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STATUS OF THE CERULEAN WARBLER (*Dendroica cerulea*) IN NEBRASKA

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INTRODUCTION

The Cerulean Warbler is a species of high conservation concern because of apparent long-term declines throughout its breeding range (Hamel 2000a, Hamel et al. 2004, Sauer et al. 2005) and threats to and reduction of breeding and wintering habitat (Hamel et al. 2004, Rick et al. 2004). Nebraska has traditionally been at the western periphery of the species' breeding range, where it is restricted to mature woodlands in the Missouri River Valley (Sharpe et al. 2001, Mollhoff 2001). The Cerulean Warbler is a Tier I "at-risk" species under the Nebraska Natural Legacy Plan because it is a conservation priority (Schneider et al. 2005). In 2004, then Nebraska Game and Parks Commission Nongame Bird Program Manager John Dinan initiated a project to inventory the species' breeding distribution in the state. Here, we review the species' status in Nebraska by reference to previous reports and by summarizing results of the 2004 inventory. We also comment on habitat associations observed in Nebraska and consider possible explanations for the species' limited distribution in the state.

BACKGROUND

The Cerulean Warbler is a rare summer resident in extreme eastern Nebraska (Mollhoff 2001, Sharpe et al. 2001). Reports of birds, let alone nests, have been few and inconsistent during the last century, and whether the species breeds in Nebraska every year is conjectural. The difficulty in locating nests or finding evidence of breeding for this species is well-known due to its propensity to forage and nest high in leafy trees. Mollhoff (2001) reported the species at 4 sites in 1984-89, but breeding was not confirmed. Sharpe et al. (2001) cite only one instance of breeding since 1978: a female gathering nest material at Ashford Scout Camp in Thurston County 17-18 May 1997, observed by the authors. In addition, there is an unpublished report of a pair at Ashford Scout Camp 12 May 1993 (Huser, pers. obs.). The female was on the nest 14 May; however, the entire nest disappeared prior to 15-16 May, unrelated to weather conditions.

Prior to these records, Ducey (1988) cites breeding records in Sarpy County in 1944 and 1978, and in Sarpy and Dakota Counties prior to 1920. On 13 July 1978 Diggs and Diggs (1978), while banding at Fontenelle Forest, Sarpy County, netted a female in post-breeding molt with a large brood patch, indicating that it had bred in the vicinity. Their mist-net was set up immediately northeast of the Camp Gifford Road railroad crossing. Garrett (1944) found a nest at Fontenelle Forest in 1944; the nest was just north of the railroad tracks between Mill and Handsome

Hollows. Wallace (1901) found 3 nests in 1900 "near Bellevue"; two contained eggs and the third a young bird. At this time Cerulean Warbler appears to have been more numerous, as Bruner et al (1904) describe it as "a rather common summer resident along the wooded bluffs of the Missouri river, where it breeds." The only other nesting record is of a nest found by Aughey on Pilgrim Hill in Dakota County in 1865 (Youngworth 1957); Sharpe (1993) questioned this report based on Aughey's statement that Aughey had found 6 nests in Nebraska, all of which were in plum bushes 2-4 feet above ground, a most unlikely nest site for a Cerulean Warbler. In this same paper, Sharpe (1993) mentioned that he himself had observed 3 nests of Cerulean Warbler in Nebraska, all above 40 feet; unfortunately no details of these nestings have been published, although presumably they took place in the period 1960-1980 when Sharpe was active in the field.

Despite the few breeding records, especially in recent years, there are several reports most years of singing males in spring, almost all from a few publicly-owned locations which preserve a large proportion of the remaining deciduous upland and bottomland forest in Nebraska. These reports are from Ponca State Park, Dixon County, in 1994; Ashford Scout Camp, Thurston County, most years since 1984; Neale Woods, Washington County, in 2000; Fontenelle Forest, Sarpy County, most years since 1983; and Indian Cave State Park, Richardson County, in 1995 and since 2001. Away from these locations, there are fewer than 20 reports, all but 3 of which are in extreme southeast Nebraska and the eastern Platte River Valley. The exceptions are one at Lake Ogallala, Keith County, 7 May 1999 (Brown and Brown 2001); a specimen collected near Rushville in Sheridan County 6 June 1964, which had enlarged testes but was considered to be a migrant (Short 1965); and an undocumented report 2 May 1978 in Sioux County (*The Nebraska Bird Review* 46:81).

METHODS

We conducted surveys for Cerulean Warblers in eastern Nebraska in May, June and July 2004. We began by focusing on sites where Cerulean Warblers had been previously reported, including 1) Ashford Scout Camp in extreme northern Thurston County and adjacent privately-owned land in southern Dakota County, 2) Neale Woods, Douglas and Washington County, 3) Hummel Park, Douglas County, 4) Fontenelle Forest, Sarpy County, and 5) and Indian Cave State Park, extreme eastern Nemaha and Richardson Counties. These locations all allow public access, and contain virtually all of the remaining upland and bottomland forest in the Missouri River Valley. Other woodland tracts with public or Tribal ownership were surveyed despite the absence of previous Cerulean Warbler sightings. These included the Nature Conservancy's Rulo Bluffs, Richardson County; Dodge Park, Douglas County; two locations in Thurston County owned by the Omaha Tribe, Hole-in-the-Rock and Big Elk Parks; two locations in Thurston County owned by the Winnebago Tribe, one about 1.5 miles west of Big Bear Creek and the other about 1.5 miles upstream from the mouth of Horsehead Creek; and Basswood Ridge State Wildlife Management Area, Dakota County.

Cerulean Warblers have been found in Nebraska almost exclusively near a geographically significant stream. We reviewed maps provided by Realty and Environmental Services, Nebraska Game and Parks Division, in an attempt to locate streams and significant woodlands in private ownership. There are few of these;

Silcock accessed two, one located along Winnebago Creek in Richardson County, and the other along Wine Branch Road in Richardson County. Silcock was unable to contact another landowner in Richardson County, whose property also looked promising. Huser surveyed privately-owned land in southern Dakota County immediately north of and contiguous with Ashford Scout Camp (data from this site are included with those from Ashford Scout Camp). Jorgensen surveyed from a county road in an area southwest of Blair, Washington County, that has promising woodland habitat along a stream.

Cerulean Warblers forage and nest high in leafy deciduous trees that extend above the forest canopy and therefore they are difficult to see and study. Males are loud, persistent singers and are usually vocal for most of the day. Thus, we used song identification as our primary method for locating birds. We used taped Cerulean Warbler songs occasionally, with no set protocol, in order to attract a singing bird for better observation or perhaps induce a quiet bird to sing. Such use of tapes did not result in discovery of any additional Cerulean Warblers. We did not set up specific listening posts or transects, but covered likely habitat, often several times, by walking and recording the route and singing locations with a GPS unit. Maintained trails were followed when they led to or through traditional Cerulean Warbler locations or alongside streams, but much of the walking was off trails, especially along ridges and upper reaches of streams some distance from trails. Special effort was made to survey a range of habitats, including those from which we were unaware of any previous sightings.

Because the song is rather loud and carries some distance, we consider it unlikely that a singing bird would be missed during the May-June song period, as our slow-to-medium walking pace would place us within the territory of a singing bird for several minutes, ample time to hear the persistently-given song at least once. The song generally follows a consistent species-characteristic pattern, but some songs are aberrant to some degree. Because of this, we attempted to observe any bird singing a song that at least slightly resembled that of a Cerulean Warbler to be certain of its identity. Northern Parula (*Parula americana*) and American Redstart (*Setophaga ruticilla*), both commonly found in southeast Nebraska in summer, sometimes sing songs which, if not heard well, might suggest a Cerulean Warbler, and, in fact, the presence of Northern Parula was considered indicative of habitat which might also support Cerulean Warblers. Other such "indicator species" we noted are Acadian Flycatcher (*Empidonax virescens*), Kentucky Warbler (*Oporornis formosus*), and Louisiana Waterthrush (*Seiurus motacilla*). During our surveys, all birds seen or heard were noted, with particular attention given to those species of interest to the Nebraska Natural Heritage Program.

When a singing Cerulean Warbler was located, we attempted to see it to confirm its identification, and we looked carefully for any evidence of the presence of a nest or a female. Return visits were made to these locations to ascertain whether the singing bird was still there, and, if so, to gather additional evidence for presence of a female or nesting behavior.

RESULTS

The results of survey trips are shown in Table 1. We expended 75 hours surveying for or re-checking previously-found Cerulean Warblers. During searches we

TABLE 1. Sites surveyed for Cerulean Warblers in eastern Nebraska, 2004. The final column indicates whether birds seen were previously reported, and when.

Date	Location	County	Hours	Cerulean Warblers
May 15	Ashford Scout Camp	Thurston	5	0
May 22	Basswood Ridge WMA	Dakota	5	0
	Indian Cave State Park	Richardson	6.75	1 male (new)
May 23	Neale Woods (MRET)	Washington	2	1 male (new)
	Hummel Park	Douglas	1	1 male (new)
May 26	Hummel Park	Douglas	1.5	1 male (23 May) 1 female (new)
	Neale Woods (MRET)	Washington	1.5	0
May 29	Rulo Bluffs	Richardson	3.5	0
	Wine Branch Road	Richardson	1	0
May 30	Indian Cave State Park	Richardson	4	1 male (22 May)
	Indian Cave State Park	Nemaha	5	0
May 31	Indian Cave State Park	Richardson	3	1 male (22 May)
Jun 6	Hummel Park	Douglas	1	1-2 males
	Neale Woods (MRET)	Washington	1	0
	Dodge Park	Douglas	1	0
	Fontenelle Forest	Sarpy	2.25	1 male (new)
Jun 12	Indian Cave State Park	Nemaha	0.5	0
	Winnebago Creek	Richardson	1	0
	Tobacco Island WMA	Cass	1	0
	Fontenelle Forest	Sarpy	1	0
Jun 13	Indian Cave State Park	Richardson	3.5	1 male (22 May)
Jun 18	Ashford Scout Camp	Thurston-Dakota	7.5	1-2 males (new)
Jun 26	Hole-in-the-Rock	Thurston	5	0
Jun 27	County Rd 228	Washington	1	0
Jul 2	Big Bear Creek	Thurston	5	0
Jul 11	Horsehead Creek	Thurston	2	0
	Big Elk Park	Thurston	1	0
	Fontenelle Forest	Sarpy	1	0
	Hummel Park	Douglas	1	0
Totals			75	5-7 males
				1 female

found between 5 and 7 singing males and one female. All "new" birds were found in the period mid-May through mid-June. The sole female was paired with a singing male at Hummel Park at a location where a singing male had been present for several years previously. At this location, Silcock and other observers (Loren and Babs Padelford, pers. obs.) were fairly sure that two singing males were present; the Padelfords heard singing males at two locations about a half mile apart, and later Silcock heard what seemed to be songs coming from different directions but only ~200 yards apart. Furthermore, 2 singing males had been observed in prior years by Jorgensen. Similarly, at Ashford Scout Camp Huser heard either two males 80-100 yards apart or a single male singing from the extremes of a single breeding territory. Apart from the observation of a paired female at Hummel Park, no evidence of breeding was obtained. The singing male at Neale Woods apparently departed, as it was not heard on later visits.

Based on our findings, we can make a rough estimate of the number of singing male Cerulean Warblers present in Nebraska May-July, 2004. In this survey, our minimum count was 5, and our maximum 7. The number could be higher due to the possibility that the birds occupy unsurveyed sites, but our survey indicates that the number of Cerulean Warblers present in Nebraska during the breeding season is likely limited to a handful of individuals.

DISCUSSION AND CONCLUSIONS

Cerulean Warbler breeding numbers in Nebraska are likely limited because of quality and quantity of suitable habitat. The species is considered "area sensitive" and large forest tracts may be required to support "stable breeding populations" (Hamel 2000b). Minimum area requirements to support breeding birds have not been conclusively established, but estimates range from 75 to 1700 acres depending on region (Hamel 2000b). Extensive mature woodland tracts in Nebraska are limited and relatively small compared to other areas of the species' range. Nebraska's largest remaining contiguous area of upland woodland is the roughly 3000 acres at Indian Cave State Park and of bottomland forest the roughly 400 acres at Fontenelle Forest.

Forest tract size is, however, only one variable limiting numbers in Nebraska. Cerulean Warblers require a specific forest canopy structure (Hamel 2000b). Hamel stated: "Important habitat elements for this species thus appear to be large forest tracts with big deciduous trees in mature to older-growth forest with horizontal heterogeneity of the canopy". Hamel (2000b) noted that the forest utilized by Cerulean Warblers, whether upland or bottomland, has a discontinuous canopy and an open understory which provides open space below the nest site; gaps and openings are compatible with the presence of Cerulean Warblers, and, indeed, may attract them. Remaining forested areas in eastern Nebraska have all been logged in the past, removing tall trees that extend through the canopy and thereby eliminating the canopy discontinuity favored by the species (Hamel 2000b).

An important observation of this survey was the similarity of habitat features at each location Cerulean Warblers were found in Nebraska. These are finer features than are usually provided in the literature: (1) adjacent or surrounding extensive forest, (2) presence of a geographically significant stream, and (3) a fairly flat area with tall supra-canopy deciduous trees. This raises an intriguing question: why do Cerulean Warblers appear not to utilize ridges or other upland forest in

Nebraska, as they do in most other parts of their breeding range (Hamel 2000b), and, indeed, appear to require the presence of a stream? Due to the importance of canopy discontinuity in maintenance of stable breeding populations of Cerulean Warblers, we further believe that the consistent occurrence of Cerulean Warblers in Nebraska adjacent to streams may result from the canopy discontinuity, both horizontal and vertical, provided by the presence of a stream.

Cleared areas, even the presence of roads, adjacent to forested streams may not be a deterrent, such as at the Hummel Park site. This site, the only location in this study that provided evidence of breeding, was adjacent on one side of a significant stream to an open area with a small public park area beside a well-used paved road, and on the other side to steep hillsides of oak-hickory forest. Although nesting may not have occurred at Hummel Park in 2004, we observed the female there only in tall trees immediately adjacent to the stream. Of course, the presence of an open area or road also provides the canopy discontinuity important to Cerulean Warblers, as discussed above. At three additional locations, Indian Cave State Park, Fontenelle Forest, and Ashford Scout Camp, habitat was tall supra-canopy trees (oak, hickory, or cottonwood) located on flattish stream benches surrounded for at least 300 yards by rather steep hillsides of upland hardwood forest. At Neale Woods, habitat was similar: the singing male was utilizing tall trees (cottonwoods in this case) adjacent to a stream bordered by steep upland forest on one side and bottomland forest on the other.

In this study, no Cerulean Warblers were found entirely within bottomland forest, such as the floodplain areas at Fontenelle Forest. Nevertheless, Cerulean Warblers were present along North Stream Trail in Fontenelle Forest essentially annually until 1999, although no female has been found there since 1996. Significantly, North Stream Trail is adjacent to a stream; the south end of the trail is in the general area where Diggs and Diggs (1978) netted a female with an active brood patch. The only prior evidence for nesting in this floodplain habitat at Fontenelle Forest was a nest located in 1944 along a bottomland stream bordered on one side by railroad tracks and steep hillside forest and on the other by floodplain forest. We have no information as to location of the nests found by Wallace (1901).

Sites currently used by Cerulean Warblers in Nebraska are relatively secure from large-scale habitat alterations. Continuing regeneration and maturation of woodland tracts, particularly those on reserves such as Indian Cave State Park, may provide additional, albeit limited, suitable habitat in the future. Variables unrelated to habitat quality and extent may, however, threaten Nebraska's small population. Cerulean Warbler range has shifted northeastward over the past several decades (Hamel et al. 2004). This may further isolate breeding birds in Nebraska that are already relatively isolated from one another and from areas farther east that have higher densities and may potentially serve as a source of additional breeding birds. Fluctuations of populations at core breeding areas can affect a species' status in peripheral areas of a species' range (Jorgensen and Dinsmore 2005). Thus, the presence of suitable habitat may not be enough to sustain breeding birds in Nebraska.

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