SPRING 2016 RAPTOR MIGRATION REPORT

GUNSIGHT MOUNTAIN HAWKWATCH – ALASKA

HawkWatch International, Inc.

Salt Lake City, Utah

HAWKWATCH INTERNATIONAL
Conserving Raptors and Our Shared Environment

ALASKA DEPARTMENT OF FISH AND GAME

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Anchorage Audubon Society

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GUNSIGHT MOUNTAIN HAWKWATCH - ALASKA

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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. HWI plans to operate the site for a second consecutive year in spring 2017.

The Gunsight Mountain HawkWatch was 1 of 9 long-term, annual migration counts operated or co-sponsored by HWI in North America during autumn 2015 and spring 2016. 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 conducted by two experienced observers (C. Davis and R. Rubenthaler) with several seasons of raptor migration experience. Additional survey effort was provided by HWI staff (N. Paprocki: 7 March – 18 March), volunteer Dan Crowson (22 days), 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 – 31 March at 11:15 AKST were conducted from the milepost 121 pullout (GPS coordinates: 61.881901, -147.336551). Counts from 31 March at 11:15 AKST – 15 May were conducted at the milepost 120 pullout (GPS coordinates: 61.865761, -147.349418). We also conducted two days of counts (16 & 17 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 Alaska Standard Time (PST). 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.

2016 RESULTS AND DISCUSSION

Observation effort and weather summary

Gunsight Mountain HawkWatch's standard season runs 7 March – 15 May; in 2016 observers were able to count on 65 of a possible 70 days during this period for a total of 491.3 hours (Appendix C). Daily count effort ranged from 3.5 – 9 hours depending on weather and flight conditions, and no counts were conducted on 5 days due to weather or planned off days for observers. 2016 was the first year hourly weather was recorded at the site. The average hourly temperature was 3.8 ºC (Range: -14.0 – 18.3 ºC) and average wind speed was 4.9 km/hr (Range: 0 – 24.0 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 (16% of hourly wind directions). Average atmospheric pressure was 29.45 in HG (Range: 28.99 – 30.12 in HG). In 2016 based on hourly recording of conditions during observation it was clear 29% of the time, partly cloudy 13% of the time, mostly cloudy 23% of the time, and overcast 35% of the time.

FLIGHT SUMMARY

2016 Overall Flight

A total of 3,143 migrant raptors of 13 species were counted in 2016 (Table 1).

The flight consisted of 44 % Buteos, 39% Eagles, 8% Accipiters, 8% Harriers, 0.01 % Falcons, 0.01% Ospreys, and 0.0% unidentified raptors. Golden Eagles were the most commonly observed species (37% of the total), followed by Red-tailed Hawks (34%), Rough-legged Hawks (9%), Northern Harriers (8%), and Sharp-shinned Hawks (6%). The remaining species comprised 2% or less each (Table 1).

2016 was the first year of full-time standardized counts conducted at Gunsight Mountain, making comparisons to historic part-time counts difficult. Results from 2017 will allow us to begin making year-to-year passage comparisons, however we make some very general comparisons to total historic counts for particular species in the sections below.

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) = 7.01 raptors/hr; SW winds (all W to S winds; 16% of hourly records) = 6.02 raptors/hr; All other wind directions (32% of hourly records) = 4.96 raptors/hr (Figure 2). Qualitative comparisons between hourly passage rates suggests that tail winds (NE in origin) and wind directions oriented parallel to the valley (NE or SW) correlate to slightly higher passage rates.

Total Flight (Fig. 3):

640 raptors per 100 hours of observation were counted at Gunsight Mountain in 2016. The total count of 3,143 raptors surpassed the previous season high of 2,272 raptors set in 2009 when counts were conducted on only 31 days. Previous season passage rates were considerably higher than those in 2016 (Average = 1,429 raptors per 100 hours), suggesting lower than average passage rates, biased historical counts (i.e., ending the count early when the flight was slow), or both.

We observed a bimodal distribution in the overall passage rate timing from 7 March – 15 May corresponding to the peak Golden Eagle and Buteo flight, respectively (Figure 3). The first peak occurred from 22 – 26 March, while the second peak occurred from 11 – 15 April.

Osprey and Northern Harriers (Fig. 4):

The Northern Harrier count (244) was lower than totals from two historic seasons of part-time counts, including the record high count set in 2006 (493; Table 1), suggesting it was a below average year for harrier's (confirmed via communications with local volunteers). The Osprey count (17) was the highest ever documented at Gunsight Mountain (Table 1).

The timing of Northern Harrier migration peaked from 21 – 25 April, and was later than most other species observed (Figure 4). The onset of migration occurred suddenly from 11 – 15 April creating a slightly skewed distribution.

Accipiters (Figs. 5 & 6):

The Sharp-shinned Hawk count (189) was the second highest ever documented at Gunsight Mountain, but was lower than the historic record set in 2006 (227), when only 17 days of counts were conducted. The Northern Goshawk count (63) was the highest ever documented at the site.

The timing of Sharp-shinned Hawk migration peaked from 21 – 25 April, and was later than most other species observed (Figure 5). Northern Goshawk passage rates were low throughout the season, but two small peaks were observered from 22 – 26 March and 1 – 5 April (Figure 6) suggesting an earlier migration than other species except the Golden Eagle.

Buteoine Hawks (Figs. 7, 8, 11, & 12):

Counts of both Red-tailed Hawks (1,066) and Rough-legged Hawks (297) in 2016 were lower than historic record highs of 1,078 (2008) and 479 (2009), respectively. In fact, the 2016 Rough-legged Hawk count total was lower than totals from four historical seasons of part-time counts, suggesting the possiblitiy of recent declines in this population. Observers also counted a single migrant Swainson's Hawk on 6 May 2016, providing photo documentation to verify the rare sighting.

The timing of both Red-tailed Hawk and Rough-legged hawk migration peaked from 11 – 15 April (Figure 7, Figure 8). This timing corresponded to the second total passage peak we observed (Figure 3).

Of the 1,066 Red-tailed Hawks, 783 were successfully identified to the Harlan's subspecies (73%). Most of the remaining 27% were too distant, or not clearly vibisible enough to confidently identify to subspecies. In 2015, several light-morph Red-tailed Hawks were identified to the northeastern subspecies *abieticola*, suggesting there is some low-level mixture of eastern birds into this breeding population. Of the 783 Red-tailed Hawks identified to the Harlan's subspecies, 741 were classified as dark-morphs (95%) and 42 were classified as light-morphs (5%); a lower than average proportion of light-morphs than historically seen at the site (9–12 %, J. Liguori personal communication).

Of the 283 Rough-legged Hawks identified to color-morph (95% light or dark, 5% unknown), 157 were classified as light-morph (55%) while 126 were classified as dark-morph (45%). Birds classified as dark-morphs likely represent a mix of true dark-morphs and heavily marked light-morphs, which are difficiult to distinguish at a distance. Historical counts estimated the approximate proportion of dark-morphs at 40% (Fritz and Fritz 2011).

Two remotely-tracked Rough-legged Hawks migrated through the Gunsight Mountain corridor in 2016, providing a unique look at the potential location of the breeding source populations. A single adult trapped on the wintering grounds in Washington state migrated past the site on 22 April and was recorded by observers as wearing a transmitter. Hourly GPS locations later confirmed the bird moved past the site during the hour that observers recorded an adult light-morph wearing a backpack transmitter. This individual did not appear to breed in 2016, but wandered between the Alaska Peninsula near Katmai National Park and the more interior Kuskoskwim Mountains (Figure 11; J. Watson unpublished data).

Another adult Rough-legged Hawk trapped on the wintering grounds in Nevada migrated past the site on 18 April and established a summer territory near the western tip of the Alaska Peninsula (Figure 12, J. Kidd unpublished data). This individual could have been seen by our observers (although no sightings of a backpack transmitter were reported on that day), however the same individual was remotely-tracked on spring migration in 2015 and did not use the immediate Gunsight Mountain migration corridor and would not have been counted suggesting some interannual variation in local migration movements. Tracking data from these two individuals suggests Rough-legged Hawks migrating past Gunsight Mountain breed or summer on the Alaska Peninsula, and perhaps to a lesser degree the Yukon-Kuskokwim River drainages of western Alaska.

Eagles (Fig. 9):

The Golden Eagle count (1,163) was the highest ever documented at Gunsight Mountain, more than doubling the previous record high in 2009 (492). This was mainly because of the early onset of migration counts in 2016 (7 March) compared to the earliest recorded historical observation date of 22 March 2008. Bald Eagle counts (56) also surpassed the previous record high, however migrant Bald Eagles are notoriously difficult to count at Gunsight Mountain because of their unusual flight patterns (i.e., often opposite the direction of the overall flight), and HWI will recommend the cessation of Bald Eagle counts in future years as there are no current pressing conservation concerns for the Bald Eagle in Alaska (T. Booms personal communication).

We began counts on 7 March 2016 in an attempt to document the beginning of the Golden Eagle migration season. Low passage rates during the first 5-day count window suggest we did document the beginning of eagle migration, and Golden Eagle passage peaked from 22 – 26 March (Figure 9).

We were unable to age much of the Golden Eagle flight because the bulk flight-line distance is too far (several kilometers) for confident aging, prohibiting meaningful age structure analyses of migrants. In addition, proper aging of migrant Golden Eagles is quite difficult and often requires a full tail-spread to confirm adult vs. older sub-adults (Liguori 2004). However, data from eagles trapped concurrently with migration counts suggests that much of the migrant population counted prior to 10 April (95% of total flight) consists of adults and sub-adults ≥ 4 years old (Alaska Department of Game & Fish and U.S. Fish & Wildlife Service unpublished data).

Falcons (Fig. 10):

The proportion of overall flight for all falcon species was low (0.01%), however Merlin counts (27) were the highest ever recorded at the site. Observers also counted 3 Peregrine Falcons, 2 American Kestrels, and 1 Gyrfalcon.

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 all other species observed (Figure 10).

VISITOR PARTICIPATION AND PUBLIC OUTREACH

Over 200 individuals visited the Gunsight Mountain HawkWatch site in 2016 to watch hawks together and learn about their migration, natural history, ecology, and some of the threats raptors face. Many visitors also contributed volunteer time and mileage to the project (65 individuals) while assisting official observers with the count. This volunteer support was a huge boost to our count effort, and if perpetuated, 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.

2015 FALL MIGRATION ACROSS HWI'S NETWORK

HawkWatch International and partners operated 8 fall count sites in 2015 (Figure 13). During the 4,252 hours of standardized observation we counted 700,457 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 2015 included (Table 2):

- Above average or average counts at 6 of 8 sites
    - Exceptions were Chelan Ridge and Manzano Mountain sites which had significantly low counts.
- Below average Golden Eagle counts at 6 of 8 sites—only above average count was at Commissary Ridge, WY
- Below historic average American Kestrel counts at 6 of 9 sites
- Significantly low counts of all accipiter species at both Pacific Northwest sites
- Significantly high Turkey Vulture counts at 5 of 7 sites where counted (record set at 3 sites: Chelan Ridge, Goshute Mountains, and Corpus Christi-where 170,976 were counted!)
- Above average or average Broad-winged Hawk numbers at all sites with record numbers at 3 sites (Chelan Ridge, Goshute Mountains, and Yaki Point).

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 2016 migration count at Gunsight Mountain was generously provided by a grant from the Eppley Foundation for Scientific Research. Additional funding for the Gunsight Mountain count board was provided by the Anchorage Audubon Society. HWI private donors and members also contributed financial support. The 2016 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.

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 2016. Two individuals from this community deserve special recognition: White Keys and Dan Crowson. White Keys

has played an enormous role in volunteer recruitment, organization, and other logistical aspects of the project, while Dan Crowson donated much volunteer hawk watching time and equipment, while also provided our observers with jovial company. Travis Booms (Alaska Department of Fish & Game) also provided guidance, encouragement, and critical logistical support in the field for which we are very grateful. James Watson (Washington Dept. of Fish and Wildlife) and Jeff Kidd (Kidd Biological, Inc.) contributed information on remotely-tracked Rough-legged Hawks for this report. Special thanks to Tom "Hawk" and Dove Hawkins for their hospitality and company at Sheep Mtn Vacation Rentals. Finally, enormous thanks and appreciation to our 2016 observers: Rya Rubenthaler and Caitlin Davis. Your willingness to brave the cold Alaskan spring for a season full of unknowns will not be forgotten!

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Table 1. Counts and historic records of spring migrating raptors at the Gunsight Mountain HawkWatch, AK. Note that 2003 – 2009 mean counts represent partial count seasons.

	Species	2003-2009[1] Mean Count	2016	All-time Historic Records Season	Daily
	Osprey	1.4	17	17 (2016)	6 (2016)
	Northern Harrier	205.3	244	493 (2006)	167 (2006)
	Short-eared Owl	0.1	0	1 (2003)	1 (2003)
Accipiters					
	Sharp-shinned Hawk	101.4	189	227 (2006)	58 (2006)
	Northern Goshawk	17.7	63	63 (2016)	6 (2009)
	TOTAL ACCIPITERS	119.1	252	252 (2016)	
Buteos					
	Swainson's Hawk	0.3	1	1 (3x)	1 (3x)
	Red-tailed Hawk	714.9	1066	1078 (2008)	269 (2009)
	Rough-legged Hawk	326.1	297	479 (2009)	126 (2005)
	Unidentified buteo	9.3	12		
	TOTAL BUTEOS	1050.3	1376	1538 (2009)	
Eagles					
	Golden Eagle	345.4	1163	1163 (2016)	229 (2016)
	Bald Eagle	17.1	56	56 (2016)	12 (2015)
	Unknown eagles	0	1		
	TOTAL EAGLES	362.5	1220	1220 (2016)	
Falcons					
	American Kestrel	2.4	2	7 (2007)	3 (2007)
	Merlin	10.7	27	27 (2016)	5 (>3x)
	Peregrine Falcon	3	3	6 (2005)	3 (2005)
	Gyrfalcon	0.3	1	1 (3x)	1 (3x)
	Unidentified falcon	0.1	1		
	TOTAL FALCONS	16.5	34	34 (2016)	
	Unidentified Raptor	11.6	0		
	GRAND TOTAL	1767.3	3143	3143 (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.

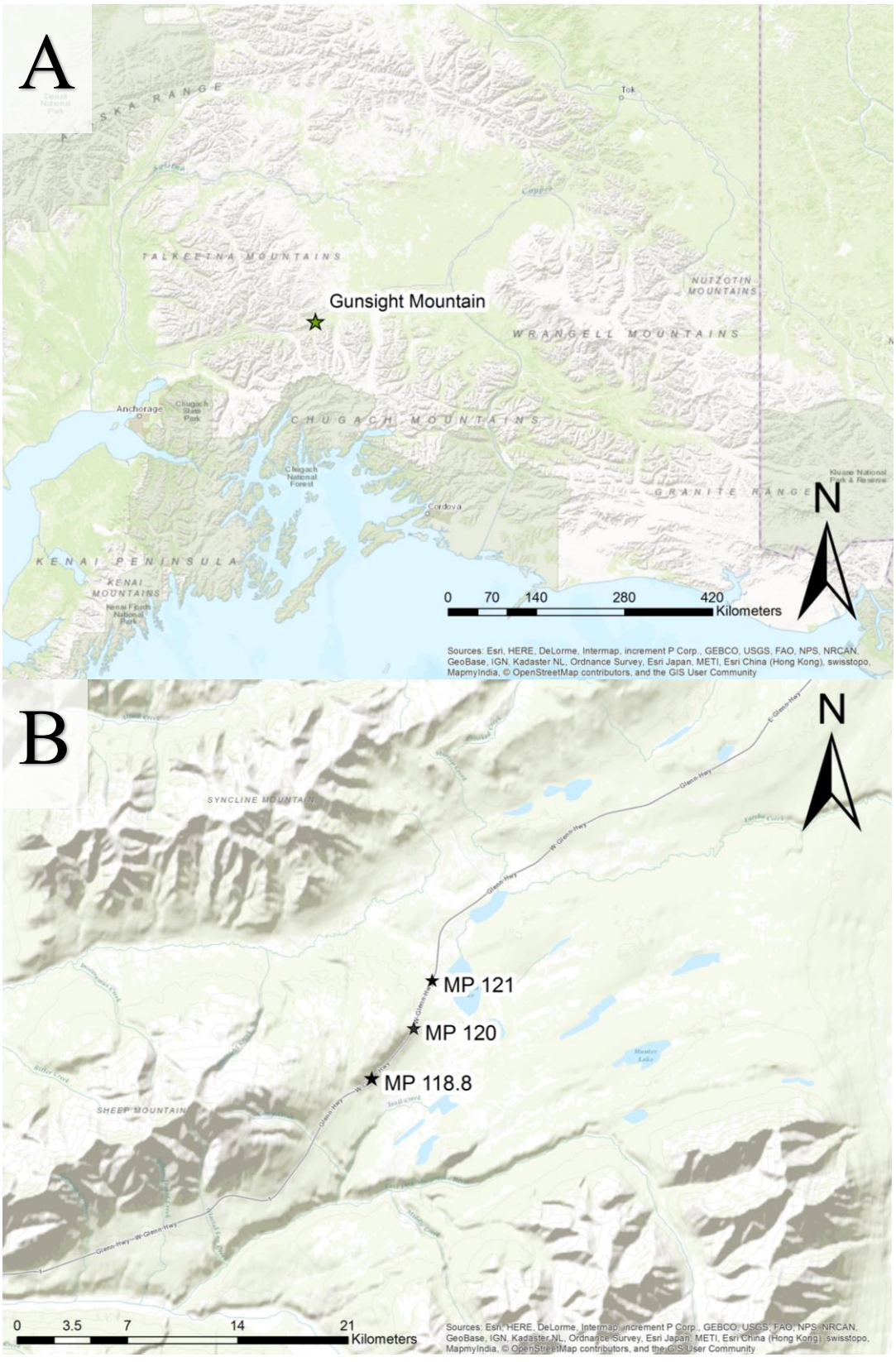

Figure 1. The location of (A) Gunsight Mountain, Matanuska-Susitna Borough, Alaska and (B) three count sites used during spring migration from 7 March – 15 May.

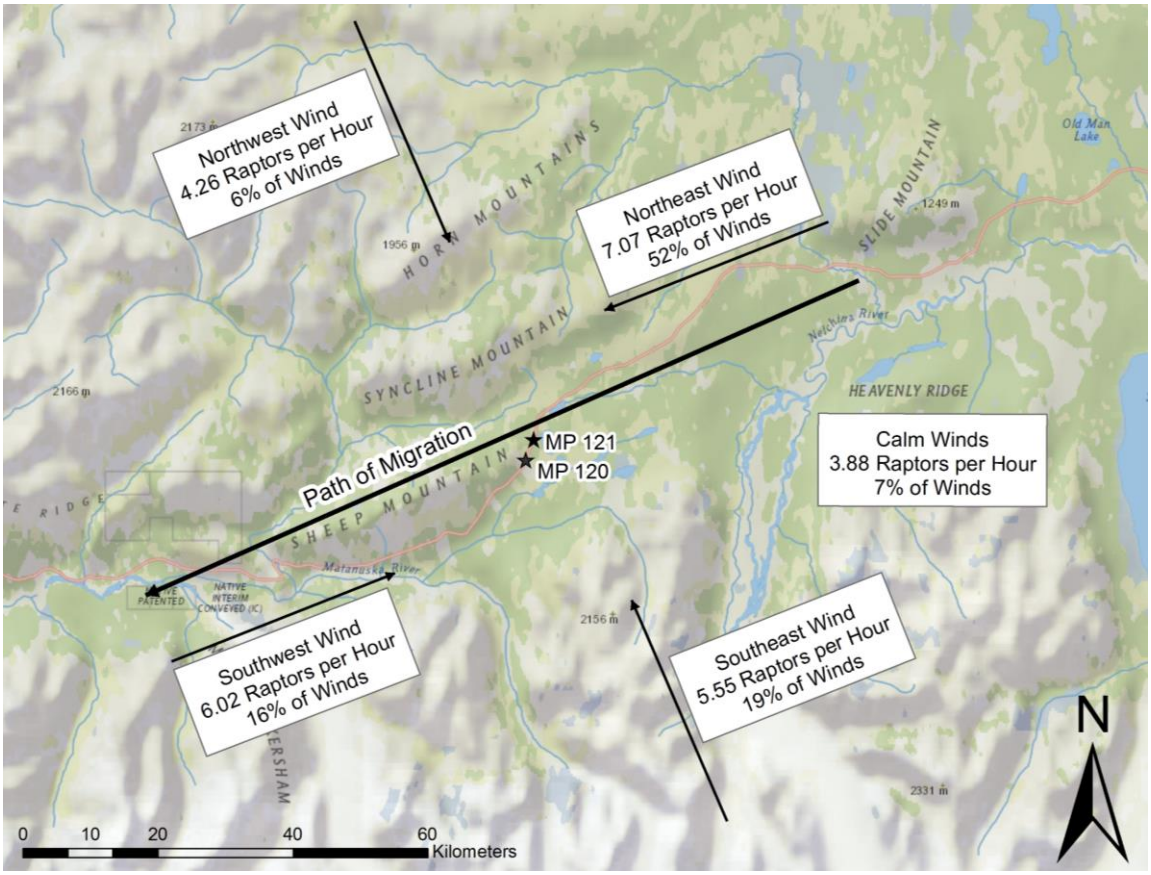

Figure 2. 2016 hourly passage rates by hourly wind direction at Gunsight Mountain, Matanuska-Susitna Borough, Alaska.

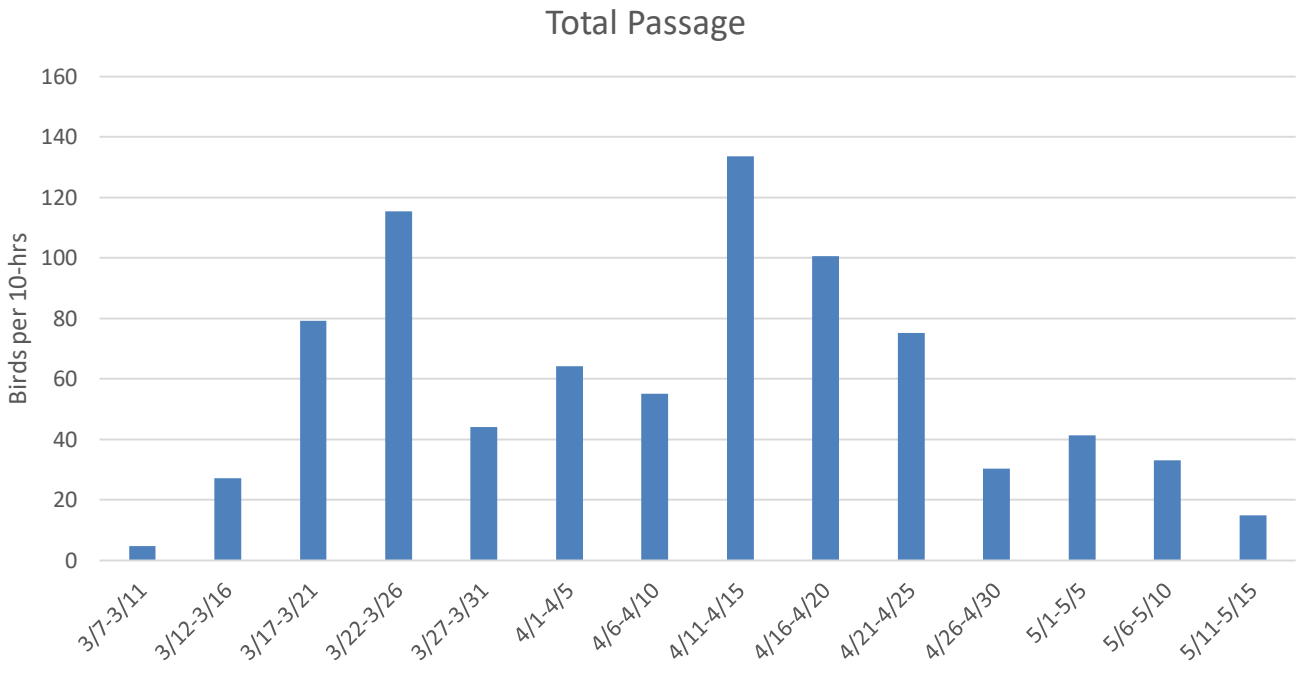

Figure 3. Spring 2016 Total Migrant Raptor Passage Rates within 5-day Windows at Gunsight Mountain, AK.

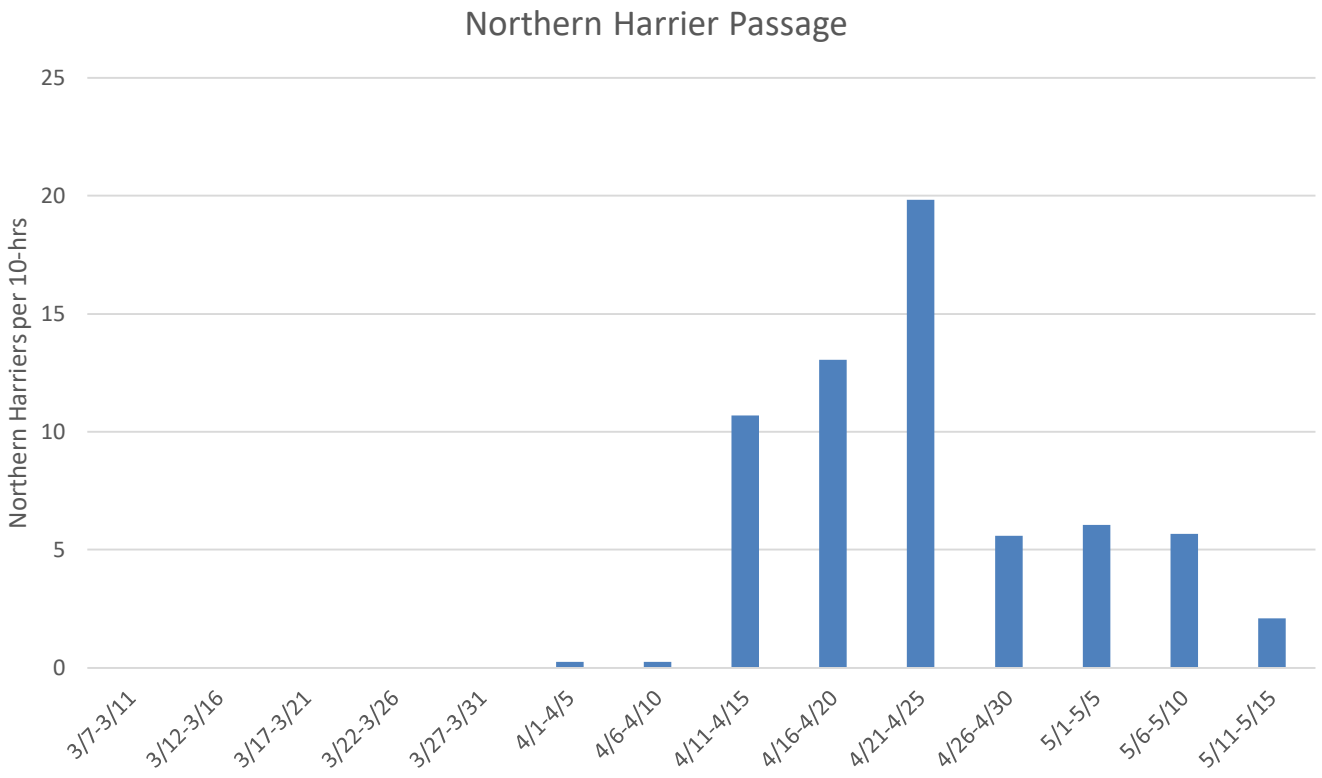

Figure 4. Spring 2016 Northern Harrier Passage Rates within 5-day Windows at Gunsight Mountain, AK.

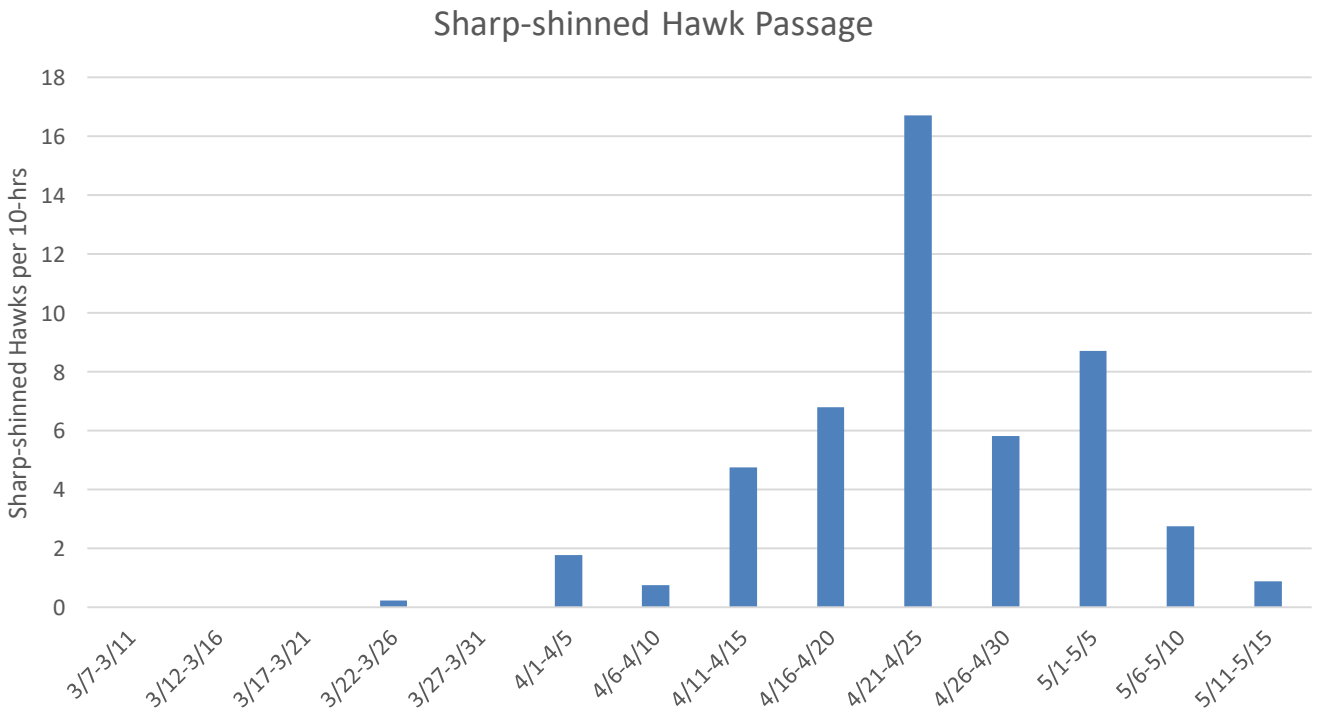

Figure 5. Spring 2016 Sharp-shinned Hawk Passage Rates within 5-day Windows at Gunsight Mountain, AK.

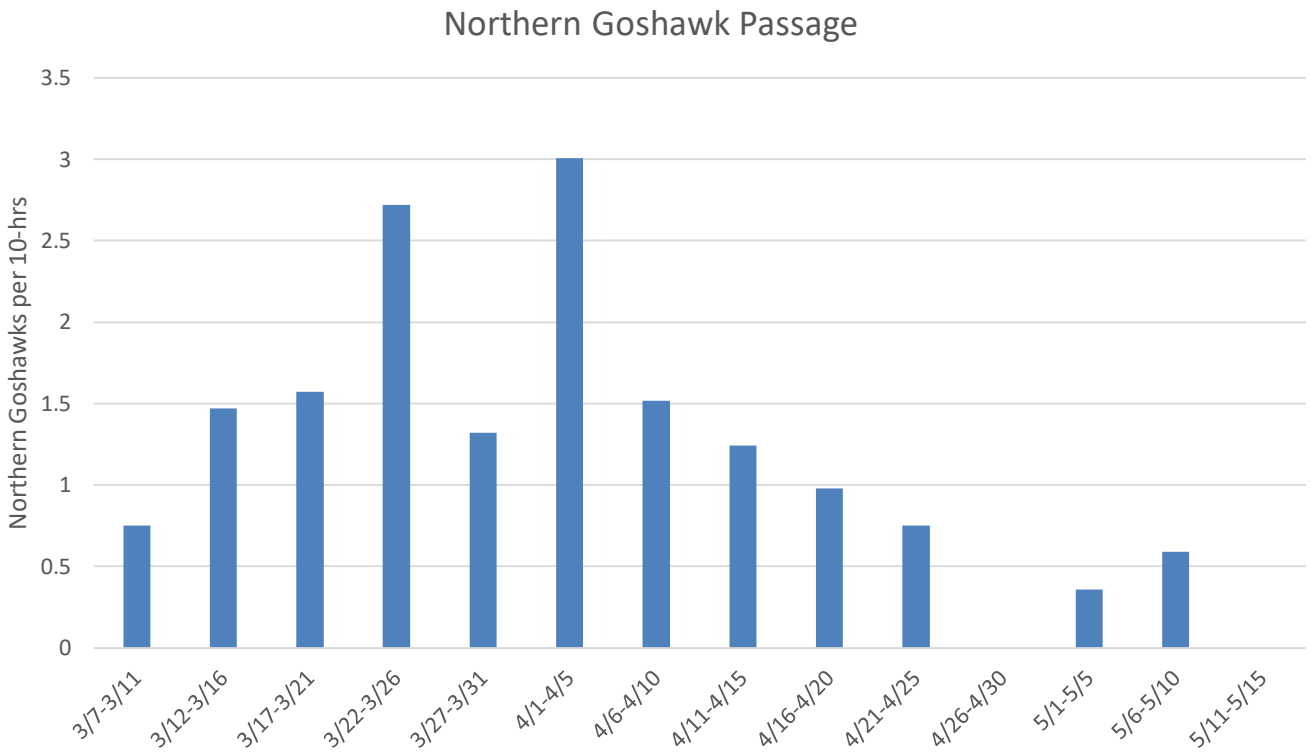

Figure 6. Spring 2016 Northern Goshawk Passage Rates within 5-day Windows at Gunsight Mountain, AK.

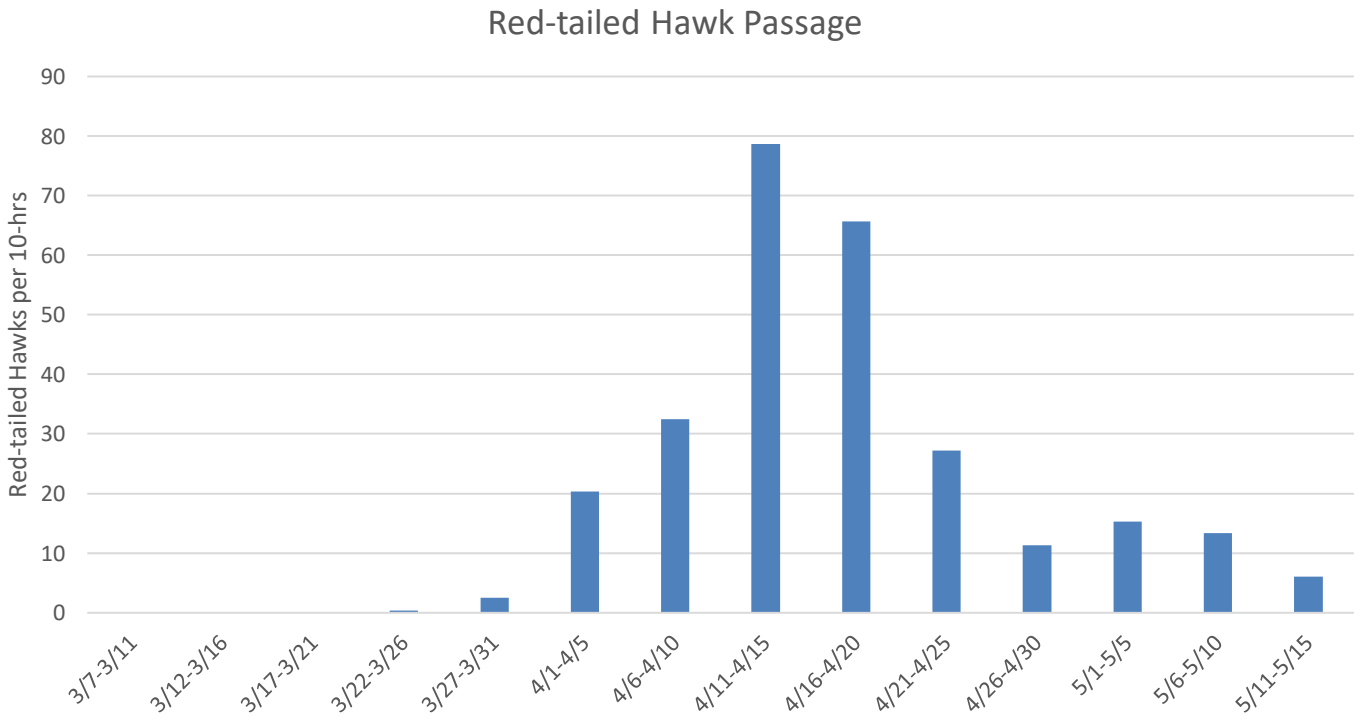

Figure 7. Spring 2016 Red-tailed Hawk Passage Rates within 5-day Windows at Gunsight Mountain, AK.

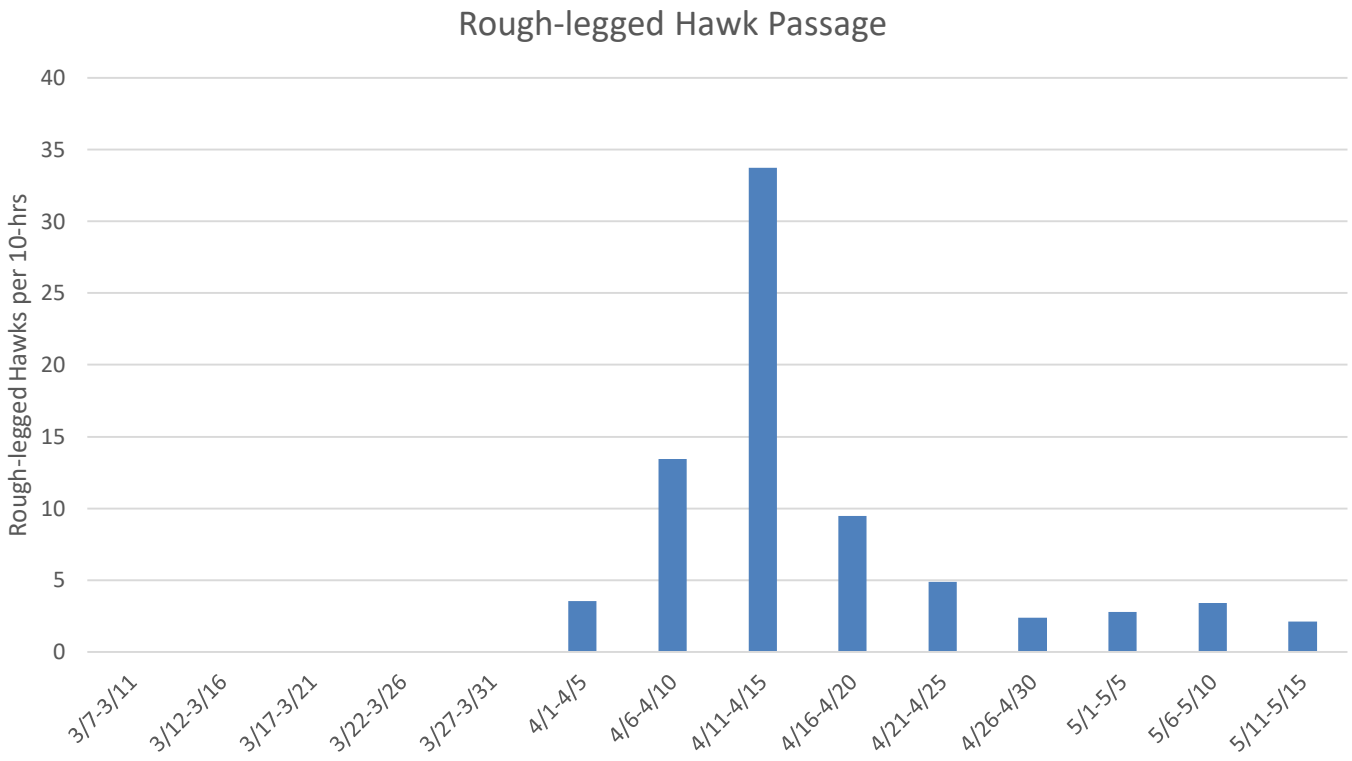

Figure 8. Spring 2016 Rough-legged Hawk Passage Rates within 5-day Windows at Gunsight Mountain, AK.

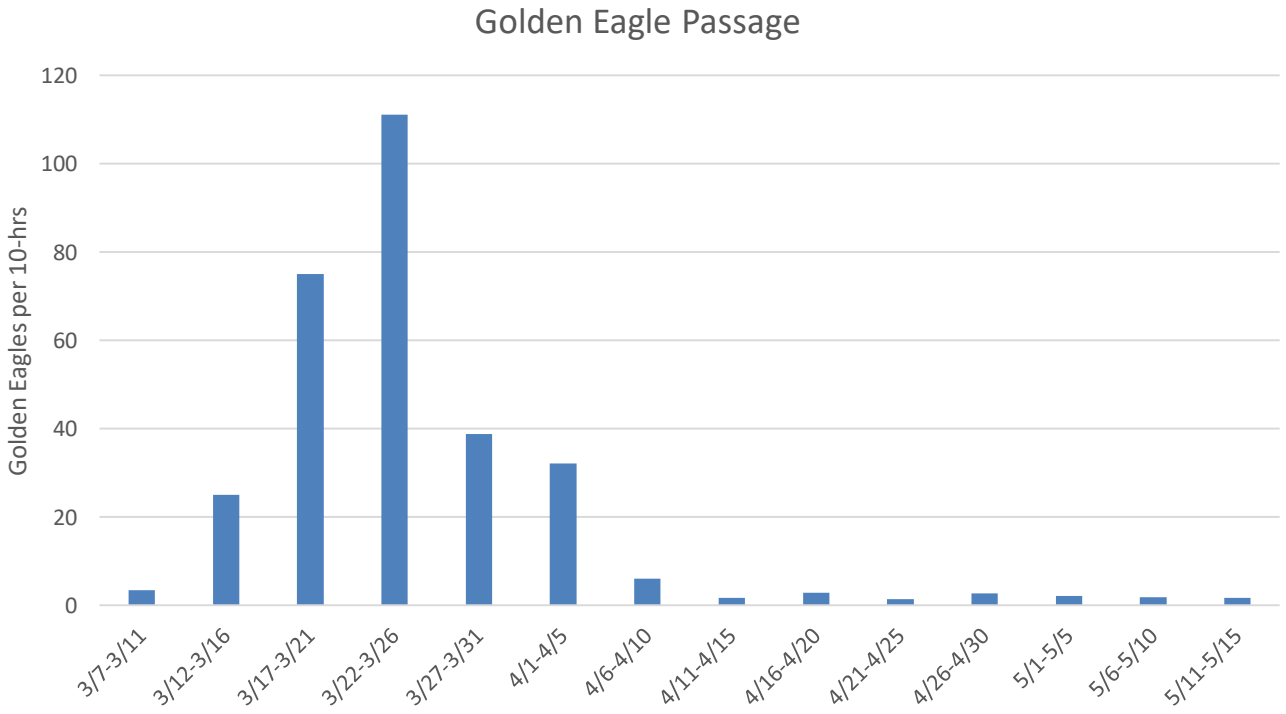

Figure 9. Spring 2016 Golden Eagle Passage Rates within 5-day Windows at Gunsight Mountain, AK.

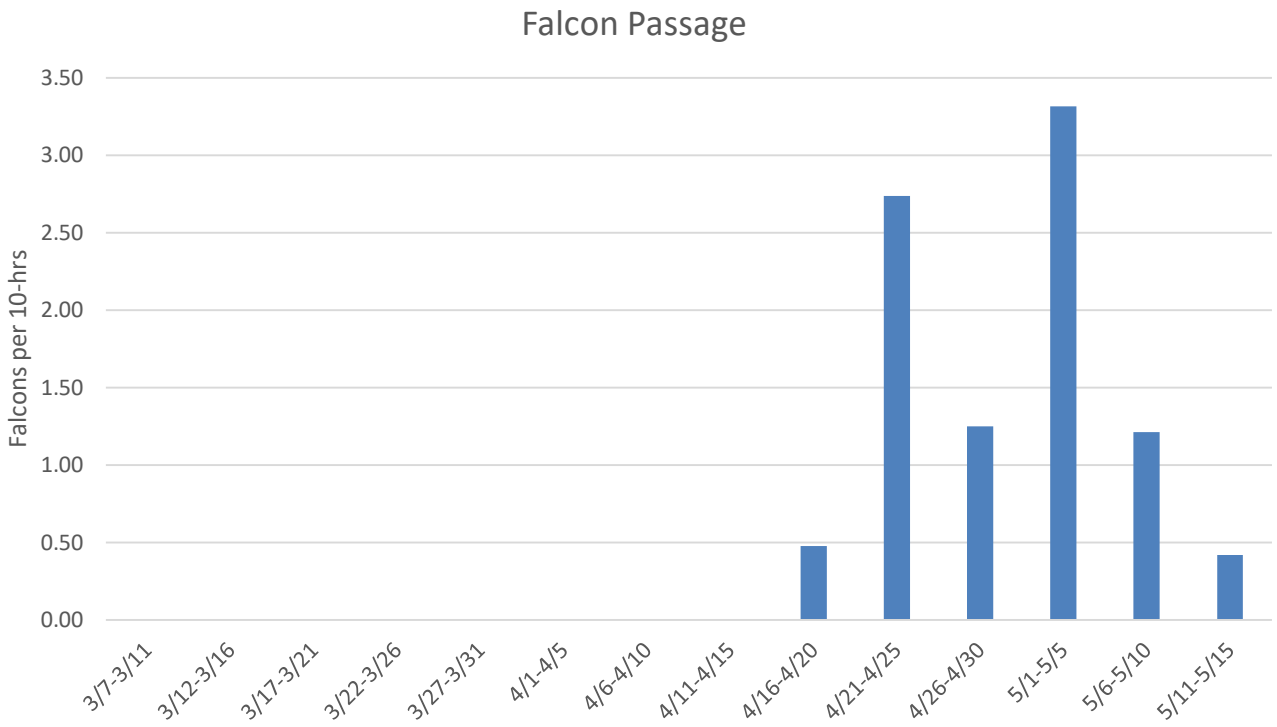

Figure 10. Spring 2016 Falcon Passage Rates within 5-day Windows at Gunsight Mountain, AK.

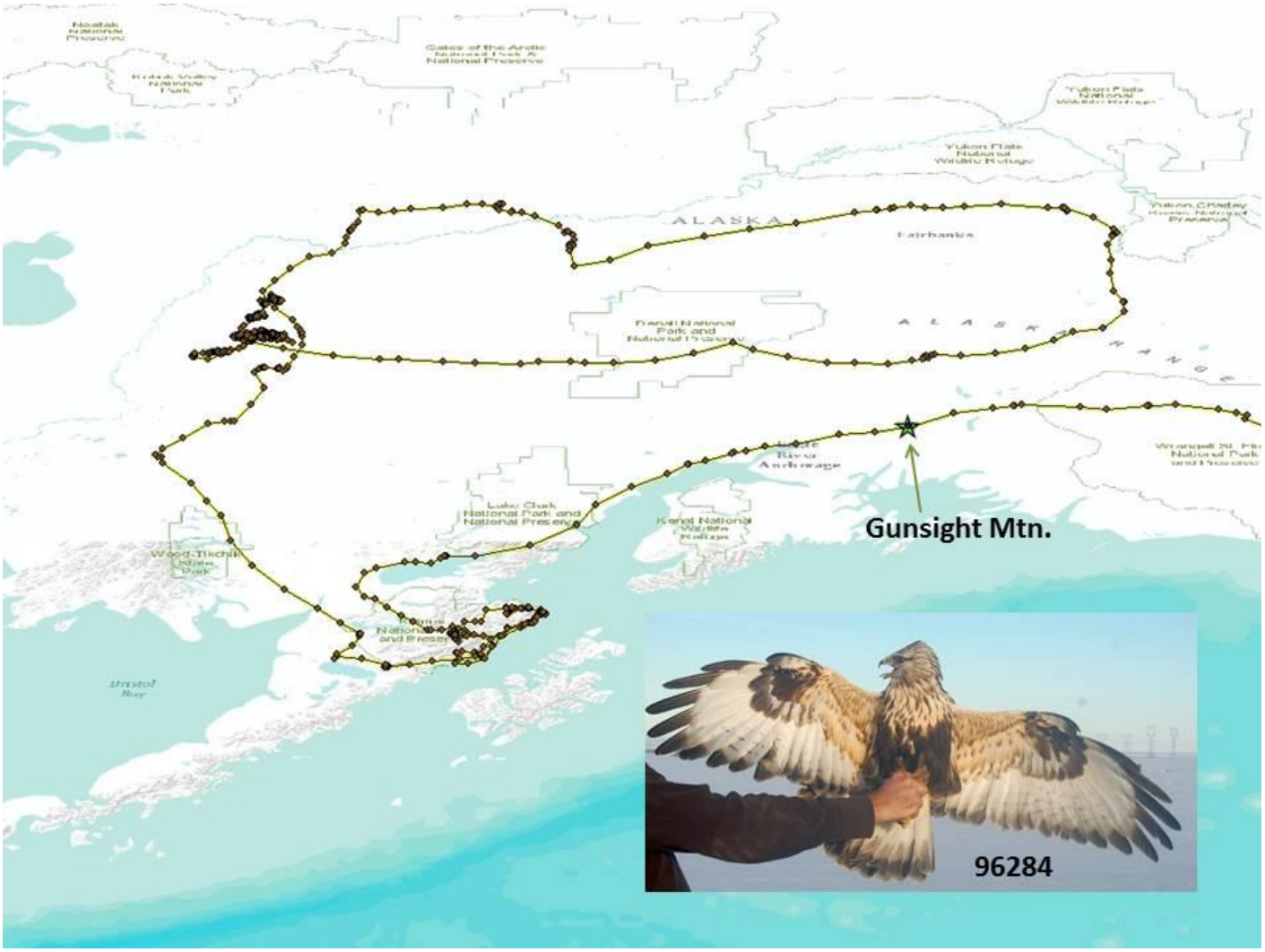

Figure 11. 2016 Spring migration and summer locations from a remotely-tracked Rough-legged Hawk captured in Washington, U.S.A., winter 2016. Map contributed by James Watson, Washington Department of Fish and Wildlife.

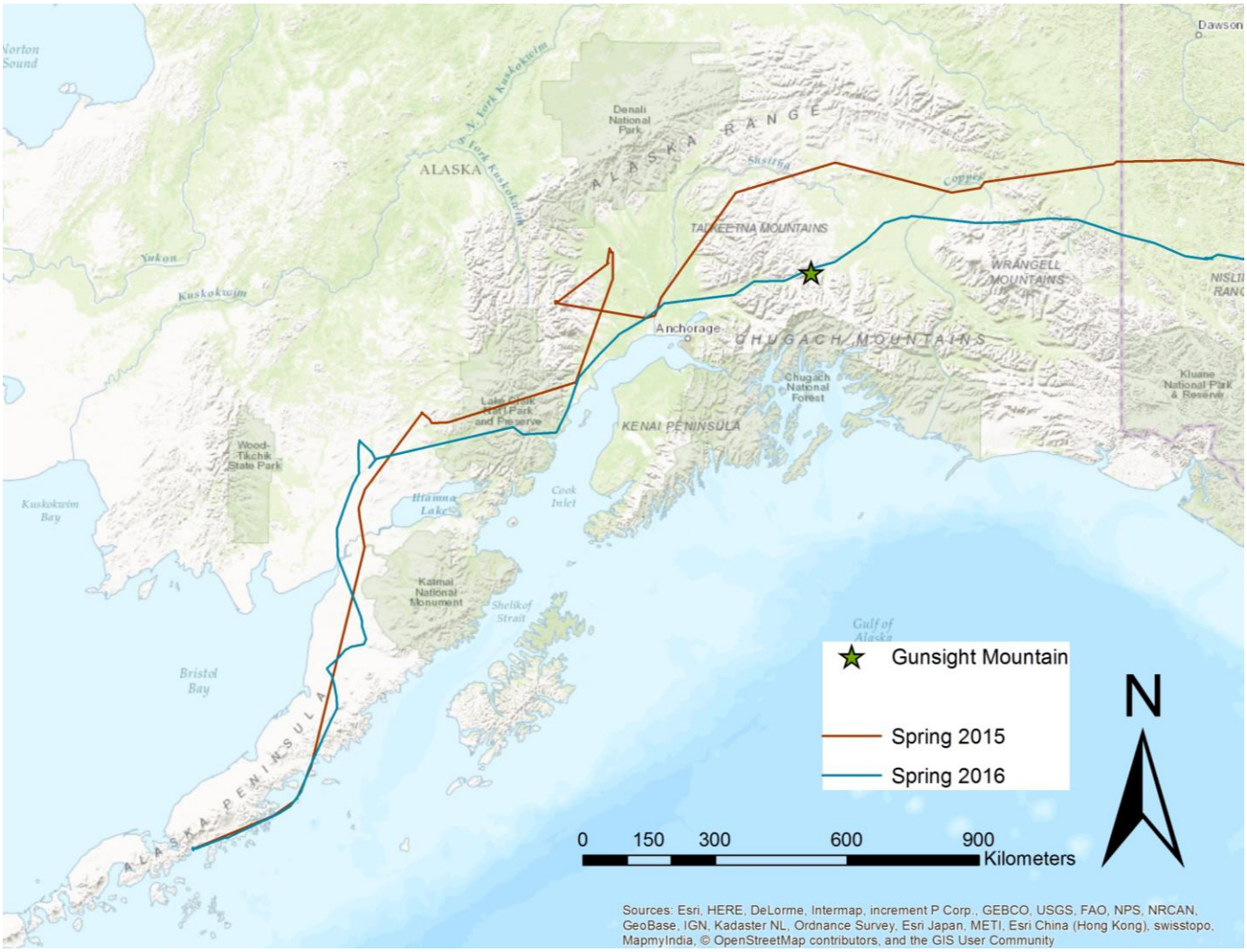

Figure 12. 2015 and 2016 Spring migration tracks from a remotely-tracked Rough-legged Hawk captured in Eureka, Nevada, U.S.A., winter 2015. Southwesterly migration tracks terminate near the individuals breeding territory on the Alaska Peninsula. Data contributed by Jeff Kidd, Kidd Biological, Inc.

Table 2. Summary of the 2015 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 site 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 count. *In 2015 HWI monitored migration for 4,252 hrs and counted 700,457 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 2015							
Species	**365.7**	**338.8**	**399.1**	**532.5**	**679.8**	**568.3**	**553.4**	**814.8**
Black Vulture								186
Turkey Vulture	494	*81*	5	90	*1102*		292	*170976*
Osprey	67	28	*22*	39	162	*75*	30	194
Northern Harrier	24	73	141	*64*	239	55	51	169
Crested Caracara								4
Common Black Hawk								0
Harris' Hawk								2
Accipiters								
Sharp-shinned Hawk	964	367	*655*	1321	6769	2209	1420	1914
Cooper's Hawk	226	179	306	526	4418	1538	469	1094
Northern Goshawk	19	15	38	48	100	3	3	0
Unidentified accipiter	44	41	94	71	43	*728*	39	69
TOTAL ACCIPITERS	1253	602	*1093*	1966	11330	*4478*	1931	3077
Buteos								
Red-shouldered Hawk	1	0	0	0	0	0	0	23
Broad-winged Hawk	4	*16*	29	30	*336*	*47*	18	472276
Short-tailed Hawk								2
Swainson's Hawk	1	14	2	202	*2856*	138	388	2941
White-tailed Hawk								43
Zone-tailed Hawk							1	13
Red-tailed Hawk	614	139	*382*	1070	*6988*	*1723*	384	68
Ferruginous Hawk	0	0	6	3	21	8	2	4
Rough-legged Hawk	1	35	*96*	11	11	0	0	0
Unidentified buteo	3	30	29	47	15	68	16	9
TOTAL BUTEOS	624	234	*544*	1363	*10227*	*1984*	809	475379
Eagles								
Golden Eagle	56	60	1134	*359*	170	1	43	2
Bald Eagle	78	*16*	81	169	15	11	1	14
Unknown eagles	1	1	2	9	0	0	1	0
TOTAL EAGLES	135	77	1217	537	185	12	45	16
Falcons								
American Kestrel	8	16	*180*	189	1881	595	267	1171
Merlin	69	34	*36*	19	73	10	37	*117*
Prairie Falcon	4	7	6	11	37	6	5	4
Peregrine Falcon	12	7	21	8	45	9	23	146
Aplomado Falcon								0
Unidentified falcon	7	2	7	11	1	17	3	11
TOTAL FALCONS	100	66	*250*	238	2037	637	335	1449
Kites								
Hook-billed Kite								0
Swallow-tailed Kite								89
White-tailed Kite								5
Mississippi Kite								8506
Unidentified Kites								0
TOTAL KITES								8600
Unidentified Raptor	7	31	9	12	0	49	7	137
GRAND TOTAL	2704	1192	3281	4309	25282	*7290*	3500	660189

Figure 13. Locations of fall HawkWatch sites operated by HWI and partners (symbols with borders represent sites that conducted banding in 2015).

Appendix A. History of official observer participation at Gunsight Mountain, AK: 2003–2016.

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.

2012 Voluntarily surveyed: Dan Crowson, Paul Fritz, Bob Sartor, Charlie Sartor, and Jim Herbert,

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.

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[1] Historical observer information from 2003 – 2012 obtained from data entered into hawkcount.org.

[2] Numbers in parentheses indicate previous full seasons 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
Bald Eagle	*Haliaeetus leucocephalus*	BE	U	I, S1, S2, NA, A, U[6]	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 tail; U = Unknown.

[6] 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 dark band on tail; NA = Not adult: unknown age immature/subadult; A = Adult: includes near adult with dark flecks in head and dark tail tip, and adult with white head and tail; U = Unknown.

Appendix C. Annual observation effort and spring raptor migration counts by species at Gunsight Mountain, AK: 2003–2016.

YEAR	2003	2004	2005	2006	2007	2008	2009	2012[1]	2015	2016
Start date	23-Mar	31-Mar	26-Mar	25-Mar	24-Mar	22-Mar	25-Mar	25-Mar	6-Apr	7-Mar
End date	17-May	2-May	1-May	7-May	6-May	2-May	30-Apr	10-Apr	27-Apr	14-May
Days of observation	23	22	22	17	22	28	31	8	16	65
Hours of observation	99.0	105.0	96.8	80.3	119.0	137.5	211.6	30.5	135.1	491.3
Raptors / 100 hours	1304	1100	1774	2823	1470	1396	1074	895	1027	640
SPECIES										
Osprey	0	0	0	7	2	1	0	0	0	17
Northern Harrier	150	159	293	493	196	52	94	2	51	244
Short-eared Owl	1	0	0	0	0	0	0	0	0	0
Sharp-shinned Hawk	63	119	137	227	93	33	38	1	16	189
Northern Goshawk	15	5	13	9	22	17	43	4	14	63
TOTAL ACCIPITERS	78	124	150	236	115	50	81	5	30	252
Swainson's Hawk	0	1	0	1	0	0	0	0	0	1
Red-tailed Hawk	461	452	625	666	663	1078	1059	68	938	1066
Rough-legged Hawk	265	219	357	368	310	285	479	11	207	297
Unidentified buteo	36	0	2	0	16	11	0	0	16	12
TOTAL BUTEOS	762	672	984	1,035	989	1,374	1,538	79	1,161	1,376
Golden Eagle	269	127	252	462	395	421	492	178	88	1163
Bald Eagle	14	20	9	10	4	15	48	9	53	56
Unidentified eagle	0	0	0	0	0	0	0	0	0	1
TOTAL EAGLES	283	147	261	472	399	436	540	187	141	1220
American Kestrel	3	3	1	2	7	0	1	0	0	2
Merlin	8	12	20	18	5	5	7	0	2	27
Peregrine Falcon	2	3	6	3	2	1	4	0	1	3
Gyrfalcon	0	0	0	1	0	1	0	0	0	1
Unknown falcon	1	0	0	0	0	0	0	0	0	1
TOTAL FALCONS	14	18	27	24	14	7	12	0	3	34
Unidentified raptor	3	35	2	0	34	0	7	0	1	0
GRAND TOTAL	1,291	1,155	1,717	2,267	1,749	1,920	2,272	273	1,387	3,143

[1]2003 – 2012 data obtained from hawkcount.org and primarily collected by Cecily Fritz, Paul Fritz, Bob Sartor, Charlie Sartor, and other volunteers. Used with permission.