# 2018 Nebraska Bald Eagle Nesting Report

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The Bald Eagle (*Haliaeetus leucocephalus*), a species once threatened with extinction, has increased throughout North America since the mid- to late 20th Century.  In Nebraska, Bald Eagles bred historically, but were absent as a breeding species for most of the 20th Century.  The first active successful modern Bald Eagle nest in Nebraska was recorded in 1991 (Farrar 1991).  Since 1991, increases in the number of Bald Eagle breeding pairs in Nebraska have been remarkable.  Within the last 28 years the Bald Eagle has gone from a nonexistent breeding species in Nebraska to one that is relatively numerous. Nebraska originally had a federal recovery goal of ten active breeding pairs (USFWS 1983).  This goal was met in 1996 and has been surpassed every year since (Jorgensen and Dinan 2018).  In 2007, the year the Bald Eagle was removed from the federal list of threatened and endangered species, the number of active Bald Eagle nests in Nebraska had grown to 54 active nests.  Less than a decade later in 2016, the number of known active nests nearly tripled to 161.

Since 1991, the Nongame Bird Program of the Nebraska Game and Parks Commission (NGPC-NBP) has conducted annual statewide Bald Eagle nest monitoring.  The approach used by the NGPC-NBP is outlined by Jorgensen and Dinan (2012, 2013, 2014, 2016, 2017), but generally has involved NGPC-NBP and partners surveying all known nests in the state to determine whether individual nests are active or not active.  The NGPC-NBP has surveyed a majority of the nests in the state.  Other formal surveys have been conducted regularly by the National Park Service (Missouri and Niobrara Rivers) and the Platte River Recovery Implementation Program (central Platte River; Platte River Recovery Implementation Program 2017).  Nest activity for other nests located on conservation properties (e.g., National Wildlife Refuges, Wildlife Management Areas) are typically reported by personnel from respective management agencies.  Finally, additional information about other nests, including new ones discovered each year, are received opportunistically from various sources including wildlife professionals, birders, landowners and the public.

This traditional approach of annual statewide Bald Eagle nest monitoring, employed since 2012, has become challenging to implement and is no longer efficient due to increases in the number of Bald Eagle nests.  In 2017, we developed a new nest monitoring methodology to: 1) annually produce an estimate of the minimum number of active Bald Eagle nests in the state, 2) maintain our database of current active Bald Eagle nests, and, 3) reduce resource commitment used to conduct traditional Bald Eagle nesting surveys (Jorgensen and Dinan 2018).  This new approach was implemented in 2017 (Jorgensen and Dinan 2018) and 2018.  Results from the 2018 survey are summarized in this report.

METHODS

This year was the second year we used the new survey methodology developed prior to the 2017 nest monitoring season.  The new approach (see Jorgensen and Dinan 2018) replaces methods used from 1991-2016 (see Jorgensen and Dinan 2015, 2016, 2017).  The basic premise of our new methodology was surveying only a proportion of previously-known nests and using data from all previous years of nest monitoring to estimate a probability that previously-known nests, not surveyed in 2018, were active during the survey year.  Additional information was also considered in our calculations and we provide details of this approach below.

**Table 1.** Proposed schedule of monitoring units for surveys from 2017-2019 from 2017 report (Jorgensen and Dinan 2018).

| Year | Selected Management Unites | Proportion of nests selected to be surveyed* |
|------|---------------------------|-----------------------------------------------|
| 2017 | Loup and Middle Niobrara | 35% |
| 2018 | Elkhorn, Northeast, Central Platte, North and South Platte, and Northwest | 33% |
| 2019 | Lower Platte, Republican, Southeast, and Lower Niobrara | 33% |

*Based on 2016 nest numbers

Under the new approach, we separated the state into monitoring units based on survey opportunities and constraints loosely based on Nebraska's watersheds (Figure 1), which are areas where Bald Eagle nests are disproportionately distributed. The approach was used so that survey effort was distributed as evenly as possible throughout a three-year survey cycle based on the distribution of nests in previous years (Table 1).
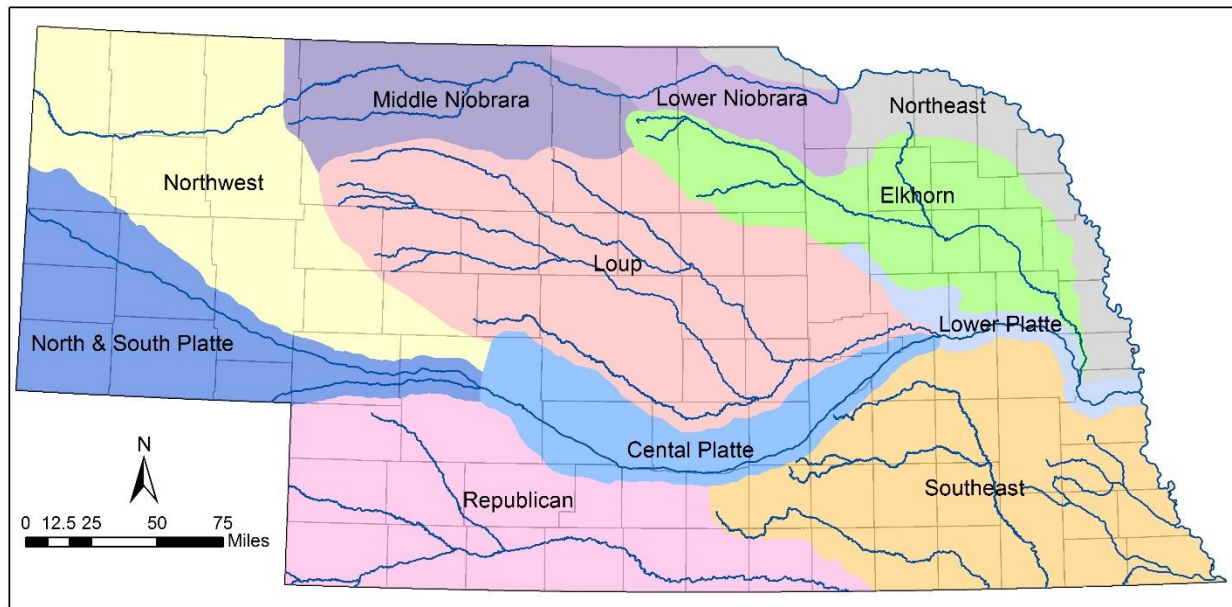


**Figure 1.** Bald Eagle monitoring units.

Formal surveys in selected monitoring units were conducted following the same basic methods used since 2012 (see Jorgensen and Dinan 2012, 2013, 2014, 2016, 2017). Along with formal surveys we also collected information on a number of nests outside of the selected monitoring units that were surveyed opportunistically by Nebraska Game and Parks Commission (NGPC) staff or by others. Nest status was categorized as either active or inactive. We defined an active nest as a nest in which a pair of adult Bald Eagles was engaged in breeding activity (e.g., incubating eggs, tending to young). We did not monitor active nests throughout the nesting season to determine nest productivity.

Using data from the formal surveys as well as data collected opportunistically, we developed the following equation to calculate an estimate the number of active nests in Nebraska in 2018. This equation consists of six metrics or categories, described below.

**# of active nests = NONsurveyed + NONopportunistic + NONnew + NONre-established + NONunsurveyed**

1. **NONsurveyed (formal surveys of known nests active the previous years)**

   Formal surveys of known nests that were active in 2016 or 2017 were conducted by NGPC staff. These formal surveys provide a count of the total number of nests that were previously known and active in 2016 or 2017 and which were determined to be active in the selected monitoring units in 2018.

2. **NONopportunistic (opportunistic surveys of known nests active the previous year)**

   In 2018, several known nests outside of the selected monitoring units that were active in 2017 were surveyed opportunistically by the NGPC, National Park Service, U.S. Fish and Wildlife Service, and others, including members of the public. These nests were surveyed due to being highly visible, easily observed while conducting other activities, or reported by members of the public. These surveys provided a count of the number of nests outside of the selected monitoring units that were previously known and active in 2017 and which were opportunistically surveyed and determined to be active in 2018.

3. **NONnew (formal and opportunistic surveys of new nests found in 2017)**

   Throughout 2018, we recorded nest activity information on a number of nests that were documented for the first time in 2018. These so-called "new nests" either were found during formal or opportunistic surveys or were reported to us by others. At the end of the year we possessed a count of new nests determined to be active in 2018.

4. **NONre-established (formal and opportunistic surveys of re-established nests checked in 2018)**

   During 2018, we recorded nest activity information on two known nests that were recorded as inactive the previous years but were determined to be active in 2018. These re-established nests were found during both formal and opportunistic surveys or reported to us by others.

5. **NONunsurveyed$_{2017}$ (estimating nest activity of unsurveyed nests that were active in 2017)**

   We used Program MARK (White and Burnham 1999) and Bald Eagle nesting data collected from 1991 – 2016 to estimate the probability that a nest active one year will be active the following year. The estimate we produced is tantamount to a survival estimate (for an

animal of interest) that is commonly produced in mark-recapture analyses (White and Burnham 1999). The top model in our analysis estimated the probability that a nest active one year will be active again the following year to be 0.884 (SE = 0.010, 95% CI = 0.862-0.903). We multiplied the number of nests that were active in 2017 and not surveyed in 2018 by this probability estimate to generate a prediction of the number of the unsurveyed nests that were active in 2017 (NONunsurveyed2017 = number of nests unsurveyed * 0.884).

6. **NONunsurveyed$_{2016}$ (estimating nest activity of unsurveyed nests that were active in 2016)**

   We added an additional term to estimate the probability that a nest active one year will be active two years later in order to account for the active nests from 2016 that were not monitored in either 2017 or 2018. This estimated probability (0.774) is lower than the **NONunsurveyed$_{2017}$** probability (0.884) to account for the extra year between confirmed activity.

Any one nest could only be included in only one of the five categories. For example, a nest in the NONunsurveyed category that was opportunistically surveyed was moved to the NONopportunistic category. We compared the 2018 total to previous years' totals.

RESULTS

The 2018 season initially began with the intent to proceed to the next monitoring unit established by the 2017 plan in order to monitor nests in areas not covered during the previous year. However, a cold spring and logistical constraints led to reduced monitoring effort compared to previous years.

We estimated 196 active nests in Nebraska in 2018. While slightly lower than last year's number of 207, this calculation relies more on existing information than previous years' results because of the reduced survey effort was in 2018.  Only 40 nests monitored in 2018 compared to 170 nests surveyed in 2017 and 220 nests surveyed in 2016. Overall, 36 of the 40 nests that we monitored in 2018 were considered active. Eighteen nests that were active in 2017 or 2016 were surveyed in 2018, and 16 of these were active in 2018 (NON = 16). Eight nests were opportunistically surveyed (6 last surveyed in 2017 and 2 last surveyed in 2016), and all 8 were considered active. We found 11 new nests and 10 were considered active. Two nests were considered reestablished from before 2016. Out of 122 nests that were active in 2017 and went unmonitored in 2018, we predicted that 108 of these would remain active (122 * 0.884 = 108). Additionally, 67 nests that were active in 2016 went unmonitored in both 2017 and 2018, and we predicted that 52 of these would remain active (67 * 0.774 = 52).

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**16** (NON$_{surveyed}$) + **8** (NON$_{opportunistic}$) + **10** (NON$_{new}$) + **2** (NON$_{re-established}$) + **108** (NON$_{surveyed\ 2017}$) + **52** (NON$_{surveyed2016}$) = **196** (Active Bald Eagle nests in Nebraska in 2018)
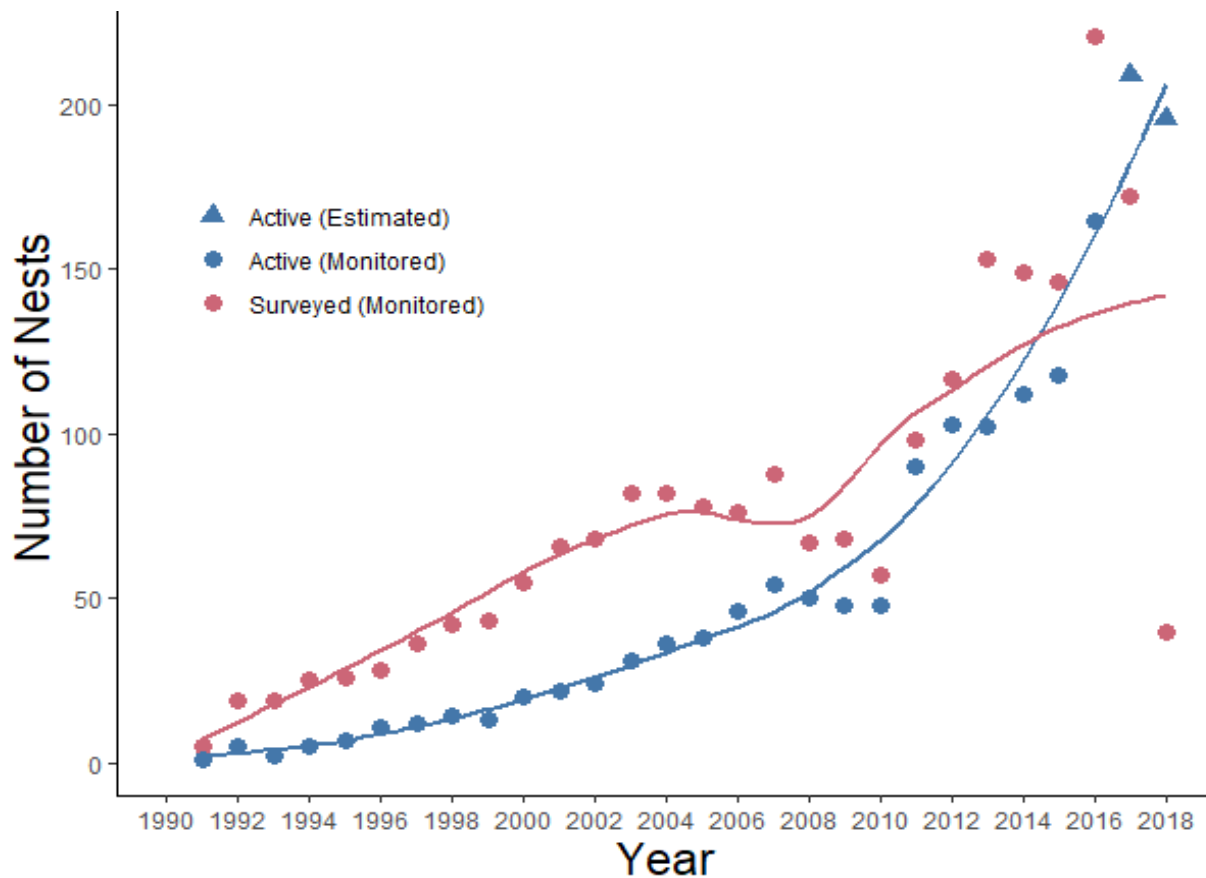
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**Figure 2.** Number of Bald Eagle nests surveyed (red points) and number of active nests (blue points) in Nebraska from 1991 - 2018. The solid dots represent survey results using the old methodology (Jorgensen and Dinan 2017) and the triangles represent survey results using the new estimation methodology used since 2017 (Jorgensen and Dinan 2018). The trend lines were created using locally weighted scatterplot smoothing (LOESS) in Program R (R Development Core Team 2018).

DISCUSSION

The overall estimated total of 196 active Bald Eagle nests in Nebraska in 2017 represents a 5% decrease from the 209 nests estimated as active in 2017. While the estimated number of active nests is slightly lower than in 2017, this number still exceeds the total number of recorded active nests in the years prior to 2017 (162 in 2016, 118 in 2015), and puts the number of nesting Bald Eagles in the state at a very healthy level (Figure 2).

Our survey methodology and the limited number of nests monitored in 2018 are important factors to consider when interpreting our results. Our estimated number of active Bald Eagle nests in 2018 should be viewed as a minimum estimate since it is essentially certain the actual number of active nests in the state in 2018 was much higher. Of the 40 nests surveyed, 36 were considered active. This apparent activity probability (0.90) is actually higher than the estimated active probability for the number

unmonitored nests from previous years used in the 2018 estimation formula (0.884 probability that an unmonitored nest from 2017 is active in 2018, and a 0.774 probability that active nest from 2016 remained active after being unmonitored for two years).

The continued use of the new survey approach was successful in allowing us to achieve our objectives of 1) producing an estimate of the minimum number of active Bald Eagle in the state, 2) maintaining our database of current active Bald nests, and, 3) reducing resource commitment used to conduct Bald Eagle nesting surveys.  The new survey approach was intended to be used to "wind down" Bald Eagle nest monitoring altogether as the species is presently numerous in the state.

We decided to discontinue formal Bald Eagle nest monitoring after 2018 due to the ever-increasing number of nests in the state.  This outcome likely would have been realized regardless of this decision because a cold, snowy early spring and record flooding in March in eastern Nebraska would have hampered our ability to survey nests had this been our intent.  Thus, this is the final Nebraska Bald Eagle Nesting Report.  The Bald Eagle is likely more numerous presently as a nesting species in Nebraska than it has been in over 150 years, if not longer.  It is reasonable to suspect that there may be close to 300 breeding pairs of Bald Eagles in Nebraska in 2019.   Bald Eagles are also increasingly nesting in areas that would likely have been deemed unsuitable only years ago.   The species recovery in Nebraska and throughout the Unites States is a remarkable conservation success story.

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