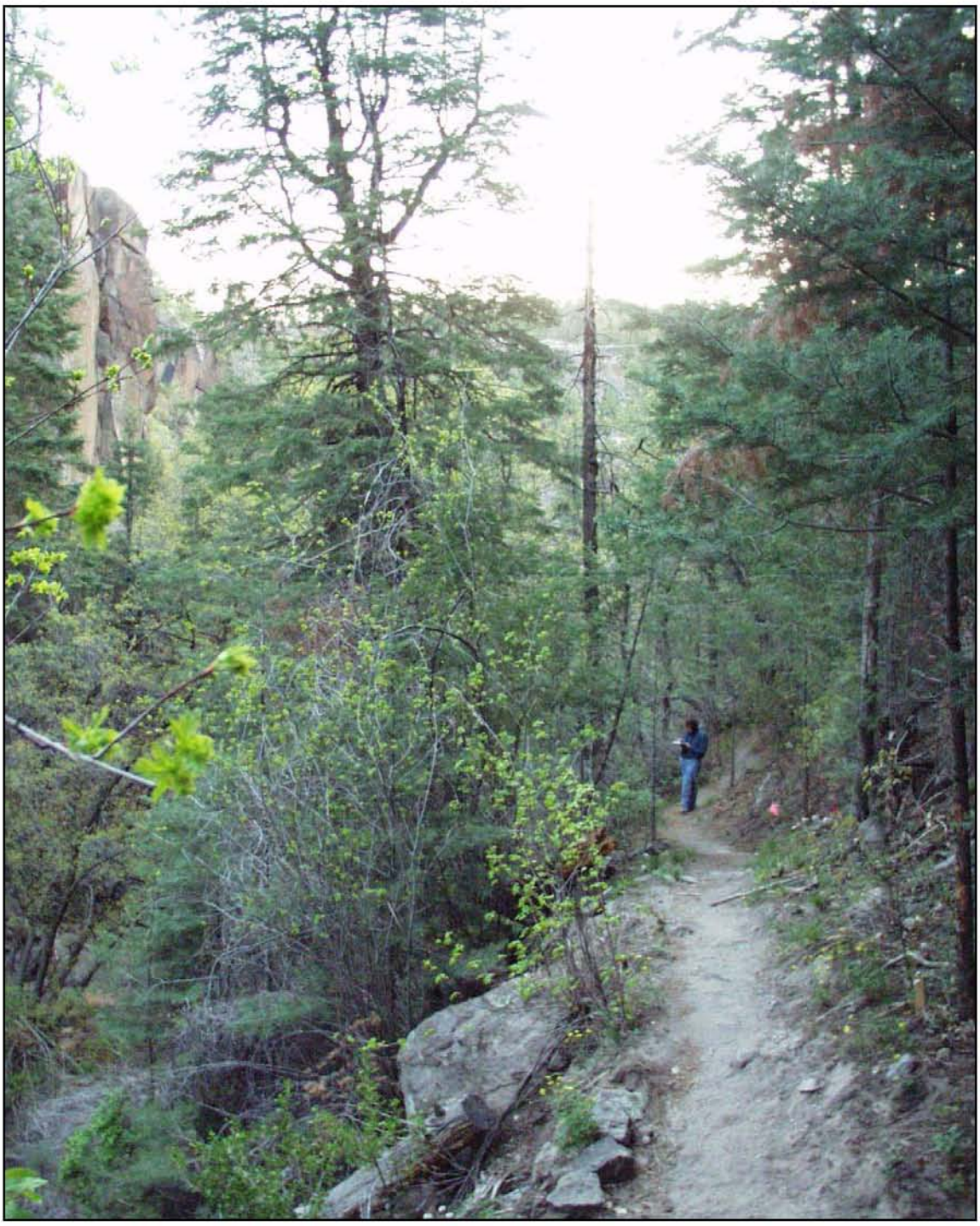
LA-UR-03-8693

Ecological Risk Bird Survey Results

Conducted in the Los Alamos and Pueblo Canyon Systems.



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INTRODUCTION:

This project was in support of adverse effects assessments in Los Alamos and Pueblo Canyons. Details on the lines of evidence used to evaluate adverse ecological effects are provided in Katzman (2002). This study complements other studies performed in Los Alamos and Pueblo Canyons, including previously published data (Foxx 1995). There were six sites surveyed to determine avian use of areas that are potentially contaminated. The areas surveyed included reaches in Acid, Pueblo, Los Alamos, and DP Canyons. In addition, Guaje Canyon was surveyed as a control. All sites were surveyed between 2001 and 2003.

METHODS:

In each survey area, the birds present were recorded by a point count method. Upon arrival to a survey area, surveyors would walk through the area, stopping at 200 m (656 ft) intervals where they would record all birds seen or heard for a period of six minutes. Surveys began soon after daybreak and ended before 11 a.m. Each observation of a species encountered was recorded with the following information: species code, sex, age, and distance from observation point. The surveyors estimated the distance to the birds seen. Habitat type and meteorological information at each observation point were also recorded. At the completion of each survey point, the primary observer would record all species, comparing the species list with the other surveyor's list. Any unknown birds were looked up immediately in a field guide (National Geographic Society 1983) or in references upon return to the lab (Ehrilich *et al.* 1988 and Travis 1992).

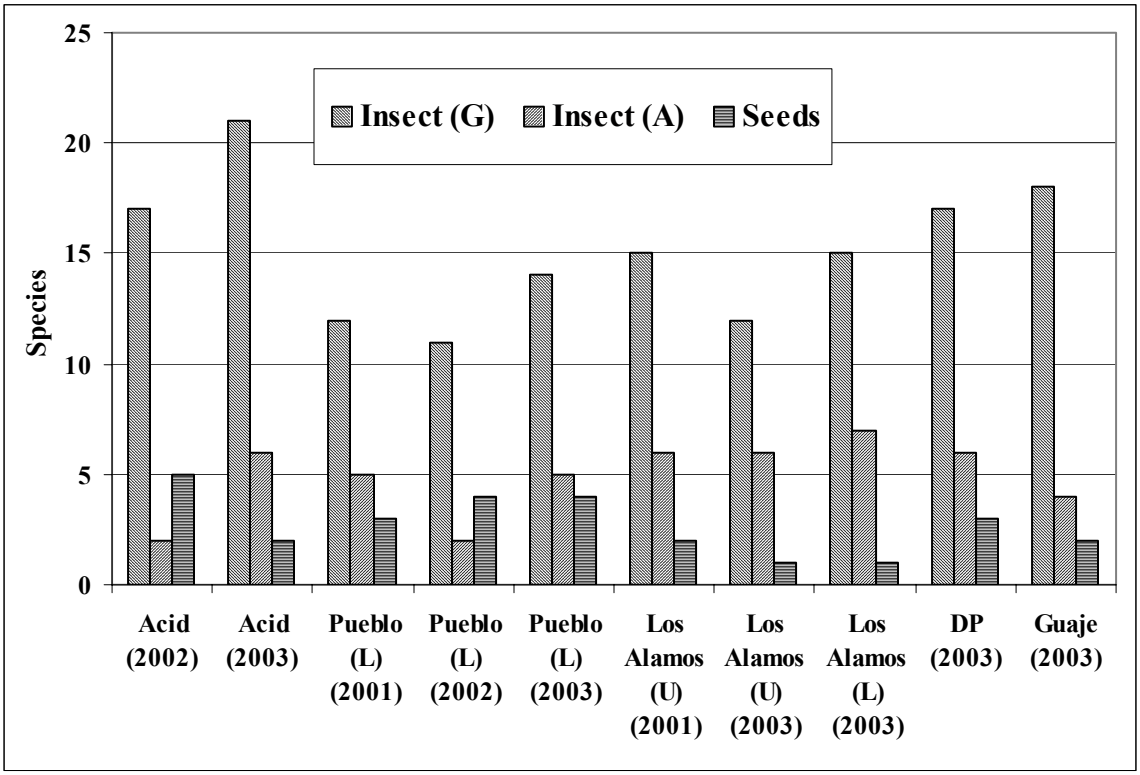
RESULTS:

The following tables (3 – 12) represent a summary of the species encountered at each survey area. The species lists are intended to provide a general list of species and a relative abundance of each species at the location during the survey. These data are not intended to represent a total number of species in a particular area or population levels of any recorded species. These data can, if repeated, provide general trends in species composition but cannot provide a measurement of density or population levels. The diversity of each site was calculated using the Shannon-Weiner Biodiversity Index (Table 1). Based on the similarities between all of the sites it can be reasonably assumed that all the sites have similar diversity of bird populations. Among all of the sites, 1,497 birds were recorded of 65 different species. The diet types of the species at each study area are explained in Table 2 – 12.

Table 1: Summary of Survey Locations.

Site	Investigation Reach	Total Number of Birds	Number of Species	Diversity of Site $H' = -[\sum (p_i)(\ln p_i)]$
Acid Canyon (2002)	AC-1, AC-2, AC-3, P-1-FW, P-1E, and P1-W.	158	31	2.891
Acid Canyon (2003)	AC-1, AC-2, AC-3, P-1-FW, P-1E, and P1-W.	246	33	2.864
Lower Pueblo Canyon (2001)	P-3W	118	25	2.849
Lower Pueblo Canyon (2002)	P-3W	191	20	2.222
Lower Pueblo Canyon (2003)	P-3W	144	23	2.648
Upper Los Alamos Canyon (2001)	LA-1C	114	28	2.832
Upper Los Alamos Canyon (2003)	LA-1C	97	21	2.631
Lower Los Alamos Canyon (2003)	LA-2E, and DP-4.	145	25	2.541
DP Canyon (2003)	DP-1W, DP-1C, DP-2, and DP 3	176	28	2.885
Guaje Canyon (2003)	Areas of Mammal Grids	108	26	3.053

Table 2: Summary of Major Diet Types at Each Survey Location.



(G = Insects foraged off of the ground or vegetation; A = Insects foraged in air)

Table 3 - Acid Canyon:

Transect consisted of 12 point locations that extend the length of Acid and Upper Pueblo Canyon. Survey conducted on September 5, 2002.

Species	Diet	Number Seen	Relative Abundance
Acorn Woodpecker	I/G	2	1.27%
American Robin	I/G	1	0.63%
Band-tailed Pigeon	S	1	0.63%
Black-chinned Hummingbird	N	5	3.16%
Broad-tailed Hummingbird	N	13	8.23%
Brown Creeper	I/G	1	0.63%
Canyon Towhee	S	5	3.16%
Canyon Wren	I/G	4	2.53%
Common Bushtit	I/G	5	3.16%
Common Raven	O/C	20	12.66%
Evening Grosbeak	S	3	1.90%
Grey Flycatcher	I/A	1	0.63%
Hairy Woodpecker	I/G	1	0.63%
Hermit Thrush	I/G	1	0.63%
Lesser Goldfinch	S	1	0.63%
Mountain Chickadee	I/G	3	1.90%
Northern Flicker	I/G	10	6.33%
Pygmy Nuthatch	I/G	30	18.99%
Red Crossbill	S	12	7.59%
Rufus Hummingbird	N	3	1.90%
Scrub Jay	O	16	10.13%
Solitary Vireo	I/G	1	0.63%
Spotted Towhee	I/G	1	0.63%
Steller's Jay	O	4	2.53%
Violet-green Swallow	I/A	1	0.63%
Western Tanager	I/G	2	1.27%
White Breasted Nuthatch	I/G	5	3.16%
Wilson's Warbler	I/G	3	1.90%
Yellow Warbler	I/G	2	1.27%
Yellow-rumped Warbler	I/G	1	0.63%
TOTAL		158	100.00%

I = Insects (G = surface forage; A = aerial forage); N = Nectar; F = Fish; S = Seed; O = Omnivorous; C = Carrion.

Table 4 - Acid Canyon:

Transect consisted of 12 point locations that extend the length of Acid and Upper Pueblo Canyon. Survey conducted on May 14, 2003.

Species	Diet	Number Seen	Relative Abundance
Acorn Woodpecker	I/G	3	1.22%
American Robin	I/G	8	3.25%
Ash-throated Flycatcher	I/A	2	0.81%
Black-headed Grosbeak	I/G	12	4.88%
Broad-tailed Hummingbird	N	22	8.94%
Canyon Wren	I/G	8	3.25%
Chipping Sparrow	I/G	1	0.41%
Common Raven	O/C	30	12.20%
Dark-eyed Junco	I/A	4	1.63%
Great Blue Heron	F	1	0.41%
Gray Flycatcher	I/A	4	1.63%
Hermit Thrush	I/G	2	0.81%
House Finch	S	2	0.81%
Magnolia Warbler	I/G	2	0.81%
Mountain Chickadee	I/G	9	3.66%
Mourning Dove	S	4	1.63%
Northern Flicker	I/G	4	1.63%
Orange-crowned Warbler	I/G	4	1.63%
Pine Siskin	S	3	1.22%
Pygmy Nuthatch	I/G	2	0.81%
Sage Sparrow	I/G	1	0.41%
Solitary Vireo	I/G	17	6.91%
Spotted Towhee	I/G	11	4.47%
Steller's Jay	O	5	2.03%
Violet-green Swallow	I/A	57	23.17%
Virginia's Warbler	I/G	10	4.07%
White-breasted Nuthatch	I/G	4	1.63%
Western Tanager	I/G	5	2.03%
Wilson's Warbler	I/G	2	0.81%
White-throated Swift	I/A	2	0.81%
Western Wood-Pewee	I/A	1	0.41%
Yellow Warbler	I/G	1	0.41%
Yellow-rumped Warbler	I/G	3	1.22%
TOTAL		246	100.00%

I = Insects (G = surface forage; A = aerial forage); N = Nectar; F = Fish; S = Seed; O = Omnivorous; C = Carrion.

Table 5 - Lower Pueblo Canyon:

Transect consisted of 9 points and began west of the sewage treatment plant outfall and proceeded east. Survey conducted on July 24, 2001.

Species	Diet	Number Seen	Relative Abundance
Acorn Woodpecker	I/G	1	0.85%
American Robin	I/G	7	5.93%
Ash-throated Flycatcher	I/A	3	2.54%
Black-headed Grosbeak	I/G	1	0.85%
Broad-tailed Hummingbird	N	8	6.78%
Cassin's Kingbird	I/A	6	5.08%
Canyon Towhee	I/G	2	1.69%
Canyon Wren	I/G	3	2.54%
Chipping Sparrow	I/G	2	1.69%
Clark's Nutcracker	O	2	1.69%
Common Nighthawk	I/A	2	1.69%
Common Raven	O/C	1	0.85%
Grace's Warbler	I/G	1	0.85%
Lesser Goldfinch	S	9	7.63%
Mountain Chickadee	I/G	1	0.85%
Mourning Dove	S	5	4.24%
Northern Flicker	I/G	6	5.08%
Pine Siskin	S	12	10.17%
Solitary Vireo	I/G	2	1.69%
Pygmy Nuthatch	I/G	6	5.08%
Red Tailed Hawk	M	1	0.85%
Spotted Towhee	I/G	11	9.32%
Steller's Jay	O	6	5.08%
Townsend's Solitaire	I/A	1	0.85%
Violet-green Swallow	I/A	19	16.10%
TOTAL		118	100.00%
I = Insects (G = surface forage; A = aerial forage); N = Nectar; F = Fish; S = Seed; O = Omnivorous; C = Carrion.			

Table 6 - Lower Pueblo Canyon:

Transect consisted of 7 points and began west of the sewage treatment plant outfall and proceeded east. Survey conducted on September 26, 2002.

Species	Diet	Number Seen	Relative Abundance
Acorn Woodpecker	I/G	9	4.71%
Chipping Sparrow	I/G	1	0.52%
Common Raven	O/C	8	4.19%
Dark-eyed Junco	S	1	0.52%
House Finch	S	15	7.85%
Lesser Goldfinch	S	1	0.52%
Mountain Chickadee	I/G	7	3.66%
Northern Flicker	I/G	12	6.28%
Pygmy Nuthatch	I/G	32	16.75%
Red Crossbill	S	3	1.57%
Scrub Jay	O	7	3.66%
Spotted Towhee	I/G	6	3.14%
Steller's Jay	O	3	1.57%
Townsend's Solitaire	I/A	6	3.14%
Warbling Vireo	I/G	1	0.52%
White-breasted Nuthatch	I/G	2	1.05%
White-crowned Sparrow	I/G	1	0.52%
Wilson's Warbler	I/G	4	2.09%
White-throated Swift	I/A	70	36.65%
Yellow-rumped Warbler	I/G	2	1.05%
TOTAL		191	100.00%
I = Insects (G = surface forage; A = aerial forage); N = Nectar; F = Fish; S = Seed; O = Omnivorous; C = Carrion.			

Table 7 - Lower Pueblo Canyon:

Transect consisted of 7 points and began west of the sewage treatment plant outfall and proceeded east. Survey conducted on May 22, 2003.

Species	Diet	Number Seen	Relative Abundance
American Robin	I/G	10	6.94%
Ash-throated Flycatcher	I/A	3	2.08%
Black-headed Grosbeak	I/G	7	4.86%
Chipping Sparrow	I/G	3	2.08%
Common Raven	O/C	6	4.17%
Gray Flycatcher	I/A	1	0.69%
Green-tailed Towhee	I/G	1	0.69%
House Finch	S	7	4.86%
Mourning Dove	S	9	6.25%
Northern Flicker	I/G	3	2.08%
Pine Siskin	S	1	0.69%
Pygmy Nuthatch	I/G	10	6.94%
Rock Wren	I/G	1	0.69%
Scrub Jay	S/I/G	1	0.69%
Song Sparrow	I/G	5	3.47%
Solitary Vireo	I/G	1	0.69%
Spotted Towhee	I/G	10	6.94%
Violet-green Swallow	I/A	40	27.78%
Virginia's Warbler	I/G	7	4.86%
Western Bluebird	I/A	6	4.17%
Western Tanager	I/G	6	4.17%
Western Wood-Pewee	I/A	4	2.78%
Yellow-rumped Warbler	I/G	2	1.39%
TOTAL		144	100.00%
I = Insects (G = surface forage; A = aerial forage); N = Nectar; F = Fish; S = Seed; O = Omnivorous: C = Carrion.			

Table 8 - Upper Los Alamos Canyon:

Transect consisted of 9 points and began just east of the TA-2 boundary and proceeded east. Survey conducted on July 19, 2001.

Species	Diet	Number Seen	Relative Abundance
American Robin	I/G	9	7.83%
Ash-throated Flycatcher	I/A	1	0.87%
Blue-grey Gnatcatcher	I/G	1	0.87%
Broad-tailed Hummingbird	N	5	4.35%
Canyon Wren	I/G	6	5.22%
Chipping Sparrow	I/G	2	1.74%
Clark's Nutcracker	O	1	0.87%
Common Nighthawk	I/A	1	0.87%
Common Raven	O/C	2	1.74%
Grey Flycatcher	I/A	1	0.87%
Hermit Thrush	I/G	1	0.87%
Juniper Titmouse	I/G	1	0.87%
Lesser Goldfinch	S	2	1.74%
Mountain Chickadee	I/G	7	6.09%
Northern Flicker	I/G	3	2.61%
Pine Siskin	S	24	20.87%
Solitary Vireo	I/G	1	0.87%
Pygmy Nuthatch	I/G	3	2.61%
Rock Wren	I/G	4	3.48%
Scrub Jay	O	2	1.74%
Spotted Towhee	I/G	12	10.43%
Steller's Jay	O	1	0.87%
Violet-green Swallow	I/A	9	7.83%
Warbling Vireo	I/G	1	0.87%
White-breasted Nuthatch	I/G	2	1.74%
Western Tanager	I/G	3	2.61%
White-throated Swift	I/A	1	0.87%
Western-wood Pewee	I/A	8	6.96%
TOTAL		114	100%
I = Insects (G = surface forage; A = aerial forage); N = Nectar; F = Fish; S = Seed; O = Omnivorous; C = Carrion.			

Table 9 - Upper Los Alamos Canyon:

Transect consisted of 5 points and began just east of the TA-2 boundary and proceeded east. Survey conducted on May 20, 2003.

Species	Diet	Number Seen	Relative Abundance
American Robin	I/G	1	1.03%
Ash-throated Flycatcher	I/A	3	3.09%
Black-headed Grosbeak	I/G	2	2.06%
Black-throated Gray Warbler	I/G	2	2.06%
Broad-tailed Hummingbird	N	16	16.49%
Canyon Towhee	S	2	2.06%
Canyon Wren	I/G	3	3.09%
Common Raven	O/C	5	5.15%
Downy Woodpecker	I/G	4	4.12%
Gray Flycatcher	I/A	1	1.03%
Mountain Chickadee	I/G	6	6.19%
Northern Flicker	I/G	1	1.03%
Solitary Vireo	I/G	4	4.12%
Spotted Towhee	I/G	5	5.15%
Townsend's Solitaire	I/A	2	2.06%
Violet-green Swallow	I/A	21	21.65%
White-breasted Nuthatch	I/G	2	2.06%
Western Tanager	I/G	8	8.25%
White-throated Swift	I/A	1	1.03%
Western Wood-Pewee	I/A	2	2.06%
Yellow-rumped Warbler	I/G	6	6.19%
TOTAL		97	100.00%
I = Insects (G = surface forage; A = aerial forage); N = Nectar; F = Fish; S = Seed; O = Omnivorous; C = Carrion.			

Table 10 - Lower-Los Alamos Canyon:

Transect consisted of 9 points that began in lower Los Alamos Canyon at the confluence with DP canyon and proceeded east. Survey conducted on May 29, 2003.

Species	Diet	Number Seen	Relative Abundance
American Robin	**I/G**	**1**	**0.69%**
Ash-throated Flycatcher	**I/A**	**6**	**4.14%**
Black-headed Grosbeak	**I/G**	**2**	**1.38%**
Broad-tailed Hummingbird	**N**	**2**	**1.38%**
Canyon Wren	**I/G**	**7**	**4.83%**
Common Raven	**O/C**	**5**	**3.45%**
Downy Woodpecker	**I/G**	**1**	**0.69%**
Dusky Flycatcher	**I/A**	**1**	**0.69%**
Gray Flycatcher	**I/A**	**2**	**1.38%**
Mountain Chickadee	**I/G**	**4**	**2.76%**
Mourning Dove	**S**	**9**	**6.21%**
Northern Flicker	**I/G**	**6**	**4.14%**
Orange-crowned Warbler	**I/G**	**1**	**0.69%**
Pygmy Nuthatch	**I/G**	**3**	**2.07%**
Solitary Vireo	**I/G**	**1**	**0.69%**
Spotted Towhee	**I/G**	**7**	**4.83%**
Steller's Jay	**O**	**2**	**1.38%**
Violet-green Swallow	**I/A**	**52**	**35.86%**
Virginia's Warbler	**I/G**	**3**	**2.07%**
Warbling Vireo	**I/G**	**2**	**1.38%**
Western Bluebird	**I/A**	**1**	**0.69%**
Western Tanager	**I/G**	**12**	**8.28%**
Rock Wren	**I/G**	**4**	**2.76%**
White-throated Swift	**I/A**	**5**	**3.45%**
Western Wood-Pewee	**I/A**	**7**	**4.83%**
TOTAL		**145**	**100.00%**
I = Insects (G = surface forage; A = aerial forage); N = Nectar; F = Fish; S = Seed; O = Omnivorous; C = Carrion.			

Table 11 - DP Canyon:

Transect consisted of 9 points and began at the top of the canyon and proceed east. Survey conducted on June 13, 2003.

Species	Diet	Number Seen	Relative Abundance
American Robin	I/G	3	1.70%
Ash-throated Flycatcher	I/A	1	0.57%
Brown-headed Cowbird	I/G	2	1.14%
Black-headed Grosbeak	I/G	7	3.98%
Brown Creeper	I/G	1	0.57%
Broad-tailed Hummingbird	N	7	3.98%
Canyon Wren	I/G	1	0.57%
Common Raven	O/C	4	2.27%
Dark-eyed Junco	S	2	1.14%
Grey Flycatcher	I/A	1	0.57%
Hairy Woodpecker	I/G	8	4.55%
House Finch	S	1	0.57%
Mountain Chickadee	I/G	5	2.84%
Mourning Dove	S	3	1.70%
Northern Flicker	I/G	2	1.14%
Orange-crowned Warbler	I/G	3	1.70%
Pygmy Nuthatch	I/G	25	14.20%
Scrub Jay	I/G	5	2.84%
Solitary Vireo	I/G	4	2.27%
Spotted Towhee	I/G	14	7.95%
Steller's Jay	S/I/G	2	1.14%
Townsend's Solitaire	I/A	1	0.57%
Violet-green Swallow	I/A	20	11.36%
Virginia's Warbler	I/G	11	6.25%
White-breasted Nuthatch	I/G	10	5.68%
Western Bluebird	I/A	3	1.70%
Western Tanager	I/G	7	3.98%
Western Wood-Pewee	I/A	23	13.07%
TOTAL		176	100.00%
I = Insects (G = surface forage; A = aerial forage); N = Nectar; F = Fish; S = Seed; O = Omnivorous; C = Carrion.			

Table 12 - Guaje Canyon:

Transect consisted of 7 points in lower Guaje Canyon. Survey conducted on June 3, 2003.

Species	Diet	TOTAL	Relative Abundance
American Robin	I/G	5	4.63%
Black-chinned Hummingbird	N	3	2.78%
Bewick's Wren	I/G	4	3.70%
Black-headed Grosbeak	I/G	6	5.56%
Brown Creeper	I/G	2	1.85%
Bushtit	I/G	5	4.63%
Common Raven	O/C	5	4.63%
Dusky Flycatcher	I/A	1	0.93%
Gray Flycatcher	I/A	5	4.63%
Green-tailed Towhee	I/G	1	0.93%
Hairy Woodpecker	I/G	4	3.70%
House Finch	S	2	1.85%
Mountain Chickadee	I/G	1	0.93%
Mourning Dove	S	6	5.56%
Orange-crowned Warbler	I/G	5	4.63%
Pygmy Nuthatch	I/G	3	2.78%
Ruby-crowned Kinglet	I/G	3	2.78%
Solitary Vireo	I/G	5	4.63%
Spotted Towhee	I/G	4	3.70%
Steller's Jay	O	3	2.78%
Violet-green Swallow	I/A	5	4.63%
Warbling Vireo	I/G	4	3.70%
White-breasted Nuthatch	I/G	1	0.93%
Western Tanager	I/G	14	12.96%
Western Wood-Pewee	I/A	10	9.26%
Yellow-rumped Warbler	I/G	1	0.93%
TOTAL		108	100.00%
I = Insects (G = surface forage; A = aerial forage); N = Nectar; F = Fish; S = Seed; O = Omnivorous; C = Carrion.			

CONCLUSION:

The site surveys employed in this study only provide a limited estimate of the species diversity for each location at the time of survey. Bird populations will vary between years and within years depending on the season. Additionally, environmental factors such as droughts or fires can significantly affect avian population dynamics in the short-term. To begin to detect permanent trends in avian populations, all sites would require annual surveys over a longer period of time. To detect any potential effects from sources

of environmental contaminates, an invasive and long-term monitoring program would need to be established.

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