

**NATAL SITE TO BREEDING SITE
DISPERSAL OF AN OKLAHOMA BALD EAGLE**

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Abstract—Juvenile dispersal can be defined as the movement between an animal's point of origin and where it later breeds. Dispersal in Bald Eagles (*Haliaeetus leucocephalus*) is difficult to study because of a prolonged sub-adult period during which juveniles wander widely. We report on the use of satellite transmitters to monitor movements of juvenile Bald Eagles, including one individual which survived to breed at age 5 about 100 km from its natal site, providing the first known dispersal distance for a wild-reared Bald Eagle in Oklahoma.

INTRODUCTION

One life history component that affects animals both individually and as part of populations, is juvenile dispersal. Dispersal has been defined in various ways, including “the movement the animal makes from its point of origin to the place where it reproduces or would have reproduced if it had survived and found a mate” (Howard 1960). Dispersal can convey advantages such as reducing inbreeding, making use of additional available habitat, repopulating areas of extirpation, enabling discontinuous distributions, and reducing intraspecific conflict. However, it also carries risks by involving travel to unfamiliar and potentially unsuitable habitats.

Dispersal of Bald Eagles (*Haliaeetus leucocephalus*) has been difficult to study because of an extended subadult period lasting at least three, and up to five years before maturation and first breeding (Buehler 2000), and also due to the potential for dispersal in this species to extend hundreds of kilometers. Four nestling eagles in Saskatchewan marked with patagial tags or leg bands later nested within 25 km of their natal territories (Gerrard *et al.* 1992). Nine eagles marked as nestlings in southeast Texas later nested in the same region, while two additional eagles nested farther away in Arizona and in Sonora, Mexico (Mabie *et al.* 1994). For seven nestling eagles marked in the greater Yellowstone National Park region, and later observed nesting as adults, dispersal distances ranged from 28 to 328 km, with a mean distance of about 101 km (Harmata *et al.* 1999).

Significant effort is required to obtain subsequent breeding location data for eagles marked as nestlings. Intense scrutiny over a large geographic area for three to five years or more post-fledging is needed, as is a means of collecting fortuitous or solicited observations of marked birds. Additional difficulties with marking studies include the limited number of locations likely to be obtained during the lengthy subadult period, during which eagles may wander widely; the inability to accurately recognize colors or numbers of markers under field conditions; and the potential for marker loss during the time required to obtain the desired information.

Availability of GPS receivers combined with Platform Transmitter Terminals (PTTs) which broadcast data over Ultra High Frequencies (UHF) to the Argos satellite system (www.argos-system.org) have revolutionized wildlife tracking (Meyburg and Fuller 2007). Such systems allow for frequent or even near-continuous location tracking over a multi-year period for animals capable of carrying the necessary hardware. Ongoing miniaturization of this equipment has increased the number of animal species capable of carrying PTTs, and we employed 30-gram units on nestling Bald Eagles in 2010 with the objectives of monitoring the movements of subadult eagles, and if the birds survived and the hardware functioned long enough, to provide data on juvenile dispersal to breeding sites. Here, we report on dispersal distance of an Oklahoma eagle.

METHODS

In May 2010, we placed 30-gram PTTs on two nestling eagles near Sand Springs in Tulsa County, Oklahoma (Figure 1). The PTTs, manufactured by North Star Science and Technology, LLC (<https://www.northstarst.com>), consisted of a GPS receiver for acquiring accurate location data (typically to within several meters), a UHF transmitter and antenna for broadcasting these data to Argos satellites, a capacitor to provide power, and a solar panel to charge the capacitor. Their expected functional lifespan is 3–5 years, although some are reported to have lasted longer in previous studies. The PTTs were mounted atop a closed-cell foam pad to slightly elevate the PTTs on the birds' backs and thus help prevent feathers from obstructing the solar panels. The PTTs were attached using backpack-style harnesses made of low-friction Teflon ribbon, and were programmed to provide three GPS locations daily. These data were obtained by us weekly from the satellite system. The eagles were believed to be one male and one female, based on their relative sizes at the time of transmitter installation.



Figure 1. Two sibling Bald Eagles (*Haliaeetus leucocephalus*), left and center, in a nest near Sand Springs, Oklahoma, were equipped with backpack-style satellite trackers in 2010. Only two of the three chicks were equipped due to cost, and the desire to track chicks from multiple nests. Photo by Steve Sherrod.

RESULTS

From the time it fledged in June 2010, the male eagle wandered for four years within an area bounded by southern Nebraska and the Texas coast, although spending most of its time in Oklahoma. Its first winter was spent in Texas, and it made brief spring and summer visits into Kansas and Nebraska in 2012 and 2013, but it largely remained in northeastern Oklahoma, within about 100 km of the Tulsa area. In June of 2014, its location signal became stationary, and with the help of a local game warden, we retrieved its carcass from Osage County, Oklahoma, approximately 41 km northwest of its natal site. Decomposition precluded determination of a cause of death. Movement patterns in the months leading up to the time of its death did not suggest that the eagle had been on a nesting territory. The bird was in its fourth calendar year and entering its fifth summer.

The female eagle ranged from Kansas to Texas, although spending most of its time in Oklahoma. Its first winter was spent in Texas and it then briefly wandered north into Kansas in spring 2011. Parts of its second fall and winter were also spent in Texas, but after that, the bulk of its movements formed a triangle roughly encompassing

the area between Norman, Tulsa, and Ponca City. By January 2015, approximately 4.5 years after fledging, its tracking location points were increasingly concentrated northeast of Oklahoma City near Wellston in Lincoln County, Oklahoma, suggesting establishment of a territory, and a site visit confirmed the presence of a nest (Figure 2). By late February, tracking locations became nearly stationary, suggesting that incubation had begun. Subsequent field monitoring of the nest confirmed that two offspring were successfully raised, and they fledged in May 2015. The nest location was 100 km southwest of the female eagle's natal site, and is the second known eagle nest in Lincoln County (GMSARC unpubl. data).



Figure 2. A Bald Eagle (*Haliaeetus leucocephalus*) nest in Lincoln County, Oklahoma established 100 km southwest of the natal site of a satellite-tracked eagle in 2015, nearly five years after fledging. This site had reportedly also been a heron rookery in previous years, with old nests still visible above the larger eagle nest. Photo by Ryan VanZant.

DISCUSSION

Little is known about dispersal distances in Oklahoma eagles. Historically, Bald Eagles were rare, intermittent, and largely unsuccessful breeders in Oklahoma (Lish and Sherrod 1986) until a seven-year captive-raising-and-release program was initiated in Bartlesville in 1984 (Jenkins and Sherrod 1993). This process, known as hacking (Sherrod *et al.* 1982), relied on philopatry by young eagles, in which they returned to breed in the vicinity where they fledged. Starting with zero nests in Oklahoma and following releases of 275 captive-raised eagles in five southeastern states, including 90 eagles released in Oklahoma, by 2002 we knew of 33 nests in Oklahoma (Jenkins 2004), by 2003 we knew of over 40 occupied nests (Jenkins and Sherrod 2005), and by 2011, over 120 (GMSARC unpubl. data). Banding and other marking techniques were utilized on released birds. One released male eagle built two nests near the hack tower at Sequoyah National Wildlife Refuge in subsequent years. We also learned of additional cases of breeding by captive-raised and released eagles that provided less specific information about distances from release sites (Jenkins and Sherrod 1993). It is in the context of this limited history of nesting Bald Eagles in Oklahoma that we hoped to gather data on breeding dispersal by Oklahoma eagles.

We believe this 100-km dispersal by a satellite-tracked female Bald Eagle to be the first known dispersal distance by a wild-raised eagle in Oklahoma. The natal site of this eagle along the Arkansas River west of Tulsa lies within the area of the highest breeding density of eagles in Oklahoma (GMSARC unpubl. data). Local competition for territories may have contributed to the relatively long dispersal distance into a county with few prior nest records. This dispersal record and successful nesting attempt also illustrates the potential value of long-range dispersal to the species in terms of range and population expansion, both of which appear to be continuing in Oklahoma Bald Eagles.

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