SPRING 2018 RAPTOR MIGRATION REPORT

GUNSIGHT MOUNTAIN HAWKWATCH – ALASKA

© Stephen Nelson

HawkWatch International, Inc.

Salt Lake City, Utah

Anchorage Audubon Society

ALASKA DEPARTMENT OF FISH AND GAME

HAWKWATCH INTERNATIONAL

Conserving Raptors and Our Shared Environment

www.hawkwatch.org

SPRING 2018 RAPTOR MIGRATION REPORT
GUNSIGHT MOUNTAIN HAWKWATCH - ALASKA

Report prepared by:

Neil Paprocki

Counts conducted by:

Frank Simeone and Stephen Nelson

On-site education by:

Frank Simeone and Stephen Nelson

Project coordinated by:

HawkWatch International, Inc.

Principal Investigator: Neil Paprocki

2240 E. 900 S., Salt Lake City, Utah 84106

(801) 484-6808

July 2018

HAWKWATCH INTERNATIONAL

Conserving Raptors and Our Shared Environment

www.hawkwatch.org

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The Gunsight Mountain HawkWatch in southcentral Alaska is a new effort to monitor population trends of migratory raptors breeding in portions of southern and western Alaska. HawkWatch International (HWI) initiated full-season standardized counts at Gunsight Mountain in spring 2016, however the area has been a well-known migration corridor since the 1970s. Bob Dittrich and Ted Swem conducted sporadic counts at Gunsight Mountain in the 1980s, and several years of incomplete counts were conducted between 2003 – 2009 (Fritz and Fritz 2011). In 2015, HWI conducted 2-weeks of exploratory spring migration counts with funding provided by the U.S. Fish & Wildlife Service and Anchorage Audubon Society. In 2016, HWI conducted the first full-season of standardized spring migration counts at Gunsight Mountain with support from The Eppley Foundation for Scientific Research and Anchorage Audubon Society. A second and third full-season of standardized counts were conducted in 2017 and 2018 with support from Alaska Department of Fish and Game (ADFG) and the Anchorage Audubon Society. HWI will temporarily cease operations at Gunsight Mountain in 2019, while shifting focus to a full-season of counting around Kluane Lake, Yukon Territory during the fall of 2019.

The Gunsight Mountain HawkWatch was 1 of 9 long-term, annual migration counts operated or co-sponsored by HWI in North America during autumn 2017 and spring 2018. The primary objective of these efforts is to track long-term regional population trends of diurnal raptors in western North America and around the Texas Gulf Coast (Hoffman and Smith 2003; Smith et al. 2001, 2008 a, b). The status of many of Alaska's raptor species is assessed via the citizen science-based Breeding Bird Survey (BBS), which does not sample raptors well in Alaska because of the remoteness of the state, and the nature of the survey protocol (it is designed for songbirds along roads that have relatively small territories and are very vocal). Monitoring a portion of Alaska's migrant raptors via counts at Gunsight Mountain may add substantially to our knowledge of raptor population size and health in the state. Gunsight Mountain falls within the Northwestern Interior Forest, Northern Pacific Rainforest, and Western Alaska bird conservation regions, and the Pacific Birds Habitat Joint Venture. Raptors can serve as important biological indicators of ecosystem health (Bildstein 2001) and long-term migration counts can be a cost effective and efficient method for monitoring regional status and trends of multiple raptor species (Zalles and Bildstein 2000).

In addition to long-term counting and banding efforts, HWI conducts and supports other studies to further our knowledge about the biology of migrating raptors. Some of these efforts include: telemetry work to identify species' ranges, migratory routes, and connectivity, as well as blood sampling to track changes in raptor health (e.g., Hoffman et al. 2002, Lott and Smith 2006, Goodrich and Smith 2008, DeLong and Hoffman 2004, McBride et al. 2004).

Beyond having scientific and conservation value, each site in HWI's migration network offers unique opportunities for the public to learn about raptors and the natural environment. Providing such opportunities is an important component of the Gunsight Mountain HawkWatch and HWI's overall mission. With thousands of people driving the Glenn Highway in Alaska each year and easy accessibility, Gunsight Mountain offers excellent opportunities for public outreach and educating visitors about the conservation needs and biology of raptors and the ecosystems of the great state of Alaska.

STUDY SITE

The migration at Gunsight Mountain is unique among sites in HWI's network for a variety of reasons. Gunsight Mountain is a valley migration site lying in the Tahneta Pass between the Chugach and Talkeetna Mountain ranges, 155 km miles northeast of Anchorage and 113 km from Palmer along the Glenn Highway (Figure 1A). These two glacial-covered mountain ranges may act as barriers to migration for two reasons: 1) minimal thermal lift is generated over glaciers, and 2) raptors tend to avoid sparsley vegetated landscapes. As raptors move in a southwesterly direction through the valley during spring,

these two mountain ranges act as a natural funnel, concentrating migrating raptors through the Tahneta Pass. Several feet of snow usually cover the ground throughout much of the migration season, providing excellent reflective underside lighting on sunny days. Gunsight Mountain is also the only spring migration site in HWI's current migration network.

The Gunsight Mountain count sites (described in Methods) are located at various pullouts along the Glenn Highway, Matanuska-Susitna Borough, Alaska. The count sites can be easily accessed immediately adjacent to the Glenn Highway at mileposts 121, 120, and 118.8 (Figure 1B). Early season counting is conducted at the milepost 121 pullout as the bulk of Golden Eagle passage occurs along the distant Syncline Mountains to the north. Mid- and late-season counting is conducted at the milepost 120 pullout as the migratory flight shifts away from the Syncline Mountains and is dominated by flights overhead and over the valley north of the Chugach Range for all species. Two days of counting are also performed at the milepost 118.8 pullout concurrent with the annual Anchorage Audubon Society and Mat-Su Birders Hawk Watch Weekend. Observation site elevations range from 918 – 985 m and provide excellent views of the valley and surrounding mountains to the north, east, and south. Gunsight Mountain itself (el. 1,963 m) largely obstructs views to the west. The predominant vegetation within the valley consists of Black Spruce (*Picea mariana*), Alder (*Alnus sp.*), and Willow (*Salix sp.*).

METHODS

From 7 March – 15 May, HawkWatch International (HWI) conducted spring raptor migration counts at Gunsight Mountain. Hawk counts were primarily conducted by two experienced observers (F. Simeone and S. Nelson) with several seasons of raptor migration experience (Appendix A). Additional survey effort (minimum of 6 days) was provided by HWI staff (N. Paprocki & J. Watson: 6 days each) and numerous other volunteers from the Anchorage Audubon Society and Mat-Su Birders.

We conducted counts at three different pullouts along the Glenn Highway, Matanuska-Susitna Borough, Alaska (Figure 1B). Counts from 7 March – 1 April were conducted from the milepost 121 pullout (GPS coordinates: 61.881901, -147.336551). Counts from 2 April – 15 May were conducted at the milepost 120 pullout (GPS coordinates: 61.865761, -147.349418). We also conducted two days of counts (21 & 22 April) at the milepost 118.8 pullout (GPS coordinates: 61.853095, -147.371737).

Weather permitting; observations usually began at 0900 H and ended at 1700 H Alaskan Standard Time. Data collection followed standardized protocols used at all HWI migration sites (Hoffman and Smith 2003). Observers routinely recorded the following data:

1. Species, age, sex, and color morph of each migrant raptor, whenever possible and applicable (Appendix B lists common and scientific names for all species, information about the applicability of age, sex, and color morph distinctions, and two-letter codes used to identify species in some tables and figures).
2. Hour of passage for each migrant; e.g., the 1000–1059 H AKST.
3. Wind speed and direction, air temperature, percent cloud cover, predominant cloud type(s), presence of precipitation, visibility, and an assessment of thermal-lift conditions, recorded for each hour of observation on the half hour.
4. Predominant direction, altitude, and distance from the lookout of the flight during each hour.
5. Total minutes observed and the mean number of observers present during each hour (included designated observers plus volunteers/visitors who actively contributed to the count [active scanning, pointing out birds, recording data, etc.] for more than 10 minutes in a given hour), recorded on the hour.

6. A subjective visitor-disturbance rating for each hour, recorded on the hour.
7. Daily start and end times for each official observer.

2018 RESULTS AND DISCUSSION

Observation effort and weather summary

Gunsight Mountain HawkWatch's standard season runs 7 March – 15 May; in 2018 observers were able to count on 69 of a possible 70 days during this period for a total of 515.75 hours (Appendix C). Daily count effort ranged from 2 – 9.5 hours depending on weather and flight conditions, and no counts were conducted on 1 day due to weather. The average hourly temperature was 0.5 ºC (Range: -15.3 – 14.0 ºC) and average wind speed was 4.7 km/hr (Range: 0 – 30.0 km/hr). The Gunsight Mountain valley is oriented in a NE-SW direction and NE winds predominated (52% of hourly wind directions) over SW winds (21% of hourly wind directions). Average atmospheric pressure was 29.72 in HG (Range: 28.72 – 30.45 in HG). In 2018 based on hourly recording of conditions during observation it was clear 30% of the time, partly cloudy 20% of the time, mostly cloudy 16% of the time, and overcast 34% of the time. Compared to 2016 and 2017, 2018 was colder with higher atmospheric pressure (Appendix D).

FLIGHT SUMMARY

2018 Overall Flight (Fig. 3, Appendix C):

A total of 3,004 migrant raptors of 12 species were counted in 2018 (Table 1) for a total passage rate of 582 raptors per 100 hours of observation. This total and passage rate were lower than 2016 but higher than 2017 counts (Appendix C). Compared to 2016 and 2017, raw counts of Northern Harrier and Rough-legged Hawk were considerably higher in 2018, while no species were considerably lower (Appendix C).

The 2018 flight consisted of 47% Buteos, 34% Eagles, 10% Harriers, 6.8% Accipiters, 1.4% Falcons, and 0.6% Ospreys. The Red-tailed Hawk was the most commonly observed species (34% of the total), followed by Golden Eagle (34%), Rough-legged Hawk (12%), Northern Harrier (10%), and Sharp-shinned Hawk (5%). The remaining species comprised 2% or less each (Table 1).

Wind direction is known to affect passage rates at particular migration sites (Swem 1982). Since the Gunsight Mountain valley is oriented in a NE-SW direction, we calculated the following hourly passage rate averages by hourly wind direction: NE winds (all N to E winds; 52% of hourly records) = 6.58 raptors/hr; SW winds (all W to S winds; 21% of hourly records) = 6.06 raptors/hr; All other wind directions (27% of hourly records) = 4.42 raptors/hr (Figure 2). Qualitative comparisons between hourly passage rates suggests that tail winds (NE in origin) corresponded to slightly higher passage rates in 2016, 2017, and 2018 (Appendix D).

We observed a complex distribution in the overall passage rate timing from 7 March – 15 May with three peaks in passage rate (Figure 3). The first peak occurred from 22 – 26 March; second peak from 11 – 15 April; and third peak from 1 – 5 May.

Osprey and Northern Harriers (Fig. 4):

The 2018 Northern Harrier count (314) was higher than both the 2016 and 2017 totals (244 and 171, respectively), suggesting a higher passage rate for the species. The 2018 Osprey count (19) was the highest ever documented at Gunsight Mountain (Table 1). On May 2, 2018 a total of seven migrant Osprey were counted, breaking the previous single-day record of six.

The timing of Northern Harrier migration peaked from 1 – 5 May, and was later than most other species observed (Figure 4). The 2018 harrier migration peaked later than both 2016 and 2017 (21 – 25 April and 26 – 30 April, respectively; Figure 4), suggesting a delayed passage.

Accipiters (Figs. 5 & 6):

The 2018 Sharp-shinned Hawk count (144) was lower than the 2016 total (189) but higher than the 2017 total (134), suggesting an intermediate passage rate for the species. The 2018 Northern Goshawk count (60) was very similar to both 2016 anmd 2017 totals (63 and 61, respectively).

The timing of Sharp-shinned Hawk migration peaked from 1 – 5 May, and was later than most other species observed (Figure 5). The 2018 Sharp-shinned Hawk migration peaked later than both 2016 and 2017 (21 – 25 April and 26 – 30 April, respectively; Figure 5), suggesting a delayed passage. Northern Goshawk passage rates were low throughout the season, but peaked from 22 – 26 March (Figure 6) suggesting an earlier migration than most other species. The timing of the 2018 Northern Goshawk migration was similar to 2016 and 2017 (Figure 6).

Buteoine Hawks (Figs. 7 & 8):

The 2018 Red-tailed Hawk count (1,028) was slightly lower than the 2016 and 2017 totals (1,066 and 1,104, respectively), however all three years were fairly consistent. The 2018 Rough-legged Hawk count (364) was higher than both the 2016 and 2017 totals (297 and 223, respectively), suggesting a higher passage rate for the species. Observers also counted three migrant Swainson's Hawks in 2018, esclipsing the previous single-season record of two (Appendix C).

The timing of the Red-tailed Hawk and Rough-legged Hawk migration was considerably different in 2018. Rough-legged Hawk peak migration (11 – 15 April; Figure 7) was roughly two-weeks earlier than Red-tailed Hawk peak migration (26 – 30 April; Figure 8). The timing of the 2018 Rough-legged Hawk migration was similar to 2016 and 2017 (Figure 8), while the 2018 Red-tailed Hawk migration peaked later than both 2016 and 2017 (11 – 15 April and 6 – 10 April, respectively; Figure 7), suggesting a delayed passage.

The delayed Red-tailed Hawk migration in 2018 may have been the result of heavy winter and spring snowpack in parts of Alberta, Montana, and surrounding areas where the bulks of the Harlan's likely pass through during migration (local communications). Rough-legged Hawks also use this same migration corridor however, and their migration timing was not delayed suggesting a possible alternative explanation.

Eagles (Fig. 9):

The 2018 Golden Eagle count (1,020) was slightly lower than the 2016 total (1,163), but substantially higher than the 2017 total (705).

In 2018, we again began counts on 7 March in an attempt to document the beginning of the Golden Eagle migration season. Very low passage rates during the first two, 5-day count windows (< 1.4 eagles per 10 hours) suggests we did document the beginning of eagle migration. Golden Eagle passage in 2018 peaked from 22 – 26 March (Figure 9), which was similar to the peak timing in 2016 but slightly earlier than in 2017 (27 – 31 March).

On April 7, 2018 a wing-tagged Golden Eagle was photographed passing over Gunsight Mountain. Photographs by S. Nelson revealed a tag number of '226', white numbering on a blue patagial tag. The information was sent to the Raptor View Research Institute in Montana. Shortly thereafter, HWI received confirmation that the bird was originally captured and tagged on October 22, 2013 at Nora Ridge, Montana as a fall migrant. At the time of capture, the bird was aged as a fifth year and later sexed via DNA as a female. At the time of our siting in 2018, the bird was 10 years old. The Raptor View Research Institute has had several other Golden Eagles trapped in Montana re-sighted in Alaska and nearby

Canada, confirming the Rocky Mountain front range in Montana as a migration corridor for Alaskan Golden Eagles. This fact has also been verified by extensive satellite/GPS tracking of bird from Alaska by several organizations (Alaska Department of Fish & Game, National Park Service, and U.S. Fish & Wildlife Service).

Bald Eagles were again not counted in 2018 due to their unusual spring flight patterns, low passage rates, and lack of pressing conservation need in Alaska (Paprocki 2017).

Falcons (Fig. 10):

Proportion of the overall flight for all falcon species was low (1.4%), however the Peregrine Falcon count (8) was the highest ever recorded at the site. Observers also counted 25 Merlins, 7 American Kestrels, 1 Gyrfalcon, and 1 unknown falcon (Table 1).

We combined all falcon species in our timing analysis because of low individual species counts. The timing of Falcon migration peaked from 1 – 5 May, and was later than most other species observed (Figure 10). Low passage rates make between year comparisons difficult, but overall falcon timing appeared to be slightly later in 2018 compared to 2017 (Figure 10).

THE FUTURE OF GUNSIGHT MOUNTAIN

HawkWatch International has now conducted three full seasons of spring raptor migration counts at Gunsight Mountain. Each of these three years has been quite different in terms of migration composition and timing, and we feel we've established a solid foundation documenting the natural variation that occurs here. HWI has also established strong local partnerships in south-central Alaska, and we feel very good about the pieces-in-place that could make Gunsight Mountain into a long-term raptor migration monitoring site.

During this same time, HWI has also explored alternative fall migration counts at Kluane Lake, Yukon Territory, Canada. We chose Kluane Lake as there was a concensus among Alaskan raptor experts that this area may be the single largest "catchment" of migratory raptors leaving Alaska during the fall, with a particular focus on Golden Eagles. Based on this knowledge, HWI conducted a month of exploratory counts around Kluane Lake in 2017, counting an impressive number of migratory raptors. From 24 September – 22 October 2017, HWI counted 1,397 Golden Eagles and 1,842 total migrant raptors (HWI unpublished data). Given these impressive count totals, HWI and its partners agreed that a full season of counts at Kluane Lake should be given priority.

Beginning in 2019, spring migration counts at Gunsight Mountain will be temporarily ceased to allow HWI to divert resources towards a full season fall count at Kluane Lake in 2019. After the fall of 2019, HWI will reassess the long-term options at these two northernmost migration sites in North America. While we are temporarily discontinuing counts at Gunsight Mountain, HWI may indeed be back again in the future. Until then, we know the energetic south-central Alaskan community will continue to hold its annual Hawk Watch Weekend, continuing the long held tradition of HawkWatching in Alaska!

VISITOR PARTICIPATION AND PUBLIC OUTREACH

Hundreds of people made individual visits to the Gunsight Mountain HawkWatch site in 2018 to watch hawks together and learn about their migration, natural history, ecology, and some of the threats raptors face. Many visitors contributed officially documented volunteer time and mileage to the project (21 individuals) while assisting official observers with the count. The 2018 volunteer effort was valued at an estimated $47,385.92. This volunteer support was a huge boost to our count effort and helped fund the 2018 spring count. If counting resumes at Gunsight Moutain in the future, it may be a way to continue long-term survey efforts through the use of matching funds from volunteer time and mileage. The vast

majority of visitors spending time at the site were Alaskan residents visiting from the communities in and around Anchorage, Palmer, and Fairbanks.

Francesco Simeone and Stephen Nelson provided great daily interpretation information to visitors. Additionally, F. Simeone provided a formal presentation on raptor migration at Gunsight Mountain to Anchorage Audubon Society members and the general public on 21 April to a total of 40 attendees. Finally, the 2018 Hawk Watch Weekend hosted by the Anchorage Audubon Society and Mat-Su Birders was a huge success with over 120 total visitors over the jovial 2-day weekend.

2017 FALL MIGRATION ACROSS HWI'S NETWORK

HawkWatch International and partners operated 8 fall count sites in 2017 (Figure 13). During the 4,486 hours of standardized observation, we counted 305,549 migrating birds of prey. The power and utility of HWI's network of fall count sites, and long-term monitoring in general, lies in that it allows identification of patterns in regional raptor populations, both over time at a single site and also network-wide. Declines in counts or passage rates for a species or group of species at the regional level can highlight the need for more focused research or management attention at local scales, while increases may indicate the success of management and conservation efforts. While each site in HWI's network varied in terms of individual species or group counts, notable network-wide patterns in 2017 included (Table 2):

- No sites with above average overall counts in 2017
- Below average Sharp-shinned Hawk numbers at 5 of 8 sites (including 2 sites w/ record low
- counts).
- Below average count of American Kestrels at 6 of 8 sites (3 with record lows) and no sites with
- above average counts
- Below average counts for Prairie Falcons at 4 of 8 sites (2 with record lows).
- Below average counts for Red-tailed Hawks at 4 of 8 sites, including a record low at Corpus
- Christi; above average counts at 3 sites.
- Record highs for:
    - Broad-winged Hawks at Chelan Ridge and Manzano Mountains
    - Sharp-shinned Hawks and Peregrine Falcons at Corpus Christi
    - Zone-tailed Hawks (6) at Manzano Mountains

HWI partners with Hawk Mountain Sanctuary, the Hawk Migration Association of North America (HMANA), and Bird Studies Canada (BSC) to provide western US data for the Raptor Population Index (RPI), a collaborative standardized effort to monitor raptor migration across North America.

ACKNOWLEDGMENTS

Funding for the 2018 migration count at Gunsight Mountain was generously provided through a working agreement with the Alaska Department of Fish and Game, greatly facilited by Travis Booms. HWI private donors and members also contributed financial support. The 2018 count would not have been possible without funding for a 2-week exploratory count in 2015 provided by Steve Lewis of the U.S. Fish & Wildlife Service and the Anchorage Audubon Society and a full-season count in 2016 funded by the Eppley Foundation for Research.

None of this work would have been possible without the intrepid early observations conducted at Gunsight Mountain by Bob Dittrich, Ted Swem, and others. Paul and Cecily Fritz carried the torch of hawkwatching at Gunsight Mountain during the 2000s, and greatly inspired the local bird watching communities in Anchorage and Palmer to become more involved in counting at Gunsight. Their article on "The Hawks of Gunsight Mountain, Alaska" in a 2011 issue of Birding Magazine initially introduced

HawkWatch International to the site during the summer of 2014. We are indebted to all of these people for discovering the site, conducting historic migration counts, and for rallying local community support.

A huge thank you must be extended to all of the volunteer observers who assisting in this count effort, and for providing their volunteer time and mileage information to the Alaska Department of Fish and Game for future funding efforts. The local birding community from the Anchorage Audubon Society and Mat-Su Birders put on another fabulous and well-attended Hawk Watching Weekend in 2018. White Keys (Anchorage Audubon) again played an enormous role in volunteer recruitment, organization, and other logistical aspects of the project. Paul and Sue Wiltse provided generous food donations to our 2018 crew, for which we are very grateful. Special thanks to Tom "Hawk" and Dove Hawkins for their hospitality and company at Sheep Mtn Vacation Rentals. Enormous thanks and appreciation to our 2018 observers: Franceso Simeone and Stephen Nelson. Your willingness to brave the cold Alaskan spring will not be forgotten. Finally, we'd like to extend a thank you to all prior counters, volunteers, supporters, and friends who helped to make HWIs counts at Gunsight Mountain from 2015 – 2018 possible: THANK YOU EVERYONE. This would not have been possible without you all.

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 (Editors), Hawkwatching in the Americas. Hawk Migration Association of North America, North Wales, Pennsylvania, USA.

Bildstein, K. L., J. P. Smith, E. Ruelas Inzunza, and R. R. Veit (Editors). 2008. The state of North America's birds of prey. Series in Ornithology No. 3. Nuttall Ornithological Club, Cambridge, Massachusetts, and the American Ornithologists' Union, Washington, DC, USA.

Farmer, C. J., and J. P. Smith. 2009. Migration counts indicate widespread declines of American Kestrels (*Falco sparverius*) in North America. Journal of Raptor Research 43(4).

Fritz, P., and C. Fritz. 2011. The hawks of Gunsight Mountain, Alaska. *Birding* January 2011:31–36.

Paprocki, N. 2017. Spring 2017 raptor migration report: Gunsight Moutnain HawkWatch – Alaska. HawkWatch International, Inc., Salt Lake City, Utah.

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

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

Liguori, J. 2004. How to age Golden Eagles: techniques for birds observed in flight. Birding June 2004:278–283.

McIntyre, C.L., D.C. Douglas, and M.W. Collopy. 2008. Movements of Golden Eagles (*Aquila chrysaetos*) from interior Alaska during their first year of independence. The Auk 125(1):214–224.

Smallwood, J.A., M.F. Causey, D.H. Mossop, J.R. Klucsarits, B. Robertson, S. Robertson, J. Mason, M.J. Maurer, R.J. Melvin, R.D. Dawson, G.R. Bortolotti, J.W. Parrish, Jr., T.F. Breen, and K. Boyd. 2009. Why are American Kestrel (*Falco sparverius*) populations declining in North America? Evidence from nest-box programs. Journal of Raptor Research 43(4):274-282.

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, Massachusetts, and American Ornithologists' Union, Washington, DC.

Smith, J. P., 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, Massachusetts, and American Ornithologists' Union, Washington, DC.

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, United Kingdom, and Hawk Mountain Sanctuary Association, Kempton, Pennsylvania, USA.

Table 1. Counts and historical records of spring migrating raptors at the Gunsight Mountain HawkWatch, AK. Note that 2003 – 2017 mean counts represent 8 years of partial-season counts from 2003 – 2009 & 2015, and two full-season of counts in 2016 and 2017; all other years had less than 16 days of counts conducted and were not included in our summary data, but are included for purposes of daily records.

		2003-2017		All-time Historical Records	
	Species	**Mean Count[1]**	**2018**	**Season**	**Daily**
	Osprey	4.5	19	19 (2018)	7 (2018)
	Northern Harrier	190.3	314	493 (2006)	167 (2006)
	Short-eared Owl	0.2	0	1 (2x)	1 (2x)
Accipiters					
	Sharp-shinned Hawk	104.9	144	227 (2006)	58 (2006)
	Northern Goshawk	26.2	60	63 (2016)	9 (2017)
	TOTAL ACCIPITERS	131.1	204	252 (2016)	
Buteos					
	Swainson's Hawk	0.5	3	3 (2018)	1 (>3x)
	Red-tailed Hawk	811.2	1028	1104 (2017)	269 (2009)
	Rough-legged Hawk	301.0	364	479 (2009)	126 (2005)
	Unidentified buteo	10.2	10		
	TOTAL BUTEOS	1122.9	1402	1538 (2009)	
Eagles					
	Golden Eagle	437.4	1020	1163 (2016)	229 (2016)
	Unknown eagles	0.1	0		
	TOTAL EAGLES	437.5	1020	1163 (2016)	
Falcons					
	American Kestrel	2.7	7	8 (2017)	3 (2007)
	Merlin	12.8	25	27 (2016)	7 (2011)
	Peregrine Falcon	2.9	8	8 (2018)	3 (2005)
	Gyrfalcon	0.5	1	2 (2017)	1 (>3x)
	Unidentified falcon	0.2	1		
	TOTAL FALCONS	19.1	42	42 (2018)	
	Unidentified Raptor	8.4	0		
	GRAND TOTAL	1914.0	3004	3087 (2016)	429 (2005)

[1]Data obtained from hawkcount.org and primarily collected by Cecily Fritz, Paul Fritz, Bob Sartor, Charlie Sartor, and other volunteers. Used with permission.

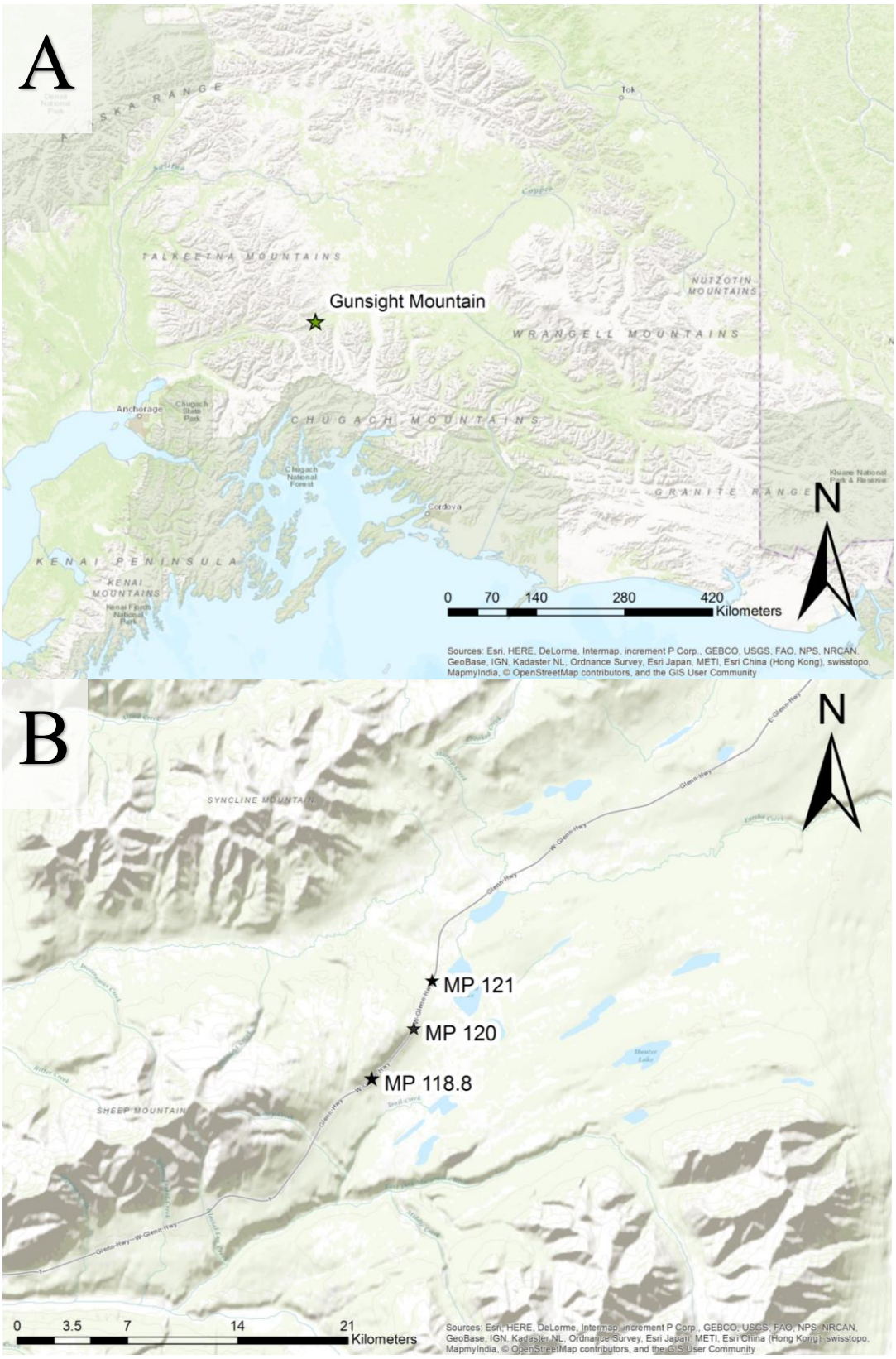

Figure 1. The location of (A) Gunsight Mountain, Matanuska-Susitna Borough, Alaska and (B) three count sites used during spring migration from 7 March – 15 May.

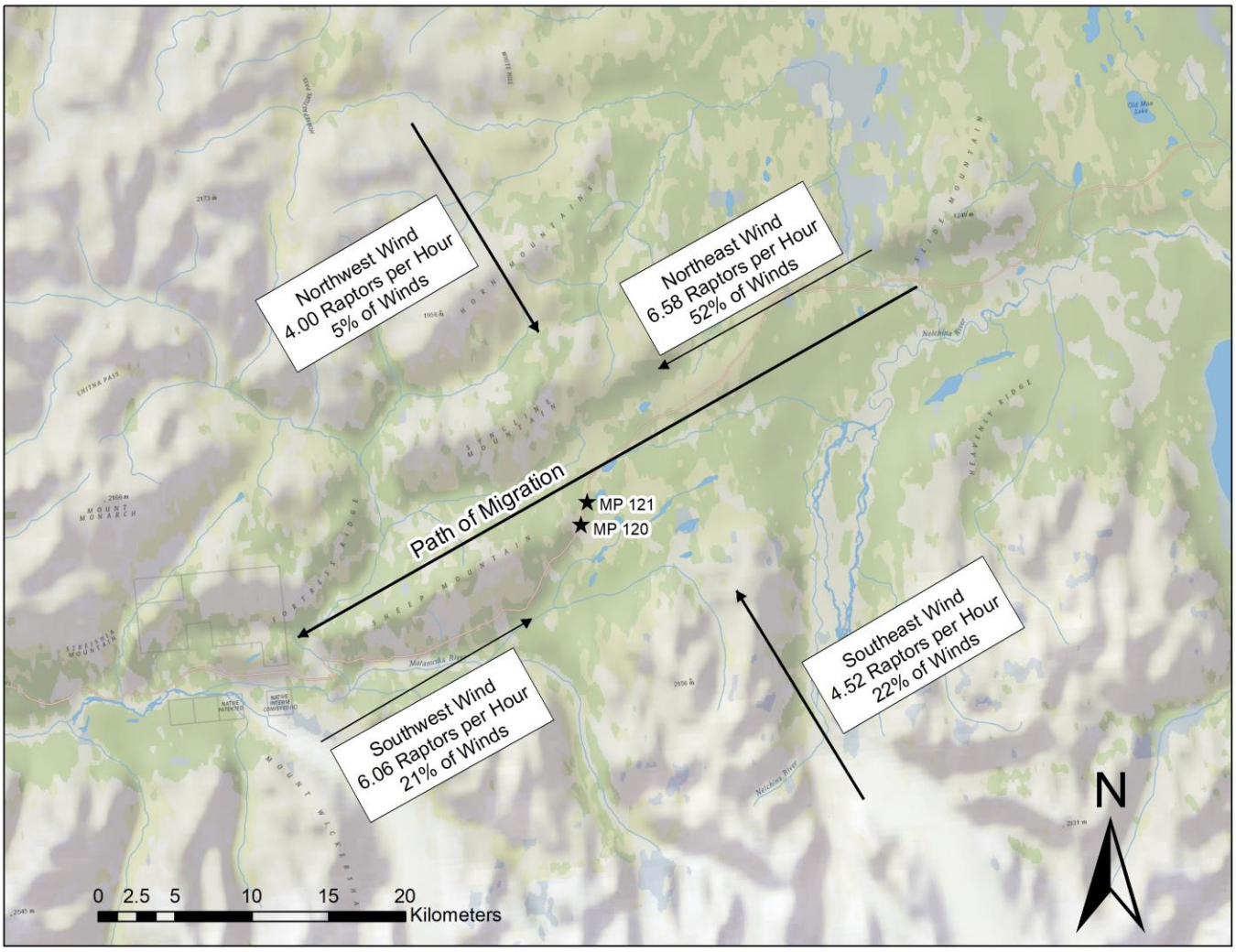

Figure 2. 2018 hourly passage rates by hourly wind direction at Gunsight Mountain, Matanuska-Susitna Borough, Alaska.

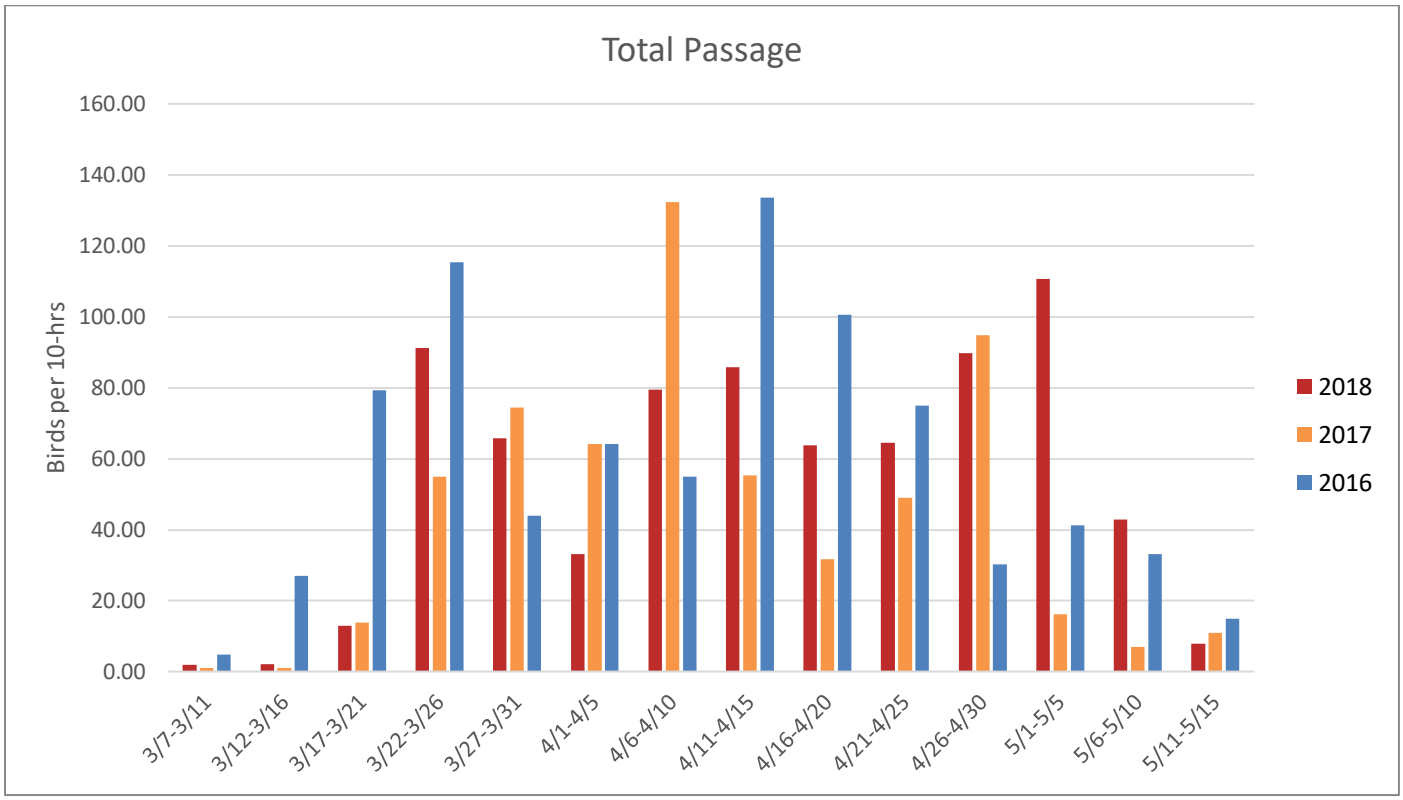

Figure 3. Spring 2018 (red), 2017 (orange), and 2016 (blue) Total Migrant Raptor Passage Rates within 5-day Windows at Gunsight Mountain, AK.

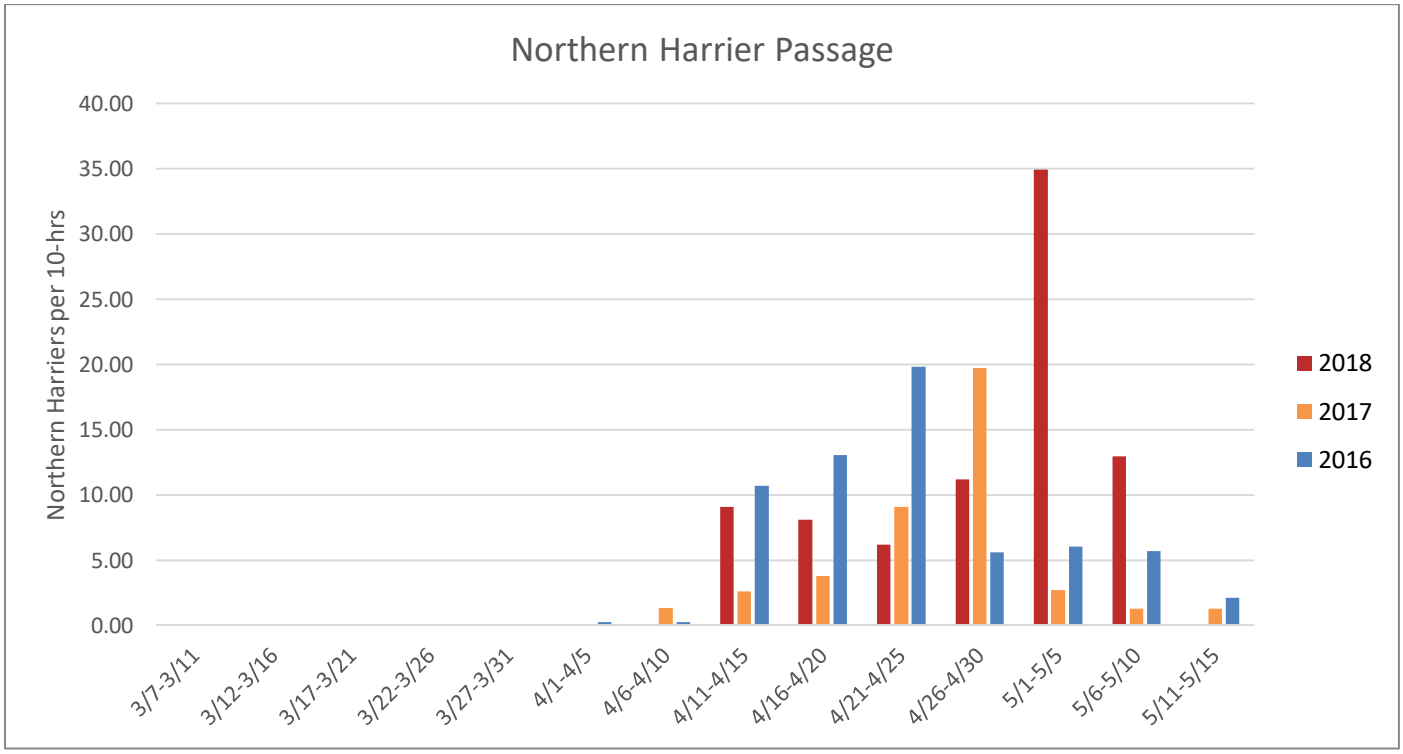

Figure 4. Spring 2018 (red), 2017 (orange), and 2016 (blue) Northern Harrier Passage Rates within 5-day Windows at Gunsight Mountain, AK.

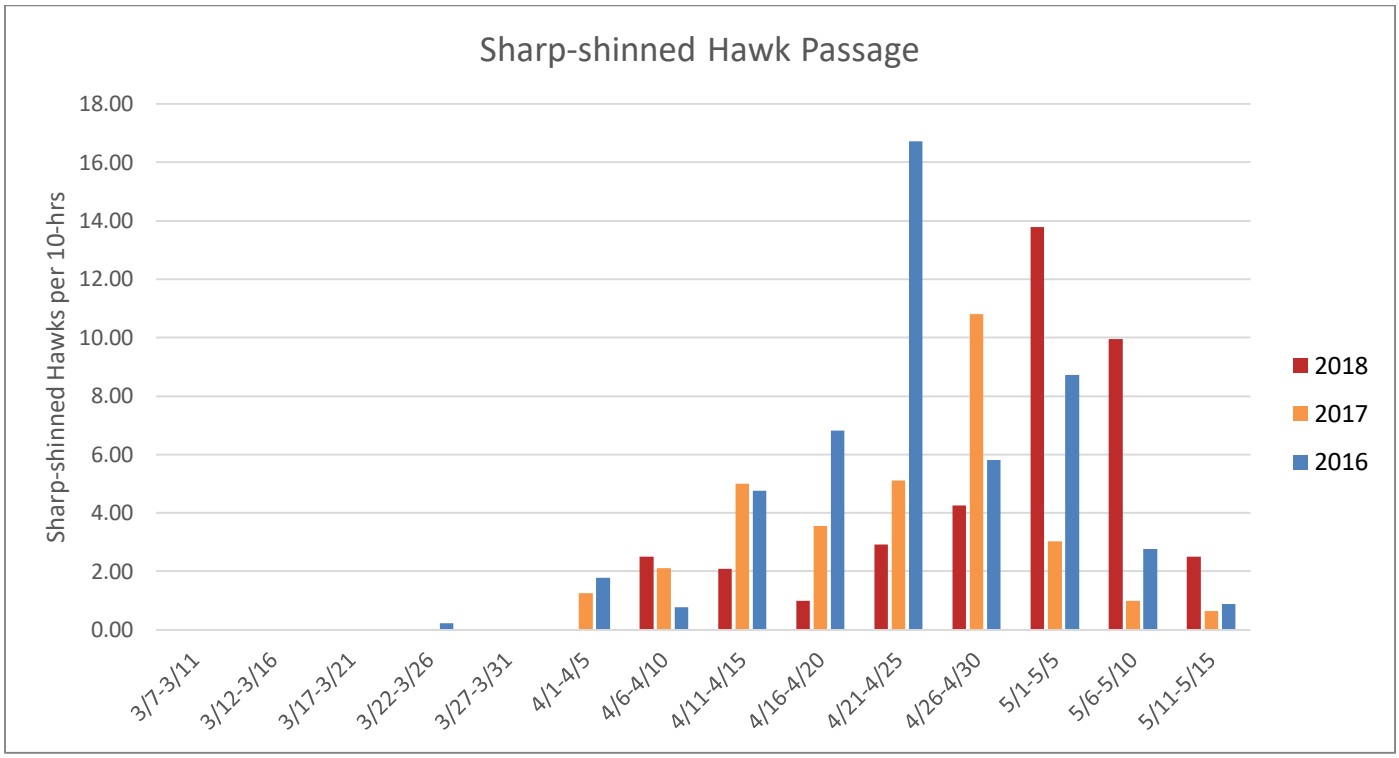

Figure 5. Spring 2018 (red), 2017 (orange), and 2016 (blue) Sharp-shinned Hawk Passage Rates within 5-day Windows at Gunsight Mountain, AK.

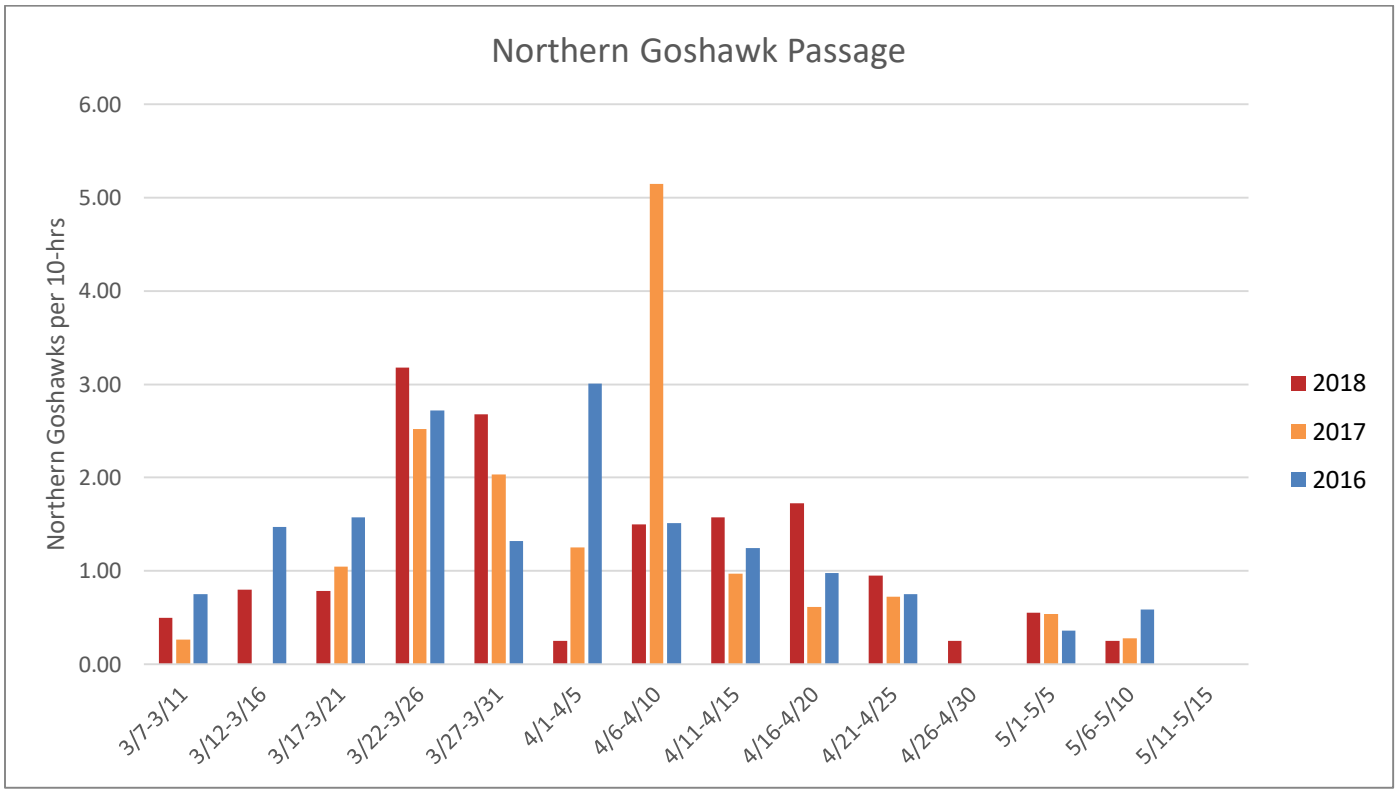

Figure 6. Spring 2018 (red), 2017 (orange), and 2016 (blue) Northern Goshawk Passage Rates within 5-day Windows at Gunsight Mountain, AK.

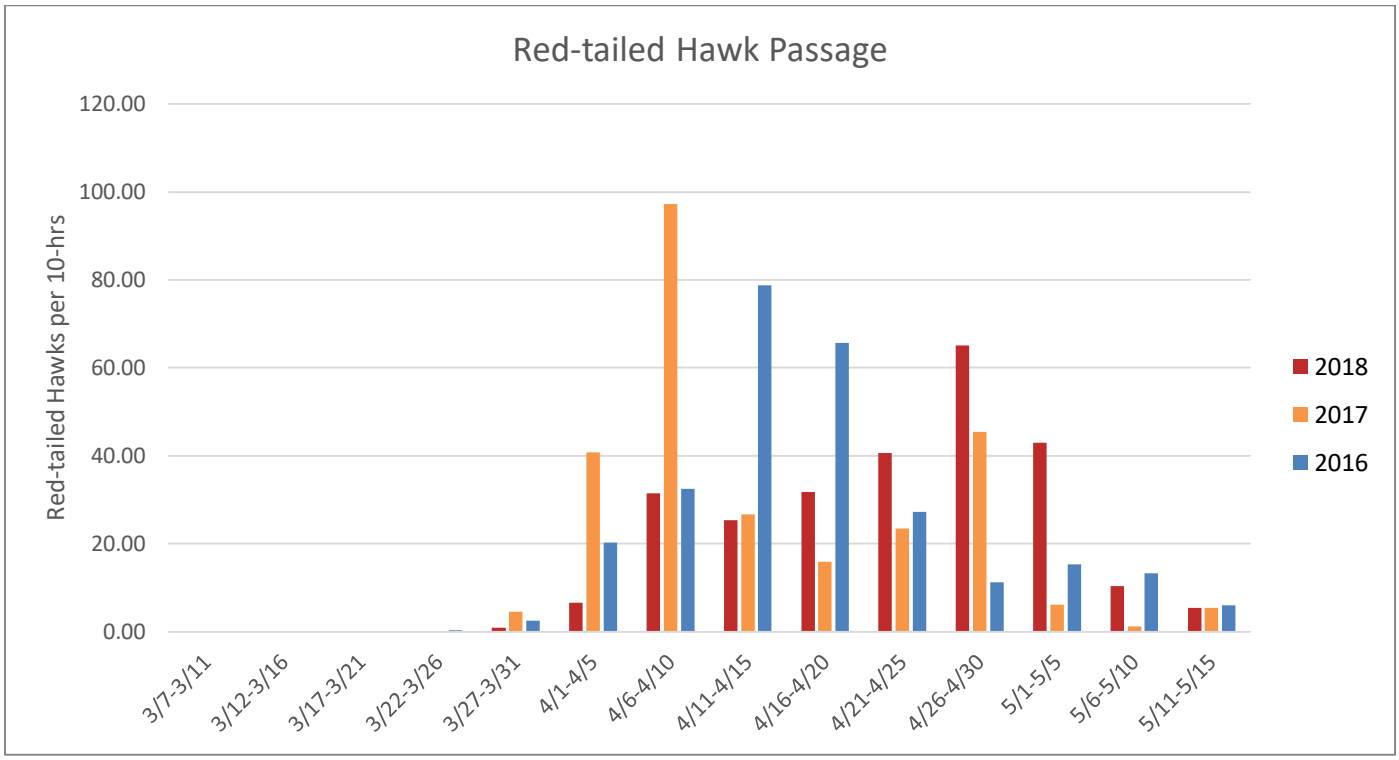

Figure 7. Spring 2018 (red), 2017 (orange), and 2016 (blue) Red-tailed Hawk Passage Rates within 5-day Windows at Gunsight Mountain, AK.

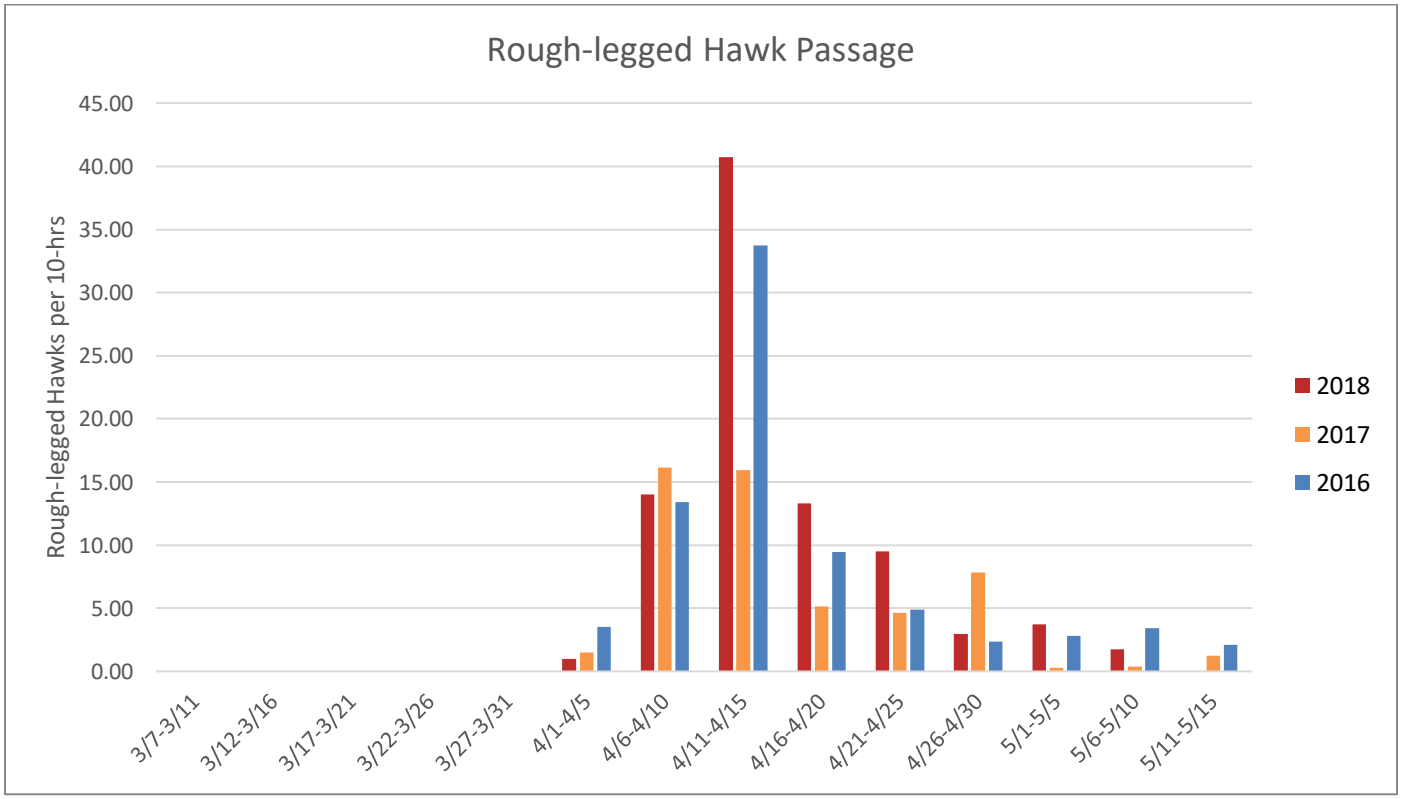

Figure 8. Spring 2018 (red), 2017 (orange), and 2016 (blue) Rough-legged Hawk Passage Rates within 5-day Windows at Gunsight Mountain, AK.

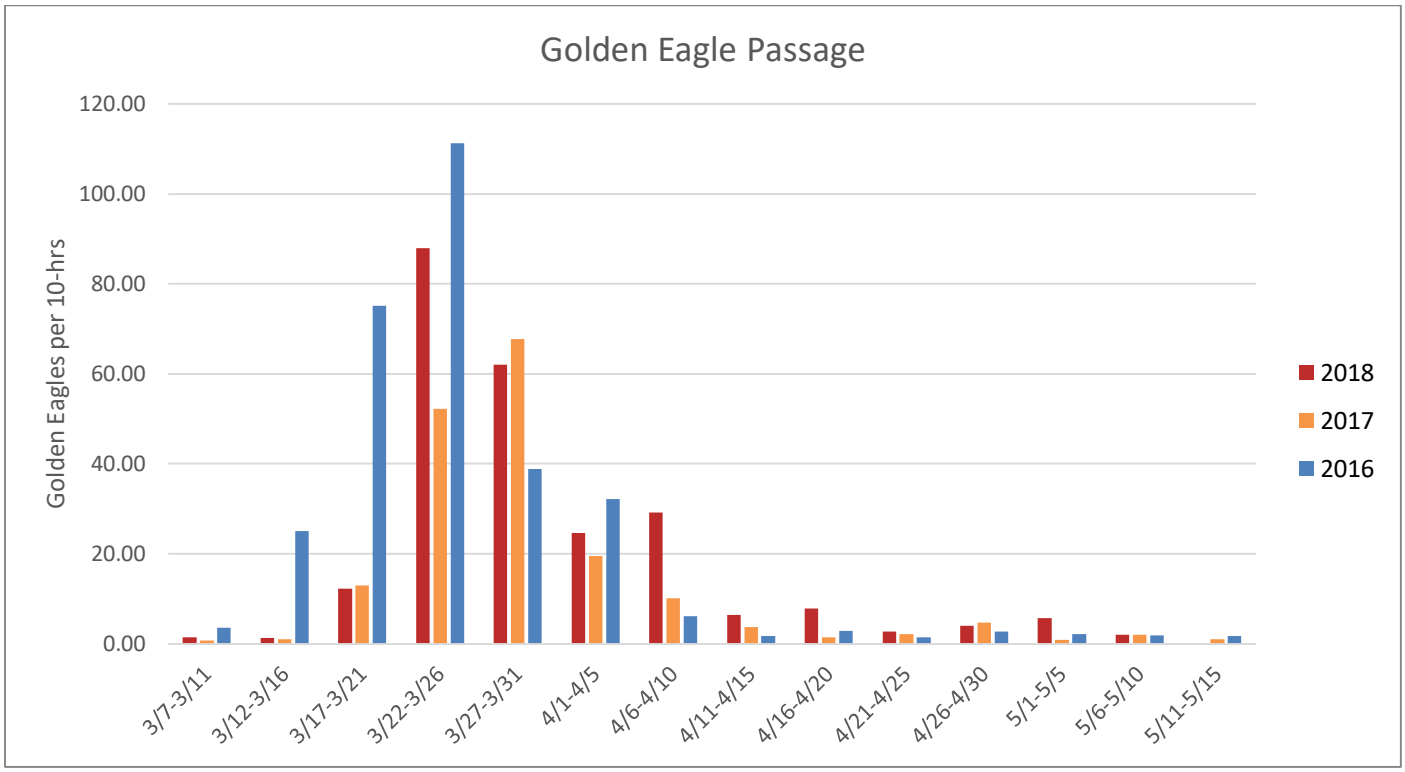

Figure 9. Spring 2018 (red), 2017 (orange), and 2016 (blue) Golden Eagle Passage Rates within 5-day Windows at Gunsight Mountain, AK.

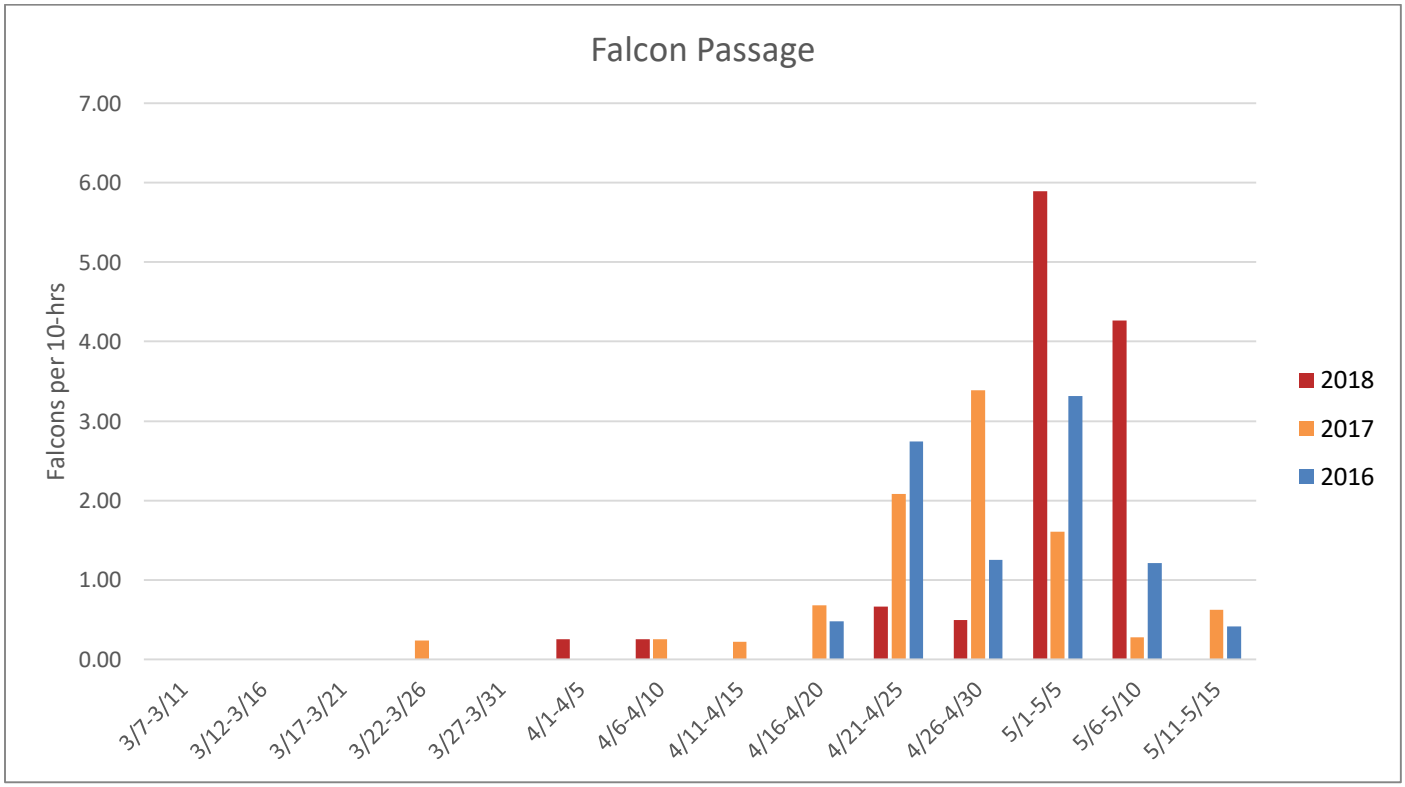

Figure 10. Spring 2018 (red), 2017 (orange), and 2016 (blue) Falcon Passage Rates within 5-day Windows at Gunsight Mountain, AK.

Table 2. Summary of the 2017 fall flight of migrating raptors across HWI's monitoring network. Values are counts; green indicates a count significantly higher (outside the 95% confidence interval) than the historic average, red indicates a count significantly lower than average, and black indicates a count that does not differ from the site average. Asterisks denote a record high or low count. *In 2017 HWI monitored fall migration for 4,486 hrs and counted 305,549 birds.*

	Bonney Butte, OR	Chelan Ridge, WA	Bridger Mtn, MT	Commissary Ridge, WY	Goshute Mts, NV	Yaki Pt, AZ	Manzano Mts, NM	Corpus Christi, TX
	Hours Counted in 2017							
Species	**430.1**	**409.1**	**424.3**	**530.5**	**697.75**	**595.4**	**570.8**	**828.3**
Black Vulture								409
Turkey Vulture	474	29	*29*	94	264	na	480	87934
Osprey	78	*11*	7	49	88	48.	52	138
Northern Harrier	22	74	50	27	157	55	54	351
Crested Caracara								4
Common Black Hawk								0
Harris' Hawk								10
Accipiters								
Sharp-shinned Hawk	*525*	*245*	321	695	2519	1234	1658	*2681*
Cooper's Hawk	347	*110*	191	414	1528	761	1244	1358
Northern Goshawk	26	19	39	36	125	5	21	0
Unidentified accipiter	33	49	45	44	324	133	169	100
TOTAL ACCIPITERS	931	*423*	596	1189	4496	2133	3092	4139
Buteos								
Red-shouldered Hawk	0	0	0	0	0	*1*	0	*15*
Broad-winged Hawk	7	*21*	11	34	95	31	*23*	*160916*
Short-tailed Hawk								1
Swainson's Hawk	2	17	5	112	499	68	496	8891
White-tailed Hawk								16
Zone-tailed Hawk							*6*	16
Red-tailed Hawk	371	*107*	208	846	3884	1291	930	139
Ferruginous Hawk	1	0	5	2	26	4	11	1
Rough-legged Hawk	6	17	64	10	19	0	0	0
Unidentified buteo	18	29	19	31	212	21	53	42
TOTAL BUTEOS	405	*191*	312	1035	4735	1416	1519	*170037*
Eagles								
Golden Eagle	*27*	*11*	1476	289	252	3	117	0
Bald Eagle	86	5	69	155	14	12	1	13
Unknown eagles	2	2	1	1	3	0	1	0
TOTAL EAGLES	115	*18*	1549	445	269	15	119	13
Falcons								
American Kestrel	*7*	11	74	87	*616*	*332*	388	960
Merlin	74	*18*	22	17	60	13	32	113
Prairie Falcon	5	6	13	*2*	31	*2*	13	5
Peregrine Falcon	11	8	13	9	25	10	79	*343*
Aplomado Falcon								1
Unidentified falcon	9	14	6	11	17	7	14	14
TOTAL FALCONS	106	57	128	126	749	*364*	526	1436
Kites								
Hook-billed Kite								0
Swallow-tailed Kite								109
White-tailed Kite								7
Mississippi Kite								11362
Unidentified Kites								0
TOTAL KITES								11478
Unidentified Raptor	10	50	25	15	48	7	34	205
GRAND TOTAL	**2141**	***853***	**2696**	**2980**	**10806**	**4041**	**5877**	***276155***
	2141	**853**	**2696**	**2980**	**10806**	**4041**	**5877**	**276155**

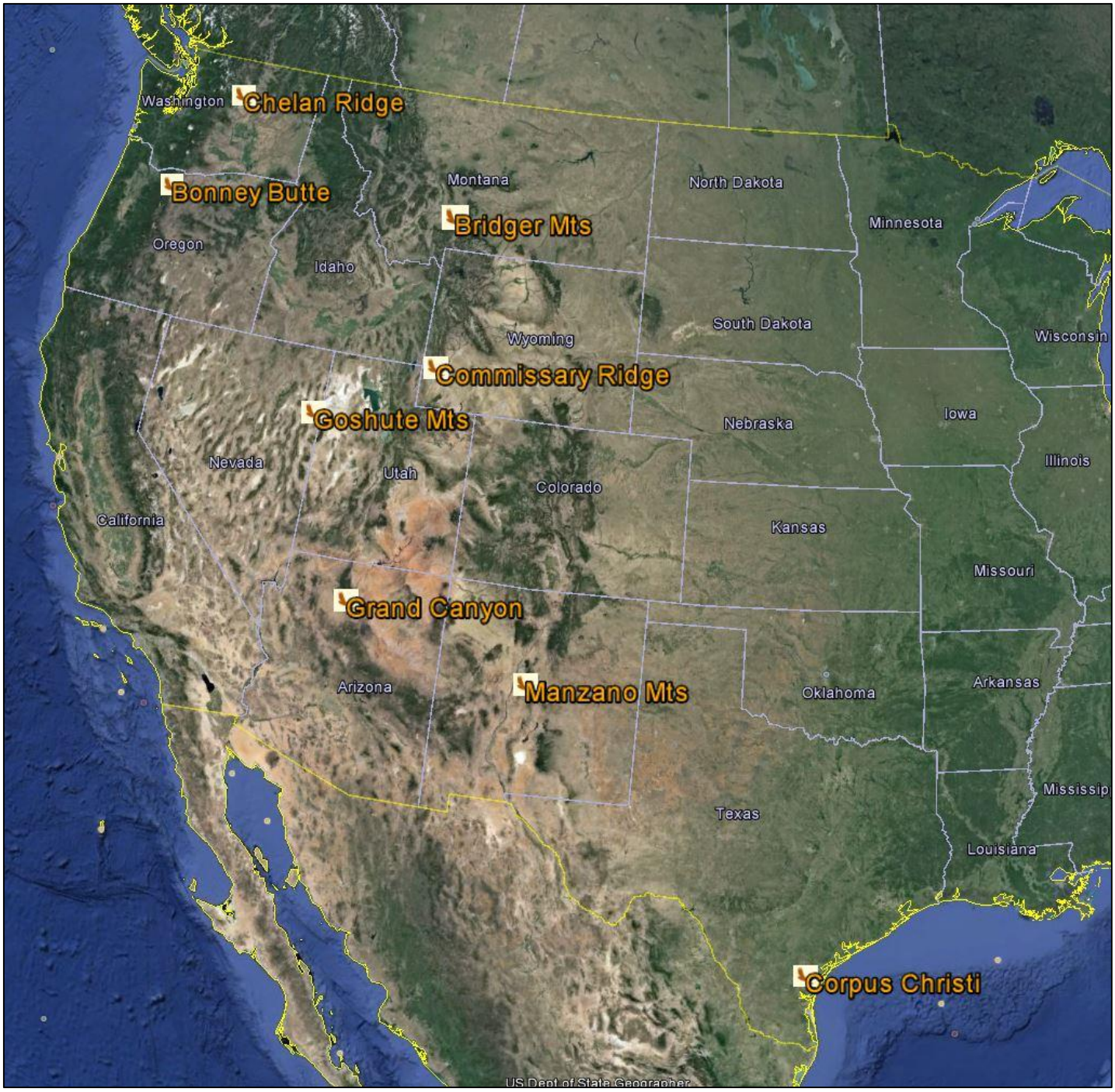

Figure 13. Locations of fall HawkWatch sites operated by HWI and partners.

Appendix A. History of official observer participation at Gunsight Mountain, AK: 2003–2017.

2003[1] Voluntarily surveyed: Cecily Fritz, Paul Fritz, Bob Sartor, Charlie Sartor, and other volunteers.

2004 Voluntarily surveyed: Cecily Fritz, Paul Fritz, Bob Sartor, Charlie Sartor, and other volunteers.

2005 Voluntarily surveyed: Cecily Fritz, Paul Fritz, Bob Sartor, Charlie Sartor, and other volunteers.

2006 Voluntarily surveyed: Cecily Fritz, Paul Fritz, Bob Sartor, Charlie Sartor, Bob Dittrick, and other volunteers.

2007 Voluntarily surveyed: Cecily Fritz, Paul Fritz, Bob Sartor, Charlie Sartor, and other volunteers.

2008 Voluntarily surveyed: Cecily Fritz, Paul Fritz, Bob Sartor, Charlie Sartor, Bill Clark, and other volunteers.

2009 Voluntarily surveyed: Paul Fritz, and other volunteers.

2015 One full-time observer with additional rotating volunteer support: Neil Paprocki, and 58 volunteer observers.

2016 Two full-time observers: Rya Rubenthaler (4)[2], Caitlin Davis (1), Dan Crowson, Neil Paprocki, and other volunteers.

2017 Two full-time observers: Frank Nicoletti (35) and Francesco Simeone (1).

2018 Two full-time observers: Francesco Simeone (3) and Stephen Nelson (1).

---

[1] Historical observer information from 2003 – 2009 obtained from data entered into hawkcount.org.

[2] Numbers in parentheses indicate previous full seasons (spring and fall) of observation experience.

Appendix B. Common and scientific names, species codes, and regularly applied age, sex, and color-morph classifications for all diurnal raptor species observed during spring migration at Gunsight Mountain, AK.

Common Name	Scientific Name	Species Code	Sub-species Code[1]	Age[2]	Sex[3]	Color Morph[4]
Osprey	*Pandion haliaetus*	OS	U	U	U	NA
Northern Harrier	*Circus cyaneus*	NH	U	A I Br U	M F U	NA
Sharp-shinned Hawk	*Accipiter striatus*	SS	U	A I U	U	NA
Northern Goshawk	*Accipiter gentilis*	NG	U	A I U	U	NA
Unknown accipiter	*Accipiter* spp.	UA	U	U	U	NA
Swainson's Hawk	*Buteo swainsoni*	SW	U	U	U	D L U
Red-tailed Hawk	*Buteo jamaicensis*	RT	H, O, U	A I U	U	D L U
Rough-legged Hawk	*Buteo lagopus*	RL	U	A I U	U	D L U
Unknown buteo	*Buteo* spp.	UB	U	U	U	NA
Golden Eagle	*Aquila chrysaetos*	GE	U	I, S, NA, A, U[5]	U	NA
Unknown eagle	*Aquila* or *Haliaeetus spp.*	UE	U	U	U	NA
American Kestrel	*Falco sparverius*	AK	U	U	M F U	NA
Merlin	*Falco columbarius*	ML	U	U	U	NA
Peregrine Falcon	*Falco mexicanus*	PG	U	U	U	NA
Gyrfalcon	*Falco peregrinus*	GY	U	A I U	U	NA
Unknown falcon	*Falco* spp.	UF	U	U	U	NA
Unknown raptor		UU	U	U	U	NA

[1] Sub-species codes: H = Harlan's, O = other, U = unknown.

[2] Age codes: A = adult, I = immature (HY), Br = brown (adult female or immature), U = unknown age.

[3] Sex codes: M = male, F = female, U = unknown.

[4] Color morph codes: D = dark or rufous, L = light, U = unknown, NA = not applicable.

[5] 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 variable 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 spread tail; U = Unknown.

Appendix C. Annual observation effort and spring raptor migration counts by species at Gunsight Mountain, AK: 2003–2018. Includes years where counts were conducted for a minimum of 16 days.

YEAR	2003	2004	2005	2006	2007	2008	2009[1]	2015	2016	2017	2018
Start date	23-Mar	31-Mar	26-Mar	25-Mar	24-Mar	22-Mar	25-Mar	6-Apr	7-Mar	7-Mar	7-Mar
End date	17-May	2-May	1-May	7-May	6-May	2-May	30-Apr	27-Apr	14-May	15-May	15-May
Days of observation	23	22	22	17	22	28	31	16	65	67	69
Hours of observation	99.0	105.0	96.8	80.3	119.0	137.5	211.6	135.1	491.3	514.0	515.8
Raptors / 100 hours	1290	1080	1764	2811	1466	1385	1051	987	628	480	582
SPECIES											
Osprey	0	0	0	7	2	1	0	0	17	18	19
Northern Harrier	150	159	293	493	196	52	94	51	244	171	314
Short-eared Owl	1	0	0	0	0	0	0	0	0	1	0
Sharp-shinned Hawk	63	119	137	227	93	33	38	16	189	134	144
Northern Goshawk	15	5	13	9	22	17	43	14	63	61	60
TOTAL ACCIPITERS	78	124	150	236	115	50	81	30	252	195	204
Swainson's Hawk	0	1	0	1	0	0	0	0	1	2	3
Red-tailed Hawk	461	452	625	666	663	1078	1059	938	1066	1104	1028
Rough-legged Hawk	265	219	357	368	310	285	479	207	297	223	364
Unidentified buteo	36	0	2	0	16	11	0	16	12	9	10
TOTAL BUTEOS	762	672	984	1035	989	1374	1538	1161	1376	1338	1402
Golden Eagle	269	127	252	462	395	421	492	88	1163	705	1020
Unidentified eagle	0	0	0	0	0	0	0	0	1	0	0
TOTAL EAGLES	269	127	252	462	395	421	492	88	1164	705	1020
American Kestrel	3	3	1	2	7	0	1	0	2	8	7
Merlin	8	12	20	18	5	5	7	2	27	24	25
Peregrine Falcon	2	3	6	3	2	1	4	1	3	4	8
Gyrfalcon	0	0	0	1	0	1	0	0	1	2	1
Unknown falcon	1	0	0	0	0	0	0	0	1	0	1
TOTAL FALCONS	14	18	27	24	14	7	12	3	34	38	42
Unidentified raptor	3	35	2	0	34	0	7	1	0	2	0
GRAND TOTAL	1277	1135	1708	2257	1745	1905	2224	1334	3087	2468	3004

[1]2003 – 2009 data obtained from hawkcount.org and primarily collected by Cecily Fritz, Paul Fritz, Bob Sartor, Charlie Sartor, and other volunteers. Used with permission.

Appendix D. Weather and flight summary for spring raptor migration counts at Gunsight Mountain, AK: 2016 – 2018.

YEAR	2016	2017	2018
No Count Days	5	3	1
Total Raptors	3087	2468	3004
Raptors / hour	6.3	4.8	5.8
WIND			
Average Hourly Wind km / hr	4.9	4.7	4.8
N-E wind % of hourly	52	64	52
N-E Raptors / hour	7.07	5.17	6.58
E-S wind % of hourly	19	23	22
E-S Raptors / hour	5.55	3.93	4.52
S-W wind % of hourly	16	10	21
S-W Raptors / hour	6.02	3.87	6.06
W-N wind % of hourly	6	2	5
W-N Raptors / hour	4.26	3.44	4.00
TEMPERATURE & PRESSURE			
Average Hourly Temp °C	3.8	0.9	0.5
Average Hourly Pressure	29.45	29.71	29.72
CLOUD COVER			
Clear %	29	36	30
Partly cloudy %	13	12	20
Mostly cloudy %	23	18	16
Overcast %	35	35	34
FLIGHT DIRECTION			
No flight/not recorded %	31	35	34
% of flight hours (East)	23	30	29
% of flight hours (West)	28	29	23
% of flight hours (Overhead)	35	22	31
% of flight hours (Mixed)	13	18	17
FLIGHT HEIGHT			
Below eye level	2	0	0
Eye level to 30m	6	8	8
Unaided eye	71	52	53
At limit of unaided vision	9	34	30
Binoculars (to 10x)	0.3	6	4
Variable	12	0	3