

# ARIZONA GOLDEN EAGLE PRODUCTIVITY ASSESSMENT 2023

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*Photo by J. Presler*



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# ARIZONA GOLDEN EAGLE PRODUCTIVITY ASSESSMENT 2023

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## INTRODUCTION

In 1940, the U.S. Congress passed the Bald Eagle Protection Act to protect declining populations of bald eagles (*Haliaeetus leucocephalus*). This legislation was amended in 1962 to include golden eagles (*Aquila chrysaetos*), becoming the Bald and Golden Eagle Protection Act (Eagle Act). In the late 2000s, the U.S. Fish and Wildlife Service (USFWS) clarified definitions within the Eagle Act and finalized regulations providing a mechanism to authorize take (USFWS 2007a, b; USFWS 2009). In December 2013 the USFWS also finalized revisions to the rule governing eagle take permits and extended programmatic permits to a maximum of 30 years (USFWS 2013), a rule which was challenged in court and vacated. As a result, the USFWS developed a new rule and a programmatic environmental impact statement in December 2016 to reinstate the 30-year permit and to modify other aspects of take permit implementation (USFWS 2016a, 2016b, 2017). For implementation of take permits to be compatible with the congressional intent of the Eagle Act (i.e., stable or increasing breeding populations), accurate population estimates and trends are needed (Millsap et al. 2013).

In 2010, after the USFWS made its initial clarifications to the Eagle Act, a group of state and federal agencies, Native American tribes, and private entities in Arizona established the Southwestern Golden Eagle Management Committee (SWGEMC) as a means to enhance coordination and communication among interested parties and to provide oversight for golden eagle management in the state. Prior to the formation of the SWGEMC, information on the status, distribution, and life history of breeding golden eagles in Arizona was limited (e.g., Millsap 1981, Eakle and Grubb 1986, Grubb and Eakle 1987, Corman and Wise-Gervais 2005). Observations collected by the Arizona Game and Fish Department (Department) were dated or gathered incidentally or intermittently, and no formalized study to document statewide population numbers had ever been implemented. In 2006, the Department conducted a ground survey effort limited to 85 previously known breeding areas (BAs) and found 14 were occupied by golden eagles (unpublished data). All of these past observations and other information from partners were used to establish a foundation for a more coordinated population assessment effort in Arizona.

Some members of the SWGEMC provided funds to the Department to implement statewide nest inventory, occupancy, and productivity surveys for cliff-nesting golden eagles. The Department's Terrestrial Wildlife (Nongame) Branch conducted aerial occupancy and nest survey efforts in 2011-2014 and 2020-2022, and completed a five-year project in 2015-2019 to assess productivity at a subsample of known BAs (McCarty and Jacobson 2011, 2012; McCarty et al. 2013-2021, 2023). Additionally, the Department's Wildlife Contracts Branch conducted surveys on the Barry M. Goldwater Air Force Range (BMGR) via fixed-wing aircraft in May 2013 and March 2014 and via helicopter in August 2014 (Sturla et al. 2014a), as well as other helicopter surveys in southwestern Arizona (Sturla et al. 2014b). This report summarizes results from the 2023 productivity survey, excluding those conducted on the BMGR which are detailed in a separate

report. After the 2023 season, there were 352 known golden eagle BAs, 57 historic BAs, and 489 potential BAs outside of Native American lands in Arizona.

### STUDY AREA

In 2023, the golden eagle occupancy and reproductive assessment was conducted in eastern and southwestern Arizona covering portions of Apache, Coconino, Greenlee, La Paz, Maricopa, Mohave, Navajo, Yavapai, and Yuma counties (Figure 1). Surveys mainly occurred over private lands and those administered by the Arizona State Land Department, Bureau of Land Management, U.S. Forest Service (USFS), USFWS, and U.S. Department of Defense.

The surveyed areas included a variety of habitat types within Bird Conservation Regions 16, 33, and 34 (NABCI 2000) and were characterized by eight biotic communities: Great Basin Conifer Woodland, Great Basin Desertscrub, Interior Chaparral, Mohave Desertscrub, Plains and Great Basin Grassland, Rocky Mountain (Petran) Montane Conifer Forest, Semidesert Grassland, and Sonoran Desertscrub (Brown 1994). Elevation of surveyed areas ranged from approximately 300 to 2,450 m (980 to 8,000 ft).

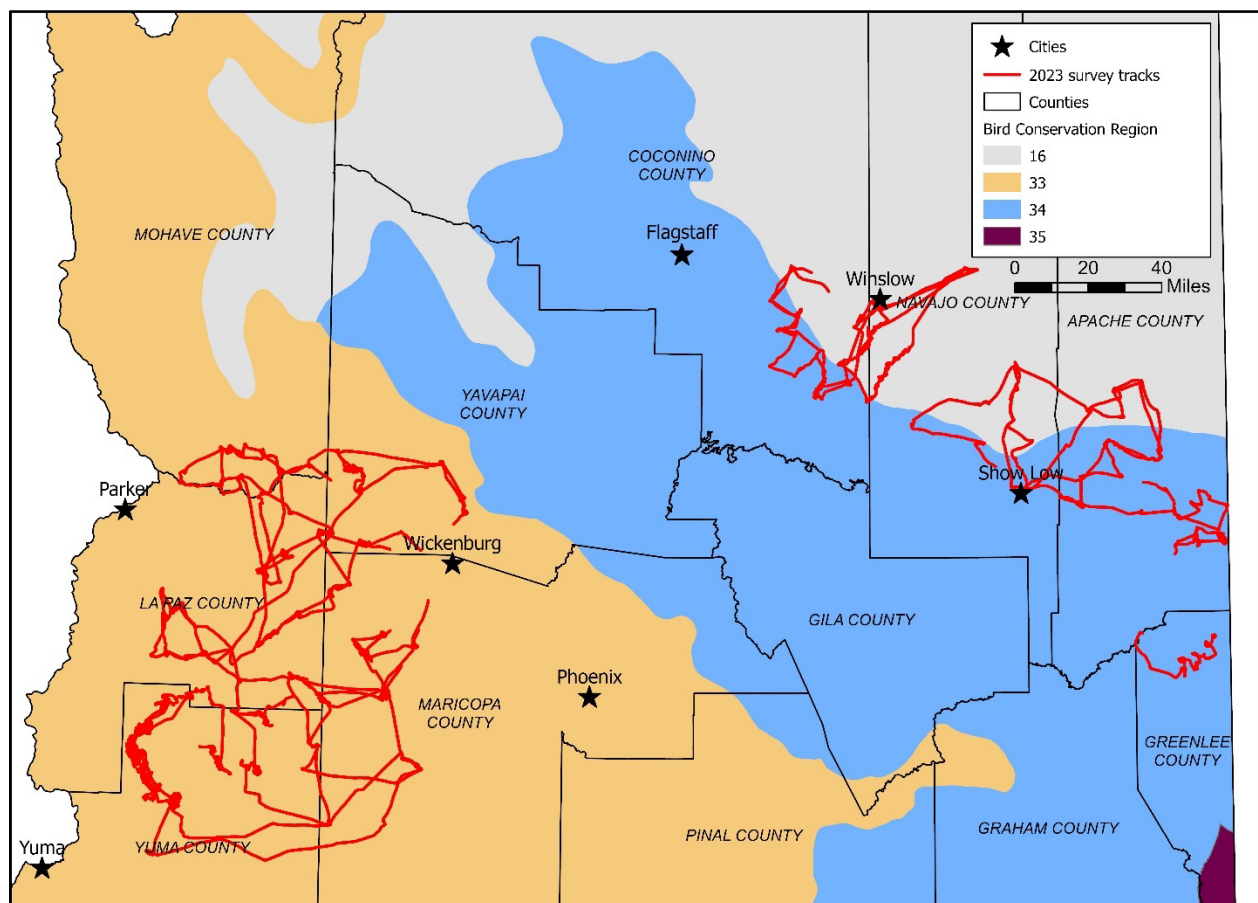


Figure 1. Study area of golden eagle survey flights conducted in Arizona in 2023.

## METHODS

We followed operational definitions of breeding status derived from Postupalsky (1974, 1983), Steenhof and Kochert (1982), and Driscoll (2010) (Appendix A). An area was termed a golden eagle breeding area (BA) only if it had been documented as occupied at least once within the last ten years. BAs with no documented occupancy for more than ten years were termed “historic BAs”. However, in many cases a BA designated as historic reflects a lack of occupancy monitoring rather than a ten-year period when the site was known to be unoccupied. Areas with one or more “large” nests but without documentation of positive occupancy status were called “potential BAs”. All potential or historic BAs documented as occupied during surveys are reclassified as BAs in future reports. “Large” refers to nests we considered having suitable qualities (e.g., large size and large sticks) for breeding golden eagles based on our experience with bald and golden eagle nests in Arizona (Grubb and Eakle 1987). “Medium” refers to nests that were not likely to have been large enough for golden eagle use and were probable red-tailed hawk (*Buteo jamaicensis*) or common raven (*Corvus corax*) structures.

In 2020, we began a long-term occupancy and productivity monitoring plan for golden eagles, selecting a different region of the state each year and visiting all known nest sites, collecting occupancy and productivity data, and searching for new nests and territories within that region. Over several years, the entire state (excepting tribal lands) will be surveyed. This year’s survey regions were selected mainly by default as the largest areas that had not been surveyed since 2020. We also incorporated data from the 2011-2019 surveys and considered opportunities to fill in gaps in knowledge of golden eagle distribution and occupancy. Survey efforts were primarily focused on examining all previously discovered large nests and secondarily searching cliff habitat deemed suitable for nesting golden eagles as time allowed.

Although the goal was to survey each BA, historic BA, or potential BA twice, in practice some areas were only surveyed once due to unexpected delays, mechanical or logistical issues, inclement weather, or other factors. When faced with these realities, we prioritized visits to BAs and historic BAs, and sites where at least one golden eagle was detected on any prior visits, over potential BAs. This year, aerial surveys on the Kofa National Wildlife Refuge occurred once and were delayed until early May in order to avoid the majority of the birthing period of bighorn sheep (*Ovis canadensis*). Surveys on the Yuma Proving Ground also were conducted only once due to the logistics and planning needed to access the restricted airspace. At a few other areas, there were no existing nests to revisit, and one potential BA was considered to be a probable hawk territory and not worthy of using additional flight time to check later in the season.

The first set of surveys occurred in late February to early March to coincide with pre- and early-incubation behavior of golden eagles in Arizona (McCarty et al. 2023). The second round of surveys occurred three to four weeks later (late March to early April) to determine occupancy if it was not observed during the first visit. In order to save time and resources, not all of the sites found with an active nest during the first round of surveys were re-visited in the second round. BAs that were found occupied after one of the first two rounds were visited again in May and/or June as necessary to document the number of young hatched (if any) and reaching at least 80% of fledging age. For golden eagles, measures of 80% of fledging age range from 51-56 days old (7.3-8 weeks)

(Kochert et al. 2002, Driscoll 2010, Brown et al. 2013, Pagel et al. 2010). The 80% standard for our assessment was at least 7.5 weeks old although surveys were generally timed for eight weeks old. Golden eagle nestlings were aged following Hoechlin (1976) and Driscoll (2010).

Aerial surveys were conducted on February 21, 23-24, 27-28, and March 3, 22-24, 27-28, May 4-5, 16, 18, and June 2. Some observations were also made opportunistically during helicopter surveys of bald eagle nests from January to May. A team of two to three biologists completed the surveys from a helicopter flown at approximately 60 m (200 ft) above ground level and at 50-80 knots (approximately 60-90 mph), however in June the observations of final nesting status (to document 80% of fledging age) were made via ground visits or fixed-wing aircraft including a 1974 Cessna 185 or 1981 Cessna 185. Altitude and speed of aerial surveys were influenced by topography, ground-based obstacles (presence of high-tension wires, meteorological towers, etc.), and wind. Multiple passes were sometimes necessary to accurately document occupancy and productivity. The minimum data recorded for all surveys included occupancy status, number of adults and their behavior, number of eggs (if visible) and/or young, nestling age, and nest condition. Supplemental information included nest characteristics (size, position on cliff, substrate descriptors, etc.), assessment of site for ground access, and observations of other raptor species. The locations of new nests were recorded on Garmin GPSMAP 64s units. Photos were taken of active nests and most other large nests for future reference using a Nikon D610 DSLR camera with Sigma lens (150-600mm).

Laying, hatching, and fledging dates were estimated using nestling age (based on plumage development) as a starting point. For this purpose only, the incubation period was considered to take 45 days and age at fledging to be 70 days old. For pairs producing more than one nestling, the average age of the young was used to generate a single set of estimates per active nest. Fledging dates were only estimated for successful sites.

In December 2016, the USFWS changed the scale at which eagle populations are to be evaluated, from Bird Conservation Regions (BCRs) to migratory flyways (USFWS 2016a, b). The change enlarged eagle management units to correspond to the USFWS administrative flyways, with provisions for evaluating effects of take permits at more local levels. In Arizona, the Department has utilized the BCR approach since productivity surveys began in 2015. For the sake of consistency, and since BCRs allow for finer-scale comparison within the state, we continue to reference the BCRs. Arizona includes BCRs 16 (Southern Rockies/Colorado Plateau), 33 (Sonoran and Mohave Deserts), 34 (Sierra Madre Occidental), and 35 (Chihuahuan Desert) (NABCI 2000), however BCR 35 in southeastern Arizona was not covered in this year's study area.

## RESULTS

The 2023 golden eagle survey effort totaled 79.9 hours (4,794 minutes) of aerial surveys over 16 days (Appendix B). In addition, ground surveys were conducted for 1.1 hours over three days.

In total, we surveyed 36 previously-known breeding areas, 5 historic breeding areas, and 67 potential breeding areas at least twice. Additionally, we visited 23 other sites one time only,

including 2 BAs, 2 historic BAs, and 19 potential BAs. Notable findings included 8 new breeding areas and 11 new potential BAs.

Occupancy was documented at 23 of 44 (52.3%) areas eligible for analysis (i.e., they were surveyed at least twice to determine occupancy and included previously-known BAs, new BAs, and re-occupied historic BAs) (Table 1, Appendix C). Of the 23 occupied areas, 21 (91.3%) were active and 2 were occupied-only (8.7%). A total of 16 nestlings hatched at the 21 active areas, and 14 young fledged from 13 successful nesting attempts. Overall, productivity was 0.61 young fledged per occupied BA and mean brood size was 1.1 nestlings. Productivity was highest within BCR 34 (0.80, n=10 occupied) and lowest in BCR 16 (0.38, n=8) (Table 1).

Based on the observation of nestlings that were aged by feather development, we estimated egg-laying, hatching, and fledging dates for 13 of the active BAs (Table 2). Statewide, the 2023 average estimated laying date was February 18 (range February 7 to March 10), average hatching date was April 4 (March 24 to April 24), and average fledging date was June 12 (June 2 to July 3). Estimated dates within each BCR varied, with the earliest initiation dates in BCR 34 and later in BCRs 16 and 33, although sample sizes were small (Table 2).

| Table 1. Summary of Arizona golden eagle productivity in 2023. |            |           |           |            |
|----------------------------------------------------------------|------------|-----------|-----------|------------|
|                                                                | All areas  | BCR 16    | BCR 33    | BCR 34     |
| Areas surveyed                                                 | 44         | 15        | 11        | 18         |
| Occupied                                                       | 23 (52.3%) | 8 (53.3%) | 5 (45.5%) | 10 (55.6%) |
| Active                                                         | 21         | 7         | 5         | 9          |
| Failed breeding attempts                                       | 8          | 4         | 2         | 2          |
| Successful breeding attempts                                   | 13         | 3         | 3         | 7          |
| Young hatched                                                  | 16         | 4         | 4         | 8          |
| Young fledged                                                  | 14         | 3         | 3         | 8          |
| Nest success (successful/occupied)                             | 0.57       | 0.38      | 0.60      | 0.70       |
| Mean brood size (fledged/successful)                           | 1.1        | 1.0       | 1.0       | 1.1        |
| Productivity (fledged/occupied)                                | 0.61       | 0.38      | 0.60      | 0.80       |

| Table 2. Estimated average laying, hatching, and fledging dates in 2023. |                    |                   |                   |                   |
|--------------------------------------------------------------------------|--------------------|-------------------|-------------------|-------------------|
| Estimated:                                                               | Statewide total    | BCR 16            | BCR 33            | BCR 34            |
| Laying date                                                              | February 18 (n=13) | February 21 (n=3) | February 20 (n=3) | February 16 (n=7) |
| Hatching date                                                            | April 4 (n=13)     | April 7 (n=3)     | April 6 (n=3)     | April 2 (n=7)     |
| Fledging date                                                            | June 12 (n=13)     | June 15 (n=3)     | June 15 (n=3)     | June 10 (n=7)     |

### RESULTS OF NEST SURVEYS

Results worthy of discussion are described below and include surveys in suitable habitat (including new BAs and new potential BAs), surveys in breeding areas (previously known BAs, potential BAs, and historic BAs), discovery of new nests, and additional golden eagle sightings. Nest locations are sensitive data, considered confidential by the Department, and omitted from this report. Management agencies requiring specific locations should contact the Department's Heritage Data Management System at (623) 236-7618.

### Breeding Areas

A total of 36 previously-known breeding areas were surveyed at least twice and occupancy was confirmed at 15 sites (Table 3). At four of the breeding areas, occupancy has not been detected for at least 10 years and they are now considered historic breeding areas. Additionally, two breeding areas on the Kofa NWR were surveyed only once.

### Apache County

*Hollow Hill (1GE058)*. – On February 28, a golden eagle was incubating in a new nest (#5) on a cliff ledge directly below nest #2. One nestling was observed on May 16 and 24 (Figure 2).

*Mesa Redonda (1GE052)*. – On February 28, a golden eagle was incubating in a new nest (#4) on a cliff (Figure 2).



Figure 2. Nestling at the Hollow Hill breeding area (left) and golden eagle incubating at the Mesa Redonda breeding area (right).

*Pink Cliff (1GE008)*. – On March 28, a golden eagle flew from nest #2, which was empty, and a second golden eagle was perched nearby (Figure 3).

### Coconino County

*Anderson Canyon (2NE073)*. – No occupancy has been detected at this breeding area for at least ten years, and the site will now be considered as a historic breeding area.

*Jacks Canyon 1 (2NE078)*. – On February 27, a golden eagle was standing in nest #1 (Figure 3). On March 27, there was greenery in nest #1 and it was in fair to good condition, but no eggs or young were present.



Figure 3. Golden eagle perched at the Pink Cliff breeding area (left) and golden eagle standing in nest at the Jack's Canyon 1 breeding area (right).

#### Navajo County

*Clear Creek (2GE075)*. – On March 27, a golden eagle was incubating in a new nest (#8) on a cliff, and one nestling was observed on May 16 and June 8 (Figure 4).



Figure 4. Adult incubating (left) and one nestling (right) at the Clear Creek breeding area.

*Corbet Tank (1GE055)*. – No occupancy has been detected at this breeding area for at least ten years, and the site will now be considered as a historic breeding area.

#### Yavapai County

*Harcuvar North (4GE003)*. – No occupancy has been detected at this breeding area for at least ten years, and the site will now be considered as a historic breeding area.

*Poachie (4GE004)*. – No occupancy has been detected at this breeding area for at least ten years, and the site will now be considered as a historic breeding area.

| Table 3. Summary of breeding areas examined during nest surveys in 2023. |                      |                        |                     |                                                                                                                                                    |
|--------------------------------------------------------------------------|----------------------|------------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Breeding area                                                            | Area ID <sup>1</sup> | Dates surveyed         | Status <sup>2</sup> | Comments                                                                                                                                           |
| <b>Apache County</b>                                                     |                      |                        |                     |                                                                                                                                                    |
| Black Ridge                                                              | 1GE060               | 2/28, 5/16, 5/24       | S                   | 2/28: Golden eagle incubating in nest #1. 5/16: One nestling, 7 weeks old. 5/24: One nestling, 8 weeks old. One adult perched.                     |
| Concho                                                                   | 1NE006               | 2/28, 3/28             | U                   | All known nests empty. No eagles.                                                                                                                  |
| Dutch Mountain                                                           | 1GE017               | 2/28, 3/28, 5/16, 6/21 | S                   | 3/28: Golden eagle incubating in nest #2. 5/16: Adult with two nestlings, 3-3.5 weeks old. 6/21: Two nestlings, 8-8.5 weeks old. One adult flying. |
| Hollow Hill                                                              | 1GE058               | 2/28, 5/16, 5/24       | S                   | 2/28: Golden eagle incubating in new nest #5. 5/16: One nestling, 7 weeks old. 5/24: One nestling, 8 weeks old.                                    |
| Indian Tank                                                              | 1GE062               | 3/3, 3/28              | U                   | All known nests empty. No eagles.                                                                                                                  |
| LCR Lyman Lake                                                           | 1GE019               | 3/3, 5/16, 6/2         | S                   | 3/3: Golden eagle incubating in nest #2. 5/16: Adult with one nestling, 5 weeks old. 6/2: One nestling, 7.5-8 weeks old.                           |
| Mesa Redonda                                                             | 1GE052               | 2/28, 5/16, 5/24       | S                   | 2/28: Golden eagle incubating in new nest #4. 5/16: One nestling, 6.5 weeks old. 5/24: One nestling, 7.5 weeks old. Two adults in area.            |
| Pink Cliff                                                               | 1GE008               | 2/28, 3/28, 5/16       | O                   | All known nests empty. 3/28: Two adults in area.                                                                                                   |
| Salado                                                                   | 1GE059               | 2/28, 3/28, 5/16       | F                   | 2/28: Golden eagle at nest #1. 3/28: Golden eagle incubating in nest #1. 5/16: Nest #1 empty, failed.                                              |
| Stinking Springs Mountain                                                | 1GE061               | 2/28, 3/28             | U                   | All known nests empty. No eagles.                                                                                                                  |
| Wolf Mountain                                                            | 1GE001               | 2/28, 3/28             | U                   | All known nests empty. No eagles.                                                                                                                  |
| Ziegler Mountain                                                         | 1GE002               | 2/28, 3/28             | U                   | All known nests empty. No eagles.                                                                                                                  |
| <b>Coconino County</b>                                                   |                      |                        |                     |                                                                                                                                                    |
| Anderson Canyon                                                          | 2NE073               | 2/27, 3/27             | U                   | All known nests empty. No eagles.                                                                                                                  |
| Canyon Diablo                                                            | 2GE045               | 2/27, 3/27             | U                   | All known nests empty. No eagles.                                                                                                                  |
| Grapevine                                                                | 2GE074               | 2/27, 3/27, 5/16       | F                   | 2/27: One golden eagle flying. 3/27: Golden eagle incubating in nest #3. Second adult flying. 5/16: nest #3 empty, failed.                         |
| Grapevine 2                                                              | 2NE074               | 2/27, 3/27             | U                   | All known nests empty. No eagles.                                                                                                                  |
| Grapevine 3                                                              | 2NE075               | 2/27, 3/27             | U                   | All known nests empty. No eagles.                                                                                                                  |
| Jacks Canyon 1                                                           | 2NE078               | 2/27, 3/27             | O                   | 2/27: Golden eagle standing in nest #1. 3/27: Greenery in nest #1.                                                                                 |
| <b>La Paz County</b>                                                     |                      |                        |                     |                                                                                                                                                    |
| Eagletails                                                               | 4NE007               | 2/24, 3/24, 5/18, 6/2  | S                   | 2/24 and 3/24: Golden eagle incubating in nest #3. 5/18: One nestling, 6 weeks old. 6/2: One nestling, 8 weeks old.                                |
| Harcuvar South                                                           | 4NE043               | 2/21, 3/22             | U                   | All known nests empty. No eagles.                                                                                                                  |
| Kofa                                                                     | 4GE002               | 5/5                    | --                  | Nests #1-2 empty.                                                                                                                                  |
| <b>Maricopa County</b>                                                   |                      |                        |                     |                                                                                                                                                    |
| Belmont West                                                             | 4NE004               | 2/24, 3/27, 5/18, 6/2  | S                   | 2/24 and 3/27: Golden eagle incubating in nest #7. 5/18: Two nestlings, 6 weeks old. 6/2: One nestling, 7.5-8 weeks old.                           |

<sup>1</sup>Breeding area identification code.

<sup>2</sup>F=failed, O=occupied, S=Successful, U=Unoccupied, --=Undetermined.

| Table 3 continued.     |                      |                       |                     |                                                                                                                          |
|------------------------|----------------------|-----------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------|
| Breeding area          | Area ID <sup>1</sup> | Dates surveyed        | Status <sup>2</sup> | Comments                                                                                                                 |
| Harquahala             | 4GE001               | 2/23, 3/22            | U                   | All known nests empty. No eagles.                                                                                        |
| Harquahala North       | 4NE031               | 2/23, 3/22, 5/18, 6/2 | S                   | 2/23 and 3/22: Golden eagle incubating in nest #1. 5/18: One nestling, 6 weeks old. 6/2: One nestling, 8 weeks old.      |
| <b>Mohave County</b>   |                      |                       |                     |                                                                                                                          |
| Aubrey Peak Wilderness | 3GE001               | 2/21, 3/22            | U                   | No eagles seen. Not all nests found, difficult to survey well.                                                           |
| <b>Navajo County</b>   |                      |                       |                     |                                                                                                                          |
| Black Canyon           | 1NE004               | 2/28, 3/28            | U                   | All known nests empty. No eagles.                                                                                        |
| Black Rock Spring      | 1GE054               | 2/27, 3/27            | U                   | All known nests empty. No eagles.                                                                                        |
| Chevelon Canyon 3      | 1NE009               | 2/27, 3/28            | U                   | All known nests empty. No eagles.                                                                                        |
| Chevelon Canyon 6      | 1NE012               | 2/27, 3/28            | U                   | All known nests empty. No eagles.                                                                                        |
| Chevelon-Rock Creek    | 1GE053               | 2/27, 3/28            | U                   | All known nests empty. No eagles.                                                                                        |
| Clear Creek            | 2GE075               | 2/28, 3/27, 5/16, 6/8 | S                   | 3/27: Golden eagle incubating in new nest #8. 5/16: One nestling, 5 weeks old. 6/8: One nestling, 8+ weeks old.          |
| Corbet Tank            | 1GE055               | 2/28, 3/27            | U                   | No eagles. Not all nests found.                                                                                          |
| Silver 1               | 1NE017               | 2/28, 3/28, 5/16      | F                   | 2/28 and 3/28: Golden eagle incubating in nest #3. 5/16: Nest #3 empty, failed.                                          |
| The Canal              | 1GE009               | 2/28, 5/16, 6/2       | S                   | 2/28: Golden eagle incubating in nest #2. 5/16: One nestling, 6.5-7 weeks old. 6/2: One fledgling and one adult perched. |
| <b>Yavapai County</b>  |                      |                       |                     |                                                                                                                          |
| Peoples Canyon         | 3GE002               | 2/21, 3/23            | U                   | No eagles seen. Not all nests found.                                                                                     |
| Harcuvar North         | 4GE003               | 2/21, 2/23, 3/22      | U                   | All known nests empty. No eagles.                                                                                        |
| Poachie                | 4GE004               | 2/21, 3/23            | U                   | All known nests empty. No eagles.                                                                                        |
| <b>Yuma County</b>     |                      |                       |                     |                                                                                                                          |
| Courthouse             | 4GE005               | 5/5                   | --                  | No eagles seen. Area not completely surveyed.                                                                            |

<sup>1</sup>Breeding area identification code.

<sup>2</sup>F=failed, O=occupied, S=Successful, U=Unoccupied, --=Undetermined.

### *Historic Breeding Areas*

Five historic breeding areas were surveyed at least twice (Table 4). Occupancy was not confirmed at any of the sites, however a single golden eagle was observed at one of them. Additionally, two historic breeding areas were surveyed only once.

### Apache County

*Nutrios Creek (1GE015)*. – On March 28, a red-tailed hawk was seen incubating in nest #2.

### Coconino County

*Chevelon Butte (1GE003)*. – No nests were found during two visits; however one golden eagle was seen perched and flying in the area on March 27.

*Heaps Tree (1GE010)*. – On February 28, no nests were found and nest #2 was presumed fallen.

Navajo County

*Cottonwood Wash (1GE018)*. – On March 28, a prairie falcon (*Falco mexicanus*) was seen incubating in nest #2.

| Table 4. Summary of historic breeding areas surveyed in 2023. |                      |                |                     |                                                                                                            |
|---------------------------------------------------------------|----------------------|----------------|---------------------|------------------------------------------------------------------------------------------------------------|
| Historic breeding area                                        | Area ID <sup>1</sup> | Dates surveyed | Status <sup>2</sup> | Comments                                                                                                   |
| <b>Apache County</b>                                          |                      |                |                     |                                                                                                            |
| Heaps Tree                                                    | 1GE010               | 2/28           | --                  | Nest #2 fallen. No eagles.                                                                                 |
| Nutrios Creek                                                 | 1GE015               | 3/3, 3/28      | U                   | All known nests empty. No eagles. 3/28: Red-tailed hawk incubating in nest #2.                             |
| <b>Coconino County</b>                                        |                      |                |                     |                                                                                                            |
| Chevelon Butte                                                | 1GE003               | 2/27, 3/27     | U                   | No nests found. 3/27: One golden eagle flying and perched.                                                 |
| <b>Mohave County</b>                                          |                      |                |                     |                                                                                                            |
| Eagle Point                                                   | 3GE004               | 2/21, 3/22     | U                   | All known nests empty. No eagles.                                                                          |
| Maggie Wash                                                   | 3GE003               | 2/21           | --                  | Nest #1 not found. No eagles.                                                                              |
| <b>Navajo County</b>                                          |                      |                |                     |                                                                                                            |
| Cottonwood Wash                                               | 1GE018               | 2/28, 3/28     | U                   | All known nests empty. 2/28: One near-adult bald eagle flying. 3/28: Prairie falcon incubating in nest #2. |
| Woodruff Ditch                                                | 1GE007               | 2/28, 3/28     | U                   | One nest found in poor condition. No eagles.                                                               |

<sup>1</sup>Breeding area identification code.

<sup>2</sup>N1=One golden eagle and at least one large nest observed, U=Unoccupied, --=Undetermined.

*Potential Breeding Areas*

A total of 67 previously documented potential BAs were surveyed at least twice (Table 5). Eight of the sites were found occupied for the first time and will be designated as breeding areas in future reports. Single golden eagles were observed at two of the sites. An additional 19 potential BAs were surveyed only once. Only the occupied areas and eagle sightings are included below.

Apache County

*State Line (INE041)*. – On March 3, a golden eagle was incubating in nest #3, representing the first time occupancy has been documented at this site since it was discovered in 2017 (Figure 5).

Coconino County

*Canyon Diablo 3 (2NE077)*. – On February 27, a golden eagle was incubating in a new nest (#2) on a cliff, representing the first time occupancy has been documented at this site since it was discovered in 2012 (a single golden eagle was observed in the area in 2013). A small nestling was seen on March 27, recently hatched. On May 16, the nestling was 7.5-8 weeks old (Figure 5).



Figure 5. Golden eagle incubating at the State Line breeding area (left) and nestling at the Canyon Diablo 3 breeding area (right).

*Clear Creek 3 (1NE014).* – On February 28 and March 27, a golden eagle was incubating in nest #8, representing the first time occupancy has been documented at this site since it was discovered in 2012 (Figure 6). On May 16, the nest was empty and the breeding attempt had failed

*Clear Creek 5 (2NE080).* – On February 27, a golden eagle was incubating in nest #5, representing the first time occupancy has been documented at this site since it was discovered in 2012 (Figure 6). On May 16, we observed a dead nestling in the nest which appeared to have been approximately 5 weeks old when it died.



Figure 6. Golden eagle incubating at the Clear Creek 3 breeding area (left) and golden eagle incubating at the Clear Creek 5 breeding area (right).

#### La Paz County

*New Water 2 (4NE027).* – On February 23, a golden eagle was incubating in nest #1, representing the first time that occupancy has been documented at this site since it was discovered in 2011 (Figure 7).

*Plomosa 3 (4NE036).* – On February 23, one golden eagle was seen flying near cliffs in the nest area. No other eagles were seen and none of the nests had greenery or other signs of nesting activity.

Navajo County

*Chevelon Canyon 5 (INE011)*. – On February 27, a golden eagle was incubating in a nest #3, representing the first time occupancy has been documented at this site since it was discovered in 2012. One nestling was observed at 5 weeks old on May 16, and 7.5-8 weeks old on June 2.

*Chevelon Canyon 8 (INE044)*. – On February 27 and March 28, a golden eagle was incubating in a new nest (#3) on a cliff, representing the first time occupancy has been documented at this site since it was discovered in 2019. On May 16, the nest was empty and the breeding attempt had failed (Figure 7).



Figure 7. Golden eagle incubating at the New Water 2 breeding area (left) and new nest at the Chevelon Canyon 8 breeding area (right).

Yavapai County

*Harcuvar Stem (4NE018)*. – On March 22, a golden eagle flew off a cliff in the nest area. No other eagles were seen and none of the nests had greenery or other signs of nesting activity.

*Ives Peak (4NE001)*. – On February 21, a pair of golden eagles was perched on a cliff together and we found three new large nests. An adult was incubating in a one of the new nests (#3) on March 23 (Figure 8), however the nest was empty on May 18.



Figure 8. Golden eagle incubating at the Ives Peak breeding area.

| Table 5. Summary of potential breeding areas examined during nest surveys in 2023. <sup>1</sup> |                      |                       |                     |                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------|----------------------|-----------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Potential breeding area                                                                         | Area ID <sup>2</sup> | Dates surveyed        | Status <sup>3</sup> | Comments                                                                                                                                                |
| <b>Apache County</b>                                                                            |                      |                       |                     |                                                                                                                                                         |
| State Line                                                                                      | 1NE041               | 3/3, 5/16             | S                   | 3/3: Golden eagle incubating in nest #3. 5/16: Adult with one nestling, $\geq 7.5$ weeks old.                                                           |
| <b>Coconino County</b>                                                                          |                      |                       |                     |                                                                                                                                                         |
| Canyon Diablo 3                                                                                 | 2NE077               | 2/27, 3/27, 5/16      | S                   | 2/27: Golden eagle incubating in new nest #2. 3/27: One hatchling in nest. Adult soaring nearby. 5/16: One nestling 7.5-8 weeks old. One adult perched. |
| Clear Creek 3                                                                                   | 1NE014               | 2/28, 3/27, 5/16      | F                   | 2/28 and 3/27: Golden eagle incubating in nest #8. 5/16: Nest #8 empty, failed.                                                                         |
| Clear Creek 5                                                                                   | 2NE080               | 2/27, 3/27, 5/16      | F                   | 2/27: Golden eagle incubating in nest #5. 3/27: Adult incubating or brooding. 5/16: One nestling dead in nest. Failed.                                  |
| <b>La Paz County</b>                                                                            |                      |                       |                     |                                                                                                                                                         |
| New Water 2                                                                                     | 4NE027               | 2/23, 3/23            | F                   | 2/23: Golden eagle incubating in nest #1. 3/23: Nest empty, failed.                                                                                     |
| Plomosa 3                                                                                       | 4NE036               | 2/23, 3/23            | N1                  | All known nests empty. 2/23: One golden eagle flying close to cliffs.                                                                                   |
| <b>Navajo County</b>                                                                            |                      |                       |                     |                                                                                                                                                         |
| Chevelon Canyon 5                                                                               | 1NE011               | 2/27, 3/28, 5/16, 6/2 | S                   | 2/27: Golden eagle incubating in nest #3. 3/28: Adult incubating or brooding. 5/16: One nestling, 5 weeks old. 6/2: One nestling, 7.5-8 weeks old.      |
| Chevelon Canyon 8                                                                               | 1NE044               | 2/27, 3/28, 5/16      | F                   | 2/27 and 3/28: Golden eagle incubating in new nest #3. 5/16: Nest #3 empty, failed.                                                                     |
| <b>Yavapai County</b>                                                                           |                      |                       |                     |                                                                                                                                                         |
| Harcuvar Stem                                                                                   | 4NE018               | 2/23, 3/22            | N1                  | All known nests empty. 3/22: One golden eagle flew off cliff.                                                                                           |
| Ives Peak                                                                                       | 4NE001               | 2/21, 3/23, 5/18      | F                   | 2/21: Pair of golden eagles perched. 3/23: Golden eagle incubating in new nest #3. 5/18: Nest #3 empty, failed.                                         |

<sup>1</sup>Only includes sites that were occupied or where a single golden eagle was seen.

<sup>2</sup>Area identification code.

<sup>3</sup>F=failed, N1=One golden eagle and at least one large nest observed, S=successful.

### *Surveys in Suitable Nesting Habitat*

Eleven new potential BAs were documented during surveys in suitable golden eagle habitat, which were mainly completed in Yuma County (Table 6). Eight of these new areas were found in May while searching the Castle Dome Mountains of the Kofa NWR. Although cliff substrate is abundant in the Castle Dome Mountains and many large nests were discovered, golden eagle occupancy was not documented. Two new potential BAs were found in Greenlee County while searching the Blue River area and creeks flowing into it, and one other new potential BA was found in Yuma County. In total, 27 new large nests were found during these surveys. No eagles were seen.

| Table 6. Summary of surveys in suitable nesting habitat in 2023. |                      |          |                |                                         |
|------------------------------------------------------------------|----------------------|----------|----------------|-----------------------------------------|
| Area name                                                        | Area ID <sup>1</sup> | County   | Dates surveyed | Comments                                |
| KP Creek                                                         | 1NE046               | Greenlee | 3/3            | One new large nest found. No eagles.    |
| Foote Creek                                                      | 1NE047               | Greenlee | 3/3            | Two new large nests found. No eagles.   |
| Castle Dome 1                                                    | 4NE121               | Yuma     | 5/4            | Four new large nests found. No eagles.  |
| Castle Dome 2                                                    | 4NE122               | Yuma     | 5/4            | Four new large nests found. No eagles.  |
| Castle Dome 3                                                    | 4NE123               | Yuma     | 5/4            | One new large nest found. No eagles.    |
| Castle Dome 4                                                    | 4NE124               | Yuma     | 5/4            | One new large nest found. No eagles.    |
| Castle Dome 5                                                    | 4NE125               | Yuma     | 5/4            | Five new large nests found. No eagles.  |
| Castle Dome 6                                                    | 4NE126               | Yuma     | 5/4            | One new large nest found. No eagles.    |
| Hidden Valley                                                    | 4NE127               | Yuma     | 5/5            | Three new large nests found. No eagles. |
| Castle Dome 7                                                    | 4NE128               | Yuma     | 5/5            | Two new large nests found. No eagles.   |
| Deadman Mountain                                                 | 4NE129               | Yuma     | 3/24           | Three new large nests found. No eagles. |

<sup>1</sup>Area identification code.

## DISCUSSION

The observed occupancy of BAs surveyed in 2023 (52.3%) was average compared to occupancy and productivity surveys since 2015 (Table 7). As usual, we caution that our observed occupancy rates are likely lower than reality in part due to reliance on aerial surveys and the associated difficulty in detecting resident eagles that do not lay eggs. For example, McIntyre (2002) found an overall occupancy rate of 83.0% (ranging from 69.7% to 93.4%) in a long-term study of golden eagles in Alaska using a combination of foot, dogsled, and helicopter. Productivity at our surveyed areas in 2023 (0.61) was slightly above the average of 0.57 from 2015-2022 (Table 7), excluding 2020 when the COVID-19 pandemic interrupted our ability to survey. Other studies have reported higher mean annual brood size and productivity than seen in our Arizona results (Table 8).

Nesting chronology data was combined from the 2015-2019 and 2021-2023 surveys to help fine-tune the planning of future efforts. Statewide, the average estimated laying date is February 21 (n=208, range January 25 to March 23), hatching is April 7 (n=208, range March 11 to May 7), and fledging is June 15 (n=179, range May 20 to July 16) (Figure 9). Estimates of laying, hatching, and fledging dates were based on the observed plumage development of nestlings, which could have led to errors in nesting chronology. Nesting attempts that failed prior to hatching were excluded from laying estimates.

Currently in Arizona there are 352 known golden eagle BAs, 57 historic BAs, and 479 potential BAs, excluding those that occur on Native American lands (Table 9, Figure 10).

Table 7. Summary of Arizona golden eagle occupancy and productivity at sampled breeding areas in 2015-2023.

|                     | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 <sup>a</sup> | 2021 | 2022 | 2023 |
|---------------------|------|------|------|------|------|-------------------|------|------|------|
| BAs examined        | 87   | 100  | 102  | 101  | 112  | 68                | 93   | 95   | 44   |
| Number occupied     | 45   | 67   | 61   | 47   | 70   | 42                | 48   | 25   | 23   |
| Percent occupied    | 51.7 | 67.0 | 59.8 | 46.5 | 62.5 | 61.8              | 51.6 | 26.3 | 52.3 |
| Active              | 42   | 58   | 49   | 33   | 59   | --                | 44   | 18   | 21   |
| Failed attempts     | 17   | 19   | 16   | 20   | 26   | --                | 30   | 6    | 8    |
| Successful attempts | 25   | 39   | 33   | 13   | 33   | --                | 14   | 12   | 13   |
| Young hatched       | 34   | 59   | 50   | 24   | 47   | --                | 24   | 16   | 16   |
| Young fledged       | 28   | 52   | 44   | 19   | 39   | --                | 16   | 14   | 14   |
| Nest success        | 0.56 | 0.58 | 0.54 | 0.28 | 0.47 | --                | 0.29 | 0.48 | 0.57 |
| Mean brood size     | 1.12 | 1.33 | 1.33 | 1.46 | 1.18 | --                | 1.14 | 1.16 | 1.08 |
| Productivity        | 0.63 | 0.78 | 0.72 | 0.40 | 0.56 | --                | 0.33 | 0.56 | 0.61 |

<sup>a</sup>In 2020, the COVID-19 pandemic prevented aerial surveys and collection of data from occurring after April 2.

Table 8. Comparison of golden eagle productivity and brood size research.

| Study                               | State | Years | Mean annual brood size | Brood size range | Mean annual productivity | Productivity range |
|-------------------------------------|-------|-------|------------------------|------------------|--------------------------|--------------------|
| This study (2015-2023) <sup>a</sup> | AZ    | 8     | 1.23                   | 1.08 - 1.46      | 0.57                     | 0.33 - 0.78        |
| McIntyre 2002                       | AK    | 12    | 1.45                   | 1.13 - 1.68      | 0.68                     | 0.16 - 1.16        |
| Phillips et al. 1990                | MT/WY | 11    | 1.30                   | 1.1 - 1.8        | 0.78                     | 0.37 - 1.50        |
| Steenhof et al. 1997                | ID    | 24    | 1.56                   | 1.0 - 2.0        | 0.79                     | 0.16 - 1.38        |
| Phillips and Beske 1990             | WY    | 5     | 1.48                   | 1.33 - 1.65      | 0.81                     | 0.52 - 1.16        |
| Thompson et al. 1982                | OR    | 16    | 1.70                   | 1.42 - 2.0       | 1.08                     | 0.20 - 1.67        |
| Millsap 1981                        | AZ    | 2     | 1.58 <sup>b</sup>      | --               | 1.25                     | --                 |

<sup>a</sup>Excluding 2020.

<sup>b</sup>Per active nest.

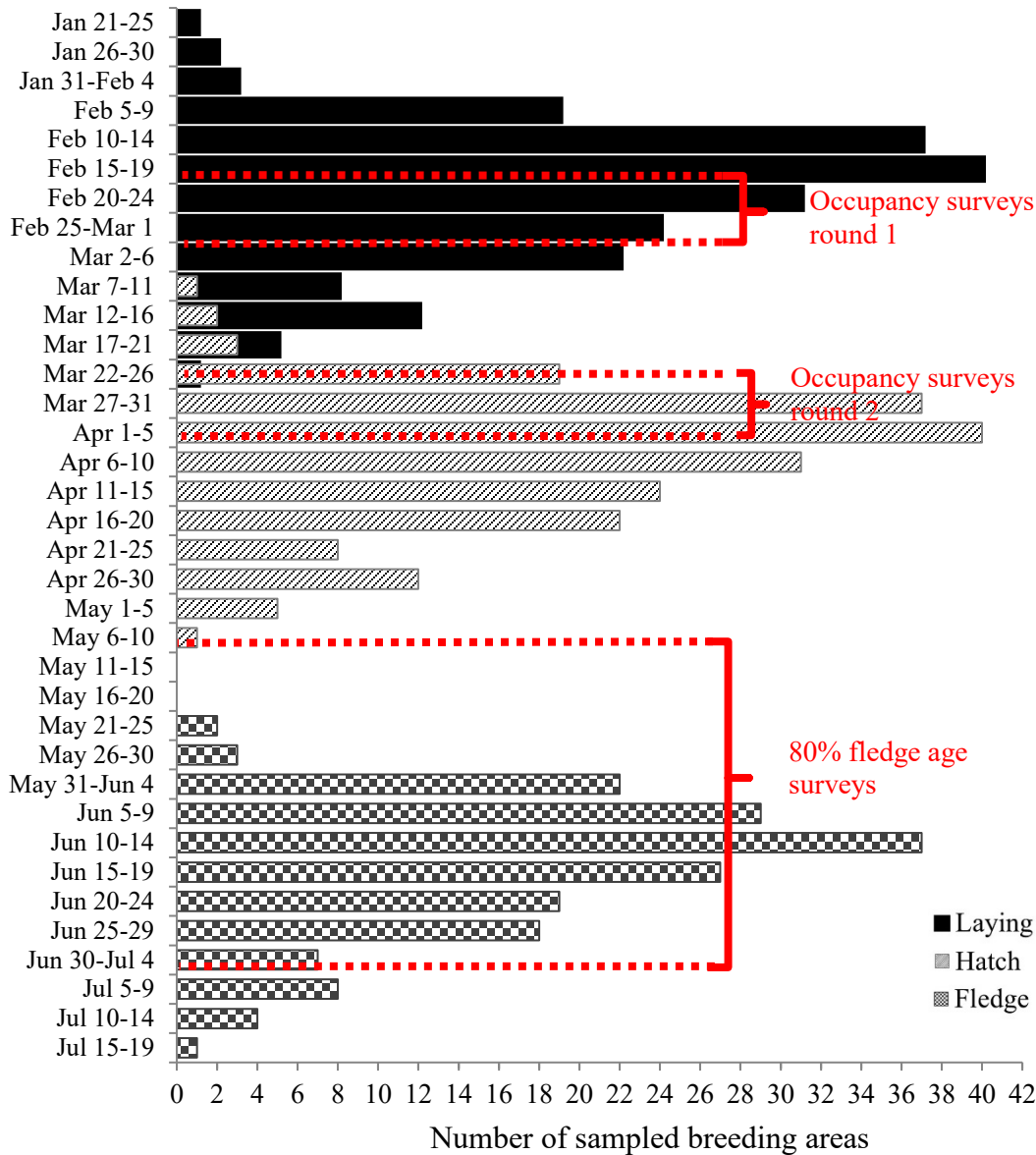


Figure 9. Estimated laying, hatching, and fledging dates at sampled golden eagle breeding areas 2015-2019, and 2021-2023 including recommended timing for future aerial surveys.

| Table 9. Number of current, historic, and potential golden eagle breeding areas, and large nests within potential BAs, by Bird Conservation Region in Arizona as of 2023. |             |              |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------|---------------|
| BCR number                                                                                                                                                                | Current BAs | Historic BAs | Potential BAs |
| 16                                                                                                                                                                        | 87          | 15           | 79            |
| 33                                                                                                                                                                        | 72          | 14           | 186           |
| 34                                                                                                                                                                        | 191         | 27           | 213           |
| 35                                                                                                                                                                        | 2           | 1            | 1             |
| Total                                                                                                                                                                     | 352         | 57           | 479           |

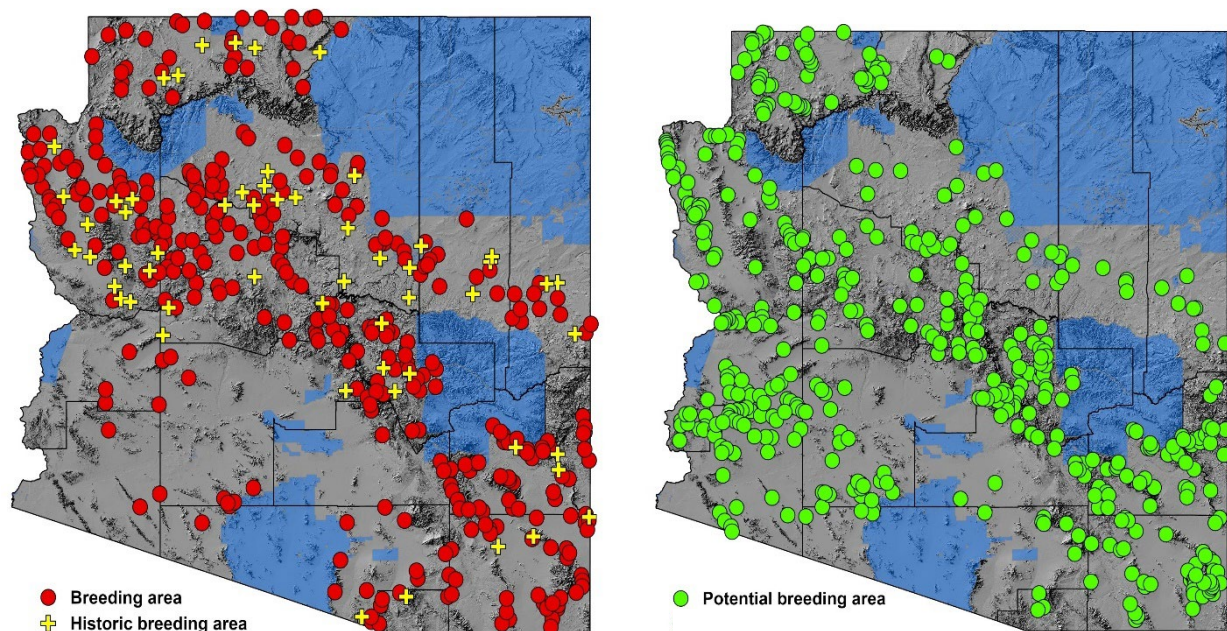


Figure 10. Maps of current and historic golden eagle breeding areas (left) and potential breeding areas (right) in Arizona, excluding Native American lands (blue shaded). County lines in black.

#### MANAGEMENT RECOMMENDATIONS

1. Future survey efforts should incorporate segments of suitable habitat within each of Arizona's three main BCR's that have not been fully explored:
  - a. In BCR 16, the Grand Wash Cliffs north of Grand Canyon, Andrus Canyon, Kanab Creek and tributaries (Grama and Hack Canyons), Kaibab Plateau, Saddle Mountain Wilderness Area, Marble Canyon, Grand Canyon National Park.
  - b. In BCR 33, portions of Yuma Proving Ground, Barry M. Goldwater Range (West), Organ Pipe National Monument, Cabeza Prieta National Wildlife Refuge, and Buckskin, Dome Rock, Eagletail, Gila Bend, Rawhide, and Trigo Mountains.
  - c. In BCR 34, portions of the Superstition Wilderness, southern Tonto National Forest, Coconino National Forest (Sedona area), Coronado National Forest (including portions of Atascosa, Chiricahua, Huachuca, Patagonia, Pinaleno, Santa Catalina, and Santa Rita Mountains), and Apache-Sitgreaves National Forest (Greenlee County; San Francisco and Blue Rivers).
2. Partner with tribes and Department of Defense to conduct nest inventory or occupancy surveys to fill in gaps of golden eagle breeding distribution.
3. Incorporate limited ground surveys into the monitoring plan to supplement aerial surveys. Observations from the ground would be especially beneficial January through March to detect occupancy.

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#### APPENDIX A: TERMINOLOGY AND RAPTOR REPRODUCTIVE STATUS CRITERIA

**Breeding Area (BA):** An area containing one or more nests within the range of a mated pair of birds displaying occupancy as described below. Operationally, once a BA is established, we consider it a BA whether it is occupied by eagles in a given year or not, until or unless it is designated historical (i.e., ten consecutive years unoccupied).

**Occupied BA:** An occupied BA must have a nest, which is any nest, where at least one of the following activity patterns was observed during the breeding season:

- a. Young were raised.
- b. Eggs were laid.
- c. One adult sitting low in a nest, presumably incubating.
- d. Two adults present on or near the nest.
- e. One adult and one bird in immature plumage at or near a nest, if mating behavior was observed (display flight, nest repair, copulation).
- f. A recently repaired nest with fresh sticks, or fresh boughs on top, and/or droppings and/or molted feathers on its rim or underneath.

**Active Nest:** A nest in which eggs have been laid. Activity patterns (a), (b), and (c) above are diagnostic of an active nest.

**Unoccupied BA:** A nest or group of nests at which none of the activity patterns diagnostic of occupancy were observed in a given breeding season. At least two visits are required with 30 days between visits in order to designate the site as unoccupied. Sites must have existed as occupied before they can be recognized and classified as an unoccupied BA.

**Historic BA:** A BA documented as having been unoccupied for ten consecutive years prior to the current year.

**Successful nest:** An active nest from which at least one young fledged during the breeding season under consideration. Nests were successful if at least one young was raised past 80% of fledging age.

**Failed nest:** An active nest from which no young fledged regardless of cause.

**Productivity:** The number of young fledged per occupied BA.

**Nest success:** The number of successful nesting attempts per occupied BA.

**Mean brood size:** The number of young produced per successful breeding attempt.

APPENDIX B: AREAS SURVEYED FOR GOLDEN EAGLES IN 2023

| Table 10. Summary of aerial survey areas and survey time in 2023. |                  |                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date                                                              | Duration (hours) | Locations surveyed                                                                                                                                                                                                                            |
| 2/21                                                              | 5.3              | Aubrey Peak Wilderness, Bill Williams Mountains, Bill Williams River, Black Mountains, Harcuvar Mountains, Peoples Canyon, Rawhide Mountains.                                                                                                 |
| 2/23                                                              | 4.8              | Coyote Peak, Harcuvar Mountains, Harquahala Mountains, Little Harquahala Mountains, Little Horn Mountains, New Water Mountains, Plomosa Mountains.                                                                                            |
| 2/24                                                              | 5.0              | Belmont Mountains, Big Horn Mountains, Eagletail Mountains, Gila Bend Mountains, Picacho Hills, Saddle Mountain, Turtleback Mountain.                                                                                                         |
| 2/27                                                              | 4.9              | Anderson Canyon, Black Rock, Canyon Diablo, Chevelon Butte, Chevelon Canyon, Clear Creek, Flying Butte, Grapevine Canyon, Jack's Canyon.                                                                                                      |
| 2/28                                                              | 6.0              | Black Canyon, Cerro Hueco, Clear Creek, Concho Creek, Cottonwood Wash, Dutch Mountain, Little Colorado River, Lyman Lake, Mesa Redonda, Pink Cliffs, Second Knolls, Silver Creek, Stinking Springs Mountain, Wolf Mountain, Ziegler Mountain. |
| 3/3                                                               | 4.3              | Apache-Sitgreaves National Forest, Blue Range Primitive Area, Coyote Creek, Little Colorado River, Nelson Reservoir, Nutrioso Creek.                                                                                                          |
| 3/22                                                              | 4.7              | Aguila Valley, Artillery Mountains, Aubrey Peak Wilderness, Harcuvar Mountains, Harquahala Mountains, Little Harquahala Mountains, Rawhide Mountains.                                                                                         |
| 3/23                                                              | 4.5              | Arrastra Mountain Wilderness, Black Mountains, Coyote Peak, New Water Mountains, Plomosa Mountains, Weaver Mountains.                                                                                                                         |
| 3/24                                                              | 6.6              | Castle Dome Mountains, Eagletail Mountains, Gila Bend Mountains, Little Horn Mountains, Palomas Mountains, Red Bluff Mountains, Saddle Mountain, Tank Mountains.                                                                              |
| 3/27                                                              | 4.2              | Anderson Canyon, Belmont Mountains, Black Rock, Big Horn Mountains, Canyon Diablo, Chevelon Butte, Chevelon Canyon, Clear Creek, Flying Butte, Grapevine Canyon, Jack's Canyon, Sugarloaf Mountain.                                           |
| 3/28                                                              | 6.2              | Black Canyon, Chevelon Canyon, Cerro Hueco, Concho Creek, Cottonwood Wash, Dutch Mountain, Little Colorado River, Lyman Lake, Pink Cliffs, Second Knolls, Silver Creek, Stinking Springs Mountain, Wolf Mountain, Ziegler Mountain.           |
| 5/4                                                               | 6.2              | Castle Dome Mountains.                                                                                                                                                                                                                        |
| 5/5                                                               | 4.5              | Castle Dome Mountains, Kofa Mountains.                                                                                                                                                                                                        |
| 5/16                                                              | 5.9              | Canyon Diablo, Chevelon Canyon, Clear Creek, Grapevine Canyon, Pink Cliffs, Second Knolls, Silver Creek.                                                                                                                                      |
| 5/18                                                              | 2.5              | Arrastra Mountain Wilderness, Eagletail Mountains, Harquahala Mountains, Sugarloaf Mountain.                                                                                                                                                  |
| 6/2                                                               | 4.3              | Chevelon Canyon, Clear Creek, Eagletail Mountains, Harquahala Mountains, Little Colorado River, Sugarloaf Mountain.                                                                                                                           |

APPENDIX C: 2023 GOLDEN EAGLE PRODUCTIVITY

| Table 11. Arizona golden eagle breeding area productivity, 2023. |      |        |                                   |      |                   |         |                   |         |
|------------------------------------------------------------------|------|--------|-----------------------------------|------|-------------------|---------|-------------------|---------|
| Area ID                                                          | Nest | Status | Incubation Range                  | Eggs | Hatch Range       | Hatched | Fledge Range      | Fledged |
| 1GE001                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 1GE002                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 1GE008                                                           | 0    | O      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 1GE009                                                           | 2    | S      | <2/28                             | 1    | 2/28-5/16         | 1       | 5/16-6/2          | 1       |
| 1GE017                                                           | 2    | S      | 2/28-3/28                         | 2    | 3/28-5/16         | 2       | >6/21             | 2       |
| 1GE019                                                           | 2    | S      | <3/3                              | 1    | 3/3-5/16          | 1       | >6/2              | 1       |
| 1GE052                                                           | 4    | S      | <2/28                             | 1    | 2/28-5/16         | 1       | >5/24             | 1       |
| 1GE053                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 1GE054                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 1GE055                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 1GE058                                                           | 5    | S      | <2/28                             | 1    | 2/28-5/16         | 1       | >5/24             | 1       |
| 1GE059                                                           | 1    | F      | 2/28-3/28                         | 1    | Failed 3/28-5/16. |         |                   |         |
| 1GE060                                                           | 1    | S      | <2/28                             | 1    | 2/28-5/16         | 1       | >5/24             | 1       |
| 1GE061                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 1GE062                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 1NE004                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 1NE006                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 1NE009                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 1NE011                                                           | 3    | S      | <2/27                             | 1    | 2/27-5/16         | 1       | >6/2              | 1       |
| 1NE012                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 1NE014                                                           | 8    | F      | <2/28                             | 1    | Failed 3/27-5/16. |         |                   |         |
| 1NE017                                                           | 3    | F      | <2/28                             | 1    | Failed 3/28-5/16. |         |                   |         |
| 1NE041                                                           | 3    | S      | <3/3                              | 1    | 3/3-5/16          | 1       | >5/16             | 1       |
| 1NE044                                                           | 3    | F      | <2/27                             | 1    | Failed 3/28-5/16. |         |                   |         |
| 2GE045                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 2GE074                                                           | 3    | F      | 2/27-3/27                         | 1    | Failed 3/27-5/16. |         |                   |         |
| 2GE075                                                           | 8    | S      | 2/28-3/27                         | 1    | 3/27-5/16         | 1       | >6/8              | 1       |
| 2NE073                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 2NE074                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 2NE075                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 2NE077                                                           | 2    | S      | <2/27                             | 1    | 2/27-3/27         | 1       | >5/16             | 1       |
| 2NE078                                                           | 0    | O      | Golden eagle standing in nest.    |      |                   |         |                   |         |
| 2NE080                                                           | 5    | F      | <2/27                             | 1    | 2/27-5/16         | 1       | Failed 3/27-5/16. |         |
| 3GE001                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 3GE002                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 4GE001                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 4GE003                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 4GE004                                                           | 0    | U      | All known nests empty. No eagles. |      |                   |         |                   |         |
| 4NE001                                                           | 3    | F      | 2/21-3/23                         | 1    | Failed 3/23-5/18. |         |                   |         |
| 4NE004                                                           | 7    | S      | <2/24                             | 2    | 3/27-5/18         | 2       | >6/2              | 1       |

<sup>1</sup>Breeding area identification code.

<sup>2</sup>F=failed; S=successful; O=occupied; U=unoccupied.

<sup>3</sup>Represents minimum number of eggs laid.

| Table 11 continued. |      |        |                                   |      |                   |         |              |         |
|---------------------|------|--------|-----------------------------------|------|-------------------|---------|--------------|---------|
| Area ID             | Nest | Status | Incubation Range                  | Eggs | Hatch Range       | Hatched | Fledge Range | Fledged |
| 4NE007              | 3    | S      | <2/24                             | 1    | 3/24-5/18         | 1       | >6/2         | 1       |
| 4NE027              | 1    | F      | <2/23                             | 1    | Failed 2/23-3/23. |         |              |         |
| 4NE031              | 1    | S      | <2/23                             | 1    | 3/22-5/18         | 1       | >6/2         | 1       |
| 4NE043              | 0    | U      | All known nests empty. No eagles. |      |                   |         |              |         |

<sup>1</sup>Breeding area identification code.

<sup>2</sup>F=failed; S=successful; O=occupied; U=unoccupied.

<sup>3</sup>Represents minimum number of eggs laid.