HABITAT ASSESSMENT OF AN INLAND POPULATION OF THE GULF COAST KANGAROO RAT (*DIPODOMYS COMPACTUS*).

THESIS

Presented to the Graduate Council of
Texas State University-San Marcos
in Partial Fulfillment
of the Requirements

for the Degree

Master of WILDILFE ECOLOGY

by

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San Marcos, Texas
August 2012

HABITAT ASSESSMENT OF AN INLAND POPULATION

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ACKNOWLEDGMENTS

I would like to thank my committee members for all of their guidance, James Rogers, Mindy Murray, and other fellow students who assisted in the data gathering, and my friends and family who always believed in me and pushed me to do better. I would like to thank Mike Stautzenberger and the owners of Diamond Half Ranch for allowing me to conduct my research on the property, the Department of Biology for the support, through a position as an instructional assistant, during the project, and the James A. "Buddy" Davidson Foundation for funding.

This manuscript was submitted on June 14, 2012.

TABLE OF CONTENTS

Page

ACKNOWLEDGMENTS v

LIST OF TABLES vii

LIST OF FIGURES viii

ABSTRACT ix

CHAPTER I: INTRODUCTION 1

CHAPTER II: MATERIALS AND METHODS 6

Study Area 6
Sampling Procedures 8
Statistical Analysis 10

CHAPTER III: RESULTS 12

CHAPTER IV: DISCUSSION 17

LITERATURE CITED 23

LIST OF TABLES

Table

Page

1. Description of soil types found on the Diamond Half Ranch including composition, profile, and depth to water table (http://websoilsurvey.nrcs.usda.gov) 10

2. Points with active burrows present during each season. 13

3. Means (95% confidence intervals) for each microhabitat parameter for each season for points with and without active Gulf Coast kangaroo rat burrows present on the Diamond Half Ranch in Guadalupe County, Texas.. 14

4. Results from the nested two-factor ANOVA for each microhabitat parameter for the season and for the presence or absence (Burrow P/A) of active burrows nested within each season...16

5. A list of some kangaroo rat species that occur in the United States including their substrate preferences and habitat associations. This shows which species are habitat specialists and which are habitat generalists..21

LIST OF FIGURES

Figure

Page

1. Location map indicating where in the state of Texas and Guadalupe County Diamond Half Ranch occurs. 7

2. Diamond Half Ranch with the 57 randomly generated points. 9

3. The annual mean percent cover or height and standard errors for the six microhabitat parameters analyzed on the Diamond Half Ranch in association with the Gulf Coast kangaroo rat. 18

ABSTRACT

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RAT (*DIPODOMYS COMPACTUS*)

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August 2012

SUPERVISING PROFESSOR: THOMAS R. SIMPSON

I conducted a habitat assessment on an inland population of the Gulf Coast kangaroo rat (*Dipodomys compactus*) located in Guadalupe County, Texas. Previous

research on the Padre Island population of the Gulf Coast kangaroo rat has shown the species to inhabit open areas with deep sand and little vegetation, essentially barren sand dunes. However, this distinct habitat type does not occur inland and yet the species is found in certain areas of inland south Texas. The goal of my study was to determine if the northernmost known population of *D. compactus* retains the species affinity for deep sparsely-vegetated sand habitat. My study site was the Diamond Half Ranch consisting of approximately 2303.3 ha, located 16 km south of Seguin, Texas. In order to assess the habitat associations of this inland Gulf Coast kangaroo rat population, 57 points were semi-randomly located across the study site. At each of these points, I used the Daubenmire frame technique to record the percent of ground cover for grass, forbs, small woody plants, litter (dead herbaceous material), and bare substrate (soil, rock) within a 10 m circle centered on the point. I also recorded the average height of the tallest plants, the average tree canopy present at each point using a spherical densiometer, and the number of active (uncluttered opening, feces, tracks, etc) burrow openings. Data were collected in May 2011, August 2011, November 2011, and February 2012. The results indicated a significant difference in microhabitat parameters between points with and points without active burrows present. The differences were due largely to the percent forbs, bare substrate, and tree canopy cover present, as well as the height of the herbaceous vegetation. The percent cover of litter and the percent tree canopy cover were consistently greater at points with active burrows absent while the percent cover of bare substrate was consistently greater at points with burrows present. At the scale of the entire ranch, habitat use (burrow digging) by the Gulf Coast kangaroo rat appears to be correlated with the presence of native plants, disturbed soils, and bare substrate such as grazed and unimproved pastures. The results of my study might aid in searching for additional inland *D. compactus* populations and development of management practices to sustain current populations.

CHAPTER I

INTRODUCTION

The Gulf Coast kangaroo rat (*Dipodomys compactus*), belongs to the family Heteromyidae which includes other New World rodent species such as kangaroo rats, pocket mice, and kangaroo mice that live in the deserts, grasslands, and shrublands of the western United States (Best et al. 1993). Until the 1970s, the Gulf Coast kangaroo rat was thought to occur only on the coastal barrier islands and adjacent mainland of the Texas Gulf Coast. The currently recognized distribution extends from Mustang Island and Padre Island, Texas, northward to Bexar and Gonzales counties (Linzey and Hammerson 2008a). Morphologically, this species is similar to other kangaroo rats in Texas, with minor differences such as a shorter tail, shorter and coarser pelage, and paler coloration (Baumgardner 1991). With few exceptions, much of what is known about the Gulf Coast kangaroo rat has been inferred from indirect evidence or from life history information of other kangaroo rat species.

Davis (1942) classified the Gulf Coast kangaroo rat as a subspecies of Ord's kangaroo rat (*Dipodomys ordii*) based on cranial characteristics and proportions of the tail and body. After genetic analysis, Johnson and Selander (1971) regarded the Gulf Coast kangaroo rat as a separate species. The Gulf Coast kangaroo rat has been studied on the barrier islands of Texas, but little research has been conducted on mainland populations and only a few inland populations have even been identified. Kennedy et al. (1973) researched the activity patterns of this species on Padre Island. Baumgardner and Schmidly (1985) studied the microhabitat relationship between the Gulf Coast kangaroo rat and Ord's kangaroo rat in South Texas, as well as habitat selection by each species in the presence and absence of the other.

Morphological and genetic research, such as width of the skull, nasal length, molar width, and length and width of mastoid bullae, has been conducted to compare the Gulf Coast kangaroo rat to other species of kangaroo rats (Jannett 1976; Schnell et al. 1978; Dalquest et al. 1992; Baumgardner and Kennedy 1994; Carrasco 2000).

Not all kangaroo rats inhabit identical habitats. The range in habitats for Ord's kangaroo rat includes semi-arid grasslands, mixed-grasslands, scrublands, and sandy soils (Bailey 1931; Hall 1941; Hallett 1982) while the desert kangaroo rat (*Dipodomys deserti*) is restricted to sand dunes in the most arid region of southwestern North America (Brown and Lieberman 1973). According to Baumgardner (1991), the Gulf Coast kangaroo rat inhabits sparsely vegetated sites usually confined to dune areas, common habitat on the barrier islands of Texas. However, little is known about the habitat associations of inland populations of the Gulf Coast kangaroo rat existing well away from the gulf coast and barrier islands and their distinctive dune habitat.

The majority of research on the habitat relationships of kangaroo rats has been conducted on species other than the Gulf Coast kangaroo rat. Schroder (1987) conducted research on habitat selection and the coexistence of Merriam's (*Dipodomys merriamii*), Ord's (*D. ordii*), and Banner-tailed (*D. spectabilis*) kangaroo rats. The study revealed that both Merriam's and Ord's kangaroo rats were captured at the same trap sites but that Merriam's kangaroo rat were typically captured in shrub dominated habitat while Ord's kangaroo rat were typically captured in areas with more grass clumps. In a study comparing microhabitats of Ord's kangaroo rat and the silky pocket mouse (*Perognathus flavus*), Lemen and Rosenzweig (1978) determined that Ord's kangaroo rat does not utilize areas with dense grassy habitat, possibly due to the complex maze of roots and stems. This would reduce the efficiency of movement for the kangaroo rat because of its bipedal locomotion. The substrate on which a kangaroo rat lives can strongly influence foraging behavior by affecting the rate and ease with which the food can be found and their ability to evade predators (Hardy 1945; Thompson 1982; Price and Waser 1984; Price and Longland 1989; Longland and Price 1991; Pierce et al. 1992).

Microhabitat is important to kangaroo rats in terms of foraging, locomotion, and ability to escape from predators. Lemen and Rosenzweig (1978) reported that Ord's kangaroo rat forages for seeds only in open areas around grass clumps. Reichman (1975) stated that kangaroo rat species forage mainly in open, vegetation-free habitats for rich seed resources. Due to the bipedal locomotion and enlarged auditory bullae the kangaroo rat is able to exploit the open areas because they can easily detect and escape predators (Webster 1962; Eisenberg 1963). The Banner-tailed kangaroo rat is reported to prefer open grasslands with little shrub cover (Vorhies and Taylor 1922; Hoffmeister 1986). The chisel-toothed kangaroo rat (*D. microps*) is typically associated with desert valleys dominated by saltbush or upland desert areas with deciduous blackbush (Hayssen 1991). The Panamint kangaroo rat (*D. panamintinus*) is the only species of kangaroo rat that occurs in the open areas within pinyon-juniper woodlands (Intress and Best 1990). In many studies, populations of Merriam's kangaroo rat, Ord's kangaroo rat, and Stephen's kangaroo rat (*D. stephensi*) increased when shrub species were reduced suggesting that they select habitat with little woody canopy cover present (Rosenzweig 1973; Whitford et al. 1978; Thompson 1982; Price and Waser 1984; Price et al. 1994; Price et al. 1995).

Soil is an important aspect of the habitat for kangaroo rats. Foraging decisions can be largely affected by the rate at which food can be extracted from the soil and the ability for the kangaroo rats to avoid predation (Rosenzweig and Winakur 1969; Bowers 1982; Price and Heinz 1984; Kotler 1984; Brown et al. 1988; Price et al. 2000). Soil texture is important in the amount of metabolic energy required for the kangaroo rat to burrow or forage. Burrow humidity and their ability to cut through and move the soil is largely affected by soil texture (Hoover et al. 1977; Vleck 1979).

In order to effectively manage and conserve habitat for wildlife, detailed knowledge of the habitats with which a species is associated must be acquired (Burkey 1989; Goombridge 1992; Burkey 1995; Goldingay and Price 1997). Many species have been placed on the endangered species list because of degradation and fragmentation of their habitat. Due to the vulnerability of the Gulf Coast kangaroo rat on the barrier islands of Texas caused by anthropogenic changes and development (TPWD 2005), more information about inland populations must be obtained. In this study I investigated the microhabitat parameters of a northern inland population of the Gulf Coast kangaroo rat situated in the Carizzo Sands soil formation in Guadalupe County, Texas. This study was designed to determine which microhabitat parameters have a greater influence on the presence or absence of the Gulf Coast kangaroo rat as indicated by the placement of burrows. I expected results suggesting that woody canopy cover, herbaceous vegetation height, soil type, and percentage of bare ground present have the greatest influence on the location of Gulf Coast kangaroo rat burrows based on previous research on this species on Padre Island. I expected that this northern inland population of Gulf Coast kangaroo rat would have microhabitat associations similar to those of the barrier island populations.

CHAPTER II

MATERIALS AND METHODS

Study Area

My study site was the Diamond Half Ranch consisting of approximately 2303.3 ha, located 16 km south of Seguin, Texas, in Guadalupe County (Figure 1). It is a working cattle ranch with recreational hunting of white-tailed deer. The ranch is situated over the Carrizo-Wilcox aquifer, which provides water for many of the surrounding areas. The dominant woody species in this area are mesquite (*Prosopis glandulosa*), post oak (*Quercus stellata*), blackjack oak (*Quercus marylandica*), with scrub brush, and scattered grasslands (Smyrl 2011). The soil types occurring on the study site included Demona loamy fine sand (DmC), Patilo and Arenosa Soils (PaD), Arenosa fine sand (ArD), Nebgen-Jedd complex (NcF), and Windthorst fine sandy loam (WdC3; Table 1).

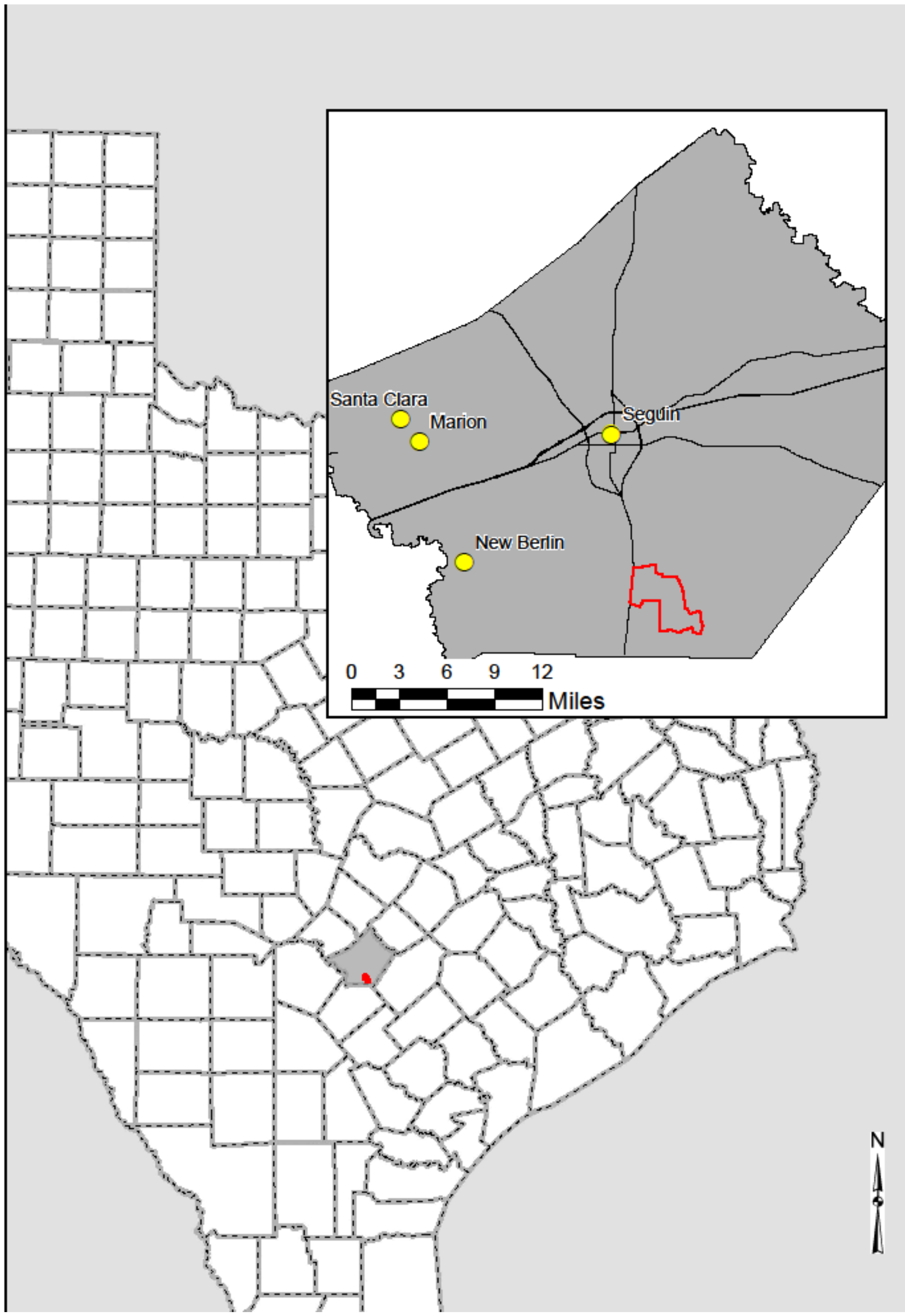

Figure 1. Location map indicating where in the state of Texas and Guadalupe County Diamond Half Ranch occurs. The ranch is approximately 16 km south of Seguin.

Sampling Procedures

Using ArcGIS, I located 57 randomly generated points on the study site. At each point, I divided the surrounding area into 90 degree quarters extending 10 m from the center point. At the center point and at a randomly selected location in each quarter, I recorded the percent of ground cover for grass, forbs, small woody plants, litter (dead herbaceous material), and bare substrate (soil, rock) as well as the height of the tallest plant in centimeters using the Daubenmire frame technique (Daubenmire 1959). Using a spherical densiometer, I calculated the percent tree canopy cover at each Daubenmire frame (Adler and Wilson 1987). I averaged the data of the measurements at all of the points for each recorded parameter. I counted active kangaroo rat burrow openings within a 10 m radius of each point. An “active” burrow opening showed recent activity (uncluttered opening, feces, tracks, etc.). Blocked or unmaintained burrow openings were not counted (Nadeau et al. 1995). I measured the distance from each center point to the nearest forest canopy edge in meters and determined the soil type at each point using the Web Soil Survey (http://websoilsurvey.nrcs.usda.gov). I recorded data in May 2011 (Spring), August 2011 (Summer), November 2011 (Fall), and February 2012 (Winter). This provided seasonal data on vegetation and presence of burrows.

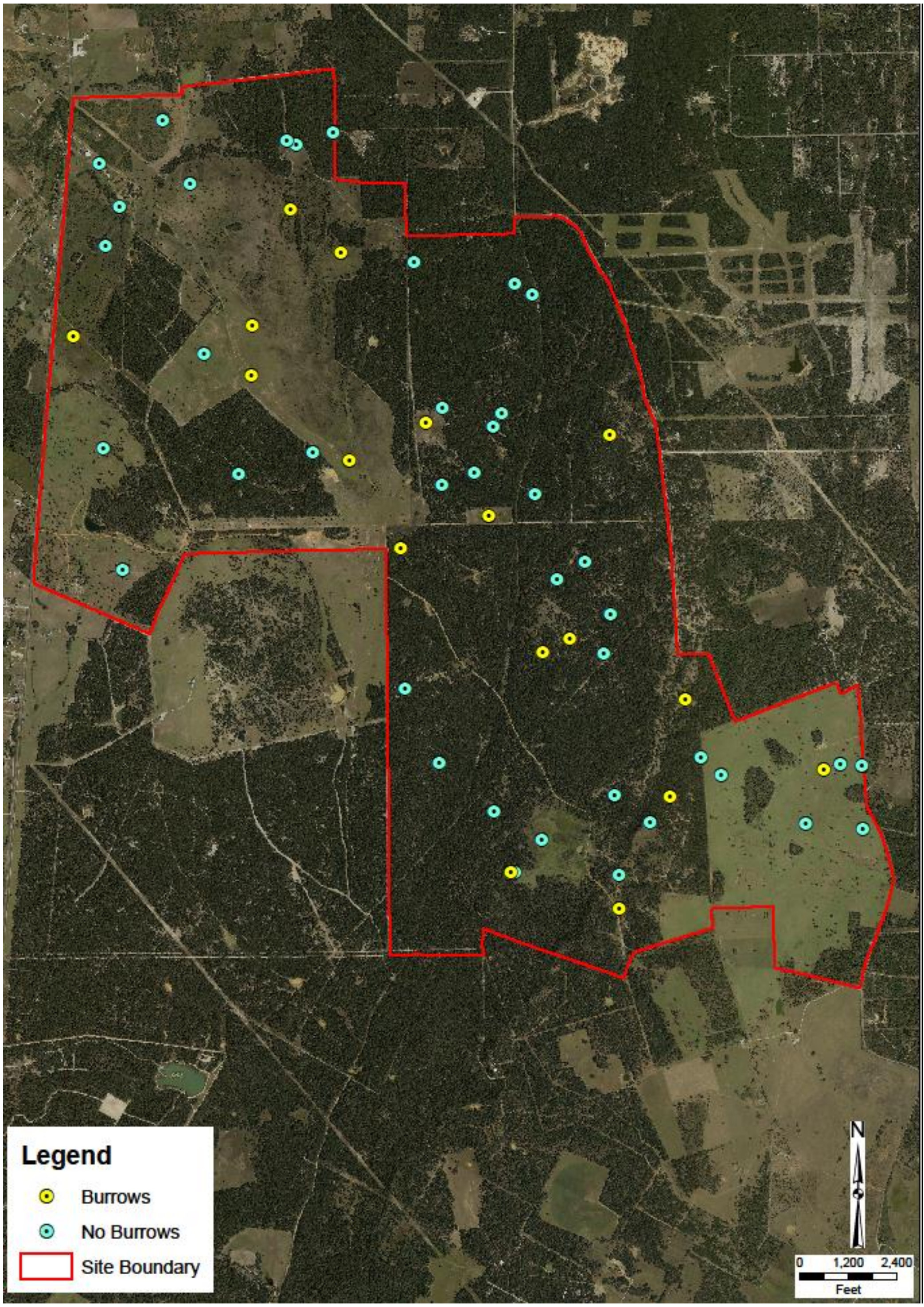

Figure 2. Diamond Half Ranch with the 57 randomly generated points. Active Gulf Coast kangaroo rat burrows were present at 17 points indicated by yellow dots. Blue dots indicate 40 points without active burrows present.

Table 1. Description of soil types found on the Diamond Half Ranch including composition, profile, and depth to water table (http://websoilsurvey.nrcs.usda.gov).

Soil Type	Composition/Profile	Depth to Water Table	Percent of Site
Patilo and Arenosa Soils, 1 to 8 percent slopes (PaD)	0 - 52 in: Fine Sand 52 - 84 in: Sandy Clay Loam	48 - 72 in	82%
Arenosa fine sand, 1 to 8 percent slopes (ArD)	0 - 96 in: Fine Sand	More than 80 in	11%
Nebgen-Judd Complex, 3 to 20 percent slopes (NcF)	Nebgen 0 - 7 in: Stony fine sandy loam 7 - 14 in: Bedrock Judd 0 - 10 in: Extremely gravelly sandy loam 10 - 24 in: Sandy Clay 24 - 48 in: Bedrock	More than 80 in	3%
Windthorst fine sandy loam, 1 to 5 percent slopes, eroded (WdC3)	0 - 8 in: Fine sandy loam 8 - 36 in: Clay 36 - 48 in: Sandy clay 48 - 72 in: Sandy clay loam	More than 80 in	2%
Demona loamy fine sand, 1 to 5 percent slopes (DmC)	0 - 24 in: Loamy fine sand 24 - 46 in: clay 46 - 62 in: Sandy clay	18 - 42 in	2%

Statistical Analysis

The percent cover for grass, forbs, litter, bare substrate, and tree canopy cover were transformed using the arcsine transformation since they were percentage data (Sokal and Rohlf 1984). I used a one way multivariate analysis of variance (MANOVA) to determine if the microhabitat parameters differed among points based on the presence or absence of active burrows for each season and for the entire year. For the MANOVAs, presence or absence of active burrows (group of points with active burrows present and a group without active burrows present) represented a two level independent factor and the parameters represented six dependent variables treated as one comprehensive or combined variable. These MANOVAs were used as an initial way of controlling for Type I errors (i.e., incorrectly rejecting a true null hypothesis) that can occur when there are multiple tests applied individually to multiple response variables. Statistical significance in the MANOVA indicates that one or more of the dependent variables is significantly different between treatments (or groups) and thus warrants conducting the univariate tests (Sokal and Rohlf 1984). Given that both MANOVAs were significant, I then used a nested two-factor ANOVA to test for differences between the group of points with active burrows and the group without active burrows. The ANOVA was applied separately for each microhabitat parameter. In the nested two-factor ANOVA the presence or absence of active burrows represented a grouping variable nested within the seasons for the individual parameters. This design tests for differences between each season as well as differences between the two groups of points (active burrows present or absent) within each season. I did not use the measurement of distance to the nearest forest canopy and percent small woody plant cover in the analysis because the data did not meet the assumption of normality and could not be transformed in any way to achieve normality.

CHAPTER III

RESULTS

Seventeen points (30%), indicated by the yellow points in Figure 1, had active burrows present in one or more seasons. Nine points had active burrows present during two or more seasons, and 5 points had active burrows present during all seasons (Table 2). The greatest number of active burrow openings were counted in the spring and the least number of active burrow openings counted was in the winter. The points with active burrows present varied a lot in the number of active burrow openings counted.

The mean height of herbaceous vegetation at points without active burrows was approximately twice that of points with active burrows in Spring and Summer with the difference being slightly less during Fall and Winter (Table 3). The percent cover of litter and the percent tree canopy cover were consistently greater at points without active burrows present while the percent cover of bare substrate was consistently much greater at points with active burrows present. Percent cover of forbs was similar in all seasons except February which was considerably higher at points with active burrows present. The percent cover of grass was similar in all seasons with a higher percentage occurring at points without active burrows than with active burrows (Table 3).

Table 2. Points with active burrows present during each season. This information includes the number of active burrow openings counted at each point during the season in which they were observed.

Point	**Season(s)**	**Active burrow openings**
9	Summer	6
18	Fall	3
22	Spring; Summer; Fall; Winter	22, 19, 22, 3
23	Spring; Summer; Fall; Winter	24, 48, 19, 24
24	Summer	6
25	Winter	4
26	Summer; Winter	4, 9
28	Spring; Summer; Fall; Winter	78, 25, 20, 7
30	Fall	4
35	Spring; Summer; Fall; Winter	13, 5, 8, 2
36A	Spring; Summer; Fall	27, 6, 6
38	Spring	16
40	Summer	3
41	Spring; Summer; Fall; Winter	8, 8, 9, 29
45	Spring; Summer; Fall; Winter	7, 13, 4, 5
46	Spring; Summer	7, 12
52	Winter	6

Table 3. Means (95% confidence intervals) for each microhabitat parameter for each season for points with and without active Gulf Coast kangaroo rat burrows present on the Diamond Half Ranch in Guadalupe County, Texas. The means are from the non-transformed data.

Season	**Grass**	**Forbs**	**Litter**	**Bare Substrate**	**Height (cm)**	**Canopy Cover**
SPRING						
WITH BURROWS	11.4	4.1	49.1	24.3	16.3	2.6
(N=9)	± 6.9	± 1.6	± 16.5	± 13.9	± 3	± 5.2
WITHOUT BURROWS	17.7	4.1	61.9	8.7	35.3	47.6
(N=48)	± 4.3	± 1.1	± 6.9	± 3.5	± 4.8	± 11.6
SUMMER						
WITH BURROWS	5.1	6.2	43.4	32	16	1.4
(N=12)	± 2.5	± 3.1	± 11.5	± 11.2	± 4.4	± 2.2
WITHOUT BURROWS	7.7	1.4	60.5	7.4	33.4	47.7
(N=46)	± 3.1	± 0.7	± 7.9	± 3.9	± 6.2	± 11.7
FALL						
WITH BURROWS	5.2	4.5	29	39.9	30.3	4.4
(N=9)	± 3.3	± 2.4	± 14.5	± 19.8	± 12.6	± 5.7
WITHOUT BURROWS	11	4.1	58.2	11.6	35.1	41.8
(N=48)	± 3.9	± 1.9	± 49.4	± 5.5	± 6.4	± 11.7
WINTER						
WITH BURROWS	1.8	36.9	16.7	21.9	15	3.1
(N=9)	± 0.5	± 23.3	± 16.6	± 20.9	± 6.4	± 5.9
WITHOUT BURROWS	3.9	13.5	54.9	7.4	20.9	41.6
(N=48)	± 1.8	± 5.2	± 10.5	± 3.4	± 3.2	± 10.9

Results of the MANOVA indicated a significant difference ($P < 0.01$) in microhabitat parameters between points with and points without active burrows present within the year (Pillai = 0.557, $F_{8,48} = 7.556$, $P < 0.001$) as well as within each season (Spring, Pillai = 0.557, $F_{8,48} = 7.556$, $P<0.001$; Summer, Pillai = 0.544, $F_{8,48} = 7.149$, $P<0.001$; Fall, Pillai = 0.394, $F_{8,48} = 3.904$, $P<0.001$; Winter, Pillai = 0.379, $F_{8,48} = 3.595$, $P<0.001$). The results of the individual nested two-factor ANOVAs show that differences between points with and points without active burrows present within each season are due largely to the percent forbs, litter, bare substrate, tree canopy cover and the height of the vegetation (Table 4). Grass showed a significant difference between season overall but no significant difference between the presence or absence of active burrows ($F_{4,220} = 1.032$, $P = 0.391$).

Table 4. Results from the nested two-factor ANOVA for each microhabitat parameter for the season and for the presence or absence (Burrow P/A) of active burrows nested within each season. The percentage data were arcsine transformed.

Microhabitat parameter	**Source**[†]	**SS**	**MSE**	***F***	***P***
Grass	Season	1.64	0.55	20.41	<0.0001
	Season (Burrow P/A)	0.11	0.03	1.03	0.391
Forbs	Season	2.02	0.67	23.09	0.0005
	Season (Burrow P/A)	1	0.25	8.6	< 0.0001
Litter	Season	0.41	0.14	1	0.396
	Season (Burrow P/A)	2.81	0.7	5.1	0.0006
Bare Substrate	Season	0.23	0.08	1.22	0.302
	Season (Burrow P/A)	3.39	0.85	13.39	< 0.0001
Height	Season	6917	2305.6	7.5	0.0008
	Season (Burrow P/A)	5572	1392.9	4.53	0.0016
Tree Canopy Cover	Season	0.24	0.08	0.28	0.837
	Season (Burrow P/A)	12.13	3.03	10.67	< 0.0001

[†] For “season”, degrees of freedom were 3 and 220. For “Season (Burrow P/A)”, degrees of freedom were 4 and 220.

CHAPTER IV

DISCUSSION

My results suggest that there is a significant difference between locations (microhabitats) where Gulf Coast kangaroo rats dig burrows and where they do not. At Diamond Half Ranch, Gulf Coast kangaroo rats tend to dig burrows where the percent tree canopy cover, percent cover of litter, and the height of herbaceous vegetation are low and the percent cover of bare substrate is high (Figure 3). The soil types at the points at which burrows were present were PaD (12 points) and ArD (5 points) suggesting that a soil that consists primarily of deep fine sandy soils not loamy or clayey soils are necessary for the Gulf Coast kangaroo rat. This suggests that clay content could inhibit burrowing or foraging (Baumgardner and Schmidly 1985).

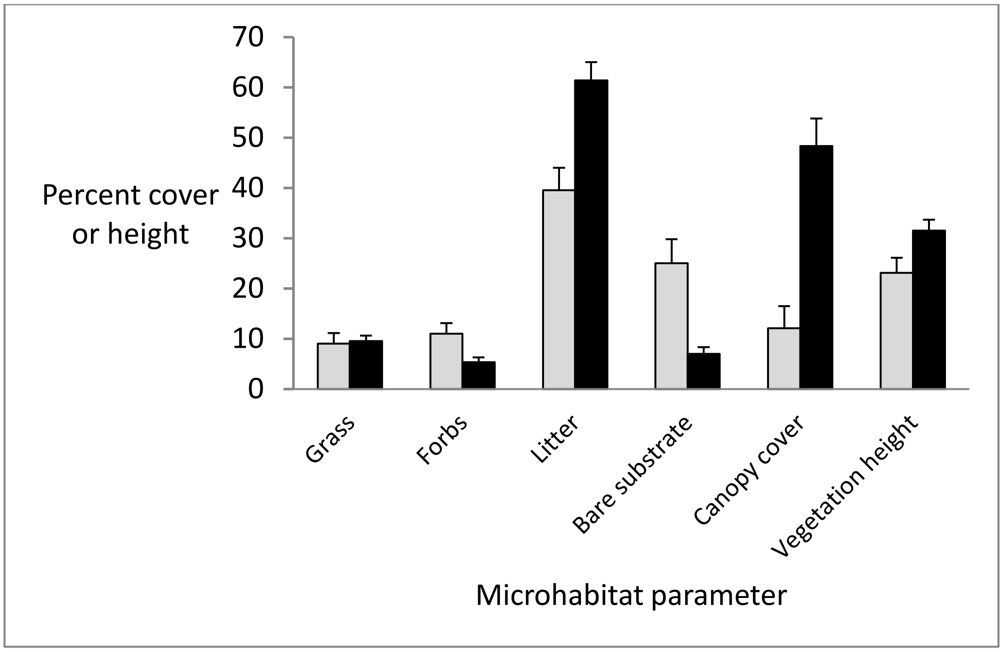

Figure 3. The annual mean percent cover or height and standard errors for the six microhabitat parameters analyzed on the Diamond Half Ranch in association with the Gulf Coast kangaroo rat. The grey bars represent the annual means for points with burrows present and the black bars represent the annual means for points without burrows present.

Percent cover of forbs was also a significant habitat parameter for the presence of Gulf Coast kangaroo rat. The means for percent cover of forbs for the points with burrows present was higher than those without burrows in summer, fall, and winter. Forbs provide seeds as the primary food source for the Gulf Coast kangaroo rat. Price and Heinz (1984) suggested that harvesting success for kangaroo rats declines as seed size decreases. Other species of kangaroo rats, such as Ord’s kangaroo rat, prefer large seeds (Henderson 1990).

Additionally, my results suggest that Gulf Coast kangaroo rats may be incompatible with dense stands of some improved grasses, such as Coastal Bermuda Grass (*Cynodon dactylon*) because it produces dense cover with little bare substrate and potentially limits germination and growth of forbs.

Gulf Coast kangaroo rats were not active (as indicated by the absence of active burrows) in areas with greater tree canopy cover and percent cover of litter. These two parameters are likely related due to the amount of leaves dropped from deciduous trees. The larger amounts of litter present could inhibit the movement of the kangaroo rat due to their bipedal locomotion and enlarged hind limbs and may impact their ability to forage and escape predation (Howell 1932; Longland and Price 1991; Pierce et al. 1992). In addition to inhibiting movement, the greater canopy cover and greater amounts of litter could reduce forb growth and seed production impacting the available food supply for the kangaroo rats. The percent cover of herbaceous vegetation (grass and forbs) throughout the year was low compared to percent cover of bare substrate, suggesting that the Gulf Coast kangaroo rat prefers areas with less vegetative cover. The height and composition of the vegetation in an area could hinder their movement affecting their ability to forage and escape predation.

Based on my study, land use relationships can be derived for the Gulf Coast kangaroo rat. The presence of Gulf Coast kangaroo rats in an area appears to be correlated with the presence of native plants, disturbed soils, and bare ground. Areas with this type of habitat are primarily native pastures used for grazing cattle. Active burrows were typically present in areas on the study site grazed by cattle. Grazing causes changes to occur in densities of grasses and forbs which can affect foraging strategies of kangaroo rats and other rodents (Brotherson and Brotherson 1981; Bock et al. 1984).

Results similar to my study suggest that other kangaroo rats and heteromyid species prefer to inhabit areas with low densities of herbaceous vegetation and low canopy cover (Rosenzweig 1977; Mellink 1985; Stangle et al. 1992). Kelt et al. (2005), researching effective management tools for the endangered Stephens' kangaroo rat, reported that populations increased in areas where mowing and grazing practices were implemented. Merriams' kangaroo rat populations have been reported to be more abundant in grazed areas (Hayward et al. 1997). The impacts of grazing on foliage, such as decreasing shrub densities and the height of herbaceous vegetation, can increase the habitat potential for the presence of Gulf Coast kangaroo rats. Kangaroo rats can have a positive impact through seed dispersal since they tend to store more seeds than they need. Reynolds (1958) reported that large seeded perennials increased within plots where Merriam's kangaroo rat was present.

The study site is located within the Post Oak Savannah Ecoregion of Texas which is changing structurally due to fire suppression. Fire suppression has led to structural changes within these savannahs such as, increased tree density, basal area, and canopy cover (Stout 1944, Cooper 1960, Abrams 1986). These changes may have important implications for the management of the Gulf Coast kangaroo rat since they choose open habitats with little vegetation or canopy cover.

The results from this study are consistent with research that has been conducted on kangaroo rat species including the Gulf Coast kangaroo rat on the barrier islands. The

Gulf Coast kangaroo rat is more selective in habitat preferences than some other species of kangaroo rats (Table 5).

Table 5. A list of some kangaroo rat species that occur in the United States including their substrate preferences and habitat associations. This shows which species are habitat specialists and which are habitat generalists.

Common Name	**Scientific Name**	**Substrate**	**Habitat**
Gulf Coast kangaroo rat (Schmidly 2004)	*Dipodomys compactus*	deep, loose sand	sparsely vegetation open areas; shifting dunes
Texas kangaroo rat (Schmidly 2004)	*Dipodomys elator*	clay soils	sparse, short grasses and small, scattered mesquite bushes
Merriam's kangaroo rat (Schmidly 2004)	*Dipodomys merriami*	sandy soils, clay soils, gravelly soils, and rocks	scattered grasses and shrubs
Ord's kangaroo rat (Schmidly 2004)	*Dipodomys ordii*	sandy soils; rarely on hard and gravelly soils	open areas with clumps of grass
Banner-tailed kangaroo rat (Schmidly 2004)	*Dipodomys spectabilis*	hard and moderately gravelly soils	sparsely brush-covered slopes and low hills; slopes covered with scattered, mixed stands of creosote bush and acacias
Chisel-toothed kangaroo rat (Hayssen 1991)	*Dipodomys microps*	medium to fine gravelly soils	desert valleys dominated by saltbush; upland desert areas with deciduous blackbush
Panamint kangaroo rat (Intress and Best 1990)	*Dipodomys panamintinus*	course sand; gravelly soils	pinyon-juniper woodlands
Dulzura kangaroo rat (Linzey et al 2008)	*Dipodomys simulans*	gravelly and sand soils	open chaparral and grasslands
Agile kangaroo rat (Linzey and Hammerson 2008b)	*Dipodomys agilis*	excavated sandy or gravelly soils	chaparral-covered slopes upward to coniferous forests
Stephen's kangaroo rat (Bleich 1977)	*Dipodomys stephensi*	gravelly soils; sandy soils	sagebrush and annual grasslands
Desert kangaroo rat (Best et al 1989)	*Dipodomys deserti*	sandy soils; silty soils; gravelly soils	lowest, hottest, most arid regions; open areas with little shrub cover

This population of Gulf Coast kangaroo rats appears to inhabit open areas with loose, deep fine sands and little vegetation. Similar to other kangaroo rats, they appear to favor disturbed areas where some type of vegetation removal, such as grazing, takes place. These results can be used to determine additional inland areas that may be compatible with the Gulf Coast kangaroo rat and aid in searching for more inland populations that have not been discovered yet.

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