few years. The control work had been contracted to an agricultural pesticide firm from Red Lodge. We were unable to visit these colonies in 2012, but it is apparent that prairie dogs in the Little Powder River Complex have been subjected to poisoning since the 1930s. In addition, at least 1 plague epizootic has occurred in recent years.

Big Lake Complex

Prairie dog colonies at the Big Lake Complex were mapped on 23 May and 1-6 June 2012. Maps of prairie dog colonies developed from 2009 NAIP imagery showed that most of the colonies in this area were very large. Of the five prairie dog complexes that we visited, this complex appeared to have a higher percentage of the landscape composed of gently rolling prairie which probably accounted for the large colonies. Almost half of the prairie dog acreage in this complex was under a single landownership and the landowner declined to permit mapping of his colonies. Another landowner with a considerable amount of prairie dog acreage was adamant that we not map any prairie dogs colonies on his property and even visited us in the field to verify that we did not cross his property line while mapping. The most common reason cited for refusal to map prairie dog colonies on private land is the landowner does not want the government knowing what they have on their property. We have explained to many landowners that presence of prairie dog colonies on their property and their approximate size was determined from aerial photos (or in the case of our mapping efforts in North Dakota, aerial surveys), but none have ever changed their position of no mapping when presented with this information.

Within or adjacent to the Big Lake Complex, a total of 72 prairie dog colonies were either mapped or viewed from public roads. Of the 72 colonies visited, we received landowner permission to access and map 27 colonies. These mapped colonies totaled 2,345 acres with the average colony size being 87 acres. This was a minimum size since 4 mapped colonies had portions that extended onto adjacent landownership where we did not have permission to map. Only 3 colonies were determined to be inactive. Fourteen colonies appeared to be greatly reduced in size due to plague and an additional 2 colonies appeared to have prairie dogs dying from plague while we were working in the area. We found 4 colonies within and adjacent to the complex that we thought had been poisoned.

NAIP imagery versus actual prairie dog acreage results and discussion

NAIP mapped prairie dog colonies in the Big Lake Complex were much larger than what we observed on the ground although much of the difference that we observed could be attributed to plague and poisoning. There were only 4 colonies where we were able to map the entire colony and we were reasonably certain that there was no plague. These 4 colonies only averaged 26.5% of the NAIP mapped acres. Colony 2843 was mapped as 9 separate colonies that totaled 1,923 acres. The NAIP mapped acreage for this colony was 3,808 acres. However, there appeared to have been about 500 acres of the colony located on land that recently changed ownership and

had been converted to agricultural production (some prairie dogs were scattered through this wheat field). So if 500 acres is subtracted from the NAIP mapped acres, our GPS mapped acreage for this colony was about 58% of the NAIP data. Colony 2843 did have prairie dogs dying from apparent plague while we were working in this complex, but our mapping effort took in most of the recently active colony. Because of the apparent plague epizootic in the Big Lake Complex and the small sample of mapped colonies not impacted by plague, it is not possible to compare the accuracy of NAIP mapped prairie dog acreages in the rolling prairie of the Big Lake Complex to the accuracy of NAIP mapped prairie dog acreages in the drainage dissected prairie dog colonies of the Little Powder River Complex. However, at both complexes NAIP mapped acreages appeared to greatly overestimate the actual prairie dog colony size.

The NAIP mapped acreage estimate for the Big Lake prairie dog complex was 15,138 acres with the average colony size being 293.9 acres. Based on our survey effort in this area, we estimated the actual prairie dog occupied area to be less than half of this figure, and possibly not even 5,000 acres because of the apparent plague epizootic. However, we found a prairie dog colony (about 160 acres) that was apparently missed during the NAIP mapping effort that was just outside the complex boundary and would have linked the Big Lake Complex to another complex of colonies to the northeast towards Broadview. The NAIP mapped acreage estimate for this complex of colonies was 2,618 acres. This would suggest that there could have been another 1,000 acres of prairie occupied habitat in this complex

Prairie dog shooting observations

Prairie dog shooting appeared to be common in this complex. Most of the shooting seemed to take place on the weekend suggesting that the shooters were probably from the Billings area. We talked to one group of shooters and they stated that they had come to this area for 20 years to shoot prairie dogs and that they were from Billings. One evening we observed a group of shooters from Yellowstone County trespass onto private land to place an exploding target on a prairie dog mound, and then return to their vehicle to sit and wait for a prairie dog to sit on the mound next to the target. Their wait was cut short when the landowner arrived and dealt with the trespass issue.

Another landowner in the southwestern corner of the Big Lake Complex mentioned that her son was trapping and shooting prairie dogs at a colony next to their house in an attempt to get rid of them. While mapping this colony, we did observe several leg-hold traps set at burrow entrances.

Prairie dog colony poisoning observations

We did find 3 prairie dog colonies that appeared to have been poisoned in this complex. These were in the southeastern corner of the Big Lake Complex and only small areas of prairie dog activity remained. We surmised that these colonies were poisoned because they were located at least 5 miles from the area where prairie dogs activity was noted to be declining due to possible active plague. We also observed T-feeders at Colonies 2886 and 3187 which would be an indicator that anticoagulant poisons (Rozol or Ramik Green) were being used to poison prairie dogs. Colony 2886 was actually located just east of the Big Lake Complex and appeared to be used for winter livestock feeding. It was a much smaller colony (a few acres) than the colony outline that was displayed on our GPS unit. One rancher in the Big Lake Complex did mention that Rozol had been used in this area for some prairie dog control.

Suspected plague presence

During the time period that we worked in the Big Lake Complex, it was apparent that prairie dogs were dying in some colonies possibly due to plague, but we have no definitive assessment of this hypothesis. Rather, this statement of possible active plague in the Big Lake Complex is based on a large scale die off of prairie dogs on land with multiple ownerships and landowners stating that they did not poison the prairie dogs.
Three portions of colony 2843 were mapped on 23 May and low levels of prairie dog activity were noted on a 500-acre section of the colony immediately north of Big Lake. Some of the inactivity could have been due to flooding in 2011, a year of above normal precipitation. However, the inactive areas included elevated areas in the colony, a ridge top and ridge side. This colony was visited again on 1, 2 and 6 June. During each visit, there seemed to be fewer prairie dogs active above ground than on the previous visit. On 1 June within an estimated 75-acre area, we only counted 6 prairie dogs above ground while in the same area we counted 6 adult burrowing owls. On 2 June we talked to a landowner residing along the northeast portion of this colony. He stated that prairie dog shooters had just told him they could not find any prairie dogs to shoot in the area we mapped on 23 May. He stated to his knowledge the adjacent landowner had not poisoned the 500 acres which were right next to his house, and the adjacent landowner had specifically directed the shooters to this colony, thinking that there were lots of prairie dogs there. In addition, a 300-acre area of this colony was noted as very active on 23 May, seemed to have few prairie dogs when mapped on 4 June and on 6 June we specifically returned to this area to assess prairie dog activity, and we only observed a few juvenile prairie dogs above ground.

Immediately north of Colony 2843 was the large Colony 3047 which had large areas of inactivity or low activity. This colony spanned several land ownerships including State and USUSFWS. We talked to 1 landowner who told us that prairie dogs started dying about 2 years ago. Based on residual amount of residual vegetation it appeared that a core area of the colony was indeed abandoned in 2010. The landowner said that he did not poison prairie dogs because it was too expensive. In this portion of the Big Lake Complex, we found several more colonies that also appeared to be impacted by plague.

At Colony 3047, which was identified by a landowner where prairie dogs first started dying in 2010 from apparent plague, we conducted counts from the county road of prairie dogs above ground in 7 areas of the colony that still appeared to be active. Counts ranged from 1 prairie dog to 28 prairie dogs and averaged 10 prairie dogs per area counted. In addition, there were many areas in this colony that we did not observe prairie dogs. We found that similar counts at colonies not impacted by plague were generally in the 50-100 prairie dog range. This comparison is just to provide some scale of the level of prairie dog decline in the colonies impacted by plague. It appears that a plague epizootic started in the Big Lake Complex in 2010, spread considerably in 2011 and remained active in 2012.

Custer County Complex

We mapped prairie dog colonies in the Custer County Complex from 7-14 June 2012. For the Custer Complex, we mapped or viewed from public roads a total of 74 prairie dog colonies. We mapped 61 colonies, 5 colonies were determined to be inactive, and at 8 other active colonies we did not receive permission to map. Our mapping effort totaled 1,678 acres of prairie dog

colonies. Average colony size was 30.0 acres, but there were 2 colonies that extended onto different landownership where we did not get permission to map. For the 25 prairie dog colonies on the ranch where plague and poisoning had occurred, total prairie dog acreage was 168 acres (versus 355 mapped acres in 1996) and the average colony size was 6.7 acres. For the 27 prairie dog colonies on the ranch where plague and poisoning were not reported, total prairie dog acreage was 1,360.7 acres (versus 443 mapped acres in 1996) and the average colony size was 50.3 acres.

NAIP Imagery versus actual prairie dog acreage results and discussion

NAIP mapped acreage for these 2 groupings of prairie dog colonies was 2,017 and 3,099 acres, and the actual GPS mapped acreage was 8% and 34 % of the NAIP acreage, respectively. (Note: for the ranch reporting no plague, we removed Colony 6899 [3,491 NAIP acres] from this calculation because it was primarily on an adjacent ranch and clearly had been impacted by plague.) Table 2 shows a comparison of NAIP and GPS acreages for prairie dog colonies on this ranch where the entire colonies were mapped.

Table 2. A comparison of prairie dog colony acreages as determined from 2009 NAIP aerial photos and acreages of the same colonies mapped with GPS in spring 2012 in a portion of the Custer County Complex that apparently did not experience a plague epizootic.

Colony ID #	NAIP Acres	Mapped Acres	Mapped Acres as a Percentage of NAIP
6921	51.9	6.9	13.2
6880	2181.9	637.2	29.2
6881	155.7	64.1	41.2
6903	116.1	21.0	18.1
6909	71.7	16.2	22.6
6969	173.0	120.8	69.8
7017	49.4	2.7	5.4 - many abandoned burrows
6919	32.1	0.0	no evidence of colony at this site
6708	27.2	4.3	15.8
6737	39.5	14.0	35.4
6724	160.6	64.6	40.2
TOTAL/AVERAGE	3059.1	887.2	26.4

The difference between NAIP acreages and GPS mapped acreages for both ranches is substantial. For the ranch which reported no plague, we did not see much in the way of obvious colony contraction and the difference between NAIP and GPS acreages should be considered significant. For the ranch reporting plague and poisoning we did see areas where colonies had been abandoned as evidenced by old prairie dog mounds. Most of the colonies that we did not get permission to map, but were visible from public roads, appeared to be greatly reduced from plague. The total NAIP mapped acres for this complex was 13,344 acres with the average colony size of 342 acres. Our best guess for prairie dog acreage in this complex in June 2012 would be around 2,000 acres.

Prairie dog shooting observations

Prairie dog shooters were encountered at the Custer Complex. The ranch reporting plague and poisoning rented a cabin to prairie dog shooters and 1 group from Minnesota was shooting prairie dogs in this area while we were mapping. The landowner noted that shooters staying at his cabin were disappointed by the low prairie dog numbers. At the other ranch where we mapped prairie dog colonies, the landowner had just evicted a group of shooters from his property whom he had specifically told the previous day that they could not shoot prairie dogs on his land. They had left gates open and cattle ended up in the wrong pasture and he was pretty upset when we spoke to him.

Plague and poisoning observations

We were able to get permission to map prairie dog colonies from the 2 major landowners with prairie dogs in this area which also captured the dichotomy of prairie dog activity. The landowner within the plague zone also mentioned that he hired 3 men to poison prairie dogs for him for most of the summer 2009 about the same time plague appeared. Thus it is not certain if the decline of prairie dogs on his property was due to poisoning or plague, or both. He did not mention what poisons were used for prairie dog control, but Rozol was not legal for use in Montana until 1 October 2009.

The other rancher reported that he did not poison his prairie dogs nor did he allow prairie dog shooting. He claimed that when Keith Wittenhagen (Wittenhagen and Tribby 1996) mapped prairie dogs on his ranch in 1996 that there were 3,600 acres of prairie dogs then and that prairie dogs occupied acreage had increased since then. We have a copy of Whittenhagen and Tribby (1996), and it appears that the 3,600 acre figure (actually 3,136 acres) was for the Haughian Livestock Allotment in Custer Creek (3 drainages to the east and not part of our 2012 mapping effort). Wittenhagen and Tribby (1996) show that the actual figure for this ranch in 1996 was 443 acres, and 355 acres for the ranch with poison and plague. This area was impacted by plague in the late 1980s – early 1990s and Wittenhagen and Tribby (1996) noted that prairie dog colonies in this area were in the process of recovering in 1996. Plague apparently became epizootic in this complex about 3 years ago based on comments we received from a rancher. On the eastern portion of the complex, prairie dog colonies were reduced to small pockets of prairie dog activity. On the western portion of this complex, prairie dog colonies seemed to be very active and one rancher claimed that plague had missed his colonies. Another explanation might be that the plague epizootic had not reached his property yet as it was present right at the eastern boundary of the ranch.

Musselshell and Petroleum Counties Complex

We mapped prairie dog colonies at the Musselshell and Petroleum Counties Complexes from 22-24 June 2012. These 2 complexes are treated as a single complex because there really is no significant gap between the complexes.

Overall we were able to map, or view from public roads, 30 colonies in this complex. Two were determined to be inactive and the other 28 were active but greatly reduced by plague. We mapped 19 prairie dog colonies in this complex and they totaled 469 acres and average of 24.7 acres per colony.

The majority of the prairie dog colonies in this complex are owned by 5 members of the same family and only 1 of the 5 granted permission to map ("have at it" was his reply). Another landowner lived near Denver, CO and wanted to receive a written statement from MTFWP detailing the purpose of our mapping effort.

We found that virtually all of the landowners, whether they granted permission or not, wanted to know the purpose of gathering information about prairie dogs. Even landowners we spoke to that did not have prairie dogs on their land, wanted to know the purpose of the mapping effort. Moreover, very few ranchers could accept the idea that we were gathering information on prairie dogs for monitoring purposes. Most ranchers suspected that MTFWP was up to something more significant that might result in loss of private property rights. In the Musselshell/Petroleum Complex we heard comments about MTFWP sending bison to Fort Peck Reservation, and "MTFWP has never done anything for me so I am not going to do anything for MTFWP".

Our mapping effort in this complex also included 2 colonies located a few miles north of the northwestern corner of the complex. We had previously mapped these colonies and one was over 1,200 acres in 2004 (Knowles 2004) and it had several mountain plovers on it (Knowles 2005). Our remap of the colony found that it consisted of several smaller colonies that totaled 218 acres. No mountain plovers were found during our mapping effort, but there were several burrowing owls on the colonies.

NAIP Imagery versus actual prairie dog acreage results and discussion

There were 9 colonies where we were able to map the entire colony and compare our GPS data to 2009 NAIP imagery mapping data, and the GPS mapped colonies averaged 30.1% as large as the NAIP mapped colonies (range of 2 -59%) (Table 3). Plague undoubtedly was a major factor contributing to the difference between the 2 mapping techniques. Total NAIP mapped acres for the Musselshell/Petroleum Complex was 8,765 acres with the average colony size being 214 acres. Based on our sample of GPS mapped colonies, there could be around 2,600 acres of active prairie dog colonies in this complex.

Table 3. A comparison of prairie dog colony acreages as determined from 2009 NAIP aerial photos and acreages of the same colonies mapped with GPS in June 2012 in the Musselshell and Petroleum Counties Complexes.

Colony ID #	NAIP Acres	Mapped Acres	Mapped Acres as a Percentage of NAIP
7372	101.3	12.2	12.0
6657	93.9	1.5	1.6
6455	51.9	5.4	10.4
6454	22.2	7.3	32.9
6476	145.8	25.8	17.3
6562	177.9	90.7	51.0
6577	22.2	12.2	54.9
6631	98.8	58.0	58.7
6759	44.5	7.8	17.5
TOTAL/AVERAGE	758.5	118.0	28.5

Plague observations

Plague had recently been present in this complex and there were no prairie dog colonies that appeared to fully active. In fact, most colonies were drastically reduced in size and most of the inactive portions of the colonies were dominated by cheatgrass. The cheatgrass dominated areas in late June had a purple color and were relatively easy to see from a distance. Most of the prairie dog colonies that we observed in this complex appeared to be reduced to just pockets of prairie dog activity, similar to what we saw on the eastern half of the Custer County Complex.

Sodbusting

We also spoke to a contract farmer who reported that he had sod busted 12,000 acres in the past few years along the east side of the Musselshell/ Petroleum Complex and he planned to sod bust another 8,000 acres this year. This land was formerly owned by Bethel College in Kansas which received the land over a half century ago as an endowment. They sold this 44,000-acre property in 2009 for $150 per acre to compensate for declining revenues from financial investments. The land had just changed ownership again and the new owner wanted more land cultivated. The farmer said the property included prairie dog colonies and sage grouse, and that the golden eagle was the biggest threat to sage grouse. We did mention that the 2 species had coexisted for thousands of years and did just fine until recently, but that did not change his opinion or dislike for eagles.

ASSOCIATED SPECIES

Little Powder River Complex

In the Little Powder River Complex, we observed ferruginous hawks at 5 colonies, 3 burrowing owls at 3 colonies and 6 golden eagles at 3 colonies. In addition, golden eagles were also observed soaring at several locations off of prairie dog colonies, primarily in the area where fee shooting was conducted. One landowner reported an eagle nest in a ponderosa pine close to Colony 576, but she said that recently the nest had been inactive. This and adjacent colonies were poisoned with Rozol within the past year. No mountain plovers were found in this complex, and the habitat based on topography was not suitable for mountain plovers. Western meadowlarks were abundant in the Little Powder River prairie dog colonies.

Big Lake Complex

At the Big Lake Complex we observed 6 ferruginous hawks at 5 colonies, and 9 golden eagles at 7 colonies. We also observed a bald eagle on 2 occasions in 1 colony feeding on what appeared to be dead prairie dogs. A total of 28 adult burrowing owls were observed at 14 colonies. Of the 5 complexes that we worked in, this complex seemed to have the most burrowing owls. We also found a dead adult burrowing owl at Colony 3160 that appeared to have been shot. We had observed prairie dog shooters at the colony the previous day.

Our experience for the past 2 decades of mapping prairie dog colonies is that it is not unusual to find dead burrowing owls that appear to have been shot. Other species that we have observed shot in prairie dog colonies include; ferruginous hawks, golden eagles, back-billed magpies, American crows (*Corvus brachyrhynchos*), gulls (*Larus* spp.), coyotes, badgers, striped skunks (*Mephitis mephitis*), and white-tailed jackrabbits (*Lepus townsendii*).

Western meadowlarks (*Sturnella neglecta*), horned larks (*Eremophila alpestris*), lark buntings (*Calamospiza melanocorys*), and McCown longspurs (*Calcarius mccownii*) were common in prairie dog colonies in this complex. There was also a badger and a coyote found at 1 colony each. Prairie rattlesnakes were observed on and adjacent to prairie dog colonies on 6 occasions. Although the larger colonies in the Big Lake Complex appeared to have suitable habitat for mountain plovers, none were observed. The absence of mountain plovers at this complex was consistent with previous observations here in 2005. Five short horned lizards were observed on or near prairie dog mounds at the Hail Stone National Wildlife Refuge prairie dog colony (#3318). Richardson's ground squirrels were frequently observed along the margins of prairie dog colonies in this complex.

Custer Complex

At the Custer Complex, we observed 20 burrowing owls at 10 prairie dog colonies. Three of these owls were chicks in a burrow, and each chick was a different size suggesting that incubation for burrowing owls begins when the first egg is laid. The chicks were at the burrow entrance begging for food from the adults. Our observation of adult burrowing owls with dependent young in a burrow is that they leave the nest burrow area while we are mapping a colony and don't return until we leave. This is probably not a critical issue when mapping because we are in a colony only for a short period, but prairie dog shooters may spend hours (sometimes an entire day) in a colony shooting. This disturbance to burrowing owls due to shooting activity was noted by Knowles (1982) when conducting experimental shooting at a prairie dog colony for population control. Whittenhagen and Tribby (1996) only observed 25 burrowing owls and 9 ferruginous hawks in 92 colonies in and adjacent to this complex.

Only 1 golden eagle was observed in a prairie dog colony at the Custer Complex. On the ranch reporting plague and poisoning we observed an inactive golden eagle nest in a cottonwood tree, and another golden eagle nest that had fallen from a gumbo cliff next to active prairie dog colony. We also observed 3 ferruginous hawks at 2 colonies and 6 turkey vultures at 3 colonies, and on 3 different days, we observed a prairie rattlesnake in or close to the same un-mounded prairie dog burrow. Other associated species observations included 1 coyote and 2 badgers. We observed winter greater sage grouse (*Centrocercus urophasianus*) dropping on several of the prairie dog colonies along Sand Creek on the western portion of the Custer County Complex, but we did not observe any sage grouse, suggesting that summer habitat may be located somewhere else. No mountain plovers were found in this complex and the habitat based on topography was not suitable for them. We have previously searched this area and not found mountain plovers, but Dood (1980) observed 1mountain plover on a prairie dog colony in Custer Creek during the late summer migration. Not associated with prairie dogs but observed in this area was a milk snake (*Lampropeltis triangulum*).

Musselshell/Petroleum Complex

In the Musselshell/Petroleum Complex, we observed 6 burrowing owls in 4 colonies, 1 golden eagle, 1 ferruginous hawk and 1 prairie rattlesnake. We did not observe any mountain plovers. We had previously surveyed this complex for mountain plovers in 2005 and did not find any except for 2 colonies located just northwest of this complex.

CONCLUSIONS AND RECOMMENDATIONS

NAIP Imagery

The reduction of prairie dog colony size by apparent plague at 4 complexes and significant poisoning at the fifth complex made it difficult to accurately compare the NAIP mapping technique to the GPS based on-the-ground mapping. However, in every case where an entire colony was mapped with GPS, it was substantially less than what was estimated by NAIP.

In March 2012, we mapped prairie dog colonies at First Peoples Buffalo Jump State Park, and similar problems were noted. NAIP imagery mapping lumped small colonies into large colonies and overestimated the colony size. Our mapped acreages were 43% and 67% of the 2 NAIP mapped colonies at the State Park where there was no poisoning or evidence of plague. Maxell et al. (2010) predicted that their mapping technique would overestimate prairie dog colony size because the perimeter grid cells only needed 1 prairie dog burrow to be counted as part of the colony. They also noted that ant mounds, ground squirrel mounds and other areas of bared dirt might be incorrectly classified as a prairie dog mound.

The differences between the 2 mapping techniques were dramatic and substantial, but not consistent. Some of the differences could be attributed to poisoning or plague that occurred between 2009 and 2012, but it was also apparent that the NAIP mapping technique included substantial amounts of unoccupied habitat. NAIP also overestimated the colony size because even if only 1 prairie dog mound was viewed in a 1 hectare grid cell, the whole cell was counted as being occupied by prairie dogs. Initially this seems to be a small error, but multiplied around an entire perimeter of a colony, it can be substantial. For example, a 40-acre prairie dog colony will usually have a perimeter greater than a mile. There can be a considerable number of 1 ha cells that will lie along the perimeter, and virtually all the cells will overestimate the area that is occupied by prairie dogs. With a 40 acre colony there could be 17 cells on the perimeter, adding as much as an additional 40 acres to the colony size. This seemingly small problem illustrates how a sampling bias repeated over and over again can significantly skew the result in a particular direction. Maxell et al. (2010) recommended that their data not be used for prairie dog conservation planning without ground truthing prairie dog colonies with GPS based mapping.

A more accurate method to determine prairie dog colony size from NAIP imagery is needed. In 2006, when North Dakota Game and Fish first received NAIP imagery, we overlaid GPS mapped colony boundaries on the NAIP photos, and the mapped colony boundaries corresponded well to what appeared to be a prairie dog colony boundaries on the photos. Another method might be to draw the colony boundary on the photo and determine the acreage from the polygon on the photo. This would assure that unoccupied habitat would not be included in the colony, and it would not have the problem of perimeter blocks exaggerating the actual colony boundary. This method might require more time, but the greater accuracy may be worth the investment.

NAIP was highly successful in finding prairie dog colonies. During all our work, we only found 2 colonies (both just outside of a complex; one was just a few acres and the other about 160 acres) that were not detected through the NAIP imagery. In each complex we had a few colonies that we classified as inactive, but an earlier aerial survey of the NAIP identified colonies classified as active. In most cases this was a result of once active towns becoming inactive, but

there was 1 colony in the Custer County Complex (6919) that we classified as inactive, although there was no sign that a colony had ever existed there.

Based on our ground surveys of each prairie dog complex, it was apparent that there was considerably less prairie dog acreage than determined from NAIP imagery. The difference for each complex could have been from quarter to a half of NAIP imagery acreage. These differences between GPS and NAIP based mapping were due to sampling bias and prairie dog die-offs due to plague and poisoning between 2009 and 2012.

Recreational Shooting

We observed recreational shooting at all areas that we mapped. Shooters in the Little Powder River and Custer Complexes were primarily non-resident. At least 1 landowner at each of these complexes had a cabin available for shooters to stay at. One also charged a fee for shooting while the other rancher did not charge. Both these ranchers also had recently poisoned prairie dogs. Based on our 2003 mapping effort in the Little Powder River Complex there was a second rancher in this area that conducted a shooting program for prairie dogs, but in 2012 our conversation with this rancher we did not have a discussion about prairie dog shooting. In North Dakota, we encountered at least 4 ranchers who had prairie dog shooting programs that assessed a fee for shooting and provided lodging. Based on our experience of prairie dog mapping in Montana and North Dakota, it appears that the number of ranchers conducting prairie dog fee shooting is relatively low, but the number of prairie dog shooters in general is significant.

At the Big Lake, Musselshell and Petroleum Complexes, all the shooters that we encountered were either from the Billings area or were landowners. We did not find any fee shooting programs in these areas, but we were told 1 absentee landowner regularly brought clients to his ranch specifically to shoot prairie dogs. Our experience is that local prairie dog shooters frequently fail to ask permission of the landowner to shoot prairie dogs. They have expressed the theory that ranchers would never stop a person from shooting prairie dogs. However, our experience is that many ranchers consider prairie dog shooters as too much of a liability. We receive reports from ranchers of shot cattle, buildings being struck by bullets, barbwire strands severed by bullets (this is actually common and is an indication of the amount of shooting occurring in prairie dog colonies), gates left open, ruts from driving off-road during the wet season, and fears of fire during the dry season.

Poisoning with the anticoagulants, Rozol and Ramik Green

We documented the use of anticoagulants (Rozol and Ramik Green) for prairie dog control (T-feeders and whole colony treatment) at 3 complexes during a period when they were not registered for use in Montana. EPA registration will be reinstated in Montana (except for existing ferret reintroduction sites) as of 1 October 2012.

This toxicant will likely change the entire dynamics of prairie dog control from one of population management to prairie dog elimination (see Appendix A). In the process, there will be considerable secondary poisoning of avian and mammalian predators that scavenge prairie dog carcasses which could have far reaching effects on species already undergoing population declines. Prairie dog complexes reduced by plague epizootics will be very vulnerable to total control with Rozol. The USFWS Section 7 Consultation that bans the use of Rozol in ferret

reintroduction sites, but allows it elsewhere for prairie dog control, will impact the number of private landowners who might otherwise participate in ferret reintroduction. These large prairie dog colony complexes that we worked on in 2012 will likely be destined to become small complexes, or eliminated entirely, and finding a ferret reintroduction site will become even more difficult.

Because of secondary toxicity, Rozol should not used to control prairie dogs on public lands (both state and Federal). We suggest that MTFWP develop an agreement with Montana Department of Natural Resources (MTDNR) stipulating that lease of state sections with prairie dog colonies prohibit the use of Rozol and similar compounds with secondary toxicity. A similar agreement needs to be developed with Montana Bureau of Land Management and the Custer National Forest.

Consideration of The First Peoples Buffalo Jump State Park for Black-footed Ferrets

The First Peoples Buffalo Jump State Park and adjacent state lands contain about 1,000 acres of very active prairie dog colonies. This is a relatively isolated prairie dog colony complex and so far, there is no record of plague in the complex. Management of the prairie dog colonies at the Park is under state jurisdiction (MTFWP, MTDNR) and currently is under consideration for use of poison to substantially reduce their prairie dog colonies. Based on the decline of prairie dogs in the major complexes we worked in, coupled with the coming of Rozol for prairie dog control, the First Peoples Buffalo Jump State Park might be a good option for black-footed ferret reintroduction. Even though the prairie dog acreage is not great enough to support a viable ferret population, it could well serve as a ferret nursery if properly managed. Considering the questionable current and future outlook for prairie dog ecosystems in Montana, eliminating any colonies currently under MTFWP management should be carefully considered.

LITERATURE CITED

Burgess, K. 1978. A survey of prairie dog towns. Unpublished report. Custer National Forest. 19pp.

Colorado Cattlemen's Association. 2010. Rozol supports cattlemen. Colorado Cattlemen's Association News 2 September 2010.

Dood, A.R. 1980. Terry Badlands nongame survey and inventory final report. MT. Dept. of Fish, Wildlife, and Parks and Bureau of Land Management, Helena, MT 70p

FaunaWest. 1998. Status of the black-tailed and white-tailed prairie dog in Montana. Unpublished report. Montana Fish, Wildlife and Parks. Helena, MT.

Flath, D.L., and T.W. Clark. 1986. Historic Status of black-footed ferret habitat in Montana. Great Basin Naturalist Memoirs No.8:63-71

Fisher, D. and R. Timm. 1987. Laboratory trial of chlorophacinone as a prairie dog toxicant. Great Plains Wildlife Damage Control Workshop Proceedings. Pp. 67-69.

Hegdal, P.L. and B.A. Colvin. 1988. Potential hazard to eastern screech-owls and other raptors of brodifacoum bait used for vole control in orchards. Environ Toxicol Chem, 7: 245-260

Knowles, C.J. 1982. Habitat affinity, populations, and control of black-tailed prairie dogs on the Charles M. Russell National Wildlife Refuge. Ph.D. Dissertation. Univ. of Montana, Missoula. 171pp.

Knowles, C.J. 1986. Population recovery of black-tailed prairie dogs following control with zinc phosphide. Journal of Range Management

Knowles, C.J. 2003. Status of the black-tailed prairie dog in North Dakota. Unpublished report. North Dakota Game and Fish. Bismarck. 47pp.

Knowles, C.J. 2004 An inventory of black and white-tailed prairie dog colonies in the Billings a nd Powder River Resource Areas. Unpublished report. Montana Natural Heritage Program, Helena. 12pp.

Knowles, C.J. 2007. Status of the black-tailed prairie dog in North Dakota. Unpublished report. North Dakota Game and Fish. Bismarck. 49pp.

Knowles, C.J., J.D. Proctor, S.C. Forest. 2002. Black-tailed prairie dog abundance and distribution in the Great Plains based on historic and contemporary information. Great Plains Research 12:219-254.

Lee, C, P. Gibson, and J. Wilson. 2005. In-Burrow Application of Rozol to Manage Black-Tailed Prairie Dogs. Published in Proceedings of the 11th Wildlife Damage Management Conference. (D.L. Nolte, K.A. Fagerstone, Eds). 2005.

Maxell, B.A., S. Blum, and K.V. Walker. 2010. Preliminary Report: Mapping Black-tailed Prairie Dog (*Cynomys ludovicianus*) colonies across Montana using the National Agriculture Imagery Program (NAIP) 2005 imagery. Report to the Miles City Field Office of the Bureau of Land Management and the Nongame Program of the Montana Department of Fish, Wildlife, and Parks. Helena, MT: Montana Natural Heritage Program. 27 pp. plus an appendix.

Mendenhall, V.M. and L.F. Pank. 1980. Secondary poisoning of owls by anticoagulant rodenticides. Wildl Soc Bull, 8(4): 311-315

Merson, M.H. and R.E. Byers. 1984. Residues of the rodenticide brodifacoum in voles and raptors after orchard treatment. J Wildl. Manage, 48: 212-216.

Sullins, M. 1982. Efficacy of diphacinone baits for controlling black-tailed prairie dogs. Mont. Dept. of Agriculture, Tech. Rep. 82-6, Helena

TIETJEN, H.P. 1976. Zinc phosphide- a control agent for black-tailed prairie dogs. U.S. Fish and Wildlife Service, Wildlife Leaflet 509, Washington D.C., USA.

Williams, T. 2009. Ted Williams tears into prairie dog poisoning, "thrill kill" slobs. The Wilderness Sports Man.

WITMER, G.W., AND K.A. FAGERSTONE. 2003. The use of toxicants in black-tailed prairie dog management: An overview. Proceedings of the Wildlife Damage Management Conference 10:359-369.

Wittenhagen, K.W. and D.C. Tribby. 1996. Status of the black-tailed prairie dog in the Custer Creek Complex, Big Dry Resource Area. Unpublished Report, BLM, Miles City, MT.

Vyas, N.B., C.S. Hulse, C.P. Rice. 2012. Chlorophacinome residues in mammalian prey at a black-tailed prairie dog colony. Environmental Toxicology and Chemistry, In Press.

APPENDIX A

AN ANALYSIS OF
PRAIRIE DOG POISONING

Zinc Phosphide, Rozol, and Ramik Green Differences

Anticoagulants such as Rozol (Chlorophacinone) and Ramik Green (Diphacinone) (also sold under the brand name Kaput-D by Scimetrics) can both be effective prairie dog killers. Unlike zinc phosphide, there are no detectable odors or tastes to prairie dogs. As such, pre-baiting is not required which cuts in half the labor needed to poison a colony when label restrictions are not followed. Anticoagulants are not neutralized by moisture so they are long lasting and their use is not limited to dry periods (label restrictions on Rozol, if followed, restrict use from October through March). Anticoagulants are slow acting, taking a week or more to kill a prairie dog, so prairie dogs often consume considerably more than a lethal dose of the anticoagulant before they die. Because of this, the anticoagulant accumulates in body tissues, and their carcasses pose secondary toxicity hazards to birds and mammals that scavenge them (Vyas et al. 2012). On the other hand, since zinc phosphide forms phosphine gas when it comes in contact with stomach fluids, it generally kills prairie dogs within 4 hours of ingestion, does not accumulate in body tissues, and ultimately vents to the atmosphere, posing virtually no secondary toxicity hazards to scavengers (Tietjen 1976). In addition, about 90% of the prairie dogs die in their burrows.

Prairie dogs acquiring a sub-lethal dose of an anticoagulant are unable to associate their condition with the grain bait making it possible to effectively re-treat a colony within the same year (label restrictions on Rozol say retreatment is permitted after 1-2 months). With zinc phosphide treated grain bait, prairie dogs are able to smell and taste the zinc phosphide, and those prairie dogs receiving a sub-lethal dose will avoid treated grain bait for the remainder of their life. To be effective, retreatment of colonies with zinc phosphide must be at 2 or 3 year intervals to allow survivors time to die a natural death, or as an alternative, active burrows must be treated with a fumigant such as aluminum phosphide.

The secondary toxicity hazards of anticoagulants have been investigated and some studies have found significant loss of predators feeding on poisoned rodents. Hegdol and Colvin (1988) reported 58% mortality on radio-marked eastern screech owls (*Megascops asio*) having more than 20% of their home range overlapping orchards that had been treated with anticoagulants (brodifacoum) while owls with less than 10% home range overlap with orchards had only 17% mortality. Mendenhall and Pank (1980) reported that 5 of 6 barn owls (*Tyto alba*) fed rats killed by anticoagulants died. Merson and Byers (1984) found very little mortality of eastern screech owls at an orchard where voles were poisoned with the anticoagulant brodifacoum, but the owls did have sub-lethal levels of the anticoagulant. Fisher and Timm (1987) reported 5 of 6 domestic ferrets died after being fed prairie dogs killed by Rozol. Vyas et al. (2012) reported that secondary toxicity hazards of prairie dogs poisoned by Rozol (chlorophacinone) was much higher than previously reported based on the number of prairie dogs dying above ground and Rozol residues found in the carcasses. The USFWS has reported in Kansas that ferruginous hawks (*Buteo regalis*), golden eagles (*Aquila chrysaetos*), bald eagles (*Haliaeetus leucocephalus*), burrowing owls (*Athene cunicularia*), black-billed magpies (*Pica hudsonia*), turkey vultures (*Cathartes aura*), wild turkeys (*Meleagris gallopavo*), badgers (*Taxidea taxus*), swift foxes (*Vulpes velox*), coyotes (*Canis latrans*), and raccoons (*Procyon lotor*) have been found dead in areas where prairie dogs were poisoned. All carcasses tested showed Rozol residues (Williams 2009).

Notes on past prairie dog poisoning in North Dakota and similarities with Montana

In 2002, we mapped prairie dog colonies in southwestern North Dakota, and found that some ranchers were using strychnine treated grain bait to poison prairie dogs (Knowles 2003). Strychnine is not registered as a toxicant for prairie dog control, it is acutely toxic with prairie dogs dying on the surface within minutes of ingestion of the grain bait, and it causes secondary toxicity to scavengers. One rancher we interviewed even acknowledged that badgers were dying along with the prairie dogs – justifying the collateral damage by saying "what's a few badgers?". We notified North Dakota Game and Fish (NDGF) that Farmers Union Coop in Bismarck was supplying the strychnine grain bait for prairie dog control, and NDGF addressed this issue. In 2006, we mapped prairie dog colonies in North Dakota again, and found that ranchers were using Ramik Green, an anticoagulant, to poison prairie dogs. Ranchers were cooperatively working on large blocks of land and the treatment consisted of going mound to mound in prairie dog colonies and placing 1 cup of grain bait on each mound. Our visual assessment of treated colonies showed that this was highly effective at eliminating prairie dogs. A grain elevator in this area was supplying the Ramik Green to ranchers although the label restriction on Ramik Green at that time was for rodent control in and around buildings, but not for open field use nor was it registered for prairie dog control work. The ranchers were aware that they were out of compliance with the label restrictions, the elevator owner was aware how the Ramik Green was being used, and the manufacturer of Ramik Green in Madison, WI, Hacco, Inc., was questioning the large volume of treated grain bait going to a single grain elevator, but no one in this rural area of south-central North Dakota, or at Hacco, Inc. spoke out. This is clear evidence that label restrictions mean nothing to landowners determined to rid their property of prairie dogs. We contacted North Dakota Game and Fish to see how they ultimately handled this situation – their response was that they could not remember.

One rancher living at the edge of this large block of treated prairie dog colonies purchased a ton of Ramik Green to treat almost 1,000 acres of prairie dog colonies on his ranch. Rather than participate with the other area ranchers, he treated the colonies by himself by driving through the colonies on an ATV and broadcasting the grain bait by hand. With this technique, there was no appreciable kill on his colonies. However, only 1 burrowing owl was observed on this complex of colonies which was considerably less than what would have been expected for this area of North Dakota. The broadcasting of Ramik Green grain bait may have impacted the small mammal community and also secondarily poisoned burrowing owls.

Zinc Phosphide, Ramik Green and Rozol Application and Certification

From our North Dakota experience, we have concluded that ranchers prefer to poison prairie dogs with toxicants other than zinc phosphide. In North Dakota during 2002, we found people using bubble gum (not very effective), water melon rind soaked in antifreeze (not very effective), anhydrous ammonia (extremely dangerous), strychnine (not registered for use on prairie dogs) and the propane cannon (dangerous and very slow) rather than zinc phosphide. Although zinc phosphide is an effective poison when applied properly, it has developed a poor reputation among ranchers. Complaints we have heard about zinc phosphide are: 1) poor levels of control (some ranchers don't believe in pre-baiting), 2) too much labor because of pre-baiting, 3) grain bait is neutralized by precipitation (failed to check a weather forecast prior to application), 4) zinc phosphide has a short shelf life if not stored properly, and 5) it requires that the rancher have a pesticide applicator certification (too much red tape). Also, ranchers who have used

strychnine to poison prairie dogs are accustomed to seeing dead and dying prairie dogs on the surface before they have even finished applying the treated grain bait, while prairie dogs poisoned with zinc phosphide die in their burrows hours later creating the impression that zinc phosphide is not an effective poison.

Rozol is also classified as restricted use pesticides and also requires a pesticide applicator certification to use as a prairie dog toxicant. In Montana, the state is divided into 5 regions, and each fall in several cities within a region Montana State University Extension presents half day and full day workshops to provide the necessary training for certification. The pesticide applicator certification is good for 5 years at which time attendance at a workshop is required for re-certification. Attendees of the workshops are given 3 credits for each half day workshop, and the Federal government certification program requires a specific number of credits for a specific category of certification such as private applicator, commercial applicator, pesticide dealer, and pesticide research. There is no charge to attend the workshops and a free lunch is provided at full day workshops. It appears that private applicator certification requires about 1 day of training every 5 years to obtain and maintain certification.

Based on research conducted in Kansas on Rozol for controlling prairie dogs, the level of control obtained when the bait is placed in prairie dog burrows according to the label restriction can be highly variable and is frequently unacceptable (i.e. less than 70% efficacy). In addition, if label restrictions for Rozol are followed, there is considerably more labor involved poisoning with Rozol rather than zinc phosphide because placing bait in a burrow by hand is a slow tedious process and multiple trips to a poisoned colony are required to collect carcasses. The only way Rozol can effectively compete with zinc phosphide as a prairie dog control agent is to not follow label restrictions.

One rancher in the Little Powder River Complex, who stated he used Rozol to poison prairie dogs, described assisting professional prairie dog poisoners working in this area and that they delivered poison bait to prairie dog mounds from ATVs driving 15-20 MPH. In this part of the conversation he was not clear what poison was being used (Rozol or zinc phosphide). However, the web page, www.prairiedogbaiter.com shows ATVs mounted with twin hoppers designed to deliver ¼ cup poison bait per "serving" (zinc phosphide only requires a 1 teaspoon per bait spot) which suggests that this was designed for delivery of Rozol from a moving vehicle. The delivery tubes are about 1 foot out from either side the front wheels making it unlikely the bait would be accurately placed 6 inches below the surface in a prairie dog burrow as required by the label restrictions for Rozol. All the prairie dog poisoning that we have observed over the past 2 decades the bait delivery system has been from ATVs because they are so much faster than walking and dropping bait by hand. It is unrealistic to think that prairie dog control work will be conducted on foot and bait delivered by hand. Another problem with placing Rozol bait inside burrows is that without visually marking a burrow with spray paint or a flag it is impossible to know if the burrow was treated without close examination of the burrow. Either way this adds considerable effort to poisoning with Rozol if label restrictions are followed.

The label restriction on Rozol also requires that prairie dog colonies be searched for dead and dying prairie dogs starting 4-5 days after poisoning and continuing every other day until dead prairie dogs are not found (that is 1 clear search). The dead prairie dogs are to be disposed of by burial and not just thrown down a prairie dog burrow. Both the hand bait delivery 6 inches into the burrow and carcass collection after poisoning add considerable labor to poisoning prairie

dogs with Rozol. South Dakota Department Agriculture estimated that poisoning with Rozol resulted in 50% higher costs than poisoning with zinc phosphide if label restrictions were followed. They also stated that the level of control achieved when Rozol was placed in the burrow was poor. Based on available information, it is unlikely that ranchers will follow label restrictions because above ground application of Rozol is so much faster and results in greater kill. In addition, it is extremely unlikely that carcasses will be picked up.

The search requirement is basically meaningless for the following reasons. 1) Untrained people have no idea how to conduct systematic searches and find small animals. We have examined prairie dog colonies after prairie dog shooters have shot at the colony and our experience is that dead prairie dogs are not easily spotted from long distances. 2) The minimum search standards of 60 m line spacing at no more than 4 mph are not adequate for locating all carcasses (10 m search lines at 1-2 mph would be approaching complete coverage and is the standard used by tortoise biologists and archeologists.) If conducted at all, the most likely search will be made from a moving vehicle with a single pass through a colony in hopes that nothing will be found. Moreover, most people do not want to handle dead prairie dogs. 3) Prairie dogs dying above ground are scavenged within 24 hours (Tietjen 1976) as predators are active both day and night. On the Pine Ridge Reservation, illegal application of 600 pounds of Rozol translated to at least 400 prairie dog carcasses found above ground. Even if carcasses were truly removed every other day there would be plenty of opportunity for scavengers to have access to dead prairie dogs. 4) Prairie dogs dying within burrows will be dug out by badgers, long-tailed weasels (*Mustela frenata*), black-footed ferrets, coyotes, and swift foxes. No matter how many carcasses are picked up, these predators will end up as collateral damage. Our experience with poisoning prairie dogs with zinc phosphide is that quite a few prairie dogs die right at the burrow entrance and would not be seen with 60m search line spacing. These carcasses would be easily scavenged. 5) Other small mammal species will die and would be available to scavengers.

History of Rozol

Rozol is manufactured in Milwaukee, WI by Liphatech, and Ramik Green is manufactured near Madison, WI by Hacco Inc. (It should also be noted that Liphatech in 1988 purchased Scimetrics' zinc phosphide rodent bait business, and Liphatech still sells zinc phosphide products.) Both Liphatech, Inc. (parent company De Sangosse Group) and Hacco, Inc. (parent company Neogen Corporation) are subsidiaries of large multinational firms that market their products world-wide. Liphatech's efforts to get Rozol (Clorophacinone) approved for prairie dog control and Hacco's efforts to get Ramik Green (Diphacinone) approved for ground squirrel control were business ventures to expand their markets without concern for ecosystem function. These companies are working worldwide to get their patented chemicals registered for use in foreign countries as a means of increasing sales (information available on parent company web pages). The Hacco web page dedicates a little space about poisoning responsibly and includes a statement about the importance of predators. On an organism level, Rozol is a vitamin K cycle disruptor that leads to a slow painful death by internal bleeding, but when specifically used to target the elimination of black-tailed prairie dogs over broad regions it will be an ecosystem disruptor like Compound 1080. This is of particular concern with prairie dogs because their extreme coloniality makes it possible to know where virtually all prairie dogs live on a unit of land (ranch, drainage basin, county). It was adequately demonstrated in the 1950s and 1960s

with Compound 1080 that prairie dogs could be eliminated from large areas. Expect the same with Rozol.

Rozol was developed in the early 1960s by a French pharmaceutical company as a blood thinner. It was originally marketed as a mouse and rat poison in multi dose bait bars or single dose pellet baits for use in and around buildings. Research into Rozol as a prairie dog control agent was conducted in Kansas by Charles Lee starting in 2002 when initial tests showed a mean efficacy of 68%. Additional tests at 10 colonies in 2003 had mean reduction in prairie dog activity of 57%. The bait was place 15cm inside of prairie dog burrows presumably to prevent birds from consuming the bait. Early research on prairie dog control with zinc phosphide by Tietjen (1976) found that placing zinc phosphide treated bait inside burrow entrances resulted in lower levels of control because prairie dogs don't normally feed in their burrows. The EPA does not register toxicants unless the level of control exceeds 70% (Witmer and Fagerstone 2003). In addition, the EPA registration process for vertebrate pesticides normally requires extensive toxicity, efficacy, and nontarget hazard data not generally required for other types of pesticides (Witmer and Fagerstone 2003). In 2004, Lee et al. (2005) poisoned 15 additional prairie dog colonies throughout western Kansas with Rozol and had a mean reduction in prairie dog activity of 91%. In this 2005 paper (Lee et al. 2005), the authors do not mention any of their previous work with Rozol and the substantially lower levels of control. Moreover, in the 2005 paper, it is apparent that there were no untreated colonies used as a control to evaluate the changes in prairie dog activity at each of their treated colonies. In addition, the burrow plug method for evaluation of control has been demonstrated to be a poor indicator of prairie dog numbers (Knowles 1982, Sullins 1982).

Despite these obvious problems with the research, i.e. the data were contestable; Rozol received Special Local Need (SLN) approval in Kansas. Even the EPA acknowledged in their SLN permit that the "rational for the local special need … was thin" because zinc phosphide was available, had a good record as a prairie dog control agent, and had minimal secondary toxicity . Despite their statement above, the EPA signed off on a prairie dog toxicant every bit as bad as Compound 1080 which was banned by executive order in 1972 following a decade of effort by wildlife professional to stop the use of Compound 1080. Moreover, there was no research specifically conducted to evaluate the ecological consequences of using Rozol in a field situation – specifically what might happen if label restrictions are not followed. We do not know the role Liphatech played in this research or its political involvement in obtaining a SLN permit from the EPA, but this is the company that has donated $0.05 per pound of Rozol sold in Colorado to the Colorado Cattlemen's Association (Colorado Cattlemen's Association 2010) to fight for private property rights.

Five other states (Colorado, Oklahoma, Nebraska, **Texas** and **Wyoming**) also received SLN permits to use Rozol. In 2005, South Dakota Department of Agriculture rejected the idea of a SLN permit for Rozol because: 1) zinc phosphide was readily available, 2) Rozol applied according to label restrictions had low efficacy, 3) risk of secondary toxicity was high and had not been adequately investigated, and 4) the cost of applying Rozol according to label restrictions was 50% greater than zinc phosphide. The SLN permit process was clearly a backdoor route to gaining EPA registration for Rozol.

Rozol as a toxicant for black-tailed prairie dog control finally received EPA registration in May 2009, but was not legal to use in Montana until 1 October 2009 based on label restrictions. That

registration was cancelled on 27 July 2011 in Montana, North Dakota, South Dakota, and New Mexico. The cancellation was a result of a suit brought against the EPA by private conservation organizations over the failure of the EPA to conduct Section 7 Consultation with the USFWS when they registered Rozol for prairie dog control. Section 7 Consultation is required because the black-footed ferret is an endangered species and is associated with prairie dogs. The judge, in her ruling, did not cancel the registration in the states where Rozol had been previously approved for Special Local Needs. She made it clear that she was not going to shut off a source of revenue for Liphatech. By February 2012, the USFWS had written the draft Biological Opinion for Section 7 Consultation, and on 10 April 2012 the final Biological Opinion was issued with a non-jeopardy opinion for black-footed ferrets and other endangered species with the following stipulations:

1) Prohibiting application of Rozol Prairie Dog Bait within current and future black-footed ferret (Mustela nigripes) reintroduction areas to reduce the level of impact on the black-footed ferret;

2) Prohibiting application of Rozol Prairie Dog Bait within five southwestern New Mexico counties to avoid impacts on listed species including the Chiricahua leopard frog (*Lithobates [Rana] chiricahuensis*), jaguar (*Panthera onca*), New Mexico ridge-nosed rattlesnake (*Crotalus willardi obscures*), Mexican gray wolf (*Canis lupus*), and the Mexican Spotted Owl (*Strix occidentalis lucida*);

3) Shortening the application season where the range of the black-tailed prairie dog overlaps with listed species including the grizzly bear (*Ursus arctos horribilis*) and Preble's meadow jumping mouse (*Zapus hudsonius preblei*); and

4) Amending the Rozol product label to require enhanced searches to remove poisoned prairie dogs. These Bulletins will put into place geographic restrictions on the use of Rozol Prairie Dog Bait in six states (Colorado, Kansas, Montana, New Mexico, South Dakota, and Wyoming) in order to minimize potential adverse impacts to eight federally listed species. The Bulletins will become enforceable on October 1, 2012, which is the start of the Rozol Prairie Dog Bait use season.

Jeopardy rulings in Section 7 Consultation by the USFWS are rare. Rather, the USFWS generally issues a non-jeopardy ruling with stipulations such as the case with Rozol.

Rozol in Montana

In Montana, these restrictions only apply to portions of Fort Belknap and Northern Cheyenne Reservations, the BLM 40 complex in southern Phillips County (all with failed ferret reintroductions), and the CMR's UL Bend ferret reintroduction area. Prairie dog control with toxicants at these reintroduction sites would have required Section 7 Consultation even if the USFWS had not placed stipulations on Rozol. Consequently, for Montana and probably most other states with black-footed ferret reintroductions, the Section 7 Consultation concerning Rozol did little to change the situation since most ferret reintroduction sites are already under some form of Federal jurisdiction. The USFWS logic for not extending the stipulations beyond ferret reintroduction areas was that they did not want private landowners to become adversarial towards black-footed ferret reintroduction. Our experience with the agricultural community is that over 99% of the people have an extreme dislike for prairie dogs and the few people we have

encountered who seem to show some tolerance for prairie dogs, really would be happy to have them gone if they had a means to do it.

In the Little Powder River Complex, Rozol was probably being brought into Montana from Wyoming where it was still approved for prairie dog control, or it could have been retained by landowners from the 2009 – 2011 period when it was registered for use as a prairie dog control toxicant in Montana. One rancher told us that they could get rid of prairie dogs if it were not for the BLM land in this area that served as a prairie dog refuge. Although this statement was a little boastful, ranchers using zinc phosphide to control prairie dogs always told us that they had tried for many years to get rid of prairie dogs, but had been ultimately unsuccessful. This new level of confidence probably reflects the shift from zinc phosphide to Rozol. Another rancher took us to 2 colonies where he had poisoned with Rozol. We found no prairie dogs in one colony and a few in the other colony. He said the surviving prairie dogs would be gone very soon as he intended to cultivate the land. His explanation for why other ranchers in the area still had prairie dogs on their property was that they were lazy.

Both in North Dakota and the Little Powder River Complex, we observed that where poisoning was conducted by professional rodent control operators they used zinc phosphide for the control work. Those ranchers who contracted out prairie dog control work seemed to be satisfied about the efficacy of zinc phosphide. Almost without exception we observed that these ranchers rarely tried to conduct follow-up control work on the surviving prairie dogs to totally eliminate a prairie dog colony. Rather, they seemed to accept the cyclic nature of managing prairie dog populations. This most likely will not be the case once Rozol becomes available again.

We have observed T-feeders in prairie dog colonies in several areas of Montana including the Little Powder River, Big Lake and Petroleum Complexes. T-feeders are constructed out of 4-inch diameter PVC pipe in the shape of an upside down T consisting of a PVC pipe T fitting with about a foot of pipe fitted to each end of the T. Pipes at the top of the T are left open at the outside ends and the pipe at the lower portion of the T is fitted with a cap. The T is then set upside down and secured to the base of a fence post. The cap is then removed, the standing pipe is filled with grain bait, and the pipe is then recapped. The T-feeders we examined appeared to be baited with both Rozol and Ramik Green. Usually there were just a few T-feeders in a colony but some colonies had up to 8-12 feeders. The concept is that prairie dogs (and other small mammals) would enter the open pipe ends to feed on the grain bait and eventually die. The bait inside the pipe is protected from the weather, and only prairie dogs and other small mammals have access to the grain bait. None of the T-feeders we have seen appeared to be maintained. Probably the ranchers found out what we already knew – the territorial nature of prairie dog social organization limits the number of prairie dogs that would potentially take the grain bait to those living within a couple hundred feet a T-feeder. A few T-feeders in a prairie dog colony are basically meaningless from a population standpoint. T-feeders were developed at Montana State University for Richardson's ground squirrel (*Urocitellus richardsoni*) control and have been promoted by MSU wildlife extension since at least 2005.

The Little Powder River Complex rancher, who claimed to have poisoned prairie dogs with Rozol, told us that he did not pay attention to certification. Obviously he had some method to acquire the Rozol bait without being certified. Ranchers in North Dakota told us that one person in an area might be a licensed pesticide applicator and he would purchase Ramik Green for other ranchers. It was common for ranchers in North Dakota to have 1 or 2 green plastic 5-gallon

buckets of Ramik Green in their machine sheds to use for eliminating prairie dogs that might show up at a stockwater site or elsewhere on their property.

The private sector has made it clear their goal is to eliminate prairie dogs on private lands, and they will likely push for prairie dog control on public lands citing public lands as a source of re-infestation. During the 1960s when Compound 1080 was used for prairie dog control, the few surviving prairie dog colonies were neatly planned for each county as 1 acre here and a couple acres there. This was clearly the situation in 1964 when prairie dogs were first mapped on the CMR. Something similar is likely to develop with Rozol. It is left to government conservation organizations to regulate these toxicants and address the ecosystem concerns.