GGRO's East Bay Cooper's Hawk Intensive Nesting Survey -- 2003

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The Golden Gate Raptor Observatory is a program of the Golden Gate National Parks Conservancy (formerly the Golden Gate National Parks Association) in cooperation with the National Park Service. Three paid staff and more than 300 volunteers track and monitor the spectacular fall migration of birds of prey over the Marin Headlands each fall, and also conduct related raptor research and conservation studies. Our ultimate mission is to inspire the preservation of California's birds of prey populations. We operate from a philosophy that effective conservation requires careful scientific data collection and community involvement.

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Summary

Although the Cooper's Hawk (*Accipiter cooperii*) is not endangered nor otherwise listed at the federal level, it has been noted as a "Bird of Special Concern" on lists published by the California Department of Fish and Game in 1978 and 1992. Also protected by the Migratory Bird Treaty Act of 1918, a Cooper's Hawk may not be hunted, taken, captured, killed, possessed, sold, bought, exported, imported, transported, carried, or received, without penalty. This applies to the hawk's body, parts, nest, or eggs -- unless the perpetrator has a permit to do so.

We began our research on this species in 2002 in order to monitor what seemed to be a large and fairly dense population of nesting hawks in the urban East Bay region near San Francisco, California. Intensive ecological studies of urban Cooper's Hawks have been conducted recently in Wisconsin, Arizona, British Columbia, and Indiana for varying numbers of years, yielding valuable data on raptor survival in human-developed areas. Secondarily, we sought to create a database on Cooper's Hawk nesting trends that we could compare annually with our GGRO hawk migration counts in Marin County. The latter is the longest continuously-collected and standardized data set on raptor migration numbers in California, having begun in 1986.

In 2002 and 2003, we used approximately two dozen trained volunteers to locate Cooper's Hawks nest in the cities of Berkeley and Albany, Alameda County, California. The East Bay Birders' listserv also proved invaluable for receiving Cooper's Hawk sightings and nest reports from its members. In an urban study area nearly 11 square miles, we found 12 nests each in 2002 and 2003, ten of which were in the same territory.

In 2002, twelve Cooper's Hawk pairs fledged 40 young (3.3 young per successful nest). In 2003, nine pairs fledged 36 young (4.0 per nest). Nest spacing was 232 hectares (~573 acres) per breeding pair in 2002, compared to 309 ha (~763 acres) per pair in 2003. Our Berkeley-Albany study area hosts one of the densest concentrations of nesting Cooper's Hawks ever recorded.

Cooper's Hawk nesting activity started as early as the end of January into February when single males or pairs showed up on territories. We observed nest building as early as late February, but as late as April. Incubation of eggs ranged from early April thru mid-May. Hatching began in early May although occurred as late as mid-June. Young were fledging (branching) from the nest from early June through mid-July. Parental feeding on the natal territory continued as late as the end of July.

Of 24 nest attempts, the most common nest trees were American Elm (6), Coast Live Oak (5), and Monterey Pine (4). Other nest tree species were Coast Redwood, Bay Laurel, American Sweet Gum, Blue Gum Eucalyptus, Ponderosa Pine, and Ash. Land ownership for the 24 sites from most to least common were: street/private (9), Berkeley City Parks (6), University of California, Berkeley (4), St. Mary's College High School (2); Albany Parks (2), and East Bay Municipal Utility District (1).

During 2002, we picked up 579 prey samples, which collectively contained 16 species of birds and three species of mammals. Mourning Dove and American Robin accounted for nearly half of all samples. Adding in Rock Pigeon, Western Scrub-Jay, and House Sparrow, these five species account for more than 75% of all samples.

Introduction (AMF)

> "The notable increase of noxious rodents during the last few years in certain parts of the United States and the subsequent damage to crops are due in no small part to the diminished number of birds of prey, which formerly destroyed them and aided in keeping down their numbers. A few hawks are injurious, and the bulk of the depredations on birds and chickens chargeable against hawks is committed by three species – the Cooper's hawk, the sharp-shinned hawk, and the goshawk. The farmer's boy should learn to know these daring robbers by sight, so as to kill them whenever possible."
>
> - *HW Henshaw -- Chief, US Biological Survey.* National Geographic. *1913.*

Cooper's Hawks (*Accipiter cooperii*) are the lynxes of the bird world. They are wild, unusual, secretive, rarely-seen, capable of using accelerated speed or a stunning pounce to catch their prey. But over the last decade -- thanks primarily to a few dedicated raptor biologists – part of that view has changed. In some, perhaps many, urban areas of the United States, Cooper's Hawks are seen often. They nest in our yard-trees, our city parks, our cemeteries. They feed on our feederbirds, our escaped budgies, our mice and rats.

Cooper's Hawks are fast and secretive to be sure, but are they wild and unusual when they appear in cities like Berkeley, California? Absolutely. These wild-eyed bird-hunters in our urban regions deliver wildness to us. They remind us that our Droll Yankee birdfeeders support a prey population whether we like to admit it or not. I hope that as bird-lovers learn about the precipitous lives of Cooper's Hawks, Accipiter Fan Clubs will emerge and more people will allow themselves to see both chickadee and Coop as fascinating. Broad-minded birdfeeder-fillers can claim with pride that they support a food-chain that has connected these birds for millions of years. Their relationship is essential to both predator and prey, and is spectacular to witness up-close.

Urban Cooper's Hawks

In 1993, the Raptor Research Foundation (RRF) sponsored a symposium entitled "Raptors in Human-Altered Environments" that gathered 24 speakers from a dozen countries, all working around the edge of the big question: "As we convert our natural landscapes, what creatures will get squeezed out?" Or to put it more proactively: "How can we modify our land conversions to bring more species along?" Fortunately, RRF teamed with Academic Press to create a book from the proceedings (Bird et al 1996), so that the stories told a decade ago have had some lasting value.

One of those chapters is a synopsis of the Cooper's Hawk research of Robert Rosenfield and John Bielefeldt, in Steven's Point, Wisconsin (Rosenfield et al 1993). Rosenfield and Bielefeldt's work has established the urban Cooper's Hawk as a fascinating source of ecological questions and answers. Does nesting density connote habitat quality? Can urban Cooper's survive without adjacent "source" populations in more rural regions? How do Cooper's disperse and select habitats within urban regions?

Rosenfield and Bielefeldt, along with other cooperators, have been working on Cooper's Hawk nesting studies in Portage, Waukesha, and Waupaca counties, Wisconsin, at least since 1980, having produced more than *two dozen* papers or chapters related to the topic, as well as Rosenfield's dissertation (1990). Their most intensive urban nesting site has been in the city of Steven's Point. Much of their collected knowledge through the early 1990s is reported in Rosenfield and Bielefeldt (1993).

In 1993, Clint Boal began studying Cooper's Hawks of Tucson, Arizona, while a doctoral student under William Mannan, eventually focusing his attention on the urban zone as an "ecological trap" (Boal and Mannan 1998). Boal, Mannan, and other cooperators uncovered a fascinating ecological storyline that contrasted Tucson Cooper's with Cooper's from outlying rural areas.

Tucson's Cooper's had larger clutches than did the rural hawks; however, the nestling mortality rate for urban chicks was 50% while the rural areas was just under 5%. The main cause of this urban chick death was trichomoniasis, an infection caused by *Trichomonas gallinae*, a parasitic protozoan found in Inca (52% infection rate) and Mourning doves (16%) (Hedlund 1998 as cited by Boal and Mannan 1999). These two dove species together account for 84% of the diet of Tucson Cooper's Hawks, and play a minor role in the diets of rural Coops (Boal and Mannan 1999, Estes and Mannan 2003).

In addition to Tucson and Steven's Point, we've read of recent urban Cooper's Hawks studies being conducted in Victoria, BC (Stewart et al 1996), and Terre Haute, Indiana (Roth and Lima 2003). Clearly, with rural zones being altered to urban zones across the continent, the chance to learn the habitat needs, ecological requirements, and human tolerances of an avian predator is exceptional. And beyond the scientific data that may be collected close to home, the chance to create educational opportunities to help birders and non-birders alike appreciate the ancient role of this "daring robber" is critical.

California Cooper's Hawks

Not a lot of Cooper's Hawk breeding studies have been published for Northern California. A diligent raptor watcher, Henry S. Fitch published some early results of a 1939 Coop nesting study in San Joaquin County (Fitch et al 1946). Brian Walton [no date] studied clutch size and reproductive success in the early 1970s. A master's student from UC Davis, Chris Asay published a version of his thesis documenting the nest traits of 77 Coop nests in the outlying oak forests of Sacramento, Stockton, and San Diego (Asay 1980, 1987).

More recently, biologist Clay Fletcher (2002) began tracking Cooper's Hawk nests while doing botanical fieldwork at the Pinnacles National Monument. Since 1999, Fletcher has made accipiter nesting at the Pinnacles the topic of his Masters' research at California Polytechnic University, San Luis Obispo. Locally, in the San Francisco Bay Area, Sureda and Keane (1996) documented the mid-season re-nesting of a juvenile female Coop nesting with an adult male in the Fort Funston region of San Francisco. In the early 1990s, Jesus et al (1994) monitored three years of Coop nest activity in an urban East Bay city park, where the male had an aberrantly-colored gray breast, and the female was normal. The juveniles were some even mix of normal brown-colored and unusual slate-gray-colored individuals.

Since 1990, the Golden Gate Raptor Observatory has sponsored a Bay Area Raptor Nesting Survey (BARNS) project, a standard nest data card system that we developed to keep track of the small mountain of raptor gossip that passes through our offices each spring. Although we've collected data on hundreds of nests, we'd never conducted an intensive single-species, single-location nest search that might yield data on nesting density and reproductive success that could serve as corroboration (or refutation) of our annual fall migration trends.

In 2002, after collecting BARNS data on Berkeley region Cooper's Hawks nests for more than a decade, we decided to test the interest of GGRO volunteers in pursuing an East Bay springtime project. The response was high; twenty-five people showed up at our first meeting in the corner of a tacqueria in North Berkeley, and our focused effort began immediately.

Methods

Searching for New Nests

As in 2002, during February through July 2003, we split up a team of 24 people, all trained in raptor identification, to search the city limits of Berkeley and Albany in Alameda County, California, for Cooper's Hawks and appropriate Cooper's Hawk nesting territories. To create a more thoroughly urban study area with a good degree of human activity, we excluded the Berkeley Marina, Aquatic Park, Golden Gate Fields, East Shore State Park, the Highway 80 corridor, and the upper regions of the University of California near and above Strawberry Canyon, the Greek Theatre, and the Memorial Stadium. The total study area was a rectangle roughly 3.6 by 2.9 miles, or 10.7 square miles, which translates to 6873 acres or 2782 hectares. (*Please note*: this area was miscalculated in the *2002 CHINS Report*.)

We continued to use the 19 search areas from 2002 to give volunteers a chance to study, restudy, and know an area thoroughly. We asked nest searchers to walk, drive, bike, and linger in their survey areas as much as possible during the nesting season, to investigate any tree greater than 30 feet for signs of Coop activity: nest platforms, whitewash, prey remains, feathers, etc. We instructed observers to make at least two dawn visits to listen for dawn duets (Rosenfield and Bielefeldt 1991), and to watch for morning flight displays, such as flutter flights and tail-chases.

We reviewed with our teams the precautions listed in Fyfe and Olendorff (1976), so as to have the minimum possible impact on the Coops. However it was interesting to watch the Cooper's Hawks watch the urban world pass by them, and marvel at the resilience that they could show, given some habitat, some prey, and some altitude.

Taped Calls

In spring 2003, we conducted 15 taped call surveys prior to incubation in areas that appeared to be likely nesting habitat (Rosenfield et al 1985, Rosenfield et al 1988, Stewart et al 1996). This did not yield any new nests in these areas.

Territory Monitoring

In February 2003, we assigned at least two volunteers to monitor each of 12 nesting territories from 2002. Nest searchers were asked to keep written notes of their survey times and nest visits.

We also asked surveyors to pick up any prey remains, pellets, eggshell fragments, and hawk feathers in the vicinity of nests. We did not count eggs. Young were counted as they were visible in the nest (~7+ days) and the chicks' ages were estimated using visual and behavioral clues from Meng and Rosenfield (1988), and Rosenfield and Bielefeldt (1993):

9 days post-hatching:	deep fluffy white chick, no dark juvenal feathers, stands feebly and flaps
11 days:	darker feather tips begin to break out of sheaths; male & female tarsi are different sizes
13 days:	shows awareness of small moving objects near nest
14 days:	active parental brooding starts to diminish
16-18 days:	preens well, does threat posture, dismembers prey, flaps wings
21 days:	flight feathers and scapulars prominently emerging from down
24 days:	shields food from sibs with wings, strikes at objects with feet
26 days:	males start to leap, climb, and flap to other branches
28 days:	juvenal feather nearly complete (little down left)
29 days:	female nestlings start to leap, climb, and flap to other branches
30-45 days:	branchers still affiliate with nest for prey deliveries from parents
51–54 days:	few young still near nests, max. length of flight feathers reached

East Bay Regional Cooper's Hawk Nests

In addition to the intensive study area, we collected anecdotal information from known observers on East Bay nests from as far south as Alameda to as far north as El Cerrito.

Habitat Study

During the winters 2002-2003 and 2003-2004, we made detailed measurements of each nest site, including: tree diameter breast height; tree species; tree height; nest height; elevation; nest aspect; slope; and gps coordinates. We paced or measured distances from the nest tree to the nearest flowing water, road, and human activity. We also tracked the distances to the 2002 nest if it was in the same territory. Results from our habitat analysis will be detailed in a future publication.

Results

Nest Searching & Territory Monitoring

Cooper's Hawks built at least twelve nests in the Berkeley/Albany study area in 2003. Of the twelve we located, ten were built in the same nesting territory as last year. Four of the 2002 nests were used for nesting this year. Six nests were located within 400 feet (~121 meters) of last year's nests, while another was built five blocks away from last year's nesting territory. The average distance between 2002 and 2003 nests was 250 feet (76 m.) and the range was 72 to 400 feet, or 22 to 121 meters. One new nest was discovered at the top of Spruce Street at East Bay Municipal Utility District's Summit Reservoir (EBMUD). The only 2002 nesting territory that was not reused this year was the Milvia site, where the adult female had been found dead after the young fledged in July 2002. However, the young were still dependent at that time and relied on the adult male for support.

Productivity

Of the twelve active nests for the 2003 nesting season, nine were successful in fledging juveniles (Table 2). At one nest, the adult female was found dead prior to incubation. At two other unsuccessful nests, Cooper's Hawk eggshell fragments were found under the nest fairly early in the incubation stage.

Although fewer nests were successful this year, productivity of successful nests was higher than in 2002 (Table 1). In 2003, the average number of juveniles dispersing from the natal area was 4.0 juveniles per nest, with nearly 89% of the successful nests having at least 4 nestlings. In 2002, these figures were 3.33 juveniles per nest fledging, with only 41.7% of the nests having 4 or 5 nestlings.

Spacing

This year the nest spacing was 309 ha per breeding pair, compared to 232 ha per pair in 2002 (Table 5). Most of the 2003 nests seemed to be located in the eastern two-thirds of the study area. This may have been because there were a greater number of mature trees for nesting and cover in this area. In this eastern portion of Berkeley, nests ranged from 0.8 to 1.1 km (0.33-0.50 miles) apart. Across the entire study site, nests were as far as 2.4 km (1.5 miles) apart. There were no favored tree species for nesting. Twelve nests were placed in six different tree species. There were two nests each in Coast Live Oak, American Elm, Blue Gum Eucalyptus, and Ash, three nests in Monterey Pine, and one nest in Ponderosa Pine (Tables 3 & 4).

The height of the trees seemed to be more significant in nest site selection than the type of tree. The height of nests in trees averaged about 65% of the height of the tree with the range being from 54 to 84% -- well below the tops of the crowns. Nest tree heights ranged from 38 to 125 feet tall.

Additional East Bay Region Nests

We heard of eight other active nests outside of the Berkeley-Albany study area in 2003. The average nest success (# chicks at post-branching) of these was 3.0 per nest. Here is a brief listing:

Nest	# Post-Branchers	Land Status
Lafayette, Alameda	3	street
Colby, Oakland	5	street
Lake Merritt, Oakland	4	city park
Long Ridge, Oakland	4	street
Canyon Trail, El Cerrito	3	city park
Blake, Kensington	2	city park
Rifle Range, Tilden Park	0	regional park
Havey Canyon, Tilden Park	3	regional park

Prey & Feather Remains

In 2003, more than 455 prey remains were collected and are in the process of being sorted and identified. In 2002, 579 feather and skeletal prey remains were collected and identified, with the results shown in Table 6. Nearly two-thirds of these prey remains were three bird species: Mourning Dove (24.4%), American Robin (23.4%), and Rock Pigeon (16.6%). [*Note:* Rock Doves have recently been re-named Rock Pigeons by the American Ornithologists Union.]

We analyzed 37 pellets and found feathers, fur, beaks, bird feet, and complete wing bones of small passerines. Also found in the pellets were seeds and entire crops from small birds that were still filled with seeds. Many of these seeds were the type found in bird feeders (millet and milo). This would indicate that prey may have been taken from areas near bird feeders or, at least, that prey had visited feeders at some time prior to being taken by a Cooper's Hawk. Also of interest were the barks and sticks found in the pellets. Thirty-two percent of the pellets contained bark or sticks, and one pellet contained a black, rubbery, synthetic material.

In addition, we collected 60 molted Cooper's Hawk feathers for later analysis.

Nest/Territory Accounts

In this report, nest locations have purposely been kept vague in order to protect the Cooper's Hawks from undue disturbance. If you are a city planner or biologist who has good reasons for knowing an exact nest location, please do not hesitate to call or email GGRO director Allen Fish. Contact info is at the front of this report.

Hinkel Park Nest

Fledged five. Monitored by Lewis Cooper and Yvonne McHugh. Tony Brake and Greg Gothard took some excellent photos of juveniles in the nest feeding, and interacting on the boughs of the tree and soaring over the canopy. Tony and Yvonne were able to witness one juvenile Cooper's Hawk catch a rat, and another a mouse. In July, the Greek tragedy, *The Bacchae*, by Euripides, was performed at the Hinkel Amphitheater while aerial displays of screaming and diving just-fledged Cooper's Hawks were taking place above the stage. At the end of the performance, one actor explained that the scene-stealers were raptors!

Russell-Ashby Nest

Fledged four. Monitored by Ina Lockwood who photographed the pair copulating, and a single Cooper's Hawk perching on a television antenna. Located on the very quiet Russell Street in 2002, this year the nest was located on a big Elm over the very heavily-traveled Ashby Avenue. Any prey dropped from the nest was immediately pancaked on the street below from all the traffic passing by.

UC Berkeley Nest

Fledged zero. Monitored by Juta Savage and Eric Jepsen. This nest moved from the Redwood used in 2002 to the same nest location in a eucalyptus that it occupied in 2001. The 2003 nest was unsuccessful, possibly because of predation. Cooper's Hawk eggshells were found under the nest on April 15th. (In 2002, a raccoon was seen at the nest site at this same tree.) A juvenile male was seen in the nest area the day after the eggshells were found, and was seen off and on until April 30th. No other nests were located after this date, although adults were seen flying across campus.

Kerr Nest

Fledged zero. Monitored by Eric Jepsen and Ande Bennett with help from Ina Lockwood. Ina made the earliest observation of an adult pair at any nest area in the study -- January 30th. This pair was observed building a nest in a Eucalyptus south of the residence building at the end of North Street in March. At the end of March, a UC employee picked up a dead Cooper's Hawk. About 8 to 10 days later, a second-year, juvenile female Cooper's Hawk was seen carrying sticks to last year's nest area and copulating with the adult male.

This latter female eventually ended up using the 2002 nest. She sat on the nest for 80 days. This was long past the 30 days required for incubation, so it appeared that the eggs were not viable. The male continued to hunt and bring prey to her the entire time she sat on the nest.

Remillard Park Nest

Fledged five. Monitored by Lew Cooper and the Haiman Team (Aaron and Josh Haiman and Ann Kositsky, Frazer Meacham, and Chris Berner). The 2002 nest was re-used this year. Greg Gothard photographed the branchers and young on the nest. Again Cooper's Hawks coexisted with Common Ravens nesting some 300 feet from the hawk nest, and rock-climbers on the rock adjacent to the nest seemed to have no ill-effect on the nesting Cooper's Hawks.

Codornices Park Nest

Fledged five. Monitored by Gerald Connell, with help from Ande Bennett. The 2003 nest was not located until June 2nd. This pair was seen rebuilding last year's nest early in the season. It was assumed that the female would occupy this nest. Last year, because of an obstructed view of the nest, the female could not be detected on it. When it was noted that prey deliveries were being made to a different nest, the young had already hatched, and were one to two weeks old.

Spaulding Nest

Fledged four. Monitored by Diane Bahr and Yvonne McHugh, with help from Ande Bennett. This year's nest was located in a backyard pine, approximately 300 feet from its 2002 location on Spaulding Avenue.

Diane Bahr had a friend whose backyard deck provided very comfortable viewing of this nest from a lounge chair. Still, the general viewing of the nest was much more difficult in the dense pine than it was in the more open Sweet Gum tree, which they used last year. It was also difficult to collect prey remains, as access to the nest and to plucking posts was limited. At one point during the nesting season, Diane observed an adult Cooper's Hawk from this nest lying down, stretched out in a prone position on the backyard lawn of a neighbor. It remained there for 5 to 10 minutes before it flew off to the nest tree.

Woolsey Nest

Fledged five. Monitored by Kari Rodenkirchen and Allison Levin. The 2003 nest was one tree east from the 2002 site. This nest became very difficult to observe because the male Cooper's Hawk was very aggressive in its nest defense and continually dove on both observers. We observed five juveniles branching initially, but could only locate four eventual fledglings just prior to dispersal.

In July, the Lindsay Museum (Walnut Creek, CA) reported that they received a juvenile Cooper's Hawk with spinal cord injuries that had been picked up at Martin Luther King Junior Way and Alcatraz Street, only three blocks away from the Woolsey Nest. This could explain the missing juvenile.

Albany Hill Nest

Fledged zero. Monitored by Jim Brulet. The 2002 nest was re-used, however, on April 19th, Jim noticed that the female was no longer on the nest, and a juvenile male was seen at this site.

Two days later, eggshells were found under the nest, and one side of the nest appeared to have been pulled down. Shortly thereafter a juvenile male was seen at the nest site while an adult female was heard calling in the distance, but no physical interaction was ever observed between the two.

St. Mary's Nest

Fledged four. Monitored by Bob Numeroff and Robert Shepard, along with Jennie Rhine. The 2002 nest blew down in July 2002. A new nest was rebuilt at an even higher location in the same Eucalyptus in 2003. The banks and upland area along Codornices Creek where the nest was located received significant vegetative rehab in the off-season. Several large eucalyptus trees were removed and native shrubs were planted. Many of the trees that are currently used by the hawks for perching and plucking are dead or dying, and may be removed in the future.

Oregon-Derby Nest

Fledged four. Monitored by Ande Bennett, and Horacio and Mona Mena. A nest was started last year on Derby Street, but it was never occupied, then a very late nest was discovered on Oregon Street. It was felt that the same pair might have built these two nests, and the late nest on Oregon Street was a re-nesting. This hypothesis was supported since there was not a nest on Oregon Street this year, and nesting occurred on Derby Street just down the street from last year's nesting attempt.

During incubation, Ande Bennett was able to observe the male flying by and stopping to perch near the nest. Similar behavior was described by in *The Handbook of North American Birds* (Meng and Rosenfield 1988*)*. This was also a difficult nest from which to collect prey items, since no plucking posts seemed to be on the street.

Summit Nest

Fledged three. Monitored by Lew Cooper and Ralph Pericoli. This nest was newly discovered in 2003. Early in the season, we noticed that a pair of adult Cooper's Hawks was perched on the edge of the wooded area along Spruce Street at East Bay Municipal Utility District's Summit Reservoir, and at times they engaged in courtship flights.

We requested permission from EBMUD to enter the fenced-in woodlot in search of a nest, but because of the orange terrorist alert at the time, this was delayed. So instead of doing a search during the incubation period when activity would be minimal, we put off a search until after hatching occurred. After the young hatch, the feeding activity, begging calls, and whitewash below the nest would more easily reveal the presence of the nest.

On June 25th, Lew and Ralph got into the wooded area and immediately located the nest from the white droppings below the nest. The nestlings were two to three weeks old at the time,

several weeks younger than hawks at most of the other nests. One juvenile just four weeks out of the nest, was seen harassing and chasing off a Common Raven. The two birds would exchange turns diving on the other in spectacular aerial displays until several other ravens joined the fracas and the precocious Cooper's Hawk dove for cover.

Sharp-shinned Hawk Nesting

While investigating a report of Cooper's Hawks above the University of California at Berkeley, Ralph Pericoli observed a pair of Sharp-shinned Hawks building a nest on May 19th. Prey exchange was observed whereby the male flew toward the tree canopy in a spiral flight with the female in pursuit. He then dropped the prey to her from above, which she caught in mid-air. Incubation, feeding, and fledging were observed and photographed by Tony Brake. This pair fledged five young and seemed to be two to three weeks behind the Cooper's Hawks activity.

More Questions

Since this is an informal report, we thought we'd throw out to you some of the questions that are teasing our interest. The big block on accomplishing any of these projects will be funding mainly for staffing. Diligent and careful study of birds requires a larger chunk of consistent effort than most of us could do on a part-time basis. If you wish to underwrite the costs for a full-time Cooper's Hawk researcher or grad student, call Allen Fish at the GGRO.

1. **How long do the adults and juveniles stay in the nesting area?** Last year a pair of adults was seen at the Hinkel Park territory on September 21st, and a female was seen one block away at another nest on November 29th and December 7th. Also, prey remains and whitewash were found on-site through November. This year there was a juvenile and an adult at a nest on September 21st. Were these off-season birds the same ones that nested or fledged there? Do the same Cooper's Hawks come back to nest the following year? These questions could be answered using individual color-marking schemes, such as color bands, or using telemetry -- both potential but costly studies.

2. **How far do adults and juvenile range during the breeding season and in the winter season?** The corollary question to the one above – Are there enough resources, ie, prey, to support the adults at the nest territory through the off-season?

3. **How and how far do juveniles disperse?** Juvenile dispersal, whether learned or genetically programmed, sets up some large questions about the quality of habitat for Cooper's Hawks in the region. For many birds, natal dispersal, the distance between birthsite and the site of first breeding, is greater for females and shorter for males (Greenwood 1980). Do Cooper's Hawks in Berkeley follow this pattern?

4. **What determines a Cooper's Hawk nesting territory in Berkeley?** How does a Coop select its habitat for nesting? Are these old locations? Are they based on tree height and girth and canopy and type? Are they based on a strong local prey supply, perhaps a high concentration of bird feeders? One 2002 nest was placed oddly in a smallish and solitary Coast Live Oak which stood in a used car lot. Lots of fenders and pavement. We were puzzled by this placement until we learned that several neighbors were religious bird feeders, including one who had a regular year-round bird bath.

5. **What is the impact of predators on the Cooper's Hawks nesting cycle in Berkeley?** Common Ravens, Raccoons, Great Horned Owls, and humans have all had some impact on the breeders we've studies for the past two years. Is there an increasing impact from any of these that we could divert?

6. **Is Berkeley a sink or a source population of Cooper's Hawks?** If we were to do the same nest-monitoring study in the relatively wild and vast oak-studded East Bay Park and MUD lands just east of Berkeley, would we find a higher nesting success than that in Berkeley? If so, could Berkeley have a seemingly stable nesting Coop population without a "wilder" population of Cooper's Hawks next door to perhaps contribute to its numbers? If the wilder area had a poorer nest success, how could an urban area have achieved a higher level of nest success than a relatively wild, classic California Cooper's Hawk habitat?

7. **What is the relevant history of ecosystem and habitat structural change that allows Berkeley to support this large concentration of Cooper's Hawks?** Because of the University of California, the birds and trees of Berkeley may be among the most studied in the world. Are there records at the Museum of Vertebrate Zoology of historical nests in the study area? What could we learn about the plantings of city trees, their species and ages, their relationships to original creeks and tributaries, and their occupancy by Cooper's Hawks? What would an ideal Cooper's Hawk nesting territory look like" in central coastal California? And how long would it take to "garden" for Cooper's Hawks, ie, to restore an urban area to a state of use for nesting Cooper's?

Table 1: 2002 Nest Productivity

Nest	# Hatched	# Post-Branchers[a]
Milvia	5	5
Hinkel	5	5
Russell	4	4
UC	4	4
Kerr	3	3[b]
Remillard	3	3
Codornices	3	3
Spaulding	4	3[c]
Woolsey	3	3
Albany	3	3
St. Mary's	2	2
Oregon	2	2
TOTAL	**41**	**40**
AVERAGE/successful nest	**3.42/nest**	**3.33/nest**

a The highest number of chicks counted after all had started branching.
b 2 chicks lost after branching 6/19/02
c 1 chick lost 5/21/02

Table 2: 2003 Nest Productivity

Nest	# Observed in Nest	# Observed at Branching	# Post-Branchers[a]
Hinkel	5	5	5
Russell- Ashby	4	4	4
UC	fail[b]	fail	fail
Kerr	fail[c]	fail	fail
Remillard	5	5	3
Codornices	not visible	5	5
Spaulding-Dwight	3	4	4
Woolsey	3	5	5
Albany	fail[b]	fail	fail
St. Mary's	4	4	4
Oregon-Derby	4	4	3
Summit	2	2	3
TOTAL	**30[d]**	**38**	**36**
Average/successful nest	**3.33**	**4.22**	**4.0**
Average/nesting attempts	**2.5**	**3.17**	**3.0**

a The highest number of chicks counted after all had started branching.
b Suspected raccoon predation.
c First female died; replacement female in juv plumage incubated addled eggs for 69 days.
d Low numbers reflect difficultly of seeing into nests.

Table 3: 2002 Nesting Events – First Dates Observed

Location	Pair on Territory	Building	Incubating	Hatching[a]	Branching	Flying	Leaving[b]	Tree
Milvia	2/13	2/27	3/30	5/6-5/10	6/5	6/11	7/16	Am. Elm
Hinkel	3/1	Not observed	Unknown	5/20	6/22	6/25	7/30	Coast Live Oak
Russell	3/19	3/20	Unknown	5/20	6/22	6/25	7/30	Am. Elm
UC	3/19	3/22	4/19	5/18	6/18	Not observed	Not observed	Coast Redwood
Kerr	3/9	Unknown	4/6	5/6-5/10	6/4	6/11	7/24	Am. Elm
Remillard	2/26	Unknown	Unknown	5/15	6/15	6/20	Not observed	Monterey Pine
Codornices	2/27	2/27	4/15	5/19	6/19	6/24	7/20	Bay Laurel
Spaulding	3/26	Unknown	4/19	5/10	6/9	Not observed	7/22	Am. Sweet Gum
Woolsey	6/16	Found late	Found late	Found late	6/28	Not observed	7/31	Ash
Albany	4/20	Unknown	Unknown	5/23	6/22	7/1	7/26	Coast Live Oak
St. Mary's	2/5	2/27	4/10	5/15	6/19	6/21	7/31	Eucalyptus
Oregon	7/31	Found late	Found late	Found late	Found late	Found late	7/31	Coast Live Oak

a Some estimated based on branching dates or incubation dates.
b Date of the last sighting made in the natal area.

Table 4: 2003 Nesting Events -- First Dates Observed

Location	Pair on Territory	Building	Incubating	Hatching[a]	Branching	Flying	Leaving[b]	Tree
Hinkel	2/15	2/21	4/6	5/8-5/14	6/15	6/16	7/21	Coast Live Oak
Russell-Ashby	3/5	2/25	4/15	5/17-5/23	6/23	6/26	Not observed	Am. Elm
UC	3/5	3/14	Not available	Nest disturbed	-	-	-	Eucalyptus
Kerr	1/30	4/8	4/27	None	-	-	-	Am. Elm
Remillard	2/21	2/21	4/10	5/12-5/18	6/15	6/22	7/19	Mont. Pine
Codornices	2/18	Not observed	Not observed	5/19-5/25	6/22	6/24	7/19	Ponderosa Pine
Spaulding-Dwight	2/21	3/17	4/11	5/8-5/14	6/14	6/16	7/29	Mont. Pine
Woolsey	3/7	3/7	4/10	5/11-5/17	6/14	6/16	7/29	Ash
Albany	2/9	Not observed	4/11	Nest disturbed	-	-	-	Coast Live Oak
St. Mary's	2/13	2/24	4/10	5/15-5/21	6/18	6/24	7/29	Eucalyptus
Oregon-Derby	2/24	3/7	4/7	5/20-5/26	6/23	6/25	7/29	Amer. Elm
Summit	2/28	Not observed	Not observed	6/4-6/10	7/9	7/11	Not observed	Mont. Pine

a Some estimated based on branching dates or incubation dates.
b Date of the last sighting made in the natal area.

Table 5: Cooper's Hawk Nest Spacing

Location	Year	Habitat	Searched (ha)	Breeding Pairs	Hectares/Pair	Pairs/1000-ha	Authors
Berkeley	2002	urban	2782	12	232	4.3	this study
Berkeley	2003	urban	2782	9	309	3.2	this study
Steven's Point, Wisc.	1993	urban	3540	13	272	3.6	Rosenfield et al 1995
Kettle Moraine, Wisc.	1992	rural	2980	9	331	3.0	Rosenfield et al 1995
Tucson, Ariz.	1996	urban	12,682	29	437	2.3	Boal & Mannan 1998

Table 6: Cooper's Hawk Prey 2002

Compiled by Ralph Pericoli

Species	Number	Percent
Mourning Dove	143	24.7
American Robin	135	23.4
Rock Pigeon (formerly "Rock Dove")	96	16.6
Western Scrub-Jay	47	8.1
House Sparrow	28	4.8
House Finch	20	3.5
European Starling	20	3.5
Northern Mockingbird	5	0.9
Steller's Jay	4	0.7
Varied Thrush	3	0.5
Brewer's Blackbird	3	0.5
Bushtit	2	0.3
California Towhee	2	0.3
Dark-eyed Junco	2	0.3
Downy Woodpecker	2	0.3
Budgerigar	1	0.2
Unidentified Birds	59	10.2
Brown Rat	3	0.5
Dusky-footed Woodrat	1	0.2
Eastern Fox Squirrel	1	0.2
Unidentified Mammals	2	0.3
Total	**579**	**100**

Samples identified by Ralph Pericoli (GGRO) and Tina Cheng (UC Berkeley).

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Appendix -- Noteworthy Observations

These are some high points and qualitative stories for the 2003 CHINS season. There are many fascinating stories here; in many ways this may be the most important part of this report. The initials correspond with the volunteer who observed the behavior and wrote the note. Their names are listed on the inside front cover. "COHA" is a banders' field code for Cooper's Hawk.

Hinkel Nest

2/15/03	After copulating and preening, the male did a trapeze-acrobat type falling off a branch. (YM)
3/12/03	No COHA calls 'til 0607, then single note call repeated several times. Seems mister rises first... female did not sound off until 0617 from same area. (LC)
4/15/03	Tail of female was sticking out of the nest, ...there was lots of passerine activity in the park today, robins all over the place. Some came within 10 feet of the nest within the canopy. (LC)
5/11/03	Initially female COHA not visible on nest. 0835 male arrives and both birds are visible for about a minute (both tails seen). Movement of both birds, but activity uncertain. Both birds on nest for 20 minutes. No vocalizations. (LC)
5/14/03	Two pieces of down on the north side of the nest, COHA on nest busy doing something. (YM)
5/20/03	COHA flew to the nest. Consumed the prey item on the nest for about 15 minutes. Did not seem to be feeding chicks – just eating very fast. (YM)
5/22/03	The female is lying on the nest with the nestlings in front of her. California Conservation Corps cutting brush from an old burn at the base of the tree using chain saws. (RP)
5/23/03	She then assumed a half mantling attitude with wings partially extended. She was in bright sunlight, and she was, no doubt, shielding chicks. Her head dipped down occasionally. By this time, the temperature had risen considerably. (LC)
6/15/03	A dog walker said his dog chased a squirrel up the nest tree and a COHA chased it back down. (RP)
6/22/03	In the week since last viewing, substantial development has occurred. Tails are longer and wing feathers (remiges) are almost fully grown so that in flights, birds appear approximately full size. Tails (rectrices) are about ¾ lengths and are showing 'delta' tail configuration with outer rectrices noticeably shorter. Head feathering is becoming more tawny and eyes all show pale iris. (LC)
6/22/03	The beating of the drums at Euripides *The Bacchae* presented at the amphitheatre did not disturb the juvenile Cooper's Hawks at the nest. In fact, to Allen, they seemed to be swaying to the beat of the drums. (RP)

7/7/03 One with prey item… it had trouble finding a stable perch, ie, balancing with big prey item (pigeon?) in its talons. Finally, got into a crook of the tree with some ivy and started eating. (YM)

7/8/03 A group of Day Camp kids noisily made their way below feeding tree. The eater barely looked up, and its partner gave a quick look and shifted slightly. (LC)

7/8/03 Four juveniles for sure. One caught a big rat in the ivy by the top of the amphitheatre steps. Barely able to fly with it over to the slope near the boarded-up house. Hopped under the fence with the rat to the asphalt path and then up the wall to a rock, and eventually started to eat it. Looked tough to eat. The rat was too big for the juv to fly up the tree with it… then I saw a juv COHA fly to the railing by the top of the amphitheatre steps near me, hop down to the top steps, then down one more step, momentarily disappear and then flew up the railing with a mouse! (YM)

7/9/03 Photographed a juvenile with a chunk of bark in its talons holding it up to its beak a gnawing on it. (TB)

7/9/03 Three of the four juvs started flying high over the nest, circling and circling. Then they flew away north. (YM)

7/13/03 A juvenile flew up and snatched an oak gall out of the tree. Then broke off a stick and flew to a different tree and started gnawing on it. (YM)

<u>UC Nest</u>

2/4/03 Lots of noise and activity at loading dock at building near eucalyptus. (EJ)

3/14/03 All kinds of activity under nest: students constantly walking through, street sweepers, delivery trucks, and bicyclists. (EJ)

4/20/03 A weak male 'kip' call was heard. Located COHA in top of Redwood tree near bridge-broke stick and flew to another Redwood downstream and perched. COHA is very light breasted and streaked. (RP)

4/29/03 Juvenile male flew into nest. Appeared to be arranging sticks. (RP, AF)

<u>Kerr Nest</u>

1/28/03 Steller's Jay present, making Coop male 'clucking' sound as before prey exchange. Then it went into basic coop alarm call. It was very good at the calls. Question: Does the jay have great memory from last year, or did the jay hear that call recently? (EJ)

2/20/03 B-Safe Van pulls into empty parking meters, both birds withdraw up towards eucalyptus along sports field. (EJ)

4/8/03 Male and female perched together in pine across from new nest site in courtyard (south) with row of eucalyptus trees. Tree where male takes sticks during observations is eucalyptus in middle of row next to pine tree. Female of pair (with juvenile streaks) takes off for old nest while male is snapping sticks. He followed her back to 2002 nest and watched her take her sticks there. (AB)

Ande felt the female was leading the male back to rebuild the 2002 nest, which she eventually occupied.

4/20/03 Fresh piece of eucalyptus branch is laying across 2002 nest. (AB)

5/13/03 One adult coop 'kaking', two Steller's Jays also making alarm calls, one second year Red-tailed Hawk perched high. Coop finally drove it off to the southwest, over the Clark Kerr Campus flying close the whole time. (EJ)

5/28/03 Couple series of short, slightly plaintive calls from female. Male not visible. Peep ... peep ... keer ... keer ... not high decibel. (EJ)

6/6/03 Squirrel climbing up main trunk came two to three feet of female coop on nest. Female stood and spread wings with mouth open. Squirrel seemed fairly nonchalant and continued up a branch diagonally away from the nest. (EJ)

6/6/03 Also twice this week, a street cleaner has driven under the nest, seemingly to no effect on coop. Garbage truck plus traffic have also driven under nest. (EJ)

Remillard Nest

2/21/03 At 0643, second hawk makes dipping flight below number one hawk and lands out of view in coast live oak, number two bird engages in loopy dipping fly by and returns, landing c. 6 feet away on the same branch as number one. Side by side hawks maintain this position for about two to three minutes... with both COHAs in view, size differential is obvious (number two is smaller). Number two (male) makes another dipping fly by, comes back, and lands right next to female. Copulation now occurs with a whew-whew vocalization. (LC)

3/19/03 This was my closest view yet of pair, and one other noteworthy thing was the complete silence of their flight; they fly quickly from place to place without a sound. (LC)

6/6/03 Female feeding chicks aged 2 ½ to 3 ½ weeks. All grab for morsels of prey at the same time when they are offered by the female. After being fed the young are very active- stretching, flapping, moving about the next and jockeying for position as they settled back down into the nest. (RP)

Codornices Nest

6/14/03 Was a very big organized picnic in the park much activity and noise even at that late hour. During day it must have been a lot noisier. (GC)

7/13/03 One of the chicks chased a crow out over the reservoir. (GC)

7/19/03 One was moving about in the tree south of the reservoir with the crows. One landed in the top most branch of one of the tall firs next to third base. Suddenly, it dove on a crow that was on the end of a lower branch. Looked like they touched- scared the hell out of the crow- it was screaming as it flew off to the south. (GC)

Spaulding Nest

4/1/03	Crows chasing a Cooper's Hawk across Dwight. (YM)
4/4/03	Neighbors said that in past years the COHAs had hunted at his birdfeeder and used the birdbath in his backyard. His recollection was that the hawks had been in the neighborhood for about 10 years. (RP)
4/18/03	Reported witnessing predation. Both Cooper's Hawks were in the air and one dove down and came up with prey. It flew to several different perches before feeding. (DB)
7/2/03	A cherry bomb exploding startled all four juveniles. They flushed from their perch but alighted in nearby trees. (DB, RP)

Woolsey Nest

4/5/03	Male takes a dive at me, then perches... (AL)
4/16/03	Mom on nest. Male takes a double dive on me. (AL)
5/5/03	I approached the tree with the nest. Female flew out from it and dives at me two times (really close!) I screamed ... female returned to nest. Male dived on person walking down street. (AL)
5/28/03	One COHA on nest…other COHA extremely active flying around nest and swooping at contractor working at house next to nest. Also swooped at me several times. Very attentive to nest area." (KR)
6/4/03	Visited nest area, then walked quietly past it to corner, crossed street toward Redwood, and male dived on me. (AL)
6/4/03	One COHA on nest – cannot see chicks, other COHA swooped at me a lot, followed me around the block and kept swooping very closely. (KR)
6/10/03	Cannot stay long looking at nest – the one COHA is quick in spotting any one near nest and came at me – follows me when I move and continues to swoop. It might be the binoculars since other people are on street and they don't bother them. (KR)
6/13/03	One Cooper's Hawk is in an acacia tree. As soon as it spots me, it flies at me swooping. (KR)
6/18/03	I stood talking to the homeowner. The male seemed like he was going to come down on me, but he veered and sat on the tree's first Y – very close to us. I got the impression that he is familiar with the homeowner (blonde female) and I was safe. (AL)
6/20/03	Male started diving on a couple of pedestrians. One man noticed and was very disturbed. I told him the male has a nest nearby that he was protecting. Nearby children were yelling "He does that to everybody! He's trying to catch you! He's a crow!" Saw one chick sitting on 3-foot high picket fence, woman walked right past (she didn't notice the bird, and the bird didn't fly off)." (AL)

6/22/03 Found 5 branchers. The youngest is perhaps just starting to jump off the nest… was tearing at the sticks in top edge of the nest with its beak for 3-4 minutes until a large chunk of the nest fell on a car below. (AB)

6/22/03 Yesterday …the male kept diving on me – recognizes my binoculars? I didn't see him today. Thank god. (AL)

Albany Hill Nest

2/9/03 Pair of adult COHAs seen moving one ahead of the other through the oak forest north of last year's nest. One would swoop low under the perch of the other and land ahead of it. Then the other would follow and do the same. They continued on in an inverted leap-frog through the oak forest. (JM, RP)

3/28/03 Adult COHA added sticks to nest and was bouncing up and down as if to firmly pack the nesting material into the nest. (JM)

4/8/03 Bird dived on observer on approach. (JM)

4/19/03 Observed juvenile COHA flying about and perching in vicinity of nest. At times perched within one or two feet of the nest, but not in or on the nest. This COHA made several attempts to break off small twigs from trees, but did not attempt to add them to the nest. (JM)

St. Mary's Nest

4/10/03 Observed male attacking and chasing off several ravens and crows. (JR)

7/7/03 A juvenile male chased a squirrel around and around the trunk of a tree. This same juvenile dove on a squirrel. The squirrel reared back and opened its mouth with its paws raised in the air in a defensive pose. The COHA flared off at the last moment when it saw this. This juvenile then landed on the road along Codornices Creek and pecked at something on the pavement, then chased a seed pappus (parachute) on foot that was blowing down the road. (JM, RP)

7/13/03 Antonio, the gardener at St. Mary's, says that he sees heightened activity – calling and flying – of the Cooper's Hawks around 4 pm daily. (RP)

Oregon-Derby Nest

5/19/03 Male flew through nest tree N to S lands in Redwood tree perch- sits and preens. Ten minutes later female clucks and he flies to the nest momentarily. (AB)

7/9/03 Can only find three juveniles . . . watched one of three pursue finches on power pole lines, casually for play. (AB)

Summit Nest

6/25/03	Female took off and circled keeping an eye on us ... not used to seeing people in her domain. (LC)
7/14/03	The juveniles at the Summit Reservoir had a strong "kakking" response to my presence. (The call was given in a high-pitched juvenile voice.) They may be unaccustomed to the presence of humans. (RP)
7/28/03	One juvenile intercepted an adult with prey over the reservoir and they did a mid-air prey exchange. (RP)

Miscellaneous

5/9/03	Julie Goldzman reported that a hawk chased a bird into the Bread Workshop Bakery at Strawberry Creek Park. They had a hard time getting it out.

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