



Final Report:

**Pipe Spring National Monument
Avian Inventory, 1998-2001**

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SUMMARY

Pipe Spring National Monument and the surrounding Kaibab-Paiute Indian Reservation are part of a predominantly arid landscape comprised of desert shrublands and pinyon-juniper woodlands. Pipe Spring is one of few perennial water sources on the Arizona Strip that provide an important resource for resident bird populations and is also essential migratory stopover habitat for neotropical migrants heading either to their breeding or wintering grounds.

From 1999 - 2001, we conducted breeding and non-breeding (winter and migration) bird surveys at Pipe Spring National Monument, Arizona and on adjacent Kaibab Paiute tribal lands administered by the National Park Service and the Kaibab Paiute Indian Reservation, respectively. Non-breeding winter surveys were conducted between November – February, spring migration surveys were conducted between 15 April – 15 May and fall migration surveys from 15 August – 15 September. During the breeding season, we conducted 142 VCP point count surveys in two habitat types (pinyon-juniper and desert scrubland) between 15 May -15 July and recorded 45 species. In the same time period we conducted incidental surveys in the small riparian areas, housing area, and livestock corrals, detecting an additional 25 species. Nocturnal surveys detected two owl species, Great-horned Owl and Northern Pygmy Owl. During breeding season surveys we detected 3 bird species that had not previously been recorded breeding in the park. Nest searching conducted in the housing area, windbreak (riparian zone), pinyon/juniper and shrubland habitats detected 48 nests of 13 different species. During non-breeding winter surveys, we detected a total of 36 species, including 18 year-round, resident species. Migration surveys were conducted in both spring and fall. We detected 11 species during spring migration that used the monument as only stopover habitat and 17 species during fall migration. None of these migrating species breed or winter at Pipe Spring National Monument or the surrounding area.

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INTRODUCTION

Pipe Spring National Monument is a 40 acre monument that lies at the base of the Vermilion Cliffs along the northern border of the Arizona Strip, 14 miles west of Fredonia, Arizona. Separated from the rest of the state by the Grand Canyon, the Arizona Strip consists of a series of rugged plateaus, each ending abruptly at its western edge with a steep escarpment and deeply cut by canyons draining toward the Colorado River. With the exception of the high Kaibab Plateau and a few mountains, the Arizona Strip is a desert scrubland, covered primarily with sagebrush (*Artemisia spp.*), saltbush (*Atriplex spp.*), and rabbitbrush (*Chrysothamnus spp.*), and pinyon/juniper. Pipe Spring National Monument is on the Moccasin Terrace of the Markagunt Plateau at the southern sloping base of the Vermilion cliffs at an elevation of 1,524 meters (5000 ft). The climate is temperate, and the vegetation species are semi-desert. From the monument, dry upland desert (Arizona Strip) extends southward for 48 Kilometers (30 miles) before it descends into the Grand Canyon. The Monument is entirely surrounded by the Kaibab-Paiute Indian Reservation. As one of few perennial water sources on the Arizona Strip, the springs of Pipe Spring provide a vital resource for resident bird populations and may also be vital as a breeding site and migratory stopover for neotropical migrants heading either to their breeding or wintering grounds.

During pioneer occupation, Pipe Spring was operated as a cattle ranch and the surrounding natural vegetation was heavily grazed. In fact, livestock grazing is intricately intertwined in the history of Pipe Spring and has greatly impacted the natural habitat and determined present day conditions (see pinyon-juniper, sagebrush and urbanization ecology and management, below). As reported in Alexander (1998), livestock operations started at Pipe Spring in 1873 with only 143 cattle, while over 11,000 sheep were grazing in the Pipe Spring area in 1872. By 1878, 2947 cattle were on the rangeland, and in 1879, the total decreased to 2603 along with 192 horses. Then, by 1901, most of the Arizona Strip, excluding the Pipe and Moccasin Springs, had an estimated 25,000 cattle on it. West and south of Pipe Spring, during 1915 to 1917, goats were grazed. Additionally, these figures exclude the number of cattle that were driven from the free range of the Arizona Strip to drink at Pipe Spring that represented one of the few water sources on the Arizona Strip and so was heavily exploited. The photographs of Pipe Spring during the period from 1891 through 1930 all thoroughly show the impacts of intensive grazing (Alexander 1998).

It was not until the mid-twentieth century that the vegetation of Pipe Spring started to recover from the grazing impacts of the past. The C.G. Crampton collection from Special Collections at the University of Utah consists of 45 photographs of the Pipe Spring National Monument taken from 1952 to 1971, most of which show vegetation much like that which exists on the monument today (Alexander 1998).

Pipe Spring Habitat and Vegetation

The species composition and plant communities that occurred at Pipe Spring prior to grazing are not known. Currently, the Monument supports two major vegetation types: a scrubland/shrubsteppe community and a pinyon- juniper community. The northwest section of

the park is a pinyon-juniper woodland with a woody shrub, perennial grass, and annual forb understory. This habitat type extends into the Kaibab Paiute Indian Reservation. The eastern and southwestern region of the monument is shrubland and shrubsteppe (areas of shrubland/grassland mosaic), with sagebrush (*Artemisia* spp.), saltbush (*Atriplex* spp.), and rabbitbrush (*Chrysothamnus* spp.), and small patches of perennial grassland and annual forb understory. This habitat type also extends into the adjacent Kaibab Paiute Indian Reservation.

Specifically, the shrubland/shrubsteppe community is a sagebrush vegetation community composed of the saltbush (*Atriplex*)- sagebrush (*Artemisia*) association that is dominated by shadscale saltbush (*Atriplex confertifolia*, *Atriplex canescens*), bigelow sage (*Artemisia bigelovii*), big sagebrush (*Artemisia tridentata*), gray threadleaf snakeweed (*Gutierrezia glomerella*, *Gutierrezia microcephala*), winterfat (*Eurotia lanata*), Southern goldenbush (*Isocoma pluriflora*), and rubber rabbitbush (*Chrysothamnus graveolens*).

Currently the pinyon-juniper plant community occupies a small portion of the northwest corner of the monument, yet is one of most predominant habitat types adjacent to the monument. The pinyon-juniper zone is dominated by two-needle pinyon (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), sagebrush (*Artemisia* spp.), Utah serviceberry (*Amelanchier utahensis*), roundleaf buffaloberry (*Shepherdia rotundifolia*), green rabbitbrush (*Chrysothamnus viscidiflorus*), snakeweed (*Gutierrezia* spp., *Cowania mexicana*), Mormon tea (*Ephedra viridis*), yucca (*Yucca* spp.), and Cactus (*Opuntia* spp.).

In addition to these “natural” communities, Pipe Spring NM contains a third habitat comprised of buildings, roads, man-made ponds, the springs, orchards, ornamental vegetation, and livestock corrals. We call this the “urbanized” community type.

Historically there have been three springs at the Monument. Pipe Spring, the main spring, emerged from beneath the fort; Tunnel Spring, located southwest of the fort, and West Cabin spring. The springs are fed by the Navajo Sandstone aquifer to the north and west, via the Sevier Fault. The West Cabin Spring flows naturally in the monument, creating a small riparian area southwest of the cabin.

In June of 1999, Pipe Spring ceased to flow for the first time on record. This spring, located beneath the fort known as “Winsor Castle” was divided into two flows. One flowed through an historic subsurface trench to an emergence point outside the west gate of the Castle, known as Big Spring. The second flow was piped beneath the Castle courtyard into and through the Castle’s Spring Room. The runoff from both Big Spring and the Spring Room fed historic masonry ponds south of the Castle. These ponds drain into the windbreak where culturally introduced plants are located, which includes a variety of shade trees. It was not until November of 2000 that water was returned to the ponds (culinary water was piped in). This lack of water in the ponds and in the windbreak, have negatively affected the bird community at the monument.

The windbreak, which is considered the riparian zone of the monument, is one of the main attractants of many bird species, particularly during migration in the spring and fall. The vegetation on the north end of the windbreak is mainly white poplar (*Populus alba*). The south

end of the windbreak adjacent to the south corral is mainly trees of heaven (*Ailanthus altissima*). Throughout the windbreak there are fruit trees and a grape arbor.

The area known as “the meadow” in the southwest portion of the monument historically received water from Tunnel Spring. Later and now water in this area is from the over flow of the ponds. This area “the meadow” was associated with a pond that was constructed in 1926. This area consists mainly of coyote willow (*Salix exigua*) trees growing in what is now a dry drainage channel. Typically, coyote willow grows where the soil is saturated for most of the year; it is not usually found in intermittent streambeds. The water from this pond was used to irrigate the land around and below the pond. This pond was filled in the late 1960’s or early 1970’s. During this time, run off from the meadow pond, and perhaps from the fort ponds, watered the willows. After the pond was filled in, water runoff from the fort ponds was and currently is the primary water source for this area. The construction of the horse corral and any diversion of the water draining from the main ponds east of the fort again altered the drainage patterns of this area. Therefore, the arid condition of the meadow has now allowed *Atriplex canescens* and *Chrysothamnus nauseosus* to invade and to become established. Presently, very little riparian vegetation exists in this area.

The residence area located at the south end of the park is another major attractant of many bird species at Pipe Spring National Monument. Residence housing was established in 1959 and has expanded since. The vegetation consists of a mix of many introduced species. These include: Lombardy poplar (*Populus nigra*) Carolina poplar (*Populus Canadensis*), an assortment of fruit tress, ornamental junipers, mulberry shrubs (*Morus spp.*), plum thickets (*Prunus spp.*) and lawns.

There are two corrals located within the monuments boundary. One is located on the north end while the other is located on the south end. Livestock occupies both. The windbreak is the eastern border of the south corral while saltbush and sage border the west end. The north corral is bordered by pinyon-juniper on the north end and an historic structure.

The monument, while primarily a historical park and relatively small (40 acres), provides a diversity of resources for birds. The spring waters emerge from several locations and provide a unique resource in an arid landscape, providing suitable drinking areas for bird species, and supporting riparian vegetation, including large deciduous trees that provide food (insects), cover, and nesting areas for many birds. Overall, bird life, especially during migration, may be considered abundant.

Understanding the relationship between habitat and the bird species or bird community is of key importance for management and conservation of avian resources. This is especially true of the bird community at Pipe Spring National Monument and the surrounding Kaibab Paiute tribal lands. Pipe Spring has important breeding sites for neotropical migrants and year-round residents, yet very little is known about the avifauna at this National Park and the surrounding area. Recognizing the need for more information regarding the bird community, Pipe Spring National Monument initiated and supported this study.

OBJECTIVES

A main objective of this three-year study has been to develop and implement standardized baseline inventories of the breeding and non-breeding birds and the habitats they use within Pipe Spring National Monument and the surrounding Kaibab Paiute tribal lands. This report summarizes the results of this inventory.

The second major objective of this study has been to develop recommendations for monitoring avian resources at Pipe Spring NM and the surrounding area. These recommendations have been developed with the recognition that the National Park Service's Northern Colorado Plateau network (that includes Pipe Spring NM and Parks in the vicinity; i.e., Parashant National Monument, Zion National Park and Cedar Breaks National Park), is in the process of determining monitoring priorities for the region and designing a long-term monitoring program for National Park resources. Therefore, our recommendations include guidelines from the Northern Colorado Plateau network for designing a monitoring program. In addition, we provide more specific suggestions for monitoring the birds of Pipe Spring NM, should this be determined a priority. These recommendations for monitoring are based on the information gathered during the inventory stage.

Specifically, the objectives of this project were to:

- 1) Determine the occurrence of breeding and non-breeding bird species in the habitats at Pipe Spring National Monument and the surrounding Kaibab Paiute tribal lands. Record and calculate frequency of occurrence and species richness at selected sites within the monument and surrounding lands.
- 2) Develop recommendations for a long-term avian monitoring program for Pipe Spring National Monument and the surrounding Kaibab Paiute tribal lands. Identify specific sites as monitoring sites where permanent point count stations will be established. NPS personnel will then be able to continue this program in the future.
- 3) Produce a final report, and lay the foundation for annual reports, that will assist National Park Service managers in developing resource management plans that would protect habitat for threatened and endangered or sensitive avian species at Pipe Spring National Monument. This information will also help in assessing the impacts of internal operations.
- 4) To provide the monument with an annotated checklist of avian species that occur in the monument and the surrounding tribal lands.
- 5) Conduct a literature search to find historic and recent data regarding the birds of Pipe Spring National Monument and the Arizona Strip.

METHODS

For measuring breeding birds we used the variable circular plot point count method, spot-mapping, nest searching, and specific surveys for the housing area, corrals, and owl and raptor species. For non-breeding migration surveys we used mist-netting and incidental searches. For non-breeding winter surveys we employed incidental searches, raptor surveys, and corral surveys. The methods for these surveys are described below.

Breeding Season Variable Circular Plot Point Count Surveys

At Pipe Spring N.M., we found that point count surveys were more appropriate than walking surveys because a stationary observer spends more time searching for birds and less time watching the path of travel.

Birds were surveyed using the variable circular plot point count method (VCP) as described in detail by Fancy (1997) and Ralph et al. (1995). VCP transects were established in both the scrub and pinyon-juniper habitats. Depending on stand size and shape we established three to ten point count stations, located 200 meters apart, in each habitat type (Table 1). Three visits were conducted to cover the period in which the greatest number of passerine bird species would be exhibiting breeding behavior such as territorial singing and calling. Visits were started at sunrise and completed by 1000. No visits lasted beyond 1000. At each point count station the observer recorded all individual birds seen or heard during 7 minutes with counting being subdivided into 3 periods: 0-3 minutes, 3-5 minutes and 5-7 minutes. Counting began immediately after arriving at a station. For each species heard or seen during the count, we estimated the horizontal distance between the observer and the bird. If the bird was not seen, the observer estimated the distance to a tree or bush or other object where they thought the bird was located. Birds flying over during the count were recorded in the same time periods but with no estimates of distance.

Table 1. The number of point count stations per habitat at Pipe Spring National Monument and adjacent Kaibab Paiute tribal land, during breeding season (May – June) 2000-2001.

Habitat Type	Number of Stations		Total
	Pipe Spring National Monument	Kaibab Paiute tribal lands	
Scrub Habitat	3	7	10
Pinyon/Juniper Habitat	1	9	10
Wind break/orchard	1	0	1

Additional notes were taken regarding whether detections were songs, calls, or other (drumming, wings), whether the detection is aural, visual or both, and whether the bird was detected from previous point count stations to avoid double counting individuals. Birds flushed while walking between point count stations were also noted and recorded. Field sheets were modeled after those recommended by Ralph et al. (1995).

Incidental Breeding Surveys

Most bird survey methods provide good information for common species, but relatively sparse

information for rare or secretive species. This does not mean the survey method is invalid; rather, it is a reflection of the difficulty of sampling rare and secretive species using general methods. Therefore, in addition to the point counts, incidental searches were conducted of all habitats during the breeding and non-breeding periods to increase the chance of detecting rare and secretive species that occur in the park. During incidental surveys, personnel went to the different habitats where point count surveys had been established and recorded all species they saw or heard, habitat type, location of the bird, date, and general behavior. These surveys were conducted in conjunction with the standard survey protocol (i.e., point counts) during the breeding season.

Non-breeding Migration Surveys

We used the constant-effort mist net technique to inventory birds that use Pipe Spring as stopover habitat during the spring and fall migrations; we also conducted incidental search surveys in all habitats in order to detect birds not captured in mist nets. Surveys and mist-netting were conducted during the 1999-2001 spring and fall migration periods. We used five 12 m x 2.5 m mist nets located in the riparian zone below the ponds. Nets were placed in the same locations during each netting session.

Non-breeding Winter Surveys

During the non-breeding, non-migratory season (December – January) we adopted the incidental search method for its appeal to volunteers and due to the small, concentrated area at Pipe Spring NM. This method mimics the technique a birder would use while searching for birds in a given area (Ralph et al. 1993). Each plot is selected according to the habitat type with a buffer of at least 25 m between each habitat type. The observer records the number of birds of each species seen and heard, the substrate they were observed using and the behavior occurring at the time the bird was observed. These surveys were conducted between 0900 and 1200, with an extra visit made in the late afternoon in order to increase the probability of detecting vultures, buteos, or any other birds not found in early morning (Robbins 1981).

Corral Surveys

The corrals represent unique habitat and we wanted to document what bird species use this resource. Surveyors conducted surveys at least once per week from 1 May through 15 July 2000. Additionally, surveys were completed throughout the year. Survey times varied between 0600-1600, and were staggered each week in order to arrive at both sites at varying times throughout the day. Surveys began on the hour and lasted for 30 minutes. During the surveys all bird species were detected by sight and song.

We recorded the species, number observed, sex, and foraging behavior every 10 minutes throughout each survey period. We noted the specific foraging substrate within the site, and, when possible, what each bird was consuming (e.g., grain, dung, insects).

Housing Area Surveys

Surveys in the housing complex at Pipe Spring National Monument consisted of incidental search surveys that were conducted from April – July 1999-2001. This method mimics the technique a birder would use while searching for birds in a given area (Ralph et al. 1993). The observer recorded the number of birds of each species seen and heard, the substrate they were observed using and the behavior occurring at the time the bird was observed. These surveys were conducted between 0900 and 1100.

Nest Surveys

During the breeding season, after conducting point count surveys in the morning, we searched for nests of all bird species using the methods described by Martin and Geupel (1993). Most nests were located by observing the behavior of the breeding birds, but nests were also located by systematically searching appropriate nesting substrates. Care was taken to avoid disturbing nesting birds or alerting predators to the presence of the nest. Nests were monitored every 3 to 4 days to determine nest fate, as per Martin and Geupel (1993).

Spot Mapping Surveys

Spot-mapping surveys were conducted only in the windbreak/riparian zone at Pipe Spring National Monument during the breeding season because the windbreak is a relatively small area that encompasses unique habitat (i.e., cottonwoods, orchards, and the natural spring runoff water diverted through this area) that attracts high concentrations of species. This method is labor-intensive, and was used solely during the 2000 breeding season. This survey method consists of marking the locations of observed birds on a detailed map during several visits ($n = 8$) within the breeding season in order to determine the number of territories for each species in an area and to estimate density of each species.

We spot mapped the windbreak area from 0530-1000 when the birds sing most actively, from 1 June through 15 July 2000. Maps of this area were drawn to scale (1:2000). During each visit the whole area was covered evenly. Observers walked with moderate speed and recorded all birds heard or seen during the entire visit. Stops were frequently made to hunt for simultaneous detections of different individuals of the same species, and to listen and mark the birds on the map.

Owl and Diurnal Raptor Surveys

Nocturnal birds (specifically owls) were surveyed using taped broadcasts. Caprimulgids (i.e., Common Poor-wills, (*Phalaenoptilus nuttallii*), and Lesser Nighthawks, (*Chordeiles minor*) are vocal enough that playback recordings are rarely needed during these surveys. Owls, however, have been effectively surveyed using tape broadcasts and human vocalizations of the owl species songs and calls (Springer 1978, Forsman 1983). These surveys were conducted in all possible suitable habitats, or where historical sightings had been noted. Tape broadcasts of vocalizations were played for 15 minutes at each designated point. Surveys were conducted between 1 hour after sunset and 1 hour before sunrise. We conducted four surveys during the breeding season.

Survey data included species encountered, number of individuals detected of each species, habitat, location, dates, and evidence of breeding status (i.e. courtship behavior, nests). All other nocturnal and crepuscular species were also noted.

Diurnal raptor surveys consisted of incidental surveys and incidental search surveys. All raptors detected during and between the surveys mentioned above were recorded. Additionally, we conducted incidental search surveys, in all seasons, specifically for diurnal raptors in the afternoons, when thermals had formed and there was a higher probability of detection than the regular early morning bird surveys. Date, time of detection, location, species, and number of individuals detected were recorded during these surveys

ANALYSIS

Estimating Breeding Bird Richness, Relative Abundance and Density

It is rarely possible to count all of the birds that are actually present in an area, and therefore it is desirable to estimate the proportion of birds that were present but not detected. Distance sampling (a type of VCP survey) provides a methodology for estimating the density of bird populations using the software program DISTANCE (Buckland et al. 1993). We employed distance sampling because it is the most established method for estimating detectability and density, and the sampling can be conducted by only one person. This method has been used for more than 30 years to estimate animal abundance. It has been found to be a reliable method for estimating relative abundance and population trends for many bird species and is currently being used to sample birds in many National Parks (Fancy 1997, Nelson and Fancy 1999).

Unfortunately, in order to analyze sampling data using the DISTANCE program, it is necessary to have a minimum of 100 detections for each species for which you want to estimate density (number per area). We were unable to sample enough point counts while maintaining the required distance between point count locations to acquire the needed sample sizes, even for the most common species. Therefore, we report the point count data as the relative abundance, not the density, of each species in the habitats sampled in Pipe Spring NM and the surrounding tribal lands that were sampled. The relative abundance reported consists of the total number of detections (all point counts combined for the entire breeding season) for each species. Species richness is defined as the total number of species per habitat.

RESULTS

This section describes results from three and half years of avian survey work at Pipe Spring National Monument (1998-2001). Several types of surveys were conducted, and the results of each survey type are presented, including:

- breeding season variable circular plot point count surveys;
- breeding season incidental observation surveys;
- non-breeding migration surveys;
- non-breeding winter surveys;
- corral surveys;
- housing area surveys;
- nest surveys;
- spot-mapping surveys; and
- owl and raptor surveys.

Breeding Season Variable Circular Plot Point Count Surveys

Survey Effort

A total of 16.6 hours of point count surveys were conducted during the 2000 and 2001 breeding seasons combined (this does not include the time traveling between points). In 2000, we conducted 42 point count surveys in desert scrub habitat and 60 in pinyon-juniper habitat. In 2001, we conducted 16 point count surveys in desert scrub habitat and 24 in pinyon-juniper habitat (Table 2).

Table 2. Summary of point count survey effort, Pipe Spring National Monument, 2000-2001.

Year	Habitat	# Visits	# Points/Visit	#Hrs. of Survey
2000	Desert Scrub	6	7	11.9
	Pinyon-Juniper	6	10	
2001	Desert Scrub	2	8	4.7
	Pinyon-Juniper	3	8	

Species Richness

In 2000, we detected 545 individuals of 44 species; in 2001, we detected 182 birds of 29 species. Combining both years, we detected a total of 727 individuals of 45 species (Table 3).

Overall, the Black-throated Sparrow (BTSP) was the most commonly detected bird; it accounted for 16% of all detections (115 of 722). In desert shrubland habitat the BTSP was also the most commonly detected bird, accounting for 32% of all detections; the most commonly detected bird in pinyon-juniper was the Bewick's Wren, accounting for 12.6% of all detections in that habitat.

Table 3. Species and total number of individuals detected during all point count surveys combined, 2000-2001, Pipe Spring National Monument. Species are ordered in decreasing frequency of total detections; the number of detections for each species in pinyon-juniper and desert scrub habitats is also provided. Species detected in 2000 and 2001 point count surveys are indicated by an X in the respective columns. Status: B = Breeder in area; PB = Probable Breeder; M = Migrant; W = Winter Resident.

Rank	Status	Common Name	2000	2001	PJ	Scrub	Total
1	B,R	Black-throated Sparrow	X	X	25	90	115
2	B,R	Bewick's Wren	X	X	56	12	68
3	B,R	Bushtit	X	X	59	-	59
4	B	Ash-throated Flycatcher	X	X	43	7	50
5	B,R	Western Scrub-Jay	X	X	43	-	43
6	B	Gray Vireo	X	X	36	-	36
7	B,R	House Finch	X	X	18	17	35
8	B	Brown-headed Cowbird	X	X	24	6	30
9	B	Mourning Dove	X	X	21	7	28
10	B	Northern Mockingbird	X	X	5	21	26
11	B	Blue-gray Gnatcatcher	X	X	25	-	25
12	B	Cassin's Kingbird	X	X	-	23	23
13	B	Violet-green Swallow	X		6	12	18
14	B?	Northern Rough-winged Swallow	X		1	13	14
15	B,R	Say's Phoebe	X	X	5	7	12
16	B	Black-chinned Hummingbird	X		3	8	11
16	PB	White-throated Swift	X	X	8	3	11
18	B	Bullock's Oriole	X		-	10	10
18	B	Green-tailed Towhee	X	X	10	-	10
18	B	Juniper Titmouse	X	X	10	-	10
18	B	Scott's Oriole	X	X	10	-	10
18	B	Western Meadowlark	X	X	1	9	10
23	B	Common Raven	X	X	1	7	8
24	B	Rock Wren	X	X	2	5	7
25	PB	Black-throated Gray Warbler	X	X	6	-	6
25	B	Western Kingbird	X	X	-	6	6
27	B?	Black-chinned Sparrow	X		5	-	5
27	B	Canyon Wren	X		5	-	5
29	PB?	Brewer's Sparrow	X	X	-	4	4
29	B,R	Lesser Goldfinch	X		4	-	4
31	M	Broad-tailed Hummingbird	X	X	2	1	3
31	B	Horned Lark		X	-	3	3
33	B,R	Crissal Thrasher	X	X	1	1	2
33	M	MacGillivray's Warbler	X		1	1	2
33	M	Rufous Hummingbird	X		2	-	2
33	B	Yellow Warbler	X		-	2	2
37	B	Blue Grosbeak	X		-	1	1
37	B?	Cliff Swallow	X		-	1	1
37	B,R	Gambel's Quail	X		-	1	1
37	?	Killdeer	X		-	1	1
37	?	Northern Harrier	X		1	-	1
37	?	Rufous-crowned Sparrow	X		-	1	1
37	PB,R	Spotted Towhee		X	1	-	1
37	M	Townsend's Warbler	X		1	-	1
37	M	Western Tanager	X		1	-	1
45	Total species detected		Total detections		442	280	722

Breeding Season Incidental Observation Data

Survey Effort

Species encountered between and after point count surveys between 2000-2001 breeding seasons were recorded as incidental observations.

Species Richness

Combining 2000 and 2001 breeding seasons, we detected 428 individuals of 59 species as incidental observations; in 2000, we detected 246 individuals of 54 species and in 2001, we detected 182 birds of 33 species (Table 4). The most commonly detected bird was the Brown-headed Cowbird; it accounted for 14.5% of all incidental observation detections (62 of 428) (Table 4). Twenty-five species were detected during incidental observation surveys that were not detected during point count surveys.

Table 4. Summary of incidental observations during breeding seasons 2000-2001, Pipe Spring National Monument. Shaded lines indicated species that were not detected during point count surveys. Species detected in 2000 and 2001 incidental search surveys are indicated by an X in the respective columns. Status: B = Breeder; M = Migrant; PB = Probable Breeder; R = Year-round Resident.

Rank	Status	Species	2000	2001	No. Detections
1	B	Brown-headed Cowbird	X	X	62
2	B,R	House Sparrow	X	X	47
3	B,R	Bushtit	X	X	39
4	B,R	European Starling	X	X	21
5	B,R	House Finch	X	X	19
6	B	Violet-green Swallow	X	X	15
7	B,R	Bewick's Wren	X	X	14
7	B	Cassin's Kingbird	X	X	14
9	B	Western Kingbird	X	X	12
10	B	Bullock's Oriole	X	X	11
10	B,R	Gambel's Quail	X	X	11
10	B?	Northern Rough-winged Swallow	X	X	11
10	B	Mourning Dove	X	X	11
14	B	Black-chinned Hummingbird	X	X	10
14	B	Say's Phoebe	X	X	10
14	B,R	Western Scrub-Jay	X	X	10
14	B	Black-throated Sparrow	X	X	10
18	B	Ash-throated Flycatcher	X	X	7
18	?	Lark Sparrow	X		7
20	B	Blue Grosbeak	X	X	6
20	B,R	Crissal Thrasher	X	X	6
20	B	Western Wood Pewee	X	X	6
23	B	Yellow Warbler	X	X	5
24	B,R	American Robin	X		4
24	B,R	Blue-gray Gnatcatcher	X	X	4
24	B,R	Common Raven	X	X	4
24	B	Northern Mockingbird	X	X	4
24	B	Scott's Oriole	X		4
29	B	Lesser Goldfinch	X		3
30	PB?	Brewer's Sparrow		X	2

Table 4 (cont'd)

Rank	Status	Species	2000	2001	No. Detections
30	M	Broad-tailed Hummingbird	X	X	2
30	B,R	Canyon Wren	X	X	2
30	M	Chipping Sparrow	X		2
30	M	Great Blue Heron	X		2
30	B	Gray Flycatcher	X		2
30	M	Phainopepla	X		2
30	B,R	Song Sparrow		X	2
30	M	Warbling Vireo	X		2
30	M	Western Tanager	X		2
30	PB	White-throated Swift		X	2
41	M	Black-crowned Night Heron	X		1
41	M	Black-headed Grosbeak	X		1
41	M	Cattle Egret	X		1
41	PB	Common Nighthawk	X		1
41	M	Common Yellowthroat	X		1
41	M	Downy Woodpecker	X		1
41	B	Green-tailed Towhee		X	1
41	M	Hooded Warbler	X		1
41	B	Juniper Titmouse	X		1
41	?	Northern Harrier	X		1
41	M	Plumbeous Vireo	X		1
41	B,R	Rock Wren		X	1
41	PB	Red-tailed Hawk	X		1
41	M	Rufous Hummingbird	X		1
41	B,R	Sharp-shinned Hawk	X		1
41	M	Turkey Vulture		X	1
41	?	Vesper Sparrow	X		1
41	M	Hermit Thrush	X		1
41	M	Unknown Gull	X		1
59	Total species detected		Total detections		428

Non-Breeding Migration Surveys

During spring migration (1999-2001), we detected 359 individuals of 46 species (including migratory and resident species); we captured 90 birds of 22 species during 175:55 (hr:min) mist-net hours (Table 5), and detected 24 additional species during incidental search surveys. Of the 46 species detected, 11 (24%) were exclusively migrant species; an additional 7 species are known to both migrate through the area and also winter in the Monument, but do not breed there. The remainder of the species breed in the area, or are year-round residents (some of the individuals detected of these species may be migratory; Table 6a).

During fall migration (1999-2001), we detected 371 individuals of 53 species (including migratory and resident species); we captured 43 birds of 19 species during 194:25 (hr:min) mist-net hours (Table 5), and detected 34 additional species during incidental search surveys. Of the total 53 species detected, 17 (32%) were exclusively migrant species; an additional 6 species are known to both migrate through the area and also winter in the Monument, but do not breed there. The remainder of the species breed in the area, or are year-round residents (some of the individuals detected of these species may be migratory; Table 6b).

Table 5. Summary of net open-close times during spring and fall migrations, Pipe Spring National Monument 1999-2001.

Season	Date	Daily Hrs:Min	Total Hrs:Min
Spring	26 April 1999	15:00	175:55
	27 April 1999	23:45	
	7 May 1999	16:30	
	17 April 2000	23:15	
	25 April 2000	21:00	
	2 May 2000	26:00	
	12 May 2000	20:00	
	19 May 2000	5:50	
	2 June 2000	15:05	
	15 May 2001	9:30	
Fall	27 August 1999	28:25	194:25
	2 September 1999	22:10	
	12 September 1999	32:10	
	20 September 1990	28:00	
	27 September 1999	32:25	
	28 August 2000	18:45	
	8 September 2000	18:30	
	11 September 2000	14:00	

In total, 71 species were observed using Pipe Spring National Monument and the surrounding tribal lands during the migratory season (Table 6a and 6b). At a minimum, twenty-one species used the Monument as stopover habitat along migratory routes. Additionally, it is highly likely that individuals of species that breed and/or winter in the monument, are migratory from areas outside Pipe Spring and use it as stopover habitat.

Overall, mist netting during the fall migration was significantly more successful than during the spring in terms of species abundance and richness; however, yearly variations did occur (e.g., in 2000, more birds were captured during spring than in the fall, but species richness was the same).

Tables 6a and 6b. Summary of migrating birds, 1999-2001, Pipe Spring National Monument. (a) Spring migration; (b) Fall migration. Status: B = Breeder in area; M = Migrant (does not breed in area); W = Winter Resident. Note: shaded lines highlight species that are exclusively migratory in Pipe Spring.

(a) Spring Data

Rank	Status	Species	No. Banded	No. Detected	Total
1	W	White-crowned Sparrow	31	30	61
2	B, W	House Sparrow	10	23	33
3	B	Black-chinned Hummingbird	-	27	27
4	B,W	House Finch	1	25	26
5	B,W	European Starling	5	19	24
6	B,W	Gambel's Quail	-	20	20
7	B,W	American Robin	7	10	17
7	M,W	Yellow-rumped Warbler	8	9	17
9	B	Brown-headed Cowbird	-	16	16

Table 6a (cont'd)

Rank	Status	Species	No. Banded	No. Detected	Total
10	M,W	Mallard	-	11	11
11	B,W	Bewick's Wren	2	8	10
12	B,W	Common Raven	-	7	7
13	M, W	Brewer's Sparrow	-	6	6
13	B	Cassin's Kingbird	-	6	6
15	B	Ash-throated Flycatcher	-	5	5
15	M	Common Yellowthroat	4	1	5
17	B	Bullock's Oriole	-	4	4
17	B,W	Greater Roadrunner	-	4	4
17	B,W	Say's Phoebe	-	4	4
17	B,W	Song Sparrow	-	4	4
17	B,W	Western Scrub-Jay	-	4	4
17	M	Western Tanager	2	2	4
17	B	Yellow Warbler	3	1	4
24	M,W	Lincoln's Sparrow	3	-	3
24	M	Yellow-breasted Chat	3	-	3
24	B,W	Lesser Goldfinch	-	3	3
27	B,W	Blue-gray Gnatcatcher	-	2	2
27	B	Black-throated Sparrow	-	2	2
27	M,W	Canada Goose	-	2	2
27	B,W	Canyon Wren	-	2	2
27	B,W	Green-tailed Towhee	1	1	2
27	M	Hermit Thrush	1	1	2
27	M	Hooded Warbler	1	1	2
27	M,W	House Wren	2	-	2
27	M	Virginia's Warbler	1	1	2
27	B	Western Kingbird	-	2	2
37	M	American Redstart	1	-	1
37	M	Black-capped Chickadee	1	-	1
37	M	Cordilleran Flycatcher	1	-	1
37	B,W	Crissal Thrasher	-	1	1
37	B,W	Rock Wren	-	1	1
37	M	Rufous Hummingbird	-	1	1
37	B,W	Sharp-shinned Hawk	-	1	1
37	B,W	Spotted Towhee	1	-	1
37	B	White-throated Swift	-	1	1
	M	Unknown Empidonax	1	-	1
	M	Unknown Vireo	-	1	1
45		<i>Total species detected detections</i>	<i>Total</i>	<i>90</i>	<i>269</i>
				<i>359</i>	

(b) Fall Data

Rank	Status	Species	No. Banded	No. Detected	Total
1	B,W	House Sparrow	-	55	55
2	B,W	House Finch	-	34	34
3	B,W	Bushtit	-	29	29
4	B,W	Western Scrub-Jay	-	23	23
5	M	Western Tanager	12	5	17

Table 6b (cont'd)

Rank	Status	Species	No. Banded	No. Detected	Total
6	M	Cattle Egret	-	15	15
6	B	Black-chinned Hummingbird	-	15	15
6	B,W	American Robin	1	14	15
9	M,W	Brewer's Sparrow	1	12	13
10	M,W	Lincoln's Sparrow	-	10	10
11	B,W	European Starling	-	9	9
12	M	Rufous Hummingbird	-	8	8
12	B,W	Common Raven	-	8	8
14	B	Black-throated Sparrow	-	7	7
14	M	Wilson's Warbler	5	2	7
16	M?	Black-tailed Gnatcatcher	-	6	6
16	M	Broad-tailed Hummingbird	-	6	6
16	B,W	Rock Wren	1	5	6
19	B,W	Lesser Goldfinch	-	5	5
19	B,W	Gambel's Quail	-	5	5
19	B,W	Northern Flicker	-	5	5
19	B	Northern Mockingbird	1	4	5
19	M	Nashville Warbler	3	2	5
19	B	Yellow Warbler	4	1	5
25	B,W	Bewick's Wren	-	4	4
25	B,W	Blue-gray Gnatcatcher	-	4	4
25	M	Hermit Thrush	4	-	4
25	B,W	Spotted Towhee	1	3	4
29	B,W	Crissal Thrasher	-	3	3
29	M	MacGillivray's Warbler	1	2	3
29	B,W	Mourning Dove	-	3	3
29	B	Western Wood Pewee	-	3	3
33	M	Black-headed Grosbeak	-	2	2
33	B?,W	Cooper's Hawk	-	2	2
33	M	Townsend's Warbler	-	2	2
33	B	Blue Grosbeak	-	2	2
33	M,W	Yellow-rumped Warbler	2	-	2
	M	Unknown Empidonax	-	2	2
	M	Unknown Hummingbird	-	2	2
38	M,W	American Kestrel	-	1	1
38	B	Bullock's Oriole	1	-	1
38	M	Calliope Hummingbird	-	1	1
38	B,W	Canyon Wren	-	1	1
38	M,W	Dark-eyed Junco	-	1	1
38	M	Dusky Flycatcher	1	-	1
38	M	Gray Catbird	1	-	1
38	B,W	Juniper Titmouse	-	1	1
38	M	Northern Waterthrush	-	-	1
38	W	Pine Siskin	-	1	1
38	M	Plumbeous Vireo	1	-	1
38	B,W	Red-tailed Hawk	-	1	1
38	B,W	Say's Phoebe	-	1	1
38	B,W	Sharp-shinned Hawk	-	1	1
38	W	Steller's Jay	1	-	1
38	M	Yellow-breasted Chat	1	-	1
53	<i>Total species detected detections</i>		<i>Total</i>	43	328
				371	

Non-Breeding Winter Surveys

Survey Effort

We conducted 31.9 hours of non-breeding winter bird surveys from 1998-2001 (Table 7). All winter surveys were conducted on dates between November and March using the area-search methodology. During these surveys, we documented habitat use, behavior, and time of survey.

Table 7. Summary of winter bird survey effort, Pipe Spring National Monument, 1998-2001.

Year	Dates	Survey Time
1998	4, 5, 19 Nov; 9, 10, 14 Dec	14.2
1999	11 Nov; 15, 17 Dec	6.2
2000	29 Feb; 22 March; 17 Nov; 30 Dec	8.5
2001	31 Jan; 22 Feb	3.0

Species Richness

We detected 1,127 individuals of 36 species; we suggest these species to be winter inhabitants (Table 8). When combined with our breeding bird surveys, there are presently 18 year-round (resident) species inhabiting the Monument and the surrounding tribal lands.

Table 8. Summary of winter incidental search data, Pipe Spring National Monument, 1998-2001. Shaded lines indicate species that are considered year-round inhabitants. An “X” indicates whether a species was detected during a particular year.

Rank	Species	1998	1999	2000	2001	No. Detections
1	White-crowned Sparrow	X	X	X	X	287
2	Dark-eyed Junco	X	X	X	X	224
3	House Sparrow	X	X	X	X	126
4	Gambel's Quail	X		X	X	105
5	European Starling	X		X	X	68
6	House Finch	X	X	X		49
7	Cedar Waxwing	X				35
8	Lesser Goldfinch	X				33
9	Western Scrub-Jay	X		X	X	28
10	Bushtit		X			19
11	Mallard	X		X		18
12	Song Sparrow	X		X		16
13	Red-winged Blackbird			X	X	12
13	Common Raven	X	X	X	X	12
15	Canyon Wren	X		X	X	11
16	Rock Wren	X		X		10

Table 8 (cont'd)

Rank	Species	1998	1999	2000	2001	No. Detections
17	Domesticated Waterfowl			X		8
17	Ruby-crowned Kinglet	X		X		8
17	Western Bluebird	X			X	8
20	Crissal Thrasher	X		X		7
21	American Robin			X	X	6
21	Northern Flicker	X			X	6
23	Red-naped Sapsucker	X	X			5
24	Mountain Chickadee	X				4
25	Black-throated Sparrow			X		3
25	Spotted Towhee	X				3
27	Bewick's Wren			X	X	2
27	Brewer's Blackbird			X	X	2
27	Greater Roadrunner	X				2
27	Yellow-bellied Sapsucker	X				2
27	Red-tailed Hawk	X		X		2
27	Yellow-rumped Warbler	X		X		2
33	American Crow			X		1
33	American Goldfinch		X			1
33	Golden Eagle			X		1
33	Juniper Titmouse	X				1
36	<i>Total number of species detected</i>	<i>Total number of detections</i>				1127

Corral Surveys

During 2000, we surveyed both the south and north corrals. These surveys were designed to note all bird species that may feed at these corral sites. The most noted birds to feed at corral sites are White-crowned Sparrows (Table 9). Brown-headed Cowbirds were also frequently detected at the corrals. Surveys in 2000 were mainly completed during the breeding season; however, a few surveys were completed throughout the year. The most noted species during non-breeding season surveys was the White-crowned Sparrow, followed by Gambel's Quail and the American Robin. During the breeding season, Brown-headed Cowbirds were the most observed species feeding at the corrals. Also during the breeding season, six separate surveys noted no birds feeding at the corrals.

Table 9. Summary of corral surveys, 2000, Pipe Spring National Monument. Status: B = Breeder in area; M = Migrant; YR = Year-round Resident; W = Winter Resident.

Rank	Status	Species	Frequency
1	W	White-crowned Sparrow	75
2	B	Brown-headed Cowbird	12
3	B	Mourning Dove	7
4	YR	House Sparrow	6
5	YR	Gambel's Quail	5
6	YR	American Robin	4
7	B	Lark Sparrow	2
7	YR	Say's Phoebe	2

Table 9 (cont'd)

Rank	Status	Species	Frequency
7	YR	Western Scrub-Jay	2
10	B	Black-chinned Hummingbird	1
10	B	Cassin's Kingbird	1
10	YR	Common Raven	1
10	YR	European Starling	1
10	YR	Sharp-shinned Hawk	1
14	Total number of species detected		Total number of detections
			120

Housing Surveys

Survey Effort

Incidental search surveys were conducted around the housing complex at Pipe Spring National Monument from April–July 1999-2001.

Species Richness

During housing surveys, we detected 441 birds of 34 species (Table 10). By far, the most common species detected were House Sparrow, White-crowned Sparrow and House Finch together comprising 52% of all detections. White-crowned Sparrows were all detected prior to the onset of the breeding season.

Table 10. Summary of housing surveys, 1999-2001, Pipe Spring National Monument. Status: B = Breeder; M = Migrant; PB = Probable Breeder; R = Year-round Resident, W = Winter Resident

Rank	Status	Species	No. Detections
1	B,R	House Sparrow	82
2	W,M	White-crowned Sparrow	76
3	B,R	House Finch	72
4	B	Black-chinned Hummingbird	22
5	B,R	Gambel's Quail	20
6	B,R	European Starling	19
7	B	Bullock's Oriole	18
8	B	Western Kingbird	17
9	B,R	Mourning Dove	15
10	B,R	Western Scrub-Jay	14
11	B,R	American Robin	12
12	B,R	Bewick's Wren	10
13	B,R	Spotted Towhee	7
14	B	Ash-throated Flycatcher	6
14	B	Brown-headed Cowbird	6
14	W	Ruby-crowned Kinglet	6
17	B,R	Bushtit	5
17	B,R	Lesser Goldfinch	5
19	B	Yellow Warbler	4
20	B	Cassin's Kingbird	3
20	B,R	Green-tailed Towhee	3
20	B	Northern Mockingbird	3

Table 10 (cont'd)

Rank	Status	Species	No. Detections
23	M,W	Chipping Sparrow	2
23	B	Northern Rough-winged Swallow	2
23	B,R	Say's Phoebe	2
23	B	Violet-green Swallow	2
27	M	Black-headed Grosbeak	1
27	B	Black-throated Sparrow	1
27	B,R	Common Raven	1
27	M,W	Lincoln's Sparrow	1
27	M	Northern Waterthrush	1
27	M	Rufous Hummingbird	1
27	B	Western Wood Pewee	1
27	M	Wilson's Warbler	1
34		Total number of species detected	Total number of detections
			441

Nest Surveys

Nest-search surveys were conducted between 1 April – 31 July 2000 at Pipe Spring National Monument. Nests of 13 species of birds were detected. Of the 48 nests detected, 19 (40%) were successful and 25 (52%) failed; the outcome of four nests was unknown (Table 11). According to our surveys, the most successful breeders were House Sparrows and European Starlings; House Finches had the most number of nests, but only 2 of 12 were successful. There were relatively few nests that we could look into to see the contents, yet we found three nests that had been parasitized by Brown-headed cowbirds and contained cowbird eggs. These were a Blue Grosbeak, a Black-throated Sparrow, and House Finch.

Table 11. Summary of nests found during breeding season 2000, Pipe Spring National Monument. Frequency = number of nests detected. Successful = number of successful nests; unkn = number of nests unknown if successful.

Rank	Species	No. Nests	No. Successful
1	House Finch	12	2; 2 unkn
2	Black-chinned Hummingbird	8	0
3	House Sparrow	7	5; 1 unkn
4	European Starling	5	5
5	Black-throated Sparrow	3	1
5	Bullock's Oriole	3	3
7	Western Kingbird	2	1 unkn
7	Western Wood Pewee	2	0
7	Cassin's Kingbird	2	1
10	Northern Mockingbird	1	1
10	Say's Phoebe	1	1
10	American Robin	1	0
10	Blue Grosbeak	1	0
13	Total number of species	Total number of nests	48
			19, 4 unkn

Spot Mapping Results

Spot mapping was conducted only at the windbreak area, which consists of a cottonwood overstory and a dense understory of grape orchards, shrubs and grasses, and thus represents unique a riparian habitat within the surrounding arid landscape. The results of spot mapping are summarized for each species and are listed in Appendix C. We report abundances for species, but were unable to estimate the density of each species due to the limited number of individuals of each species in this relatively small area.

Raptor and Owl Surveys

We conducted four Raptor surveys throughout each year. We observed five species within or adjacent to the monument. The raptors that we observed included; Cooper's Hawk (*Accipiter cooperii*), Sharp-shinned Hawk (*Accipiter striatus*), Red-tailed Hawk (*Buteo jamaicensis*), Golden Eagle (*Aquila chrysaetos*), American Kestrel, (*Falco sparverius*). None of the five raptors detected were observed breeding within the monument boundaries.

From April - July of 1999 and 2000 we conducted four owl surveys. In order to determine what owls were in the monument we used playback tape recordings of the species known to occur in the area. Northern Pygmy Owls (*Glaucidium gnoma*) and Great-horned Owls (*Bubo virginianus*) were detected in 1999, yet not detected in 2000 surveys.

Species - Habitat Relationships

The species and number of individuals per species in each habitat and in habitats within habitats (microhabitats) are listed in Appendix D. Some species are generalists, found in nearly every habitat type (e.g., Brown-headed Cowbird, Western Scrub Jay, and House Finch). Other species are specialists (obligates), found in only one habitat type (e.g., Gray Flycatcher, Loggerhead Shrike, Red-naped Sapsucker) (see Table 12).

Table 12. Number of obligate species (detected in only one habitat type) in each of the major habitats and microhabitats at Pipe Spring National Monument. Data is based on breeding season variable circular plot point count and incidental surveys at Pipe Spring National Monument and Kaibab-Paiute Indian Reservation during breeding seasons of 1999- 2001 (15 May – 15 July).

Habitat	No. of Obligate Species
Pinyon-juniper	13
Riparian (windbreak/orchard)	12
Shrubland/shrubsteppe	5
Housing area	2
Willow	0
Pond	0
Corral	0
Orchard	0
Cliff	0
Total	32

The table below reports species richness (the total number of species) per habitat type. The riparian area had the highest number species detected. The native habitats of pinyon-juniper and shrubland had the next highest species richness.

Table 13. Species richness (total number of species) in each habitat and microhabitat at Pipe Spring National Monument. Data is based on breeding season variable circular plot point count and incidental surveys at Pipe Spring National Monument and Kaibab-Paiute Indian Reservation during breeding seasons of 1999- 2001 (15 May – 15 July).

Habitat	Total No. Species
Riparian (windbreak/orchard)	43
Pinyon-juniper	40
Shrubland/shrubsteppe	35
Housing area	31
Willow	7
Pond	6
Corral	5
Orchard	5
Cliff	5

DISCUSSION

Project Contributions to the Knowledge of the Park's Avifauna.

Breeding Species

We detected 3 bird species that had not previously been recorded breeding in the park: Scott's Oriole, Black-tailed Gnatcatcher, and Black-chinned Sparrow. For the Scott's Oriole, a lack of previous records could indicate that Scott's Orioles expanded their range into the park, or that they were previously present but not detected. Scott's Orioles breed in pinyon-juniper habitat which occupies a very small portion of the monument relative to the amount of pinyon-juniper adjacent to the park, which has never been formally surveyed previous to this study. Therefore, Scott's Orioles may have always been there but, due to limited habitat and lack of surveys, they may have not been detected before.

Black-chinned Sparrows were detected repeatedly throughout the breeding season. They are usually found in arid scrub, sagebrush, and brushy slopes. Pipe Spring National Monument is just within their known geographic range. Thus, since they were detected throughout the breeding season, and apparently appropriate habitat exists, they may be breeding in the Monument, though no nests were found.

Four species, Black-tailed Gnatcatcher, Lucy's Warbler, Abert's Towhee, and Rufous-crowned Sparrow were all detected once during our breeding season inventory. Pipe Spring National Monument lies on the northern edge of all four species' breeding range. Black-tailed Gnatcatcher, Lucy's Warbler, and Abert's Towhee's breeding habitat consists of desert woodlands, streamside thickets and desert washes where suitable habitat exists within the

riparian windbreak at Pipe Spring NM, and in areas surrounding the monument (i.e., Kanab Creek, Moccasin). Rufous-crowned Sparrow habitat (rocky hillsides and steep brushy slopes) also exists in and around Pipe Spring NM. Thus, it is possible that suitable habitat exists for these birds and they may have bred here, or may in the future breed in the monument area.

Although discussions of habitat and habitat suitability typically focus on vegetation characteristics, many other factors are important components of a species' habitat. For example, geographic location, temperature, humidity, predators, food resources, and even adjacent land uses can influence whether a habitat is truly suitable and/or occupied (Morrison et al. 1992). It is possible that one or more non-vegetative habitat components within our survey area are unsuitable for breeding for each of these species.

We report what species were detected at Pipe Spring National Monument during these surveys, yet we do not report what species "should be" there but are missing. When discussing potential reasons for the absence of breeding species, it must be remembered that we know very little about the history of these species in this region, or the factors that may contribute to their presence or absence. Therefore, all such discussions involve much speculation, with no guarantee that any of the speculation is correct. Furthermore, the absence of these breeding species in a three year period does not mean that these species have not bred there recently, or will not in the near future. Sogge (1997) documented several instances where Willow Flycatchers disappeared from former breeding locations along the Colorado River, only to reappear after 3-5 year absences. Thus, several years of surveys may be necessary to provide high confidence that these breeding species are truly absent from Pipe Spring and its surrounding area.

Non-breeding Migrating Species

During migration, many neotropical migrants may travel distances as far as 14,400 km (9,000 mi), and the rigors of migration often push birds to their physiological limits (Moore 1990). Therefore, they require adequate stopover areas along the way to supplement energetic requirements. Stopover habitat is defined as an area with a combination of resources (food, cover, water) and environmental conditions (temperature, precipitation, presence and absence of predators and competitors) that promotes use by individuals of a given species and allows those individuals to survive during passage (Morrison et al. 1992). Specifically, adequate stopover habitat must have: 1) enough food to meet its energetic requirements; 2) vegetative cover to avoid predation; and 3) sufficient uniform habitat to replenish fat reserves efficiently (Moore and Yong 1991). Stopover habitat can be particularly important in regions where it is restricted and limited and in which the migrant must overcome many geographic barriers (deserts, mountain ranges, large bodies of water; Moore 1991). The lack of suitable stopover habitat may result in death and contribute to future population declines (Moore 1990). The ecological diversity of migratory species makes a general assessment of habitat requirements and the development of management strategies for migrants particularly difficult. However, it is widely recognized that the preservation and conservation of southwestern riparian habitats such as Pipe Spring NM should be of major concern.

Pipe Spring NM serves as an essential migratory stopover site since it is situated among geographic barriers (e.g., Arizona Strip, the Grand Canyon, a landscape comprised of arid habitats). Therefore, the habitat of Pipe Spring NM is likely supplying migrating birds with essential resources for successful migration. Many of the species detected during the migration surveys, including Common Yellowthroats, Lincoln's Sparrows, Yellow-breasted Chats, and Wilson Warblers are typically associated moist habitats. The springs and riparian vegetation at the monument constitute a unique moist habitat within the arid surrounding landscape that these migrants can utilize for food and cover. This habitat is clearly serving as an important migratory stopover area for many Neotropical and short distance migrants, and is deserving of protection and management.

Non-breeding Winter Birds

Pipe Spring NM provides winter habitat for both the year-round, resident species and species that breed elsewhere but winter there (Table 8). As discussed below in the habitat ecology and management sections, pinyon-juniper habitat provides valuable winter food in the form of berries and seeds. In addition, livestock corrals offer a year-round supply of seeds from livestock feed. Thus, the availability of these habitats, and the others that Pipe Spring NM contains, including the riparian vegetation around the springs, influence what species winter there. Of the species that exclusively winter at Pipe Spring, some are likely short-distance migrants, moving down from higher elevation habitats in the region where they breed. These species include the Dark-eyed Junco, Mountain Chickadee, Ruby-crowned Kinglet, Red-naped Sapsucker, and the Western bluebird. The most common winter bird during the surveys, the White-crowned Sparrow, breeds farther north, as does the Cedar Waxwing. Two Yellow-rumped Warblers were also detected. This species is near the northern limit of its regular wintering range at Pipe Spring, but has been known to show some plasticity in its choice of wintering sites. It will winter farther north and will shift to more southerly sites in response to changing climatic conditions that affect food abundance (Terrill and Ohmart 1984, Ehrlich et al. 1988).

Seasonal differences in bird species abundance and distribution

Avian abundance and diversity at Pipe Spring NM is substantially higher during the breeding and migration seasons than in winter. In the breeding season, Pipe Spring NM hosts well over twice the number of species found during the winter. In addition, Pipe Spring NM is an important stop-over site for migrating birds in both spring and fall and represents a unique resource in the area. Indeed, the greatest diversity of species has been noted during the spring and fall migrations, as documented in historical records of birds in the park. Thus, to affect the largest number of species of the greatest diversity, the monument should focus its management and monitoring efforts on factors that affect birds in the breeding and migration seasons.

Ecology and Management of Specific Habitats Within and Surrounding Pipe Spring NM

The main habitats within Pipe Spring NM and the surrounding tribal lands surveyed during this project are described in the introduction above. They include the "natural" habitats of sagebrush/scrub and pinyon-juniper, and the "urbanized" habitat that includes the buildings, the

orchards, the springs and their associated riparian habitat, the ponds, and livestock corrals. We discuss the ecology and management of each of these habitats as they relate to birds, below.

Shrubland/Shrub-steppe Ecology and Management

Shrubland habitats composed of sagebrush and other native shrubs and shrubsteppe (areas of shrubland/grassland mosaic), cover approximately 150 million acres of the American West, and comprise one of the most extensive ecosystems in North America. This “sagebrush sea” extends from the east side of the Cascade Mountains in Washington and Oregon, east to western and central Wyoming, southwest Montana, and the western edge of the Dakota grasslands, and south into western Colorado, northern New Mexico, and Arizona. The sagebrush habitat of the Pipe Spring National Monument and its surroundings is distinctive in that it is comprised of sagebrush at the southern limits of its distribution. Thus it represents a unique and important habitat, especially for birds, as bird specialists may be poorly equipped to tolerate conditions beyond those experienced in the core of their geographic range (Brown 1995, Pavlacky et al. 2001).

For many decades, range scientists believed that grasslands originally dominated the Intermountain West, and that sagebrush invaded because of heavy grazing. As a result, numerous projects were undertaken to clear sagebrush from areas. More recently it has become evident that sagebrush, not grasslands, was dominant and widespread, and that the boundaries of sagebrush habitats were generally the same as they are today. Furthermore, it is now recognized that sagebrush habitats provide important habitat to many plant and animal species. In fact, many sagebrush birds live nowhere else (Paige and Ritter 1999).

Unfortunately though, widespread throughout the west, sagebrush habitats are threatened throughout their range. They have experienced habitat loss, fragmentation, and degradation due to agriculture, livestock grazing, and the invasion of exotic annual plants. Nationally, grassland and shrubland birds show the most consistent population declines over the last 30 years of any group of bird species. Across the U.S. the populations of 63 percent of shrubland and shrub-dependent birds are declining (Paige and Ritter 1999). In the intermountain west, more than 50 percent of grassland and shrubland bird species show downward population trends (Sauer et al. 1996, ALA 2003).

The predominant impact of agricultural development is the conversion of shrubland areas to grasslands and croplands and the subsequent fragmentation of once contiguous shrublands. Yet, agricultural development plays a less obvious but destructive role in the introduction and spread of alien plants into natural habitats, which may now be the most serious threat to these habitats (Rotenberry 1998). Agricultural areas, and their associated roads, serve as continually renewable sources for immigrant alien species of plants (Janzen 1986, Alberts et al. 1993, Rotenberry 1998). Additionally, agricultural areas apparently extend the landscape-level distribution of Brown-headed Cowbirds (an avian brood parasite), and corvids such as Common Ravens and American Crows, which can be major predators of songbird nests (Marzluff et al. 1994, Rotenberry 1998).

Livestock grazing impacts sagebrush habitats in several interrelated ways. It can influence bird communities by creating habitat for foraging Brown-headed Cowbirds as well as greatly

affecting native vegetation. Because western shrublands did not evolve under grazing pressure from large ungulates such as Bison, the impact due to livestock grazing has been detrimental to native vegetation (Mack and Thompson 1982, Rotenberry 1998, Paige and Ritter 1999). It disturbs the soil and results in selective removal of plant biomass, thus altering competitive relationships among species and can lead to an increase in unpalatable species. In addition, it destroys microbiotic crust that usually forms on the soil and thus adversely influences water infiltration, erosion, and nitrogen fixation (Harper and Marble 1988, Rotenberry 1998). This destruction can have long-term effects: recovery from grazing, that includes a well developed crust community, can take a decade or more, depending on the type of disturbance, presence of inoculants from nearby crust communities, and occurrence of invasive weeds (Belnap 1993, St. Clair and Johansen 1993, Kaltenecker 1997, Paige and Ritter 1999).

Soil disturbance from grazing also promotes the germination of annual plant seeds and thus promotes the invasion of exotic annual plants into otherwise undisturbed areas. This process has resulted in perhaps the greatest impact on western shrublands: the establishment of the invasive, exotic cheatgrass (*Bromus tectorum*). Cheatgrass first appeared in the early to mid 1800s, probably as a contaminant in grain seed (Mack 1981) and quickly spread among agricultural areas and along roads and railroads. But it spread into otherwise undisturbed shrublands through widespread livestock grazing and the disturbance of the soils surface.

Cheatgrass' principle impact has been to alter the fire ecology of scrub and shrub-steppe ecosystems. Native bunchgrasses do not provide continuous cover of fuel; fires do not spread easily, thus large fires in pristine native shrublands were relatively rare (Whisenant 1990, Rotenberry 1998). Conversely, cheatgrass provides a continuous surface cover of relatively fine fuel that carries fire into and over much larger areas than likely occurred historically (Whisenant 1990, www.ut.blm.gov/FireRehab). It matures and dries earlier than native bunchgrass, increasing the chance of fire earlier in the season (Knick and Rotenberry 1997). Also, because it does not catch and hold snow like a diverse perennial stand of vegetation, the site becomes drier (desertification; www.ut.blm.gov/FireRehab). In fact, shrublands infested with cheatgrass are 20 times more likely to burn than those without (Stewart and Hull 1949; Whisenant 1990). The cheatgrass invasion and the resulting increased risk of fire in shrublands is of urgent concern and is illustrated by the fact that the acres of Utah Bureau of Land Management (BLM) land burned by wildfire increased from 4,549 acres in 1991 to 308,457 acres in 1996 (www.ut.blm.gov/FireRehab).

In addition to increasing the probability of fire, the establishment of cheatgrass reduces the average fire-return intervals to less than five years, and reduces the chances for sagebrush and native bunchgrasses to regenerate (Whisenant 1990). Post-fire survivorship of cheatgrass is high because it is a winter annual that matures and sets seed by the onset of summer fires, which shatter the seed heads. Conversely, native perennial grasses mature in the summer, and have low survivorship after fires. The establishment of cheatgrass in an area makes the area more likely to burn again. Thus, once cheatgrass becomes a part of an ecosystem, it is highly likely to remain a part of it (Rotenberry 1998). Unlike cheatgrass, sagebrush after a fire must be re-established by wind-dispersed seeds or by seeds in the soil. A second fire within 5-8 years can destroy any viable sagebrush seeds in the seed bank. Thus, subsequent recovery of sagebrush can only come from other living sagebrush. Sage seeds are disbursed by wind, and disperse only about 30 m

from a seed source (Meyer 1994, Paige and Ritter 1999). Additionally, sagebrush may take several years to mature before producing seed. Thus repeated, frequent fires can eliminate sagebrush entirely, cheatgrass becomes established and creates uniform annual grasslands perpetuated by large, frequent fires and void of native plant communities (Whisenant 1990, Paige and Ritter 1999). Restoring these native plants is then extremely difficult if not impossible (West 1988, Paige and Ritter 1999).

Presently, non-native grasses and agricultural conversion now dominate much of the sagebrush lands in the Intermountain West (Paige and Ritter 1999). This conversion of sagebrush landscapes to a new state dominated by exotic annual grasslands and high fire frequencies (Knick and Rotenberry 1997) results in changes in the avian composition from communities composed of shrubland obligates to those composed of grassland species (such as Meadowlarks and Horned Larks). Sagebrush habitat has been found to support more species, have a greater bird density, and a greater individual density for most species, than cheatgrass habitat types (Schuler et al. 1993). Correspondingly, the bird species perhaps in the most need of conservation attention are those most typical of undisturbed shrub-steppe including Sage Grouse, Brewers Sparrows, Sage Sparrows, Black-throated sparrows, and Sage Thrashers (Rotenberry 1998, Paige and Ritter 1999).

The sagebrush/shrubsteppe obligate that breeds at Pipe Spring NM is the Black-throated Sparrow, while Brewers Sparrows use the area during migration. Another obligate, the Sage Grouse historically occurred in Arizona: One was seen near Nixon Spring in the Mt. Trumbull region, July 29, 1937 (Leroy Arnold; Phillips et al. 1964).

Because non-native grasses and agricultural conversion now dominate so much area in the Intermountain West, it is especially important to sustain remaining native plant communities in a healthy state to support native birds and other wildlife (Paige and Ritter 1999). At Pipe Spring, establishing and maintaining a healthy sagebrush community and its associated wildlife would require protecting and sustaining the remaining biological crust communities by minimizing sources of soil disturbance, such as off-road vehicle use or heavy grazing. Rehabilitating sites depleted of native grasses and forbs may require seeding native species, using local, native genotypes that are competitive with non-native weeds, and temporarily eliminating or reducing livestock grazing. In addition, avoidance of the processes that degrade or destroy natural water flow or the vegetation in and around seeps, springs, wet meadows and riparian vegetation is also critical for the many bird species that depend on forbs and insects available in moist places. Finally, ground squirrel and prairie dog colonies provide nesting burrows for burrowing owls, and maintain small mammal populations as prey for many bird and mammal predators (Paige and Ritter 1999). Thus, management should be directed to establish and/or maintain conditions that ensure the presence of these species.

Pinyon-Juniper Ecology and Management

Most of the present-day North American deserts were occupied by woodlands of juniper and/or pinyon pine during the ice age (Pleistocene), which ended 10,000 years ago (Cole 1990). Since that time, changes in climate, heavy livestock use, and changes in fire frequency have influenced the distribution of pinyon-juniper woodlands. Currently, pinyon-juniper habitat covers an

estimated 45.3 million acres in the Intermountain West, mainly in Nevada, Utah, Colorado, New Mexico and Arizona (O'Brian and Woudenberg 1999). On the Colorado Plateau, pinyon pine and juniper woodlands are widespread between about 5000 ft. to 7000 ft in elevation. Yet within pinyon-juniper woodlands there is considerable variation in the composition and density of trees and the composition and density of the understory vegetation. The understory is central to understanding the ecology and ecosystem function of a pinyon-juniper site (Tausch 1999), and its composition can be dependent on such things as soil type, aspect, climate, and the influences of grazing and fire.

Two factors that have altered the frequency of fires and thus affected the distribution of pinyon-juniper are fire suppression and livestock grazing that removes fine fuels. Presettlement (before the introduction of livestock) fires occurred more frequently on sites with deeper soils that produced an abundance of fine fuels, while fires were less frequent on areas with shallow soils and rocky sites that produced less fine fuel (Goguen and Mathews 1998). The combination of grazing, which reduces the fine fuels that carry fires, and active fire suppression is thought to have resulted in the establishment of pinyon and juniper in formerly sagebrush-dominated lands. Yet, the introduction and invasion of exotic annuals, primarily grasses such as cheatgrass, has dramatically changed successional patterns following fires on many sites and subsequent fire intensity and frequency. Particularly where pinyon is dominant, these woodlands are also crossing a threshold to susceptibility to intense crown fires; these types of fires are on the increase. The intensity of these fires on tree dominated sites can also help push the site across another threshold to dominance by exotics, changing the successional dynamics of the site and increasing fire frequency (Tausch 2002). (Please see Sagebrush Ecology and Management, above, for a discussion of the effects of cheatgrass on fire frequency, intensity, and size.)

As stated above, presettlement and post settlement patterns of pinyon-juniper distribution, and the distribution and composition of its understory vegetation vary considerably, both temporally and spatially, and can be site-specific. This is illustrated by the results of a study of vegetation change in the past 5,000 years in the area that is now Capital Reef National Park, Utah. Cole et al. (1997) used plant parts collected from fossil and recent pack-rat middens to reconstruct presettlement vegetation and grazing impacts in the Park. They demonstrated that drastic vegetation changes, unprecedented during the last 5,000 years, occurred during the last century. Presettlement vegetation favored by cattle for grazing and by sheep for browsing was locally eliminated while other less palatable species became more common. Highly palatable plants such as winterfat and ricegrass are now absent or reduced. In addition, sheep browsing reduced the amount of Pinyon pine; sagebrush and roundleaf buffaloberry were also recently reduced to their lowest level in the 5,400-year record. Conversely, species typical of overgrazed range, such as snakeweed, viscid rabbitbrush, and Russian thistle, not recorded prior to the historic introduction of grazing animals, are now present. Also, pollen of Utah juniper was found to have decreased in the last 200 years. They concluded that these records demonstrate that the most severe vegetation changes of the previous 5,400 years occurred during the last 200 years and these changes can be primarily attributed to grazing by livestock. Furthermore, they found that the reduction of pinyon pine by sheep browsing contradicts the widespread concept of overgrazing causing expansion of pinyon-juniper woodland (Cole et al. 1997).

Alexander (1998) reconstructed the composition of presettlement plant communities for the Pipe Spring area by compiling information from library archives, diary manuscripts, historic photographs, and knowledgeable professionals. From information given in Thatcher and Hart (1974) and other first hand accounts (e.g. Heaton 1936), he determined that the plant community in the northwest region of the park was historically pinyon juniper woodland, as it is to today. Also, Arnold et al. (1964) reported that the pattern throughout the Arizona Strip is for pinyon and juniper over time to become dominant in desert scrublands. This process appears to be occurring in the northeast quarter and southwest quarter of the Monument that contains a few seedling juniper trees among the desert scrubland vegetation (Alexander 1998).

Pinyon-juniper woodlands provide important habitat to many wildlife species on the Colorado Plateau, many of which are pinyon-juniper obligates or semi-obligates. Pinyon-juniper forest outranks many more other forests types in the abundance and variety of birds it supports and the particular combination of bird species found in pinyon-juniper habitats is not only distinctive, a relatively high percentage of those species are rare or absent from other habitat types (Paulin et al. 1999). Additionally, Sieg (1991) found significantly higher bird numbers and species richness in pinyon-juniper woodlands than in adjacent grasslands in every season. The low degree of similarity of the avian community to those of other habitats and the high percentage of obligate and semi-obligate species suggests that pinyon-juniper habitat contributes substantially to landscape-level avian diversity (Paulin et al. 1999).

Pinyon-juniper woodlands have unique features that may contribute to their importance to wildlife. Sieg (1991) speculated that the combination of readily available food (from cones and berries) coupled with good thermal cover made pinyon-juniper habitat especially attractive to birds in the winter (Paulin et al. 1999). It is attractive to other animals too. A study of 214 Gray Fox (*Urocyon cinereoargenteus*) scats from a pinyon-juniper zone in eastern Utah found that mature Utah juniper berries were the most commonly taken food items during a two-year period (White et al. 1999). In addition to providing food resources, pinyon-juniper provides vertical structure and cover not found in adjacent habitats that are often open grasslands and/or shrublands. Cover values make pinyon-juniper a critical element for big game winter range.

Several bird species are considered specialist (obligates and semi-obligates) within this plant community because they demonstrate relatively narrow niche breadth within the pinyon-juniper vegetation type (Balda and Masters 1980, Pavlacky and Anderson 2001). These specialists include Gray Flycatcher, Gray Vireo, Juniper Titmouse, Bewick's Wren, Blue-gray Gnatcatcher, Black-throated Gray Warbler, Ash-throated Flycatcher, Bullock's Oriole, Pinyon Jay, Western Scrub Jay, and Scott's Oriole (Larson and Bock 1986, Anderson and Gutzwiller 1994, AOU 1998, Paulin et al. 1999).

Within pinyon-juniper woodlands, the composition of the avian community is correlated with the density of pinyon pines (Pavlacky and Anderson 2001). For example, the abundance of bark-gleaning insectivores is positively correlated with pinyon pine density in semi-arid woodlands of Arizona (Masters 1979). Furthermore, the presence of pinyon pine has been found to have a greater influence on occupancy by pinyon-juniper specialists than increased juniper regeneration. For example, Gray Flycatcher, Juniper Titmouse, Bewick's Wren, and Black-throated Gray

Warbler territories contained pinyon pine more often than expected (Pavlacky and Anderson 2001).

In addition, most species were associated with conditions typical of mature pinyon-juniper woodlands (Pavlacky and Anderson 2001)). In Wyoming, the Gray Flycatcher, Juniper Titmouse, and Bewick's Wren preferred woodlands with a high overstory of juniper cover, and pinyon pine was particularly important to these species. The Juniper Titmouse and the Gray Flycatcher were associated with senescent trees, the Blue-gray Gnatcatchers with *Rosaceae* shrubs and rock outcrops, and the Black-throated Gray Warbler with Pinyon Pine. Blue-gray Gnatcatchers, Gray Flycatchers, and Black-throated Gray Warblers were in woodlands that had high seedling and sapling density (Pavlacky and Anderson 2001).

Many of these same pinyon-juniper specialists inhabit the pinyon-juniper woodlands of Pipe Spring National Monument. The avian inventory found that the following species are pinyon-juniper specialist in the Monument: Gray Flycatcher, Gray Vireo, Juniper Titmouse, Bewick's Wren, Blue-gray Gnatcatcher, Ash-throated Flycatcher, Western Scrub Jay, Scott's Oriole, Bushtit, Black-throated Sparrow, and Green-tailed Towhee. Another specialist, a migrant in the Monument, the Black-throated Gray Warbler was recorded in the pinyon-juniper habitat.

Because the composition of the bird community is affected by the composition of the vegetation overstory, understory, and successional stage, the conservation of pinyon-juniper specialists will likely benefit from the maintenance of successional processes, particularly those that perpetuate mature juniper woodland with a pinyon pine component. Yet, given that pinyon-juniper specialists occupy different conditions of mature woodland, simply maintaining mature woodland on the landscape may not ensure the persistence of all species. Ultimately, the biological integrity of the pinyon-juniper woodland community would be enhanced by ensuring the presence of multiple stages of mature woodland on the landscape (Paulin et al. 1999, Pavlacky and Anderson 2001).

The pinyon-juniper bird community is not only influenced by vegetation composition and structure. As mentioned above, livestock grazing can affect pinyon-juniper bird communities by altering the composition and structure of pinyon-juniper vegetation, and influencing fire intensity, size and frequency. In addition, livestock grazing can affect the bird community by increasing the likelihood of nest parasitism by Brown-headed Cowbirds. In fact, livestock can have a great affect on bird productivity even when livestock are not grazing within the pinyon-juniper. In New Mexico pinyon-juniper habitat, Goguen and Mathews (1998) found that cowbird parasitism rates were high in both grazed and ungrazed sites (75% of the nests of the solitary vireo, western tanager, and blue-gray gnatcatcher were parasitized in both treatments). The high rates of parasitism were likely due to the high density of local cowbirds because of abundant feeding sites (i.e., livestock), the high mobility of cowbirds, and the close proximity of grazed areas to ungrazed areas. Pipe Spring National Monument provides favorable habitat for Brown-headed Cowbirds, including feeding grounds in and around the corrals. As a result, Cowbirds are abundant at Pipe Spring and likely parasitize nests, thus affecting bird productivity, throughout the area. Thus, in addition to ensuring the presence of multiple stages of mature woodland on the landscape, the biological integrity of the pinyon-juniper woodland bird

community would also be enhanced by taking measures to reduce the influences of livestock and associated cowbirds at the landscape level.

Urbanized Habitat (the buildings, orchards, springs and their associated riparian habitat, and livestock corrals) Ecology and Management

Urbanization, the conversion of natural landscapes to a landscape that includes buildings, roads, water diversions, fences, and domesticated animals, affects birds directly and indirectly (Marzluff 1997). Settlement modifies water and sediment fluxes; reduces and fragments natural habitats; introduces exotic organisms; severely alters energy flow and nutrient cycles; and overstresses entire ecosystems (Marzluff et al. 2001). It directly changes ecosystem processes, habitat, and food supply. Indirectly, it affects birds' predators, competitors and disease organisms. These effects lead to significant changes in the population biology of birds in urban areas with resulting effects on bird communities (Marzluff et al. 1998). Essentially, the establishment of human cultural resources allows for the introduction of an urban avifauna typified by invaders, often exotics (Knight 1990, Marzluff et al. 1998).

The effects of urbanization likely to have the greatest impact on birds are changes in the basic functioning of the ecosystem from a natural state. Some of the most notable changes due to urbanization are the reduction in natural processes such as fire, alteration of nutrient cycling, and disruption of water cycling (Marzluff et al. 1998).

In particular, habitation by humans and domestic livestock greatly increases water requirements, and the resultant use of water affects the distribution and cycling of water in surrounding areas (Knight 1990). If aquifers are used at greater than replacement rates, water tables are lowered (Thorn et al. 1993). Springs and seeps important to wildlife may then dry up, causing reductions or redistributions of nonurban birds (Marzluff et al. 1998).

Direct habitat modification by urbanization includes the removal of native plant species from urban environments and replacement by exotic ornamentals, including lawns. In particular, an unnatural feature of urban and suburban areas is the relative scarcity of tree cavities because of pruning, cavity filling, snag removal, and tree thinning. Even moderately developed environments contain few standing or downed dead trees that provide nest and foraging sites for cavity nesters and timber drillers. Thus the process of urbanization likely benefits ground gleaning and probing birds (e.g., American Robins and American Crow), granivores, and species that nest in human-made structures or ornamental vegetation. It reduces shrub and canopy nesters and foragers (many warblers, sparrows, tanagers and grosbeaks) and reduces burn specialists, cavity nesters and bark drillers (Marzluff 1997, Marzluff et al. 1998).

Indirectly, settlement and urbanization affect birds' predators, competitors and disease organisms. It often leads to a greater abundance of some nest predators that in turn affects the composition of the bird community (Wilcove 1985, Marzluff et al. 1994). The bird community is also affected by the shortage of tree cavities in settlement areas that results in intensified interspecific competition, including competition between native and exotic species, for nesting and roosting space (Marzluff et al. 1998). Finally, the presence of artificial feeders and

concentrated food sources associated with livestock corrals concentrates birds and increases the ability of disease to spread among individuals.

At Pipe Spring the existence of buildings, non-native, ornamental vegetation, and livestock corrals (that provide a concentrated year-round food source) has affected ecosystem processes and allowed for the establishment of an urban avifauna typified by invaders, including exotic species. Exotic species such as the European Starling and House Sparrow, and other invaders such as the House Finch breed in the housing and surrounding area, primarily using man-made structures and introduced vegetation for nesting sites. The European Starling offers intense competition for nesting cavities and has a detrimental effect on many native cavity-nesting species (Cabe 1993). Starlings are well established at Pipe Spring, using both natural cavities that may have otherwise been used by native species, and man-made structures to nest in. Five European Starling nests were located during nest searches. Three nests were built in manmade structures: two in buildings and one in a stone wall; while two nests were located in cavities in snags. Native cavity nesters that may be detrimentally affected by Starlings at Pipe Spring include the Ash-throated flycatcher, Juniper Titmouse, Bewick's Wren, and Northern Flicker.

Urbanization has provided habitat for House Sparrows, another common exotic species at Pipe Spring. House Sparrows are known to forcibly evict native species from nest sites (Lowther and Cink 1992) and have been recorded killing both adult and nestling Bluebirds (Gowaty 1984). At Pipe Spring NM we observed aggressive competition with a native species: House Sparrows evicted Cassin's Kingbirds from an active nest, then used the nest (K. Broadhead pers. comm.). In all, seven House Sparrow nests were found: 5 were located in trees or snags (including the one taken from the kingbirds), and two were in buildings.

As mentioned above, the pruning of dead vegetation and cutting of snags is generally detrimental to native bird species and these activities at Pipe Spring likely affect the birds there. The species most likely to be affected by pruning include flycatchers that use dead limbs for perches while foraging, bark gleaners that use them as foraging substrate, and cavity nesters that use large dead limbs as nest sites. The removal of snags is detrimental to numerous species that use dead trees as perches and is especially detrimental to cavity nesters as it further reduces the limited number of nest sites available.

Perhaps the greatest effects on the Pipe Spring bird community are those associated with the change in the availability of water and the associated changes in vegetation around the springs. As reported in Alexander (1998), the large canopy trees, white poplar (*Populus alba*), Fremont Cottonwood (*Populus fremontii*), and Lombardy poplar (*Populus nigra*) in the spring area were planted by the Woolley family in the 1880's. If any Fremont Cottonwood existed at the spring before the construction of the ranches, they would probably have been cut down for fire wood or building material since Alonzo Winsor described the Pipe Spring area as being without any trees in the late 1860's. The trees were mature by the 1930's and by the 1960's they provided a significant canopy over the entire region surrounding the fort. Thus these trees constitute unique habitat in an arid landscape that have provided an essential migratory stopover site for many birds for at least a hundred years. The site's importance is enhanced in that it is situated among geographic barriers (e.g., Arizona Strip, the Grand Canyon, a landscape comprised of arid habitats). It likely supplies migrating birds with essential resources for successful migration for

at least a hundred years. In addition, several species use them for nesting and foraging during the breeding season. Every effort should be made to maintain these deciduous trees.

Another major impact on the birds of Pipe Spring NM and a consequence of urbanization, has been the introduction of livestock into the Pipe Spring landscape. In addition to the effects that livestock has on the different habitats (discussed above), the presence of livestock has allowed for the invasion of Brown-headed Cowbirds. Two livestock corrals have existed at Pipe Spring NM since at least 1930 and are regularly visited by foraging Brown-headed Cowbirds. In addition, the surrounding tribal lands are grazed, and a concentrated foraging area has existed since the 1970's, at the Meadowwayne Dairy in Colorado City, approximately 35 miles away. Not surprisingly, Brown-headed Cowbirds were the most commonly detected birds during the breeding season incidental surveys, accounting for 14.5% of all incidental observation detections (62 of 428; Table 4). The abundance of cowbirds has likely had a large impact on the birds of the area.

Brown-headed Cowbirds typically demonstrate a pattern of daily movement between separate foraging and breeding areas. Radio-tracking of cowbirds in the eastern Sierra Nevada of California showed that females and males spent mornings in host-rich habitat such as riparian zones and then commuted 30-40 km (19-25 miles) in the late morning and afternoon to one or more prime feeding sites, such as horse corrals and pack stations (Rothstein et al. 1984).

Likewise, in New Mexico pinyon-juniper, Goguen and Mathews (1998) found no difference between grazed and ungrazed sites when they compared habitat and vegetation features, the bird community, nesting success, and cause specific rates of nest failure among the 7 common bird species. They also found no difference in cowbird parasitism rates, they were high in both grazed and ungrazed sites (75% of the nests of the Solitary Vireo, Western Tanager, and Blue-gray Gnatcatcher were parasitized in both treatments). The high rates of parasitism were likely due to the high density of local cowbirds because of abundant feeding sites (i.e., livestock), the high mobility of cowbirds, and the close proximity of grazed areas to ungrazed areas.

Bird Species Richness Across Habitats

We found that several habitats in the park differed in the bird communities that they hosted (Appendix D, Table 13). For example, the riparian woodland and the pinyon-juniper woodland habitats had the highest species richness, and they also had the greatest number of obligate species (species found only in that one habitat type). We will discuss each habitat type in turn.

Riparian woodland hosted the greatest number of breeding season species in the park (43 species) and also had a high number of obligate species (12 species; 37.5% of all obligate species). In winter, riparian woodland habitat was also the most diverse, hosting 83% of the species found in the monument. The disproportionate use of riparian woodland by birds has been found by other studies in the Southwest (Carothers 1974, Szaro 1980). Thus, these watered habitats appear to attract migrating birds, and their maintenance will significantly affect the diversity of species that utilize the monument.

The pinyon-juniper woodland hosted the next highest species richness; a total of 40 species were detected in this habitat. It also had the greatest number of specialists/obligates, including the Gray Flycatcher, Gray Vireo, Juniper Titmouse, Bewick's Wren, Blue-gray Gnatcatcher, Western Scrub Jay, Scott's Oriole, Bushtit, Black-chinned Sparrow, and Green-tailed Towhee. Another specialist, a migrant in the monument, the Black-throated Gray Warbler was also recorded in the pinyon-juniper habitat. Thus, the presence of juniper and pinyon trees and associated large shrubs, such as the cliffrose, contributes greatly to the bird diversity within the monument.

The next highest bird species richness (35 species) was in the shrubland/shrubsteppe habitat, with 5 species that were found in no other habitat: Cliff Swallow, Horned Lark, Killdeer, and Western Meadowlark. Interestingly, all of these species are associated with shrubsteppe habitat (shrubland that is a mosaic of grasslands and shrubs) rather than areas of dense shrub. Pipe Spring NM has both shrubsteppe habitat (with substantial grassland) and areas of denser shrubs. Species more typically associated with dense shrubs (e.g., Black-throated Sparrow, Gambel's Quail) were also detected in other habitats and thus not shrubland/shrubsteppe obligates.

A relatively high number of species was detected in the housing area (31 species). Viewed on a larger scale that considers the surrounding landscape, the greatest affect on the avian community of Pipe Spring NM and the surrounding area likely comes from the process of urbanization, as described in detail above (see Urbanized habitat ecology and management, above). The presence of buildings, exotic plants including the orchard trees, lawns, and ornamentals, livestock corrals, ponds and roads has allowed for the establishment of exotic and invasive species. These species are generalist, found in all or most of the other habitats, as reflected by the fact that the housing area had only two species found in no other habitat: the American Crow and a Chipping Sparrow (that was a transient in the housing area). Thus, the species that use the housing area affect not only the avian community in the urbanized area but in the surrounding habitats as well.

Because of their small size, the cliff, corral, orchard, and willow areas had no species that were found only within them. Yet, when viewed at a smaller scale, we found that distinct habitats within the general habitats (microhabitats) can also contribute to avian diversity within the Monument. For example, the presence of cliffs in the Monument provides habitat for a distinctive bird community that depends on cliffs for food, cover, and nesting sites. These include the Canyon Wren, Rock Wren, White-throated Swift, Violet-green and Northern Rough-winged Swallows. Rock Wrens are abundant birds in this habitat type and they showed a strong habitat association with bare ground and rock. Similarly, Wiens and Rotenberry (1981) found a strong association between the abundance of Rock Wrens and "rocky outcrops."

Comparison of Survey Techniques and Recommendations

We used four different survey methods at Pipe Spring NM and the Kaibab-Paiute Indian Reservation. During the breeding season we used point count surveys, incidental surveys, spot map surveys, and incidental search surveys in the corrals and housing areas. To conduct valid variable circular plot point counts (VCPs), the individual point count stations must be a minimum of 200 meters apart. Thus, due to the limited size of Pipe Spring NM (16 hectares; 40 acres), and the limited area of habitats within the monument, we were unable to utilize VCPs in

all but the habitats with the largest areas (i.e., scrub and pinyon-juniper habitats). Therefore we mainly used spot mapping within the windbreak riparian area in order to confirm breeding and determine abundance and density of each breeding species. Within the monument we also used incidental search surveys, which enabled us to concentrate on all habitat types and nests of breeding species. Adjacent to the monument within the Kaibab Paiute Indian Reservation in both the pinyon-juniper and sagebrush habitat types we used point count surveys in 2000 and 2001. This survey method was the most efficient for estimating bird abundances, and thus facilitates comparisons among habitats or years. Thus, we recommend continuing variable circular plot point counts surveys in both pinyon-juniper and sagebrush habitats and incidental search surveys with the monument boundaries. Incidental search method will accomplish the same as spot-mapping, and spot mapping is prohibitively time consuming (see Management Recommendations section, below).

During migration, we used both mist netting and incidental search surveys. We attempted mist netting throughout the monument but had our highest success in the windbreak riparian zone. This method is highly successful in detecting birds during migration when most species are very inconspicuous (not singing). Yet, this method is very costly, time consuming and requires highly trained personnel. Incidental search surveys were not as successful during migration because most species are very inconspicuous during migration, and therefore are difficult to determine their presence. Thus, if continued migration surveys are conducted, we recommend mist netting during spring and fall migration if funding and trained personnel are available. If funding or trained personnel were not available, incidental search surveys in each habitat type, mainly concentrating within the windbreak would be sufficient to detect the most common migrants. This should be completed during the spring (April, May and early June) and during the fall (late August and September). One survey visit per week would be sufficient.

During the winter, we conducted incidental search surveys within the monument and in the pinyon-juniper, sagebrush habitats throughout the Kaibab Paiute Indian Reservation. During the winter most species are also very inconspicuous (not singing) and are not detected unless the bird is flushed while walking about or actively sought. Thus, we recommend continuing incidental search surveys in all habitat types during the winter and continue Christmas Bird Counts, which seems to detect a number species on a yearly basis. These surveys should be conducted from December – February at least three times each month.

CONCLUSION

During this project, which included historical review and current surveys, we detected three species never before recorded in the Monument. Historical land uses, such as livestock grazing and settlement have influenced the vegetation and the habitats that currently exist within the Monument and the surrounding tribal lands. The desert shrublands and pinyon-juniper woodlands provide habitat for a diverse array of bird species, including several pinyon-juniper obligates. The housing and livestock areas have allowed for the establishment of several exotic and invasive bird species, including the Brown-headed Cowbird.

Perhaps most importantly, Pipe Spring NM, situated among geographic barriers (e.g., Arizona Strip, the Grand Canyon, a landscape comprised of arid habitats), serves as an essential

migratory stopover site. Many of the species detected during the migration surveys, including Common Yellowthroats, Lincoln's Sparrows, Yellow-breasted Chats, and Wilson Warblers are typically associated moist habitats. The springs and riparian vegetation at the monument constitute a uniquely moist habitat within the arid surrounding landscape that these migrants can utilize for food and cover. This habitat is clearly serving as an important migratory stopover area for many Neotropical and short distance migrants, and is deserving of protection and management.

Recommendations for Designing an Avian Monitoring Program at Pipe Spring National Monument

Overview

Developing monitoring and research programs that provide information on what is there, how things are changing, and what can be reasonably managed for, is a challenging task. A monitoring program should provide data that enables the detection of environmental change, provides insights to the ecological consequences of these changes, and helps decision makers determine if the observed changes warrant changes in management practices (Noon et al. 1999).

In general, birds are considered a valuable monitoring tool because their dynamics closely parallel those of the ecosystem, they are sensitive enough to provide an early warning of change, they provide continuous assessment over a wide range of stresses and have dynamics that can be attributed to either natural cycles or anthropogenic stressors, are distributed over wide geographical area/or are very numerous, can be accurately estimated, have costs of measurement that are not cost prohibitive, are low impact measurement, and can have measurable results that are repeatable. Thus, birds are an appropriate choice for indicators of change throughout the Colorado Plateau and a monitoring program should be established.

To develop monitoring protocols to adequately monitor avian population trends for just Pipe Spring National Monument and its surrounding area would be problematic. A larger area must be considered in order to provide the information needed. However, there are some factors that can be monitored on a local scale that can contribute to the conservation of the local avian population. These include, 1) monitoring the avian populations at the horse corrals, which have contributed to the increase in Brown-headed Cowbirds, a brood parasite that can affect the productivity of a number of nesting species at Pipe Spring; 2) monitoring the population increase of House Sparrows and European Starlings within the Monument's housing development including the fort and the visitor center. Both of these species can greatly affect the nesting success of many other species, both local and long-distance migrants. These are very important local issues that can have huge effects on the avian population at Pipe Spring National Monument and the surrounding tribal lands. However, these problems are on a very small scale and cannot adequately evaluate avian population trends on a larger scale. An appropriate larger scale would encompass the Arizona Strip, state of Utah, the Colorado Plateau or even the western United States.

Many bird monitoring programs are designed, and data collected, in a "bottom-up" approach, focusing on a specific species (i.e., Southwest Willow Flycatcher) within the area to be monitored. Yet, recognizing the complexity of multi-species/multi-resource management, many conservationists and scientists have acknowledged the need for a combination of "top-down"/coarse filter biogeographical and regional approaches and "bottom-up"/fine filter species-specific management to conserve biological diversity (Thompson et al. 2000). This combined approach is especially appropriate for developing monitoring programs and adapting management strategies concerning the avifauna throughout the Colorado Plateau, as the ecological processes that affect the avian community of this area occur at multiple spatial and temporal scales. For example, many bird species utilize portions of Pipe Spring NM, the Arizona Strip and even the Colorado Plateau and its resources for only part of each year (i.e.,

wintering or breeding seasons), and are likely influenced by processes occurring beyond the confines of the area to be monitored. Thus, it would be appropriate to incorporate information about breeding bird population trends across multiple scales, thereby enhancing the ability to identify factors affecting the species of concern and prioritize conservation and management efforts. Therefore, the following recommendations for designing a monitoring program are meant to be applied at a larger scale such as the Arizona Strip, the state of Utah, or the Colorado Plateau, that would encompass Pipe Spring National Monument and the Kaibab/Piute tribal lands.

The development of a comprehensive design for future monitoring and management of the avifauna throughout the Colorado Plateau, including Pipe Spring NM and the adjacent Kaibab/Piute tribal lands, will require and the cooperation of many land management agencies (i.e., National Park Service, Native American tribal lands, Bureau of Land Management, State of Utah). The design of a monitoring program at this scale should incorporate both, a top-down planning effort, based on assessments or patterns at larger spatial and ecological scales, and bottom-up effort based on patterns or data at smaller scales.

The steps involved in designing a monitoring program should include the following key components, following the suggestions of Noon et al. (1999):

1. Identification of stressors relating to management goals.
2. Development of a conceptual model linking stressors to ecological responses.
3. Identification of avian indicators responsive to environmental stressors.
4. Estimation of the status and trend of avian indicators/Establishment of sample design.
5. Definition of response criteria/Calculation of benchmark conditions.
6. Linkage of monitoring results to decision-making.

1. Identification of Stressors Relating to Management Goals.

An initial step in designing a monitoring program should be the identification of anticipated extrinsic environmental stressors, both natural and human-induced, that may compromise ecosystem integrity and alter its component species and resources. If the effects of these stressors exceed the resilience or adaptational limits of the ecosystem, the ecosystem will change. This change may result in management goals being compromised, necessitating adapting management actions (Noon et al. 1999). Therefore, it is essential to identify potential stressors, at the ecosystem level down to the within-habitat level, focusing on those stressors that are subject to management decisions (e.g. livestock grazing, recreational use, land-use patterns in surrounding uplands).

The next step in monitoring design involves identifying the ecological resources expected to be affected by these stressors (e.g., shrubland habitat, riparian vegetation, soils, water resources). The National Park Service will need to compile an inventory, based on a thorough review of published and unpublished information, including this report, of the ecological attributes (both habitat components and avian resources) of all habitats that are likely to be affected by stressors within the area to be monitored. It is also helpful to identify the temporal scale associated with each of the different stressors and the resources they affect.

2. Development of a Conceptual Model Linking Stressors to Ecological Responses.

Conceptual models of the resources of concern are a key tool for designing a monitoring program and form the basis for selecting indicators for monitoring. Using the information gathered during step one, above, conceptual models will need to be developed of the linkages among stressors and ecosystem resources. Specifically, the linkages among the avifauna and resource components of concern must be identified.

In order to determine linkages and develop conceptual models, it is useful to employ a bottom-up/fine filter evaluation of current information regarding avian species-specific attributes. Many programs for inventorying and monitoring avifauna have used assemblage-level measures of avian populations as their response variables, including species richness (the number of species), abundance (the number of individuals), and diversity indices. Yet, it is species-specific life history traits that affect at least some community-wide patterns, and interpreting diversity index patterns such as these can only be accomplished by looking at changes in each individual species and determining how these changes affect the diversity values (Wiens 1989, Morrison et al. 1992, Sogge et al. 1998). Furthermore, a monitoring program that tracks populations of species assemblages, without measuring populations of specific species, may mask trends affecting individual species. In the situation where the population of one species is declining, this represents a potentially large risk (Block et al. 1995). Therefore, in order to better understand linkages between avian populations and vegetation/habitat parameters, there is a need to identify what constitutes a resource on species-specific basis, and the factors that may influence the linkages between the abundance, availability, and use of that resource (Wiens 1989). This will enable the determination of appropriate response variables to measure and monitor in order to make inferences about the effects of management actions/disturbance events on birds throughout the Colorado Plateau.

3. Identification of Avian Indicators Responsive to Environmental Stressors

The ultimate success or failure of a monitoring program may be determined by this one step of selecting indicators (Noon et al. 1999). The identification of stressors, the ecological resources affected by them, and the development of conceptual models will enable selection of avian indicators. Indicators should reflect ecological resources and be able to indicate changes that would warrant management action. To aid in the selection of indicators one should ask: Do the avian parameters measured by the monitoring program provide insights to the ecological consequences of disturbance events? Do they enable prediction of how changes in abundance and availability of ecological resources may affect bird species and assemblages?

Thus, it is possible through this process to select individual species to serve as indicators for monitoring. In addition, it may be appropriate to examine species-specific data and identify assemblages, if any, of species that are similarly linked to key resource attributes and/or stressors.

4. Estimation of the Status and Trend of Avian Indicators/Establishment of Sample Design.

As part of the process of developing an avian monitoring program it is necessary to determine the number of samples needed to yield statistically significant results in trend analysis (using data such as that from Johnson 2000, 2001, Johnson et al. 2001a, and 2001b, Norvel et al. 2000). Also, trends in species populations over the monitoring period will be analyzed, although often these analyses will only be possible for the most abundant breeding species (Johnson et al. 2001a and 2001b).

The ability of an avian monitoring program to track trends in populations can be enhanced by considering populations at multiple scales, including larger scales. Therefore, it would be beneficial to incorporate the Colorado Plateau-wide trend information with trend information from multiple spatial and temporal scales. One can then assess which species found within the Colorado Plateau are of concern at a state-wide, regional, and national scale using Breeding Bird Survey trend results for the period from 1966 to 2001 (Sauer et al. 2001), Partners in Flight national, state-wide, and regional (Colorado Plateau) Bird Conservation Plans, and expert opinions. Comparing the patterns of these trends will determine if the trends are due to local perturbations/disturbances such as corrals at Pipe Spring NM, or are likely the result of factors occurring at larger scales, beyond the confines of the Pipe Spring NM. Also, by combining this information one can determine if these species can be effectively monitored using existing protocols/methodologies, or if new methodologies need to be developed. This information will also enable the appraisal of Pipe Spring's role in providing important habitat (i.e. sagebrush) for species of concern when considered at the local, ecosystem-wide, state-wide, regional, and national scale. Concomitantly, the National Park Service should attempt to identify attributes specific to the Pipe Spring NM and its surrounding area that may contribute to its ability to provide long-term conservation benefits and maintain sensitive avian populations. All of this information will greatly enhance the ability of the National Park Service to prioritize conservation and management efforts.

Appropriate sampling protocols, based on specific monitoring objectives, will then be developed as needed. The sampling methods chosen will depend upon which resources were determined to be of the most interest, and what indicators were chosen to monitor changes. For example, livestock grazing could be identified as a major stressor of the shrubland ecosystem. An indicator used to monitor its effects could be the abundance of Brown-headed Cowbirds locally, at the landscape level, and regionally. Sampling could then be developed to adequately measure Brown-headed Cowbird abundance at multiple spatial scales. Sampling could also include nest finding and monitoring of species of concern in the habitat of concern, in order to measure the effects of cowbirds on avian productivity and population trends. Additionally, as discussed above, sampling should be designed so that it provides useful measures of a resource that can be used to guide management action. In this example, a threshold value (i.e., a specific abundance of cowbirds, or a nest productivity rate) would be identified. When this figure was exceeded, management action would be taken.

When developing a sampling design, what constitutes a "biologically significant" trend must be determined; values from literature tend to range between 3-5% (Eagle et al. 2000). It is essential to evaluate whether the monitoring program, as designed, can detect a change of this magnitude, especially for sensitive species. Avian monitoring programs often depend on standardized count data such as point-count data to attempt to measure trends. Tools exist for analyzing this type

data to determine its ability to detect biologically significant trends. For example, the program Monitor, a software package for estimating the power of biological monitoring programs to detect trends in abundance, can be used to explore the relationships between power, sample size, and estimated variance, counts per year, precision criteria, and desired trend level (Eagle et al. 2000). This information can assist in refining avian monitoring protocols as needed to produce meaningful, useful results.

5. Definition of Response Criteria/Calculation of Expected Values and Trends.

The avian monitoring program to be developed should include the generation of expected values (i.e. benchmark conditions) for avian monitoring, as generation of expected values is an essential component of a monitoring program. Only by comparing observed and expected values or trends can a determination be made about the effectiveness of management practices (Noon et al. 1999). Estimation of expected values, such as the benchmark values for avian populations, is problematic, especially in a system such as Colorado Plateau that has experienced significant human-induced and natural change. Yet, selection must be based on the best available information, and benchmark conditions for avian populations may be best categorized by target distributions rather than threshold values (see Noon et al. 1999). The monitoring program should allow for periodic estimates of the direction and magnitude of indicator change, providing an ongoing evaluation of the effectiveness of management strategies.

6. Linkage of Monitoring Results to Decision-making.

For a monitoring program to be of value it must be of use to decision-makers. Thus, the avian monitoring program should be designed to provide the information required by the National Park Service to adjust management activities to mitigate unplanned and undesirable outcomes.

The specific objective for an avian monitoring program is to identify an optimal design for an efficient and effective long-term avian monitoring program for the National Parks throughout the Colorado Plateau, and lands surrounding these parks, that can be implemented by the National Park Service. This includes ensuring that the avian monitoring program provides the actual information needed by decision-makers, in a format that is easily interpreted and useable. A well-designed monitoring program, developed following the steps described above, will directly contribute to the National Park Services meeting the statutory requirements of the National Parks Omnibus Management Act of 1998. This recent legislation and National Park Service policy requires that park managers know the condition of natural resources under their stewardship and monitor long-term trends in those resources in order to fulfill the NPS mission of conserving parks unimpaired (www.nature.nps.gov).

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APPENDICES

Appendix A. Annotated Checklist of the Birds of Pipe Spring National Monument 1999-2001. This checklist is based on information collected during 1999-2001 surveys and historical observations.

Introduction

The following is a list, in taxonomic order, of 116 bird species recorded for Pipe Spring National Monument. There are also 51 species listed as historical sightings that were not detected during this inventory. Most of these species are migrants that are seen casually from year to year. This checklist may be also used as a general guide to birds of some nearby areas, but the status of many birds may be different outside of the immediate monument boundaries.

Many of the breeding and non-breeding species that use this area are neotropical migrants. Neotropical migrants are birds that winter in Mexico, South and Central America and migrate northward annually to breed throughout North America. Some species of neotropical migrant birds have suffered significant population declines throughout their range due primarily to habitat destruction, alteration, and fragmentation. These population declines are a cause for immediate concern, and many government and private organizations in North, Central, and South America are promoting conservation of neotropical migrants.

The rest of the birds in the monument are either short distance migrants (Black-throated Sparrows), winter residents (White-crowned Sparrows), year round residents (Gambel's Quail), and stopover migrants (i.e., Western Tanagers and Common Yellow-throat). Short distance migrants are those birds that breed in the monument and migrate in the winter to lower elevations (i.e. Virgin River) and/or lower latitudes (southwest United States). Winter residents are those birds that breed in either high elevation habitat and/or latitudes and winter at Pipe Spring NM. Year round residents are those birds that are present at Pipe Spring throughout the year where they breed and winter. Stopover migrants use the monument as a stopover site to replenish their energy requirements in order to continue their migration north in the spring and south in the fall. Pipe Spring is an ideal location as a stopover site for migrants. It is in the middle of the Arizona Strip where very little exists (water and/or food) to replenish the energy requirements to continue their migration. In the southwest stopover sites are also habitats that are on the decline in North America due to habitat destruction, alteration and fragmentation and are of great concern for the conservation of many bird species. The goal of these conservation efforts is to protect the birds and their habitats so that species do not become endangered or extinct in the future.

This checklist presents the seasonal status (based on number of individuals and how often they are seen) and preferred habitat(s) of each bird species recorded in the monument and immediate vicinity. It is important to note that our status and abundance categories are based primarily on estimates of the frequency of occurrence and the number of individuals likely to be present and/or observed during intensive searches of the appropriate habitat. Many or most of the "uncommon" species are conspicuous and often observed, even though few individuals are present. Therefore, many "uncommon" species are typically seen during trips to the monument.

Common names of the birds and the order in which they are listed conform to the American Ornithologists' Union Check-list of North American Birds (7th edition, 1998) and subsequent supplements. The common names of known or suspected breeders in this area are underlined. A → symbol next to the species' name indicates a neotropical migrant.

Information for this checklist is based on this intensive three year bird inventory, published literature (such as *American Birds*), unpublished reports and data, museum specimens, and on information generously provided by individuals with many years of experience birding at the Monument. In particular, we thank the local bird communities, providing valuable observations and those of the Audubon Society. Based on comparisons with historic data, the abundance and status of several species has changed significantly. Such changes are noted with brief textual explanations in the checklist.

Future birding efforts and research will undoubtedly uncover new species and/or provide information that may modify the status of some species in this checklist. The National Park Service encourages reporting sightings of new and rare species to Pipe Spring National Monument or to authors of this checklist. The information given for each species is outlined below.

COMMON AND SCIENTIFIC NAME

Common and scientific names of the birds and the order in which they are listed conform to the American Ornithologists' Union Check-list of North American Birds (7th edition, 1998) and subsequent supplements.

BREEDING and NEOTROPICAL MIGRATORY STATUS

Underlined Known or suspected to breed within the area.

→ Neotropical migrant species

Breeding Evidence: Under this section we provide a summary of all evidence that we found of each species breeding evidence in the monument.

ABUNDANCE and RESIDENCY STATUS

Abundant: usually observed or present in large numbers (more than 100 per day).

Common: usually observed or present in moderate numbers (25 - 100 per day).

Fairly Common: usually observed or present in small numbers (10 - 25 per day).

Uncommon: usually observed in low numbers (1 - 10 per day).

Rare: one to a low number observed annually (1 - 10 per year).

Irregular: fairly common to abundant some years, totally absent in others.

Casual: one to a low number seen in some years, totally absent in others.

Note that "uncommon" species are often frequently seen, though in low numbers. For species with only one or two records, the year and month (where available) of the sighting(s) will be indicated in checklist.

NUMBER OF DETECTIONS:

The number of detections listed are the number of times that this species has been recorded within the Monument, not necessarily the number of individuals. For many species, such as territorial songbirds, the number of detections is probably very similar to the number of individuals. However, for flocking species such as waterfowl or some wintering/migrating land birds, the number of detections and individuals may be quite different. For example, an observation of a flock of 40 Dark-eyed Juncos would be considered one sighting. Because the number, timing, and location of surveys varied each year, this number should be considered only an approximate, relative index of detectability, not a population estimate or measure (particularly for species with few detections)

DATE RANGE

This is the range of dates (month/day) for which we have records for each species. In the case of spring and fall migrants, this may include a range of dates for each migratory season. Date ranges are omitted for species present year round, and for species with few or no recent records.

HABITAT TYPES

Wind Break/Riparian: Very little riparian vegetation exists in this area. It is restricted to the drainage of the spring south and west of west cabin and the small patch of surviving willow (*Salix spp.*) south of the horse corral. The windbreak consists of large canopy trees which consists of white poplar (*Populus alba*), Fremont cottonwood (*Populus fremontii*), and Lombardy poplar (*Populus nigra*), are the predominant tree species in the windbreak area.

Mixed Desert Upland Shrubs: The eastern and southwestern region of the monument is an *Atriplex spp.* (Saltbush), *Chrysothamnus spp.* (Rabbitbrush), and *Artemisia spp.* (sagebrush) scrubland with small patches of perennial grassland and annual forb understory. This area also includes cliffs and rocky outcrops.

Pinyon Pine and Juniper: The northwest section of the park is a pinyon-juniper woodland with a mountain brush, perennial grass, and annual forb understory. This area also includes cliffs and rocky outcrops.

Residential: The housing area at the monument consists of white poplar, Fremont cottonwood, Carolina Poplar (*Populus canadensis*) and Lombardy poplar with Kentucky bluegrass (*Poa pratensis*) and various ornamental shrubs.

BREEDING EVIDENCE

This section will describe any observations or evidence of nesting activity within the monument for all species currently known or strongly suspected to breed there.

DATA SOURCES

Unless otherwise noted, information presented comes from this study, including the field notes provided by Pipe Spring National Monument personnel and Northern Arizona Audubon Society. Other sources are referenced in the species accounts, and a list of literature cited may be found at the end of this chapter.

SPECIES ACCOUNTS

Herons and Egrets

Great Blue Heron → (*Ardea herodias*): Irregular visitor throughout the year

of Detections: 2

Date ranges: 3, 7 July 2000; December - January

Habitat: Windbreak and ponds.

Notes: Non-breeder at the monument and observed rarely. Usually noted as a lone bird either roosting in the windbreak or near the ponds.

Cattle Egret → (*Bubulcus ibis*): Casual migrant visitor

of Detections: 2

Date ranges: 24 May 2000; 18 September 2000

Habitat: Windbreak and ponds.

Notes: First observations of this species at Pipe Spring NM, very infrequent visitor.

Snowy Egret → (*Egretta thula*): Casual migrant visitor

of Detections: 20-40

Date ranges: April - May ; September

Habitat: Windbreak and ponds.

Notes: Casual visitor at Pipe Spring NM, R. Wilt observed 20 to 40 Snowy Egrets during 2 different observations in April and September 1974 during migration.

Black-crowned Night-heron → (*Nycticorax nycticorax*): Casual migrant visitor

of Detections: 1

Date ranges: 19 June 2000

Habitat: Windbreak/riparian and ponds

Notes: Seen very infrequent during migration, R. Wilt also observed this species in May 1973.

Ducks, Geese, and Swans

Canada Goose (*Branta canadensis*): Casual migrant and winter visitor

of Detections: 1

Date range: 20 March 1999

Habitat: ponds

Notes: Very infrequent visitor, first noted in December 1972, also observed during fall migration.

Mallard (*Anas platyrhynchos*): Irregular migrant and winter visitor

of Detections: 7

Date Range: 10 December – 20 March

Habitat: ponds

Notes: Seen mainly during the winter, but not observed every year. R. Wauer (1959) and R. Wilt (1974) observed single birds in July.

Appendix A (cont'd)**New World Vultures**

Turkey Vulture → (*Cathartes aura*): Irregular migrant and winter visitor

of Detections: 1

Date Range: 27 June 2001

Habitat: Can be seen soaring over virtually any part of the monument.

Notes: Noted mainly in December during Christmas Bird Counts. However M. and S. Carr (1998) observed Turkey Vultures during spring migration.

California Condor (*Gymnogyps californianus*)

Date: 04/2000, 07/2001

Habitat: Can be seen soaring over virtually any part of the monument. Also perched on the cliffs above the monument

Notes: Detected by Peregrine Fund Biologist, soaring above cliffs west of Pipe Spring.

Kites, Eagles, Hawks and Falcons

Bald Eagle (*Haliaeetus leucocephalus*) Rare winter resident.

Date: February and 1 April 1973, Christmas Bird Count 2001.

Observer: R. Wilt

Notes: Adult and immature observed outside of the monument.

Golden Eagle (*Aquila chrysaetos*): Rare winter resident.

of Detections: 1

Date Range: 1 April 1999

Habitat: Cliffs and upland.

Notes: During present inventory observed a pair in the cliffs west of the monument and hunting in the scrub north of the monument. Observed most commonly in the winter during Christmas Bird Counts. R. Wilt (1972-74) observed Golden Eagles in the fall.

Northern Harrier → (*Circus cyaneus*): Casual visitor.

of Detections: 2

Date Range: 19 June 2000; 12 July 2000

Habitat: Occurs occasionally as a "flyover" virtually any part of the monument.

Notes: Seen more recently (1992-1999) during Christmas bird count.

Sharp-shinned Hawk → (*Accipiter striatus*): Rare year round visitor.

of Detections: 4

Date Range: 4 May 2000; 27 September 2000

Habitat: Windbreak and upland shrub and pinyon/juniper.

Notes: Seen hunting for passerine birds in the windbreak during the winter. Casually been observed during the summer, possible breeder in the windbreak.

Cooper's Hawk → (*Accipiter cooperii*): Rare year round visitor.

of Detections: 2

Date Range: 28 August 2000; 18 September 2000

Habitat: Windbreak and upland shrub and pinyon/juniper

Notes: Seen hunting throughout the monument. Seen most commonly in the winter, but R. Wilt noted it breeding with young at Moccasin in 1973. Possible breeding habitat available at Pipe Spring.

Red-tailed Hawk → (*Buteo jamaicensis*): Rare winter visitor.

of Detections: 6

Date Range: 19 November – 15 January; 20 May 2000

Habitat: Windbreak and "flyover" all parts of the monument

Appendix A (cont'd)

Notes: Most commonly seen in the winter during Christmas Bird Counts. Also observed during breeding season, but no confirmed nests in the monument.

American Kestrel → (*Falco sparverius*): Casual winter and migrant visitor.

of Detections: 1

Date Range: 28 August 2000

Habitat: Windbreak and shrub habitat.

Notes: Observed in the winter during Christmas Bird Counts. R. Wilt (1974) also observed this species during spring and fall migration

Peregrine Falcon → (*Falco peregrinus*): Casual visitor

of Detections: 1

Date Range: 15 January 1999

Habitat: Cliffs

Notes: Second observation of this species at Pipe Spring. Only other observation during Christmas Bird Count in 1992.

Gallinaceous Birds

Gambel's Quail (*Callipepla gambelii*): Common year round resident

of Detections: 58

Date Range: Year-round resident

Habitat: Upland scrub, windbreak and residential area.

Notes: This bird is very common. Numbers can vary from year to year depending on breeding success.

Shorebirds

Killdeer → (*Charadrius vociferus*): Irregular visitor

of Detections: 1

Date Range: 29 June 2000

Habitat: Ponds and windbreak

Notes: Seen normally during the winter, but R. Wilt (1973) noted pairs during the breeding season at Moccasin.

Gulls

Unknown Gull

of Detections: 1

Date Range: 30 May 2000

Habitat:

Notes:

Pigeons and Doves

Mourning Dove (*Zenaida macroura*): Fairly Common breeder and year round resident.

of Detections: 51

Date Range: 18 April – 27 September

Habitat: Nests in trees, shrubs and the ground in scrub, residential area, and windbreak. Forages in all habitats within the monument.

Notes: This bird is a "common" year round resident at Pipe Spring and the surrounding area. Noted as a breeding species by R. Wilt (1973).

Cuckoos and Roadrunners

Greater Roadrunner (*Geococcyx californianus*): Rare year round resident

of Detections: 5

Date Range: Year-round resident

Appendix A (cont'd)

Habitat: Upland pinyon/juniper and scrub

Notes: Although large, the roadrunner is surprisingly elusive and difficult to observe. The males maintain large territories and therefore not many resident individuals within the monument. Observed during Christmas Bird Count (1972). Also observed during Christmas bird counts in 1998 and 1992.

Owls

Being nocturnal, owls are not adequately surveyed with morning point counts. Usually quite and inconspicuous during the day, owls are often not seen during general bird surveys. They may be more common than the number of detections suggest. Several of the species listed below were detected during focused nocturnal owl surveys, conducted with tape playback, and would have been entirely missed during daytime survey efforts.

Great Horned Owl (*Bubo virginianus*): Rare permanent resident.

of Detections: 3

Date Range: 1 January – 31 December

Habitat: Windbreak riparian areas with large trees.

Notes: One of the most widespread owls in North America, with the ability to live in a wide range of habitats.

Found by J. Gifford (1972) and R. Wilt and (1974), and a dead Great-horned Owl in 1999 by park personnel. Noted as a regular breeder within the area of the monument. Also observed in 1997 during Christmas Bird Counts.

Northern Pygmy Owl (*Glaucidium gnoma*): One record: Christmas Bird Count 1992.

Notes: Fairly common resident of coniferous forests in central Arizona (Monson and Phillips 1981), and so probably an occasional transient into nearby lowlands.

Burrowing Owl (*Athene cunicularia*): One record - May 1974. Irregular visitor

Habitat: An open shrub and grasslands species

Notes: This species was quite common throughout the Arizona Strip, but due to overgrazing and the reduced number of Prairie Dogs this species is very rare in the area. One nest discovered by R. Wilt May 26 1974. Surrounding area birds observed in scrub and grasslands.

Goatsuckers

Nighthawks and poorwills are active primarily at dusk. Our recent bird surveys, based on morning counts, are not an effective method for sampling such crepuscular, aerial species. Therefore, the lack or scarcity of current records may be a function of sampling technique rather than an absence of this species.

Common Nighthawk → (*Chordeiles minor*): Uncommon summer resident.

of Detections: 2

Date Range: late May - Sept

Habitat: Upland and foraging throughout the monument

Notes: Adults were flushed from the ground during the breeding season, so this is a possible breeder even though no nests (which are very cryptic) have been found. R. Wilt (1959) and R. Wilt (1974) noted this species as common. Phillips et al. (1964) described it as a common summer resident in Upper Sonoran Zones in central Arizona, and accepted several records from the Arizona Strip. It may be locally more common now than early in this century, or it might simply have been misidentified (as a Lesser Nighthawk) or overlooked due to its crepuscular habits.

Swifts

A note on swifts: Our surveys were not focused on aerial foragers in general and probably seriously under-counted all swifts. Though these counts are not a well standardized method for estimating abundance, they provide a relative index of abundance and give some ideas of arrival and departure dates.

White-throated Swift → (*Aeronautes saxatalis*): Fairly common spring and summer resident and probable breeder.

of Detections: 18

Appendix A (cont'd)

Date Range: 3 April – late Sept.

Breeding Evidence: Occupancy throughout breeding season and appropriate nesting cliffs available.

Habitat: Aerial forager that nests in cliffs near riparian areas.

Notes: R. Hudson (1958) and R. Wilt (1974) noted that this species was quite common along the cliffs and near the ponds.

Hummingbirds

Black-chinned Hummingbird → (*Archilochus alexandri*): Fairly common spring and summer breeder.

of Detections: 48

Date Range: 18 April – 11 September

Habitat: Windbreak, including residential area.

Breeding evidence: Nests found.

Notes: The most widespread and abundant hummingbird, both now and historically (R. Wilt 1973).

Broad-tailed Hummingbird → (*Selasphorus platycercus*): Rare spring and fall migrant.

of Detections: 7

Date Range: early May - 26 May and Mid August - 9 September

Notes: A fairly common breeder at higher elevations, spring and fall migrant elsewhere in the at Pipe Spring.

Calliope Hummingbird → (*Stellula calliope*): Casual spring and fall migrant

of Detections: 1

Date Range: 28 August 2000

Habitat: Windbreak and residential area

Notes: First record by R. Wilt (1974). Can be seen casually at the bird feeders in the residential area in the spring and fall.

Rufous Hummingbird → (*Selasphorus rufus*): Irregular spring and fall migrant

of Detections: 8

Date Range: 26 April 2001 (one detection) and 29 June – 9 September Notes:

Notes: First record by R. Wilt (1973). Can be seen at the bird feeders in the residential area in the spring and early fall.

Woodpeckers

Northern (Red-shafted) Flicker → (*Colaptes [auratus] cafer*): Uncommon permanent resident breeder.

of Detections: 8

Date Range: Year-round resident

Habitat: Riparian

Breeding Evidence: Year-round occupancy in appropriate habitat and territorial behavior.

Notes: At Pipe Spring, most common during winter with few breeding locally due to limited habitat (windbreak and resident area).

Red-naped Sapsucker → (*Sphyrapicus varius nuchalis*): Casual transient. Formally known as Yellow-bellied Sapsucker

of Detections: 3

Date Range: 9-10 December 1998; 6 June 1999

Habitat: Riparian

Notes: Possible breeder, but unlikely, R. Wauer (1963) and R. Wilt (1973) noted mainly in the winter during Christmas bird counts

Downy Woodpecker (*Picoides pubescens*): Casual Transient

of Detections: 1

Date Range: 19 July 2000

Appendix A (cont'd)

Habitat: residential area and windbreak

Notes: All historical detections are during the winter, the bird noted in 2000 may have been an early fall migrant.

Hairy Woodpecker (*Picoides villosus*) Uncommon winter resident

Date: December 1963-65, 1967, 1969-70, 1973, 1 October 1974, 1979, 1995, 1996, 1998, 2001

Observer: Christmas Bird Count; R

Notes: Observed at Pipe Spring, Jacob's Lake (common), and Moccasin (uncommon).

Tyrant Flycatchers

Western Wood-pewee → (*Contopus sordidulus*): Uncommon summer transient and breeder.

of Detections: 22

Date Range: 18 May - 9 September

Habitat: Windbreak riparian area.

Breeding Evidence: Breeding is inferred from regular detections throughout the summer, and singing/territorial behavior.

Notes: R. Wilt (1973) describes daily summer sightings of this species, nest found in windbreak area in 2000.

Gray Flycatcher → (*Empidonax wrightii*): Uncommon summer breeder

of Detections: 6

Date Range: 17 June – 23 July

Habitat: Pinyon/Juniper and in non-grazed sagebrush

Notes: A common breeder in pinyon-juniper habitat in northern Arizona. It probably occurs casually to rarely in the monument as a spring migrant.

Dusky Flycatcher → (*Empidonax oberholseri*): Casual migrant

of Detections: 1

Date Range: 11 September 2000

Habitat: Stop-over habitat in windbreak riparian area

Notes: R. Wilt (1973) only observed this bird during fall migration.

Cordilleran Flycatcher (*Empidonax occidentalis*) Casual migrant

of Detections: 1

Date Range: 15 May 1999

Habitat: Stop-over habitat in windbreak riparian area

Notes: R. Wilt (1973) only observed this bird during fall migration.

Say's Phoebe → (*Sayornis saya*): Uncommon breeder and winter transient.

of Detections: 31

Date Range: 26 April – 23 July; 23 February 1999 (one detection)

Habitat: Scrub/sagebrush and residential area.

Breeding Evidence: Nests found.

Notes: Although uncommon in terms of numbers, Say's Phoebes are very conspicuous and can usually be seen on any spring or summer visit to upland habitats.

Ash-throated Flycatcher → (*Myiarchus cinerascens*): Fairly common spring and summer breeder.

of Detections: 69

Date Range: 26 April – 23 July

Habitat: Primarily upland, but edge of windbreak riparian

Breeding Evidence: Nests found.

Notes: Reported as common by R. Hudson (1958) and R. Wilt (1973-74). This is one of the most frequently seen birds in the summer at the monument, primarily because of its large size and conspicuous behavior.

Appendix A (cont'd)

Cassin's Kingbird → (*Tyrannus vociferans*): Uncommon spring and summer breeder.

of Detections: 30

Date Range: 26 April – 15 August

Habitat: Primarily in windbreak riparian area and residential area, but also some upland areas

Breeding Evidence: Nest building and nests found.

Notes: R. Wilt (1973-74) found nests and listed the Cassin's Kingbird as a common breeder within the monument.

Western Kingbird → (*Tyrannus verticalis*): Uncommon spring and summer breeder.

of Detections: 37

Date Range: 19 April – 23 July

Habitat: Primarily windbreak riparian, but also upland scrub.

Breeding Evidence: Adults seen with juveniles.

Notes: R. Wilt (1973-74) found nests and listed the Cassin's Kingbird as a common breeder within the monument.

Larks

Horned Lark (*Eremophila alpestris*): Winter visitor

of Detections: 1

Date Range: 14 June 2001 most detection in the winter

Notes: Historically a common winter visitor (Wilt 1973-74, R. Foster 1970, R. Wauer 1963-65, B.A. Lund 1964, and R. Foster 1970-71). Breeding birds prefer open dirt and rocky areas, and short grasslands, which are common adjacent to the monument.

Swallows

A note on swallows: Our surveys were not focused on aerial foragers in general and probably seriously undercounted all swallows. Though these counts are not a well standardized method for estimating abundance, they provide a relative index of abundance and give some ideas of arrival and departure dates.

Violet-green Swallow → (*Tachycineta thalassina*): Fairly common spring and summer breeder.

of Detections: 27

Date Range: 10 April - August

Habitat: Cliffs, ponds and windbreak

Breeding Evidence: Nests and juveniles found.

Notes: This is a tree nesting species, and breeding status is inferred from observations of adults in and around riparian trees throughout the summer. Flocks can usually be seen flying low over the ponds and the cliffs of the Monument.

Northern Rough-winged Swallow → (*Stelgidopteryx serripennis*): Uncommon spring and summer breeder.

of Detections: 19

Date Range: Late May - August

Habitat: Cliffs, ponds and windbreak

Breeding Evidence: A bank nesting species. Breeding is assumed, because the birds are detected throughout the breeding season, however, no nests were found.

Notes: R. Wilt (1974) notes them as a fairly common breeder at the barn and cliffs within the monument.

Cliff Swallow → (*Hirundo pyrrhonota*): Irregular visitor.

of Detections: 1

Date Range: 7 July 2000

Habitat: Cliff swallows build gourd-shaped nests of mud under overhanging cliffs, bridges, and eaves of buildings, yet no breeding detected during this inventory

Notes: R. Wilt (1973) noted the first record at the monument.

Appendix A (cont'd)

Barn Swallow → (*Hirundo pyrrhonota*): Irregular visitor.

of Detections: No detection during this inventory; only 2 previous records.

Date Range: Spring and fall migrant

Habitat: Cliff swallows build half cup shaped nests of mud under overhanging cliffs, bridges, and eaves of buildings, yet no breeding detected during this inventory

Notes: R. Wilt (1973) noted this species in low numbers in May and September at the monument.

Crows and Jays

Western Scrub Jay (*Aphelocoma caerulescens*): Fairly Common year round breeding resident

of Detections: 74

Date Range: Year-round resident

Habitat: Pinyon/juniper

Breeding Evidence: Scrub Jay very common throughout the breeding season. No nests found yet flocks noted throughout the summer.

Notes: Scrub jays are common in dense pinyon pine and juniper habitats at the Arizona Strip.

Noted consistently during Christmas Bird Counts.

Steller's Jay (*Cyanocitta stelleri*) Uncommon year round resident.

Date Range: September

Historical Dates: December 1972, 1997; winter 1973

Observer: Christmas Bird Count; R. Wilt

Notes: Observed wintering at Pipe Spring.

Pinyon Jay (*Gymnorhinus cyanocephalus*) Common year round resident.

Date Range: December-January

Historical Dates: 14-20 May 1958; December 1963, 1965, 1969, 1972-74, 1992, December 2003.

Observer: Christmas Bird Count

Notes: Observed wintering at Pipe Spring and its vicinity. Possible year round resident.

American Crow (*Corvus brachyrhynchos*): Casual visitor

of Detections: 2

Habitat: 25 June 1999

Notes: Historically B. Foster (1958) noted one sighting, the only historical sighting. Pipe Spring falls within its breeding range, but not signs of breeding. Only recently has this species started to expand its range due to ever growing food source (i.e. trash dumps).

Common Raven (*Corvus corax*): Uncommon permanent resident.

of Detections: 35

Date Range: Year-round

Habitat: Generalist, though nests in cliffs

Breeding Evidence: Nests detected near the Cliffs just outside the monument.

Notes: One of the most frequently seen birds (though not in large numbers), often soaring high above Monument.

Chickadees and Titmice

Mountain Chickadee (*Parus gambeli*): Rare fall and winter resident

of Detections: 2

Date Range: 4-5 November 1998

Notes: Mountain Chickadees breed and reside in the higher elevations above the Arizona Strip, but occasionally appear at Pipe Spring in late fall and winter (R. Waurer 1963-64, Christmas Bird Count 1963-67, R. Wilt 1972).

Appendix A (cont'd)

Black-caped Chickadee (*Poecile atricapillus*): Casual winter visitor

of Detections: 1

Date Range: 14 May 1999

Notes: Black-caped Chickadees breed and reside in the higher elevations above the Arizona Strip, but occasionally appear at Pipe Spring in late fall and winter (R. Waurer 1963-64, Christmas Bird Count 1963-67, R. Wilt 1972).

Juniper Titmouse (*Parus inornatus*): Rare year-round resident and breeder.

of Detections: 13

Date Range: Year-round resident

Habitat: Primarily upland pinyon/juniper trees and shrubs, but uses riparian areas during winter

Notes: Juniper Titmouse formally noted as Plain Titmouse are common in dense pinyon pine and juniper habitats at the Arizona Strip. Noted consistently during Christmas Bird Counts.

Bushtit (*Psaltirparus minimus*): Fairly common permanent resident and breeder.

of Detections: 45

Date Range: Year-round resident

Habitat: Primarily upland, but uses riparian in winter

Breeding Evidence: Nests found.

Notes: A common resident of Upper Sonoran woodlands throughout Arizona (Monson and Phillips 1981).

Commonly seen during Christmas Bird Counts at Pipe Spring (1963-Present).

Nuthatches and Creepers

White-breasted Nuthatch (*Sitta carolinensis*): Rare winter, casual spring and fall visitor

of Detections: None during this inventory, only historical sightings.

Date Range: December - March; August - October; April

Habitat: Most sightings were in the windbreak.

Notes: Breeds and reside in the higher elevations above the Arizona Strip, but occasionally appear at Pipe Spring in late fall, spring and winter (R. Wilt 1972-74).

Wrens

Rock Wren → (*Salpinctes obsoletus*): Uncommon permanent resident and breeder.

of Detections: 29

Date Range: Year-round resident

Habitat: Rock and cliff areas in uplands

Breeding Evidence: Breeding status implied from presence of singing individuals in appropriate breeding habitat throughout the summer.

Notes: A very vocal and readily detected species in areas with cliff and large rocks. Rock Wren nests are well concealed deep inside cracks in cliffs or jumbles of boulders. It is much more prevalent as a breeder than the small number of located nests would suggest.

Canyon Wren (*Catherpes mexicanus*): Uncommon permanent resident.

of Detections: 19

Date Range: Year-round resident

Habitat: Cliffs and rocky areas in uplands

Breeding Evidence: Breeding status implied from presence of singing individuals in appropriate breeding habitat throughout the summer.

Notes: Common resident of cliffs and canyons in Arizona (Monson and Phillips 1981). Can be heard on almost any spring through fall visit to the appropriate habitat within the monument.

Bewick's Wren (*Thryomanes bewickii*): Uncommon fall and winter, fairly common spring and summer breeder.

of Detections: 97

Date Range: Year-round resident

Appendix A (cont'd)

Habitat: Primarily riparian, but some use of adjacent upland in post-breeding season and winter.

Breeding Evidence: Nests and juveniles.

Notes: This very vocal species is readily heard in and near riparian areas, especially during the breeding season. The difference in abundance between breeding and nonbreeding season may actually be a function of detectability, rather than actual population size differences.

House Wren → (*Troglodytes aedon*): Casual migrant.

of Detections: 1

Date Range: 25 June 1999

Notes: Breeds and reside in the higher elevations above the Arizona Strip, but occasionally appear at Pipe Spring in fall (August – Sept), spring (April) and winter (Christmas Bird Count) (B. Lund 1969, R. Wilt 1974).

Kinglets, Gnatcatchers, and Thrushes

Ruby-crowned Kinglet → (*Regulus calendula*): Common winter and spring visitor.

of Detections: 10

Date Range: 4 November – 24 April

Habitat: Primarily riparian, but also upland habitats with trees

Notes: Very active and vocal with a distinct call, this is one of the Monument's most readily detected winter birds. R. Wauer (1964-65) and R. Wilt observed it common during Christmas Bird Counts.

Blue-gray Gnatcatcher → (*Polioptila caerulea*): Casual winter and fall, uncommon spring and summer breeder.

of Detections: 30

Date Range: 26 April – August 27

Habitat: Windbreak and adjacent shrubby uplands

Breeding Evidence: Breeding status implied from presence of singing individuals in appropriate breeding habitat throughout the summer.

Notes: R. Wilt (1974) found this species during spring and fall migration with no mention of breeding. It appears this species may be a more frequent breeder now than in the mid-1900's.

Black-tailed Gnatcatcher (*Polioptila caerulea*): Casual migrant, first detection of this species.

of Detections: 4

Date Range: 27 August 1999

Habitat: Inhabits desert washes, arid brushlands

Notes: Pipe Spring is on the northern edge of this species breeding range and would not suspect it as a common visitor of the monument except during fall migration.

Western Bluebird → (*Sialia mexicana*): Rare winter, uncommon spring and fall.

of Detections: 2

Date Range: 8 January - 21 April; 14 October - 5 December

Habitat: Riparian corridor and juniper uplands

Notes: Usually detected in small flocks, often flying over. May be seen or heard in any habitat within the monument, though most frequently in areas with trees. Not commonly detected except during Christmas Bird Counts (R. Wilt 1972, R. Wauer 1964-65). Observed during Christmas Bird Counts in 1992.

Hermit Thrush → (*Catharus guttatus*): Casual spring and fall visitor.

of Detections: 3

Date Range: 12 May 2000

Notes: Breeds and reside in the higher elevations above the Arizona Strip, R. Wilt (1973-74) observed one observation in late July.

American Robin → (*Turdus migratorius*): Common fall through spring visitor, common summer breeder.

of Detections: 26

Date Range: Year-round resident

Appendix A (cont'd)

Habitat: Riparian woodland breeder, uses juniper uplands and grasslands in migration and winter.

Breeding Evidence: Nests and juveniles found.

Mockingbirds and Thrashers

Gray Catbird → (*Dumetella carolinensis*): First record at Pipe Spring

of Detections: 1

Date Range: 12 September 1999

Habitat: Windbreak

Notes: Mist netted this bird during fall migration. Pipe Spring is west of this species breeding and winter range, may casually be observed as a vagrant at the monument during spring and fall migration.

Northern Mockingbird → (*Mimus polyglottus*): Common spring and summer breeder.

of Detections: 36

Date Range: 19 April - 28 August

Habitat: Upland habitats, especially with trees and tall shrubs

Nesting Frequency: Nests found.

Notes: This very vocal species is readily heard in and near upland areas, especially during the breeding season.

Crissal Thrasher (*Toxostoma crissale*): Uncommon spring and summer breeder

of Detections: 21

Date Range: Year-round resident

Habitat: Shrubby uplands

Breeding Evidence: Breeding status implied from presence of singing individuals in appropriate breeding habitat throughout the summer.

Notes: A secretive and difficult to find species except during the breeding season, when it can be very vocal. R. Wilt (1973) noted seeing this species in the same location during 1966 Christmas Bird Count.

Waxwings

Cedar Waxwing → (*Bombycilla cedrorum*): Irregular winter visitor

of Detections: 15

Date Range: 9 December 1998

Habitat:

Notes: A rare fall and uncommon spring migrant elsewhere. Historically observed during the winter (R. Wauer 1969, R. Wilt), however this species has been observed during late spring (late May and early June) migration (R. Wilt 1973-74).

Silky Flycatchers

Phainopepla → (*Phainopepla nitens*): Casual visitor

of Detections: 2

Date Range: 3, 8 July 2000

Habitat: Riparian woodlands (especially mesquite) and uplands with trees and tall shrubs

Notes: Pipe Spring is the most northern part of the Phainopepla's breeding range. R. Wilt (1972-74) detected this species during late spring and the breeding season. Few birds were detected during this inventory and no nests were found yet this bird may breed in the surrounding area where appropriate habitat exists.

Shrikes

Loggerhead Shrike → (*Lanius ludovicianus*): Rare year round visitor

of Detections: 1

Date Range: 7 July 1999; December - January

Habitat: Uplands with trees and tall shrubs

Appendix A (cont'd)

Notes: Pipe Spring is south of its breeding range and only one historical record detected this bird in July (R. Wauer 1959). During this inventory we did not detect this species in the winter, however, R. Wilt (1972-74) and Christmas Bird Counts (1963-present) detected Loggerhead Shrikes consistently most years.

Starlings

European Starling (*Sturnus vulgaris*): Fairly common to common year-round resident and breeder.

of Detections: 49

Date Range: Year-round resident

Habitat: Riparian windbreak, residential area.

Breeding Evidence: Adults with nest material entering holes in cottonwoods (particularly at the residence area and the windbreak), and juveniles seen near nest holes.

Notes: Starlings were introduced to North America in 1890 and 1891, when approximately 100 birds were released in New York's Central Park (Cabe 1993). The species spread rapidly and were present in the western United States by 1940. This is likely very close to its actual establishment date here and in the Verde Valley, because it was not listed in numerous ornithological records prior to the early 1940's. Throughout the United States, starlings have become an unwanted "pest" species because they compete with native species for nesting cavities. We have observed starlings chasing American Kestrels and Northern Flickers away from potential nest cavities at the Well picnic area.

Vireos

Gray Vireo → (*Vireo vicinior*): Rare spring and summer breeder

of Detections: 35

Date Range: 26 May – 12 July

Habitat: Pinyon/juniper and shrubs.

Breeding Evidence: Breeding status implied from presence of singing individuals in appropriate breeding habitat throughout the summer.

Notes: R. Wilt (1972-74) detected this species on twice, which are the only records at the monument. Most detections during the 1999-2001 inventory were outside the monument in pinyon/juniper Kaibab/Piute tribal lands north of the monument. This also is a species of concern in the states of Arizona and Utah.

Solitary (Plumbeus) Vireo → (*Vireo solitarius*): Irregular spring/fall and winter visitor

of Detections: 3

Date Range: 2 June – 7 July

Habitat: Windbreak

Notes: This species breeds in woodland habitats, which is appropriate within the windbreak at Pipe Spring, but due to the limited available habitat, breeding may vary from year to year. R. Wilt (1972-74) also noted this bird during the winter as well as Christmas bird counts in 1992.

Warbling Vireo → (*Vireo gilvus*): Casual spring and fall migrant, rare summer breeder.

of Detections: 3

Date Range: 2 June – 19 July

Habitat: Riparian

Notes: This is a possible breeder within the windbreak at Pipe Spring, however, due to the limited available habitat, breeding may vary from year to year. Statewide, a common summer resident in riparian habitat with willows, maples, and box-elder (Phillips et al. 1964), but primarily a migrant at Pipe Spring (R. Wilt 1972-74).

Wood Warblers

Nashville Warbler → (*Vermivora ruficapilla*): Casual spring and fall migrant

of Detections: 4

Date Range: 27 August – 18 September

Habitat: Riparian windbreak

Appendix A (cont'd)

Notes: Mist netted this bird during fall migration. Pipe Spring is south of this species breeding range, may casually be observed as a vagrant at the monument during spring and fall migration.

Virginia's Warbler → (*Vermivora virginiae*): Casual spring migrant

of Detections: 2

Date Range: 7 May 1999

Habitat: Riparian woodlands

Notes: Common summer resident in brush habitats at high elevations, and irregular transient during migration (Phillips et al. 1964).

Lucy's Warbler → (*Vermivora luciae*): First detection at Pipe Spring, Casual visitor

of Detections: 2

Date Range: 15 June 1999

Habitat: Riparian woodlands

Notes: Pipe Spring is located at the most northern edge of this species breeding range. The appropriate habitat exists and if this species range expands it could be a yearly breeder at the monument.

Yellow Warbler → (*Dendroica petechia*): Uncommon breeder

of Detections: 20

Date Range: 5 May – 12 September

Habitat: Riparian woodlands

Notes: This species often nests high above ground, so nests may go undetected. A more common nester than suggested by the small number of nests found. R. Wilt (1972-74) found that this species a common breeder

Yellow-rumped Warbler → (*Dendroica coronata*): Fairly common winter visitor, Uncommon spring and fall migrant

of Detections: 12

Date Range: September - April

Habitat: Riparian Woodlands

Breeds and reside in the higher elevations above the Arizona Strip. Commonly detected in the winter.

Black-throated Gray Warbler → (*Dendroica nigrescens*): Rare spring and summer breeder

of Detections: 5

Date Range: 26 May – 11 June

Habitat: Scrub and pinyon/juniper woodlands

Notes: Reported by R. Wilt only as a casual spring and spring migrant. Breeds in pinyon and juniper forests along the Mogollon Rim (Phillips et al. 1964), and an uncommon to fairly common spring and fall migrant statewide (Phillips et al. 1964)

Townsend's Warbler → (*Dendroica townsendi*): Casual spring and fall migrant

of Detections: 2

Date Range: 26 May 2000; 18 September 2000

Habitat: Riparian woodlands

Notes: A fairly common transient in lower elevations throughout Arizona (Phillips et al. 1964).

Northern Waterthrush → (*Seiurus noveboracensis*): Casual spring migrant

of Detections: 1

Date Range: 18 May 2000

Habitat: Riparian woodlands

Notes: An uncommon stream-side transient statewide (Phillips et al. 1964) and a rare spring and fall migrant in dense riparian areas elsewhere. Four other records by R. Wilt in 1972-74.

MacGillivray's Warbler → (*Oporornis tolmiei*): Rare spring and fall migrant

of Detections: 6

Appendix A (cont'd)

Date Range: 24 May; 27 September

Habitat: Riparian woodlands, particularly with wet, dense understory vegetation

Notes: Observed and mist netted in riparian windbreak

Common Yellowthroat → (*Geothlypis trichas*): Irregular spring migrant

of Detections: 5

Date Range: 27 April – 24 May

Habitat: Marsh and other wetlands, often near riparian windbreak

Notes: Described by Wilt (1974) as a rare spring and fall migrant. A fairly common breeder in dense riparian areas throughout Arizona (Phillips et al. 1964).

Hooded Warbler → (*Wilsonia citrina*): First observation at Pipe Spring, Casual spring migrant.

of Detections: 3

Date Range: 12 May 2000

Notes: A male was mist netted in the windbreak; eastern United States breeder, very few documented in Arizona (Phillips et al. 1964).

Wilson's Warbler → (*Wilsonia pusilla*): Rare spring and fall migrant

of Detections: 8

Date Range: 27 August – 20 September; 24 April 2000 (one detection)

Habitat: Riparian woodlands

Notes: Described by R. Wilt (1972-74) as an uncommon spring migrant at Pipe Spring, but no records of breeding within the monument.

Yellow-breasted Chat → (*Icteria virens*): Rare spring and fall migrant; casual breeder

of Detections: 4

Date Range: 15 May – 11 September

Habitat: Riparian woodland and mesquite bosque

Notes: Common breeder statewide in riparian and mesquite bosque habitats (Phillips et al. 1964).

At Pipe Spring appropriate habitat exists in the riparian windbreak, but habitat availability limits chats breeding opportunities. Most commonly detected as a migrant (R. Wilt 1974).

American Redstart → (*Setophaga ruticilla*): Casual spring and fall migrant

of Detections: 1

Date Range: 19 May 2000

Habitat: Riparian Woodlands

Notes: Described by R. Wilt (1972-74) as an uncommon spring migrant at Pipe Spring, with no records of breeding within the monument.

Tanagers

Western Tanager → (*Piranga ludoviciana*): Rare spring and fall migrant

of Detections: 21

Date Range: 26 April – May; 20 August - 9 September

Habitat: Found in Riparian Windbreak

Notes: Breeds and resides in the higher elevations above the Arizona Strip. R. Wilt (1972-74) commonly detected this species during spring and fall migration.

Cardinals, Grosbeaks and Allies

Black-headed Grosbeak → (*Pheucticus melanocephalus*): Rare spring and fall migrant.

of Detections: 5

Date Range: 30 May; 28 August

Habitat: Riparian windbreak

Appendix A (cont'd)

Notes: Reported by R. Hudson (1958) and R. Wilt (1974) as rare spring and summer visitor. An uncommon but regular migrant throughout Arizona (Phillips et al. 1964). Probably occurs more frequently in the monument than the number of detections implies.

Blue Grosbeak → (*Guiraca caerulea*): Rare spring and fall migrant; rare breeder.

of Detections: 10

Date Range: 30 May – 28 August

Habitat: Riparian woodlands with shrubby vegetation

Breeding Evidence: Nests detected. Verified cowbird host in monument.

Notes: Fairly common breeder in willow and cottonwood associations throughout Arizona (Monson and Phillips 1981). At Pipe Spring appropriate habitat exists in the riparian windbreak, but limited habitat availability deters this species breeding opportunities. Most commonly detected as a migrant at Pipe Spring (Wilt 1974).

Sparrows and Towhees

Green-tailed Towhee → (*Pipilo chlorurus*): Rare breeder and rare winter resident

of Detections: 17

Date Range: 18 April – 27 June; 1 December – 1 January

Habitat: Pinyon/juniper woodlands

Breeding Evidence: Breeding status implied from presence of singing individuals in appropriate breeding habitat throughout the summer.

Notes: This shy, secretive species is easily overlooked during winter and migration, and may be more common than sightings indicate.

Spotted (Rufous-sided) Towhee (*Pipilo erythrophthalmus*): Rare breeder and fairly common winter resident

of Detections: 18

Date Range: Year-round resident

Habitat: Riparian woodlands with dense understory.

Breeding Evidence: Breeding is inferred from presence of adults throughout breeding season.

Notes: Inhabits very dense habitats, and is more often heard singing or scratching on the ground than seen. Detected also during Christmas Bird Counts (R. Wilt 1972-74).

Abert's Towhee (*Pipilo aberti*): First record at Pipe Spring; Casual summer visitor

of Detections: 1

Date Range: 7 July 1999

Habitat: Desert riparian and adjacent shrub

Notes: Observed in riparian windbreak. Pipe Spring is located on the edge of the most northern range of this species. Appropriate habitat exists at the monument, yet very little habitat available.

Rufous-crowned Sparrow (*Aimophila ruficeps*): First record at Pipe Spring; Casual summer visitor

of Detections: 1

Date Range: 27 June 2000

Habitat: Desert riparian and adjacent shrub

Notes: Observed in riparian windbreak. Pipe Spring is located on the edge of the most northern range of this species. Appropriate habitat exists at the monument, yet very little habitat available.

Chipping Sparrow → (*Spizella passerina*): Fairly common fall migrant, uncommon to rare spring and summer.

of Detections: 2

Date Range: 8 July 2000

Habitat: Riparian and uplands

Notes: A "rather common" summer resident in open wooded parts of the Upper Sonoran Zone in central Arizona (Monson and Phillips 1981), uncommon summer resident in northern Arizona. R. Wilt (1972-74) also noted this bird during the winter as well as Christmas bird counts in 1992. Observed during Christmas Bird counts (1991, 1994, 1996-1999).

Appendix A (cont'd)

Brewer's Sparrow → (*Spizella breweri*): Fairly common spring and fall migrant.

of Detections: 11

Date Range: 27 April – 27 September: December

Habitat: Upland shrub

Notes: Pipes Spring and its vicinity are just south of this species breeding range, therefore no breeding records exist. Observed during Christmas Bird Counts (CBC 1963; CBC 1973-74).

Lark Sparrow → (*Chondestes grammacus*): Rare breeder

of Detections: 6

Date Range: 24 May – 19 July

Habitat: Riparian woodlands and uplands with trees and shrubs

Notes: R. Wilt (1974) observed this species breeding and located a nest. Note in the windbreak and shrub habitat west areas of the monument.

Black-chinned Sparrow → (*Spizella atrogularis*): First records at Pipe Spring; casual spring migrant, possible breeder outside the monument at mid-elevations

of Detections: 5

Date Range: 26 May – July 2 2000

Habitat: Brushy arid slopes

Notes: Pipe Spring lies on the edge of this species breeding range. No breeding records in the area of this species, may just occupy the monument during spring and fall migration.

Black-throated Sparrow → (*Amphispiza bilineata*): Common spring and summer breeder.

of Detections: 128

Date Range: 24 May – 18 September

Habitat: Uplands with trees and shrubs

Breeding Evidence: Nests found. Verified cowbird host.

Notes: Listed as common breeder by R. Wauer 1963 and R Wilt (1974). This is the most abundant upland breeding species within and adjacent to the monument, and a frequent host to cowbird nest parasitism. Refer to Johnson (1997) for details of the breeding ecology and habitat use of this species.

Sage Sparrow → (*Amphispiza belli*): Rare winter visitor

of Detections: Historical sightings

Date Range: 30 November - 12 March

Habitat: Upland shrub and trees

Notes: Pipe Spring is just south of this species breeding range. Historically casual in fall and winter (R. Wauer 1963, R. Wilt). Recently numbers may have declined in the winter.

Song Sparrow → (*Melospiza melodia*): Rare winter and fall, uncommon spring and summer resident, rare breeder.

of Detections: 15

Date Range: September; April; December-March.

Habitat: Riparian areas with dense understory or shrubs.

Notes: Reported as uncommon by (R. Wauer 1963, R. Wilt 1974), a fairly common winter visitor. A common breeding species in some dense riparian habitats across Arizona (Phillips et al. 1964). It is relatively uncommon in the monument due to limited dense understory vegetation in the riparian zone.

Vesper Sparrow → (*Pooecetes gramineus*): Casual spring and fall migrant; casual winter visitor

of Detections: 1

Date Range: 3 June 2000

Habitat: Dry grasslands, farmlands and sagebrush

Notes: Pipe Spring is on the most southern edge of this species breeding range. Most noted in the winter (R. Wilt 1974).

Appendix A (cont'd)

Lincoln's Sparrow → (*Melospiza lincolnii*): Rare spring and fall migrant; Casual winter visitor

of Detections: 4

Date Range: 24 April; 18 September

Habitat: Riparian areas and tall grasslands

Notes: Shy and secretive during winter and migration, this species is sometimes misidentified by inexperienced birders as a Song Sparrow.

White-crowned Sparrow → (*Zonotrichia leucophrys*): Abundant spring/fall migrant and winter visitor.

of Detections: 79

Date Range: 4 November – 19 May

Habitat: All habitats with trees and shrubs, in pasture/grassland.

Notes: A very frequently detected wintering species. Almost always found in flocks of 10 to over 150 individuals. Commonly found in the corrals and shrub areas of the monument.

Dark-eyed Junco → (*Junco hyemalis*): Common winter and fall resident, uncommon in the spring.

of Detections: 31

Date Range: 4 January - 20 April; 14 October - 13 December

Habitat: Riparian windbreak and uplands with trees and shrubs

Notes: A commonly detected wintering species. Usually occurs in flocks of 5 to 25 individuals. Five subspecies present at the monument; "Slate-colored" (rare, but several records at Montezuma Well and Montezuma Castle), "Oregon" (common), "Pink-sided" (fairly common), "Gray-headed" (casual, but recorded at Montezuma Well), and "Red-backed" (rare and sporadic).

Blackbirds and Orioles

Red-winged Blackbird (*Agelaius phoeniceus*): Rare winter resident.

of Detections: 2

Date Range: 15 January 1999; 17 November 2000

Habitat: Marshes and riparian woodlands

Notes: At the monument, usually seen in flocks flying over, perched amid riparian woodlands, or near the ponds.

Western Meadowlark (*Sturnella neglecta*): Rare breeder; rare winter visitor

of Detections: 13

Date Range: 6 June – 9 July; likely a year-round resident

Habitat: Grasslands and open shrub uplands.

Breeding Evidence: Breeding is inferred from presence of adults throughout breeding season.

Notes: We found no evidence of current breeding within the monument, although meadowlarks are very common in the scrub and pinyon/juniper immediately the monument boundaries. Reported by Wauer (1963) and Wilt 1974 as a common winter resident.

Brown-headed Cowbird → (*Molothrus ater*): Common breeder

of Detections: 77

Date Range: 26 April – 23 July

Habitat: Riparian woodlands, shrub and pinyon/juniper uplands, residential and corrals

Notes: Widespread throughout the monument. Their numbers and distribution probably increased as irrigated agriculture and urban development spread throughout the Arizona Strip. Wauer (1959) described cowbirds as present from April through October. We recorded evidence of Brown-headed Cowbirds parasitizing nests of four other bird species in the monument. Large concentration near Colorado City where a dairy farm is located.

Bullock's (Northern) Oriole → (*Icterus bullockii*): Rare breeder

of Detections: 38

Date Range: 4 May – 28 August

Habitat: Riparian woodlands

Breeding Evidence: Nests found.

Appendix A (cont'd)

Notes: This was formerly considered as the western subspecies of the Northern Oriole. However, the American Ornithologists' Union recently renamed it (again) as a separate species.

Scott's Oriole → (*Icterus parisorum*): Rare breeder; first record in the monument and adjacent lands.

of Detections: 12

Date Range: 26 May – 19 July

Habitat: Pinyon/juniper

Notes: A common summer resident arid and semi-arid habitats in northern Arizona (Phillips et al. 1964). Sightings in the monument are rare due to the limited available habitat, however, observed throughout the breeding season in adjacent Kaibab/Piute pinyon/juniper habitat.

Only one historical sighting at Mt. Trumble (Wilt 1974).

Finches and Allies

House Finch (*Carpodacus mexicanus*): Common permanent resident and breeder.

of Detections: 143

Date Range: Year-round resident

Habitat: Breeds primarily in upland shrubs/trees and along cliffs, but also uses riparian areas (particularly in nonbreeding season).

Breeding Evidence: Nests found.

Notes: A common species in the area and the monument since at least the early 1900's (Phillips et al. 1964) Many descriptions of nests within the monument, especially near housing areas.

Pine Siskin (*Carduelis pinus*): Uncommon winter resident

of Detections: 1

Date Range: 20 August 1999; April-May and 1 December –30 January.

Notes: Most sighting in the monument during Christmas Bird Counts (1963-1996). Seen mainly in the riparian windbreak and housing areas.

Lesser Goldfinch → (*Carduelis psaltria*): Uncommon summer breeder, rare to uncommon rest of year.

of Detections: 21

Date Range: Year-round

Habitat: Riparian woodlands and adjacent uplands in summer, as well as fields and shrubby areas in winter.

Breeding Evidence: Nest found.

Notes: Fairly common breeder in Sonoran Zone riparian habitats statewide (Monson and Phillips 1981). Breed as late as September in other parts of Arizona, so our summer (ending in July and August) may have missed some nesting attempts.

American Goldfinch → (*Carduelis tristis*): Uncommon winter resident.

of Detections: 6

Date Range: irregular occurrences in February, June, November, December

Habitat: Riparian woodlands

Notes: Reported as uncommon by (R. Waurer 1963, R. Wilt 1974), a fairly common winter resident.

Evening Grosbeak → (*Coccothraustes vespertinus*): Irregular spring and fall migrant; rare winter resident

of Detections: 1

Date Range: 6 June 1999; irregular occurrences in April and May; December – January.

Notes: Breeds and resides in the higher elevations above the Arizona Strip. R. Wilt (1972-74) detected during many Christmas Bird Counts (R. Wilt 1974)

Old World Weaver Finches

House Sparrow (*Passer domesticus*): Common year round breeder

of Detections: 100

Appendix A (cont'd)

Date Range: Year-round resident

Habitat: Found in association with human housing or urban development.

Notes: This species was introduced into eastern North America from Europe in 1850 and 1851 (Lowther and Cink 1992) when approximately 100 birds were released in Brooklyn, New York, with subsequent releases in San Francisco (1871 and 1872) and Salt Lake City (1873 and 1874). This species is common throughout the monument. Observed this species predate a Kingbird nest and latter occupy it.

HISTORICAL INCIDENTAL OBSERVATIONS

These observations were recorded by Pipes Spring National Monument personnel and visitors before 1999, and are species that were not observed during this inventory.

Grebes

Eared Grebe → (*Podiceps nigricollis*)

Date: 18-24 September 1974; 30 December 1973

Observer: R. Wilt; Christmas Bird Count

Notes: Riggs Pond and Pipe Spring Pond

Pied-billed Grebe → (*Podilymbus podiceps*)

Date: 28 October-15 December 1972, 6 March 1974, 5 April-11 May 1974, October 1974; 21 December 1973

Observer: R. Wilt; Christmas Bird Count

Notes: Observed at Pipe Spring and Kaibab ponds.

Pelicans

American White Pelican → (*Pelecanus erythrorhynchos*)

Date: 27 October 1972; 11 November

Observer: R. Wilt

Notes: none

Hérons, Bitterns and Egrets

Green Heron (*Butorides virescens*)

Date: 3 October 1973

Observer: R. Wilt

Notes: Observed at Piute Pond and Pipe Spring NM Pond.

Least Bittern (*Ixobrychus exilis*)

Date: July 23 and 24 1974

Observer: R. Wilt

Notes: Female foraging at Pipe Spring Ponds.

Ibises, Spoonbills

White-faced Ibis (*Plegadis chihi*)

Date: May 31 and June 1 1974

Observer: R. Wilt

Notes: none

Ducks, Geese and Swans

Wood Duck (*Aix sponsa*)

Date: 18 December 1992

Appendix A (cont'd)

Observer: Christmas Bird Count

Notes: Observed at Pipe Spring NM ponds.

Green-winged Teal (*Anas crecca*)

Date: September, October, December 1964 -1974

Observer: Christmas Bird counts and R. Wilt

Notes: Observed at Pipe Spring NM ponds.

Northern Shoveler (*Anas clypeata*)

Date: 27 September 1973

Observer: R. Wilt

Notes: Observed at Riggs Pond.

Blue-winged Teal (*Anas discors*)

Date: Oct 1973; 29 April – 23 May 1974; 17 – 20 July 1974

Observer: R. Wilt

Notes: Observed at Pipe Spring Ponds

Ring-necked Duck (*Aythya collaris*)

Date: December 1966, 1967 Christmas Bird Count; 21, 23 March 1974

Observer: Christmas Bird Count; R. Wilt

Notes: Observed at Pipe Spring Ponds.

Bufflehead (*Bucephala albeola*)

Date: 22 December 1969; 13 March 1974; 8 and 18 April 1974

Observer: Christmas Bird Count; R. Wilt

Notes Observed at Pipe Spring Ponds.

Ruddy Duck (*Oxyura jamaicensis*)

Date: December 1963-1972

Observer: Christmas Bird Counts

Notes: Observed at Pipe Spring Ponds and ponds located on Kaibab/Piute tribal lands.

Hawks, Kites and Eagles**Swainson's Hawk** → (*Buteo swainsoni*)

Date: December 1973; 25 July

Observer: Christmas Bird Count; R. Wilt

Notes: Two observed soaring together; unusual sighting for that time of year. Observed at Pipe Spring (during CBC) and De Motte (by Wilt).

Rough-legged Hawk → (*Buteo lagopus*)

Date: 27-28 September 1974

Observer: R. Wilt

Notes: Observed at Kaibab, Pipe Spring, and Moccasin; both male and female observed.

Rails, Gallinules and Coots**Virginia Rail** (*Rallus limicola*)

Date: 1-2 May and 8 June-1 July 1974

Observer: R. Wilt

Notes: An adult with 2 chicks was observed.

Appendix A (cont'd)**Sora** (*Porzana Carolina*)

Date: 1-2 May and 14 May 1974

Observer: R. Wilt

Notes: none.

American Coot (*Fulica Americana*)

Date: 28 December, 23 December 1963, December 1966, 22 December 1969, 21, 30 December 1973, 19 December 1974, 22 December 1979; Summer, 10 October 1973, 17-30 September 1974, October 1974

Observer: Christmas Bird Count; R. Wilt

Notes: Observed at Kaibab Ponds and marsh 2 miles east of Pipe Spring; breeding confirmed.

Sandpipers, Phalaropes**Greater Yellow Legs** (*Tringa melanoleuca*)

Date: 3, 5 August 1973, 28 April 1974

Observer: R. Wilt

Notes: Observed at Riggs Pond and Pipe Spring; uncommon migrant.

Long-billed Curlew (*Numenius americanus*)

Date: 5-8 May 1974, 25 June 1974

Observer: R. Wilt

Notes: Observed seven miles east of Pipe Spring.

Least Sandpiper *Calidris minutilla*

Date: 5, 10 August 1973, 20-24 April 1974, 20 August 1974

Observer: R. Wilt

Notes: Observed at Pipe Spring, Riggs and Two-mile ponds; uncommon migrant.

Long-billed Dowitcher (*Limnodromus scolopaceus*)

Date: 8 April – 13 May 1974

Observer: R. Wilt

Notes: none.

Common Snipe (*Gallinago gallinago*)

Date: December 1969, 1972-74, 1979, 1992; 12, 30 April, 21 August, 25 September 1974

Observer: Christmas Bird Count; R. Wilt

Notes: Observed at Two-mile and Riggs Ponds; present all winter in 1973.

Wilson's Phalarope (*Phalaropus tricolor*)

Date: 23 July and 10 August 1973, 20 April – 23 May 1974,

Observer: R. Wilt

Notes: Observed at Pipe Spring and Kaibab & Riggs Ponds

Skuas, Gulls, Terns and Skimmers**Ring-billed Gull** (*Larus delawarensis*)

Date: 18 March 1974

Observer: R. Wilt

Notes: none.

Appendix A (cont'd)**Pigeons, Doves****Band-tailed Pigeon** (*Patagioenas fasciata*)

Date: 10 July 1973

Observer: R. Wilt

Notes: Observed for a week

Owls**Long-eared Owl** (*Asio otus*)

Date: December 1964

Observer: Christmas Bird Count

Notes: none.

Nighthawks, Nightjars**Common Poorwill** (*Phalaenoptilus nuttalli*)

Date: 22 September 1973, 7 May-27 August 1974

Observer: R. Wilt

Notes: Heard at night throughout summer.

Woodpeckers**Ladder-backed Woodpecker** (*Picoides scalaris*)

Date: December 1965

Observer: Christmas Bird Count

Notes: none

Tyrant Flycatchers**Willow Flycatcher** → (*Empidonax traillii*)

Date: 26 September 1974

Observer: R. Wilt

Notes: none

Shrikes**Northern Shrike** → (*Lanius excubitor*)

Date: December 1966-70, 1972-73, 1979, 1992, 1994; 6 January and 12 April 1974

Observer: Christmas Bird Count; R. Wilt

Notes: none

Crows, Jays**Clark's Nutcracker** (*Nucifraga Columbiana*)

Date: 7 July 1959; December 1973; late January 1973

Observer: R. Wauer; R. Wilt; Christmas Bird Count

Notes: none.

Swallows**Tree Swallow** → (*Tachycinetaow bicolor*)

Date: 4-8 April and 4 July 1974, 25 July

Observer: R. Wilt

Notes: Common during migration. Observed at Pipe Spring and De Motte

Appendix A (cont'd)**Nuthatches and Creepers****Red-breasted Nuthatch** (*Sitta canadensis*)

Date: 21 September-12 October 1973, 12 April 1974

Observer: R. Wilt

Notes: none.

Brown Creeper (*Certhia americana*)

Date: December 1963 & 1964; 12 April and 13 October 1974

Observer: Christmas Bird Count; R. Wilt

Notes: none

Wrens**Winter Wren** (*Troglodytes troglodytes*)

Date: 22 December 1979

Observer: J. Crawford, J. Gifford, and W. Herr

Notes: none

Thrushes**Townsend's Solitaire** → (*Myadestes townsendi*)

Date: December 1963-65, 1970, 1972-74, 1979; 11-30 September 1973, 12 April 1974, 29 September-11 October 1974

Observer: Christmas Bird Count; R. Wilt

Notes: Wilt observed that they stayed up on mesas. Observed at Pipe Spring and Moccasin.

Swainson's Thrush → (*Catharus ustulatus*)

Date: 26 September 1974

Observer: R. Wilt

Notes: Observed at Moccasin; first area record.

Wagtails, Pipits**American Pipit** → (*Anthus rubescens*)

Date: December 1965, 1972; 29 September through winter 1973, 2 April-16 May 1974, 7-30 October 1974

Observer: Christmas Bird Count; R. Wilt

Notes: Observed at Pipe Spring, De Motte and Riggs ponds; also observed at Colorado City, AZ.

Wood-Warblers**Northern Parula** → (*Parula americana*)

Date: 26 September 1974

Observer: R. Wilt

Notes: First area record.

Black-throated Blue Warbler → (*Dendroica caerulescens*)

Date: 27-29 September

Observer: R. Wilt

Notes: A male and a female were observed.

Appendix A (cont'd)**Townsend's Warbler** → (*Dendroica townsendi*)

Date: 23, 30 September 1974

Observer: R. Wilt

Notes: First two area records.

Sparrows and Towhees**Lark Bunting** → (*Calamospiza melanocorys*)

Date: December 1967; 16 May 1973, 12 April 1974, 22 May and early June

Observer: Christmas Bird Count; R. Wilt

Notes: Common on dry lands 10 miles south of Pipe Spring.

Savannah Sparrow → (*Passerculus sandwichensis*)

Date: 12 April 1974, 8 September-1 October 1974

Observer: R. Wilt

Notes: none.

Harris's Sparrow → (*Zonotrichia querula*)

Date: December 1967, 1969, 1972-73; 2 November 1972, 12 November-8 May 1973, 12 April 1974

Observer: Christmas Bird Count; R. Wilt

Notes: Observed to winter at Pipe Spring in 1973 by R. Wilt

White-throated Sparrow → (*Zonotrichia albicollis*)

Date: 30 December 1973; February and 28 April-2 May 1973, 12 April 1974

Observer: Christmas Bird Count; R. Wilt

Notes: Suspected to have wintered at Pipe Spring in 1973, but not confirmed.

Cardinals**Lazuli Bunting** → (*Passerina amoena*)

Date: 14-20 May 1958; 4-15 May 1973, 12 April-9 June 1974 and 28 September 1974

Appendix A (cont'd)

Observer: R. Hudson; R. Wilt

Notes: Observed at Pipe Spring and Moccasin.

Finches**Purple Finch** → (*Carpodacus purpureus*)

Date: 29 November 1972, 12 April 1974; 26 December 1972

Observer: R. Wilt; Christmas Bird Count

Notes: Observed at Pipe Spring and just north of the monument.

Appendix B. Nests of bird species detected at Pipe Spring National Monument, 2000. Species, substrate, location in the monument or reservation, nest outcome and comments are all listed below.

Nest #	Date	Species	Substrate	Veg Type	Location	Outcome	Comments
1	4/24/2000	Black-chinned Hummingbird	tree branch	Cottonwood	Resident	Fail	depredated
2	4/24/2000	House Finch	tree trunk	Cottonwood	Resident	Fail	abandon
3	4/24/2000	Black-chinned Hummingbird	tree branch	White poplar	Windbreak	Fail	abandon
4	4/24/2000	European Starling	tree trunk	Snag	Corral	Successful	unknown
5	4/19/2000	House Sparrow	Building	Building	V.C.	Successful	unknown
6	4/28/2000	American Robin	tree trunk	Cottonwood	Resident	Fail	abandon
7	5/1/2000	House Finch	tree trunk	Cottonwood	Resident	Fail	depredated
8	5/4/2000	European Starling	Building	Building	V.C.	Successful	unknown
9	5/5/2000	House Finch	tree trunk	Cottonwood	Resident	Fail	depredated
10	5/5/2000	House Finch	tree branch	Cottonwood	V.C.	Fail	depredated
11	5/5/2000	House Sparrow	Snag	Snag	Orchard	Successful	unknown
12	5/20/2000	Black-chinned Hummingbird	tree branch	White poplar	Windbreak	Fail	depredated
13	5/20/2000	Black-chinned Hummingbird	tree branch	White poplar	Windbreak	Fail	abandon
14	5/20/2000	European Starling	Building	Building	V.C.	Successful	unknown
15	5/20/2000	House Sparrow	Building	Building	V.C.	Successful	unknown
16	5/20/2000	Cassin's Kingbird	tree trunk	Black Locust	Orchard	Fail	depredated by HOSPs, KMB
17	5/20/2000	House Finch	tree branch	Locust	Orchard	Unknown	unknown
18	5/4/2000	European Starling	tree trunk	Snag	Windbreak	successful	unknown
19	5/20/2000	House Finch	tree branch	Cottonwood	V.C.	fail	depredated
20	5/24/2000	Black-throated Sparrow	shrub branch	Sagebrush	Piute Res.	abandon	brood parasitized
21	5/24/2000	House Finch	tree branch	Mullberry	resident	fail	predation/brood parasitism
22	5/24/2000	House Finch	roof of house	Building	resident	successful	2 fledge
23	5/24/2000	House Finch	tree trunk	Cottonwood	resident	abandon	unknown
24	5/26/2000	Say's Phoebe	beam of castle	Building	castle	successful	fledged 2+
25	5/30/2000	European Starling	sandstone wall	Building	V.C.	successful	unknown
26	6/3/2000	Cassin's Kingbird	tree trunk	Cottonwood	resident	successful	unknown
27	6/3/2000	House Sparrow	tree trunk	Cottonwood	windbreak	unknown	unknown
28	6/3/2000	House Sparrow	tree branch	Locust	orchard	abandon	unknown
29	6/18/2000	Black-throated Sparrow	shrub trunk	salt bush	Piute Res.	fail	depredated
30	6/19/2000	Black-chinned Hummingbird	tree branch	Mullberry	resident	fail	unknown
31	6/19/2000	House Finch	tree trunk	Cottonwood	resident	successful	fledged 2
32	6/21/2000	Black-chinned Hummingbird	tree branch	Ash	resident	fail	unknown
33	6/21/2000	House Sparrow	tree branch	Cottonwood	resident	successful	unknown
34	6/23/2000	House Finch	tree trunk	Cottonwood	resident	fail	unknown
35	6/23/2000	Black-chinned Hummingbird	tree branch	White poplar	windbreak	fail	Predation
36	6/23/2000	Bullock's Oriole	tree branch	Cottonwood	resident	successful	2 fledge
37	6/29/2000	Bullock's Oriole	tree branch	Cottonwood	resident	successful	1 fledge
38	6/29/2000	Western-wood Pewee	tree branch	White poplar	windbreak	fail	predation
39	6/23/2000	Western-wood Pewee	tree branch	White poplar	windbreak	fail	abandon
40	6/29/2000	Black-chinned Hummingbird	tree branch	White poplar	windbreak	fail	Predation
41	6/27/2000	House Sparrow	tree trunk	Black Locust	Orchard	successful	CAKI #16 taken over by HOSP
42	7/7/2000	Western Kingbird	tree trunk	Black locust	orchard	fail	Unknown
43	7/7/2000	Black-throated Sparrow	Shrub	salt bush	Piute Res.	successful	2 fledge
44	7/13/2000	Bullock's Oriole	tree branch	Black Locust	garden	successful	Unknown
45	7/16/2000	Western Kingbird	tree trunk	Cottonwood	resident	unknown	Unknown
46	7/19/2000	Blue Grosbeak	Grapevine	Grapevine	windbreak	fail	cowbird parasitism
47	7/11/2000	House Finch	tree trunk	Cottonwood	windbreak	unknown	Unknown
48	7/11/2000	Northern Mockingbird	tree trunk	Cottonwood	resident	successful	2 fledge

Appendix C. Spot map observations of species breeding in the windbreak riparian zone at Pipe Spring National Monument, 2000. Species, territory behavior, nest location, nest outcome and any comments are listed below.

American Robin

Territory: No aggressive interactions observed.

Nest: One nest located outside windbreak area (in residential area).

Notes: Family unit (2 adults, 1 fledgling) observed foraging frequently in windbreak area (under grape trellis and low foliage of plum trees). Fledgling fledged ~21 June 00.

Ash-throated Flycatcher

Territory: Adults began establishing territory in mid-July (as spot-mapping halted).

Nest: None detected.

Notes: Possible copulation or chase; one then chased a Bushtit (16 July 00).

Bewick's Wren

Territory: 2 territories established; one at north end of corral, one at south end. Riparian habitat included in portion of both territories.

Nest: None detected.

Notes: On 2 June 00, 2 fledglings and 1 adult were caught in mist net. On 3 July 00, 1 juvenile was caught in mist net.

Black-chinned Hummingbird

Territory: 2 (possibly 3) territories established.

Nest: 5 nests detected, 3 in one territory and 2 in the other; multiple nests seem to be "renests" after first (and second) ones were abandoned. 2 nests contained eggs (incubation observed at one nest), but nestlings were not detected.

Notes: Aggressive behavior was detected on several occasions.

Blue Grosbeak

Territory: 1 territory established.

Nest: 1 nest detected; parasitized (contained 1 BLGR egg, 2 BHCO eggs).

Brown-headed Cowbird

Nest: Parasitized 1 BLGR nest (contained 1 BLGR egg, 2 BHCO eggs).

Cassin's Kingbird

Territory: 1 territory established.

Nest: 1 nest detected. CAKI building nest 3 June, incubating 29 June, incubating/brooding 8 July, and feeding 11-20 July 00.

European Starling

Nest: 2 nests detected. First nest was detected 24 April 00; nestlings being fed 20 May. Second nest detected 4 May; nestlings were being fed. The nests were active at the same time. Both were located in two different cavities of the same tree.

Notes: At least 6 individuals were active within the area.

House Finch

Territory: Possibly 1 territory; pair was detected on two occasions.

Nest: None detected.

House Sparrow

Territory: Unknown.

Nest: None detected.

Notes: Pairs were detected on several occasions. Aggressive interactions observed between multiple males and females.

Appendix C (cont'd)**Western Kingbird**

Territory: Unknown.

Nest: None detected.

Notes: Aggressive interactions observed.

Western Wood-Pewee

Territory: 1 territory established.

Nest: 2 nests detected. Neither were successful. First nest detected 22 June 00, but later was abandoned.

Second nest was being built 29 June, incubating 3 July, no activity 8 July, mirrored 16 July and egg-shell fragments were detected. Second nest was abandoned after being depredated.

Notes: The female was netted and banded 8 July; brood patch was wrinkly.

Yellow Warbler

Territory: Male attempted to establish territory, but was unsuccessful.

Notes: One male (a floater) remained most of the season; other Yellow Warblers visited area, but did not stay.

[illegible]

Appendix D (cont'd)

SPECIES	HABITAT									Total
	Cliffs	Corral	Housing	Orchard	Pinyon	Pond	Riparian	Scrub	Willow	
Lesser Goldfinch			4		4		3			11
Loggerhead Shrike								1		1
Lucy's Warbler							2			2
MacGillivray's Warbler					1			1		2
Morning Dove			6		18		1	15	2	42
Northern Flicker							1			1
Northern Harrier					1					1
Northern Mockingbird			2	1	6			20		29
Northern Rough-winged Swallow	3		1		1		1	10		16
Plumbeous Vireo							3			3
Red-napped Sapsucker							1			1
Rock Wren	1				2		1	9		13
Rufous Hummingbird			1		2		1			4
Say's Phoebe			3		5			10		18
Scott's Oriole					8					8
Song Sparrow			1				5	1		7
Spotted Towhee			1		1		6			8
Townsend's Warbler					1					1
Turkey Vulture					1					1
Unknown					1			1		2
Violet-green Swallow	2		2		6	1	4	9	1	25
White-crowned Sparrow			3				1	2		6
Western Kingbird			19	1	1		3	7		31
Western Meadowlark					1			12		13
Western Scrub Jay		1	6	1	42		1		2	53
Western Tanager					1		2			3
Western Wood-Pewee			1	1			14	1		17
Wilson's Warbler							1			1
White-throated Swift	1				8		5	3		17
Yellow-breasted Chat							1			1
Yellow Warbler			3				3			6
TOTAL	8	9	207	5	397	7	150	330	9	1122