



GOLDEN GATE RAPTOR OBSERVATORY

Season Summary 2024

HAWKWATCH • BANDING • COMMUNITY SCIENCE • RESEARCH

Golden Gate Raptor Observatory

ABOUT

The Golden Gate Raptor Observatory (GGRO) is a program of the Golden Gate National Parks Conservancy in cooperation with the National Park Service and is made up of 150 community volunteers and a small staff. The GGRO's mission is the preservation of California raptors through scientific research, outreach, and community involvement. Each year, we study and monitor the Pacific Raptor Flyway from the Marin Headlands, part of the Golden Gate National Recreation Area.

The GGRO Season Summary offers preliminary data and observations from the 2024 fall raptor migration at the Marin Headlands as well as updates on our programs and research.

We offer deep gratitude to the Gregory Hind Endowment Fund for critical support, and to the hundreds of people who donated in 2024.

SEASON SUMMARY 2024

Compiled and edited by Michela Gentile and Mellice Hackett. Text by Karen Chen, Carmen DeLeon, Teresa Ely, Rose Fielding, and Doris Rodriguez. Data compiled by Lizzy Edson, Teresa Ely, Rose Fielding, Allen Fish, and Doris Rodriguez.

If you would like to use GGRO data, please email ggro@parksconservancy.org.

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Cover illustration: American Kestrel with a transmitter by Siobhan Ruck

SUPPORT

Golden Gate National Parks Conservancy

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Introduction

We can't provide a summary of the 2024 season without first acknowledging the program pause that so deeply affected our data collection and volunteer community this year. Unexpected staffing changes mid-season led the hawkwatch and banding programs to pause on September 6, after only 25 days. Hawkwatch was able to resume on October 14, while banding unfortunately remained paused for the rest of the year. One thing that remained constant was our dedication to documenting the beauty and mystery of the fall migration through the Pacific Raptor Flyway.

The day the program pause was announced, hawkwatch volunteers organized amongst themselves and independently continued the daily count on Hawk Hill. Banders joined hawkwatchers, creating new friendships and strengthening old bonds as they scanned the skies.

Thanks to the volunteers' determination, we have a more complete picture of the 2024 season. While there were several notable decreases in species counts this year (possibly due to an unusual number of fogged-out days during peak season), one species showed an increase that both programs noticed within the first two weeks—the American Kestrel.

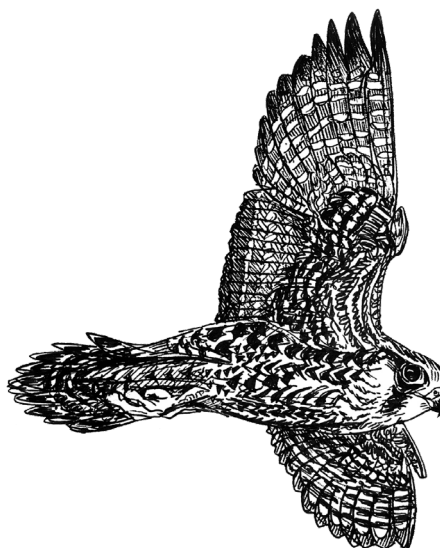
In total, hawkwatchers counted 412 kestrels (1.13 kestrels per hour), a marked increase from the previous 10-year average of 286 kestrels (0.64 kestrels per hour). During the 25 days that the banding program operated in 2024, 11 kestrels were banded compared to an average of one kestrel banded during that same period of the previous three seasons.

This increase in our favorite fierce, diminutive falcons sparks so many questions. Which factors led to the higher species count this year? Were there changes in prey abundance, nesting success, competition, predation, favorable weather patterns, all or none of the above? These questions remind us of why we are here. By continuing to document and provide a crucial glimpse into the migration patterns of the 19 raptor species that use this area to hunt, to roost, to nest, or simply to pass through, we are collecting data that can be used to provide answers to these questions and many more.

No matter what initially drew individual staff and volunteers to get involved with the GGRO throughout the past 40 years, we are all still here for the same reasons: our passion for raptor conservation, and our love of the incredible community that has formed over decades of teamwork on the hill and in the blinds. Thank you all for making the GGRO what it is today.

Rose Fielding

GGRO Program Manager, Hawkwatch
Conservation and Community Science Department
Golden Gate National Parks Conservancy



Hawkwatch

The 2024 hawkwatch season shined a spotlight on volunteer dedication and passion; this amazing teamwork gave us a more complete picture of this season's migration.

Although data was collected consistently throughout the season, there were three distinct periods due to the program pause. The first period was August 12–September 5, when data collection proceeded as normal with the help of a new digital data entry system. The second period was September 6–October 13, when hawkwatch volunteers collected data independently using paper datasheets. The third period was October 14–December 1, when staff again joined volunteers and collected data digitally. While all three periods were populated with talented and dedicated birders and data recorders, we acknowledge that changing the way data was collected mid-season could have affected the integrity of the full dataset. Because of this, the 2024 dataset will be caveated in future analyses.

The hawkwatch charts on pages 5 and 6 visualize this season's migration rate for each species and compares them to past seasons, measured in raptors observed per hour. Note that the data have been trimmed to a five-hour counting window of 10 a.m.-3 p.m. across seasons, and that we use the previous 10-year averages for each species' migration rate to compare to past years.

As in previous seasons, the four most-counted species during the observed 2024 migration were Red-tailed Hawks, Cooper's Hawks, Sharp-shinned Hawks, and Turkey Vultures. These four species accounted for over 86% of all raptors recorded from Hawk Hill this season.

The drop in the average number of raptors counted per hour (RPH) stands out. The 2024 average RPH was 38.77, while the previous 10-year average RPH was 51.48 (a decline of 24.69%). While many individual species' RPH numbers decreased in 2024, there were a few notable increases: American Kestrels (with an increase from 0.64 to 1.13 counted per hour, or a 76.56% increase), Bald Eagles (with an increase from 0.03 to 0.04 counted per hour, or a 33.33% increase), and Broad-winged Hawks (with an increase from 0.79 to 1.07 counted per hour, or a 35.44% increase). - *Rose Fielding*

DAY LEADERS

Jon Altemus, Jane Ambrosini, Don Bartling, Andy Bradshaw, Courtney Buechert, Christine Cariño, Conner Cimmityotti, Deborah Crooks, John Davis, Catherine Elliot, Michaela Figari, Sam Hontalas, Mary Kenney, Mary Malec, Horacio Mena, Brian O'Laughlin, Becky Olsen, Libby Rouan, Jane Rudebusch, Linda Schneider, Holly Thomas, Ken Wilson, Gretchen Zantzing

Hawkwatch

RAPTORS SIGHTED BY THE GGRO IN THE MARIN HEADLANDS, CALIFORNIA, 2024

	Official Count 2024 (sightings)	Unofficial Count 2024 (sightings)	Combined Count 2024 (sightings)	Average Count 2011-2023* (sightings)
Turkey Vulture	2909	1760	4669	6948
Osprey	24	20	44	65
White-tailed Kite	15	9	24	51
Bald Eagle	15	1	16	14
Northern Harrier	224	34	258	473
Sharp-shinned Hawk	462	680	1142	3132
Cooper's Hawk	408	530	938	2123
American Goshawk	0	0	0	1
Red-shouldered Hawk	69	81	150	353
Broad-winged Hawk	4	386	390	356
Swainson's Hawk	3	2	5	8
Red-tailed Hawk	3966	1454	5420	7935
Ferruginous Hawk	13	2	15	28
Rough-legged Hawk	0	0	0	5
Golden Eagle	6	2	8	14
American Kestrel	308	104	412	286
Merlin	73	4	77	181
Peregrine Falcon	101	21	122	229
Prairie Falcon	1	2	3	4
Unidentified	269	189	458	911
TOTAL	8870	5281	14,151	23,114
Hours Counted	260.75	104.25	365	449

Data compiled by Lizzy Edson, Rose Fielding, and Allen Fish. If you would like to use these data, please email ggro@parksconservancy.org.
 * The 10-year average used survey hours 10 a.m.-3 p.m. for the years 2011-2023, removing 2013, 2020, and 2021.

Hawkwatch

RAPORS SIGHTED PER HOUR BY THE GGRO IN THE MARIN HEADLANDS, CALIFORNIA, 2024

	Migration Rate 2024 (sightings/hour)	Average Rate 2011-2023* (sightings/hour)	% Change in Rate**
Turkey Vulture	12.79	15.47	-17.3
Osprey	0.12	0.14	-14.3
White-tailed Kite	0.07	0.11	-36.4
Bald Eagle	0.04	0.03	33.3
Northern Harrier	0.71	1.05	-32.4
Sharp-shinned Hawk	3.13	6.98	-55.2
Cooper's Hawk	2.57	4.73	-45.7
American Goshawk	0	<0.01	n/a
Red-shouldered Hawk	0.41	0.79	-48.1
Broad-winged Hawk	1.07	0.79	35.4
Swainson's Hawk	0.01	0.02	-50
Red-tailed Hawk	14.85	17.67	-16
Ferruginous Hawk	0.04	0.06	-33.3
Rough-legged Hawk	0.00	0.01	-100
Golden Eagle	0.02	0.03	-33.3
American Kestrel	1.13	0.64	76.6
Merlin	0.21	0.40	-47.5
Peregrine Falcon	0.33	0.51	-35.3
Prairie Falcon	0.01	0.01	0
Unidentified	1.25	2.03	-38.4
TOTAL	38.77	51.48	-24.7

Data compiled by Lizzy Edson, Rose Fielding, and Allen Fish. If you would like to use these data, please email ggro@parksconservancy.org.

* The 10-year average used survey hours 10 a.m.-3 p.m. for the years 2011-2023, removing 2013, 2020, and 2021.

** Change in migration rate from the 2011-2023 average to 2024.

Banding

The banding season ran August 12–September 5, with a total capture of 70 birds of four different species. Despite the abruptly shortened season, we experienced a surprising uptick of captured American Kestrels. We banded 11 kestrels in just under a month. Red-tailed Hawks comprised the majority, rocking a solid 40 captures, which is 57% of the total capture data! Cooper’s Hawks were starting to trail into the mix, tallying 18 by the time the program was paused. We also managed to squeeze in a single Red-shouldered Hawk.

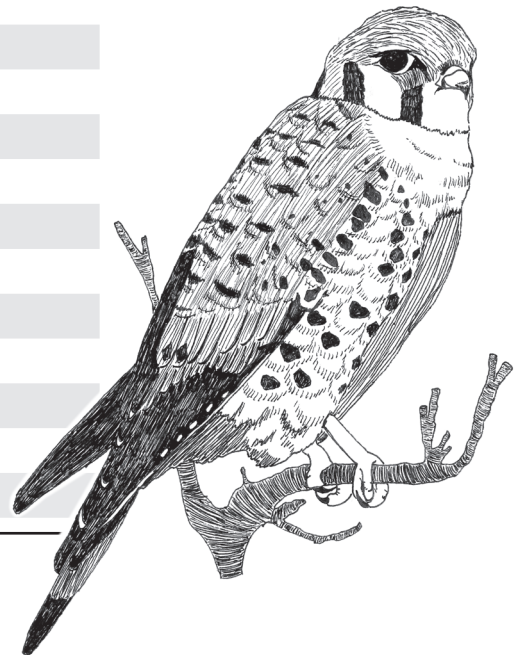
Because the season was shortened, 2024 banding data will not be used in year-to-year comparisons. Fortunately, the GGRO has a knack for thriving through unprecedented events—a pandemic, government shutdowns, and this season’s sudden pause. Through it all, our community has displayed a willingness to band together for our overall goal of raptor conservation. - *Doris Rodriguez*

RAPTORS BANDED BY THE GGRO
IN THE MARIN HEADLANDS, CALIFORNIA, 2024

Species	Past 10-Year Average*	2024**
Turkey Vulture	2	0
Northern Harrier	6	0
Sharp-shinned Hawk	302	0
Cooper’s Hawk	406	18
American Goshawk	0	0
Red-shouldered Hawk	14	1
Broad-winged Hawk	2	0
Swainson’s Hawk	0	0
Red-tailed Hawk	192	40
Ferruginous Hawk	0	0
Rough-legged Hawk	0	0
American Kestrel	19	11
Merlin	23	0
Peregrine Falcon	5	0
Prairie Falcon	1	0
Total Banded	972	70

DAY LEADERS

Anne Ardillo, Mike Armer, Eddie Bartley, Marc Blumberg, Robyn Boothby, Nancy Brink, Carmen DeLeon, Ben Dudek, Teresa Ely, Diane Horn, Elisha Hull, Eric Jepsen, John Keane, Eric Lynch, Mark McCaustland, Nancy Mori, Jeff Robinson, Doris Rodriguez



American Kestrel illustration: Karen Chen

Data compiled by Teresa Ely and Doris Rodriguez. If you would like to use these data, please email ggro@parksconservancy.org.

*From the early 1990s through 2019, on most days we used four banding blinds in the GGRO banding program. From 2021 on, we only used three blinds, therefore this chart shows the 10-year banding average for only the three blinds, making comparisons more valid.

**The 2024 season was truncated to August 12–September 5 due to reduced staff capacity. Numbers are significantly lower due to the shorter season.

Research

MOTUS

2024 marks the GGRO's second year participating in the Motus Wildlife Tracking System, a global collaborative research network that uses radio telemetry and strategically placed receivers to track the movements of a variety of wildlife. We continued to collaborate with Ryan Bourbour, Levi Souza, and Shannon Skalos from the California Department of Fish and Wildlife (CDFW), and we deployed a second set of Motus tags (radio transmitters) to monitor the migration of American Kestrels during the fall of 2024. Over the first three weeks of the migration season, former Banding Manager Teresa Ely attached transmitters to eight American Kestrels—five females and three males. This effort is part of a small but growing number of research projects using Motus technology to track American Kestrels across North America.

2024 HIGHLIGHTS: WHERE ARE THE KESTRELS NOW?

- **Southbound Journeys:** Four kestrels quickly migrated to Southern California and Mexico. Unfortunately, three of these birds' signals were lost in September, likely due to the limited number of Motus stations in these areas. One bird that reached Mexico later reversed course, flying north to the Channel Islands. After spending several days there, it continued to the Anaheim area, where it appears to have settled for the winter.
- **California Residents:** Three kestrels have remained in California, with two still transmitting signals as of the time of publication. One bird has stayed locally in the San Francisco Bay Area, while the other is currently in the Central Valley.
- **Northern Traveler:** One kestrel headed north after tagging and is currently residing in the Colusa area.

This ongoing project provides invaluable insights into the migration patterns and habitat use of American Kestrels, helping to inform conservation efforts for this charismatic species. - *Teresa Ely*

PUBLICATIONS

Brodman, R. S., Wommack, E. A., Meisman, E. D., Echávez, L. M., Fanucchi, K. M., Ely, T. E., & Briggs, C. W. (2024). Sexual Dimorphism in Plumage Coloration of Swainson's Hawks (*Buteo swainsoni*). *Journal of Raptor Research*, 58(3). <https://doi.org/10.3356/jrr-23-67>

Bourbour, R. P., Aylward, C. M., Meehan, T. D., Martinico, B. L., Badger, M. E., Goodbla, A. M., Fish, A. M., Ely, T. E., Briggs, C. W., & Hull, E. M. (2024). Feeding en route: Prey availability and traits influence prey selection by an avian predator on migration. *Journal of Animal Ecology*, 93(9), 1176–1191. <https://doi.org/10.1111/1365-2656.14122>

Echávez, L. M. & Fish, A. M. (2024). Golden Gate Raptor Observatory. *Hawk Migration Studies*, 50(1), 41–42. <https://view.publitas.com/hmana-1/hawk-migration-studies-vol-50-no-1/page/42-43>

PRESENTATIONS

Bourbour, R., Souza, L., Cornelius, N., Skalos, S., Sardinas, H., Smith, K., Albright, W., & Selmon, M. (2024, February 5-8). *Expanding wildlife tracking capabilities with Motus*. [Conference Session]. The Western Section of the Wildlife Society, Santa Rosa, CA, United States. <https://sonomacounty2024.tws-west.org>



Outreach

It was a year of pivot and collaboration to engage raptor fans of all ages. We applaud the seasonal GGRO staff for their resilience as they redirected their enthusiasm for hands-on raptor research to outreach efforts for the duration of the program pause.

During the foggy days of August, we constructed colorful duct tape art featuring the wingspans of 19 raptor species and flight silhouettes. As visitors approached the hawkwatch area, they spread their arms wide to see which raptor they most closely measured up with. We welcomed 7,840 visitors during the fall migration, with an average rate of 30 people per hour. Official visitor counts were not maintained during the six-week-long hawkwatch program pause.

We teamed up with our talented Parks Conservancy community engagement colleagues to reach over 400 learners with guided and drop-in activities at Hawk Hill. Together we partnered with Rafiki Coalition, VA Warriors, and QTPOC Birders to offer raptor watching walks for community members. With the Roving Ranger, a mobile nature pop-up, the team also brought activities to encourage awe, wonder, wellness, and curiosity outdoors.

The decade-old Migratory Story program forged ahead through the collaboration of our Crissy Field Center colleagues, the GGRO field team, and hawkwatch volunteers. Parks Conservancy colleagues at the Crissy Field Center visited bilingual elementary school classrooms for a briefing on raptors, highlighting the similarities between migrations of all living organisms. The culmination of each Migratory Story program was a field trip to Hawk Hill where we welcomed a steady flight of SFUSD classes, totaling 207 fifth graders. Hawkwatch resumed operation on time for a joyous cacophony of 50 first graders from the San Francisco Day School. They stormed the hill alongside their teachers and hawkwatch volunteers, eager to look for and count the raptors passing above as they practiced observation skills, including the occasional new-or-already-counted Turkey Vulture debate. We were delighted to connect with and foster the future generation of conservationists and migration storytellers.

Digital outreach enhanced the GGRO's virtual presence in 2024. Seventy-seven [Instagram](#) posts featured fun facts and migration highlights, garnering over 300 new followers. Our top post which earned over 1000 likes was "Lawrencium Travels the Bay," a collaboration with Cal Falcons that explained how bird banding and local scientist cooperation made it possible to track the life story of a local Peregrine Falcon. On our [Daily Hawk Count blog](#), staff highlighted daily observations of bird and weather activity, including notable species sightings. The blog, which also hosts our daily hawk count, saw 11,078 page views over the year. - *Carmen DeLeon and Karen Chen*

Volunteers

In 2024, we were once again shown how dynamic, proactive, and resilient the GGRO community is. These wonderful people are not only our volunteers, but are also our mentors, collaborators, friends, advocates, and advisors. We are incredibly grateful for your support this season. Thank you to:

Jon Altemus	Rich Eliason	William Ludan	Steve Rock
Jan Ambrosini	Catherine Elliott	Tom Luster	Paul Romanak
Anne Ardillo	Michaela Figari	Eric Lynch	Anne Ross
Jennifer Armer	Erin Fisher-Colton	Yvette MacDonald	Elizabeth Rouan
Kendra Armer	Dan Foldes	Mary Malec	Siobhan Ruck
Mike Armer	Joanne Fong	Robert Martin	Jane Rudebusch
Stefanie Arthur	Annalise Fox	Breanna Martinico	Peter Sapienza
Mary Badger	Megan Fradley-Smith	Krish Maypole	Lisa Sargent
Lynn Bantley	Ashley Friscia	Cindy McCauley	Sarah Sawtelle
Eddie Bartley	Carole Garrett	Mark McCaustland	Linda Schneider
Don Bartling	Alison Gee	Tomas McKay	Jack Schofield
Margot Bezruczyk	Amy Gilgan	Marcia Medrano	Rebecca Schwartz
Ann Marie Bisagno	Chris Gould	Ann Meisinger	Paulette Sherry
Marc Blumberg	Maureen Grabowski	Horacio Mena	Nathan Smale
Robert Blumberg	Susan Greef	Jennifer Miller	Tatyana Soto Bartz
Robyn Boothby	Keith Gress	Rachel Miller	Heller Stanton
Ryan Bourbour	Jessica Grubaugh	Maggie Montenegro	Tim Stroshane
Andy Bradshaw	Melissa Hero	Nancy Mori	Natalie Tan-Torres
Nancy Brink	Tori Herzog	Paula Moser	Christina Tarr
Lydia Bruno	Kim Hettler-Coleman	Kimberlie Moutoux	Holly Thomas
Arden Bucklin-Sporer	Parker Holzman Smith	Tani Myers	Laura Thomas
Courtney Buechert	Calvin Hom	Rebecca Natoli	Traci Tsukida
Ryan Byrnes	Sam Hontalas	Wing Ng	Joanna van Dyk
Christine Cariño	Diane Horn	Craig Nikitas	Michael Voeltz
Oliver Chesley	Elisha Hull	Brian O'Laughlin	Kristin Vorhies
Dani Christensen	Julian Hyde	Ana Olivar	Noreen Weeden
Conner Cimmiyotti	Katie Jacobson	Rebecca Olsen	Emily Weil
Laura Coatney	Eric Jepsen	Kristin Olson	Carol Weinstein
Patricia Contaxis	Chelsea Johnson	Sarah Parnell	Amanda Werrell
Patrick Coughlin	Joshua Kay	Sean Parnell	Jeff Wilcox
Alexandra Cox	John Keane	Winter Patterson	Ken Wilson
Deborah Crooks	Mary Kenney	Denise Peck	Step Wilson
Cynthia Crossen	Dan Knight	Ma'ayan Pe'er	Sam Wong
Chris Cruz	Melissa Kohner	Jean Perata	Woody Woodbury
Candace Davenport	Rina Kor	Jeanette Pettibone	Erin Woods
John Davis	Maryrose Kulick	Roy Pisetsky	Jim Yampolsky
Dennis Davison	Rachel Lawrence	Cricket Rasket	Nick Yatsko
Yuching Desch	Patti Lessard	Sonja Raub	Pauline Yeckley
Ben Dudek	Cody Levin	Lora Roame	Gretchen Zantzinger
Joan Duffield	Alex Loucks	Jeff Robinson	

RAPTOR SIGHTINGS 2012-2024

Marin Headlands, California

	2012	2014	2015	2016	2017	2018	2019	2022	2023	2024
Turkey Vulture	6622	8433	9692	5998	7063	6694	7340	5974	5216	4669
Osprey	62	79	83	67	63	67	58	41	69	44
White-tailed Kite	129	73	36	20	61	42	31	14	21	24
Bald Eagle	8	9	8	8	17	14	19	20	25	16
Northern Harrier	523	394	442	354	905	600	807	191	175	258
Sharp-shinned Hawk	3149	3539	4652	4138	3107	3389	2021	1905	2794	1142
Cooper's Hawk	2695	2169	3106	1998	2198	1914	2629	891	1821	938
American Goshawk	0	0	2	0	0	3	0	0	0	0
Red-shouldered Hawk	604	578	574	265	220	362	280	189	208	150
Broad-winged Hawk	755	310	344	289	286	295	110	558	410	390
Swainson's Hawk	11	10	6	5	13	5	4	8	4	5
Red-tailed Hawk	8603	7559	10,017	5676	9132	9230	8248	6195	7160	5420
Ferruginous Hawk	31	19	73	48	20	29	17	11	15	15
Rough-legged Hawk	19	1	1	4	1	8	8	1	2	0
Golden Eagle	13	32	18	13	16	14	13	8	5	8
American Kestrel	396	380	297	229	268	349	286	115	178	412
Merlin	180	183	257	178	252	182	156	87	173	77
Peregrine Falcon	246	279	225	199	252	205	196	209	215	122
Prairie Falcon	8	7	6	2	5	2	0	4	5	3
Unidentified	1084	1159	1381	862	906	909	784	424	589	458
Total Sightings	25,138	25,213	31,220	20,353	24,785	24,323	23,007	16,845	19,085	14,151
Hours	442	488	540	443	474	408	443	411	393	365
Raptors Per Hour	56.9	51.7	57.8	41.2	52.3	59.7	51.9	41.0	48.6	38.8

Data compiled by Lizzy Edson, Allen Fish, and Rose Fielding. Due to the impacts of regional and world events, GGRO annual data trends should not be assessed without specific knowledge and consultation with GGRO staff. If you would like to use these data, please contact us: ggro@parksconservancy.org.

RAPTORS BANDED 1983–2024*

Marin Headlands, California

	1983-2015	2016	2017	2018	2019	2021	2022	2023	2024***	Total
Turkey Vulture**	n/a	n/a	5	5	2	0	0	2	0	19
Northern Harrier	301	3	3	6	10	6	1	1	0	341
Sharp-shinned Hawk	11,934	463	330	413	181	184	238	318	0	13,994
Cooper's Hawk	14,887	503	496	468	596	283	197	379	18	17,663
American Goshawk	7	0	0	1	0	0	0	0	0	7
Red-shouldered Hawk	446	12	3	12	15	22	12	4	1	519
Broad-winged Hawk	40	2	1	5	0	1	1	0	0	48
Swainson's Hawk	10	0	1	0	0	0	0	0	0	11
Red-tailed Hawk	9570	229	212	342	227	195	127	140	40	11,053
Ferruginous Hawk	2	0	1	0	0	1	0	0	0	4
Rough-legged Hawk	6	0	0	0	0	1	0	0	0	7
American Kestrel	1403	24	21	26	10	7	10	3	11	1523
Merlin	742	34	37	21	23	16	8	12	0	876
Peregrine Falcon	92	9	11	5	7	5	7	2	0	138
Prairie Falcon	47	2	1	1	0	1	0	0	0	51
Total Banded	39,487	1281	1122	1305	1071	722	601	861	70	46,254

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*The 2021-2024 banding seasons operated with three blinds. All previous seasons operated with four. This is a contributing factor to lower numbers. Numbers have not been adjusted for changes in banding season start and end dates in recent years, nor for changes in daily start and end times.

**The 2020 banding season was suspended due to the COVID-19 pandemic. However, five Turkey Vultures were tagged in 2020.

***The 2024 season was truncated to August 12–September 5 due to reduced staff capacity. Numbers are significantly lower due to the shorter season.



White-tailed Kite illustration: Karen Chen

Golden Gate Raptor Observatory

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