FALL 2018 RAPTOR MIGRATION STUDY
IN THE BRIDGER MOUNTAINS, MONTANA

Sacajawea Audubon, Bozeman, MT

&

HawkWatch International, Salt Lake City, Utah

March~ 2019

FALL 2018 RAPTOR MIGRATION STUDY IN THE BRIDGER MOUNTAINS, MONTANA

Report prepared by:

Adam Richardson, Steve Hoffman & David Oleyar

Counts conducted by:

Adam Richardson, Alice Morris & Bret Davis

Project coordinated by:

HawkWatch International, Inc., Principal Investigator: Dr. David Oleyar

2240 South 900 East, Salt Lake City, Utah 84106

&

Sacajawea Audubon Society, Project Coordinator: Steve Hoffman

PO Box 1711, Bozeman, MT 59771-1711

Report submitted to:

U.S. Forest Service, Custer Gallatin National Forest

Hebgen Lake & Bozeman Ranger Districts

ATTN: Randall Scarlett, Biologist

330 Gallatin Road

West Yellowstone, MT 59758

March 2019

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

The Bridger Mountains Raptor Migration Project in southwestern Montana is an ongoing effort to monitor long-term population trends of raptors using this portion of the Rocky Mountain Flyway (Omland and Hoffman 1996, Hoffman and Smith 2003, Smith et al. 2008a). HawkWatch International (HWI) initiated a partial-season count at this site in 1991, with standardized, full-season annual monitoring commencing in 1992. Beginning in 2009, Montana Audubon took the lead in funding and coordinating these annual counts. In 2017 primary responsibility for conducting the count was transferred to Sacajawea Audubon Society (based in Bozeman, MT). This flyway is renowned for large numbers of migrating Golden Eagles (see Appendix A for all raptor species, including scientific names, observed at this site). To date, 18 species of raptors have been documented migrating along the Bridger Mountains, with annual autumn counts typically ranging between 2,000 and 3,500 migrants. This report summarizes count results for the 2018 season, the 27th consecutive full-season autumn count of migratory raptors at this site.

The Bridger Project is one of eight long-term, annual fall migration counts conducted or co-sponsored by HWI in North America in autumn 2018 (the Bridger count is the only count conducted or co-sponsored by HWI in the state of Montana). Previously, a total of five annual, full-season counts had been conducted in Montana, but in the fall of 2018 the Big Belts site had only a partial-season count, and no count was conducted at Nora Ridge, a site formerly manned by Raptor View Research Institute (RVRI). Instead, RVRI conducted an informal count from the trapping blind at their Rogers Pass banding site. It is important to note that a new, full-season count was initiated at Cut Bank, MT this fall (Kate Atkins, pers. Comm; see also: http://hawkcount.org/month_summary.php?rsite=783&ryear=2018&rmonth=11).

The primary objective of these efforts is to track long-term trends of diurnal raptor populations in western North America (Hoffman et al. 2002, Hoffman and Smith 2003, Smith et al. 2008a & b). Raptors serve as important biological indicators of ecosystem health (Bildstein 2001), and long-term monitoring of migrating raptors is the most efficient, cost-effective method for assessing regional population status and trends of multiple raptor species (Zalles & Bildstein 2000, Bildstein et al. 2008).

STUDY SITE

The Bridger Mountains is an isolated, relatively narrow range that runs primarily along a north–south axis. From Sacajawea Peak (2,950 m elevation) the range extends southward for 40 km before ending at Bozeman Pass, 20 km east of Bozeman, Montana. Consistent westerly winds buffet the Bridger Range and create excellent, predictable lift, attracting good numbers and a diversity of southbound migrant raptors each fall. The observation site is a helicopter-landing platform atop the Bridger Bowl Ski Area at an elevation of 2,610m (45° 49.022' N, 110° 55.778' W; Fig. 1). The site is situated within the Custer Gallatin National Forest on the crest of Bridger Ridge, about 25 km northeast of Bozeman and 3 km north of Saddle Peak. The helicopter pad is a 5m x 5m concrete platform located approximately 50m north of a ski patrol hut. The site is accessed by walking along a primitive dirt road on the east-facing slope for 5 km (610m rise in elevation) to the top of the Bridger Bowl Ski Area's Bridger Lift, then continuing uphill a few hundred meters along a narrow footpath to the crest of the Bridger Ridge, and then north for 50m to the observation site.

METHODS

Since this project's inception two official, well-qualified observers have conducted standardized daily counts of migrating raptors from the same designated observation site from late August/early September through late October/early November. In 2018 Adam Richardson returned to the Bridger Hawk Watch for his 2nd season. Adam was accompanied by Bret Davis through 17 September, and later by Alice Morris (beginning 30 September), who observed for her first (partial) season in 2018. Daily observations began on 26 August and continued through 10 November (the latest observation date in the 27 full seasons of the Bridger count). Counts typically began at 0900 H and ended at 1700 H Mountain Standard Time (MST). Scanning and most in-flight raptor identification was made with Swarovski EL 8.5 X 42 (Alice) and 10 X 42 Nikon Monarch 7 binoculars (Adam). Distant individuals were identified with a 20-60 X 86 Vortex Razor HD spotting scope mounted on a Manfrotto 190XV Tripod. The use of a spotting scope also allowed for aging a greater proportion of Golden Eagles during the late afternoon hours, when the position of the sun made aging backlit birds extremely difficult. Adam Richardson provided on-site training for Alice Morris. Local birding enthusiasts Paulette Epple, Matt Keefer and Bob Smith frequently contributed full days as volunteers to assist with the hawk watch effort (as did several other expert local birders; see Acknowledgments for a more complete list of volunteer observers).

The observation site was accessed daily by the observers, either by hiking 4km (with a780m elevation gain) from the lower parking area, or from the newly constructed ski patrol hut on the ridge near the observation site, which often served as overnight lodging.

As in several previous years, two owl decoys were used again in 2018 to attract passing migrant raptors; both were elevated 4m above the ground to make them more visible to passing raptors. A nearby owl was situated 5m directly to the north of the observation point; it was fastened to a pole secured to an upside-down ski patrol sign. This sign was wedged into the rimrock and large rocks were piled atop the sign to provide a stable base. This set-up also provided easy access to take down the near owl (to thwart would-be hooligans from molesting it). A more distant owl was situated 600m to the north at the far (north) end of "Tilly Peak" atop a metal post that is part of Bridger Bowl's ridge access system. The near-owl was erected at the start of the count, and the far-owl became operational on 11 September. The more distant "Tilly owl" remained up until 30 October, when it was removed before an approaching winter storm. The near owl was taken down once on 4 September, and re-installed on 5 September (through 2 October). On 3 October the near owl remained down until 22 October to prepare for the possibility of a helicopter landing in the morning. This near owl was again erected from 22 October through 31 October, when it was removed for the remainder of the season in advance of an approaching winter storm.

Ten species of resident raptors were observed during the 2018 season. A detailed description of the protocols used to differentiate the resident from migrating ones is provided in the Resident Raptors section of this report (see pp. 12-13).

The observers routinely recorded the following data each day:

1. Species, age, sex and color morph of each migrant raptor, whenever possible and applicable (Appendix A lists common and scientific names for all species, species-specific information about the applicability of various age, sex, and color-morph distinctions, and two-letter species codes).

2. Hour of passage for each migrant; e.g., the 0900-0959 H, etc. (MST).

3. Wind speed and direction, air temperature, percent cloud cover, predominant cloud type(s), presence

of precipitation (and type), visibility and a subjective assessment of thermal lift conditions (i.e., excellent, good, fair & poor) for each hour of observation (each of these assessed on the half-hour).

4. Predominant direction, altitude, and horizontal distance (from the observation point) of the migratory raptor flight for each hour.

5. Total minutes observed, and the mean number of observers present during each hour (which included designated observers plus volunteers/visitors who contributed substantially to the count [actively scanning, pointing out birds, recording data, etc.] for at least 10 minutes in a given hour).

6. A subjective "visitor-disturbance rating" (high, moderate, low, none) was determined for each hour.

7. Observation start and end times for each observer.

This year the crew didn't have access to the weather station maintained by Bridger Bowl on the ridgeline directly above the observation point. For the 2018 season weather measurements were made using a hand-held 2500 Kestrel (barometric pressure) and a brass zip-o-gauge thermometer. Additionally, the Beaufort Scale was used to estimate windspeed, as it was determined early in the count period that the 2500 Kestrel routinely underestimated wind speeds at the observation point (OP), due to the OP being sheltered by nearby trees.

The Bridger weather station generally provides a more accurate reading of the windspeed, due to its location approximately 10m aloft, and well above the cover of the trees on the west side of the observation point. For this reason, in 2017 the Bridger station consistently measured higher wind-speeds than in 2018, especially when typical W-SW winds predominated. It is also assumed the Bridger weather station provided more accurate temperature readings, since the Kestrel occasionally displayed inexplicable ambient temperature variations.

For this reason, in the future we suggest data from the more-accurate Bridger weather station be used/compared daily when available in the future. When it isn't available it is recommended to take the barometric pressure using the 2500 Kestrel, temperature with an inexpensive thermometer placed in the shade and suspended near the OP. It is also recommended that wind measurements continue to be estimated using the Beaufort Scale, due to the bias created by the tree-sheltered nature of the OP.

The method for recording data in 2018 was a return to paper data sheets. Dunkadoo (dunkadoo.org) was not used this year due to Wi – Fi not being available on the OP. Hourly raptor count totals were posted on (hawkcount.org) daily. Daily and seasonal Bridger raptor count totals were also periodically posted on Sacajawea Audubon website's home page (sacajaweaaudubon.org). Daily lists of all bird species were also posted on eBird for the Bridger Bowl Hawk Watch Hotspot (ebird.org/ebird/hotspot/L2979461).

Calculation of "adjusted" (to standardize species-specific sampling periods) passage rates (migrants counted per 100 hours of observation) and analysis of trends, updated through 2018, generally follows Hoffman and Smith (2003), using linear and quadratic regression statistical techniques. In comparing 2018 data (for each species) with annual means and 95% confidence intervals for all previous seasons, we determined significance when the 2018 value fell outside the 95% confidence interval of the associated mean for the1992-2017 passage rates.

RESULTS AND DISCUSSION

OBSERVATION EFFORT AND WEATHER SUMMARY:

In 2018 observers conducted counts on 62 of 77 possible days between 26 August and 10 November, for a total of 395.5 observation hours. Total observation hours were 12% above the 1992-2017 mean of 354.7 (± 21.5) hours. Beginning in 1997 the count has typically run from late August/early September through late October/very early November. In 2017 the start date was advanced one day to 26 August to begin to evaluate the possibility of a progressively earlier raptor migration, presumably due to climate change (see Filippi-Codaccioni et al. 2010, Therrien et al. 2017). This was repeated in 2018, as well as extending the planned end-date to 10 November.

Inclement weather and/or difficult access prevented any observations on 25 days during the 2018 season. In addition, inclement weather reduced the total daily observation period to less than four hours on 15 additional days. In 2018, the observers (Bret, Alice and Adam) often resided atop the Bridger Ridge; this provided the opportunity to conduct counts during brief breaks during stormy weather. On 7 days an effort was made to start the count earlier or extend it later, and so were able to count during brief breaks in weather during long-lasting storms (see hourly observation efforts in Appendix C and at hawkcount.org).

The 2018 season was plagued by multiple, long-lasting storms that obscured visibility due to persistent, low clouds, rain and/or snow. These storms occurred on 27 - 30 September, 4 -10 October, 31 October to 8 November. In addition, brief, one-day storms occurred on 27 August, 19 and 24 September, 13 October, and 1 and 10 November.

On 27 August, 0.4 inches of rain fell in the Bridger Canyon, producing snow at the higher elevations. This made for exceptionally clear skies until 30 August, when the haze from area wildfires returned to the ridge. On 19 September, the Bridger Mountains received a wintry mix of fog, rain and sleet. On 20 September it snowed for the first 30 minutes of the count. On the evening of 23 September, 4 inches of graupel (snow pellets) fell along Bridger ridge. On the morning of 24 September, it looked as if a count might be possible, but low-lying clouds never lifted. Instead, a light snow fell throughout the day. By 25 September 0.75 inches of new snow was estimated to have fallen above 9,500 ft. On the evening of 27 September 0.5 inches of snow fell along the ridge. For the next two days Bridger Ridge remained shrouded in fog. The snow level fell to 8,600 ft during this weather event.

On the evening of 4 October, 5 inches of snow fell and this winter storm dominated the Bridger Mountains weather off and on for the next 7 days. This storm occurred during the historical peak migration period (especially for Golden Eagles), and also coincided with the site's typical busiest visitation period. By the time the storm left the area, nearly a foot of snow had fallen along the ridge, and snow levels nearly reached the base of the Bridgers. This prolonged storm likely had the single greatest impact on our low counts of raptors (especially Golden Eagles) compared to 2017.

On 13 October the Bridger Mountains received another 7.5 inches of snow. This made skiing possible for a few days, but this snow eventually melted. By 29 October the snow began to steadily accumulate along the ridge, and winter storms became more frequent. Snow fell consistently from the end of October until the evening of 8 November. The road to the trailhead became impassable on 1 November. Starting in early November the ridge was accessed only by snowshoes or skis from Jim Bridger Lodge. One final, full-day count was conducted during a brief break in storms on 9 November.

On the final day of the count we experienced heavy snowfall atop the Bridgers, hence a hasty retreat was made from the summit with the last of the observer's gear.

Haze from area wildfires was considerably better compared to 2017. For the most part fire haze was inconsistent at best, but lingered to some extent until 3 October. Compared to the poor visibility and associated decrease in thermal lift in 2017, 2018 proved to be much better with regards to adequate visibility to scan and detect distant migrating raptors.

FLIGHT SUMMARY:

The fall 2018 raptor migration count tallied 2,048 diurnal raptors of 17 species (Table 1). This is 18% below the 1992-2017 mean of 2,496 (∓ 208). In 2018 the following species recorded in lower than average numbers (above the 95% confidence interval of the long-term mean): Sharp-shinned Hawk, Red-tailed Hawk, Bald Eagle, Ferruginous Hawk, Golden Eagle, Merlin, Prairie Falcon, and Northern Goshawk. In 2018 the following species were recorded in higher than average numbers: Turkey Vulture, Osprey, Northern Harrier, Cooper's Hawk, Broad-winged Hawk, Rough-legged Hawk, American Kestrel, and Peregrine Falcon.

Eagles represented the largest proportion of any raptor group this season, comprising 52.4% of the total raptor count in 2018 (slightly lower than the long-term mean for this parameter; see Fig 2). Accipiters were the next largest group tallied (24.3% - equaling the long-term mean for this parameter), followed by buteos (10.3% - well above the long-term average of 8.6%), and falcons (6.4% - also slightly above average). Harriers, vultures, ospreys and unidentified raptors comprised 3% or less each.

Golden Eagles were the most numerous species, making up 49% of the total count, followed by Sharp-shinned Hawks (12%), Cooper's Hawks (11%), Red-tailed Hawks (6%), American Kestrels (4%), Bald Eagle (3%), Northern Harrier (3%) and Rough-legged Hawk (3%). The remaining 9 species collectively comprised 11%.

LONG-TERM TRENDS:

The most worrisome trend documented by the Bridger Mountain Hawk Watch over the past 26 count seasons is the significant long-term decline in Golden Eagle passage rates ($p<0.001$; Fig. 3e). This trend is consistent with most other long-term Golden Eagle migration counts across western North America (see https://www.birdscanada.org/birdmon/default/popindices.jsp or http://www.rpi-project.org/2016/graphs.php?rsite=592%3AF). However, after the lowest seasonal count in 2009, passage rates of Golden Eagles along the Bridger Ridge have stabilized, suggesting that the long-term decline of this species has likely arrested in recent years. In fact, there is actually a recent (slight) upward trend in passage rates of adult, non-adult, and total Golden Eagles, indicating a partial recovery in Golden Eagle populations using this Rocky Mountain Front flyway during the past few years. Our low 2018 Golden Eagle count may dampen the optimism we had after the 2017 count, when we had our largest flight (1476) since 1999 (when 1870 were tallied). In 2018, we tallied only 1,004 Golden Eagles, the 4th lowest in the 27-year history of this count. This is one of the many reasons why long-term monitoring of raptor populations is important; the upcoming 2019 count will be of particular interest. Causes for this long-term decline are not fully understood, and therefore cannot be addressed in this report (although habitat degradation and fragmentation, with a concomitant reduction in their favored prey [especially jackrabbits] are likely contributing factors).

As stated in the Flight Summary, one accipiter species, the Cooper's Hawk, increased in 2018. Unfortunately, in contrast, Sharp-shinned Hawks and Northern Goshawks have steadily declined over the last two years. Sharp-shinned Hawks dropped from 617-242 from 2016-2018, and Northern Goshawk from 62-12, respectively (see Fig. 3c).

The increasing trend in Turkey Vultures noted from 2015-2017 did not continue in 2018, with only 10 individuals detected. This number is more in line with the above-average vulture detection rates in 1997, 2011, and 2013-2018. The average increase in Turkey Vultures recorded at the Bridgers over the past eight years suggests these birds are expanding their range northward in response to a warming climate (see Fig. 3b). This phenomenon has been documented at all other Rocky Mountain migration sites as well as all raptor migration monitoring sites throughout the Midwest and eastern North America (see hawkcount.org and rpi-project.org for more details). Due to accelerating global warming, we predict that this continent-wide trend in Turkey Vulture abundance is likely to continue for decades to come.

We are pleased to report generally positive, long-term count trends for Osprey, Broad-winged Hawk, Red-tailed Hawk, Merlin and Peregrine Falcon. However, the Red-tailed Hawk upswing observed in recent years dropped off notably in 2018 (see Figs. 3b, 3d & 3g).

The Merlin, Peregrine Falcon and Broad-winged Hawk have all shown significant long-term increases, although we have less confidence in these trends due to very small sample sizes for all three species (under 15 birds/100 hrs; see Figs. 3d & 3g). It is notable that nationwide count trends generally show gradual long-term declines in Broad-winged Hawk counts in eastern North America (Bildstein et al. 2008; rpi-project.org), but increasing trends over the past 20 years in the West (Smith et al. 2008). The reason(s) for the apparent Broad-winged Hawk increase in western North America is unknown. Peregrine Falcons are continuing their continent-wide comeback from historic lows in the early 1970s; their decline (from 1946-1975) was caused entirely by widespread use of DDT throughout the Americas. In addition, based upon long-term nesting data, Bald Eagles have shown a steady upswing over the past several decades. However, we have not seen this upward trend in Bald Eagle counts in the Bridgers (see Fig. 3f). Since Bald Eagles are primarily late-autumn migrants, climate change may be causing them to migrate south later in the fall. Hence, they are detected in lower numbers due to our relatively early count-season window.

Of the remaining eight species, four (Cooper's Hawks, American Kestrels, Northern Harriers, and Rough-legged Hawks) exhibited passage rates exceeding 10 birds/100 hours; none showed significant long-term count trends in either direction (see Figs. 3b, 3c, 3d & 3g). Ospreys and Prairie Falcons are infrequently observed as migrants; hence, these low counts likely preclude meaningful trend analyses (but see Figs. 3b & 3g). In this report we do not plot long-term trends for the Swainson's Hawk and the Ferruginous Hawk because of extremely low annual counts (generally only 2-4 individuals/season) for these two species.

The significant long-term trend for total raptors ($p < 0.05$, Fig. 3a) illustrates a recent upswing from a low point in 2008-2009, suggesting migratory raptor populations as a whole have generally been doing better in recent years across much of western North America. Smith et al. (2008a) reported trend analyses for data collected through 2005 for most long-term autumn migration study sites in western North America, including the Bridger Mountains. These and subsequent analyses (reported by the Raptor Population Index or "RPI" project (see http://www.rpi-project.org for updated trend graphs) are based on a more complex analytical approach (see Farmer et al. 2007, and Crewe et al. 2016) than what was reported in Hoffman and Smith (2003) and used herein to present trend analyses through 2018.

With few notable exceptions, the long-term trend estimates for each species as calculated by the more complex method generally yielded similar results to those obtained from the simpler methodology used herein and described more fully in Hoffman and Smith (2003) (see: https://www.birdscanada.org/birdmon/default/popindices.jsp or http://www.rpi-project.org/2016/graphs.php?rsite=592%3AF).

AGE RATIOS:

Overall, immature-to adult ratios for both Golden and Bald eagles in 2018 were about half the long-term average (Table 2), suggesting the possibility that this year's breeding success was well below average. Please note, however, that the calculated age-ratio values presented in Table 2 do not reflect the actual ratio of first-year birds to adults, since the "immature" category includes the combined totals for subadult, non-adult and immature (first-year birds) age classes (hence "immature" birds as classified herein range from 4 months to 3.5 years of age). Consequently, the calculated age ratios presented in Table 2 do not directly measure the current year's breeding success, but rather provide a rough estimate of breeding success during the previous 3-4 breeding seasons as well as overall survival of these younger age classes during this same time frame.

An alternative explanation for the low proportion of younger age classes for both Golden and Bald eagles in 2018 is that observations this season were significantly hampered by poor weather during the seasonal time frame when a high proportion of the young eagles were likely passing through. Of course, there is the possibility that both factors worked concurrently to contribute to the remarkably low percentage of young eagles documented this fall at our Bridger site.

It is important to emphasize that satellite radio tracking data as well as sightings of wing-tagged Golden Eagles (data gathered by RVRI – see rvri.org) indicate that the origins of these migrating eagles encompasses a vast region of western North America, from as far north as the Brooks Range of northern Alaska, south all the way to western Montana (and all latitudes in between!). Hence, Golden Eagle breeding success as well as long-term survival along the Bridger migratory flyway is likely to vary substantially along this flyway, likely due to variations in local and regional weather patterns and fluctuations in prey populations. In short, our Golden Eagle count statistics in the Bridgers for any given year represents the cumulative variation in both breeding success and survival of immature, subadult and adult Golden Eagles throughout the flyway during not only the current breeding season, but for many years previous to the current year.

RESIDENT RAPTORS:

This year our observers recorded 10 raptor species that consistently displayed resident behavior near the observation site. These included the Turkey Vulture, Sharp-shinned Hawk, Cooper's Hawk, Northern Goshawk, Red-tailed Hawk, Golden Eagle, Bald Eagle, Peregrine Falcon, Prairie Falcon and American Kestrel.

Turkey Vulture – Historically, Turkey Vultures have rarely been documented as residents on Bridger Ridge. However, in both 2016 and 2017 flocks of 8–12 individuals frequently cruised up and down the ridgeline near the observation point. In 2018, possibly the same vulture flock (averaging about 7 vultures) that was observed during this same time frame in 2017, was observed on 3–4 September. Other than these two days in September, usually no more than 1–2 individuals were detected at any given time. One interesting observation occurred on 3 September, when a flock of 5 Turkey Vultures were noted flying southbound high directly over the OP. One of the vultures appeared to take a swipe

at another, but upon further inspection it was actually a migrant Golden Eagle being mobbed by one of the vultures. Perhaps the eagle had ventured too close to the vulture flock? The tendency of the resident vultures to stream overhead, north-to-south, only to return from the south hours later made distinguishing migrant from resident vultures quite difficult. These thermal-loving scavengers, migrants and residents, were last seen on 18 September, coinciding with the arrival of the season's first winter storm.

Sharp-shinned Hawk – Resident Sharp-shinned Hawks were regularly seen from the start of the season until 22 October. A pair of immature birds, presumably siblings, was often seen hunting, playing and mobbing the decoy owl together throughout this time period. A single adult was seen sporadically during this same period flying north, hunting, or mobbing the decoy owls.

Cooper's Hawk – One each immature and adult Cooper's Hawks were identified as residents at the start of the season, and were seen regularly until 18 September. These birds were observed hunting low in the trees near the observation point and/or mobbing the decoy owl.

Northern Goshawk – Observations of resident Northern Goshawks were relatively rare this season. An immature was seen on 10 September mobbing the near owl and flying north along the ridge. Possibly this same individual provided a memorable observation on 26 September, when the bird was first detected circling up west of the OP. This individual pursued a resident Clark's Nutcracker that frequently perched just to the south of the OP. The Northern Goshawk was unsuccessful in its attempt to capture its prey, but veered north and took a swipe at our near-owl before continuing north along the ridge.

Red-tailed Hawk – Resident Red-tailed Hawks detections were limited to four individuals, two adult light-morphs, an adult dark-morph and an immature light-morph. The adult light-morphs were detected most frequently, and a single individual was last seen on 21 October. One of these two adult light-morphs was quite aggressive toward all migrating raptors, and seemed to consider the "Treed Ridge" area to the north of the OP as its territory. On 4 September this buteo was seen stooping on a resident adult Golden Eagle that was perched on the west face of Tilly. This adult, light-morph Red-tailed Hawk actually chased off the Golden Eagle!

Golden Eagle – Resident Golden Eagles were commonly observed throughout the entire count period this season. At least one territorial adult pair was confirmed. A subadult was also regularly seen throughout the season through 23 October. One immature Golden Eagle was also detected regularly until 27 October. On 17 September the two adults and one subadult were seen kettling together out over the Treed Ridge. The adults and subadult often displayed to passing migrants, doing their well-known "roller-coaster" maneuver. On 21 September two adult birds were seen kettling near Tilly before moving north. While they were still visible two more adult birds were seen moving north along the same flight path. This was the only instance when 4 adult Golden Eagles were detected at the same time, all exhibiting typical resident behavior.

Bald Eagle – Only 2 resident Bald Eagle detections were made this season. One adult and one juvenile bird were observed, respectively. The juvenile bird was seen once, on 15 October, flying north over the Bridgers. The following day, on 16 October, an adult bird was spotted on the west face of Tilly perched in a snag where it was being harangued by a resident Common Raven. These birds were only seen once, and because the Bridger Mountains are considered as atypical Bald Eagle habitat, we concluded that they were both birds that were passing through the area.

Peregrine Falcon – Two immatures and one adult Peregrine Falcon were confirmed as residents. These birds hunted the steep slopes and cliff faces around Tilly Peak, frequently dog-fighting with passing migrant raptors and treating the hawk watchers to numerous impressive displays. The adult resident was first identified on 29 August, and the immature was first confirmed on 7 September. On 10

September two immatures were seen dog-fighting with a migrant Northern Harrier before flying north toward Ross Peak. One of the immatures and the adult were both last observed on 17 September patrolling the ridge to the south before stooping on prey along the west side of the ridge.

Prairie Falcon – On 30 August a resident Prairie Falcon was first seen on its favorite flight line, approaching low on the east side of the OP, and then darting through to the west side of the ridge before moving toward the south again. It was regularly seen on this flight path, periodically kiting in the wind. Sometimes it would actively hunt the slope just below and to the east of the OP. This little talus slope harbored nearly a dozen chipmunks foraging regularly. This resident bird remained in the area until 19 October, when its near-daily occurrence abruptly ceased. (This is the exact same departure date as in 2017!).

American Kestrel – At least one male/female pair of American Kestrels were resident on the ridge until 18 September, which coincided with the arrival of the first wintry weather of the count season. These birds were often observed mobbing the decoy owls and hunting migrating butterflies and dragonflies from favored perches atop the fingers of limestone rimrock just to the south of the OP. On 4 September two immature American Kestrels were detected flying up the west side of Tilly, one eventually perching in a snag in this vicinity. These two immatures were never detected again.

PUBLIC VISITATION:

Bridger Ridge, above Bridger Bowl Ski Area, in addition to the Hawk Watch, hosts a variety of other outdoor activities the Bozeman community regularly engages in, such as hiking, trail running, and skiing. Since the 2018 raptor migration season proved to be considerably less smoky than in 2017, public visitation this year was quite frequent on the ridge. Throughout our fall season we witnessed a steady stream of outdoor enthusiasts; weekends on the Bridger Ridge were generally bustling with runners, hikers and birdwatchers alike. A total of 270 visitors signed our visitor log this season, nearly three times the number of signatures collected in 2017. Several residents of nearby communities joined us on multiple occasions, eager for a good raptor-viewing day. The official observers were always thankful to have the company of many outdoor enthusiasts to share this remarkable raptor migration spectacle!

Early season skiing began in earnest by 12 October, but this first significant snow did not stay long. By Halloween another winter storm arrived, and the winter's snowpack began to accumulate in earnest. Again, visitation surged, as many eager winter sports enthusiasts sought out fresh, unconsolidated snow.

The 22nd annual Bridger RaptorFest (5 – 7 October, see www.bridgerraptorfest.org/), run primarily by volunteers (as well as Bridger Bowl staffers), drew a few visitors to the Hawk Watch, despite a wintry storm impacting the area. The festival kicked off on Friday night at the Ellen Theater in downtown Bozeman, where Amanda Rodewald, Keynote Speaker, gave a talk entitled: *Coffee, communities, and conservation: how your cup can make a difference.* Amanda Rodewald is the Garvin Professor and Senior Director of Conservation Science at the Cornell Lab of Ornithology and Department of Natural Resources at Cornell University.

In total, 5 inches fell along the ridge during the nearly 6-day weather event in early October. Despite the weather, three intrepid Sacajawea Audubon Society volunteers (Elisabeth Swanson, Carol Anderson and Jerry Buckley) ascended the ridge to assist with visitation during the festival on 6 October. Since there was no visibility to even begin a count, only 4 visitors made it up. One was a birder, David Olsen. David managed to pick up 16 species during his round-trip hike from the Jim Bridger Lodge to

the ridge and back. He spotted a Northern Pygmy - Owl on his way down, and this detection was a first for this eBird Hotspot. Below, at festival headquarters, folks participated in a wide range of raptor-related activities (nest box-building, binocular-viewing, raptor identification lectures, and live-raptor demonstrations) throughout the weekend.

Throughout the late fall season raffle tickets for two all-season ski passes at Bridger Bowl were sold by Sacajawea Audubon volunteers. The two ski passes, generously donated by Bridger Bowl, generated revenues of more than $2,500. Additional raffle items were provided by: Patagonia (Dillon Outlet), Lehrkind Mansion Bed & Breakfast, Merlin Birding and Nature Tours, and Sola Cafe. These funds provided critically-needed support for the 2018 Bridger count.

Steve Hoffman made multiple trips to the ridge throughout the season to enjoy the flight (and the view!). Steve's lifelong passion of studying raptor migration provided a wealth of information to the observers during his visits, and of course, he has a keen eye for migrating raptors, having launched this as well as many other raptor count sites throughout the western and southern U.S.

OTHER WILDLIFE:

Sitting on a prominent ridgetop for eight hours every day throughout the fall is not only a great way to observe large numbers of diurnal raptors in flight, but affords opportunities to observe and enjoy many other wildlife species as well. Numerous resident and migrant songbirds as well as several species of mammals were observed throughout the season. Mountain Chickadees, Red-breasted Nuthatches, Clark's Nutcrackers and Steller's Jays were regularly observed near the observation point; the chickadees and nuthatches became so acclimated to our presence, they occasionally landed on the observers! For complete bird lists taken daily from the observation point, please refer to the Bridger Bowl Hawk Watch Hotspot on the eBird website: ebird.org/ebird/hotspot/L2979461.

Early in the season the observers witnessed unusually large swarms of tiny flying insects, which seemed to attract a variety of songbirds to Bridger Ridge. Especially prevalent were Yellow-rumped, and Wilson's warblers, as well as Ruby-crowned Kinglets. Other songbirds attracted to the insect hatch included Mountain Chickadees, Rock Wrens and Red-breasted Nuthatches.

Dragonflies were observed migrating throughout September, and these were preyed upon by several raptor species, especially American Kestrels. A resident pair of American Kestrels perched on the fingers of rimrock to the south of the OP and perch-hunted for dragonflies regularly.

Most ubiquitous among the resident birds seen from the observation point were corvids. Common Ravens and Clark's Nutcrackers were abundant. Ravens would often interact with migrating raptors, play among themselves, or harass the decoy owls while engaging in an array of vocalizations and aerial maneuvers. Steller's Jays, Pinyon Jays, American Crows and Black-billed Magpies were also observed (and heard) periodically throughout the area.

Other birds observed along Bridger Ridge included woodpeckers (Northern Flicker, Hairy Woodpecker, American Three-toed Woodpecker and Pileated Woodpecker), thrushes (American Robin, Townsend's Solitaire and Swainson's Thrush), Cassin's Finch, Dusky Grouse and Dark-eyed Junco.

Throughout the first half of the season Mountain Bluebirds migrated along the ridge in flocks of 1-10 birds. During the latter half of the season a completely different suite of migrating songbirds, primarily

finches, dominated the passerine bird migration. These included Evening Grosbeak, Pine Grosbeak and Pine Siskin. Even more impressive were Gray-crowned Rosy-Finches that migrated through in large flocks that sometimes numbered more than a thousand individuals. These birds began migrating steadily in early October. On several occasions the massive rosy-finch flocks landed near the observation point, providing spectacular views.

On 3 October a flock of 8 Canada Geese migrated past the observation point. Shortly after this flock passed, 2 lone Snow Geese were seen migrating from east to west through Ross Pass. A flock of 25 Sandhill Crane rounded out this day of superb weather for migrating waterbirds.

Other notable migrants were a small group of 8 White-throated Swifts on 5 September, 2 Northern Rough-winged Swallows on 1 September, and 17 Barn Swallow on 11 September. One lone Double – crested Cormorant crossed the Bridgers from east to west directly in front of the OP on 12 October. This bird made one slow circle just to the north of the OP (near Tilly Peak) before continuing west.

A large population of chipmunks frequented the talus slope below the OP for most of the fall. Their movements seemed to be of particular interest to our resident Prairie Falcon. A total of three red squirrels were seen until the first snowfall of the season. After this weather event one remained and was frequently heard scolding the chipmunks for coming too close to its carefully selected pine cones which lay scattered below several Douglas-fir trees near the OP. This same red squirrel was seen frequently towards the end of the count ferrying mouthfuls of grasses to line its winter nest.

A black bear was seen towards the end of September. Possibly this same individual was spotted again in the vicinity of Tilly, where it foraged daily for about a week. A moose cow and calf were observed in Bridger Canyon in mid–October. About a week later mule deer were seen frequently near the ridgeline to the north.

Large groups of mountain goats were present throughout the count period this year. This herd varied from 6–24 individuals, 3 of which were kids. Additionally, hikers reported seeing them frequently to the north and south of the OP. Towards the end of October, with the arrival of several feet of snow, the goats were no longer observed and likely dispersed from the area.

PROJECT PUBLICITY:

The Bridger Bowl Hawk Watch Project received publicity in 2018 primarily through the annual RaptorFest event, which once again was convened during the first weekend in October. This event once again attracted an estimated 4,000+ participants! In addition, a documentary film (already shown on the Smithsonian cable television station) produced by Grizzly Creek Films (GCF), entitled *Birds of Greater Yellowstone*, obtained footage of migrating Golden Eagles atop the Bridgers for a second straight year this autumn. Eric Bendick and others (of GCF) spent a spectacular fall day in mid-October with light east winds and superb visibility. This fine mid-October day produced a good flight of 50 Golden Eagles, with many of the birds flying extremely close to the videographers (An unintended consequence of the filmmakers setting up directly in the observers' line of sight was the unusually high number of unknown raptor detections for this day - 27 total.)

We hope to continue (and increase) the project's public visibility in future years, since community engagement is one of the stated objectives of the project. We hope increased public awareness and participation in the project will help inspire much-needed environmental activism throughout the Bozeman area, a community which is strongly outdoor-oriented.

RECOMMENDATIONS

The wisdom of initiating the count on 26 August (for the second consecutive season) was not supported by our count during these first six days of this count season. During this late August period we tallied only 53 raptors (2.5% of the seasonal raptor total) of 12 species. Golden Eagle migrants numbered only 18 birds (although they were recorded migrating four out of the first five days of the count). Since it appears that the timing of early-season raptor migration is still in flux, a decision to permanently move the count forward any earlier in August will require further assessment in the years to come. Please note, however, that there is a growing number of studies showing a trend toward earlier fall raptor movements, presumably due to climate change (see Filippi-Codaccioni et al. 2010, Jean-Francois Therrien et al. 2017). The primary hypothesis is that, with earlier breeding and thus earlier fledging, and with key prey species becoming increasingly scarce earlier during the hot, dry late summer period (likely due to earlier aestivation/hibernation), many raptors may be initiating their migration earlier relative to what has been the norm over the past several decades.

ACKNOWLEDGMENTS

Generous funding for the 2018 field season was provided by NaturEner USA, a wind energy company active in northern Montana (their critically important 2018 support was facilitated by Steve Laufenberg), USDA Forest Service, Custer Gallatin National Forest (2018 funding facilitated primarily by Forest Biologist Randy Scarlett), Sacajawea Audubon Society (SAS), Bridger Bowl Ski Area (support facilitated by Erin O'Connor), GCC, Inc. (which operates the Trident Cement Plant near Three Forks; support facilitated by Greg Gannon), as well as many generous individual contributors to SAS (including Martha & Hobart Collins, Bill Simkins & Erna Smeets, and Jean Setter). Randy Elliott of Bridger Bowl provided essential logistic support. Of special importance was full-season access to the Bridger Bowl Ski-Patrol Hut on Bridger Ridge for both overnight lodging and shelter from foul weather. Randy Scarlett and Wendy Urie of Custer-Gallatin National Forest thankfully coordinated the issuance of required US Forest Service access permits, and also provided essential portable toilets.

We especially wish to thank Jerry Buckley & Elisabeth Swanson for providing comfortable, in-town lodging for Alice Morris during her time off the mountain. Similarly, Lila Bishop provided lodging for Adam Richardson during his biweekly day off. This year the observers were able to take their days off on poor-weather days, when visibility made counting impossible. During a transition period of nearly two weeks towards the end of September, when Adam sometimes counted alone, Judy Tsiang, Paulette Epple, Matthew Keefer and Steve Hoffman all made exceptional efforts to fill in as second observers so as to generally maintain the double-observer scientific protocol established since the Bridger count was initiated in 1991.

LITERATURE CITED:

Bildstein, K.L. 2001. Why migratory birds of prey make great biological indicators. Pages 169–179 in K.L. Bildstein and D. Klem, Jr. (Editors), Hawkwatching in the Americas. Hawk Migration Association of North America, North Wales, PA.

_____, J.P. Smith, E. Ruelas Inzunza, and R.R. Veit (Editors). 2008. State of North America's Birds of Prey. Series in Ornithology No. 3. Nuttall Ornithological Club, Cambridge, MA, and American Ornithologists' Union, Washington, DC.

Crewe, T., D. Oleyar, D. Lepage, L. Goodrich, D. Brandes, J. Brown, and J. Sodergren. The Raptor Population Index, 2016 Analysis Methods and Trend Results. Available at: http://rpi-project.org/2016/

Davis, B.H., S.W. Hoffman, and D. Oleyar. 2017. Fall 2016 raptor migration study in the Bridger Mountains, MT. Unpubl. report submitted to the US Forest Service, Custer Gallatin National Forest, Bozeman, MT. 30pp.

Farmer, C.J., L.J. Goodrich, E. Ruelas Inzunza, and J.P. Smith. 2008. Conservation status of North America's birds of prey. Pages 303–420 In: K. L. Bildstein, J. P. Smith, and E. Ruelas Inzunza, and R. R. Veit (Editors), State of North America's Birds of Prey. Series in Ornithology No. 3, Nuttall Ornithological Club, Cambridge, MA, and American Ornithologists' Union, Washington, DC.

_____, D.J.T. Hussell, and D. Mizrahi. 2007. Detecting population trends in migratory birds of prey. Auk 124:1047–1062.

_____, and J.P. Smith. 2009. Migration counts indicate widespread declines of American Kestrels (*Falco sparverius*) in North America. J. of Raptor Research 43:263-273.

Filippi-Codaccioni, O., J.-P. Moussus, J.-P. Urcun, and F. Jiguet 2010. Advanced departure dates in long-distance migratory raptors. J. of Ornith. 151: 687–694.

Hoffman, S.W., and J.P. Smith. 2003. Population trends of migratory raptors in western North America, 1977–2001. Condor 105:397–419.

_____, J.P. Smith, and T.D. Meehan. 2002. Breeding grounds, winter ranges, and migratory routes of raptors in the Mountain West. J. of Raptor Research 36:97–110.

Omland, K.S., and S.W. Hoffman. 1996. Seasonal, diel, and spatial dispersion patterns of Golden Eagle autumn migration in southwestern Montana. Condor 98:633–636.

Smith, J.P., C.J. Farmer, S.W. Hoffman, G.S. Kaltenecker, K.Z. Woodruff, and P. Sherrington. 2008a. Trends in autumn counts of migratory raptors in western North America. Pages 217–252 In: K. L. Bildstein, J. P. Smith, E. Ruelas Inzunza, and R. R. Veit (Editors), State of North America's Birds of Prey. Series in Ornithology No. 3, Nuttall Ornithological Club, Cambridge, MA, and American Ornithologists' Union, Washington, DC.

_____, C J. Farmer, S.W. Hoffman, C.A. Lott, L.J. Goodrich, J. Simon, C. Riley, and E. Ruelas Inzunza. 2008b. Trends in autumn counts of migratory raptors around the Gulf of Mexico, 1995–2005. Pages 253–278 In: K. L. Bildstein, J. P. Smith, E. Ruelas Inzunza, and R.R. Veit (Editors), State of North America's Birds of Prey. Series in Ornithology No. 3, Nuttall Ornithological Club, Cambridge, MA, and American Ornithologists' Union, Washington, DC.

Therrien, J-F, N. Lecomte, T. Zgirski, M. Jaffre, A. Beardsell, L.Goodrich, J. Bety, A. Franke, E. Zlonis, and K. Bildstein. 2017. Long-term phenological shifts in migration and breeding-area residency in eastern North American raptors. Auk (134): 871–881.

Zalles, J.I., and K.L. Bildstein (Editors). 2000. Raptor Watch: A Global Directory of Raptor Migration sites. BirdLife Conservation Series No. 9. BirdLife International, Cambridge, U.K., and Hawk Mountain Sanctuary Association, Kempton, PA.

Table 1. Species-specific average counts (1992 – 2017) versus 2018 count and historic high counts of fall migrating raptors in the Bridger Mountains, MT.

		1992-2017				All-time Historic Records	
	Species	Mean Count	± 95 % CI	2018	% Change	Record Count	Year
	Turkey Vulture	6	± 3	10	67	29	2013
	Osprey	8	± 2	12	50	22	2015
	Northern Harrier	56	± 18	58	4	230	1998
Accipiters							
	Sharp-shinned Hawk	368	± 51	242	-34	658	2015
	Cooper's Hawk	176	± 26	216	23	347	1997
	Northern Goshawk	34	± 8	12	-65	96	1992
	TOTAL ACCIPITERS*	*625*	± *78*	*498*	*-20*	*1096*	*2015*
Buteos							
	Broad-winged Hawk	14	± 5	21	50	48	2013
	Swainson's Hawk	4	± 1	2	-50	11	1992
	Red-tailed Hawk	144	± 30	115	-20	389	2015
	Ferruginous Hawk	3	± 1	2	-33	8	2014
	Rough-legged Hawk	40	± 9	55	38	96	2015
	TOTAL BUTEOS*	*219*	± *43*	*211*	*-4*	*552*	*2015*
Eagles							
	Golden Eagle	1340	± 114	1004	-25	1871	1996
	Bald Eagle	78	± 9	59	-24	128	2000
	TOTAL EAGLES*	*1422*	± *119*	*1074*	*-25*	*1966*	*1999*
Falcons							
	American Kestrel	83	± 16	87	5	181	2015
	Merlin	14	± 4	9	-36	36	2015
	Prairie Falcon	14	± 2	12	-14	22	2006
	Peregrine Falcon	14	± 4	16	14	34	2012
	TOTAL FALCONS*	*132*	± *22*	*132*	*0*	*251*	*2015*
	GRAND TOTAL*	**2496**	**± 208**	**2048**	**-18**	**3532**	**1998**

***** Totals include unidentified (# unidentified for each category given in Appendix D).

Table 2. Fall counts by age class and immature[1]: adult ratios for Golden and Bald eagles migrating through the Bridger Mountains, MT: 1992–2017 versus 2018.

	Total and Age-classified Counts						% Unknown Age		Immature: Adult Ratio	
	2018			1992-2017 average						
	Imm[1]	Adult.	Total[2]	Imm[1]	Adult	Total[2]	1992–2017[3]	2018	1992–2017[3]	2018
Golden Eagle	325	445	1004	639	479	1340	26	25	1.3: 1	0.7
Bald Eagle	12	45	59	29	47	77	5	3	0.6: 1	0.3

[1] Values for the "immature" category represent the combined totals for subadult, non-adult, and immature eagle counts (see Appendix A for eagle age classification scheme).

[2] Totals include all age-unidentified individuals.

[3] Mean value. For age ratios and percent unknown category, note that the long-term mean immature: adult ratio (and percent unknown age) is an average of annual ratios (and % unknown), and thus may differ from the value obtained by dividing long-term total numbers of immatures and adults. Discrepancies in the two values reflect high annual variation in total numbers, and the observed age ratios (as well as % unknown).

Figure 1. Location of the Bridger Mountains Raptor Migration Project study site.

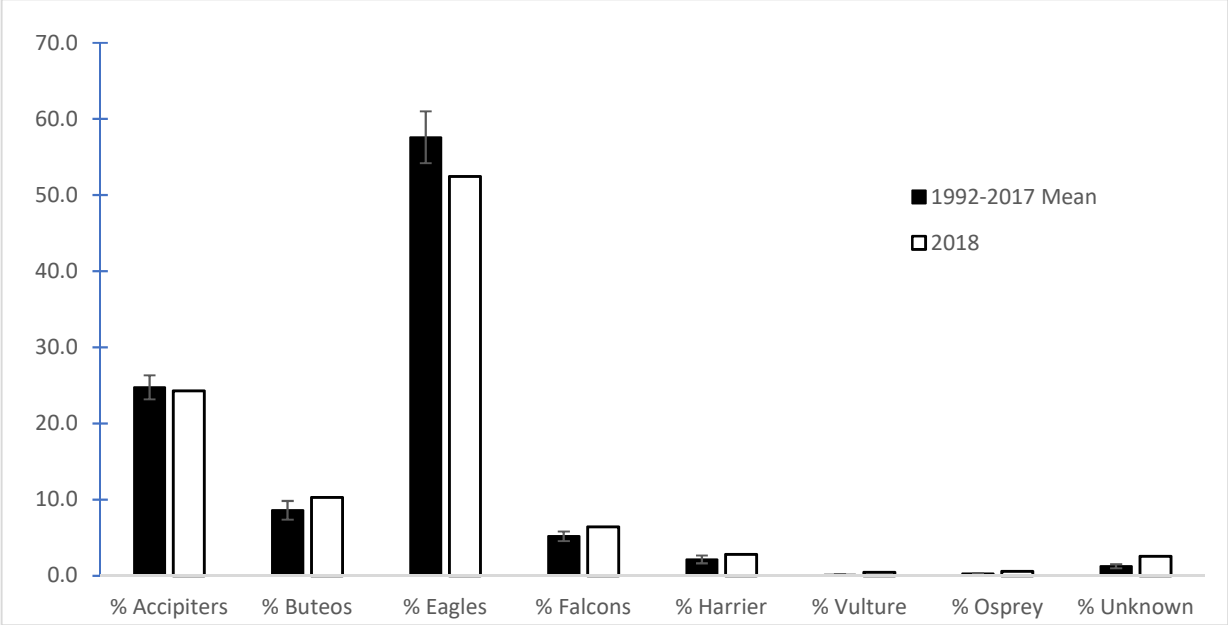


Figure 2. Fall raptor migration flight composition by major species groups in the Bridger Mountains, MT: 2018 versus 1992-2017 mean. (Note: error bars are one standard deviation.)

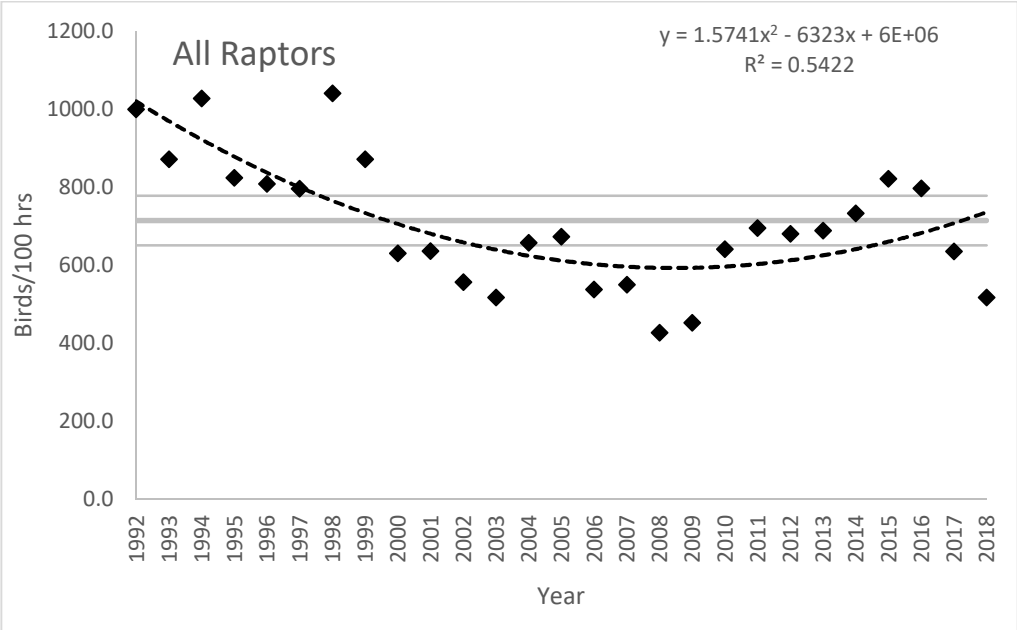


Figure 3a. Effort-adjusted fall migration passage rates for all diurnal raptors in the Bridger Mountains, MT. Dashed line indicates significant ($p < 0.05$) population trend based on quadratic regression analysis. Solid grey lines represent mean (thick) and upper and lower 95% confidence intervals (thin) of historical counts (1992-2018).

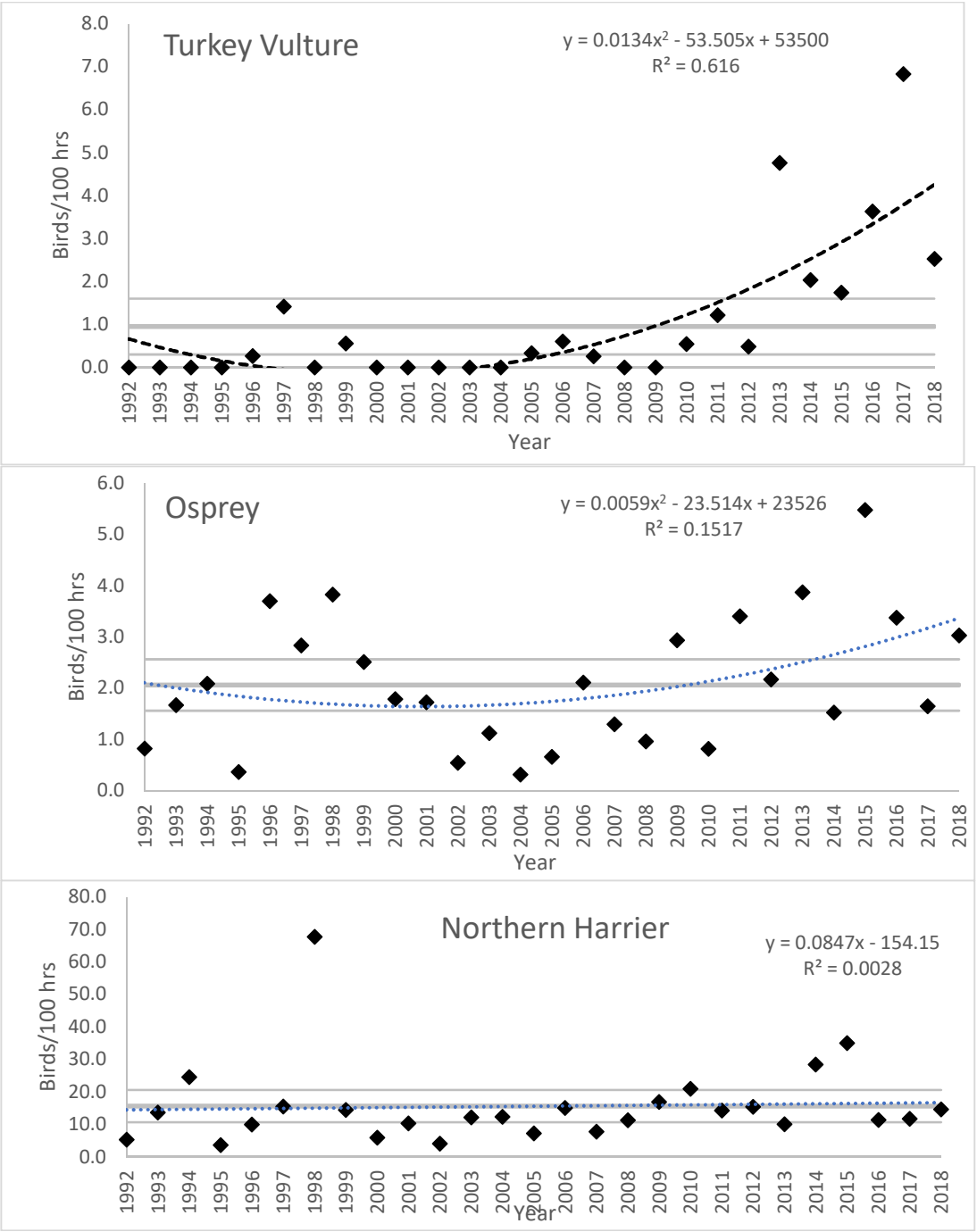


Figure 3b. Effort-adjusted fall migration passage rates for Turkey Vultures, Ospreys and Northern Harriers in the Bridger Mountains, MT. Dashed lines indicate significant ($p < 0.05$) population trend based on quadratic (Turkey Vulture and Osprey) and linear (Northern Harrier) regression analyses. Solid grey lines represent mean (thick) and upper and lower 95% confidence intervals (thin) of historical counts (1992-2018).

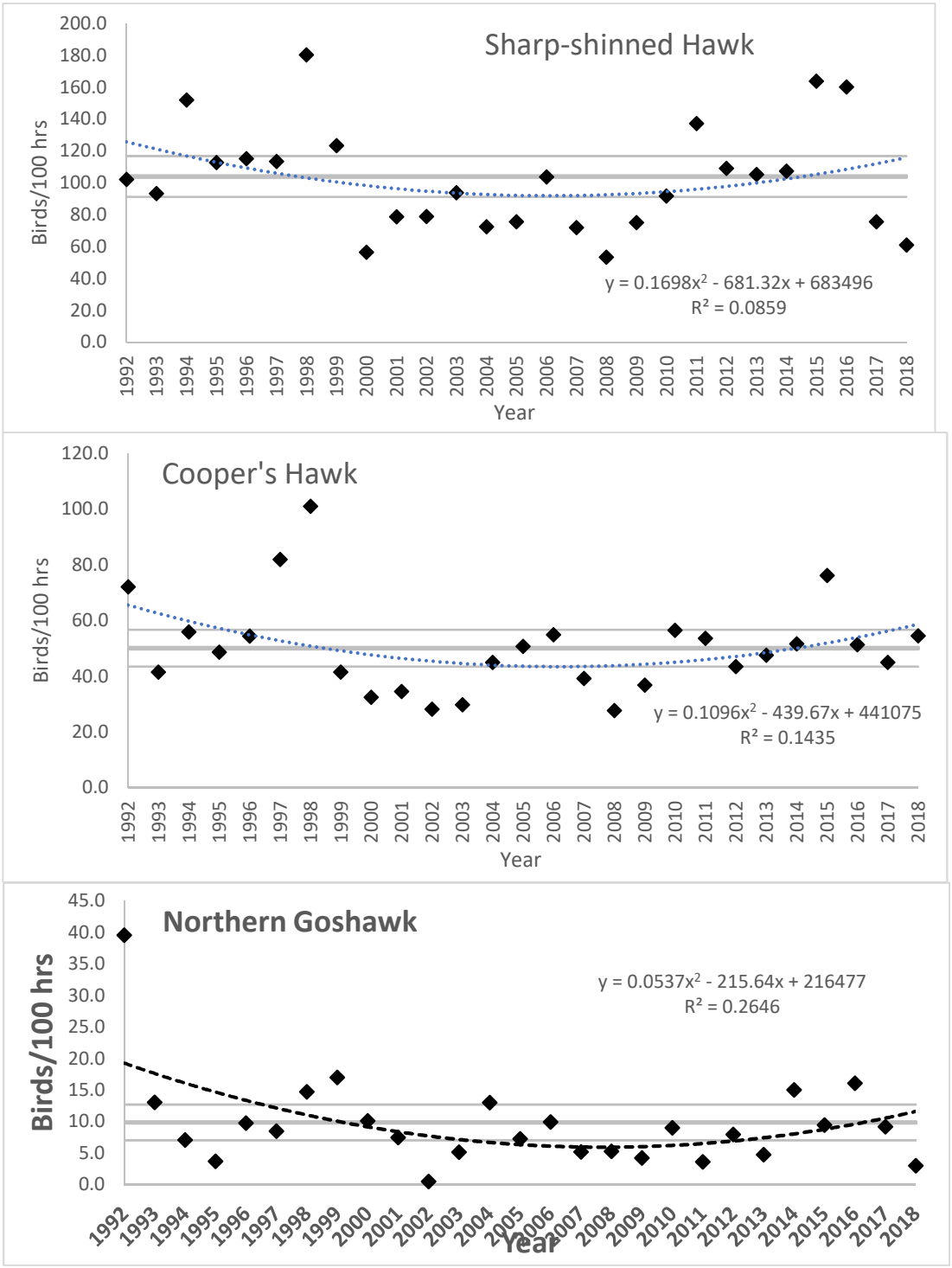


Figure 3c. Effort-adjusted fall migration passage rates for Sharp-Shinned Hawks, Cooper's Hawks and Northern Goshawks in the Bridger Mountains, MT. Dashed line indicates significant ($p < 0.05$) population trend based on quadratic regression analyses. Solid grey lines represent mean (thick) and upper and lower 95% confidence intervals (thin) of historical counts (1992-2018).

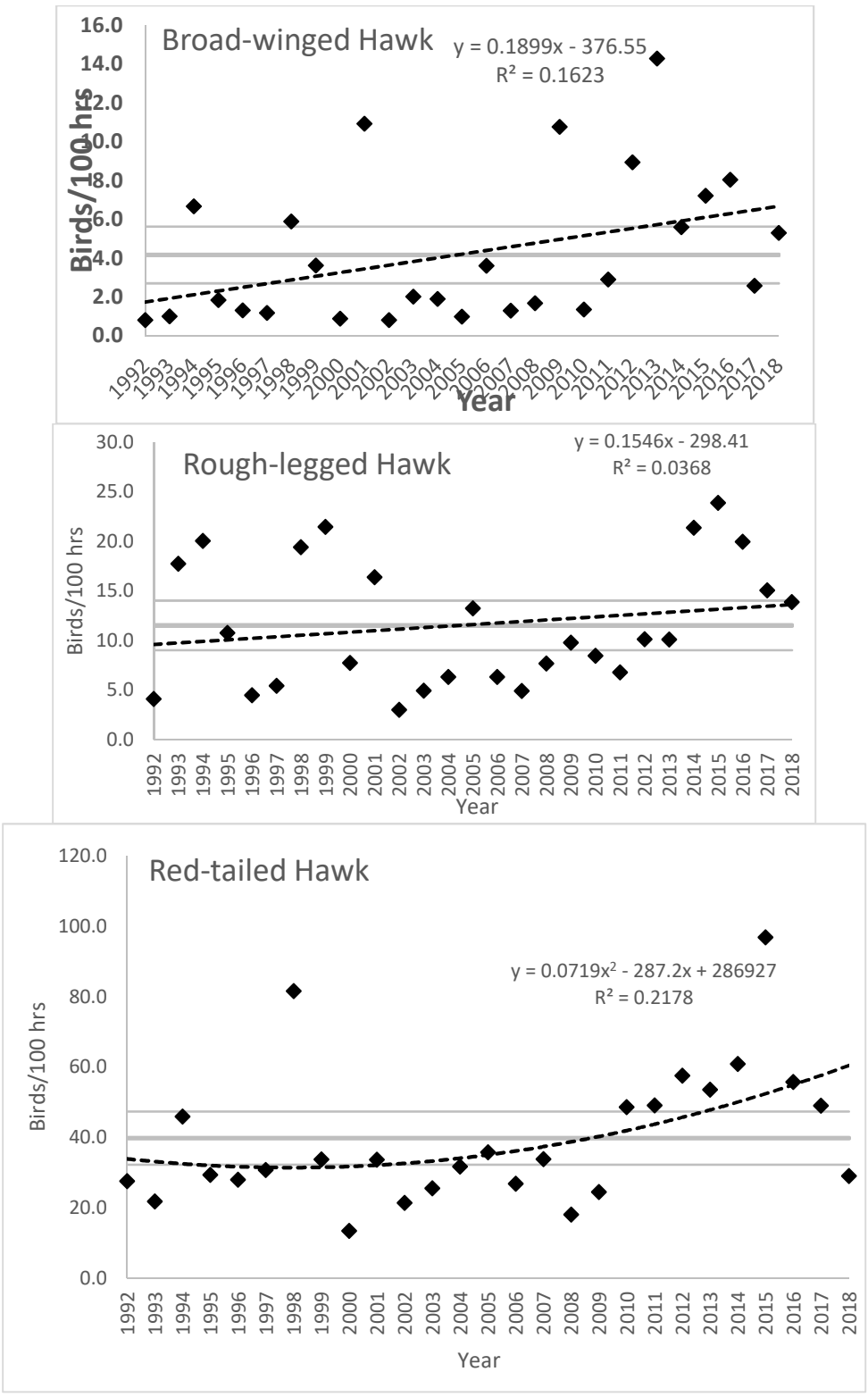
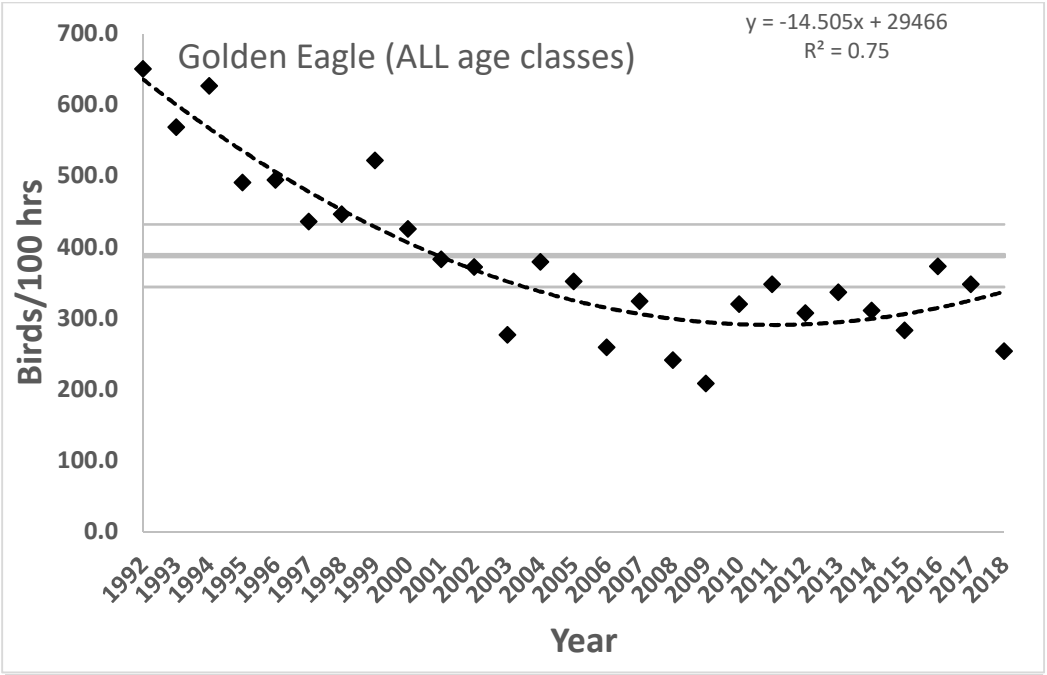


Figure 3d. Effort-adjusted fall migration passage rates for Broad-winged, Rough-legged, and Red-tailed Hawk in the Bridger Mountains, MT. Dashed line indicates significant ($p < 0.05$) population trend based on quadratic (Red-tailed Hawk) and linear (Broad-winged and Rough-legged hawks) regression analyses. Solid grey lines represent mean (thick) and upper and lower 95% confidence intervals (thin) of historical counts (1992-2018).



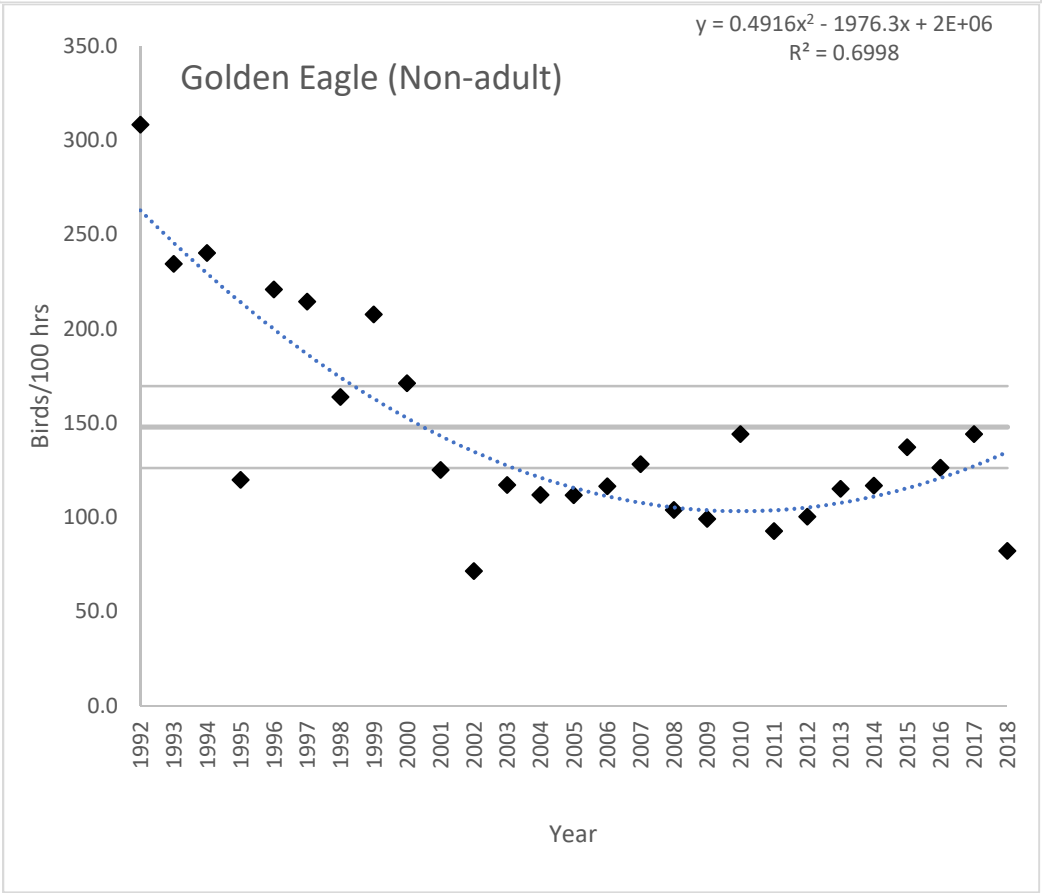


Figure 3e. Effort-adjusted fall migration passage rate comparison for adult vs. non-adult (subadult, immature and non-adult birds) Golden Eagles in the Bridger Mountains, MT. Dashed line indicates significant ($p < 0.05$) population trend based on quadratic regression analyses. Solid grey lines represent mean thick) and upper and lower 95% confidence intervals (thin) of historical counts (1992-2018).

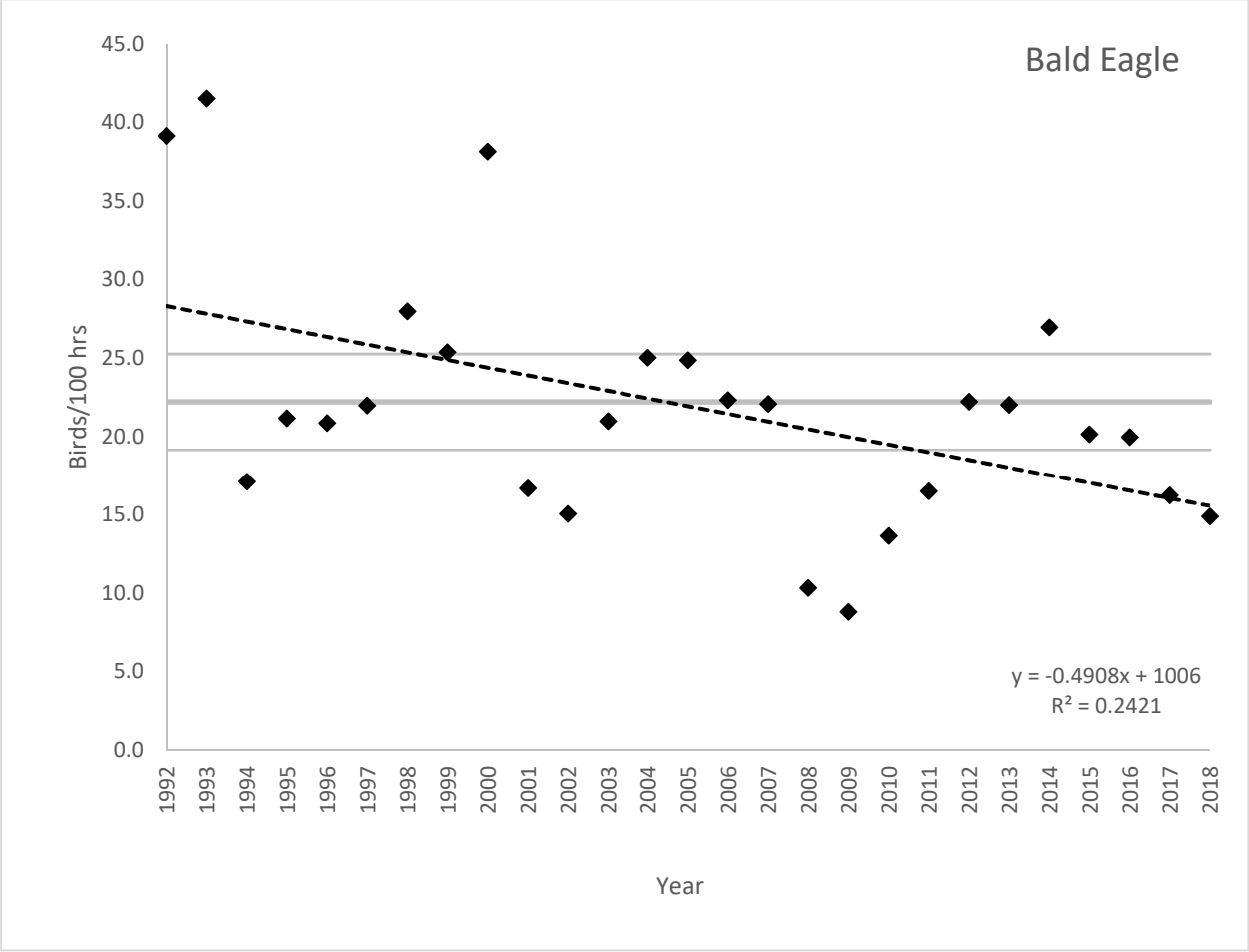
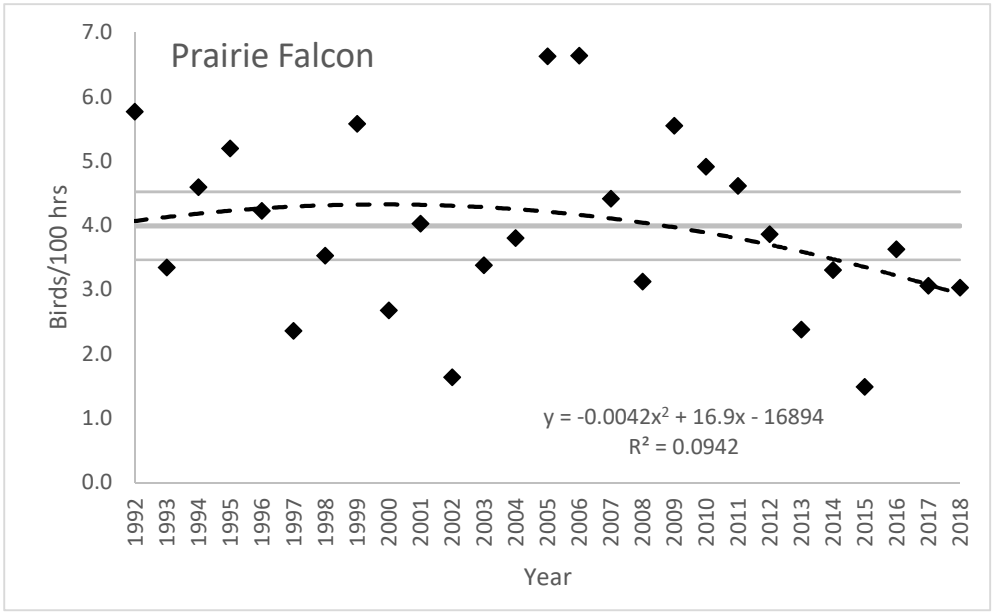


Figure 3f. Effort-adjusted fall migration passage rates for Bald Eagles in the Bridger Mountains, MT. Dashed line indicates significant ($p < 0.05$) population trend based on linear regression analysis. Solid grey lines represent mean (thick) and upper and lower 95% confidence intervals (thin) of historical counts (1992-2018).



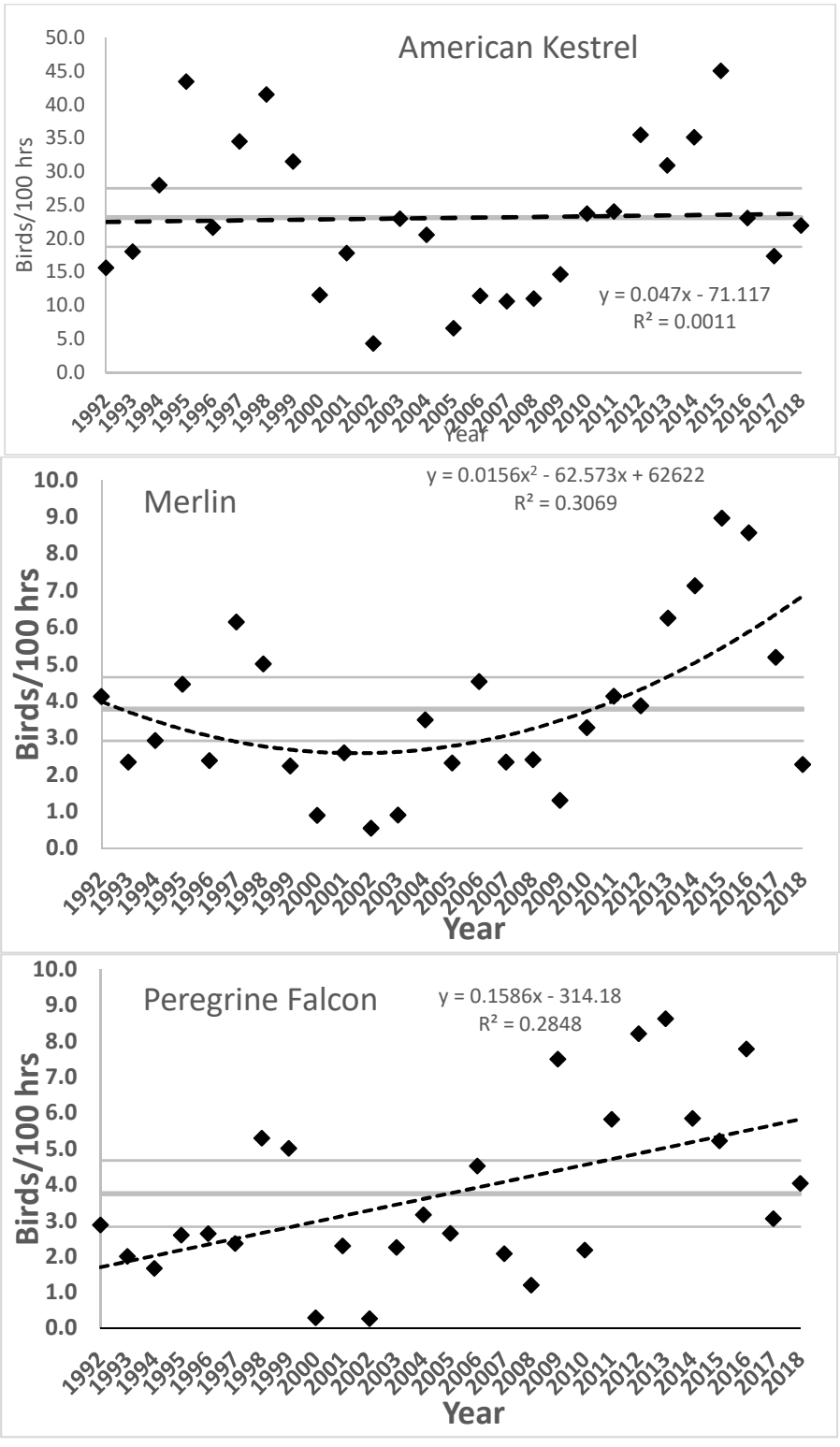


Figure 3g. Effort-adjusted fall migration passage rates for Prairie Falcon, American Kestrel, Merlin, and Peregrine Falcon in the Bridger Mountains, MT. Dashed line indicates significant ($p < 0.10$) population trend based on quadratic (Prairie Falcon and Merlin) and linear (American Kestrel and Peregrine Falcon) regression analyses. Solid grey lines represent mean (thick) and upper and lower 95% confidence intervals (thin) of historical counts (1992-2018).

Appendix A. Common and scientific names, species codes, and age, sex and color-morph classifications for all diurnal raptor species observed during fall migration in the Bridger Mountains, MT.

Common Name	Scientific Name	Species Code	Age[1]	Sex[2]	Color Morph[3]
Turkey Vulture	*Cathartes aura*	TV	U	U	NA
Osprey	*Pandion haliaetus*	OS	U	U	NA
Northern Harrier	*Circus cyaneus*	NH	A I Br U	M F U	NA
Sharp-shinned Hawk	*Accipiter striatus*	SS	A I U	U	NA
Cooper's Hawk	*Accipiter cooperii*	CH	A I U	U	NA
Northern Goshawk	*Accipiter gentilis*	NG	A I U	U	NA
Unknown small accipiter	*A. striatus* or *cooperii*	SA	U	U	NA
Unknown large accipiter	*A. cooperii* or *gentilis*	LA	U	U	NA
Unknown accipiter	*Accipiter* spp.	UA	U	U	NA
Broad-winged Hawk	*Buteo platypterus*	BW	A I U	U	D L U
Swainson's Hawk	*Buteo swainsoni*	SW	U	U	D L U
Red-tailed Hawk	*Buteo jamaicensis*	RT	A I U	U	D L U
Ferruginous Hawk	*Buteo regalis*	FH	A I U	U	D L U
Rough-legged Hawk	*Buteo lagopus*	RL	U	U	D L U
Unknown buteo	*Buteo* spp.	UB	U	U	D L U
Golden Eagle	*Aquila chrysaetos*	GE	I, S, NA, A, U[4]	U	NA
Bald Eagle	*Haliaeetus leucocephalus*	BE	I, S1, S2, NA, A, U[5]	U	NA
Unknown eagle	*Aquila* or *Haliaeetus spp.*	UE	U	U	NA
American Kestrel	*Falco sparverius*	AK	U	M F U	NA
Merlin	*Falco columbarius*	ML	AM Br	AM U	NA
Prairie Falcon	*Falco mexicanus*	PR	U	U	NA
Peregrine Falcon	*Falco peregrines*	PG	A I U	U	NA
Gyrfalcon	*Falco rusticolus*	GY	A I U	U	W G D
Unknown small falcon	*F. sparverius* or *columbarius*	SF	U	U	NA
Unknown large falcon	*F. mexicanus* or *peregrines*	LF	U	U	NA
Unknown falcon	*Falco* spp.	UF	U	U	NA
Unknown raptor	Falconiformes	UU	U	U	NA

[1] Age codes: A = adult, I = immature, Br = brown (adult female or immature), U = unknown age.
[2] Sex codes: M = male, F = female, U = unknown.
[3] Color morph codes: D = dark or rufous, G = gray; L = light, W = white; U = unknown, NA = not applicable.
[4] Golden Eagle age codes: I = Immature: juvenile or first-year bird, bold white wing patch visible below, bold white in tail, no molt; S = Subadult: white wing patch weak or absent, obvious white in tail and molt or tawny bar visible on upper wing; NA = Not adult: unknown age immature/subadult; A = Adult: no white in wings or tail; U = Unknown.
[5] Bald Eagle age codes: I = Immature: juvenile or first-year bird, dark breast and tawny belly; S1 = young Subadult: Basic I and II plumages, light belly, upside-down triangle on back; S2 = older Subadult: Basic III plumage, head mostly white with osprey-like dark eye line and usually a dark terminal band on tail; NA = Not adult: unknown age immature/subadult; A = Adult: includes near adult with dark flecks in head and weak dark tail tip, and adult with completely white head and tail; U = Unknown.

Appendix B. A complete history of primary observers for the Bridger Mountains Raptor Migration Project (1991-2018). Numbers given in parentheses indicate the number of full seasons of previous raptor migration counting experience.

1991: Variable teams throughout: Kristian Shawn Omland (0), Phil West (1), LisaBeth Daly (2), Craig Limpach (1)
1992: Two observers throughout: Emily Teachout (1), Phil West (2)
1993: Two observers throughout: Adam Kaufman (0), Anne-Marie Gillesberg (0)
1994: Two observers throughout: Chris Gill (0), Stephanie Schmidt (1)
1995: Two observers throughout: Scott Harris (0), Sue Thomas (0)
1996: Two observers throughout: Jason Beason (0), Niels Maumenee (0)
1997: Two observers throughout: Jason Beason (1), Patty Scifres (0)
1998: Two observers throughout: Jason Beason (2), Mike Neal (0)
1999: Two observers throughout: Mike Neal (2), Greg Levandoski (1)
2000: Two observers throughout: Ryan Wagner (1), Tracy Elsey (0)
2001: Two observers throughout: Ryan Wagner (2), Jeff Maurer (4)
2002: Two observers throughout: Matt Proett (0), Marg Lomow (2; half-season), Maureen Essen (0; half-season)
2003: Two observers throughout: Samantha Burrell (0), Carl Bullock (0)
2004: Two observers throughout: Allison Peterson (0), John Bell (0)
2005: Two observers throughout: Corey Michell (0), Beau Fairchild (0)
2006: Two observers throughout: Brian Cook (0), Jamie Granger (0)
2007: Two observers throughout: Jody Vogeler (0), Brenden McGugin (0)
2008: Two observers throughout: Amy Seaman (0), Michaela Hitchcock (0), John Bell (2)
2009: Two observers throughout: Caitlin Kroeger (0), Jason Minné (0)
2010: Two observers throughout: Jamie Hogberg (0), David Laufenberg (0)
2011: Two observers throughout: Brian Connelly (3), John Martineau (0)
2012: Two observers throughout: Bret Davis (0), Kalon Baughan (0)
2013: Two observers throughout: Bret Davis (1), Kalon Baughan (1)
2014: Two observers throughout: Bret Davis (2), Mikaela Howie (0)
2015: Two observers throughout: Andrew Eberly (2), Bridget Bradshaw (1)
2016: Two observers throughout: Bret Davis (5), Jess Cosentino (3)
2017: Two observers throughout: Bret Davis (6), Adam Richardson (0)
2018: Two observers throughout: Adam Richardson (1), Bret Davis (7; quarter-season), Alice Morris (0; half-season)

Appendix C. Daily observation effort and raptor migration counts by species in the Bridger Mountains, MT, Fall 2018. (see Appendix A for species codes[1]).

Date	Hours	TV	OS	BE	NH	SS	CH	NG	BW	RT	RL	SW	FH	GE	AK	ML	PG	PR	UA	UB	UF	UE	UR	TOTAL	#/hour
26-Aug	**2.5**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
27-Aug	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
28-Aug	**7.5**	0	1	1	0	0	0	0	0	1	0	0	0	3	0	0	1	0	0	0	0	0	0	**7**	**1**
29-Aug	**8**	0	0	1	2	0	0	0	0	0	0	0	0	6	6	0	0	0	0	0	0	0	0	**15**	**1.9**
30-Aug	**8.5**	2	0	0	1	1	0	0	0	0	0	0	0	4	1	0	0	0	0	1	0	0	1	**11**	**1.3**
31-Aug	**7.7**	0	1	0	0	2	0	0	3	3	0	0	1	5	3	0	0	1	0	1	0	0	0	**20**	**2.6**
1-Sep	**8**	0	0	0	0	2	2	0	0	5	0	0	0	2	2	0	0	0	0	0	0	0	1	**14**	**1.8**
2-Sep	**8**	0	1	0	2	2	2	0	0	0	0	0	1	5	0	0	0	0	0	0	0	0	0	**13**	**1.6**
3-Sep	**8**	0	1	0	1	0	2	0	0	0	0	0	0	1	3	0	0	0	1	0	0	0	0	**9**	**1.1**
4-Sep	**3.2**	0	0	1	1	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	**5**	**0.6**
5-Sep	**8**	1	0	0	1	1	5	2	0	3	0	0	0	1	2	0	0	0	0	0	0	0	0	**16**	**4.9**
6-Sep	**8**	1	0	0	5	12	8	1	1	7	0	0	0	4	5	0	2	0	1	0	2	0	1	**50**	**6.3**
7-Sep	**8**	0	0	0	0	1	0	0	4	3	0	0	0	5	2	0	0	0	0	0	0	0	0	**15**	**1.9**
8-Sep	**8**	0	1	1	0	3	3	0	0	1	0	0	0	5	8	0	2	0	1	0	0	1	1	**27**	**3.4**
9-Sep	**7.7**	3	0	1	0	5	13	1	0	4	0	0	0	12	8	1	2	0	0	0	0	0	1	**51**	**6.6**
10-Sep	**8**	0	0	0	2	8	11	0	1	2	0	0	0	12	2	0	0	0	3	0	0	0	0	**41**	**5.1**
11-Sep	**8**	0	0	0	7	6	9	0	1	6	0	0	0	6	7	0	1	0	0	0	1	0	0	**44**	**5.5**
12-Sep	**7**	0	0	0	4	4	14	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0	**26**	**3.7**
13-Sep	**4.8**	0	0	0	1	1	3	0	4	7	0	0	0	5	0	0	0	0	1	0	0	0	0	**22**	**4.6**
14-Sep	**8**	0	0	0	4	7	10	0	1	0	0	1	0	2	0	0	1	0	0	2	0	0	1	**29**	**3.6**
15-Sep	**8**	0	0	0	0	5	7	0	0	1	0	0	0	3	0	0	1	1	0	0	0	0	0	**18**	**2.3**
16-Sep	**8**	0	4	0	6	13	28	0	2	5	0	0	0	6	6	0	2	1	3	0	0	0	4	**80**	**10**
17-Sep	**8.5**	2	0	0	1	13	6	0	0	5	0	0	0	19	8	1	0	0	2	0	0	0	0	**57**	**6.7**
18-Sep	**8.2**	0	1	0	4	6	1	0	1	0	0	0	0	9	3	0	1	0	0	0	0	0	1	**27**	**3.3**
19-Sep	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
20-Sep	**3**	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	**3**	**1**
21-Sep	**8**	0	1	0	0	2	8	1	0	7	0	0	0	13	1	0	0	0	1	3	1	0	0	**38**	**4.8**
22-Sep	**8**	0	0	2	1	11	19	0	0	11	0	0	0	22	3	1	0	0	1	2	1	0	1	**75**	**9.4**
23-Sep	**6.5**	0	0	1	0	4	8	0	0	2	0	0	0	6	0	0	0	0	0	0	0	0	0	**21**	**3.2**
24-Sep	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
25-Sep	**6.5**	0	0	0	0	0	3	0	0	2	0	0	0	18	3	0	0	0	0	0	0	1	0	**27**	**4.2**
26-Sep	**8**	0	1	2	3	14	22	1	0	11	0	0	0	66	9	1	0	0	2	0	0	1	0	**133**	**16.6**
27-Sep	**7.7**	0	0	0	0	1	4	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	**11**	**1.4**
28-Sep	**2.5**	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	**2**	**0.8**
29-Sep	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**

30-Sep	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
1-Oct	**8**	1	0	2	3	3	6	0	0	1	0	0	0	17	4	0	0	0	1	1	1	0	1	**41**	**5.1**
2-Oct	**7.5**	0	0	0	0	1	4	0	0	0	0	0	0	12	0	1	0	0	1	0	1	0	0	**20**	**2.7**
3-Oct	**8**	0	0	5	1	9	6	0	0	7	1	0	0	46	0	0	2	2	1	4	0	0	1	**85**	**10.6**
4-Oct	**2**	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	**3**	**1.5**
5-Oct	**5.2**	0	0	1	0	1	1	1	0	1	0	0	0	14	0	0	0	0	0	0	0	0	0	**19**	**3.6**
6-Oct	**3.5**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
7-Oct	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
8-Oct	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
9-Oct	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
10-Oct	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
11-Oct	**1.5**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
12-Oct	**8**	0	0	0	0	21	5	1	0	0	1	0	0	60	0	0	0	0	3	0	0	1	4	**96**	**12**
13-Oct	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
14-Oct	**2.5**	0	0	1	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	**21**	**8.4**
15-Oct	**8**	0	0	1	0	12	4	1	0	1	4	0	0	15	0	0	0	1	2	0	0	0	0	**41**	**5.1**
16-Oct	**8**	0	0	1	0	6	0	0	0	0	12	0	0	3	0	1	0	0	2	0	0	0	1	**26**	**3.3**
17-Oct	**8**	0	0	8	1	7	2	0	0	2	4	0	0	50	0	0	0	0	0	0	1	0	27	**102**	**12.8**
18-Oct	**8.5**	0	0	3	1	10	0	0	2	3	3	0	0	114	0	0	0	1	0	2	0	5	1	**145**	**16.7**
19-Oct	**8.2**	0	0	2	1	13	0	0	1	1	2	0	0	86	0	0	0	2	1	0	0	0	1	**110**	**12.9**
20-Oct	**8**	0	0	2	1	10	0	0	0	1	4	0	0	51	0	0	0	0	0	0	0	0	0	**69**	**8.4**
21-Oct	**8**	0	0	2	0	10	0	1	0	4	4	0	0	34	0	1	1	0	0	0	0	0	1	**58**	**7.3**
22-Oct	**8**	0	0	2	2	2	0	0	0	2	2	0	0	40	0	0	0	0	0	0	0	0	0	**50**	**6.3**
23-Oct	**8.2**	0	0	4	2	4	0	1	0	1	8	0	0	31	0	0	0	0	0	0	0	0	0	**51**	**6.2**
24-Oct	**8**	0	0	4	0	5	0	0	0	1	1	0	0	43	0	1	0	0	0	0	0	0	3	**58**	**7.3**
25-Oct	**8.5**	0	0	6	0	1	0	0	0	0	0	0	0	51	0	0	0	1	1	0	0	0	0	**60**	**7.1**
26-Oct	**6**	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	1	0	**4**	**0.7**
27-Oct	**3.5**	0	0	2	0	1	0	0	0	1	2	0	0	17	0	0	0	0	0	0	0	0	0	**23**	**6.6**
28-Oct	**7**	0	0	2	0	0	0	1	0	0	3	0	0	15	0	0	0	1	0	0	0	0	0	**22**	**3.1**
29-Oct	**1.7**	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**	**0.6**
30-Oct	**3.2**	0	0	1	0	0	0	0	0	1	0	0	0	8	0	0	0	0	0	0	0	0	0	**10**	**3.1**
31-Oct	**4**	0	0	0	0	1	0	0	0	0	1	0	0	6	0	0	0	0	0	0	0	0	0	**8**	**2**
1-Oct	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
2-Nov	**3.5**	0	0	0	0	0	0	0	0	0	1	0	0	10	0	0	0	0	0	0	0	1	1	**13**	**3.7**
3-Nov	**1.2**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
4-Nov	**1**	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**	**0.8**
5-Nov	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
6-Nov	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
7-Nov	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
8-Nov	**0.5**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**
9-Nov	**8**	0	0	0	0	0	0	0	0	0	1	0	0	3	0	0	0	0	0	0	0	0	0	**4**	**0.5**
10-Nov	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**-**

TOTAL	395	10	12	59	58	242	216	12	21	115	55	2	2	1004	87	9	16	12	28	16	8	11	53	2048

[1] Species code UA is combined Unknown Accipiter, Small Accipiter, and Large Accipiter totals. (UF is combined Unknown Falcon, Small Falcon, and Large Falcon totals.)

Appendix D. Annual observation effort and fall raptor migration counts by species in the Bridger Mountains, MT: 1991–2018.

	1991	1992	1993	1994	1995	1996	1997
Start date	15-Sep	6-Sep	9-Sep	13-Sep	10-Sep	1-Sep	27-Aug
End date	3-Nov	28-Oct	31-Oct	30-Oct	2-Nov	30-Oct	31-Oct
Observation days	32	39	46	36	42	53	62
Observation hours	191.1	242.58	298.50	239.25	269.17	378.25	422.92
Raptors / 100 hours	926.7	1000.1	871.7	1027.8	824.0	808.5	796.1
SPECIES	RAPTOR COUNTS						
Turkey Vulture	3	0	0	0	0	1	6
Osprey	2	2	5	5	1	14	12
Northern Harrier	19	13	41	59	10	38	66
Sharp-shinned Hawk	88	248	279	364	304	436	480
Cooper's Hawk	87	175	124	134	131	206	347
Northern Goshawk	27	96	39	17	10	37	36
Unidentified Accipiter	70	35	27	20	33	51	53
Total Accipiters	272	554	469	535	478	730	916
Broad-winged Hawk	0	2	3	16	5	5	5
Swainson's Hawk	1	11	0	3	2	0	6
Red-tailed Hawk	26	67	65	110	79	106	130
Ferruginous Hawk	3	1	1	1	0	5	4
Rough-legged Hawk	9	10	53	48	29	17	23
Unidentified Buteo	14	8	19	15	18	13	20
Total Buteos	53	99	141	193	133	146	188
Golden Eagle	1280	1579	1699	1500	1322	1871	1844
Bald Eagle	43	95	124	41	57	79	93
Unidentified Eagle	5	2	17	0	25	14	0
Total Eagles	1328	1676	1840	1541	1404	1964	1937
American Kestrel	33	38	54	67	117	82	146
Merlin	2	10	7	7	12	9	26
Prairie Falcon	9	14	10	11	14	16	10
Peregrine Falcon	1	7	6	4	7	10	10
Gyrfalcon	0	0	0	0	0	0	0
Unidentified Falcon	5	3	2	4	2	5	17
Total Falcons	50	72	79	93	152	122	209
Unidentified Raptor	44	10	27	33	40	43	33
Grand Total	1771	2426	2602	2459	2218	3058	3367

Appendix D. (continued)

	1998	1999	2000	2001	2002	2003	2004
Start date	28-Aug	29-Aug	29-Aug	27-Aug	27-Aug	27-Aug	27-Aug
End date	31-Oct	31-Oct	29-Oct	31-Oct	27-Oct	31-Oct	27-Oct
Obs. Days	56	57	52	58	52	64	48
Obs. Hours	339.33	358.24	335.40	347.49	365.84	443.18	316.70
Raptors/100 hrs	1040.9	871.8	630.9	636.3	556.0	517.6	655.2
SPECIES			RAPTOR COUNTS				
Turkey Vulture	0	2	0	0	0	0	0
Osprey	13	9	6	6	2	5	1
Northern Harrier	230	52	20	36	15	54	39
Sharp-shinned Hawk	612	442	190	274	288	416	229
Cooper's Hawk	343	149	109	120	103	132	142
Northern Goshawk	50	61	34	26	2	23	41
Unidentified Accipiter	49	39	35	27	20	33	48
Total Accipiters	1054	691	368	447	413	604	460
Broad-winged Hawk	20	13	3	38	3	9	6
Swainson’s Hawk	2	3	3	0	1	2	0
Red-tailed Hawk	277	121	45	117	78	113	100
Ferruginous Hawk	7	4	1	3	0	1	3
Rough-legged Hawk	66	77	26	57	11	22	20
Unidentified Buteo	13	3	8	6	9	6	18
Total Buteos	385	221	86	221	102	153	147
Golden Eagle	1516	1870	1429	1330	1359	1226	1196
Bald Eagle	95	91	128	58	55	93	79
Unidentified Eagle	15	5	3	2	15	4	2
Total Eagles	1626	1966	1560	1390	1429	1323	1277
American Kestrel	141	113	39	62	16	102	65
Merlin	17	8	3	9	2	4	11
Prairie Falcon	12	20	9	14	6	15	12
Peregrine Falcon	18	18	1	8	1	10	10
Gyrfalcon	0	1	0	0	0	0	0
Unidentified Falcon	8	6	4	3	5	4	15
Total Falcons	196	166	56	96	30	135	113
Unidentified Raptor	28	16	20	15	43	20	38
Grand Total	3532	3123	2116	2211	2034	2294	2075

Appendix D. (continued)

	2005	2006	2007	2008	2009	2010	2011
Start date	27-Aug	27-Aug	27-Aug	27-Aug	6-Sep	28-Aug	2-Sep
End date	31-Oct	29-Oct	29-Oct	31-Oct	31-Oct	1-Nov	4-Nov
Observation days	48	45	56	56	44	54	57
Observation hours	300.83	331.25	384.59	415.49	306.25	366.00	411.42
Raptors / 100 hours	674.8	538.3	550.5	427.7	453.2	641.8	695.9
SPECIES			RAPTOR COUNTS				
Turkey Vulture	1	2	1	0	0	2	5
Osprey	2	7	5	4	9	3	14
Northern Harrier	22	50	30	47	52	77	59
Sharp-shinned Hawk	228	344	277	222	230	336	565
Cooper's Hawk	153	182	151	115	113	207	221
Northern Goshawk	22	33	20	22	13	33	15
Unidentified Accipiter	123	10	29	56	19	87	37
Total Accipiters	526	569	477	415	375	663	838
Broad-winged Hawk	3	12	5	7	33	5	12
Swainson's Hawk	0	0	3	8	4	1	2
Red-tailed Hawk	108	89	130	75	75	178	202
Ferruginous Hawk	2	3	5	1	2	3	2
Rough-legged Hawk	40	21	19	32	30	31	28
Unidentified Buteo	27	2	11	10	10	20	4
Total Buteos	180	127	173	133	154	238	250
Golden Eagle	1061	859	1247	1003	638	1171	1431
Bald Eagle	75	74	85	43	27	50	68
Unidentified Eagle	1	1	0	10	4	1	0
Total Eagles	1137	934	1332	1056	669	1222	1499
American Kestrel	20	38	41	46	45	87	99
Merlin	7	15	9	10	4	12	17
Prairie Falcon	20	22	17	13	17	18	19
Peregrine Falcon	8	15	8	5	23	8	24
Gyrfalcon	0	0	0	0	0	0	0
Unidentified Falcon	53	1	7	10	10	5	2
Total Falcons	108	91	82	84	99	130	161
Unidentified Raptor	54	3	17	38	30	14	37
Grand Total	2030	1783	2117	1777	1388	2349	2863

Appendix D. (continued)

	2012	2013	2014	2015	2016	2017	2018	Mean
Start date	1-Sep	1-Sep	1-Sep	29-Aug	27-Aug	26-Aug	26-Aug	31-Aug
End date	5-Nov	5-Nov	8-Nov	2-Nov	5-Nov	8-Nov	10-Nov	1-Nov
Observation days	58	50	57	55	54	60	52	52
Observation hours	414.38	335.76	399.67	401.33	385.2	424.3	395.5	356.2
Raptors / 100 hours	680.0	688.9	720.4	822.0	798.1	635.5	516.5	707.6
SPECIES				RAPTOR COUNTS				
Turkey Vulture	2	16	8	7	14	29	10	3
Osprey	9	13	6	22	13	7	12	8
Northern Harrier	64	34	112	141	44	50	58	56
Sharp-shinned Hawk	452	354	422	658	617	321	242	365
Cooper's Hawk	180	160	203	306	198	191	216	176
Northern Goshawk	33	16	59	38	62	39	12	33
Unidentified Accipiter	58	35	66	94	61	45	28	36
Total Accipiters	723	565	750	1096	938	596	498	589
Broad-winged Hawk	37	48	22	29	31	11	21	15
Swainson's Hawk	8	4	2	3	4	5	2	3
Red-tailed Hawk	238	180	239	389	215	208	115	139
Ferruginous Hawk	4	3	8	6	3	5	2	3
Rough-legged Hawk	42	34	84	96	77	64	55	41
Unidentified Buteo	12	17	37	29	16	19	16	14
Total Buteos	341	286	392	552	346	312	211	196
Golden Eagle	1272	1131	1222	1138	1437	1476	1004	1321
Bald Eagle	92	74	106	81	77	69	59	77
Unidentified Eagle	12	3	11	2	1	4	11	6
Total Eagles	1376	1208	1339	1221	1515	1549	1074	1410
American Kestrel	147	104	138	181	89	74	87	83
Merlin	16	21	28	36	33	22	9	13
Prairie Falcon	16	8	13	6	14	13	12	14
Peregrine Falcon	34	29	23	21	30	13	16	14
Gyrfalcon	0	0	0	0	0	0		0.05