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Spring and Fall Small Mammal Sampling Report for Cañon de Valle and Pajarito Canyon, 2001

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Edited by Hector Hinojosa, Group IM-1
Prepared by Teresa Hiteman, Group ESH-20

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Kathryn Bennett
Rhonda Robinson
Dave Keller
Sherri Frybarger
Mark Tardiff
Don Hickmott

• Los Alamos
NATIONAL LABORATORY
Los Alamos NM 87545

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by

Kathryn Bennett, Rhonda Robinson, Dave Keller, Sherri Frybarger, Mark Tardiff, and Don Hickmott

ABSTRACT

A screening ecological risk assessment was performed for Cañon de Valle. Six contaminants of potential ecological concern (COPECs), barium, copper, lead, silver, and two high explosives, HMx and RDx, failed the screen for the terrestrial and riparian systems in the canyon, establishing a need for further site-specific evaluations. A small mammal study was initiated as a means for assessing potential adverse effects in the canyon that could be attributed to the COPECs in the terrestrial and riparian systems. The study resulted in sampling small mammals in late spring to early summer and again in early fall in Cañon de Valle and a reference canyon, Pajarito Canyon. Species composition, body weights, and general reproductive status of small mammals in both Cañon de Valle and Pajarito Canyon were similar. Cañon de Valle samples had a slightly lowerm ean body weight of males than did Pajarito Canyon during spring sampling, but were similar during fall sampling. Capture rates for both Cañon de Valle and Pajarito Canyon were very low when compared to other years in similar locations and habitat. This also resulted in low density estimates in both canyons. Low capture rates have also been seen through spring and summer at other sites within the Laboratory during 2001. Low capture rates and density estimates may be attributed to previous drought years as well as impacts from the Cerro Grande fire. However, Cañon de Valle had higher capture rates, density estimates, and species diversity than the reference site, Pajarito Canyon. Based on these limited data from just two sampling periods, Cañon de Valle did not show adverse population characteristics when compared to the reference site, Pajarito Canyon.

1.0 INTRODUCTION

A screening ecological risk assessment was performed for Cañon de Valle. Six contaminants of potential ecological concern (COPECs), barium, copper, lead, silver, and two high explosives, HMx and RDx, failed the screen for the terrestrial and riparian systems in the canyon, establishing a need for further site-specific evaluations. A small mammal study was initiated as a means for assessing potential adverse effects in the canyon that could be attributed to the COPECs in the terrestrial and riparian systems. The study resulted in sampling small mammals in late spring to early summer and again in early fall. The category 'small mammal' generally includes ground-dwelling species with body weights ranging from 6 to 900 g, such as shrews, mice, voles, chipmunks, gophers, rock squirrels, and tree squirrels. Small mammals have been frequently used to monitor the presence of contaminants and have been found to be effective biomonitors. They are low in the food chain, have relatively short life spans (less than one year), and a small home range (usually 100 m^2). In addition, depending on habitat and environmental conditions, they are usually abundant and easy to capture (Talmage 1989).

This report provides the results from both spring and fall trapping periods for Cañon de Valle and a reference canyon, Pajarito Canyon.

2.0 METHODOLOGY

2.1 Reconnaissance Sampling

Trapping arrays were set up in Cañon de Valle (Figure 1) and a reference canyon, Pajarito Canyon (Figure 2), during May 2001 and again in September to October 2001. The Pajarito Canyon site was selected as the reference canyon based on similar topography, elevation, water presence and quantity, vegetation, and burn severity to the Cañon de Valle site. The reconnaissance trapping was used to identify small mammal species common to both canyons and to get a qualitative indication of the relative abundance of the captured species. Reconnaissance trapping was conducted for two nights. The information was used to assess whether the two canyons supported similar small mammal species composition.

2.2 Small Mammal Population Trapping and Characterization

For trapping in the narrow canyon areas of Cañon de Valle and Pajarito Canyon, we used two rectangular grids in each canyon. Grids in the same canyon were separated by a minimum of 100 meters. Each grid was configured with 5 trap lines and 20 trap stations per line. Each trap was placed at 10-meter intervals. We used a combination of Sherman traps and pitfall traps. One Sherman and one pitfall trap were placed at each trap station along the trap line that ran adjacent to the stream channel (Figure 3). All other trap stations consisted of two Sherman traps. The trap lines followed the lay of the land using the stream channel as the baseline. In the late afternoon, Sherman traps were opened and baited. Bait was a mixture of peanut butter and sweet feed (molasses coated horse feed). Pitfall traps were also opened in the afternoon. The traps were checked early in the morning. Traps that had not been tripped by animals were then closed and all tripped traps were collected for animal processing (Figure 4).

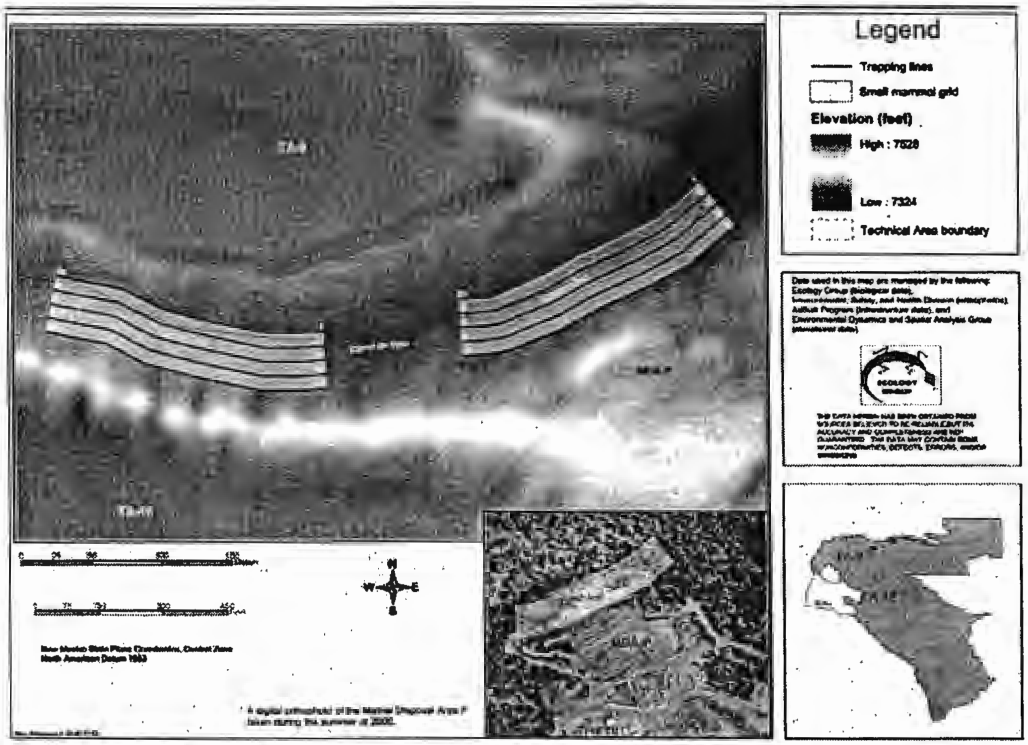


Figure 1. Location and configuration of the small mammal trapping grids in Cañon de Valle.

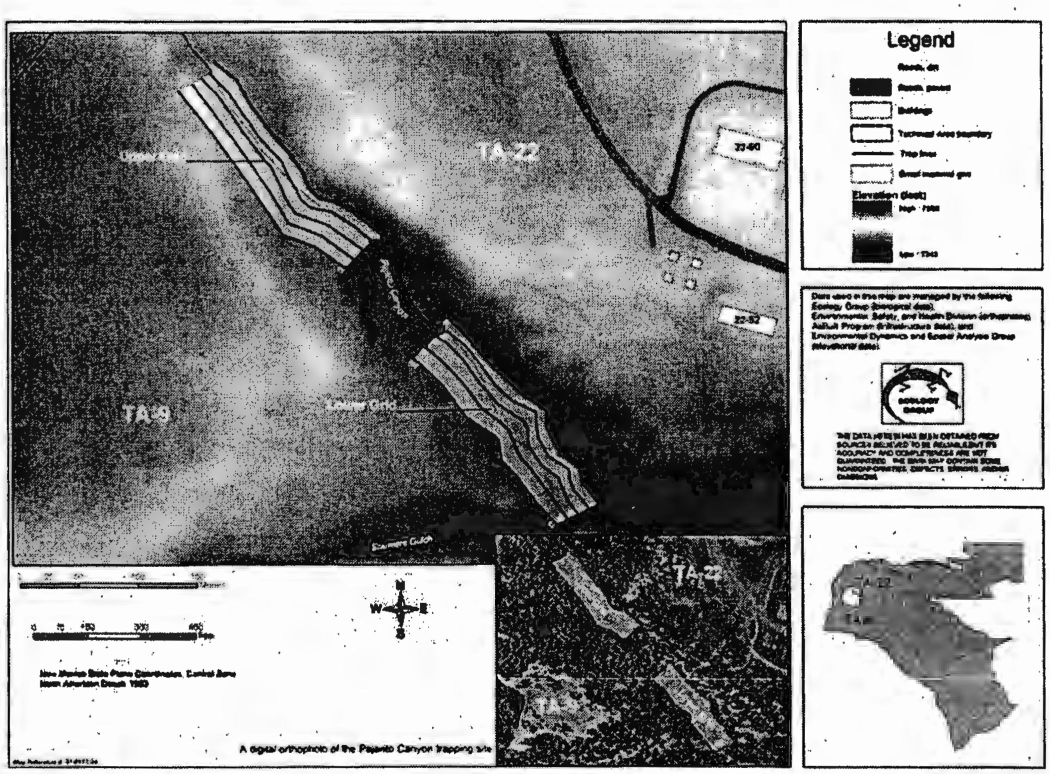


Figure 2. Location and configuration of the small mammal trapping grids in Pajarito Canyon.

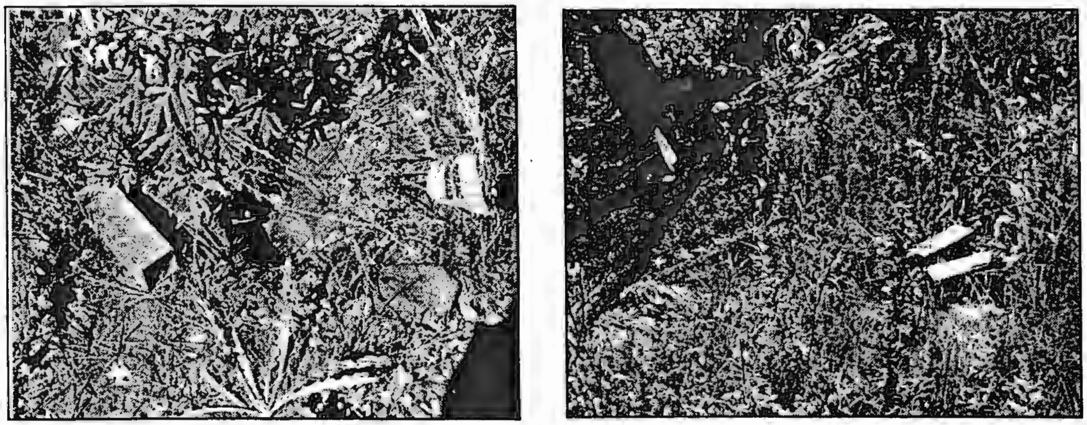


Figure 3. A Sherman and a pitfall trap placed next to a stream channel (left) and two Sherman traps at one station (right).

Figure 4. A Sherman trap (left) and a deer mouse placed in a plastic bag for processing (right).

Animals collected on nights 1 through 3 were weighed and measured (body length, tail length, hind foot length, and ear length). Sex and species were determined. Reproductive status was recorded, and the trap number was noted. The animals were also ear tagged (#FF ear tag) and then released. Individual animal characteristics were recorded only on the first day of capture. Trap number and ear tag numbers were recorded for all animals captured or recaptured. After the fourth night of trapping, we recorded all information on new captures and noted any recaptures. Because of the low number of captures in the spring, all species but deer mice *(Peromyscus maniculatus)* were released. During spring sampling, we obtained blood samples (from the interorbital region) for Hantavirus screening from deer mice only.I n the fall we obtained blood samples from brush mice

(*Peromyscus boylli*), deer mice, and wood rats *(Neotoma mexicana)* for Hantavirus screening. All other species were released after capture. The University of New Mexico Medical School performed all of the screening. All target species were euthanized on the last day of trapping during each trapping session. Only animals that screened negative for Hantavirus were analyzed for contaminants.

Densities were estimated using Leslie's regression method (Seber 1982) applied to each grid where daily total numbers of captures were plotted against the cumulative daily captures. Confidence intervals were calculated at 95% using the general method (Seber 1982). Mean percent daily capture rates were calculated and compared to 1993 data where similar sites were trapped (Raymer and Biggs 1994). Because of the low capture rates in the spring and some daily mortality, density could not be estimated using the program CAPTURE (White et al. 1982). The assumption of a closed population was violated; therefore, a Leslie's regression was used. Leslie's regression was also used for fall samples so both fall and spring samples could be compared. Species composition of each canyon was determined as well as a comparison of sex ratios, reproductive stages, and mean weights. A General Linear Model (GLM), analysis of variance was performed on weights to test for differences between the grids. However, because of the low captures and the differences in the amount of captures within the four grids, only descriptive statistics were examined for density, species composition, and reproductive stages.

3.0 RESULTS

The first night of reconnaissance sampling resulted in zero captures in both canyons. Because we did not capture any animals the first night, we set out the full population sampling grids for a second night of reconnaissance sampling.All traps were baited. From the second night of trapping we captured 12 deer mice in Cañon de Valle and four deer mice in Pajarito Canyon. Since the same species were caught in each canyon, population sampling continued with the second night of reconnaissance trapping being used as the first night of population sampling.

3.1 Species Composition

Spring

Twenty-one deer mice were captured in Cañon de Valle and eight were captured in Pajarito Canyon. Long-tail voles (*Microtus longicaudus*) were captured in both canyons, but in low numbers. However, both canyons had similar percent species composition. Figure 5 shows the species composition of each canyon.

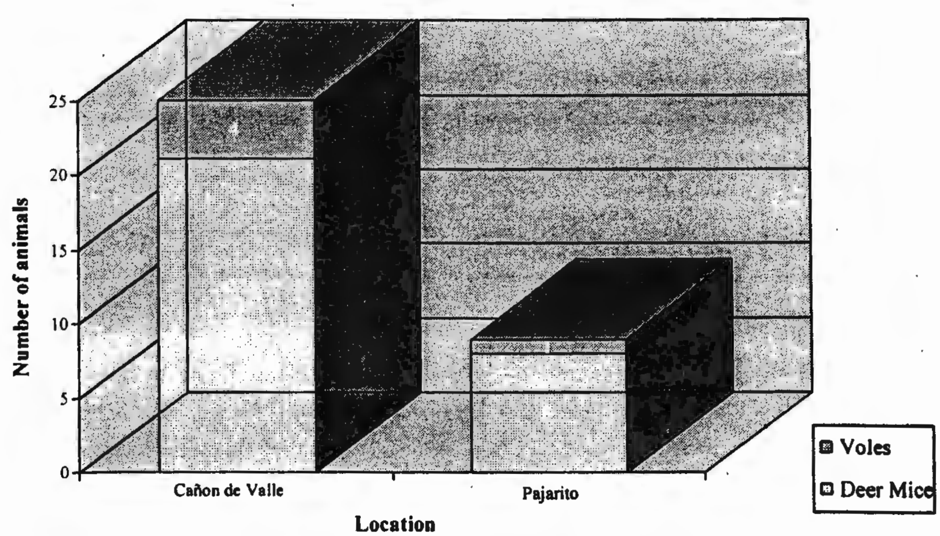


Figure 5. The number of species captured in Cañon de Valle and Pajarito Canyon during spring sampling.

Fall

Twenty-five deer mice were captured in Cañon de Valle and 17 were captured in Pajarito Canyon. Seventeen brush mice were captured in Cañon de Valle and eight in Pajarito Canyon. A very low number of Mexican woodrats were captured in both canyons. Western harvest mice *(Reithrodontomys megalotis*) and pinyon mice (*Peromyscus truei*) were captured only in Cañon de Valle. Figure 6 shows the species composition of each canyon.

3.2 Sex Ratios and Reproductive Status

Spring

Because of low capture rates, sex ratios and reproductive status were only compared for deer mice. Percentages of adult males to adult females were similar between the two

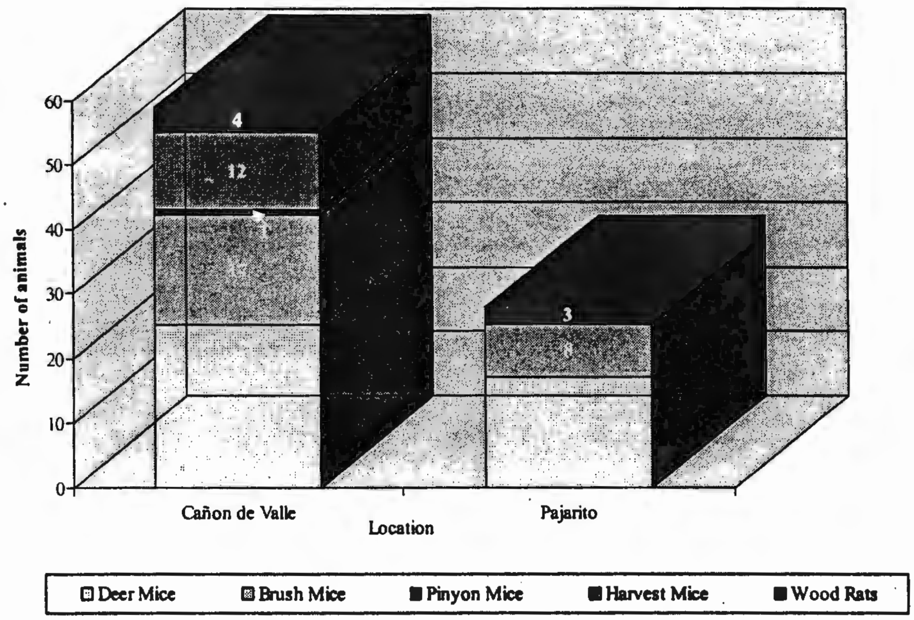


Figure 6. The number of each species captured in Cañon de Valle and Pajarito Canyon during fall sampling.

canyons. Cañon de Valle had 72% adult males and Pajarito Canyon had 78% adult males. Cañon de Valle had 28% adult females, while Pajarito Canyon had 22% adult females (Figure 7). The Cañon de Valle adult male to Pajarito Canyon adult male ratio was 2.6 to 1, and the Cañon de Valle adult female to Pajarito Canyon female ratio was 3.5 to 1.

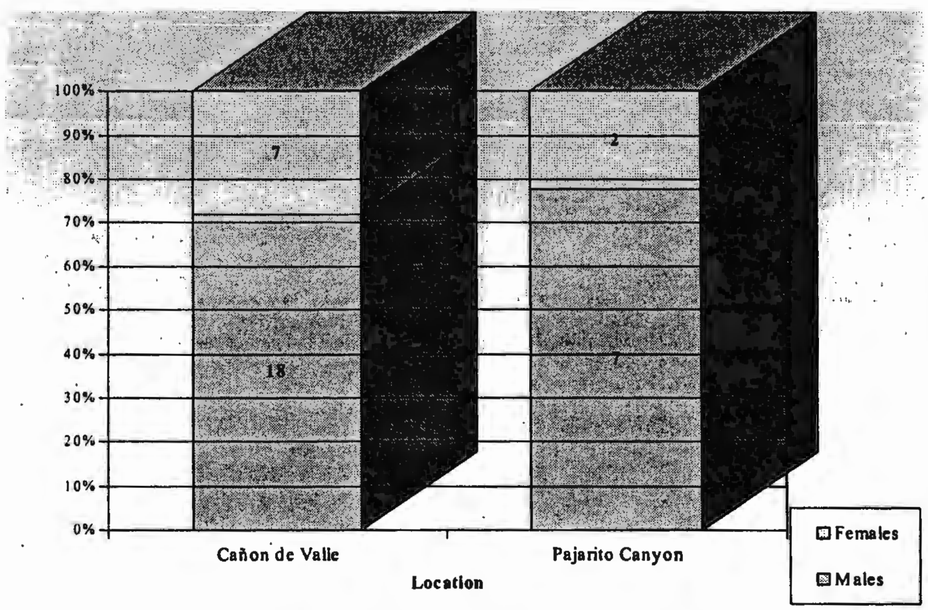


Figure 7. Percentages of male and female small mammal species captured during the spring in Cañon de Valle and Pajarito Canyon.

A reproductive category was assigned to each animal. All male small mammals were assigned to one of three categories (scrotal, non-scrotal, and juveniles). All female small mammals were assigned to one of four categories (adult non-reproductive, pregnant, lactating, and juveniles). Male small mammals in Cañon de Valle were represented in all three categories. No juvenile males were trapped in Pajarito Canyon in the spring (Figure 8). No juvenile female deer mice were captured in either Cañon de Valle or Pajarito Canyon in the spring.B oth canyons had adult females that were considered non-reproductive because they were neither pregnant nor lactating. Cañon de Valle had both pregnant and lactating females (Figure 9).

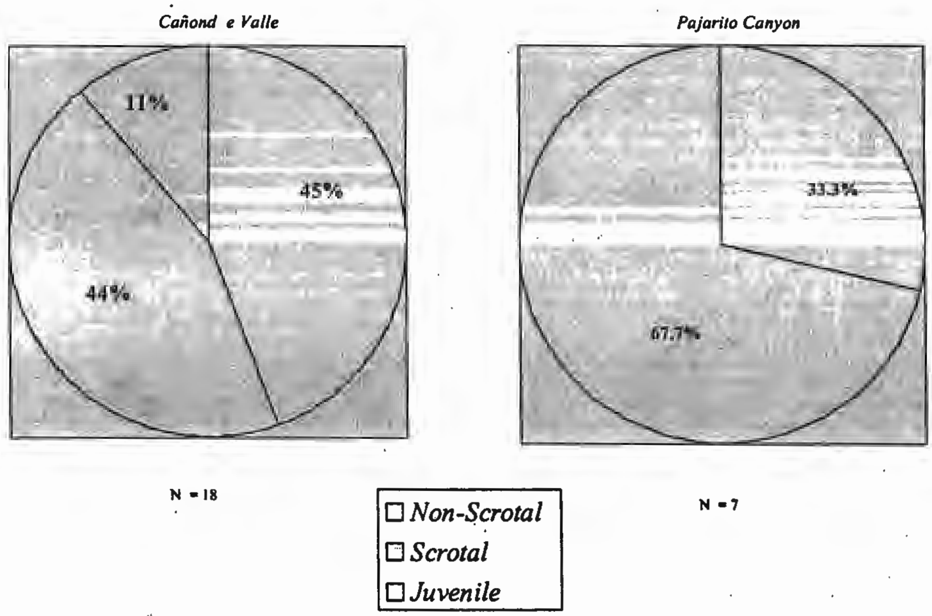


Figure 8. Reproductive status of male small mammals captured during the spring in Cañon de Valle and Pajarito Canyon.

FALL

Similar sex ratios were found between the two canyons. Cañon de Valle had 46% adult males, and Pajarito Canyon had 50% adult males. Cañon de Valle had 54% adult females, and Pajarito Canyon had 50% adult females (Figure10). The Cañon de Valle adult male to Pajarito Canyon adult male ratio was 1.9 to 1, and the Cañon de Valle adult female to Pajarito Canyon adult female ratio was 2.3 to 1.

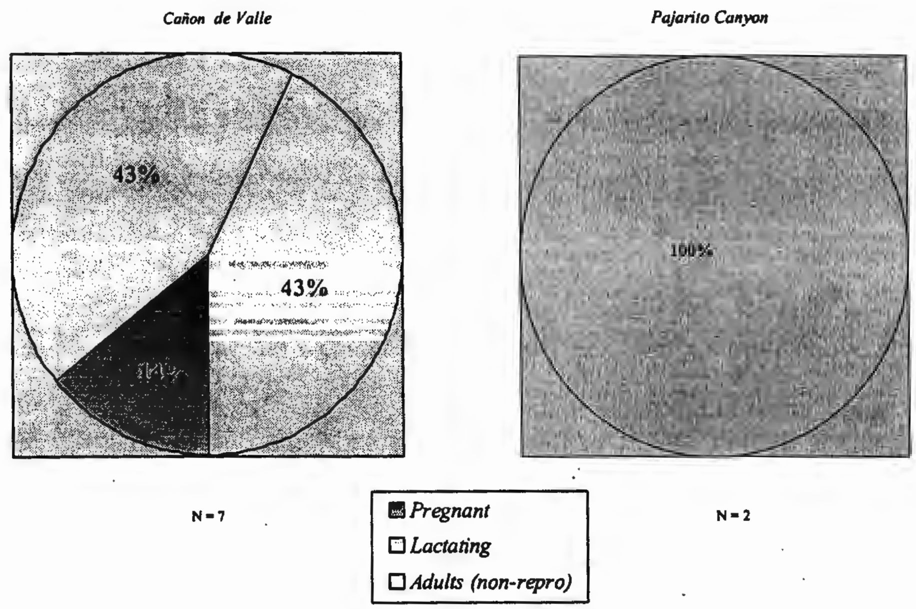


Figure 9. Reproductive status of female small mammals captured during the spring in Cañon de Valle and Pajarito Canyon.

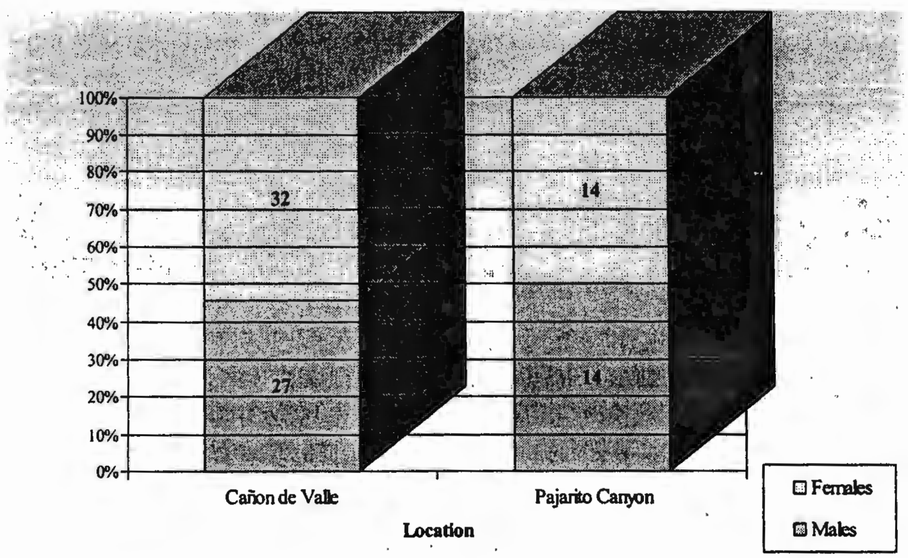


Figure 10. Percentages of male and female small mammal species captured during the fall in Cañon de Valle and Pajarito Canyon.

A reproductive category was assigned to each animal. All male small mammals were assigned to one of three categories (scrotal, non-scrotal, and juveniles). Female small mammals were assigned to one of four categories (adult non-reproductive, pregnant, lactating, and juveniles). Male small mammals in Cañon de Valle and Pajarito were represented in all three categories. Three juvenile male small mammals were trapped in Cañon de Valle and one male juvenile in Pajarito Canyon (Figure 11). No juvenile female small mammals were captured in Pajarito Canyon. Six juvenile female small mammals were captured in Cañon de Valle. Both canyons had adult females that were considered non-reproductive because they were neither pregnant nor lactating. Cañon de Valle and Pajarito Canyon had both pregnant and lactating females (Figure 12).

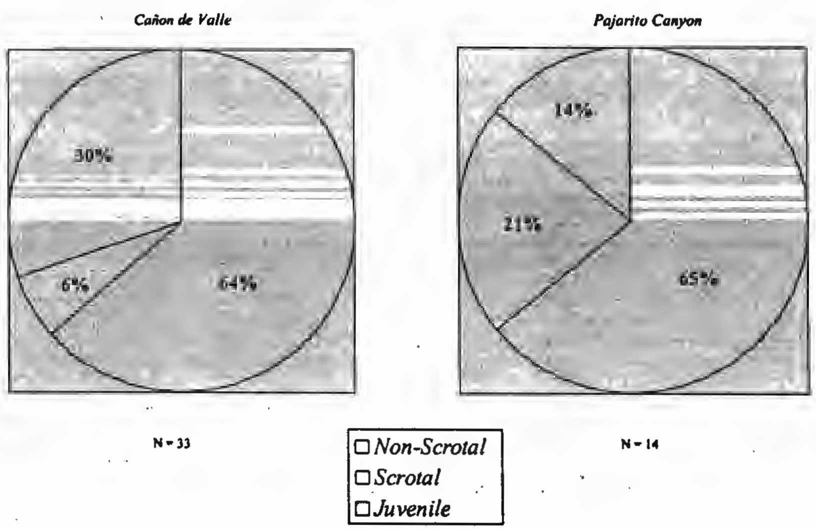


Figure 11. Reproductive status of male small mammal species captured during the fall in Cañon de Valle and Pajarito Canyon.

3.3 Weights

Spring

Total body weights were measured for each species captured and the weights compared between grids and sites. Because of low capture rates, comparisons of body weights were only performed on deer mice. Cañon de Valle had the lowest overall mean body weights (16.6 g, se = 1.05) compared to Pajarito (19.75 g, se = 1.29). However, there were no statistical differences ($\alpha = 0.05$) in mean body weights detected between grids and sites (GLM, F = 1.10, p = 0.3676). When weights were compared by sex, adult females from both canyons had similar body weights (Cañon de Valle, 18.6 g, se = 1.11; Pajarito, 18.5 g, se = 1.5 [GLM,F = 0.45, p = 0.7309]). Cañon de Valle adult males had slightly but not statistically lower body weights (17.0 g, se = 1.36) than Pajarito Canyon adult males (18.5 g, se = 1.68) (Figure 13 [GLM,F = 1.34, p = 0.2974]).

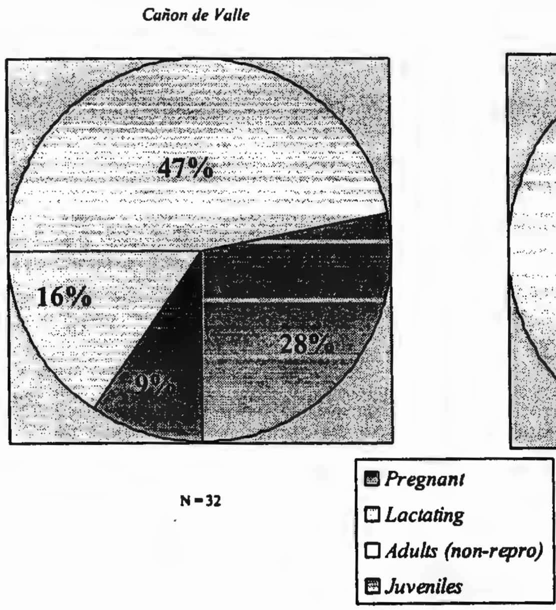


Figure 12. Reproductive status of female small mammal species captured during the fall in Cañon de Valle and Pajarito Canyon.

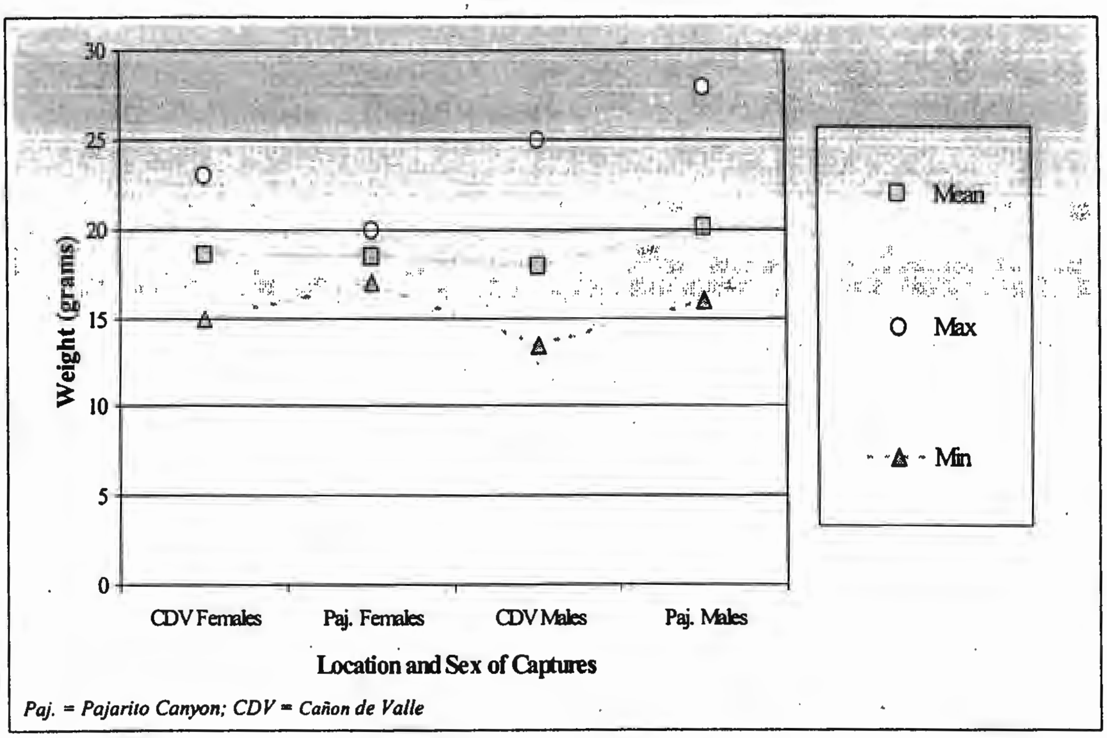
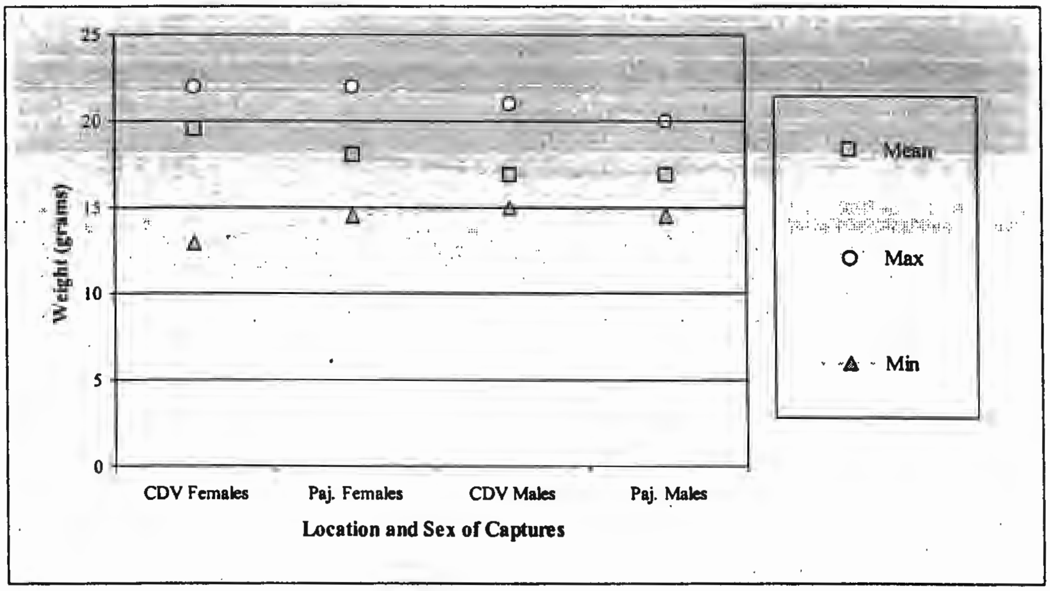


Figure 13. Mean,m aximum, and minimum weights of adult deer mice by sex captured during the spring in Cañon de Valle and Pajarito Canyon.

FALL

Total body weights were measured for each deer mouse captured and the weights compared between sites. Grids within Cañon de Valle and Pajarito Canyon had similar mean body weights (GLM, F = 0.72, p = 0.5436). When weights were compared by sex, adult females from Cañon de Valle (19.5 g se = 1.1) had slightly higher, but not statistically higher (GLM, F = 1.57, p = 0.2432) weights than adult females in Pajarito Canyon (18.06 g, se = 0.928). Similar body weights were detected in Cañon de Valle adult males (16.9 g, se = 0.79) and Pajarito Canyon adult males (17.7 g, se = 0.9) (Figure 14 [GLM, F = 0.82, p = 0.5118]).



Paj. = Pajarito Canyon; CDV = Cañon de Valle

Figure 14. Mean,m aximum, and minimum weights of deer mice by sex captured during the fall in Pajarito Canyon and Cañon de Valle.

Brush mice were captured in both canyons. Cañon de Valle adult males had slightly lower body weights, but not statistically lower than Pajarito Canyon adult males (GLM, F = 0.82, p = 0.5215). Adult females in Cañon de Valle had lower weights but again these weights were not statistically different than those weights of animals captured in Pajarito Canyon (Figure 15, [GLM, F = 1.28, p = 0.3344]). Because of the low number of captures of harvest mice, pinyon mice, and wood rats, a site-by-site comparison was not performed.

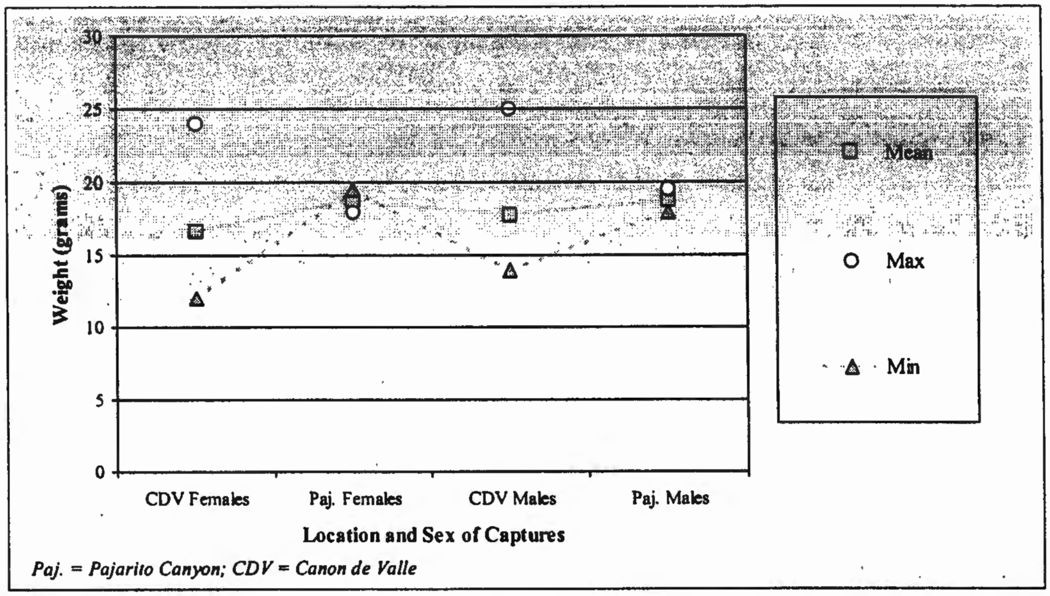


Figure 15. Mean, maximum, and minimum weights of brush mice by sex captured during the fall in Pajarito Canyon and Cañon de Valle.

3.4 Mean Percent Daily Capture Rates

Spring

Mean percent capture rates were calculated for Pajarito Canyon and Cañon de Valle. Mean percent capture rates for our spring 2001 samples were calculated using 200 trap stations per canyon. These values were compared to capture rates calculated from data obtained during the early summer in 1993 (Raymer and Biggs 1994). Pajarito Canyon (2001) had the lowest mean percent capture rates of <1%. Cañon de Valle (1993) had the highest mean percent capture rate of >14%. The 2001 mean percent capture rates in both Cañon de Valle and Pajarito Canyon were substantially less than those calculated in 1993 (Figure 16).

Fall

Mean percent capture rates were calculated for Pajarito Canyon and Cañon de Valle. Mean percent capture rates for our fall 2001 samples were calculated using 200 trap stations per canyon. These values were compared to capture rates calculated from data obtained during the early summer in 1993 (Raymer and Biggs 1994). Mean percent daily capture rates increased from the spring rates. However, the fall mean daily capture rates from both canyons were still lower than those of 1993. During the fall 2001 sampling period, the Cañon de Valle mean percent daily capture rate had the largest increase (Figure 16).

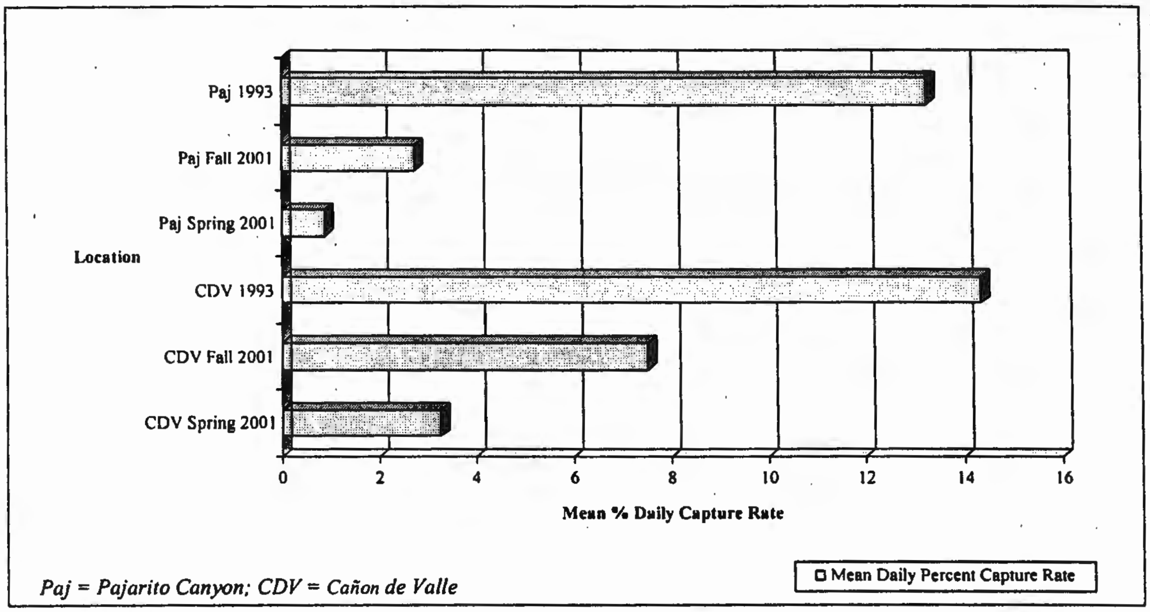


Figure 16. Mean percent daily capture rates for Pajarito Canyon and Cañon de Valle during 1993 and 2001.

3.5 Density Estimates

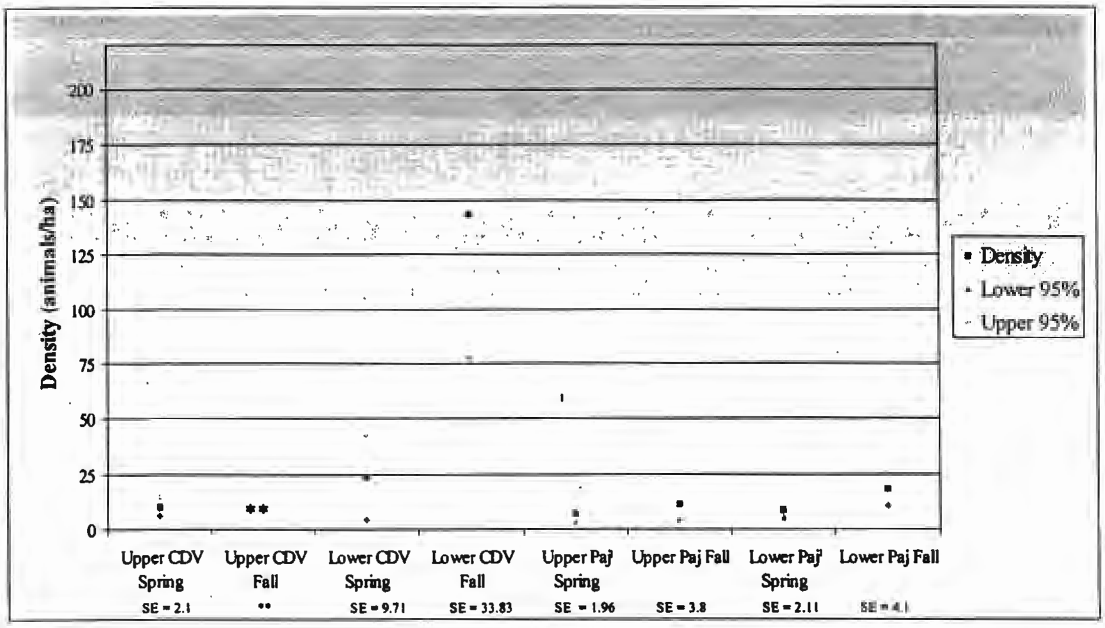
Spring

The lower grid in Cañon de Valle had the highest estimated density (23.63 animals/ha) but also the highest standard error (SE) of 9.71 (Figure 17). The upper grid in Cañon de Valle and the grids in Pajarito Canyon yielded density estimates that were comparable. The upper grid of Pajarito Canyon was estimated to have the lowest density (7.11 animals/ha) and a SE of 2.11. Because of our low number of captures, density estimates we calculated violated the assumption of a large sample size and values may be overestimated. However, density estimates still allow for a site-to-site comparison.

Fall

Density estimates for upper Cañon de Valle could not be calculated because of a nonlinear new daily capture (5, 4, 8, 6). The Leslie's regression assumes a linear new daily capture such as 8, 6, 5, 4. Lower Cañon de Valle experienced a sharp increase in the density estimate from spring, an estimate of ~23.63 animals to 143.8 animals. Both

Pajarito Canyon grids had a slight increase in density compared to the spring sampling (Figure 17).



*Paj = Pajarito Canyon; CDV = Cañon de Valle ** = Non-linear daily captures (5, 4, 8, 6); density estimate invalid. Upper Spring CDV had the following daily captures (5, 2, 2, 0).* [1] Density estimates may be overestimated due to assumption of large sample size violated

Figure 17. Density estimates with 95% confidence levels and standard error (SE) for small mammal species captured during spring and fall sampling in Pajarito Canyon and Cañon de Valle.

4.0 SUMMARY AND DISCUSSION

A small mammal study was initiated as a means for assessing adverse effects in the canyon that could be attributed to the COPECs in the terrestrial and riparian systems. This report summarizes the results for the spring and fall sessions.

Species composition, body weights, and general reproductive status of both Cañon de Valle and Pajarito Canyon were similar. Cañon de Valle had a slightly lower mean body weight of males than did Pajarito Canyon during the spring sampling, but were similar during fall sampling.

Cañon de Valle had more classes of reproductive stages than Pajarito Canyon for both sampling periods. No juvenile females were captured in Pajarito Canyon in the spring sampling. All females from Pajarito Canyon were adult, non-reproductive during the spring. However, the differences in reproductive classes are most likely attributed to low capture rates in the canyon.

Capture rates for both Cañon de Valle and Pajarito Canyon were very low when compared to other years in similar locations and habitat. This also resulted in low density estimates in both canyons.L ow capture rates have also been seen through spring and summer at other sites within the Laboratory during 2001. An undisturbed piñon-juniper woodland site had a mean percent daily capture rate of 0% (trapping occurred over a seven-day period) (Bennett unpublished). Low spring capture rates and density estimates may be attributed to previous drought years. In addition, the Cerro Grande fire had moderately to lightly burned both areas, causing a temporary reduction in habitat quality. Also, predator pressures may have increased in areas that were not severely burned, depressing small mammal populations of the general area.I n the fall, mean daily percent capture rates and density estimates increased in both canyons. However, Cañon de Valle had the greatest increase. Increases were possibly attributed to the increase of vegetation, resulting in more forage material and shelter. Cañon de Valle's great increase was most likely attributed to the presence of permanent water within the site, resulting in greater plant density. Pajarito Canyon's intermittent stream channel was mostly dry during the fall sampling and streamside vegetation was sparse. Based on the two sampling periods, Cañon de Valle did not show adverse population characteristics when compared to the reference site, Pajarito Canyon.

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