STUDY

VARIATION IN DISTURBANCE RESPONSES BY BLACK-TAILED PRAIRIE DOGS (*CYNOMYS LUDOVICIANUS*)

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ABSTRACT

Prairie dogs in Boulder, Colorado are thought of in two different lights. Some believe that they are agricultural pests that need to be eradicated and others believe that not only do prairie dogs have intrinsic value, but they are also essential to the diminishing prairie ecosystem in which they reside. In Boulder County, there have been efforts to preserve prairie dog habitat. These efforts should not be overlooked because the intention was well meant. However, the prairie dogs have to share most of their space with people, like at Marshall road in south Boulder. At other locations like Dry Creek in east Boulder, the prairie dogs must contend with people and domestic dogs. My objective was to study both of these populations to develop an idea of how they react to given disturbance because even though the intent of the efforts was to help protect prairie dogs, the efforts may have become misguided. Some populations of prairie dogs might be living in potentially harmful conditions.

NTRODUCTION

As the population of people increases universally, the amount of land that is left untouched by human activity decreases. This is of great concern because with loss of native land comes a loss of biodiversity and an increasing chance of extinction for many plant and animal species. The extinction of one organism can be devastating, especially if that organism is a keystone species. Such is the case of concern with the black-tailed prairie dog, (Cynomys ludovicianus), in Boulder, Colorado.

There are four species of prairie dogs. At the beginning of this century, their colonies stretched across over at least 100 million acres in western North America and by 1960, the range had been reduced to about 1,500,000 acres – a mere 1.5% of their original habitat of mixed grass

prairie (Marsh 1984). The black-tailed prairie dog, who is native to Colorado, has suffered the effects of habitat reduction in the Boulder area due primarily to flood irrigation and annual cropping practices (BCGMP, 1999). This is unfortunate because the decrease in number, size, and distribution of their colonies has and will continue to be a risk factor for all organisms associated with the ecosystem in which the prairie dog lives (BCGMP 1999). Indeed, the prairie dog is considered by some to be a keystone species for the prairie ecosystem. This means that they are an essential aspect of the landscape and their presence enables other organisms to exist. If prairie dog populations are altered in any way, the potential for drastic consequences for other species is high.

In November 1993, Boulder County acquired thousands of acres of land in the plains of Boulder County due to county open space sales and use tax; much of this land is inhabited by the black-tailed prairie dog (BCGMP 1999). There have been relocations of prairie dogs to these areas and they continue presently. However, the prairie dogs do not have exclusive access to this land. Rather, they have to share it with people and in some cases, free-running domestic dogs (Canis familiaris) who use these open spaces recreationally. Human presence is always a potential threat to wildlife but there also appears to be an additional risk of dogs harassing, potentially stressing, and even harming these prairie dogs, as was studied by Bekoff and Ickes in 1998.

My study focused specifically on both Boulder, Colorado research sites used in Bekoff and Ickes' 1998 study. I did not however use the "dog-free" Marshall road site as a control for the "dog-friendly" Dry Creek site as did their study. Rather, I studied both sites and compared them to one another thoroughly. My hypothesis was that there would be visible behavioral variance in responses to disturbance among the two populations. In addition, I predicted that the presence of both humans and dogs would prohibit the prairie dogs from engaging in their normal activities more so than the presence of humans alone. Results would likely aid in making both

sites, as well as others, as prairie dog friendly as possible to ensure their safety, longevity, and persistence as a species.

METHODS

Data were collected by observation at both the Dry Creek and Marshall road locations. The Dry Creek recreational area is located in East Boulder and is near a fairly busy road. It is an area that is frequently visited by people and their pet dogs. The prairie dog colony is approximately 14 acres (Bekoff and Ickes 1998) and is centered in the middle of a singular walking trail. In fact, the whole colony is intersected by this trail. The Marshall Road location is in south Boulder and is secluded from any main roads. The colony is about half the size of the Dry Creek colony and is again located centrally. Like at Dry Creek, the colony is intersected by a walking trail. There are only people allowed at the Marshall Road site and there are far less people here than at Dry Creek on any one day.

At both sites, I (with the help of one other individual) took a pair of binoculars, a tape measure, a stopwatch, a notebook, and writing utensil. The only exception was on day 1 when only preliminary behavioral data were being assessed. Only a notebook, writing utensil, and stopwatch were used this day. A camera was also brought on one occasion to both sites. The study was conducted in October and November 1999 for a total of seven days. Sixteen hours were spent in the field.

On day 1 at a non-related, non-experimental prairie dog colony near Boulder Reservoir, behavioral sampling and 1-0 recording at ten-minute intervals were used to establish an ethogram of expected behavior at subsequent sites. The following behavioral responses to disturbance, taken from Bekoff, et. al 1998, were noted: interruption of interactions, alarm call barking, returning to burrow, and concealment.

At the Dry Creek site, two sorts of trials were conducted. The first involved sequence sampling and continuous recording of interactions between any dog and any prairie dog. Twelve

observations described by Bekoff and Ickes 1999 were listed on a piece of paper and a "+" mark was made if the animal performed the action and a "–" marks was made if the animal did not perform the action. Brief descriptions were made where applicable. The observations were: dog ignored prairie dog, dog approached prairie dog, prairie dog reaction, dog walked toward prairie dog, dog stalked prairie dog, dog ran toward prairie dog before prairie dog retreated, dog ran after prairie dog retreated, dog chased prairie dog, dog extracted a concealed prairie dog, dog's breed, dog's size, and finally the overall sequence time. There were a total of 10 sequences recorded. Percentage of occurrence of the first nine acts would determine to what *extent* the prairie dogs were being disturbed. The additional three observations were made to simply show *trends*.

The other kind of trial conducted at both Dry Creek and Marshall road was between prairie dogs and humans where four measures, taken from Bekoff and Ickes (1999), were recorded. 21 trials were conducted - 13 at Marshall road and 8 at Dry Creek. 18/21 (86%) total trials were interactions between a researcher and a prairie dog. 3/21 (14%) trials were between a member of the public and a prairie dog. According to King (1955), the avoidance response to disturbance for prairie dogs consists of an alarm call followed by running to the burrow, hiding, and then reappearing when danger is gone. Thus, for my study, sequence sampling and continuous recording were used to record the following observations: bark distance (number of feet between a prairie dog and human when the prairie dog emits a warning signal and heads for the burrow entrance), concealment distance (number of feet between the human and burrow when the prairie dog conceals itself in the burrow), sequence time (the number of seconds that it takes for the prairie dog to run to its burrow, pause at the burrow's entrance, flatten down inside the burrow, wag its tail, bark, and conceal itself totally underground), and concealment time (number of seconds from the time that all individuals in the group conceal themselves to the time that one reappears above ground – seconds were cut off at 600 because no prairie dogs reappeared after this time). Results from these trials would provide numerical values to compile into graphs. This would allow determination of any difference in time or distance that prairie dogs reacted to

disturbance and consequently, differences in behavior of both populations could be assessed as planned. I assumed that if the prairie dogs were going to react at a further distance, then they were less habituated to disturbance. If it took them a shorter amount of time to react to disturbance and "recuperate" from disturbance – that is reappear from underground - then they had more time to perform "normal" prairie dog activities.

One other general observation that was made at both sites was that of how the prairie dogs spent their time to assess what their "normal" activities were. Hoagland (1995) describes some of the behaviors seen in prairie dogs as "jump-yip display" of territoriality, play, allogrooming, mouth-to-mouth contacts, as well as scratching to remove fleas, pushing, kicking, and pounding dirt, and collecting mouthfuls of dry grass. In addition, they have an elaborate communication system with at least 11 separate calls. Only the first four behaviors and various calls could be accounted for in my study.

RESULTS

Table 1 displays the ethogram that was established on day 1 and clearly shows which of the four behavioral responses were seen in this population of prairie dogs. These prairie dogs lived in a location that had little disturbance, which was essential to take into consideration when studying the other two sites. Though these data were not analyzed in any way, it was important to observe the way that prairie dogs in a natural, undisturbed habitat behaved.

Table 2 refers to the data that were collected at Dry Creek. Only 30% of the dogs observed ignored the prairie dogs at Dry Creek. All prairie dogs reacted to disturbance in ways that indicate alarm – running, barking, and wagging of the tail. Though there were incidences of dogs walking toward and stalking prairie dogs as well as dogs running toward prairie dogs before and after retreat, there were no cases of a dog actually chasing or extracting prairie dogs.

Most of the dogs that were present at Dry Creek on the research days were considered "large" (approximately 25kg. or larger). The average time that a dog interacted with any one

prairie dog was 3.43 minutes – regardless of the dog's breed. The only other substantial observation that I made was that of the dogs that were involved with harassing prairie dogs, 42% were Husky breed – a dog that is well-known for it's hyperactivity.

My results concurred with Bekoff and Ickes who found that the prairie dogs at Dry Creek were overall less cautious around humans than those at Marshall road were. The bark distance, concealment distance, and concealment time were on average, higher at Marshall road than Dry Creek as shown in Figures 1, 2 and 4 respectively. What this means is that the prairie dogs at Marshall road reacted to human disturbance and began to conceal themselves at further distances than the Dry Creek population. It also took them a longer time to reappear after concealing themselves underground. The Marshall road prairie dogs did have a shorter sequence time than did the Dry Creek ones.

The Dry Creek prairie dogs were rarely seen doing anything but behaving vigilantly. On all occasions of visiting this site, the colony appeared chaotic and little time was spent behaving in ways that non-disturbed prairie dogs would – like those observed for the construction of the ethogram. The Marshall road population spent the majority of their time stuffing grass in their mouths, scurrying about socializing without any visible signs of vigilance, and in a few cases allogrooming.

DISCUSSION

This duration of this study was not nearly as long as that of Bekoff and Ickes. However, the data show similar results. It is clear that disturbed prairie dogs do behave differently than do those that are undisturbed and that the disturbed population invested less time in normal activity.

Dry Creek prairie dogs were more accustomed to the disturbance of humans than were the Marshall road prairie dogs. Not only did this concur with what Bekoff and Ickes found, but also previous studies by Adams et al. (1987) in which prairie dogs living in/near a city (and thus disturbed) were less wary than were country ones. The reason that the Dry Creek prairie dogs

were more accustomed to human disturbance and therefore reacted differently to disturbance is likely because Dry Creek is more frequented. However, it is also likely that the prairie dogs here are more accustomed to both the presence of humans *and* dogs and this is why they react to disturbance the way that they do. It is possible that if there were no dogs allowed here, they would behave more similarly to the Marshall road population. Of all the people seen at Dry Creek, almost every single one of them had at least one dog with them. It is obvious that dogs pose more of a threat than do humans but it is doubtful that the prairie dogs are distinguishing between the two at Dry Creek. They see figures, whether human or dog, and react (see Figures 1, 2, and 4, as well as Table 2).

The prairie dogs at Marshall road are indeed more wary but I also found their reactions to be less chaotic and severe. In fact, my data were likely skewed because of a particular day when the Marshall population seemed unusually subdued and allowed me within dangerously close proximity of them.

The only puzzling data that appeared to make no sense was that of the sequence time between the two populations. In these data, the Marshall road population had a smaller amount of time than the Dry Creek population (see Figure 3). Adams et. al 1987 suggests that such a result could be due to the fact that "once the avoidance threshold is reached, subsequent responses are the same regardless of the area in which the animals live."

In conclusion, this study does not prove that prairie dogs that live at Dry Creek, or other similar locations, are living a completely stressful and precarious existence and that the disturbance they encounter is affecting their reproduction or persistence as a species. However, it is not difficult to see that the Dry Creek population does face *some* challenges that the Marshall road prairie dogs do not have and this was proven to make a difference in how they behaved. Though the Marshall road prairie dogs might not behave as "normally" as a population that has never come in contact with humans or domestic dogs, it is certain that they are behaving more normally that the Dry Creek ones. It would be in prairie dogs' best interest if the people behind

the management plan in Boulder and elsewhere would consider disallowing the presence of domestic dogs to run freely near their colonies. This will likely be disagreeable to the general public, in which case research ought to be done that aims to find if the prairie dogs would act differently if the dogs were free running or kept on a leash. Additionally, it may be useful to see if the prairie dogs react to large hyperactive dogs, like Huskies more so than small reserved dogs like terriers. My suggestion is that dogs should be at least kept on leashes if not prohibited from areas where prairie dogs exist.

Table 1

Behavioral responses	a	b	c	d
10 minutes	1	1	1	1
20 minutes	1	0	1	0
30 minutes	1	0	1	1
40 minutes	0	1	0	1
50 minutes	0	1	1	0
1 hour	1	1	0	0

a = interruption of interactions

b = alarm call barking

c = return to burrow

d = concealment

Table 2

Dog ignored p.dog	-	+	-	-	-	-	-	-
Dog approached	+	+	+	+	+	+	+	+
p.dog reaction	run	bark	bark	bark	bark	bark	run	wag
dog walked	-	+	-	-	-	-	+	+
dog stalked	30s	-	-	-	20s	-	-	-
dog ran b-4 retreat	-	+	+	+	-	-	+	+
dog ran after retreat	+	-	-	-	+	+	-	-
dog chase	-	+	-	-	-	-	-	-
dog extract	-	+	-	-	-	-	-	-
K-9 breed	hsky	terr	hsky	g.sher	rot	hsky	ret.	akita
K-9 size	lg	sm	lg	lg	lg	lg	lg	lg
Overall seq. time	3.25	N/A	4.5	4	4.5	3	1.5	3

Figure 1

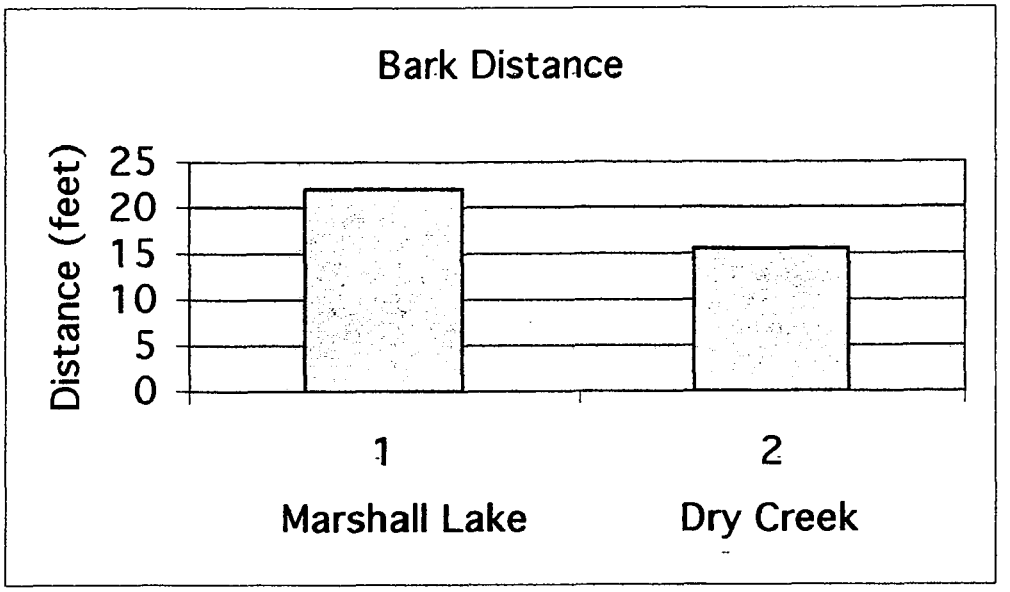

Bark Distance
Distance (feet)
25
20
15
10
5
0
1
2
Marshall Lake
Dry Creek

Figure 2

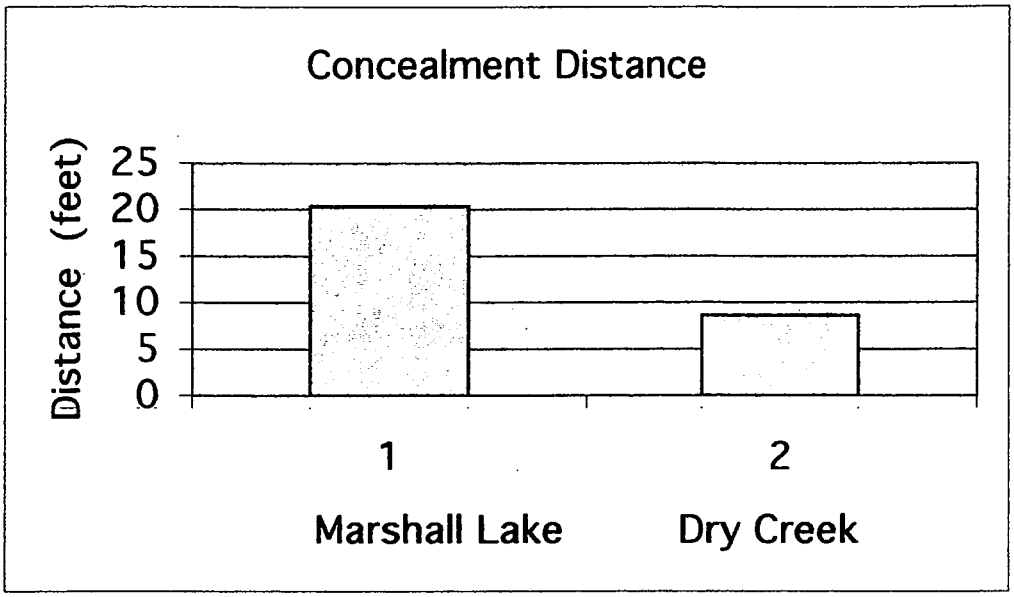

Concealment Distance
Distance (feet)
25
20
15
10
5
0
1
2
Marshall Lake
Dry Creek

Figure 3

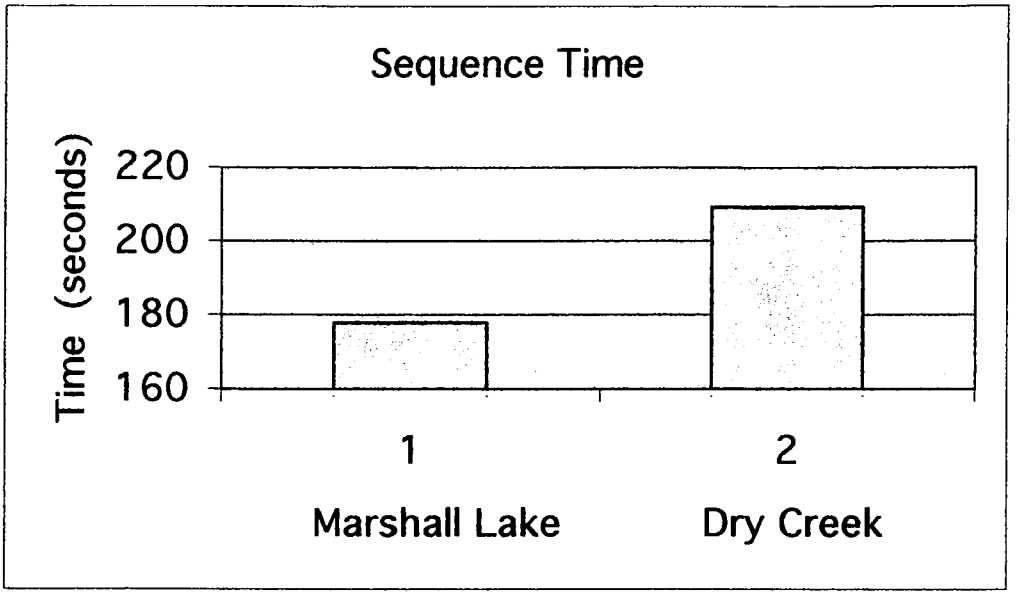

Sequence Time
Time (seconds)
220
200
180
160
1
2
Marshall Lake
Dry Creek

Figure 4

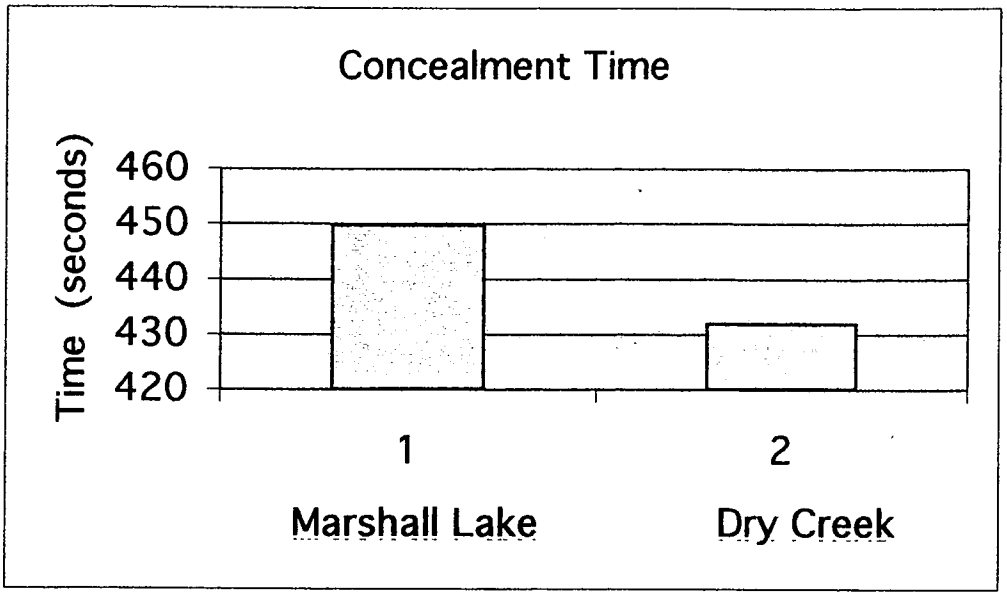
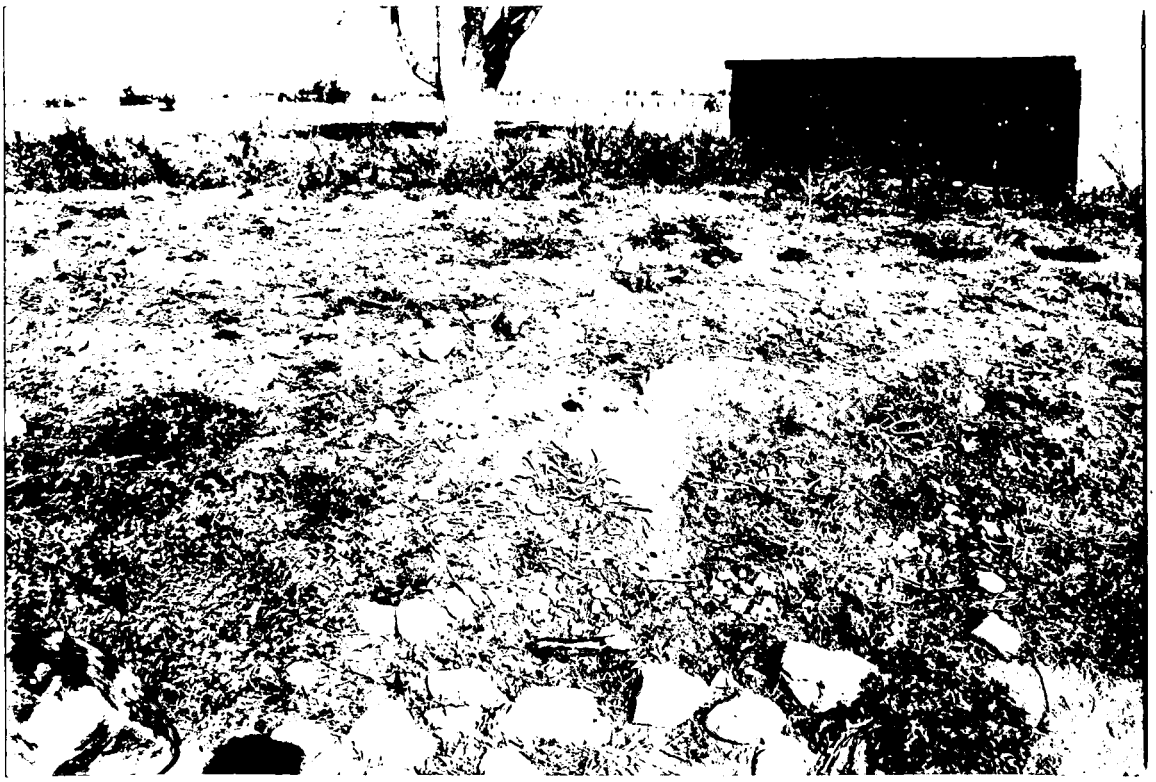
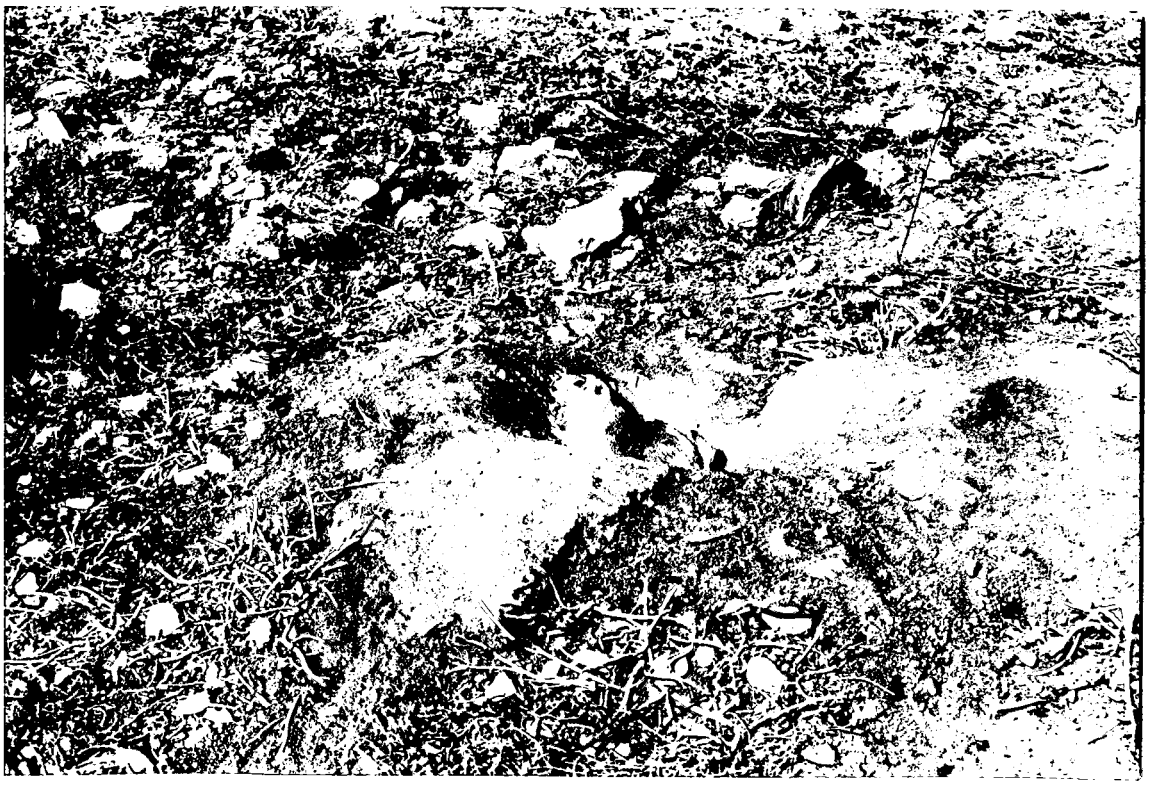

Concealment Time
Time (seconds)
460
450
440
430
420
1
2
Marshall Lake
Dry Creek

Figure 5
(over)





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