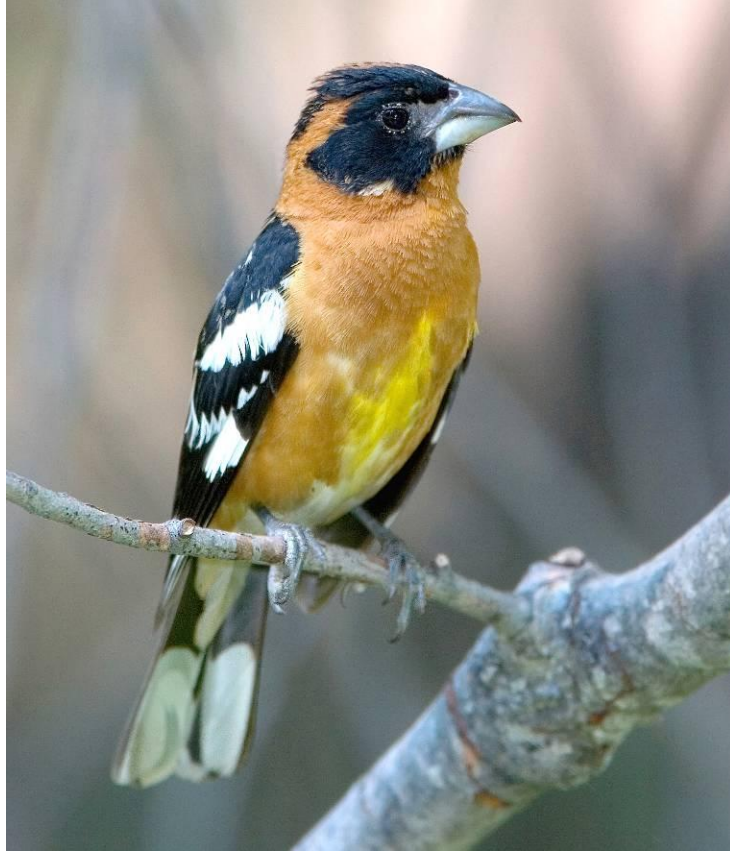


# Monitoring the Birds of Kaibab National Forest: 2008 Field Season Report



**March 2009**



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Tech. Report # M-Kaibab08-01

**In Cooperation With:**





# ROCKY MOUNTAIN BIRD OBSERVATORY

**Mission:** *To conserve birds and their habitats*

**Vision:** *Native bird populations are sustained in healthy ecosystems*

**Core Values:** *(Our goals for achieving our mission)*

1. **Science** provides the foundation for effective bird conservation.
2. **Education** is critical to the success of bird conservation.
3. **Stewardship** of birds and their habitats is a shared responsibility.

**RMBO accomplishes its mission by:**

**Partnering** with state and federal natural resource agencies, private landowners, schools, and other nonprofits for conservation.

**Studying** bird responses to habitat conditions, ecological processes, and management actions to provide scientific information that guides bird conservation efforts.

**Monitoring** long-term trends in bird populations for our region.

**Providing** active, experiential, education programs that create an awareness and appreciation for birds.

**Sharing** the latest information in land management and bird conservation practices.

**Developing** voluntary, working partnerships with landowners to engage them in conservation.

**Working** across political and jurisdictional boundaries including, counties, states, regions, and national boundaries. Our conservation work emphasizes the Western United States, including the Great Plains, as well as Latin America.

**Creating** informed publics and building consensus for bird conservation needs.

**Suggested Citation:**

**Birek Jeff, D. Hanni, R. Sparks, J. Blakesley, 2008.** *Monitoring the Birds of Kaibab National Forest: 2008 Field Season Report.* Tech. Rep. M-Kaibab08-01. Rocky Mountain Bird Observatory, Brighton, CO, 42 pp.

**Cover Photo:** Black-headed Grosbeak by Gary Woods <http://www.woodshots.com>

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## EXECUTIVE SUMMARY

Birds are excellent indicators of environmental quality and change. In addition, they are one of the most highly visible and valued components of our native wildlife. Monitoring birds provides data needed not only to effectively manage bird populations, but also to understand the effects of human activities on the ecosystem and to gauge their sustainability. Because bird communities reflect an integration of a broad array of ecosystem conditions, monitoring entire bird communities at the habitat level offers a cost-effective means for monitoring biological integrity at a variety of scales.

In 2008, Rocky Mountain Bird Observatory (RMBO), in conjunction with the Kaibab National Forest (KNF), continued with the second year of *Monitoring Birds of Kaibab National Forest* (MBKNF), a partnership effort using a protocol similar to other RMBO monitoring programs as delineated by Panjabi (2006). RMBO designed this program to provide statistically rigorous long-term trend data for populations of most diurnal, regularly breeding bird species in the Kaibab National Forest, including some U.S. Forest Service Region 3 Sensitive Species and KNF Management Indicator Species (MIS). In the short term, this program provides information needed to effectively manage and conserve bird populations in the KNF, including the spatial distribution, abundance, and relationship to important habitat characteristics for bird species. This cooperative project supports the KNF's efforts to comply with requirements set forth in the National Forest Management Act and other statutes and regulations. It also contributes to RMBO's broader landscape-scale breeding bird monitoring program, which currently includes 11 states in the Rocky Mountain and Great Plains regions.

This year, RMBO staff conducted 90 point transect surveys (1,181 point counts) in three habitats (Pinyon-Juniper, Mixed-Conifer, and Ponderosa Pine) within the KNF. RMBO staff conducted an average of 13 point counts per transect and recorded 98 breeding bird species distributed throughout the KNF. Observers detected many of these species on only a few occasions. We included density estimates for species with at least 60 utilizable detections in all years combined for a sampled habitat. We calculated density estimates for XX species, including three MIS: Hairy Woodpecker, Juniper Titmouse, and Pygmy Nuthatch.

## **ACKNOWLEDGEMENTS**

The U.S. Forest Service funded this project, through a challenge cost-share agreement between Kaibab National Forest and Rocky Mountain Bird Observatory.

We sincerely thank Bill Noble, Kristin Bratland and Mikele Painter, of the U.S. Forest Service, for their support and involvement in the program, as well as for logistical assistance provided before the field season. We also thank Ariel Leonard and Robert Richardson of the U.S. Forest Service for providing GIS information. We are grateful to the 2008 field crew, Greg Levandoski, Kathryn Riley, and Bob Muscarella who spent many weeks in the field, sometimes under difficult conditions, conducting surveys and seeking out birds. Rob Sparks provided essential GIS and MS Access support for pre-season preparations. Thanks to John Stevenson of the Coconino NF for providing radios, and therefore a safer season, for both of our crews in Arizona. We are especially appreciative to Chandman Sambuu for managing the database; his efforts were essential to the successful completion of this report.

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## INTRODUCTION

### Program History

In 2005, the KNF initiated a pilot monitoring program for landbirds (Noble 2005) using protocol developed by Buckland et. al. (2001). The KNF expanded the effort in 2006, resampling the 2005 transects and adding new transects. The KNF included two mammal species, tassel-eared and red squirrels, in their survey effort. It soon became apparent that, in order to meet the Forest's monitoring objectives, an effort was necessary beyond that which the KNF could sustain on its own. In 2007, RMBO began working with the KNF. The KNF is a funding partner and assisted with logistical coordination while RMBO collected, analyzed, and summarized the survey data. Fiscal Year 2007 marked the first year of implementing the MBKNF program. We designed this program to improve our knowledge and provide population status and trend data for most diurnal, regularly-occurring breeding landbirds of the Forest. In 2008, we completed 90 transects including 17 transects new to MBKNF.

### Reasons for Monitoring

Birds are excellent indicators of biological integrity and ecosystem health (Morrison 1986, Bureau of Land Management 1998, Hutto 1998, O'Connell et al. 2000, Rich 2002, U.S. EPA 2002, Birdlife International 2003). Birds comprise a diverse group of niche specialists, occupy a broad range of habitats, are sensitive to both physical and chemical impacts on the environment, and often reflect the abundance and diversity of other organisms with which they coexist; they are useful barometers for environmental change and measuring the sustainability of human activities on ecosystems.

Bird communities reflect an integration of a broad array of ecosystem conditions, including productivity, vegetation structure and composition; water quality; and landscape integrity (Adamus et al. 2001). The response of bird communities to changes in the environment can be examined at a variety of spatial scales making them a powerful and practical tool for evaluating the broader effects of resource management, conservation and restoration activities, or other environmental changes. Birds are generally abundant, conspicuous, and relatively easy to identify; monitoring their populations can be more efficient than monitoring other taxonomic groups.

Population monitoring forms the backbone of avian conservation. Without current monitoring data, conservation efforts may be misguided and inefficient. For these and other reasons, legislation such as the National Environmental Policy Act (1969), Endangered Species Act (ESA; 1973), and the Forest Management Act (1976), as well as various state laws, Forest plans, preserve management plans, and other long-range plans require population monitoring (Sauer 1993, Manley et al. 1993).

Given the declines of many bird species that breed in North America, there is an urgent need for monitoring programs that serve as an "early-warning" system to identify declining species and the causes of declines so that natural resource managers can proactively prevent further losses. RMBO's monitoring programs are comparable,

repeatable, data rich, long-term, multi-scale, and accessible so that managers can make informed decisions to effectively conserve birds and their habitats.

## Monitoring Objectives

The objectives of the KNF monitoring effort were to track potential management impacts on avifauna. We are obligated to monitor MIS, but wanted to inform management decision-makers of impacts to other avian species, including those highlighted by Partners in Flight and the US Fish and Wildlife Service. Additionally, many of the MIS selected for the KNF are not good indicators for the habitats that dominate our landscape. Therefore, broad surveys, rather than targeting specific species, could provide information on which species would serve as better management indicators. Landbird surveys represented a means to achieve all the above goals.

RMBO's bird monitoring programs provide population trend or status data on regularly-occurring breeding species within the study areas. Initially, we expect to collect data to provide "early-warning" information for all species that can be monitored through a habitat-based approach. After establishing this monitoring framework, we anticipate collecting more demographic information and testing a priori hypotheses to determine the possible reasons for known declines and to better inform management decisions. Herein we discuss the initial "early-warning" monitoring framework, the monitoring goals and progress.

The specific objectives of RMBO's monitoring program are:

- 1.) to provide better information on distribution and abundance for most breeding landbirds, especially priority species;
- 2.) to provide basic habitat association data for most bird species;
- 3.) to provide long-term trend or status data on most regularly occurring breeding species in the region, while being able to detect population rises and declines of 3.0% per year or greater within a 30-year period;
- 4.) to maintain a high-quality database that is accessible to all of our collaborators, as well as the public, in the form of raw and summarized data; and
- 5.) to generate decision support tools such as population density models that help guide conservation efforts and provide a better measure of our conservation success.



## METHODS

### Study Area

#### *Habitats*

In 2007, RMBO and biologists from the KNF selected three vegetation cover types (Pinyon-Juniper, (PJ), Mixed-Conifer (MC) and Ponderosa Pine (PP)) in which to place 90 point transects (Figure 1). We selected these habitats because they comprise over 83% of the KNF (10 other vegetation types constitute the balance of the landscape) and the most active management occurs in these cover types.

#### Mixed-Conifer (MC)

Mixed-Conifer is conifer-dominated forest made up of a diversity of tree species. On transects distributed throughout the KNF, the most commonly recorded overstory species are white fir (*Abies concolor*), ponderosa pine (*Pinus ponderosa*), spruce, (*Picea spp.*), Douglas fir (*Pseudotsuga menziesii*) and quaking aspen (*Populus tremuloides*). Saplings of predominantly white fir make up the understory.

#### Ponderosa Pine (PP)

Ponderosa Pine is composed of conifer stands dominated by ponderosa pine that are typically lower in elevation than mixed-conifer stands. In addition to ponderosa pine, the most common tree species are juniper (*Juniperus spp.*) and pinyon pine (*Pinus edulis*). The most frequently encountered shrubs are common juniper (*Juniperus communis*) and Gambel oak (*Quercus gambelii*).

#### Pinyon/Juniper (PJ)

Originally Pinyon-Juniper was called Woodland/Grassland and it described the combination of pinyon-juniper woodland and savannah grasslands. We combined these habitats because they could not be differentiated as the two habitats are heavily intermixed. However, once surveys were started it became apparent that all the randomly selected transects for this vegetation type occurred in true pinyon-juniper woodland, hence it will be referred to as pinyon-juniper (PJ) from this point forward. The most common vegetation within this cover type is pinyon pine and juniper species interspersed with sage (*Artemisia spp.*) shrubland.

### Field Personnel

RMBO staff, consisting of three experienced biological technicians with good aural and visual bird-identification skills, conducted field work in 2008. Technicians completed a ten-day training program at the beginning of the field season to ensure full understanding of the field protocols, practice bird and plant identification, and calibrate distance estimation in a variety of habitats.

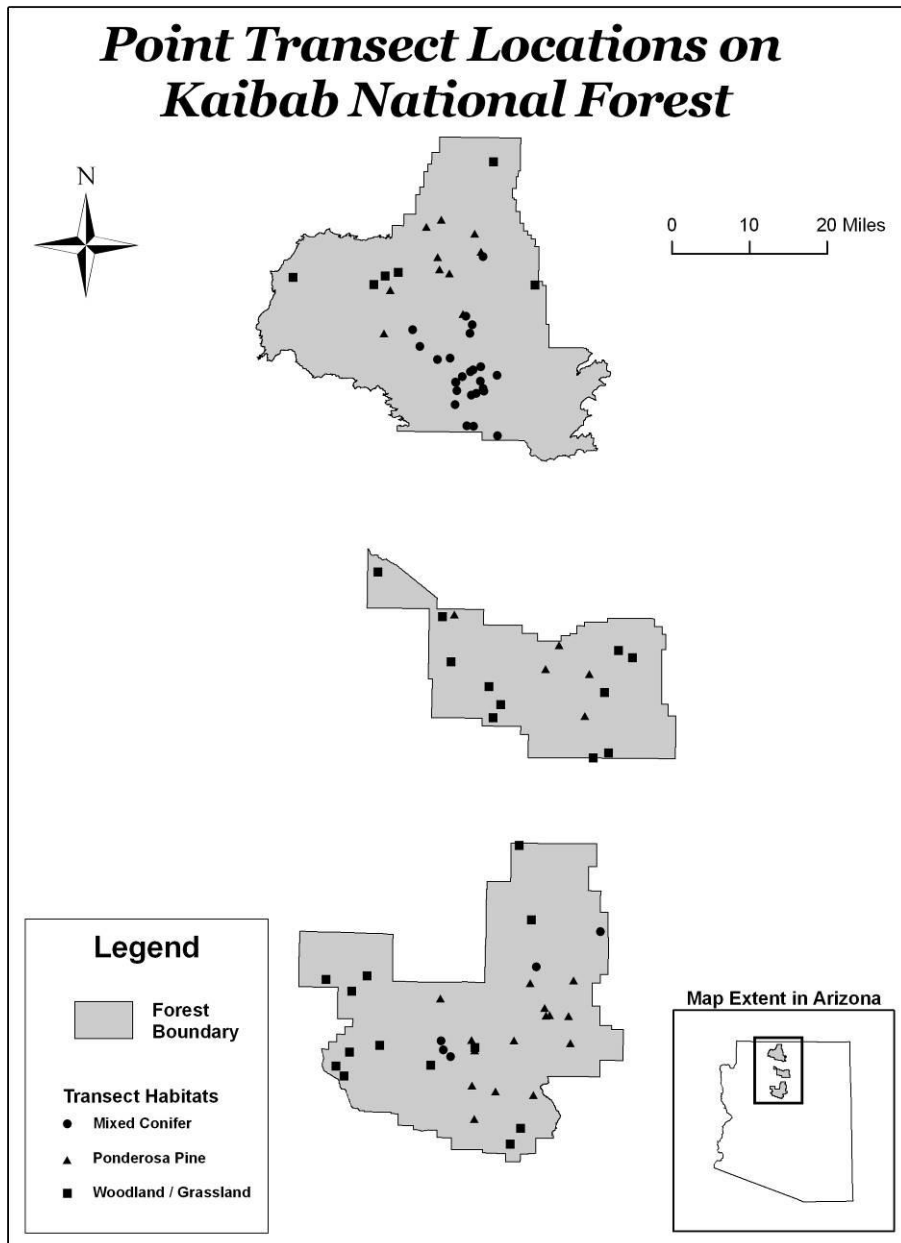


Figure 1. KNF transects by habitat

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### Site Selection

The KNF selected all survey sites for the MBKNF project and established the transects surveyed in 2005 and 2006. RMBO technicians established all transects added in 2007 and 2008, including the majority of those located on the North Kaibab Ranger District.

Transect locations were randomly selected from stands stratified by habitat. We did not include wilderness areas as potential survey locations.

### **Point Transect Protocol**

To sample bird populations in habitats selected for monitoring, RMBO staff conducted point transects (Buckland et al. 2001) following protocol established by Leukering (2000) and modified by Panjabi (2006). Observers conducted point transects in the morning, between ½-hour before sunrise and 11 AM. For new transects, observers established an access point, a randomly-selected bearing, and randomly-selected distance within 400 m of the access point to place the first point count location. On the morning of the sample, the observer began the point transect at the first count station and then continued along the randomly-selected bearing for all remaining points if possible. In some cases, the pre-selected bearing lead the observer out of the target habitat or to some obstruction (e.g. cliff or private land). When this happened, the observer returned to the last point and randomly turned the transect right or left 90 degrees and then alternated right or left if additional turns were necessary.

Observers conducted as many as 15 five-minute point counts 250 meters apart along point transects. For every bird detected, they recorded species, sex, distance from observer, time interval within the five-minute count, and type of detection (call, song or visual sighting). Observers measured distances using Bushnell® Yardage Pro 500 laser rangefinders. When it was not possible to measure distance to a bird, observers estimated distance by measuring to some nearby object. Observers treated the 250-m intervals between count stations as sections of a line transect and recorded certain bird and squirrel species that occur in low-densities (all grouse, raptors, woodpeckers, and a few other rare or uncommon species). They measured the distance and bearing to individuals of these low-density species from the transect line. Observers did not include low-density species in the line-transect data that were detected on a previous or subsequent point. Observers also recorded detections of birds flying over.

We considered all non-independent detections of birds, i.e., flocks or pairs of conspecific birds together in close proximity, as part of a 'cluster' rather than as separate independent observations. Observers recorded clusters as *C*, the number of birds detected within the cluster.

At the start and end of transects, observers recorded time and atmospheric data (i.e., temperature in degrees Fahrenheit, cloud cover, precipitation, and wind in the Beaufort scale). They recorded locations of count stations using hand-held Garmin® E-trex™ Global Positioning System (GPS) units. Observers logged all GPS data in Universal Transverse Mercator (UTM) North American Datum 1927. Before beginning a point count, observers recorded vegetation data within a 50-m radius of the point, including structural stage, forest canopy closure, mean canopy height, types and relative proportions of overstory trees, sub-canopy tree species composition, percent coverage and types of shrubs, and types and relative proportions of ground cover. They recorded vegetation data quietly; allowing birds, disturbed by our approach, time to return to their normal habits prior to beginning the point count.

## Squirrel Sign Sampling Protocol

In an effort to provide a basic metric for the squirrel populations of the KNF, this protocol has been developed to be implemented alongside MBKNF. The squirrel sign sampling utilizes sightings of obvious squirrel sign during the walk back to the vehicle after the point-transect surveys for birds have been completed for the morning.

Each 250-m segment between bird point count stations is considered a transect line. Using data sheets provided, the technician will look for five types of squirrel sign that fall into three categories out to 5 meters on each side as they walk between points.

### Cones:

- Cores – the center of cones which have had their scales removed to gain access to the seeds inside. Only cones that appear fresh were counted.
- Scales – the scales which are peeled from the cones. Often seen further away from the trunk than cone cores.

### Clippings:

- Branch cuttings – principally, but not exclusively, from Ponderosa Pine, these are clusters of needles with several inches of twig attached which are cut from the tree. Squirrels cut twigs in a diagonal fashion which is generally easily distinguished from branches that have been sheared off by wind or other forces. Cuttings that have needles that are different colors from each other have been cut at different times and are counted as two feeding events.
- Peeled twigs – after branches have been cut, a section of twig (usually 3-5") is cut off the end and the cambium is eaten, leaving a bright sections of twig of a fairly uniform size. These are usually seen among branch cuttings. Either will count as a clipping, but both will not count as two events as they are part of the same process. Only Abert's Squirrel feeds on ponderosa pine cambium this way.

### Middens:

Middens are piles of cone scales and cores, often near the base of a trees or downed log. Only red squirrels produce middens. Observers recorded whether the midden was recently used.

In all cases you are counting feeding events, therefore each grouping of each type of sign is only counted once per 20 m section. That is, once one type of sign is seen, any other encounters with that sign type will not be counted until another 20 m have passed on the transect. This is to help separate feeding events in a conservative fashion. The only exception is branch cuttings of different ages as stated above. Observers recorded whether or not oak was present on each section.

## Data Analysis

We use Distance 5.0<sup>®</sup>, an analysis program, to generate density estimates ( $D$ ) from point count data (Thomas et al. 2006). Buckland et al. (2001) developed the concepts and methods of distance analysis. Distance analysis relies on three assumptions:

1. observers detect all birds directly at the point (i.e. distance to detection is 0);

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2. observers measure distances of birds close to the point accurately; and
3. birds do not move in response to the observer's presence.

Distance 5.0<sup>®</sup> fits a unique detection function to the distribution of species in a sampled habitat. Because the detection function is unique to each species in all sampled habitats, Distance 5.0<sup>®</sup> is more suitable than other analytical programs for highly varied sampling landscapes.

The number of detections used in analyses ( $n$ ) may be fewer than the number of birds observed ( $M$ ) because:

1. we record a cluster of birds as a single detection;
2. we exclude birds detected far from the observer; and
3. we remove birds detected flying over but not using the habitat.

The difference between ( $n$ ) and ( $M$ ) can be large for species that we often observe in groups (e.g., swifts, swallows, and crossbills), at great distance (e.g. raptors and corvids), and while flying over (e.g. Pine Siskin and Evening Grosbeak). We also excluded all birds detected greater than 99 m from the observer. We did this to eliminate the strong bias of KNF data in 2006. That year surveyors recorded all detections of 100 m or greater as simply "100 m," resulting in over 30% of detection distances equaling exactly 100 m for that year. This bias makes it almost impossible to apply distance analysis techniques to the dataset.

We generated density estimates ( $D$ ) for species which had at least 60 independent detections ( $n$ ) in a sampled habitat across all years. The number of all birds and squirrels recorded ( $M$ ) by habitat on KNF transects, including all species excluded from analyses, is provided in Appendix A. For squirrel sign data, we did not use PJ in the analysis.

## RESULTS

RMBO staff conducted 1,181 point counts along 90 transects in three habitats between 26 May and 10 July, 2008 on the forest-wide MBKNF project.

We recorded 10,580 birds of 98 species on MBKNF transects in 2008. We provided density estimates for 67 species/habitat relationships based on the 2005-2008 data. If we did not use the 2005-2006 data, we would have been able to calculate density estimates for only 49 species/habitat relationships.

The number of species we detected this year in sampled habitats ranged from 62 in Mixed-Conifer to 78 in Woodland/Grassland. We detected some of these species peripheral to the habitat in which we recorded them.

### Mixed Conifer (MC)

We conducted 381 point counts along 30 transects in 2008 for an average of 13 points per transect in Mixed-Conifer. We recorded 4,451 birds representing 62 species. Technicians detected an average of 148 birds and 22 species per transect in Mixed-Conifer.

Table 1. Estimated densities in Mixed-Conifer in Kaibab National Forest, 2005-2008<sup>1</sup>. MIS are bolded.

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	<i>%CV</i>	<i>n</i>
Williamson's Sapsucker	2005	--	--	--	--	1
	2006	4.4	1.4	13.8	78	19
	2007	40.1	13.0	123.7	77	41
	2008	13.8	4.6	41.8	75	34
<b>Hairy Woodpecker</b>	<b>2005</b>	--	--	--	--	<b>4</b>
	<b>2006</b>	<b>2.9</b>	<b>1.5</b>	<b>5.7</b>	<b>42</b>	<b>14</b>
	<b>2007</b>	<b>31.8</b>	<b>19.0</b>	<b>53.1</b>	<b>32</b>	<b>36</b>
	<b>2008</b>	<b>12.8</b>	<b>7.4</b>	<b>22.2</b>	<b>34</b>	<b>35</b>
Northern Flicker	2005	--	--	--	--	4
	2006	2.8	1.8	4.6	29	26
	2007	23.5	17.3	32.0	18	51
	2008	16.7	13.3	21.0	14	87
Western Wood-Pewee	2005	--	--	--	--	1
	2006	2.0	0.8	5.1	61	26
	2007	13.3	5.6	31.5	56	42
	2008	18.6	8.4	41.0	51	138
Warbling Vireo	2005	61.4	33.7	111.9	34	22
	2006	25.6	17.1	38.3	25	123
	2007	85.3	62.4	116.4	18	96
	2008	84.6	66.7	107.3	14	231
Steller's Jay	2005	--	--	--	--	8
	2006	1.6	1.0	2.5	30	20
	2007	7.4	4.1	13.4	35	22
	2008	7.8	5.5	11.2	22	57
Violet-green Swallow	2005	--	--	--	--	0

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Species	Year	D	LCL	UCL	%CV	n
	2006	5.1	2.5	10.4	45	13
Violet-green Swallow (cont'd)	2007	75.3	47.4	119.7	28	46
	2008	70.6	48.1	103.5	23	96
Mountain Chickadee	2005	--	--	--	--	7
	2006	30.7	21.1	44.8	23	119
	2007	83.8	63.9	109.9	16	78
	2008	84.3	66.8	106.4	14	182
Red-breasted Nuthatch	2005	--	--	--	--	9
	2006	4.7	2.7	7.9	33	44
	2007	16.8	11.3	25.1	24	39
	2008	9.3	6.5	13.3	22	53
Brown Creeper	2005	--	--	--	--	7
	2006	19.0	10.8	33.3	35	22
	2007	--	--	--	--	9
	2008	53.8	36.1	80.1	24	37
House Wren	2005	--	--	--	--	9
	2006	3.5	2.0	5.9	33	21
	2007	34.8	19.7	61.6	34	50
	2008	30.2	23.1	39.4	16	101
Ruby-crowned Kinglet	2005	45.5	24.6	83.9	34	17
	2006	19.1	13.4	27.2	22	96
	2007	46.2	32.1	66.6	21	56
	2008	66.7	49.4	90.0	18	189
Hermit Thrush	2005	20.1	14.6	27.7	18	21
	2006	5.5	3.8	7.9	22	77
	2007	44.9	33.2	60.6	18	152
	2008	37.7	30.0	47.3	14	299
American Robin	2005	--	--	--	--	4
	2006	3.7	2.1	6.7	36	26
	2007	8.9	4.4	17.9	42	15
	2008	17.2	12.1	24.4	21	68
Yellow-rumped Warbler	2005	112.4	60.6	208.7	35	29
	2006	52.0	35.6	75.9	23	179
	2007	178.3	132.5	239.9	18	148
	2008	253.9	207.5	310.7	12	480
Grace's Warbler	2005	36.8	15.7	86.1	49	10
	2006	4.9	2.6	9.2	39	18
	2007	14.8	5.6	39.0	61	13
	2008	24.1	12.4	47.0	41	50
Western Tanager	2005	38.9	20.1	75.3	37	18
	2006	15.8	10.8	22.9	23	98
	2007	88.7	68.4	114.9	15	130
	2008	84.2	72.1	98.3	9	296
Chipping Sparrow	2005	--	--	--	--	8
	2006	9.0	5.7	14.1	28	57
	2007	13.6	7.3	25.4	37	22
	2008	43.9	32.5	59.4	18	172
Dark-eyed Junco	2005	--	--	--	--	8
	2006	26.5	18.0	39.1	24	72

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Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
	2007	109.9	85.4	141.3	15	72
Dark-eyed Junco (cont'd)	2008	147.9	110.9	197.3	17	224
Black-headed Grosbeak	2005	17.9	6.6	48.7	59	10
	2006	2.3	1.1	4.6	45	17
	2007	8.3	4.9	13.9	31	15
	2008	6.1	3.8	9.7	28	26
Pine Siskin	2005	101.4	42.2	243.3	51	21
	2006	18.0	10.5	30.8	33	30
	2007	--	--	--	--	7
	2008	122.3	86.0	173.8	21	141

*D* = estimated density (birds/km<sup>2</sup>); *LCL* and *UCL* = lower and upper 90% confidence limits on *D*; %*CV* = percent coefficient of variation of *D*; *n* = number of observations used to estimate *D*. We did not include density estimates for species with *n*<10.

Ponderosa Pine (PP)

We conducted 409 point counts along 30 transects in 2008 for an average of 14 points per transect in Ponderosa Pine. We recorded 3,666 birds representing 66 species. Technicians detected an average of 103 birds and 22 species per transect in Ponderosa Pine.

Table 2. Estimated densities in Ponderosa Pine in Kaibab National Forest, 2005-2008<sup>1</sup>. MIS are bolded.

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Mourning Dove	2005	--	--	--	--	1
	2006	6.3	4.1	9.7	26	26
	2007	4.6	2.6	8.0	34	28
	2008	4.0	2.5	6.5	29	29
Broad-tailed Hummingbird	2005	18.0	8.0	40.6	49	5
	2006	--	--	--	--	0
	2007	49.0	32.4	74.2	25	22
	2008	70.1	41.4	118.7	32	40
<b>Hairy Woodpecker</b>	<b>2005</b>	<b>7.6</b>	<b>4.0</b>	<b>14.1</b>	<b>37</b>	<b>15</b>
	<b>2006</b>	<b>7.6</b>	<b>4.8</b>	<b>11.9</b>	<b>27</b>	<b>16</b>
	<b>2007</b>	<b>15.9</b>	<b>10.1</b>	<b>25.0</b>	<b>27</b>	<b>50</b>
	<b>2008</b>	<b>10.3</b>	<b>6.3</b>	<b>16.7</b>	<b>29</b>	<b>41</b>
Northern Flicker	2005	7.1	5.1	9.9	20	23
	2006	9.6	5.6	16.4	32	33
	2007	12.0	8.8	16.3	19	63
	2008	9.4	6.4	13.6	23	61
Western Wood-Pewee	2005	18.5	11.4	30.0	29	60
	2006	7.3	4.5	11.6	28	25
	2007	21.1	15.8	28.3	17	110
	2008	18.0	12.7	25.5	21	123
Gray Flycatcher	2005	--	--	--	--	8
	2006	11.4	5.4	24.3	46	20
	2007	--	--	--	--	6
	2008	8.6	4.1	18.1	46	30
Ash-throated Flycatcher	2005	6.5	2.8	15.2	52	16
	2006	6.1	2.1	17.9	68	16



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Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	%CV	<i>n</i>
	2007	2.8	1.1	6.9	58	10
Ash-throated Flycatcher	2008	8.1	4.2	15.6	40	42
Plumbeous Vireo	2005	11.8	8.2	17.0	22	40
	2006	11.1	7.4	16.5	24	40
	2007	18.2	13.2	25.0	19	100
	2008	14.7	11.2	19.3	16	105
Warbling Vireo	2005	7.3	2.8	18.8	60	18
	2006	8.7	3.5	22.0	58	23
	2007	7.7	4.4	13.5	34	31
	2008	5.0	2.1	11.5	53	26
Steller's Jay	2005	11.4	6.9	18.9	30	30
	2006	10.8	7.2	16.1	24	26
	2007	22.4	16.0	31.3	20	91
	2008	13.7	10.5	17.9	16	75
Common Raven	2005	--	--	--	--	4
	2006	--	--	--	--	9
	2007	5.5	3.4	8.9	29	22
	2008	7.0	4.1	11.9	33	32
Violet-green Swallow	2005	--	--	--	--	7
	2006	--	--	--	--	8
	2007	33.1	16.9	65.1	41	52
	2008	32.5	20.5	51.4	28	54
Mountain Chickadee	2005	41.5	26.0	66.0	27	59
	2006	41.0	32.0	52.6	15	60
	2007	68.2	55.4	83.9	12	155
	2008	43.0	32.9	56.2	16	126
White-breasted Nuthatch	2005	16.2	11.6	22.8	20	45
	2006	23.1	17.8	30.0	15	67
	2007	30.8	24.6	38.5	13	137
	2008	17.1	12.7	23.0	18	100
<b>Pygmy Nuthatch</b>	<b>2005</b>	<b>46.8</b>	<b>32.5</b>	<b>67.5</b>	<b>21</b>	<b>86</b>
	<b>2006</b>	<b>61.5</b>	<b>46.2</b>	<b>82.0</b>	<b>17</b>	<b>79</b>
	<b>2007</b>	<b>78.1</b>	<b>55.9</b>	<b>109.0</b>	<b>20</b>	<b>192</b>
	<b>2008</b>	<b>28.9</b>	<b>22.7</b>	<b>36.9</b>	<b>15</b>	<b>105</b>
Western Bluebird	2005	28.1	17.7	44.7	27	38
	2006	32.6	23.0	46.0	20	47
	2007	31.1	22.6	42.9	19	64
	2008	35.0	25.3	48.3	19	96
Hermit Thrush	2005	2.7	1.4	5.4	40	16
	2006	--	--	--	--	5
	2007	3.8	2.1	6.9	36	36
	2008	1.9	1.1	3.4	33	24
American Robin	2005	15.3	10.1	23.0	24	39
	2006	9.2	4.8	17.8	40	25
	2007	18.8	13.6	26.1	19	76
	2008	17.1	11.8	24.6	22	84
Virginia's Warbler	2005	11.8	5.6	24.8	45	17
	2006	8.5	4.2	17.3	43	13
	2007	11.6	6.7	20.1	34	27

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Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
	2008	8.9	4.3	18.2	44	27
Yellow-rumped Warbler	2005	31.8	20.6	49.1	26	68
	2006	32.6	22.2	47.9	23	74
	2007	11.0	6.7	18.1	30	38
	2008	23.1	16.5	32.4	20	103
Grace's Warbler	2005	34.2	23.2	50.5	23	97
	2006	25.2	17.1	37.2	23	76
	2007	24.8	17.0	36.3	23	114
	2008	24.8	16.8	36.5	24	147
Western Tanager	2005	17.4	12.1	25.0	22	63
	2006	13.8	9.7	19.5	21	53
	2007	24.7	17.6	34.8	21	143
	2008	23.0	17.1	31.0	18	172
Chipping Sparrow	2005	22.5	15.4	32.7	22	52
	2006	20.3	13.6	30.4	24	50
	2007	8.5	5.4	13.6	28	32
	2008	9.6	7.3	12.7	17	46
Dark-eyed Junco	2005	64.3	34.2	120.8	39	99
	2006	78.8	51.8	119.8	26	116
	2007	98.3	66.7	144.9	24	220
	2008	52.7	39.7	70.1	17	179
Black-headed Grosbeak	2005	8.9	4.8	16.3	36	20
	2006	9.6	5.5	16.9	33	23
	2007	10.2	6.4	16.2	28	37
	2008	9.3	5.2	16.5	35	44
Brown-headed Cowbird	2005	6.0	3.2	11.3	38	10
	2006	7.5	4.2	13.5	35	14
	2007	6.0	3.5	10.5	34	18
	2008	8.7	4.8	15.8	36	31

*D* = estimated density (birds/km<sup>2</sup>); *LCL* and *UCL* = lower and upper 90% confidence limits on *D*; %*CV* = percent coefficient of variation of *D*; *n* = number of observations used to estimate *D*. We did not include density estimates for species with *n*<10.

Pinyon-Juniper (PJ)

We conducted 391 point counts along 30 transects in 2008 for an average of 13 points per transect in Pinyon-Juniper. We recorded 2,463 birds representing 78 species. Technicians detected an average of 82 birds and 19 species per transect in Pinyon-Juniper.

Table 3. Estimated densities in Pinyon-Juniper forest in Kaibab National Forest, 2005-2008<sup>1</sup>. MIS are bolded.

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Mourning Dove	2005	--	--	--	--	2
	2006	--	--	--	--	9
	2007	5.9	3.6	9.7	31	29
	2008	3.9	2.3	6.5	32	24
Gray Flycatcher	2005	44.5	7.1	277.6	71	13
	2006	25.2	14.1	45.2	34	28
	2007	29.9	20.8	42.9	22	74

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<b>Species</b>	<b>Year</b>	<b>D</b>	<b>LCL</b>	<b>UCL</b>	<b>%CV</b>	<b>n</b>
	2008	25.8	18.3	36.3	21	84
Ash-throated Flycatcher	2005	35.9	19.7	65.2	22	15
	2006	16.4	9.2	29.1	33	26
	2007	38.0	28.3	51.2	18	134
	2008	38.5	30.8	48.1	13	180
Plumbeous Vireo	2005	--	--	--	--	1
	2006	2.6	0.7	9.9	87	3
	2007	11.4	6.1	21.3	38	29
	2008	15.8	10.1	24.8	28	53
Common Raven	2005	--	--	--	--	0
	2006	--	--	--	--	4
	2007	15.5	8.8	27.5	35	26
	2008	16.8	6.1	46.0	65	14
Mountain Chickadee	2005	--	--	--	--	1
	2006	--	--	--	--	8
	2007	96.0	69.8	132.2	19	135
	2008	23.3	14.8	36.7	27	40
<b>Juniper Titmouse</b>	<b>2005</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>9</b>
	<b>2006</b>	<b>53.8</b>	<b>27.6</b>	<b>105.2</b>	<b>39</b>	<b>27</b>
	<b>2007</b>	<b>51.8</b>	<b>34.7</b>	<b>77.3</b>	<b>24</b>	<b>65</b>
	<b>2008</b>	<b>59.3</b>	<b>45.8</b>	<b>76.7</b>	<b>16</b>	<b>106</b>
White-breasted Nuthatch	2005	--	--	--	--	1
	2006	10.6	4.8	23.3	47	13
	2007	24.5	15.6	38.4	27	66
	2008	10.3	7.1	14.9	22	36
Bewick's Wren	2005	--	--	--	--	7
	2006	18.5	9.2	36.9	41	29
	2007	18.8	11.7	30.4	29	65
	2008	24.9	17.7	35.1	21	113
Blue-gray Gnatcatcher	2005	--	--	--	--	1
	2006	38.0	16.9	85.4	48	17
	2007	29.1	17.5	48.2	31	26
	2008	19.8	11.1	35.2	35	25
American Robin	2005	--	--	--	--	0
	2006	--	--	--	--	0
	2007	11.3	6.5	19.4	33	42
	2008	3.7	1.4	9.9	64	18
Northern Mockingbird	2005	--	--	--	--	0
	2006	8.9	3.5	22.3	57	22
	2007	4.3	2.2	8.6	43	23
	2008	3.0	0.9	9.7	78	22
Black-throated Gray Warbler	2005	--	--	--	--	8
	2006	25.3	12.3	52.2	42	20
	2007	38.6	21.9	67.7	34	67
	2008	51.7	37.3	71.6	19	120
Western Tanager	2005	--	--	--	--	2
	2006	--	--	--	--	2
	2007	13.3	7.4	23.8	35	50
	2008	11.5	7.8	16.9	23	58

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Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Spotted Towhee	2005	--	--	--	--	5
Spotted Towhee (cont'd)	2006	19.6	9.6	40.1	42	31
	2007	27.8	17.9	43.1	26	98
	2008	14.2	9.0	22.6	28	66
Chipping Sparrow	2005	94.5	47.2	189.2	30	19
	2006	58.9	38.1	91.2	26	45
	2007	52.2	35.7	76.4	23	88
	2008	42.8	31.3	58.5	19	95
Lark Sparrow	2005	--	--	--	--	4
	2006	10.5	5.3	21.1	42	15
	2007	5.7	3.1	10.3	37	18
	2008	6.7	3.8	11.9	35	25
Dark-eyed Junco	2005	--	--	--	--	0
	2006	--	--	--	--	0
	2007	18.6	9.2	37.6	43	40
	2008	6.2	2.6	14.8	54	18
Black-headed Grosbeak	2005	--	--	--	--	1
	2006	5.3	2.9	9.7	35	10
	2007	6.0	3.6	9.9	31	24
	2008	6.3	3.9	10.4	30	35

*D* = estimated density (birds/km<sup>2</sup>); *LCL* and *UCL* = lower and upper 90% confidence limits on *D*; %*CV* = percent coefficient of variation of *D*; *n* = number of observations used to estimate *D*. We did not include density estimates for species with *n*<10.

Squirrel Sign Results

In 2008, observers sampled 60 transects and 730 line segments (250-m each) for squirrel sign in the two habitats used for analysis. Observers covered over 180 hectares of the sampling landscape. There were 6.96 feeding events observed per hectare in PP and MC combined. Sign was most dense on transect AZ-PP32 with an average of 40.3 feeding events per hectare sampled. Sign was over twice as dense on PP transects (8.8 feeding events per hectare) as MC transects (4.2 feeding events per hectare). A table with sign observed by transect is in appendix D.

## DISCUSSION AND RECOMMENDATIONS

The habitat-stratified point transects produced excellent estimates with low coefficients of variation for three MIS in at least one habitat surveyed in 2008. Thus we should be able to detect habitat-specific population trends for Hairy Woodpecker, Juniper Titmouse, and Pygmy Nuthatch within our maximum target of 30 years. Unfortunately, the addition of 20 new transects in 2008 did not allow us to estimate densities for any new MIS this year. All species with management designations that were observed between 2005-2008 are listed in Appendix B.

We did not sample riparian or wetland habitats in 2008, so we detected few MIS associated with these habitats (Cinnamon Teal, Lincoln's Sparrow, and Yellow-breasted Chat). In the future, at least 20 riparian transects would have to be established and conducted in the KNF to obtain enough detections to monitor these species. We also detected very few Red-naped Sapsuckers and Lucy's Warblers. These species are present in low densities in the habitats we surveyed and are therefore less likely to be encountered. Wild Turkey may be present in sufficient numbers, but are difficult to detect because of their secretive and wary behavior.

The addition of 17 forest transects (mixed conifer and ponderosa pine) in 2008 yielded a greater number of detections for several secretive or low-density species than in previous years. In 2008, 62 species were detected in greater numbers than in any previous year of MBKNF.

The RMBO habitat-based land monitoring protocol does not adequately detect some MIS. In these cases (Northern Goshawk, Mexican Spotted Owl) the KNF monitors them in separate efforts. One way to monitor the health of bird populations, especially small ones, is to monitor reproductive output at nests. While this method can be more labor intensive than count-based monitoring, reproductive output monitoring does not necessarily inefficiency. Because of the already extensive point transect effort undertaken each year, implementing additional field techniques to target other high-priority species can be done with little extra effort. In the future, it will also be possible to analyze presence and absence of vegetation variables with those of the bird and squirrel communities. With the recent addition of monitoring projects in adjacent forests (Coconino and Prescott), the expanded monitoring effort will provide meaningful trend data to help guide management decisions throughout the KNF.

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## APPENDIX A.

List of all bird species observed during point transects in Kaibab National Forest, with species totals from 2005-2008 and species totals by habitat in 2008.

Species <sup>1</sup>	Total # of individuals observed per habitat <sup>2</sup> , 2008			Total # of individuals observed per year (in all habitats surveyed <sup>3</sup> )			
	MC	PP	PJ	2008	2007	2006	2005
Common Goldeneye	--	--	--	--	3	--	--
Dusky Grouse	--	--	--	--	5	--	--
<b>Wild Turkey</b>	<b>4</b>	<b>4</b>	<b>2</b>	<b>10</b>	<b>9</b>	<b>1</b>	<b>1</b>
Gambel's Quail	--	1	14	15	--	8	1
Double-crested Cormorant	--	1	--	1	--	--	--
Great Blue Heron	--	2	--	2	1	--	--
Turkey Vulture	3	2	3	8	8	3	--
Sharp-shinned Hawk	--	--	2	2	--	--	--
Cooper's Hawk	--	--	--	--	3	2	--
<b>Northern Goshawk</b>	<b>3</b>	--	<b>1</b>	<b>4</b>	<b>1</b>	--	--
Red-tailed Hawk	2	9	6	17	10	2	--
American Kestrel	1	--	2	3	3	--	--
Peregrine Falcon	2	--	--	2	--	--	--
Band-tailed Pigeon	3	--	2	5	1	4	4
Mourning Dove	12	64	51	127	77	170	3
Greater Roadrunner	--	1	5	6	--	--	--
Great Horned Owl	--	1	--	1	--	--	--
Lesser Nighthawk	--	--	--	--	--	1	2
Common Nighthawk	--	5	2	7	10	9	--
White-throated Swift	1	--	6	7	23	17	--
Black-chinned Hummingbird	--	--	--	--	5	3	--
Broad-tailed Hummingbird	31	44	14	89	60	55	13
Rufous Hummingbird	--	--	--	--	1	--	--
Acorn Woodpecker	1	5	2	8	12	--	4
Williamson's Sapsucker	118	6	--	124	52	53	3
<b>Red-naped Sapsucker</b>	<b>10</b>	--	--	<b>10</b>	<b>3</b>	<b>6</b>	--
Ladder-backed Woodpecker	--	--	--	--	1	--	--
Downy Woodpecker	3	--	1	4	10	9	1
<b>Hairy Woodpecker</b>	<b>63</b>	<b>71</b>	<b>20</b>	<b>154</b>	<b>149</b>	<b>55</b>	<b>30</b>
American Three-toed Woodpecker	2	--	--	2	1	--	--
Northern Flicker	135	94	12	241	186	147	49
Olive-sided Flycatcher	7	4	3	14	5	6	--
Western Wood-Pewee	155	155	15	325	194	105	79
Hammond's Flycatcher	--	--	--	--	16	--	1
Gray Flycatcher	--	30	88	118	93	77	22
Dusky Flycatcher	--	--	6	6	26	1	9



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Species <sup>1</sup>	Total # of individuals observed per habitat <sup>2</sup> , 2008			Total # of individuals observed per year (in all habitats surveyed <sup>3</sup> )			
	MC	PP	PJ	2008	2007	2006	2005
Cordilleran Flycatcher	19	12	4	35	14	13	11
Say's Phoebe	--	1	1	2	1	1	--
Ash-throated Flycatcher	--	48	207	255	176	76	36
Cassin's Kingbird	--	--	15	15	3	19	--
Western Kingbird	--	--	--	--	4	3	1
Gray Vireo	--	--	8	8	26	14	--
Plumbeous Vireo	4	118	64	186	142	56	44
Hutton's Vireo	--	--	--	--	--	1	--
Warbling Vireo	259	32	3	294	132	212	83
Steller's Jay	84	110	26	220	168	85	51
Western Scrub-Jay	--	3	43	46	42	23	5
Pinyon Jay	--	11	85	96	47	175	39
Clark's Nutcracker	45	15	27	87	9	34	--
American Crow	--	8	--	8	20	15	--
Common Raven	82	78	139	299	179	126	23
Horned Lark	--	--	--	--	--	6	--
Purple Martin	--	1	--	1	11	5	--
Tree Swallow	--	--	--	--	3	--	--
Violet-green Swallow	189	100	35	324	177	183	36
Northern Rough-winged Swallow	--	--	3	3	8	1	--
Black-capped Chickadee	--	--	--	--	1	--	--
Mountain Chickadee	206	194	64	464	414	278	99
<b>Juniper Titmouse</b>	<b>--</b>	<b>10</b>	<b>166</b>	<b>176</b>	<b>108</b>	<b>65</b>	<b>14</b>
Bushtit	--	--	15	15	30	63	24
Red-breasted Nuthatch	81	--	1	82	57	77	16
White-breasted Nuthatch	20	128	49	197	269	127	61
<b>Pygmy Nuthatch</b>	<b>19</b>	<b>200</b>	<b>29</b>	<b>248</b>	<b>378</b>	<b>176</b>	<b>108</b>
Brown Creeper	40	21	1	62	39	39	14
Rock Wren	7	2	11	20	1	5	--
Canyon Wren	2	--	--	2	3	3	--
Bewick's Wren	1	7	129	137	67	80	7
House Wren	113	20	--	133	68	40	23
Golden-crowned Kinglet	--	--	--	--	1	--	--
Ruby-crowned Kinglet	217	--	--	217	66	173	41
Blue-gray Gnatcatcher	--	1	27	28	32	21	1
Black-tailed Gnatcatcher	--	--	--	--	2	--	--
Western Bluebird	27	108	16	151	87	83	44
Mountain Bluebird	3	3	10	16	70	9	7
Townsend's Solitaire	2	4	--	6	34	8	8
Hermit Thrush	427	46	7	480	212	217	70

MONITORING THE BIRDS OF KAIBAB NATIONAL FOREST: 2008

Species <sup>1</sup>	Total # of individuals observed per habitat <sup>2</sup> , 2008			Total # of individuals observed per year (in all habitats surveyed <sup>3</sup> )			
	MC	PP	PJ	2008	2007	2006	2005
American Robin	75	113	24	212	157	70	62
Northern Mockingbird	--	--	39	39	30	74	--
Olive Warbler	--	--	--	--	15	8	--
Orange-crowned Warbler	--	--	--	--	--	2	--
Virginia's Warbler	24	27	13	64	56	20	26
<b>Lucy's Warbler</b>	--	--	--	--	<b>1</b>	--	--
Yellow Warbler	1	1	1	3	15	--	--
Yellow-rumped Warbler	541	106	23	670	206	399	135
Black-throated Gray Warbler	1	24	144	169	91	53	18
Hermit Warbler	--	--	--	--	6	--	--
Grace's Warbler	50	155	15	220	135	155	128
MacGillivray's Warbler	--	--	--	--	3	--	--
Wilson's Warbler	--	--	1	1	--	--	--
Red-faced Warbler	8	1	1	10	--	10	15
Hepatic Tanager	1	7	10	18	3	2	--
Western Tanager	330	201	76	607	353	255	111
Green-tailed Towhee	--	--	3	3	2	4	--
Spotted Towhee	--	11	75	86	115	61	9
Abert's Towhee	--	--	--	--	--	1	--
Chipping Sparrow	177	51	116	344	154	244	107
Brewer's Sparrow	--	--	7	7	12	1	--
Black-chinned Sparrow	--	--	1	1	3	--	--
Vesper Sparrow	--	6	14	20	22	4	2
Lark Sparrow	2	1	41	44	26	28	12
Black-throated Sparrow	--	--	15	15	10	9	--
<b>Lincoln's Sparrow</b>	--	--	--	--	<b>2</b>	--	--
Dark-eyed Junco	273	204	21	498	394	293	129
Rose-breasted Grosbeak	1	--	--	1	--	--	--
Black-headed Grosbeak	31	46	48	125	93	79	34
Blue Grosbeak	--	--	--	--	1	--	--
Lazuli Bunting	2	--	4	6	--	--	--
Red-winged Blackbird	--	2	--	2	--	1	2
Eastern Meadowlark	--	--	3	3	--	--	--
Western Meadowlark	--	12	--	12	25	1	1
Brewer's Blackbird	--	--	--	--	--	--	3
Brown-headed Cowbird	7	32	26	65	52	32	11
Hooded Oriole	--	--	--	--	--	1	--
Bullock's Oriole	--	--	1	1	--	--	--
Scott's Oriole	--	--	2	2	1	6	--
Pine Grosbeak	5	--	--	5	8	--	--

MONITORING THE BIRDS OF KAIBAB NATIONAL FOREST: 2008

Species <sup>1</sup>	Total # of individuals observed per habitat <sup>2</sup> , 2008			Total # of individuals observed per year (in all habitats surveyed <sup>3</sup> )			
	MC	PP	PJ	2008	2007	2006	2005
Cassin's Finch	11	2	--	13	5	4	3
House Finch	--	--	25	25	14	26	3
Red Crossbill	11	7	16	34	--	154	10
Pine Siskin	204	18	2	224	10	116	49
Lesser Goldfinch	1	2	5	8	--	9	5
American Goldfinch	--	--	--	--	2	--	--
Evening Grosbeak	5	--	--	5	--	11	2
Abert's Squirrel	2	18	3	23	56	--	--
Red Squirrel	91	14	--	105	36	--	--

<sup>1</sup> Common Names are from the A.O.U. Check-list of North American Birds, Seventh Edition (2003).

<sup>2</sup> Habitats: MC=Mixed-Conifer; PP=Ponderosa Pine; PJ=Pinyon-Juniper

<sup>3</sup> The number of transects and habitats surveyed each year may vary.

**APPENDIX B.****List of bird species with management designation observed during point transects in Kaibab National Forest from 2005-2008.**

Species <sup>1</sup>	Species Management Designation							
	AZGFD <sup>2</sup>	USFS <sup>3</sup>		USFWS <sup>4</sup>			PIF <sup>5</sup>	
		KNF	Region 3	BCR16	BCR34	Region 2	BCR16	BCR34
Dusky Grouse	SGCN						CC	
Wild Turkey	SGCN	MIS						
Gambel's Quail								CS,RS
Double-crested Cormorant	SGCN							
Cooper's Hawk								RS
Northern Goshawk	SGCN	MIS	R3SS		BCC			RC
Peregrine Falcon	SGCN		R3SS	BCC	BCC	BCC		
Band-tailed Pigeon							CC	CC
Common Nighthawk							RC	
White-throated Swift							CC,RS	CC,RS
Black-chinned Hummingbird					BCC			
Broad-tailed Hummingbird							RS	
Williamson's Sapsucker				BCC			CS,RS	
Red-naped Sapsucker	SGCN	MIS						
Downy Woodpecker	SGCN							
Hairy Woodpecker		MIS						
American Three-toed Woodpecker	SGCN							
Olive-sided Flycatcher	SGCN						CC	CC
Cordilleran Flycatcher							RS	RS
Say's Phoebe							RS	
Cassin's Kingbird								RC,RS
Gray Vireo				BCC		BCC	CC,RC,RS	CC,RC,RS
Plumbeous Vireo							RS	RS
Warbling Vireo							RS	
Pinyon Jay				BCC			CC,RC,CS,RS	CC,RC
Clark's Nutcracker	SGCN						CS,RS	
Purple Martin	SGCN							
Tree Swallow	SGCN							

MONITORING THE BIRDS OF KAIBAB NATIONAL FOREST: 2008

Species <sup>1</sup>	Species Management Designation							
	AZGFD <sup>2</sup>	USFS <sup>3</sup>		USFWS <sup>4</sup>			PIF <sup>5</sup>	
		KNF	Region 3	BCR16	BCR34	Region 2	BCR16	BCR34
Violet-green Swallow							RS	
Juniper Titmouse		MIS					RC,RS	RC,RS
Pygmy Nuthatch		MIS					RC	RS
Rock Wren							RS	
Canyon Wren							RC	RS
Golden-crowned Kinglet	SGCN							
Ruby-crowned Kinglet	SGCN							
Western Bluebird							RS	RS
Mountain Bluebird							RC,CS,RS	
Olive Warbler					BCC	BCC		RS
Orange-crowned Warbler	SGCN							
Virginia's Warbler				BCC			CC,RC,RS	CC,RS
Lucy's Warbler		MIS						CC,RC,CS,RS
Black-throated Gray Warbler				BCC	BCC	BCC	RC	RC
Grace's Warbler				BCC	BCC	BCC	CC,RC	
MacGillivray's Warbler	SGCN							
Red-faced Warbler					BCC			CC,CS,RS
Hepatic Tanager								RS
Green-tailed Towhee	SGCN						CS,RS	
Spotted Towhee								RC,RS
Abert's Towhee								CC
Brewer's Sparrow							CC,RC	
Black-chinned Sparrow						BCC	CC	CC,RS
Black-throated Sparrow							RC	RS
Lincoln's Sparrow	SGCN	MIS						
Eastern Meadowlark								RC
Hooded Oriole						BCC		RS
Scott's Oriole								CS,RS
Pine Grosbeak	SGCN							
Cassin's Finch	SGCN						RC	
Pine Siskin							RC,RS	
Evening Grosbeak	SGCN							

<sup>1</sup> Common Names are from the A.O.U. Check-list of North American Birds, Seventh Edition (2003).

## MONITORING THE BIRDS OF KAIBAB NATIONAL FOREST: 2008

- <sup>2</sup> AZGFD=Arizona Game and Fish Department, SGCN=Species of Greatest Conservation Need (Arizona's Comprehensive Wildlife Conservation Strategy: 2005-2015 (2006)).
- <sup>3</sup> USFS=United States Forest Service, KNF=Kaibab National Forest, MIS=Management Indicator Species; Region3=USFS Region 3, R[3]SS=USFS Region 3 Sensitive Species.
- <sup>4</sup> USFWS=U.S. Fish and Wildlife Service, BCR=Bird Conservation Region, Region 2=USFWS [R6 doesn't apply and it's the SW region for both agencies because, well, it's the SW!] BCC=Bird of Conservation Concern.
- <sup>5</sup> PIF=Partners in Flight, BCR=Bird Conservation Region, CC=Continental Concern Species, RC=Regional Concern Species, CS=Continental Stewardship Species, RS = Regional Stewardship Species.

## APPENDIX C

Bird observations by ranger district and habitat.

Species	North District														Grand Total
	Mid-elevation Conifer					Ponderosa Pine					Pinyon-Juniper				
	2005	2006	2007	2008	Total	2005	2006	2007	2008	Total	2006	2007	2008	Total	
Aberts Squirrel	--	--	15	1	16	--	--	1	6	7	--	2	--	2	25
American Crow	--	1	--	--	1	--	4	--	--	4	1	1	--	2	7
American Goldfinch	--	--	--	--	--	--	--	2	--	2	--	--	--	--	2
American Kestrel	--	--	--	1	1	--	--	--	--	--	--	--	--	--	1
American Robin	5	23	9	57	94	3	3	7	18	31	--	6	--	6	131
American Three-toed Woodpecker	--	--	1	2	3	--	--	--	--	--	--	--	--	--	3
Ash-throated Flycatcher	--	--	--	--	--	--	1	--	--	1	10	27	38	75	76
Band-tailed Pigeon	--	1	--	--	1	--	--	--	--	--	--	--	2	2	3
Bewick's Wren	--	--	--	1	1	--	--	--	--	--	8	14	26	48	49
Black-capped Chickadee	--	--	--	--	--	--	--	1	--	1	--	--	--	--	1
Black-chinned Hummingbird	--	--	--	--	--	--	--	2	--	2	--	--	--	--	2
Black-chinned Sparrow	--	--	--	--	--	--	--	--	--	--	--	1	1	2	2
Black-headed Grosbeak	2	1	15	20	38	2	--	7	7	16	4	2	10	16	70
Black-throated Gray Warbler	--	--	--	--	--	--	1	--	--	1	11	2	35	48	49
Black-throated Sparrow	--	--	--	--	--	--	--	--	--	--	--	6	13	19	19
Blue-gray Gnatcatcher	--	--	--	--	--	--	--	--	--	--	3	7	16	26	26
Broad-tailed Hummingbird	--	6	16	25	47	4	5	14	20	43	--	1	5	6	96
Brown Creeper	2	18	11	28	59	--	3	6	4	13	--	--	--	--	72
Brown-headed Cowbird	--	--	1	1	2	4	3	1	1	9	2	--	2	4	15
Bushtit	--	--	--	--	--	--	2	--	--	2	9	20	10	39	41
Canyon Wren	--	--	--	--	--	--	--	--	--	--	1	--	--	1	1
Cassin's Finch	--	3	5	11	19	--	--	--	2	2	--	--	--	--	21
Cassin's Kingbird	--	--	--	--	--	--	--	--	--	--	--	--	3	3	3
Chipping Sparrow	--	41	18	167	226	3	12	11	12	38	4	6	13	23	287

MONITORING THE BIRDS OF KAIBAB NATIONAL FOREST: 2008

Species	North District														
	Mid-elevation Conifer					Ponderosa Pine					Pinyon-Juniper				Grand Total
	2005	2006	2007	2008	Total	2005	2006	2007	2008	Total	2006	2007	2008	Total	
Clark's Nutcracker	--	22	5	34	61	--	2	3	8	13	--	--	13	13	87
Common Goldeneye	--	--	1	--	1	--	--	2	--	2	--	--	--	--	3
Common Nighthawk	--	--	--	--	--	--	--	5	2	7	--	--	2	2	9
Common Raven	1	14	13	77	105	1	1	9	14	25	41	6	3	50	180
Cooper's Hawk	--	--	2	--	2	--	--	--	--	--	2	--	--	2	4
Cordilleran Flycatcher	1	--	--	1	2	--	1	--	--	1	--	--	--	--	3
Dark-eyed Junco	4	63	57	240	364	18	32	52	61	163	--	--	1	1	528
Downy Woodpecker	--	1	1	3	5	--	--	--	--	--	--	--	--	--	5
Dusky Flycatcher	--	--	--	--	--	--	--	1	--	1	--	--	--	--	1
Dusky Grouse	--	--	5	--	5	--	--	--	--	--	--	--	--	--	5
Evening Grosbeak	--	3	--	5	8	--	--	--	--	--	--	--	--	--	8
Grace's Warbler	5	16	3	49	73	7	13	25	68	113	--	--	--	--	186
Gray Flycatcher	--	--	--	--	--	--	--	--	2	2	11	11	33	55	57
Gray Vireo	--	--	--	--	--	--	--	--	--	--	--	3	6	9	9
Green-tailed Towhee	--	--	--	--	--	--	--	--	--	--	1	--	2	3	3
Hairy Woodpecker	2	8	40	56	106	4	1	33	23	61	--	3	3	6	173
Hammond's Flycatcher	--	--	--	--	--	--	--	5	--	5	--	--	--	--	5
Hepatic Tanager	--	--	--	1	1	--	--	--	--	--	--	--	2	2	3
Hermit Thrush	15	90	118	374	597	2	5	18	20	45	--	--	--	--	642
House Finch	--	--	4	--	4	--	--	--	--	--	--	--	16	16	20
House Wren	1	16	30	92	139	--	--	10	14	24	--	--	--	--	163
Juniper Titmouse	--	--	--	--	--	--	--	2	--	2	1	4	22	27	29
Lark Sparrow	--	--	--	2	2	--	--	--	--	--	--	--	--	--	2
Lazuli Bunting	--	--	--	2	2	--	--	--	--	--	--	--	4	4	6
Lesser Goldfinch	--	--	--	1	1	--	--	--	--	--	--	--	1	1	2
Mountain Bluebird	--	--	--	1	1	--	--	2	--	2	--	--	4	4	7
Mountain Chickadee	2	94	50	173	319	10	8	36	28	82	8	28	9	45	446
Mourning Dove	--	16	5	11	32	--	12	11	31	54	9	--	17	26	112
Northern Flicker	1	30	40	117	188	4	5	24	32	65	2	4	1	7	260



MONITORING THE BIRDS OF KAIBAB NATIONAL FOREST: 2008

Species	North District														Grand Total
	Mid-elevation Conifer					Ponderosa Pine					Pinyon-Juniper				
	2005	2006	2007	2008	Total	2005	2006	2007	2008	Total	2006	2007	2008	Total	
Northern Goshawk	--	--	1	3	4	--	--	--	--	--	--	--	--	--	4
Northern Rough-winged Swallow	--	--	--	--	--	--	1	--	--	1	--	--	--	--	1
Olive Warbler	--	--	--	--	--	--	--	3	--	3	--	--	--	--	3
Olive-sided Flycatcher	--	2	--	3	5	--	--	--	--	--	--	--	--	--	5
Pine Grosbeak	--	--	3	5	8	--	--	3	--	3	--	--	--	--	11
Pine Siskin	1	42	3	174	220	6	2	1	9	18	--	--	1	1	239
Pinyon Jay	--	--	--	--	--	--	--	--	--	--	2	11	8	21	21
Plumbeous Vireo	--	--	--	1	1	7	5	19	24	55	3	2	11	16	72
Purple Martin	--	--	1	--	1	--	--	--	--	--	--	3	--	3	4
Pygmy Nuthatch	--	8	35	10	53	10	26	129	60	225	3	--	--	3	281
Red Crossbill	--	65	--	10	75	1	7	--	2	10	--	--	16	16	101
Red Squirrel	--	--	24	87	111	--	--	1	4	5	--	1	--	1	117
Red-breasted Nuthatch	--	33	27	56	116	--	1	3	--	4	3	--	1	4	124
Red-faced Warbler	3	--	--	1	4	--	--	--	--	--	--	--	--	--	4
Red-naped Sapsucker	--	1	2	6	9	--	--	1	--	1	--	--	--	--	10
Red-tailed Hawk	--	1	--	2	3	--	--	1	2	3	1	--	2	3	9
Rock Wren	--	--	--	1	1	--	1	--	--	1	1	1	4	6	8
Ruby-crowned Kinglet	8	95	45	205	353	--	--	--	--	--	--	--	--	--	353
Rufous Hummingbird	--	--	--	--	--	--	--	1	--	1	--	--	--	--	1
Say's Phoebe	--	--	--	--	--	--	--	--	--	--	--	--	1	1	1
Sharp-shinned Hawk	--	--	--	--	--	--	--	--	--	--	--	--	2	2	2
Spotted Towhee	--	--	--	--	--	--	--	--	4	4	13	25	28	66	70
Steller's Jay	1	18	11	62	92	3	10	31	27	71	5	--	9	14	177
Townsend's Solitaire	--	2	2	1	5	2	5	5	--	12	--	--	--	--	17
Tree Swallow	--	--	--	--	--	--	--	--	--	--	--	1	--	1	1
Turkey Vulture	--	1	--	3	4	--	--	--	1	1	--	1	--	1	6
Vesper Sparrow	--	--	--	--	--	--	--	--	--	--	--	--	1	1	1
Violet-green Swallow	--	55	48	165	268	5	11	28	29	73	5	--	2	7	348
Virginia's Warbler	3	--	--	2	5	4	5	1	--	10	4	--	10	14	29

MONITORING THE BIRDS OF KAIBAB NATIONAL FOREST: 2008

Species	North District														Grand Total
	Mid-elevation Conifer					Ponderosa Pine					Pinyon-Juniper				
	2005	2006	2007	2008	Total	2005	2006	2007	2008	Total	2006	2007	2008	Total	
Warbling Vireo	4	94	70	230	398	1	1	6	14	22	--	--	3	3	423
Western Bluebird	--	--	2	27	29	1	7	16	32	56	5	--	5	10	95
Western Scrub-Jay	--	--	--	--	--	--	--	--	1	1	--	4	3	7	8
Western Tanager	4	87	92	284	467	10	11	57	81	159	--	2	15	17	643
Western Wood-Pewee	2	31	24	127	184	21	7	23	46	97	--	--	--	--	281
White-breasted Nuthatch	6	11	7	14	38	9	15	37	33	94	7	13	11	31	163
White-throated Swift	--	--	8	1	9	--	--	--	--	--	2	6	2	10	19
Wild Turkey	--	--	--	4	4	--	--	1	--	1	--	--	--	--	5
Williamson's Sapsucker	--	19	34	113	166	--	1	--	3	4	--	--	--	--	170
Yellow Warbler	--	--	--	--	--	--	--	1	--	1	--	--	--	--	1
Yellow-rumped Warbler	7	133	109	472	721	7	18	9	45	79	--	--	--	--	800
<b>Grand Total</b>	80	1165	1013	3622	5880	149	248	667	790	1854	182	224	448	854	8588

MONITORING THE BIRDS OF KAIBAB NATIONAL FOREST: 2008

Species	Tusayan District									
	Ponderosa Pine					Pinyon-Juniper				Grand Total
	2005	2006	2007	2008	Total	2006	2007	2008	Total	
Aberts Squirrel	--	--	4	1	5	--	--	--	--	5
Abert's Towhee	--	1	--	--	1	--	--	--	--	1
Acorn Woodpecker	2	--	--	--	2	--	--	--	--	2
American Crow	--	--	--	--	--	--	19	--	19	19
American Kestrel	--	--	--	--	--	--	--	1	1	1
American Robin	11	13	10	16	50	--	10	2	12	62
Ash-throated Flycatcher	12	14	13	37	76	6	71	94	171	247
Bewick's Wren	--	2	1	2	5	3	30	46	79	84
Black-chinned Hummingbird	--	--	1	--	1	--	2	--	2	3
Black-headed Grosbeak	8	12	13	4	37	1	3	6	10	47
Black-throated Gray Warbler	1	14	12	20	47	5	60	91	156	203
Black-throated Sparrow	--	--	--	--	--	1	4	--	5	5
Blue-gray Gnatcatcher	--	--	--	--	--	9	17	10	36	36
Brewer's Sparrow	--	--	1	--	1	1	--	2	3	4
Broad-tailed Hummingbird	--	4	--	1	5	--	--	1	1	6
Brown Creeper	1	2	5	1	9	--	2	--	2	11
Brown-headed Cowbird	--	4	2	5	11	--	11	12	23	34
Bushtit	--	4	--	--	4	11	--	5	16	20
Canyon Wren	--	1	--	--	1	--	--	--	--	1
Cassin's Kingbird	--	--	--	--	--	1	1	9	11	11
Chipping Sparrow	10	18	2	6	36	6	31	36	73	109
Clark's Nutcracker	--	1	--	1	2	--	--	--	--	2
Common Nighthawk	--	--	--	1	1	--	3	--	3	4
Common Raven	1	10	6	11	28	--	28	65	93	121
Cooper's Hawk	--	--	--	--	--	--	1	--	1	1
Cordilleran Flycatcher	1	--	--	1	2	--	--	1	1	3
Dark-eyed Junco	26	26	49	28	129	--	13	6	19	148
Downy Woodpecker	--	--	--	--	--	--	5	--	5	5
Dusky Flycatcher	--	--	--	--	--	--	3	4	7	7
Gambel's Quail	--	--	--	1	1	--	--	--	--	1
Grace's Warbler	32	31	16	37	116	--	3	3	6	122
Gray Flycatcher	6	8	4	16	34	7	44	34	85	119
Gray Vireo	--	--	--	--	--	3	21	--	24	24
Green-tailed Towhee	--	--	--	--	--	1	2	1	4	4
Hairy Woodpecker	8	7	20	16	51	2	17	13	32	83
Hammond's Flycatcher	--	--	8	--	8	--	1	--	1	9
Hepatic Tanager	--	--	1	3	4	--	--	--	--	4
Hermit Thrush	6	1	1	1	9	--	8	1	9	18
House Finch	--	--	1	--	1	--	1	1	2	3
House Wren	--	3	--	--	3	--	--	--	--	3
Juniper Titmouse	--	2	3	6	11	15	43	78	136	147
Ladder-backed Woodpecker	--	--	--	--	--	--	1	--	1	1
Lark Sparrow	--	--	--	--	--	--	3	2	5	5
Lesser Goldfinch	1	1	--	--	2	--	--	1	1	3

MONITORING THE BIRDS OF KAIBAB NATIONAL FOREST: 2008

Species	Tusayan District									
	Ponderosa Pine					Pinyon-Juniper				Grand Total
	2005	2006	2007	2008	Total	2006	2007	2008	Total	
Lincoln's Sparrow	--	--	--	--	--	--	2	--	2	2
Lucy's Warbler	--	--	1	--	1	--	--	--	--	1
Mountain Bluebird	--	--	11	--	11	--	11	4	15	26
Mountain Chickadee	28	24	49	36	137	3	92	44	139	276
Mourning Dove	--	27	4	9	40	5	10	7	22	62
Northern Flicker	5	22	10	10	47	--	10	3	13	60
Northern Goshawk	--	--	--	--	--	--	--	1	1	1
Northern Mockingbird	--	--	--	--	--	1	3	--	4	4
Northern Rough-winged Swallow	--	--	--	--	--	--	4	2	6	6
Olive-sided Flycatcher	--	3	--	--	3	--	--	2	2	5
Pine Siskin	1	3	--	1	5	--	--	--	--	5
Pinyon Jay	1	104	--	8	113	2	13	25	40	153
Plumbeous Vireo	11	21	34	30	96	--	12	35	47	143
Purple Martin	--	--	2	--	2	--	--	--	--	2
Pygmy Nuthatch	35	38	66	24	163	--	25	10	35	198
Red Crossbill	1	9	--	3	13	--	--	--	--	13
Red Squirrel	--	--	2	2	4	--	3	--	3	7
Red-breasted Nuthatch	--	--	1	--	1	--	--	--	--	1
Red-tailed Hawk	--	--	--	1	1	--	--	--	--	1
Rock Wren	--	1	--	--	1	--	--	5	5	6
Ruby-crowned Kinglet	--	--	1	--	1	--	1	--	1	2
Spotted Towhee	--	1	5	4	10	10	42	31	83	93
Steller's Jay	8	15	30	15	68	--	12	3	15	83
Townsend's Solitaire	--	--	2	2	4	--	1	--	1	5
Tree Swallow	--	--	2	--	2	--	--	--	--	2
Turkey Vulture	--	--	--	--	--	--	2	1	3	3
Vesper Sparrow	--	--	1	--	1	--	10	6	16	17
Violet-green Swallow	1	19	30	21	71	--	13	18	31	102
Virginia's Warbler	--	--	12	3	15	--	3	--	3	18
Warbling Vireo	--	--	5	--	5	--	--	--	--	5
Western Bluebird	10	12	13	18	53	--	5	6	11	64
Western Scrub-Jay	--	--	4	2	6	2	13	11	26	32
Western Tanager	21	9	28	26	84	--	14	18	32	116
Western Wood-Pewee	7	10	22	13	52	--	15	1	16	68
White-breasted Nuthatch	9	22	32	23	86	5	51	26	82	168
White-throated Swift	--	--	--	--	--	--	1	--	1	1
Wild Turkey	--	--	2	--	2	--	--	1	1	3
Yellow Warbler	--	--	--	--	--	--	1	--	1	1
Yellow-rumped Warbler	7	16	12	10	45	--	3	4	7	52
<b>Grand Total</b>	<b>271</b>	<b>535</b>	<b>554</b>	<b>476</b>	<b>1836</b>	<b>100</b>	<b>830</b>	<b>789</b>	<b>1719</b>	<b>3555</b>

MONITORING THE BIRDS OF KAIBAB NATIONAL FOREST: 2008

Species	Williams District															Grand Total
	Mid-elevation Conifer					Ponderosa Pine					Pinyon-Juniper					
	2005	2006	2007	2008	Total	2005	2006	2007	2008	Total	2005	2006	2007	2008	Total	
Aberts Squirrel	--	--	6	1	7	--	--	13	11	24	--	--	1	2	3	34
Acorn Woodpecker	--	--	1	1	2	--	--	5	5	10	--	--	1	2	3	15
American Crow	--	--	--	--	--	--	--	--	8	8	--	6	--	--	6	14
American Kestrel	--	--	--	--	--	--	--	2	--	2	--	--	1	1	2	4
American Robin	--	--	10	8	18	26	11	56	64	157	--	--	20	19	39	214
Ash-throated Flycatcher	--	--	--	--	--	1	1	--	10	12	8	19	63	66	156	168
Band-tailed Pigeon	3	2	1	3	9	1	1	--	--	2	--	--	--	--	--	11
Bewick's Wren	--	--	--	--	--	--	4	--	4	8	--	24	22	46	92	100
Black-chinned Sparrow	--	--	--	--	--	--	--	--	--	--	--	--	2	--	2	2
Black-headed Grosbeak	6	8	2	9	25	9	17	20	30	76	1	14	21	28	64	165
Black-tailed Gnatcatcher	--	--	--	--	--	--	--	--	--	--	--	--	2	--	2	2
Black-throated Gray Warbler	--	--	--	1	1	3	1	3	4	11	--	16	14	14	44	56
Black-throated Sparrow	--	--	--	--	--	--	--	--	--	--	--	8	--	2	10	10
Blue Grosbeak	--	--	--	--	--	--	--	--	--	--	--	--	1	--	1	1
Blue-gray Gnatcatcher	--	--	--	--	--	--	--	--	1	1	--	7	8	1	16	17
Brewer's Sparrow	--	--	--	--	--	--	--	--	--	--	--	--	6	5	11	11
Broad-tailed Hummingbird	1	2	9	6	18	4	1	6	10	21	--	10	4	5	19	58
Brown Creeper	5	2	5	3	15	3	1	4	10	18	--	--	2	1	3	36
Brown-headed Cowbird	--	--	--	5	5	4	6	15	20	45	--	5	16	12	33	83
Bullock's Oriole	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1	1
Bushtit	--	--	--	--	--	1	--	--	--	1	--	13	8	--	21	22
Canyon Wren	--	--	2	2	4	--	1	1	--	2	--	--	--	--	--	6
Cassin's Finch	--	--	--	--	--	1	--	--	--	1	--	--	--	--	--	1
Cassin's Kingbird	--	--	--	--	--	--	--	--	--	--	--	7	2	3	12	12
Chipping Sparrow	--	--	--	3	3	19	22	17	19	77	9	44	54	61	168	248
Clark's Nutcracker	--	6	1	11	18	--	--	--	4	4	--	--	--	14	14	36
Common Nighthawk	--	--	--	--	--	--	--	--	2	2	--	7	2	--	9	11
Common Raven	--	--	2	4	6	9	13	44	40	106	--	23	51	61	135	247

MONITORING THE BIRDS OF KAIBAB NATIONAL FOREST: 2008

Species	Williams District															Grand Total
	Mid-elevation Conifer					Ponderosa Pine					Pinyon-Juniper					
	2005	2006	2007	2008	Total	2005	2006	2007	2008	Total	2005	2006	2007	2008	Total	
Cordilleran Flycatcher	6	4	12	18	40	--	5	2	6	13	--	--	--	3	3	56
Dark-eyed Junco	2	8	27	20	57	29	39	100	77	245	--	--	26	4	30	332
Double-crested Cormorant	--	--	--	--	--	--	--	--	1	1	--	--	--	--	--	1
Downy Woodpecker	--	--	4	--	4	--	--	--	--	--	--	1	--	1	2	6
Dusky Flycatcher	--	--	--	--	--	4	--	12	--	16	--	--	5	2	7	23
Eastern Meadowlark	--	--	--	--	--	--	--	--	--	--	--	--	--	3	3	3
Gambel's Quail	--	--	--	--	--	--	--	--	--	--	1	7	--	14	22	22
Golden-crowned Kinglet	--	--	--	--	--	--	--	1	--	1	--	--	--	--	--	1
Grace's Warbler	2	1	12	1	16	15	15	38	20	88	--	--	1	8	9	113
Gray Flycatcher	--	--	1	--	1	--	6	--	12	18	--	17	29	19	65	84
Gray Vireo	--	--	--	--	--	--	1	--	--	1	--	4	2	2	8	9
Great Blue Heron	--	--	--	--	--	--	--	--	2	2	--	--	--	--	--	2
Great Horned Owl	--	--	--	--	--	--	--	--	1	1	--	--	--	--	--	1
Greater Roadrunner	--	--	--	--	--	--	--	--	1	1	--	--	--	5	5	6
Green-tailed Towhee	--	--	--	--	--	--	--	--	--	--	--	2	--	--	2	2
Hairy Woodpecker	2	5	9	6	22	4	3	5	15	27	--	1	8	4	13	62
Hammond's Flycatcher	--	--	--	--	--	--	--	1	--	1	--	--	--	--	--	1
Hepatic Tanager	--	--	--	--	--	--	--	1	4	5	--	2	1	8	11	16
Hermit Thrush	11	18	14	23	66	2	10	8	5	25	--	--	--	5	5	96
Hermit Warbler	--	--	2	--	2	--	--	4	--	4	--	--	--	--	--	6
Hooded Oriole	--	--	--	--	--	--	--	--	--	--	--	1	--	--	1	1
Horned Lark	--	--	--	--	--	--	--	--	--	--	--	6	--	--	6	6
House Finch	--	--	--	--	--	--	--	--	--	--	--	12	6	8	26	26
House Wren	6	5	18	14	43	1	1	3	3	8	--	1	--	--	1	52
Hutton's Vireo	--	--	--	--	--	--	--	--	--	--	--	1	--	--	1	1
Juniper Titmouse	--	--	--	--	--	1	3	--	3	7	10	11	54	56	131	138
Lark Sparrow	--	--	2	--	2	--	--	4	1	5	12	24	15	39	90	97
Lesser Goldfinch	--	--	--	--	--	2	2	--	1	5	--	4	--	3	7	12
Lesser Nighthawk	--	--	--	--	--	--	--	--	--	--	2	1	--	--	3	3

MONITORING THE BIRDS OF KAIBAB NATIONAL FOREST: 2008

Species	Williams District															Grand Total
	Mid-elevation Conifer					Ponderosa Pine					Pinyon-Juniper					
	2005	2006	2007	2008	Total	2005	2006	2007	2008	Total	2005	2006	2007	2008	Total	
MacGillivray's Warbler	--	--	--	--	--	--	--	1	--	1	--	--	2	--	2	3
Mountain Bluebird	--	--	--	2	2	7	--	2	3	12	--	6	36	1	43	57
Mountain Chickadee	5	19	18	23	65	19	26	65	97	207	--	3	25	4	32	304
Mourning Dove	--	5	1	1	7	1	25	18	17	61	2	15	14	26	57	125
Northern Flicker	1	6	11	10	28	12	24	33	30	99	--	4	21	6	31	158
Northern Mockingbird	--	--	--	--	--	--	--	--	--	--	--	61	27	39	127	127
Northern Rough-winged Swallow	--	--	--	--	--	--	--	3	--	3	--	--	1	1	2	5
Olive Warbler	--	1	2	--	3	--	7	4	--	11	--	--	2	--	2	16
Olive-sided Flycatcher	--	--	4	4	8	--	--	--	--	--	--	1	--	1	2	10
Orange-crowned Warbler	--	1	--	--	1	--	1	--	--	1	--	--	--	--	--	2
Peregrine Falcon	--	--	--	2	2	--	--	--	--	--	--	--	--	--	--	2
Pine Siskin	3	1	3	1	8	6	1	--	3	10	--	--	--	1	1	19
Pinyon Jay	--	--	--	--	--	--	--	--	3	3	1	41	20	51	113	116
Plumbeous Vireo	--	1	6	3	10	9	11	39	55	114	--	--	15	16	31	155
Purple Martin	--	--	2	--	2	--	--	1	1	2	--	--	--	--	--	4
Pygmy Nuthatch	5	--	4	9	18	22	16	52	81	171	--	--	3	14	17	206
Red Crossbill	4	--	--	1	5	4	4	--	2	10	--	--	--	--	--	15
Red Squirrel	--	--	2	1	3	--	--	--	3	3	--	--	3	--	3	9
Red-breasted Nuthatch	12	17	11	22	62	--	--	--	--	--	--	--	7	--	7	69
Red-faced Warbler	9	6	--	7	22	--	1	--	1	2	--	--	--	1	1	25
Red-naped Sapsucker	--	--	--	2	2	--	--	--	--	--	--	--	--	--	--	2
Red-tailed Hawk	--	--	--	--	--	--	--	2	4	6	--	--	5	4	9	15
Red-winged Blackbird	--	--	--	--	--	--	1	--	2	3	--	--	--	--	--	3
Rock Wren	--	--	--	6	6	--	--	--	1	1	--	1	--	2	3	10
Rose-breasted Grosbeak	--	--	--	1	1	--	--	--	--	--	--	--	--	--	--	1
Ruby-crowned Kinglet	1	--	3	--	4	--	--	--	--	--	--	--	--	--	--	4
Say's Phoebe	--	--	--	--	--	--	--	--	1	1	--	1	1	--	2	3
Scott's Oriole	--	--	--	--	--	--	--	--	--	--	--	--	1	2	3	3
Spotted Towhee	1	--	1	--	2	--	6	--	3	9	6	22	33	16	77	88

MONITORING THE BIRDS OF KAIBAB NATIONAL FOREST: 2008

Species	Williams District															Grand Total
	Mid-elevation Conifer					Ponderosa Pine					Pinyon-Juniper					
	2005	2006	2007	2008	Total	2005	2006	2007	2008	Total	2005	2006	2007	2008	Total	
Steller's Jay	7	4	14	21	46	16	8	32	50	106	--	--	17	9	26	178
Townsend's Solitaire	1	--	11	1	13	2	--	7	2	11	--	--	2	--	2	26
Turkey Vulture	--	--	1	--	1	--	--	1	1	2	--	1	2	2	5	8
Vesper Sparrow	--	--	--	--	--	--	--	6	6	12	--	4	2	7	13	25
Violet-green Swallow	--	--	4	9	13	--	9	21	9	39	--	--	2	11	13	65
Virginia's Warbler	3	1	18	22	44	6	8	9	22	45	--	--	6	3	9	98
Warbling Vireo	4	--	9	7	20	--	1	4	1	6	--	--	1	--	1	27
Western Bluebird	--	--	--	--	--	15	18	33	38	104	--	2	8	4	14	118
Western Kingbird	--	--	--	--	--	--	--	1	--	1	1	3	3	--	7	8
Western Meadowlark	--	--	--	--	--	--	--	10	12	22	--	1	13	--	14	36
Western Scrub-Jay	--	--	1	--	1	2	1	2	--	5	1	13	10	27	51	57
Western Tanager	1	3	14	24	42	13	22	31	45	111	--	3	38	37	78	231
Western Wood-Pewee	--	--	9	13	22	15	12	45	63	135	--	2	8	9	19	176
White-breasted Nuthatch	1	--	22	6	29	13	14	64	56	147	--	2	11	9	22	198
White-throated Swift	--	--	--	--	--	--	--	1	--	1	--	15	5	4	24	25
Wild Turkey	--	--	--	--	--	--	1	1	4	6	--	--	--	--	--	6
Wilson's Warbler	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1	1
Yellow Warbler	--	--	4	1	5	--	--	7	1	8	--	--	--	1	1	14
Yellow-rumped Warbler	14	18	19	22	73	19	22	9	28	78	--	--	1	16	17	168
<b>Grand Total</b>	116	144	334	360	954	320	403	869	1039	2631	54	499	793	853	2199	5784



**APPENDIX D****Squirrel sign totals by transect**

Transect	Sum of Cones	Sum of Clippings	Sum of Middens	Total Sign	Effort	Area (hectares)	Sign/Area (hec)
AZ-MC04	0	0	0	0	14	3.5	0
AZ-MC09	0	0	0	0	10	2.5	0
AZ-MC10	16	30	2	48	11	2.75	17.45454545
AZ-MC12	1	9	1	11	13	3.25	3.384615385
AZ-MC13	12	18	1	31	14	3.5	8.857142857
AZ-MC14	8	32	2	42	11	2.75	15.27272727
AZ-MC15	0	0	0	0	14	3.5	0
AZ-MC16	25	33	3	61	11	2.75	22.18181818
AZ-MC20	0	2	0	2	14	3.5	0.571428571
AZ-MC21	0	0	0	0	14	3.5	0
AZ-MC22	0	0	0	0	14	3.5	0
AZ-MC24	12	3	0	15	8	2	7.5
AZ-MC25	0	4	0	4	7	1.75	2.285714286
AZ-MC26	0	5	0	5	9	2.25	2.222222222
AZ-MC30	4	6	1	11	8	2	5.5
AZ-MC51	0	0	0	0	14	3.5	0
AZ-MC52	4	11	1	16	10	2.5	6.4
AZ-MC53	0	0	0	0	8	2	0
AZ-MC63	3	5	0	8	7	1.75	4.571428571
AZ-MC64	0	8	3	11	13	3.25	3.384615385
AZ-MC65	21	43	1	65	14	3.5	18.57142857
AZ-MC67	0	0	0	0	14	3.5	0
AZ-MC89	0	0	0	0	9	2.25	0
AZ-MC90	0	0	0	0	14	3.5	0
AZ-MC91	0	0	0	0	14	3.5	0
AZ-MC92	0	0	0	0	14	3.5	0
AZ-MC93	8	12	0	20	14	3.5	5.714285714
AZ-MC94	0	0	0	0	14	3.5	0
AZ-MC95	1	11	1	13	13	3.25	4
AZ-MC97	1	5	0	6	7	1.75	3.428571429
AZ-PP01	34	62	0	96	14	3.5	27.42857143
AZ-PP02	7	6	0	13	7	1.75	7.428571429
AZ-PP05	14	57	0	71	14	3.5	20.28571429
AZ-PP06	0	18	1	19	14	3.5	5.428571429
AZ-PP07	0	0	0	0	10	2.5	0
AZ-PP18	0	0	0	0	14	3.5	0
AZ-PP27	0	0	0	0	14	3.5	0
AZ-PP28	0	0	0	0	14	3.5	0
AZ-PP29	0	6	0	6	12	3	2
AZ-PP31	39	18	0	57	14	3.5	16.28571429
AZ-PP32	34	107	0	141	14	3.5	40.28571429
AZ-PP33	0	0	0	0	8	2	0

MONITORING THE BIRDS OF KAIBAB NATIONAL FOREST: 2008

Transect	Sum of Cones	Sum of Clippings	Sum of Middens	Total Sign	Effort	Area (hectares)	Sign/Area (hec)
AZ-PP34	0	0	0	0	14	3.5	0
AZ-PP36	0	0	0	0	14	3.5	0
AZ-PP38	4	48	0	52	12	3	17.333333333
AZ-PP39	0	0	0	0	13	3.25	0
AZ-PP40	0	10	0	10	9	2.25	4.444444444
AZ-PP67	38	1	0	39	12	3	13
AZ-PP68	20	25	0	45	14	3.5	12.85714286
AZ-PP70	25	13	0	38	14	3.5	10.85714286
AZ-PP71	25	29	0	54	10	2.5	21.6
AZ-PP72	0	0	0	0	14	3.5	0
AZ-PP73	19	52	0	71	11	2.75	25.81818182
AZ-PP75	0	0	0	0	12	3	0
AZ-PP76	0	0	0	0	14	3.5	0
AZ-PP79	0	0	0	0	14	3.5	0
AZ-PP80	0	0	0	0	14	3.5	0
AZ-PP84	9	37	0	46	13	3.25	14.15384615
AZ-PP85	34	31	0	65	12	3	21.66666667
AZ-PP88	1	13	0	14	14	3.5	4
<b>Grand Total</b>	<b>442</b>	<b>812</b>	<b>17</b>	<b>1271</b>	<b>730</b>	<b>182.5</b>	<b>6.964383562</b>