

# Boulder Reservoir 2014 Birds of Special Concern Monitoring Report



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## **Introduction**

The marshes and grasslands surrounding Boulder Reservoir support more nests of Boulder County birds of special concern than any other comparably sized area in the county (Hallock and Jones 2010). American Bitterns (Boulder County isolated and restricted) and Northern Harriers (Boulder County rare and declining) have nested in wetlands west of Coot Lake and west of Boulder Reservoir (Hallock and Jones 2010, Jones 2013b). The harrier nests were the only successful ones observed in Boulder County from 2004-13 (Jones 2013a).

Burrowing Owls (Boulder County isolated and restricted) have nested in prairie dog colonies west and north of the reservoir and east of the reservoir dam (Jones and Mahoney 2003, Jones 2013). Boulder Reservoir is one of only two locations in the county where Burrowing Owl nesting activity has been reported within each of the past four decades (Hallock and Jones 2013, Jones and Mahoney 2003).

Ospreys (isolated and restricted) have nested in the Little Dry Creek and Dry Creek wetlands, west of the reservoir, and on the North Rim open space property 1.5 km northwest of the reservoir. The Little Dry Creek site was the first documented Osprey nesting site in Boulder County (Boulder County Nature Association, unpublished data).

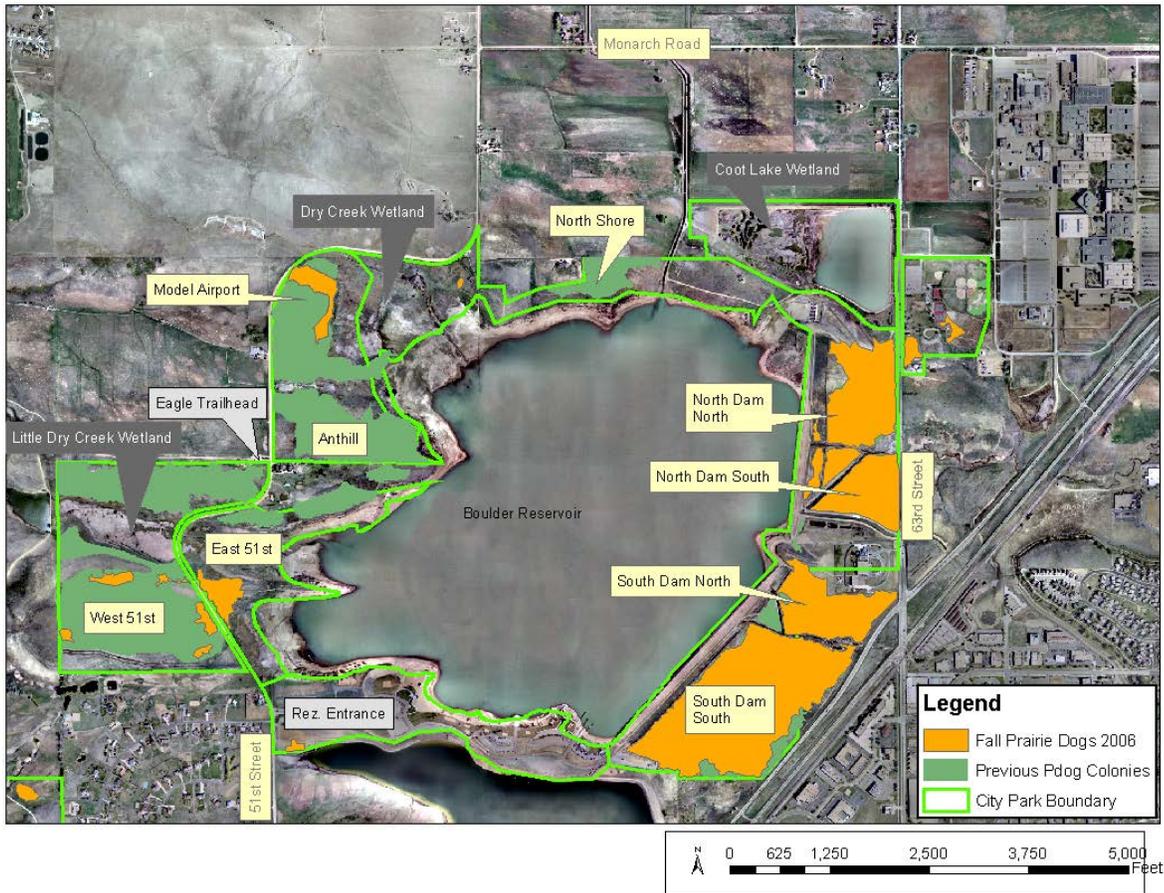
Since 2004 Boulder Parks and Recreation Department volunteers have monitored nesting activities of these and other birds of concern within Parks and Recreation properties surrounding the reservoir and Coot Lake. During 2014, 29 volunteers devoted approximately 388 hours (126 hours in training, 262 hours of fieldwork and commuting) to this monitoring effort.

Locating nest sites, tracking nesting success, and monitoring human activities that might disturb active nests all contribute to conservation of species of concern on Boulder Parks and Recreation Department properties. Since Boulder Reservoir is visited by tens of thousands of recreationists each year, nest monitoring can be particularly helpful to land managers wishing to designate and protect sensitive wildlife areas.

## **Methods**

Each volunteer was assigned to one of three areas--Coot Lake wetland, Little Dry Creek wetland, or Dry Creek wetland--and asked to visit the assigned area once monthly, May-July, during early morning or early evening. Volunteers listened and watched for target species for at least 60 minutes from designated observation points and/or while walking on roads or trails near their assigned areas. In addition, each volunteer was assigned a prairie dog colony to monitor for burrowing owls and asked to scan the colony with binoculars for at least 10 minutes from each of two survey points, once monthly, May-July. Volunteers were asked to report any sign of burrowing owl activity (including white excrement on prairie dog burrows) within each colony during each 20-minute observation (Figure 1, Table 5).

Figure 1. Location of Monitored Prairie Dog Colonies



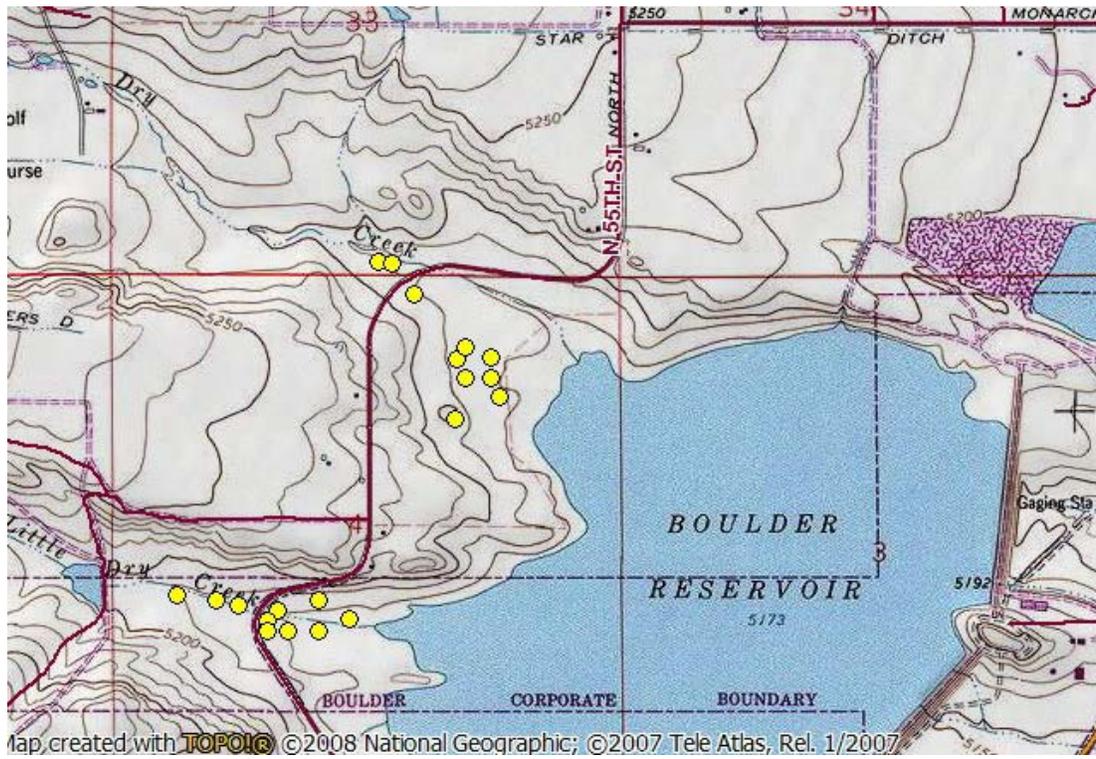
## Results and Discussion

### American Bittern (Boulder County Isolated and Restricted)

During 2014 we saw or heard American Bitterns at five locations: Dry Creek wetland north of the Anthill, Dry Creek wetland west of N. 53rd St., Dry Creek wetland 50-100 m north of the Boulder aeromodeling facility, and Little Dry Creek Wetland both east and west of North 51st Street (Figure 2). One to three adults were heard calling at several locations within the Dry Creek marshes on 6, 15, 17, and 21 May; and on 1 and 4 June. Two American Bitterns were observed flying over these marshes on 7 June, and a single bittern was observed flying over the marshes on 9, 13, and 17 June. We observed no evidence of successful nesting, but monitors did see as many as four bitterns flying at one time within the Little Dry Creek drainage.

Three calling bitterns were heard, and one seen flying, in the Little Dry Creek wetland west of North 51st Street on 5 May and four were observed flying over the marsh on both sides of the road on 29 June, suggesting the likelihood of two nesting territories. Bitterns were also heard calling in the Little Dry Creek marsh on 16, 18, 20, 24, 25, and 30 May; and 16 and 25 June. One or more bitterns were seen perching in or flying over the marsh on 18, 20, and 24 May; and 1, 24, and 25 June (Figure 2).

Figure 2. American Bittern 2014 approximate sighting locations.



American Bitterns lay their eggs on platform nests constructed in dense emergent vegetation or, less frequently, in dense grasslands (Gibbs, Melvin, and Reid 2009). North American nesting success appears highest within large unfragmented marshes (Gibbs, Melvin, and Reid 2009). As a result of fragmentation and loss of wetlands, along with pesticide contamination and human disturbance of marshes, North American breeding populations have declined since 1966 (Kingery 1998, Gibbs, Melvin, and Reid 2009). Sauer, Hines, and Fallon (2012) reported an annual rate of decline of nearly 1.8% from 1966-2011 on North American Breeding Bird Survey routes.

Strategies that increase the size of marshes and protect them from disturbance by humans and pets should benefit nesting bitterns. In Boulder County the species is still limited to fewer than a dozen documented nesting sites, and eight of these are in wetlands adjacent to Boulder Reservoir, privately-owned Six-Mile Reservoir, and Coot Lake. All of the sites are in small (< 5 ha) cattail marshes near reservoirs or within the St. Vrain Creek or Boulder Creek floodplains, and most lie in areas that are fragmented by mining, farming, roads, or trails.

All but one of the known sites (Six-Mile Reservoir) lie on public lands, but their vulnerability to urban-adapted predators and proximity to recreational trails may limit nesting success. Young bitterns are difficult to detect among the cattail foliage, and any attempt to count or band young would require a significant amount of disturbance of nesting areas. Therefore, it seems most prudent to continue to monitor sites from afar, limit human encroachment within 200 m of any active nests, and strive to expand the areas of protected cattail marshes and surrounding wetlands.

Table 1. Nesting Season Observations of American Bittern.

Site	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Coot Lake	2 young	active	active	active	active	inactive	active	active	active	pair	inactive
Dry Creek	inactive	inactive	active	1 yg.	active	active	2 yg.	2 terr.	2 terr.	3 terr.	3 terr.
L. Dry Cr.	active	active	active	active	active	active	inactive	active	pair	inactive	2 ter.

Active: observed in area; Failed: nesting noted, but no young survived; Inactive: none observed in area; Pair: copulation or territorial behavior; Fledged: young able to fly from nest; Territories: nesting territory established.

Figure 3. American Bittern 2004-13 suspected territories, with years suspected active.



**Northern Harrier (Boulder County Rare and Declining)**

We observed a pair of Northern Harriers flying low over the Little Dry Creek wetlands, carrying nesting material, and chasing away other raptors on 1 April. On 30 April and 1 May, several food deliveries by the male and food exchanges between the male and female over a location in the marsh 70-100 m west of North 51st Street suggested that the female had begun incubating in that location. The adult male was observed hovering over the marsh or chasing birds or coyotes away from the suspected nest location on 16, 17, 18, 20, 21, 23, 24, and 25 May.

On 25 May the female joined the male in attacking an American Bittern that had wandered near the nest, and on 30 May the adult male and adult female were seen flying together over the marsh. On 4 June both adults were observed flying and hunting away from the presumed nest location for most of a two-hour observation. From these observations, we conclude that the eggs probably had hatched by 25-30 May.

On 25 June volunteers observed two fledged Northern Harriers perching on the ground and in trees on the edge of the marsh. During the same time, the female delivered prey to the nest, suggesting that a third fledgling was still perched in the marsh. The two fledglings were observed sporadically perching near or flying over the marsh until 8 July and were observed again on the west side of the reservoir in late August. So we conclude that the nest fledged two or three young, of which two probably survived two months or more after fledging.

We began annual monitoring of nesting Northern Harriers within the study area in 2004 (Table 2, Figure 4). Successful nesting occurred in the Coot Lake wetlands in 2004 (4 young fledged), in the Little Dry Creek wetlands in 2004 (4 young fledged) and 2009 (4 young fledged), and in the Dry Creek wetlands in 2010 (3 young fledged). Unsuccessful nesting occurred in the Little Dry Creek wetlands in 2005 and 2007-8 and in the Dry Creek wetlands in 2006, 2008, and 2011. No apparent nesting was observed during 2012 or 2013. The successful 2014 nest was the fifth successful nest reported within the study area during 11 years of observation.

The total of only 18 young fledged from at least 11 nesting attempts since 2004 is probably not enough to sustain a viable nesting population (Johnsgard 1990).

Table 2. Nesting Season Observations of Northern Harrier.

Site	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Coot Lake	4 fledged	pair	inactive	inactive	inactive	inactive	inactive	inactive	inactive	inactive	Inactive
Dry Creek	inactive	inactive	failed	inactive	failed	inactive	3 fledged	failed	inactive	inactive	Inactive
L. Dry Creek	4 fledged	pair	2 failed	failed	failed	4 fledged	inactive	inactive	inactive	inactive	3 fledged

Active: observed in area; Failed: nesting noted, but no young survived; Inactive: none observed in area; Pair: copulation or territorial behavior; Fledged: young flying from nest; Territories: nesting territory established.

A second successful Northern Harrier nest in Boulder County, located near Saint Vrain Creek south of Hygiene, fledged at least three young in late June (Will Keeley, Boulder Open Space and Mountain Parks, pers. comm.). This observation, combined with the successful nest west of Boulder Reservoir, makes 2014 the first year since 2004 when more than one successful Northern Harrier nest has been documented in Boulder County.

Northern Harrier nesting populations have declined throughout many regions of North America. The North American Breeding Bird Survey (Sauer et. al. 2012) reported a 2% annual decline in Northern Harrier observations from 1966-2011 throughout the shortgrass and mixed-grass prairie regions of the Great Plains. Fragmentation of wetland breeding habitats by agriculture, along with poisoning of rodent prey by herbicides and pesticides, have probably contributed to this decline (Smith et. al. 2011).

It's likely that fragmentation of potential nesting habitat by roads, agriculture, and other human activities severely limits Northern Harrier nesting opportunities and nesting success in Boulder County. Nests situated in smaller, fragmented marshes may be more susceptible to predation by carnivores and raptors (Smith et. al. 2011). We've often observed coyotes nosing around Northern Harrier nesting areas west of the reservoir and Red-tailed Hawks harassing nesting harriers (Jones 2006-13).

Figure 4. Northern Harrier 2014 Approximate Nest Location.

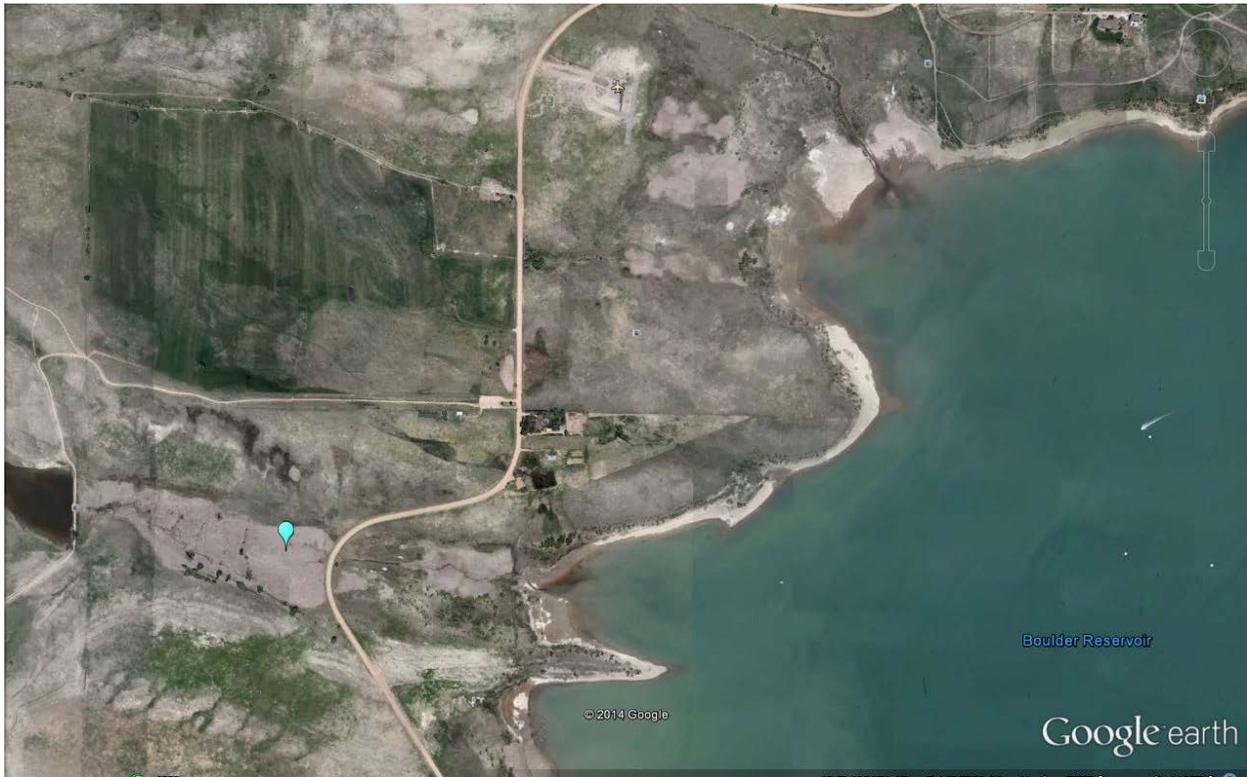
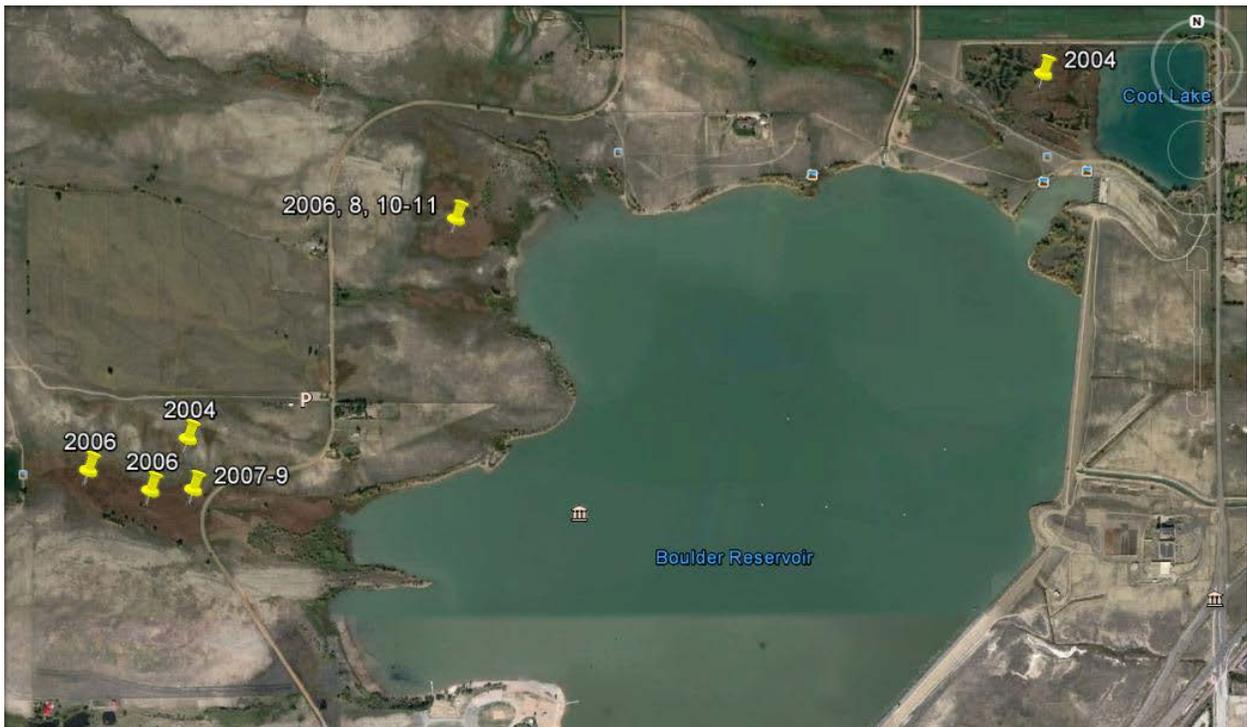


Figure 5. Northern Harrier 2004-13 approximate nest locations near Boulder Reservoir.



Based on recent observations, Northern Harrier appears to be among the most endangered nesting bird species in Boulder County (see Hallock and Jones 2010). Therefore, every effort should be undertaken to protect and expand potential nesting areas. The Colorado Division of Wildlife gives no nesting buffer recommendations for Northern Harrier, but they do recommend 400 m buffers (no human activity or new occupation) for similar-sized Swainson's Hawks and 800 m nest buffers for Prairie Falcon, Peregrine Falcon, and Northern Goshawk (Colorado Division of Wildlife 2008); so 400 m seems a minimal buffer for Northern Harrier nests, especially considering their nests are located on the ground and particularly vulnerable to disturbance by roaming hikers and dogs. Encroachment by hikers and their dogs into the closed area along the northwestern shoreline of the reservoir was reported on several occasions by volunteers during the 2013 and 2014 nesting seasons. Better enforcement of this closure would benefit nesting Northern Harriers, as would efforts to restrict all human traffic passing near the Little Dry Creek and Dry Creek wetlands to the existing road right-of-way. At Coot Lake, dogs should be leashed throughout the Northern Harrier April-August nesting season, or at least until it has been established that no harriers are nesting, on the trail encircling the wetlands west of the lake. In addition, Boulder Parks and Recreation could meet with Boulder Open Space and Mountain Parks to discuss possible ways of expanding the extent of marshes within the Dry Creek wetland West of N. 53rd St.

In instances when pairs may choose to nest within 400 m of existing trails or other recreational facilities, seasonal closures of those facilities will contribute to nesting success. Raptors may be more inclined to abandon nesting sites during the nest-building and early incubation periods than during the chick-rearing period (Colorado Division of Wildlife 2008; Craighead and Craighead 1965). The Northern Harrier nesting chronology, below, based on observations at Boulder Reservoir from 2006-14, can inform decisions about seasonal closures:

Nest building: 12 April-14 June

Incubation: 30 April-26 July

Feeding young on the nest: 25 May-7 July

Fledged (independently flying) young: 25 June-15 August

### **Osprey (Boulder County Isolated and Restricted)**

We observed an Osprey pair on the northernmost artificial nesting platform within the Little Dry Creek wetland east of N. 51st St. beginning on 30 April (Figure 5). We observed incubation on this platform from 1-20 May, food regurgitation on the nest by one of the adults on 7 June, and three chicks on the nest on 15 June. At least two of these chicks appear to have fledged in late July.

An adult pair was observed perched on the artificial nesting platform in the Dry Creek drainage 50 m west of N. 53rd St. on 2, 6, 7, 15, 19, and 21 May, but we observed no evidence of incubation. One or both adult ospreys were observed standing on the nest platform on 23 May and on 1, 4, 7, 13, and 17 June. This chronology suggests that this nest failed prior to egg-laying. This nest also failed in 2011, 2012, and 2013.

Prior to 2011, this nesting platform supported an unusually productive nest, fledging 20 young from 2004-10. Reasons for the 2011-14 nest failure are undetermined, but the abrupt transition from a productive nest to an unproductive one suggests that perhaps one of the original pair died and was replaced by a less fertile or less experienced adult. We observed no evidence of direct disturbance of this nest, though the adults sometimes exhibited agitated behavior when passers-by stopped to photograph the nest from the road.

Table 3. Nesting Season Observations of Osprey.

Site	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Dry Creek	2 fledged	2 fledged	2 fledged	4 fledged	4 fledged	3 fledged	3 fledged	failed	failed	failed	failed
L. Dry North	inactive	inactive	inactive	inactive	inactive	failed	inactive	inactive	3 fledged	failed	2 fledged
L. Dry South	inactive	inactive	inactive	inactive	3 fledged	3 fledged	2 fledged	2 fledged	goose nest	goose nest	goose nest
North Rim	inactive	2 fledged	1 fledged	failed	2 fledged	2 fledged	1 fledged	failed	NA	failed	NA

Active: observed in area; Failed: nesting noted, but no young survived; Inactive: none observed in area; Pair: copulation or territorial behavior; Fledged: young able to fly from nest. NA: no monitoring information available.

Figure 5. Osprey 2004-14 nest locations.



**Bald Eagle (Boulder County Isolated and Restricted)**

We observed an adult and subadult (3-4 year-old) bald eagle perched on telephone poles and trees on the southwest side of the reservoir throughout April and May. We observed no signs of nesting activity. Bald eagles began construction of the nest within the Dry Creek drainage west of the reservoir during 2011, but no other nesting activity has been observed within the study area.

**Burrowing Owl (Boulder County Isolated and Restricted)**

We observed no Burrowing Owls within the study area during 2014, and Burrowing Owls have not been observed nesting successfully within the study area since 2004 (Table 5).

Table 5. Burrowing Owl 2004-13 observations at Boulder Reservoir.

Site	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
North Dam	3 fledged	1 adult seen	inactive	inactive	inactive	Inactive	inactive	inactive	inactive	inactive	Inactive
Dry Creek	inactive	inactive	inactive	inactive	inactive	Inactive	inactive	pair	inactive	inactive	Inactive
L. Dry Creek	inactive	inactive	inactive	1 adult seen	inactive	Inactive	inactive	inactive	inactive	inactive	Inactive
Axelson	NA*	NA	NA	NA	7 fledged	NA	NA	NA	active	NA	NA

NA: no monitoring information available; Active: observed in area; Failed: nesting noted, but no young survived; Inactive: none observed in area; Pair: copulation or territorial behavior; Fledged: young able to fly from nest.

A total of 3 pairs were observed nesting in Boulder County, and those nests produced 18 visible young (Table 6). Low fledge rates throughout Boulder County during the past 20 years (Jones and Mahoney 2003, Boulder County Nature Association unpublished data) suggest that high mortality of young owls, possibly caused by predation, has contributed to declining burrowing owl numbers throughout the county. A total of 46 nesting attempts observed within Boulder County from 2008-14 produced only 126 observed young (Table 6). These nest productivity rates are significantly below those reported for other High Plains burrowing owl populations (Johnsgard 1999) and may not be sufficient to maintain viable nesting populations.

Table 6. Burrowing Owl Nesting Success in Boulder County, 2008-14. Nesting attempts/total young observed.

Years	Boulder County Parks and Open Space <sup>1</sup>	Boulder Open Space and Mountain Parks <sup>2</sup>	Boulder Parks and Recreation	Total
2008	NA	7/22	0/0	NA
2009	5/9	6/7	0/0	11/16
2010	5/12	5/10	0/0	10/22
2011	3/15	6/18	0/0	9/33
2012	6/9	3/11	0/0	9/20
2013	1/4	3/13	0/0	4/17
2014	1/5	2/13	0/0	3/18

Stop listening to him

<sup>1</sup> Susan Spalding, Boulder County Parks and Open Space, pers. comm.; Jones, Stephen. 2014. Boulder County Parks and open space burrowing owl nest monitoring summary.

<sup>2</sup> Christian Nunes, Boulder County Parks and Open Space, pers. comm.

Protection and conservation of prairie dog colonies around the reservoir may contribute to future burrowing owl nesting success, especially if prairie dog colonies are relatively large and buffered from disturbance. A variety of studies conducted on the Great Plains and in the Great Basin have determined that burrowing owl nesting success is positively correlated with the size of prairie dog colonies and the density of active burrows within colonies (Desmond, Savidge, and Eskridge 2000; Lantz, Smith, and Keinath 2004); and negatively correlated with the degree of fragmentation of grassland habitat and proximity of human activity to existing nests (Haug 1985, Hughes 1993, Pezolesi 1994, Desmond, Savidge, and Eskridge 2000).

Burrowing Owls nesting in smaller prairie dog colonies appear more vulnerable to predation and have fewer potential nesting burrows to choose from (Desmond, Savidge, and Eskridge 2000; Lance, Smith, and Keinath 2004). In addition, larger numbers of Burrowing Owls nesting in larger prairie dog colonies may gain an advantage over predators through increased vigilance. American Badgers, Coyotes, Red Foxes, Red-tailed Hawks, and Great Horned Owls are considered significant predators of Burrowing Owls (Lance, Smith, and Keinath 2004). Automobiles also kill burrowing owls. Over a five-year period during the 1990s, 26 of 28 injured burrowing owls admitted to the Birds of Prey Rehabilitation Foundation in Broomfield, Colorado, had been struck by cars (Sigrid Ueblacker, pers. comm.).

No researchers have attempted to set a minimal or optimal size of prairie dog colonies used successfully for nesting by Burrowing Owls, but Lance, Smith, and Keinath (2004) identified the following indicators of suitable nesting habitat:

1. Open, dry, treeless areas on grasslands, shrublands, and desert floors.
2. Gentle slopes, short vegetation, high percentages of bare ground.
3. High densities of burrows.
4. Current activity of burrowing mammals, primarily prairie dogs.
5. Close proximity to other nesting Burrowing Owls
6. Dried manure from cows, horses, or bison.

Lance, Smith, and Keinath (2004) also synthesized a list of priorities for nesting burrowing owl habitat enhancement and conservation:

1. Maintain prairie dog colonies through landowner agreements and habitat management plans.
2. Designate 1/4-mile to 1/2-mile buffer zones around known Burrowing Owl nests where pesticide use, rodent control, and human disturbances are restricted.
3. Protect all known nest burrows, and retain prairie dog burrows as future nest burrows.
4. Maintain areas of short grass and open ground.
5. Do not eliminate prairie dogs and ground squirrels.
6. Avoid fragmenting habitat in known nesting areas. Roads, pipelines, plowing, and industrial developments will fragment burrowing owl nesting habitat and should be avoided in known nesting areas.
7. Delay spring mowing in hayfields until late July, avoid nighttime mowing, and space mowings widely apart throughout the season to allow higher likelihood of successful nesting.
8. Leave dirt berms along edges of cultivated fields.
9. Consider installing artificial nest burrows in areas where burrowing mammals have been exterminated and burrow availability has diminished.
10. Preserve rights-of-way, haylands, and uncultivated fields within 600 m of nests for foraging. Taller grasses may be grazed to attract primary burrowers such as prairie dogs.
11. Provide fresh cattle dung near nesting areas if dung is not available.

## Incidental Observations

Between 20 April and 8 August, we observed a total of 70 bird species within the study area, including 60 potential breeding species (Table 7). Nesting was confirmed for 13 species. Species observed during 2014 included 9 Boulder County or Colorado Natural Heritage Program birds of special concern\*: Eared Grebe, American White Pelican, American Bittern, Snowy Egret, White-Faced Ibis, Osprey, Bald Eagle, Northern Harrier, and Grasshopper Sparrow.

Table 7. Birds observed with observed breeding behaviors, 15 April-31 July 2014

Species	Coot Lake	Dry Creek	Little Dry Creek
Canada Goose	Pair	Fledged young	Occupied nest
Gadwall		Pair	Pair
American Wigeon			Pair
Mallard	Pair	Fledged young	Fledged young
Blue-winged Teal			Seen
Northern Shoveler			Seen
Pied-billed Grebe	Seen 5 May		
Eared Grebe*	Observed non-breeder		
Western Grebe	Seen	Seen	Fledged young
D-crested Cormorant		Observed non-breeder	Observed non-breeder
A. White Pelican*		Observed non-breeder	Observed non-breeder
American Bittern*		Territory	Territory
Great Blue Heron		Nest with young	Seen
Snowy Egret*		Observed non-breeder	
Bl-crowned Night Heron	Seen		
White-faced Ibis*	Seen	Seen 2 June	Seen 12, 19 May
Turkey Vulture	Observed non-breeder	Observed non-breeder	Observed non-breeder
Bald Eagle	Observed non-breeder	Observed non-breeder	Observed non-breeder
Osprey*	Seen	Occupied nest	Nest with young
Northern Harrier*	Seen	Pair	Fledged young
Swainson's Hawk		Seen	
Red-tailed Hawk		Nest with young	Occupied nest
Sora			Territory
Virginia Rail			Territory
American Coot	Territory	Seen	
Killdeer	Territory		Territory
Spotted Sandpiper		Territory	Territory
Wilson's Snipe	Territory	Territory	Territory
Ring-billed Gull	Observed non-breeder	Observed non-breeder	Observed non-breeder
Rock Pigeon			Seen
Mourning Dove	Nest building	Seen	Territory
Eur. Collared-Dove	Territory	Seen	Territory
Great Horned Owl	Territory	Seen	Seen
Br.-tailed Hummingbird			Seen

Species	Coot Lake	Dry Creek	Little Dry Creek
Belted Kingfisher			Seen
Northern Flicker			Territory
American Kestrel			Seen
Say's Phoebe	Carrying food		Nest with young
Western Kingbird	Occupied nest	Territory	Nest with young
Eastern Kingbird	Pair	Territory	Seen
Blue Jay			Seen
Black-billed Magpie	Seen	Seen	Seen
American Crow	Seen	Seen	Seen
Common Raven			Observed non-breeder
Tree swallow	Seen		Seen
Violet-green Swallow			Seen
Cliff Swallow	Nest with young		Seen
Barn Swallow	Seen	Seen April-July	Seen
House Wren	Territory		
American Robin	Seen	Territory	Seen
European Starling	Seen		
Common Yellowthroat	Territory	Territory	Territory
Yellow Warbler	Pair	Singing male	Singing male
Yellow-rumped Warbler	Observed non-breeder	Observed non-breeder	Observed non-breeder
Western Tanager	Seen		
Chipping Sparrow			Observed non-breeder
Vesper Sparrow	Territory		Singing male
Lark Bunting			Seen 12 May
Savannah Sparrow	Territory		
Grasshopper Sparrow*	Singing male		
Song Sparrow	Territory	Territory	Territory
Wh.-crowned Sparrow		Observed non-breeder	
R-winged Blackbird	Occupied nest	Territory	Territory
Western Meadowlark	Territory	Territory	Territory
Y.-headed Blackbird			Pair
Common Grackle		Seen	Seen
Bullock's Oriole	Nest with young	Territory	Seen
House Finch		Seen	Seen
Lesser Goldfinch			Seen
American Goldfinch	Feeding fledglings		Feeding fledglings

### Disturbances of Nesting Bird Habitat

We asked volunteers to report any observed disturbances of nesting bird habitat as well as violations of area closures and dog voice-and-sight regulations. Since we did not develop protocols for defining "disturbance" or "dog-off-leash," it's more useful to report these observations anecdotally than to attempt to quantify them. Listed below are specific 2014 observations for specific areas (all times are MST):

### Coot Lake

A Boulder Parks and Recreation wildlife camera recorded a picture of a dog running through the closed wetland area on 1551 MST, 17 June.

### Dry Creek

29 May, 0700: A nonmember of the Boulder Aeromodeling Society parked in front of the entrance gate, jumped the gate, and went into the airport facility. He then began flying his model airplane before the designated flight time. He was confronted and advised of the rules and expressed displeasure but left facility (John Wold).

8 June, 0700: One off-leash dog in North Shore closed area, near North 55th Street trailhead; guardian entered area, whistling to retrieve dog (Nancy Ries Morrison).

23 July, 0630: Ospreys on nest platform and adjacent pole exhibited agitated behavior after an observer on road walked by nest (Gary Rabourn).

### Little Dry Creek

20 May, 1200: Two Bald Eagles flushed off roadside perches by stopping cars and pedestrians (Sharon Anderson).

4 July, 0700: Car parks in "no parking" area on curve of North 51st Street within 100 m of Northern Harrier nest (Gary Rabourn).

## **Management**

Historic nesting sites for American Bitterns, Northern Harriers, Ospreys, and Burrowing Owls at Boulder Reservoir lie in relatively small remaining fragments of marsh and prairie habitat that are bisected or bordered by heavily used roads and trails. The proximity of these remaining natural habitats to disturbed areas and human activities poses challenges to nesting birds. Urban-adapted predators, including American Raccoon, Coyote, Red-tailed Hawk, and Great Horned Owl, can easily find and prey on nests that are situated in small or easily accessed cattail marshes and grassland patches. Human activities such as hiking, jogging, bicycle riding, or dog-walking, when conducted off-trail or off-road, can flush birds off their nests or discourage them from nesting. To alleviate these risks to nesting birds, management of relatively natural areas around the reservoir should maximize the size of unfragmented habitat patches and minimize the amount of human encroachment into these patches.

As a general rule, humans and their pets should be restricted from encroaching into marshes or prairie dog colonies on the west and north sides of the reservoir, where American Bitterns, Ospreys, Northern Harriers, and Burrowing Owls nest; and into the marsh and prairie dog colonies west and south of Coot Lake, where American Bitterns, Northern Harriers, and Burrowing Owls have nested. Specific management recommendations, are included in my 2012 report and, by management zone in my 2013 comprehensive breeding and migratory bird survey report (Jones 2013a). Many of these recommendations have already been implemented:

### **Little Dry Creek and Dry Creek Marshes**

1. Restrict all human recreational activity to the N. 51st St. right-of-way and Eagle Trail. Maintain fences on both sides of the road and Eagle Trail.
2. Maintain buoy lines across both inlets, March-August, to limit encroachment of boats into Osprey and American Bittern nesting and foraging habitat.
3. Post the shoreline areas west and south of the North Shore parking area and north of the reservoir entrance as closed to hikers and dogs, 1 April-10 September. Increase enforcement of this closure.
4. Restrict activity at the model airplane facility, as necessary, to protect nesting raptors and bitterns. Staff should do this on a case-by-case basis, using active monitoring of nesting pairs to assess their vulnerability to disturbance. Investigate the possibility of moving the facility to a less sensitive site on city-owned land.

### **Coot Lake Area**

1. Restrict all recreational activity to existing trails. Monitor the wetland area for disturbance by humans or dogs.
2. Require that dogs to be leashed on the trail immediately bordering the wetland west of Coot Lake April-June or until American Bitterns or Northern Harriers have completed nesting.
3. Continue to protect all prairie dog colonies in the area from disturbance by recreational users and dogs.

### **Nest Buffers**

Colorado State Parks and Wildlife has developed guidelines for recommended buffers and seasonal restrictions around active raptor nests. These guidelines represent minimum standards for protecting nesting raptors from disturbance. While some nesting species, including Osprey, may habituate to human activities, others are easily disturbed (Colorado Division of Wildlife 2008). Disturbances can be subtle and difficult to measure, ranging from adults becoming slightly more vigilant and thus reducing foraging time to adults actually abandoning their nests (Colorado Division of Wildlife 2008). For species such as Northern Harrier and Burrowing Owl, which have experienced low nesting productivity in Boulder County and appear to be on the brink of extirpation from the county, protection of nests from human disturbance is critical:

*Osprey recommended buffer: No surface occupancy (beyond that which historically occurred in the area) within 400 m of active nests. Seasonal restriction to all human encroachment within 400 m of active nests from 1 April--31 August (or until all young have fledged from nest). A possible exception to this limitation would be state-mandated spraying of "A" listed weed species, with prior approval from the Colorado Division of Wildlife, during the time after all eggs have hatched.*

*Northern Harrier recommended buffer: No surface occupancy (beyond that which historically occurred in the area) within 400 m of active nests. Seasonal restriction to all human encroachment within 400 m of active nests from 1 April-31 July (or until all young have fledged from nest). A possible exception to this limitation would be state-mandated spraying of "A" listed weed species, with prior approval from the Colorado Division of Wildlife, during the time after all eggs have hatched.*

*Burrowing Owl recommended buffer: No human encroachment within 50 m of nest sites, 15 March-31 October. There should be no human encroachment into any prairie dog colonies where burrowing owls are present between 15 March and 31 October, until all nest burrows have been located. An exception to this encroachment restriction would be prairie dog colonies where burrows need to be sampled for suspected plague.*

American Bittern nests are susceptible to disturbance by humans and free-roaming dogs. Various scientists have suggested buffers of 50-200 m for nesting herons (Beans and Niles 2003). Since bitterns typically breed in cattail marshes where their ground nests are shielded from view, their nests may require less buffering from human activities than is necessary for the more visible nests of colonial-nesting herons. However, American Bitterns nesting near Boulder Reservoir may be particularly vulnerable to disturbance due to the proximity of their nests to trails and roads

I recommend a minimum buffer area (no human encroachment) of 200 m around suspected American Bittern nests. In addition, dog-on-leash and dog-on-trail restrictions should be strictly enforced near marshes where bitterns are believed to nest. This is especially important at the wetlands west of Coot Lake, where bitterns are seen almost every spring but appear to have experienced little or no nesting success (see Table 1).

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## Appendix: 2014 Monitoring Summary and Volunteer Roster

### Coot Lake

27 April. No target species seen (Andes-Georges).  
29 April, 1830-1920. No target species seen.  
8 May, 1735-1850. No target species seen, possible harrier soaring low over cattail marsh (Rosborough).  
14 May, 0630-0930. No target species seen (Painter).  
15 May, 1700-1800. No target species seen (Rosborough).  
17 May, 0619-740. No target species seen (Litkowski).  
25 May, 0510-0610. No target species seen (Ponsors).  
29 May, 0501-0616. No target species seen (Litkowski).  
1 June, 0420-0530. One Osprey seen twice flying over ponds (Andes-Georges).  
1 June, 0530-0730. One Osprey flying over the area on the reservoir side (Ridgeways).  
2 June, 1730-2000. No target species seen (Rosborough).  
3 June, 0735-0940. No target species seen (Rosborough).  
19 June, 0510-45. No target species observed (Andes-Georges).  
21 June, 0457-0606. Northern Harrier flies over reservoir (Litkowski).  
24 June, 1840-1940. No target species observed (Rosborough).  
27 June, 0700-0815. No target species observed (Hartrick).  
29 June, 0600-0800. No target species observed.  
8 July, 1830-1945. No target species seen.  
1 July, 1815-1930. Osprey observed catching a fish and flying away to the south (Rosborough).  
26 July, 0445-0610. Osprey seen swooping over lake several times. Red Fox seen, also a possible Prairie falcon (Litkowski).

### Dry Creek

#### American Bittern

6 May, 0530-0653. One or two calling in marsh between airport and reservoir (Klomp).  
15 May, 0545-0745. One heard calling (Ridgeways).  
17 May, 0555-710. One heard near crossing of Dry Creek, one north of Anthill (Palmer).  
21 May, 0545-815. One heard (Ridgeways).  
1 June, 1730-1940. One heard calling from west of the road and two heard calling from what appeared to be two separate areas east of model airport (Klomp).  
4 June. One heard (Rabourn).  
7 June. Two seen flying up out of marsh near model airport (Rabourn).  
9 June, 1730-1830. One flying over Anthill (Klomp).  
13 June, 0450-0700. One heard (Noonan).  
17 June, 0500-0745. One flying over road toward reservoir (Ridgeways)

#### Osprey

2 May, 0625-830. Pair perched on nesting platform (Noonan).  
6 May. Both adults present, no evidence of incubation (Klomp).  
7 May, 0550-0830. Pair present but not apparently incubating (Noonan).

15 May. One possibly incubating, three others present (Ridgeways).  
19 May, 1730-1930. Both adults present but no sign of incubation (Klomp).  
21 May, 0545-0815. Both adults present and one on nest, but no evidence of eggs or incubation (Ridgeways).  
23 May, 0550-0650. One adult present on nest platform but not incubating (Palmer).  
1 June, 1730-1940. Lone Osprey standing on nest platform. No incubation observed (Klomp).  
4 June, 0515-730. Both adults still present in area. No sign of incubation (Rabourn). 0450-0700. None seen (Noonan).  
7 June. Just one Osprey seen (Rabourn).  
13 June. Two observed, neither on nest (Noonan).  
17 June. Just one Osprey seen (Ridgeways).

### **Little Dry Creek**

#### American Bittern

5 May, 1815-1930. Three heard, one heron-like bird flying (Steffes).  
6 May, 0515-0715. Two observed (Rabourn)  
16 May, 0500-0820. At least two heard, one by the reservoir shore, and at least one west of North 51st (Anderson and DiNatale).  
18 May, 0500-0720 . One vocalizing and perching in cattails 100 m west of northern harrier nest site (Anderson).  
20 May: 2 seen flying, perching, and heard calling in marsh area between reservoir and road (Pow).  
24 May, 0530-0730. One heard and seen flying over North 51st.  
25 May. One heard (Ponsors).  
30 May. One or more heard calling in marsh (Pow).  
1 June, 0625-831. One observed just east of road (Swarts).  
16 June, 1830-1945. One heard.  
21 June, 0420-0530. Several calls heard (DiNatale).  
24 June, 0450-0655. One flying south into the wetland from toward the reservoir (Noonan).  
25 June, 0445-0645. Two observed in marsh (Raybourn).  
25 June, morning. Heard and saw at least two calling from area of cattail marsh maybe 20 feet east of the road (Ponsors).  
29 June, morning. Four seen flying around marsh, suggesting two nests (Ponsors).

#### Northern Harrier

1 April. Pair observed nest building and defending territory (Rabourn).  
30 April, 0540-740. Male flying over wetland and surrounding grasslands apparently hunting. Dropped into cattails about 75 m west of road and disappeared for a long time (DiNatale).  
30 April, 0624-815. Male flying over the cattail marsh, circling, then 15 min. later flying with female over marsh. Female dropped down and disappeared into the cattails. Male landed on the northern edge of the marsh, then began harassing coyote. Potential nest site is in the middle of the marsh, just 20-40 m west of road (Dozier)  
1 May, 0610-930. One male flying over the south side of the cattail marsh area. Later perching and preening on the ground on the North side of the marsh. Chased a red-tailed hawk for 15-20 min., then perched in a tree adjacent to south side of marsh (Pow).  
1 May, 0600-0800. Male flying over cattail marsh, perching in marsh and in trees on south side of marsh, chasing red-tailed hawk (Leigh B. and Painter).  
5 May. One flying over marsh at dusk (Steffes).

6 May. Two observed (Rabourn).

16 May, 0615-0830. Male hovering and soaring over the cattail marsh near suspected nest site. Harassing something not visible in cattails. Possibly a bittern, however. Female also seen dropping in to marsh, about 20 feet away from the road (Dozier).

16 May, 0500-820. Male northern Harrier flying around wetland and surrounding area apparently hunting (Anderson and DiNatale).

17 May, 1645-1820. Pair circled marsh, female landed within marsh and remained for rest of observation (Burley and Schappe).

18 May, 0500-7000. Male seen fighting with other big birds and flying away from territory (Anderson).

20 May, 0545-815. Male flew overhead near reservoir entrance. Food exchange with female at 0628 (Pow and Raybourn).

21 May. Male seen flying over Little Dry Creek area (Ridgeways).

23 May, 0600-810. Male observed flying over and perching in cattail marsh (Noonan).

24 May, 0530-730. Male northern harrier perched on yucca stalk in prairie dog colony and flying over wetland (DiNatale).

24 May, 1718-1930. Male seen flying near road (Steffes).

25 May, 0620-0720. Male diving repeatedly at something in cattails. Female appeared soon after and joined in diving at whatever was in the marsh. Then she flew and landed in the marsh and stayed put. Male continued harassing whatever was in the marsh near the nest. After a while, an American bittern flew up out of that area, and later the male chased a red-tailed hawk over the marsh and away to the west (Ponsors). [Female's behavior suggests to me that the eggs might have hatched. SJ].

30 May, 0540-0820. Male and female observed flying together over marsh west of road. Female lands in marsh near nest site and male makes apparent food drop there. Male continues hunting and feeding for 15-20 min. (Pow). 0445-0645. Male and female seen (DiNatale)

31 May, 1336-1420. Male harrier seen (Burley).

4 June, 0515-715. Both adults present flying and hunting, both off the nest for most of the visitation time (Rabourn).

7 June, 0600-700. None observed (Rabourn).

10 June, 0715-0815. Both adults present, female brings food to nest area twice, male dive bombs Osprey that is flying over territory (Dozier).

15 June, 1545-1745. Both adults present, mostly away from nesting area; female brings food to nest (Pow/DiNatale).

16 June, 1830-1945. Male hunting low to ground (Steffes).

17 June, morning. Both adults flying back and forth to nest and both off the nest for long periods of time, suggesting that the young have hatched (Master).

21 June, 0420-0530. Both adults off nest, flying together and exchanging food (DiNatale).

24 June, 0450-0655. Both adults off the nest for 30 min. or more, flying together and repeatedly divebombing a coyote as it was trotting by the marsh (Noonan).

25 June, morning. Two fledged harriers observed and female brings food down to nest, suggesting a third baby is still on or near the nest (Ponsors).

8 July, 0630-0754. Female hunting over marsh and being harassed by blackbirds (Steffes).

### Osprey

30 April, 0624-815; 1100-45. One sitting on nest and a second Osprey flying into nest (Dozier).

1 May. One incubating and one flying (Pow).

1 May. Both adults present, one appears to be incubating (Leigh and Painter).

8 May, 0710-30. Both adults present, one on nest (Anderson and DiNatale).  
20 May, 0545-815. One on nest and one perched on first phone pole north of nest platform (Pow).  
7 June, 0600-700. Both adults on nest platform and one appears to be regurgitating food for young (Rabourn).  
10 June, 0500-0715. One chick observed on nest (Ridgeways). Probably two chicks (Dozier).  
15 June, 1545-1745. Both adults and three chicks present (Pow).  
21 June. One chick visible (DiNatale).  
27 August, 1745-1845. One osprey perched beside nest (Bohin).

### Bald Eagle

30 April: Adult (female?) with subadult male perched on telephone pole in lower marsh area for more than 60 min. (Dozier and Pow).  
1 May: Adult and subadult bald eagle perched in Cottonwood (Bohin).  
20 May, 1230-1400. Adult on ground mantling over dead cottontail while subadult was perched on a nearby pole. Adult appears to have fish hook in its beak (Anderson).

### **Prairie Dog Colonies**

Anthill: 15 May (Ridgeways), 19 May (Klomp), 2 June (Klomp), 9 June (Klomp), 13 June (Noonan), 17 June (Ridgeways).  
Eagle Trail: 17 May (Burley and Schappe), 1 June (Swarts), 3 July (Rabourn), 4 July (Raybourn), 27 July (Swarts).  
Model Airport: 6 May (Raybourn), 12 May (Rabourn).  
North Dam: 14 May (Painter), 17 May (Litkowski), 21 June (Litkowski), 27 and 29 June (Hartrick), 26 July (Litkowski).  
North Shore: 2 May (Noonan), 1 July (Noonan), 14 July (Noonan).  
South Dam North: 29 May (Litkowski).  
South Dam South: 29 April (Roxborough), 3 June (Roxborough), 24 June (Roxborough), 1 July (Roxborough), 8 July (Roxborough).  
West 51st: 30 April (DiNatale), 1 May (DiNatale and Painter), 16 May (DiNatale), 15 June (DiNatale), 16 June (Steffes), 8 July (Steffes).  
Windsurfer Point: 30 April (Dozier), 16 May (Dozier), 2 July (Dozier).

### **Observer Hours**

George Alexander: 8:30  
Linda Andes-Georges: 8  
Sharon Anderson: 12:10  
Patrick Bohin: 5.5  
Emily Burley: 10  
Patrick Burley: 10  
Leigh DiNatale: 23:15  
Carol Dozier: 13:50  
Katie Hartrick: 13  
Kay Hartrick: 13  
Chuck Klomp: 11:40  
Liz Litkowski: 7:25  
Doyle McClure: 6

Nancy Ries Morrison: 22:22

Kitty Noonan: 30:05

Sabine Painter: 14:45

Linda Palmer: 6

Mark Ponsor: 9

Sue Ponsor: 9

Janine Pow: 20:45

Gary Raybourn: 30:46

Gretchen Ridgeway: 22:45

Peter Ridgeway: 22:45

George Rosborough: 21:15

Patrick Schappe: 2

Kate Steffes: 11:20

William Steffes: 11:20

Anna Swarts: 12:07

Roger Walker: 4

Total training hours: 126

Total field observation hours: 268

Total volunteer hours: 393