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NESTING OF LONG-EARED OWLS ALONG THE LOWER BIG LOST RIVER, IDAHO: A COMPARISON OF 1975–76 AND 1996–97

NATALIE A. FAHLER[1] AND LESTER D. FLAKE[2]
South Dakota State University, Wildlife and Fisheries Sciences Department, Box 2140B, Brookings, SD 57007 U.S.A.

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Long-eared Owls (*Asio otus*) are found throughout much of North America and Eurasia, typically inhabiting open forests or dense vegetation adjacent to open grasslands or shrublands (Marks et al. 1994). These owls generally nest in abandoned stick nests of other birds. Research from 1975–76 (Craig 1977, 1979, Craig and Trost 1979) provided information on Long-eared Owls that nested along a 25-km stretch of the Big Lost River on the Idaho National Engineering and Environmental Laboratory (INEEL) in southeastern Idaho (Fig. 1). These nesting Long-eared Owls used abandoned Black-billed Magpie (*Pica pica*) nests built in narrow-leaved cottonwood (*Populus angustifolia*) trees.

Diversion of water for irrigation, the INEEL flood control diversion dam, and recent droughts have dewatered the Big Lost River during much of the summer, contributing to the decline of narrow-leaved cottonwood trees growing on its banks. The INEEL diversion dam was constructed in 1958, and the dam and containment dikes were enlarged in 1984 to reduce the threat of floods to research facilities on the INEEL (Stone et al. 1993). Annual flow records from 1965–98 for the Big Lost River on the INEEL (at Lincoln Boulevard Bridge) vary greatly but demonstrate a general decline in stream flow and two multi-year periods of zero or nearly zero stream flow (Fig 2). The periods from 1977–80 and 1987–94 were partic-

[1] Present address: U.S. Fish and Wildlife Service, Ecological Services, 420 S. Garfield Ave., Suite 400, Pierre, SD U.S.A.

[2] Corresponding author's e-mail address: Lester_Flake@sdstate.edu

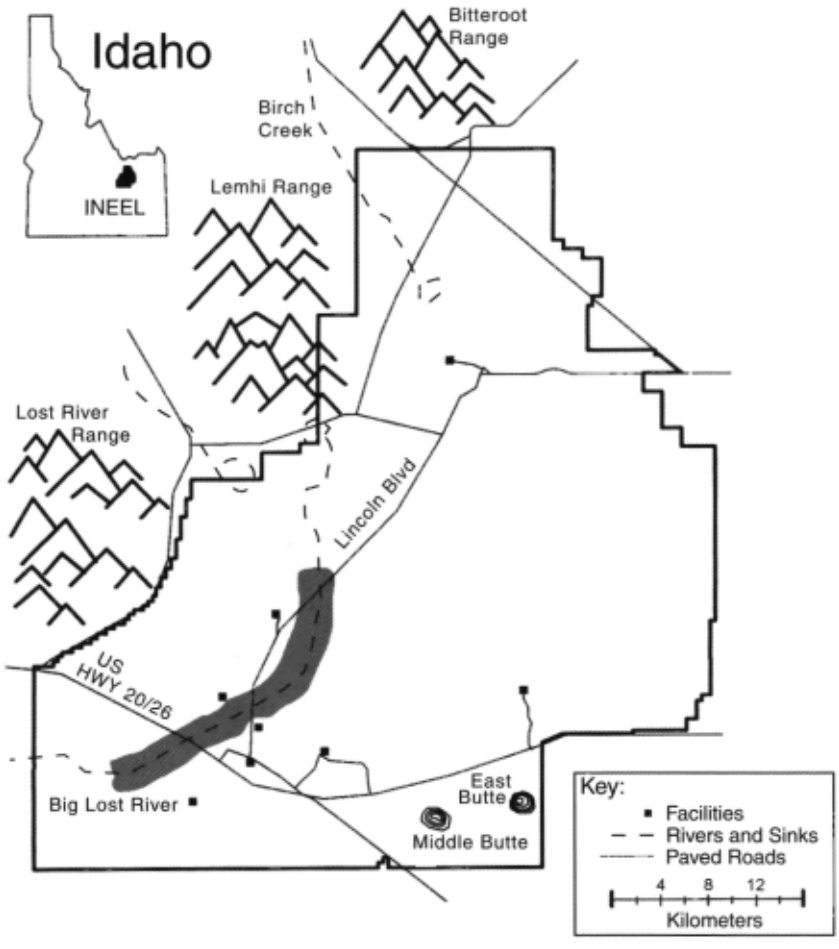

Figure 1. Study area along the Big Lost River (darkened; width not to scale) on the Idaho National Engineering and Environmental Laboratory (INEEL), was set up to duplicate area studied by Craig (1977).

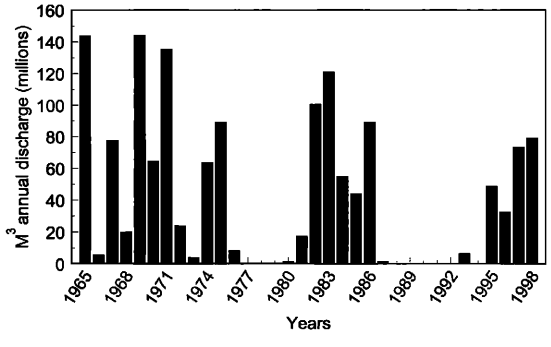

Figure 2. Stream flow on the study area as indicated by annual discharge (m^3) of the Big Lost River at Lincoln Boulevard Bridge, approximately in the middle of the study area.

ularly devastating for narrow-leaved cottonwood survival (Bennett 1990, U.S. Geological Survey, Idaho District unpubl. data). Aerial photographs from 1976 and 1991 indicate a reduction of live narrow-leaved cottonwoods from 124 to 23 trees (81.5%) within the lower two-thirds of Craig's (1977) study area (S. Majors unpubl. data).

Our objectives were to determine whether changes in numbers of nesting Long-eared Owls and potential nest sites (e.g., Black-billed Magpie or other concealed stick nests) have occurred along the lower Big Lost River on the INEEL, given the increasing decadence of narrow-leaved cottonwood trees.

STUDY AREA AND METHODS

The INEEL is a 2315 km^2 U.S. Department of Energy research and development facility located in the shrub-steppe habitat of southeastern Idaho. The study area was a 25-km stretch of the Big Lost River that extended from

ca. 8 km south of Highway 20/26 on the southern end of the INEEL, north across Highway 20/26, to just downstream of where the Big Lost River crosses Lincoln Boulevard on the INEEL for the second time. We attempted to sample the same area studied by Craig (1977) (Fig. 1). The majority of this stretch of the Big Lost River was accessible by vehicle, though some less accessible sites required hiking. We followed Craig (1977) by checking stick nests on both sides of the river by climbing trees and looking directly into the nest bowl, or by viewing them from a site on the ground if the nest bowl was visible. Most trees were narrow-leaved cottonwood, but Utah juniper (*Juniperus osteosperma*) trees within 100 m of the Big Lost River channel were also searched. The area searched along the river in 1975–76 was at least as wide as we searched during this study and probably extended out further at locations where junipers were near the river and not occluded from view by the terrain (T. Craig pers. comm.). Utah junipers were lacking or sparse in most of the study area particularly north of Highway 20/26. Searches for Long-eared Owl nests were conducted 9–18 July 1996, relatively late in the fledging period, and 28 May–5 June 1997. Nesting attempts included occupied nests and evidence of recent nesting. Occupied nests contained eggs or young, or we found young nearby (i.e., branching stage); the adults were normally observed. Recent nesting attempts included those sites where we found a combination of feathers, fecal droppings and pellets, or evidence of abandoned or destroyed eggs or young, indicating nesting earlier within the same year.

RESULTS AND DISCUSSION

Comparison of 1996–97 to 1975–76. In spite of the late survey in 1996, three Long-eared Owl nests were found containing young that varied in age from recently hatched to branching age (21 d, Marks et al. 1994). Two of the occupied nests were in dead narrow-leaved cottonwood trees in the cavity of Black-billed Magpie nests while the third was in a hawk nest in a live Utah juniper. Recent whitewash (feces), pellets, and feathers matching that observed at occupied Long-eared Owl nests were also discovered at seven Black-billed Magpie nests in partially live or dead, narrow-leaved cottonwoods as well as one old hawk nest in a live juniper. Long-eared Owl feathers at these recent nest attempts were primarily smaller feathers from the breast or abdominal region. With the addition of these eight nest attempts, we concluded that Long-eared Owls used at least 11 nests in 1996.

Eleven occupied nests were found in 1997 with some adults still incubating during the survey. In addition, one recent attempt was found that contained preyed-upon eggs of Long-eared Owls. Thus, a total of 12 nest attempts were located in 1997. Seven of these nest attempts were located in partially live or dead, narrow-leaved cottonwood trees, while five were in live Utah junipers.

In both 1996 and 1997, all Long-eared Owl nests within narrow-leaved cottonwood trees were in the nest chamber of abandoned Black-billed Magpie nests. Black-billed Magpie nests have the outside appearance of a large hollow ball of sticks or twigs. The stick or twig matrices on the sides and top (canopy) are sparser than the base and include an opening (sometimes two openings) for entrance to the nest bowl. All of the Long-eared Owls using magpie nests in this study used nests with the stick canopy intact. The Long-eared Owl nests in Utah junipers were in old nests of buteos (*Buteo* spp.), and the tree foliage provided substantial concealment around and over the nest. During this study, almost all of the narrow-leaved cottonwoods available and used as nest trees had only a few live branches, or were completely dead, while all junipers with nests were live with full foliage.

Craig (1979) counted three Long-eared Owl nesting attempts in 1975 and 16 nesting attempts in 1976 on the Big Lost River study area. All of the nesting Long-eared Owls found in that study used Black-billed Magpie nests, and all but one was inside the nest cavity (Craig 1979, Craig and Trost 1979). Furthermore, all Long-eared Owl nests in 1975–76 were in narrow-leaved cottonwoods, though Utah junipers near the river were also searched (T. Craig pers. comm.). In contrast, in 1996–97 we found 70.6% of Long-eared Owl nests in old magpie nests in cottonwoods, while the rest were in former hawk nests concealed in Utah juniper. Similarly, in Idaho's Snake River Birds of Prey area, ca. 70% of the Long-eared Owl nests were in former magpie nests (Marks 1986) and the rest in old American Crow (*Corvus brachyrhynchos*) nests. We found no evidence of nesting American Crows along the Big Lost River or elsewhere on the INEEL, but we did observe occupied and old nests of buteos in both Utah junipers and narrow-leaved cottonwoods (Hansen and Flake 1995).

Eighty-eight old Black-billed Magpie nests that appeared to be suitable for Long-eared Owls were located on the study area during 1975–76 (Craig 1977, Craig and Trost 1979), almost all of which were in cottonwood trees (T. Craig pers. comm.). Assuming all 88 sites were available during both years of that study, 3.4% were used by Long-eared Owls in 1975 and 18.2% in 1976. In 1997, we found 61 old Black-billed Magpie and hawk nests that appeared suitable for Long-eared Owl occupancy. We did not record suitable nests by hawk or magpie category, but we recollect that 10 or fewer of the nests suitable for Long-eared Owls were hawk nests in Utah junipers, while at least 51 were magpie nests, primarily in narrow-leaved cottonwoods.

In comparison, Long-eared Owls at the Snake River Birds of Prey Area used both platform type nests (American Crows) and Magpie nests in deciduous trees and large shrubs (Marks 1986). Long-eared Owls did not use the platform stick nests of hawks within the narrow-leaved cottonwoods in our study area, perhaps due to inadequate foliage for concealment (i.e., the cottonwoods were dead or only partially foliated), or possibly due to interference by other raptors. In any event, we did not count these as potential nests. Therefore, assuming all 61 suitable nests existed during both years of our study, 18.0% of available nests were used by Long-eared

Owls in 1996 and 19.7% in 1997. These rates are almost identical to the rate of 1976 but exceed the occupancy rate for 1975 (Craig 1977, 1979).

Ecological Implications. Densities of nesting Long-eared Owls can vary directly with small mammal prey abundance (Korpimäki and Norrdahl 1991, Korpimäki 1992). Thus, variation among years as observed by Craig (1979) from 1975–76 is not unusual and could be directly related to prey availability. Unfortunately, data on small mammal abundance in the study area was not collected during our study or in 1975–76. Differences and similarities among numbers of nesting Long-eared Owls from the mid-1970s (Craig and Trost 1979, Craig 1979) and this study could primarily reflect variation in prey availability; thus, nesting population comparisons between these two studies should be made with caution.

The ability of trees along the Big Lost River to support nesting Long-eared Owls has apparently not declined appreciably since the 1975–76 study of Craig (1977, 1979) and Craig and Trost (1979), despite the increased decadence and decrease in numbers of cottonwoods. However, in this study 33% of the Long-eared Owl nests were in old hawk nests in Utah juniper, while all the nests in 1975–76 were associated with Black-billed Magpie nests in narrow-leaved cottonwoods. Concurrent with the death and increased decadence of most cottonwoods has been a coincidental increase in the apparent numbers of Red-tailed Hawks (*Buteo jamaicensis*) and Swainson's Hawks (*Buteo swainsoni*) nesting on the INEEL (Hansen and Flake 1995) compared to the mid 1970s (Craig 1979). Long-eared Owls may be increasing their use of old hawk nests in junipers due to increased availability of these nests and the reduction in available Black-billed Magpie nests in narrow-leaved cottonwoods. Black-billed Magpie populations have remained relatively stable in Idaho since 1966 (Sauer et al. 2000). We could not clearly decipher Utah junipers from dark lava flows, dark soils, and shrubs on 1976, 1978, and 1991 aerial photos. Thus, we cannot comment on possible changes in the availability of Utah junipers.

Regulation of stream flow in the Big Lost River was initiated as early as 1918 when the Mackay Dam and reservoir were completed (Big Lost River Irrigation District, Mackay, Idaho). Stream flow in the lower portion of the Big Lost River has been impacted by upstream irrigation, as well as by the INEEL diversion dam, during all but the highest runoff periods. Because of these restrictions on water flow into the lower Big Lost River, narrow-leaved cottonwoods along the river channel are either dead or retain a few live branches. Furthermore, little cottonwood regeneration exists, and no regeneration lives beyond the sapling stage. Intact Black-billed Magpie nests, and therefore potential nesting sites for Long-eared Owls, have been reduced in the study area (81 in 1975–76 vs. ca. 51 in 1996–97). Utah juniper trees and associated *Buteo* nests appear to be buffering the effects of narrow-leaved cottonwood losses on nesting Long-eared Owls. Unless adequate stream flows are restored, narrow-leaved cottonwoods will likely continue to decline in abundance and vigor, and the ability of this riparian area to support nesting Long-eared Owls (as well as other nesting raptors) will likely be reduced.

Dewatering and loss of cottonwoods has also occurred on considerable portions of the lower Big Lost River above our study area. Thus, the potential effects on Long-eared Owls, other raptors, and the riparian community in general are more extensive than our limited study area might suggest. Management for at least some water at all times within the lower Big Lost River, both above and within the INEEL, could restore narrow-leaved cottonwoods and reverse the damaging effects of past dewatering. We encourage periodic monitoring of the cottonwoods and nesting raptors in this important, but currently degraded, ecosystem.

RESUMEN.—Dos registros desde 1965 indican que la regulación del flujo de la corriente y la desviación para irrigación ha reducido progresivamente el flujo del agua en el canal mas bajo del Gran Río Perdido en el sureste de Idaho, esto ha causado la decadencia y la perdida de regeneración en algodones silvestres de hoja angosta (*Populus angustifolia*) a lo largo de su hábitat ripario. Estudiamos la anidación de búhos de orejas largas (*Asio otus*) en el bajo Gran Río Perdido en 1996–97 y comparamos los conteos con aquellos de 1975–76 en la misma área (Craig 1977, 1979, Craig and Trost 1979). Encontramos números similares de nidos a aquellos encontrados a mediados de los 70's, a pesar de la perdida, decadencia y carencia de regeneración del algodón silvestre. A mediados de los 70's, 100% de los nidos de los búhos orejilargos estaban en los nidos de urracas de pico negro (*Pica pica*) en los algodonales; sin embargo, en este estudio, 70.6% de los nidos estaban en nidos de Urraca en algodonales mientras que los nidos restantes ocurrieron en nidos de Buteo en juníperos de UTA (*Juniperus osteosperma*) cerca al canal del río. Nuestros conteos de nidos viejos de chamizos indican que este cambio puede estar relacionado al decline en la disponibilidad de nidos de urraca en los algodonales que aun permanecen y a un incremento en los nidos de gavilanes en los juníperos cerca al río. Nosotros recomendamos un monitoreo periódico de los algodonales de hoja angosta, de los búhos de orejas largas que están anidando, de otras rapaces y de las urracas de pico negro asociadas con este hábitat ripario degradado.

[Traducción de César Márquez]

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BEHAVIORAL AND PHYSICAL DEVELOPMENT OF A NESTLING CRESTED EAGLE (*MORPHNUS GUIANENSIS*)

DAVID F. WHITACRE[1]
The Peregrine Fund, 5668 West Flying Hawk Lane, Boise, ID 83709 U.S.A.

JUVENTINO LOPEZ AVILA AND GREGORIO LOPEZ AVILA
Fondo Peregrino, Parque Nacional Tikal, Flores, Petén, Guatemala

KEY WORDS: *Crested Eagle*; Morphnus guianensis; *nestling*; *behavior*; *development*; *nesting biology*; *tropical*.

Rates of physical and behavioral development in nestling birds are key aspects of avian life histories (Starck and Ricklefs 1998). Details of the growth and development of many falconiforms are lacking. One such poorly known species is the Crested Eagle (*Morphnus guianensis*). Although this is the second largest of widespread Neotropical forest eagles, virtually all that is known concerning the species' nesting biology and behavior is based on a single nest (Bierregaard 1984).

We studied nesting biology, behavior, and diet at two nests of Crested Eagles in Guatemala's Petén lowlands Most results are presented elsewhere (Whitacre et al. in press a, D. Whitacre unpubl. data). Here we describe the progression of behavioral and physical development in a single wild nestling, and present a growth curve and behavioral notes from a captive-reared nestling.

STUDY AREA AND METHODS

We studied two Crested Eagle nests. Nest No. 1 (1994) was 7 km south of Tikal National Park, and nest No. 2

[1] E-mail address: dwhitacre@peregrinefund.org