



Consultants in Natural Resources and the Environment

2023 Great Blue Heron Monitoring Survey Report Metzger Farm Open Space Westminster, Colorado

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Appendix A Photo Log

2023 Great Blue Heron Monitoring Survey Report

Metzger Farm Open Space

Westminster, Colorado

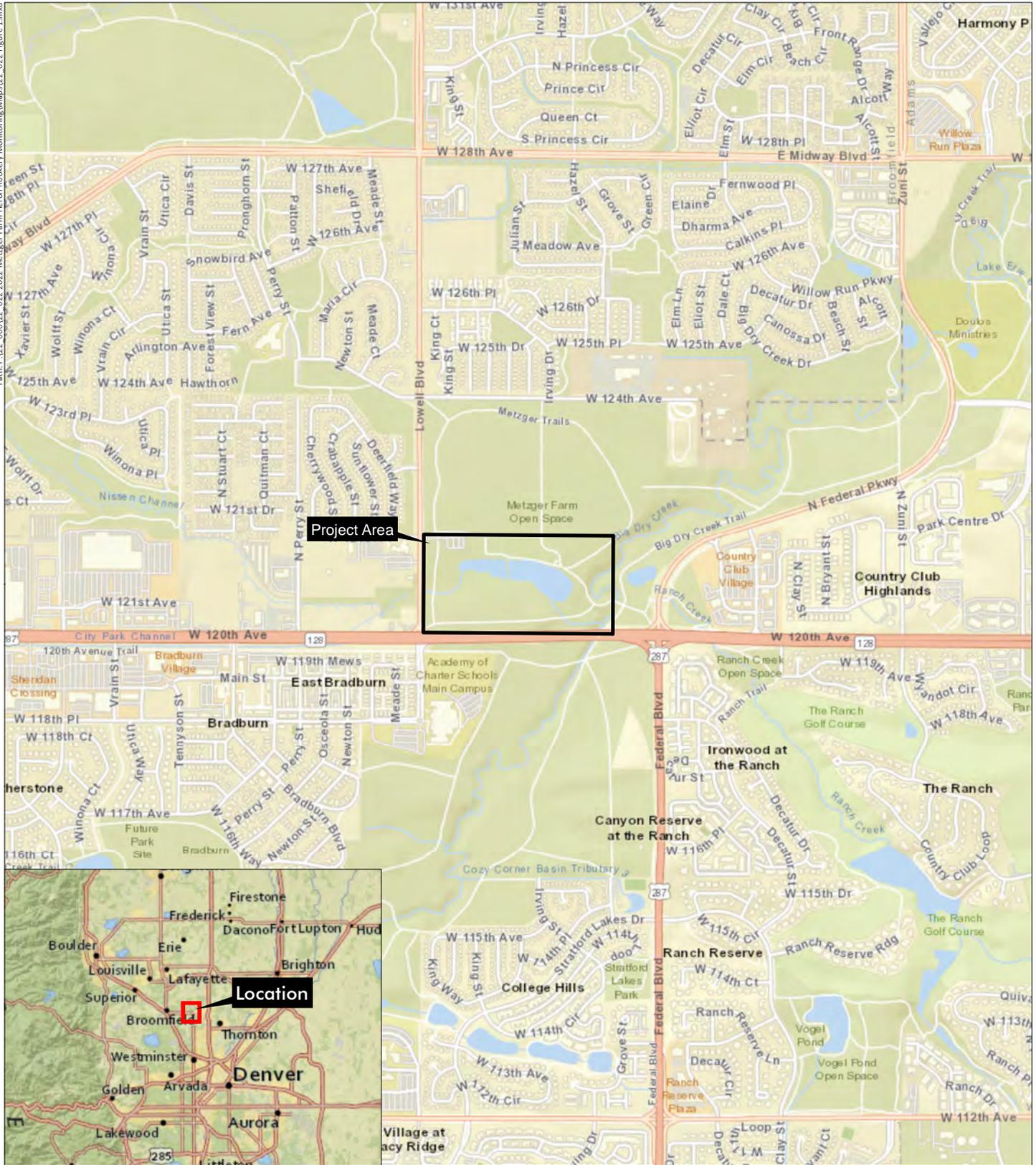
October 24, 2023

Introduction

The cities of Broomfield and Westminster (Cities), under the auspices of the Broomfield-Westminster Open Space Foundation, Inc., retained ERO Resources Corporation (ERO) to conduct great blue heron (heron - *Ardea herodias*) monitoring surveys for the Metzger Farm Open Space property in Westminster, Colorado (Metzger Farm; project area; Figure 1). A small heron rookery (rookery) occurs on the southeast shore of the Lower Pond (Figure 2). In spring 2012, open space amenities were built near the rookery, including construction of a new trail. The open space amenities contributed to increased recreation and the number of visitors to the area. Monitoring surveys of the rookery were conducted during the 2013 through 2023 heron breeding seasons to assess the status, activity, and viability of the rookery and to note any signs of disturbance associated with the increased recreational activities around the rookery.

The heron is a migratory bird species protected by international treaty under the Migratory Bird Treaty Act of 1918 (16 United States Code 703-711). Herons congregate during the breeding season in rookeries for the purpose of courtship, nest building, egg-laying and incubation, and chick rearing (Vermont Fish and Wildlife Department Agency of Natural Resources 2002). Heron colonies are dynamic and can vary annually, especially in areas of high disturbance (Butler 1992). Small colonies are less stable and relocate more frequently than colonies with more than 50 nests (Gebauer and Moul 2001). Individual nest site fidelity is apparently weak, with one study reporting that 13 of the 14 marked individuals chose different nests the following year (Simpson 1984). Colony size and location are related to the quality and quantity of nearby foraging areas (Vennesland and Butler 2011).

Response to disturbance can vary between sites and times of the breeding season (Vos et al. 1985). Herons are less tolerant of disturbance during the pre-nesting and courtship periods and become less likely to temporarily leave or abandon nests after laying eggs (Bowman and Siderius 1984; Rogers Jr. and Smith 1995). Herons often habituate to nonthreatening repeated activities, and colonies near existing human activities may tolerate more disturbance than colonies in undisturbed areas (Parker 1980; Vos et al. 1985; Simpson 1984; Webb and Forbes 1982; Bowman and Siderius 1984). According to the Colorado Breeding Bird Atlas (Wickersham 2016), courtship and nest building begin in late February and hatching occurs 25 to 29 days later. In Colorado, young are observed in heron nests during May, June, and July (Wickersham 2016).



Metzger Farm Open Space Heron Survey

Section 32, T1S, R68W; 6th PM
 UTM NAD 83: Zone 13N; 497392mE, 4418405mN
 Longitude 105.030515°W, Latitude 39.915734°N
 USGS Lafayette, CO Quadrangle
 Adams County, Colorado

Figure 1 Vicinity Map

Prepared for: Broomfield-Westminster
 Open Space
 File: 22_022 Figure 1.mxd (GS)
 April 20, 2023





Metzger Farm Open Space Heron Survey

- Observation Point
- Great Blue Heron Rookery, Nests A-F

Image Source: Google Earth©, June 10, 2021

Figure 2 Great Blue Heron Monitoring

Prepared for: Broomfield-Westminster
 Open Space
 File: 22_022 Figure 2.mxd (GS)
 April 20, 2023



Purpose

Before construction of new recreation facilities at Metzger Farm in 2012, the Cities retained ERO to conduct a general assessment of the project area, provide regulatory background, describe potential migratory bird issues, and recommend resolution to the identified issues. Based on these recommendations, the Cities installed signs and a fence as a barrier between the trail and rookery to discourage foot traffic near the rookery. The primary purpose of the monitoring surveys is to note heron behavior and response to the new facilities and increased recreational activities around the rookery throughout the nesting season. In addition, the monitoring surveys are used as periodic evaluations of the breeding status and reproductive success of herons nesting in the project area. A secondary objective of the surveys is to evaluate any interactions between the herons and other birds that nest in the vicinity.

Project Location

The project area is northeast of the West 120th Avenue and Lowell Boulevard intersection in Westminster, Colorado (Figure 1). The project area is in Section 32, Township 1 South, Range 68 West of the 6th Principal Meridian in Adams County, Colorado. The UTM coordinates of the approximate center of the project area are NAD 83; 497392mE, 4418405mN, Zone 13N. The longitude/latitude of the project area is -105.030515°W/39.915734°N. The elevation of the project area is approximately 5,230 feet above sea level.

Ecological Characteristics of the Site

The project area is an open space parcel surrounded by residential land, commercial land, and adjacent parks and open space (Figure 1 and Figure 2). Lowell Boulevard runs north and south along the western edge of the project area and West 120th Avenue runs along the southern project area boundary. The vegetation in most of the project area is dominated by upland species including cheatgrass (*Bromus tectorum*), smooth brome (*Bromus inermis*), Canada thistle (*Cirsium arvense*), streambank wheatgrass (*Elymus lanceolatus*), and crossflower (*Chorispora tenella*). Large plains cottonwood (*Populus deltoides*) and Russian olive (*Elaeagnus angustifolia*) trees border the southern and western edges of the Lower Pond, which has intermittent fringes of wetlands. The Upper Pond, located directly west of the Lower Pond, consists largely of a broadleaf cattail (*Typha latifolia*) marsh (Figure 2). Since construction of the new recreation facilities in 2012, only minor changes have occurred in or adjacent to the project area, including construction along West 120th Avenue directly south of the rookery during the 2016 and 2017 nesting seasons, and continuing improvements to on-site facilities, including the farmhouse and caretaker house.

Methods

The monitoring surveys were conducted from Observation Point A, the fishing dock on the north shore of the Lower Pond, and Observation Point B, the pavilion just north of the fishing dock. The surveys

were conducted at varying times of day, each lasting 30 minutes. In 2023, ERO biologists Emma Clary and Jared Dubiel conducted eight 30-minute surveys from April 18 through August 4, 2023 (Surveys 1 through 8). From April 18 through August 4, most of the surveys were conducted once every two weeks. During the surveys, ERO noted heron behavior, phases of nesting, breeding success, and the condition and effectiveness of the installed signs and fencing in minimizing human disturbance. ERO used an alphabetic system to document the progression of each heron nest in the rookery (Figure 3). The photo log is in Appendix A. ERO prepared an email for the Cities after each survey summarizing existing site conditions, heron behavior, and human activities.

Results

During the 2013, 2014, and 2021 breeding seasons, the rookery was divided between two adjacent trees, identified as the east and west rookery trees; meanwhile, during the 2016 through 2020, 2022, and 2023 breeding seasons, only the east tree was being used for nesting by the herons. At the beginning of the 2023 breeding season, ERO observed six active established heron nests (Nests A, B, C, D, E, and F) (Figure 3). Based on observations during ERO’s surveys, it appeared that egg laying and incubation likely occurred at Nests A, C, and D; however, there was no evidence of hatching. The three remaining nests (Nest B, E, and F) resulted in successful reproduction and fledging.

In previous years, red-tailed hawks (*Buteo jamaicensis*) and great horned owls (*Bubo virginianus*) nested close to the heron rookery. During the 2023 monitoring season, no breeding behavior or nesting activity was observed in the vicinity of the rookery by these species.

The following section contains details from the surveys during the 2023 breeding season.

Great Blue Herons

During the 2023 season, a total of four chicks were seen in the three successful active breeding nests. Table 1 summarizes the survey numbers for the herons in the rookery at Metzger Farm throughout the 2023 nesting season. ERO believes that all chicks fledged by Survey 8 as all the nests appeared inactive during the August 4 site visit.

Table 1. 2023 survey results for great blue herons in the project area at Metzger Farm.

| Survey # Date of Site Visit | Active Heron Nests | Adult Herons Observed | Heron Chicks/ Fledglings Observed | Disturbances from Human Activity or Interactions between Herons and Other Bird Species | Other Birds Observed in the Area |
|--------------------------------|--------------------|-----------------------|--------------------------------------|--|---|
| 1 4/18/2023 | 6 | 8 | 0 | None | Black-billed magpies, red-winged blackbirds, common mallards, Canada geese, common grackles, cormorant, and blue jay. |
| 2 5/8/2023 | 6 | 7 | 2 | None | Black-billed magpies, American robin, common mallards, snowy egret, common grackles, cormorant, and blue jay. |

2023 Great Blue Heron Monitoring Survey Report
 Metzger Farm Open Space
 Westminster, Colorado

| Survey # Date of Site Visit | Active Heron Nests | Adult Herons Observed | Heron Chicks/ Fledglings Observed | Disturbances from Human Activity or Interactions between Herons and Other Bird Species | Other Birds Observed in the Area |
|--------------------------------|--------------------|-----------------------|--------------------------------------|--|--|
| 3 5/25/2023 | 6 | 7 | 0 | None | Black-billed magpies, American robins, blue jay, house wrens, common yellowthroats, red-winged blackbirds, common grackles, cormorant, house finches, house sparrows, western meadowlarks, European starlings, American goldfinches, and northern rough-winged swallow. |
| 4 6/8/2023 | 6 | 7 | 3 | None | Black-billed magpies, American robins, blue jay, house wrens, red-winged blackbirds, common grackles, cormorant, American goldfinches, Swainson' hawk, lesser goldfinch, belted kingfisher, Lincoln's sparrow, barn swallow, bank swallow, common mallard, and northern rough-winged swallow. |
| 5 6/21/2023 | 6 | 7 | 2 | None | Black-billed magpies, American robins, western meadowlarks, blue jay, house wrens, red-winged blackbirds, common grackles, cormorant, American goldfinches, lesser goldfinch, house finch, European starlings, killdeer, song sparrow, barn swallow, and northern rough-winged swallow. |
| 6 7/5/2023 | 6 | 7 | 2 | None | Mourning doves, say's phoebe, northern flicker, American robins, western meadowlarks, blue jay, house wrens, red-winged blackbirds, common grackles, lesser goldfinch, house finch, European starlings, song sparrow, and northern rough-winged swallow. |
| 7 7/17/2023 | 6 | 4 | 0 | None | Cormorant, black-crowned night heron, northern flicker, blue jay, house wrens, red-winged blackbirds, common grackles, lesser goldfinch, house finch, song sparrow, cliff swallow, northern rough-winged swallow, belted kingfisher, black-capped chickadee, mallards, and American goldfinch. |
| 8 8/4/2023 | 0 | 0 | 0 | None | Blue jay, American robins, common grackles, house finch, black a song sparrow, cliff swallow, northern rough-winged swallow, and black-capped chickadee. |

During Survey 1 on April 18, 2023, ERO observed eight adult herons and six active nests (Nests A, B, C, D, E, and F), as well as one nest in the process of being built (Photo 1). Each of the six established nests had an adult heron either settled within or perched on it.

During Survey 2 on May 8, 2023, ERO observed seven adult herons and six active nests (Nests A, B, C, D, E, and F). The nest being built during Survey 1 was not completed, and no herons were observed using this nest for the remainder of the 2023 breeding season. All the active nests were attended by at least one adult heron throughout the survey, with the adult herons either incubating or perched within the nests. One adult heron was observed leaving the rookery to fly north at the beginning of the survey. An adult was observed feeding two chicks in Nest E (Photo 2).



Metzger Farm Open Space Heron Survey

Figure 3
Great Blue Heron Nesting Sites

Prepared for: Broomfield-Westminster
Open Space
File: 22_022Figure 3.pdf
April 20, 2023



During Survey 3 on May 25, 2023, ERO observed seven adult herons in the six active nests (Nests A, B, C, D, E, and F). All the active nests were attended by at least one adult heron throughout the survey, with the adult herons either incubating within or perched on the nests (Photo 3). No chicks were observed throughout the duration of the survey; however, it was assumed that two chicks were in Nest E where they were observed during the previous survey.

During Survey 4 on June 8, 2023, ERO observed seven adult herons in the six active nests. All of the active nests were attended by at least one adult heron throughout the survey, with the adult herons either brooding within or perched on the nests. Two fledglings were observed standing with adults on Nest E (Photo 4). One chick was observed in Nest F being fed and standing up in the nest (Photo 5).

During Survey 5 on June 21, 2023, ERO observed seven adult herons in the six active nests. All of the active nests were attended by at least one adult heron throughout the survey, with the adult herons either brooding or incubating within or perched on the nests. Two fledglings were observed standing with two adults on Nest E. One adult was observed perched in a tree just west of Nest F. No chicks were observed during the duration of the survey, although the presence of the chick in Nest F was assumed based on observations during the previous survey.

During Survey 6 on July 5, 2023, ERO observed seven adult herons and six active nests. All the active nests were attended by at least one adult heron throughout the survey, with the adult herons either brooding or incubating within or perched on the nests. One fledgling was observed standing with two adults on each Nest B and Nest E (Photo 6). It is highly likely that a chick was present in Nest B during previous surveys, but it could not be viewed due to the dense foliage and the angles of the observation points. Two adults were also observed in Nest C. No young chicks were observed during the duration of the survey.

During Survey 7 on July 17, 2023, ERO observed four adult herons and six active nests. Nests C and D were occupied by one adult, and Nest F had two adults present at the beginning of the survey, with one adult flying away during the survey (Photo 7). No herons were observed in Nests A, C, or D, and no chicks or fledglings were observed in these nests during previous surveys, which suggests hatching failure. ERO assumed that these remaining nests were no longer active since no adults were observed in the nests or around the pond.

During Survey 8 on August 4, 2023, ERO did not observe any adult or young herons (Photo 8). Based on previous observations, it was concluded that young successfully fledged from Nests B (one young), E (two young), and F (one young), and that Nests A, C, and D failed. Based on ERO's observations during this survey, ERO assumed that all of the nestlings had fledged.

Great Horned Owls

During the 2015 and 2016 breeding seasons, great horned owls were observed nesting in or adjacent to the heron rookery. During the 2017 breeding season, one great horned owl nest was active near residential structures on the Metzger Farm property; however, the nest was destroyed during a

windstorm in mid-April. During the 2018 surveys, great horned owls were seen near the residential structures, but no interactions between the owls and the herons were observed. During the 2019 breeding season, ERO observed an adult great horned owl and three owl nestlings in trees southeast, adjacent to the rookery and, according to local birdwatchers, all three nestlings fledged. During the 2020 breeding season, no great horned owls or nests were observed during the surveys. In 2021, three juvenile owls were observed during the June 23 site visit; however, no nest was found in the trees near the heron rookery. During the 2022 and 2023 breeding seasons, no great horned owls were observed near the rookery.

Red-Tailed Hawks

A red-tailed hawk nest was observed during the 2013 and 2014 breeding seasons immediately south of the heron rookery. In 2015 and 2016, the red-tailed hawk nest was relocated to a plains cottonwood tree east and adjacent to the rookery. No red-tailed hawks were observed near the rookery throughout the 2017 nesting season. In 2018, an active red-tailed hawk nest with one nestling was observed in the east rookery tree. In 2019, 2020, 2021, 2022, and 2023, no red-tailed hawk nests or breeding activity were seen near the rookery and no interactions were observed between the herons and red-tailed hawks.

Other Migratory Birds

In addition to the herons, several other migratory birds were observed nesting or foraging in the project area during the 2023 surveys, including Canada goose (*Branta canadensis*), red-winged blackbird (*Agelaius phoeniceus*), common yellowthroat (*Geothlypis trichas*), barn swallow (*Hirundo rustica*), house wren (*Troglodytes aedon*), black-billed magpie (*Pica hudsonia*), American robin (*Turdus migratorius*), black-capped chickadee (*Poecile atricapillus*), blue jay (*Cyanocitta cristata*), European starling (*Sturnus vulgaris*), northern rough-winged swallow (*Stelgidopteryx serripennis*), mourning dove (*Zenaidura macroura*), common grackle (*Quiscalus quiscula*), gray catbird (*Dumetella carolinensis*), double-crested cormorant (*Phalacrocorax auritus*), mallard (*Anas platyrhynchos*), and snowy egret (*Egretta thula*). Over the years, black-crowned night herons (*Nycticorax nycticorax*) frequently perched in a dense Russian olive tree stand in the western portion of the Lower Pond. ERO observed this species in the same area several times during the 2013 through 2017 and 2022 breeding season surveys, and once during the 2019, 2021, and 2023 breeding season surveys.

Conclusion and Discussion

Hérons successfully nested and produced young relatively close to the recreation areas at Metzger Farm from 2013 to 2023. Table 2 lists the timeline of several key life stages, the dates they transpired, and the final productivity of the heron rookery during the 2013 through 2023 nesting seasons. The following paragraphs provide a brief summary of annual heron nesting at Metzger Farm.

2013 Nesting Season: Five active heron nests produced chicks. At least five individual chicks successfully fledged during the 2013 nesting season.

2014 Nesting Season: Eight active nests were observed with heron chicks observed in all the nests, and 18 individual chicks successfully fledged during the 2014 nesting season. However, there may have been more individuals that were not seen during the monitoring survey times or that were not visible due to dense foliage.

2015 Nesting Season: Three nests produced chicks, with at least 10 individual chicks successfully fledging.

2016 Nesting Season: Three nests produced chicks, with nine chicks successfully fledging. Despite the territorial behavior by great horned owls, winter storm events, and adjacent construction, only one less heron chick successfully fledged during the 2016 nesting season than during the 2015 nesting season.

2017 Nesting Season: With one productive nest, the herons successfully fledged three chicks, six less than in 2016.

2018 Nesting Season: One nest produced four chicks, three of which had successfully fledged at the time of the August 10 site visit.

2019 Nesting Season: Three nests produced chicks, with 8 of the 10 fledging successfully by the August 2 site visit.

2020 Nesting Season: Five nests produced chicks, with 9 of the 10 fledging successfully by the July 24 site visit. One nestling was confirmed dead.

2021 Nesting Season: Six nests produced chicks, with 17 chicks fledged by the July 30 site visit.

2022 Nesting Season: During Survey 4, it was clear that five nests had produced a total of seven chicks. Based on observations during the remaining surveys, ERO believes all seven chicks successfully fledged.

2023 Nesting Season: Three nests produced chicks, with four chicks fledged by the August 4 site visit.

Table 2. 2013 through 2023 nesting season summary.

| Season | Onset of Nest Building | Confirmed Incubation | Date First Chick Observed | Fledging Range | Number of Productive Nests | Maximum Number of Chicks Observed | Productivity (Average Number of Chicks per Nest) |
|--------|------------------------|----------------------|---------------------------|----------------|----------------------------|-----------------------------------|--|
| 2013 | Before 5/3 | Before 5/3 | 5/3 | 6/14-7/9 | 5 | 5 | 1 |
| 2014 | Before 3/28 | 4/10 | 5/6 | 6/20-8/15 | 8 | 18 | 2.25 |
| 2015 | Before 3/14 | 4/8 | 5/11 | 6/18-7/23 | 3 | 10 | 3.33 |
| 2016 | Before 3/28 | 4/5 | 5/10 | 6/24-7/29 | 3 | 9 | 3 |
| 2017 | Before 5/12 | Before 5/12 | 5/12 | 6/22-7/21 | 1 | 3 | 3 |
| 2018 | Before 5/8 | Before 5/8 | 6/14 | 7/11-8/10 | 1 | 4 | 4 |
| 2019 | Before 4/19 | 4/19 | 5/17 | 6/21-8/2 | 3 | 8 | 2.66 |
| 2020 | Before 5/13 | 5/13* | 5/13 | 5/13-7/24 | 5 | 9 | 1.8 |
| 2021 | Before 5/10 | 5/10* | 6/10 | 7/24-7/30 | 6 | 17 | 2.83 |
| 2022 | Before 4/15 | Before 5/3 | 5/20 | 6/17-7/25 | 5 | 7 | 1.4 |
| 2023 | Before 4/18 | Before 5/8 | 5/8 | 6/8-7/17 | 3 | 4 | 1.33 |

*Official ERO monitoring began on these dates, but incubation had already begun in some nests.

Based on the results of the monitoring surveys during the 2013 through 2023 seasons, nesting at the Metzger Farm rookery has been continuous; however, there have been variances in the number of productive nests and the number of chicks (Table 2). In 2014, the most active nests and number of chicks were observed. Since 2014, the number of active nests and chicks decreased, with only one active nest during the 2017 and 2018 seasons. The total breeding production at the rookery increased in 2019, with three active nests compared to one the previous year, and four more chicks successfully fledging (Table 2). In 2020, the total breeding production at the rookery increased again, with five productive nests compared to three, and one more chick successfully fledging (Table 2). In addition, although they were not productive and no incubation behavior was observed, during the 2020 breeding season, ERO observed two additional nests attended by adult herons at the rookery. The number of active nests and total number of fledglings increased again in 2021, nearly doubling what was observed in 2020 and showing a trend of growth since the 2018 breeding season. In addition, the survival rate in 2021 was higher than in the previous breeding season. During the 2022 breeding season, the number of active nests and total number of fledglings were similar to the results from the 2020 breeding season. Events including the windstorm and predation resulted in the loss of two active nests and two adult herons during the 2022 breeding season, which likely affected productivity and success in the rookery. The 2023 season saw a decrease in productive nests, potentially as a result of a delayed breeding season due to unusually high amounts of precipitation and inclement weather early in the year. Unfavorable weather conditions likely contribute heavily to lower hatching success (Page 1975).

Numerous factors (listed below), either independently or in combination, may account for the variability in active nests and chicks observed since 2013, particularly during the 2017, 2018, 2022, and 2023 breeding seasons. Based on ERO's observations, these factors may have contributed to the seasonal timing of the breeding but not to the survival rate of the nestlings. Of note, evidence suggests small colonies are less stable and generally have lower productivity than large colonies (Butler 1995).

- **Weather** – The weather has been shown to affect the foraging behavior and success of several avian species (Bovino and Burt 1979). In 2017, the large number of rainstorms and occasional snowfall in late spring may have contributed to the abandonment of previously active nests. In addition, the weather in the spring and early summer of 2019 was unusually severe including snow in late May and a severe thunderstorm with high-velocity rain and hail in the area in July, which may have contributed to the mortality of two chicks. The wet spring in 2021 and 2023 may have contributed to the heron's later nesting date than in other years. A large windstorm early in the 2022 breeding season also resulted in the death of an adult and the destruction of two nests. It is likely that in 2023, hatching failed in three of the nests due to heavy and frequent rain throughout the breeding season.
- **Increased recreation, nearby construction, and unauthorized disturbance** – Herons are particularly susceptible to disturbance while nesting. Although response varies among sites and relative to the stage of nesting, nest site and colony abandonment can occur because of human activities within 0.3 mile. Some colonies or members of a colony can be easily disturbed early in the nesting season and may even move or abandon the nest when people approach on foot to within a few hundred yards (Butler 1992). Traffic along West 120th Avenue, within 320 feet of the heron rookery, occurs throughout the year. Additionally, recreationists, including walkers, runners, and fishermen, have been observed along the trails and the northern bank of the Lower

Pond in the project area in previous breeding seasons. Construction was also present near the rookery during the 2016 and 2017 nesting seasons. No disturbance indicators or behavioral reactions to human presence or human activities were observed during the 2018 through 2023 breeding seasons.

- **Predation risk** – Adult herons are occasionally preyed on or attacked by hawks and owls, but predation is not a limiting factor on their populations (Canadian Wildlife Service 1990). The eggs and young can be heavily preyed upon in the nest by crows, ravens, hawks, owls, gulls, and raccoons (Butler 1992). When predation on an adult or chick occurs at a breeding colony, the other birds sometimes abandon the colony (R. Butler 1991). During the 2016 season, several aggressive and territorial interactions were observed between nesting herons and great horned owls at the rookery. During the 2022 breeding season, a coyote is known to have caught and preyed on one adult heron. No predation was observed by ERO during the 2023 breeding season.
- **Food resources** – Studies have shown that the number of heron breeding pairs is positively and significantly correlated with the area of suitable foraging habitat (R. Butler 1991). Therefore, if there is more competition for food or less food resources in an area, the area is less likely to support a heron colony.

Based on the results of the monitoring surveys, it appears that the colony is habituating to existing levels of human activity and other stressors in the area and has had successful breeding seasons. The more permanent signage and barrier fencing installed between the Upper and Lower Ponds and along the northeastern edge of the Lower Pond appear to be keeping human activity limited to the designated trails. In addition, no great horned owls or red-tailed hawks were observed nesting near the rookery in 2023 and no interactions were observed between the herons and great horned owls or red-tailed hawks during the 2019 through 2023 monitoring surveys. The previous increase in active and successful heron nests at the rookery during the 2019, 2020, and 2021 seasons could be associated with one discrete factor, or a combination of factors, including those discussed above.

References

- Bovino, R. Russell, and Edward H. Burt. 1979. "Weather-Dependent Foraging of Great Blue Herons (*Ardea Herodias*).” University of Tennessee Department of Psychology.
- Bowman, I., and J. Siderius. 1984. "Management Guidelines for the Protection of Heronries in Ontario.” Toronto, Ontario, Canada: Ontario Ministry of Natural Resources, Wildlife Branch.
- Butler, Robert. 1991. "Habitat Selection and Time of Breeding in The Great Blue Heron (*Ardea Herodias*).” University of British Columbia.
https://publications.gc.ca/collections/collection_2021/eccc/cw66/CW66-738-1991-eng.pdf.
- Butler, Robert W. 1992. "Great Blue Heron (*Ardea Herodias*).” In *The Birds of North America*, No. 25. Philadelphia, PA: The Birds of North America, Inc.

- Butler, Robert W. 1995. *The Patient Predator: Foraging and Population Ecology of the Great Blue Heron (Ardea Herodias) in British Columbia*. Occasional Paper Number 86. Ottawa, Ontario, Canada: Canadian Wildlife Service.
- Canadian Wildlife Service. 1990. "Hinterland Who's Who: Great Blue Heron." <http://www.cwssc.ec.gc.ca/hww-fap/heron/heron.html>.
- Gebauer, M.B., and I.E. Moul. 2001. "Status of the Great Blue Heron in British Columbia. B.C." Wildlife Working Report WR-102. Victoria, BC: Ministry of Environment, Lands and Parks Wildlife Branch.
- Page, P. J. 1975. "Breeding Biology of the Great Blue Heron in the San Joaquin River Heronry." Thesis. Fresno, California: California State University.
- Parker, J. 1980. "Great Blue Herons (Ardea Herodias) in Northwestern Montana: Nesting Habitat Use and the Effects of Human Disturbance." Thesis. Missoula, Montana: University of Montana.
- Rogers Jr., J.A., and H.T. Smith. 1995. "Set-Back Distances to Protect Nesting Bird Colonies from Human Disturbance in Florida." *Conservation Biology* 9:89–99.
- Simpson, Keith. 1984. "Factors Affecting Reproduction in Great Blue Herons (Ardea Herodias)." Thesis. Vancouver, Canada: University of British Columbia.
- Vennesland, R.G., and Robert W. Butler. 2011. "Great Blue Heron (Ardea Herodias)." In *The Birds of North America*. Vol. Version 2.0. Ithaca, NY: Cornell Lab of Ornithology.
- Vermont Fish and Wildlife Department Agency of Natural Resources. 2002. "Guidelines for Protection and Mitigation of Impacts to Great Blue Heron Rookeries in Vermont." January.
- Vos, Diana K., Ronald A. Ryder, and Walter D. Gaul. 1985. "Response of Breeding Great Blue Herons to Human Disturbance in North Central Colorado." *Colonial Waterbirds* 8(1):13–22.
- Webb, R.S., and L.S. Forbes. 1982. "Colony Establishment in an Urban Site by Great Blue Herons." *Murrelet* 63:91–92.
- Wickersham, J.L. 2016. "Colorado Breeding Bird Atlas (L. E. Wickersham, Ed.)." In Colorado Breeding Bird Atlas, 172–73. Colorado Bird Partnership and Colorado Parks and Wildlife.

PHOTO LOG
METZGER FARMS OPEN SPACE
BROOMFIELD, COLORADO
APRIL 18 THROUGH AUGUST 4, 2023



Photo 1 - Two adult herons constructing a nest during Survey 1. View is south.



Photo 2 - One adult heron feeding two chicks in Nest E during Survey 2. View is south.

PHOTO LOG
METZGER FARMS OPEN SPACE
BROOMFIELD, COLORADO
APRIL 18 THROUGH AUGUST 4, 2023



Photo 3 - One adult heron perched in a nest during Survey 3. View is south.



Photo 4 - Two fledgling herons and two adults perched next to Nest E during Survey 4. View is south.

PHOTO LOG
METZGER FARMS OPEN SPACE
BROOMFIELD, COLORADO
APRIL 18 THROUGH AUGUST 4, 2023



Photo 5 - One adult heron and a nestling heron during Survey 4. View is south.



Photo 6 - Two adult herons and a fledgling perched during Survey 6. View is south.

PHOTO LOG
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Photo 7 - One adult heron brooding in a nest during Survey 7. View is south.



Photo 8 - Inactive rookery observed during Survey 8. View is south.