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POINT COUNT SURVEYS OF BREEDING BIRDS IN THE OBED WILD AND SCENIC RIVER

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During early to mid-June of each summer from 1998 to 2003, Barbara H. Stedman conducted point count surveys to document the breeding birds of the Obed Wild and Scenic River (OWSR), the only federally designated wild and scenic river in Tennessee. Annual surveys covered 50 nonrandomly selected plots, at each of which birds were counted for 5 minutes. In 2004, a federally mandated inventory of the park's avifauna began, using a set of 30 mainly randomly selected plots, each surveyed for 10 minutes. The 30 plots established in 2004 may be surveyed in the future. However, the 50 previously established plots are not scheduled for future surveys (except for plots common to both sets of surveys). Consequently, results from the 50 point-count surveys conducted 1998 to 2003 are presented here because they are likely to possess historical value as baseline data and because they suggest immediate land management considerations.

We have published the raw data, including the number of plots at which each species was registered each year and the total number of individuals counted each year, from the point count surveys conducted 1998-2002 in the OWSR elsewhere (Stedman and Stedman 2002), but point count survey results for 2003 (Table 1), as well as discussion of the overall results for six years, are presented here for the first time. Our data analysis was simple, based only on obtaining totals of

Table 1. Total numbers of individuals recorded at 50 point count plots, each surveyed for 5 minutes per annum, in the Obed Wild and Scenic River, 1998-2003 (common names of Neotropical migrants are boldfaced).

Species	Scientific Name	1998	1999	2000	2001	2002	2003
Wood Duck	<i>Aix sponsa</i>	2	3	-	-	-	-
Ruffed Grouse	<i>Bonasa umbellus</i>	3	1	1	-	1	1
Wild Turkey	<i>Meleagris gallopavo</i>	1	3	1	2	3	-
Northern Bobwhite	<i>Colinus virginianus</i>	1	1	-	1	1	-
Great Blue Heron	<i>Ardea herodias</i>	1	-	3	1	1	1
Green Heron	<i>Butorides virescens</i>	1	-	-	-	-	-
Black Vulture	<i>Coragyps atratus</i>	2	-	1	1	-	1
Turkey Vulture	<i>Cathartes aura</i>	16	3	8	4	2	3
Osprey	<i>Pandion haliaetus</i>	1	1	-	-	-	-
Red-shouldered Hawk	<i>Buteo lineatus</i>	4	-	1	4	2	3
Broad-winged Hawk	<i>Buteo platypterus</i>	6	-	-	1	4	2
Red-tailed Hawk	<i>Buteo jamaicensis</i>	2	-	-	-	-	2
Killdeer	<i>Charadrius vociferus</i>	1	1	-	-	-	1
American Woodcock	<i>Scolopax minor</i>	-	1	-	-	1	-
Mourning Dove	<i>Zenaida macroura</i>	9	23	8	16	20	20
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	1	-	-	-	1	-
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	11	17	8	13	9	7
Eastern Screech-Owl	<i>Otus asio</i>	2	-	-	1	-	-
Great Horned Owl	<i>Bubo virginianus</i>	2	-	-	2	1	-
Barred Owl	<i>Strix varia</i>	2	1	2	2	1	-
Chimney Swift	<i>Chaetura pelagica</i>	5	2	-	-	3	2
Ruby-throat. Hummingbird	<i>Archilochus colubris</i>	1	-	2	1	2	1
Belted Kingfisher	<i>Ceryle alcyon</i>	3	2	3	5	5	2
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	-	1	1	-	1	-
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	4	3	7	9	12	6
Downy Woodpecker	<i>Picoides pubescens</i>	8	4	4	6	9	10
Hairy Woodpecker	<i>Picoides villosus</i>	9	3	7	4	10	17
Northern Flicker	<i>Colaptes auratus</i>	3	3	3	3	5	4
Pileated Woodpecker	<i>Dryocopus pileatus</i>	24	20	17	29	23	21
Eastern Wood-Pewee	<i>Contopus virens</i>	5	8	8	9	3	3
Acadian Flycatcher	<i>Empidonax virescens</i>	39	60	51	42	31	35
Eastern Phoebe	<i>Sayornis phoebe</i>	12	14	12	12	9	8

Species	Scientific Name	1998	1999	2000	2001	2002	2003
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	5	2	3	1	3	4
Eastern Kingbird	<i>Tyrannus tyrannus</i>	1	1	-	-	-	-
White-eyed Vireo	<i>Vireo griseus</i>	8	14	18	16	10	10
Yellow-throated Vireo	<i>Vireo flavifrons</i>	6	4	4	10	2	1
Blue-headed Vireo	<i>Vireo solitarius</i>	14	30	22	40	41	64
Red-eyed Vireo	<i>Vireo olivaceus</i>	162	226	169	154	119	124
Blue Jay	<i>Cyanocitta cristata</i>	24	24	32	35	26	44
American Crow	<i>Corvus brachyrhynchos</i>	61	36	37	47	37	46
Purple Martin	<i>Progne subis</i>	2	1	-	-	2	-
N. Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	6	1	7	7	4	5
Barn Swallow	<i>Hirundo rustica</i>	2	2	2	-	-	-
Carolina Chickadee	<i>Poecile carolinensis</i>	57	41	36	39	28	35
Tufted Titmouse	<i>Baeolophus bicolor</i>	51	39	43	33	41	30
White-breasted Nuthatch	<i>Sitta carolinensis</i>	10	9	10	26	18	13
Carolina Wren	<i>Thryothorus ludovicianus</i>	34	30	37	25	38	51
Blue-gray Gnatcatcher	<i>Poliopftila caerulea</i>	11	11	8	13	12	6
Eastern Bluebird	<i>Sialia sialis</i>	1	1	2	2	2	2
Wood Thrush	<i>Hylocichla mustelina</i>	26	22	32	33	35	33
American Robin	<i>Turdus migratorius</i>	2	3	2	1	5	1
Gray Catbird	<i>Dumetella carolinensis</i>	1	2	-	-	-	1
Brown Thrasher	<i>Toxostoma rufum</i>	3	5	1	1	0	4
Cedar Waxwing	<i>Bombycilla cedrorum</i>	1	1	-	4	-	2
Northern Parula	<i>Parula americana</i>	10	10	8	14	14	8
Black-throated Green Warbler	<i>Dendroica virens</i>	61	38	36	69	39	36
Yellow-throated Warbler	<i>Dendroica dominica</i>	19	14	15	16	19	13
Pine Warbler	<i>Dendroica pinus</i>	12	8	7	8	13	4
Prairie Warbler	<i>Dendroica discolor</i>	23	19	23	13	9	3
Cerulean Warbler	<i>Dendroica cerulea</i>	-	1	1	-	-	1
Black-and-white Warbler	<i>Mniotilta varia</i>	58	22	66	28	23	31
Worm-eating Warbler	<i>Helminthos vermivorum</i>	43	30	24	32	32	29
Swainson's Warbler	<i>Limnithlypis swainsonii</i>	4	2	2	4	3	2
Ovenbird	<i>Seiurus aurocapillus</i>	78	56	66	34	50	39
Louisiana Waterthrush	<i>Seiurus motacilla</i>	10	11	17	14	14	17
Kentucky Warbler	<i>Oporornis formosus</i>	6	3	6	8	4	3
Common Yellowthroat	<i>Geothlypis trichas</i>	11	5	5	1	2	1
Hooded Warbler	<i>Wilsonia citrina</i>	85	70	79	75	81	50

Species	Scientific Name	1998	1999	2000	2001	2002	2003
Yellow-breasted Chat	<i>Icteria virens</i>	13	6	7	10	6	3
Summer Tanager	<i>Piranga rubra</i>	2	3	4	1	1	1
Scarlet Tanager	<i>Piranga olivacea</i>	36	35	39	46	37	33
Eastern Towhee	<i>Pipilo erythrophthalmus</i>	11	12	12	15	11	8
Chipping Sparrow	<i>Spizella passerina</i>	2	3	1	-	1	3
Field Sparrow	<i>Spizella pusilla</i>	2	2	1	3	8	1
Song Sparrow	<i>Melospiza melodia</i>	3	-	-	2	-	-
Northern Cardinal	<i>Cardinalis cardinalis</i>	35	30	31	28	36	48
Blue Grosbeak	<i>Passerina caerulea</i>	-	-	-	-	1	-
Indigo Bunting	<i>Passerina cyanea</i>	55	47	62	65	49	37
Eastern Meadowlark	<i>Sturnella magna</i>	-	-	1	-	-	-
Common Grackle	<i>Quiscalus quiscula</i>	1	-	1	2	1	2
Brown-headed Cowbird	<i>Molothrus ater</i>	3	4	-	-	1	1
American Goldfinch	<i>Carduelis tristis</i>	4	10	7	11	9	-
Total Species/Year		77	68	64	63	67	64

individuals seen or heard during the entire period of each point count at unlimited distance and roughly comparing these totals from year to year. However, the data sheets resulting from the surveys are available at the park resource management office for other types of analysis by interested researchers in the future; these data sheets have also been submitted to the Partners in Flight (PIF) program coordinated by the Tennessee Wildlife Resources Agency (TWRA).

Below we offer comments on several aspects of the point count surveys: plot location; procedures followed to record birds at each plot; general results of the point count surveys, including potential biases in the results; and a way in which habitat management in the park might be changed in light of survey results.

OBED WILD AND SCENIC RIVER

We have previously described the OWSR, including a general description of the location of the plots where point count surveys of birds were conducted (Stedman and Stedman 2002), so it will suffice here to state that the park is situated along the gorges of Clear Creek, Daddy's Creek, and the Obed River in Cumberland and Morgan counties. We want to draw attention to four prominent features of the park: it is small (c. 2100 ha, only about 60% being currently in the public domain), narrow (often extending less than 0.5 km from the river bank to the park boundary), linear (being c. 54 km long), and possesses high relief (many canyon walls exceeding 100 m in height). Forest types in the park include riparian

forest along the rivers in the bottom of the gorges, white pine-hemlock forest along the lower slopes of the gorges, deciduous (including mixed mesophytic) forests along the upper slopes of the gorges, and several forest types associated with conifers along the rims of the gorges; some of these forest types have undergone recent reductions as explained below.

POINT COUNTS

TWRA coordinates PIF activities and therefore point-count surveys conducted in Tennessee. In 1998 TWRA recommended the establishment of a minimum of 50 plots per site surveyed (J. York pers. com.). When the point-count survey was initiated in the OWSR, this minimum was difficult to achieve because of the park's small size and limited suitable access to many areas within it. Because of these factors and several others noted below, the locations of the 50 plots established in the OWSR were determined in a nonrandom manner.

In determining the location of plots, B. Stedman gave consideration to the following matters: avoidance of areas subject to noise generated by rapids; bunching of plots to allow half a dozen or more to be surveyed in a single morning session, a consideration that worked against the next item in this list; and distributing plots along the entire river corridor to allow sampling of as many sites and habitats within the OWSR as possible. Plots were generally located away from roads but were often placed along trails or unofficial footpaths.

The locations of about half of the original 50 point-count plots were pinpointed using global positioning system (GPS) equipment. These location data are available from the Resource Management Office, OWSR (L. Morgan-Smith pers. com.). Technical difficulties prevented the acquisition of GPS data at the remaining plots.

PIF protocols based largely on those recommended by Hamel (1992) were followed in surveying the 50 plots in the OWSR. Birds were surveyed once during the period from 1-20 June at each plot for a five-minute period (segregated into initial three-minute [1-3] and closing two-minute [4-5] segments), although a more recent version of the point count protocol requires a 10-minute counting period broken into segments of three (1-3), two (4-5), and five (6-10) minutes (Hamel et al. 1996). All birds were recorded as occurring at one of two distance intervals — < 50 m; > 50 m — although Hamel et al. (1996) recommend three distance intervals — 0-25 m; 25-50 m; and > 50 m — and an even more recent version of the point count protocol requires recording birds at four distance intervals — 0-25 m; 25-50 m; 50-100 m; and >100 m (W.C. Hunter pers. com.). Care was taken to avoid duplicate counting of individuals, by conservatively counting, particularly when plots were located at the minimum allowable distance (250 m) from one another. During each year of the survey, 5-6 morning sessions of approximately 3 hours each were required to survey all 50 plots; daily sessions typically started about 0600 and ended by 0920 EDT.

Because of the nature of its topography, the OWSR offers some challenges to field workers conducting point-count surveys. The main river gorge often offers

obstacles to effective access to, and hearing of, birds, including steep slopes that cause sound waves to be amplified or diminished in unexpected ways and rock promontories that obstruct sound waves. In addition, noise caused by rapids often makes bird vocalizations difficult to hear at sites within 100 m of the river, sometimes farther, depending on the volume of water in the river.

RESULTS AND DISCUSSION

During the six years of point-count surveys in the OWSR, 82 species of birds were observed (Table 1), a number comparing favorably with the total of 91 species registered by Butler (2001) during point-count surveys in north-central Tennessee. Butler's work, resulting in one of very few published point-count surveys from Tennessee available for comparison, was conducted during three breeding seasons (1993-1995), involved a larger set of points (2,021), was distributed over a larger area (500,000 ha) at a generally lower average elevation, and covered a greater diversity of habitats than was the case with the present survey.

Neotropical migrants ($n = 40$, boldfaced in Table 1) formed a substantial percentage (c. 49%) of species registered during these point-count surveys. Given the high percentage of the park that is covered by natural vegetation communities and the corresponding low percentage of the park that has been replaced by human-altered land cover, the park bird community would be expected to possess a large Neotropical migrant component, as discussed by Butler (2001). Neotropical migrants formed a similarly large percentage (46%) of breeding birds detected on roadside point-count surveys in the Big South Fork National River and Recreation Area, another predominantly forested park located just north of the OWSR in Fentress, Morgan, Pickett, and Scott counties, Tennessee, and McCreary County, Kentucky (Stedman 1998).

The data resulting from the OWSR point count surveys conducted 1998 to 2003 were obtained from plots that were not randomly selected. Consequently, it is possible that some survey results portray the bird community of the park in a biased manner although the degree to which nonrandom plot selection biases the results is difficult to determine. The potential presence of some bias in the results, although assumed to be negligible by the authors, should be considered by anyone using the data in future analyses; in particular, the nonrandom nature of plot location could mean that "quantitative inferences about trends over time can't be made for areas outside the sampling points themselves" (R. Emmott pers. com.). Data from future point-count surveys in the park will be acquired from plots that were selected more randomly than the plots selected for the present point count surveys. A comparison of results acquired in the future with the present results may shed light on the issue of bias potentially created by nonrandom selection of plots.

Although the exact number of species that might breed in the OWSR in a typical six-year period is unknown, it is probably not much more than 100, given the small size of the park and the fairly limited habitats found within it. We have

elsewhere (Stedman and Stedman 2002) listed 94 species as collectively breeding in the OWSR and the Big South Fork National River and Recreation Area, a figure that lends credence to the theoretical limit of 100 noted above. Consequently, the observation of 82 species using the point-count method of surveying birds from 1998 to 2003 testifies to the overall efficiency of this survey method for detecting breeding birds, as well as to the diversity of the avifauna inhabiting the OWSR. In order to increase the detection of breeding species in the park, B. Stedman found it necessary to supplement the point-count method with other, more time and labor intensive, bird survey methods, including nest searches and surveys focused on nocturnal species (results not presented here).

During the early to mid-1990s two large wildfires — one along Clear Creek near Lilly and the other along the Obed River near the confluence with Clear Creek — led to opening of the forest and subsequent growth of a fairly substantial amount of shrub-scrub habitat by the mid- to late 1990s. In addition, another shrub-scrub site was created in the mid-1990s as a result of land clearing associated with development of a public use area in the vicinity of Lilly Bluff. Observation of species breeding in shrub-scrub habitat was high during the late 1990s by comparison with observation of such species in later surveys. By the breeding season of 2002 most of the shrub-scrub sites where plots for point counts were located had matured to young forest with little or no shrub-scrub replacement or maintenance.

Because the data obtained during this six-year point-count survey are probably not statistically robust, conclusions drawn from analysis of the data must be guarded ones. We allow the reader to draw most of these conclusions, but we want to draw attention to the reduction in registrations of three obligate scrub-shrub breeding birds — Prairie Warbler, Common Yellowthroat, and Yellow-breasted Chat — during the half-decade of the survey (Table 1). We note that reduced registrations of these species are certainly correlated with reduced presence of shrub-scrub habitat in the park during the same time interval and may well be caused by that reduction.

The reduction in the shrub-scrub component in the OWSR by 2002-2003 may not only have affected species that typically breed in this habitat, but it may also have had an effect on species, such as wood warblers, that breed in nearby mature forest and that benefit from adjacent shrub-scrub habitat by using the latter as a "nursery" area for fledglings and adults. The high quality cover and prey available in shrub-scrub habitat are thought to allow these species to attain greater post-fledging survival rates than the rates occurring in mature forest (Faaborg 2002).

One additional factor regarding shrub-scrub habitat in the OWSR needs mention. During the last years (2001-2003) of the survey, an outbreak of southern pine beetle (*Dendroctonus frontalis*) killed a large fraction of the mature pines in the park. At many point-count plots, pines were originally the dominant species of the forest. At some of these plots, the loss of pines opened up the mature forest

component in the park by creating areas resembling "clear-cuts" that led to the formation of a small amount of shrub-scrub habitat. As a result of the beetle outbreak, the overall forest structure in the park was greatly changed from areas where coniferous or mixed forest dominated to areas dominated by deciduous forests (on the upper slopes of the gorge and adjacent, higher flat areas) or deciduous-hemlock forests (on the lower slopes of the gorge).

We wish to echo Robinson et al. (1995) in pointing out that naturally created patches of shrub-scrub habitat (i.e., from fires and insect outbreaks) are currently not known to cause the kinds of decreases in the nesting success of shrub-scrub bird species or deep forest bird species that are associated with homogenic fragmentation at the level of 30% of the landscape. At the landscape level, human-caused fragmentation and alteration of habitat are widely known to affect breeding bird populations in a negative manner (Robinson et al. 1995). We would be remiss if we did not point out that homogenic fragmentation of habitat near most of the OWSR's boundaries (i.e., nearly all the park's boundaries except those adjacent to the Catoosa Wildlife Management Area) is an ongoing, probably escalating, process that could eventually result in declines of both shrub-scrub species and deep forest species adjacent to, and possibly within, the park because of its narrow, highly linear nature.

In view of continental declines documented for several species of Neotropical migrants that are obligate breeders in shrub-scrub habitat (Pardieck and Sauer 2000; W.C. Hunter et al. 2001), including the previously mentioned Prairie Warbler, some consideration might be given by OWSR management personnel to maintaining shrub-scrub habitat at selected sites, including the Lilly Bluff area, within the park. Prescribed burns are one means to achieve this objective; another means might be to allow naturally occurring fires to burn themselves out rather than to suppress them as quickly as possible if such fires occur at sites where shrub-scrub habitat requires maintenance. Neither of these practices is yet part of the park's management policy regarding fires or habitat management (N. Keohane, pers. com.).

As we enter an era when intensive efforts are being undertaken to inventory and monitor many taxa, including birds, on public lands, projects such as the one described above will become increasingly important to conduct. It will be equally important to report their results, especially if they are to have a bearing on future management practices on public lands.

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