

GOLDEN GATE  
NATIONAL  
PARKS  
CONSERVANCY

# PACIFIC RAPTOR

GOLDEN GATE RAPTOR OBSERVATORY



*at forty*

FALL MIGRATION 2023 | ISSUE 45 | PUBLISHED FEBRUARY 2025



# PACIFIC RAPTOR 45

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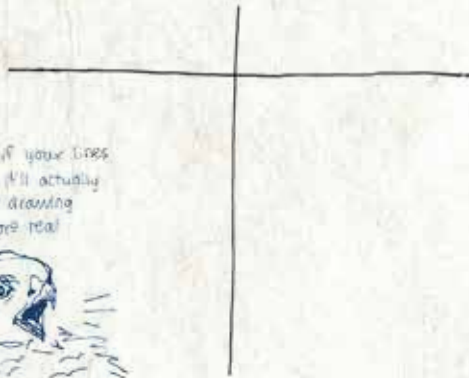


# LET'S DRAW A COOPER'S HAWK



Improve your Raptor ID skills through doodling -  
Observing shapes is great practice for hawkwatching!

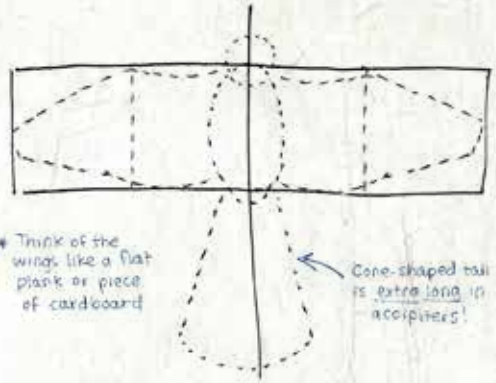
1. Start with your simple frame.



Don't worry if your lines  
are loose - it'll actually  
help your drawing  
feel more real!



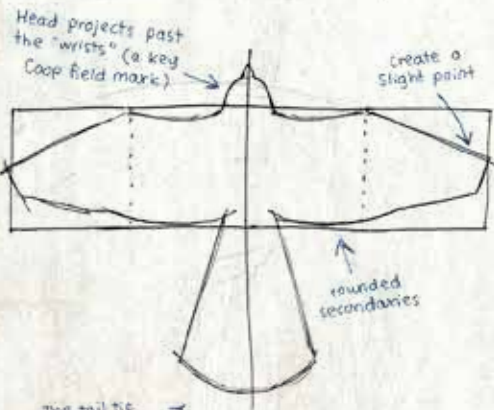
2. Box in the wings while keeping proportions in mind! Accipiters have shorter and more rounded wings relative to Falcons or Buteos.



\* Think of the wings like a flat plank or piece of cardboard

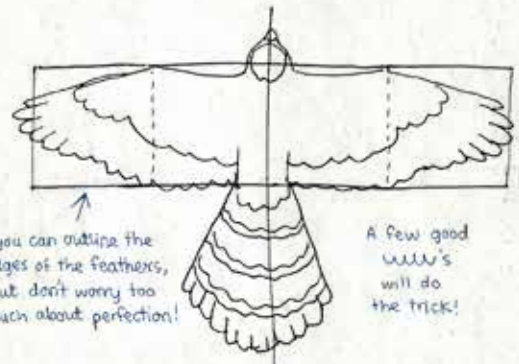
Cone-shaped tail is extra long in accipiters!

3. Create the hawk's rough outline using the boxes as your guide.



The tail tip should be slightly rounded

4. Add some details to bring your Coop to life!



By EMMA REGNIER 2024 @falcofous

## INTRODUCTION

# 40 Years and Counting!

Since 1984, the Golden Gate Raptor Observatory (GGRO), a program of the Golden Gate National Parks Conservancy in partnership with the National Park Service (NPS), has played a critical role monitoring raptors and their impact on ecosystem health. It's been the largest and longest-running volunteer program in the park, where each year several hundred people generously share their time and support, showcasing community science at its best.

As we celebrate the GGRO's 40th birthday in 2024, we're honored to be the recipient of the NPS "Excellence in Volunteerism" award in the "Innovation" category. From NPS: "This award recognizes a volunteer initiative within a park or program that has demonstrated significant innovation or creativity in meeting a park/program goal or need through volunteerism." It honors the GGRO's commitment to community science both in principle and in practice, and our significant contribution to the national parks.

Big anniversaries are a natural point of reflection and inflection. Over its 40 years, the GGRO has helped thousands of people understand and care about birds of prey. We've created a raptor monitoring and tracking system for the Pacific Flyway that's never been more critical, given the rapid pace of ecological change our planet faces. We've mentored hundreds of young people toward careers in conservation, and created effective partnerships with academic, agency, and community partners. And we've learned something new from each migration season—sometimes from one day's flight.

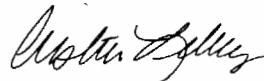
As we look to the next 40 years, we're committed to nurturing the GGRO's role as an outstanding model of community science. We'll connect more people to this work and to these incredible creatures. There's more to learn about the impacts of climate change and other challenges for raptors and the landscapes they inhabit. We'll continue to monitor birds of prey as we evolve our program, including moving to a digital-only version of *Pacific Raptor* to create a more dynamic, interactive, and sustainable experience for readers.

And on a personal note, I (Allen) say farewell to the Parks Conservancy. It has been an incredible 39 years building an important raptor conservation community science program and the legacy will continue as the Parks Conservancy, with the National Park Service, advances this impactful work.

Yours in conservation,



**Allen Fish**  
Former Director, Golden Gate Raptor Observatory  
Golden Gate National Parks Conservancy



**Christine Lehnertz**  
President and CEO  
Golden Gate National Parks Conservancy



THIS PAGE: Laura Echávez and Krista Fanucchi.

RIGHT: Isabella Plummer, Clare SantaColoma, Krista Fanucchi, Juan Esparza, Oliver Chesley, Cira Seyer Ochi, and Laura Echávez.  
Photos: Parks Conservancy

## INTRODUCTION

# GGRO Announcements

### PEOPLE

We are deeply grateful to our Biotechnicians, Laura Echávez and Krista Fanucchi, for their critical support during the 2022-2023 migration seasons. Laura and Krista each brought needed experience and skills, especially appreciated during this time of change and transition. Krista is now a Central Coast Rangeland Ecologist with Point Blue Conservation Science, while Laura joined San Francisco Bay Bird Observatory as a Biologist/Education Specialist. We send gratitude and wish excellent adventures to both.

2023 marked the first year since 2019 that we were able to bring seasonal interns back to the GGRO, an impactful tradition that extends back to 1986. Over four decades, 125 interns have launched careers with the help of GGRO staff, volunteers, and migrating raptors. To form the 2023 cohort, we brought together two interns from the NPS Scientists in Parks program, Isabella Plummer and Clare SantaColoma, with two Parks Conservancy interns, Juan Esparza and Oliver Chesley. Thank you for strengthening our field teams and raptor monitoring in 2023.

### SCIENCE

#### 2023 Publications

Martinico, B. L., Sage, G. K., Gravley, M. C., Talbot, S. L., Bourbour, R. P., Hull, A. C., Haak, B. A., Fish, A. M., and Hull, J. M. (2023). Population genetics and phylogeography of North American Merlins (*Falco columbarius*) in the post-DDT era. *Ibis* 165 (3): 862-874. <https://doi.org/10.1111/ibi.13182>

Smallwood, J. A., Ely, T. E., and Hallett, C. E. (2022). The use, and misuse, of the subterminal black tail band to age female American kestrels. *Journal of Raptor Research* 57 (2). <https://doi.org/10.3356/jrr-22-45>

#### 2023 Presentations

Ely, T. E., Echavez, L., and Smallwood, J. A. (2023). *Techniques for handling, auxiliary marking, and measuring raptors after capture*. [Workshop]. Raptor Research Foundation Conference, Albuquerque, NM. <https://raptorresearchfoundation.org/current-conference/workshops/>

Fish, A. M. (2023). *Shifting phenologies, shrinking birds, and migratory short-stopping: forty years at the intersection of climate change and the Pacific Raptor Flyway*. Pacific Climate conference. Pacific Grove, CA. <https://sites.google.com/site/paclimconference/past-workshops/paclim-2023>



## STORIES FROM THE HILL

Hawk Hill is a crossroads where so much life meets. It's fitting that it's also the home of the GGRO, which is an intersection of conservation science and community. We work in an ecosystem of partners and programs that further intersect with our scope in different ways, including the work of fellow Parks Conservancy teams to connect communities to these public lands. Here we present two stories that reflect these meaningful collaborations in 2023.



Community members hiked to the top of Hawk Hill to make observations from the four hawkwatch quadrants.  
Photo: Allen Fish



## Roving Ranger Visits Hawk Hill

ZAIRA SIERRA

**T**he Roving Ranger is our colorful, eye-catching nature pop-up that some visitors encountered at Hawk Hill this past migration season. As they approached, many expected to find a warm cup of coffee or other refreshment at this converted delivery truck. Instead, they were greeted by passionate Parks Conservancy staff who were ready to talk about raptors, show them their characteristics up close, and engage in dialogue about the significance of the site for raptors. Two Parks Conservancy teams, Community Stewardship and Engagement and the GGRO, collaborated to find creative ways to highlight the fall raptor migration, to welcome visitors to Hawk Hill, and to bring attention to the work to capture data about the migration.

Our team visited Hawk Hill with the Roving Ranger on four Saturdays during the fall migration in 2023. Our setup included a series of interactive activities and materials to spark curiosity about raptors' diets and characteristics, as well as offering guided walks for

birdwatching. Many people we engaged with were pleasantly surprised to learn about raptors and others shared their own knowledge of birds of prey.

A visitor named D'Angelo stands out. Our team had met D'Angelo at a previous community event in Marin City and invited him to our program at Hawk Hill. D'Angelo's interest piqued, and he and his mom came to Hawk Hill to learn more about raptors. On their first visit, our bird walk was uneventful—the birds we saw were far away and the day was chilly! As a big bird enthusiast myself, simply being at Hawk Hill is exciting, but I do think about how I can make this exciting for people of all ages and backgrounds. That day, I was not too sure if D'Angelo would be hooked on birding. Little did I know, he came back to the next program and was ready to see and learn more! He let me know that he had brought his own field guide and had been learning more about local birds.

Hawk Hill showed off that day, and the first sighting on our walk was a Northern Harrier. Our group

worked on focusing our binoculars on the bird—we used the fence rail to support our arms as it hovered. Suddenly, the Northern Harrier took a dive and scooped up a field mouse from the brush just below us. We all gasped and let each other know the hawk had just caught its lunch! I loved hearing everyone's interpretation of what had just happened, while we all worked to keep our binoculars focused on the harrier.



NPS and Parks Conservancy staff engage visitors at the Roving Ranger on Hawk Hill.  
Photo: Allen Fish

## STORIES FROM THE HILL

As we continued to observe, two Ravens came by to announce their presence to the Northern Harrier, and the harrier lost its lunch. This whole interaction provided such an enriching conversation about all the relationships in this ecosystem. We were all very excited and curious, and talked with each other as we continued to make our way up Hawk Hill.

Once we reached the top, D'Angelo spoke to the GGRO hawkwatchers, eagerly sharing what he had just witnessed and letting us all know he had a new favorite bird. It was the Northern Harrier!

It was time to head back, and D'Angelo asked his mom if they could stay back with the hawkwatch team to hear more about their work and continue to

birdwatch. This is when I was assured that he was hooked on birding!

As our Parks Conservancy teams continue to create programs and welcome visitors to our parks, we are happy to know that our offerings contribute to creating joy in our community for our environment and to making birding more accessible to all.



After learning about the most common raptors seen from Hawk Hill, community members tried spotting birds through binoculars.  
Photo: Allen Fish

## Sharing Our Migratory Stories

JESSICA LIE

**B**uteo!" The students' delighted voices filled the Tunnel Tops Outpost. I turned to see them excitedly pointing at a Red-tailed Hawk perched on a nearby lamppost. These youth from Edwin and Anita Lee Newcomer School (EALNS) had just been to Hawk Hill that morning and learned to identify four different raptor types, including buteos (bigger raptors with pizza-shaped tails). EALNS serves recently immigrated Chinese-speaking students, some who had been in the U.S. for just a few weeks, if not days, before this field trip. And already, they were bringing their Hawk Hill learning back into their new city of San Francisco.

Migratory Story is a youth program that aims to connect raptor migration with the human migration experience. Led by our Parks Conservancy Youth Programs staff with the support of the GGRO, the program includes a classroom visit and a field trip to Hawk Hill during the fall raptor migration season. In the classroom visit, we start building relationships with the students while introducing the field trip and migration concepts. On Hawk Hill, students learn to identify raptors and, with binoculars and data sheets in hand, count them. We then create space for students to reflect on and share their own migration stories. Our goal is for youth to see their and their families' journeys as special as the journeys of raptors.



Students share their own migratory stories. Photo: Jessica Lie

## STORIES FROM THE HILL

In line with uplifting the migration experience, we prioritize Title I public schools located in immigrant and historically migrant communities to participate in Migratory Story. For the 2023-24 school year, we partnered with 11 fifth grade classes from six elementary schools in San Francisco and Sausalito/Marin City. We were especially excited to pilot a middle school version of the program with Dr. Martin Luther King, Jr. Academy and the Emerging Bilingual program at Visitacion Valley Middle School. In total, we brought 298 students to Hawk Hill with over half of programs facilitated in Spanish and/or Mandarin.

My personal highlight from the 2023 Migratory Story season was a new activity we incorporated for students to share their migration stories across classes and schools. Students added sticky notes to a large world map in response to three different prompts:

- My family moved from \_\_\_ because \_\_\_.
- I want to move to \_\_\_ because \_\_\_.
- I love the \_\_\_ in \_\_\_.

We were all inspired by the authenticity and vulnerability that the students embodied in sharing their stories and truths. These photos represent just a few of those stories.

In that spirit, we invite you to join us in celebration of our interconnected migration experiences, raptor and human, and to reflect on your migration story using the following questions:

- Where did you or your family migrate from and why?
- Where would you want to migrate to and why?
- What do you love about where you migrated from or where you live now?

Lastly, Migratory Story would not be possible without the support of so many:



Thank you to Tom Meyer, who has provided annual generous support for this program since 2015 in honor of his late wife, longtime GGRO bander and federal judge Jennie Rhine.

Thank you to the Parks Conservancy Youth Programs and NPS staff past and present who helped build this program and create a welcoming space for students.

Thank you to the GGRO which has been unwavering in its support of Migratory Story.

Thank you to the youth and teacher partners for being themselves and sharing their migratory stories.

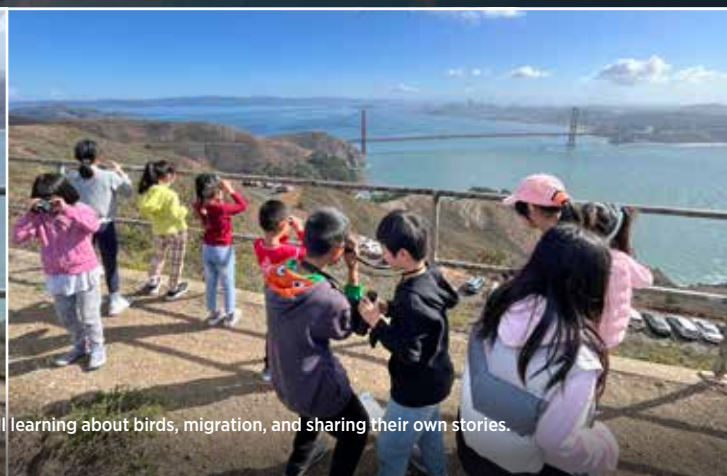
## STORIES FROM THE HILL



Personal stories shared by youth participants in Migratory Story. Photo: Jessica Lie



Students from the Edwin and Anita Lee Newcomer School enjoy a day on Hawk Hill learning about birds, migration, and sharing their own stories. Photos: Jessica Lie



# Motus Tracking Starts at the GGRO

TERESA ELY



One day in mid-March 2023, I received an email from Dr. Ryan Bourbour, Environmental Scientist, California Department of Fish and Wildlife (CDFW): “How interested would GGRO be in deploying Motus tags on raptors?” My response was, “Very!” Two days later, Ryan got the green light for GGRO staff to place Motus tags on American Kestrels and Sharp-shinned Hawks.

Working with Ryan and CDFW colleagues Levi Souza and Dr. Shannon Skalos, I placed the Motus tags (transmitters) on eight Sharp-shinned Hawks and one American Kestrel during October-November 2023. We jumped at the chance to participate because of the new view it could offer on the Pacific raptor migration.

## WHAT IS MOTUS?

The Motus Wildlife Tracking System (Motus) is an international collaborative network of researchers and radio stations that uses automated radiotelemetry to study the movement of many kinds of animals, from insects to birds to bats. As of March 2024, there are over 50 Motus receiver stations in California, and over 2,000 throughout the U.S. The GGRO is the first group to place Motus tags on Sharp-shinned Hawks and is one of 10 projects currently using Motus to study American Kestrels.



Sharp-shinned Hawk. Photo: Teresa Ely

For many years, GGRO biologists and other raptor researchers have dreamt of small, lightweight tracking devices that could one day allow us to study the movements of small raptors. The GGRO has a rich history of tracking raptor flights up and down California. From 1989 to the present, we’ve tracked flight paths of more than 75 birds using

radiotelemetry, GSM technology, and satellite transmitters. For each of these techniques, we have been limited to studying only larger raptor species because of the weight of the transmitters.

Motus was established by Birds Canada in 2014 to reveal the secrets of small-bird migration, but the radio transmitters can also be made small enough for bats and large insects such as dragonflies and butterflies. The key difference between this radiotracking system and the radio-transmitter systems of the late 1900s is that Motus receivers are placed on fixed towers, buildings, and bridges. The Motus-tagged bird, bat, or bug must pass within 10 miles of the receiver to ping the receiver, and when it does, the location is time- and date-stamped.

Because Motus requires fixed towers, the system’s accuracy correlates with the number of towers in the region of migration for each species tracked. We are fortunate that in the northern San Francisco Bay Area, a collaboration of agencies including the U.S.

Geological Survey, the National Park Service, CDFW, Audubon California, and others have been working together to set up towers for several years. On September 15, 2023, the Marin Headlands got its first tower, located on Wolfback Ridge in the hills above Sausalito, thanks to the hard work of CDFW staff and local biologists Dr. Gabriel Reyes (U.S. Geological Survey) and Dr. Bill Merkle (National Park Service).

Largely thanks to the leadership of CDFW biologists, there are many agency, NGO, and landowner collaborations currently coming together to create new Motus receiver locations in California and beyond, especially in ecologically rich landscapes such as the San Francisco Bay and Delta, and the coastal zones.

### MATCHING THE BIRD WITH THE TRANSMITTER

To be a candidate for a transmitter, a bird must first be in good health. We look for birds that: 1) have a decent amount of fat reserves (stored in their wing pits), 2) have a nice rounded “keel” (the muscle mass around the breastbone), and 3) are within a certain weight. The maximum transmitter weight that any bird is allowed to carry is 3% of their body weight. This is true for the Red-tailed Hawks and Turkey Vultures that the GGRO has tracked with satellite transmitters, and all bird biologists apply this same measure, whether studying shorebirds, songbirds, or birds of prey.

### STUDYING THE SMALL RAPTORS

American Kestrels and Sharp-shinned Hawks are two of the smallest raptors that the GGRO bands every fall, weighing between 85 and 220 grams, depending on species and sex. American Kestrel populations have been in decline over the last 20 years, and we are starting to see declines in Sharp-shinned Hawk migration numbers in the Pacific region. Sharpshins are also more difficult to study due to their secretive nature and elusive nesting locations. To help us learn more about the reasons for declines, we need to start to understand the species’ annual cycles of movement. Where are they going in the fall? Where are they wintering, where are they breeding, and back again?

### THE 2023 MOTUS SEASON

During fall 2023, we placed Motus tags on one female American Kestrel, four juvenile female Sharp-shinned Hawks, three juvenile male Sharp-shinned Hawks, and one adult female Sharp-shinned Hawk, for a total of nine birds. Below are snapshots of each bird’s flight, the first glimpse we have at these species’ activity at this scale. We are excited for what future years of Motus tracking can tell us.

Please note that the maps show Motus stations that detected the birds as points and a representation of their flight direction as lines, not their exact flight path. Learn more about Motus and explore more data at [motus.org](https://motus.org).

## RESEARCH NOTE



<b>ID#</b>	50976
<b>DATE TAGGED</b>	OCTOBER 11, 2023
<b>SPECIES</b>	SHARP-SHINNED HAWK, JUVENILE FEMALE
<b>SEE MORE</b>	<a href="https://motus.org/data/track?tagDeploymentId=50976">https://motus.org/data/track?tagDeploymentId=50976</a>

This bird remained in the Bay Area and was detected at Motus stations on Wolfback Ridge above Sausalito, at Richardson Bay Audubon Center (Tiburon), and at Napa-Sonoma Marsh regularly for two months, until December 13.



<b>ID#</b>	51308
<b>DATE TAGGED</b>	OCTOBER 27, 2023
<b>SPECIES</b>	AMERICAN KESTREL, FEMALE
<b>SEE MORE</b>	<a href="https://motus.org/data/track?tagDeploymentId=51308">https://motus.org/data/track?tagDeploymentId=51308</a>

On October 28, this kestrel pinged the Wolfback Ridge and Richardson Bay Audubon Center stations, then just five hours later, pinged a CDFW station at Santa Cruz, CA. All was silent until 22 days later, when on November 19, 24, and 26, she pinged the station at Punta Mazo, San Quintin Nature Reserve, Baja California, Mexico, 700 miles south of the Marin Headlands.





<b>ID#</b>	51393
<b>DATE TAGGED</b>	NOVEMBER 1, 2023
<b>SPECIES</b>	SHARP-SHINNED HAWK, JUVENILE FEMALE
<b>SEE MORE</b>	<a href="https://motus.org/data/track?tagDeploymentId=51393">https://motus.org/data/track?tagDeploymentId=51393</a>
<p>For two days this bird pinged Wolfback Ridge, Santa Cruz on the third day, and Salt Slough station near Los Banos on the fourth. Her last detection was November 5.</p>	



<b>ID#</b>	51562
<b>DATE TAGGED</b>	NOVEMBER 10, 2023
<b>SPECIES</b>	SHARP-SHINNED HAWK, JUVENILE MALE
<b>SEE MORE</b>	<a href="https://motus.org/data/track?tagDeploymentId=51562">https://motus.org/data/track?tagDeploymentId=51562</a>
<p>This bird first pinged Napa-Sonoma Marsh, then Santa Cruz about 5 days later. It was detected in Santa Cruz again a week later, then south at Elkhorn Slough, then further south past Big Sur to Piedras Blancas four days later.</p>	



A Sharp-shinned Hawk cruises by the Hill.  
Photo: Don Bartling

# Of Eagles and Broadwings

LAURA ECHÁVEZ

**A**s we welcomed new and long-term volunteers and interns that could now join the hawkwatch teams, the start of the 2023 GGRO migration season brought a palpable feeling of excitement. Every fall provides us with numerous opportunities to grow as community scientists and learn from the unpredictable lessons the birds have in store for us. This past fall season, which spanned from August 16 to December 3, did just that.

The 2023 GGRO hawkwatch community consisted of 83 volunteers, including 11 first-year apprentices and 10 second-year apprentices. In addition to the dedicated efforts of volunteers, staff played a crucial role on Hawk Hill, and we were fortunate to have the talent and support of four Interns, two Biotechnicians, and one Program Coordinator. In total, a hawkwatch team was on Hawk Hill for 88 of 112 possible days (78.6%) during autumn 2023, and they counted for 393 hours, about 64 hours more than the previous 10-year average for counting (the average count includes data from 2009-2022).



Broad-winged Hawk. Photo: Don Bartling

Each year presents new challenges, most outside of our control, that keep us from counting 100% of the planned days. Mainly, weather and natural disasters are at the forefront of our radar. Every year, we expect the unpredictability of wildfire events or shifts in the annual fog cycle to cause some disruption. Fortunately, aside from a handful of scorching days that drove us off Hawk Hill for a fraction of a day, fog was our principal nemesis. Eighteen days were missed due to fog-out conditions, including a near record-breaking streak of six consecutive fog days without a hawk count.

Despite the fog, the 2023 season brought some highlights. Our teams tallied nearly 20,000 sightings, an increase from 2022 and an 8.3% increase from the 10-year average. We can account for this uptick in sightings to more “normal” numbers of our bread-and-butter species: Cooper’s Hawks and Sharp-shinned Hawks. In contrast to the 2022 fall migration season, when we saw a sharp delay and decline in the accipiter flight, Cooper’s and Sharpshins increased by 900 sightings each, 16% over the 10-year average for both species.

Additionally, Red-tailed Hawks saw a similar increase from the 2022 season by nearly 1000 sightings and 21% over the 10-year average. Turkey Vultures were our second most-sighted species in 2023, though they showed a decline from 2022 and were 5% under the 10-year average. Overall, these four species made up 89% of the GGRO’s sightings in 2023.

Many of the remaining species we observed this year increased from their 10-year average, including Osprey, Merlin, Peregrine Falcon, and Prairie Falcon. Osprey were sighted 68% more than the previous year and 35% more than the 10-year average. Merlin’s 178 sightings were 99% higher than 2022 and 43% than the previous 10-year average. Peregrine Falcon

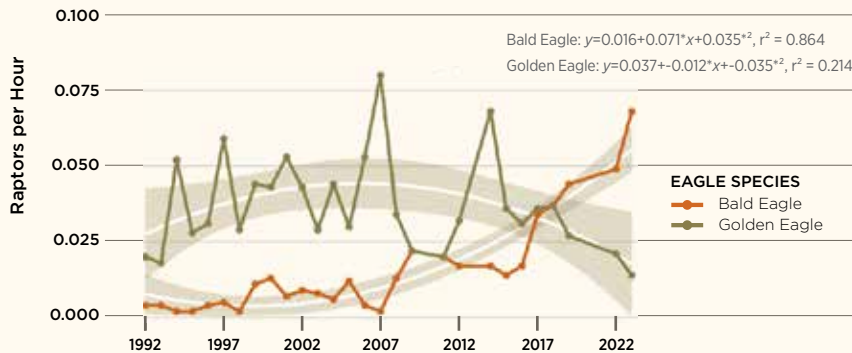
increased by only 3% from 2022, but 26% from the 10-year average. Though we recorded one sighting more of Prairie Falcon from 2022, this elusive species did not change from the average. Although most falcon species observed from Hawk Hill had increased sightings from the previous year, American Kestrels saw a 14% decline from the previous 10-year average.

One of the many benefits of observing the south-bound raptor journey each fall is witnessing first-hand the success stories of species that were once endangered. A wonderful example of this is the Bald

Eagle. In the starting years of the GGRO hawkwatch, we only recorded one or two sightings of Bald Eagles each year. However, Balds have shown a steady incline over the past 30 years. The 2023 season recorded a 20% increase from the 2022 sightings and an incredible 178% over the previous 10-year average. Since 2017, Bald Eagle sightings have outnumbered Golden Eagle sightings six out of seven fall migration seasons. Conversely, Golden Eagle sightings appear to be on a slow decline—the 2023 season recorded a 50% decline in Goldens from their 10-year average.

## EAGLE TRENDS OVER TIME

Based on GGRO hawk counts 1992-2023



Annual hawkwatch counts over the past 30 years show a 178% increase in Bald Eagles and a 50% decrease in Golden Eagles.

Figure by Lizzy Edson. Data collected by the Golden Gate Raptor Observatory.

## HAWKWATCH 2023

The long-term GGRO dataset also gives us the opportunity to raise the alarm when species trends appear to be in a steady decline. Of the remaining six species with fewer sightings in 2023, White-tailed Kites and Northern Harriers were down from their average by more than 50%. Although White-tailed Kites saw a 50% increase from 2022, their 2023 sightings were more than 54% below the 10-year average, showing kites to be on a slow downward path. Similarly, Northern Harriers decreased by 8% since 2022 and by 52% from their 10-year average.

GGRO data serve as indices for species population trends across the Pacific states. Sometimes, the trends have a clear rise or decline, while for some species, the line may fluctuate in a haphazard zigzag, potentially depicting the effects of climate change, habitat loss, and prey fluctuations on a particular species. From 1992 to 2011, Broad-winged Hawks showed a wavering pattern that kept them at a slightly inclined plateau. However, Broadwing trends appear to be shifting in the last decade. The spike up to 755 Broadwing sightings in 2012 seemed to be an anomaly, but the last couple of years suggest an increase in Broadwings migrating along the Pacific Flyway. The 2023 sightings for Broadwings saw an increase of 47% from their

10-year average. Although it is too early to say what the cause of the recent increase may be, our hawkwatch teams will continue to marvel at the sight of these Eastern buteos.

Although 2023 was a raptor migration season with some healing aspects for GGRO teams and staff, the species counts seem to portend both intriguing and concerning trends for the years ahead. Still, the essence of the Golden Gate migration, its simple magnificence and its unpredictability, was captured by GGRO intern Oliver Chesley from the end-of-day hawkwatch blog for October 3. This had been highest count day for 2023 with 907 sightings including 133 Broad-winged Hawks:

**“After we spent the first minutes of the day staring halfheartedly into the fog, we were rewarded with an inkling of what the day would bring—a group of 15 Broad-winged Hawks, materializing from the mist and swirling around the hilltop in remarkably close quarters.”**



GGRO Scientists in Parks Intern Clare SantaColoma presents a raptor identification lesson for hawkwatchers. Photo: Krista Fanucchi

## HAWKWATCH 2023

# RAPTOR SIGHTINGS

GOLDEN GATE RAPTOR OBSERVATORY  
MARIN HEADLANDS, CALIFORNIA

	COUNT 2023	AVG COUNT 2009-2022*	RATE 2023	AVG RATE 2009-2022*	% CHANGE IN RATE**
	sightings	sightings	sightings/hr	sightings/hr	
Turkey Vulture	5216	5471	13.28	16.66	-20
Osprey	69	51	0.18	0.16	12.5
White-tailed Kite	21	46	0.05	0.14	-64
Bald Eagle	25	9	0.06	0.03	100
Northern Harrier	175	367	0.45	1.12	-60
Sharp-shinned Hawk	2794	2392	7.11	7.29	-2.5
Cooper's Hawk	1821	1564	4.64	4.76	-2.5
American Goshawk	0	< 1	0	< 0.01	n/a
Red-shouldered Hawk	208	329	0.53	1	-47
Broad-winged Hawk	410	278	1.04	0.85	22
Swainson's Hawk	4	6	0.01	0.02	-50
Red-tailed Hawk	7160	5904	18.23	17.98	1
Ferruginous Hawk	15	20	0.04	0.06	-33
Rough-legged Hawk	2	3	0.01	0.01	0
Golden Eagle	5	10	0.01	0.03	-67
American Kestrel	178	207	0.45	0.63	-29
Merlin	173	121	0.44	0.37	19
Peregrine Falcon	215	171	0.55	0.52	6
Prairie Falcon	5	4	0.01	0.01	0
Unidentified	589	673	1.5	2.05	-27
Total	19,085	17,626	48.59	53.69	-12
Hours Counted	392.8	328.4			

Data compiled by Lizzy Edson and Allen Fish. If you would like to use these data, please contact us: [ggro@parksconservancy.org](mailto:ggro@parksconservancy.org).

\*The 10-year average used survey hours 10 a.m.–3 p.m. only for the years 2009-2022, removing 2010, 2013, 2020, and 2021.

\*\*Change in migration rate from the 2009-2022 average to 2023.

## A Possible Redtail-Roughleg Hybrid at Hawk Hill

ALLEN FISH

**A**bout 7 p.m. on October 26, 2023, I got an email from GGRO apprentice hawkwatcher Wing Ng. We had both spent the day hawkwatching on Hawk Hill, and Wing had been going through her photos from the day.

“For some reason, this Redtail looked different to me—the tail and wing panels are very light (in contrast with the rest of its back), its underside looks dark, and I can’t see the patagial mark as clearly as with other Redtails,” Wing observed. “I know there are many variations of Redtail, and I am fascinated by

these variations. I am just wondering: which variation would you consider this to be?”

I scrolled through Wing’s photos, five stills grabbed from a 43-second video. The first showed a dorsal view of a juvenile western Red-tailed Hawk, slightly lighter than average, mostly in the pale wing windows but nothing new. I opened the second photo. It was a ventral view of a medium color morph, juvenile Rough-legged Hawk, with a black carpal patch and belly band. It was a different species. These were two different birds.



A possible Red-tailed x Rough-legged Hawk hybrid, first observed by Wing Ng.  
Photos: Wing Ng

## HAWKWATCH 2023

Wing confirmed it was one bird and showed me the full video. Dorsal Redtail, ventral Roughleg? In our hawkwatch program's entire history, no one had knowingly recorded a hybrid raptor. While we couldn't know for sure, the possibility was exciting.

Several details stood out about this hawk:

- Strong black carpals, no visible patagial marks in the underwing
- Thick Roughleg-style black bellyband extending to the lower belly, a bit more than a Redtail would show
- The dorsal, primary wing windows are a tad pale for a juvenile Redtail, but not white like a Roughleg (although the ventral view of the wing window is white)
- The tail, dorsal and ventral, looks mostly like a juvenile Redtail, but with a subtly paler look closer to the body, and darker closer to the tail tip

- The wing profile (the angle of the wings) seems to come upward from the body just a bit as Roughlegs do, but in the video some angles look like a high juvenile Redtail wing

The frustrating thing about a possible hybrid bird in the field is that you can never really know what you've got, unless the bird is caught and samples are taken. For now, as happens with many hybrid bird sightings, we ended up in identification limbo. And if it really were a hybrid, is it first generation or a crossing that occurred generations back?

But that wasn't all for hybrids this season. Sixteen days after Wing captured her hybrid *Buteo* video, on November 11, the whole hawkwatch team including Wing and her partner Jonathan Chan saw a possible Redtail x Roughleg hybrid circle overhead. Jonathan photographed a superb ventral view of the bird, clarifying all the details that Wing had seen two weeks prior. To me, it looks like the same bird.



A possible Red-tailed x Rough-legged Hawk hybrid, observed by the GGRO hawkwatch.  
Photos: Jonathan Chan

## HAWKWATCH 2023

This sighting reminded me that GGRO volunteer leader and bird photographer John Davis had photographed a possible Redtail x Roughleg hybrid in the Monte Bello Open Space near Woodside, CA, in December 2020. This adult *Buteo* with both a red tail and black carpal patches had been documented on eBird by Peter Hart with superb photos. John had managed to find the bird again 10 days later.

John noted, “It had an odd posture for a Redtail, more kink in the wrists more of the time. It kited before diving, which I usually only see young Redtails doing. It dove with a posture that surprised me as well, almost like a White-tailed Kite with wings kinked and tips up. It also perched in the tops of Coast Live Oaks which I find uncommon for Redtails around here, but I have seen visiting Roughlegs do. Perching on thin power lines is another unusual Redtail trait but not uncommon for Roughies.”

In a 2007 paper, long-time GGRO advisor, collaborator, and volunteer Dr. Elisha Hull of UC Davis led a research team in a genetic analysis seeking evidence of hybridizations from blood sampled from 468 Red-tailed and 357 Swainson’s Hawks<sup>1</sup>. Of the



The possible hybrid hawk, prey in talons. Photo: John Davis

825 samples, three of the hawks showed “an intermediate genetic position between the genotypic clusters of the two species.” As a focused analysis of hybrids in buteos, this seems like a remarkably high number. About 0.36%, or 3.6 out of 1000 birds showed evidence of hybridization between these two species.

A quick search on eBird in spring 2024 showed an astonishing 50 Redtail x Roughleg hybrid records for North America, 35 with photo documentation. Beyond the California sighting above, they ranged from the Pacific Northwest to southeastern Arizona to the Midwest and Great Lakes, and one in Maryland. And of course, many observers don’t document their sightings on eBird, so there could be more. We’ll have to add a new color plate to field guides!

The appearance of a possible hybrid *Buteo* twice on Hawk Hill after almost 40 hawkwatch seasons was astounding. There are many themes and lessons contained in that story, but a big one is the gratitude for the documenters, who lug big cameras to Hawk Hill and other locations and wait for the moment to skillfully capture something new.

“I think the increase in hybrid observations is a testament to the use and advances of equipment and technologies,” Wing reflected. “Besides the increases in tracking and DNA studies, having tools like high-quality digital cameras and the eBird database allow researchers, citizen scientists, and casual birders more opportunities to record, document, share, and study the hawks. For a new hawkwatcher like myself, I am amazed at the skills and dedication of the people who started observing hawk migration years ago without the modern technology that I enjoy today.”

Great thanks to Wing Ng and Jonathan Chan for documenting the 2023 possible hybrid, and to John Davis for his photos from 2020.

<sup>1</sup>Hull, E. M., Savage, W., Smith, J. P., Murphy, N., Cullen, L., Hutchins, A. C., and Ernest, H. B. (2007). Hybridization among Buteos: Swainson’s Hawks (*Buteo swainsoni*) × Red-Tailed Hawks (*Buteo jamaicensis*). *Wilson Journal of Ornithology* 119 (4): 579-84. <http://www.jstor.org/stable/20456060>



## Collaboration on Hawk Hill

HOLLY THOMAS

**T**his is a reflection on how our resilient GGRO hawkwatch teams turned an unexpected change into a positive for raptor data collection.

Hawk Hill is one of the most visited spots in the Golden Gate National Recreation Area. Besides GGRO hawkwatchers, visitors include tourists from everywhere, large crowds of birders during migration season, and some expert birders. Some experts are hawkwatchers who have been visiting Hawk Hill for many years and are part of the GGRO community; others are not experienced in GGRO's counting

systems, but they bring incredible spotting and identification skills to Hawk Hill.

Visiting birders help ensure that our data are accurate and complete. They help identify challenging birds. They spot distant or fast-moving birds that the official team may miss. They demonstrate skills needed to collect accurate data, and many have become mentors to GGRO volunteers. When many birders are present on peak migration days, we all enjoy a mood of fun and camaraderie.



Holly Thomas scans the horizon. Photo: John Davis

Although interacting with both expert and novice visitors can be rewarding, visiting birders might also call out incorrect identifications (IDs) or convey incorrect information. While expert birders can impart many valuable skills, they sometimes bring a culture to Hawk Hill that can be competitive and intimidating.

### FENCE UP, FENCE DOWN

In response to COVID-19 during 2020-22, the National Park Service placed a short fence to separate the official hawkwatch count area from the rest of the hill while data was being collected. This reduced the risk of transmission for GGRO hawkwatchers while volunteering. GGRO staff took this barrier down in 2023 but left the sides still standing. Now, it defines the area as special and yet still invites visitors in. I never liked having a fence and was happy and relieved when it was turned into an open gate. Some volunteers, however, perceived the fence as good for data collection and were sorry to see it go.

There were pros and cons to the fence, besides its pandemic-era safety purpose. The fence deprived GGRO staff and volunteers of those positive interactions with people who came to the best spot along the Pacific Raptor Flyway to view the spectacle of migration, including visiting expert birders. However, the fence forced hawkwatch teams to discover what volunteering was like with fewer external experts.

In 2020-2022, with the fence up, I observed not only the raptors, but the GGRO hawkwatching teams as well. From both inside and outside the fence, I noticed:

- Newer counters were more willing to make identifications.
- Newer counters picked up skills more quickly.
- Some volunteers felt the count was more fun, as they had more opportunity to spot, work, and call birds.
- Many were less intimidated about making calls.

By 2023, such observations led GGRO staff to craft new guidelines for how GGRO teams would interact with visiting experts. These included:

- Visiting birders hoping to call out IDs for the official count should first check in with GGRO count leaders.
- Visitors would hand off sightings to the GGRO hawkwatch team to verify and report.
- Experienced counters and birders would hold back on calling IDs of interesting birds so that beginners could have the opportunity to spot, work, and call them.

The challenge became an opportunity for a positive culture change for the GGRO hawkwatch.

### GAINING CONFIDENCE

During the COVID-19 years, GGRO hawkwatch leaders and staff wondered whether having fewer expert visitors on the Hill would affect data accuracy. The problem was not a trivial one, but we tackled it by becoming more collaborative.

Collaborating on an ID helped us both to make calls and to be confident in them. It involved discussion about plumage details and field marks that all pointed toward the same conclusion on the species. This gave us a collective means of achieving reasonable confidence that an ID was correct, without relying as much on outside experts. And we all learned more, together.

Here's a composite example what I saw in 2023:

I observe a bird overhead. My first impression is Sharpshin, but I don't feel confident. I ask for help from other counters. One points out the relatively short tail. Another notes the square tail corners. Another observes that its wrists are pushed forward, and its head is hunched back into the leading edge of its wings. Another observes that it is getting kicked around in a moderate wind, and so on. The bird goes into the datasheet as a Sharpshinned Hawk.

In 2023, I saw hawkwatchers collaborate over and over again to resolve doubts about challenging birds. By the end of the season, I was confident that our data had lost no accuracy compared with the years when visiting experts were more abundant, and our culture had been more dependent on competition.

I acknowledge that a collaborative ID system is not always practical. In 2023, I saw at least one team on a high-count day after having been fogged out most of the season. On days like that, you can't afford the time or energy to extensively discuss each bird—not without missing many birds entirely. You just do the best you can. Also, collaboration depends covertly on the presence of some experts (experienced GGRO volunteers or visitors) who can kindly nudge discussions towards accuracy.

In addition, I noticed a change in how we resolved conflicts, usually disagreement about a bird's species or some characteristic (such as age or sex). Pre-COVID-19, conflicts among GGRO hawkwatchers were often resolved by letting the most confident or highest-status observer make the final ID. But because collaboration often brings up details that do not all point the same way, a disputed bird is likely to get recorded as unidentified. This change does not make our calls less accurate. On the contrary, I think that it reduces mistakes overall.

Overall, collaboration is more than a means to resolve or avoid conflicts. In my pre-retirement days as a union steward, I saw that collaboration could make better use of limited resources than competition. Competing devotes valuable resources to defeating presumed opponents. Collaboration aims to allocate and administer resources so that everyone gets more of what they want. Over time, you get more bang for your buck by collaborating than you do by competing.

### COMMUNITY BENEFITS

A collaborative ID system benefits the GGRO by increasing all counters' opportunities to improve their skills. Everyone, regardless of skill level, becomes a better birder when we intentionally build a more collaborative culture.

**Everyone, regardless of skill level, becomes a better birder when we intentionally build a more collaborative culture.**

For example, everyone is more aware of the different field marks that an observer might have used to support an ID. Experienced hawkwatchers are better role models when they are willing to ask for assistance, express doubts, and collaborate with others to resolve them. And more people, especially beginners, participate actively. This is more fun, helps people learn faster than observing passively, and may help retain promising volunteers who are not yet experts.

### CONCLUSION

Collaboration cannot be the only tool in our hawkwatching toolkit. Nonetheless, of all the changes I have seen on Hawk Hill since I started in 2011, reliance on a more collaborative ID system may be the most profound. I saw it emerge as an effective way to ensure accurate IDs when experts were scarce. It makes efficient use of limited resources. It allows us to resolve disputes with courtesy and respect. It fosters learning on the part of aspiring hawkwatchers and others. And it puts into practice the theory that the GGRO gives community members the opportunity to participate in collecting data—which is what makes it unlike any other major hawk count site that I know of. This means that the GGRO's hawk count can offer more fun and more learning for more people.

# The Crossroads of Innovation and Longevity

TERESA ELY

**T**he GGRO's 2023 banding season was highly productive. Our collaborations with external biologists plus advancements in technology enhanced our data collection, analysis, and knowledge of Pacific region raptor movements and ecology.

We marked our inaugural participation in an international collaborative research network that uses radiotelemetry to track broad animal movements, the Motus Wildlife Tracking System.

We continued studying raptor diets thanks to a partnership with Dr. Rebecca Gooley, a Smith Fellowship recipient working with Dr. Elisha Hull's lab at UC Davis. This partnership includes a series of research projects that will give us baseline data on the diets of migrating raptors. Diet information is critical to understanding how climate impacts can desynchronize the timing of migrating predators and migrating prey.

Readers may remember that in 2015 and 2016, Dr. Ryan Bourbour and Dr. Elisha Hull pioneered a novel approach to study the diet of migrating Merlins by using a Q-Tip-style swab to capture bits of leftover food from their beaks and talons. In 2023, dedicated GGRO banding volunteers took 495 swab samples from a variety of raptors, including American Kestrels, Cooper's Hawks, Merlins, Red-shouldered Hawks, Red-tailed Hawks, Sharp-shinned Hawks, a Northern Harrier, and a Peregrine Falcon.

Our daily operations continued throughout the autumn uninterrupted by fires, smoke, rain, and COVID-19. The season started on August 14 and ended December 3, and 859 raptors of eight species were banded among our three banding stations.

Among the top three species typically banded at GGRO, banding totals for Cooper's and Sharp-shinned Hawks have returned to average levels after some below-average years. Conversely, Red-tailed Hawks saw a robust start to the migration season with strong banding totals, although the late-season wave of Redtail migration appeared to be more subdued.

The 2023 banding totals for Northern Harriers, Peregrine Falcons, Red-shouldered Hawks, Merlins, and American Kestrels all fell below the previous 10-year average. For Merlins and Kestrels, the decrease in totals can be attributed in part to an unforeseen reduction in trapping effort. No Prairie Falcons or Broad-winged Hawks were banded. Although the number of species banded remained average, the below-average totals for each of these raptors gave the impression of diminished diversity.



Program Coordinator Carmen DeLeon releases a juvenile Red-tailed Hawk with a lavender color-band. Photo: Oliver Chesley

## BANDING 2023

The peak season in late September began with a gradual increase in raptor numbers, reminiscent of a typical season buildup, but was swiftly followed by a sharp decline. Banding teams consistently banded 20 to 40 raptors per day for approximately a week leading up to the peak day, October 3, during which 75 raptors were banded, primarily Cooper's Hawks (44), along with Sharp-shinned and three Red-tailed hawks. However, the momentum abruptly waned the following day, with only 29 raptors banded, and subsequently, daily banding totals failed to surpass 10 birds per day.

Color-banding efforts were successful this season as we attached a unique color band to two Peregrine Falcons, four Red-shouldered Hawks, and 119 Red-tailed Hawks. Color-bands allow observers to record the band details from a hawk sighted in the wild, thus increasing our band encounter rate and collecting more location data from the same number of raptors banded.

We had two foreign recaptures this year (when a hawk is trapped that was already banded at another location). Both were from HawkWatch International's (HWI) Bonney Butte banding station in northern Oregon. One juvenile female Sharp-shinned Hawk banded by HWI on September 14 was recaptured by the GGRO on September 27. One juvenile female Cooper's Hawk banded on September 17 in Oregon was recaptured on October 3 by the GGRO. And in return, the Bonney Butte banders recaptured a banded Sharp-shinned hawk (adult female) on October 13, 2023, that GGRO banded on October 11, 2022.

Lastly, the return of 74 banding volunteers marks a significant milestone in the GGRO's 40-year legacy. The longevity of our volunteers not only signals their dedication but also shows the enduring impact of our shared mission. Among these volunteers are individuals whose commitment spans multiple years and multiple decades. Their continued involvement speaks volumes about the meaningful connections they have forged with our community, the profound sense of fulfillment they derive from contributing to raptor research, and their unwavering dedication to making a positive difference for conservation.



On October 13, 2023, banders at Bonny Butte recaptured an adult female Sharp-shinned Hawk that the GGRO had banded on October 11, 2022. Photo courtesy of Tim Baerwald

We are deeply honored to recognize the extraordinary dedication of Craig Nikitas and John Keane, who have generously volunteered for an impressive three and four decades, respectively, with the GGRO banding program and the National Park Service. Their remarkable commitment and passion for raptor research have not only enriched the GGRO but also serve as inspiration to other volunteers within our raptor community.

We also welcomed an Academic Intern, Cira Seyer-Ochi, who helped us with several projects that improved our educational specimen collection during her 10-week position. We also proudly celebrate the invaluable contributions of our four dedicated interns, Oliver Chesley, Juan Esparza, Isabella Plummer, and Clare SantaColoma, who brought fresh perspectives and enthusiasm to our season. Their hard work, creativity, and commitment to excellence have left a lasting imprint. Additionally, we extend our appreciation to our two esteemed Biotechnicians, Laura Echávez and Krista Fanucchi, who successfully completed their terms, demonstrating exceptional skill and dedication in advancing our systems.



A newly banded Sharp-shinned Hawk ready for the bander to take their final measurements before release.  
Photo: Robyn Boothby

## BANDING TOTALS

### GOLDEN GATE RAPTOR OBSERVATORY MARIN HEADLANDS, CALIFORNIA

SPECIES	PAST 10-YEAR AVERAGE*	2023
Turkey Vulture	2	2
Northern Harrier	6	1
Sharp-shinned Hawk	291	318
Cooper's Hawk	393	379
American Goshawk	0	0
Red-shouldered Hawk	17	4
Broad-winged Hawk	3	0
Swainson's Hawk	0	0
Red-tailed Hawk	225	140
Ferruginous Hawk	0	0
Rough-legged Hawk	0	0
American Kestrel	21	3
Merlin	22	12
Peregrine Falcon	5	2
Prairie Falcon	1	0
<b>Total</b>		<b>861</b>

\*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.

Data compiled by Teresa Ely. If you would like to use these data, please contact us: [ggro@parksconservancy.org](mailto:ggro@parksconservancy.org)

# And It Was Awesome: A Volunteer Leader's Thirty-Year Reflection

CRAIG NIKITAS

**E**IGHTEEN years ago, at the close of the 2005 GGRO fall migration, I was invited to write the annual banding article for *Pacific Raptor*. I enthusiastically discussed the results and value of our banding work, and described how fulfilling it is to band hawks in the beautiful setting of the Marin Headlands. Poetics aside, the strong motif of that essay was numbers. Counting and measuring. Data and metrics. The raw product of our scientific efforts.

Each migration season produces a tally of species, and the totals of each species banded. We note the number of captures expected and attained and quantify the weights and lengths of key body parts of the hawks in hand. All are recorded with precision, including the unique band number for each. Those are the numbers.

After discussing all the data coming from our efforts, I concluded my 2005 article with a mention of another number we track at season's end—the countdown of months and weeks until the beginning of the next migration. That is, how much off-season patience is required until summer's end when we can

resume our beloved avocation—banding hawks. For many of us, banding is not only a primary pastime, but it is also a major component of our personalities. We are happiest while working amid the annual fall migration, watching and counting raptors overhead, and holding some raptors briefly before they resume their migration.

So I appreciate this opportunity to discuss, beyond numbers and data, what the GGRO banding program has accomplished over many years. The GGRO's growth, evolution, and adaptations to changing times over my three-decade tenure as a volunteer are impressive. Here's why it has meant the world to me to participate in such an outstanding program.

The founders of what became the GGRO banding program did an admirable job. From 1983 to 1992, the decade before I joined, they put in place an effective scientific and raptor-safe trapping system that depended on a large cadre of volunteer community scientists. There was a comprehensive training program in place, so that new volunteer banders



Craig Nikitas (center) with banding team. Photo: Robert Martin



## BANDING 2023

could learn the range of esoteric skills needed to attract, then safely trap, handle, band, measure, and release a substantial number of raptors. That training gave us new folks the confidence to undertake the complex, exacting work of banding, and especially the responsibility of handling these wild creatures.

And it was awesome. I'll never forget the excitement of going to the blinds as an apprentice. My anticipation was tinged with apprehension until I could perform the trapping and banding process with some confidence. The joy of banding my first bird (a Red-tailed Hawk), and the thrill of catching and processing my second (a Cooper's Hawk), are cherished memories. Nothing is as satisfying as releasing a wild hawk, a creature of both ferocity and beauty. You hold them briefly then release them back into the sky, to a life of flight and speed and visual richness, of struggle and survival, a life that we can barely imagine.

After decades in the Marin Headlands, and after banding hundreds of raptors, I still feel these emotions (minus my beginner's anxiety). To this day, my time here is a wonder, a connection to the wild side of a world that is too easily submerged and diminished in daily life. This is why I do this work, why I sit in dripping fog or dry heat or high wind, on steep and rocky hills, year after year. This is why I keep coming back.

For almost 50 years I have volunteered at various wildlife institutions, caring for non-releasable educational birds, and rehabilitating injured raptors and other animals. As rewarding as that work has been, none of these jobs compare to banding wild raptors in the Marin Headlands with the GGRO. None of the organizations was as welcoming to new recruits, none as concerned about training nor as willing to improve protocols and expand the scope of its work as the GGRO. The wildlife component of volunteer work here is superbly handled, but so is the human side.

There are many at the GGRO who can write in greater depth and detail about the advances that have been implemented over time, but I want to list some of the accomplishments of the GGRO banding program that stand out for me:



Craig Nikitas received the President's Lifetime Achievement Award for volunteer service in 2023. Photo: Krista Fanucchi

- Adopting a Code of Ethics that expresses the values of the GGRO Banding Program, to set program priorities and expectations, and to guide decision-making.
- Collecting morphometric (body measurements) and plumage data beyond the minimum to expand knowledge about raptors of the Pacific region. This includes noting plumage variations and recording molt patterns to study ageing.
- Rewriting and refining identification and age-sex keys for species like Cooper's, Red-tailed, and Red-shouldered Hawks, whose Pacific populations have been understudied for measurements, weights, and plumages.
- Instituting the use of color bands with large-sized alpha-numeric codes, enabling birdwatchers to record band numbers using optics, rather than relying solely on recoveries from injured or deceased hawks.
- Using telemetry systems such as tail-mounted radio transmitters, solar-powered satellite transmitters, SMS backpacks, and ultra-small Motus transmitters, to track fine-scale movements of select individuals and species.

## BANDING 2023

- Assembling a library of a few feathers from each hawk banded to be used for current and future biochemical, genetic, and stable isotope analyses.
- Swabbing hundreds of raptor beaks and talons for identifying trace DNA of prey species—cooperative work with UC Davis scientists that tells us how certain species “fuel” their migrations.
- Implementing handling protocols to prevent potential spread of HPAI (Highly Pathogenic Avian Influenza) and West Nile Virus.
- Continually assessing and increasing our focus on human wellness and safety, including modifying field procedures to prevent COVID-19 transmission.
- Improving apprentice and volunteer leadership trainings, expanding the GGRO Banding Manual, and creating volunteer-driven “think tanks” for creating better public access to GGRO data and results, and to improve Diversity, Equity, and Inclusion principles within the GGRO community.
- Publishing more than 40 articles to advance the study of raptor biology through banding and tracking.

That’s a pretty impressive list, isn’t it? The GGRO is an unlikely phenomenon, a place where mostly non-professional volunteers do important and professional-grade field biology for the National Park Service. But how is this possible? I’ll tell you the secret: it’s the people.

The GGRO managers, Parks Conservancy supervisors and administrators, and many volunteers with whom I’ve worked are an intelligent, passionate, and compassionate group whose dedication and creativity for raptor conservation and science are unrivaled. I am grateful beyond words for them all, and for the opportunity I’ve had to participate and contribute. Every minute of time, every sacrifice, everything I’ve given to this program, has been repaid exponentially. Thank you, GGRO.

If you are someone who loves wildlife, the environment, meaningful work, and great company, please consider applying to volunteer at the GGRO. It’s hard to imagine a better place to satisfy those desires. I hope, as we say, I’ll see you on the Hill.



A newly banded American Kestrel takes flight. Photo: Carmen DeLeon



Anastasia Ennis makes her final observations after banding and measuring a Sharp-shinned Hawk.  
Photo: Oliver Chesley

## Band Recoveries and Encounters 2022-2023

CARMEN DELEON

**B**and recoveries and encounters are brief snapshots of raptors' lives from which we are slowly weaving an ecological tapestry. They give us concrete data about where and when a hawk is seen, as well as clues about relationships and hardships—often, but not always, at the end of their lives. Each band we place is a hope for more threads to help create a bigger picture of the Pacific Raptor Flyway, both its inner workings and how it responds to climate change and other human impacts.

**1658-B, C** Juvenile male Red-tailed Hawk metal and color banded 9/10/2019 by Eddie Bartley; photographed 9/25/2022 and 11/25/2022 perched on a power pole in Pacifica, San Mateo Co., CA; reported by Joseph Morlan.

**1717-B, C** Juvenile male Red-tailed Hawk metal and color banded 8/11/2021 by Teresa Ely; sighted in San Francisco Co., CA, in two locations:

- 6/27/2023 photographed standing in a parking space at the Church St. Safeway by Brett TeSlaa;
- 7/11/2023 sighted several times at the U.S. Mint by Gordon Chan.



Encounter 1717-B. Photo: Brett TeSlaa

**1748-B** Juvenile Red-tailed Hawk banded 10/8/2003 by Buzz Hull; found 11/26/2022 partly decomposed with the head missing in Golden Gate Park, San Francisco Co., CA; reported by James Addison.

**1754-B, C** Juvenile male Red-tailed Hawk banded 8/27/2021 by Mike Armer; seen 8/24/2023 and 11/20/2023 hunting and perching near Pillar Point Airport, near Miramar, San Mateo Co., CA; reported by Cricket Raspet.

**1755** Juvenile male Red-tailed Hawk metal and color banded 9/7/2022 by Krista Fanucchi; found dead 11/9/2022 on the south end of Three Meadows Trail in Maxwell Farms Regional Park, El Verano, Sonoma Co., CA; reported by Beth Wyatt.

**1756** Juvenile male Red-tailed Hawk metal and color banded 9/14/2021 by Cindy McCauley; extensively decomposed carcass found 10/17/2022 in Seal Beach, Orange Co., CA; reported by Bob Schallman.

**1757** Juvenile female Red-tailed Hawk metal and color banded 9/3/2022 by Jack Schofield; found 11/8/2022 lethargic next to a building at NASA's Ames Research Center, Mountain View, Santa Clara Co., CA; transferred to Wildlife Center of Silicon Valley where it died from suspected head trauma; cause of death later determined to be HPAI with tests by CDFW Wildlife Health Lab; reported by Christopher Alderete and Krysta Rogers.

**1758** Juvenile female Red-tailed Hawk metal and color banded 9/12/2022 by Rachel Lawrence; sighted and recovered in San Francisco Co., CA, in two locations:



Encounter 1758. Photo: Peter Quirke

- 10/26/2022 photographed from inside an office while it was perched on a window ledge near Candlestick Park; reported by Peter Landwehr;
- 12/19/2022 found dead under a high voltage power line by SF Animal Care and Control; reported by Peter Quirke.

**1759** Juvenile male Peregrine Falcon metal and color banded 11/28/22 by Noreen Weeden; sighted 1/6/2023 on the SF Bay Osprey webcam livestream perching on the Whirley Crane in Point Richmond, Contra Costa Co., CA; reported by Robin Banks.

**1760-A, B, C** Juvenile female Red-tailed Hawk metal and color banded 9/8/2022 by Candace Davenport;

- 10/1/2022 and 10/3/2022 sighted perched on a trail sign near Poplar Beach, Half Moon Bay, San Mateo Co., CA; reported by Christopher Warner-Carey and Patrick Coughlin;
- 2/11/23 died upon arrival at Peninsula Humane Society after being picked up by an animal control officer; hawk was found on a bench gagging and breathing heavily in Pescadero, San Mateo Co., CA; reported by Makayla Berndt.

**1761** Juvenile female Red-tailed Hawk metal and color banded 9/8/2022 by Candace Davenport; photographed 11/14/2022 perched on a dead tree over the Coast Trail in Point Reyes National Seashore, Olema, Marin Co., CA; reported by Erin Fisher-Colton.



Encounter 1761. Photo: Erin Fisher-Colton

**1762** Juvenile female Red-tailed Hawk metal and color banded 9/15/2022 by Titine Newsham; found 12/27/2022 dead near a parking lot while the finder was on a goose hunt in Willows, Glenn Co., CA; reported by Mike Murphy.



Encounter 1760. Photo: Patrick Coughlin

**1763** Juvenile male Red-tailed Hawk metal and color banded 9/12/2022 by Ryan Byrnes; photographed 11/25/2022 in a tree near the San Francisco Botanical Garden, San Francisco Co., CA; reported by Deborah Underwood.



Encounter 1763. Photo: Deborah Underwood

**1764-A, B, C** Juvenile male Red-tailed Hawk metal and color banded 10/7/2022 by Jennifer Brown;

- 10/14/22 photographed perched along a fence and trail sign by Poplar Beach, San Mateo Co., CA; reported by Patrick Coughlin and Wing Ng;
- 11/20/22 sighted in Golden Gate Park, San Francisco Co., CA; reported by Kristopher Cavin.



Encounter 1764. Photo: Wing Ng

**1765** Juvenile female Cooper's Hawk banded 9/21/2022 by Krista Fanucchi; found dead 2/2/2023 after striking a window at a house in Sausalito, Marin Co., CA; reported by Sam Osburn.

**1766** Juvenile male Sharp-shinned Hawk banded 10/12/2022 by Margot Bezrutczyk; found dead 11/17/2022 near an outhouse with its body curled up in Gorda, Monterey Co., CA; reported by Brendon Shave.

**1767** Juvenile male Red-tailed Hawk metal and color banded 9/30/2021 by Teresa Ely; sighted 8/8/2022 perched in a tree in Helen Putnam Regional Park, near Petaluma, Sonoma Co., CA; reported by Don Bullick.

**1768** Juvenile female Peregrine Falcon metal and color banded 9/13/2022 by Kristin Olson; found 9/13/2022 on the ground, San Francisco Co., CA; received 17 days of care at Peninsula Humane Society and was released in San Francisco; reported by Alex Elias.

**1769** Juvenile male Red-tailed Hawk metal and color banded 10/17/2013 by Claire O'Neil; sighted 10/20/2022 at Poplar Bluff, Half Moon Bay, San Mateo Co., CA; reported by Bridget Ahern.

**1771** Juvenile female Cooper's Hawk banded 9/27/2022 by Kristin Olson; found dead 10/16/2022 after striking a patio window possibly in pursuit of a dove at a home in Shandon, San Luis Obispo Co., CA; reported by Nancy Kimmell.

**1772** Juvenile female Cooper's Hawk banded 10/12/2022 by Margot Bezrutczyk; leg with band found 1/10/2023 in Clarksburg, Yolo Co., CA; reported by Jarrett Omand.

**1773** Juvenile Red-tailed Hawk banded 8/22/1998 by Kit Daine; sighted 3/19/2023 colliding with the bison fencing in Golden Gate Park, San Francisco Co., CA; picked up by SF Animal Care and Control and transferred to Peninsula Humane Society; hawk was not bearing weight on right leg; after 5 days of care, it

## BANDING 2023

was humanely euthanized due to a decline in condition which the veterinarian suspected was due to geriatric age; reported by Angie Yen.

**1776** Juvenile male Red-tailed Hawk metal and color banded 10/11/2022 by Anne Ardillo; found dead 3/10/2023 in an empty lot in Montara, San Mateo Co., CA; reported on behalf of a neighbor by Kari Kilstrom.

**1777** Juvenile female Cooper's Hawk banded 9/22/2015 by Marc Blumberg; skeleton with band found 4/8/2023 in Willits, Mendocino Co., CA; reported by Garret Peterson.

**1778** Juvenile female Cooper's Hawk banded 9/28/2022 by Laura Echávez; found dead 10/21/2022 at Esalen Institute, Big Sur, Monterey Co., CA; reported by Alicia Hahn.

**1779** Juvenile male Red-tailed Hawk metal and color banded 11/5/2021 by Jennifer Brown; sighted 1/16/2023 along University Ave in Berkeley, Alameda Co., CA; reported by Jim Roach.



Encounter 1780. Photo: Robert Wolfe

**1780** Adult female Peregrine Falcon banded 9/24/2014 by Calvin Hom; found dead 2/14/2023 after a windstorm on Ocean Beach, San Francisco Co., CA; reported by Robert Wolfe.

**1781** Adult female Cooper's Hawk banded 11/5/2021 by Sarah Sawtelle; found decomposed 3/3/2023 near Bicentennial Campground, Marin Headlands, Marin Co., CA; reported by Oonagh Degenhardt.

**1782** Juvenile female Peregrine Falcon banded 10/26/2009 by Diane Bahr; found dead 3/22/2023 on a beach after a rainstorm in Santa Barbara, Santa Barbara Co., CA; reported by Joe Wieland.

**1784** Juvenile male Red-tailed Hawk metal and color banded 10/9/2022 by Mary Badger; found 3/16/2023 being chased by dogs in Glen Canyon Park, San Francisco Co., CA; transferred to WildCare by Bay Raptor Rescue; died 3/17/2023 due to severe emaciation and high parasite load; reported by Craig Nikitas.

**1785** Juvenile female Red-tailed Hawk metal and color banded 8/31/2021 by Ashley Santiago; Berkeley Animal Services picked up the hawk 3/26/2023 from a parking lot with an injured wing, a suspected car strike on Adeline St., Berkeley, Alameda Co., CA; transferred to Lindsay Wildlife Hospital where it was humanely euthanized due to severe wing fracture; reported by Jessica Menne.

**1786** Juvenile female Red-tailed Hawk banded 11/4/2021 by Calvin Hom; found dead 12/21/2022 with eyes sunken in and no apparent injury in a field near Swanton, Santa Cruz Co., CA; reported on behalf of the finder by Steve Schindler.

**1787** Adult male Red-tailed Hawk banded 12/11/2018 by Kirsti Carr; sighted 5/3/2023 at Stafford Lake Park, Novato, Marin Co., CA; reported by Sam Osburn.

## BANDING 2023

**1788** Juvenile male Red-tailed Hawk metal and color banded 9/22/2022 by Calvin Hom; sighted 8/31/2023 on a garden fence where an unbanded Redtail was diving on it in Bodega Bay, Sonoma Co., CA; reported by Emily Thompson.



Encounter 1788. Photo: Emily Thompson

**1789** Juvenile female Red-tailed Hawk metal and color banded 9/9/2022 by Rachel Miller; carcass found 10/30/23 half buried with very little flesh and degraded feathers at the Baylands, near Fremont, Alameda Co., CA; reported by Dani Christensen.

**1790** Juvenile female Cooper's Hawk banded 9/11/2019 by Paul Romanak; found 10/18/2023 freshly dead in a Coast Redwood grove near Albion, Mendocino Co., CA; reported by Steven Ellis.

**1791** Juvenile male Sharp-shinned Hawk banded 10/1/2023 by Sean Parnell; found dead 11/26/2023 outside a home in San Rafael, Marin Co., CA; reported by Rowena DeMayo.

**1792** Juvenile male Red-tailed Hawk metal and color banded 8/15/2023 by Oliver Chesley; photographed 9/6/2023 perched on a patio railing in Pacifica, San Mateo Co., CA; reported by Debra Chan.

**1793** Juvenile female Cooper's Hawk banded 10/7/2023 by Lynn Bantley; found dead 11/3/2023 in Morgan Hill, Santa Clara Co., CA; reported by Lyle Abreu.

**1794** Juvenile female Sharp-shinned Hawk banded 10/3/2023 by Marc Blumberg; found dead 11/27/2023 emaciated with head injury in the middle of a road in San Rafael, Marin Co., CA; reported by Connor Cimmiyotti.

**1795** Juvenile female Sharp-shinned Hawk banded 9/26/2023 by Eric Jepsen; found 10/23/2023 in the upper elevations of an energy plant in Stanislaus Co., CA; staff trapped the hawk and prepared for transport to a wildlife rescue facility but it did not survive; they suspect that it succumbed to stress from the hot, ashy conditions inside; reported by K. McLaughlin.

**1796** Juvenile female Sharp-shinned Hawk banded 10/4/2023 by Mark McCaustland; found dead 11/22/2023 in rural lands near Patterson, Stanislaus Co., CA; reported by Ronald Archuleta.

**1797** Juvenile male Red-tailed Hawk metal and color banded 9/5/2023 by Anne Ardillo; photographed 9/7/2023 during Hawkwatch on Hawk Hill, Marin Headlands, Marin Co., CA; reported by John Davis.

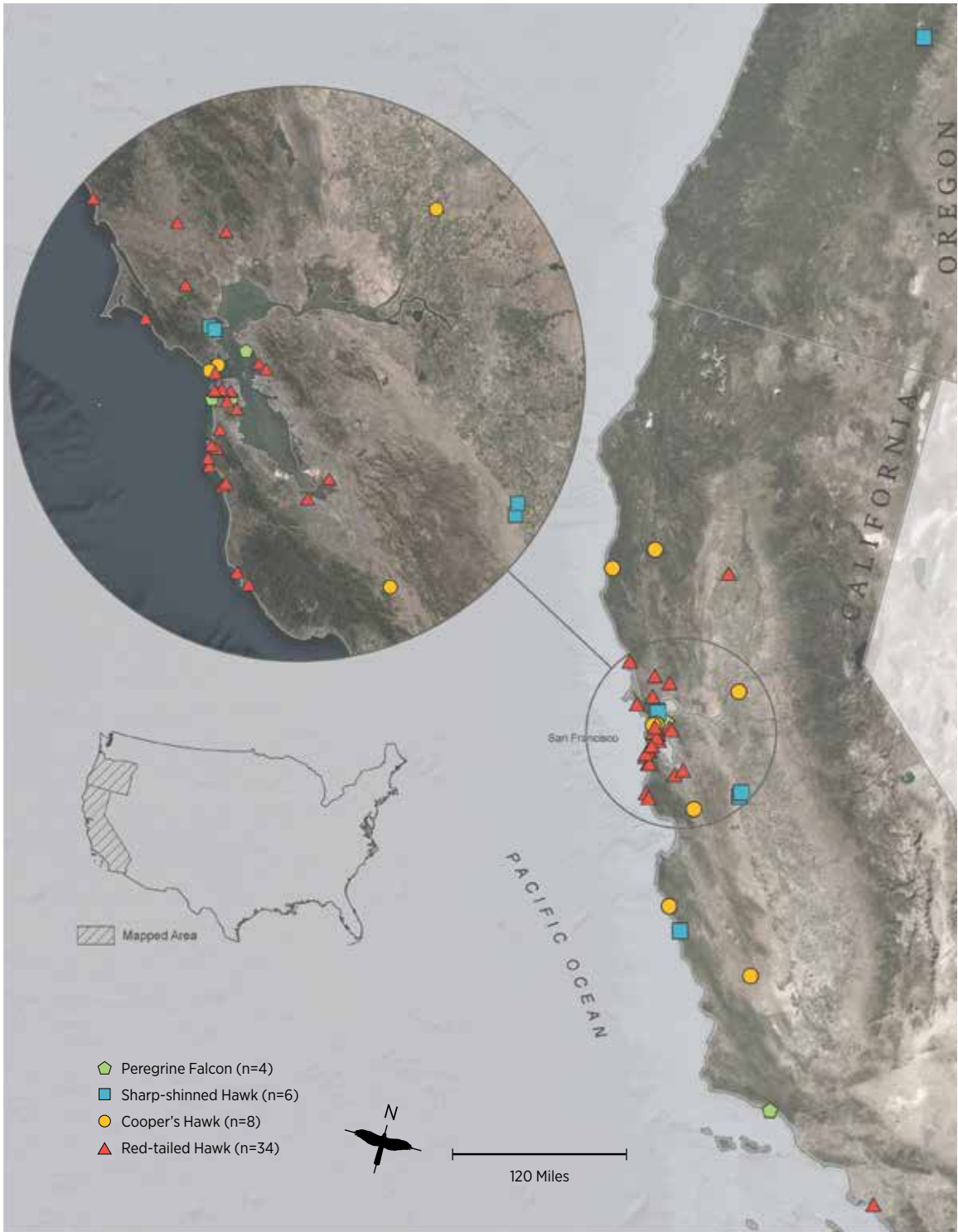


Encounter 1797. Photo: John Davis

**1798** Juvenile female Sharp-shinned Hawk banded 10/11/2022 by Jeff Robinson; recaptured and photographed 10/13/2023 by the banding team from Hawkwatch International at Bonney Butte, Clackamas Co., OR; reported by Jesse Watson.



BAND RECOVERIES/ENCOUNTERS 2022-23



Map: Eddie Fitzsimmons/Tukman Geospatial and Zac Stanley/NPS



Red-tailed Hawk. Photo: John Davis

# THE GGRO AT 40: What Did We Learn?

ALLEN FISH

**T**he impressive numbers on the following page are a snapshot of what we've accomplished, and as you can see, there's so much to be proud of. But numbers don't capture everything on their own. How can we fully assess the GGRO's 40 years of community science raptor monitoring? The following pages are more in-depth glimpses at how we've grappled with this mind-boggling task.

To start, there are lots of critical bird data. For example, we can show trendlines for 18 species that impart patterns for detecting broad population changes, and even climate impacts on the timing of migration. There are body measurements of over 46,000 raptors, which provide a foundation for studying physiological change in hawks during this time of rapid global change. We have mapped 1800 recovery and encounter locations for hawks banded at the Marin Headlands. Whether showing long-distance migrations, or short dispersals, these maps help us see the most basic patterns of the Pacific Raptor Flyway, and how those patterns have changed over time, including due to climate change.

There's also an incredible human story. The GGRO is one of the longest-running community science programs in the national parks. Our massive datasets

have been made possible by a community of more than 2000 volunteers over 40 years. That translates to more than 925,000 hours by conservative estimate, and if we attach to that a modest field biologists' salary, over \$18 million dollars' worth of staffing.

The real meaning behind such numbers is vast: careers launched, lives changed, passions sparked, and mentors and friendships grown. We insist on a community science approach to this work because investing in the community pays dividends far beyond work completed. The GGRO is a unique pathway to meaningfully connect people to our public lands and to learn science skills outside a classroom. What's more, the relationship is reciprocal. The value and consistency of our data are a direct result of our community scientists' incredible commitment—donating their time and talents, sometimes over many years, including experienced volunteers mentoring newcomers. This simply couldn't have been done without our community.

Let's now explore some of what we've learned together over 40 years—some of our great scientific achievements and our window into the dynamic Pacific Raptor Flyway.

**900,237**  
RAPTOR SIGHTINGS

**22,506**  
RAPTOR SIGHTINGS  
average per year

**46,184**  
RAPTORS BANDED

**1,816**  
BAND RECOVERIES  
& ENCOUNTERS

**36,646**  
SIGHTINGS

**MOST RAPTORS COUNTED**  
in one migration season  
(2002)

**2,243**  
HAWKS & FALCONS

**MOST RAPTORS BANDED**  
in one migration season  
(2007)

**75**

HAWKS TRACKED WITH  
RADIO, SATELLITE,  
GS, & MOTUS  
TECHNOLOGIES

**112**  
SCIENTIFIC  
PUBLICATIONS  
& REPORTS

**16**  
PHD  
DISSERTATIONS  
& MS THESES

**38**  
BOOKS USED  
GGRO DATA  
OR STORIES



**\$18.9 MILLION**

VOLUNTEER-PROVIDED VALUE

**946,324**

TOTAL VOLUNTEER HOURS

**237**

VOLUNTEERS  
average per year

**23,136**

VOLUNTEER HOURS  
average per year

**125**

INTERNS  
launched careers

**278,707**

VISITORS WELCOMED TO HAWK HILL

This snapshot highlights some of our accomplishments over 40 years. It helps us clarify pieces of our program's impact, as well as reflect on all that can't be captured in a number.

*Compiled by Allen Fish and designed by Linzy Lim.*

**102**

SCIENTIFIC CONFERENCE  
PRESENTATIONS  
& POSTERS

**225**

NEWSPAPER & MAGAZINE  
ARTICLES, BLOGS, RADIO,  
& TV STORIES

# Trends in Raptor Sightings by Species

ALLEN FISH

**H**ere we present the trend in raptor sightings over the history of the GGRO Hawkwatch program for 18 of the 19 raptor species that we observe each year. These graphs are a culmination of decades of counting hawks each fall, a way to summarize what we saw. Only with this dedication can the patterns you see on these pages emerge. I'll offer a few suggestions below to help you interpret them.

First, you'll notice that these species trend graphs represent closer to 30 years than to 40. This is because our hawkwatch started in 1986 and it took us a few years to create a consistent counting methodology (called the quadrant system). So, 1992 is the start year for all species (with a few exceptions for rarer species whose clock we can start in the mid-1980s).

You'll note that the vertical axis is the rate of migration, measured as raptors per hour or rph. In a four-month migration season, if we tallied 2000 Cooper's Hawks in 400 hours of counting, that would translate to 5.0 rph for Cooper's. If you glance through the vertical axes for all the species, you'll see that the numbers jump around a lot. Some raptors are very rare, such as Prairie Falcon, while some are very common, such as Turkey Vulture. This doesn't change the trend for each raptor, although a trend for a more numerous species is likely a more accurate trend.

The dots are the rate of migration for each species for each year. The trendline for each species runs through the middle, a mathematical model that best fits the dot pattern of that species. The narrowness of the shaded area around the trendline indicates how well the model fits the dot pattern, an insight into the amount of variation between the dots. Take a look at the Bald Eagle for a really tight-fitting model.

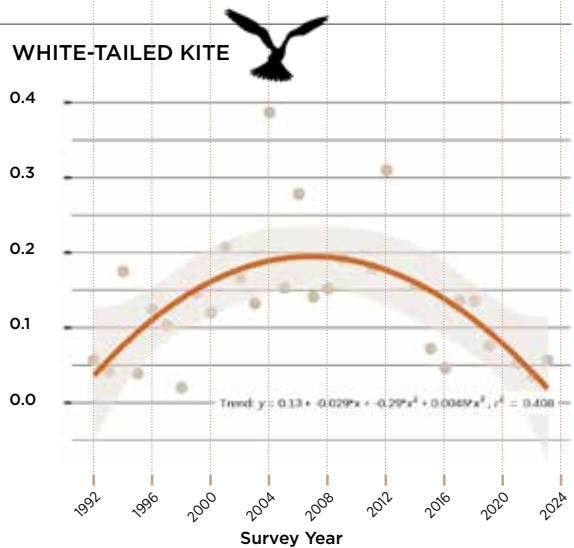
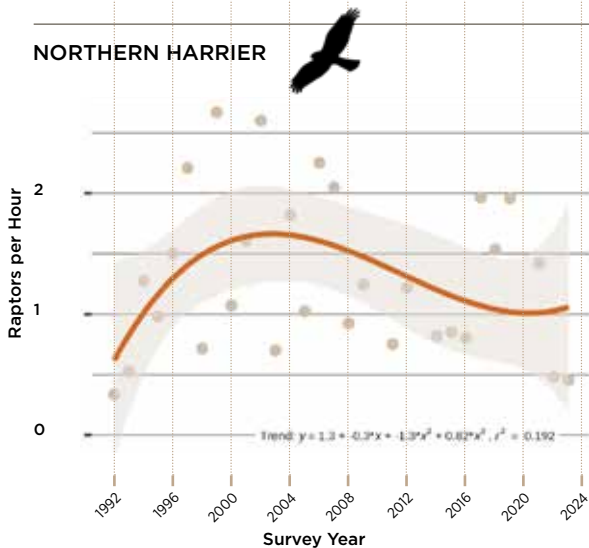
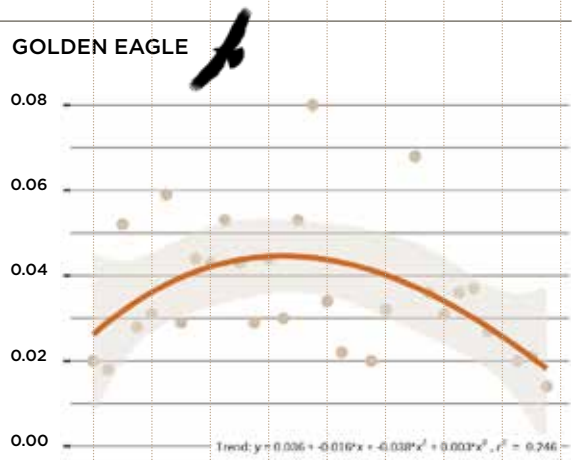
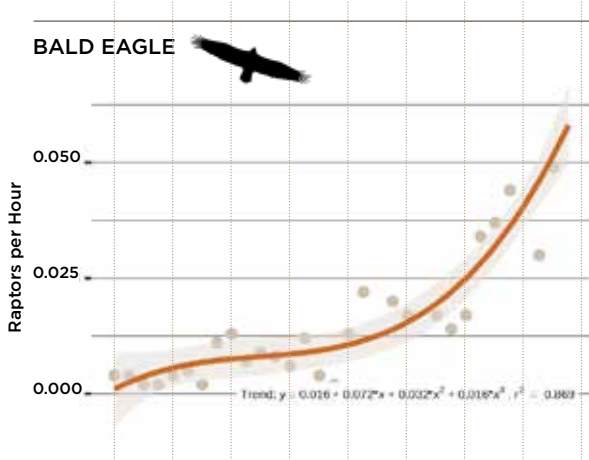
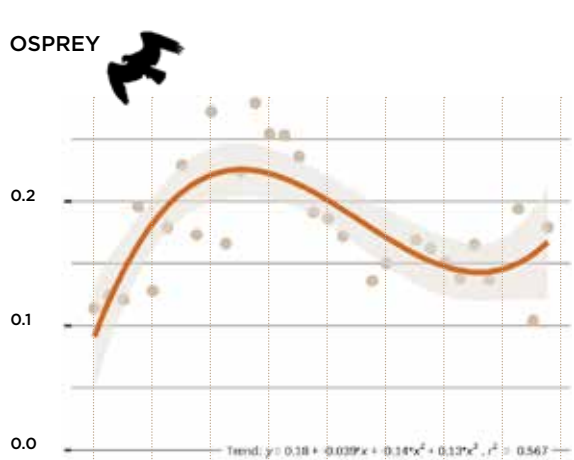
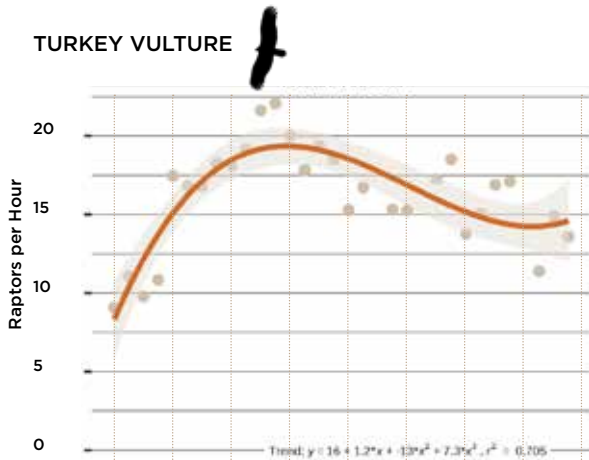
The American Kestrel and Peregrine Falcon graphs particularly illustrate the value of this data. Forty years ago, Peregrines were very rare across the continent, and American Kestrels were one of the most common birds of prey. Today, their statuses have reversed. The Peregrine Falcon is now one of the most easily sighted Bay Area raptors, while American Kestrels have decreased continent-wide for two decades. The Kestrel decline may have multiple causes and is the subject of much study.

As you study these graphs, try to relate the trend shown (increasing, decreasing, steady, or cyclic) to what you know about each species and what it needs to survive. Think about its prey preferences (whether specific or general), preferred habitat, range, and migratory habits. All of these are part of each species' story indicated by the trend. You may even devise your own hypothesis for each one.



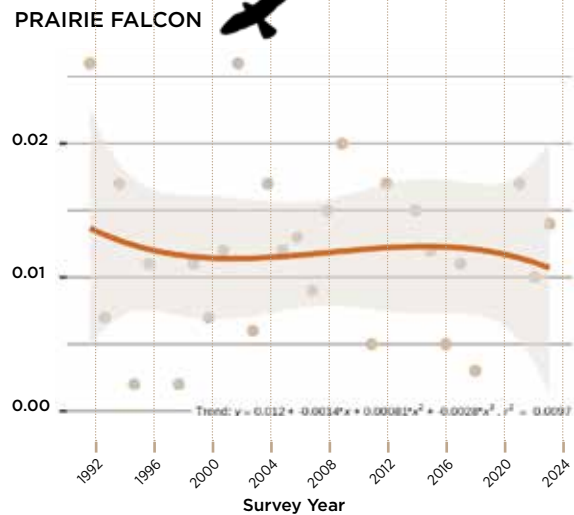
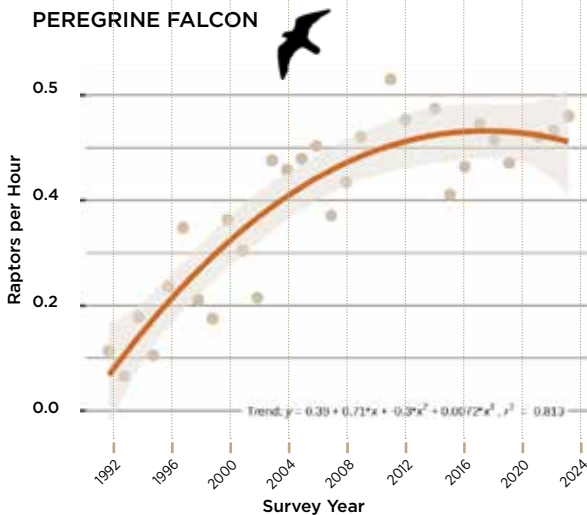
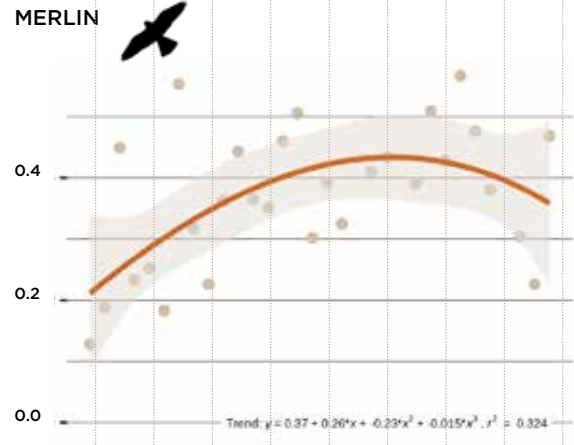
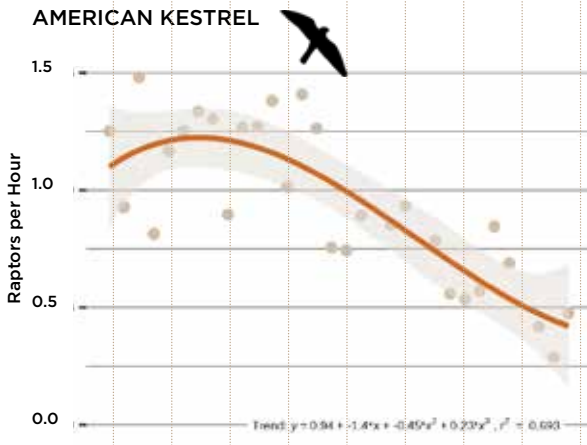
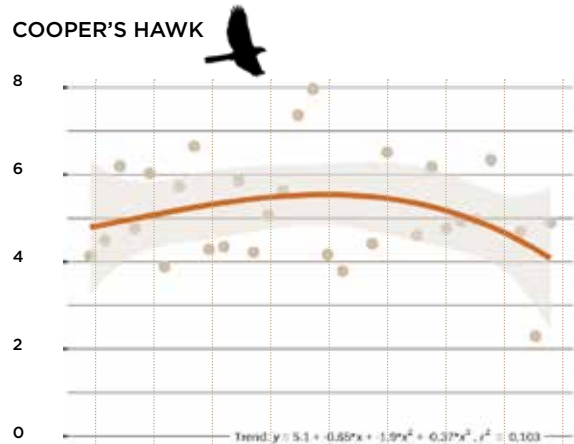
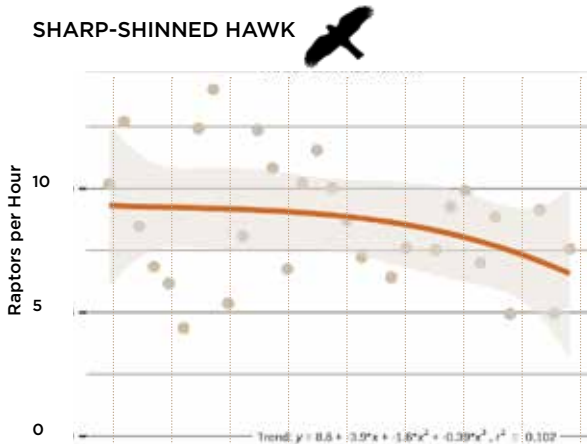
Golden Eagle, American Kestrel, and Peregrine Falcon illustrations: Ryan Jones

SPECIES TRENDS OVER TIME based on GGRO hawk counts 1992-2023



Figures by Lizzy Edson. Data collected by the Golden Gate Raptor Observatory.

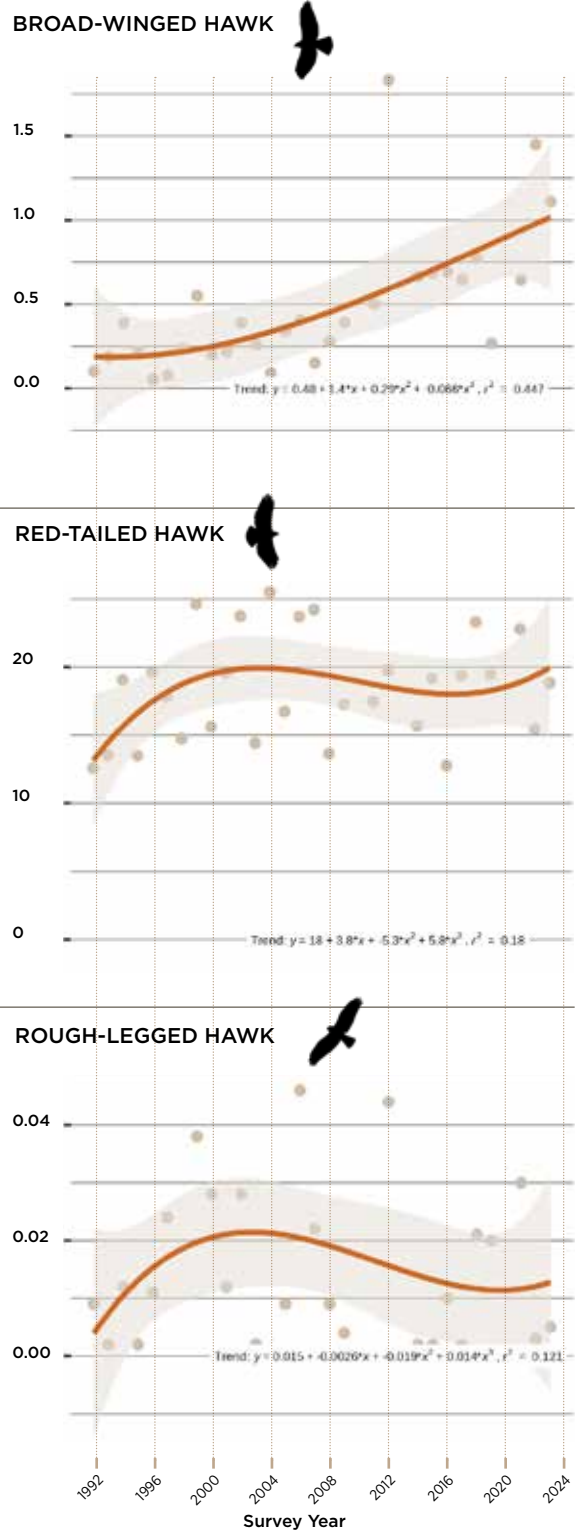
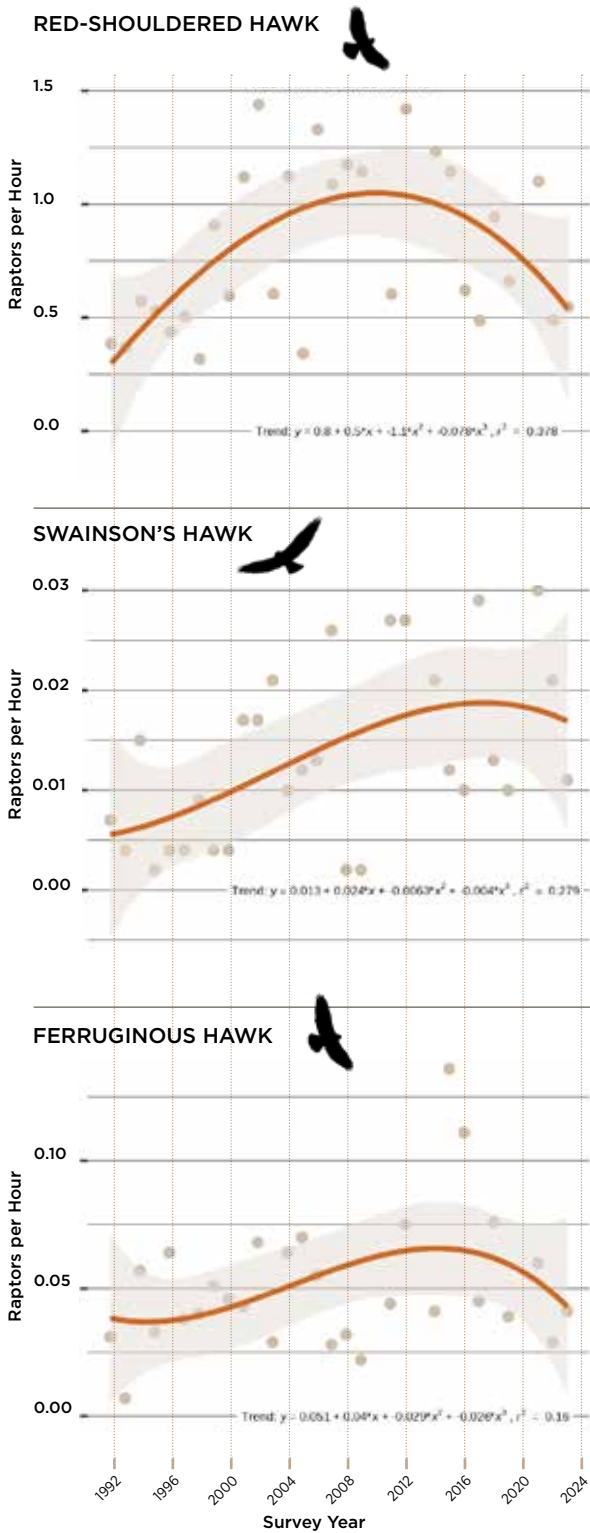
SPECIES TRENDS OVER TIME based on GGRO hawk counts 1992-2023



Figures by Lizzy Edson. Data collected by the Golden Gate Raptor Observatory.



SPECIES TRENDS OVER TIME based on GGRO hawk counts 1992-2023



Figures by Lizzy Edson. Data collected by the Golden Gate Raptor Observatory.

# The Shape of Migration Through Band Recoveries

ALLEN FISH

**T**he four maps that follow show all GGRO band recoveries and encounters reported to date. They are separated into All Species, Red-tailed Hawks, Accipiters, and Other Species. About 4% of all the birds banded by the GGRO are recovered (when the bird is found dead or injured) or encountered (when the bird is observed alive) sometime in the future. By the late 1980s, with 1000s of raptors banded annually at the GGRO, the shape of a Pacific Raptor Flyway started to take form.

The first map of all species (page 47) shows the central part of the Pacific Raptor Flyway, especially how it hugs the coastline and valleys. The eastern boundary is less distinct, but there's a hint that the Sierra Nevada/Cascade Range, or the colder mountain temperatures, might block some bird's eastward movements. That said, it's important to remember that a recovery or encounter is a point of contact between a person and a hawk, which means that there will be more recoveries where there are more people. And there are more recoveries closer to the Marin Headlands, where the hawks were banded.

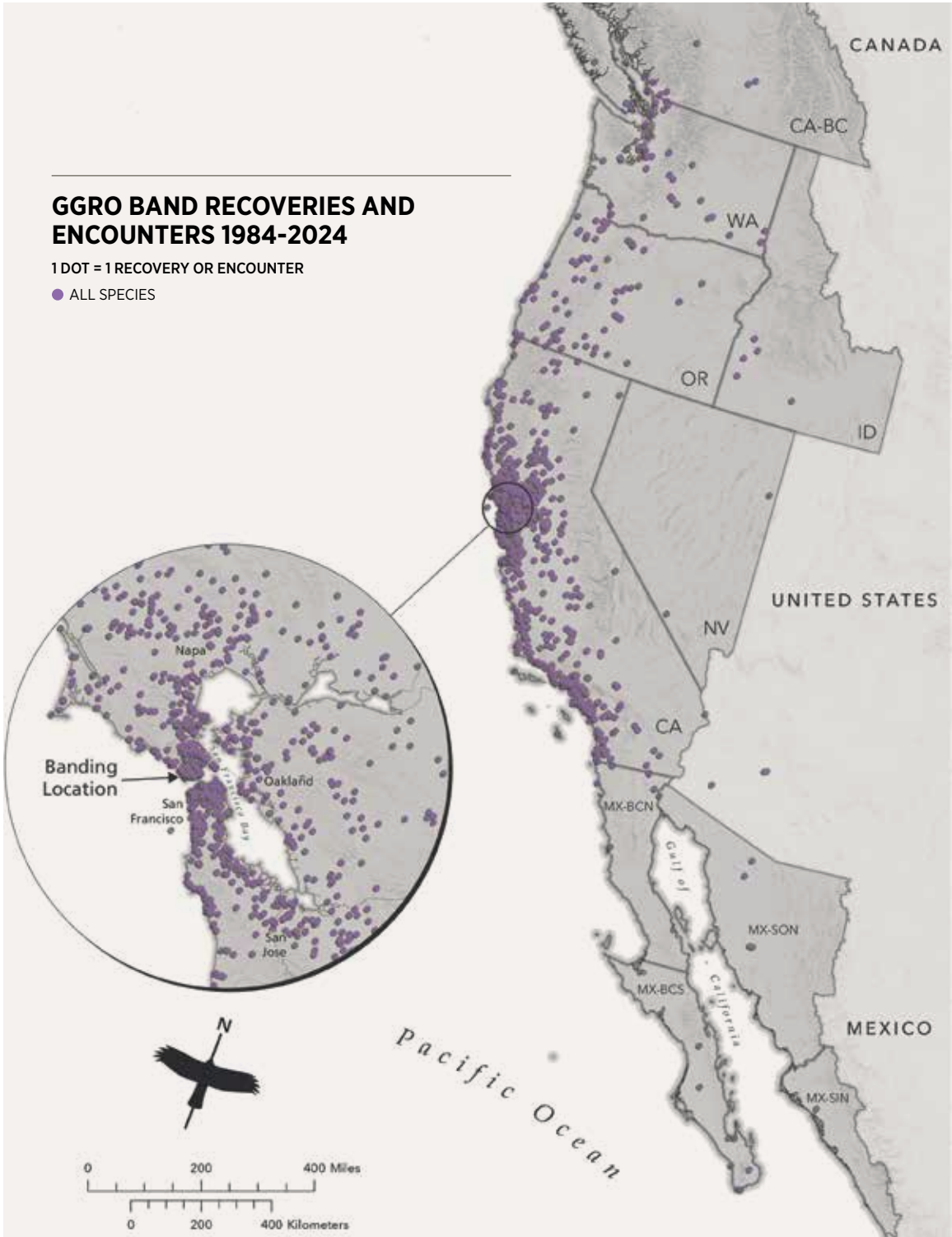
Since the most-banded species at the GGRO are Red-tailed (page 49), and Cooper's and Sharp-shinned Hawks (page 48), it's these three that dominate the band recoveries as well. They are recovered over similar geographies, although there seem to be more accipiters making it into Baja and more Redtails moving east of the Cascades.

The final map on page 50 includes seven species for which we have much smaller numbers. Some of these show the longest flights, especially the falcons. Notice the offshore Peregrine recoveries, two in the Channel Islands, and one near the Farallones, the latter a juvenile bird that biologist Peter Pyle picked out of the Pacific Ocean after watching a Peregrine-on-Peregrine territorial battle.

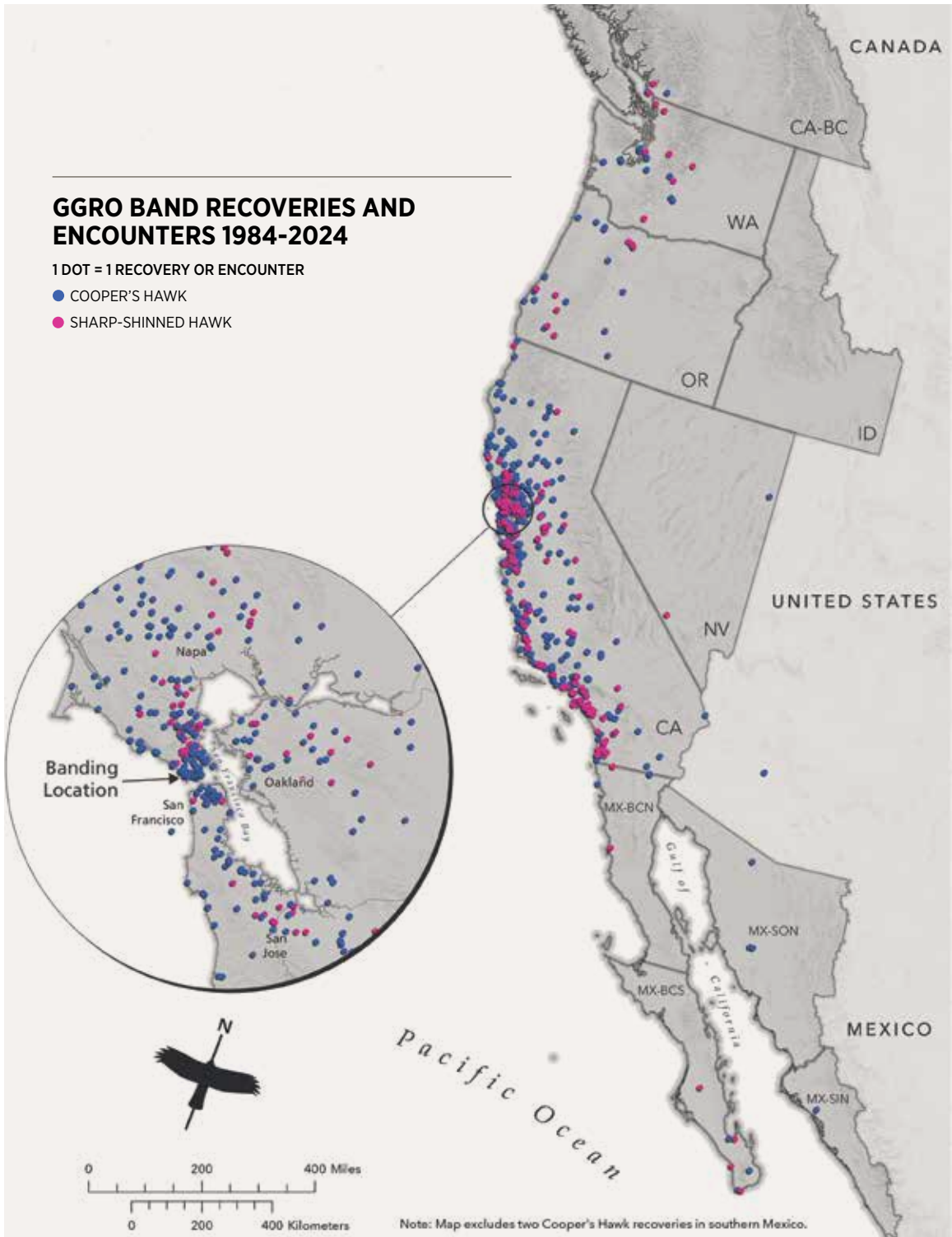
How far south do Golden Gate raptors migrate? There are two Cooper's Hawks from southern Mexico that we couldn't include and still fit the map to the page, but that's just the extent of our band recoveries. We know that some species, especially Swainson's and Broad-winged Hawks, Osprey, and Peregrine Falcons are often flying deep into Mexico and farther south, even into the Amazon, the coast of Chile, and the pampas of Argentina. Someday, we hope that a band recovery, or more likely a satellite tracking device, will document such a flight for us.



Adult male Northern Harrier  
illustration: Ryan Jones



Map: Zac Stanley/NPS Data provided by: Teresa Ely/Parks Conservancy

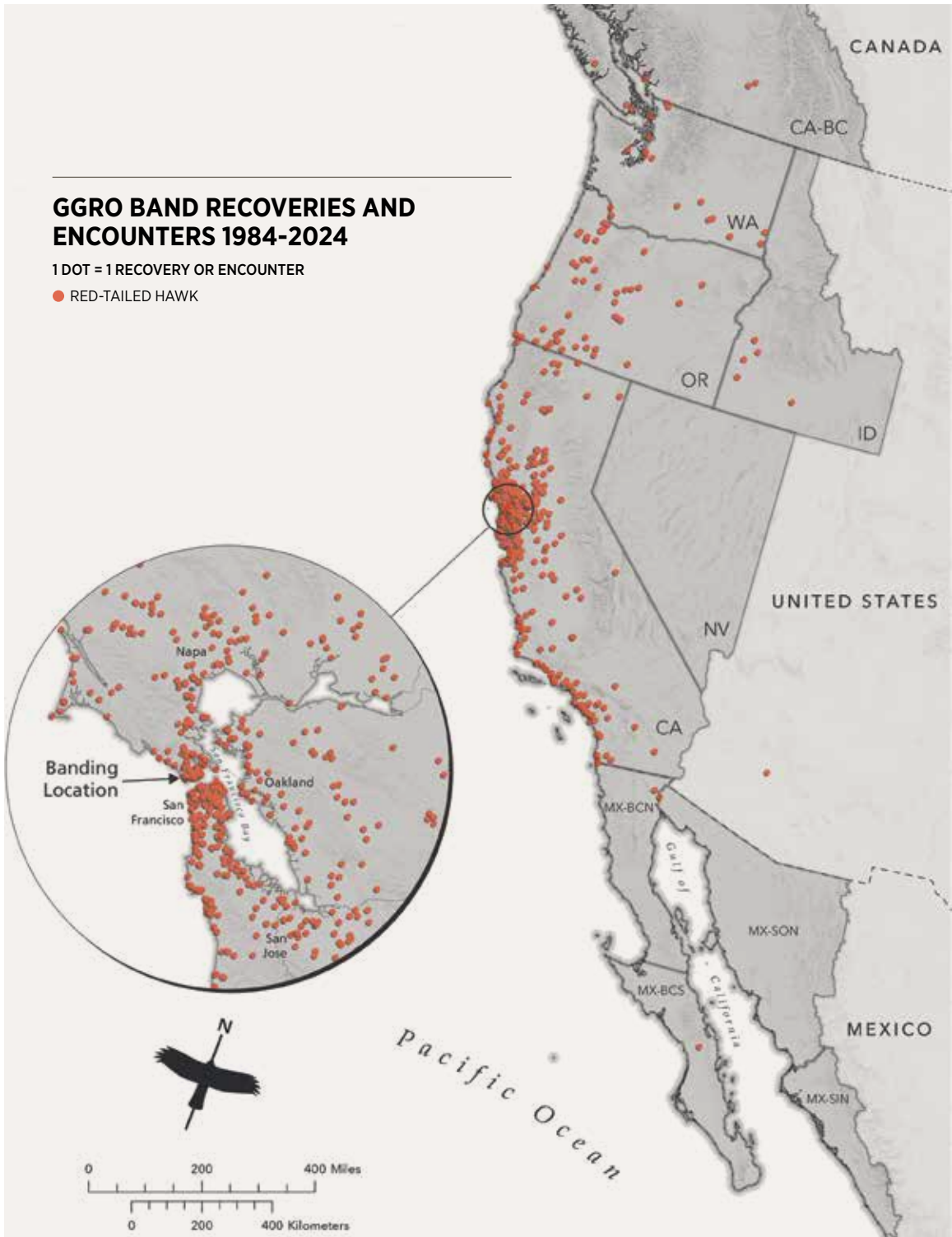


Map: Zac Stanley/NPS Data provided by: Teresa Ely/Parks Conservancy

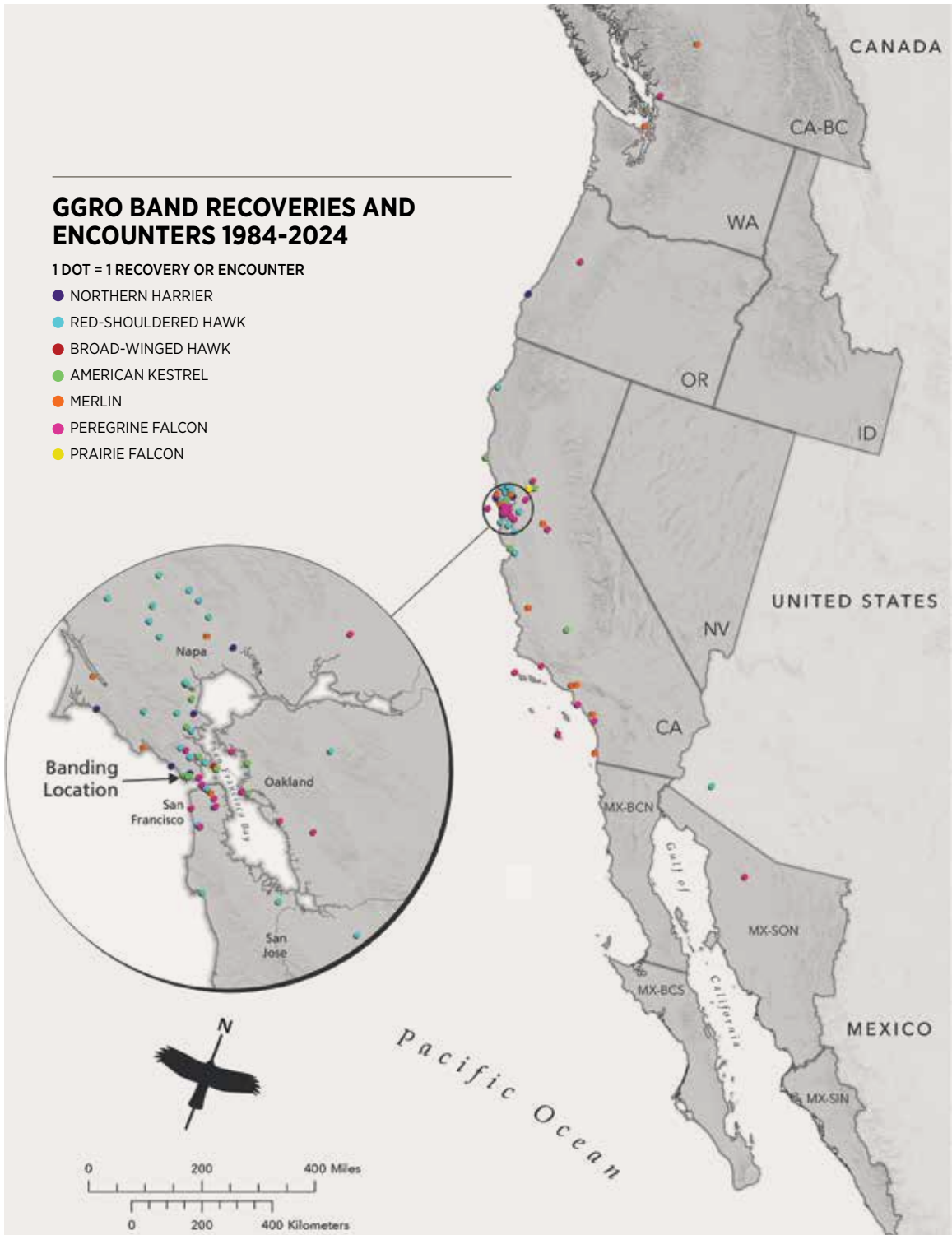
## GGRO BAND RECOVERIES AND ENCOUNTERS 1984-2024

1 DOT = 1 RECOVERY OR ENCOUNTER

● RED-TAILED HAWK



Map: Zac Stanley/NPS Data provided by: Teresa Ely/Parks Conservancy



Map: Zac Stanley/NPS Data provided by: Teresa Ely/Parks Conservancy

## Epilogue

**T**o a human, 40 years is squarely middle age. To a Red-tailed Hawk, 40 years is, on average, about eight generations. Many studies of hawks tend to last two to five years at best—the time to do a graduate degree or to finish a contract job—so most studies capture only a single generation of birds, if that. Because of the closely aligned vision of the Parks Conservancy and the National Park Service, we have been able to collect long-term migration data, enabling us to see what happened across generations of raptors. These are invaluable data for monitoring the Pacific Raptor Flyway, and no one else is collecting it. With the continued support of our community of park staff, community scientists, and donors, we will keep this unique and critical work in place—hopefully for another 40 years. I'd need many more pages to thank everyone who has contributed over these four decades and counting (and banding), and all who yet will.



# Moments and Milestones

## 10,000 YEARS AGO

The most recent ice age ends, leaving a south-pointing triangle just five miles across at the southern end of present-day Marin County.

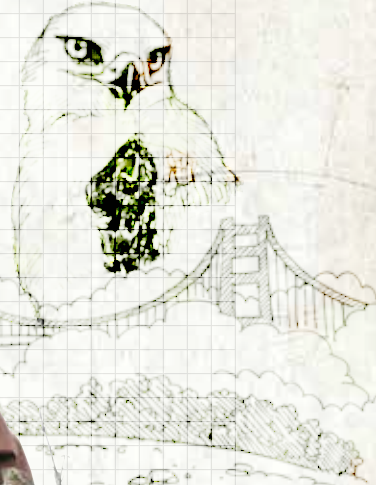
The Coast Miwok people are, and continue to be, the original stewards of this land.



## ALLEN FISH

### 1983

GGNRA Wildlife Ecologist Judd Howell sets up a pilot banding station at Hawk Hill on September 24, banding two Cooper's Hawks in the first hour. 113 days later, one of these hawks is recovered in Mexicali, Mexico.



### 1984

With volunteer support from the San Francisco Zoo, Howell establishes raptor banding as an NPS volunteer program, planting the seeds for the GGRO as a community science program in our national parklands.

On September 21, Faust and colleagues count more than 2800 raptor sightings from Hawk Hill, mostly accipiters, the program's highest one-day count ever recorded.

### 1986

Maria Ferrera is the first GGRO intern, brought aboard to help start the GGRO hawkwatch. As of 2023, the GGRO has hosted 125 interns, who today work across the continent as biologists, teachers, and more, in academia, government agencies, NGOs, and consulting businesses.

Volunteers Sally Mills and Bill Prochnow organize the first issue of the *Pacific Raptor Report* (now *Pacific Raptor*), an annual newsletter of community science and raptor studies for GGRO volunteers, donors, colleagues, and park staff.



### 1972

Birdwatchers note the fall migration of raptors through the coastal Bay Area, first near Twin Peaks in San Francisco, then at the Marin Headlands just one month before the founding of the Golden Gate National Recreation Area on October 27.



\$97,500

### 1985

Howell and Greg Moore, director of the Golden Gate National Parks Association (now Conservancy), collaborate on a grant proposal to the San Francisco Foundation to fund the new Golden Gate Raptor Observatory (GGRO). The Association is awarded \$97,500 for three years.



### 1979

California Academy of Sciences biologist Laurence Binford publishes his account of the Marin Headlands raptor migration in the journal *Western Birds*, creating a scientific record of the Golden Gate migration.

### 1982

NPS volunteer Carter Faust starts daily raptor counts on Hawk Hill, producing spreadsheets on his new Apple computer for park staff and local birders.

Allen Fish is hired to be the GGRO director. 110 banding volunteers start the 1985 season. The GGRO is the first cooperative program of the NPS and the Parks Association.

Photos and illustrations (clockwise): Nelia White, Matthew Perry, Siobhan Ruck, Parks Conservancy, David Jesus, George Eade



## CELEBRATING 40 YEARS



**1989**

GGRO volunteers and interns invent a new counting system, called the quadrant method, to ensure greater consistency and repeatability in hawkwatch

**1990**

GGRO volunteers raise money to start a radiotelemetry program to learn with greater detail where hawks go and how they navigate the urban zones of coastal California. The first radio-tracked bird is a juvenile Red-tailed Hawk dubbed Adam who is followed for 12 days from Marin southward into the Salinas Valley.

**1991**

The Parks Conservancy hires volunteer bander and biologist Angus "Buzz" Hull to be the GGRO's banding manager. The Apple Corporation donates a desktop computer, the Apple IIC.



**1992**

Hawk Talks begin as one of the GGRO's public engagement efforts. The GGRO has welcomed thousands of visitors to Hawk Hill over the years, sharing about our work and the fascinating world of raptors.

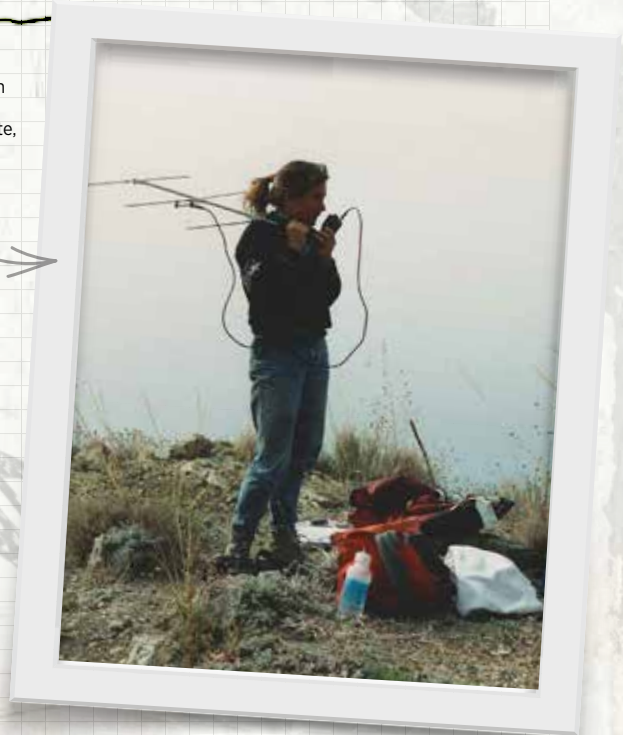
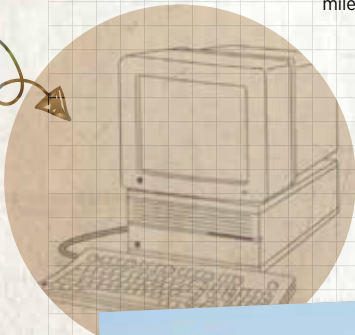
The sixth radio-tracked hawk, a Redtail named Francisco, crosses south across the Golden Gate, then reverses course and flies 50 miles/day northward to reach the Lost Coast, south of Arcata. Six weeks later Francisco is detected in the Salinas Valley. This one bird changes many assumptions about California hawks needing to fly south in the fall.

**1996**

Volunteers Karyn Vogel and Greg Gothard create the GGRO's first website, ggro.org, later incorporated into parksconservancy.org.

**1994**

The incredible GGRO radiotelemetry team tracks the first Broad-winged Hawk from the Marin Headlands, which reaches Tecate, Mexico in just four days, averaging 140 miles per day.



Photos and illustrations (clockwise): Bill Prochnow, Parks Conservancy, Mike Hall, Phoebe Parker Shames, Siobhan Ruck

## CELEBRATING 40 YEARS



### 2002

An East Bay contingency of GGRO volunteers led by Ralph Pericoli start a nine-year annual nest search of Cooper's Hawks, eventually learning that Berkeley hosts one of the highest densities of nesting Cooper's Hawks anywhere. The study inspires environmental journalist Lisa Owens Viani to start Raptors Are the Solution. RATS addresses the dangers of rodenticides to all wildlife and ecosystems, pets and people.

### 2005

In March, while monitoring a Peregrine eyrie in the Marin Headlands, volunteer Steve Bauer notices a steady stream of raptor migrants heading north. The newly found spring migration is monitored by a handful of observers for the next decade, showing a similar species range as the fall, but about one-fifth of the raptor numbers.



### 2004

The Parks Conservancy announces a new Data Analysis and Publication Fund for the GGRO. The DAP Fund was set up to support the part of the science process that follows data collection: lab analyses, publishing papers, conference attendance, and other activities that help share out GGRO science. In the first six months, 85 volunteers kick in more than \$20,000 for the DAP.

### 2007

Volunteers Michael Armer and Beth Sturgeon trap and band a Eurasian Kestrel in the Marin Headlands, the first documentation of this species in California.

### 2012

On the morning of September 27, the foggy skies dissipate to reveal five separate flocks of Broad-winged Hawks, more than 135 hawks at one moment. High counts continue for the next four days, resulting in more than 755 Broadwing sightings for the season, six times their average count.

Buzz Hull retires after working for the Conservancy in different GGRO capacities for two decades. Former intern Dr. Chris Briggs becomes the GGRO's Research Director and Banding Manager.

The GGRO begins its first forays into satellite tracking, placing GSM transmitters on five Redtails, and documenting flights as the hawks seem to settle around the greater Bay Area for winter. The next June, one of the "local" hawks flies north to Walla Walla, WA, in just 10 days.



Photos and illustrations (clockwise): Parks Conservancy, Lora Roame, Mason Cummings, Don Bartling, David Jesus, David Jesus

## CELEBRATING 40 YEARS

### 2013

Leslie and Troy Daniels set up the Greg Hind Endowment “to further the conservation, scientific, citizen science and educational goals of the GGRO.” Leslie’s brother Greg Hind, who passed away in 2012, was himself an inventor, scientist, conservationist, and philanthropist, and as a teen had raised an injured Red-tailed Hawk back to health. The Daniels family’s support for the GGRO has been deeply felt and mission-critical.



### 2016

Former GGRO intern Teresa Ely, having just completed her master’s degree compiling American Kestrel migration trends across the continent, becomes the GGRO’s new Banding Manager following Chris Briggs’ departure. Long-time GGRO volunteer and colleague Step Wilson takes on the new Hawkwatch Manager role.



### 2020

COVID-19-related staffing cuts impact the 2020 migration season, suspending the banding program. The hawkwatch season shrinks to increase safety, collecting one-third of the hours of an average season. Unable to work in the field, banding volunteers rally to fill a variety of behind-the-scenes tasks from starting a Diversity, Equity, and Inclusion committee to creating raptor science web content.

### 2021

Senior Biologist Teresa Ely enacts a range of safety field procedures to bring back banding.

Former intern Ashley Santiago joins as the first Biotechnician to provide field support, while Mellice Hackett starts as the first Operations Manager to support a new Conservation and Community Science Department which houses the GGRO.

### 2022

Former intern Laura Echávez and biologist Krista Fanucchi join as Biotechnicians the 2022 and 2023 seasons, and to ensure safety as the pandemic evolves.



### 2015

GGRO staff and volunteers host the annual Raptor Research Foundation conference in Sacramento, the largest annual meeting of international ecologists, biologists, planners, and students of birds of prey, their science and conservation.

In honor of his late wife Jennie Rhine, a GGRO bander and federal court judge, Tom Meyer asks the GGRO to create a meaningful experience for youth who don’t have easy access to Hawk Hill. Migratory Story becomes a Parks Conservancy program where kids learn about hawk migration while also exploring their own stories of migration. Over the subsequent decade, the program reaches well over 1200 kids.

### 2017

The GGRO launches Project Zopilote, a deep dive into the movement and ecology of Turkey Vultures, led by Teresa Ely. Bay Area vulture migrations are mysterious, and early information on the risks to vultures caused by rat poisons and other toxins has shown the need for better data on these magnificent and often ignored birds.

### 2023

Dr. John Keane, wildlife ecologist for the U.S. Forest Service, is the first GGRO volunteer to reach 40 years of service. John started banding in the Marin Headlands while an undergrad at San Francisco State University in 1984. He then earned an MS at UC Berkeley and a PhD at UC Davis studying goshawks in the Tahoe Basin, all while continuing as a volunteer bander and leader through the decades.

The GGRO begins working with Motus, an international wildlife radio-tracking network. The first nine raptors outfitted with Motus tags at the GGRO take flight.

Photos and illustrations (clockwise): Ryan Jones, Parks Conservancy, Mary Kenney, Mary Kenney, Don Bartling, Allen Fish

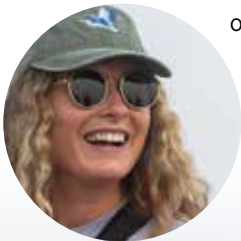
## Inter-Intern Interview

OLIVIA WONG, GGRO INTERN 2018  
CLARE SANTACOLOMA, GGRO INTERN 2023

**T**he worlds of wildlife biology and raptor research can be mysterious for aspiring biologists and outsiders alike. When building a career in this field via internships, seasonal positions, and graduate programs, the “correct” path isn’t always clear. The pressure to make the right decision when weighing opportunities can be overwhelming. The chance to speak with more established biologists to gain their guidance is rare.

I was excited to interview Olivia Wong for *Pacific Raptor*. I loved learning about her life and inspiring trajectory toward her current position with the U.S. Fish and Wildlife Service (USFWS). Olivia’s passion for conservation is evident in her impressive resume and in her words. She highlights that there’s no one route to success in this field, and that it’s often the differences between our flight paths that make our community stronger.

— CLARE SANTACOLOMA



### How did your interest in birds start? How did you come to the GGRO and what was your experience?

I’d been birding a lot longer than I realized. As a suburban kid, I enjoyed watching crows and Canada Geese and Red-tailed Hawks at my local park, but I didn’t seriously consider birds and wildlife as a career until college. I was initially on the pre-veterinary track but one of my teaching assistants happened to be both a GGRO volunteer and a graduate student working on Northern Harrier breeding ecology, (now) Dr. Shannon Skalos. At some point we talked about her research, and I ended up assisting her. That was my first field experience, and I fully fell in love with raptors!

Dr. Skalos connected me with her advisor, Dr. Elisha Hull, who advised me on my undergraduate thesis where I analyzed GGRO hawkwatch and banding data for changes in Accipiter migration phenology over time. I then applied for the GGRO internship so I could contribute to the data collection! I quickly learned to love the dynamic nature of everything that hawkwatch and banding entailed.



Olivia Wong as a GGRO intern releases a hawk after banding.  
Photo: Parks Conservancy

In addition to learning a whole bunch of technical skills, I also valued the rare and important experience of working with the diverse group of GGRO volunteers. The community of volunteers from all sorts of professional and personal backgrounds brought together by their passion for raptors was both surprising and inspiring, and a testament to the power of community science.

The GGRO staff—Allen, Teresa, Step, and Kelsie—and my fellow interns made me feel like I was part of one big family. We had some challenges that season (including a two-week shutdown due to smoke from the 2018 Camp Fire), but learning to adapt as a team was a valuable learning (and bonding) experience. The GGRO internship was truly one of the best jobs I've ever had. The birds, the people, and the Marin Headlands all hold a special place in my heart!

### **What was your path to graduate school and working with Pueo?**

After dipping my toes into research as an undergrad, I knew I enjoyed the hands-on, question-driven type of learning that working on a specific project entailed. I planned on going to graduate school to continue developing my research and analytical skills. However, I was nervous about getting in and finding the right combination of 1) an interesting project, 2) an advisor that matched my mentoring needs, 3) funding, and 4) a place I'd like to live during school (often overlooked but important).

I kept an open mind and reached out to a couple avian ecology labs. A lot of applying to graduate programs is being in the right place or talking to the right person at the right time, and in that way I stumbled upon the Hawai'i Wildlife Ecology lab led by Dr. Melissa Price. She had a new project working on Pueo, the Hawaiian Short-eared Owl. Spoiler alert: there are still a lot of research gaps for Pueo!

One major gap was breeding ecology, a great fit for me because of my previous experience with harriers. Northern Harriers and Short-eared Owls have a lot in common. They both nest on the ground, eat a lot of small rodents, and can be frustratingly sneaky for a big raptor. I had the field skills, and I was lucky that most of the funding was already in place.

Developing my project was mostly smooth, but not without hiccups. One week after I moved to Hawai'i, the COVID-19 lockdowns began. That meant quite a few setbacks: obtaining permits, accessing field sites, and potentially losing funding. But even without pandemic-related challenges, most grad school experiences are similar. You start off with big ideas, run into roadblocks and reassess your project, and end up with a product that's not exactly what you'd planned but is still valuable.



A young Pueo. Photo: Olivia Wong

### **What is the significance of Pueo?**

Ecologically, Pueo are one of only two native raptor species in the Hawaiian Islands, and one of 11 Short-eared Owl subspecies worldwide. (The other Hawaiian raptor is a small buteo, the 'Io, or the Hawaiian Hawk.)

Short-ears provide biologists with a fascinating opportunity to investigate variation in life-history traits (e.g., movement or breeding strategies) within one species, since they're one of few raptors distributed across multiple continents, latitudes, and both continental and island systems. Other research shows that many such variations can result from differences in landscape or latitude, or in island versus continental ecosystems. However, most research on Short-eared Owls to date has taken place in the U.S., Canada, and Europe, so our understanding of this open-habitat, rodent-specialist raptor is based on only two geographies. Our work with Pueo is part of the bigger picture of global Short-eared Owl research and provides another piece of the puzzle in our understanding of how this species evolved in different landscapes.

Culturally, Pueo are beloved by a lot of locals and Native Hawaiians. For some Native Hawaiians, the physical manifestation of their 'aumakua (deified ancestral guardian spirit) is a Pueo. For them, 'aumakua are treated as family members that are deeply respected and valued. Pueo also frequently occur in mo'olelo (stories, myths, and legends) that reflect a longstanding connection to and knowledge of Pueo by Native Hawaiians.

### Can you share a highlight from your findings?

I collected specific breeding parameters (e.g., clutch size, number of chicks fledged) and nest site characteristics from focal study sites. I also harnessed incidental nest observations from partners statewide to see what we could learn.

The most surprising result was the variation in nesting habitat across all the incidental data. There were observations of nests in the steep, fern-lined cliffsides of mountainous Kaua'i, and on the beach on Midway Atoll! I received a photo of a tiny Pueo nestling surrounded by dead Sooty Terns and tropicbird chicks that its parents had brought back as prey. It was cool to see how many seabirds this Pueo nest was consuming!



Pueo (Hawaiian Short-eared Owl) hold both ecological and cultural significance. Photo: Olivia Wong

### What's your current position and what drew you to it?

I'm now the USFWS Migratory Birds and Habitat Program's Hawai'i Biologist. I work on the conservation and management of all non-Endangered Species Act-listed bird species in the islands (including Pueo, 'Io, and a bunch of seabirds and migratory shorebirds). I provide technical advising to state, federal, and non-governmental organizations about management issues and help coordinate research and conservation plans for a variety of species. It's both exciting and intimidating because there's flexibility to decide which projects to pursue, and I'm learning a lot working on species and conservation problems new to me, like seabird ecology and offshore wind development.

My path to this position began during grad school. I was looking for a summer job so I could continue to pay rent while my funding was paused. I found the USFWS Directorate Fellows Program, which runs 10-week, paid summer internships and which carries direct-hire authority with many federal agencies. Mine was with the Migratory Birds and Habitat Program working on a seabird colony mapping project.

A couple of months after graduating, this position opened and they offered it to me. I knew the team was great, and that the position would offer experience implementing conservation research and management plans for a variety of species.

### Do you have advice for aspiring wildlife biologists?

There's pressure especially early in your career to pursue positions that are poorly paid or unpaid, or with long days and unsafe working conditions, to gain experience with specific species or systems. It's a broader issue where historically, these types of seasonal jobs were the norm. I encourage people to resist that pressure and emphasize that there's no specific path you must take to be a wildlife biologist. Take those opportunities if you want them, but don't feel it's a necessity to advance your career. Be open to new experiences that may be outside your comfort zone, and know it's ok if you aren't willing to sacrifice everything for a job. Everyone's journey and timeline look different, and having a diversity of experiences makes our community stronger. There's no "right" way to traverse this field.

## INTERVIEW

### What are some aspirations you have for your future?

I'm working on publishing something from my master's thesis, plus a couple papers on Pueo from our research team. I'm excited by all there is to do for Hawai'i bird conservation and the challenges this new job will entail. I'm also grateful for a permanent position with better work-life balance than grad school, and I'm figuring out my new routines and workflow. That includes cultivating my interests outside of work again and enjoying the many beautiful hikes and beaches of Hawai'i, while still holding a position that is both intellectually stimulating and management-oriented.

### Who has inspired or helped you in your journey?

I'm grateful to have had many supportive mentors throughout my career. This includes grad students and supervisors who made space for me to tag along on their projects, answered my many questions about their paths, and pointed me toward life-changing opportunities. I'm also inspired by my peers. Fellow interns, coworkers, and lab mates have always been a great source of support as we navigated the early stages of our careers together. I'm happy to see where they've gone and I'm inspired by how they're paving their own paths.



Olivia now works as the USFWS Migratory Birds and Habitat Program's Hawai'i Biologist. Photo: Olivia Wong

## Supporters 2023

**R**aptors fascinate us for their keen abilities, mysterious lives, and amazing annual migrations. They are also critical members of the ecosystems of every location they visit along the vast Pacific Flyway, including the Bay Area. Keeping a pulse on birds of prey tells us about their condition and about how the landscapes they inhabit are doing. The breadth of what we can learn and the kinds of questions we can ask, enabled by our steadfast annual monitoring, has an enormous impact on science and conservation.

But science doesn't happen without community. The GGRO is a standout program because it brings together conservation science with our community of park volunteers, donors, interns, and staff. We sincerely thank and salute the thousands of people that have created the GGRO over 40 years and counting. Space prohibits us from listing all of you, but you know who you are.

Cheers to our 2023 volunteers and supporters. You are the present and the forefront of our next 40 years.





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Red-tailed Hawk. Photo: John Davis [https://www.flickr.com/photos/john\\_davis/10000000000/](https://www.flickr.com/photos/john_davis/10000000000/)

Nineteen species of hawks, kites, osprey, falcons, eagles, and vultures pass by the Marin Headlands each year on their impressive migratory journeys. Your support allows us to keep a pulse on their populations and track their movements throughout the Pacific region. This critical window on the Pacific Raptor Flyway would not be possible without generous donations to support this work. The Golden Gate Raptor Observatory is a program of the Golden Gate National Parks Conservancy, which houses numerous programs to care for, and connect communities to, our parks.

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Make a gift today and do your part to keep Bay Area raptors flying.  
Thank you for being a part of our community!

## CONTRIBUTORS

# Pacific Raptor 45 Contributors



Turkey Vulture. Photo: John Davis

As the Parks Conservancy's Conservation and Community Science Program Coordinator **Carmen DeLeon** supports GGRO and One Tam staff and volunteers.

A 2008 GGRO Intern, **Teresa Ely** is the Conservancy's former GGRO Senior Biologist and Banding Manager.

**Allen Fish** is the Conservancy's former GGRO Director and Hawkwatch Manager.

2017 GGRO intern and 2022-23 Biotechnician **Laura Echávez** earned her master's degree at Cal Poly Humboldt and is now a Biologist-Educator at San Francisco Bay Bird Observatory.

**Elizabeth Edson** is the Parks Conservancy's former Data Manager, a shared appointment with the NPS Inventory and Monitoring team.

A daughter of immigrants, **Jessica Lie** is a former facilitator of Migratory Story experiences and program manager for the Parks Conservancy's Youth Programs team.

GGRO bander, volunteer leader and docent **Craig Nikitas** is the founder/director of Bay Raptor Rescue, a free service to aid wild raptors found ill, injured, grounded, or trapped. For more info, please visit [BayRaptorRescue.org](http://BayRaptorRescue.org).

Raptor biologist and illustrator **Emma Regnier** (@falcofous) was a 2019 GGRO intern. Emma recently completed the Scientific Illustration program at CSU Monterey Bay.

One of GGRO's 2023 Scientist-in-Park interns, **Clare SantaColoma** has switched coasts to become a Plover Biologist in Cape Cod, Massachusetts.

**Zaira Sierra** is a Community Engagement Program Manager at the Parks Conservancy, and one of the great minds inside the Park's magnificent Roving Ranger program.

Volunteer leader **Holly Thomas** has contributed 13 autumns of her life to the GGRO hawkwatch, including more than 150 hours in 2023 alone.



The world watched this Peregrine Falcon family grow and successfully fledge on Alcatraz Island. The mother was famous even before this debut: her name is Lawrencium, and she is the daughter of the beloved pair Annie and Grinnell that made their home in UC Berkeley's Campanile for many years. She was identified on Alcatraz in 2020 by bands placed on her as a chick in 2018 - she and her mate are the first Peregrines ever recorded to nest on the island.

Pictured here are several images from the small camera placed near their nest in 2023 for monitoring. Through the collaboration of many National Park Service and Parks Conservancy staff - biologists, operations managers, communications and media specialists, and more - a livestream launched the next year and introduced them to the world. This window into their daily lives holds so much value from both a conservation and community perspective.

Peregrines hold a special place in many hearts. They dazzle us with their speed. We haven't forgotten that we almost lost them due to pesticide use. This project is one small piece of a decades-long effort by so many that's resulted in a tremendous recovery.

We are hopeful to greet Lawrencium again next spring. Learn more and follow her story at [parksconservancy.org/parks/watch-peregrine-falcon-nest-webcam-alcatraz-island](https://parksconservancy.org/parks/watch-peregrine-falcon-nest-webcam-alcatraz-island).

Photos: Parks Conservancy





[parksconservancy.org/ggro](http://parksconservancy.org/ggro)



[parksconservancy.org](http://parksconservancy.org)



[nps.gov/goga](http://nps.gov/goga)

**The Golden Gate Raptor Observatory is a program of the Golden Gate National Parks Conservancy, in cooperation with the National Park Service.**

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*All raptors at the GGRO have been handled and banded with appropriate State, Federal, and IACUC permits.*



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