ERID 098255

LA-UR-07-6269

Title **The Morphology of the Many-Lined Skink (*Eumeces multivirgatus*) at Los Alamos National Laboratory**

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The Morphology of the Many-Lined Skink (*Eumeces multivirgatus*) at Los Alamos National Laboratory

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Abstract

In the summer of 2001, a study of many-lined skinks (*Eumeces multivirgatus*) was conducted to examine whether there were morphological differences in skinks on the Los Alamos National Laboratory (LANL) compared to offsite skinks. Appendage loss, tail malformation, and other morphological anomalies were compared in skinks inhabiting four canyons to test the hypothesis that soil and sediment contamination may be associated with morphological anomalies. Four canyons were selected for sampling: two canyons within LANL (Sandia [SA] and DP) that contain polychlorinated biphenyls and dichlorodiphenyltrichloroethane (DDT) and two offsite canyons (Garcia [GA] and Chupaderos [CH]) that are relatively uncontaminated. Pitfall trapping in the four canyons produced a total of 484 captures (377 original skinks; 107 recaptures), with the original captures distributed between canyons as follows: CH = 61, GA = 54, DP = 128, and SA = 134. Normalized catch rates were highest in systems with high amounts of ground cover (grass, rock, and/or litter). The rates of appendage loss and tail and pattern abnormality by canyon were GA, 32%; DP, 26%; CH, 18%; and SA, 18%. There was no significant difference in the frequency of these anomalies between canyons (Marginal test of homogeneity, Chi-Square = 6.0, df = 3, p = 0.12). No significant difference in the frequency of joint abnormality or loss was detected between canyons (Marginal test of homogeneity, Chi-Square = 0.69, df = 3, p = 0.88). The evidence did not support the hypothesis that soil/sediment contamination is associated with morphological anomalies. When the effect of skink age was removed by excluding data on hatchlings and juveniles, which tested the hypothesis that skinks develop abnormalities as they ingest contamination during growth, the conclusions did not change. Instead, comparisons suggest that natural variation in factors producing appendage loss, tail malformation, and other anomalies is substantial. The results of this study also suggest that the magnitude of differences between canyons may be small, but that overall rates of appendage loss, tail abnormality, and other anomalies were high compared to other lizard studies. However, the rate of abnormality observed in the field was comparable to the overall appendage defect rate (29%) observed in a survey of museum specimens. There was a positive relationship between tail loss and the presence of any appendage loss or abnormality (Marginal homogeneity test, Chi Square = 17.7, df = 1, p<0.0001), indicating that factors that cause tail loss, such as predation, may also be responsible for other anomalies such as appendage loss or abnormality. The body condition, as measured by a regression of mass to snout-to-vent length, of onsite skinks was significantly greater than in offsite skinks, but we could not exclude alternate hypotheses that body condition may be related to population density differences. Lastly, ectoparasite (trombiculid mite) infection was significantly greater in onsite skinks than in offsite skinks, but there was no measurable relationship to skink condition.

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Introduction

The many-lined skink (*Eumeces multivirgatus*) is a semi-fossorial lizard that is very elusive to humans because of its burrowing nature and other behavior. *E. multivirgatus* has been studied little in New Mexico and is one of only three species in the state, but it is thought to be ubiquitous in many areas including the Los Alamos area. In the late 1970s Bogert (1979) found this species in several canyons in the Los Alamos area underneath logs and rocks. It was also commonly found in the Pajarito wetlands in the 1990s (Nelson et al. 1998). In general, *E. multivirgatus* is thought to eat insects, spiders, mollusks, and other lizards (Foxx et al. 1999), but in Nebraska this species was found to have the greatest specialization in food in comparison to three other species of lizards (Ballinger et al. 1990). Almost half of the skinks' diet was comprised of orthoptera (mostly crickets) and aranae in the Nebraska study.

In the summer of 2000 a study on organic contaminant levels in food chains leading to the great horned owl was conducted in Sandia (SA) and DP canyons at the Los Alamos National Laboratory (LANL) (Gonzales et al. 2001). Although no offsite reference was used in the study because of problems related to the Cerro Grande Fire, some observations of morphological aberrations in several of the many-lined skinks prompted a study on skink morphology in the summer of 2001. The 2001 morphology study was also conducted in Sandia and DP canyons (LANL onsite), as well as in Garcia (GA) and Chupaderos (CH) canyons (offsite reference), which lay to the north of LANL in the Santa Fe National Forest. DP and Sandia canyons, were originally selected for their elevated levels of dichlorodiphenyltrichloroethane (DDT) and polychlorinated biphenyls (PCBs), respectively. Although data is lacking on the effects of contaminants on reptiles and amphibians, it is known that reptiles and, especially, amphibians can be sensitive to the effects of contaminants (Souder 2000; Hall and Henry 1992; Lambert 1997; Campbell and Campbell 2000). Organic compounds, such as PCBs (Gutleb et al. 1999) and DDTs (Guillette and Crain 1996), are sometimes responsible because of their ability to induce toxic effects such as hormone imbalances, reproductive effects, neurological disorders, and malformations. A previous report (Gonzales et al. 2001) summarized some of the literature on these effects, but generally effects levels have been higher than levels measured at LANL. The area of Sandia Wetland included in the study has up to 2 mg/kg PCB mixture (Aroclor) in sediment (Katzman 2000). DP Canyon has up to 0.12 mg/kg DDT in sediment and also has PCBs, radionuclides, and metals (R. Ryti, personal communication). Paired pitfall traps and drift fences were used to trap skinks in 10- and 25-m arrays along 200-m transects. The purpose of this study was to determine if a relationship existed between contaminated sites and skink morphology. A mark-recapture study of skinks from the four canyons (two offsite controls, two onsite contaminated canyons) was conducted. Physical characteristics of skinks were compared between canyons and between onsite and offsite groups to determine if an association existed between rates of morphological anomalies and location. In addition, museum samples were examined for comparison of morphological defect rates.

Methods

Trapping System. Trap systems consisting of pitfall trap arrays along 200-m transects were constructed in four canyons. The habitat, as shown in Figure 1, was

Figure 1. Photos of the general habitat at (a) Sandia Canyon, (b) DP Canyon, (c) Garcia Canyon, and (d) Chupaderos Canyon.

patches of ponderosa pine (*Pinus ponderosa*) overstory interspersed with an understory of patches of shrub (e.g., gambels oak, *Quercus gambelii*; squaw bush, *Rhus trilobata*; New Mexico locust, *Robinia neomexicanus*; and willow, *Salix* spp.), grasses, and forbs (e.g., fringed sage, *Artemisia* spp.) bordered by intermittent streams. Two 200-m transects were established in each canyon and each consisted of six 10-ft and four 25-ft bucket arrays with metal flashing drift fence as shown in Figure 2. The 10-ft arrays had two sets of paired 3.8-L buckets, and the 25-ft

arrays had three sets of paired buckets (Fig. 2). Table 1 shows the make-up of these trap systems. Each transect also had a single bucket located halfway between each array (Fig. 2). The trap systems contained the same numbers and types of bucket arrays. Trap systems were opened on 15 June and closed by 7 September. Each trap system was operated for approximately the same number of trap days. (Trap days refers to the number of pitfall traps in a system times the total number of days that traps were open.) Total trap days varied slightly between canyons (CH = 10,880, GA = 10,774, DP = 11,288, and SA = 10,608) but the morphological analyses were conducted under the assumption that trap days were the same for each site because an adjustment (ANCOVA) for trap days did not change the catch ranking for the canyons. The order of catch, ranked from highest to lowest, was SA, DP, CH, and GA. Additionally, since trap systems were composed of two 200-m traplines, it was assumed that the catch from each system reflected the population density of each site.

Data Collected. Captured skinks were transported to LANL's Ecology Group laboratory, data were recorded, and the skinks were given a unique code by injecting colored elastomers (Northwest Marine Technologies, Inc., 2401 Bristol Court S.W., Olympia, WA 98502, biology@nmt-inc.com) in the inguinal and axial regions of the venter. Snout-vent length (SVL), mass, tail length, tail condition (original, regenerated, fresh break, nub), sex, numbers of missing claws/toe-tips, missing digits, missing limb segments, missing or abnormal joints, and any other abnormalities were noted. The number of skin scars and presence or absence of ectoparasites were also noted. Skinks were examined with Optivisor magnifiers. After data collection, the skinks were released at the point of capture.

Table 1. Skink Trap System Identification and Description in Four Canyons

	Location			
	Chupaderos Canyon	**Garcia Canyon**	**DP Canyon**	**Sandia Canyon**
Abbreviation	CH	GA	DP	SA
Treatment	reference	reference	onsite	onsite
number of trap lines per canyon	2	2	2	2
number of 25-ft arrays per trap line*	5	5	5	5
number of buckets per 25-ft array	6	6	6	6
number of 10-ft arrays per trap line*	5	5	5	5
number of buckets per 10-ft array	4	4	4	4
number of single buckets between arrays per trap line	18	18	18	18
total number of buckets per trap line	68	68	68	68
total length of trap line, meters	200	200	200	200

*All arrays (25- and 10-ft) had 6-in. metal flashing fences as shown in Figure 2.

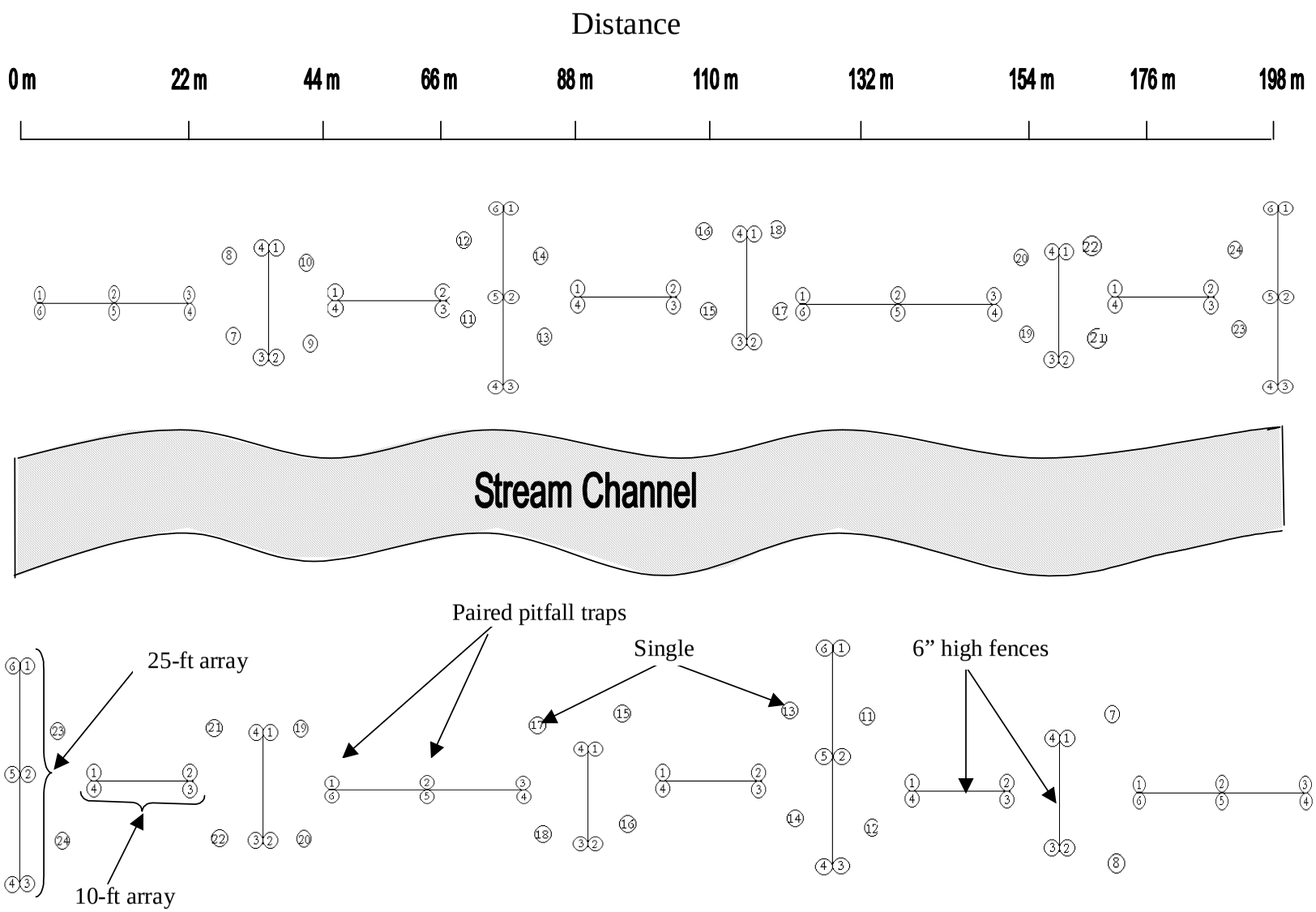


Figure 2. Schematic showing the makeup of 200-m trapping systems (transects).

Statistical Analyses. Simple morphological variables (i.e., SVL, number of claws/toe tips, etc.) were compared between sites with parametric and nonparamentric tests as continuous and/or nominal variables. Two indexes were constructed to summarize morphological data for overall comparisons. The first index was designed to measure frequency and was based on the presence or absence of any appendage loss or tail or pattern abnormality. If a skink had any abnormality, measured by the continuous variables (claws/toe-tips, digits, limb segments, joints) or the nominal variables (tail and pattern abnormality) it received a present score and no abnormalities received an absent score. The second index, a "sum" index was a continuous variable, designed to measure overall prevalence and intensity of abnormalities. This index was the sum of counts: claw/toe-tip (normal = 20), digit (normal = 20), limb segment (normal = 12) and joint measurements (normal = 12). The normal scores were based on five claws per hand or foot, five digits per hand or foot, three limb segments per arm (upper or medial, lower or distal, hand), three limb segments per leg (upper or medial, lower or distal, foot), three joints per arm (shoulder, elbow, wrist) and three joints per leg (hip, knee, ankle). The variable "claw/toe-tip" was scored as zero in the 1–20 count if a claw was missing and the first or second distal terminal phalanges. The variable "digits" was scored as zero if additional phalanges, metatarsals, or metacarpals were missing. Although these indexes and measurements were a simplification of morphology, this was a preliminary study designed to inspect relatively large sample sizes to see if there was an indication of a statistical relationship between contaminated sites and morphology. More detailed morphological inspection such as x rays would have posed risks for large segments of the skink population and interfered with the skinks annual cycles because of longer hold times in the lab. These types of studies would be warranted with smaller samples, if an association was found between contamination and morphology.

This study uses "appendage loss" to refer to limbs, feet, or hands. Tail loss is considered separately. Frequency of appendage loss and abnormality is defined as the presence or absence in all skinks of appendage loss or abnormality. Prevalence is a function of frequency and intensity of appendage loss. It is the intensity of appendage loss, measured by the appendage counts for all skinks. Intensity of appendage loss is measured by the appendage counts of skinks that have some degree of loss. Non-afflicted skinks are excluded. In this study, higher prevalence and intensity are reflected as lower counts of appendages and lower values for the sum index.

Museum Specimen Comparison. *E. multivarigatus* specimens from the Museum of Southwestern Biology were examined for morphological defects, especially lost appendages, as another basis for comparison of the LANL onsite anomaly rates. Effects of county of origin, body size, and previous tail loss on likelihood of appendage loss were evaluated using generalized linear models analysis (Appendix A).

Habitat. Using a modified point-quarter analysis method, we quantified the habitat associated with each transect system and trap array. At each array we included a circular area (176 m^2) that was based on a radius of 7.5 m from center. Each circular area was divided in quarters along lines of direction (N, S, E, and W). Percent of quadrant covered by plants, rocks, litter, and dead wood (standing or fallen was estimated. Other habitat modifiers (anything interpreted as being a potential factor in the

living habitat of a many-lined skink) such as roads, streams, and inclines (stream banks, arroyos, burrows) were also included in the determination of ground cover. Special soil conditions (obviously low soil bulk density) were also noted. The habitats varied by vegetation more than other factors. Garcia Canyon soil had noticeably low bulk density soils as based on depression and other signs such as gopher mounds. All frequently occurring plants and trees were identified by species except for grasses. Percentage ground cover and aerial cover were absolute rather than relative; i.e., greater than 100% was possible such as in the case where litter was overlain by live plant material, rock, or dead wood. The number of modifiers and the distances in which modifiers occurred as measured from the center of each array were also recorded. Skink trap rates per bucket were compared between arrays, and associations with general habitat features were noted.

Results

Trapping Program. Pitfall trapping for *E. multivigatus* in four canyons of the Los Alamos area produced a total of 484 captures for the period 15 June to 7 September 2001 (43,520 Trap Days). Appendix B is the raw data and Table 2 is a summary of the catch totals and count of the various morphological anomalies. Excluding the 107 recaptures, a total of 377 skinks were caught, distributed between canyons as follows: CH = 61, GA = 54, DP = 128, and SA = 134. Ignoring recaptures, environmental factors (moisture, vegetation, etc.) can be considered for speculating on reasons for differences in skink populations between canyons, trap systems (transects) within a canyon, or arrays within a trap system. The results of the habitat analysis are presented in Appendix C. DP Canyon and, especially, SA Canyon drainages have water consistently throughout the year. Water flows most consistently in SA Canyon as evidenced by the cattail-dominated wetland supported by the hydric conditions. The DP Canyon drainage has seeps that provide at least pools of water when not flowing throughout the year. CH and GA canyons were dry much of the summer and were heavily flooded several times toward the end of the sampling period. More moisture also has likely resulted in greater plant cover in SA and DP canyons, which in turn could contribute to higher populations of skinks. SA and DP canyons had mean ground cover values of 92% and 97%, respectively, compared to CH and GA canyons at 54% and 60%, respectively (Table A-2). CH and GA canyons are drier, but also were burned in the Cerro Grande Fire in May 2000. The fire and post-fire flooding likely affected skink populations. Where there was a transect on both the north (south-facing) and south (north-facing) side of the drainage (SA, DP, and CH), the north side always had more captures. The north sides generally experience more solar radiation as they have a southern exposure.

Comparing transect differences, SA-N and DP-N by far had the highest original skinks. Ground cover for these two systems was about 90% for both. DP-S and SA-S had higher ground cover, so the southern exposure of SA-N and DP-N may be a factor in skink preference. Within transects and normalizing for differences in the number of buckets for a 10-ft (4 buckets) vs 25-ft (6 buckets) array, larger populations of skinks seem to be associated with some arrays than others. Over the entire trapping period, array SA-N198 caught an average of 3.7 skinks per trap, and SA-N132 caught 2.5 skinks per trap, the two highest catch rates of all arrays. SA-N198 had a large amount of total ground cover (~91%) and was characterized by moderate grass cover, boulder-sized rocks, a

Table 2. Summary of Skink Catch and Morphology Data

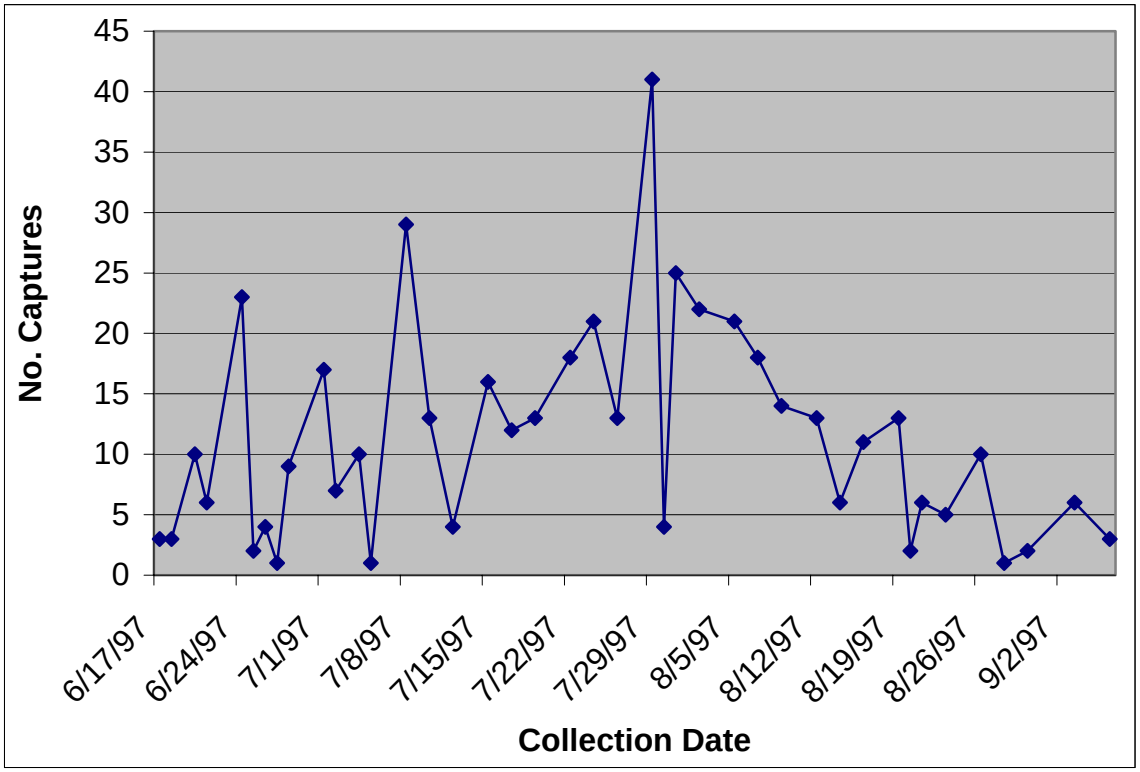
Item	Chupaderos Canyon	Garcia Canyon	DP Canyon	Sandia Canyon
Total catch	78	60	192	154
Original catch	61	54	128	134
Recaptures	17	6	64	20
Recapture rate (%)	21.79	10.00	33.33	12.99
Date opened	19-Jun	19-Jun	15-Jun	19-Jun
Date closed	7-Sep	6-Sep	6-Sep	5-Sep
Days open	80	79	83	78
Number of traps	136	136	136	136
Trap Days	10,880	10,744	11,288	10,608
Frequency of appendage loss and tail or pattern abnormality				
present	11	17	33	24
absent	50	36	92	109
Frequency of claw/toe-tip loss				
present	11	17	29	17
absent	50	36	96	116
Frequency of digit loss				
present	7	10	22	13
absent	54	43	103	120
Frequency of limb segment loss				
present	2	2	3	2
absent	59	51	122	131
Frequency of joint loss or abnormality				
present	2	1	3	2
absent	59	52	122	131
Frequency of tail abnormality				
present	0	0	7	7
absent	61	53	118	126
Frequency of pattern abnormality				
present	0	0	1	1
absent	61	53	124	132
Frequency of tail loss				
present	39	28	76	83
absent (original tail)	22	25	49	51
Frequency of mites on skinks				
present	0	1	26	14
absent	61	51	96	117
Frequency of scars on skinks				
present	28	51	24	44
absent	33	77	30	90
skinks >45 mm SVL	41	47	99	75
skinks <45 mm SVL	20	7	29	59

small amount of litter, a moderate amount of overhead shading (~37% aerial cover), and flowing water within the 7.5-m radius from array center. SA-N132 also had a large amount of total ground cover (~103%), sparse grass cover, some boulder-sized rock, thick litter, a moderate amount of shading (~46% aerial cover), and flowing water within the 7.5-m radius from array center. The high total ground cover, some shading, nearby water, and southern exposure were common to both of these productive arrays. DP-N198 caught an average of 2.2 skinks per trap and was characterized by a large amount of total ground cover (~91%), moderate grass cover intermixed with willow and New Mexico olive, rotted wood, litter, ~35% aerial cover, and flowing water within the 7.5-m radius from array center. SA-N0 array averaged 2 skinks per trap and was characterized by 86% ground cover, light (5%) to heavy (75%) grass cover, light litter, and streamwater with cattails in almost half of the 176-m^2 circular plot. DP-S154 and DP-S0 caught 1.8 and 1.7 skinks per trap, respectively. Both were characterized by a large amount of total ground cover (94% and 99%, respectively), moderate to high grass cover, shrubs, alternating thin and thick depths of litter, light shading, and water nearby. Finally, GA-N2 had a relatively high catch rate (1.5 skinks per trap) compared to other arrays in the GA transects but it had no easily distinguishable unique habitat features.

The trap rate (catches per unit time) totaled for all canyons and by canyon is shown in Figure 3. No noticeable patterns were discerned with regard to a possible cause of the changes in trap rate. Several years of trapping in Pajarito wetlands in the 1990s showed a statistically significant difference in seasonal variation and highest catches in August (Nelson et al. 1998).

Table 2 shows the makeup (catch, recapture, location, and trap system structure) of the trap systems. These sample sizes formed the basis for an analysis of morphology in relation to soil contamination. Appendage loss, tail abnormality, and pattern abnormality measurements were compared between reference, or offsite, canyons (CH, GA) and contaminated canyons (DP, SA). Body condition, SNL, tail loss, skin scars, and mites were also compared as potential factors related to morphological anomalies. A comparison was also made to museum specimen data collected as described in Appendix A. Table 3 summarizes the frequency, prevalence, and intensity of appendage loss and abnormalities and the results of statistical tests performed to assess the significance of differences between canyons. Table 3 also includes comparisons of SVL, body condition, tail loss, mites, and scars. Table 4 is a comparison of reference and onsite data and the results of the statistical tests performed to assess the significance of differences between the onsite vs offsite data. Table 5 compares SVL by the presence or absence of appendage loss and abnormality, mites, and scars. Table 6 is a ranking amongst the canyons based on the values of frequency, prevalence, intensity, SVL, and body condition.

Frequencies of Appendage Loss and Tail and Pattern Anomalies. Table 3 shows that GA had the highest frequency (32.1%) of any appendage loss or tail and pattern abnormality. DP (26.4%) had the second highest frequency while CH (18.0%) and SA (18.0%) were very close in value. There was no significant difference in the frequency of any appendage loss or abnormalities between canyons (Marginal test of homogeneity, Chi-Square = 5.997, df = 3, p = 0.117). A frequency ranking of the canyons did not support an association between the frequency of morphological abnormality and contaminated canyons.



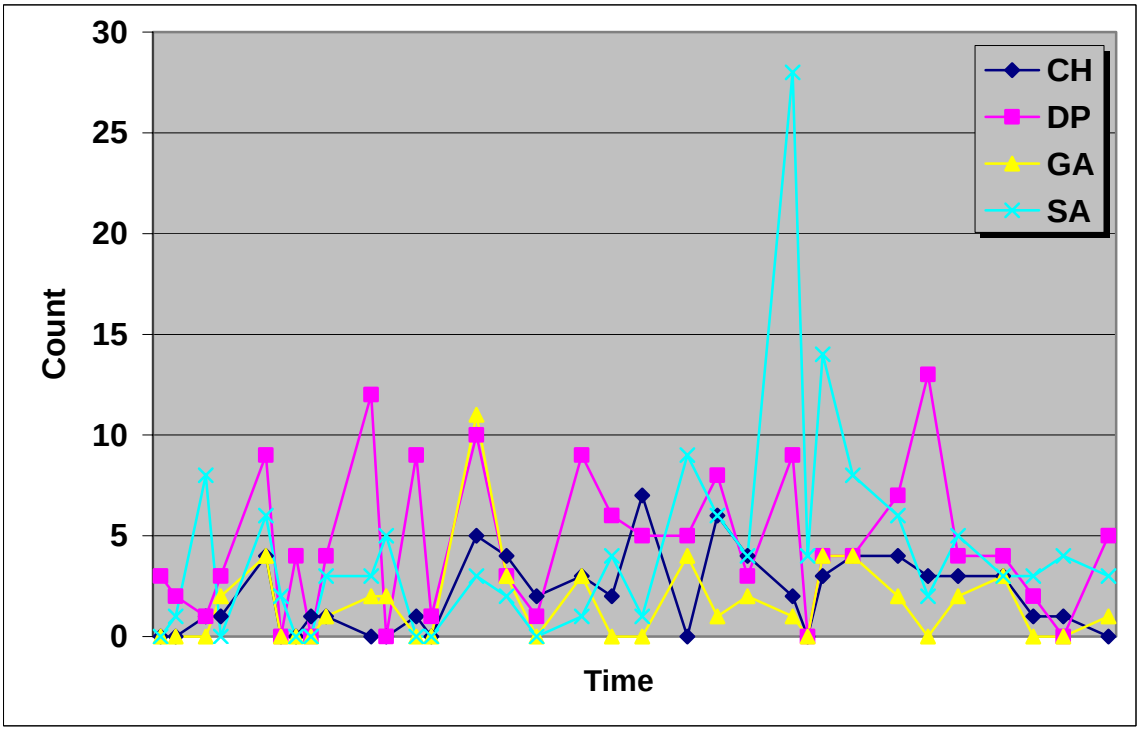


Figure 3. Skink trap rate totaled (top chart) for eight trapping systems (transects) in four canyons in the Los Alamos, NM, area and separated by canyon (bottom chart). CH = Chupaderos Canyon, DP = DP Canyon, GA = Garcia Canyon, and SA = Sandia Canyon.

Table 3. Frequency, Prevalence, and Intensity of Appendage Loss and Abnormalities in Skinks Captured in Four Canyons and Statistical Test Results

Item	Chupaderos Canyon	Garcia Canyon	DP Canyon	Sandia Canyon	Test	p value	Power of test
Frequency of appendage loss and tail or pattern abnormality, %	18.03	32.08	26.40	18.05	Marginal homogeneity	0.1117	-
Frequency of claw/toe-tip loss, %	18.03	32.08	23.20	12.78	Marginal homogeneity	0.0174	-
Frequency of digit loss, %	11.48	18.87	17.60	9.77	Marginal homogeneity	0.1960	-
Frequency of limb segment loss, %	3.28	3.77	2.40	1.50	Marginal homogeneity	0.7831	-
Frequency of joint loss or abnormality, %	3.28	1.89	2.40	1.50	Marginal homogeneity	0.8761	-
Frequency of tail abnormality, %	0.00	0.00	5.60	5.26	Marginal homogeneity	0.0917	-
Frequency of pattern abnormality, %	0.00	0.00	0.80	0.75	Marginal homogeneity	0.8275	-
Frequency of appendage loss and tail or pattern abnormality excluding skinks <45 mm, %	19.51	36.96	34.02	28.00	Marginal homogeneity	0.2585	-
Prevalence of all appendage loss, mean of the "sum" index	62.71	62.76	62.94	63.00	Kruskall-Wallis	0.0237	-
Prevalence of all appendage loss, mean of the "sum" index		62.76		63.00	Mann-Whitney	0.0023	-
Prevalence of claw/toe-tip loss, mean count	19.41	19.27	19.42	19.55	Kruskall-Wallis	0.0237	-
Prevalence of claw/toe-tip loss, mean count		19.23		19.55	Mann-Whitney	0.0031	-
Prevalence of digit loss, mean count	19.53	19.59	19.60	19.62	Kruskall-Wallis	0.3180	-
Prevalence of limb segment loss, mean	11.89	11.96	11.95	11.91	Kruskall-Wallis	0.7961	-
Prevalence of joint abnormality or loss, mean counts	11.89	11.98	11.97	11.92	Kruskall-Wallis	0.8795	-
Prevalence of all appendage loss, excluding skinks <45 mm, mean of the "sum" index	63.22	62.57	62.64	62.89	Kruskall-Wallis	0.1305	-
Intensity of appendage loss, mean count	56.82	60.12	59.45	56.18	Kruskall-Wallis	0.9130	0.28
Intensity of claw/toe-tip loss, mean count	16.73	17.59	17.52	16.47	Kruskall-Wallis	0.5534	0.17
Intensity of digit loss, mean count	15.86	17.80	17.62	16.15	Kruskall-Wallis	0.1194	0.30
Intensity of limb segment loss, mean count	8.50	11.00	10.00	6.00			
Intensity of joint abnormality or loss, mean count	8.50	11.00	10.67	6.50			
Intensity of appendage loss, excluding skinks <45 mm, mean count	60.00	60.12	59.45	58.47	ANCOVA on 1/log(sum. index)	0.7216	0.13
SVL, all skinks, mean count	51.09	56.13	52.37	46.88	ANOVA	0.0082	0.98
SVL, excluding skinks <45 mm, mean	58.74	60.09	58.46	60.52	ANOVA	0.1562	0.45
Hatchling and young skinks, %	32.79	12.96	22.66	44.03			
Body condition, mean residuals from regression SVL, mass	0.002	0.025	0.002	-0.013	ANOVA	0.0210	0.75
Body condition, excluding skinks <45 mm, mean residuals from regression SVL, mass	0.013	0.021	0.005	-0.014	ANOVA	0.0568	0.62
Frequency of tail loss, %	63.93	52.83	60.80	61.94	Marginal homogeneity	0.631	

Table 3. cont.

Item	Chupaderos Canyon	Garcia Canyon	DP Canyon	Sandia Canyon	Test	p value	Power of test
Frequency of mites, %	0.000	1.92	21.31	10.69	Marginal homogeneity	<0 .0001	
Mean mite counts	0.000	0.03	1.54	0.37	Kruskall-Wallis	0.0004	0.75
Frequency of skin scars, %	45.90	44.44	39.84	32.84	Marginal homogeneity	0.2537	
Mean number of skin scars	0.933	1.08	0.89	0.82	Kruskall-Wallis	0.321	0.14

Table 4. Comparison of Offsite and Onsite Data and Statistical Test Results

Item	Reference Sites (CH, GA)	LANL Sites (DP, SA)	Test	p value	Power of test
Frequency of appendage loss or tail or pattern abnormality	24.560	22.090	Marginal homogeneity	0.6011	
Frequency of appendage loss or tail or pattern abnormality excluding skinks <45 mm	28.740	31.400	Marginal homogeneity	0.6606	
Prevalence of all appendage loss, mean of the "sum" index	62.728	62.973	ANCOVA	0.5867	0.083
Prevalence of all appendage loss, excluding skinks <45 mm, mean of the "sum" index	62.874	62.750	ANCOVA	0.7655	0.060
Intensity of appendage loss, mean	58.821	58.239	ANCOVA on log (sum index)	0.6722	0.070
Intensity of appendage loss excluding skinks <45 mm, mean	60.080	59.114	ANCOVA on 1/log (sum index)	0.3731	0.139
SVL, mean	53.431	49.560	ANOVA	0.0158	0.678
SVL, excluding skinks <45 mm, mean	59.451	59.347	ANOVA	0.9052	0.052
Body condition, mean residuals from regression SVL, mass	0.013	-0.006	ANOVA	0.0322	0.564
Body condition, excluding skinks <45 mm, mean residuals from regression SVL, mass	0.017	-0.003	ANOVA	0.0367	0.542

Table 5. A Comparison of SVL by the Presence or Absence of Appendage Loss and Abnormality, Mites, and Scars

Item	Presence n	Absence n	SVL Mean Presence	SVL Mean Absence	Test	p value
Any appendage loss or abnormality	85	287	59.218	48.281	ANOVA	<0.0001
Excluding skinks <45 mm, any appendage loss or abnormality	79	180	60.873	58.734	ANOVA	0.0148
Claws/toe-tips	74	298	58.679	48.819	ANOVA	<0.0001
Digits	51	321	58.172	49.606	ANOVA	<0.0001
Limb segments	9	363	55.111	50.673	Mann-Whitney	0.3275
Joint loss or abnormality	8	364	54.514	50.698	Mann-Whitney	0.4013
Mites	41	325	51.607	50.916	ANOVA	0.7696
Scars	147	229	56.186	47.234	ANOVA	<0.0001

Table 6. A Ranking of Canyons by Value of Frequency, Prevalence, Intensity, SVL, and Body Condition Measurements

Item: Ranking of Canyons	1 (Highest Value)	2	3	4 (Lowest Value)	Significance of Statistical Test	Comments
Frequency, any appendage loss or abnormality	GA	DP	SA	CH	ns	
Frequency of appendage loss or tail or pattern abnormality, excluding skinks <45 mm	GA	DP	SA	CH	ns	
Frequency of claws/toe-tips (= any appendage loss)	GA	DP	CH	SA	s	GA > SA, (also DP > SA, p = .09)
Frequency of digit loss	GA	DP	CH	SA	ns	
Frequency of limb segment loss	GA	CH	DP	SA	ns	
Frequency of joint loss or abnormality	CH	DP	GA	SA	ns	
Frequency of tail abnormality	DP	SA			marginal	absent in CH, GA
Frequency of pattern abnormality	DP	SA			ns	absent in CH, GA
Prevalence of all appendage loss, mean of the "sum" index	CH	GA	DP	SA	s	GA > SA
Prevalence of claw/toe-tip loss, mean	GA	CH	DP	SA	s	GA > SA
Prevalence of digit loss, mean	CH	GA	DP	SA	ns	
Prevalence of limb segment loss, mean	CH	SA	DP	GA	ns	
Prevalence of joint abnormality or loss, mean	CH	SA	DP	GA	ns	
Prevalence of all appendage loss, excluding skinks <45 mm, mean of the "sum" index	GA	DP	SA	CH	ns	
Intensity of appendage loss, mean	SA	CH	DP	GA	ns	
Intensity of claw/toe-tip loss, mean	SA	CH	DP	GA	ns	
Intensity of digit loss, mean	CH	SA	DP	GA	ns	
Intensity of limb segment loss, mean	SA	CH	DP	GA	ns	
Intensity of joint abnormality or loss, mean	SA	CH	DP	GA	ns	
Intensity of appendage loss excluding skinks <45 mm, mean	SA	DP	CH	GA	ns	
SVL, all skinks, mean	GA	DP	CH	SA	s	GA > SA, DP > SA
SVL, excluding skinks <45 mm, mean	SA	GA	CH	DP	ns	
Body condition, mean residuals from regression SVL, mass	GA	DP	CH	SA	s	DP = CH, GA > SA
Body condition, excluding skinks <45 mm, mean residuals from regression SVL, mass	GA	CH	DP	SA	s	GA > SA

These were high rates of morphological loss and abnormality compared to other lizard studies in New Mexico (D. Sias, personal communication). It is important to note that these values are purely quantitative with no measure of quality of anomaly.

The frequency of claw/toe-tip loss was greatest in GA (32.1%), followed by DP

(23.0%), CH (18.0%), and SA (12.8%). There was a significant difference in the frequency of claw/toe-tip loss between canyons (Marginal test of homogeneity, Chi-Square = 10.15, df = 3, p = 0.0174). GA had higher and SA had lower frequencies than expected. This evidence did not support the hypothesis that contaminated canyons (DP, SA) may be linked to high rates of morphological deformity.

Table 3 shows the frequency of digit loss was greatest in GA (18.9%), followed by DP (17.6%), CH (11.5%), and SA (9.8%). There was no significant difference in frequency of digit loss between canyons (Marginal test of homogeneity, Chi-Square = 4.69, df = 3, p = .196). The frequency of limb segment loss was greatest in GA (3.8%), followed by CH (3.3%), DP (2.4%), and SA (1.5%). There was no significant difference in the frequency of limb segment loss between canyons (Marginal test of homogeneity, Chi-Square = 1.075, df = 3, p = .7831). The frequency of joint abnormality or loss was greatest in CH (3.28%), followed by DP (2.40%), GA (1.89%), and SA (1.50%). No significant difference in the frequency of joint abnormality or loss was detected between canyons (Marginal test of homogeneity, Chi-Square = 0.688, df = 3, p = 0.8761). Some expected cell values for the Chi-Square are less than five in the limb segment and joint comparisons, so these tests were used with caution. However the ranking of the canyons by frequency did not support an association with contaminated canyons and higher levels of morphological abnormality.

DP Canyon had an abnormal tail frequency of 5.6%, followed by SA (5.3%), CH (0%), and GA (0%). Two forked tail skinks (Fig. 4) were collected in DP Canyon**.** Additionally, SA and DP had 12 skinks with abnormal tail regeneration. Neither of the reference sites had any noticeable tail abnormalities. There was a marginally significant difference in the frequency of tail abnormalities between canyons (Marginal test of homogeneity, Chi-Square = 6.448, df = 3, p = 0.0917). The ranking of the tail abnormality frequencies was consistent with an association between contaminated canyons and morphological abnormality.

Contaminated sites, DP and SA each had one skink with an unusual pattern of stripes and neither reference site had observations of unusual stripe patterns. At all locations there were also stripe color and size variations that were not considered unusual, variation in contrast, and variation in the presence or absence of stripes. Figure 5 shows some of these variations, including a plain (stripe-less) copper-colored “morph.”

A histogram of SVL (Fig. 6) shows a bimodal shape, with two distinct classes of SVL distributions, one group of hatchlings and juveniles and a group of larger adult skinks. Large skinks (>45 mm SVL) had higher frequencies of appendage loss and abnormality (30.5%) than juvenile skinks (5.3%) (Marginal test of homogeneity, Chi Square = 28.324, df = 1, p <0.0001). A possible hypothesis was that skinks develop abnormalities as they ingest contaminated substances during growth. To examine this, all skinks less than 45 mm were excluded, which excluded the hatchlings and juvenile skinks from an analysis of frequency. GA (37.0%) still had the highest frequency of any appendage loss or tail or pattern abnormality, followed by DP (34.0%), SA (28.0%), and CH (19.5%). There was no significant difference in frequency between canyons (Marginal test of homogeneity, Chi-Square = 4.028, df = 3, p = .2585).

The data were grouped as a reference (CH, GA) and a contaminated (DP, SA) site (Table 4). Inspection of the data showed there was a slightly higher, but non-significant frequency of appendage loss and abnormality in the reference (24.6%) than

Figure 4. Regenerated tails of *E. multivirgatus* with appearance often referred to as "forked."

Figure 5. Photos of color variation ("morphs") in the many-lined skink collected in the Los Alamos area; (a) common striped pattern with wide black stripes and single vertebral cream stripe; (b) common striped pattern, thinner stripes, lighter color; (c) copper morph coloration, no stripes; (d) juvenile.

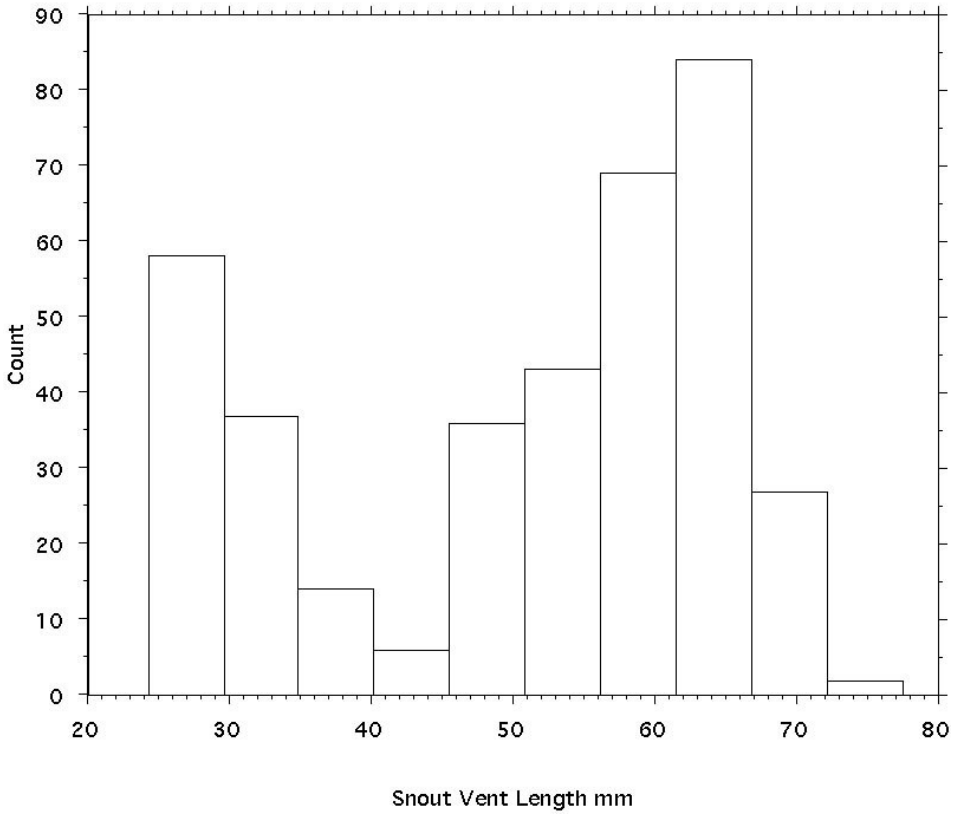


Figure 6. Histogram of the distribution of SVL of *E. multivirgatus* captured in the Los Alamos area.

the contaminated (22.1%) site (Marginal test of homogeneity, Chi Square = 0.273, df = 1, p = .6011). For larger skinks (>45 mm) the data showed there was a slightly higher, but non-significant frequency of appendage loss and abnormality in contaminated (31.4%) than the reference (28.7%) site (Marginal test of homogeneity, Chi-Square = 0.193, df = 1, p = 0.6606).

The Prevalence of Appendage Loss. The sum index of remaining claws/toe-tips, digits, limb segments, and joints was examined as well as individual appendage type counts to determine prevalence of appendage loss in the canyons. A higher value for the counts or sum index indicates less appendage loss. Inspection of the data (Table 3) showed the sum index of appendage loss was slightly higher (less appendage loss) for contaminated sites, SA (mean = 63.0) and DP (mean = 62.9), than reference sites, CH (mean = 62.71) and GA (mean = 62.76). There was a significant difference in sum indexes between canyons (Kruskall-Wallis test, Chi-Square = 9.4669, df = 3, p = 0.0237). GA had a higher prevalence of appendage loss than SA (Mann Whitney U test on the sum index, p = .0023). This was the opposite pattern than what would be expected if there was a positive association between contaminated canyons and appendage loss. All other pair-wise comparisons showed insignificant differences between canyons. When the prevalence analysis was restricted to adult skinks (>45 mm), there was no significant difference between canyons (Kruskal-Wallis

test, Chi-Square = 5.6398, df = 3, p = 0.1305). The means of the sum index for the canyons, CH = 63.2, SA = 62.9, DP = 62.6, and GA = 62.6, show that adult skinks in CH and SA had the lowest prevalence of appendage loss. This pattern did not support an association between contamination and appendage loss.

Table 3 shows there were no significant differences in prevalence of appendage loss between canyons for claws/toe-tips, digits, limb segments, or joints. Table 4 shows there was no significant difference in the prevalence of appendage loss in reference (mean = 62.7%) and contaminated (mean = 63.0%) sites (Mann-Whitney U test, p = 0.1407). For skinks >45 mm there also was no significant difference in the prevalence of appendage loss between reference (mean = 62.9) and contaminated (62.8%) sites (Mann-Whitney U test, p = 0.6661).

The distribution of the sum indexes by canyon might have indicated differences in the qualitative nature of appendage loss. Four pair-wise comparisons of the sum index distributions showed no significant differences between reference and contaminated canyons (Kolmogorov-Smirnov tests, DP - GA, DP - CH, SA - GA, SA - CH).

The Intensity of Appendage Loss. There was no significant difference in the quantitative intensity of appendage loss between canyons. Table 3 shows that the sum index of appendage loss is most intense for SA (56.2), followed by CH (56.8), DP (59.5), and GA (60.1), but these were nonsignificant differences (Kruskall-Wallis test, Chi Square = 0.5267, df = 3, p = 0.9130). For skinks >45 mm, Table 3 shows that the mean count of appendage loss is most intense for SA (58.5), followed by DP (59.5), CH (60.0), and GA (60.1), but there were also insignificant differences between the canyons—ANCOVA (1/log [sum index], p = 0.7826). No comparison of claws/toe-tips or digits showed significant differences between canyons. Limb segments and joints were not analyzed because of small sample sizes (limb segments n = 9 and joints n = 8). Nor did ranking the means for appendage counts across canyons suggest an association between intensity of appendage loss and contamination. From most intense to least intense, the loss of claws/toe-tips, limb segments, and joints counts ranked as follows: SA, CH, DP, and GA. Digits ranked as follows: CH, SA, DP, and GA. Figure 7a–c shows skinks with some of the more pronounced physical anomalies trapped at the onsite locations. Similar discoveries were made in the 2000 biocontaminant study (Gonzales et al. 2001).

Snout Vent Length. Table 3 shows that SVL differed between canyons (ANOVA, F = 6.608, df = 3, p = 0.002). GA SVL was larger than SA (ANOVA post hoc, Bonferoni/Dunn, p <0.001), and DP SVL was larger than SA (ANOVA post hoc, Bonferoni/Dunn, p = 0.0016). Excluding skinks <45 mm, there was no difference in SVL between canyons (ANOVA, F = 1.755, p = .1562). Analyses (ANCOVA), which adjusted for SVL differences between canyons indicated no significant differences in prevalence or intensity of appendage loss. Reference canyon skinks (mean SVL = 53.4) were larger than onsite canyon skinks (mean SVL = 49.560) (ANOVA, F = 5.884, df =1, p = 0.0155). However, there was no difference in SVL when skinks <45 mm were excluded (reference mean SVL = 59.5, site mean SVL = 59.4, ANOVA, F = 0.015, df = 1, p = 0.9032). However, the SVL differences can be attributed to differing proportions of young skinks in the canyons in relation to adult skink sample sizes (% young: SA = 44%, CH = 33%, DP = 23%, GA = 13%).

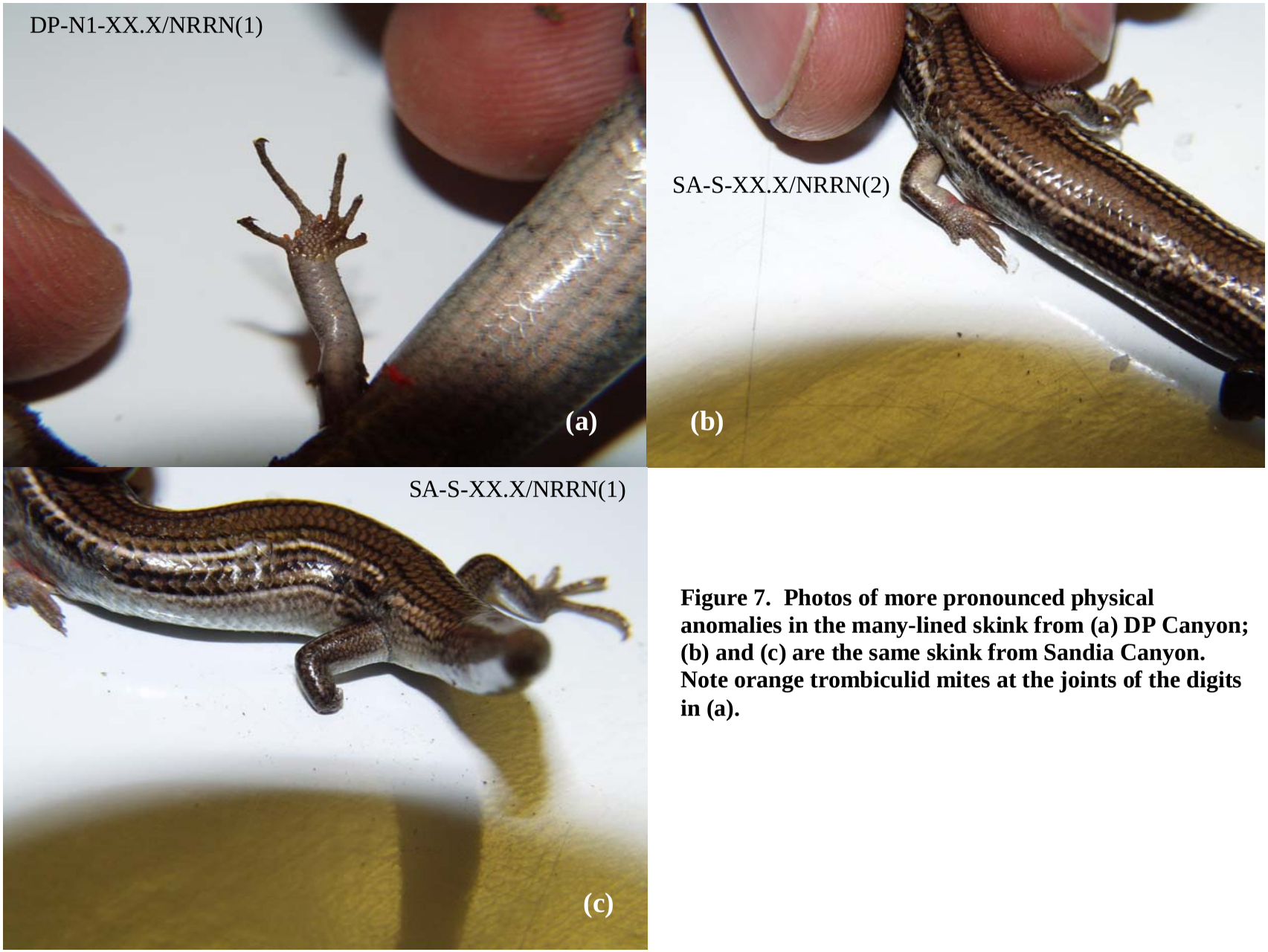


Figure 7. Photos of more pronounced physical anomalies in the many-lined skink from (a) DP Canyon; (b) and (c) are the same skink from Sandia Canyon. Note orange trombiculid mites at the joints of the digits in (a).

Table 5 shows that skinks that had appendage loss or abnormality had greater SVL (mean SVL = 59.2) than skinks with no appendage loss or abnormality (mean SVL = 48.3) (ANOVA, F = 42.504 df = 1, p <0.0001). Excluding all skinks <45 mm, skinks with appendage loss or abnormality (mean SVL = 60.9) had larger SVL than other skinks (Mean SVL = 58.7) (ANOVA, F = 6.019, df = 1, p = 0.0148). For all skinks, a similar pattern, where SVL is larger in afflicted than non-afflicted skinks applied to claws/toe-tips, digits, limb segments, and joints. These findings are consistent with a hypothesis that appendage loss is more frequent in large skinks and may accumulate or develop over time or growth (to the extent SVL reflects time).

Body Condition. The residuals from a regression of mass to SVL—(log (mass) = 3.026(log [SVL]) - 4.793, R^2 = 0.967, p <.0001)—were examined to compare the body condition of skinks with the effect of SVL removed. Canyon residuals (mean residuals, GA = 0.025, CH = 0.002, DP = 0.002, SA = -0.013) were significantly different (ANOVA, F = 3.281, df = 3, p = 0.0210). GA residuals were larger (better skink condition) than SA residuals (Bonferoni/Dunn post hoc tests, p = 0.0022). Excluding skinks <45 mm, reference canyon residuals tended to be larger than contaminated canyon residuals, suggesting that reference canyon skinks had better condition than contaminated canyons. Mean residuals (GA = 0.021, CH = 0.013, DP = 0.005, SA = -0.014) were different (ANOVA, F = 2.542, df = 3, p = 0.0542). GA skinks had better condition (higher residuals) than SA skinks (Bonferoni/Dunn post hoc test, p value limit for significance 0.0083, actual test p = 0.0119). When the four canyons are grouped by site, reference canyon skinks had better condition (mean residual = 0.013) than contaminated canyon skinks (mean residual = -0.006) (ANOVA, F = 4.620, p = 0.0322). The residual comparisons and the ranking of the canyons by mean residual indicate a tendency for the reference canyon skinks to have better condition than skinks from contaminated canyons. These findings were consistent with the idea that contamination may influence morphology in some fashion. However, this finding did not allow us to rule out alternative hypotheses. For instance, body condition may be inversely related to population density or the proportion of hatchlings. The unique catch figures (SA = 133, DP = 126, CH = 61, GA = 53) were in the reverse order of body condition rankings and are consistent with the idea that body condition may be inversely related to population density.

Tail Loss, Skin Scars, and Mite Infection. We investigated two relationships: tail loss and appendage loss and, secondly, mite infestation and appendage loss. There was no significant difference in the frequency of tail loss between canyons (CH = 63.9%, GA = 52.8%, DP = 60.8%, SA = 61.9%, Marginal homogeneity test, Chi Square = 1.727, df = 4, p = 0.6310). There was a positive relationship between tail loss and the presence of any appendage loss or abnormality (Marginal homogeneity test, Chi Square = 17.747,df = 1, p <0.0001, contingency coefficient = 0.219, p <0.0001). Eighty percent of the skinks with appendage loss or abnormality had regenerated or broken tails. In contrast 55% of the skinks without any appendage loss or abnormality had tail loss. Excluding skinks <45 mm, there was still a positive relationship between tail loss and the presence of appendage loss abnormality (Marginal homogeneity test, Chi Square = 4.156, df = 1, p <0.0415, contingency coefficient = 0.126, p <0.0591). Tail loss occurred in 81%

of skinks with appendage loss or abnormality and in 69% of skinks without any appendage loss or abnormality.

Skinks with tail loss were larger (mean SVL = 55.5 mm) than skinks without tail loss (mean = 44 mm) (ANOVA, F = 76.457, df = 1, p <0.0001). Excluding skinks <45 mm, skinks with tail loss were still larger (mean SVL = 60.145 mm) than skinks without tail loss (mean SVL = 57.338) (ANOVA, F = 9.854, df = 1, p = 0.0019). These findings paralleled the findings that appendage loss and abnormality were positively associated with larger skinks. In conjunction with the finding that tail loss was positively associated with appendage loss and abnormality, this supported a hypothesis that some of the same factors that produced tail loss were associated with appendage loss.

It was noteworthy that after adjusting for SVL, no relationship was detected between the presence of appendage loss or abnormality and the number of skin scars on skinks (ANCOVA, dependant variable = log [scars + 10], covariate = log [SVL], factor = P/A of appendage loss, F = 0.121, df = 1, p = 0.7287). This suggested additional factors may be involved with appendage loss that may not have produced skin scars.

The presence or absence of trombiculid mites (see Fig. 7a for example) on skinks was quite different comparing canyons (Marginal homogeneity test, Chi Square = 24.766, df = 3, p <0.0001). Ectoparasite infections on skinks were concentrated in DP (21.3% infected) and SA (10.7% infected) canyons. In contrast, few mites were found on skinks in CH (0%) and GA (1.9%). Ectoparasite counts were also different between canyons (Kruskal-Wallis test, p = 0.0004). However, there was no relationship between the presence of mites and the presence of appendage loss or abnormality (Marginal homogeneity test, Chi Square = 0.066, df = 1, p = 0.7970). There was also no indication of a difference in body condition (residuals of regression Mass, SVL) between infected skinks and uninfected skinks (ANOVA, F = 0.008, df = 1, p = 0.9304).

Discussion

This study was designed to see if there was an association between skink morphological anomalies and contaminated locations within LANL. Two contaminated canyons and two presumably uncontaminated canyons were trapped for skinks. Morphological anomaly was measured by appendage loss or malformation, the presence or absence of aberrant dorsal patterns, and tail malformation in uniquely caught skinks (no recaptures). *E. multivirgatus* inhabiting four canyons of the Jemez Mountains (two within LANL and two on Santa Fe National Forest) exhibited high rates of appendage loss, tail malformation, and pattern anomalies (all skinks, range 18%–32%, skinks >45 mm, range 20%–37%) regardless of location. The frequency of claw/toe-tip loss was 13%–32%, and the frequency of digit loss was 10%–19%. These findings have implications for any lizard study that has used toe clipping as a method of identification, which historically has been a common method. Secondly, although appendage loss is infrequently reported in the literature, compared to field experience in New Mexico with lizards (D. Sias, personal communication), these are high rates of appendage loss and anomaly. However, these rates were comparable to the overall appendage defect rate (29%) in museum samples (Appendix A).

We have insufficient information to determine if these rates are unique to this species or environment. Eighteen *E. multivirgatus* caught as part of a lizard community study at the Black River, NM,

had complete appendages (unpublished data, Sias). One hundred and twenty seven *E. callicephalus* captured in Guadalupe Canyon, NM, had a toe loss rate of 6.3% (Sias and Painter, 2002). One hundred *E. obsoletus* caught at Mescalero Sands, NM, had a 4% rate of toe loss (unpublished data from Snell et al., 1997). Fellars and Drost (1991) report an overall rate of foot injury (includes toes) of 3.3% for 610 *Xantusia riversiana*. Foot injury varied by habitat, with clay soil (globs of clay sticking toes together) associated with higher rates of foot injury (23%). Tinkle (1967) reported rates of toe loss varied from 1%–8% in populations of *Uta stansburiana*. Rand (1965) reported rates in *Tropiduras torquatus* of 30%–40%. Toe injury rates varied in *Anolis sagrei* caught at 24 sites across six islands (Schoener and Schoener 1980). Females (883) had rates of front toe injury ranging from 0%–18.2% and hind toe injury ranging from 0%–13.2%. Males (638) had rates of front and hind toe injury ranging from 0%–18.2%. However the mean injury rates for all these populations were low (means: female front toe injury = 6.7%, female hind toe injury = 5.8%, male front toe injury = 5.5%, male hind toe injury = 7.7%).

There were no significant differences between the four canyons in the overall frequency of appendage loss, tail malformation, and pattern anomaly. The frequency of claw/toe–tip loss was greater in GA (reference) than SA (contaminated). There were no detectable differences in the frequency of digit, limb segment, or joint loss or malformation between the canyons. The analysis of frequency did not provide support for a hypothesis that malformation may be associated with contamination. The issue is not simply the sample size or the power of statistical tests, since a ranking of the canyons by frequency value shows that a reference site (GA or CH) had the highest frequency for loss of claws/toe-tips, digits, limb segments, and joints. Also, a contaminated site (SA) had the lowest frequency for these appendage measurements. Table 6 provides a convenient ranking of canyons based on the values for frequency, prevalence, intensity, and body condition. Inspection of this table can suggest trends in data that may not have registered significance in statistical tests as a result of sample size.

Additional analyses were restricted to adult skinks (>45 mm) under the assumption that appendage loss or malformation may take time to develop, either through ingestion of contamination or accumulation of scars from predator encounters, incidental attacks, or disease. In the large skinks, we found a similar lack of support for an association between contamination and malformation. There was no difference between canyons in the frequency of overall appendage loss, tail malformation, or pattern anomaly. A ranking of the canyons showed that reference canyons had both the highest and lowest frequencies.

The possibility exists that natural factors could be related to appendage loss in some canyons and soil contamination factors could be related to appendage loss in other canyons. The net result may be similar frequencies. If this is the case, the implication is that any malformation attributed to contamination is a small effect, and not greater than natural variation in factors influencing appendage loss.

Tail malformation (forked tails and abnormal tail regeneration) was reported from contaminated sites, DP and SA, and not reported from reference sites. The frequency of tail malformation was marginally greater in the contaminated sites. It is possible that ingested and subsequently accumulated contaminants may influence re-growth of tails, but not noticeably influence growth of original tails because

contaminants have not accumulated at higher levels during original growth. One skink of aberrant pattern was reported from each of the contaminated canyons, and none were reported from reference canyons, but the frequencies were not significantly different. The pattern abnormalities could support a hypothesis that contamination may be associated with malformation and pattern abnormality, but the occurrence in only two skinks weakens this argument and the appearance of unusual dorsal patterns is also consistent with an alternative hypothesis. Furthermore, rare pattern variation may be detectable in large sample sizes, DP and SA had sample sizes of more than twice the level of reference canyons.

The prevalence of all appendage loss (sum index) and the subset of claw/toe-tip loss were greater in GA than SA, with no differences found in other comparisons. When skinks <45 mm were excluded from the analysis, there was no difference in the prevalence of appendage loss between canyons. This exclusion eliminates the potential confounding effect of different proportions of young skinks in each canyon's sample (i.e., SA had 44% hatchling and young of the year in the unique catch, GA had 13%). The prevalence of digit, limb segment, and joint loss or malformation was not significantly different between the sites. If the canyons are ranked by the values of the six prevalence measurements reported (Table 6), reference sites have the highest prevalence of appendage loss in all six measurements. Reference sites also rank second highest in prevalence in three of the six prevalence measurements.

The intensity of anomalies shown in Figure 7a–c were present in a few skinks collected onsite. Comparisons of the intensity of overall appendage loss, claws/toe-tips, digits, limb segments, and joints showed no significant quantitative differences between canyons. Ranking canyons from most intense to least intense appendage loss showed that a contaminated canyon (SA) had the highest intensity in five of six measurements. Excluding skinks <45 mm, there was no significant difference in intensity between canyons, but contaminated canyons had the highest intensities. This finding may reflect a qualitative difference in appendage loss and malformation between canyons; however, if this difference exists, it must be evaluated by a different type of study or measurement. If, in fact a qualitative difference was found it would support the hypothesis that malformation attributed to contamination is a small effect, and not greater than variation in natural factors influencing appendage loss.

Since intensity calculations exclude all normal skinks, the sample sizes became substantially smaller. In this study, the intensity sample sizes for the statistical tests were claws/toe-tips = 74, digits = 51, limb segments = 9, joints = 8. When each of these samples is allocated to four sites, it is clear that the statistical tests lack power. Statistical tests for intensity of limb segments and joints were not reported because of small sample size.

The body condition of GA Canyon (reference) skinks was higher than SA (contaminated). Other comparisons of body condition were not significantly different. Excluding skinks <45 mm, GA body condition was still significantly higher than SA. This finding is consistent with the idea that contamination may influence skink morphology. However, it is also consistent with alternative hypotheses. Body condition may be inversely related to reproductive effort and SA had 44% hatchlings and young of the year; whereas, the GA catch had only 13% hatchlings and juveniles. Since the trapping program started 15 June, many females may have already oviposited in SA, which would seasonally reduce the mass and lower condition until skink fat

bodies were built up later in the season. The first hatchling appeared 18 July, therefore, it was likely that incubation extended back before 15 June, the start of trapping. Body condition may also be inversely related to population density as a result of intraspecific competition. The unique catch reflects the population density in each canyon since the traplines were all 200 m. The ranking of catch by canyon (SA = 134, DP = 128, CH = 61, and GA = 54) is the reverse of a ranking of canyons by body condition (only skinks >45 mm), GA, CH, DP, SA, which supports the hypothesis of reduced body condition at the reference sites being caused by intraspecific competition for food.

The four canyons were grouped into reference (CH, GA) and contaminated (DP, SA) sites. There was no significant difference between sites considering frequency, prevalence, and intensity of appendage loss, tail malformation, or pattern anomaly. The reference site skinks had significantly better body condition than contaminated site. These findings parallel the analysis of the four canyons separately.

We investigated SVL, tail loss, scars, and mites to see if these factors could explain variation in appendage loss. There was a difference in mean SVL between canyons, but when skinks <45 mm were excluded from the calculations, there was no significant difference in mean SVL between canyons. The SVL difference between the canyons was attributable to the proportion of hatchlings in each canyon's catch. Canyons with higher proportions of hatchlings tend to have lower mean SVL. Skinks with appendage loss or abnormality had greater SVL than skinks without appendage loss. Excluding skinks <45 mm, skinks with appendage loss still had greater SVL than skinks without appendage loss. For all skinks and excluding skinks <45 mm, skinks with tail loss had greater SVL than skinks without tail loss. SVL reflects age and growth. SVL, tail loss, appendage loss, and abnormality were positively associated. These findings suggest that some of the same natural factors that cause tail loss (i.e. predation, intraspecific encounters, freeze damage, ectoparasitism, disease) may also cause appendage loss and malformation. The findings also suggest that appendage loss and abnormality is associated with either growth or age. No significant relationship between skin scars and appendage loss was detected.

Trombiculid mite frequencies and mite counts were much higher in contaminated canyons compared to reference canyons. However, there was no association between the presence of mites and appendage loss or malformation. There also was no significant difference in the body condition of infected and uninfected skinks. Trombiculid mites were preferentially attached in the foot and hand area of *E. multivirgatus* (Fig. 7a). The possibility remains the mite attachment may involve post-attachment infection, pathogen transmittal, or alteration of blood flow to digits. Any of these factors are potential causes for damage and loss of claws/toe-tips, digits, and limb segments.

Summary and Conclusions

There was insufficient evidence to conclude that localized soil or sediment contamination may be associated with morphological anomalies. Instead, the comparisons of four canyons suggest that natural variation in factors producing appendage loss, tail malformation, and pattern anomalies is substantial and may mask any potential abnormalities that may be associated with these levels and types of soil contamination. High variation in measured quantities means larger sample sizes are required to find significant differences. The results of this study also

suggest that the magnitude of differences between canyons may be small, but that the overall rates of appendage loss, tail abnormality, and pattern anomalies were high compared to other lizard studies.

Recommendations

The continuation of this study for the 2002 reptile activity season would increase sample sizes and allow us to gather the recapture data for the 377 uniquely caught skinks. This would allow study of how appendage loss and malformation develops over time. Since the trap systems are already in place, the trapping program could start approximately a month earlier, which would enhance the data set and provide a true replication. The results of analysis of 2001 data suggest *E. multivirgatus* in both contaminated and reference canyons have, compared to other species, high rates of appendage loss for unknown reasons. The variation in natural factors related to appendage loss and malformation may overwhelm variation in those parameters as caused by other factors. There was slight indication that abnormal tails and dorsal patterns occur in higher proportions in contaminated canyons. Larger sample sizes will allow more powerful tests on such parameters as intensity, which when measured, excludes all morphologically complete skinks, reducing sample size. Also, analyses restricted to skinks >45 mm had sample sizes reduced from 376 to 261, a situation where additional sampling allows for greater discrimination. If deeper buckets are substituted for the existing buckets, additional sympatric reptiles (larger lizards) could be studied for appendage loss and malformation.

SVL, tail loss, and appendage loss and abnormality were positively associated. These findings suggest that appendage loss and abnormality may be associated with either age or growth as reflected in SVL. Also, some of the same factors that cause tail loss may be associated with appendage loss and abnormality.

Since CH and GA were burned in the Cerro Grande Fire of 2000, skink recovery from the impact of fire and associated flooding could be studied relative to time since the fire. The pre-fire baseline in CH and GA canyons is not known, but there may be areas in these canyons that did not burn and did not flood and those areas could provide a baseline of sorts.

The existing analysis supports the idea that localized areas of soil contamination may not have detectable adverse effects on individual skinks. A second year of additional data could confirm this finding. Finally, the natural history data provided by this study is a unique contribution to New Mexico herpetology, since extensive long-term studies of *E. multivirgatus* have not been done. Infraspecific variation is badly in need of study (Degenhardt et al. 1996; Painter 2001). Quantifying any associations between skink capture rates and the habitat data collected in this study would be valuable to the herpetology community.

Acknowledgements

This study was funded by LANL's Site-wide Issues Office (SIO), Doris Garvey, Project Leader. Thanks to Ken Rea of SIO for reviewing this report. Carey Bare (ESH-20) is the manager of the Biological Resource Management Plan under which this study was conducted.

The distances between trapping sites and the heat and other harsh environmental conditions at the study locations made working conditions somewhat difficult. Many from LANL in addition to the authors helped with trap installation and in checking and maintaining the approximately 520 traps that were used. They included Robert Budd,

Michelle Cummer, Julie Cummings, Sherri Frybarger, Leslie Hansen, Christine Nathansen-Hargis, Charles Hathcock, Julie Hill, Brandon Pearson, David Lujan, Adrian Martinez, Louie Naranjo, Jr., Eric Quintana, Winters Redstar, Susan Rupp, Leonard Sandoval, Patrick Valerio, Rick Velasquez, and the authors of this report.

We appreciate Governor Gutierrez of Santa Clara Pueblo allowing us to access Garcia and Chupaderos Canyons through Pueblo roads, and thanks to John Miera and Mary Orr of the USDA Forest Service for allowing us to study skinks in Garcia and Chupaderos Canyons.

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Appendix A
Prevalence of Morphological Defects in Many-Lined Skink Specimens

Environmental Health Associates
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September 30, 2001

Summary

Many-lined skink (*Eumeces multivarigatus*) specimens from the Museum of Southwestern Biology were examined for morphological defects, especially lost appendages. The likelihood of a skink having an appendage defect was 0.29 (0.15 – 0.46 profile likelihood 95% confidence interval). The defect rate for losses more extensive than a digit was 0.03. Effects of county of origin, body size, and previous tail loss on likelihood of appendage loss were evaluated using generalized linear models analysis. The best predictor for likelihood of morphological defects was snout-vent length. There was only weak evidence that stressful events like previous predation attempts may affect defect prevalence. County of origin did not affect likelihood of defects.

Introduction

Baseline estimates of environmental states and processes may benefit from examination of materials maintained by museums. Museum specimens can provide pre-disturbance reference or reference data and may provide additional regional references where disturbance processes are reduced. Therefore, this study examined many-lined skink specimens from the Museum of Southwestern Biology to determine the prevalence of morphological defects, especially in limbs, for comparison with similar data collected at Los Alamos National Laboratory.

Methods

Many-lined skinks in the collection of Museum of Southwestern Biology were examined for morphological defects. Specimens were examined for missing nails, digits, forelimb, humerus/femur, and other external defects. If a segment of an appendage was missing it was recorded by its left/right side, anterior/posterior position, segment of the appendage (humerus/femur, forelimb, hand, digit, nail), and, if applicable, the numbered position of the missing digit or nail. Digits were numbered from 1 to 5 beginning with 1 at the thumb/big toe to 5 at the pinky/little toe. Tails were designated as complete, freshly broken, or regenerating/regenerated. If the tail had been broken and was regenerating, the length of the regenerating portion was measured. Additional measurements were snout-vent length (SVL), head width at the widest point between the eyes and ears, and tail length. Tail and SVL measurements were made with a ruler and other measurements were made with a caliper. A hand lens was used to examine defects.

Generalized linear models (link and binomial error distribution) were used to characterize the relative importance of factors that may affect the

likelihood of morphological defects. For this analysis, lost nails were ignored, and defect observations were aggregated over each individual before analysis and don't required repeated-measures analysis. Location-specific factors may affect skink health, so county of collection was included in the development of explanatory models. Age is a factor that may affect the accumulation of injuries. Two measures of age, SVL and head width, were used in generalized linear models to explain how likelihood of injury accumulates over time and how defects may adversely affect survival. Another factor considered was whether there was other evidence of previous stress or trauma. Tail loss with regeneration was assumed to indicate the specimen had survived a stressful incident, which also may have caused appendage loss. SVL and head width were modeled as continuous covariates; whereas, indicator variables were used to estimate effects of tail loss and county of origin.

Results

Although the museum data set was not extensive, it contained specimens from several counties in New Mexico (Figure A-1). All specimens from Los Alamos County were removed from the analysis data set because the location of collection for some was uncertain. Five other specimens from Bernalillo County were dropped from analysis, because they were held in captivity for an extended period before preservations. Candidate specimens from Eddy County, New Mexico, come from much different habitats and were not measured. Table A-1 provides additional details for the analysis data set (n = 31).

The aggregated likelihood of a skink having an appendage defect was 0.29 (0.15 – 0.46 profile likelihood 95% confidence interval). Eight of the 9 specimens with defects had missing digits and one had lost the limb at the humerus. None of the defects appeared to be artifacts of storage, although digits lost during storage may be difficult to discern without microscopic examination.

Three approximating models were identified as having value for describing the probability of many-lined skinks missing an appendage or part of an appendage (Table A-2). The most parsimonious model from this set indicates the likelihood of appendage loss increases with body size (SVL; Fig. A-2). There was weak evidence that tail loss may affect defect prevalence of morphological defects. County of origin did not affect likelihood of defects. An *a posteriori* model with predictor variables County and SVL was applied to the data and resulted in a delta AIC about 3.4.

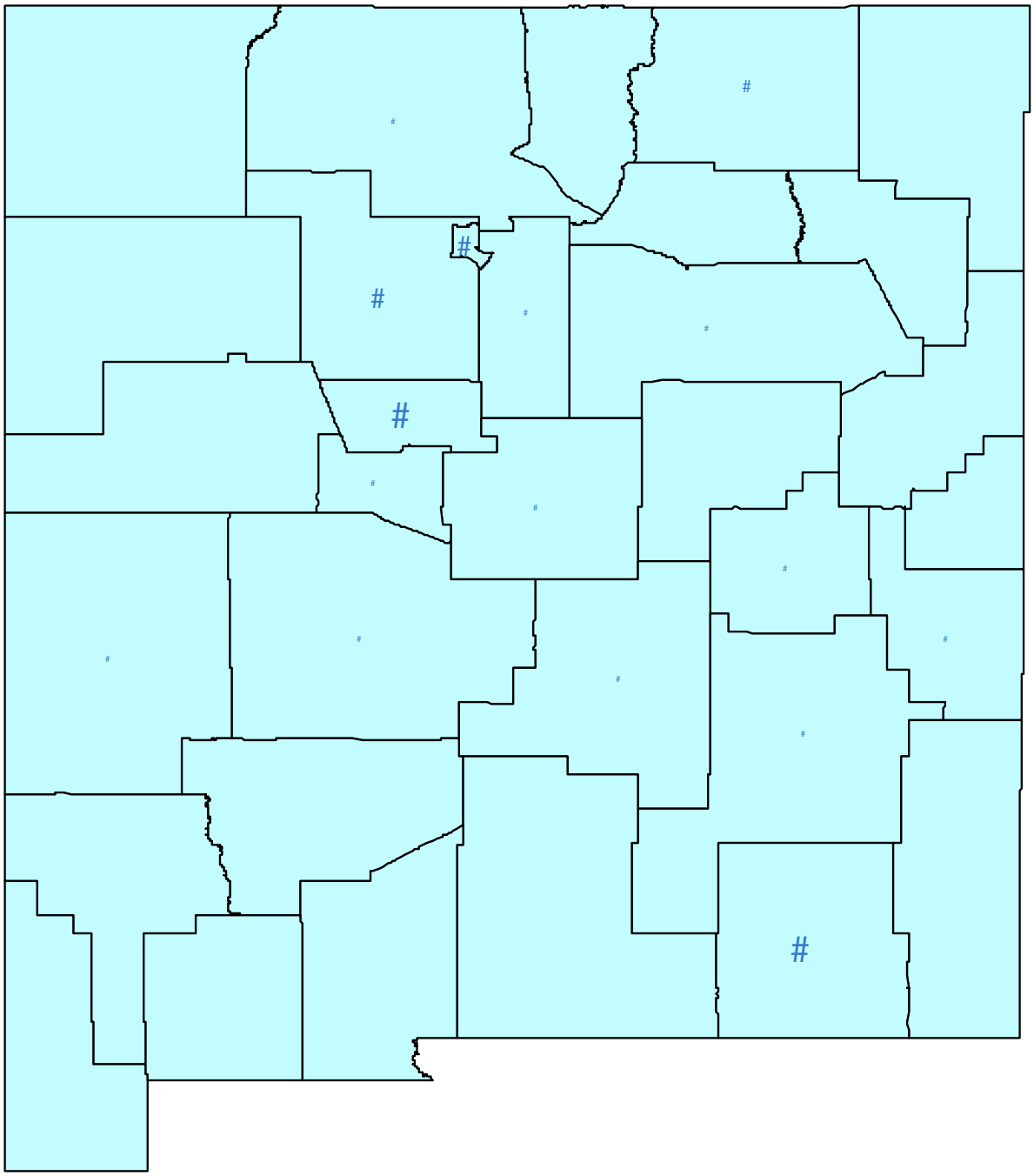

Figure A-1. Spatial distribution of many-lined skink specimens in the Southwest Museum of Biology collection. Number of specimens is proportional to size of the symbols in the counties.

Table A-1. Summary Information for Selected Many-Lined Skink Specimens in the Museum of Southwest Biology Collection

County	ID	Head width (mm)	SVL (mm)	Tail length (mm)	Tail class	Length of regener-ated tail (mm)	Missing Segment	Side	Anterior/ Posterior	Length of residual segment (mm)	Location	Location notes
Bernalillo	126	5	41	6	fb	0	none				Sandia Mts	Sulphur Canyon, Sandia Mts
Bernalillo	127	6	46	73	o	0	none				Sandia Mts	Sulphur Canyon, Sandia Mts
Bernalillo	2381	8.3	62	23	fb	0	humerus	l	a	1	Sandia Mts	Cienega Canyon, Sandia Mts
Bernalillo	2381	7.6	61	20	fb	78	humerus	l	a	1	Sandia Mts	Cienega Canyon, Sandia Mts
Bernalillo	2382	9	65	58	r	50	none				Sandia Mts	Cienega Canyon, Sandia Mts
Bernalillo	2383	4.9	35	38	fb	0	none				Sandia Mts	Cienega Canyon, Sandia Mts
Bernalillo	5903	6.8	58	54	o	0	none				Sandia Mts	Bear & Pino Canyon, Sandia Mts
Bernalillo	5903	6.5	61	52	o	0	none				Sandia Mts	Bear & Pino Canyon, Sandia Mts
Bernalillo	5904	8.8	65	8	fb	0	none				Sandia Mts	Cienega Canyon, T11N, R5E, Sec 23,Sandia Mts
Bernalillo	5904	8.7	66	39	fb	0	none				Sandia Mts	Cienega Canyon, T11N, R5E, Sec 23,Sandia Mts
Bernalillo	6159	5.1	34	.	o	0	none				Sandia Mts	Suphur Springs, Sandia Mts
Bernalillo	10276	9.2	70	47	r	36	none				Sandia Mts	Cieniga Canyon Camp area, Sandia Mts
Bernalillo	10276	8.2	70	44	r	36	none				Sandia Mts	Cieniga Canyon Camp area, Sandia Mts
Bernalillo	11288	7	54	63	r	32	none				Manzano Mts	Hwy 10 South, 2 mi. N of Chilili
Bernalillo	11288	7	55	62	r	33	none				Manzano Mts	Hwy 10 South, 2 mi. N of Chilili
Bernalillo	11609	7.7	59	66	r	42	none				Sandia Mts	Cienega Canyon Campground, E side Sandia Mts
Bernalillo	31001	3.8	25	30	o	0	none				Manzano Mts	~1mi S of Juan Tomas, in can trap (W.G. Degenhardt property)
Bernalillo	43994	7.8	68	112	o	0	none				Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	43995	8.1	60	58	r	46	digit_2	l	a	1	Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	43995	8.1	60	58	r	46	digit_3	l	a	1	Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	43996	7.5	62	106	r	28	digit_1	r	a	1	Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	43996	7.5	62	106	r	28	digit_3	r	a	0.5	Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	43996	7.5	62	106	r	28	digit_4	r	a	0.25	Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	43996	7.5	62	106	r	28	digit_5	r	a		Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	43996	7.5	62	106	r	28	digit_1	l	a	1	Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	43996	7.5	62	106	r	28	digit_2	l	a	2	Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	43996	7.5	62	106	r	28	digit_3	l	a	2	Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	43996	7.5	62	106	r	28	digit_5	l	p	0.5	Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	43996	7.5	62	106	r	28	digit_3	l	p	1	Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	43996	7.5	62	106	r	28	digit_1	r	p		Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	43996	7.5	62	106	r	28	digit_2	r	p	1	Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	43996	7.5	62	106	r	28	digit_3	r	p	1	Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	43996	7.5	62	106	r	28	nail_4	r	p	1	Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	43997	7.1	60	114	o	0	none				Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	43998	8.3	64	65	r1	34	none				Sandia Mts	Sandia Mountains - donated alive to museum; preserved Aug 1962
Bernalillo	51681	6.6	65	34	r	26	digit_2	r	p	1.5	Sandia Mts	Sandia Mts., Cienega Cyn, dry hillside ca.100m downstream from Cienega Springs
Bernalillo	53916	7.5	70	54	r	48	digit_1	l	a	1	Sandia Mts	Sandia Mts., Cienega Cyn, dry hillside ca 100m downstream from Cienega Springs
Bernalillo	53916	7.5	70	54	r	48	digit_3	r	p	1	Sandia Mts	Sandia Mts., Cienega Cyn, dry hillside ca 100m downstream from Cienega Springs
Bernalillo	53916	7.5	70	54	r	48	digit_4	r	p	1	Sandia Mts	Sandia Mts., Cienega Cyn, dry hillside ca 100m downstream from Cienega Springs
Bernalillo	53916	7.5	70	54	r	48	digit_5	r	p	0.5	Sandia Mts	Sandia Mts., Cienega Cyn, dry hillside ca 100m downstream from Cienega Springs

County	ID	Head width (mm)	SVL (mm)	Tail length (mm)	Tail class	Length of regener-ated tail (mm)	Missing Segment	Side	Anterior/ Posterior	Length of residual segment (mm)	Location	Location notes
Bernalillo	53916	7.5	70	54	r	48	digit_2	l	p	0	Sandia Mts	Sandia Mts., Cienega Cyn, dry hillside ca 100m downstream from Cienega Springs
Bernalillo	53916	7.5	70	54	r	48	digit_3	l	p	0	Sandia Mts	Sandia Mts., Cienega Cyn, dry hillside ca 100m downstream from Cienega Springs
Bernalillo	53916	7.5	70	54	r	48	digit_4	l	p		Sandia Mts	Sandia Mts., Cienega Cyn, dry hillside ca 100m downstream from Cienega Springs
Bernalillo	53916	7.5	70	54	r	48	digit_5	l	p	0.5	Sandia Mts	Sandia Mts., Cienega Cyn, dry hillside ca 100m downstream from Cienega Springs
Colfax	5280	6.9	69	108	o	0	digit_3	l	a	2	Sangre de Cristo Mts	Old Camp, Philmont Scout Ranch
Colfax	5299	6.6	61	60	r	39	none				Sangre de Cristo Mts	Ponal (Ponil on label), Philmont Scout Ranch
Colfax	5300	3.5	27	29	fb	0	none				Sangre de Cristo Mts	Dan Beard Camp, Philmont Scout Ranch
Colfax	19894	3.2	26	31	o	0	none				Sangre de Cristo Mts	About 25 7/10 mi. N. and 2 9/10 mi. W. Cimmaron
Colfax	40391	5.1	49	32	fb	0	none				Sangre de Cristo Mts	Philmont Scout Ranch, Miner's Park, near dry
Los Alamos	11230	9.6	60	15	fb	0	none				Manzano Mts	Fourth of July Picnic Grounds, Manzano Mts
Los Alamos	25828	5.5	42	.	o	0	none				Pajarito Cyn	Pajarito Canyon, E of White Rock, 36 degrees 51min; 106 degrees W 16min
Los Alamos	36411	7.8	65	81	o	0	none				Sandia Cyn	Gambel's oak, Douglas fir, etc. under flat rock nr. rd. in sand Sandia Cyn, 7150' elev., nr. rd. above Stream, Rubinia
Los Alamos	36412	6.6	46	65	o	0	digit_5	l	p	0.8	North mesa	Jemez Mts., end of North mesa, 7150' elev., under log in ponderosa, pinon, juniper, Gambel's oak
Los Alamos	36413	7.3	60	41	n	4	nail_3	r	a	0	Sandia Cyn	Jemez Mts., Sandia Cyn nr. stream, emerged from grass & was taken in open area @ 2:07pm
Los Alamos	36414	7	52	71	r	19	none				Pueblo Cyn	Pueblo Cyn. 6500', 200m W of emergency landing field in ponderosa pine, gambels oak
Los Alamos	36415	5.4	42	21	fb	0	digit_5	l	a	0	Sandia Cyn	Jemez Mts. Sandia Cyn. ca6800' on vertical surgace of rock nr. stream @12:45pm had emerged from grass
Los Alamos	36415	5.4	42	21	fb	0	digit_2	r	p	0.1	Sandia Cyn	Jemez Mts. Sandia Cyn. ca6800' on vertical surgace of rock nr. stream @12:45pm had emerged from grass
Los Alamos	36415	5.4	42	21	fb	0	digit_3	r	p	0.1	Sandia Cyn	Jemez Mts. Sandia Cyn. ca6800' on vertical surgace of rock nr. stream @12:45pm had emerged from grass
Los Alamos	36415	5.4	42	21	fb	0	digit_4	r	p	0.1	Sandia Cyn	Jemez Mts. Sandia Cyn. ca6800' on vertical surgace of rock nr. stream @12:45pm had emerged from grass
Los Alamos	36415	5.4	42	21	fb	0	nail_5	r	p	0	Sandia Cyn	Jemez Mts. Sandia Cyn. ca6800' on vertical surgace of rock nr. stream @12:45pm had emerged from grass
Los Alamos	36416	9.1	66	47	n	5	none				Canada del Buey	upper end of N Fork of Canada del Buey, 6700'. in open grassy area below narrow branches of cyn. Douglas fir some Abies and pine
Los Alamos	36417	7.6	53	34	r	25	none				Pueblo Cyn	Pueblo Cyn. in Ponderosa pine, gambels oak 100m S of Stream
Los Alamos	36419	7.6	51	61	r	32	none				Bayo Cyn	Jemez Mts. Bayo Cyn under log @11:20am body 9C air 14.5C, 6600' elev.
Los Alamos	36420	7.1	59	23	fb	0	none				Canada del Buey	Jemez Mts., N Fork Canada del Buey ponderosa & pinon juniper 6700' el. Douglas fir
Los Alamos	36421	4	32	33	fb	0	none				Canada del	Jemez Mts., N Fork Canada del Buey under log moist grassy area ca6700'

County	ID	Head width (mm)	SVL (mm)	Tail length (mm)	Tail class	Length of regener-ated tail (mm)	Missing Segment	Side	Anterior/ Posterior	Length of residual segment (mm)	Location	Location notes
Los Alamos	36422	5.7	44	29	n	7	digit_1	l	p	0.2	Buey Canada del Buey	Canada del Buey, 6600' el., under log in moist area w/ grass between Pinus ponderosa, Pinus edulis, Rhus, Quercus gambeli
Los Alamos	36424	8.1	57	80	o	0	none				Pueblo Cyn	Pueblo Cyn., 6700' el., in Ponderosa pine under moist log, body @ 10C, air @ 14.8C
Los Alamos	36425	4	35	41	o	0	none				North mesa	Jemez Mts., E end of North Mesa,, 7150' el., under rock in pine, juniper, gambels oak
Los Alamos	36426	4	27	38	o	0	none				North mesa	Jemez Mts., E end of North Mesa under rock @ 925DST, in ponderosa, pinon, juniper - 7150'el.
Los Alamos	60902	3.3	26	8	fb	0	none				Water Cyn	E facing slope just S of Water Cyn, along NM4
Los Alamos	61022	6.5	51	68	r	11	digit_1	r	p	0	N/A	N/A
Rio Arriba	50213	4.8	39	50	o	0	none				UNKNOWN	Gold Ranch, 2.2 mi NNE of Gavilan
Rio Arriba	51954	7.4	69	42	fb	0	digit_4	l	a	1	UNKNOWN	Monero Creek, 5mi E & 3mi S Lumberton
Rio Arriba	51954	7.4	69	42	fb	0	digit_5	r	a	0	UNKNOWN	Monero Creek, 5mi E & 3mi S Lumberton
San Miguel	50215		0	0		0	none				UNKNOWN	A.Roy Ranch RR Tracho ca2mi NE of Las Vegas
Sandoval	121	6.7	57	13	fb	0	none				Jemez Valley	Jemez Valley, 2 mi above Soda Dam
Sandoval	6903	5.9	47	11	fb	0	digit_4	l	a	1.1	Jemez Mts	S Camp Zia, Jemez Mts, 7620'
Sandoval	6903	5.9	47	11	fb	0	digit_4	l	p	0	Jemez Mts	S Camp Zia, Jemez Mts, 7620'
Sandoval	6904	7.5	64	92	o	0	none				Jemez Mts	S Camp Zia, Jemez Mts, 7620'
Sandoval	19895	6.4	51	38	r	20	none				Sandia Mts	1/2 mi. N. (via NM Hwy. 44) of Capulin Spring Picnic Area, Sandia Mtns
Sandoval	30661	6.1	46	19	fb	0	none				Bandelier Nat'l Mon	Bandelier Nat'l Mon., Upper Lummis Canyon, above trail crossing, S. canyon Wall, elev.6300ft
Sandoval	33736	9	64	71	r	49	digit_2	r	a	1	N/A	SE 1/4 of NM28, T19N, R3E, under rock of rocky outcropping, Ponderosa Pine
Sandoval	33737	7.4	56	38	fb	0	none				N/A	SE 1/4 of NM28, T19N, R3E, under rock of rocky outcropping, Ponderosa Pine
Sandoval	33738	4	29	16	fb	3	none				N/A	SE 1/4 of NM28, T19N, R3E, under rock of rocky outcropping, Ponderosa Pine
Sandoval	36423	7.6	53	26	r	16	digit_5	r	p	0.5	San Ildefonso Pblo	Cedro Cyn, under pine log in grassy area w/ Rhus ponderosa, Pinus edulis, Juniperus monosperma, & squaw bush
Sandoval	50214	8.1	67	59	o	0	digit_3	r	p	0.1	Sandia Mts	Sandia Presley Camp, Las Huertas Cyn., Sandia Mts.
Sandoval	50214	8.1	67	59	o	0	digit_4	r	p	0.2	Sandia Mts	Sandia Presley Camp, Las Huertas Cyn., Sandia Mts.

Table A-2. Selection of an Approximating Model for Describing Background Rates of Appendage Defects in Many-Lined Skinks[a]

Model	AIC	delta AIC
SVL	32.7167	0
SVL, Head	34.3343	1.6176
PrevPred, SVL	34.5609	1.8442
SVL|Head[b]	35.2611	2.5444
PrevPred|SVL|Head	35.5208	2.8041
PrevPred, SVL, Head	35.9372	3.2205
Head	36.768	4.0513
PrevPred|SVL, Head	37.7795	5.0628
PrevPred|head, SVL	37.937	5.2203
PrevPred, Head	38.6468	5.9301
Mean	39.3513	6.6346
PrevPred	39.8575	7.1408
PrevPred, Location	43.5392	10.8225
Location	43.7851	11.0684

[a]Three models with delta AIC ≤2 were identified, however, only the most parsimonious *SVL* model was used. SVL = snout-vent length in mm, Head = head width (mm), PrevPred = tail loss and regeneration assumed to be evidence of previous predation, Location = county of collection, Mean = mean effect model.
[b]Symbolizes that all main effects and interactions were modeled, e.g., *SVL, Head, SVL*Head*.

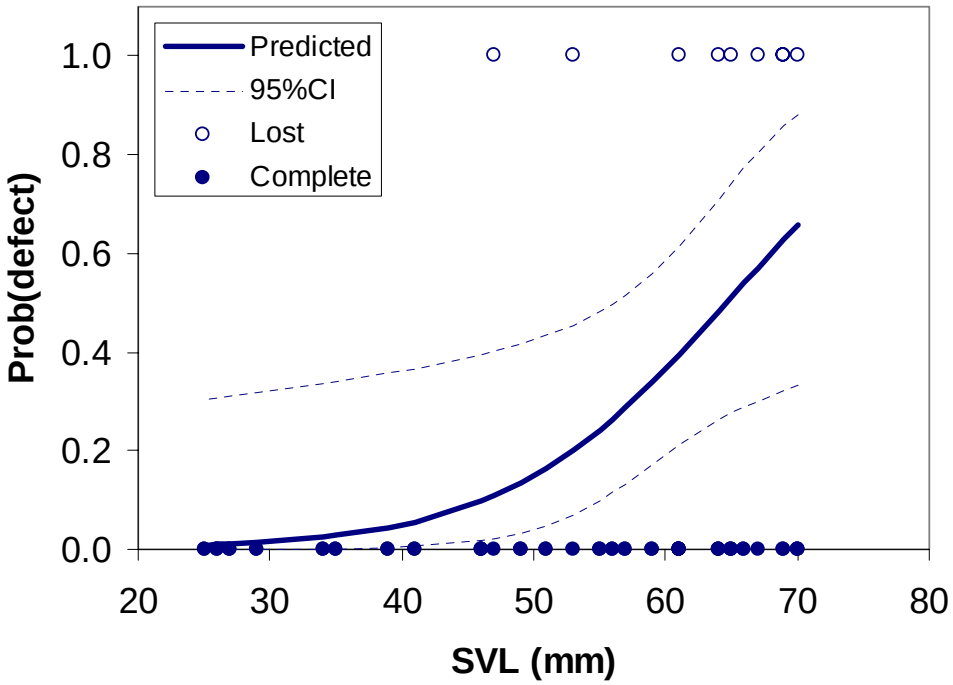

Figure A-2. Size-based changes in the probability of a lost appendage segment in many-lined skink museum specimens collected from selected counties from northern New Mexico. Open circles represent specimens lacking a portion of one or more appendages and dots represent specimens with a complete set of appendages. The solid line is the logistic regression model, logit (defect) = -7.7 + 0.12*SVL, where SVL is snout-vent length in mm.

Discussion

Twenty-nine percent of many-lined skinks had a morphological defect to one or more limbs, and 3% of skinks had a defect that involved more than loss of a digit. Prevalence of observed defects in museum specimens could be affected by storage conditions. The visual analysis of defects did not reveal an obvious relationship between storage and defects. The positive correlation between SVL and defect prevalence does not appear to be consistent with storage effects, which probably occur randomly.

The positive correlation of body size and defect prevalence is consistent with the lifetime accumulation of injuries and defects. Defects present at birth would remain constant or decrease in prevalence if they are associated with an adverse effect on fitness.

The cause of these defects cannot be inferred from this analysis, but the analysis shows that evaluation of morphological defect prevalence across sites should be adjusted for body size. The adjustment can be accomplished, as in this study, by applying generalized linear model analysis. Statistical analyses using covariables also may be useful for evaluating prevalence of defects from field studies. Field studies also may benefit by using individual- and group-level covariables in a capture-recapture analysis.

Acknowledgments

The Museum of Southwestern Biology provided access to specimens. Jill Podolsky provided valuable assistance identifying skink collection sites.

Appendix B: Raw Data on Skink Morphology and Various Catch Information

Count	Lizard ID	Lizard #	Capture Date	Canyon	Site	Trap no.	Recapture	Trap Type (25A, 10A, SB)	Array Length	Trap Type (A, SB)	Sex	SVL mm	Tail length mm	Tail class (o,r,fb,n)	Mass (g)	No. of normal toe tips-claws 20 = n	No. of normal digits 20 = n	No. of normal limb segments 12 = n	No. of normal joints 12 = n
1			18-Jun	DP	DP-N	17		SB		SB	m	62.26	62.65	r	2.5	20	20	12	12
2			18-Jun	DP	DP-N	16		SB		SB		38.43	42.75						
3			18-Jun	DP	DP-S	9		SB		SB	m	64.33	36.2	r	3.5	20	20	12	12
4	RRNN	1	19-Jun	DP	DP-N	15		SB		SB	j	43.82	38.17	r	1	20	20	12	12
5	RNRN	2	19-Jun	DP	DP-N	15		SB		SB	f	61.59	98.03	o	4.5	18	18	12	12
6			19-Jun	SA	SA-N	0.3		25A	25	A	j	48.47	58.84	r	1.5	20	20	12	12
7			21-Jun	CH	CH-N	21		SB		SB	j	43.43	31.29	fb	0.5	15	15	12	12
8	RNNR	3	21-Jun	DP	DP-N	22.1		10A	10	A	f	68.45	46.7	r	5.5	20	20	12	12
9	RRNN	1	21-Jun	SA	SA-N	198.3		25A	25	A	f	68.03	56.49	r	5	20	20	12	12
10	NRNR	5	21-Jun	SA	SA-N	18		SB		SB	f	65.61	52.65	r	5.5	20	20	12	12
11	NNRR	6	21-Jun	SA	SA-N	132.3		25A	25	A	j	48.93	43.14	r	2	20	20	12	12
12	RRRN	7	21-Jun	SA	SA-N	110.3		10A	10	A	f	57.19	84.68	o	3	20	20	12	12
13			21-Jun	SA	SA-N	110.3		10A	10	A	f	63.29	12.62	fb	3.5	19	20	12	12
14	RNRN	2	21-Jun	SA	SA-S	22.1		10A	10	A	m	47.11	49.59	r	2	19	20	12	12
15	RNNR	3	21-Jun	SA	SA-S	22.6		10A	10	A	f	61.27	83.19	o	3.5	19	19	12	12
16	NRRN	4	21-Jun	SA	SA-S	198.4		25A	25	A	f	61.48	26.71	n	4.5	12	12	9	10
17	RRNN		22-Jun	CH	CH-S	9		SB		SB	f	57.02	47.1	r	3	20	20	12	12
18	NRRN	4	22-Jun	DP	DP-N	198.2		25A	25	A	f	53.24	47.3	r	2.5	19	19	12	12
19	NRNR	5	22-Jun	DP	DP-N	88.4		10A	10	A	f	49.75	56.09	r	1.5	20	20	12	12
20	NNRR	6	22-Jun	DP	DP-N	198.5		25A	25	A	j	49.2	54.48	r	2	20	20	12	12
21	RRNN		22-Jun	GA	GA-N1	198.4		25A	25	A	f	57.15	59.67	r	3	20	20	12	12
22	RNRN		22-Jun	GA	GA-N1	0.6		25A	25	A	f	59.74	89.57	o	3.5	20	20	12	12
23	NRRN		25-Jun	CH	CH-N	44.2		10A	10	A	j	42.86	33.43	r	1	20	20	12	12
24	NRNR		25-Jun	CH	CH-N	36SE of 9					m	67.2	99.34	o	6.5	20	20	12	12
25	RNRN		25-Jun	CH	CH-S	15		SB		SB	j	49.03	68.07	fb	2	20	20	12	12
26	RNNR		25-Jun	CH	CH-S	14		SB		SB	f	54.31	80.49	o	3.5	20	20	12	12
27	RRRN	7	25-Jun	DP	DP-N	88.1		10A	10	A	f	59.49	66.01	r	4	20	20	12	12
28	RNRR	9	25-Jun	DP	DP-N	20		SB		SB	f	67.43	76.69	r	6	20	20	12	12
29	NRRR	10	25-Jun	DP	DP-N	132.3		25A	25	A	f	57.22	61.1	r	3.5	17	17	10	12
30	YNYN	12	25-Jun	DP	DP-N	66.4		25A	25	A	f	64.1	98.58	o	5.5	20	20	12	12
31	YNNY	13	25-Jun	DP	DP-N	198.2		25A	25	A	f	67.32	50.44*	r	5.5	13	15	12	12
32	NYYN	14	25-Jun	DP	DP-N	21		SB		SB	f	56.63	70.32	r	3	20	20	12	12
33	NYNY	15	25-Jun	DP	DP-N	0.4		25A	25	A	f	57.6	77.8	r	3.5	20	20	12	12
34	RRNR	8	25-Jun	DP	DP-S	198.6		25A	25	A	m	56.5	64.22	r	3.5	20	20	12	12

Count	Lizard ID	Lizard #	Capture Date	Canyon	Site	Trap no.	Recapture	Trap Type (25A, 10A, SB)	Array Length	Trap Type (A, SB)	Sex	SVL mm	Tail length mm	Tail class (o,r,fb,n)	Mass (g)	No. of normal toe tips-claws 20 = n	No. of normal digits 20 = n	No. of normal limb segments 12 = n	No. of normal joints 12 = n
35	YYNN	11	25-Jun	DP	DP-S	11		SB		SB	f	59.07	64.21	r	4	20	20	12	12
36	NRRN		25-Jun	GA	GA-N1	8		SB		SB	f	62.45	105.53	o	5	19	19	11	12
37	RNNR		25-Jun	GA	GA-N1	10		SB		SB	f	59.83	67.7	r	3.5	13	20	12	12
38	NRNR		25-Jun	GA	GA-N1	44.2		10A	10	A	j	52.03	79.43	o	2.5	20	20	12	12
39	RRNR	8	25-Jun	GA	GA-N2	132.3		25A	25	A	m	59.5	68.3	r2	4	19	19	12	12
40	RNRR	9	25-Jun	SA	SA-N	132.6		25A	25	A	m	61.87	66.51	r	4.5	20	20	12	12
41	YNYN	12	25-Jun	SA	SA-N	198.1		25A	25	A	f	62.19	46.95	r	3.5	20	20	12	12
42	YNNY	13	25-Jun	SA	SA-N	0.1		25A	25	A	f	63.75	47.93	r	4	19	20	12	12
43	NYYN	14	25-Jun	SA	SA-N	0.1		25A	25	A	j	50.6	66.74	r	2	20	20	12	12
44	NYNY	15	25-Jun	SA	SA-N	198.4		25A	25	A	m	62.94	57.5	r	5	20	20	12	12
45	YNYN	12	25-Jun	SA	SA-N	110.3		10A	10	A	m	70.63	56.14	r	5.5	20	20	12	12
46	NNYY	16	26-Jun	SA	SA-S	9		SB		SB	f	62.46	66.1	r	4	20	20	12	12
47	YYNN	11	26-Jun	SA	SA-S	198.1		25A	25	A	f	57.9	63.63	r	3	20	20	12	12
48	NNYY	16	27-Jun	DP	DP-N	8		SB		SB	f	63.7	52.97	r	5.5	20	20	12	12
49	YYYN	17	27-Jun	DP	DP-N	198.4		25A	25	A	f	62.44	60.09	r	3	20	20	12	12
50	YYNY	18	27-Jun	DP	DP-N	15		SB		SB	f	61.49	39.34*	r	4.5	15	15	9	10
51	YNYY	19	27-Jun	DP	DP-N	198.3		25A	25	A	j	46.39	67.39	o	1.5	20	20	12	12
52	RRRN		28-Jun	CH	CH-S	13		SB		SB	f	58.35	60.39	r	3	20	20	12	12
53	NNRR		29-Jun	CH	CH-S	8		SB		SB	j	52.58	79.08	o	2.75	20	20	12	12
54	NGNG	25	29-Jun	DP	DP-N	132.2		25A	25	A	f	61.61	64.79	r	4.16	20	20	12	12
55	GNGN	22	29-Jun	DP	DP-N	16		SB		SB	m	65.76	38.16	n/r2	5.55	19	19	12	12
56	RRNR	8	29-Jun	DP	DP-N	132.2		25A	25	A	j	50.17	63.39	o	2.05	20	20	12	12
57	GGNN	21	29-Jun	DP	DP-S	110.1		10A	10	A	j	53.62	57.89	r	3.01	15	15	12	12
58	NRRR		29-Jun	GA	GA-N2	132.1		25A	25	A	f	61.89	93.83	o	5	20	20	12	12
59	YYNY	18	29-Jun	SA	SA-N	198.4		25A	25	A	f	56.18	65.63	r	3.53	19	19	12	12
60	GNGN	22	29-Jun	SA	SA-S	198.6		25A	25	A	j	51.03	76.21	o	2.59	19	19	12	12
61	YYYN	17	29-Jun	SA	SA-S	0.4		25A	25	A	f	63.49	77.22	r	4.76	20	20	12	12
62	GNNG	23	2-Jul	DP	DP-N	198.3		25A	25	A	f	56.63	62.21	r	3.69	18	20	12	12
63	NGGN	24	2-Jul	DP	DP-N	22.2		10A	10	A	j	52.4	85.97	o	2.73	20	20	12	12
64			2-Jul	DP	DP-N	110.1		10A	10	A	f	61.46	39.57	r	3.23	19	20	12	12
65	NYYY	20	2-Jul	DP	DP-N	44.3		10A	10	A	j	47.41	13.47	fb	1.52	20	20	12	12
66	NNGG	26	2-Jul	DP	DP-N	8		SB		SB	f	57.76	56.15	r	3.19	20	20	12	12
67	GGGN	27	2-Jul	DP	DP-N	22.4		10A	10	A	m	66.23	63.38	r2	5.18	20	20	12	12
68	GGNG	28	2-Jul	DP	DP-N	154.3		10A	10	A	f	58.67	92.23	o	3.57	20	20	12	12
69	GNGG	29	2-Jul	DP	DP-N	154.2		10A	10	A	f	59.86	64.08	r	3.79	20	20	12	12
70	NGGG	30	2-Jul	DP	DP-N	132.5		25A	25	A	j	51.29	81.23	o	2.39	20	20	12	12
71	OONN	31	2-Jul	DP	DP-N	16		SB		SB	j	49.09	73.03	o	2.25	20	20	12	12
72	ONON	32	2-Jul	DP	DP-N	176.2		10A	10	A	j	50.41	65.24	o	2.08	20	20	12	12

Count	Lizard ID	Lizard #	Capture Date	Canyon	Site	Trap no.	Recapture	Trap Type (25A, 10A, SB)	Array Length	Trap Type (A, SB)	Sex	SVL mm	Tail length mm	Tail class (o,r,fb,n)	Mass (g)	No. of normal toe tips-claws 20 = n	No. of normal digits 20 = n	No. of normal limb segments 12 = n	No. of normal joints 12 = n
73	ONNO	33	2-Jul	DP	DP-N	88.3		10A	10	A	m	66.22	64.01	r2	5.7	20	20	12	12
74	NNRR		2-Jul	GA	GA-N1	44.4		10A	10	A	o	66.44	105.18	o	6.08	20	20	12	12
75	RRRN		2-Jul	GA	GA-N2	44.4		10A	10	A	j	51	79	o	2.4	20	20	12	12
76	YNYY	19	2-Jul	SA	SA-N	154.4		10A	10	A	m	64.46	51.95	r	4.67	20	20	12	12
77	NYYY	20	2-Jul	SA	SA-N	0.3		25A	25	A	f	61.49	80.85	o	4.01	20	20	12	12
78	GGNN	21	2-Jul	SA	SA-N	10		SB		SB	f	49.39	28.83	r	1.76	15	15	12	12
79	YYNN		3-Jul	GA	GA-N1	198.5		25A	25	A	f	52.12	64.72	r	2.43	20	20	12	12
80	GGGN		3-Jul	GA	GA-N1	0.2		25A	25	A	f	63.84	55.87	r	6.54	17	19	12	12
81	NGNG	25	3-Jul	SA	SA-N	44.2		10A	10	A	f	62.99	80.44	r	5.27	19	20	12	12
82	NNGG	26	3-Jul	SA	SA-N	176.3		10A	10	A	f	67.53	31.07	r	4.55	18	18	12	12
83	GGNG	28	3-Jul	SA	SA-N	198.3		25A	25	A	j	52.32	22.3*	r	2.58	20	20	12	12
84	GNNG	23	3-Jul	SA	SA-S	0.6		25A	25	A	f	59.41	69.88	r	3.98	20	20	12	12
85	NGGN	24	3-Jul	SA	SA-S	198.3		25A	25	A	f	66.33	103.33	o	5.66	20	20	12	12
86	RRNR		5-Jul	CH	CH-N	198.6		25A	25	A	j	50.27	44.14	r	2.8	20	20	12	12
87	NOON	34	5-Jul	DP	DP-N	44.1		10A	10	A	j	47.37	52.03	r	1.96	19	20	12	12
88	NNOO	36	5-Jul	DP	DP-N	198.1		25A	25	A	f	54.04	67.52	r	3.26	20	20	12	12
89	OOON	37	5-Jul	DP	DP-N	88.3		10A	10	A	f	58.15	51.62		2.89	20	20	12	12
90	OONO	38	5-Jul	DP	DP-N	66.3		25A	25	A	j	51.15	69.57	o	2.51	20	20	12	12
91	NRGN	44	5-Jul	DP	DP-N	66.6		25A	25	A	j	50.77	78.08	o	2.71	19	20	12	12
92	NONO	35	5-Jul	DP	DP-S	110.3		10A	10	A	j	45.71	18.17*	fb	1.98	20	20	12	12
93	RNNG	43	5-Jul	DP	DP-S	0.5		25A	25	A	j	47.2	64.7	r	1.97	20	20	12	12
94	NRNG	45	5-Jul	DP	DP-S	154.3		10A	10	A	f	58.31	53.64	r	3.66	20	20	12	12
95	RNRR		9-Jul	CH	CH-N	154.3		10A	10	A	f	57.88	89.13	o	4.2	17	17	12	12
96	NRRR		9-Jul	CH	CH-N	176.3		10A	10	A	f	53.57	55.2	r	2.83	19	20	12	12
97	YYNN		9-Jul	CH	CH-N	9		SB		SB	f	61.68	66.5	r	4.79	20	20	12	12
98	YNYN		9-Jul	CH	CH-N	8		SB		SB	j	54.7	72.59	r	3.23	20	20	12	12
99	YNNY		9-Jul	CH	CH-N	14		SB		SB	f	60.01	54.79	r	3.4	20	20	12	12
100	OOOO	39	9-Jul	DP	DP-N	132.3		25A	25	A	j	50.73	76.38	o	2.47	20	20	12	12
101	NOOO	40	9-Jul	DP	DP-N	18		SB		SB	j	49.66	72.74	o	2.62	20	20	12	12
102	RGNN	41	9-Jul	DP	DP-N	154.3		10A	10	A	j	46.95	71.58	o	2.26	20	20	12	12
103	GNRN	48	9-Jul	DP	DP-N	0.1		25A	25	A	f	61.67	71.72	fb	4.63	18	20	12	12
104	GNNR	49	9-Jul	DP	DP-N	132.3		25A	25	A	m	55.96	61.14	r	4.01	20	20	12	12
105	RNGN	42	9-Jul	DP	DP-S	198.5		25A	25	A	j	49.28	64.75	o	2.6	20	20	12	12
106	NNRG	46	9-Jul	DP	DP-S	0.5		25A	25	A	f	66.65	58.56	r	5.55	17	20	12	12
107	GRNN	47	9-Jul	DP	DP-S	0.2		25A	25	A	j	51.13	83.07	o	2.63	20	20	12	12
108	NGRN	50	9-Jul	DP	DP-S	154.2		10A	10	A	f	59.82	75.89	r	4.31	18	18	12	12
109	YNYN		9-Jul	GA	GA-N1	44.3		10A	10	A	m	66.17	67.15	r	6.96	20	20	12	12
110	YNNY		9-Jul	GA	GA-N1	0.3		25A	25	A	j	53.35	12.17	fb	3.15	20	20	12	12

Count	Lizard ID	Lizard #	Capture Date	Canyon	Site	Trap no.	Recapture	Trap Type (25A, 10A, SB)	Array Length	Trap Type (A, SB)	Sex	SVL mm	Tail length mm	Tail class (o,r,fb,n)	Mass (g)	No. of normal toe tips-claws 20 = n	No. of normal digits 20 = n	No. of normal limb segments 12 = n	No. of normal joints 12 = n
111	YNYY		9-Jul	GA	GA-N1	154.2		10A	10	A	m	62.02	82.05	r	4.95	18	10	12	12
112			9-Jul	GA	GA-N1	154.2		10A	10	A	j	55.25	88.81	o	2.46	20	20	12	12
113	NYYN		9-Jul	GA	GA-N2	132.2		25A	25	A	m	65.17	82.44	r	6.7	19	20	12	12
114	NYNY		9-Jul	GA	GA-N2	132.5		25A	25	A	j	50.04	69.56	o	2	20	20	12	12
115	NNYY		9-Jul	GA	GA-N2	88.1		10A	10	A	f	60.67	92.5	o	4.39	19	20	12	12
116	YYYN		9-Jul	GA	GA-N2	13		SB		SB	f	74.8	38.48	r	6.18	20	20	12	12
117	YYNY		9-Jul	GA	GA-N2	132.5		25A	25	A	j	53.26	89.59	o	2.72	20	20	12	12
118	NYYY		9-Jul	GA	GA-N2	0.2		25A	25	A	f	61.29	57.48	r2	4.43	19	19	12	12
119			9-Jul	GA	GA-N2	11		SB		SB	f	63.55	47.06	fb	4.42	19	20	11	11
120	NYYN		11-Jul	CH	CH-N	132.5		25A	25	A	f	59.31	58.39	r	3.57	19	20	12	12
121	GNGG		11-Jul	SA	SA-N	20		SB		SB	f	61.13	79.17	r	4.68	20	20	12	12
122	NGNR	51	11-Jul	DP	DP-N	22		SB		SB	f	61.55	97.96	o	5.37	20	20	12	12
123	NNGR	52	11-Jul	DP	DP-S	14		SB		SB	m	64.32	43.03	r	4.41	17	19	12	12
124	GGNN		11-Jul	GA	GA-N2	44.4		10A	10	A	f	66.44	34.21	fb	3.86	20	20	12	12
125	NYNY		11-Jul	CH	CH-S	88.1		10A	10	A	f	59.46	97.04	o	5.41	20	20	12	12
126	GNGN		11-Jul	GA	GA-N1	154.3		10A	10	A	f	60.67	51.88	r	3.29	20	20	12	12
127	GNNG		11-Jul	GA	GA-N1	10		SB		SB	f	61.8	81.86	r	4.82	19	19	12	12
128	NNYY		11-Jul	CH	CH-N	16		SB		SB	f	60.56	81.31	r	5.55	16	17	12	12
129	OYNN	53	11-Jul	DP	DP-S	12		SB		SB	m	59.36	65.43	r	3.77	19	50	12	12
130	NGGG		11-Jul	SA	SA-N	154.3		10A	10	A	j	45.86	57.15	r	1.82	20	20	12	12
131			11-Jul		TA-21-210*						f	67.02	41.2	r	3.13	20	20	12	12
132	YYYN		13-Jul	CH	CH-N	8		SB		SB	f	58.21	81.97	o	3.48	20	20	12	12
133	YYNY		13-Jul	CH	CH-S	88.1		10A	10	A	f	66.3	70.69	r	3.96	20	20	12	12
134	ONYN	54	13-Jul	DP	DP-N	22.1		10A	10	A	m	51.41	55.61	r	3.21	20	20	12	12
135	YNYY		16-Jul	CH	CH-S	0.4		25A	25	A	j	49.82	66.2	n	2.24	20	20	12	12
136	ONNY	55	16-Jul	DP	DP-N	132.2		25A	25	A	f	64.92	46.16	r2	4.39	18	18	11	11
137	NOYN	56	16-Jul	DP	DP-S	0.3		25A	25	A	f	54.09	59.58	r	2.93	20	20	12	12
138	NGGG		16-Jul	SA	SA-S	22		SB		SB	f	49.34	65.64	r	2.24	20	20	12	12
139	NONY	57	16-Jul	DP	DP-S	66.2		25A	25	A	f	63.99	67.45*	r	5.38	19	19	12	12
140	NNOY		16-Jul	DP	DP-N	8		SB		SB	f	64.65	94.27	o	5.03	17	19	12	12
141	YONN		16-Jul	DP	DP-S	154.1		10A	10	A	j	51.64	79.48	o	3.01	20	20	12	12
142	NYYY		16-Jul	CH	CH-S	88.3		10A	10	A	f	59.63	82.38	o	3.57	18	20	12	12
143	YNON		16-Jul	DP	DP-N	198.3		25A	25	A	f	60.14	66.72	r	4.38	19	19	12	12
144	NGGN		16-Jul	GA	GA-N2	13		SB		SB	f	61.25	62.6	r	3.73	20	20	12	12
145	NGNG		16-Jul	GA	GA-N2	198.1		25A	25	A	m	53.9	81.1	o	3.22	20	20	12	12
146	NNGG		16-Jul	GA	GA-N2	11		SB		SB	f	60.44	76.16	r	4.42	19	19	12	12
147	OONN		18-Jul	SA	SA-N	19		SB		SB	f	63.1	61.18	r2	4.38	20	20	12	12

Count	Lizard ID	Lizard #	Capture Date	Canyon	Site	Trap no.	Recapture	Trap Type (25A, 10A, SB)	Array Length	Trap Type (A, SB)	Sex	SVL mm	Tail length mm	Tail class (o,r,fb,n)	Mass (g)	No. of normal toe tips-claws 20 = n	No. of normal digits 20 = n	No. of normal limb segments 12 = n	No. of normal joints 12 = n
148	ONON		18-Jul	SA	SA-N	176.4		10A	10	A	f	70.05	74.69	r	7.65	20	20	12	12
149	ONNO		18-Jul	SA	SA-N	22.2		10A	10	A	j	46.78	56.59	r	1.79	20	20	12	12
150	YNNO		18-Jul	DP	DP-N	22.3		10A	10	A	f	64.88	82.99	r2	6.29	20	20	12	12
151	NYON		18-Jul	DP	DP-N	66.1		25A	25	A	j	46.05	54.71	r	2.02	14	14	12	12
152	NYNO		18-Jul	DP	DP-S	8		SB		SB	j	52.49	38.15	r	2.19	20	20	12	12
153			18-Jul	CH	CH-N	176.2		10A	10	A	j	27.7	34.59	o	0.35	20	20	12	12
154	GGNN		20-Jul	CH	CH-N	21		SB		SB	f	58.55	54.58	r	3.61	20	20	12	12
155	GNGN		20-Jul	CH	CH-N	20		SB		SB	f	62.65	69.48	r2	4.16	20	20	12	12
156	RYNN		20-Jul	DP	DP-N	15		SB		SB	f	63.7	73.26	r	5.07	20	20	12	12
157	NGGN		20-Jul	CH	CH-S	12		SB		SB	j	51.72	84.52	o	2.71	20	20	12	12
158	RNYN		20-Jul	DP	DP-S	0.5		25A	25	A	j	50.72	57.84	r	2.44	19	19	12	12
159	htch		20-Jul	CH	CH-N	132.1		25A	25	A	j	29.77	40.01	o	0.42	20	20	12	12
160	htch		20-Jul	SA	SA-N	132.2		25A	25	A	j	28.19	37.74	o	0.37	20	20	12	12
161	htch		20-Jul	CH	CH-N	132.6		25A	25	A	j	29.18	39.58	o	0.52	20	20	12	12
162	htch		20-Jul	CH	CH-N	132.2		25A	25	A	j	29.95	38.43	o	0.64	20	20	12	12
163	htch		20-Jul	DP	DP-N	66.1		25A	25	A	j	28.43	24.2	n	0.42	20	20	12	12
164	GGGN		23-Jul	GA	GA-N2	132.3		25A	25	A	f	52.65	50.35	r	2.7	20	20	12	12
165	GGNG		23-Jul	GA	GA-N1	66.2		25A	25	A	f	62.82	56.94	n	3.6	9	20	12	12
166	GNGG		23-Jul	GA	GA-N2	198.1		25A	25	A	f	59.06	86.67	r2	4.52	20	20	12	12
167	NOON		23-Jul	SA	SA-N	198.5		25A	25	A	m	63.15	28.24	r	2.98	20	20	12	12
168	NONO		23-Jul	SA	SA-N	22.3		10A	10	A	f	59.37	82.35	r	3.96	20	20	12	12
169	NNOO		23-Jul	SA	SA-N	22.3		10A	10	A	j	58.89	80.27	o	3.56	20	20	12	12
170	OOON		23-Jul	SA	SA-N	132.6		25A	25	A	m	71.73	54.49	r	4.34	20	20	12	12
171	RNNY		23-Jul	DP	DP-N	8		SB		SB	m	65.78	87.03	o	4.95	19	19	12	12
172	NRYN		23-Jul	DP	DP-S	16		SB		SB	f	68.86	96.86	o	7.1	19	19	12	12
173	OONO		23-Jul	SA	SA-N	132.4		25A	25	SB	f	61.12	46.84	r	3.57	20	20	12	12
174	NRNY		23-Jul	DP	DP-N	19		SB		SB	f	64.56	90.14	o	5.43	20	20	12	12
175	htch		23-Jul	DP	DP-N	198.5		25A	25	A	j	27.71	26.26	fb	0.33	20	20	12	12
176	htch		23-Jul	SA	SA-N	9		SB		SB	j	28.59	38.72	o	0.37	20	20	12	12
177	htch		23-Jul	SA	SA-N	110.3		10A	10	A	j	29.89	21.25	n	0.4	20	20	12	12
178	htch		23-Jul	GA	GA-N2	21		SB		SB	j	31.05	31.48	o	0.42	20	20	12	12
179	htch		23-Jul	SA	SA-N	132.2		25A	25	A	j	29.67	37.51	o	0.38	20	20	12	12
180	htch		23-Jul	SA	SA-N	66.5		25A	25	A	j	28.9	18.17	n	0.59	20	20	12	12
181	GNNG		25-Jul	CH	CH-N	22		SB		SB	f	58.28	87.56	r	3.65	20	20	12	12
182	NGGG		25-Jul	GA	GA-N2	13		SB		SB	f	59.39	94.85	o	3.75	19	19	12	12
183	NGNG		25-Jul	CH	CH-N	22		SB		SB	f	59.13	62.98	r	3.02	20	20	12	12
184	NNGG		25-Jul	CH	CH-S	18		SB		SB	m	65.78	70.84	r	5.44	20	20	12	12

Count	Lizard ID	Lizard #	Capture Date	Canyon	Site	Trap no.	Recapture	Trap Type (25A, 10A, SB)	Array Length	Trap Type (A, SB)	Sex	SVL mm	Tail length mm	Tail class (o,r,fb,n)	Mass (g)	No. of normal toe tips-claws 20 = n	No. of normal digits 20 = n	No. of normal limb segments 12 = n	No. of normal joints 12 = n
185	GGGN		25-Jul	CH	CH-S	176.2		10A	10	A	j	44.95	28.58	n	1.4	17	18	12	12
186	GGNG		25-Jul	CH	CH-N	22		SB		SB	f	60.45	72.87	r	4.17	20	20	12	12
187	NNRY		25-Jul	DP	DP-S	20		SB		SB	j	48.58	71.39	o	1.96	20	20	12	12
188	YRNN		25-Jul	DP	DP-S	44.1		10A	10	A	j	52.26	51.3	r	2.17	20	20	12	12
189	YNRN		25-Jul	DP	DP-S	154.1		10A	10	A	f	56.45	34.78	n	2.88	20	20	12	12
190	YNNR		25-Jul	DP	DP-S	23		SB		SB	m	69.44	56.23	r	5.26	20	20	12	12
191	NYRN		25-Jul	DP	DP-N	11		SB		SB	f	69.61	68.55	r	5.87	20	20	12	12
192	NYNR		25-Jul	DP	DP-S	0.5		25A	25	A	f	61.85	67.18	r	5.03	20	20	12	12
193	ONOO		25-Jul	SA	SA-S	0.5		25A	25	A	j	49.04	41.28	r	1.69	20	20	12	12
194	NOOO		25-Jul	SA	SA-N	132.6		25A	25	A	f	66.67	115.43	o	5.68	20	20	12	12
195	RGNN		25-Jul	SA	SA-N	44.4		10A	10	A	f	65.8	65.56	r	4.1	17	17	12	12
196	htch		25-Jul	SA	SA-N	132.4		25A	25	A	j	28.75	37.69	o	0.34	19	19	12	12
197	htch		25-Jul	SA	SA-N	198.2		25A	25	A	j	29.97	38.65	o	0.36	20	20	12	12
198	htch		25-Jul	DP	DP-N	23		SB		SB	j	29.78	17.08	n	0.48	20	20	12	12
199	htch		25-Jul	CH	CH-N	24		SB		SB	j	27.9	33.51	o	0.33	20	20	12	12
200	RRRN		27-Jul	DP	DP-S	154.3		10A	10	A		62.28	69.5		4.78				
201	GNGG		27-Jul	CH	CH-S	88.2		10A	10	A	m	68.81	75.04	r	5.67	20	20	12	12
202	OONN		27-Jul	GA	GA-N2	198.4		25A	25	A	f	61.35	59.72	r	3.66	20	20	12	12
203	NGGG		27-Jul	CH	CH-N	154.4		10A	10	A	f	50.84	39.54	r	1.98	19	19	12	12
204	NNYR		27-Jul	DP	DP-N	198.5		25A	25	A	m	70.89	54.51	r	6.34	20	20	12	12
205	RONN		27-Jul	GA	DP-S	176.3		10A	10	A	f	64.64	94.33	o	4.7	19	20	12	12
206	htch		27-Jul	SA	SA-N	0.3		SB		SB	j	26.4	33.7	o	0.23	20	20	12	12
207	htch		27-Jul	SA	SA-N	110.1		10A	10	A	j	30.34	39.06	o	0.41	20	20	12	12
208	htch		27-Jul	SA	SA-N	10		SB		SB	j	27.65	34.45	fb	0.38	20	20	12	12
209	htch		27-Jul	SA	SA-S						j	29.46	36.05	o	0.4	20	20	12	12
210	htch		27-Jul	CH	CH-S	22.3		10A	10	A	j	30.27	35.27	o	0.39	20	20	12	12
211	OONN		30-Jul	CH	CH-N	66.3		25A	25	A	f	55.9	66.82	r	4.09	15	15	11	11
212	ONON		30-Jul	GA	GA-N2	132.2		25A	25	A	f	54.44	78.08	r	3.48	19	20	12	12
213	RRNG		30-Jul	SA	SA-S	132.1		25A	25	A	f	62.03	87.5	r	5.74	20	20	12	12
214	RNNG		30-Jul	SA	SA-N	110.2		10A	10	A	f	62.65	54.5	r	4.05	20	20	12	12
215	NRGN		30-Jul	SA	SA-S	44.1		10A	10	A	f	65.94	61.96	rn	4.98	20	20	12	12
216	NRNG		30-Jul	SA	SA-N	44.4		10A	10	A	f	64.68	40.37	n	3.25	20	20	12	12
217	NNRG		30-Jul	SA	SA-N	44.4		10A	10	A	f	61.86	46.69	r	4.89	20	20	12	12
218	GRNN		30-Jul	SA	SA-N	132.2		25A	25	A	f	68.01	39.01	n	4.12	16	16	12	12
219	GNRN		30-Jul	SA	SA-N	22.2		10A	10	A	f	63.75	60.55	r	4.07	20	20	12	12
220	GNNR		30-Jul	SA	SA-S	22.1		10A	10	A	j	47.65	74.62	o	1.97	20	20	12	12
221	NGRN		30-Jul	SA	SA-S	0.3		25A	25	A	m	67.71	39.13	r2	6.5	20	20	12	12

Count	Lizard ID	Lizard #	Capture Date	Canyon	Site	Trap no.	Recapture	Trap Type (25A, 10A, SB)	Array Length	Trap Type (A, SB)	Sex	SVL mm	Tail length mm	Tail class (o,r,fb,n)	Mass (g)	No. of normal toe tips-claws 20 = n	No. of normal digits 20 = n	No. of normal limb segments 12 = n	No. of normal joints 12 = n
222	NGNR		30-Jul	SA	SA-N	22.2		10A	10	A	f	67.83	36.36	r	4.27	20	20	12	12
223	NNGR		30-Jul	SA	SA-N	15		SB		SB	f	53.81	34.36	rn	2.75	20	20	12	12
224	OYNN		30-Jul	SA	SA-N	132.3		25A	25	A	m	67.3	60.46	r	4.65	20	20	12	12
225	ONYN		30-Jul	SA	SA-N	154.3		10A	10	A	f	64.36	73.62	r	4.5	20	20	12	12
226	ONNY		30-Jul	SA	SA-N	154.2		10A	10	A	m	65.43	46.08	r2	4.73	20	20	12	12
227	NOYN		30-Jul	SA	SA-N	198.5		25A	25	A	j	53.44	95.74	o	3.31	20	20	12	12
228	htch		30-Jul	SA	SA-N	198.5		25A	25	A	j	28.32	32.34	o	0.31	20	20	12	12
229	RNON		30-Jul	DP	DP-S	88.1		10A	10	A	f	56.79	43.53	o	4.48	19	19	12	12
230	RNNO		30-Jul	DP	DP-S	198.2		25A	25	A	f	63.99	82.93	r	6.13	20	20	12	12
231	htch		30-Jul	DP	DP-S	154.1		10A	10	A	j	29.13	40.25	o	0.47	20	20	12	12
232	NRON		30-Jul	DP	DP-S	20		SB		SB	j	50.91	83.29	o	2.69	20	20	12	12
233	NONY		30-Jul	SA	SA-N	154.4		10A	10	A	f	60.45	43.31	r2	4.45	20	20	12	12
234	NRNO		30-Jul	DP	DP-N	0.1		25A	25	A	f	60.36	56.68	r	3.75	20	20	12	12
235	NNRO		30-Jul	DP	DP-N	132.5		25A	25	A	f	58.87	72.56	r	4.01	20	20	12	12
236	ORNN		30-Jul	DP	DP-N	132.5		25A	25	A	j	48.57	54.11	r	2.19	20	20	12	12
237	htch		30-Jul	SA	SA-N	44.1		10A	10	A	j	25.52	20.77	n	0.32	20	20	12	12
238	htch		30-Jul	SA	SA-N	66.3		25A	25	A	j	26.45	33.3	o	0.33	20	20	12	12
239	htch		30-Jul	SA	SA-N	198.5		25A	25	A	j	29.01	34.5	o	0.3	20	20	12	12
240	NNOY		30-Jul	SA	SA-N	198.1		25A	25	A	f	63.57	47	r	4.25	20	20	12	12
241	htch		30-Jul	SA	SA-N	88.2		10A	10	A	j	30.8	41.8	o	0.43	20	20	12	12
242	htch		30-Jul	SA	SA-N	132.5		25A	25	A	j	27.11	35.4	o	0.41	20	20	12	12
243	htch		30-Jul	SA	SA-N	132.5		25A	25	A	j	27.46	20.71	n	0.36	20	20	12	12
244	htch		30-Jul	SA	SA-N	132.3		25A	25	A	j	28.41	34.48	o	0.35	20	20	12	12
245	htch		31-Jul	SA	SA-N	0.5		25A	25	A	j	28.64	32.07	o	0.39	20	20	12	12
246	htch		31-Jul	SA	SA-N	0.1		25A	25	A	j	28.49		fb	0.33	20	20	12	12
247	htch		31-Jul	SA	SA-N	9		SB		SB	j	26.7	33.93	o	0.32	20	20	12	12
248	htch		31-Jul	SA	SA-N	22.1		10A	10	A	j	28.46	33.23	o	0.39	20	20	12	12
249	ONRN		1-Aug	DP	DP-S	0.5		25A	25	A	f	66.74	107	o	4.35	20	20	12	12
250	YONN		1-Aug	SA	SA-N	110.4		10A	10	A	f	62.12	79.52	r	3.79	20	20	12	12
251	RNGN		1-Aug	DP	DP-S	176.3		10A	10	A	f	57.24	62.62	r	3.29	20	20	12	12
252	YNON		1-Aug	SA	SA-S	198.1		25A	25	A	m	65.04	34.68	r	5.07	8	14	12	12
253	YNNO		1-Aug	SA	SA-N	66.4		10A	10	A	f	64.76	108.51	o	5.31	20	20	12	12
254	NYON		1-Aug	SA	SA-N	0.2		25A	25	A	f	63.23	69.24	r	4.64	20	20	12	12
255	NYNO		1-Aug	SA	SA-N	13		SB		SB	f	69.46	80.55	r	5.57	20	20	12	12
256	ONON		1-Aug	CH	CH-N	23		SB		SB	f	64.59	79.55	n	4.13	20	20	12	12
257	htch		1-Aug	DP	DP-S	0.2		25A	25	A	j	33.3	33.17	fb	0.68	20	20	12	12
258	htch		1-Aug	GA	GA-N1	7		SB		SB	j	31.21	42.02	o	0.65	20	20	12	12
259	htch		1-Aug	GA	GA-N2	132.4		25A	25	A	j	28.14	36.01	o	0.52	20	20	12	12

Count	Lizard ID	Lizard #	Capture Date	Canyon	Site	Trap no.	Recapture	Trap Type (25A, 10A, SB)	Array Length	Trap Type (A, SB)	Sex	SVL mm	Tail length mm	Tail class (o,r,fb,n)	Mass (g)	No. of normal toe tips-claws 20 = n	No. of normal digits 20 = n	No. of normal limb segments 12 = n	No. of normal joints 12 = n
260	htch		1-Aug	GA	GA-N2	176.1		10A	10	A	j	31.15	42.77	o	0.59	20	20	12	12
261	htch		1-Aug	GA	GA-N2	8		SB		SB	j	30.8	44.83	o	0.76	20	20	12	12
262	htch		1-Aug	CH	CH-N	88.1		10A	10	A	j	29.22	36.26	o	0.41	20	20	12	12
263	htch		1-Aug	CH	CH-N	110.1		10A	10	A	j	32.84	39.94	o	0.65	20	20	12	12
264	htch		1-Aug	SA	SA-N	198.5		25A	25	A	j	26.91	33.21	o	0.41	20	20	12	12
265	htch		1-Aug	SA	SA-N	132.4		25A	25	A	j	28.31	11.82	n	0.37	20	20	12	12
266	htch		1-Aug	SA	SA-N	88.1		10A	10	A	j	29.06	17.66	n	0.43	20	20	12	12
267	htch		1-Aug	SA	SA-S	0.2		25A	10	A	j	28.81	35.18	o	0.5	20	20	12	12
268	htch		1-Aug	SA	SA-N	198.1		25A	25	A	j	49	63.1	r	2.17	20	20	12	12
269	htch		1-Aug	SA	SA-S	176.3		10A	10	A	j	28.86	36.11	o	0.44	20	20	12	12
270	htch		1-Aug	SA	SA-S	0.1		25A	25	A	j	30.41	14.14	fb	0.5	20	20	12	12
271	htch		1-Aug	SA	SA-S	154.3		10A	10	A	j	28.72	36.82	o	0.49	20	20	12	12
272	htch		1-Aug	SA	SA-S	154.3		10A	10	A	j	29.51	42.73	o	0.5	20	20	12	12
273	YNNY		3-Aug	GA	GA-N2	132.3		25A	25	A									
274	ONNO		3-Aug	GA	GA-N2	66.3		25A	25	A	f	61.46	70.63	r	5.02	20	20	12	12
275	NOON		3-Aug	GA	GA-N1	176.2		10A	10	A	f	63.44	108.21	o	4.08	20	20	12	12
276	ONNO		3-Aug	CH	CH-S	154.1		10A	10	A	j	47.33	29.88	fb	1.88	20	20	12	12
277	NONO		3-Aug	GA	GA-N1	44.2		10A	10	A	j	60.25	88.83	o	4.91	20	20	12	12
278	htch		3-Aug	CH	CH-S	22.4		10A	10	A	j	33.34	43.68	o	0.69	20	20	12	12
279	htch		3-Aug	DP	DP-N	66.1		25A	25	A	j	31.97	41.54	o	0.72	20	20	12	12
280	htch		3-Aug	SA	SA-N	66.4		10A	10	A	j	30.79	38.7	o	0.51	20	20	12	12
281	htch		3-Aug	SA	SA-N	198.6		25A	25	A	j	28.53	15.23	fb	0.35	20	20	12	12
282	htch		3-Aug	SA	SA-N	66.3		25A	25	A	j	27.59	36.69	o	0.41	20	20	12	12
283	htch		3-Aug	SA	SA-N	176.1		10A	10	A	j	29.39	37.23	o	0.39	20	20	12	12
284	htch		3-Aug	SA	SA-N	22.3		10A	10	A	j	29.43	38.14	o	0.47	20	20	12	12
285			6-Aug	DP	DP-S	44.4		10A	10	A	f	55.23	54.44	r					
286	htch		6-Aug	SA	SA-N	198.5		25A	25	A	j	29.75	31.16	n					
287	NOON		6-Aug	CH	CH-N	18		SB		SB	f	62.77	75.07	r	4.25	20	20	12	12
288	NONO		6-Aug	CH	CH-S	132.1		25A	25	A	f	62.65	59.02	r	4.6	20	20	12	12
289	RYNN		6-Aug	SA	SA-S	154		10A	10	A	f	65.96	65.69	r	4.81	20	20	12	12
290	NNOO		6-Aug	CH	CH-N	24		SB		SB	f	63.06	60.44	r	3.67	20	20	12	12
291	RGNN		6-Aug	GA	GA-N1	44.4		10A	10	A	f	64.89	107	r	6.38	18	18	12	12
292	htch		6-Aug	DP	DP-N	154.1		10A	10	A	j	28	36.25	o	0.41	20	20	12	12
293	htch		6-Aug	DP	DP-N	66.2		25A	25	A	j	29.88	29.86	n	0.45	20	20	12	12
294	htch		6-Aug	SA	SA-S	2		SB			j	29.22	38.95	fb	0.44	20	20	12	12
295	htch		6-Aug	SA	SA-N	198.6		25A	25	A	j	27.42	32.7	o	0.44	20	20	12	12
296	RNYN		8-Aug	SA	SA-S	8		SB		SB	f	55.4	44.85	o	3.66	20	20	12	12
297	NNOO		8-Aug	CH	CH-N	198.4		25A	25	A	f	63.9	70.98	r2	4.66	20	20	12	12

Count	Lizard ID	Lizard #	Capture Date	Canyon	Site	Trap no.	Recapture	Trap Type (25A, 10A, SB)	Array Length	Trap Type (A, SB)	Sex	SVL mm	Tail length mm	Tail class (o,r,fb,n)	Mass (g)	No. of normal toe tips-claws 20 = n	No. of normal digits 20 = n	No. of normal limb segments 12 = n	No. of normal joints 12 = n
298	ONNR		8-Aug	DP	DP-N	23		SB		SB	m	60.97	94.82	o	3.4	20	20	12	12
299	NORN		8-Aug	DP	DP-S	0.1		25A	25	A	f	57.01	51.3	r	3.84	19	19	12	12
300	NONR		8-Aug	DP	DP-S	66.3		25A	25	A	f	66.95	51.34	r	6.4	20	20	12	12
301	NNOR		8-Aug	DP	DP-N	198.3		25A	25	A	f	52.47	39.63	fb	2.73	20	20	12	12
302	GONN		8-Aug	DP	DP-N	66.4		25A	25	A	m	62.1	35.24	r2	5.2	17	19	12	12
303	htch-G		8-Aug	DP	DP-S	198.2		25A	25	A	j	29.46	38.44	o	0.51	20	20	12	12
304	htch-G		8-Aug	DP	DP-N	66.4		25A	25	A	j	28.71	37.02	o	0.45	20	20	12	12
305	htch-G		8-Aug	DP	DP-N	132.6		25A	25	A	j	26.08	24.02	fb	0.37	20	20	12	12
306	htch-G		8-Aug	DP	DP-N	88.2		10A	10	A	j	27.02	32.74	o	0.37	20	20	12	12
307	htch-G		8-Aug	DP	DP-S	110.2		10A	10	A	j	27.48	33.52	o	0.34	20	20	12	12
308	OOON		10-Aug	CH	CH-S	154.1		10A	10	A	f	58.97	66.19	r	4.34	20	20	12	12
309	htch-G		10-Aug	SA	SA-N	198.5		25A	25	A	j	28.79	39.1	o	0.46	20	20	12	12
310	htch-G		10-Aug	SA	SA-N	132.5		25A	25	A	j	29.15	36.41	o	0.47	20	20	12	12
311	htch-G		10-Aug	GA	GA-N2	66.2		25A	25	A	j	27.09	4.69	n	0.4	20	20	12	12
312	htch-G		10-Aug	CH	CH-N	19		SB		SB	j	32.22	43.97	o	0.61	20	20	12	12
313	htch-G		10-Aug	DP	DP-S	110.3		10A	10	A	j	30.41	41.07	o	0.52	20	20	12	12
314	htch-G		10-Aug	SA	SA-N	198.5		25A	25	A	j	29.08	36.36	o	0.4	20	20	12	12
315	htch-G		10-Aug	DP	DP-N	132.2		25A	25	A	j	26.2	32.95	o	0.25	20	20	12	12
316	htch-G		10-Aug	DP	DP-S	66.1		25A	25	A	j	30.59	40.41	o	0.47	20	20	12	12
317	htch-G		10-Aug	SA	SA-S	176.3		10A	10	A	j	28.23	37.99	o	0.38	20	20	12	12
318	htch-G		10-Aug	SA	SA-N	154.1		10A	10	A	j	27.91	37.79	o	0.43	20	20	12	12
319	GNON		10-Aug	DP	DP-N	132.5		25A	25	A	m	59.78	33.6	r2	3.18	10	12	12	11
320	NNOO		13-Aug	GA	GA-N1	12		SB		SB	f	57.24	59.06	r	3.04	20	20	12	12
321	OOON		13-Aug	GA	GA-N2	13		SB		SB	f	61.31	83.34	r	5.01	15	17	12	12
322	OONO		13-Aug	GA	GA-N2	18		SB		SB	f	63.34	91.3	r	4.94	20	20	12	12
323	ONOO		13-Aug	CH	CH-S	15		SB		SB	f	55.7	32.67	fb	3	20	20	12	12
324	NOOO		13-Aug	CH	CH-N	22		SB		SB	f	69.47	58.02	r	4.68	20	20	12	12
325	RNNY		13-Aug	SA	SA-S	198.1		25A	25	A	j	54.49	84.29	r	3.51	20	20	12	12
326	htch-G		13-Aug	SA	SA-N	198.1		25A	25	A	j	29.13	39.21	o	0.38	20	20	12	12
327	htch-G		13-Aug	DP	DP-S	88.1		10A	10	A	j	30.41	39.16	o	0.59	20	20	12	12
328	NRYN		15-Aug	SA	SA-N	44.3		10A	10	A	f	62.48	83.27	o	4.38	20	20	12	12
329	htch-G		15-Aug	SA	SA-N	198.5		25A	25	A	j	28.32	36.72	o	0.4	20	20	12	12
330	htch-G		15-Aug	DP	DP-N	0.6		25A	25	A	j	29.39	35.99	o	0.46	20	20	12	12
331	htch-G		15-Aug	DP	DP-N	198.2		25A	25	A	j	28.72	23.91	o	0.28	20	20	12	12
332	htch-G		15-Aug	SA	SA-N	198.5		25A	25	A	j	24.27	28.57	n	0.42	20	20	12	12
333	NRNY		17-Aug	SA	SA-N	0.1		25A	25	A	j	52.4	90.84	o	3.23	20	20	12	12
334	NNRY		17-Aug	SA	SA-S	154.2		10A	10	A	j	51.48	76.99	r	2.87	20	20	12	12
335	htch-G		17-Aug	SA	SA-N	22.4		10A	10	A	j	30.78	36.85	n	0.51	20	20	12	12

Count	Lizard ID	Lizard #	Capture Date	Canyon	Site	Trap no.	Recapture	Trap Type (25A, 10A, SB)	Array Length	Trap Type (A, SB)	Sex	SVL mm	Tail length mm	Tail class (o,r,fb,n)	Mass (g)	No. of normal toe tips-claws 20 = n	No. of normal digits 20 = n	No. of normal limb segments 12 = n	No. of normal joints 12 = n
336	htch-G		17-Aug	SA	SA-N	88.3		10A	10	A	j	31.15	10.79	n	0.4	20	20	12	12
337	GNNO		20-Aug	DP	DP-N	110.2		10A	10	A	f	57.46	87.66	o	3.45	20	20	12	12
338	htch-G		20-Aug	DP	DP-S	88.2					j	33.97	48	o	0.74	20	20	12	12
339	htch-G		20-Aug	SA	SA-N	110.1					j	29.05	14.33	n	0.38	20	20	12	12
340			20-Aug	GA	GA-N2	66.4					m	57.17	54.9	r2	3.87	20	20	12	12
341			17-Aug	CH	CH-N	110.3					j	35.87	27.62	fb	0.87	10	10	6	6
342			20-Aug	SA	SA-N	0.1					j	33.12	22.23	fb	0.53	5	5	3	3
343	OONO		22-Aug	GA	GA-N2	*see note					m	50.89	87.33	o	3.23	20	20	12	12
344	NOOO		22-Aug	GA	GA-N2	11		SB		SB	f	69.38	85.66	r	6.47	20	20	12	12
345	YRNN		21-Aug	SA	SA-N	198.1		25A	25	A	m	67.41	62.65	r	4.66	20	20	12	12
346	htch-G		21-Aug	SA	SA-N	9		SB		SB	j	33.98	34.78	n	0.7	20	20	12	12
347	htch-G		22-Aug	GA	GA-N2	14		SB		SB	j	31.57	28.23	n	0.57	20	20	12	12
348	htch-G		22-Aug	DP	DP-S	88.3		10A	10	A	j	35.09	51.3	o	0.85	20	20	12	12
349	htch-G		22-Aug	DP	DP-N	198.1		25A	25	A	j	33.37	46.93	o	0.63	20	20	12	12
350	htch-G		22-Aug	DP	DP-S	0.5		25A	25	A	j	35.11	51.17	o	0.67	20	20	12	12
351	YNRN		24-Aug	SA	SA-N	0.1		25A	25	A	f	64.26	62.7	r	5	19	19	12	12
352	NOOO		24-Aug	GA	GA-N2	13		SB		SB	f	64.13	82.04	o	5.68	20	20	12	12
353	NGON		24-Aug	DP	DP-N	154.1		10A	10	A	f	77.46	11.83	fb	4.02	20	20	12	12
354	htch-G		24-Aug	SA	SA-S	0.2		25A	25	A	j	33.53	47.19	o	0.8	20	20	12	12
355	htch-G		24-Aug	SA	SA-N	88.4		10A	10	A	j	32.81	21.35	n	0.53	20	20	12	12
356	YNRN		27-Aug	SA	SA-S	22.3		10A	10	A	m	67.23	68.52	r3	5.51	20	20	12	12
357	NYRN		27-Aug	SA	SA-N	9		SB		SB	m	63.36	76.89	r	5.37	18	18	12	12
358	htch-G		27-Aug	CH	CH-N	132.3		25A	25	A	j	38.7	57.17	o	1.13	20	20	12	12
359	htch-G		27-Aug	CH	CH-N	198.3		25A	25	A	j	40.06	61.15	o	1.31	20	20	12	12
360	htch-G		27-Aug	CH	CH-N	22		SB		SB	j	42.03	62.26	o	1.43	20	20	12	12
361	htch-G		27-Aug	DP	DP-N	10		SB		SB	j	35.21	49.67	o	0.68	20	20	12	12
362	htch-G		27-Aug	DP	DP-S	154.4		10A	10	A	j	35.18	34.28	n	0.78	20	20	12	12
363	htch-G		27-Aug	SA	SA-N	44.1		10A	10	A	j	35.88	26.5	r2	0.73	20	20	12	12
364	htch-G		27-Aug	DP	DP-N	44.3		10A	10	A	j	34.61	54.71	o	0.86	20	20	12	12
365	htch-G		27-Aug	SA	SA-N	0.2		25A	25	A	j	34.13	42.03	n	0.76	20	20	12	12
366	htch-G		29-Aug	DP	DP-N	110.3		10A	10	A	j	38.58	4.87	fb	0.71	20	20	12	12
367	htch-G		31-Aug	SA	SA-S	22.3		10A	10	A	j	34.98	27.88	fb	0.78	20	20	12	12
368	htch-G		31-Aug	SA	SA-N	22.3		10A	10	A	j	33.64	46.54	o	0.61	20	20	12	12
369	RGNN		4-Sep	CH	CH-N	18		SB		SB	m	65.25	61.33	r	4.9	20	20	12	12
370	NGNO		4-Sep	DP	DP-N	24		SB		SB	m	71.77	56.4	r	7.72	19	20	12	12
371	NNGO		4-Sep	DP	DP-N	18		SB		SB	m	69.93	107.48	r	7.88	20	20	12	12
372	htch-G		4-Sep	SA	SA-S	198.6		25A	25	A	j	38.46	56.48	o	1.33	20	20	12	12
373	htch-G		4-Sep	CH	CH-S	198.2		25A	25	A	j	38.45	42.39	r	1.07	20	20	12	12

Count	Lizard ID	Lizard #	Capture Date	Canyon	Site	Trap no.	Recapture	Trap Type (25A, 10A, SB)	Array Length	Trap Type (A, SB)	Sex	SVL mm	Tail length mm	Tail class (o,r,fb,n)	Mass (g)	No. of normal toe tips-claws 20 = n	No. of normal digits 20 = n	No. of normal limb segments 12 = n	No. of normal joints 12 = n
374	htch-G		4-Sep	CH	CH-N	176.1		10A	10	A	j	37.98	54.32	o	1.04	20	20	12	12
375	htch-G		6-Sep	DP	DP-N	24		SB		SB	j	34.53	46.94	o	2.71	20	20	12	12
376	RNGN		7-Sep	CH	CH-N	near 88					m	53.6	60.54	fb	5.61	20	20	12	12
377	RNNG		7-Sep	CH	CH-N	176.4		10A	10	A	j	41.22	64.71	fb	1.42	20	20	12	12
378	NRGN		7-Sep	CH	CH-S	88.3		10A	10	A	m	59.04	53.08	r	4.24	19	20	12	12
343	YNYN		5-Jul	DP	DP-N	66.5	rcp	25A	25	A									
344	NRNR		6-Jul	DP	DP-N	88.2	rcp	25A	25	A									
345	NRRN		9-Jul	SA	SA-S	198.1	rcp	25A	25	A									
346	YNYN		9-Jul	SA	SA-N	132.1	rcp	25A	25	A									
347	NYNY		9-Jul	SA	SA-N	198.5	rcp	25A	25	A									
348	NOON		9-Jul	DP	DP-N	10	rcp	SB		SB									
349	RRNN		11-Jul	CH	CH-S	14	rcp	SB		SB									
	YYNY		13-Jul	CH	CH-S	66.6	rcp	25A	25	A									
350	YYNY		16-Jul	DP	DP-N	88.1	rcp	10A	10	A									
351	NRGN		16-Jul	DP	DP-N	22.2	rcp	10A	10	A									
352	NGRN		16-Jul	DP	DP-N	66.1	rcp	25A	25	A									
353	NYYN		16-Jul	CH	CH-N	132.1	rcp	25A	25	A									
354	NRNR		18-Jul	DP	DP-N	66.1	rcp	25A	25	A									
355	YNNY		18-Jul	DP	DP-S	8	rcp	SB		SB									
356	NYNY		18-Jul	SA	SA-N	23	rcp	SB		SB									
357	RNNG		18-Jul	DP	DP-S	8	rcp	SB		SB									
358	YYNN		18-Jul	CH	CH-N	66.2	rcp	25A	25	A					3.64				
359	YNNY		20-Jul	DP	DP-S	7	rcp	SB		SB									
360	GNNG		20-Jul	DP	DP-N	198.4	rcp	25A	25	A	f			r					
361	ONGN?		20-Jul	CH	CH-S	14	rcp	SB		SB									
362	OYNN		23-Jul	DP	DP-S	66.3	rcp	25A	25	A									
363	RNRN		25-Jul	DP	DP-N	88.2	rcp	10A	10	A	f	60.19	45.99	fb	4.55	18	18	12	12
364	htch		25-Jul	SA	SA-N	110.3	rcp	10A	10	A	j	29.04	37.04	o	0.33	20	20	12	12
365	GGNN		27-Jul	CH	CH-N	23	rcp	SB		SB									
366	YNYY		27-Jul	DP	DP-N	154.3	rcp	10A	10	A					4.15				
367	YNNY		30-Jul	DP	DP-N	198.4	rcp	25A	25	A					5.45				
368	NOON		30-Jul	DP	DP-S	154.4	rcp	10A	10	A									
369	htch		30-Jul	SA	SA-N	44.4	rcp	10A	10	A	j				0.36				
370	htch		30-Jul	SA	SA-S	88.2	rcp	10A	10	A									
371	ONON		30-Jul	SA	SA-N	154.2	rcp	10A	10	A									

Count	Lizard ID	Lizard #	Capture Date	Canyon	Site	Trap no.	Recapture	Trap Type (25A, 10A, SB)	Array Length	Trap Type (A, SB)	Sex	SVL mm	Tail length mm	Tail class (o,r,fb,n)	Mass (g)	No. of normal toe tips-claws 20 = n	No. of normal digits 20 = n	No. of normal limb segments 12 = n	No. of normal joints 12 = n
372	NYYY		30-Jul	CH	CH-S	88.1	rcp	10A	10	A									
	RGNN		30-Jul	CH	CH-N	132.5	rcp	25A	25	A									
373	NRYN		1-Aug	DP	DP-S	16	rcp	SB		SB									
374	NGGN		3-Aug	CH	CH-N	24	rcp	SB		SB									
375	NNYY		3-Aug	SA	SA-S	22.4	rcp	10A	10	A									
376	NOON		3-Aug	DP	DP-N	44.1	rcp	10A	10	A									
377	NOYN		3-Aug	SA	SA-N	198.3	rcp	25A	25	A									
378			3-Aug	CH	CH-S	14	rcp	SB		SB									
379			3-Aug	DP	DP-N	132.2	rcp	25A	25	A									
	NNOO?		3-Aug	DP	DP-S	0.2	rcp	25A	25	A									
	GNNR?		3-Aug	SA	SA-N	110.2	rcp	10A	10	A									
380	NGNO?		3-Aug	DP	DP-N	176.4	rcp	10A	10	A				r					
381	htch		3-Aug	SA	SA-S	132.6	rcp	25A	25	A	j								
382	YYNN		6-Aug	DP	DP-S	66.3	rcp	25A	25	A									
383	NGNG		6-Aug	DP	DP-N	132.3	rcp	25A	25	A									
384	htch		6-Aug	SA	SA-N	198.5	rcp	25A	25	A									
385	NRRR		6-Aug	DP	DP-N	132.4	rcp	25A	25	A									
	NRYN		6-Aug	DP	DP-S	14	rcp	SB		SB									
	GGNG		6-Aug	GA	GA-N1	154.1	rcp	10A	10	A									
	NGGN?		6-Aug	GA	GA-N2	66.2	rcp	25A	25	A									
			6-Aug	SA	SA-N	22.4	rcp	10A	10	A									
386	RNRN		6-Aug	CH	CH-S	13	rcp	SB		SB	j								
387	GNNG		6-Aug	GA	GA-N1	22.1	rcp	10A	10	A		63.13	89.95	5.91	5.91	19	19	12	12
388	NNGG		8-Aug	SA	SA-N	132.2	rcp	25A	25	A									
389	YYNN		8-Aug	DP	DP-S	66.1	rcp	25A	25	A									
390	GNGN		8-Aug	CH	CH-N	21	rcp	SB		SB									
391	GNNR		8-Aug	DP	DP-N	19	rcp	SB		SB									
	NRNR		8-Aug	GA	GA-N1	44.1	rcp	10A	10	A									
392	NOON		8-Aug	CH	CH-N	44.4	rcp	10A	10	A									
393	NGGN		10-Aug	CH	CH-S	14	rcp	SB		SB									
394	NN-O		10-Aug	GA	GA-N2	12	rcp	SB		SB									
395	NNOO		13-Aug	SA	SA-N	22.3	rcp	10A	10	A									
397	NNOR		13-Aug	DP	DP-N	132.4	rcp	25A	25	A									
398	ONNR		13-Aug	DP	DP-N	198.1	rcp	25A	25	A									
399	NRNR		13-Aug	DP	DP-S	176.3	rcp	10A	10	A									
402	NNOO		15-Aug	CH	CH-N	198.4	rcp	25A	25	A									

Count	Lizard ID	Lizard #	Capture Date	Canyon	Site	Trap no.	Recapture	Trap Type (25A, 10A, SB)	Array Length	Trap Type (A, SB)	Sex	SVL mm	Tail length mm	Tail class (o,r,fb,n)	Mass (g)	No. of normal toe tips-claws 20 = n	No. of normal digits 20 = n	No. of normal limb segments 12 = n	No. of normal joints 12 = n
	RYNN		17-Aug	DP	DP-N	15	rcp	SB		SB									
	NOOO		17-Aug	DP	DP-N	154.1	rcp	10A	10	A									
	NNYY		17-Aug	DP	DP-N	154.4	rcp	10A	10	A									
407	RYNN		17-Aug	DP	DP-N	15	rcp	SB		SB									
408	NOOO		17-Aug	DP	DP-N	154.1	rcp	10A	10	A									
409	NNYY		17-Aug	DP	DP-N	154.4	rcp	10A	10	A									
403	RNNG		20-Aug	DP	DP-S	0.2	rcp	25A	25	A						19	20	12	12
404	htch		20-Aug	DP	DP-S	11	rcp	SB		SB									
405	NOYO		20-Aug	DP	DP-S	0.2	rcp	25A	25	A									
406	NOON		20-Aug	SA	SA-N	198.1	rcp	25A	25	A									
410	YNYN		20-Aug	DP	DP-S	0.2	rcp	25A	25	A						19	20	12	12
	RNNG		20-Aug	DP	DP-S	0.2	rcp	25A	25	A									
411	NNYY		20-Aug	DP	DP-S	13	rcp	SB		SB									
412	YNYN		20-Aug	DP	DP-N	198.1	rcp	25A	25	A						15	15	12	12
	YNNY		21-Aug	DP	DP-N	198.6	rcp	25A	25	A									
	ONNY		21-Aug	DP	DP-S	66.1	rcp	25A	25	A									
	NNGR		21-Aug	DP	DP-N	198.6	rcp	25A	25	A									
	ONNR		21-Aug	DP	DP-N	198.6	rcp	25A	25	A									
418	htch		22-Aug	DP	DP-N	132.4	rcp	25A	25	A									
414	ONNR		22-Aug	DP	DP-N	198.1	rcp	25A	25	A	f								
415	RNNY		22-Aug	DP	DP-N	8	rcp	SB		SB									
416	YNYN		24-Aug	CH	CH-N	66.5	rcp	10A	10	A	f								
417	N??O		24-Aug	DP	DP-S	176.3	rcp	10A	10	A									
419	OONO		24-Aug	SA	SA-N	132.3	rcp	25A	25	A	f	60.09	51.63	r	4.5				
420	YNRN		27-Aug	SA	SA-N	7	rcp	SB		SB									
421	NNRO		27-Aug	DP	DP-N	88.1	rcp	10A	10	A									
422	RNYN		27-Aug	DP	DP-N	198.4	rcp	25A	25	A									
	ONRN		27-Aug	DP	DP-S	0.3	rcp	25A	25	A									
	RNNY		27-Aug	GA	GA-2	132.1	rcp	25A	25	A									
	OONO		27-Aug	GA	GA-2	154.3	rcp	10A	10	A									
	RYNN or OYNN		27-Aug	DP	DP-S	0.1	rcp	25A	25	A									
	htch		27-Aug	DP	DP-S	22.4	rcp	10A	10	A									
	N?NR		29-Aug	DP	DP-S	21	rcp	SB		SB									
	ONNR		29-Aug	DP	DP-N	198.6	rcp	25A	25	A									
	NNOR		29-Aug	DP	DP-N	198.1	rcp	25A	25	A									
	htch		29-Aug	DP	DP-S	0.2	rcp	25A	25	A									
	NGGG		4-Sep	SA	SA-N	198.2	rcp	25A	25	A									
	htch		4-Sep	DP	DP-S	66.6	rcp	25A	25	A									

Count	Lizard ID	Lizard #	Capture Date	Canyon	Site	Trap no.	Recapture	Trap Type (25A, 10A, SB)	Array Length	Trap Type (A, SB)	Sex	SVL mm	Tail length mm	Tail class (o,r,fb,n)	Mass (g)	No. of normal toe tips-claws 20 = n	No. of normal digits 20 = n	No. of normal limb segments 12 = n	No. of normal joints 12 = n
	htch		4-Sep	DP	DP-S	0.3	rcp	25A	25	A									
	ONNR		4-Sep	DP	DP-N	198.1	rcp	25A	25	A									
	NYNY?		6-Sep	GA	GA-N2	132.1	rcp	25A	25	A									

Appendix C: Habitat Analysis Results

Table C-1. Habitat Analysis Data for Chupaderos - North Transect.

		Quadrant 1 (NW)					Quadrant 2 (NE)					Quadrant 3 (SE)					Quadrant 4 (SW)				
Site	array	Significant Habitat Modifier*	Signif. Modifier Count	Dist (m) to Signif Modif	% Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est	Est aerial cover (% of quad)
CH-N	0m	P-g	1	.5m	25%		W-r	1	1.5m	5%		P-f(art,ast)	1	2m	15%	25%	P-s(rh tr)	1	1.5m	3%	7%
area burned in		P-f(ast)	1	0m	2%	2%	T-pp	1	6.5m	1%	20%	P-g	1	0m	25%		T-pp	2	7m	<1%	25%
2000 fire		L-tk(g,pp)	1	1.5m	50%		P-g	1	0m	30%		L-tn(g,pp)	1	2m	15%		L-tk(pp,g)	1	1m	30%	
							L-tn(pp,g)	1	1.5m	20%							P-g	1	1m	10%	
		Totals:	3		**77%**	**2%**		4		**56%**	**20%**		3		**55%**	**25%**		5		**43%**	**32%**
CH-N	22m	P-f(art,ast)	1	0m	10%	20%	T-pp	1	2m	1%	30%	P-g	1	.5m	40%		P-g	1	1m	40%	
area burned in		P-g	1	.2m	30%		P-g	1	.3m	30%		P-f(art,ast)	1	2.5m	5%	10%	P-f(art,ast)	1	2m	3%	6%
2000 fire		L-tn(g,f)	1	1m	5%		P-f(art,ast)	1	1m	5%	15%	L-tn(g,pp)	1	1m	10%		L-tn(g,pp)	1	3m	15%	
		W-r&s	5	3.5m	15%		L-tn(pp,g)	1	2m	20%							W-s	5	2m	4%	
		Totals:	8		**60%**	**20%**		4		**56%**	**45%**		3		**55%**	**10%**		8		**62%**	**6%**
CH-N	44m	P-f(art,ast)	1	1m	10%	20%	P-s(rh tr)	1	4m	2%	6%	T-pp	1	5m	<1%	20%	P-s(rh tr)	1	3.5m	5%	15%
area burned in		P-g	1	.2m	20%		P-f(art,ast)	1	1m	5%	10%	W-s	1	7m	1%		T-pp	1	5m	1%	25%
2000 fire		L-tk(ast,pp,g)	1	2m	7.50%		W-r	8	3m	3%		L-tk(pp)	1	1m	50%		P-g	1	.2m	10%	
		T-pp	1	5m	1%	20%	P-g	1	0m	15%		P-f(art,ast)	1	1.5m	10%		P-f(art,ast)	1	.7m	2%	4%
		W-r(burned)	3	3.5m	2%		T-pp	1	adj quad		15%	P-g	1	.1m	10%	20%	L-tk(pp,g)	1	1m	75%	
							L-tk(pp)	1	2m	30%											
		Totals:	7		**41%**	**40%**		13		**55%**	**31%**		5		**71%**	**40%**		5		**93%**	**44%**
CH-N	66m	P-f-art,ast	1	.5m	5%		P-s(rh tr)	1	4m	2%	5%	P-f(art,ast)	1	1m	10%	20%	T-pp	1	7.5m	1%	10%
SS - ground very		P-s(rh tr, dec bd)	2	6m	4%	8%	P-f(art,ast)	1	.5m	2%	20%	P-g	1	.5m	15%		P-s(rh tr)	1	7m	5%	10%
porous		P-g	1	0m	15%		P-g	1	0m	15%		L-tn(g,ast)	1	.5m	15%		P-f(art,ast)	1	1m	2%	
		T-pp	1	7.5m	<1%	15%	L-tn	1	0m	15%							P-g	1	0m	15%	
		L-tn(g,pp)	1	.5m	3%												L-tk	1	.5m	75%	
		Totals:	6		**27%**	**23%**		4		**34%**	**25%**		3		**40%**	**20%**		5		**98%**	**20%**
CH-N	88m	P-f-art,ast,ve th	1	.5m	15%	30%	deep arroyo	1	7m	8%		T-pp	1	7.5m	1%	10%	P-f(art,ast)	1	1m	10%	20%
SS - ground very		P-s(rh tr,cr na)	2	3.5m	2%	3%	P-f(art,ast)	1	.75m	5%	15%	L-tn(f,g,pp)	1	0m	5%		P-g	1	.5m	25%	
porous		P-g	1	.3m	30%		P-g	1	1m	20%		P-g	1	1m	25%		L-tn(g,art)	1	.5m	10%	
		L-tn(g,f)	1	.5m	2%		P-s-cr na	1	5m	2%	4%	P-f(art,ast)	1	.5m	15%	25%					
			5				L-tn	1	1m	2%		P-s(rh tr)	1	7.5m	7%	15%					
		Totals:			**49%**	**33%**		5		**37%**	**19%**		5		**53%**	**50%**		3		**45%**	**20%**

		Quadrant 1 (NW)					Quadrant 2 (NE)					Quadrant 3 (SE)					Quadrant 4 (SW)				
Site	artray	Significant Habitat Modifier*	Signif. Modifier Count	Dist (m) to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist (m) to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist (m) to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist (m) to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)
CH-N	110m	P-s(rh tr)	3	5m	20%	30%	P-g	1	1m	10%		P-g	1	0m	10%		P-s	1	3m	5%	15%
SS - ground very		T-pp	1	7m	1%	20%	P-f(art,ast)	1	1m	15%	15%	P-f(art,ast)	1	1m	15%	20%	P-g	1	0m	10%	
porous		P-f(ast)	1	.5m	2%	10%	L-tn(ast,g)	1	1m	5%		L-tn(f)	1	1m	5%		L-tn	1	.5m	5%	
		P-g	1	.5m	5%							P-s	1	3m	5%	10%	P-f(art,ast)	1	1m	15%	20%
		L-tn(g,pp)	1	1m	15%																
		Totals:	7		**43%**	**60%**		3		**30%**	**15%**		4		**35%**	**30%**		4		**35%**	**35%**
CH-N	132m	P-f(ast)	1	.5m	30%	40%	P-s(rh tr)	2	2m	4%	8%	P-f(ast,art)	1	1m	5%	10%	P-f(art,ast)	1	2m	10%	30%
SS - ground very		P-g	1	1m	10%		P-scr na	2	4.5m	3%	8%	P-g	1	1m	40%		P-g	1	1m	20%	
porous		W-s(standing dead)	1	5.5m	1%		P-f(ast)	1	.5m	20%	30%	P-s-cr na	1	1.5m	1%	3%	L-tn	1	1m	10%	
		L-tn(f)	1	.5m	10%		L-tn(f)	1	.5m	10%		L-tn(f,g)	1	2m	10%						
			4		**51%**	**40%**		6		**37%**	**46%**		4		**56%**	**13%**		3		**40%**	**30%**
CH-N	154m	P-s(rh tr)	1	7.5m	10%	10%	P-s(rh tr)	2	4m	20%	25%	P-f(art,ast)	1	2m	20%	40%	W-r	1	7m	2%	
SS - ground very		P-g	1	0m	25%		W-s	1	1m	5%		P-g	1	1m	25%		P-f(art)	1	2m	15%	15%
porous		L-tn	1	0m	15%		L-tn(rh tr, g)	1	.5m	5%		L-tn(art,g)	1	.5m	10%		P-g	1	0m	40%	
																	L-tn	1	2m	5%	
																	P-s-cr na	1	7.5m	2%	
		Totals:	3		**50%**	**10%**		4		**30%**	**25%**		3		**55%**	**40%**		5		**64%**	**15%**
CH-N	176m	P-s(rh tr)	1	4.5m	3%	5%	P-s(rh tr)	3	4m	10%	15%	P-f(art)	1	.5m	25%	40%	T-pp(burned	2	7.5m	1%	5%
SS - ground very		P-s(dec-bd lf)	2	5m	5%	5%	P-f(ast,art)	1	.5m	15%	20%	P-g	1	1m	5%		P-g	1	2m	15%	
porous		P-f(art,ast)	1	.5m	15%	25%	P-g	1	.5m	5%		L-tn(art,g)	1	1m	10%		L-tn	1	2m	25%	
		P-g	1	2m	25%		L-tn	1	.5m	10%							P-f(art)	1	.5m	15%	40%
		L-tn	1	3m	15%																
		Totals:	6		**63%**	**35%**		6		**40%**	**35%**		3		**40%**	**40%**		5		**56%**	**45%**
CH-N	198m	P-s(rh tr)	1	6.5m	3%	12%	T-pp	3	3m	2%	40%	T-pp	1	2.5m	<1%	4%	T-pp	1	3.5m	1%	35%
		T-pp	1	7m	<1%	14%	W-s	1	5m	5%		P-s(rh tr)	1	5m	10%	15%	P-f(art,ast)	1	.5m	2%	4%
		P-f(art)	1	2m	5%	10%	P-f(ast,art)	1	.5m	15%		P-f(art,ast)	1	2m	1%	3%	L-tn	1	.5m	20%	
		P-g	1	1m	15%		L-tk(pp)	1	.2m	60%		P-g	1	1m	3%		P-g	1	.3m	10%	
		L-tn	1	1m	15%		P-g	1	.1m	2%		L-tn	1	0m	30%		P-s(rh tr)	1	4m	2%	
		Totals:	5		**38%**	**36%**		7		**84%**	**40%**		5		**44%**	**22%**		5		**35%**	**39%**

Table C-2. Habitat Analysis Data for Chupaderos - South Transect.

		Quadrant 1 (NW)					Quadrant 2 (NE)					Quadrant 3 (SE)					Quadrant 4 (SW)				
Site	Array	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	%Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	%Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	%Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	%Total Ground Cover Est	Est aerial cover (% of quad)
					survey area/array = 176.7146 sq.m.						survey area/quadrant = 44.18 sq.m.										
CH-S	0m	T-pp	3	2.5m	2%	65%	T-pp	2	3m	1%	25%	T-pp	1	3m	>1%	25%	W-s	2	1.5m	>1%	
		W-s	1	7m	>1%		P-g	1	1m	65%		P-g	1	1m	5%		L-tn	1	L-tn pp	1%	
		L-tn	1	2m	10%		W-s	3	6m	1%		P-f	1	.5m	5%		P-g	1	P-g	1%	
		P-g	1	1m	15%		L-tn pp	1	1m	5%		L-tn	1	1m	20%		P-f	2	P-f	2%	
		Totals:	6		**27%**	**65%**		7		**72%**	**25%**		4		**30%**	**25%**		6		**4%**	**0%**
CH-S	22m	P-f	2	.5m	?		W-s	3	3.5m	5%		P-s(fa pa)	1	.1m	1%	1%	P-s-fa pa	6	.1m	35%	40%
		L-tn	1	.3m	1%		P-g	1	1m	30%		P-g	1	.1m	25%		P-g	1	.1m	15%	
		T-pp	1	6m	1%	25%	L-tn pp	1	2m	5%		L-tn pp	1	.5m	5%		P-s(rh tr)	2	6m	25%	25%
		P-s(fa pa)	1	5m	15%	10%						W-s	2	5.5m	1%		L-tn pp	1	.5m	1%	
		W-s	1	4.5m	1%												W-s	3	1m	2%	
		Totals:	6		**18%**	**35%**		5		**40%**	**0%**		5		**32%**	**1%**		13		**78%**	**65%**
CH-S	44m	P-f	1	.5m	35%		P-g	1	.3m	5%		T-pp	1	4.5m	20%		P-g	1	.1m	2%	
		P-s(rh tr)	1	6m	2%	5%	Pf	1	.2m	10%		L-tn pp	1	.2m	15%		P-f	1	1m	50%	
		P-g	1	.2m	2%		P-s-fa pa	1	4m	2%	5%	p-g	1	.5m	2%		L-tn	1	.1m	1%	
		W-s	3	6m	1%		L-tn pp	1	1m	2%		P-f	1	1m	50%		W-s	2	4m	1%	
		L-tn	1	.5m	1%		T-pp	1	6.5m	1%	5%	W-s	1	1.5m	1%						
		T-pp	1	3.5m	>1%	15%	W-s	1	3.5m	1%											
		Totals:	8		**41%**	**20%**		6		**21%**	**10%**		5		**88%**	**0%**		5		**54%**	**0%**
CH-S	66m	T-pp	1	5m	1%	50%	P-s(rh tr)	2	2m	25%	25%	P-f	1	.4m	60%		P-f	1	1m	25%	
		P-f	1	1m	10%		P-g	1	.5m	1%		L-tn	1	.1m	1%		P-g	1	1m	25%	
		P-g	1	1m	1%		P-f	1	2m	5%		P-g	1	1m	5%		L-tn	1	1m	5%	
		L-tn	1	.5m	15%		L-tn pp	1	.3m	1%											
		Totals:	4		**27%**	**50%**		5		**32%**	**25%**		3		**66%**	**0%**		3		**55%**	**0%**
CH-S	88m	P-s(rh tr)	3	.7m	75%	75%	P-s(rh tr)	4	1m	1%	1%	P-f	1	.8m	50%	25%	P-s-fa pa	1	2m	5%	5%
		P-g	1	.1m	1%		P-f	1	1.5m	35%		P-g	1	.5m	25%		P-g	1	.1m	35%	
		W-s	2	2.5m	1%		P-g	1	.2m	15%		W-s	4	2m	1%		P-f	1	.5m	40%	
		P-f	1	6m	5%		W-s	7	.5m	5%		L-tn	1	.1m	5%		W-s	1	6m	1%	
		L-tn	1	.5m	>1%		L-tn pp	1	.5m	5%											
		Totals:	8		**82%**	**75%**		14		**61%**	**1%**		7		**81%**	**25%**		4		**81%**	**5%**

		Quadrant 1 (NW)					Quadrant 2 (NE)					Quadrant 3 (SE)					Quadrant 4 (SW)				
Site	Array	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)
CH-S	110m	T-pp	4	2.5m	5%	50%	T-pp	3	3m	2%	25%	road	1	3.5m	50%		road	1	3m	60%	
		L-tn pp	1	.5m	25%		P-f	1	.5m	25%		P-f	1	.2m	25%		P-f	1	1m	5%	
		P-f	1	1m	15%	5%	P-g	1	3m	5%		P-g	1	.1m	1%		P-g	1	1m	>1%	
		P-g	1	1m	5%		L-th pp	1	.1m	20%		L-th pp	1	.1m	10%		L-th pp	1	.1m	30%	
							W-s	1	2.5m	>1%		R	3	6m	3%						
		Totals:	7		**50%**	**55%**		7		**52%**	**25%**		7	6	**89%**	**0%**		4		**95%**	**0%**
CH-S	132m	T-pp	1	2m	1%	25%	P-s(rh tr)	2	6m	5%	5%	T-pp	1	6.5m	1%	5%	P-s(rh tr)	1	6.5m	3%	5%
		P-f	1	0m	45%	5%	P-f	1	1m	10%		P-s(rh tr)	1	6m	1%	1%	P-f	1	1m	50%	3%
		P-g	1	.5m	50%		P-g	1	1m	25%		P-f	1	.4M	30%		P-g	1	.5m	40%	
		L-tn	1	.1m	1%		L-tn pp	1	.1m	5%		P-g	1	.1M	50%		W-s	1	2m	>1%	
							W-s	1	2.5m	1%		L-th pp	1	2.50%	1%		L-th pp	1	.5m	>1%	
							T-pp	1	6m	1%	20%										
		Totals:	4		**97%**	**30%**		7		**47%**	**25%**		5		**83%**	**6%**		5		**93%**	**8%**
CH-S	154m	T-pp	1	2m	2%	75%	W-s	1	3m	10%		P-f	1	.1m	75%	10%	T-pp	1	6.5m	1%	5%
		W-s	1	2.5m	10%		P-f	1	.1m	50%		P-g	1	1.5m	5%		P-s(rh tr)	1	3m	3%	5%
		L-tn pp	1	.1m	70%		L-th pp	1	.1m	30%		L-th(pp)	1	.1m	5%		P-f	1	.5m	35%	5%
		P-f	1	1m	5%	50%	Int	1	5.5m	5%		Int	1	2.5m	5%		P-g	1	1.5m	1%	
												W-s	1	6.5m	>1%		L-th pp	1	.2m	30%	
																	Int	1	5m	5%	
		Totals:	4		**87%**	**125%**		4		**95%**	**0%**		5		**90%**	**10%**		6		**75%**	**15%**
CH-S	176m	SS-gm	14	2m	5%		P-f(art)	1	1m	10%	5%	P-f	1	1.5m	50%	10%	T-pp	1	6m	1%	25%
		P-f	1	1m	10%		P-g	1	.1m	1%		T-pp	1	6.5m	>1%	1%	P-f	1	1m	70%	20%
		P-g	1	1.5m	10%		L-th pp	1	.2m	1%		P-g	1	.1m	5%		P-g	1	1m	10%	
		L-th	1	.3m	1%		W-s	1	1m	5%		L-th pp	1	.5m	1%		L-th pp	1	.3m	1%	
		W-s	1	1m	10%							W-s	1	1m	1%		W-s	1	.5m	1%	
		P-s(rh tr)	1	6.5m	1%												P-s(rh tr)	2	6m	5%	10%
																	SS-gm	7	3m	1%	
		Totals:	19		**37%**	**0%**		4		**17%**	**5%**		5		**57%**	**11%**		14		**89%**	**55%**

Site	Array	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	%Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	%Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	%Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	%Total Ground Cover Est	Est aerial cover (% of quad)
CH-S	198m	P-f	1	.1m	30%	5%	P-f	1	1.5m	5%		T-pp	1	5m	1%	65%	T-pp	3	1m	1%	5%
		P-g	1	.1m	50%		P-g	1	.3m	15%		P-s(rh tr)	1	5m	2%	5%	SS-gm	10	1m	1%	
							L-th	1	.2m	1%		P-f	1	1m	15%	5%	P-s(rh tr)	1	6m	1%	5%
												P-g	1	.1m	10%		P-f	1	1m	15%	1%
												Int	1	5.5m	5%		P-g	1	.3m	20%	
												L-th-pp	1	.3m	1%						
		Totals:	2		**80%**	**5%**		3		**21%**	**0%**		6		**34%**	**75%**		16		**38%**	**11%**

Table C-3. Habitat Analysis Data for Sandia - North Transect.

		Quadrant 1 (NW)					Quadrant 2 (NE)					Quadrant 3 (SE)					Quadrant 4 (SW)				
Site	Array	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est	Est aerial cover (% of quad)
SA-N	0m	W-s	2	2m	5%		P-g	1	.1m	50%		P-ct tl	1	1m	90%	90%	P-ct tl	1	.5m	90%	90%
		P-g	1	.1m	75%		P-f	1	2m	5%		P-g	1	.1m	5%		P-g	1	.2m	5%	
		L-tn-dv	1	2.5m	5%		L-tn-dv	1	.2m	5%		W-s	1	.5m	>1%		L-tn-dv	1	.1m	1%	
		P-f	1	1m	1%		W-s	2	2.5m	5%		L-tn-dv	1	.1m	1%						
		totals:	5		**86%**	**0%**		5		**65%**	**0%**		4		**96%**	**90%**		3		**96%**	**90%**
SA-N	22m	W-s	1	1m	1%		P-s-qu ga	1	3m	5%	15%	P-g	1	1m	75%		P-g	1	.5m	50%	
		P-s-qu ga	1	3m	10%	25%	T-pp	2	2.5m	1%	70%	P-ct tl	1	4m	15%	15%	P-ct tl	1	5m	10%	10%
		P-g	1	.2m	50%		L-tn-pp	1	.1m	60%		L-tn-pp	1	1m	5%		L-tn-pp	1	.3m	5%	
		P-f	1	1m	1%		P-g	1	.3m	25%											
		L-tn-pp	1	.1m	5%		P-f	1	2m	1%											
		totals:	5		**67%**	**25%**		6		**92%**	**85%**		3		**95%**	**15%**		3		**65%**	**10%**
SA-N	44m	P-s-qu ga	1	3m	50%	70%	P-s-qu ga	2	1.5m	5%	95%	P-g	1	.5m	50%		P-g	1	1m	30%	
		R-b	2	3m	5%		R-b	3	3m	5%		T-pp	1	4m	>1%	1%	P-f	1	1.5m	30%	
		P-g		.2m	10%		P-g	1	.1m	5%		L-tn-dv	1	3m	10%		L-tn-dv	1	.2m	5%	
		L-tn-L	1	.2m	30%		L-tn-L	1	.1m	45%		P-f	1	1m	5%						
		W-s	1	.2m	>1%		P-f	1	.3m	>1%											
		P-f	1	0m	>1%																
		totals:	7		**95%**	**70%**		8		**60%**	**95%**		4		**65%**	**1%**		3		**65%**	**0%**
SA-N	66m	P-s-qu ga	1	1m	25%	95%	P-s-qu ga	1	2m	30%	95%	P-ct tl	1	3.5m	45%	50%	P-ct tl	1	4m	40%	
		L-tn-L	1	.2m	60%		L-tn-L	1	.2m	40%		P-g	1	1m	5%		P-s-qu ga	1	2m	15%	
		P-f-ro wo	1	1m	>1%		P-q	1	1m	1%		L-tn-dv	1	.2m	5%		P-g	1	1m	20%	
		P-g	1	1m	1%		R-b	4	3m	20%		P-s-qa ga	1	3m	>1%	1%	L-tn-L	1	.1m	20%	
		R-b	3	5m	5%		W-s	1	1m	5%		P-f-ro wo	1	1m	>1%		P-f-ro wo	1	1m	1%	
		W-s	1	1m	5%																
		totals:	8		**96%**	**95%**		8		**96%**	**95%**		5		**55%**	**51%**		5		**96%**	**0%**

SA-N	88m	P-s-qu ga	2ok grv	3.5m	5%	50%	P-s-qu ga	1	2m	5%	30%	P-ct tl	1	1m	30%	30%	P-ct tl	1	3m	70%	70%
		R-b	12	3m	50%		R-b	12	1.5m	70%		R-b	3	1m	10%		P-s-qu ga	2	1.5m	10%	30%
		L-tn-L	1	.5m	25%		L-tn-L	1	.1m	20%		P-g	1		30%		P-g	1	.2m	1%	
		W-s	1	3m	>1%		P-g	1	1m	1%		P-f-circium sp	1		>1%		L-tn-L	1	.3m	>1%	
		P-g	1	1m	5%		T-g	1	5m	1%	5%	P-s-qu ga	1		5%		R-b	1	1.5m	1%	
												T-w	1		20%	5%					
												W-s	1	4m	5%	50%					
		Totals:	17		**85%**	**50%**		16		**97%**	**35%**		9		**100%**	**85%**		6		**82%**	**100%**

		Quadrant 1 (NW)					Quadrant 2 (NE)					Quadrant 3 (SE)					Quadrant 4 (SW)				
Site	Array	Significant Habitat Modifier*	Signif. Modifier Count	Dist (m) to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist (m) to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist (m) to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist (m) to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)
SA-N	110m	R-b	10+	1m	60%		R-b	10+	1m	50%		Str-per w/ct t	1	3m	60%		Str-per	1	3m	60%	
		P-g	1	.5m	7%		P-g	1	.6m	5%		P-g	1	0m	35%		R-b	5	1.8m	15%	5%
		T-qu ga	5+	4m	3%	25%	T-qu ga	5+	2.3m	10%		T-w	10+	1m	10%	25%	P-g	1	.2m	20%	
		T-j	1	5m	<1%	5%	T-pp	1	7m	1%	30%	R-b	2	6.5m	5%		T-w	5+	1.3m	2%	5%
		L-tn-qu ga	1	3.5m	7%		L-tk-pp,qu ga	1	.5m	40%	25%						P-s-ro wo	3	2m	1%	1%
							P-s-ro wo	3	1m	1%							W-r	4	2m	2%	2%
							P-f-art	3	2m	1%	2%						T-qu ga	2	5m	2%	5%
							T-w	1	4.5m	2%							L-tn	1	1.5m	10%	
							W-r(pp)	2	1.5m	4%	4%										
		totals:	18		**77%**	**30%**		27		**114%**	**61%**		14		**110%**	**25%**		22		**112%**	**18%**
SA-N	132m	R-b	10+	1m	30%		R-b	10+	2m	30%		Str-per w/ct t	1	1.5m	75%		Str-per w/ct t	1	1.5m	75%	50%
		T-qu ga	3+	2.5m	10%	50%	T-qu ga	5+	4.5m	5%	30%	P-g	1	0m	10%		P-g	1	0m	20%	
		L-tk	1	.5m	50%		T-pp	1	2.5m	1%	25%	T-wil	1+	.3m	3%	25%	L-tk	1	0m	10%	
		W-r	3	2m	5%		L-tk-pp,qu ga	1	.3m	60%		R-b	3	4m	6%		W-r	1	7m	2%	
							W-r	2	3m	3%		L-tk	1	0m	10%						
							P-s-ro wo	2	3.5m	1%	2%	W-r	1	0m	2%						
							P-g	1	.2m	3%											
		totals:	15		**95%**	**50%**		22		**103%**	**57%**		8		**106%**	**25%**		4		**107%**	**50%**
SA-N	154m	R-b	10+	1.5m	35%		R-b	10+	2.3m	50%		Str-per w/ct t	1	2m	70%		Str-per w/ct t	1	2m	75%	
		P-g	1	0m	15%		T-qu ga	3	.7m	5%	25%	T-wil	1	.5m	5%		P-g	1	0m	10%	
		W-r	1	4m	3%	10%	T-pp	1	3.3m	<1%	20%	P-g	1	0m	25%	20%	W-r	1	5m	8%	
		T-qu ga	5+	5m	2%	15%	P-g	1	.3m	30%		R-b	3	4.8m	3%		R-b	2	2.5m	5%	
		L-tn-qu ga	1	1m	5%		L-tn-pp,qu ga	1	0m	5%		L-tn-g,w	1	0m	15%		L-tk-g,w	1	0m	3%	
		T-pp	1	7m	<1%	5%	P-f-art,ast	1	3m	1%	1%						P-s-nm ol	1	6.5m	2%	5%
																	T-w	1	.3m	2%	10%
		totals:	19		**60%**	**30%**		17		**91%**	**46%**		7		**118%**	**20%**		8		**105%**	**15%**

SA-N	176m	R-b	10+	.2m	25%		R-b	10+	.1m	30%		Str-per w/ct t	1	3m	50%		Str-per w/ct t	1	3m	65%	
		T-pp	2	5m	1%	40%	T-qu ga	1	3m	10%	20%	T-qu ga	5+	3m	8%	30%	ro wo,fa pa,	1	.2m	3%	4%
		T-qu ga	1	5.5m	2%	10%	T-pp	1	7m	<1%	5%	R-b	5+	2m	10%		R-b	4	.2m	15%	
		W-r	1	6m	2%	2%	W-r	2	2.5m	8%		T-w	1	2m	3%	8%	P-s-w	1	2m	5%	20%
		P-g	1	0m	3%		P-g	1	.7m	5%		W-r	3	2m	3%		P-g	1	1.5m	20%	
		P-f-art	1	.1m	1%		P-s-fa pa	2	7m	3%	3%	L-tk-g,w,qu g	1	2m	30%		L-tn-g,w	1	1.5m	5%	
	P-s-ro wo,ri ce		2	7.5m	2%	4%	-tn-pp,g,qu g	1	3m			P-g	1	.6m	5%		W-r	1	4m	2%	
	L-tn-qu ga,pp,g		1	2m	3%		P-f-rh ra	1	3.5m	5%		P-s-ri ce	1	2.5m	1%	1%					
							P-c-op sp	1	6.5m	1%		P-f-rh ra	1	3.5m	5%						
		totals:	19		**39%**	**56%**		20		**62%**	**28%**		19		**115%**	**39%**		10		**115%**	**24%**
SA-N	198m	R-b	10+	.5m	50%		R-b	10+	1.5m	35%		Str-per w/ct t	1	4m	50%		Str-per w/ct t	1	4m	35%	
		T-qu ga	3	6.5m	2%	10%	P-g	1	.1m	25%		P-g	1	.1m	40%		P-g	1	0m	30%	
		T-pp	1	7m	<1%	10%	T-pp	1	2m	<1%	2%	R-b	2	6.5m	2%		R-b	8	.3m	25%	
		W-r	2	5m	2%		T-j	1	6.5m	<1%	5%	T-pp	1	6m	<1%	3%	T-qu ga	2	2m	5%	
		P-g	1	1.5m	10%		T-qu ga	2	4m	2%	25%	T-w	1	3m	5%	25%	T-pp	1	7m	1%	20%
	L-tn-pp,g,qu g		1	2m	8%		L-tk-pp,qu ga,	1	1.5m	5%		L-tk-g,w	1	.3m	5%		T-w	1	3m	5%	19%
		P-f-art,ast	1	1m	2%	4%	W-r	4	2m	2%		P-f-art	1	7m	1%		L-tk-pp,qu ga,g	1	.5m	10%	20%
							P-f-art,ve th,a	1	1.2m	2%	3%	T-qu ga	1	7m	1%	1%	P-f-misc flwrs	2	7m	<1%	
							P-c-op sp	1	3.5m	1%							P-s-ly sp	1	7.5m	2%	
		Totals:	19		**74%**	**24%**		22		**72%**	**35%**		9		**104%**	**29%**		18		**113%**	**59%**

Table C-4. Habitat Analysis Data for Sandia – South Transect.

		Quadrant 1 (NW)					Quadrant 2 (NE)					Quadrant 3 (SE)					Quadrant 4 (SW)				
Site	Array	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)
SA-S	0m	P-g	1	.3m	30%		P-g	1	.2m	25%		P-g	1	.2m	25%		P-g	1	.3m	2%	
		L-tk-pp,g	1	0m	30%		L-tk-pp,g	1	0m	25%		L-tk-g,pp	1	.1m	50%		L-tk-pp	1	0m	95%	
		P-f-art	1	7m	2%		T-pp	1	6m	<1%	10%	W-r(stumps)	2	3.5m	3%		T-pp	3	5.5m	2%	50%
		Str-per w/ct t	1	4m	40%		T-qu ga	2	2.5m	<1%	2%	P-s-ch	1	3m	1%	4%	R	1	5m	3%	
							W-r	1	6.5m	2%		R	3	2.5m	3%		P-s-ch	2	2.5m	1%	3%
							Str-per w/ct t	1	4m	60%							T-j	2	3m	1%	5%
		totals:	4		**102%**	**0%**		7		**112%**	**12%**		8		**82%**	**4%**		10		**104%**	**58%**
SA-S	22m	T-pp	8	1.3m	2%	85%	P-g	1	.2m	20%		T-pp	2	5m	1%	40%	T-pp	2	6.5m	1%	20%
		P-g	1	.2m	12%		L-tk-g,pp	1	.2m	15%		P-g	1	.1m	15%		P-g	1	.3m	10%	
		L-tk-pp	1	0m	45%		Str-per w/ct t	1	3m	65%		L-tk-pp	1	0m	80%		W-r	1	6m	2%	
		Str-per w/ct tl	1	3m	40%							P-f-art	1	5m	<1%	3%	L-tk-pp,g	1	0m	70%	
		totals:	11		**99%**	**85%**		3		**100%**	**0%**		5		**96%**	**43%**		5		**83%**	**20%**
SA-S	44m	P-g	1	0m	25%		Str-per w/ct t	1	1.5m	95%		P-g	1	0m	70%		T-pp	3	3m	1%	80%
		L-tk-pp	1	0m	40%		P-g	1	0m	5%		L-tk-g,pp	1	0m	25%		P-g	1	.5m	2%	
		W-r	5		5.00%		W-r	1	1m	1%		T-qu ga	2	7m	1%	15%	L-tk-pp	1	.2m	95%	
		T-j	2	3.5m	1%	5%						P-f-art	2	.4m	1%	2%	P-f-art,ast	1	2.5m	1%	2%
		T-qu ga	1	7m	<1%	8%						P-s-ly sp	1	5m	<1%	1%					
		Str-per w/ct t	1	3m	20%																
		totals:	11		**91%**	**13%**		3		**101%**	**0%**		5		**97%**	**18%**		6		**99%**	**82%**
SA-S	66m	P-g	1	.5m	10%		P-g	1	.8m	15%		W-r	1	7.5m	2%		W-r	2	5m	1%	
		L-tk-qu ga,pp	1	0m	25%		L-tk-pp,qu ga	1	.1m	30%		T-pp	3	2.6m	2%	65%	P-g	1	1m	4%	
		T-qu ga	5	.3m	1%	3%	T-pp	2	4.8m	1%	20%	T-qu ga	3	1m	2%	5%	L-tk-pp,qu ga	1	0m	85%	
		T-pp	1	3.5m	<1%	2%	T-qu ga	2	.6m	1%	10%	T-j	1	6m	1%	1%	T-qu ga	5+	1.5m	3%	20%
		Str-per w/ct t	1	3.8m	60%		T-j	1	3m	<1%	1%	L-tk-pp,qu ga	1	0m	85%		T-pp	2	2.6m	1%	50%
							Str-per w/ct t	1	3.7m	40%		P-g	1	1m	3%						
		totals:	9		**96%**	**5%**		8		**87%**	**31%**		10		**95%**	**71%**		11		**94%**	**70%**
SA-S	88m	P-g	1	0m	25%		P-g	1	0m	4%		P-g	1	0m	70%		P-g	1	0m	35%	
		L-tk-qu ga,g	1	3m	15%		Str-per w/ct t	1	2.5m	95%		L-tk-pp,g	1	0m	15%		L-tk-pp,g	1	.5m	60%	
		T-qu ga	5	3.5m	5%	30%						T-pp	4	2m	1%	25%	T-pp	1	4.5m	1%	30%
		Str-per	1	2.5m	50%							P-f-ast,thistle	1	5m	1%		P-f-ast	1	0m	1%	2%
												Str-per w/ct t	1	2.5m	10%						
		totals:	8		**95%**	**30%**		2		**99%**	**0%**		8		**97%**	**25%**		4		**97%**	**32%**

		Quadrant 1 (NW)					Quadrant 2 (NE)					Quadrant 3 (SE)					Quadrant 4 (SW)				
Site	Array	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)
SA-S	110m	P-ct	1	3m	85%	90%	P-ct tl	1	3m	75%	80%	P-s-qu ga	6	.4m	30%	80%	P-s-qu ga	2	1m	15%	40%
		P-s-qu ga	3	1.5m	>1%	1%	T-pp	1	6m	>1%	5%	L-tn-L	1	.2m	35%		L-tn-L	1	.1m	45%	
		L-tn L	1	.2m	10%		P-s-qu ga	3	.3m	5%	10%	P-g	1	.1m	25%	5%	P-g	1	.3m	40%	5%
							L-tn-L	1	.1m	20%											
		totals:	5		**95%**	**91%**		6		**100%**	**95%**		8		**90%**	**85%**		4		**100%**	**45%**
SA-S	132m	P-ct tl	1	3m	75%	80%	P-ct	1	2.5m	75%	75%	P-s-qu ga	4	1.5m	5%	50%	P-s-qu ga	2	1.5m		35%
		P-g	1	.1m	25%		T-j	1	3.5m	>1%	1%	P-g	1	.1m	80%	5%	W-s	4	3m	10%	
		P-f	1	2m	>1%		T-pp	1	4m	>1%	1%	W-s	2	5.5m	5%		P-g	1	.1m	80%	
		T-pp	1	1m	>1%	1%	P-s-qu ga	2	4m	5%	10%	P-f-ro wo	1	.4m	>1%		P-f-ro wo	1	1m	>1%	
							P-g	1	.1m	15%		L-tn-L	1		1%		L-tn	1	.2m	1%	
							P-f-ro wo	1	.1m	>1%							T-pp	3	3.5m	5%	50%
		totals:	4		**100%**	**81%**		7		**95%**	**87%**		9		**91%**	**55%**		12		**96%**	**85%**
SA-S	154m	P-g	1	.1m	30%	5%	P-g	1	.1m	25%		T-pp	1	4m	1%	40%	T-pp	3	5m	5%	50%
		T-pp	1	4m	1%	60%	T-pp	2	6m	1%	15%	P-s-qu ga	3	4.5m	5%	35%	P-s-qu ga	2	5m	1%	5%
		P-f	1	1.5m	45%	25%	Str-int(dry)	1	2.5m	5%		P-g	1	.1m	75%		P-g	1	.5m	75%	
		Str-int-(dry)	2	2m	10%		P-f	1	4m	40%	50%	L-tn-dv	1	.1m	1%						
		W-s	1	5.5m	1%		T-w	1	3m	5%	5%	SS-gm	10	3m	1%						
		totals:	6		**87%**	**90%**		6		**76%**	**70%**		16		**83%**	**75%**		6		**81%**	**55%**
SA-S	176m	P-ct tl	1	3m	75%	75%	P-ct tl	1	4m	60%	75%	P-g	1	.1m	90%		P-s-qu ga	1	2m	40%	70%
		P-g	1	.1m	25%		Str-per	1	3m	1%		P-f	1	.2m	5%		P-f	1	.2m	>1%	
		Str-per	1	3m	1%		P-g	1	0m	35%		L-tn-dv	1	.3m	5%		P-q	1	.1m	45%	
		P-s-qu ga(dea	1	5m	1%		P-f	1	>1m	>1%							L-tn-dv	1	.2m	5%	
		P-f	1	2m	>1%		T-pp(dead)	1	4.5m	1%							SS-gm	7	3m	5%	
							L-tn-dv	1	.3m	1%											
		totals:	5		**102%**	**75%**		6		**98%**	**75%**		3		**100%**	**0%**		12		**95%**	**70%**
SA-S	198m	P-s-qu ga	1	2m	5%	65%	P-s-qu ga	2	.2m	5%	75%	P-s-qu ga	3	2m	5%	65%	P-s-qu ga	3	1m	15%	75%
		P-g	1	1m	20%		P-s-unkn?	1	.4m	1%		W-r	2	4.5m	5%		W-s	3	2.5m	10%	
		P-s-unkn?	1	1m	5%	25%	P-g	1	.3m	65%		L-tn-L	1	.2m	30%		L-tn-L	1	.2m	60%	
		L-tn-L	1	.1m	55%		L-th-L	1	.1m	20%		P-g	1	1m	25%		T-pp	1	5m	1%	20%
		W-s	1	4m	1%		W-s	1	5m	1%		P-f	1	2m	>1%		P-g	1	1.5m	>1%	
		Str-per	1	5m	15%		Str-per	1	5m	10%							P-f	1	2m	>1%	
							P-f	1	3.5m	>1%							P-s-unkn?	1	1m	1%	
		Totals:	6		**101%**	**90%**		8		**102%**	**75%**		8		**65%**	**65%**		11		**87%**	**95%**

Table C-5. Habitat Analysis Data for Garcia - North #1.

		Quadrant 1 (NW)					Quadrant 2 (NE)					Quadrant 3 (SE)					Quadrant 4 (SW)				
Site	Array	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est	% Est aerial cover (% of quad)
GA-N1	0m	P-s (ro ne)	9	1m	50%	75%	P-s(rh tr)	4	1.5m	30%	50%	P-s(rh tr)	5	2m	10%	15%	P-s (ro ne)	5	3.5m	15%	25%
		P-g	1	.1m	20%		P-s(ro ne)	5		10%	10%	P-s(ro ne)	3	1m	1%	1%	P-g	1	.5m	5%	
		P-f	1	.4m	5%	1%	L-th-dv	1	1m	1%		P-g	1	.1m	50%		P-f	1	1m	20%	10%
		L-th-dv	1	1m	1%		P-f	1	1m	5%		P-f	1	1m	5%	1%	L-dv	1	3m	5%	
							P-g	1	.1m	5%		L-th-dv	1	2m	5%		P-s (rh tr)	2	6m	5%	10%
							SS-gm	15	1.5m	5%											
		totals:	12		**76%**	**76%**		27		**56%**	**60%**		11		**71%**	**17%**		10		**50%**	**45%**
GA-N1	22m	P-f-art	1	1m	75%	30%	P-f-art	1	.4m	50%	20%	P-s-rh tr	1	1m	1%	5%	P-s-ri ce	1	2m	5%	10%
		P-g	1	.1m	15%		P-g	1	.1m	25%		P-f-ar	1	1m	15%	5%	P-s-rh tr	2	2m	5%	10%
		SS-gm	11	1.5m	5%		SS-gm	8	1m	5%		P-g	1	.1m	5%		P-s-ro ne	5	1m	1%	1%
		L-th-dv	1	.1m	1%		L-th-w	1	.1m	1%		L-th-w	1	.1m	5%		P-f-art	1	.5m	25%	10%
												ss-gm	10	5m	15%		P-g	1	.2m	15%	
																	L-th-dv	1	1m	5%	
		totals:	14		**96%**	**30%**		11		**81%**	**20%**		14		**41%**	**10%**		11		**56%**	**31%**
GA-N1	44m	P-s-rh tr	6	.5m	75%	75%	T-pp	1	6m	1%	15%	P-s-rh tr	4	1m	25%	40%	P-s-rh tr	3	.7m	30%	45%
		P-f-art	1	1m	20%		P-s-rh tr	4	.5m	40%	50%	P-f	1	1m	15%	5%	P-s-ri ce	2	1.5m	10%	15%
		P-g-bo gr	1	1m	1.00%		P-f-art	1	.3m	25%	30%	P-g	1	.3m	15%		P-f-ar	1	.3m	5%	
		L-th-L	1	.3m	5%		P-g	1	.5m	1%		SS-gm	12	1m	5%		P-g	1	.2m	1%	
							L-th-L	1	.2m	1%		L-th-L	1	.1m	1%		L-th-L	1	.1m	5%	
							SS-gm	6	2.5m	5%		P-s-ri ce	1	.2m	1%		SS-gm	7	2m	5%	
		totals:	9		**101%**	**75%**		14		**73%**	**95%**		20		**62%**	**45%**		15		**56%**	**60%**
GA-N1	66m	SS-gm	8	1m	15%		SS-gm	2	2m	5%		Str-int	1	4.5m	35%		P-s-ro ne	6	.8m	1%	1%
		P-f	1	"	1%		P-f	1	1m	5%		P-s-rh tr	4	.6m	10%	20%	P-s-rh tr	3	1m	15%	25%
		P-g	1	"	1%		P-g	1	.3m	5%		P-g	1	1m	25%		P-g	1	.4m	5%	
		P-s-rh tr	9	"	65%	75%	P-s-rh tr	8	.5m	40%	60%	P-f	1	1m	1%		P-f	1	3m	>1%	
		P-s-ri ce	2	"	5%	5%	P-s-ro ne	4	.3m	5%	5%	L-th-L	1	.6m	1%		L-th-(fr.upstr	1	1m	30%	
		L-th-L(from ups	1	"	10%												Str-int	1	3.5m	50%	
		totals:	22		**97%**	**80%**		16		**60%**	**65%**		8		**72%**	**20%**		13		**101%**	**26%**

GA-N1	88m	P-s-rh tr	1	6.5m	1%		P-s-rh tr	2	3.5m	35%	40%	SS-gm	9	.1m	5%		13	.6m	5%		
		P-f-art	1	.3m	75%		P-g	1	.3m	>1%		P-f-art	1	.2m	50%	5%	1	.3m	35%	5%	
		P-g	1	1m	>1%		P-f-art	1	.3m	15%		P-g	1	1m	>1%		1	1m	>1%		
		T-pp	1	4m	>1%	1%	L-tn-w	1	1m	1%		L-th-w	1	.3m	>1%		1		5%		
		SS-gm	5	.5m	1%		SS-gm	10	.5m	5%											
		Totals:	9		**77%**	**1%**		15		**56%**	**40%**		12		**55%**	**5%**	16			**5%**	**0%**

		Quadrant 1 (NW)					Quadrant 2 (NE)					Quadrant 3 (SE)					Quadrant 4 (SW)				
Site	**Array**	**Significant Habitat Modifier***	**Signif. Modifier Count**	**Dist to Signif Modif**	**% Total Ground Cover Est (m)**	**Est aerial cover (% of quad)**	**Significant Habitat Modifier***	**Signif. Modifier Count**	**Dist to Signif Modif**	**% Total Ground Cover Est (m)**	**Est aerial cover (% of quad)**	**Significant Habitat Modifier***	**Signif. Modifier Count**	**Dist to Signif Modif**	**% Total Ground Cover Est (m)**	**Est aerial cover (% of quad)**	**Significant Habitat Modifier***	**Signif. Modifier Count**	**Dist to Signif Modif**	**% Total Ground Cover Est (m)**	**Est aerial cover (% of quad)**
GA-N1	110m	P-s-rh tr	10+	1m	30%	60%	P-s-rh tr	6	1m	10%	25%	T-pp	1	7.5m	1%	8%	P-f-art,ast	1+	.5m	3%	3%
ground porous		P-s-ro ne	2	3m	2%	5%	L-tn-rh tr	1	1m	5%		P-s-ro ne	1	3m	<1%	3%	P-g	1	.1m	25%	
		P-f-art	1	1.5m	2%	2%	P-f-art	1	2m	5%	10%	W-s standing dea	1	2.5m	<1%		P-s-rh tr	5	2.5m	15%	50%
		P-g	1	1m	3%		P-g	1	0m	5%		P-g	1	0m	5%		R	10	2.5m	5%	
		L-tn-rh tr	1	1m	3%		W-sstanding dead	1	7m	1%		P-f-art	1	2m	2%	10%	L-tn	1	1m	5%	
		totals:	15		**40%**	**67%**		10		**26%**	**35%**		5		**8%**	**21%**		8		**53%**	**53%**
GA-N1	132m	T-pp	8	1.7m	5%	85%	T-pp	6	1m	3%	70%	T-pp	4	3m	3%	75%	T-pp	5	2m	3%	80%
		P-s-rh tr	4	.3m	3%	7%	P-f-ast,art	1+	2m	2%	3%	L-tk	1	0m	90%		L-tk	1	.2m	85%	
		P-f-art,ast	1+	1.6m	2%	4%	P-g	1+	.2m	15%		P-g	1+	1m	2%		P-s-ro ne	3	2m	3%	5%
		P-g	1+	.6m	4%		P-s-rh tr	5	2.5m	3%	8%	P-f-ast	1+	2m	2%		P-s-rh tr	1	5.5m	2%	4%
		L-tk-pp	1	.7m	80%		L-tk-pp	1+	0m	90%							P-g	1	1m	4%	
		totals:	15		**94%**	**96%**		14		**113%**	**81%**		7		**97%**	**75%**		11		**97%**	**89%**
GA-N1	154m	P-s-ro ne	2	2m	2%	4%	P-s-ro ne	2	1.5m	2%	3%	P-s-rh tr	6	2m	8%	30%	P-s-rh tr	2	1m	5%	10%
ground porous		P-s-rh tr	2	3.5m	3%	8%	P-f-art	1+	1m	5%	10%	P-s-ro ne	4	1.5m	3%	5%	P-s-ro ne	4+	.5m	15%	30%
		P-f-art,ast	1+	1m	5%	8%	P-g	1+	.5m	5%		P-g	1+	.8m	5%		P-g	1	4m	5%	
		P-g	1+	.1m	10%		T-pp	1	7.5m	1%	8%	L-tk-g,f,pp	1	3m	25%		P-f-ast,art	1+	2m	2%	2%
		L-tn	1+	2m	2%		L-tn-pp,f	1	1.5m	2%		W-s	2	3m	2%		W-r	1	3.5m	1%	
												P-f-art,ast	1+	1m	2%	5%					
		totals:	7		**22%**	**20%**		6		**15%**	**21%**		17		**45%**	**40%**		9		**28%**	**42%**
GA-N1	176m	P-s-rh tr	1+	.5m	30%	90%	P-s-ro ne	4	.8m	3%	8%	teep incline, strea	1	1.5m	65%		P-s-rh tr	3	2m	15%	20%
ground porous		P-g	1	.2m	2%		P-f-art	1+	1m	4%	8%	P-s-ro ne	2	1m	3%	7%	R	10+	1.5m	10%	
		L-tk-rh tr	1	.5m	40%		P-g	1	.1m	10%		P-g	1	.2m	10%		P-g	1+	1m	20%	
							L-tn-g	1	1m	2%		P-s-rh tr	1	1m	2%	4%	T-pp	1	7m	<1%	12%
												T-pp	2	6.5m	1%	75%	T-pn	1	7.5m	<1%	10%
												R	10+	1m	15%		P-s-ro ne	3	1.5m	2%	5%
																	L-tn-pp,pn,g	1	1m	3%	
																	P-f-art	1	6m	2%	
		totals:	3		**72%**	**90%**		7		**19%**	**16%**		17		**96%**	**86%**		21		**52%**	**47%**

GA-N1	198m	P-s-rh tr	5+	1m	8%	18%	P-s-rh tr	4	.5m	8%	15%	T-pp	2	6.5m	2%	30%	P-s-rh tr	5	.5m	2%	5%
ground porous		P-s-ro ne	5	1m	6%	12%	P-g	1	.6m	10%		P-s-ro ne	3	.8m	3%	6%	P-s-ro ne	8	2.5m	4%	8%
		P-g	1	2m	10%		P-f-art,ast	1+	3m	2%	4%	P-s-rh tr	5	1.5m	8%	15%	P-g	1	.6m	8%	
		P-g-ast,art	1	2.5m	1%	2%	P-s-ro ne	3	2.5m	2%	3%	P-g	1	.9m	7%		P-f-art	1	1.8m	2%	2%
												P-f-art,ast	1+	.9m	1%	2%	teep incline, strea	1	3m	70%	
												L-tk-pp	1	5m	40%		L-tk-pp	1	2m	20%	
		Totals:	12		**25%**	**32%**		9		**22%**	**22%**		13		**61%**	**53%**		17		**106%**	**15%**

Table C-6. Habitat Analysis Data for Garcia - North #2.

		Quadrant 1 (NW)					Quadrant 2 (NE)					Quadrant 3 (SE)					Quadrant 4 (SW)				
Site	Array	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est	Est aerial cover (% of quad)
GA-N2	0m	P-f(art)	1	.7m	30%	30%	P-f(art)	1	.5m	30%	35%	P-f(art)	1	1m	35%	35%	P-f(art)	1	1m	50%	50%
		P-g	1	.1m	30%		P-g	1	.5m	30%		P-g	1	.2m	25%		P-g	1	1m	25%	
		P-s(rh tr)	3	.5m	5%	10%	P-s(rh tr)	2	5.5m	3%	5%	P-s(ro ne)	4	.7m	5%	5%	P-s(rh tr)	1	6m	5%	15%
		P-s(ro ne)	2	3m	4%	7%	P-s(ro ne)	4	2m	2%	5%	P-s(rh tr)	1	6m	3%	6%	L tn(f,g)	1	1m	20%	
		L-tn(art g)	1	.5m	5%		P-s(ch)	1	2.5m	1%	3%	L-tn(f,g,rh tr)	1	.5m	15%		P-s(ro ne)	5	.7m	5%	7%
							T-oak	1	7.5m	3%	10%										
							L-tn(f,g)	1	1m	5%											
		totals:	8		**74%**	**47%**		11		**74%**	**58%**		8		**83%**	**46%**		9		**105%**	**72%**
GA-N2	22m	P-f(art)	1	2m	5%		P-f(art)	1	.3m	5%		P-f(art)	1	2m	15%	25%	P-f(art)	1	.3m	25%	35%
		P-g	1	.3m	30%		P-g	1	.2m	20%		P-g	1	0m	20%		P-g	1	0m	10%	
		P-s(rh tr)	3	4m	10%	20%	P-s(ch)	2	6m	2%	3%	P-s(rh tr)	2	.5m	10%	14%	P-s(rh tr)	4	.5m	15%	25%
		P-s(ro ne)	4	3.5m	5%	7%	P-s(ro ne)	3	5m	2%	5%	L-tn(f,g,rh tr)	1	0m	5%		L tn(f,g,rh tr)	1	1m	35%	
		L-tn(g,f,rh tr)	1	2m	10%		L-tn(f,g,ro ne)	1	1m	5%											
							*arroyo	1	6m	30%											
		totals:	10		**60%**	**27%**		9		**64%**	**8%**		5		**50%**	**39%**		7		**85%**	**60%**
GA-N2	44m	P-f(art)	1	1m	10%		P-f(art)	1	1m	5%	10%	P-f(art)	1	1.5m	25%	30%	P-f(art)	1	.3m	20%	30%
ground is very porous		P-g	1	.5m	10%		P-g	1	.5m	5%		P-g	1	0m	30%		P-g	1	0m	15%	
		P-s(rh tr)	2	.7m	1.0%	4%	P-s(rh tr)	6	2m	15%	20%	P-s(rh tr)	2	3.5m	5%	15%	P-s(ch)	2	.3m	3%	3%
		P-s(ch)	5	.4m	4%	10%	P-s(ch)	5	.5m	4%	8%	P-s(ro ne)	4	4.5m	5%	10%	P-s(rh tr)	4	1.5m	15%	30%
		L-tn(rh tr,g,f,pp)	1	1m	5%		L-tn(f,g,rh tr)	1	2m	3%		L-tn(f,g,rh tr)	1	3.5m	5%		P-s(ro ne)	3	4m	5%	5%
																	L-tn(f,g,rh tr)	1	1m	10%	
		totals:	10		**30%**	**14%**		14		**32%**	**38%**		9		**70%**	**55%**		12		**68%**	**68%**
GA-N2	66m	p-f(art)	1	.5m	6%	15%	P-f(art)	1	2m	3%	5%	P-f(art)	1	1.7m	15%	25%	P-f(art)	1	2m	5%	10%
ground is very porous		P-g	1	.5m	10%		P-g	1	.2m	15%		P-g	1	.1m	25%		P-g	1	0m	15%	
		P-s(rh tr)	3	4m	10%	25%	P-s	3	2m	10%	35%	P-g(ch)	1	3.5m			P-s(rh tr)	3	.6m	10%	25%
		L-tn(g,f,rh tr)	1	1m	5%		P-s	3	7.5m	5%	5%	P-s(rh tr)	2	2.5m	15%	30%	P-s(ro ne)	1	7m	2%	2%
							L-tn	1	2m	10%		P-s(?)	1	4m	1%	1%	L-tn(f,g,rh tr)	1	1m	5%	
							P-s	2	2m	2%	4%	L-tn(f,g,rh tr)	1	1m	5%						
		totals:	6		**31%**	**40%**		11		**45%**	**49%**		7		**61%**	**56%**		7		**37%**	**37%**

GA-N2	88m	P-s(rh tr)	3	.5m	10%	20%	P-s(ch)	6	1m	5%	10%	T-pp	1	5m	<1%	12%	P-s(rh tr)	2	.5m	20%	50%
ground is very porous		P-f(art)	1	2m	3%		P-f(art)	1	1.5m	2%	5%	T-j	2	4.5m	2%	18%	P-s(ch)	1	7m	2%	4%
		P-g	1	1m	5%		P-g	1	.1m	15%		P-s(ch)	4	2.5m	3%		P-f(art,ast)	2	2m	2%	2%
		P-s(ch)	8	1.5m	3%	6%	L-tn(g,pp)	1	2m	0%		P-f(art)	1	1.5m	5%	5%	P-g	1	3m	20%	
		T-pp	1	7m	1%	25%						P-g	1	.1m	5%		L-tn	1	.5m	10%	
	L-tn(g,f,pp,rh tr)		1	.5m	5%							L-tn(rh tr,f,g)	1	2m	5%						
		Totals:	15		**27%**	**51%**		9		**22%**	**15%**		10		**20%**	**35%**		7		**54%**	**56%**

		Quadrant 1 (NW)					Quadrant 2 (NE)					Quadrant 3 (SE)					Quadrant 4 (SW)				
Site	Array	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)
GA-N2	110m	P-f	1	.5m	75%	10%	P-f	1	1m	75%	10%	P-s(rh tr)	2	.5m	5%	5%	P-s(rh tr)	4	.5m	50%	25%
		P-g	1	.5m	1%		P-s(ro ne)	1	6m	1%		P-g	1	1m	25%		P-g	1	.1m	1%	
		P-s(ro ne)	1	2m	1%		P-g	1	.5m	1%		P-f	1		20%	5%	P-f	1	1m	20%	
							L-th(dv)	1	.5m	>1%		L-tn	1	.5m	>1%						
		totals:	3		**77%**	**10%**		4		**77%**	**10%**		5		**50%**	**10%**		6		**71%**	**25%**
GA-N2	132m	P-s(rh tr)	4	.5m	75%	50%	P-s(rh tr)	4	.5m	50%	50%	P-s(rh tr)	7	.3m	75%	75%	P-s	3	2.5m	25%	25%
		P-f(art)	1	2m	5%		P-f	1	1m	25%	5%	P-f(art)	1	.2m	5%	1%	P-f(art)	1	2m	25%	5%
		P-s(ro ne)	2	2.5m	1%	1%	P-g	1	.3m	1%		P-g	1	.3m	5%		P-g	1		5%	
		P-g	1	.1m	1%												L-th(w)	1	1m	5%	
		totals:	8		**82%**	**51%**		6		**76%**	**55%**		9		**85%**	**76%**		6		**60%**	**30%**
GA-N2	154m	P-s(rh tr)	1	2m	10%	15%	P-f(art)	1	.5m	50%	10%	P-s(rh tr)	1	3m	25%	30%	P-s(rh tr)	3	.5m	50%	25%
		P-f(art)	1	.1m	50%	15%	P-s(ro ne)	3	2m	20%	25%	P-s(ro ne)	1	.2m	25%	30%	P-s(ro ne)	3	1m	25%	5%
		L-th(L)	1	.1m	5%		P-g	1	.2m	5%		P-f(art)	1	.4m	15%	5%	P-f(art)	1	.1m	15%	
							L-th-w	1	.5m	1%		P-g	1	.5m	1%		P-g	1	.1m	1%	
												L-th(w)	1	.1m	>1%						
												L-th(L)	1	.3m	>1%						
		totals:	3		**65%**	**30%**		6		**76%**	**35%**		6		**66%**	**65%**		8		**91%**	**30%**
GA-N2	176m	P-f(art)	1	.2m	25%	25%	P-s(ro ne)	4	1m	10%	15%	P-s(rh tr)	3	1.5m	5%	15%	P-s(ro ne)	5	3m	30%	40%
		P-s(rh tr)	1	1.5m	5%	10%	P-s (rh tr)	4	1m	25%	40%	P-f(art)	1	.2m	25%	10%	P-f(art)	1	.1m	25%	35%
		P-g	1	.1m	1%		P-f(art)	1	.5m	25%	10%	P-g	1	.2m	25%		P-g	1	.1m	1%	
		L-th(w)	1	.2m	1%		L-th(dv)	1	.3m	1%		L-th(w)	1	1.5m	1%		L-th(w)	1	1m	1%	
		totals:	4		**32%**	**35%**		10		**61%**	**65%**		6		**56%**	**25%**		8		**57%**	**75%**
GA-N2	198m	P-s(rh tr)	5	2.5m	50%	75%	P-s(rh tr)	3	5m	25%	45%	P-s(ro ne)	1	1m	1%	1%	P-s(rh tr)	3	3.5m	30%	45%
		P-f(art)	1	.1m	20%	5%	P-s(ro ne)	2	6m	20%	30%	P-s(rh tr)	2	1m	5%	10%	T-pn	1	6.5m	1%	1%
							P-f(art)	1	1m	10%	5%	P-f(art)	1	.5m	5%	1%	P-f(art)	1	.1m	10%	1%
												P-g	1	.2m	1%		ss-gm	4	2m	1%	
																	P-g	1	1m	>1%	
		Totals:	6		**70%**	**80%**		6		**55%**	**80%**		5		**12%**	**12%**		10		**42%**	**47%**

Table C-7. Habitat Analysis Data for DP - North Transect.

		Quadrant 1 (NW)					Quadrant 2 (NE)					Quadrant 3 (SE)					Quadrant 4 (SW)				
Site	Array	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)
DP-N	0m	W-r	2	2m	2%		W-r	2	6m	1%		W-r	2	3m	<1%		Str(int)	1	4.5m	20%	
		P-s(rh tr)	1	5m	3%	3%	P-f	1	2m	30%	20%	P-g	1	0m	60%		P-f	1	3m	<1%	
		P-g	1	0m	50%		P-g	1	0m	20%		Str(int)	1	4.5m	25%		P-g	1	1m	75%	
												P-f(ve th)	1	2m	<1%						
		Totals:	4		**55%**	**3%**		4		**51%**	**20%**		5		**85%**	**0%**		3		**95%**	**0%**
DP-N	22m	P-s(fo ne)	1lg.	1m	50%	90%	P-g	1	0m	30%		Str(int)	1	2m	30%		W-r	1	6.5m	1%	
		L-tk(fo ne)	1	1m	90%		P-f(art)	1	2m	10%	10%	P-g	1	0m	50%		P-g	1	.5m	30%	
												W-r	1	7m	1%						
		Totals:	2		**140%**	**90%**		2		**40%**	**10%**		3		**81%**	**0%**		2		**31%**	**0%**
DP-N	44m	W-r	1	9m	2%		T-pp	2	6m	1%	10%	R-bd rk	1	2m	20%		R-bd rk	1	3.5m	2%	
		P-s(qu ga)	1	6m	1%	1%	P-g	1	0m	25%		P-g	1	5m	25%		Str(int)	1	3.5m	5%	
		P-g	1	0m	30%							Str(int)	1	3.5m	5%		P-g	1	4m	30%	
		L-tn	1	6m	10%																
		Totals:	4		**43%**	**1%**		3		**26%**	**10%**		3		**50%**	**0%**		3		**37%**	**0%**
DP-N	66m	W-r	3	2m	2%		P-g	1	.5m	50%		W-r	1	1m	<1%		W-r	3	3m	2%	
		T-pp	1	7.5m	<1%	5%	L-tn(pp)	1	.5m	50%		P-s(wil)	1	4.5m	15%	30%	P-s(wil)	1	3.5m	20%	35%
		P-g	1	0m	25%							P-g	1	1m	50%		P-g	1	1m	50%	
		L-tk(pp)	1	0m	80%							L-tn(pp)	1	0m	25%						
		Totals:	6		**107%**	**5%**		2		**100%**	**0%**		4		**90%**	**30%**		5		**72%**	**35%**
DP-N	88m	R	2	5m	1%		R	1	5m	1%		P-s(wil)	1	0m	25%	30%	W-r	2	1m	<1%	
		P-s(qu ga)	1	5m	1%		P-s(qu ga)	1	3m	10%	25%	P-s(fo ne)	1	2m	20%	20%	P-(mah r)	1	4.5m	2%	
		P-g	1	.5m	50%		W-r	3	4m	10%		P-g	1	0m	25%		P-s(fo ne)	1	2.5m	20%	60%
		L-tn	1	2m	15%		T-pp	1	6m	1%	5%						P-g	1	0m	20%	
							L-tk	1	5m	30%							T(pt sp)	1	5m	5%	20%
																	L-tk(fo ne)	1	0m	10%	
																	L-tn(pt sp)	1	2.5m	60%	
		Totals:	5		**67%**	**0%**		6		**52%**	**30%**		3		**70%**	**50%**		8		**117%**	**80%**

		Quadrant 1 (NW)					Quadrant 2 (NE)					Quadrant 3 (SE)					Quadrant 4 (SW)				
Site	**Array**	**Significant Habitat Modifier***	**Signif. Modifier Count**	**Dist to Signif Modif**	**% Total Ground Cover Est (m)**	**Est aerial cover (% of quad)**	**Significant Habitat Modifier***	**Signif. Modifier Count**	**Dist to Signif Modif**	**% Total Ground Cover Est (m)**	**Est aerial cover (% of quad)**	**Significant Habitat Modifier***	**Signif. Modifier Count**	**Dist to Signif Modif**	**% Total Ground Cover Est (m)**	**Est aerial cover (% of quad)**	**Significant Habitat Modifier***	**Signif. Modifier Count**	**Dist to Signif Modif**	**% Total Ground Cover Est (m)**	**Est aerial cover (% of quad)**
DP-N	110m	T-j	1	2m	<1%	2%	W-r	3	3m	3%		Str.(int)	1	3.5m	20%		Str.(int)	1	3.5m	20%	
		T-pp	1	7m	<1%	5%	R	10	4m	2%		P-g	1	1m	80%		P-s(wil)	1	0m	25%	30%
		L-tk	1	0m	95%		L-tn	1	1m	50%		L-tk	1	.5m	50%		W-r	1	3m	2%	
		R	5	3m	20%		P-g	1	.5m	20%		P-s(wil)	1	1m	20%	30%	P-g	1	0m	60%	
		P-g	1	.5m	3%		T-pp	1	5m	<1%	15%	P-s(fo ne)	1	2.5m	3%	10%	L-tk	1	0m	60%	
												W-r	1	4m	6%						
		Totals:	9		**118%**	**7%**				**75%**	**15%**		6		**179%**	**40%**		5		**167%**	**30%**
DP-N	132m	T-pn	1	2.5m	<1%	5%	T-pp	2	4m	1%	15%	Str.(int)	1	2.5m	20%		Str.(int)	1	2.5m	20%	
		T-pp	2	3.5m	<1%	5%	R	7	2m	5%		P-s(wil)	1	2m	5%	5%	P-s(wil)	1	.5m	25%	30%
		W-r	4	2m	2%		P-s(rh tr)	1	5m	1%	2%	P-g	1	0m	80%		P-g	1	0m	80%	
		R	4	2m	20%		L-tk(pp)	1	.5m	90%		W-r	1	7m	1%	<1%	W-r	1	7m	1%	<1%
		P-g	1	1m	1%		P-g	1	2m	5%											
		L-tk	1	1m	80%		W-r	3	3.5m	1%											
							P-s(wil)	1	1m	3%	3%										
							P-f(ve th)	2	1.5m	<1%											
		Totals:	13		**103%**	**10%**		18		**106%**	**20%**		4		**106%**	**5%**		4		**126%**	**30%**
DP-N	154m	P-s(fo ne)	1	2m	1%	2%	W-r	5	1.5m	3%		Str(int)	1	3m	20%		Str.(int)	1	3m	20%	
		T-pp	1	2m	<1%	4%	L-tk(pp)	1	1m	80%		W-r	3	2m	4%		W-r	2	5m	1%	
		W-r	2	1m	1%		T-pp	2	1m	1%	15%	P-g	1	3m	10%		P-g	1	1m	15%	
		R	5	4m	5%		P-s	1	2m	10%	20%	P-s(wil)	1	1m	20%	40%	P-s(wil)	1	.5m	30%	45%
		L-tk-pp	1	0m	9%		P-g	1	3m	2%		P-s(fo ne)	1	2.5m	2%	5%	P-s(fo ne)	1	2m	2%	3%
		P-g	1	3m	6%		R	1	5m	<1%		L-tk(wil,pp)	1	.5m	50%		L-tk(wil,pp)	1	0m	40%	
												R-bd rk	3	3m	20%		R-bd rk	3	3m	10%	
		Totals:	11		**22%**	**6%**		11		**96%**	**35%**		11		**126%**	**45%**		10		**118%**	**48%**

Site	Array	Significant Habitat Modifier*	Signif. Modifier Count	Dist (m) to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist (m) to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist (m) to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist (m) to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)
DP-N	176m	W-r	3	2.4m	2%		T-pp	1	1.5m	<1%	20%	P-s(wil)	1	.5m	10%	50%	Str.(int)	1	3.5m	10%	
		P-s(fo ne)	1	3.5m	10%	10%	T-oak	1	6.5m	2%	25%	P-g	1	0 m	70%		P-s(wil)	1	3m	10%	15%
		P-s(wil)	1	3.5m	1%	3%	L-tk(pp,oak)	1	0m	95%		L-tk(wil,g)	1	0m	70%		W-r	2	2m	2%	
		T-pp	1	6m	<1%	10%	R	6	4m	10%		Str(int)	1	3.5m	8%		L-tn	1	.5m	50%	
		T-j	1	6m	<1%	2%	P-g	1	1m	3%		R-bd rk	1	3.5m	20%		P-s	1	2m	1%	2%
		T-oak	1	4m	5%	10%	W-r	1	7m	1%		W-r	1	5m	1%		P-g	1	1m	20%	
		P-s(mah r)	1	3.5m	<1%												R-bd rk	1	3m	20%	
		L-tk(pp,oak)	1	1m	95%																
		R	5	3m	3%																
		Totals:	13		**116%**	**35%**		11		**111%**	**45%**		6		**179%**	**50%**		8		**113%**	**17%**
		Quadrant 1 (NW)					**Quadrant 2 (NE)**					**Quadrant 3 (SE)**					**Quadrant 4 (SW)**				
DP-N	198m	W-r	4	3.5m	1%		W-r	3	2m	1%		Str(int)	1	1.5m	13%		Str.(int)	1	1.5m	30%	
		R	10	2.5m	25%		W-s	1	3m	<1%	1%	P-s(wil)	1	3m	8%	10%	P-s(wil)	1	2m	25%	50%
		P-s(wil)	1	.5m	2%	4%	T-pp	4	5.5m	1%	50%	P-s(fo ne)	1	4m	5%	25%	P-g	1	1m	35%	
		P-g	1	0m	20%		R	10	3m	30%		P-g	1	.5m	60%		W-r	1	7.5m	<1%	
		L-tn	1	0m	20%		Str(int)	1	6.5m	2%		R	2	4m	3%		R	1	4m	1%	
							L-tk	1	2.75m	60%											
							P-g	1	0m	10%											
		Totals:	17		**68%**	**4%**		21		**104%**	**51%**		6		**89%**	**35%**		5		**91%**	**50%**

Table C-8. Habitat Analysis Data for DP - South Transect.

		Quadrant 1 (NW)					Quadrant 2 (NE)					Quadrant 3 (SE)					Quadrant 4 (SW)				
Site	array	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)
DP-S	0m	P-s(fo ne)	1	1m	5%	35%	P-s(fo ne)	1	1m	2%	5%	T-(qu ga)in grove	1	1.5m	5%	50%	P-s(rh tr)	1	5.5m	2%	5%
		P-s(ro wo)	1	4m	1%	3%	P-g	1	.5m	25%		T-j	1	1m	2%	7%	R	10	2.5m	30%	
		P-s(wil)	1	6.5m	5%	15%	W-r	1	2m	2%		W-r	3	2.8m	4%		P-g	1	0m	20%	
		P-g	1	4m	30%		Str(int)	1	3m	15%		P-g	1	0m	40%		W-r	1	2m	5%	
		Str.(int)	1	3m	25%		R-bd rk	5	2m	50%		L-tk(qu ga,pp)	1	0m	40%		P-s(rd berry)	10	.5m	5%	
		L-tn	1	1m	25%		L-tn(g)	1	1m	10%		R	5	6m	10%		T-qu ga	1	7m	2%	5%
		R	2	5m	6%		P-f(ve th,ast,clvr)	4	2.5m	1%	1%	P-s(?rd berry)	1	1m	1%		L-tk(qu ga,pp	1	.5m	25%	
		W-r	1	4.5m	3%							P-s(ro wo)	1	7m							
		Totals:	9		**100%**	**53%**		14		**105%**	**6%**		14		**102%**	**57%**		25		**89%**	**10%**
DP-S	22m	P-g	1	0m	10%		Str(int)	1	1.5m	20%		T-pp	2	7m	2%	30%	T-qu ga	1	1m	20%	70%
		T-qu ga gr	1	3m	10%	40%	P-g	1	1.5m	40%		T-qu ga-in grove	1	1.5m	3%		T-doug fir	3	7m	1%	30%
		L-tk(qu ga)	1	1m	45%		P-s(wil)	1	3m	10%	45%	W-r	3	3m	8%	30%	P-s(rh tr)	1	1m	1%	2%
		Str.(int)	1	1.5m	30%		R-bd rk	3	2m	18%		L-tk(qu ga,pp)	1	2m	70%		T-ch cherry	1	2m	1%	2%
		P-s(wil)	1	3m	3%	15%	L-tn	1	1.5m	10%		P-g	1	1m	3%		L-tk(qu ga,fir	1	.5m	95%	
		R	1	5m	6%		W-r	1	2m	1%		R	3	4m	4%		P-g	1	.2m	5%	
		W-r	1	4m	2%							P-f(rh ra)	3	3.5m	<1%		P-s(fo ne)	2	7m	<1%	2%
		P-s(rh tr)	1	7m	1%	3%						P-s(rh tr)	1	2.5m	<1%						
		Totals:	8		**107%**	**58%**		8		**99%**	**45%**		15		**90%**	**60%**		10		**123%**	**106%**
DP-S	44m	T-j	2	2m	3%	20%	P-g	1	.2m	4%		T-(qu ga) in grove		1.5m	10%	50%	T-pp	3	3.5m	2%	70%
		P-g	1	.5m	50%		P-s(wil)	1	5m	5%	28%	P-g	1	0m	0		T-j	2	5.5m	2%	5%
		P-s(wil)	1	3.5m	2%	4%	W-r	1	2m	2%		L-tk(qu ga)	1	0m	0		T-qu ga	3	1m	4%	8%
		P-f(ve th,clvr	2	4m	1%		L-tn	1	0m	15%		W-r	1	2m	2%		W-r	1	7.5m	3%	
		R-bd rk	5	4.5m	13%		Str(int)	1	5.5m	15%	20%						L-tk	1	0m	60%	
		Str.(int)	1	5.5m	25%		T-pp	1	6.5m	1%							P-s(ro wo)	1	1m	<1%	<1%
		L-tk(g)	1	.5m	20%												P-g	1	0m	15%	
		Totals:	13		**114%**	**24%**		6		**42%**	**48%**		11		**12%**	**50%**		11		**86%**	**83%**

*(area of all arrays =176.71 sq m w/ radius of 7.5m, all quadrants = 44.18 sq m) *All arrays on DP-N overlap with corresponding arrays on DP-S, e.g., DP-N (0m) overlaps with DP-S (198m)

		Quadrant 1 (NW)					Quadrant 2 (NE)					Quadrant 3 (SE)					Quadrant 4 (SW)				
Site	artray	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)
DP-S	66m	P-g	1	0m	50%		P-g	1	.1m	70%		P-g	1	.3m	50%		P-g	1	0m	30%	
		W-s	2	6m	1%		W-r	2	2m	2%		T-j	2	4m	<1%	20%	T-j	2	.5m	2%	18%
		W-r	1	7.5m	<1%		P-s(wil)	1	6m	2%	6%	T-pp	1	5m	<1%	2%	W-r	2	3.7m	1%	
		P-s(rh tr)	1	6.5m	3%	5%	L-tn	1	0m	10%		T-qu ga	1	5.5m	2%	60%	L-tk(pp,g)	1	0m	95%	
		T-pp	1	7m	<1%	5%	Str(int)	1	5m	25%		W-r	1	7m	5%		T-pp	1	7.5m	1%	25%
		P-s(wil)	1	6m	<1%	2%						L-tk(qu ga)	1	.3m	75%						
		L-tn	1	0m	15%							R	2	7.5m	1%						
		Str(int)	1	5m	25%																
		Totals:	9		**94%**	**12%**		6		**109%**	**6%**		9		**133%**	**82%**		7		**129%**	**43%**
DP-S	88m	T-qu ga	1	4m	4%	40%	P-s(wil)	1	3m	25%	70%	T-pp	2	7m	<1%	10%	T-pp	1	3m	1%	30%
		T-j	1	5m	1%	5%	P-g	1	1m	75%		L-tk(pp)	1	1m	80%		T-j	2	2m	1%	10%
		P-s(wil)	1	3m	5%	30%	Str(int)	1	1.5m	14%		P-g	1	1m	25%		T-qu ga	1	4.5m	2%	20%
		P-g	1	1m	45%		L-tk(wil)	1	2m	50%							L-tk(qu ga)	1	0m	75%	
		L-tk(qu ga,wi	1	.5m	75%		W-r	1	4.5m	1%							P-g	1	1m	2%	
		W-r	2	2m	1%																
		Str(int)	1	1.5m	20%																
		Totals:	8		**151%**	**75%**		5		**165%**	**70%**		4		**105%**	**10%**		6		**81%**	**60%**
DP-S	110m	Str(int)	1	3m	18%		Str(int)	1	3.5m	15%		T-pp	2	1.3m	1.30%	40%	T-j	2	1.5m	1%	5%
		R-bd rk	1	1.5m	45%		P-g	1	0m	60%		T-j	2	5m	2%	5%	T-pp	1	5.5m	<1%	30%
		P-g	1	0m	45%		P-s(wil)	1	.5m	25%	40%	P-g	1	4m	25%		T-elm	1	6m	<1%	3%
		P-s(wil)	1	1m	5%	20%	L-tk(wil)	1	0m	75%		L-tk(pp)	1	1m	80%		P-g	1	.5m	10%	
		P-s(fo ne)	1	6m	3%	5%						W-r	1	7m	20%		L-tk(pp)	1	.5m	80%	
		L-tk(pp,wil)	1	0m	50%																
		Totals:	6		**166%**	**25%**		4		**175%**	**40%**		7		**128%**	**45%**		6		**91%**	**38%**
DP-S	132m	P-g	1	2m	40%		P-g	1	0m			T-qu ga	3	2m	10%	80%	P-g	1	1m	<5%	
		Str(int)	1	2.5m	16%		Str(int)	1	2m	12%		P-g	1	.5m	5%		T-j	1	4.5m	1%	
		P-s(wil)	1	4m	10%	25%	P-s(wil)	1	3.5m	10%		P-s(mah r)	1	5.5m	<1%		T(qu ga)	1	4m	2%	2%
		L-tn	1	2m	20%		R-bd rk	1	3m	20%	20%	L-tk(qu ga)	1	1m	85%		Lg mtl box	2	5m	1%	
							W-r	2	3.5m	<1%		Road(dirt)	1	6m	12%		Road(dirt)	1	6m	12%	
							T-qu ga	1	2m	<1%	5%										
		Totals:	4		**86%**	**25%**		7		**42%**	**25%**		7		**112%**	**80%**		6		**16%**	**2%**

		Quadrant 1 (NW)					Quadrant 2 (NE)					Quadrant 3 (SE)					Quadrant 4 (SW)				
Site	artray	Significant Habitat Modifier*	Signif. Modifier Count	Dist (m) to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist (m) to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist (m) to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)	Significant Habitat Modifier*	Signif. Modifier Count	Dist (m) to Signif Modif	% Total Ground Cover Est (m)	Est aerial cover (% of quad)
DP-S	154m	W-r	1	7m	<1%		P-g	1	0m	30%		P-g	1	0m	40%		P-g	1	0m	90%	
		P-g	1	0m	80%		Str(int)	1	2.5m	30%		Str(int)	1	2.5m	10%		L-tn	1	0m	25%	
		L-tn	1	0m	15%		P-s(wil)	1	5m	20%	40%	P-s(wil)	1	6m	2%	5%	P-f(ve th,art)	2	3.5m	3%	
							L-tk(wil)	1	5m	20%		L-tk	1	0m	10%						
		Totals:	3		**95%**	**0%**		4		**100%**	**40%**		4		**62%**	**5%**		4		**118%**	**0%**
DP-S	176m	P-g	1	.2m	40%		Str(int)	1	.5m	20%		P-g	0m	0m	80%		P-g	1	.3m	65%	
		W-r	3	1m	2%		P-g	1	.2m	60%		W-r	2m	2m	2%		W-r	4	2m	10%	
		Str.(int)	1	1m	14%		W-r	2	2m	<1%		L-tn	1m	1m	25%		L-tn	1	1.5m	25%	
		L-tn	1	1m	10%		L-tn	1	.2m	25%											
		P-s(fo ne)	1	7m	2%	2%															
		Totals:	7		**68%**	**2%**		5		**105%**	**0%**	4			**107%**	**0%**		6		**100%**	**0%**
DP-S	198m	P-g	1	0m	80%		P-g	1	0m	90%		Road(dirt)	1	5.5m	16%		Road(dirt)	1	5.5m	20%	
		Str(int)	1	4.5m	3%		L-tk(g)	1	0m	50%		P-g	1	1m	75%		P-g	1	0m	65%	70%
		W-r	1	3m	5%		Str(int)	1	4.5m	10%		L-tk(g)	1	1m	30%		L-tk(g)	1	0m	20%	25%
		P-f(ve th)	1	7m	<1%		P-f(ve th)	2	7.5m	<1%		W-r	1	1.5m	2%		W-r	2	3m	4%	4%
		L-tk	1	0m	50%																
		Totals:	5		**138%**	**0%**		5		**150%**	**0%**		4		**123%**	**0%**		5		**109%**	**99%**

* Habitat Analysis Abbreviations:
Habitat modifiers: P = Plant where P-s = shrub, P-g = grass, P-f = forb, P-sg = sedge, P-r = rush, P-ct tl = cattail, P-unkn = unknown
Where P-s = shrub; species of shrubs are: P-s (wil) = *Salix* species (willow), P-s (fo ne) = *Forestiera neomexicana* (NM olive), P-s (fa pa) = *Fallugia paradoxa* (Apache plume), P-s (rh tr) = *Rhus trilobata* (squaw bush), P-s (cr na) = *Chrysothamnis nauseosus* (chamisa), P-s (qu ga) = *Quercus gambelii* (Gambel's oak) P-s (ly sp) = *Lycium* species (tomatillo), P-s (ri ce) = *Ribes cereum* (wax current), P-s (dec bd) = deciduous broadleaf-species unknown,
Where P-s-(rd berry?) = (red berry)-species unknown, P-s (ro ne) = *Robinia neomexicanus* (NM locust), P-s (ro wo) = *Rosa woodsii*, P-s (ma re) = *Mahonia repens* (creeping mahonia), P-s (pr sp) = *Prunus* species (choke cherry),
Where P-f = forb, types of forbs are: P-f (art) = *Artemisia* (sages), P-f (ast) = *Asteraceae* which includes sunflowers, daisies, etc., P-f (ve th) = *Verbascum thapsus* (mullein), P-f (rh ra) = *Rhus radicans* (poison ivy)
Where Str = stream, Str (int) = stream intermittant, Str (per) = stream perennial,
Where T = tree, T (pp) = ponderosa pine, T (pn) = piñon, T (j) = juniper, T (elm) = elm, T-(pt sp) = *Ptelea* species (hop tree) , T (qu ga) = *Quercus gambelli* (Gambell's oak),
Where L-tk = liter thick, L-tn = liter thin, L-dv = liter - dead vegetation,
Where W = wood, where W(r) = wood rotten, W(s) = wood sound,
Where SS = special soil condition; SS-gm = gopher mound, SS-am = ant mound, SS-p = ground porous,
Where R-bd rk = Rock (bed rock),
Where R(b) = Rock (boulder)

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