HawkWatch International

RaptorWatch

Protecting Raptors and Our Environment

Vol. XX No.3
SUMMER 2006

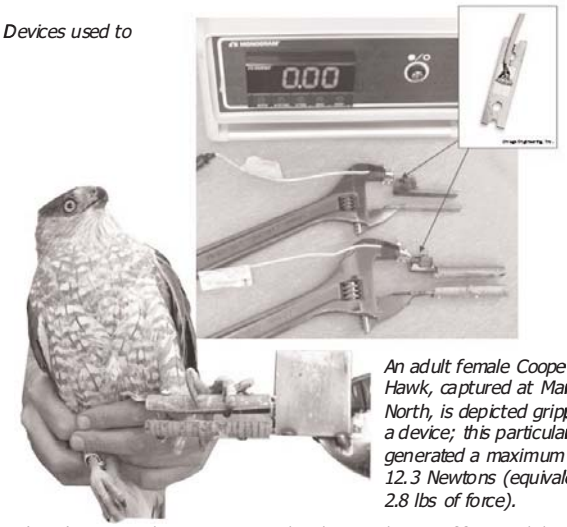
Bite & Grip Performance In Relation to Killing Behavior of North American Accipiters and Falcons

By Diego Sustaita & Fritz Hertel, Department of Biology, California State University, Northridge

Most people are well aware that raptors use their feet and beaks to procure and kill their prey. Many raptor enthusiasts also understand that hawks tend to pierce and suffocate their prey with their talons and feet, whereas falcons tend to kill by delivering powerful bites to the neck. Because they rely more heavily on them, one would expect hawks to possess certain adaptations in their feet that facilitate relatively greater force production, and likewise, falcons to possess adaptations in their jaws that facilitate relatively stronger bite forces. Intuitive as this may seem, there have been few attempts to quantify differences in bite and grip forces in hawks and falcons. Thus, we undertook a study intended to compare jaw and foot force capacity of hawks and falcons, based on musculoskeletal characteristics of museum specimens. We found important anatomical differences in their jaws and feet, which suggest differences in their relative force capacities, but we had to go one step further and validate these patterns by testing the actual bite and grip performance of live birds.

We chose accipiters (Sharp-shinned and Cooper's Hawks) and falcons (Merlins, Peregrine and Prairie Falcons, and American Kestrels), because of the similarities in their preferences for avian prey, and overall body sizes. Aside from our main objective of comparing bite and grip performance between accipiters and falcons, we sought to examine whether or not force increases proportionately with body size. We also wanted to see how well these performance measurements match force estimates that were derived from anatomical dissections of museum specimens.

We benefited from one of HWI's on-going monitoring programs to increase our sample sizes, and obtain data on raptors that we would not otherwise have access to. From September 27th to October 2nd in 2005, HWI Conservation Science Director Jeff Smith, along with a field crew comprised of Zach Hurst, Shelly Johnson, Nova MacKently, Chris Neri, Tim Hanks, Betsy Black, and Geoff Gould, graciously allowed us to piggy-back our research efforts with their fall-migration banding activities in the Manzano Mountains, New Mexico. We hiked in with staff and volunteers and set up our portable field lab near the North trapping blind, situated in a conspicuous point along the ridge about a mile in from the main fire road. After birds were captured and processed (i.e., measured and banded) by



Devices used to

An adult female Cooper's Hawk, captured at Manzano North, is depicted gripping a device; this particular bird generated a maximum of 12.3 Newtons (equivalent to 2.8 lbs of force).

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INSIDE THIS ISSUE

Society, community, family are all conserving institutions. They try to maintain stability, and to prevent, or at least to slow down, change. But the organization of the post-capitalist society of organizations is a de-stabilizer. Because its function is to put knowledge to work -- on tools, processes, and products; on work; on knowledge itself -- it must be organized for constant change. - Peter F. Drucker

Dear HWI Members, Supporters, and Friends -

One of the strengths of HawkWatch International (HWI) is the fact that we have existed as a nonprofit organization for 20 years. In fact, HWI founder Steve Hoffman began monitoring migrant raptors at sites - some of which are still in operation - 10 years earlier in 1977. The goal of HWI's raptor migration program has always been to carry out long-term monitoring, incorporating consistency and continuity from year to year. In many ways, HWI's migration counts and banding efforts are not much different from what was being done 30 years ago. At the same time, HWI has evolved a great deal since Hoffman first began working in the Wellsville and Goshute Mountains.

Since the last edition of RaptorWatch, HWI has undergone several notable changes. We've launched new projects, welcomed new staff and Board members, and have also said fond farewells to others. As of July 1st, we transitioned into a new fiscal year giving us an opportunity to take stock of the last 12 months while we also look ahead to next year.

In this edition of RaptorWatch, you will learn of some of these transformations including two major raptor conservation projects being carried out by recently appointed Conservation Scientist, Steve Slater. In conjunction with these new endeavors, HWI veteran Science Director, Jeff Smith, has had a title change to Conservation Science Director to reflect the integration of our research, monitoring, and applied conservation programs. In collaboration with HWI's Conservation Science Committee, Jeff Smith recently completed developing a long-term plan to guide departmental activities over the next 5 years. You can find a copy of the plan on the HWI website at *www.hawkwatch.org*.

Similarly, HWI's Education Director, Jen Hajj, has been working closely with HWI's Education Committee to evaluate the effectiveness of HWI's environmental education curriculum and develop strategies to enhance and improve our program offerings. This month, we welcome two incoming Education Interns: Laura Simmons will be conducting programs out of our Albuquerque field office while Laura Kohn joins us at HWI's Salt Lake City headquarters.

In June, HWI bid farewell to Evelyn Johnson who served as our Administrative Officer for over 4 years. Evelyn was often referred to as the office "Mom" and we will miss her dedicated and competent contributions to the organization, as well as her wonderful birthday cakes.

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OUR MISSION

HWI works to monitor and protect hawks, eagles, other birds of prey and their environment through research, education, and conservation.

RaptorWatch Editors, Emilie Turner, Jeff Smith, Karen Denton & Thom Benedict. Special thanks to Jerry & Sherry Liguori for their ongoing photo contributions.

RaptorWatch is published quarterly by HawkWatch International. Articles, letters, and photographs from members are welcome for possible publication. All correspondence should be directed to HawkWatch International, Attn: *RaptorWatch*,
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HWI is a non-profit 501(c)(3) corporation.

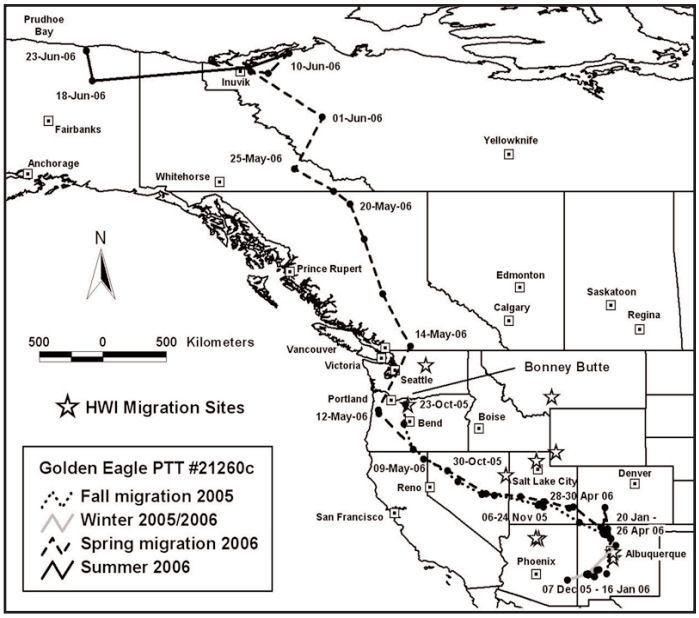
Satellite Tracking Update

By Dr. Jeff Smith, Conservation Science Director

Golden Eagles

To our great delight, we have now tracked one male Golden Eagle through essentially four complete annual cycles. Although nearly four years of transmission lifespan was believed within the realm of possibility given the expected battery power and programming applied to our eagle transmitters, it has definitely reached the expected maximum. Other similar units typically have lasted three years or less-simply a matter of unpredictable battery life. Not only has the lifespan of this transmitter exceeded our expectations, but the story told by tracking this young eagle also has been of great interest.

Originally outfitted during fall 2002 as a hatch-year bird at HWI's migration study site in the Manzano Mountains, New Mexico, this eagle has shown high fidelity to a general migration corridor but significant variation in the summer and winter ranges he has used (Figure 1). The general corridor has extended from as far south as southeastern New Mexico, where the eagle wintered in 2002/2003 and 2003/2004, up along the interface of the Rockies and Great Plains into eastern Wyoming, and continuing as far north as just south of the Arctic Circle in the Nunavut Province of north-central Canada, where he spent three of the last four summers. After wintering in New Mexico for the first two winters, he spent the next two in northwestern South Dakota and eastern Wyoming. After spending his first full summer in the Peacock Hills area of western Nunavut, he instead spent the next summer wandering around the Alberta-Saskatchewan border area ~1500 km (950 mi) farther south. For the past two summers, however, he has returned to the same basic area around the Nunavut-Northwest Territories border near Lac de Gras, about 100 km (80 mi) south of the Peacock Hills area.



The frequency of return suggests that north-central Canada is probably this eagle's natal range, which typically would also become his primary summer range as an adult breeder. As has been true for other similar birds we have tracked, young Golden Eagles often wander extensively before reaching maturity at around five years old, perhaps purposefully exploring a variety of ranges before ultimately settling on a perennial summer and possibly winter range. We also know that many northern eagles vary the distances they travel south for the winter according to climatic conditions and prey availability at northern latitudes, often moving only as far as needed to find reliable winter food sources. In this regard, the shift from wintering in New Mexico to more recently wintering in South Dakota and Wyoming may reflect the influence of increasingly warm winters allowing eagles to remain farther north. In fact, although not true as far north as Montana and Alberta, passage rates of migrating eagles have mostly been dropping since the late 1990s farther south in Wellsville Mountains of northern Utah, the Goshute Mountains of northeastern Nevada, and in the Manzano Mountains, coincident with the onset of widespread drought and much of North America experiencing four of the five warmest winters recorded during the last century.

At the time of our last newsletter update in November 2005, we were tracking four additional eagles, two outfitted during fall 2004 and two during fall 2005. One of the 2004 birds, a young male outfitted at Commissary Ridge, Wyoming, unexpectedly ceased transmitting in January 2006 after he had spent the intervening 15 months wandering a little but mostly remaining in an area ranging from ~65-100 km (40-65 mi) south and southeast of the project site. Until recently, the other 2004 bird, another young male outfitted in the Goshute Mountains, had spent his time in two basic areas: the Raft River region of southern Idaho and northwestern Utah, and the Cache Valley and Bear River regions of north-central Utah. Then in May 2006, after returning from wintering in north-central Utah, he passed through the Raft River region again (where he had previously spent almost a full year) but continued west and then north up into the mountains of central Idaho, ultimately settling for most of June in the Wood River region just south of Sun Valley. We now await further data to see what other travels this bird pursues, but clearly he appears to be a "regional resident" rather than a long-distance migrant. Our tracking data have shown that this tends to be the case for birds we encounter in the Great Basin, whereas a much greater proportion of the birds we have encountered in the Rocky Mountains have been long-distance migrants from the far north.

One of the two eagles we outfitted during fall 2005, a

Continued on next page

hatch-year male captured at Bonney Butte, Oregon, also has now been revealed as a long-distance migrant from the north (Figure 2). After capture, this bird traveled southeast across the Great Basin and eventually wintered in western New Mexico. He then set off north again in late April 2006, retraced his fall path back up through Oregon, and then continued north up into western Canada. By early June, he had reached the Inuvik region in the northwest corner of the Yukon Territory, but then veered west and as of late June was located in the Arctic National Wildlife Refuge on the north slope of Alaska. In fact, his last location is within the very same area of the ANWR that the Bush administration would like to open up for oil and gas development! Tracking of young eagles from Denali National Park by colleague Carol McIntyre of the National Park Service has similarly shown that this region is an important late summer/fall range for Alaska eagles.

After release, our second 2005 eagle, a hatch-year female outfitted in the Manzano Mountains, headed north and traveled ~450 km (280 mi) up into southwestern Colorado, where she has remained ever since. Aside from a few wandering excursions, she spent most of the winter in the Dry Creek Basin region ~200 km (125 mi) northwest of Durango. More recently, in mid-May she moved down to near Sleeping Ute Mountain ~30 km (19 mi) southwest of Cortez in the far southwest corner of Colorado, and through late June had remained in this area. Thus, like the 2004 Goshute eagle discussed above, thus far it appears that this eagle is also a regional resident just exploring different local ranges, rather than a long-distance migrant.

Northern Goshawks

As of late June 2006, two of the four female goshawks that we outfitted during fall 2005 were still alive and transmitting effectively. Along with another Wyoming bird tracked from fall 2004 through June 2005, these two birds now represent the longest survival times and successful trackings we have achieved for goshawks since 1999. After release, the surviving Oregon bird, now in her second year, initially wandered back and forth east and west of the project site over about a 10 km (6 mi) stretch of terrain, but since late November 2005, she has occupied a range just southeast of Grasshopper Point ~6 km (4 mi) southeast of the project site. One of our 2005 Wyoming goshawks, a full adult female, initially traveled ~100 km (63 mi) north of the project site, but then returned south and from late October 2005 through mid-March 2006 she was located in northeastern Utah in the Cedarview area between Monarch and Roosevelt.

Unfortunately, since then we have received little useable location data, with the sensors indicating that this is because the transmitter battery is failing, a bit earlier than hoped but within the range of expected performance variation. Our second 2005 Wyoming goshawk, outfitted as a hatch-year bird, initially traveled north ~45 km (28 mi), but then turned south and ended up ~60 km (38 mi) south of the project site near an area called the Hogback, just N of I-80 and ~20 km (12 mi) east-northeast of Evanston, Wyoming. She remained in this area through early April 2006, then set off north again and ended up in the La Barge Creek area ~60 km (38 mi) northeast of the project site. She has remained in this basic area since then, occasionally wandering 20-30 km (12-19 mi) east or west.

Of 30 total goshawks tracked since 1999, the three longest surviving have all been tracked in the last two years (2 in WY, 1 in OR). Moreover, unlike for any of the other four project sites from which we have tracked goshawks (WA, OR, NV, and NM), all three of the birds we have tracked in Wyoming (all within the last two years) have survived until their transmitter batteries failed. One possible conclusion based on this record is that the chance of survival for goshawks is generally greater in western Wyoming than in other project regions. Alternatively, the majority of our tracking efforts have corresponded to a period of severe and widespread drought in the interior West, which almost assuredly substantially affected raptor productivity and survival of especially young raptors (most of the goshawks we have tracked have been first-year birds) in the region. In fact, anecdotal reports from various colleagues suggested that goshawk nesting activity and productivity, in particular, was very low across several project areas from Arizona to Idaho during the early 2000s as the drought intensified. Conversely, with a return of good winter snowpacks and spring rains across much of the northern Great Basin and central Rockies during the last two years, productivity has undoubtedly rebounded and, therefore, may be the primary reason why the survival of our more recent Wyoming birds has been markedly higher.

Deployment Plans for Fall 2006

If all goes well and trapping conditions cooperate, we expect to outfit eight more Golden Eagles and three Red-tailed Hawks during fall 2006. The eagles will be outfitted in Nevada, Wyoming, and New Mexico, and the Red-tailed Hawks in Wyoming. Successful deployment of transmitters on three Red-tailed Hawks at Commissary Ridge, Wyoming (the first at that site) will culminate our initial objectives for studying this species. Similarly, another new multi-site deployment of Golden Eagles will greatly improve our tracking samples sizes and breadth of coverage for this species, and largely round-out achievement of our initial sample size objectives for this species. Whether or not we continue to deploy additional transmitters on these or other species in future years will depend on funding and identification of additional research and/or educational interests.

Tracking summaries and maps for all of HWI's satellite-tracked raptors can be found at *http://www.hawkwatch.org/satelliteprogram.php*.

Questions from HWI Members

Answered by Adam Hutchins & Dr. Jeff Smith

Every so often, HWI members and other folks from around the country ask us to help them solve a problem, or answer a question they have in regard to birds of prey. We do our best to answer their questions and after having collected a group of these interesting Q&As, we thought we'd share them with all of our RaptorWatch readers. We want to thank those who take the time to ask these questions and encourage our readers to feel free to do the same.

Question:
This last year I had the occasion to drive near Eagle Lake close to Houston and there is one stretch of road that is a real killing field for hawks. On three trips spread over several months I saw at least 20 dead hawks on a 15-mile stretch of road and there must have been many more killed that I did not see. Also saw many live hawks, so this must be an exceptionally good area for raptors spending the winter in Texas. Is there anything that can be done about this?

Bill
Dripping Springs, TX

Broad-Winged Hawk

Answer:
First off, thank you for your interest in conserving birds of prey. Without knowing more about the particulars of the situation (for instance what kind of bird of prey, what the landscape is that surrounds this area, and what is attracting the birds here) I can merely suggest what might be happening and what may be helpful.

The cleared, mowed areas adjacent to roadways often have many small rodents, which make up the diet of many birds of prey. Many roadways also have abundant perches available to hungry Red-tailed Hawks, American Kestrels and other less common hawks and falcons that utilize fence posts and power-poles/line when hunting. In an open area with little else to perch on the hawks are attracted to the roadsides. In heavily wooded or thick brushy area the open strips along the road can attract hawks. With a grassy median this may seem like an ideal location for a hawk to hunt. Unfortunately, cars and (more problematic) trucks can make this a death trap. I have heard and suspect that most raptor kills occurring along the roadways happen when the birds try to fly up from the sides or median when they are scared by the passing traffic. The birds may be heavier because they are carrying a morsel or have a full crop. Younger birds especially may be susceptible to trying to lift off and get over a passing semi-truck and not making it because of less flight experience and skill. Ultimately, the best fix to this problem is making this stretch of roadway much less attractive to the birds. This can only be done by changing the major feature/s that draws them there, for instance; paving the grassy, rodent rich sides or middle or placing perch deterrents on the area power poles. I'm sure lowering the speed limit through this area wouldn't hurt either.

There are some local folks in the area that may be aware of the situation and if not, they may want to know more about it. The Gulf Coast Bird Observatory is a partner of HawkWatch International and is active in your area. You can contact them via their website. *www.gcbo.org/index.html* Thanks again for your interest in finding a solution.

Question:
Recently I was once again made aware of the rat poison issue concerning wild birds, pets, and other animals, which prey on poisoned rodents. We need to continue to encourage people to use alternative methods to deal with household rodent problems (blocking openings, not leaving pet food out, etc.).

I did not find anything on your websites, and wondered why. Could it be that you do not think this issue is so critical? I wish it were true, but from my experience it is indeed a problem. Thanks for listening, and any assistance you can provide will be greatly appreciated.

Tina
Cudjoe Key, FL

Answer:
Although there is little question that secondary poisoning of raptors can occur through eating poisoned rats (see for example http://www.hungryowl.org/rodenticide.html and several other sources that come up with a Google search on "rat poison and raptors"). As a small non-profit organization,

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Sandia Mountains:
Spring 2006 Raptor Migration Project Summary
By Mike Neal, Field Studies Coordinator

Our Sandia Mountains spring migration project started off warm and dry in 2006, with temperatures in the 70s the day the count was to begin on February 24th. The site was active with local visitors and volunteers showing support for HWI's 20-year anniversary, since incorporation.

Great Falcon Season

This year our observation team included Veracruz hawkwatcher, Alberto Martinez and newcomer Ingrid Verhoeckx, with regular support from 4-year veteran Observer Ken Babcock. The final tally included 3,709 migrants of 17 species, which is a non-significant 8% below the 1985-2005 average count for the site (see Table). Counts were significantly above average for Northern Harriers, Swainson's Hawks, Merlins, Prairie and Peregrine Falcons, whereas counts were significantly below average for only Northern Goshawks, Ferruginous Hawks, Bald Eagles, American Kestrels, and Merlins. No record counts were observed for any species. The low 2006 counts further accentuate a recent declining pattern for Ferruginous Hawks. In contrast, high counts in 2006 extended distinct increasing patterns for Swainson's Hawks and especially Peregrine Falcons. Highlights of the count season included great looks at many large falcons and four Zone-tailed Hawks.

Raptor Counts and Capture Totals in the Sandia Mountains

	Counts 1985-2005 Average	Counts 2006	Captures 1990-2004 Average	Captures 2006
Hours	538	621	315	366
Count/Captures per 100 hrs.	754	570	77	51
Species				
Turkey Vulture	1419	1151	-	-
Osprey	65	70	-	-
Northern Harrier	58	69	1	0
White-tailed Kite	<1	0	-	-
Mississippi Kite	<1	0	-	-
Sharp-shinned Hawk	508	540	48	31
Cooper's Hawk	772	677	164	141
Northern Goshawk	12	8	2	0
Unidentified accipiter	68	35	-	-
Broad-winged Hawk	6	5	<1	0
Swainson's Hawk	54	68	<1	0
Red-tailed Hawk	348	296	8	4
Ferruginous Hawk	12	6	-	-
Rough-legged Hawk	<1	0	-	-
Zone-tailed Hawk	2.3	4	<1	0
Unidentified buteo	11	20	-	-
Golden Eagle	366	351	-	-
Bald Eagle	15	7	-	-
Unidentified eagle	<1	0	-	-
American Kestrel	205	181	7	4
Merlin	10	22	1	0
Prairie Falcon	24	47	2	0
Peregrine Falcon	42	97	2	5
Aplomado Falcon	<1	0	-	-
Unidentified falcon	2	3	-	-
Unidentified raptor	432	9	-	-
Total	**4047**	**3709**	**234**	**185**
Recaptures[1]	-	-	2	0
Foreign recaptures[2]	-	-	1	1

[1] Birds originally banded and later recaptured in the Sandia Mountains.

[2] Birds originally banded elsewhere and later recaptured in the Sandia Mountains.

Long-term trends in passage rates (birds counted per 100 hours of observation) of Turkey Vultures, Ospreys, Cooper's Hawks, Broad-winged Hawks, Ferruginous Hawks, and Merlins show a similar pattern of increasing trends between the mid-1980s and mid-1990s followed by stabilizing or more commonly decreasing patterns since the late 1990s. This pattern is common across HWI's western monitoring network, with the recent declines likely reflecting the effects of the widespread drought that began to plague much of the interior West after 1998. In contrast, passage rates of Peregrine Falcons continue to increase steadily at most HWI sites, reflecting maintenance of a strong recovery pattern for this once endangered species.

Low Flight Volume and Variable Winds Produce Low Capture Total

The variable winds throughout the season created challenges for veteran HWI Banders Aran Meyer and Wyatt Nimitz, but their efforts were quickly rewarded with some nice Peregrine Falcon captures. The unusual variation in the wind patterns, made it more difficult to attract migrants down to the trapping arena. Similar to the count, the final capture tally of 185 birds of five species was a non-

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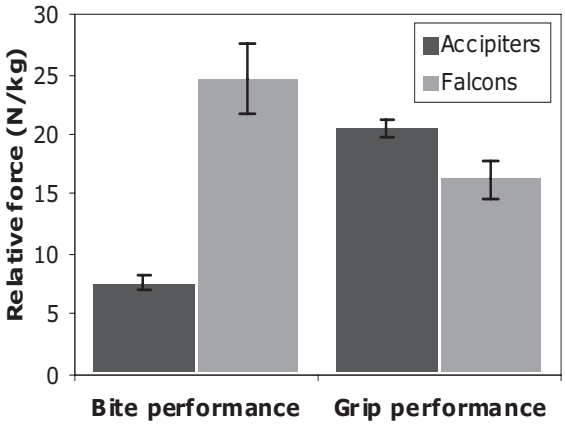
Bite & Grip Force Study (Continued)

HWI crew members, and just prior to their release, we induced them to bite and grasp modified load cells to measure their strength in Newtons (the standard metric unit of force [N]; see apparatus illustration on page 1). Thanks to their hard work (and to a weather system that pushed a rush of raptors through ahead of it in a period of just a few days) we obtained valuable data on 22 Cooper's Hawks, 23 Sharp-shinned Hawks, 2 Peregrine Falcons, and 2 American Kestrels to round out our existing dataset.

As expected, accipiters displayed much stronger grip forces than bite forces, and falcons tended to bite harder than they gripped. Maximum bite force averaged around 2 N and 8 N for accipiters and falcons, respectively (species and sexes combined), whereas maximum grip force averaged



Preliminary results of bite and grip forces (divided by body mass), from 52 accipiters (Sharp-shinned and Cooper's Hawks combined) and 19 falcons (including American Kestrels, Merlins, Peregrine, and Prairie Falcons).

around 5 N for both. These forces might seem rather low, particularly in light of the fact that one Newton amounts to a little less than a quarter of a pound of force. However, keep in mind that the raptors measured for this study averaged 0.27 kg (0.6 lbs; accipiters) and 0.38 kg (0.8 lbs; falcons) in weight. Just to provide a little perspective, maximum human bite and grip forces average around 368 N and 390 N, respectively, for an average body weight of 69 kg (152 lbs; sexes combined). Roughly speaking, this means that falcons bite, and accipiters grip, with a force equivalent to about twice their body weight, whereas, on average, human maximum bite and grip forces equate to about half our body weight. Furthermore, these measurements disregard the amount of force specifically concentrated at the tips of the raptor's talons and beaks, which given their sharpness, wouldn't need to be that much.

Preliminary analyses on captive, rehabilitation, and wild-caught raptors indicate that both bite and grip forces increase proportionately with increased body mass. Smaller raptors produce roughly the same amount of force relative to their body sizes as do larger raptors, which may have implications for prey size selection among species. Pound for pound, falcons performed stronger bites than accipiters, and conversely accipiters performed stronger grip forces than falcons. Anatomically-derived estimates of force capacity correctly predicted the observed differences in patterns of actual force production of falcons and accipiters. However, actual forces generated by live birds were generally lower than those predicted by the anatomy, suggesting that the biomechanical models need refinement, or that this method of measuring force may not elicit maximum bite and grip forces in live raptors. It is also possible that raptors generally use less force than they are capable of generating.

Thus far, these data reflect important differences in the characteristics that underlie accipiter and falcon predatory modes. The substantially stronger bite forces performed by falcons reflect greater reliance on their beaks for killing prey, and the relatively stronger grip forces performed by accipiters reflect greater reliance on their feet. Differences in grip strength were not as pronounced, however, suggesting that falcons may also have the power to kill prey with their feet as do accipiters, but instead tend to rely more on their powerful jaws. We intend to gather more data from other HWI sites in the coming year, both to augment our sample sizes and geographic representation, as well as to address other factors, such as how preferences for different types of prey might affect predatory and feeding performance.

Performance analyses have been widely employed for understanding the adaptive significance of a particular design. They have also been used to explain resource partitioning among species and for identifying patterns of evolutionary diversification. For example, studies on other raptors have suggested that differences in jaw and hind-limb force production allow for a certain degree of prey specialization, which may ultimately allow certain raptors to inhabit the same areas and avoid competition for resources. This study uniquely integrates field performance data with anatomical data for a better understanding of how accipiters and falcons are differentially adapted for their particular foraging modes, which ultimately lends important insight into their ecology and natural history.

Teachers' Corner: Being a Science Hero

By Jennifer Hajj, Education Director

"That's an agouti," the child in front of me points to a picture of a fuzzy, long-legged rodent on the classroom wall. They're one of just two animals in the world that can open a Brazil nut." I listen, fascinated, as he goes on to describe how Brazil nuts fortify themselves against the claws and teeth of predators, and how the agouti manages to get the thumb-sized nut out."Where did you learn all of this?"
"My teacher did research in the rainforest." He starts to gush about the things his teacher did, with great admiration.

In a world where interest in science seems to be waning, education institutions and government officials are scrambling for solutions. Many entities wish us to nurture a greater interest in science, but how? One solution may be to provide Science Heroes, or role models, in children's lives. Children readily accept role models, chosen from their environments. Parents, teachers, celebrities, actors, athletes and musicians are often high on the list of the heroes selected by children, who then weave these personalities into their fantasies and play.

mod·el (mŏd`l) n.
One serving as an example to be imitated or compared.

But, there's a problem. Most kids have no idea that scientists are cool. You don't see kids inventing elaborate games involving string theory, or aspiring to be like Niels Bohr or Jeff Smith. Many don't even have a good grasp of what scientists do. Ask your students to draw a picture of a scientist at work and see what they produce. You'll most likely end up with a stack of drawings of a nerdy guy in big glasses, wearing a lab coat and holding a beaker or a test tube. Perhaps scientists are not chosen as role models for several reasons: because we don't know what they do, and we don't see them at work.

What do scientists do? They employ the scientific method, systematically seeking the answers to important questions like "why" or "how." They observe a phenomenon or problem, research what is already known about it, create a possible solution and then test it in a controlled manner to see if they are correct. Then, they share their results with the community at large. This work is done in a variety of settings, because we have questions about all sorts of things. That's why we have biologists, ecologists, chemists, anthropologists, and many other -ologists in the realm of science.

What science needs is a down-to-earth spokesperson, someone that kids know, trust and relate to. As a teacher, you are in a great position to bring science into the mainstream for your students. You can bring scientists into your classroom as guest speakers, or show your students the results of different types of scientific work. Or, you can be a Science Hero yourself. You don't need to be educated at MIT to be a Science Hero. All you need to do is incorporate the practice of science into your day-to-day life, and share your results with your community: your students. Through your experiences, you become a role model for your students, bringing science into the real world where it becomes tangible. These kinds of "science appreciation" activities can open the door to an interest in science. It is important to note, however, that science appreciation is not the same thing as science skill. As a teacher, your job is not only to engage, but also to help your students explore, understand and apply the concepts. Being a Science Hero is but a step towards effective science education. The next step is to teach your students to use the scientific method, generating their own understanding of the world around them.

Sources: www.dictionary.com

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***Hawk*WATCH INTERNATIONAL** is offering an **Ecotour for Teachers** where you can meet some of our favorite Science Heros -- migration researchers! We hope you'll take the opportunity to experience and participate in our research with diurnal and nocturnal raptors, first hand. Four 2-day trips are available: Sept 9-10, Sept 16-17, Sept 18-19 and Oct 8-9. Five slots are available for each trip.

Transportation to the Goshute Mountain migration study site from Salt Lake City, food and tent are supplied, at a cost of $175 per person. The **cost also includes a live bird program, presented in your classroom in the coming school year**, to help you bring your experience of raptor migration research closer to your students.

For more information or to register, call the **Education Department at (801)484-6808 ext 107**. This ecotour features a steep hike and overnight camping at a remote campsite. Participants must be in good physical condition. Continuing education credit cannot be offered at this time.

Ask ***Hawk*WATCH International Education** to host a presentation for a community group or at your child's school. You can also DONATE to SPONSOR A SCHOOL! For more information visit the HWI website, www.hawkwatch.org or call our Education Department at (801)484-6808 x106.

HWI Contracted to Coordinate Two Raptor Research Projects

By Steven Slater, Conservation Scientist

HawkWatch International (HWI) was recently contracted by the Bureau of Land Management (BLM) to carry out two topical raptor research projects. While HWI has clearly had an impressive history in the field of migration research and monitoring (see the Spring 2006 RaptorWatch newsletter), these projects provide us with the opportunity to continue expanding our research focus into other areas of significance to raptor management and conservation. These projects also capitalize on the skills and applied research nature of the recently redefined Conservation Science Department.

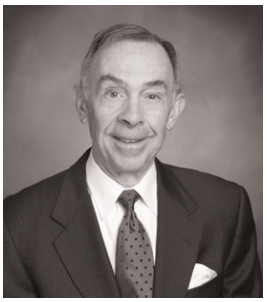
The first project, dubbed the "Raptor Perch Deterrent Study", is funded through the Kemmerer (Wyoming) BLM Field Office. The object of the study is to determine the ability of anti-perching devices to deter raptors from utilizing power line structures (i.e., support frame crossarms) associated with a newly installed transmission line in southwestern Wyoming. Generally, anti-perching devices or perch guards are used to reduce the likelihood of raptor electrocutions by deterring their use of particularly dangerous areas on power line structures. However, we will investigate their ability to render entire structures unavailable to perching raptors. In largely treeless areas, such as the sagebrush steppe, power line structures have the potential to provide hunting perches (and nest sites) where they were previously of limited availability. Although these human-created opportunities may provide some benefits to raptors, they may also lead to problems for other members of the sagebrush community. For example, some biologists have suggested power lines and associated structures have brought about increased predation pressure on Greater Sage-Grouse by Golden Eagles, especially near spring breeding grounds, or "leks", where the grouse congregate in large numbers. However, the ability of power line structures to alter the relationship between raptors and other species is largely speculative at this point. Regardless, the pervasiveness of power lines in the West (over 200,000 miles of high-voltage transmission lines alone) underscore the potential importance of this research. Fieldwork is scheduled to begin this September and continue through July of 2007. During this time, we will monitor raptor use of both the new power line and a nearby "control" line that lacks perch deterrents. We are particularly interested in documenting hunting behavior associated with the power lines and structures, to gain insight into the potential impact these human artifacts have (via raptors) on other wildlife species of the sagebrush ecosystem.

Red-tailed Hawk perching on a power pole.

The second project, or "Raptor Radii Study", is funded by a 3-year grant from the Department of Energy and administered by the Utah State Office of the BLM. The goal of this two-phase project is to further our understanding of the spatial and temporal extents at which gas and oil development activities negatively impact nesting raptors. Although general protection guidelines currently exist to buffer nesting raptors from disturbance on public lands, their applicability to individual raptor species and specifically in relation to gas and oil activities is not adequately understood. The clear importance of this research is again underscored by the widespread occurrence of such development activities in the West, but also by the high likelihood of their expansion in the future (a major focus of the Energy Policy Act of 2005 is increased domestic production of gas and oil). We are currently well underway with the first phase of this project: using historic raptor nesting data supplied by the Price (Utah) and Rawlins (Wyoming) BLM Field Offices to investigate the relationship between raptor nests and past gas and oil development activities. What we learn from this first phase will be used to guide us into the second phase of the project, in which we plan to conduct more rigorously controlled field investigations in Colorado, Utah, and Wyoming in 2007 and 2008. Presently, lands managed by the Meeker (Colorado), Price (Utah), and Rawlins (Wyoming) Field Offices are likely study areas, but we are also investigating study area possibilities near Vernal (Utah) and in the Power River Basin (Wyoming). Fieldwork will be conducted from February or March through July of each year to cover the majority of the nesting season. We will keep you informed of major developments in relation to these research projects in future newsletters.

New Staff, Board & Interns

John Witmer
Board Member



John works as the senior trust relationship manager in the Salt Lake City office of the US Bank Private Client Group. His previous position was director of planned giving for the American Cancer Society for Utah and Nevada. He is active in community affairs, having served over the years as trustee of the Bridgeport, Conn. Symphony Orchestra, trustee and treasurer of the Las Vegas Philharmonic, trustee and treasurer of the Liberace Foundation for the Performing Arts, president of the Las Vegas Planned Giving Roundtable, trustee of the American Cancer Society Great West Division, Inc., and trustee of the Oklahoma City Art Museum. John received a B.A. degree in Business Administration from Franklin & Marshall College, Lancaster, Penna., and holds an MBA degree from Widener University. Through the years, John has become increasingly concerned about the environment. He understands that monitoring the migration of raptors is a key way to measure our progress in protecting that which is vital to our long term well being.

Cathy Lambourne
Board Member

Cathy is a native Utahn and has done technical marketing in the electronic components industry for the last 25 years. She learned her love of the natural world from her dad who raised her family with a reverence for wild places. She has strived to instill the same values in her children and now her grandchildren. After receiving binoculars and a field guide as a birthday gift from her husband, and later attending a field trip with HWI founder Steve Hoffman, she and her son Anthony became intrigued by birds of prey. She has volunteered at Tracy Aviary as a bird handler and environmental educator. She also volunteers for the BLM on the RINS Project, doing raptor nest surveys in Utah's West Desert. She houses Calurus, the beautiful Red Tail hawk that HWI uses for education. She and her husband recently moved their family to Francis, a small town near The Uinta Wilderness. They are really enjoying hiking around that beautiful area with their dog Lulu. Cathy is pleased to have been given an opportunity to serve on the HWI Board.

Laura Kohn
Education Intern

Double majoring in Zoology and Animal Ecology, Laura received her Bachelor of Science from Iowa State University. Born and raised in Iowa, she grew up on a dairy farm and expanded to working with raptors once she reached college. Laura spent 3 years working with staff and veterinarians at the Wildlife Care Clinic in Iowa State's College of Veterinary Medicine. This non-profit rehabilitation facility is the home to 6 educational raptors. Nearly 600 patients, including approximately 70 different species, pass through in a year. With wildlife medicine and education being Laura's primary background, she's excited to be part of HawkWatch International and looks forward to the adventures and many opportunities that lie ahead. In her spare time she enjoys exploring Salt Lake City, working with the raptors, and reading. Her goals before leaving Utah in May include hawk trapping for HWI, hiking, and skiing.

Steve Slater
Conservation Scientist

Steve is originally from Michigan and received his bachelor's degree in Fisheries and Wildlife from Michigan State University in 1999. Before joining the HWI staff in June 2006, Steve spent 6 years in Wyoming, where he obtained his master's and doctoral degrees in Zoology and Physiology from the University of Wyoming. His master's thesis was on greater sage-grouse use of prescribed and wild burns and was completed in 2003. Steve obtained his doctoral degree in 2006 and wrote his dissertation on issues of scale and bird community responses to riparian cottonwood declines, Russian-olive invasion, and landscape alteration. Steve has had a life-long interest in birds of all kinds and enjoys bird watching, digital photography, hiking, backpacking, snowshoeing, flyfishing, and snowboarding.

Director's Letter (Continued)

Three of our Trustees came to the end of their two consecutive three year terms at the end of June. Yae Bryner, Joan Degiorgio, and Frank Howe all played an integral role in HWI's success during their years of volunteer service and we applaud their contributions.

We are also delighted to introduce several new Trustees who bring a diverse suite of skills and experience to HWI's Board. We extend a hearty welcome to Cathy Lambourne, Kate Grandison, Gary Crandall, John Witmer, Barbara Middleton, and Andy White. It is interesting to note that Cathy Lambourne has been one of our bird care volunteers for many years while Andy White worked with Steve Hoffman in the Goshute Mountains well before HWI was established.

In the midst of transition and as HWI continues to mark its 20th anniversary as a non-profit organization, we hope you will join us by renewing your support. Please consider volunteering with us, visiting one of our field sites in the fall, or host an education program for your school or community group. Also, stay tuned for emerging details on a celebratory 20th Anniversary bash in mid-November.

Eyes to the Skies,

Thom Benedict

HawkWatch International Wants Your Used Ink Cartridges!

Do you have empty inkjet or toner cartridges from your printers at home or work? If so, please help us raise additional funds for the Education Department at HawkWatch International. Simply collect the empty inkjet or toner cartridges and drop them off at the office in Salt Lake City. You may also pick up pre-paid envelopes from the office to mail inkjet cartridges at your convenience. Your cartridges will be recycled and you will be supporting HWI education programs. If you have any questions, please feel free to contact the Education Department, at interns@hawkwatch.org or by calling the HawkWatch office, 801-484-6808 ext. 106.

Have You Been Recieving HWI's New E-Newsletter?

Sign-up Today to Receive Monthly Editions of *Raptor Update* for FREE!

HawkWatch International
Two Decades & Counting

Raptor Update

MISSION
To monitor and protect hawks, eagles, other birds of prey and their environments through research, education and conservation.

Dear HawkWatch International Member,

As HawkWatch International embarks upon our 20th year, we are excited to share our new e-newsletter, *Raptor Update*. We hope you enjoy receiving these monthly updates about HWI news, events, publications, accomplishments, and more.

Eyes to the Skies!

To Subscribe ~ Email enews@hawkwatch.org and type "Subscribe" in the subject line. Let us know what you think! Do you have suggestions for what you'd like to see in upcoming issues? If so, email Emilie at eturner@hawkwatch.org

Member Q & A (Continued)

we simply do not have the resources to address every conservation issue that applies to our species of interest. This topic simply is not one that we have endeavored to address. There are just too many "serious" issues for one small organization to deal with. Our focus is on long-term migration monitoring and associated research, long-term nesting surveys and evaluating effects of habitat change and human land-use practices, and most recently addressing several other major issues for raptors like power-line electrocutions, effects of oil and gas development on nesting raptors, and lead poisoning from discarded fishing tackle and ammunition. Our education department, in pursuing a vibrant classroom and community education program, also routinely addresses issues such as misguided persecution of raptors by ranchers and promoting the value of raptors as integrated pest managers, a variety of contaminants-related issues, and a broad range of the many other problems that face raptors in dealing with our human activities. So, we do our best to address as many important issues as we can, given our limited resources, but we cannot effectively cover all possible topics.

Question:
Our backyard has been visited by a Broadwing and a Cooper. Yes, we have two bird feeders. Our birds that feed have numerous places to seek refuge. We'd be interested in feeding the hawks but don't know how to go about it. Any suggestions as to where we might find some information?

Dwight
Cincinnati, Ohio

Answer:
The species you mentioned, Broad-winged Hawks and Cooper's Hawks, as well as Sharp-shinned Hawks, are apt at catching live birds in wooded habitats and are commonly seen in eastern suburban areas. These species fixate and feed exclusively on live prey. The accipiter species, Cooper's Hawk and Sharp-shinned Hawk, feed nearly exclusively on passerines (smaller perching birds). If the birds are frequently visiting your backyard there is a good chance they are foraging on the birds attracted to your feeders. If the hawks are infrequent visitors, odds are they are attracted by the feeder birds but haven't been successful in foraging attempts.

If your aim is to attract hawks I would suggest moving the feeders to more open areas, further away from cover, or thinning vegetation in which the feeder birds are taking cover. If the hawks are able to catch a few birds they will be more inclined to remain in the area. Ultimately, you may be fortunate enough to have a local raptor family.

If your aim is to preserve your feeder birds from possible predation by feeding the hawks an alternative food; I don't know of any way to do that. The hawks are going to focus on the congregation of feeder birds and attempt to opportunistically take what they can.

If you're concerned that the hawks may be taking an excessive number of the feeder birds and want to dissuade this, simply remove the feeder for a while. As the number of area birds diminishes so will the attraction for the hawks, or provide the feeder birds with even more cover, the hawks may still visit but the duration of there stay will be much less if they are not successful in hunting. I hope I have been helpful and best of luck with your backyard birds and visiting hawks.

Question:
I would appreciate your advice on perhaps, the feeding pattern of hawks so I could avoid the time of day they usually feed or anything else that you could suggest that I might do to protect two little Chihuahuas that I own. I take them out when I am working in my back yard and was considering a pet door. Well, after watching a hawk circle the area this morning (before noon), I started rethinking a pet door and decided to turn to people that might help me with their knowledge.

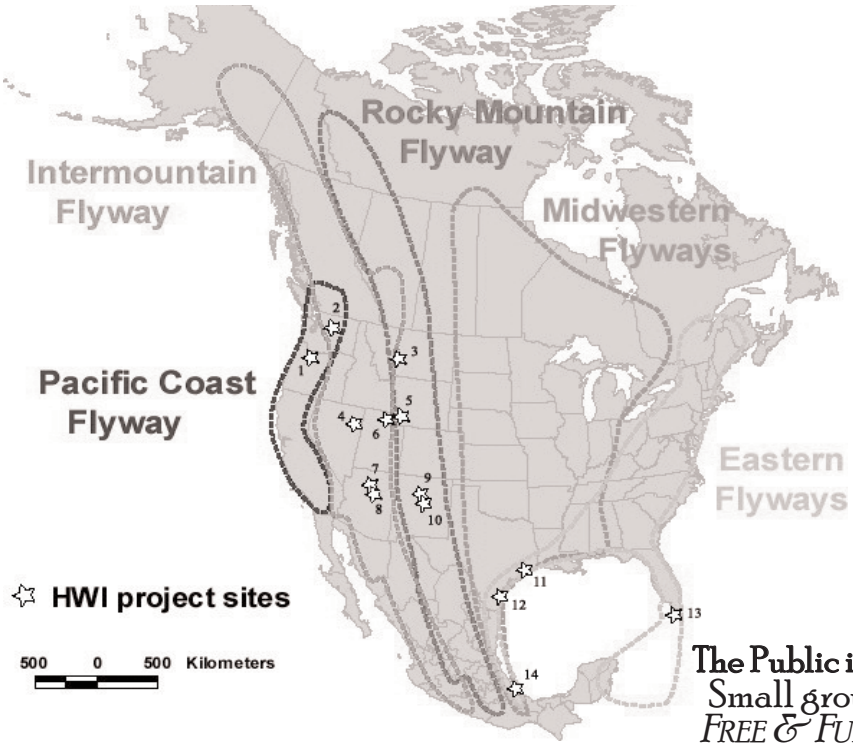
Pat
Florida

Answer:
The feeding pattern for birds of prey can be round the clock. While most diurnal birds of prey, day feeding hawks, eagles and falcons, hunt mainly in the mid morning and late afternoon, a hungry bird will hunt anytime that food is available. Owls are active most of the night and can be as much or more of a danger to smaller dogs. I can't recommend the dog door leading to an open area, but a dog door leading to an enclosure (top and sides) can protect your dogs from predators when they are outside unaccompanied.

For your information, HawkWatch International conducts a fall migration site in the Florida Keys every fall, daily September 15th through November 15th, just outside Marathon. The public is welcome to visit, no charge, as we count migrant falcons, hawks and eagles funneling in from the northeast and heading south over the Gulf. We have an on site educator to answer questions and talk about the birds flying by. If you're interested, the directions to the site are on our website, *www.hawkwatch.org*.

The 2006 Fall Raptor Migration Season is Here

NEW! View & Print Our Migration Site Brochures Online



Sites	Dates of Operation
1.*Bonney Butte, OR	Aug 27th-Oct 31st
2.*Chelan Ridge, WA	Aug 23rd-Oct 27th
3. Bridger Mountain, MT	Aug 27th-Oct 31st
4.*Goshute Mountains, NV	Aug 15th-Nov 5th
5.*Commisary Ridge, WY	Aug 27th-Oct 31st
6. Wellsville Mountains, UT	Aug 27th-Oct 31st
7.*Yaki Pt, Grand Canyon, AZ	Aug 27th-Nov 5th
8.*Lipan Pt, Grand Canyon, AZ	Aug 27th-Nov 5th
9.*Sandias Mountains, NM	Feb 24th-May 5th
10.*Manzano Mountains, NM	Aug 27th-Nov 5th
11. Smith Point, TX	Aug 15-Nov 15th
12.*Corpus Christi, TX	Aug 15-Nov 15th
13.*Florida Keys, FL	Sept 15th-Nov 7th
14.*Veracruz, Mexico	Aug 20th-Nov 20th

***FREE educational presentations are available**

The Public is Welcome at all HWI Raptor Migration Sites!
Small groups, families, and scout troops are welcome.
FREE & FUN. Visit www.hawkwatch.org for more info.

Sandia Mountains 2006 (Continued)

significant 21% below the 1990-2004 average (see Table). The captures included one previously banded male Cooper's Hawk, which was originally banded as a hatch-year bird in 2003 at HWI's fall-migration site in the nearby Manzano Mountains. This is the 43rd exchange of banded birds between the two sites since 1990.

Visitation and Public Outreach Strong for 20 year Anniversary

HWI celebrated its 20th year since incorporation in 2006 and special events were planned around the spring migration at the Sandias. A total of 481 individuals signed the site visitor log during the season, excluding numerous within-season returnees. Visitors included a variety of organized groups chaperoned by experienced Field Site Educator, Devon Batley, while Jennifer Good served as our Albuquerque-area Community Educator. Many of the groups that visited the site this season had previously participated in classroom or other community programs that Jennifer hosted in town. After learning about raptor ecology and conservation through classroom presentations, many students in particular derive great benefit from a follow-up visit to the project site where they can experience live, wild raptors up close and personal before our banders release the birds to continue their migratory journey. Such experiences frequently galvanize the interest of young students to continue studying and appreciating raptors, ultimately contributing to development of a life-long passion for conservation. Aside from continuing a typical array of classroom and other community programs, this year HWI provided a series of raptor identification and ecology presentations in Albuquerque, called "Hawk Talks," which resulted in four new visitors to the site.

Primary financial support for the Sandia Mountains Raptor Migration Project is provided by: USDA Forest Service; Cibola National Forest and Southwestern Region; the U. S. Fish and Wildlife Service, Region 2; Albuquerque Community Foundation; Intel Corporation; Public Service Company of New Mexico; New Belgium Brewing Company; Forgemaster Iron, Inc.; and HWI private donors and members.

THANKS TO OUR SUPPORTERS

HawkWatch International thanks the following corporations, foundations, government agencies and organizations for their generous contributions to our mission of monitoring and protecting raptors and our environment during the past year.

Foundations
Albuquerque Community Foundation
Community Foundation of Northcentral Washington
Earth Friends Wildlife Foundation
George S. and Dolores Doré Eccles Foundation
Fanwood Foundation
Fledgling Fund
The Houston Endowment
JEPS Foundation
Jones Family Charitable Trust
Laird Norton Family Fund
Magnolia Charitable Trust
National Fish & Wildlife Foundation
Oregon Parks Foundation
Pasadena Community Foundation
Public Service Company of NM
Schaffner Family Foundation
Temper of the Times Foundation
Walbridge Fund
Wal-Mart Foundation

Government Agencies
Cibola National Forest
Florida Fish and Wildlife Conservation Commission
Gallatin National Forest
Mt. Hood National Forest
Okanogan and Wenatchee National Forests
Sawtooth National Forest
Signals of Spring
Texas Parks and Wildlife
USDA Forest Service, Region 3
USDI Bureau of Land Management - Elko, Kemmerer & Salt Lake Field Offices
USDI Fish and Wildlife Service, Region 2
Utah Division of Wildlife Resources
Washington Department of Fish & Wildlife

Non-profit Organizations
Audubon Outdoor Club of Corpus Christi
Audubon Society of New Mexico
Central NM Audubon Society
Kittitas Audubon Society
Florida Keys Audubon Society
Grand Canyon Association
Gulf Coast Bird Observatory
New Mexico Museum of Natural History
Portland Audubon Society
Ten Thousand Villages
United Way of Salt Lake
Vancouver Audubon Society

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Patagonia Outlet - SLC
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Salt Lake Roasting Company
Sam's Club - SLC & ABQ
Swarovski Optik
Wells Fargo Bank
Wendover Nuggett
Whole Foods
Wild Bird Center
Wild Oats
XMission

If we have left off the name of your business in error, please let us know, and we will include you in the next edition of RaptorWatch.

Merlin. Photo by Gerard Phillips

THANKS TO OUR VOLUNTEERS

HWI gratefully acknowledges the following office, education and fundraising volunteers for helping us during the past six months:

New Mexico Volunteers
Elizabeth Aaron
John and Chris Acklen
Art Arenholz
Ken Babcock
Seamus Breslyn
Gregg Daniels
Bill Dory
Geoff Evans
Helen Haskell
Marion Ingalls
Shari Johnson
Melanie Keithley
Claire Lamos
Kaisa Lappalainen
Walt and Jennifer Lehman
Peter Neils and Sue Chavez
Sid Price
Lynn Schuler
Cheryl Senitz
Alice Sickels
Laura Simmons
John and Judy Sturtevant
Jason Waughtel

Utah Volunteers:
Ian Anderson
Myron Barrett
Jason Bjork
Laurie Conlon
Lisa Duran
Jehad Hyer
Dan Jorgensen
Cathy Lambourne
Jerry Liguori
Sherry Liguori
Jill Owen
Jennifer Speers
Mike Tallon
Brescia Tucker
Darrick Worsley

ADOPT-A-HAWK!

Sponsor a wild raptor banded at a HWI migration site in the United States and released to continue on its migration journey. Choose from nine different species including Flammulated Owls and Golden Eagles! Each spring and fall during raptor migration, our field crews harmlessly trap and band thousands of birds of prey as they travel through migration flyways. Recovered bands help researchers learn more about raptor migration, population health and conservation needs. Data help determine overall environmental vitality, which affects humans as well as raptors.

The proceeds from the Adopt-a-Hawk program contribute to our science, education and conservation efforts. **Adopt-a-Hawk makes a great gift!**

Your symbolic sponsorship includes:
- Certificate with adopter's name, color photo of selected species, individual band number and biological information for the specific raptor
- Fact sheet about adopted species
- One-year membership in HWI, including our quarterly *RaptorWatch* newsletter.

Species Available For Adoption

$35	**Sharp-shinned Hawk**			**Red-tailed Hawk**	**$75**
$40	**Merlin**			**Northern Goshawk**	**$100**
$50	**Cooper's Hawk**			**Golden Eagle**	**$150**
$65	**American Kestrel**			**Peregrine Falcon**	**$250**
$60	**Flammulated Owl**			**Satellite Telemetry Raptor**	**$750**

Have your certificate framed for an additional $10. Adoptions of $100 or more are framed FREE. Contact HWI at 800-726-HAWK (4295) to begin your sponsorship, or visit www.hawkwatch.org to complete your order and payment online!

YES! I Want To Join HawkWatch International!

Name _____ Address _____

Phone(s) _____ City _____

E-Mail _____ State/Zip _____

Enclosed is my Membership or Adopt-A-Hawk Donation: ❑ Adopt-A-Hawk Species: _____

❑ $20 Student/Senior ❑ $35 – $99 Sustaining ❑ $100 – $499 Falcon Club

❑ $100 Business Membership ❑ $500 – $1,000+ Eagle Club ❑ $_____ Other

I prefer to charge my Credit Card: (Credit card payments are welcome, but checks let us avoid credit card fees, and are preferred)

❑ MasterCard ❑ Visa ❑ American Express ❑ Discover

Card # _____ Security Code _____ Exp Date _____

Signature _____ **TOTAL: $_____**

Return this form with contribution to: HawkWatch International • 1800 S. West Temple, Suite 226 • Salt Lake City, Utah 84115
You can also complete a Membership or Adopt-A-Hawk application and payment online: www.hawkwatch.org

Letter from a HWI Member

Dear HawkWatch International,

Isaac at HWI s Bonney Butte Raptor Migration Site, getting a close-up view of a Sharp-shinned Hawk before releasing it back into the wild.

I am very much pleased with joining your organization. I'm 10 years old, and I love birds. I've liked birds since I was 4. Every year my family and I go up to Bonney Butte for the annual hawk watch. They have lots of different kinds of birds, even some I haven't seen before: Merlins, Cooper's Hawks, Sharpies, Golden Eagles and more. I even got to release a Sharp-shinned Hawk by myself! We got to see many birds released, including one very angry, mad male goshawk, which I thought was pretty cool. The money for my membership came from selling crafts in my neighborhood. I wanted the money to go to wildlife conservation to help protect wildlife. My membership to HawkWatch International is very special to me. It will be a great chance for me to learn new things about the secret and wonderful life of raptors. Thank you for inviting me as a member!

Your friend and future member,

Isaac Winn
Portland, OR

*Raptor*WATCH

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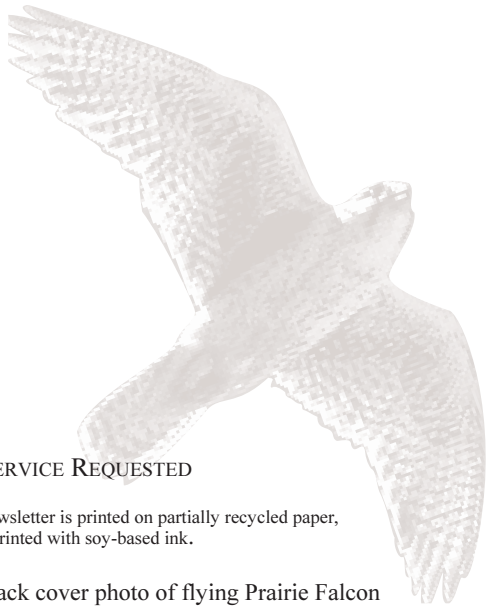

RETURN SERVICE REQUESTED

This newsletter is printed on partially recycled paper, and is printed with soy-based ink.

Front and back cover photo of flying Prairie Falcon by Brian K. Wheeler