

A Breeding Bird Inventory of Buffalo National River

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Table of Contents

<u>List of Figures</u>	iii
<u>List of Tables</u>	iii
<u>List of Appendices</u>	iii
Summary	iv
Acknowledgments.....	v
Introduction.....	1
Study area.....	2
Materials and Methods.....	3
Results.....	4
Discussion	6
Conclusion	9
Literature Cited.....	10

List of Figures

Figure 1. Location of Buffalo National River..... 11
Figure 2. Location of bird census points at Buffalo National River. 12

List of Tables

Table 1. List of birds censused at Buffalo National River by date, section, and habitat. 13
Table 2. The most abundant species censused along the Buffalo National River. 16
Table 3. Least common species censused along the Buffalo National River. 17
Table 4. Results of censuses within 50 m plots. 18
Table 5. Birds not recorded during census at Buffalo National River..... 21
Table 6. Species censused in early successional habitat..... 22
Table 7. Structural characteristics of vegetation at 216 plots along the Buffalo National River. 23
Table 8. Woody species composition and structure along 216 census points at Buffalo NR..... 24
Table 9. List of the most common canopy and subcanopy trees in study plots at Buffalo National River. N=number of trees recorded 26

List of Appendices

Appendix 1. Notes on bird species composition, distribution, etc. at Buffalo National River..... 27

Summary

A breeding bird survey was conducted at Buffalo National River between May and June 2002 via censusing point distance protocol identical to that used by the U.S. Forest Service throughout Arkansas. Special effort was also made to locate Swainson's warblers (*Limnothlypis swainsonii*) by playing a tape-recorded song in selected large cane thickets. Eighty-three species and 3,645 individual birds were censused among 225 riparian points (grassy and forested points). The most abundant, and most common, species censused include the red-eyed vireo (*Vireo olivaceus*) and indigo buntings (*Passerina cyanea*). The least common censused include migrants and habitat specific species. Five Swainson's warblers were located between Steel Creek and Dillard's and at an additional site. No Swainson's warblers were located in large cane thickets using playback. Eight cerulean warblers (*Dendroica cerulea*) were found at census points and four others detected at other sites. Cerulean warblers found in upland habitat prefer stands that have a well-developed subcanopy. Woody species composition and structure was also characterized at each forested census point. Forty-four species of trees were recorded with a relative development of the canopy and subcanopy playing a role in avian species composition. Influence of habitat is discussed and an appendix contains data regarding species abundance, distribution, and habitat use.

Acknowledgments

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Introduction

In 1998 Congress passed the National Parks Omnibus Management Act in response to concerns about the condition of natural resources within the national parks. The act requires each park to gather baseline inventory data on pertinent natural resources, data that will provide a pivotal step toward establishing an effective monitoring program furthering the ability to effectively manage and protect park resources. The National Park Service (NPS) responded with the Natural Resource Challenge program, including the establishment of biome-based inventory and monitoring networks. The Heartland Network, as part of the NPS Inventory and Monitoring (I&M) program, has undertaken inventories of vascular plants and vertebrates within fifteen parks in eight Midwestern states.

Recently, the entire suite of birds that migrate to Central and South America (neotropical migrants) has attracted national attention because of widespread population declines. Several of these neotropical migrant birds can be found along the Buffalo National River. Two species of particular concern, the cerulean warbler and Swainson's warbler utilize habitat within the National Park Service's holdings along the Buffalo National River. However, with the exception of Swainson's warbler, no systematic surveys had been conducted of the birds at the park.

External threats from changing land use and development are major concerns for park resource protection. Additional issues include: impounding of river tributaries outside of park; the small portion (11%) of the Buffalo River watershed within National Park Service administrative authority; increasing poultry and livestock operations with minimal state regulation adjacent to the park and throughout the watershed; karst geohydrology of the area expediting rapid transport of pollutants via underground water systems; and finally, little information exists on groundwater recharge to the National River.

The inventory described in this report is a census of the wooded riparian zone and selected grassy areas along the Buffalo National River. It will provide baseline data on species composition and relative abundance of both migrant and resident species found during the breeding season along the river. Given continued interest, the baseline data provided by this inventory will allow documentation of avian population and compositional changes over time.

Study area

Buffalo National River is located in the rugged Ozark Highlands of northern Arkansas (Figure 1). The survey area was located along the Buffalo River located in Marion counties, Arkansas (Figure 2). The region is characterized by narrow valleys separated by steep winding ridges and broad mountaintops.

Buffalo National River encompasses 149 narrow, linear square miles (95,730 acres) and includes 216 km (135 mi) of the 240 km (150 mi) long Buffalo River from the Boston Mountains to the White River. The headwaters are within the Ozark National Forest and were recently designated as part of the National Wild and Scenic Rivers System. Overall, 11% of the 3465.4 square km (1,338 square mi) watershed lies within National Park Service (NPS) administration and 29% is in other federal or state ownership. The majority of the watershed is in private ownership. One-third of the national river's acreage is a part of the National Wilderness Preservation System.

The river has a variety of vegetation types underlain with a karst geology of sink holes, springs, seeps, and approximately 300 known caves including the longest cave system in the state. The vegetation consists of oak, hickory, and beech forests, cedar and sandstone glades, rare river cane communities, and relic plant communities such as post oak savanna remnants.

Materials and Methods

Between 15 May and 19 June of 2002, birds were censused at 216 points located at approximately 0.5-mile intervals along the Buffalo National River between Ponca, Arkansas and the White River. Census points were located within forest stands within approximately 100 m of the river's bank. Each point was composed of three distance zones: 0-25 meters, 25-50 meters, and beyond 50 meters (as far as could be heard). In addition, three time periods were used: 0-3 min. 3-5 min. and 5-10 min. The censusing protocol used was identical to that used by the U.S. Forest Service throughout Arkansas and allows direct comparison with their data.

In addition, seven non-forested grassy areas located among the forested points were censused. Censuses conducted in grassy areas were composed of three time zones as specified above. However, in order to isolate species using grassy areas, censused birds were categorized into two groups: birds that were located in grassy areas were "in" the census plot and those birds that were using the surrounding forest were "out of" the census plot. Because the census was fitted to each grassy area, and because grassy areas differed in size, data from the grassy areas should be used to compose species lists only.

In order to account for differences in detectability, data was collected within the 50 m radius circle assuming that all species are equally detectable within the 50 m radius circle and thus, the bias associated with detectability among species would be eliminated.

Special effort was also made to locate Swainson's warblers by playing a tape-recorded song in selected large cane thickets. The tape recording was played for 1.5 minutes followed by one minute of silence during which we listened for warblers that responded to the playback. The tape player was rotated 180 degrees and the procedure repeated.

Woody vegetation was also characterized at each forest census point within an 11.3 m radius plot. Data collected included canopy cover (measured with a spherical densiometer), tree species and diameter at breast height (DBH). Trees were classified as either a canopy or subcanopy component (canopy trees were taller and formed the topmost portion of the forest whereas subcanopy included trees or shrubs whose crowns overlapped that of the canopy but did not reach the top of the canopy).

A complete species list for each plot and for areas of unique habitat, as well as habitat attributes, was recorded using standard field forms. Habitat attributes included physical site characteristics, vegetation description, and canopy strata description.

Geographic coordinates were recorded using Trimble GeoExplorer with the highest available precision for that time of day and post processed (corrected) with Pathfinder Office.

No voucher specimens or photos were collected.

Results

Eighty-three species and 3,645 individual birds were censused among the 225 points (grassy and forested points) located along the river (Table 1). The most abundant species censused include a mixture of species that require forested ecosystems, species restricted to riparian zones and generalists (Table 2). Red-eyed vireos and indigo buntings were the two most common species censused, both of which were located at over 80 % of the points censused. These two species are probably the most common species throughout forested ecosystems of the state. The American crow (*Corvus brachyrhynchos*) was the next most common species and was censused at just under 70 % of the locations. The crow is common, however, its position as third is probably due to a sampling bias as the American crow's vocalization carries farther than any of the other species censused, thus, the effective area censused for crows is larger than that censused for other birds.

The least common species (1-3 individuals detected) censused include migrants, some species as simply uncommon in Arkansas, and others that are common in Arkansas but require habitats that are not common along the Buffalo National River (Table 3). In addition, some species are common along the river but were not commonly censused due to nocturnal habits or because they restricted their activity to the area on or above the river and did not vocalize loudly. Some species are fairly common within the state but for unknown reasons were not commonly censused on the river.

Birds Located in Grassy Areas

Twenty-one species were censused among seven grassy areas along the Buffalo River (Table 6). Grassy plots had fewer species and individuals than did the forested plots however, the grassy areas added four species that were not censused at any of the forested areas (eastern kingbird, northern mockingbird, chipping sparrows). In addition, one dickcissel was located in a grassy area adjacent to a forested census location.

Swainson's Warblers and Cerulean Warblers

Four Swainson's warblers were located between Steel Creek and Dillard's while censusing. An additional Swainson's warbler was located 1.75 miles downstream of Carver while traveling to a census point. No Swainson's warblers were located in large cane thickets using playback. Eight cerulean warblers were censused between Rush and the junction of the White River. Cerulean warblers were detected 6, 10.5, 11, and 18 miles downstream of the Rush campground. Although portions of the Rush campground appeared to represent good habitat for cerulean warblers, none were detected (D. James (1986) has observed them at the campground in the past). During off hours (i.e., after 11:00 AM), one cerulean warbler was located along Cow Creek within 100 m of the Buffalo River, and three cerulean warblers along Middle Creek within about 200 m of the Buffalo River. None of the locations appeared to have more than three singing warblers. However, all locations of cerulean warblers were made during mid-June, which represents the later part of the breeding season. During the later part of the breeding season cerulean warblers sing less often. Thus, the small number of birds that were detected may not have been indicative of the actual numbers of cerulean warblers.

Differences in detectability indicate that nine species were detected in 10% or more of the plots (Table 4).

A total 1049 trees were measured, 686 canopy and 363 subcanopy. The most common canopy species (> 9 occurrences) were sycamore, box elder, sweetgum, and american elm (Table 9). The most common subcanopy species (> 9 occurrences) were similar to the canopy but also included catalpa and snags. Species found in the canopy but not in the subcanopy include green ash, black walnut, white oak, northern red oak, and black oak. Canopy cover ranged from absence of cover to 98% with an average of 87%.

Discussion

Species Present & Not Censused

Three nocturnal species were present and not censused (Table 5). Whip-poor-wills were common along the river from Ponca to Buffalo City (heard at night or in the morning before censuses began). Great horned and barred owls were also present along the river but were not detected during any of the censuses. Black-crowned night heron, several rock doves and purple martins were seen downstream from Woolum. At Maumee North a brown thrasher was seen. Finally, downstream from the Rush Campground a tree swallow and roadrunner were seen.

Species Not Censused but Possibly Present

Several species breed in Arkansas but were not censused among the 225 plots, nor were they detected during the time spent on the Buffalo River (Table 5). Some species including bells vireos, prairie warblers, Baltimore orioles, and painted buntings require shrubby habitats. The campground at Erbie represents the best habitat for these species. Although a thorough search of the campground at Erbie was conducted no additional species were detected.

Most of the grassy areas censused did not have any shrubs and consequently, were not likely to attract birds that require more complex habitats. However, several species that breed in Arkansas often use hayfields similar to the ones censused along the Buffalo River. These species include American kestrels (formerly common but now uncommon over much of Arkansas), scissor-tailed flycatchers (extremely common in Arkansas), Eastern meadowlarks (extremely common in Arkansas), grasshopper sparrows (not particularly common but present at scattered locations throughout the state), lark sparrows (fairly common in the Ozarks), and horned larks (usually associated with large expanses of pastureland).

No extensive stands of pines was encountered and consequently, species that require such stands were not recorded along the Buffalo River. Thus, pine warblers, which are extremely common in pine-dominated landscapes within Arkansas, were not detected. In addition, brown-headed nuthatches, which are fairly common in pine stands in some regions of Arkansas, were not recorded. Finally, Bachman's sparrows, are fairly uncommon in pine stands of Arkansas, and were not detected along the Buffalo River.

Several species of waders and two shorebirds that might breed along the Buffalo River were not detected. Cattle egrets and little blue herons might find suitable habitat along the Buffalo River however, most herons are fairly conspicuous when present and it is doubtful they were present in the spring of 2002. In addition, it was surprising that no killdeer were detected (this species is a common breeder in fairly open country). Killdeer would most likely be restricted to gravel bars along the river. However, they are extremely vocal and would have been detected either while censusing or canoeing between census points if they were present. American woodcocks are also possible breeders along the Buffalo River. However, woodcocks are fairly inconspicuous during the breeding season and could easily have been missed.

Several species of raptorial birds may be present as well. Coopers and sharp-shinned hawks have both breed in small numbers in Arkansas. Both species are fairly inconspicuous and do not often vocalize and may have been missed. Red-tailed hawks are common breeders in Arkansas

yet generally use open habitats and are usually fairly conspicuous. The habitat along the Buffalo may not be appropriate for red-tailed hawks.

European starlings, house finches and house sparrows commonly breed in Arkansas. All three species are associated with urban habitats and cities. Nevertheless, these species are extremely widespread within Arkansas and if more time had been spent near park residences they would have been detected.

Birds Located in Grassy Areas

In general, grassy areas had very few species and did not contribute significantly to avian diversity. Grassy areas managed as hayfields had low in avian abundance and diversity. However, changing the mowing and/or burning regimes would increase the species composition in such areas and might attract species like the prairie warbler which was not detected along the Buffalo River in 2002.

As an indication of some of the biases in detectability, note that the American crow was only detected in 2.7% of the plots and that downy woodpeckers were more commonly detected than were pileated woodpeckers. Also note that eastern phoebes were only detected in 4% of the plots sampled (as opposed to over 20% for samples beyond the 50 m radius circle). The difference in abundance is due to the affinity of phoebes for cliffs.

Given the inherent biases associated with sampling birds in fixed radius plots, the best approach is to consider data collected from within the 50 m radius plots separately from data collected from beyond 50 m. Data collected from beyond 50 m can be used as an index for comparing the abundance of species that can be heard over long distances (American crow, pileated woodpecker and great crested flycatcher). On the other hand data collected from within the 50 m plots can be used to index abundance for species that have very soft vocalizations (like gnatcatchers, redstarts, parulas etc...).

Influence of habitat

Habitat structure is known to influence avian species composition. Several studies have documented relationships between habitat structure and avian species composition (James 1971; James and Shugart 1973; Kellner 1994). The river's influence was apparent in establishing structurally unique habitats along the gravel bars and in the flood plains. Several birds were most commonly associated with this habitat including, yellow-throated warblers, Louisiana waterthrushes, American redstarts and the northern parula.

Upland forests dominated by red and white oaks (*Quercus rubra*, *Q. alba*), and absent of river birches (*Betula nigra*) and sycamores (*Platanus occidentalis*), sometimes extend down to a point just above the waters edge. These upland forests have their own avian community including, wood thrushes, scarlet tanagers, and black-and-white warblers. If the upland habitat were more common, the results of my census would have been different.

Grasslands that are maintained by mowing represent another structurally unique habitat along the Buffalo River. However, only a few species were restricted to grassy habitats along the river. As mentioned above, additional species would be attracted to the river if management of the

grassy areas were adjusted. For instance, if succession were allowed to progress beyond the grassy stage, the areas could attract bell's vireos, painted redstarts and prairie warblers among other species. In addition, by growing warm-season grasses, many of the hayfields might become more attractive to northern bobwhite. Many of the grassy areas were probably too small to attract avian species often associated with open areas. For instance, grasshopper sparrows are often found in extensive hayfields (James and Neal 1986). None of the hayfields along the Buffalo River can be classified as extensive, which may account for the absence of several species including grasshopper sparrows.

Weather

During the course of the census temperatures ranged between 7° and 24° centigrade (mean=62° C, median = 65° C, and mode = 65° C). These temperatures are probably close to optimal for censusing in this region this time of year. Cloud cover probably does not reduce avian activity. It is suspected that birds maintain more activity on cloudy compared to cloud free days. During censuses cloud cover ranged from 0% to 100%. Fifty-two percent of censuses were conducted under 80-100% cloud cover and 38% of censuses were conducted under cloudless skies. Wind has a greater influence on censuses than any other weather variable. Eighty-four percent of the censuses were conducted during windless conditions. During periods of gusting winds the census was delayed until the wind calmed so that unbiased data could be obtained.

Conclusion

Given the length of the river censused, similar data would have been obtained and produced similar conclusions (regarding the number of breeding species and their distribution patterns) if intervals had been one mile rather than half mile. This would decrease the time needed to travel the length of the river, which would result in a smaller seasonal bias. The seasonal bias is due to a decrease in the singing rate of birds associated with the progression of the breeding season and is probably not distributed evenly among species. In a census of this sort, elimination of the seasonal bias would require multiple census teams censusing birds simultaneously along the entire stretch of river. The tradeoff would be an increase in individual bias due to different capabilities of people involved.

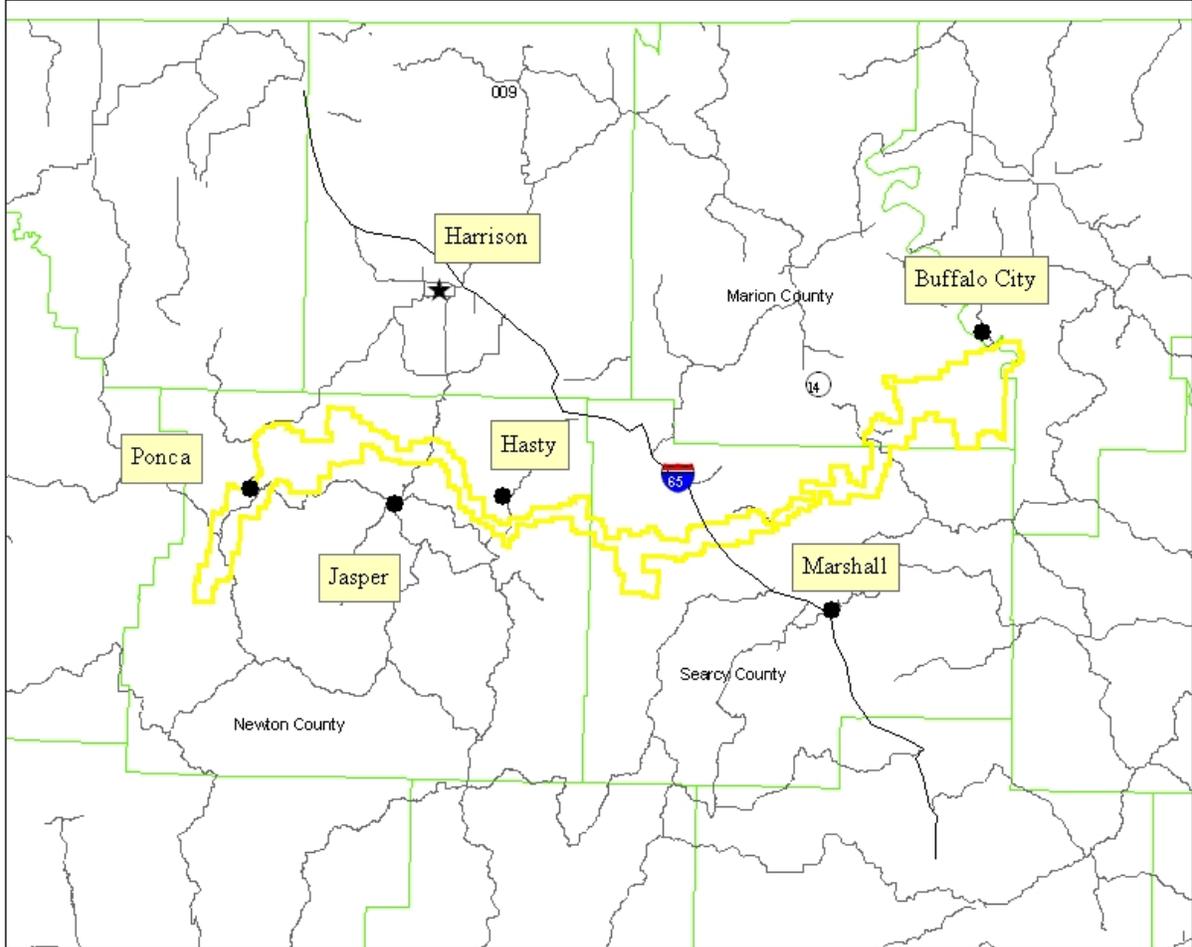
The Buffalo River influenced avian community structure. Ovenbirds, worm-eating warblers, scarlet tanagers and summer tanagers were much more common in upland areas visited during the course of the field season than in the riparian zone. Thus, a full picture of the avifauna of the Buffalo National River would require that censuses be conducted in the upland habitats as well as the riparian zone. However, although the relative numbers of various species would change dramatically, the total number of species censused would probably not change after conducting a more thorough search of upland habitats.

All of the census points were georeferenced. Consequently, one could revisit all of the points (+/- a few meters). However, given the heterogeneity of the habitat, the size of census plots (0-25 m, 25-50 m and > 50 m) and the large number of points, it is suspected that repeating the census at its current intensity (1 point/0.5 mile) would yield similar results whether or not the exact locations were revisited.

Literature Cited

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Buffalo National River



0 15 30 60
Kilometers

1:646,722

Legend

- Park Boundary
- County
- Roads

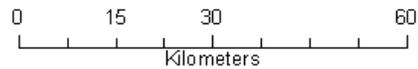
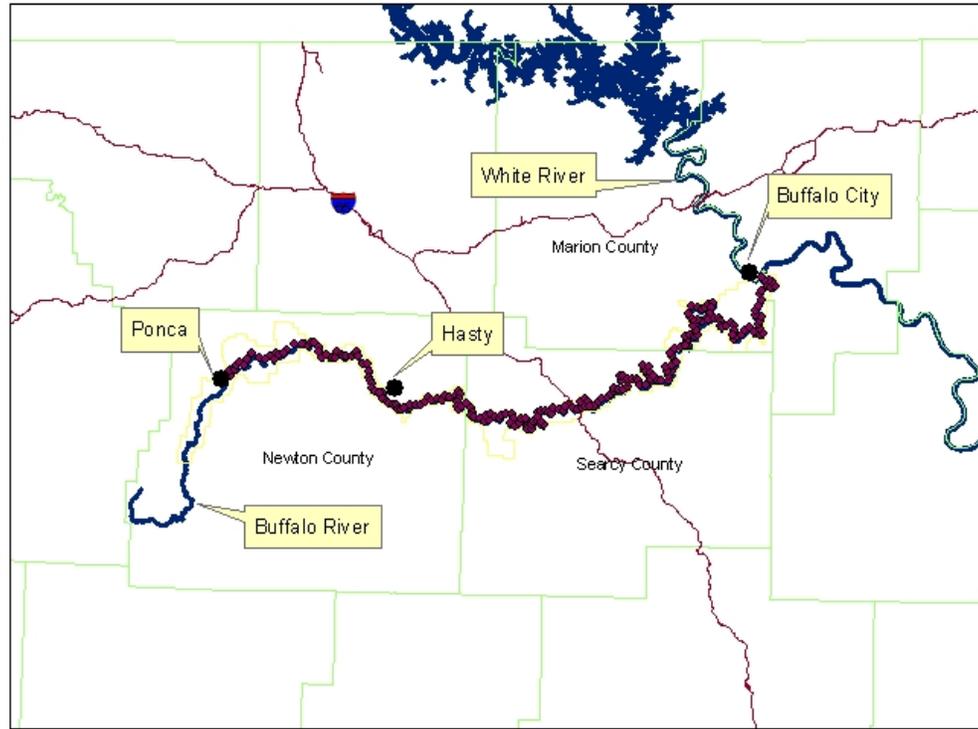


Map Produced by: Heartland Network
Inventory and Monitoring Program

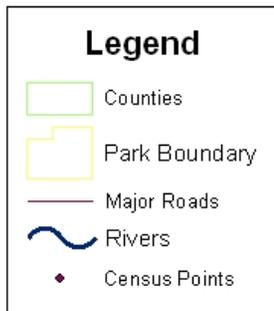
Data Source: National Park Service

Figure 1. Location of Buffalo National River.

Buffalo National River



1:888,801



Maps Produced by: Heartland Network
Insect and Bird Monitoring Program
Data Source: National Park Service

Figure 2. Location of bird census points at Buffalo National River.

Table 1. List of birds censused at Buffalo National River by date, section, and habitat.
 N = number of individuals censused

Common Name	N	Dates	River Section	Habitat
Acadian Flycatcher	82	15 M-19 J	Ponca 0.8-Rush 22	Forest
American Crow	214	15 M-19 J	Ponca 1.8-Rush 21	Generalist
American Goldfinch	27	15 M-17 J	Ponca 1.8-Rush 9.5	Generalist
American Redstart	155	16 M-19 J	Steel 3.5-Rush 19	Riparian
American Robin	1	15 M	Ponca 1.3	Open
Bald Eagle	1	19 J	Rush 19.5	Riparian
Barn swallow	3	15 M-12 J	Steel 0- Dillard 0	-
Belted Kingfisher	14	24 M-19 J	Hasty 1.5-Rush 19.5	Aquatic
Black Vulture	6	22 M-5 J	Erbie 2.5-Tyler 3.5	Generalist
Black-and-white Warbler	15	16 M-19 J	Steel 3.5-Rush 20.5	Forest
Black-throated Green Warbler	1	23 M	Ozark 1	Riparian
Blue Grosbeak	12	15 M-11 J	Steel 0-Maumee 1	Open
Blue Jay	10	24 M-12 J	Hasty 0-Buffalo Pt. 2	Generalist
Blue-gray gnatcatcher	117	15 M-19 J	Ponca 0.3-Rush 21	Generalist
Blue-winged Warbler	8	22 M-19 J	Erbie 3-Rush 20	Open
Broad-winged Hawk	5	16 M-10 J	Kyles 2-Maumee 0	Forest
Brown-headed Cowbird	46	15 M-13 J	Steel 0-Buffalo Pt. 4.5	Open
Carolina Chickadee	61	15 M-19 J	Steel 1.5-Rush 22	Generalist
Carolina Wren	160	15 M-19 J	Ponca 3-Rush 22	Generalist
Cerulean Warbler	8	16 J-19 J	Rush 6-Rush 18	Forest
Chestnut-sided Warbler	2	15 M	Ponca 1.3-Steel 2	Margins
Chimney Swift	2	16 J-19 J	Rush 2-Rush 1.8	Generalist
Chipping Sparrow	11	16 M-19 J	Kyles 1-Rush 20	Open
Chuck-wills-widow	1	17 M	Erbie 0	Forest
Cliff swallow	1	5 J	Tyler 1	-
Common Grackle	3	12 J	Buffalo Pt. 0.5	Open
Common Yellowthroat	28	22 M-19 J	Erbie 2.5-Rush 22	Open
Dickcissel	1	3 J	Woolum 8	-
Downy Woodpecker	46	15 M-19 J	Ponca 1.8-Rush 21	Forest
Eastern Bluebird	5	15 M-4 J	Steel 0-Tyler 0	Open
Eastern Kingbird	6	15 M-12 J	Steel 0-Buffalo Pt. 0	Open
Eastern Phoebe	60	15 M-19 J	Ponca 0.8-Rush 19.5	Cliffs
Eastern Screech Owl	1	12 J	Maumee	Forest
Eastern Towhee	17	15 M-19 J	Steel 0.5-Rush 21.5	Margins
Eastern Wood Pewee	1	12 J	Buffalo Pt. 0.5	Forest
Field Sparrow	7	17 M-3 J	Erbie 0-Woolum 8	Open
Fish Crow	53	16 M-19 J	Kyles 1.5-Rush 21	Generalist

Table 1. List of birds censused at Buffalo National River by date, section, and habitat (cont.).

Common Name	N	Dates	River Section	Habitat
Golden-winged Warbler	1	15 M	Steel 0.5	Forest
Gray Catbird	18	15 M-16 J	Ponca 1.3-Rush 6	Margins
Great Blue Heron	14	24 M-19 J	Pruitt 5.5-Rush 22	Aquatic
Great-crested Flycatcher	16	23 M-18 J	Pruitt 1.5-Rush 15.5	Forest
Green Heron	11	23 M-19 J	Pruitt 1.5-Rush 20	Aquatic
Hairy Woodpecker	2	25 M-16 J	Carver 1.5-Rush 6.5	Forest
Hooded Warbler	93	15 M-19 J	Ponca 1.3-Rush 19.5	Forest
Indigo Bunting	306	15 M-19 J	Ponca 0.3-Rush 22	Generalist
Kentucky Warbler	120	15 M-16 J	Ponca 0.3-Rush 21.5	Riparian
Louisiana Waterthrush	112	15 M-19 J	Ponca 0.3-Rush 20.5	Riparian
Magnolia Warbler	3	15 M	Ponca 0.3-Steel 0.5	Forest
Morning Dove	95	15 M-19 J	Ponca 1.5-Rush 20	Open
Northern Bobwhite	4	2 J-5 J	Hersey 7.5-Tyler 3	Open
Northern Cardinal	157	15 M-19 J	Ponca 0.8-Rush 22	Margins
Northern Flicker	1	5 J	Tyler 0.5	Open
Northern Mockingbird	1	4 J	Tyler 0	Open
Northern Parula	209	15 M-19 J	Ponca 0.3-Rush 22	Riparian
N. Rough-winged Swallow	44	15 M-17 J	Steel 0-Rush 12	Cliffs
Orchard Oriole	2	15 M-4 J	Steel 0-Tyler 0	Open
Ovenbird	7	15 M-26 M	Ponca 0.8-Carver 5.5	Forest
Pileated Woodpecker	61	15 M-19 J	Ponca 1.8-Rush 21	Forest
Prothonotary Warbler	13	3 J-16 J	Woolum 6.5-Rush 3.5	Riparian
Red-bellied Woodpecker	88	15 M-19 J	Ponca 0.8-Rush 21.5	Forest
Red-eyed Vireo	321	15 M-19 J	Ponca 0.3-Rush 21.5	Forest
Red-shouldered Hawk	7	16 M-19 J	Kyles 1-Rush 22	Margins
Red-winged Blackbird	2	2 J	Hersey 7.5	Marsh
Ruby-throated Hummingbird	5	4 J-13 J	Woolum 9.5-Rush 0	Generalist
Scarlet tanager	18	15 M-13 J	Ponca - Buffalo	Forest
Spotted Sandpiper	2	24 M	Pruitt 4.5	Aquatic
Summer tanager	23	23 M-19 J	Erbie-Rush	-
Swainson's Thrush	4	15 M-17 M	Ponca 0.3-Erbie 1	Forest
Swainson's Warbler	3	15 M-12 J	Steel 1-Dillard's 1	Riparian
Tennessee Warbler	1	16 M	Steel 3.5	Forest
Tufted Titmouse	199	15 M-19 J	Ponca 0.3-Rush 22	Generalist
Turkey Vulture	52	15 M-18 J	Steel Cr. 0-Rush 17	Generalist
White-breasted Nuthatch	17	15 M-19 J	Ponca 1.8-Rush 22	Forest
White-eyed Vireo	162	15 M-19 J	Steel 0.5-Rush 22	Margins

Table 1. List of birds censused at Buffalo National River by date, section, and habitat (cont.).

Common Name	N	Dates	River Section	Habitat
Wild Turkey	2	22 M-5 J	Erbie 2.5-Tyler 3	Forest
Wood Duck	8	25 M-16 J	Carver 3-Rush 5.5	Aquatic
Wood Thrush	46	15 M-16 J	Ponca 0.3-Rush 2.5	Forest
Woodpecker spp.	8			
Worm-eating Warbler	6	17 M-13 J	Pruitt 0-Buffalo Pt. 6.5	Forest
Yellow-billed Cuckoo	94	16 M-19 J	Kyles 1.5-Rush 22	Forest
Yellow-breasted Chat	41	15 M-18 J	Ponca 1.3-Rush 16.5	Open
Yellow-crowned Night Heron	1	26 M	Heresy 1	Aquatic
Yellow-throated Vireo	28	16 M-19 J	Steel 3.5-Rush 18.5	Forest
Yellow-throated Warbler	49	15 M-18 J	Steel 0.5-Rush 15	Riparian

Table 2. The most abundant species censused along the Buffalo National River.
 N = total censused; Points = number of points where the species was encountered; % = percent of points at which species was encountered.

Common Name	N	Points	%
Red-eyed Vireo	321	195	86
Indigo Bunting	306	182	81
American Crow	214	154	69
Northern Parula	209	171	76
Tufted Titmouse	199	158	70
White eyed Vireo	162	131	59
Carolina Wren	160	134	60
Northern Cardinal	158	132	59
American Redstart	155	132	59
Kentucky Warbler	120	110	49
Blue gray Gnatcatcher	117	102	45
Louisiana Waterthrush	112	94	43

Table 3. Least common species censused along the Buffalo National River.
 N=Number of individuals censused.

Common Name	N
American Robin	1
Bald Eagle	1
Barn Swallow	3
Black-throated Green warbler	1
Chimney Swift	2
Common Grackle	3
Chestnut-sided Warbler	2
Chuck-wills Widow	1
Cliff swallow	1
Dickeissel	1
Eastern Wood Pewee	1
Eastern Screech Owl	1
Golden-winged Warbler	1
Hairy Woodpecker	2
Magnolia Warbler	3
Northern Flicker	1
Northern Mockingbird	1
Orchard Oriole	2
Red-winged Blackbird	2
Spotted Sandpiper	2
Swainson's Warbler	3
Tennessee Warbler	1
Wild Turkey	1
Yellow-crowned Night Heron	1

Table 4. Results of censuses within 50 m plots.

N = number censused; N Plots = the number of plots in which species were detected; P Plots is the proportion of plots out of 225 in which each species was detected.

Common Name	N	N Plots	P Plots
Acadian Flycatcher	29	29	12.8
American Crow	8	6	2.7
American Goldfinch	5	2	0.9
American Redstart	66	55	24.4
American Robin	1	1	0.4
Bald Eagle	0	0	0
Barn Swallow	2	2	0.9
Belted Kingfisher	2	2	0.9
Black Vulture	5	3	1.3
Black-and-white Warbler	4	3	1.3
Black-throated Green Warbler	0	0	0
Blue Grosbeak	5	4	1.8
Blue Jay	0	0	0
Blue-gray gnatcatcher	50	43	19.1
Blue-winged Warbler	5	2	0.9
Broad-winged Hawk	1	1	0.4
Brown-headed Cowbird	15	11	4.9
Carolina Chickadee	10	8	3.6
Carolina Wren	20	17	8
Cerulean Warbler	5	2	0.9
Chestnut-sided Warbler	1	1	0.4
Chimney Swift	0	0	0
Chipping Sparrow	8	3	1.3
Chuck-wills-widow	0	0	0
Cliff Swallow	0	0	0
Common Grackle	2	1	0.4
Common Yellowthroat	7	7	3.1
Dickcissel	0	0	0
Downy Woodpecker	7	7	3.1
Eastern Bluebird	3	2	0.9
Eastern Kingbird	5	2	0.9
Eastern Phoebe	10	9	4
Eastern Screech Owl	0	0	0
Eastern Towhee	4	3	1.3
Eastern Wood Pewee	0	0	0
Field Sparrow	4	3	1.3

Table 4. Results of censuses within 50 m plots (cont.).

Common Name	N	N Plots	P Plots
Fish Crow	2	2	0.9
Golden-winged Warbler	0	0	0
Gray Catbird	10	9	4
Great Blue Heron	4	3	1.3
Great-crested Flycatcher	2	2	0.9
Green Heron	1	1	0.4
Hairy Woodpecker	2	2	0.9
Hooded Warbler	15	15	6.7
Indigo Bunting	91	74	32.9
Kentucky Warbler	14	12	5.3
Louisiana Waterthrush	45	36	16
Magnolia Warbler	2	2	0.9
Morning Dove	12	4	1.8
N. Rough-winged Swallow	21	10	4.4
Northern Bobwhite	0	0	0
Northern Cardinal	26	22	9.8
Northern Flicker	1	1	0.4
Northern Mockingbird	1	1	0.4
Northern Parula	24	24	10.7
Orchard Oriole	2	2	0.9
Ovenbird	0	0	0
Pileated Woodpecker	4	4	1.8
Prothonotary Warbler	7	6	2.7
Red-bellied Woodpecker	9	9	4
Red-eyed Vireo	64	57	25.3
Red-shouldered Hawk	1	1	0.4
Red-winged Blackbird	1	1	0.4
Ruby-throated Hummingbird	5	5	2.2
Scarlet Tanager	0	0	0
Spotted Sandpiper	0	0	0
Summer Tanager	2	2	0.9
Swainson's Thrush	1	1	0.4
Swainson's Warbler	1	1	0.4
Tennessee Warbler	1	1	0.4
Tufted Titmouse	32	30	13.3
Turkey Vulture	7	6	2.7
White-breasted Nuthatch	3	3	1.3

Table 4. Results of censuses within 50 m plots (cont.).

Common Name	N	N Plots	P Plots
White-eyed Vireo	29	25	11.1
Wild Turkey	1	1	0.4
Wood Duck	1	1	0.4
Wood Thrush	8	7	3.1
Woodpecker	2	2	0.9
Worm-eating Warbler	0	0	0
Yellow-billed Cuckoo	14	13	5.8
Yellow-breasted Chat	9	8	3.6
Yellow-crowned Night Heron	0	0	0
Yellow-throated Vireo	2	2	0.9
Yellow-throated Warbler	6	6	2.7

Table 5. Birds not recorded during census at Buffalo National River.

Missed	Expected	Unlikely	Extirpated
Barred Owl	Baltimore Oriole	American Kestrel	Bewick's Wren
Black-crowned night heron	Brown Thrasher	Bell's Vireo	Osprey
Brown Thrasher	Cattle Egret	Brown-headed Nuthatch	
Great Horned Owl	Cooper's Hawk	Eastern Meadowlark	
Greater Roadrunner	European Starling	Grasshopper Sparrow	
Purple Martin	House Finch	Horned Lark	
Rock Dove	House Sparrow	Lark Sparrow	
Tree Swallow	Killdeer	Loggerhead Shrike	
Whip-poor-will	Little Blue Heron	Pine Warbler	
	Prairie Warbler	Painted Bunting	
	Red-tailed Hawk	Scissor-tailed Flycatcher	
	Sharp-shinned Hawk		
	Yellow Warbler		
	Woodcock		

Missed = species was detected but not during a census, Expected= species expected; Unlikely = species breed in Arkansas in proximity to the Buffalo River but are unlikely to occur because of insufficient habitat, or because the species is rare in Arkansas; Extirpated = species probably occurred along the Buffalo at one time but are now absent.

Table 6. Species censused in early successional habitat.

N = number of individuals censused; Points = number of points at which the species was censused; % = the proportion of points at which the species was encountered.

Common Name	N	Points	%
American Crow	1	1	14
Barn Swallow	1	1	14
Blue-gray Gnatcatcher	2	2	28
Brown-headed Cowbird	6	3	42
Blue Grosbeak	2	2	28
Carolina Wren	2	2	28
Chipping Sparrow	6	2	28
Common Yellowthroat	3	3	42
Eastern Bluebird	2	1	14
Eastern Kingbird	4	1	14
Eastern Phoebe	1	1	14
Field Sparrow	2	2	28
Indigo Bunting	5	3	42
Mourning Dove	2	1	14
Northern Cardinal	1	1	14
Northern Mockingbird	1	1	14
Orchard Oriole	1	1	14
Northern Rough-winged Swallow	7	2	28
White-eyed Vireo	5	5	70
Yellow-breasted Chat	3	3	42
Yellow-breasted Chat	3	3	42

Table 7. Structural characteristics of vegetation at 216 plots along the Buffalo National River. Trees and basal area (meter²) are calculated per hectare; canopy and subcanopy represent the number of canopy and subcanopy trees in a 11.3 m radius plot.

Variable	Mean	SD	Min.	Max.
Number of trees	121	42.9	0	324
Basal area	8.1	6	0	50.8
Canopy	3.1	1.4	0	10
Subcanopy	1.7	1.4	0	8

Table 8. Woody species composition and structure along 216 census points at Buffalo NR. N = number of individual trees; DBH = Average diameter at breast height (centimeters); Min = minimum dbh; Max = maximum dbh; SD = standard deviation of dbh.

Common Name	Level	N	DBH	Min	Max	SD
American elm	canopy	55	30.78	13.1	70	10.79
	subcanopy	47	15.18	6.5	23.3	3.98
Basswood	canopy	2	38.35	37.5	39.2	1.20
	subcanopy	1	12.40	12.4	12.4	-
Black cherry	canopy	1	19.50	19.5	19.5	-
Black locust	canopy	1	40.10	40.1	40.1	-
	subcanopy	1	12.30	12.3	12.3	-
Black oak	canopy	10	42.31	23.5	58.3	9.40
	subcanopy	1	13.10	13.1	13.1	-
Black walnut	canopy	27	29.43	17.5	48.8	9.40
	subcanopy	7	12.37	8.9	15	2.03
Boxelder	canopy	95	24.22	11.1	50.7	7.71
	subcanopy	66	13.05	7.4	20.1	3.06
Butternut	canopy	1	52.20	52.2	52.2	-
Catalpa	canopy	5	29.88	22	39.5	6.49
	subcanopy	14	16.71	8.5	31	6.26
Celtis	canopy	29	38.29	14.5	67.2	15.04
	subcanopy	25	14.44	5.8	28.7	5.29
Chinquapin oak	canopy	5	49.08	29.8	84	22.66
Coffee tree	canopy	1	36.00	36	36	-
	subcanopy	1	17.20	17.2	17.2	-
Cotton wood	canopy	3	67.20	58.5	74	7.92
Dogwood	subcanopy	2	9.15	8.5	9.8	0.92
Elm	subcanopy	2	19.20	12.4	26	9.62
Green ash	canopy	35	30.61	12	61.5	13.35
	subcanopy	8	17.46	10.1	28.8	6.15
Hickory	canopy	9	33.03	14.6	45	10.77
	subcanopy	5	15.30	9.3	21.1	4.87
Honey locust	canopy	27	24.94	13	41	7.56
	subcanopy	13	15.75	7.4	25.7	5.54
Horn beam	subcanopy	1	9.20	9.2	9.2	-
Ironwood	subcanopy	9	12.76	7.5	19.5	4.24

Table 8. Woody species composition and structure along 216 census points at Buffalo NR (cont.).

Common Name	Level	N	DBH	Min	Max	SD
Mockernut hickory	canopy	19	28.96	12	47.1	10.38
	subcanopy	13	14.18	7	18.9	3.51
Mulberry	canopy	1	21.50	21.5	21.5	-
	subcanopy	2	11.05	11	11.1	0.07
N. red oak	canopy	16	39.53	15.4	74.5	14.21
Nyssa	canopy	1	21.80	21.8	21.8	-
Osage orange	subcanopy	1	11.00	11	11	-
Paw paw	subcanopy	1	6.60	6.6	6.6	-
Post oak	canopy	2	29.00	22.2	35.8	9.62
Persimmon	subcanopy	2	19.50	18.5	20.5	1.41
Red bud	subcanopy	1	11.00	11	11	-
Red cedar	canopy	4	25.28	20.1	32	5.07
	subcanopy	9	17.64	10.5	31.1	7.86
River birch	canopy	29	34.68	11.9	60.3	12.04
	subcanopy	11	18.16	11.6	27	4.80
Sasafrass	canopy	8	32.66	22.3	40.1	5.63
	subcanopy	3	26.13	16.1	39.4	11.98
Shortleaf pine	canopy	6	26.07	11.5	38.1	10.18
Silver maple	canopy	27	28.59	15.2	58.4	11.13
	subcanopy	13	14.35	7.8	22.5	3.98
Slippery elm	canopy	12	25.58	13.5	40.2	9.48
	subcanopy	22	15.06	8.8	23.8	3.88
Snag	canopy	4	30.30	14	42.6	14.39
	subcanopy	12	25.51	13.2	36.2	7.72
Sweetbay magnolia	canopy	1	50.50	50.5	50.5	-
Sweetgum	canopy	78	32.03	11.1	86.1	14.41
	subcanopy	18	13.76	9.5	19.5	2.99
Sycamore	canopy	137	34.47	12.5	147	18.56
	subcanopy	34	12.84	7.5	18.2	3.03
Tree of heaven	canopy	2	22.55	16.1	29	9.12
Umbrella magnolia	canopy	1	7.50	7.5	7.5	-
	subcanopy	5	9.54	8.5	10.9	0.98
Walnut	canopy	3	27.30	22.5	34	5.98
White oak	canopy	16	46.06	20.1	78.1	15.71
	subcanopy	2	13.05	12.2	13.9	1.20
Willow	canopy	13	12.61	4.5	37.5	10.14
	subcanopy	11	14.36	10.5	20.1	3.36

Table 9. List of the most common canopy and subcanopy trees in study plots at Buffalo National River. N=number of trees recorded

Common Name	Level	N
Sycamore	Canopy	137
Boxelder	Canopy	95
Sweetgum	Canopy	78
American elm	Canopy	55
Green ash	Canopy	35
Celtis	Canopy	29
River birch	Canopy	29
Black walnut	Canopy	27
Honey locust	Canopy	27
Silver maple	Canopy	27
Mockernut hickory	Canopy	19
N. red oak	Canopy	16
White oak	Canopy	16
Willow	Canopy	13
Slippery elm	Canopy	12
Black oak	Canopy	10
Boxelder	Subcanopy	66
American elm	Subcanopy	47
Sycamore	Subcanopy	34
Celtis	Subcanopy	25
Slippery elm	Subcanopy	22
Sweetgum	Subcanopy	18
Catalpa	Subcanopy	14
Mockernut hickory	Subcanopy	13
Silver maple	Subcanopy	13
Honey locust	Subcanopy	13
Snag	Subcanopy	12
Willow	Subcanopy	11
River birch	Subcanopy	11

Appendix 1. Notes on bird species composition, distribution, etc. at Buffalo National River.

Acadian Flycatchers were quite common along the river and were censused at 32.4% of the census points. They prefer a complex understory and are common throughout the state in mesic forest stands. They probably nest along the entire length of the river.

American Crows were detected at 68.4% of the census points. Because they are quite vocal and because their vocalization carries a great distance, I suspect that they are less abundant than the census indicates. In addition, they were usually seen or heard while flying and may not actually use the area near the river as much as one might think given the frequency with which they are observed. They probably nest within the area.

American Goldfinches were detected at 7.1% of the census points. They were usually recorded as they flew overhead. Goldfinches require open grassy areas for nesting because they feed their nestlings ripe grass seeds. However, because most of the hayfields were mowed before grass seeds ripened, goldfinches may not actually breed in the area.

American Redstarts were one of the most commonly encountered birds along the entire length of the river and were detected at 58.7% of the points censused. They were most common in forested areas adjacent to the river but were not particular as to the species composition or age of the trees. I observed one family group and am sure that they commonly breed along the river.

American Robin: I only recorded one robin (representing 0.4% of the census points). I suspect that robins do not commonly breed along the Buffalo because the habitat they prefer is not available (they are most often found in residential areas).

Bald Eagle: Only one eagle was observed (representing 0.4% of census points) near the junction of the Buffalo and White Rivers. Bald eagles could potentially nest along the river and probably did so in the past. However, I saw no sign of nesting.

Barn Swallow: Like Cliff Swallows, Barn Swallows were uncommon along the river and I only censused 2, representing 0.9% of the census locations. They may nest at Dillard's and Steel Creek but I did not notice any additional barn swallows along the river.

Belted Kingfishers were detected at 6.2% of the census points. They were observed along the entire stretch of the river and are commonly encountered while canoeing. However, like other species that restrict their activities to the river, the relative numbers censused does not reflect their abundance. They breed along the river; I observed one group of fledglings.

Black-throated Green Warbler: Only one was detected (representing 0.4% of the census points). They were recently documented as breeders in Arkansas and appear to be expanding their range within the state. However, because I only observed one (the one censused), I doubt that they currently breed along the Buffalo.

Black-and-white Warblers were detected at 6.2% of the locations. However, I suspect that they are fairly common in forests along the upper slopes above the river where they probably breed.

Black Vultures were detected at 1.7% of census points. They probably breed on the cliffs above the river. They are not as common as Turkey Vultures, but are more common than the census indicates. They are underrepresented in the census because they do not vocalize.

Blue-gray Gnatcatchers were censused throughout the course of the river and were extremely common. I located them at 45.3% of the census locations. They have a soft vocalization and are probably underrepresented in the census. Gnatcatchers utilize a wide array of habitats along the river including gravel bars with young trees (3 m tall), to mature forests. They commonly breed within the state and probably breed along the Buffalo in impressive numbers.

Blue Grosbeaks were detected at 4.9% of the census locations. They were always located in or near grassy areas and also in open areas on gravel bars. They probably breed in small numbers along the river.

Blue Jays were relatively uncommon along the river and were censused at 3.1% of the census points. They are quite vocal and their vocalization carries a great distance. Therefore, I think they were censused in greater proportion than their actual abundance. I suspect that they nest within the area.

Blue-winged Warblers were detected at 2.2% of the census points at scattered locations along the river. This species requires a fairly open habitat and is restricted to the campgrounds and areas adjacent to grassy areas. They may breed in small numbers in some of the campgrounds (I also observed them at the Steel Creek campground but not during a census).

Broad-winged Hawks were detected at 2.2% of the points. They were observed along much of the river. In Arkansas, they commonly nest in forested habitats and are not restricted to the riparian zone.

Brown-headed Cowbirds were observed at 16.8% of the census locations. Although they were observed between Steel Creek and Buffalo Point, they probably occur throughout the length of the river

Carolina Chickadees were less common than titmice. I only found them at 21.8% of the census points. However, like titmice, I found them along the entire river in a wide variety of habitats. Both species require cavities for nesting.

Carolina Wrens were encountered at 59.6% of the points I censused. I found them on gravel bars, riparian forests and also upland forests. I suspect that they commonly breed along the river although I did not notice any family groups.

Cerulean Warblers were detected at 1.7% of the census points. They were only observed between Rush and the mouth of the Buffalo and are probably rare upstream from Rush. They may be more common between Rush and the White River than my census indicates. I censused the Buffalo from Rush to the mouth in mid-June at which time Cerulean Warblers are less vocal than during mid-May. In addition, I located two additional groups of Cerulean Warblers while hiking during off hours.

Chestnut-sided Warblers were censused at 0.9% of the census locations. Like Tennessee Warblers they were only observed on the first day of the census between Ponca and a point 2 miles downstream of Steel Creek. They are an uncommon breeder in Arkansas and I suspect that they did not breed along the Buffalo National River in 2002.

Chimney Swifts were detected at 0.9% of the census locations. However, they were often observed foraging above the river. They probably nest in crevices in the cliffs and cavities in large trees along the river. They were probably slightly underrepresented by the census.

Chipping Sparrows were censused at 2.6% of the census points. They were always located in open areas associated with campgrounds or in hayfields. I suspect that they breed in such open areas along the river.

Chuck-wills-widows: Only one Chuck-wills-widow was censused (representing 0.4% of the census points). However, they were commonly heard at night along the lower stretch of the river. They were also sometimes heard along the upper stretch of the river between Ponca and Pruitt. They probably commonly breed along the river but were seldom censused because of their nocturnal habits.

Cliff Swallow: Only one Cliff Swallow was censused (representing 0.4% of the census points). I don't know why they were not more common. Several bridges span the river and appear to provide excellent nesting habitat along with the numerous cliffs above the river. My findings suggest that they do not regularly nest along the river.

Common Grackle: Only two Common Grackles were observed, both at the Buffalo Point Campground (representing 0.4% of the census points). The campground appears to supply the only reasonable habitat in the area for grackles and I suspect that they may nest in the campground.

Common Yellowthroats were located at 12.4% of the census points. I found them in areas that had extensive open habitat. They probably breed in moderate numbers wherever such habitat is present along the entire length of the river.

Dickcissel: Only one Dickcissel was censused (representing 0.4% of the census points). The grassy habitats available along the river are apparently unsuitable as habitat for dickcissels. Perhaps the grassy areas are too small to support Dickcissels. I suspect that they do not breed along the river.

Downy Woodpeckers were located at 19.5% of the census locations. They occurred along the entire length of the river and probably breed throughout the length of the river as well.

Eastern Bluebirds were only found at 1.8% of the locations. They prefer a fairly open habitat and must have cavities for nesting and probably breed in very low numbers along the Buffalo.

Eastern Kingbirds were observed at 1.3% of the census locations. They were restricted to open grassy areas. They probably breed in small numbers in the Park Service holdings along the river at the edges of open areas.

Eastern Phoebe are very common along the river and were detected at 20.8% of the census locations. They are especially common near extensive cliffs and probably nest at such cliffs along the entire river.

Eastern Screech Owls were recorded at only one point (representing 0.4% of the census locations). However they were more common than the census indicates; they were heard at several locations when I was not censusing. I suspect that they breed in forests along the river.

Eastern Towhees were censused at 7.1% of the census locations and occurred at scattered locations between Steel Creek and the mouth of the Buffalo. They prefer a mixture of habitats and I often found them in open shrubby habitats adjacent to mature forest stands.

Eastern Wood Pewee: Only one Eastern Wood Pewee was recorded (representing 0.4% of the census points). This species prefers an open understory, which may explain why it was not more commonly encountered. Their vocalization is very conspicuous so I probably recorded it in proportion to its abundance. However, they may be more common in drier, more open forest stands above the river.

Field Sparrows were also censused at 2.6% of the census points. Like Chipping Sparrows, they were always associated with hayfields and campgrounds.

Fish Crows were only recorded at 19.1% of the census locations. As with American Crows they were probably less abundant than the census suggests. I suspect that they nest along the river.

Golden-winged Warbler: One Golden-winged Warbler was heard (representing 0.4% of the census points) in the forest along the edge of the river. They do not breed in Arkansas.

Gray Catbirds were located at 7.1% of the points censused. I observed them most commonly on gravel bars that supported trees and shrubs. I suspect that they breed in moderate numbers along the river.

Great-crested Flycatchers were recorded at 7.1% of the census locations. They have a very loud vocalization that carries quite well through the forests. I suspect that they were censused in proportion to their abundance. They probably breed in the Park Service holdings along the river in small numbers.

Great Blue Herons and Green Herons were located at 4.8% and 4.4% of census locations. Like wood ducks they were observed along the entire stretch of the Buffalo National River but were not recorded on censuses in proportion to their abundance. Although I did not observe any juvenile herons, both species probably breed along the river.

Hairy Woodpecker: Only one hairy woodpecker was censused (representing 0.4% of the census points) along the river. I was surprised to find only one and I suspect that they may be more common in forests above the river. They have a loud vocalization but can be mistaken for a Downy Woodpecker.

Hooded Warblers were detected at 35.6% of the census points and were found along the entire river. They were found in mature forest stands that had an extensive understory and probably breed in such locations along the entire length of the river.

Indigo Buntings were detected at 80.9% of the census locations. They were extremely common along the river and like cardinals probably nested in a variety of edges.

Kentucky Warblers were also very common along the entire stretch of the river and were detected at 48.9% of the census locations. They were recorded at the first census point and also 0.5 miles from the mouth of the Buffalo. They prefer areas with a fairly dense understory and are probably one of the most common warblers in the area.

Louisiana Waterthrushes were extremely common in the riparian zone and were detected at 41.8% of the census points along the entire river. I observed several family groups suggesting that they commonly breed along the river.

Magnolia Warblers were detected at 1.3% of the census points. They were observed only on the first day of the census. As with Tennessee Warblers, they don't breed in Arkansas but are probably common migrants along the river during April and May.

Northern Bobwhite were censused at 1.7% of the census locations. They are present at scattered locations along the Buffalo National River. They commonly sing during May and June and their vocalization carries over long distances. Therefore, the 4 I censused reflect the rarity of bobwhite along the river. Providing more early successional habitat would probably increase their abundance.

Northern Cardinals were located at 58.6% of the census points. They were quite common in edge habitats along the river and also in campgrounds. They probably breed in a variety of habitats along the river including sandbars with scrubby vegetation and forest edges along the river.

Northern Flicker: Only one flicker was censused (representing 0.4% of the census points) along the river. I believe that the census reflects their uncommon status along the river. They prefer an open habitat with opportunities to forage on the ground and such habitat is not common along the Buffalo.

Northern Mockingbird: Only one mockingbird was censused (representing 0.4% of the census points) and was located at the Tyler Bend Campground. Mockingbirds are very conspicuous wherever they are found. Consequently, I believe that I located one of the only mockingbirds present along the river. They may breed in very low numbers in areas that support an open park-like habitat.

Northern Parulas were detected at 76.0% of the census points and were the most commonly encountered warbler along the river. They are most abundant in the riparian forest just adjacent to the river and probably represent one of the more common nesting species in the riparian forest zone of the Buffalo National River.

Northern Rough-winged Swallows were detected at 11.1% of the census points. They were very common along the entire length of the river and I observed them nesting in cavities and depressions in banks and cliffs along the river. They were difficult to census because they did not travel far from the river and do not have a loud vocalization. Thus, they were much more common than the census indicates.

Orchard Oriole: Only two orchard orioles were observed (at 0.9% of the census locations), one at Steel Creek and the other at the Tyler Bend campground. They require open habitat with scattered tall trees for nesting. Both locations appear suitable for nesting.

Ovenbirds were detected at 2.7% of the census locations. However, they are fairly common along the trails above the river. I suspect that they are common nesters in the forest stands above the river but do not occur as often within the riparian zone that I censused.

Pileated Woodpeckers were detected at 26.2% of the census points. Like Downy Woodpeckers, Pileated Woodpeckers are common along the entire stretch of the river. They are probably less common than the data indicate because their vocalization can be heard over great distances. They probably breed along the entire stretch of the river, but probably in lower numbers than Downy Woodpeckers.

Prothonotary Warblers were censused at 4.9% of the census locations. They restrict their activities to the riparian zone adjacent to the river. I suspect that the number of suitable cavities for nest sites limits them.

Red-bellied Woodpeckers were detected at 36.8% of the census points. They were the most commonly censused woodpeckers along the river. They were found in a variety of forested habitats and probably breed along the river.

Red-eyed Vireos were detected at 86.7% of the census points. They are probably the most common forest dweller in Arkansas along with Indigo Buntings and were censused in proportion to their abundance.

Red-shouldered Hawks were located at 3.1% of the census points. They are present along the entire stretch of the river and were often observed in the riparian zone, which is where they probably nest.

Red-winged Blackbird: Only one was recorded (representing 0.4% of the census points). I suspect that they don't currently nest along the river. They require marshy habitat and are often observed nesting in cattails (*Typha* spp.).

Ruby-throated Hummingbirds were detected at 2.2% of the census locations. They do not have a loud vocalization and were probably more common than the census indicates. They probably breed in the area.

Scarlet Tanagers were detected at 7.1% of the census points between Ponca and Buffalo Point. However, they probably occur wherever mature hardwood or hardwood/pine forests predominate. They are probably more abundant upslope of the river than in the areas I sampled and they probably breed within the Park Service holdings.

Spotted Sandpipers were recorded at 0.4% of census locations. However, they were commonly observed foraging along the banks of the river between 15 May and 2 June. However, like other species that restrict activities to the immediate vicinity of the river, Spotted Sandpipers were seldom censused. Currently no breeding records exist for this species in Arkansas.

Swainson's Thrushes are migrants and I detected them between 15 and 17 May. They do not breed in Arkansas. I recorded them at 1.7% of the census points.

Swainson's Warblers were detected at 1.3% of the census locations along the river. The one censused at Steel Creek on 15 May might have been migrating because it did not respond to taped playback. However, only one of the other two that we located responded to playback but they sang regularly before we played our tape.

Summer Tanagers were censused between Erbie and Rush at 9.3% of the census points. However, like Scarlet Tanagers they are probably more abundant upslope of the river in mature forests.

Tennessee Warbler: Only one Tennessee Warbler was heard (representing 0.4% of the census points). They do not nest in Arkansas but are probably fairly common migrants along the Buffalo National river during April and early May.

Tufted Titmice were encountered at 70.2% of the census points including the first and last census points. This species occurs throughout the region and will use a wide array of habitats from shrubby and fairly open habitats to mature forests.

Turkey Vultures were detected at 13.3% of the census points. They are probably the most common raptor along the river. Like black vultures they probably nest along the cliffs above the river. Also, like black vultures they were under represented in the census.

Whip-poor-wills were commonly heard along the entire river. However, they were not censused due to their nocturnal nature. Like chuck-wills-widows they probably breed in upland forests along the river.

White-breasted Nuthatches were detected at only 6.2% of the locations censused. They were present in mature forest stands and probably breed in low numbers along the river. They may be more common in the upland sites above the river.

White-eyed Vireos were detected at 58.2% of the census points. They are associated with the same forest edges that represent good Indigo Bunting habitat and are one of the more common breeding species along the river.

Wild Turkeys were recorded at 0.9% of census locations. Like Northern Bobwhite, turkeys are present and probably breed within the Park Service holdings along the river. Wild Turkeys may be more abundant than my census indicates.

Wood Ducks were detected at 1.3% of census points. However, they were commonly seen along the entire stretch of the Buffalo National River. I observed them throughout the census period and several hens were observed with ducklings. They were rarely recorded at census locations because they didn't often vocalize and they usually stayed on the water and were thus, usually not visible from my census points.

Wood Thrushes were recorded at 17.8% of the census points. They prefer very mesic sites with a mature forest and a closed canopy. I suspect that they breed in moderate numbers along the entire length of the river.

Worm-eating Warblers were detected at 2.7% of the census locations. I suspect that this species may be more common in forests along the upper slopes of the river. In the riparian zone Worm-eating Warblers probably breed in low numbers whenever a mature forest is present with a fairly open understory.

Yellow-breasted Chats were located at 16.9% of the locations censused. They were present in the same types of habitats that supported Common Yellowthroats. I censused more chats than yellowthroats, however, because the chat's vocalization travels a lot farther than the yellowthroat's. Like yellowthroats, chats probably breed in association with the open scrubby habitats along the entire river.

Yellow-billed Cuckoos were detected at 36.4% of the census points. They were extremely common along the river. They use a variety of forested habitats within the state. Along the river they were recorded in both riparian and upland forests as well as at the margins of fields. They probably breed in the area.

Yellow-crowned Night Herons were only located at 0.4% of census locations. I observed only one (the one censused) along the entire course of the river. However, the species does breed in Arkansas and it could potentially breed along the river.

Yellow-throated Vireos were censused at 12.0% of the points. They appeared in mature deciduous woodlands along the river where they probably nest in moderate numbers.

Yellow-throated Warblers were detected at 20.9% of the census points along the entire stretch of the river. They prefer the area just adjacent to the river and probably nest in moderate numbers along with Northern Parulas.