INTERNATIONAL WILDLIFE REHABILITATION COUNCIL

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# JOURNAL OF WILDLIFE REHABILITATION









## IN THIS ISSUE...

**The Exotics Dilemma ... Imping and Rehabilitation of a Long-Legged Buzzard ... Creating Effective Public Displays ... Finding Funding for Your Education Efforts ... Success Story: The Case of One Robin's Release ... Conservation Classics ... Book Reviews, Selected Abstracts, and More**



## ABOUT THE JOURNAL . . .

THE JOURNAL OF WILDLIFE REHABILITATION is designed to provide useful information to wildlife rehabilitators and others involved in the care and treatment of native wild species, with the ultimate purpose of returning them to the wild. The *Journal* is published by the International Wildlife Rehabilitation Council (IWRC), which invites your comments on this edition. Through this quarterly publication, rehabilitation courses offered in numerous locations, and an annual conference, IWRC works to disseminate information and improve the quality of care provided to wildlife.

ON THE COVER: Canada geese [photos: Roy David Farris]; a healthy raccoon [photo: Jim Isaacs]; an injured long-legged buzzard [photo: Edwin W. A. M. Vaassen]; an American robin [illustration ©1985 Pat Oldham]. BELOW: Miko, a weak, overweight, and constipated former "pet" raccoon, arrived at the Hellenic Wildlife Hospital (HWH) in Aegina, Greece [photo: Philip Dragoumis].



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# WILDLIFE REHABILITATION

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EDITORIAL

# What Is Wildlife Rehabilitation?

"When we try to pick out anything by itself, we find it hitched to everything else in the Universe." Nearly a century after John Muir wrote these words in 1911, those of us engaged in the conservation work he pioneered are still learning the breadth of their application.

IWRC's mission is "conserving and protecting wildlife and habitat through wildlife rehabilitation." The rehabilitators who comprise this organization share these goals. We strive to provide quality care to our charges—but how else do we conserve and protect wildlife?

How do we convince others of the importance of wildlife issues? Human beings influence every form of life on this planet, directly or indirectly, for good or ill. An overwhelming proportion of the animals treated by wildlife rehabilitators have suffered from their encounters with the trappings of our civilization: cars, guns, cell towers, pesticides, urban sprawl. Every single animal we see is the result of some kind of human intervention. Unless we also educate the public about wildlife issues, our efforts on behalf of individual animals are futile. Education is a key component of wildlife rehabilitation.

How do we finance our efforts to return our charges to the wild? Someday, perhaps, wildlife rehabilitation centers will be integral to every society, and their budgets will reflect every citizen's desire to support the needs of wildlife. Until that day arrives, we must appeal to the citizenry directly for support. Fundraising is a key component of wildlife rehabilitation.

Given that one of the greatest threats to wildlife around the globe—indeed, the principal cause of extinction—is habitat loss, where will we release our charges? What will we have accomplished if we fail to protect the wild places to which our charges must return? Conservation advocacy is a key component of wildlife rehabilitation.

Wildlife rehabilitation is the health provider, the caregiver. It is also the educator, the fundraiser, the advocate. Often it is all of these things rolled into one person.

This work we've undertaken requires a lot of hands. Hands to prepare the formula, feed the orphans, nurture the injured, wash the dishes, build the cages, clean the cages, stuff the envelopes, manage the phones and rally public support for sound policy making. The people who recruit and train volunteers are important to wildlife rehabilitation, as are those who handle other administrative duties; those who work with regulatory agencies and within them; those who work in the health and biology professions, or in environmental and conservation groups. Without all these people working together—albeit at times indirectly—in the long run, there would be no individual wildlife caregiving.

Your IWRC board of directors has always been committed to providing members with the information and skills necessary to provide quality animal care. Recently, the board renewed its pledge to serve the entire rehabilitation community, including those not directly involved in hands-on care— "para-rehabbers," if you will. As a result, you'll notice some changes in this and future issues of the *Journal*. As with IWRC conferences, we're making a concerted effort to invite and include information on education, administration, and advocacy issues, while still keeping you up to date on quality wildlife medicine and husbandry topics as you've come to expect. We hope you'll share your copy of the *Journal* with both wildlife caregivers and those involved in other, broader aspects of rehabilitation, and encourage them to become part of the IWRC community.

—*The IWRC Literature Committee*

# Case Study: Feather Imping and Rehabilitation of a Long-Legged Buzzard, *Buteo rufinus*

by Edwin W. A. M. Vaassen

## Species and Natural History

With its size reaching that of a lesser-spotted eagle *(Aquila pomarina)*, the long-legged buzzard (*Buteo rufinus)* is one of the largest, yet least known, *Buteo* species and one of the least studied raptors of the Western Palearctic. About 20 percent of the world population breeds in Europe, of which roughly 90 percent occurs in Turkey. The rest of the population is widely distributed, ranging from Africa and Middle Eastern countries, to Mongolia and Kazakhstan in Central Asia (Glutz et al. 1989; Cramp and Simmons 1980; Tucker and Heath 1994). Of the two known subspecies, the smaller and more reddish *B. r. cirtensis* breeds in Northern Africa and the Sinai, whereas the nominate *B. r. rufinus* breeds in the rest of the referenced breeding range. The even larger upland buzzard (*B. hemilasius)* is sometimes considered conspecific but only occurs east of the Himalayas. Although no detailed studies have been carried out in Turkey, the species' population estimates range from 1,000 to 10,000 pairs (Tucker and Heath 1994; Bilgin and Kasparek 1996) and between 3,000 and 7,000 pairs (Vaassen et al. 1998).

Through most of its range the long-legged buzzard is a migrant species; most of the Eastern European and part of the Russian population winters in Turkey, further south to Arabia, and far into the Sahara Desert. The Central Asian population migrates south to India and Arabia. In Turkey the majority of the species is resident, with only local dispersal.

Since the turn of the 20th century, the long-legged buzzard population has spread into Europe, although this has slowed in recent decades. The first breeding record for Greece was confirmed in 1930, in Bulgaria in 1960, and in Hungary in 1992 (Glutz et al. 1989; Cramp and Simmons 1980; Dudas et al. 1993). The species has undergone a large decline in some areas, especially in its Russian range; however, its population is increasing in some Eastern European countries, including Bulgaria and Hungary. Unfortunately, due to lack of research, the species population trend in Turkey remains unclear, hence its importance. The species has been recorded as being incidental in most other European countries except Britain, Ireland, Portugal, Norway, and Iceland. Today the long-legged buzzard is an endangered species in Europe. Major threats include habitat destruction and human disturbance, especially the destruction of nests and irritation during nesting (Tucker and Heath 1994). Persecution of the species by shooting is less common, at least in Turkey.

The species' habitat preference is very similar to that of the lesser kestrel *(Falco naumanni)*, namely dry highland steppe, semi-desert, and its surrounding woodlands, typically in the vicinity of water, whether lake, reservoir, or stream, including near villages surrounded by patchy cultivation. The species is commonly known as a cliff- and ledge-nesting species (Glutz et al. 1989; Cramp and Simmons, 1980), however, observations in Central Anatolia, Turkey, have found that the species most commonly breeds in trees (Gürsan 1996, 1999). Cliff, ledge, and even ground nesting may occur in Turkey, although instances of this have been recorded infrequently. In addition, these instances are more likely in more humid areas such as the Aegean and Mediterranean coast regions, where the species is less common to rare.

**EDITORIAL NOTE: Although diagnosis, treatment, and conditioning protocols described in this paper do not meet state-of-the-art care standards in much of the world, it is heartening to see the efforts being made worldwide to assist wildlife. The editorial team felt that IWRC members would be interested in reading about the status of wildlife rehabilitation in Turkey, about a little-known species that most of us do not see, and about the outstanding work of a novice group struggling without the benefit of the radiographs, laboratory diagnostics, and other veterinary assistance so many of us take for granted. We also wanted to recognize the author's efforts.**

**Ironically, just before receiving this article to review, I had the opportunity of working, by e-mail, with an architect in Istanbul, Turkey. Ozkan had rescued a European sparrowhawk that had apparently collided with a grocery window and was being attacked by crows. With my help and that of Philip Dragoumis in Greece (to whom I introduced Ozkan by e-mail), this citizen/nonscientist/nonrehabilitator was able to identify, examine, diagnose simple bruising, provide cage rest and food, and ultimately release the accipiter. It is so gratifying to see this level of concern and caring all around the world. Ozkan in Istanbul and Edwin Vaassen in Ankara are, perhaps, the vanguard of wildlife rehabilitation in Turkey! IWRC hopes to present a basic skills seminar in Athens in the near future, with European participants from other countries, and Ozkan hopes to take some vacation time to work with Philip in Greece. I am delighted that IWRC is helping to spread the knowledge to new parts of the world.**

***Louise Shimmel, Associate Editor***
***Director, Cascades Raptor Center***
***Eugene, Oregon, U.S.A.***

**ABSTRACT:** The long-legged buzzard, one of the least studied buteo hawks of the Western Paleartic, is most often found injured in winter. This article provides details on the present knowledge of the species' natural history and on the imping and treatment of an injured individual found in Turkey.

KEY WORDS: *Buteo rufinus*, Imping, Turkey, Distribution, Feeding Ecology, Breeding Biology, Behavior.

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Although the long-legged buzzard is a large raptor, similar in size to its New World cousins the ferruginous hawk (*B. regalis)* and the red-tailed hawk (*B. jamaicensis)*, it may breed quite close to human settlements. In Central Anatolia some populations have been confirmed to breed approximately 100 m from a village, which indicates the tremendous adaptability of this species (Gürsan 1999). An explanation could be the species' feeding ecology, as its diet consists mainly of small mammals like voles (*Microtus sp.*), gerbils (*Meriones sp.*), lesser mole rats (*Spalax leucodon*), and Asia Minor suslik (*Spermophilus xanthoprymnus*); small birds such as larks (*Alaudidae*) and starling (*Sturnus vulgaris*); reptiles like lizards (*Lacerta sp.*); and amphibians like frogs (*Rana sp.*), toads (*Bufo sp.*), and snakes (*Natrix, Coluber,* and *Vipera sp.*). Insects, including grasshoppers (*Coleoptra sp.*) and crickets (*Gryllidae*), are an important dietary supplement (Glutz et al. 1989; Gürsan 1996, 1999). Most of these prey species are common near wetlands, waterways, trees, and patchy cultivation—often areas where humans have established their villages. Not much is left of the original forests in Central Anatolia, so most breeding sites, if in trees, are near human settlements. In winter, the species may eat carrion or fresh shot-fowl as a supplement.

Like most other buteo hawks, the long-legged buzzard is a typical perching hunter. The species uses anything that provides a commanding outlook of the hunting area: telegraph poles, ruins, trees, posts, rocks, and dikes. Less often, the species hunts in flight about 30.5 to 45.75 m (100 to 150 ft) above the field, which enables it to scan a larger area, similar to harriers of the genus *Circus*. During hunting flights the long-legged buzzard may briefly hover just before swooping on its prey. Otherwise, the species soar hunts at higher altitudes with its wings raised in a shallow "V" and pressed slightly forward, exactly like the golden eagle (*A. chrysaetos)*. (A well-known feature, as the species is called "eagle buzzard" in Dutch, *Arendbuizerd*, and in German, *Adlerbussard.*) Long-legged buzzards will often hunt by walking through an area, preying on insects, amphibians, and small reptiles. The lesser-spotted eagle and common buzzard (*Bueto buteo)* also use this form of hunting. Throughout the year the monogamous long-legged buzzard is usually seen singly or in pairs; in winter, however, small groups of wintering birds may roost together.



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**The 2-year-old female long-legged buzzard was first seen sitting on top of a small dike between some trees. As the bird did not move when the author stopped his car just in front of her, the author concluded that it was injured.**

### How the Bird Was Obtained

In the early morning of 6 January 1999, the author's wife, Mürüvvet Vaassen, reported a subadult, buzzard-like raptor near the main road of Hacettepe University's Beytepe Campus, across from the main entrance to the facilities. When we arrived some two hours later, the bird was still sitting in the same spot—about 2 m from the main road on top of a small dike between some trees. The bird did not fly away when the car stopped just in front of it, leading to the conclusion that it was surely injured. As it could not fly, the bird first walked away, then laid on its back with its talons opposed. Next, the bird camouflaged itself by turning around, closing its wings and pushing its body on the ground. This made it easy to capture the bird (using a large tablecloth) and to bring it to Raptor Research Group Turkey in Ankara, Turkey.

### Problems and Concerns

The bird had injuries on both wings and had lost a series of four vulnerable primaries (P7–P10) from its right

wing. These injuries seemed fresh, no more than 2 days old at most and the bird was very lively. Based on our previous experience and on a physical examination, we estimated that the bird weighed more than 1 kg and thus was not starving. The bird's droppings were of normal color (blackish-green in chalk white), although somewhat thick. The trauma to the left wing was just under the carpal joint reaching from the bird's radius to the fused metacarpals. Fortunately, there was no open wound or visually determinable fracture. The joint was, however, quite swollen. The right wing appeared to have a broken humerus, with open wounds on top of the wing and at the carpus. Traces of dried blood could be seen all over the right wing. The injuries appeared to have originated from a collision with a tree, probably when diving on some prey; the missing primaries, however, were most likely broken off by another predator, probably a weasel (*Mustela sp.*) or a marten (*Martes sp.*), after the bird was grounded by the collision. This theory arose because the carpus and the primaries were notably ripped and because the right foot had what looked like a bite wound just above the talons on the front of its tarsus. A full inspection found no hawk lice or similar parasites. Overall, the bird appeared healthy, and since there were no inexpensive opportunities to examine blood samples for other diseases, no samples were taken.



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**The bird camouflaged itself by turning around, closing its wings, and pushing its body on the ground. This made it easy to capture the bird with a large tablecloth.**

In Turkey, long-legged buzzards are frequently found injured during the winter. Most injuries occur when immature and subadult birds try to prey on other birds diving into trees. The primary injuries are broken wings and traumas from collision. Long-legged buzzards are, with their low stress factor, a quick-healing, nonaggressive, and easy to handle species that generally encounters only few complications during rehabilitation. Common complications include dehydration and internal and external bacterial infections. However, because especially immature birds can become tame and get used to people easily, they must not be kept long in captivity. Since veterinarians in Turkey typically do not know much about wildlife medicine and no serious raptor or wildlife rehabilitation centers exist here, we had to look after the bird in our home.

### Comments on Rehabilitation

Throughout the 4-week rehabilitation period, the bird was fed a range of meats, including beef, mutton, and chicken, as well as liver, heart, and kidney. Additionally, small amounts of fresh-caught live crickets and toads were fed from time to time to balance the diet. Unfortunately, we were unable to catch any rodents. Because the bird weighed just about 1 kg, we handfed it 50–75 g of meat twice a day. To foster a better and quicker recovery and to eliminate any possible infections due to the open wounds on its wing and tarsus, the bird was given both vitamins and antibiotics: 1 g/d of Rostres (an antibacterial antibiotic and maturing mix, including Furazolidone, Oxytetracycline HCl, niacin, Cal-D-Pantothenate, D-Biotin, DL-

Methionine, vitamins, and metals). During the first week of captivity, the bird also received extra biotin: 0.2 ml of Gabiotan every other day. The extra biotin was given to strengthen the bird's gonadal functionality, bone structure, and feathering. A high-viscosity antiseptic and vaso-dilating creme (Pommat Ichtyolee, 10 percent pommatichtamol) was applied as a film on the open wounds and swollen parts twice a day until they were significantly healed.

Due to the lack of options, x-rays could not be taken; problems had to be confirmed by physical and visual examination. In treating the bird's broken right wing, it was fortunate that the fracture site was not too swollen and that it could be felt that the broken bone had not yet started to callus. After placing the broken bone ends in their original position, we immobilized the right wing using an elastic cotton bandage in a body wrap so that the left wing could still be opened. The bandage was kept in place for four full days to give the bones a chance to mend. (The open wound was on top of the wing, so treatment could be done without removing the bandage.) Additional cotton was put between the bird's belly and inner wing to provide stability. To decrease stress and activity while the bone was first healing, the bird was kept in a large cardboard box (twice the size of the bird), covered with a cloth to keep it dark throughout the day.

After a week of intensive care, the healing process of the broken humerus and open wounds was clearly visible and positive. To be sure of a complete healing, the bird had to be kept a while longer, and the swelling had to resolve to eliminate any complications in flight. This took another two weeks.

In the last week of treatment, the bird became lively and started to wander though the house, jumping up on its box to better view its surroundings and regaining its natural instinct. During this time the bird started to feed itself, and got clearly used to its captivity. We knew that the bird had to be released, but were unsure whether it could successfully fly without the missing primaries. It was felt that the bird could probably fly for short distances by flapping, but that soaring would be out of the question due to difficulty balancing and steering. Thus, the bird was not yet ready for a responsible release. After healing, neither the humerus fracture nor the wounds affected the bird's flight mechanics (i.e., the wings could move normally). During the last week of the posthealing period, we regularly repeated some motion exercises with the bird, physically moving its wings to help condition muscles and joints.

**Unfortunately, no serious raptor or wildlife rehabilitation centers yet exist in Turkey. People rehabilitating wildlife do so on their own initiative; no education is provided by any institution. This bird is, therefore, most probably the first imped long-legged buzzard—if not the first imped bird—in Turkey.**

Except for the broken four primaries (P7–P10) keeping it from balanced flying, the bird healed completely after 4 weeks of treatment and feeding. However, it was impossible to release the bird without perfect flight. The only possibility seemed to be to replace the broken and harassed primaries with new ones. This was the first time I was to perform such a procedure.

We called the Ankara Zoo for permission to cut some primaries from their captive long-legged buzzards (15 captive birds). Unfortunately, most of their birds also had broken or harassed primaries (due to cage wiring), but one bird appeared to be of similar size (wing 455 mm) and had clean primaries. Two primaries (P8 and P9) were cut at the shaft about 3 cm under the start of the feather itself. We anticipated that two primaries would be enough, as the species may lose two primaries, if not side by side, simultaneously in a normal molt. On the other hand, we were concerned that extra weight would occur if all four primaries were replaced by using inorganic material to imp the feathers.

The broken primaries (P7–P10) of the rehabilitated bird were cut about 4 cm away from the skin. Two 8-cm cotton sticks were prepared as a bridge between the shaft of the old primaries and the shaft of the replacement primaries by removing the cotton from both ends. The cleaned sticks were glued 4 cm into the old primary's shaft with an organic, quick-drying glue. Then a 2-cm slice was made on the inner side of the ends of the two replacement primaries. A piece of paper was held under the gluable parts so that the other feathers in the surrounding area would not be glued together. Using this precaution, the new extensions and the old shafts were glued one at a time. To get maximum stability, the new primaries had to be slipped quickly over the extension and the old shaft for an overlap of at least 2 cm over the original primary shaft.

Once this procedure was finished, we placed the bird in a small, dark space that did not allow much movement. To insure the adhesion, the glued primaries were checked about 12 hours later. The cotton sticks proved to be made of a reliable material, both strong and flexible, but also lightweight, inexpensive, and easy to glue into the feather shafts. Release was planned for the next day. In case of imping failure, the bird would not go very far and it would be a good release exercise. If no failure occurred, it would be the first and final release.

### The Release

Due to the long-legged buzzard's status in Turkey, this bird could be either a resident or a winter visitor. The

species has been recorded breeding in the near surroundings of Ankara, including Hacettepe University, so we did not have to go far for an appropriate release location. On 5 February 1999, the bird was placed in a large cardboard box and transported to the same site where it had been found four weeks earlier. (The author had hopes of monitoring the bird in this general location over the next few days.) The box was carried out of the car and put on the ground in preparation for picking the bird up out of the box. The bird probably recognized being outside, however, as it jumped out of the box and flew directly to freedom. We watched the bird for about half an hour. Everything seemed to be fine as it flew up from a branch where it had perched for about 10 minutes. We observed no problems while the bird was either flapping or soaring in the region.

Nine days later, on 14 February 1999, while on the way to work, I observed a long-legged buzzard soaring over the woods of Hacettepe University's Beytepe Campus. Stopping along the road, I watched the bird with care, and it was obvious that two primaries, P7 and P10, of its right wing were missing. This could not be any bird other than the one we had released the week before. Several other sightings of immature long-legged buzzards occurred from April on, though none of the sightings showed the missing two distinctive primaries on its right wing. (It is possible, of course, that new feathers may have grown during the molting period.)

## Comments and Conclusions

Unfortunately, no serious raptor or wildlife rehabilitation centers yet exist in Turkey. People rehabilitating wildlife do this on their own initiative; no education is provided by any institution. Therefore, this bird is most probably the first imped long-legged buzzard, if not the first imped bird, in Turkey. I had heard that feathers could be replaced using imping, but there was no local resource to demonstrate any of the techniques. The innovation of using cotton sticks proved to be worthwhile, at least for birds the size of long-legged buzzards; it might not work for smaller birds with smaller, narrower feathers.


## Acknowledgments

I would like to thank my wife, Mürüvvet Vaassen, for her help and patience during the treatment; H. Mehmet Gürsan for his comments and his help imping the bird's wing; and Can Ersoy, as well as the cage attendants of Ankara Zoo, for their cooperation. Further I sincerely thank Louise Shimmel of the IWRC for her comments and review of this article.


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**The author (center) with family and colleagues from the Raptor Research Group Turkey.**

# The Exotics Dilemma: A Case Study in Progress

**PART 1**

**by Philip Dragoumis and Astrid MacLeod**

**ABSTRACT: Wildlife rehabilitators are often contacted for assistance when a wildlife "pet" has developed a problem or is no longer wanted. Almost always illegally held, these animals frequently suffer from nutritional imbalances, stress, and lack of proper housing and medical attention. This article describes how one rehabilitation center came to admit such an animal, the problems that resulted from four years of captivity, and the methods the rehabilitators used treat these problems.**

**KEYWORDS: Wildlife Rehabilitation; Wildlife in Captivity; Illegal Trade in Wildlife; Raccoon; Natural History.**

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**ASTRID MacLEOD has worked as a wildlife rehabilitator in Manitoba, Canada. She works with Manitoba Conservation (formerly the Manitoba Ministry of Natural Resources) and is a writer and researcher.**

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## Introduction: Wildlife Without Borders

Animals in the wild are free to move about the world in ways that humans are not. Passports and visas are not required for those without citizenship. While birds, enabled by flight, enjoy free access to new horizons, mammals are limited by natural boundaries such as large bodies of water, deserts, or mountain ranges. Even so, the occasional accidental tourist has stowed away on a boat, train, or airplane. Many more animals are secreted and smuggled from their places of origin. These journeys too often lead to lives spent in isolation, misery, and neglect. This case study examines the life of one such animal, the complications that can and do ensue from neglect (intended or otherwise), and the moral and medical decisions that must be made as a result.

## The Dilemma: An Illegal Alien

On 30 March 2000, Philip Dragoumis, codirector of the Hellenic Wildlife Hospital (HWH) in Aegina, Greece, received a telephone call from a couple whose "pet" raccoon, Miko, was ill and required medical attention. Their veterinarian was unwilling to examine the animal for fear of being bitten. Dragoumis made note of the problems the owners described and agreed to help on the condition that the animal would not be returned to them. They agreed, and arrangements were made to fly the raccoon to Aegina.

Because raccoons are not indigenous to Greece, no one at HWH had experience with this species. Dragoumis turned to other International Wildlife Rehabilitation Council (IWRC) members for advice. At this point, all he knew was that Miko was four years old and captive-born. The animal had been severely constipated for at least four days, neither eating nor drinking. He was described by his owners as "overweight."

Even before the raccoon began his journey, various members of IWRC were networking to suggest a possible care protocol and appropriate housing and diet. In addition, ethical considerations were discussed, including "life after rehabilitation" options. Hospital staff then set to work constructing appropriate housing for the raccoon based on information they received from IWRC Online Hotline Raccoon Team volunteers Mary Catherine Kuruziak (Welland, Ontario) and Pat Issacs (Fort Mill, South Carolina). A 4 $m^3$ (13.12 $ft^3$) enclosure was prepared. It held a pool, logs for climbing, areas for hiding, and a bed of fresh pine needles. Once the raccoon was on his way, one of the hospital's consulting veterinarians, Dr. Kostas Demetriades, stood by, ready to evaluate the animal.

## Natural History: *Procyon lotor*

The raccoon occurs naturally only in southern Canada and some areas of the United States and Central America (Stokes 1986). During the 1930s, the raccoon was introduced into the Soviet Union and Germany; today, it is found in France, western Germany, Luxembourg, and the Netherlands.

A raccoon's home range varies according to habitat, food supply, and population density. In the rural agricultural areas of eastern North America, a home range of between 1 and 4 sq km is common. In a prairie habitat, a home range as large as 50 sq km has been observed (Environment Canada 2000).

Raccoons are able to survive in diverse habitats. While swamps, forests, marshes, farmlands, woodlots, and wetlands are preferred, the adaptable raccoon has also flourished in many cities and towns (Stokes 1986).



JIM ISAACS

**The raccoon can survive in diverse habitats. While swamps, forests, marshes, farmlands, woodlots, and wetlands are preferred, raccoons can also thrive in suburban and even urban areas.**

The raccoons of northern latitudes are generally heavier than their southern counterparts, weighing 6 to 8 kg, as opposed to 4 kg. In some areas, extreme fall weights as high as 28 kg have been recorded; these animals deposit fat as a strategy for survival in cold climates.

Although the raccoon is classified as a carnivore, its nutritional strategy is that of an omnivore. The natural diet reflects seasonal changes, with crayfish, fruits, nuts, and corn being preferred items. In spring, the raccoon feeds on animal matter that includes invertebrates and insects. Crayfish, muskrats, rabbits, squirrels, the eggs of waterfowl, and freshwater clams are consumed. In summer, as fruits and nuts become available, raccoons feed on wild cherries, elderberries, gooseberries, strawberries, and wild grapes. Cultivated crops such as corn and potatoes are raided, and the raccoon continues to eat invertebrates, amphibians, and reptiles. The rich fall diet enables raccoons in northern latitudes to accumulate sufficient fat reserves to sustain them through winter. While corn is a dietary staple, acorns, beechnuts, hazelnuts, grapes, and the larvae of hornets, bees, ants, and termites are important sources of nutrients.

The fat stores of the raccoon in autumn are built up over the entire body. It accumulates even around the tailbone, and may be as thick as 2.5 cm on the animal's back. By late autumn, approximately 50 percent of the animal's body weight may come from fat (Stokes 1986; Whitaker and Elman 1980; Environment Canada 2000). In northern areas, this stored body fat sustains the raccoon throughout the winter, although southern counterparts continue to forage year-round.

While southern raccoons den only during periods of bad weather and to rear offspring, northern raccoons den for the winter, allowing for the conservation of energy when food is not available. Rather than hibernation, this is simply a period of inactivity. Unlike animals that hibernate, raccoons' body temperatures do not drop substantially and their activities seem to be related to the air temperature. Adult males usually den alone, but a family unit (mother and kits) often dens together through the first winter. While 4 or 5 raccoons in a den are the norm, communal dens of 23 raccoons have been reported (Environment Canada 2000).

Raccoons live for an estimated 3 to 5 years in the wild, but record ages of 12 and 16 years have been noted in both captive and wild animals (Environment Canada 2000). Annual mortality rates in some areas, however, have been estimated to be as high as 50 to 60 percent. Many animals die in their first year because of disease, starvation, and predators. Diseases such as rabies and canine distemper can kill thousands of raccoons in one year. Raccoons are hunted by bobcats, coyotes, pumas, foxes, wolves, dogs, great horned owls, and fishers, but humans—and their automobiles—account for a large number of raccoon deaths.

### Convention on International Trade in Wild Fauna and Flora (CITES)

While *Procyon lotor* is not listed in the CITES Appendices, it is a protected species in most areas of North America (fur bearer), and special permits are required for import, export, or rehabilitation. In Canada, these permits are administered at the provincial level. Dave Ward, coordinator of special investigations with Manitoba Conservation (formerly the Manitoba Ministry of Natural Resources), explains that while Manitoba issues some export permits for placement of protected wildlife in special programs and for educational purposes, the department does not allow the export of animals for the pet trade. Both export permits and possession permits are required by anyone holding wildlife for any purposes.

Unfortunately, there are many problems associated with stringent enforcement of these laws. Some animals, originally placed in a completely legal manner, end up in the hands of zoo brokers and private traders. Although governments are drafting guidelines to identify requirements for many of the most commonly traded animals, there are currently countless wild species living in inappropriate housing, without proper food or medical care.

Greece is a participating member nation of the CITES convention and its government attempts to control the purchase or sale of exotic species. Much education is required, however, to stem the flow of wild animals from country to country. As long as there are people who believe that wild pets are desirable, the dilemma of what to do with exotic species will be an ongoing problem for wildlife rehabilitators.

### Patient History

While many of the details are unclear and are likely to remain so, Miko's story began at least four years ago in the


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**Miko arrived weak, unresponsive, dehydrated—and overweight.**

Czech Republic. He was born to captive raccoons who may have been of Canadian origin. Whether these animals were legally imported is not known. Miko was purchased as a juvenile and flown to Greece, where customs officials let him through, believing he was a dog.

The woman who purchased Miko was a pediatrician, which makes it all the more difficult to understand why she would assume a diet of milk, honey, biscuits, and nuts would be sufficient to the needs of a weaning carnivore. While still very young, he occasionally was taken outside, but he spent most of his time in a small indoor enclosure and had no interaction with domestic animals. Once the novelty wore off, interaction with his owners was minimal. Miko was not vaccinated or neutered; luckily, his canine teeth had been left intact.

Dragoumis was told that the animal entered his nesting box one day and reappeared some months later, transformed into an overweight, constipated animal who would not eat or drink.

### Intake and Triage

On 31 March a volunteer with HWH drove to the airport and picked up a pet carrier containing a very ill animal. The raccoon was immediately transported to the veterinary clinic, where Dr. Demetriades had been prepared to administer an anesthetic in order to perform a thorough examination. A cursory examination led him to conclud the anesthetic recommended by the North American rehabilitators might lead to severe complications. A minimal dose of Ketamine and Xylazine was administered and the raccoon was palpitated and radiographed. The radiograph showed an impaction, with air trapped in the intestines. His heart and digestive tract had been compromised by obesity.

The medications recommended by Kuruziak and Issacs were not available in Greece; Dr. Demetriades therefore administered a mixture of milk of magnesia and paraffin oil as a noninvasive first step.

Later that day, Miko was moved to HWH, where the staff began to rehydrate him. The raccoon was weak and unresponsive.

### Acknowledgements

The authors wish to thank the Canadian Wildlife Service of Environment Canada and Dave Ward, Manitoba Department of Natural Resources.

*A continuation of this case study will appear in the summer 2000 issue of the* Journal of Wildlife Rehabilitation. *At the time of publication, complications related to nutritional deficiency, a lack of exercise, and depression have become evident. Please note that as this story unfolds, the authors have no way of knowing the eventual outcome. Philip Dragoumis and his team are working hard, but Miko's condition is poor at this writing.*

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# Canada Goose (*Branta canadensis*) Ecology And Rehabilitation

## PART 1: GOSLINGS: HATCHLING TO FLIGHT STAGE

by Joanne Rogers Luebbert

ABSTRACT: Canada geese (*Branta canadensis*) are state and federally protected waterfowl, widely distributed throughout North America, that successfully nest in a wide range of habitats. They are remarkably good parents and >85 percent of goslings survive to fledge (Bellrose 1980). Orphaned goslings, however, are all too often the victims of the negative impact of humans on traditional Canada goose breeding areas and, not uncommonly, are presented to rehabilitators for captive rearing. It is challenging to successfully raise wild Canada goose goslings to flight stage without physical complications or habituation. Establishing release criteria for reintroduction to wild habitat requires a working knowledge of their natural history, conscientious attention to diet and housing, and an understanding of their complex social relationships. This paper addresses the hand-rearing of Canada goslings and includes, as a prerequisite to the subject, a brief overview of the ecology of Canada geese.

KEY WORDS: Canada Geese; Canada Goose Goslings; Gosling Husbandry; Release Criteria

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### Introduction

Canada geese (*Branta canadensis*) are indigenous to North America, ranging from Arctic tundra to Mexico. Wildlife biologists currently recognize 11 subspecies, or races, with a morphological range from 1.4 kg for the cackling Canada goose (*Branta canadensis minima*) to 9.1 kg for the giant Canada goose (*Branta canadensis maxima*). There is much mixing between races. Therefore, wildlife biologists often identify Canada geese by their geographic fidelity, such as "short-grass prairie geese," or by their size, such as "small," "medium," and "large" races. Canada geese have adapted reasonably well to the encroachment of humans on their ancestral habitat. In fact, the species has greatly benefited from waterfowl refuges and commercial grain production. Conversely, environmental contaminants and negative interactions with humans in populated areas jeopardize these wild birds. In urban areas goslings may become separated from their parents during treks from the nest site to habitat more appropriate for raising young. Both adults and young may suffer from attacks by raccoons, dogs, snapping turtles, or other predators. Injuries may also result from fishing line entanglement, encounters with motor vehicles, lead toxicity from ingesting lead shot or fishing weights, or improper restraint by humans.

### Canada Goose Ecology

**Adult Description:** Canada geese of all races have black legs and feet, and a black bill; black neck and head with a white cheek patch; dark brown to gray-brown wings, back, sides, and breast; white belly, flank, and undertail coverts; and black tail feathers separated from the rump by a white V-bar. Canada geese are sexually monomorphic. There is no eclipse phase.

**Juvenile Description:** Canada geese <1 year of age exhibit an indistinct color division between the neck and breast; the tips of their tail feathers are notched, rather than rounded. Primary wing feathers that are pointed, rather than rounded, distinguish juveniles < 1.5 years old. (Moser, Craven, and Miller 1991).

**Natural Diet:** Canada geese are herbivorous and eat grasses, grains, and aquatic vegetation. Preferred grasses include wheat (*Triticum*), ryegrass (*Lolium perenne*), clover (*Trifolium*), and common landscape grasses such as bluegrass (*Poa pratensis*) and fescue (*Festuca*). Food preferences during fall and winter vary relative to geographic availability, and include grain crops such as corn (*Zea mays*), millet (*Panicum*), buckwheat (*Fagopyrum*), and milo (*Sorghum*). Along the Atlantic and Pacific flyways, freshwater and saltwater geese may forage for aquatic plants such as pondweed (*Potamogeton ssp.*) and cordgrass (*Spartina spp.*) (Martin, Zim, and Nelson 1951). Geese clip grasses and sedges with their serrated bills. They will readily eat formulated commercial waterfowl food. The bill tips of waterfowl are remarkably sensitive, and bill injuries should be considered very painful (Ritchie, Harrison, and Harrison 1994).

**Pair Bonds and Migratory Traditions:** Canada geese may establish loose pair bonds and attempt breeding at 2 years of age; however, successful breeding seldom occurs before the age of 3 (Bellrose 1980). Geese mate for life and pairs forage, rest, swim, and fly together. The fledglings migrate with their parents to wintering habitat in the fall; remain in close proximity to their parents during the winter; and, in the spring, return with their parents to breeding grounds in northern latitudes. Guided

by their parents on these migration journeys, the goslings learn their specific migration traditions. At the breeding grounds, the subadults separate from their parents and join other nonbreeders for the duration of the breeding season. In the fall, yearlings and 2-year-old offspring may rejoin their parents and the new fledglings for migration to their wintering grounds. The larger families are usually dominant in flocks, which translates to accessing better foraging, swimming, and loafing areas. If pairs are separated by death or distance, either sex may choose a new mate before the next breeding season.

**Breeding:** Young Canada geese usually establish nesting territories in the same area from which they initiated their first flight, and return to the same area each year to nest (Bellrose 1980).

**Nest, clutch and incubation period:** After selecting a suitable site for a nest, the goose rounds out a depression and lines the rim with vegetation pulled from around the nest site. Egg laying is initiated before nest construction is completed. The nest bowl is lined with down pulled from the breast of the goose. Clutch size is typically 5 or 6 eggs (Bellrose 1980). The goose incubates the eggs and the gander defends the goose and the nest from predators. The incubation period varies with race, and ranges from 24 days for the cackling Canada goose to 30 days for the giant Canada goose (Bellrose 1980).

## Gosling Husbandry

**Diet:** Captive Canada geese have difficulty maintaining body weight on high-fiber diets consisting exclusively of plant material (Owen 1985). Therefore, offer ad libitum a commercial waterfowl diet that is formulated to meet the specific nutritional requirements of young waterfowl (Purina Duck Starter or Purina Mazuri Waterfowl Starter), breeding adults (Purina Duck Breeder or Purina Mazuri Waterfowl Breeder), or nonbreeding juveniles or adults (Purina Duck Grower or Purina Mazuri Waterfowl Maintenance). Do not substitute commercial foods formulated specifically for gamebirds, turkeys, chickens, or other avian species.

In the wild, the plants geese consume seldom exceed protein levels of 17 percent; therefore, protein levels must be carefully managed for captive waterfowl. High levels of protein are considered to be a primary causative factor in leg and wing abnormalities, and may result in death from renal failure (Ritchie, Harrison, and Harrison 1994.)

For the first 2 weeks of life, offer goslings commercial waterfowl starter at a 20 percent protein level during the day; insoluble grit, such as small cherrystone gravel, in a separate feeder; and access to spring growth plants such as alfalfa (*Medicago sativa*), ryegrass, clover, or bluegrass. Waterfowl must have grit to process grain foods. If a grazing area is not available, abundant fresh clippings of such plants should be offered ad libitum. Arctic-nesting species, such as Canada geese, may have 20 to 24 hours of daylight during the summer, and the goslings will eat at night if the light from their heat lamp illuminates their feed. From week 3 to flight stage, protein levels should be reduced to 16 percent. At 14 days, add commercial waterfowl grower or maintenance diet to the starter diet, gradually increasing the percentage of waterfowl grower until the goslings are on 100 percent grower diet. At 21 days, add scratch grains (typically a mix of cracked corn, wheat, and milo) mixed 1:1 with the grower diet, or free choice (Ritchie and Harrison 1994, and author's experience). Make every effort to provide goslings with grazing areas of spring growth grasses in protected pens during the entire growth period.

**Angel Wing:** Wing abnormalities, particularly angel wing, or oar wing, are considered to be related to excessive protein in fast-growing birds (Ritchie, Harrison, and Harrison 1994; Robbins 1993). Developing angel wing may be observed in goslings from approximately 3 to 5 weeks of age. The primary wing feathers first appear to hang, and finally to grow outward and perpendicular to the gosling's body. With the wing closed, the primary feathers do not lie under the secondary feathers of the upper wing as they do in normal development. The carpal joint twists under the weight of the primary feathers; the goose will be permanently flightless if the condition is not corrected.

Angel wing can generally be corrected during the initial stages of primary feather growth by folding the wing in normal position, with the primary flight feathers under the secondary flight feathers. With nonstick tape, tape the wing to itself (Ritchie, Harrison, and Harrison 1994). To insure healthy wing development, the wing should be so wrapped if angel wing is even suspected. After 3 to 5 days, remove the wrap for several hours, observe the wing feathers for normal positioning, and rewrap for another 3- to 5-day period, if necessary. Goslings grow at an exponential rate and care must be given to make certain the wing remains wrapped the minimum number of days necessary to correct the developing angel wing.

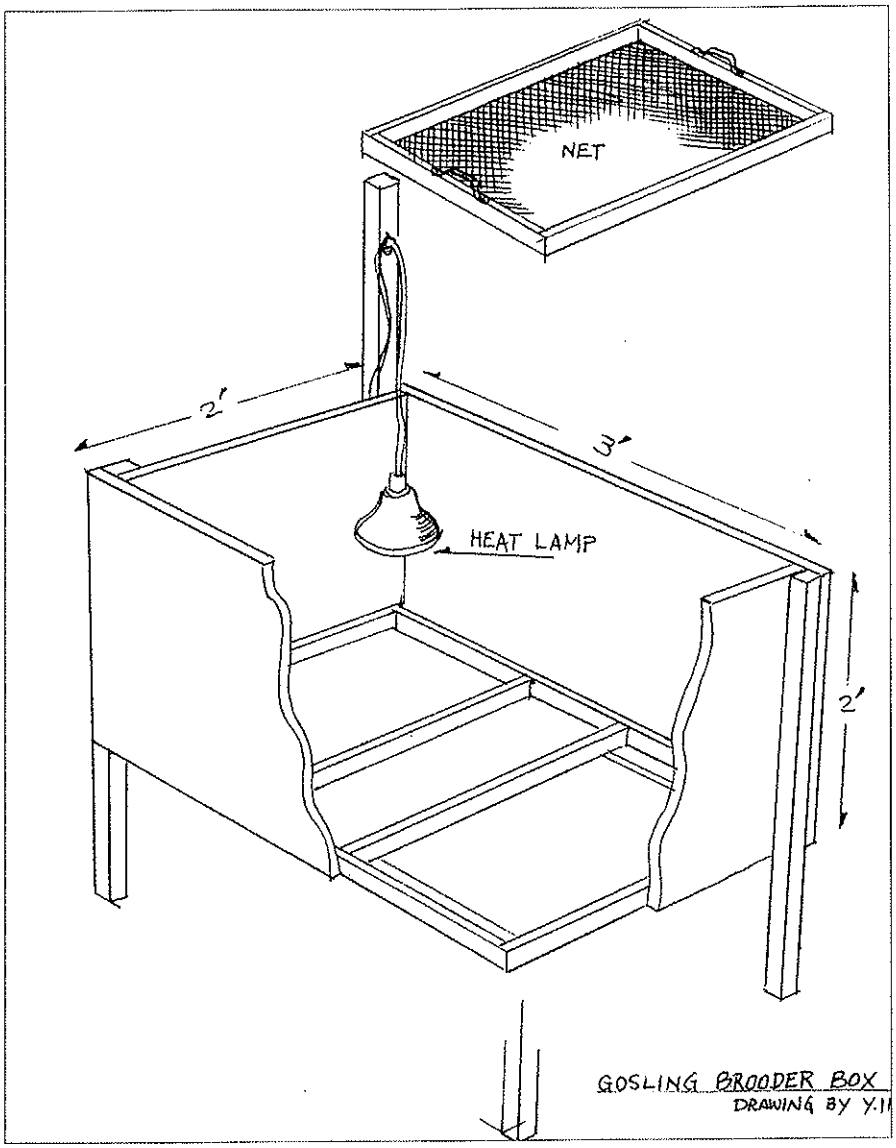


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Generous access to grass for grazing, spacious living areas, ample opportunity to exercise, and swimming are believed to reduce the incidence of wing deformities (Ritchie, Harrison, and Harrison 1994).

**Housing:** Hatchlings can be housed in brooders, such as commercial poultry brooders, with a thermostatically controlled heating element, waterers, and food trays. A brooder box can be constructed to meet the housing needs of goslings from 1 to 14 days of age. Construct the brooder box of untreated plywood, .66 m x 1 m x .66 m (2 ft x 3 ft x 2 ft). All wood surfaces can be finished with epoxy, which preserves the wood and makes the surface much easier to clean and effectively disinfect. Build a removable, plastic-coated hardware cloth floor, and a corner post from which a heat lamp can be suspended. Construct one floor using .63 cm (.25 in) mesh for hatchlings to 2 days old, and one with 1.27 cm (.5 in) mesh for goslings 3 to 14 days of age. Otherwise, use new flooring for each new group of goslings, and clean and disinfect all surfaces of the brooder box.

A 250-watt heat lamp bulb, approximately 61 cm (24 to 26 in) above the bottom screen and separated from the goslings by a protective screen, usually provides sufficient heat. Be absolutely certain the birds can in no way come into physical contact with the lamp. Ambient temperature should be between 90° F and 95° F for hatchlings. Place a thermometer on the lower portion of one of the walls and closely monitor temperatures. The behavior of the goslings is a good indicator of whether the lamp height should be adjusted. Goslings will move away from the lamp if the temperature is too high. If temperatures are too cold, they will huddle together, or pile up as close to the source of heat as possible. With ideal brooder temperatures, the goslings will be evenly distributed over the floor or will form a circle around the perimeter of the lamplight when sleeping. If the brooder box is in a cool room, covering the wire mesh with brooder paper, or smooth woven cloth and paper towels, will result in higher temperatures. Brooder paper or cloth materials must be replaced often during the day to maintain a clean environment. A poultry waterer should be placed in close proximity to the feed tray and away from the heat lamp, as warm water is a medium for bacteria. Water must be replaced a minimum of twice daily, and the waterer washed in hot, soapy water every day.




At 2 weeks of age, goslings should be moved from the brooder to a predator-proof pen enclosing a grassy area, with access to an enclosed shelter with provisions for supplemental heat. A thermal gradient range of 70° F to 95° F inside the shelter will provide optimum choices for goslings up to 3 weeks of age. Housing should be lighted at night to allow goslings the opportunity to feed. The shelter should have a smooth, epoxy-treated floor, covered with clean, dry wood shavings. All bedding must be kept dry because wet bedding and wet food are media for fungus growth, such as aspergillus, that may cause asperigillosis, a fatal respiratory disease. Remove wet material and dry the flooring before replacing bedding. The enclosure must be thoroughly cleaned and disinfected as often as necessary to maintain a healthy captive environment. Goslings should be housed in the shelter during periods of inclement weather and at night to protect them from predation. Shallow pool(s) 10.16 to 15.25 cm (4 to 6 in) deep help maintain feather condition and provide the opportunity for exercise. Step-ups made of untreated lumber from 2.5 to 10 cm (1 to 4 in) thick will aid entrance and exit from the pool. Pools must be kept very clean to minimize disease transmission.

**Egg production:** Egg production and egg laying is nutritionally exhausting. When rehabilitating a nesting female, supplement calcium, such as ground oyster shells, as the egg-laying process will catabolize calcium from bone tissue if the diet does not provide adequate calcium. A goose injured during the egg-laying period should be fed a commercial waterfowl breeder diet to insure adequate calcium and protein levels.

### Fostering Canada Goslings

Most Canada goose races willingly acquire or adopt offspring from other Canada goose parents. Interior and "large" races readily accept orphaned goslings; therefore, single goslings should be fostered with an adult pair and their similar-aged goslings, if possible. However, attempts to foster orphaned goslings with dusky (*Branta canadensis occidentalis*) and Aleutian (*Branta canadensis leucopareia*) races are usually not successful. Canada geese have a well-established dominance hierarchy and the single, hand-raised gosling will be at the bottom of the order and will not have access to preferred foraging, swimming, or safe resting areas (Raveling 1970). Hierarchy status is determined, in part, by the number of birds in a family (Raveling 1970). Goslings of Canada goose races that do not readily adopt orphaned chicks should be raised with other Canada goslings, if that option exists. Artificially created families, such as a group of orphaned goslings, have a better chance of successfully competing for food and loafing areas.

Canada goose parents from most interior and "large" races will readily accept orphaned goslings if the following protocol is employed. Fostering goslings provides the young with a much better opportunity for learning survival skills, developing appropriate species and sexual identity, and establishing migration traditions. The foster family should have goslings of similar age and size, or slightly smaller, than the orphaned chick. Attempt the fostering on a day when the weather is warm and clear and lake waters are calm. As a precaution take catching nets and a boat, if possible, to rescue the gosling in the rare event that it is rejected by the intended foster family. Transport the gosling to the lake, and hold it in hand in sight of the Canada goose family as you walk along the shore toward the family group. The gosling will usually peep loudly as you walk, and its call will attract the attention of the adult pair. Walk slowly toward the goose family, and gently toss the gosling in the water as close to the adult pair as the geese will tolerate. Expect one of the parents to immediately swim toward the chick to take it back to join the family. Observe the behavior of the birds until you are certain the adoption is successful.

Fostering is successful if the gosling is healthy, self-feeding, and hydrated. The gosling cannot be human imprinted. Imprinting is the species-specific process by which species and sexual identity are established in waterfowl hatchlings. Initial imprinting begins prior to hatching with vocalizations from the incubating goose to her goslings at the time the eggs pip. The hatchlings recognize the unique vocal qualities of their mother and respond to her familiar voice by following her. This imprinting is critical to the survival of young waterfowl. In rehabilitation, however, a conscientious effort must be made to insure the goslings do not establish a bond or attachment to humans, or to any species other than Canada geese. A gosling unable to recognize other Canada geese as its species has a very poor chance to mate; to establish fidelity to a flock of other geese; and, in fact, to survive in the

**TABLE 1. PLUMAGE DEVELOPMENT OF CANADA GOOSE GOSLINGS**

| Age | Feather Description |
|---|---|
| 1 week | Entire body bright yellow down, with a scattering of gray. Black, shiny bill, black feet. |
| 2 weeks | Yellow fluff darkens to gray from top of body downward. |
| 2 to 3.5 weeks | Body dark colored except for yellow on the flank, breast, and head. First appearance of wing and tail feathers. Legs and feet appear too large for the size of the gosling. |
| 3.5 to 5 weeks | Noticeable feathers on flanks, tail, and shoulders. Primary and secondary feather development appears; feathers are in sheaths. |
| 5 to 6 weeks | No down on underside. Breast feathers apparent. White tail coverts and black neck color appear under down. Head is light-colored down. Back is dark down except for shoulders. Primary and secondary feathers erupt from sheaths. |
| 6 to 7 weeks | Goslings vocalize a honking sound. White cheek patch appears. Feathers cover body except under folded wings, rump, head, and neck. A band of white upper-tail coverts contrasts sharply with black tail feathers. |
| 7 to 8 weeks | Folded wings cover the entire back. Primaries are at 75 percent of their growth. Down still shows on head and black neck. |
| 8 to 10 weeks | Primary wing feathers cross at base of tail. Goose completely feathered, with the possible exception of traces of down on head and neck. White upper-tail coverts covered by folded wing. Flies well. |

wild. From the first day the gosling is held captive until it is fostered, the gosling(s) should be held in housing with a mirror along one sidewall, natural feather dusters, and surrogate stuffed animals for comfort. Handling must be kept to an absolute minimum.

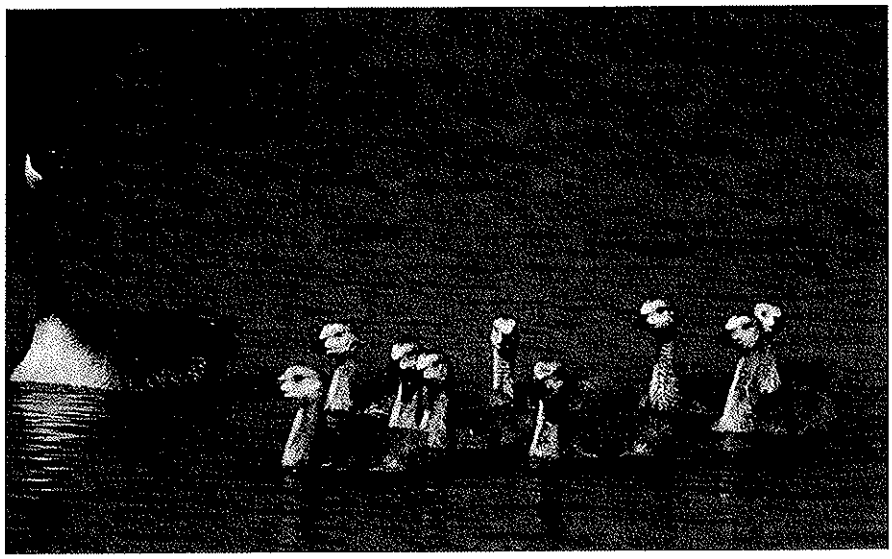
### Feather Development/Age Determination

Normal growth weights for the various Canada goose races vary widely (Sedinger 1988; Yokum and Harris 1966). Therefore, plumage development is a more reliable indicator of determining gosling age and monitoring normal growth than is weight. The plumage development description in Table 1 applies to all races.

### Release Criteria

Captive-raised, fully-fledged birds should be released in areas suitable for nesting and raising young. Canada geese adapt to a wide variety of nesting conditions and sites, including islands, shorelines, artificial nests, cliffs, and tundra. Habitat appropriate for release sites and breeding offers clean, open lakes or ponds surrounded with chemical-free grassy areas for grazing; aquatic vegetation for both food and cover; and nest sites with excellent visibility.

Hand-raised juveniles should be released when healthy, waterproof, and fully feathered. Primary feather growth should be complete and feathers should be at the hard pen stage. Choose a release date after hunting season has closed, or in an area closed to hunting, during an expected 3-day window of warm, clear weather. Choose a large, clean lake or pond, rimmed in part with aquatic vegetation, and surrounded by meadows or grain fields. Such an area would be suitable for nesting and raising young. Rehabilitators should be aware that release sites should be chosen where food supplies, safe resting areas, and open water are widely available to allow that single reintroduced goose access to food, swimming areas, and shelter without continually having to engage in agonistic encounters with more dominant Canada geese. Release Canada geese in close proximity to other Canada geese. However, allow a comfortable space, such as 23 m (25 yd), between the free-ranging geese and the reintroduced bird(s).



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Transporting the birds in airline kennels will protect their feathers, bills, and feet from injury. Provide drinking water if the release site is more than an hour's drive away. Reduce speaking to a minimum and do not make sudden movements. Carry the kennel to the shore and open the door to allow the goose an opportunity to assess its new environment. Do not force the bird to leave the kennel. Back away and observe from a hidden area, or from a distance. Allow the goose to exit the kennel when it wishes. Before you remove the kennel, be certain the bird is a reasonable distance away and interacting positively with the new flock. Observe, learn, and appreciate the privilege of working with Canada geese, a complex, intelligent, and beautiful species.

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### Note

"Part II, Adult Canada Geese" is scheduled for later publication.

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# Finding Funding for Environmental Education Efforts

by Joe E. Heimlich and Dawn D. Puglisi

ABSTRACT: Communities and schools frequently find that some part of their physical environment may need action to improve it. A group may decide to do a site cleanup, undertake beautification of an area, create a land laboratory, or establish a community education campaign on a current issue of interest. Sometimes, the creative process runs into the cold hard fact that there are limited local financial resources to fund the effort. This paper will highlight steps in identifying potential sources for funding and how to apply for those funds.

KEYWORDS: Environmental Education, Fundraising

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## Background

The two most common types of monetary awards to groups and individuals are: (1) grants and (2) gifts. Gifts are donations of monies or in-kind services or goods made to individuals or groups for which there is no expectation of outcome by the giver. A fast-food restaurant's donation of beverages to a work-group and a local philanthropist's gift of money to what is personally viewed as a "worthy" cause are outright gifts. A grant, on the other hand, is usually awarded to a group or individual based on the perceived merits of a proposed project. For small efforts, a gift is often more expeditious and easier to obtain than a grant.

For larger and more expensive projects, a grant is usually more appropriate. Grants are offered by governments, foundations (usually affiliated with an industry or company, institutions, or organizations).

Sometimes, grants are awarded based on needs of the funder. In these cases the contractors request proposals from the group or individual seeking funding, based on parameters that the funder explicitly states when offering funding. For most groups interested in environmental projects, it is more likely that a foundation that awards grants based on individual consideration of the proposal will fund a project.

## Funding Identification Steps

There are various ways to identify foundations that may fund an environmental project and to apply for funding. The process has four steps.

### Step One: Define Your Project

Before looking for monetary support, it is important that the group identify what it wants to do or accomplish. This step helps the group avoid "chasing after money," which is often a fruitless effort and requires a great deal of time. The group should determine what it wants to do in the terms of goals and outcomes.

What are the goals of the project? Very often, groups make the mistake of identifying goals as what will be done, rather than the real goal. Creating signage for a nature trail is not a goal, but a means of accomplishing the goal of having good signage along the nature trail. Goals are the end result of what the group will do. And goals have outcomes.

Outcomes drive the goals. Using the above example, why is good signage important? The outcome might be that there is improved probability that users of the nature trail will understand what they are observing. Another outcome might be the availability of information along the trail that is not visually disruptive or that blends into the environment. Agreement within the group on goals and outcomes of the project is important before the group even begins to look for funding opportunities.

How extensive is the group effort to be? Realistically, what are group members willing to do? The extensiveness of the project must be determined before asking for funding. Few, if any, foundations will award money to fund a project where the group requesting the funding does not do any of the work. The commitment of the group must be reflected in a realistic project.

Finally, the group needs to establish a realistic time line for completing the project. In initial discussions, talk among the group members should reflect how long people will be willing to commit to a particular project and how long actual

work on the project will take, including time for unplanned occurrences! Most grants are awarded on dates determined by the granter, and there is a "lag" time between submission and awarding of monies.

### Step Two: Search for Funding Sources

There are many reference tools to help a group get started in identifying possible funding sources. The list of references at the end of this paper is a good place to start. In addition, local organizations and local and state government agencies often have grant programs that may not appear in references. It is well worth the time invested to talk with environmental associations in your area to discover if they are aware of additional funding sources.

### Step Three: Select Sources that Fit Your Project

Just because a foundation awards money for environmental projects does not mean that your project will fit within the foundation's guidelines for funding. Foundations and agencies have annual reports that describe what projects were funded each year. These reports describe the foundation's goals and also provide important information such as:

- the timeline for submitting grant applications or proposals;
- the current or emerging interests of the foundation;
- geographic limitations (if any) for funding projects;
- types of projects and descriptions of past projects funded.

Using this information and the information in the directories, you can identify the funder(s) most likely to fund your group's projects.

### Step Four: Tailor Your Proposal

There is no "magic formula" to writing a proposal or completing an application form. There are, however, some tips that can be offered:

- **Read the materials from the funding source carefully.** The language used, the style of writing, the urgency of the issues are all contained within the writing of the materials.
- **Emulate this writing style.** Use the type of language the funder used, but avoid "parroting" back exactly what the funder wrote. Respond to all the issues that are relevant. Include what you need to include, but avoid extraneous words, ideas, and materials.
- **Follow application instructions.** Carefully complete any application or proposal using the guidelines for the foundation or agency. Check and recheck to ensure that everything needed is included, and nothing extra is added.
- **Be explicit about the outcomes of the project.** Most agencies and foundations are interested in results. It is important to focus on what will happen as a result of this funding that will benefit your community, your group, society, and the funder. These outcomes are sometimes called "deliverables," meaning that upon completion of the project, there will be certain tangible items that the funder can see.
- **Be creative.** It is often the unique quality of a particular proposal or application that determines what projects secure funding. What is it that can make your particular project unique?
- **Use resources available.** There are many reference materials available on writing grants and application. It is worth the time for the writer(s) to review some of the suggestions in these materials.

### Conclusion

Whatever happens, there are no guarantees. You may think that your project is perfect and that you may have a tremendously well-written application, but yet not receive funding. Or another time, you may have a hastily written proposal that is funded. There are many factors outside your control that determine funding. The answer is to be prepared, do the best writing possible, and keep on trying!

### Resources


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*"Finding Funding for Environmental Education Efforts,"* Educational Resources Information Center Digest, *July 1993, used with permission.*

# Every Picture Tells a Story: Creating More Effective Public Displays

by Pamela Swan

ABSTRACT: When it's time to create a public display for a greeting area, exhibit space, or traveling education program, relying on intuition or personal opinion can be a liability. Since few organizations have the funds to hire professional exhibit consultants, it makes sense to become familiar with what has been learned by experts in audience research, educational psychology, and exhibit design. In just a short time, one can learn simple techniques and principles that will make written information more clearly understood, help select the best visual images, and mount a professional-quality presentation of material that matches the budget.

KEY WORDS: Conservation Education, Interpretation, Public Displays, Exhibit Design

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## Introduction

The field of exhibit design and evaluation is a highly developed professional specialty. In the last few years, advancement in the study of visitor behavior has lead to a more complete understanding of how audiences typically use exhibits and how they process information presented to them. Applying this knowledge to the design of displays will make them much more effective.

If your organization has the funds to hire a professional consultant, you will benefit greatly from their expertise. This paper is in no way meant to substitute for the valuable guidance of an exhibit designer or evaluator who can tailor their advice to your situation, and bring years of experience to bear on the specific questions or pitfalls of your project.

However, many organizations need public displays but can't afford a professional exhibit planner. In these situations, decisions often are made based on intuition or opinion alone. The result often is a display that is less effective or more costly than it needs to be. Since there is so much information available based on the experience of professionals in this area, this paper is designed to introduce you to some basic principles and refer you to other resources for making informed decisions.

## Six Steps to Exhibition Design

Whether the project is large or small, try using these steps to plan your exhibit and see it through. You may decide to make one of the steps very brief or informal, depending on the nature of your organization or project. Even if the step is abbreviated, though, don't leave it out altogether; taking a shortcut can result in problems that cost more time or money in the long run. No matter what your timeline or budget, any project can be improved by using these simple principles:

### 1. Focus Your Stakeholders and Design Team

In order to develop the right content for the display, goals must be set that represent the interests of those who will be connected with the final product. Groups who have a "stake" in what your display says should be asked about their goals for the exhibit.

This should be a simple, fairly brief process. It is about information gathering, not decision making. Soliciting input from stakeholders can yield some great ideas about both goals and content, and prevents having the interests of one group or another left out or misrepresented. Often the goals will overlap, and you will begin to identify the common goals. Measure future decisions about the project against these goals.

Your design team will include the project manager, text writer, graphic designer, fabricator, and evaluator. In some cases these roles may overlap, and on very small projects you may be all those people in one! Still, the design team needs a central idea for the display, so that everyone is on the same page, literally.

Exhibit designers call this the "The Big Idea." It's not the topic, which is usually broad (e.g., helping birds). It's not necessarily the title either, which needs to be direct and attention getting (e.g., "Help! Local Birds Need Your Protection"). The Big Idea is actually a short, complete sentence that summarizes the central thought you want the display to teach (e.g., Local bird populations will benefit from controlling cats, leaving baby birds alone, and helping wildlife rehab centers.) It helps to focus what the exhibit is about, and also implies what it is not about (e.g., identifying local species, diseases of birds, introduced species). This way your team can agree on what to leave out as well as what to include in your display.

**2. Front-end Evaluation**

Now you're ready to write text, right? Not yet. You know what you want to say, but you are probably too well informed to see the material from your audience's point of view. What do they already know? What misconceptions do they have? What are they interested in learning? If you overlook this part of the design process your display may look good to *you*, but may not be very effective to *your audience*.

Conduct a simple survey of your audience. This is called a front-end evaluation because we're evaluating the content before it's even written. Make a list of 3 to 5 questions, following the guidelines presented in Table 1.

Survey as many people as possible. Your timeline may only allow you to capture 10 surveys instead of 50, but don't skip this important step of finding out what your audience knows and what they need or want to learn.

**3. Create the Mock-up**

In this step you actually create a prototype of your display and observe how your audience uses it. There will almost certainly be things you didn't expect visitors to do that make you realize you need to change something about the display. The study of visitor behavior is fascinating, and it has yielded one very important principle: don't rely on expectations—evaluate! You may find that some of the print is too high, too small, or too complex. Maybe you'll find that they aren't noticing a very important element of the display. All these things can be fixed at this stage, but if you go straight to the final design without testing it, the display would be less effective and the changes costly.

The first step in creating a mock-up is to draw your ideas on paper. Think about how your audience will use the display. These suggestions for layout can be adjusted for your space.

- If they will be in a hurry, make text minimal and use headers that encapsulate ideas.
- If they will view it from a distance, make use of vertical space.
- If the location is not in the main traffic area, use pictures, objects, or lighting to draw attention to the display.
- If they will be standing near the display, keep most information at eye level.
- If you want children to read it, make eye-level match age-appropriate text.
- Keep your most important text near the most attractive element of the display (e.g., the biggest picture, most interesting object).
- Break up information into bits with bullet points, picture captions, etc.
- Ask simple questions and give straightforward answers.
- Print text large, up to about 36 points. Make headers larger and uniform.
- Make sure that text next to an object directly relates to the object.

Next, craft the text. This is an important step and another example of how you can use the expertise of professional evaluators to make a more effective display. We all have our own speaking and writing style. If you simply express your ideas in your regular style of communication, it may say all the right things, but will the audience absorb it quickly and remember it after just one reading? Here are some ideas about writing effective educational text for displays:

- Get to the point early in your text —then, elaborate.
- Use active voicing rather than passive whenever possible.
- Use grammar check on your computer to estimate grade level (grade 6–8 is generally best).
- Look at a sentence, cross out all words above grade 6 level and see if it still makes sense. If it does, young readers will still get the point. If not, reorganize the sentence.
- In headers, avoid text that could produce confusion if words were transposed by the reader.
- Sentences should be no longer than 10–15 words, and rarely in paragraph form.

There are many details about writing label copy that can work together to improve the way your audience understands your text. Check the references at the end of this paper, or look for help in a style guide.

Once you have created a draft, it's time to test it. Put a large sheet of butcher paper in the space where the final display will go. Print out your text on the computer in the same point size and font you will use in the final form, and tape it to the butcher paper in the same layout you will use. You can use a giant font for headers, or neatly letter the headers with a large marker. Find pictures or illustrations in an old magazine that you can use as examples of the illustrations needed for your display. Of course, you can't use these exact pictures in your final product unless you get copyright permission and slides from

**TABLE 1. GUIDELINES FOR SOLICITING PUBLIC INPUT**

| | |
|---|---|
| ***Be specific...*** | "What do you think happens to baby birds put back in the nest?" |
| **Not broad...** | "What do you know about baby birds on the ground?" |
| ***Put the audience at ease...*** | "Do you have any special interest, knowledge, or training on the subject of wild birds?" |
| **Not on the spot...** | "What do you know about wild birds?" |
| ***Solicit their opinion...*** | "If we made a display about protecting wild birds in your neighborhood, what things would you like to have it include?" |
| **Rather than coaching...** | "Would you like a display on protecting wild birds to contain information about how to keep cats happy indoors?" |

the photographer or illustrator, but these mock-ups will show you what does and doesn't work for your audience.

Now step back and look at the mock-up, and think again about how the audience will use it. If you need to move elements of text or images around, that's okay. Make your mock-up look like a work in progress, and make it easy to change.

**4. Formative Evaluation and Adjustment**

It's time to ask your audience for help again. You need people who aren't involved with the project—people who really are your audience. Let them know it's a prototype of the exhibit you're designing and you'd like their opinion. Ask them to look at it for as long as they like, and then tell you what they thought. Don't coach them or offer to explain the display. Simply stand back and observe the way they use the exhibit.

When they are finished, make your questions to them simple and don't put them on the spot. Open-ended questions work well, such as: "What do you think this is about, in general?" "What did you think this part meant?" Be sure to get their overall opinion with questions like "What would you change about the display?" and "What else do you think we could add to make it better?"

If you start to hear the same things from many people, or someone has a great idea, change your mock-up on the spot. That's why it's a draft. Keep surveying people until you feel pretty comfortable with the product you've created, and with the way your audience understands it. Professional evaluators often give a small thank-you to people who take the time to answer survey questions. It can be anything from a pencil or bookmark with your organization name on it, to a sticker or piece of candy.

**5. Graphic Design and Fabrication**

Graphic designers and fabricators often can be found in the same shop. Depending on the nature of your display, a print shop may be able provide you with all the services you need or recommend someone locally. For more complex or expensive projects, consultants are available through organizations that specialize in creating museum exhibitions.

Clip art is an economical way to illustrate text on a limited budget. Professional photographs have more power to attract than most line drawings, especially if they are full-frame shots of an animal perceived as dangerous or beautiful to the viewer. Contact the publisher of a magazine or book where you have seen pictures you like. They can put you in touch with the photographer. Poor-quality snapshots can actually detract from a display, but local professional photographers often are willing to work with nonprofits to produce slides that can be digitized for illustration on your project.

Three-dimensional objects are an even stronger draw, particularly if they can be touched. A live animal associated with the display rates the highest in "attracting power," especially if it is (1) moving or eating, (2) perceived as dangerous or beautiful, or (3) a baby (especially playing). This opens up an entire discussion of displaying captive wildlife, but videos offer a nice option.

Whatever the budget, it is important to be sure the materials you use will match the professional image you want to project. Looking for the cheapest possible way to fabricate your exhibit may make it useless in a very short time. Durable materials not only keep the display in use for a longer time, but also insure a professional look that has a psychological effect on your audience. The best information in the world will not be given much attention or be regarded as important if the presentation medium is dirty or worn out.

When choosing a fabricator, get two or three estimates and ask for references. Then follow up by going to see their work somewhere and talking with the people who use their services. If you can do this at the beginning of the project, when you are putting together the design team, you may be able to get some valuable advice while planning your mock-ups that set limits for the display based on available materials.

**6. Summative Evaluation and Documentation**

You finally have the display up and it's all over, right? Almost. There's a last important step called "summative evaluation." This is the process of testing the way your audience actually uses the final product. Why? You're not going to change it now.

Maybe you won't change this display, but you've learned a great deal through the process of creating it. It's important to see whether the things you learned are actually working for you. Survey your audience one more time and see what they get from the final product. Go back to your stakeholders and find out how successful they feel the display is in reaching its goals and staying true to The Big Idea.

Avoid the tendency to try and make a summative evaluation vindicate all your hard work. If, in the end, there's something that could be done better next time, you want that in the record. If the display leaves some questions unanswered, your audience may be telling you what your next project should be.

Either way, documenting the process of creating a public display will give you a great set of guidelines for what works and doesn't work in your organization. Keeping a list of contacts and prices will make the next project easier. As your organization grows, hiring a professional evaluator and exhibit designer may be in your future. Becoming familiar with these steps may make it easier to work with them. Meanwhile, it should help you to create better public displays on your own.

**Resources and Suggested Reading**


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*This article was originally published in the 1998 IWRC Conference Proceedings.*

# *Joignez-vous à nous pour la conférence du millénaire dans la belle ville de Montréal Québec*

**WILDLIFE WITHOUT BORDERS**

**Pre-Conference Activities October 23-25**

**THE IWRC 23RD ANNUAL CONFERENCE**

**Montreal, Quebec, Canada October 26-29, 2000**

We are working in conjunction with our host group, the Urban Animal Advocates, to bring you one of our best meetings ever.

♦

Remember, the Canadian exchange rate is approximately 150%... You'll get $1.50 value for every U.S. dollar! *(hotels, meals, and shopping once in Canada)*

## ♦ Pre-Conference Activities October 23-25

**New Offering Especially for Educators!**
**Project Wild Facilitator Training Workshop:**
Project WILD is one of the most widely used conservation and environmental education programs among educators. At this lively and engaging day-long professional workshop, educators will be introduced to Project WILD materials, activities, and strategies. Through hands-on practice, educators gain the experience and confidence needed to work with their students and to integrate Project WILD into their programs. The Project WILD K-12 Activity Guide and a Certificate of Completion are provided to those who participate.

**Field Trips:**
Fabulous field trips start Mon., Oct. 23rd with a 2-day trip for **WHALE WATCHING IN TADOUSSAC.** On Wed., Oct. 25th enjoy **PARC NATURE DU BOIS-DE-L'ILE-BIZARD,** the largest marsh habitat on the island of Montréal; **BIODOME DE MONTREAL** where you can Explore three lifezones; and **PARC DES ILES DE BOUCHERVILLE,** a string of five islands located in the St. Lawrence River. **GUY HODGE MEMORIAL BIRDING TOURS** are free birding walks each morning at Mount Royal Park, just minutes away.

**IWRC Skills Seminars:**
As always we will be holding a 2 day Basic IAB training seminar as well as several advanced sessions prior to the start of the main conference. Seminars will be scheduled for Tuesday and Wednesday, October 24-25, 2000.

## ♦ Conference Activities October 26-29

**Meeting Topics:**
At this conference we will be focusing on the following areas:

- Wildlife Medicine
- Wildlife Husbandry
- Wildlife Nutrition
- Leadership Skills
- Non-Profit Administration
- Fundraising
- Wildlife Diseases/Zoonosis
- Urban Wildlife Issues
- International Wildlife Treaties/C.I.T.E.S.
- Public Education/Interpretation
- Illegal Trafficking of Wildlife
- Migration and Translocation
- Cooperative Efforts Across Borders
- Hotline/Telephone Strategies
- Effective Interaction with Regulatory Agencies
- Wildlife Management Concepts

**If you would like a registration brochure** — or if you would like to submit an abstract to be a presenter at the Conference, you can request a form from our office.
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*Mark your calendars now to reserve these dates and join us for this fact-filled, fun-filled adventure!*

## FROM THE LAST ISSUE... CASE X:

# Managing Risks

*The last Up For Discussion case raised important issues about the role of vaccinations in wildlife rehabilitation....*

For the past two summers, Emily had worked at the local wildlife rehabilitation center, feeding the orphaned baby birds and squirrels. She got a lot of satisfaction from her work was thinking about applying for her own rehabilitation license.

That afternoon, the center's staff and volunteers had attended a training on rehabilitating mid-sized mammals, followed by a planning meeting. They had discussed possible changes in their approach to rehabilitating foxes, skunks, and raccoons. During the last year, some animals with distemper and parvovirus had been admitted to the center, although the center's strict quarantine procedures had prevented a major outbreak.

Many at the meeting felt it would be better for the mid-sized mammals to be rehabilitated in smaller groups at home-based facilities. The center would provide most of the necessary materials, training, and support. Although not legally mandated, the center required that all skunks, foxes, and raccoons be vaccinated for distemper, rabies, and parvovirus. The center offered to provide these vaccines to their sub-permittees, and to offer the state-required pre-exposure rabies vaccine to all sub-permittees.

That afternoon Dennis had taken their 3-month-old puppy to the veterinarian and had gotten into a discussion about vaccinations. The veterinarian acknowledged increasing concern about both the short- and long-term effects of vaccines, explained that the law requires a rabies vaccination for all dogs, and gave Dennis some reading material.

As Emily and Dennis read the vet's materials and looked up vaccinations on the Internet, they felt increasingly concerned about the possible risks of vaccines. At the same time, they were concerned that *not* having vaccines could also increase risks.

Emily was starting to understand why some people didn't like the center's requirement of vaccinating the mid-sized wild mammals. She was also somewhat apprehensive about having a pre-exposure rabies vaccine. Dennis wondered if having wildlife in the house might expose their son or puppy to diseases or parasites, even if wildlife was generally kept in a separate room in the basement.

## QUESTIONS FOR DISCUSSION

1. **How do you feel about the decision to vaccinate wildlife in rehabilitation? Why? What factors do you consider part of the decision?**
2. **Some state agencies as well as rehabilitation facilities require pre-exposure rabies vaccines for people working with rabies vector species. How do you feel about this?**
3. **By its nature, wildlife rehabilitation includes some risks. Reducing and managing risks is critical, particularly with species that involve higher risks. What are some decisions (e.g., species to rehabilitate) and practices (e.g., cage location, sanitation) home-based rehabilitators can follow to reduce risks?**

## RESPONSES

### I.

*Patrice N. Klein, MS, DVM, DACPV*
*Wildlife Veterinarian*
*Humane Society of the United States*

***Regarding the vaccinating wildlife in rehabilitation:***

The decision to vaccinate wildlife in rehabilitation must be made predicated on a risk vs. benefit basis. What is the real or perceived risk to the animal in rehabilitation to exposure to a disease in the wild population? Would contracting the disease be life-threatening or fatal to the animal, or would the animal likely survive and develop lasting natural immunity? Are vaccines

**Wildlife rehabilitators' interests range far beyond the direct care and handling of wildlife. Standards, ethics, wildlife policy, and community involvement are among the many issues that have a direct impact on the work rehabilitators do every day.**

**Since these issues benefit from broad public discussion, this section of the *Journal* is designed to offer a forum for wildlife rehabilitators to exchange ideas about challenging issues, which are "up for discussion" by you, our readers. Some of the cases may also be discussed at upcoming IWRC conferences.**

**The following cases will present either hypothetical situations or real-life problems facing active rehabilitators. Each case is followed with several questions for readers, and responses from people involved in wildlife rehabilitation. To encourage a free exchange of ideas, both attributed and anonymous responses are welcome.**

**Each issue of the *Journal* will publish a synopsis of the original case from the last issue, several responses, and a new case for your consideration. Please see page 25 for this issue's new case, and see the box on page 24 for details about how to participate.**

**Space may not be available for all responses submitted, and responses may be edited for space and clarity, but we will include as many responses as possible. We welcome your participation. Only with your help can this forum thrive.**

***NOTE: The International Wildlife Rehabilitation Council makes no claims as to the accuracy or truth of the following cases, not does it endorse any particular answer or viewpoint.***

available that could be administered safely and effectively to the wild animal? Would the vaccines be protective (i.e., stimulate the animal's immune system to produce specific and adequate antibodies to protect the animal if subsequently exposed to the disease agent)? Or could the vaccines induce severe disease in the animal that would negate any benefit in their use?

Vaccines that are licensed by the USDA and commercially available are labeled for use in specific animals. These animals are most commonly domestic animals such as dogs, cats, ferrets, horses, and livestock. Use of these vaccines in wild animals is considered "off-label," or "extra-label," use because it has not been proven effective or protective. Therefore, the decision to administer vaccines off-label is generally at the discretion of the veterinarian. In 1994, the FDA enacted the Animal Medical Drug Use Clarification Act (AMDUCA), which allows veterinarians to prescribe extra-label uses of approved animal drugs and approved human drugs for all animals. However, the veterinarian also has the responsibility for drug effects and withdrawal periods in the animals treated.

In a practical approach to clarify this complicated issue, the rule of thumb is "in all else, do no harm." Vaccinating wild animals in rehabilitation is not an uncommon practice given the knowledge that certain diseases are endemic in local wildlife populations. When using vaccines in these animals, in consultation with a veterinarian, it is essential that *only killed vaccines* be administered. These may offer an immunologic advantage to the animal upon release to promote its survival in its natural world. The use of live, modified live, or attenuated vaccines, on the other hand, is absolutely contraindicated in off-label use. The effects of these vaccines have been demonstrated in the species for which their use has been approved and licensed. It is unknown in off-label use. Administering a live or modified live vaccine to a wild animal may do more harm than good, and may even induce a fatal reaction in the animal.

***Regarding pre-exposure rabies vaccines for rehabilitators:***

Any person working with animals, either domestic or wild, and in areas where rabies is considered an endemic disease, should and must receive pre-exposure rabies immunization. Individuals in potentially high-exposure situations, specifically, rabies vector species (RVS) rehabilitators, should be considered negligent if they fail to protect themselves through prophylactic immunization. In many states that authorize RVS rehabilitation, there is required compliance agreement that the rehabilitator receive pre-exposure rabies immunization, as a stipulation to the RVS rehabilitation permit.

RVS rehabbers have a special role in protecting the public and in ensuring their health and safety from potential exposure to rabies in wildlife. RVS rehabbers receive raccoons, skunks, foxes, coyotes, and bats from the public and must be prepared to provide secure and proper care and housing of these animals. It undermines the role of the RVS rehabber as an advocate for wildlife and a public protector to be capricious and irresponsible in their own safety and for the safety of those working with them.

***Regarding risk reduction:***

Reducing and managing risks is not unique to home-based rehabilitation. Risk reduction is an important component of any workplace. However, this becomes essential when the workplace and home are synonymous.

The first criteria is biosecurity. How can the home-based rehabilitator maintain a safe and sanitary environment for the animals and themselves in a home-based facility? What type of control measures must be instituted to minimize risks of disease exposure to other animals, and to people working in that environment? Biosecurity is as much a state of mind as it is a practice. It involves basic principles of hygiene, sanitation, and disinfection. What advice and practices would one recommend to first-time parents to guide them in reducing the risk of disease exposure in the home to their newborn infant?

Separation and containment are two more critical elements. Rehabilitation activities should be conducted in a designated area of the house that is separate from common living areas. At best this would involve separate food storage, food preparation, washing and laundry units, and animal housing. Animal feeding bowls and utensils should never be washed in the same sink or comingled with common household food and cooking utensils. Domestic animals must never have direct or indirect contact with any wild animal in rehabilitation. Indoor animal housing should be in a separate room from other rehabilitation activities. This minimizes stress to the animals, and reduces contamination of "clean" areas such as food preparation and supply storage. Outdoor caging should be constructed to prevent contact with free-ranging wildlife and possible introduction of disease. Newly received animals should be housed separately from other rehab animals for several days while evaluating the health status of the new animals. Animals known to carry infectious parasitic diseases, such as *Balyisascaris procyonis*, the raccoon roundworm, should have separate housing, bedding, and feeding bowls dedicated to and identified for use in only that species. These items should never be shared or used for other animal species.

Imprinting, habituation, and taming are potential, critical problems to be avoided, particularly in home-based rehabilitation situations. Husbandry practices are crucial to avert these behavioral traits. Separated housing and rehabilitation activities will minimize routine contact with wild animals. Housing con-specifics together will promote normal socialization of these animals. Prevent any contact with domestic companion animals that otherwise could diminish natural fear reactions in the wild animals. Never house predator and prey species in close proximity. This may appear obvious to

most rehabilitators, but when housing space becomes constrained, one often forgets the obvious in seeking expedient solutions.

A last note on biosecurity: wearing separate work clothes and shoes when conducting rehabilitation activities in home-based facilities is an essential practice to promote the rehabilitator's health and welfare. Avoid mechanical transmission of infectious agents to common living areas. You may be conscientious in minimizing introduction or transmission of infectious agents to animals within the rehabilitation areas, but undermine your family's and your own health and safety by entering the home with soiled clothing and footwear. It is important to remember that zoonosis is a two-way street: we may be susceptible to contracting some diseases from animals, but they may be similarly vulnerable to infectious agents that we may harbor. *E. coli, Salmonella sp.*, and *Giardia lambia* are just three diseases of human contamination origin. As caretakers of wildlife, we must ensure their health prior to release, and maintain ours so we may continue to protect and provide for them.

## RESPONSES

### II.

*Mary Catherine Kuruziak*
*House of Wildlife Rehabilitation Centre*
*Ontario, Canada*

***Regarding vaccinating wildlife in rehabilitation:***

Much of the information rehabilitators have to go by is received through word-of-mouth. Many of us have learned from other rehabilitators about the importance of vaccination protocols in rehabilitation facilities. For example, we now know how quickly an outbreak of viral disease can sweep through a raccoon orphanage. The shock and heartbreak of such devastating deaths is not soon forgotten by anyone who has been through this experience. In every single case study I know, it only took *one* infected animal to introduce the virus to the facility and affect all unvaccinated animals.

The effect of viral diseases on wild populations is, for the most part, out of our hands. Healthy wild animals are generally able to avoid sick individuals. Once admitted to a rehabilitation center, however, animals are often forced to live in much closer proximity than would be normal in the wild. Steps must be taken to prevent problems that arise as a result of these abnormal conditions.

The choice to administer vaccinations, under veterinary supervision, to wildlife undergoing rehabilitation is not made to protect the family "pet" from exposure. Vaccinations are administered to protect the wildlife in our facilities. The household puppy's exposure should not even be an issue in a properly set up rehabilitation facility, regardless of whether the "facility" is someone with one litter working out of their home or a wildlife centre with 100 raccoons.

Raccoons are susceptible to a wide variety of viral diseases, including feline panleukopenia, raccoon parvovirus, mink enteritis parvovirus, canine distemper, and rabies. That's quite a soup-mix to consider for a single species. It seems that by turning to the Internet for information, rather than a veterinarian with wildlife experience, Emily and Dennis have fallen into the trap of assuming "true for domestics—true for wildlife." Those who use the Internet must be especially wary, as no qualifications are required before posting information. The information Emily and Dennis read regarding vaccinations may not necessarily apply to wildlife.

When rehabilitators work in an area where viral diseases are endemic in wild populations, they are foolish not to offer some measure of protection to the other orphans in their care via vaccination. It is documented that these viruses do not offer lifetime immunity from disease to wildlife, but it is also documented that in most cases they do offer some measure of protection to the animals for the duration of time they are in our care. Some people are of the opinion that vaccinating wildlife in rehabilitation has a detrimental impact on the population balance in the wild once they are released, but there are studies that have show this is not true.

Rehabilitators need to face up to the responsibility that wildlife in their care needs protection from disease that may unknowingly be brought in by newly admitted animals. Not vaccinating them could well end up costing the lives of all the others in care.

***Regarding pre-exposure rabies vaccines for rehabilitators:***

Connecticut's "Prerequisites for Handling RVS" is a good example of how to handle this issue. The rule states: "All rehabilitators who care for rabies vector species (RVS) are required to receive a pre-exposure rabies vaccination series. This is an unconditional requirement: wildlife rehabilitation is a voluntary activity, and if people don't want to be vaccinated (or can't be for medical reasons) then they won't be allowed to care for RVS due to the risk of unapparent exposure." (*Procedures and Guidelines for Wildlife Rehabilitators Who are Authorized to*

### JOIN THE CONVERSATION

**On the following page, the *Journal* presents a new case. We invite you to read the case and consider the questions at the end. The cases are designed to raise complex issues, leaving plenty of room for varied or even contradictory perspectives. To join the conversation, send your response by 25 July 2000 to Attn: Up for Discussion, IWRC, 4437 Central Place, B-4, Suisun, CA, 94585-1633, USA, or via email to iwrc@inreach.com.**

**The *Journal* also welcomes suggestions for topics to feature in future issues.**

*Handle Rabies-Vector Species*, by Laura Simon, Connecticut Wildlife Rehabilitators Association, August 1999)

Ontario has adopted this requirement as well. If a person does not provide proof in Connecticut of that PEP status, they are not licensed. Ontario calls this a "standard," but is not yet legally able to enforce it. We would all do well to incorporate similar conditions into our standard operating procedures, preferably on a voluntary basis before it is mandated on us by legislation. I know of several rehabilitators who waited until they were bitten to get their PEP shots. Personally, I find this to be completely irresponsible and unprofessional.

## NEXT TOPIC... CASE X:

## Financial Realities

Tim and Grace Harrison had just finished looking at their rehabilitation budget and wondered what they would do. The number of animals they rehabilitated continued to increase dramatically while the money available did not. They were able to get most of their veterinary services donated, but paid for medications. Some of their wildlife food and caging supplies also had been donated. But expenses were still rising. They felt trapped between a rock and a hard place.

After volunteering for four years at the Smithville Wildlife Rehabilitation Center, last year the Harrisons had obtained their own wildlife rehabilitation permit for small mammals when the only other nearby mammal rehabilitator had moved out of state, leaving her cages for the Harrisons. The Smithville Rehab Center specialized in birds and only accepted mammals if they could immediately transfer them. With an increase in residential development in the area, more and more wild animals were being displaced. It was no surprise then that the Harrison's home-based facility had been full from Day One. Their annual rehabilitation operating budget of $9,000 had put a strain on their household finances.

During the last 15 months, they had admitted and rehabilitated 63 raccoons, 4 foxes, 9 opossums, 30 squirrels, and 8 cottontails. They had expanded their indoor and outdoor enclosures to accommodate the influx of wildlife. All of the animals had come to them through the Smithville Rehab Center, either as deliveries or referrals—including the transfer of 17 raccoons in one day. Physically, emotionally, and financially it had truly been a stressful year.

A couple of days earlier, they had received the Smithville Center's biannual newsletter. The center proudly reported a $10,000 recent donation from the Smith Valley Home Construction Corporation in recognition of the center helping them with a group of 17 raccoons. The raccoons, which were living in the path of new housing construction, had been trapped by nuisance control operators. A photograph showed the adult and juvenile raccoons being delivered to the center in traps.

The delivery of the same raccoons to the Harrisons two hours later was not mentioned. The animals had numerous trap injuries that needed emergency veterinary medical attention and their coats were in poor condition due to the junk food they had been fed by the construction workers. The Harrisons had not received any portion of the $10,000 donation to help defray their expenses rehabilitating the raccoons.

The day after reading the newsletter, Tim stopped by the center to discuss the issue with the center manager, with whom he had long had an excellent working relationship. She felt that Tim and Grace should have received some money to help with the transferred raccoons and other animals. She explained that the center's board of directors had discussed the $10,000 donation in some depth at a recent meeting. All of the board really appreciated Tim and Grace rehabilitating mammals and felt uncomfortable not giving them any of the money, but the IRS regulations prohibited tax-exempt 501(c)3 organizations, like the center, from giving money to individuals. The final board vote, while not unanimous, was that the $10,000 donation to the center would go to center projects, specifically building a new educational display and raptor enclosure.

The Harrisons were disappointed and uncertain what to do next. They had previously considered forming their own 501(c)3 organization to go after public donations, but still felt loyal to the center; they had not wanted to compete with the center's well-established fundraising activities. They were also well aware that that they could not personally continue to spend next year at the level that this year's rehabilitation activities required.

The situation needed prompt attention. A quick glance at the real estate section of the Sunday paper told the story: many new housing subdivisions were being started, meaning more animals would soon be in need.

### QUESTIONS FOR DISCUSSION:

1. **Rehabilitation activities can be expensive and financially stressful regardless of the species. What can rehabilitators do so their budget is not overburdened?**
2. **If a rehabilitation facility accepts wildlife and donations for their care, what should be done with the money if the animals are transferred to another rehabilitator for care? Why? Are there differences for non-profit groups, particularly 501(c)3 organizations?**
3. **How can larger wildlife rehabilitation facilities, if they want, support home-based wildlife rehabilitators?**
4. **Do businesses or organizations that are clearly responsible for the displacement or injury of wildlife (i.e., construction, nuisance control operators, pesticide applicators) have a financial responsibility for the animals' rehabilitative care? Why? If yes, how might action occur?**

SUCCESS STORY

# A Case of One Robin's Release

by Elizabeth P. Elliston

Between 1995 and 1997 Wildlife Rescue of New Mexico received and raised displaced baby birds in the Natural Resources building of our state fairgrounds. Here we received from the public all the "found" wildlife that came to their hands. Some, such as juvenile raptors, were sent to live with foster parents at removed locations. Others, such as robins and finches, were raised on site by dedicated staff, including students from the Albuquerque Mentorship Program.

This story is about a young robin (*Turdus migratorius*). The American robin, closely related to a thrush, is an insectivorous bird that thrives in semiurban areas. In spring and summer, when they are raising young, robins forage on lawns and in leaf litter/dead fall, where they find a wide variety of insects, true bugs, and annelid worms, which together comprise about 80 percent of their diet. As the year progresses, robins include more vegetable material in the diet, to a level of roughly 80 percent in the winter months, thus reversing the insect:vegetation ratio. They migrate relatively short distances, living in large flocks in winter and taking advantage of both native and exotic ornamental fruits and berries (Martin 1951).

All the nestling robins raised at the fairgrounds were fed the Basic Nestling Diet recommended by Marty Johnson (1986; www.iwrconline.org/rehab/robindiet.htm). Some were fed a modification of the diet that contained gelatin to form the food into "worms" (Elliston 1998). The birds were housed together in small protective cages while in the nest and during early fledgling ages. During this period they were fed by humans at schedules varying from every half-hour to once an hour or less, depending on their age.

When they started serious wing exercise and began to self-feed, the robins were removed to a large exhibition flight cage (about 2,000 $ft^3$ in size) used to house big raptors during the New Mexico State Fair. The robins completed their fledgling period in this flight, competing for food, foraging in the litter, bathing in the baths placed for this purpose, and socializing with each other (but with no adults present). Much of the front of the flight, the observation opening of the exhibit, was covered by sheeting so that the birds were removed from visible contact with humans. However, this housing could hardly be described as isolated from human contact.

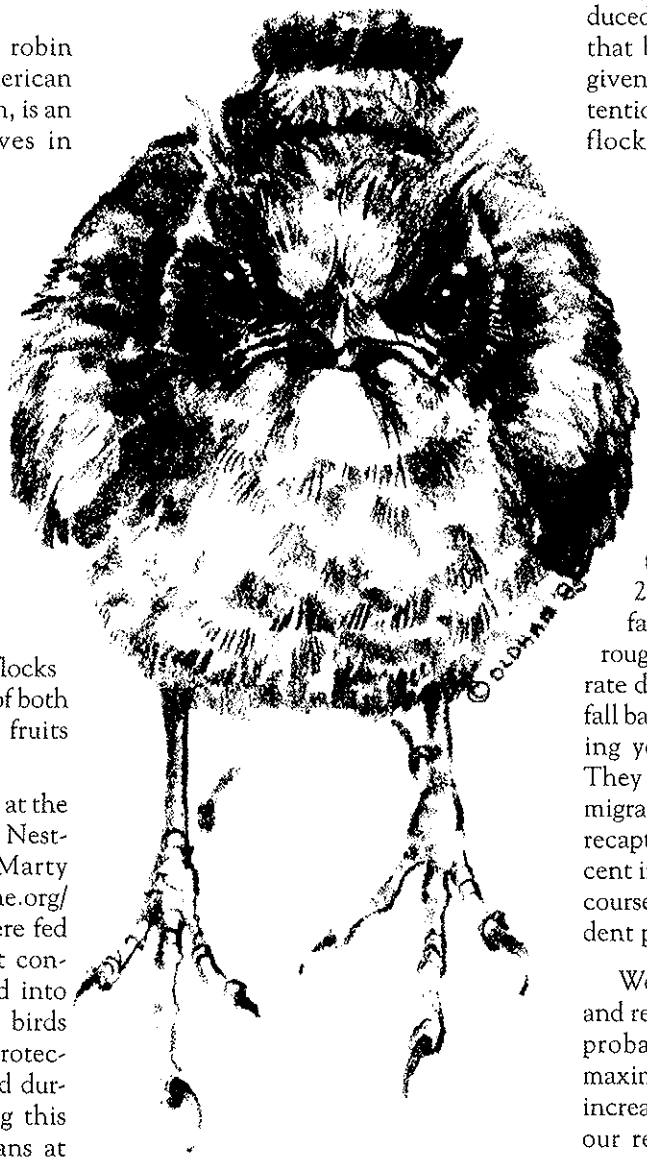


ILLUSTRATION ©1985 PAT OLDHAM

After birds were placed in the flight they were no longer weighed every day. If a particular bird appeared to be competing unsuccessfully (e.g., reduced activity, puffy, on the ground) that bird was removed, assessed, and given a few more days of intensive attention before it was returned to the flock. We found that competition stimulated the development of the robins' self-feeding skills.

When the youngest bird in the flight had been competing successfully for a week or so, we called Steve and Nancy Cox of Rio Grande Bird Research, Inc., to come and band the birds. The Coxes have been regularly mist netting and banding birds at the Rio Grande Nature Center in Albuquerque for more than 20 years. They report that of the fall birds banded they recapture roughly 1 percent the same fall. This rate drops to well below 1 percent for fall banded birds recaptured the following year (Cox 1999, pers. comm.). They also band winter populations of migratory birds. In those groups they recapture at rates of between 3–5 percent in following years. This rate is, of course, higher in banded winter resident populations.

We decided to band these songbirds and release them in an area where the probability of recapture would be maximized, potentially allowing us an increased chance of following some of our releases. All the rehabilitated

birds were recorded with slight body molt and 0 fat.

To make a long story short: bird number 94281083, a robin among about 75 similar birds raised in captivity, banded, and released, was released on 22 July 1995. His weight at that time was 60.5 g. On 5 August 1995 he was recaptured on the opposite side of the pond from the release site. Unfortunately no weight was taken. On 10 August 1995 the bird was again captured about 91.44 m (100 yds) from the first recapture site. This time he weighed 68.9 g. On the next day he was re-netted on the opposite side of the pond at a weight of 65.9 g. He has not been captured since that time.

It may be that this robin learned how to avoid the nets and is still happily living at the Nature Center. He may have been eaten by a predator, or flown into a window, as happens to so many robins. He may have migrated to another location and forgot to send a postcard. In any case, he demonstrated that even after being raised in a completely artificial setting, he had the survival skills necessary to function successfully in the wild for as long as 3 weeks. Whether those skills are instinctive, learned, or a combination of the two, is not known.

Given the oft-repeated assertions that wild birds raised in captivity do not survive in the wild, we were encouraged by the record of this bird's experience. If we had not had the opportunity to cooperate with a permitted bander the information would never have been gathered. It is interesting to note that the Coxes were also pleased to be able to identify these as rehabilitated birds, by their bands. Ordinarily the banders of Rio Grande Bird Research band about 20 wild-caught robins in a season. Banding the rehabilitated birds enabled them to understand more about the population of robins in the study area, since they knew the origins of at least some of the recaptured birds.

**Acknowledgments**

Grateful thanks are given to Steve and Nancy Cox of Rio Grande Bird Research, Inc., for giving of their time and expertise; the Rio Grande Nature Center for being supportive of our releases; the Share with Wildlife Program of the New Mexico Department of Game and Fish for partially funding this project; the New Mexico Department of Game and Fish and the U.S. Fish and Wildlife Service for permitting the program; the many members of the public who cared enough to bring displaced nestling and fledgling robins to Wildlife Rescue of New Mexico for care; and the many members of Wildlife Rescue that contributed to their eventual release.

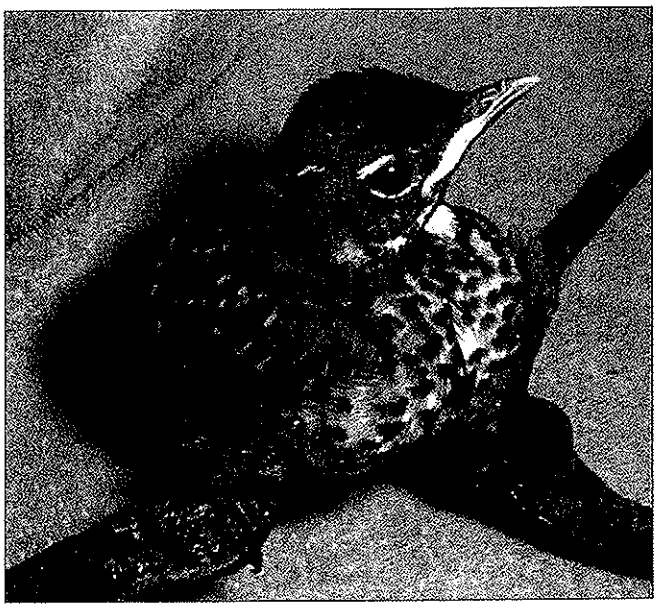
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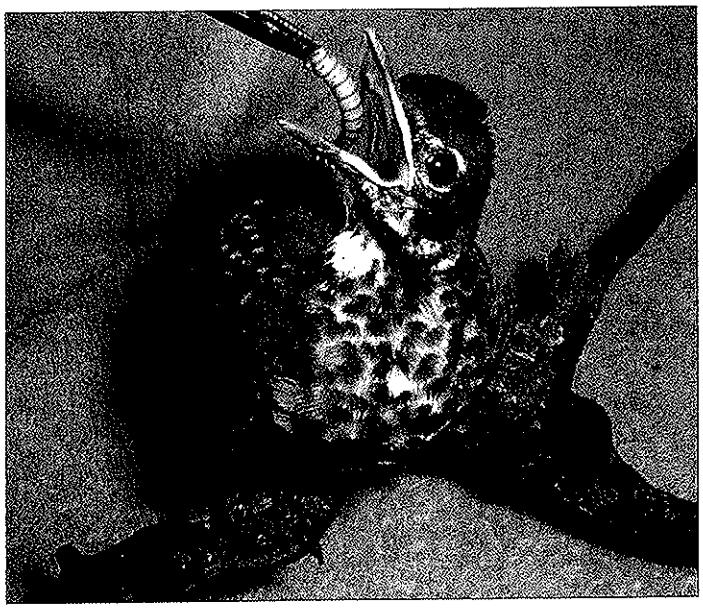
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**(Below) Initially, the robins were housed in small protective cages and fed by humans every 30 minutes to once an hour or less, depending on their age.**





COLUMN

# Operating Instructions

by Nathalie Karvonen

If you are a wildlife rehabilitator who takes calls from the public, you are operating a wildlife hotline in one form or another. You know your hotline is helping callers, but did you know that it's also contributing to your success? That the pesky phone, which never seems to stop ringing, can be one of your greatest assets. How?

### By Reducing Intakes

One of the most dramatic ways your wildlife hotline assists you is by reducing intakes. Orphan calls illustrate this point well. Generally, members of the public don't know a thing about fledgling birds, deer fawns patiently waiting for their moms to return, cottontail rabbits snuggled into a nest and left by themselves all day, baby squirrels who tug on your pant legs, and lots of other situations—but *you* do! And what you don't know you can find out from your network of fellow wildlife rehabilitators. By being available to the public, and by taking the time to educate yourself and them, two wonderful things will happen: (1) more babies will be left with their parent(s) to be raised under the best possible circumstances, and (2) you won't need to raise as many babies yourself!

At the Toronto Wildlife Centre (TWC), we run a prominent ad in local phone books that says "For FREE help with nuisance situations, please call...". This is a very effective way to reduce intakes. If you can talk to the public before they try to deal with a situation on their own (or contract with a not-so-ethical company to do it for them), you can greatly reduce the number of injured and orphaned animals created.

### By Saving Wild Lives

Your wildlife hotline helps you save wild lives. For example:

- Emphasizing quiet, minimal handling during capture and transport also improves your patients' prognoses.
- Recognizing the symptoms of poisoning allows you to caution the caller against feeding the animal, explain the urgency of providing proper care immediately, and ensures that staff are prepared to treat the animal quickly when it arrives.
- Knowing enough to ask key questions about "orphans" helps you determine whether or not the baby actually needs help.
- Determining that a small bird with a short tail hopping around on the ground is actually an injured adult and not a fledgling bird dramatically changes the information you provide to the caller.
- Advising a caller to provide gentle warmth for a hypothermic animal—and making sure an animal with head trauma does *not* have warmth applied to the head—can dramatically improve patient survival.

### By Prevention and Containing Problems

Hotline calls can alert you to problems while there is still time to limit the damage, or even prevent the situation entirely.

- An oiled bird found near a creek could indicate a possible spill nearby that may affect other wildlife.
- Poisoned bird calls alert you to the possibility that others may have ingested the toxin as well.
- A condo complex memo to residents advising them to trap and relocate all raccoons and squirrels due to complaints provides you with an opportunity to educate the community.
- Reports from the public of fraudulent wildlife removal companies allow you to warn your community and educate at the same time.

### By Establishing Your Credibility

You never know who will call your hotline. It could be a reporter, a future donor, a representative of another animal welfare organization. How you handle each and every call is a direct reflection on your organization. Establishing your credibility within the community is vital to your success; maintaining that credibility is just as important. Once you lose the public's trust, it's incredibly difficult to regain it.

### By Increasing Donations

Keep in mind that the person on the other end of the line could be one of your big donors—or a potential donor. By providing quality information and prompt, courteous assistance to every caller, you increase your opportunities to generate funds. One day, TWC had a call about a fledgling bird—one of what seemed like a zillion calls about fledglings that day. Our hotline staff handled the call in a polite, professional manner and resolved the situation. Only then did the caller identify themselves as our biggest donor (a *really* big donor).

Keeping careful records, compiling statistics, and storing thank you letters from the public will help you apply for grants to develop or sustain your hotline service. This practice allowed one Canadian wildlife center to secure a $53,000 annual grant from their regional government to operate their hotline.

### By Creating Allies

By promoting your hotline service to other organizations and agencies, as well as the public, you can broaden your circle of influence. You can correct misinformation, debunk myths, create tolerance and understanding, and reach far more individuals. This in turn helps decrease intakes. Local reporters, vet clinics, pet stores, animal control agencies, the police, and government agencies have all come to view TWC as a reliable source of information, and they turn to us often for advice. When we teach a caller about a fledgling bird they have found, we help that caller and that bird. When we tell a phone volunteer at another organization how to handle fledgling bird calls, the information spreads even further. When we explain how to help fledgling birds to a reporter writing for a major daily newspaper, we can reach millions!

*Nathalie Karvonen is the executive director of Toronto Wildlife Centre. TWC operates a wildlife hotline service available to the public 365 days a year. In 1999 the TWC hotline received more than 16,000 calls.*

COLUMN

# Open Minds

by Kieran Lindsey

During my tenure as director of an urban wildlife shelter, I had to handle countless inquiries from individuals seeking a job or a chance to volunteer. The calls usually went something like this:

**Me:** Wildlife shelter. How can I help you?

**Them:** Hi, my name is Kitty Wake and I'd like to work at your center.

**Me:** What makes you think you'd enjoy working at a rehabilitation center?

**Them:** I just love animals! I've always had lots of pets, so I have lots of experience. Basically, I just love animals and love working with them!

**Me:** Umm...that's good. So how do you feel about working with people?

When someone wants to get involved in rehabilitation, I naturally assume they like animals. But there's more to rehabilitation than animal care. It doesn't matter whether your particular situation requires you to be a specialist or a jack-of-all-trades, everyone in rehabilitation shares one important role. We are, all of us, wildlife ambassadors. We speak for wildlife, and to do that we need to interact with people.

I'm willing to bet there's not a wildlife rehabilitation organization in existence that doesn't mention education in its mission statement. Rehabilitators are big on education. We visit elementary schools and garden clubs, spend hours putting together slide programs, and often are featured guests—along with our education animals—at festivals and fairs. "Education is one of the most important things we do," we say, and truer words were never uttered. But are we walking our talk? Are we making the most of every opportunity to educate?

What about all of those people who step up to your intake desk or call your hotline? A formal education program is "show time." We're on stage, and we know it, so we're ready to play the role of educator. When we're not on stage, it can be easy to loose sight of education. There are dozens of distractions, and, let's face it, dealing with an individual one-on-one is much harder than making a presentation to a polite, enthusiastic audience. But I would argue that the survival of wildlife may well depend on our ability to reach those individuals.

Why does this fall on the shoulders of rehabilitators? Aren't we juggling enough already? And besides, I can hear you thinking, "there's already tons of environmental education going on." And so it would appear. Everywhere you look, there are books, magazines, movies, and television shows about nature in all its diversity. You can even find nature at the mall: stores like The Nature Company are brimming with tools and toys for learning about wildlife. But exposure to these educational resources—like attendance at your formal wildlife programs—is a choice. The audience has to seek out this kind of education. They have to visit the store, fill out the subscription card, buy a ticket, or, at the very least, take a break from channel surfing. These books, boutiques, and presentations are preaching to the choir. If you aren't already part of the choir, chances are you won't hear the message.

Wildlife rehabilitation offers a unique and incredibly valuable opportunity to educate. Our audience represents a broad cross-section of the population at large. Think about this for a moment. When a squirrel darts out in front of a car, it doesn't wait until it knows the driver is a member of the National Audubon Society. Birds don't look to see if the Discovery Channel is on before they crash into your window. So we can't make any assumptions about the person who shows up at our front door, perforated shoebox in hand. They might be the head curator at the local zoo; just as likely, they are a harried parent who doesn't give a flip about wildlife and really doesn't have time for this, but couldn't bear to be seen by their tearful child as an ogre who could leave a poor baby bird all alone on the sidewalk to die. This is the classic "teachable moment." It's a small window of opportunity—but big enough to show someone why they should care. It's a chance to open minds.

We can't afford to let this chance pass us by. When we do a good job delivering our message to the person in front of us, we light a spark that will spread in ways we can't imagine—to neighbors, co-workers, parents, and siblings. You and I can't possibly hope to reach everyone on our own, but imagine the impact we would have if every person who brought us an animal passed along our message to just two other people, who passed the message on to just two other people, and so on.

How can we make the most of these chances to deliver our message, especially when learning about wildlife may be the last thing on the mind of our audience? That's what I'll explore in this column: teaching on the fly. Just as every rehabilitation case demands different skills from the caregiver, every rescuer at the intake desk or caller on the other end of the telephone line presents a unique challenge to the wildlife ambassador. No one has all the answers, so while this column was not conceived as a Q&A feature, I encourage you to share your successes and frustrations. After all, we wouldn't want to pass up a chance to open our own minds, too.

*Kieran Lindsey is the former director of the TWRC Wildlife Shelter in Houston, Texas, a wildlife biologist, and president of Natural Assets Consulting. Send your comments and questions to IWRClindsey-@aol.com, or to P.O. Box 1443, Cedar Crest, NM 87008-1443, USA.*

# Conservation Classics

## A Sand County Almanac

**by Aldo Leopold**

Oxford: Oxford University Press, 1987
228 pp; $25 U.S. (cloth)

New York: Ballentine Books, 1991
$295 pp; $6.99 (paperback)

*reviewed by Kieran Lindsey*

First published in 1949, *A Sand County Almanac* is quite possibly the most influential environmental text ever written. Aldo Leopold was born in Burlington, Iowa, in 1887 and educated at the Lawrenceville School and Yale University. He joined the United States Forest Service in 1909 as a forest assistant in New Mexico and Arizona. One of the founders of the Wilderness Society, he initiated the first Forest Wilderness Area in the U.S., the Gila National Forest. Leopold founded the profession of game management and wrote the first important book on this subject.

The *Almanac* is a series of beautifully written essays on themes of human relationship with wildlife and the land. But it was not until the last two decades of his life that Leopold began to articulate a new way to look at the land and its creatures, one that took into account the whole as well as its parts.



Previously, his motivation for conservation was less for the preservation of an ecosystem, and more for the defense of good hunting game. But a fateful encounter with a wolf and her cubs helped Leopold to realize the importance of viewing the land as a community of soils, waters, plants, and animals, and then preserving it as such. Sitting above a stream, he saw an animal frolicking in the river and mistakenly assumed it to be a deer. To his surprise it was a female wolf with several pups. He shot wildly into the pack. When the smoke cleared the female wolf lay dying and a cub limped away. As he approached the female, he saw that the

> *"fierce green fire died in her eyes. I realized, and have known ever since, that there was something new to me in those eyes, something known only to her and the mountain. I was young then, and full of trigger-itch. I thought that because fewer wolves meant more deer, that no wolves would mean hunters' paradise. But after seeing the green fire die, I sensed that neither the wolf nor the mountain agreed with such a view. Since then I have lived to see state after state extirpate its wolves. I have watched the face of many a newly wolfless mountain, and seen the south-facing slopes wrinkle with a maze of new deer trails. I have seen every edible bush and seedling browsed...every edible tree defoliated.... In the end the starved bones of the hoped-for deer herd, dead of its own too-much, bleach with the bones of the dead sage, or molder under the high-lined junipers.... I now suspect that just as a deer herd lives in mortal fear of its wolves, so does a mountain live in mortal fear of its deer. And perhaps with better cause, for while a buck pulled down by wolves can be replaced in two or three years, a range pulled down by too many deer may fail of replacement in as many decades."*

The result of this and subsequent life-changing experiences was a complete rethinking of Leopold's world view, how he saw nature and our place in it. The foundation of his pioneering approach to conservation was his land ethic, "A thing is right," he reasoned, "when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise." This simple statement has become the touchstone of the conservation movement.

**Selection of the inaugural title for this column was not taken lightly, but it turned out to be an easy choice. Conservation Classics is intended to provide our readers with suggestions for building a collection of must-have wildlife and ecology reference books. We would be hard pressed to find a book more deserving of an honored place on your bookshelf than *A Sand County Almanac*.**

*For more information about Aldo Leopold, visit the Aldo Leopold Foundation at www.aldoleopold.org.*

## Small Animal Ear Diseases
### An Illustrated Guide

**By Louis N. Gotthelf, DVM**

Philadelphia: W. B. Saunders, 2000
270 pp; $45 U.S.

*Reviewed by Debra Scheenstra, DVM*

This guide is one of the best books I have ever read and used. It is extremely well organized and comprehensive as well as easy to understand whether you are a clinician, technician, or just starting to familiarize yourself with animals and their diseases. The most valuable attribute of this book are the exquisite photographs and illustrations. The primary author uses a Video Vetscope to document almost all known normal and abnormal ear conditions of dogs and cats with even more detail and clarity than is seen with an otoscope. This enables one to recognize these ear conditions in a clinical setting and reference back to the book. The emphasis is on being able to differentiate normal and abnormal characteristics to determine a proper diagnosis and treatment plan. There are step-by-step guidelines on proper examination of the ear, how to perform necessary diagnostic tests, and, most importantly, treatment of ear diseases.

The guide starts off with a well-written, easy to understand chapter on the anatomy of the canine and feline ear that contains very useful illustrations. The next chapter discusses examination of the ear, including external visual exam, use of an otoscope or Video Vetscope, and evaluating cytology of ears. Since it is very difficult to find references and clear photographs of normal ears and the tympanic membrane, this chapter is invaluable to anyone who has needed to examine a mammalian ear and try to orient themselves. In the following chapters Dr. Gotthelf provides an overview of factors that predispose the ear to disease as well as direct causes of ear diseases and conditions that cause chronic ear problems. There is a very good chapter on medications and cleansers that can be used in the ear, including explanations of their appropriate use, and which ones can be ototoxic. At the end of the book is a comprehensive ear product formulary that gives the brand name and ingredients of all current ear products. This is not available in one source anywhere else that I am aware of. For wildlife rehabilitators who receive many different donated medications, this formulary provides much-needed information.

The rest of the chapters provide the reader with the information needed to recognize and treat otitis externa, otitis media, and otitis interna, including associated neoplasia, skin diseases, and hereditary disorders. All of the chapters are well organized and easy to reference using bold letter headlines that allow you to skim through to find the information needed.

I would recommend this book to anyone who deals with mammalian ears. The photographs alone make the book worthy of being on your reference shelf. I feel veterinarians without this reference will have a more difficult time practicing excellent ear medicine on their patients.

*Debra Scheenstra is a veterinarian with Miracle Mile Veterinary Hospital in San Rafael, California.*

## Handbook of Veterinary Anesthesia
### Third Edition

**by W. M. Muir, J. A. E. Hubbell, R. T. Skarda, and R. M. Bednarski**

St. Louis: Mosby, 2000
574 pp; $49.95 U.S.

*Reviewed by Laurel Degernes*

This pocket-sized handbook has 29 chapters devoted to a variety of veterinary anesthesia topics. The book focuses primarily on anesthesia of domestic animals, including dogs, cats, horses, ruminants and pigs, but also includes one chapter on exotic pet anesthesia. Many of the chapters include information that is applicable to most domestic and nondomestic animals. The chapters are written in a well-organized outline format, with many useful tables, diagrams, and photos. An appendix section at the end provides resources for anesthetic drugs, equipment, and supplies.

The logical sequence of chapters covers pre-anesthesia patient evaluation; preparation and drugs; intravenous and inhalation anesthetic agents; patient monitoring devices and techniques; anesthesia machines; breathing systems and ventilation devices; and anesthetic procedures and techniques in small and large animals. There are also chapters on pain, fluid therapy, shock, respiratory and cardiac emergencies, and acceptable and unacceptable methods of euthanasia. The chapters on local anesthesia in ruminants, pigs, horses, and dogs and cats have detailed diagrams and descriptions to illustrate local and regional nerve blocks for a variety of anatomical locations. The indications, techniques, equipment and drugs for epidural anesthesia in large and small animals are also outlined. Acupuncture analgesia for dogs, horses, and cattle is introduced.

Of perhaps more direct interest to wildlife rehabilitators, the chapter on exotic pet anesthesia includes short sections on avian, reptile, amphibian, fish, rabbit, rodent, ferret, exotic cat, camelid, and pot-bellied pig anesthesia. Important concepts and generalities of anesthesia in each of the groups are addressed, including useful drug protocols and guidelines. Some of the information is over-simplified, which is understandable given the range of orders and classes of animals covered in one chapter. For example, in large parrots, the one- to two-hour fast prior to anesthesia may not be adequate in cases where a bird has a crop or proventriculus full of food. The book should not be considered adequate as a stand-alone resource for exotic animal anesthesia, as it is not possible to provide enough

specific information necessary for such a huge group of taxonomically unrelated animals.

The authors have done an excellent job of summarizing important concepts in veterinary anesthesia into a condensed, user-friendly, readable format. While this book is particularly useful to veterinarians in small-, mixed-, and large-animal practices, veterinarians and veterinary technicians involved in exotic animal and/or wildlife rehabilitation will also find this book a useful addition to their library, as much of the information is applicable to a variety of veterinary anesthesia applications.

*Laurel Degernes, DVM, DABVP, is associate professor of companion and wild avian medicine at the College of Veterinary Medicine at North Carolina State University.*

## Manual of Avian Medicine

**by Glenn H. Olsen, DVM, PhD, and Susan E. Orosz, DVM, PhD**

St. Louis: Mosby, 2000
622 pp; $55 U.S.

*Reviewed by Astrid Kasper, DVM*

The problem-oriented *Manual of Avian Medicine* is an ideal clinical companion. Its pocket-book size easily fits into a bag despite its 622 pages and the vast assortment of information it offers. The outline format allows the reader to quickly locate the information needed to diagnose and treat avian patients. The book is written for busy veterinarians and clinicians, so the reader is expected to have a working knowledge of normal taxonomic charts and nomenclature.

The books 27 chapters address such common clinical findings as dyspnea and other respiratory signs, abnormal droppings, vomiting and regurgitation, and seizures—to name just a few. Each chapter leads you through a diagnostic work-up plan, provides an anatomical overview, addresses the common etiologies, and offers a treatment plan. To explain the unusual method of problem solving used in this textbook I would like to give you an example: The extensive respiratory system of birds is susceptible to many environmental insults, nutritional deficiencies, and infectious and noninfectious disease processes. To develop an appropriate treatment plan, the *Manual of Avian Medicine* leads the reader through the avian respiratory anatomy and a physical examination of the respiratory system. An appropriate diagnostic plan follows the clinical parameters established in the chapter. Infectious and noninfectious etiologic agents are discussed to offer an explanation of all the possibilities that can cause the same clinical symptom for differential diagnostic work-up. The treatment plan offered depends on the clinical diagnosis of the primary problem and the patient's condition, taking into account the patient's history and diagnostic testing results.

This book also includes "hot topics" like avian behavior, anesthesia, and toxicology. An outstanding drug formulary features a comprehensive listing of drugs, indications, dosages, side effects, and more. Most ranges of blood and chemistry tables are based on adult birds only and do not include the different values of young birds. Whenever species-specific ranges are not available, the general avian ranges should be used. Psittacines and small passerine species seen in companion animal practice are emphasized throughout the book; however, other species are mentioned when and where appropriate, especially those species clinicians working in wildlife rehabilitation may encounter. In general, the diagnostic and therapeutic recommendations given for the companion bird species are also applicable to other avian species.

Overall, I highly recommend this book. Although the *Manual of Avian Medicine* has an unconventional format, it will provide you with extensive background information for your patient's medical problem in a fast and efficient way. The symptom encountered is only the tip of the iceberg and the book leads you through all the etiological possibilities, offers diagnostic strategies, and a state-of-the-art treatment plan. This book was a group effort with excellent people involved writing the appropriate chapters. I want to thank the editors Olsen and Orosz for a job well done. The *Manual for Avian Medicine* should be a frequently used reference of every hospital's library.

*Astrid Kasper is a rehabilitation veterinarian in Walnut Creek, California.*

## Hope is the Thing with Feathers

**by Christopher Cokinos**

New York: Tarcher/Putnam, 2000
352 pp; $24.95 U.S.

*Reviewed by Moti Nissani*

According to University of California biologist Peter J. Bryant, while "the natural rate of extinction is estimated at about one species per year, the present rate is estimated at 10,000 times that—about one per hour—and almost all of these losses are caused by human activities. We probably have already lost one million species, and several more million will be lost in the first few decades of the 21st century."

To confer meaning on such numbers, writers often focus on a few picturesque recorded extinctions. For this book, *Hope is the Thing with Feathers*, Christopher Cokinos selected precisely such colorful, North American, representatives of the lost million: the Carolina parakeet, the ivory-billed woodpecker, the heath hen, the passenger pigeon, the Labrador duck, and the great auk.

This meticulously researched book provides a useful description of the natural history of these annihilated birds. Carolina parakeets, for instance, would not desert their injured companions, staying nearby and showing signs of "sympathy and concern." The swift

(60 miles per hour) passenger pigeon flew in incredibly large flocks containing millions, even billions, of individuals. The goose-sized flightless great auk was married for life.

Cokinos provides a touching, lucid picture of each melancholy bird's last stand. In a typical case, the last 13 Labrador ducks may have been seen in 1904 by a respected ornithologist, who then killed a handful "even though he knew the species was nearly extinct."

The heath hen's swan song is particularly instructive. It involves the only wholehearted official effort to save one of the six lost species, thus underscoring the inherent unpredictability of the best laid ecological plans. By 1870, owing in part to destroyed habitats and expanding railroads, this hen survived only on Martha's Vineyard, Massachusetts. The closed season instituted by 1890—when only 200 hens remained—had little effect; by 1896 fewer than 100 were left. By 1907, Massachusetts set aside thousands of acres and instituted a $100 fine for poaching. By 1916, these efforts bore fruit, with the island's bird population soaring to about 2,000. Then, following a big fire, a harsh winter, and all-out management efforts, the population nosedived, falling to 23 by 1923, and to three males by 1928.

To capture the tragedy of the six species, Cokinos takes us to many a site where they once dwelled. There he deftly recreates a sense of place by portraying the creatures who still reside there and reflecting upon the gaps left by the absent ones.

The book likewise offers many fascinating details and much new information about the people whose lives crossed the lives of these six species. Thus, a logging baron explains his refusal to give the few remaining ivory-billed woodpeckers a chance: "We are just money grubbers. We are not concerned...with ethical considerations." Prof. H. B. Roney's adventures are more uplifting. Toward the end of the passenger pigeon's reign as the most numerous bird species on earth, the state of Michigan enacted protective laws. "In a heroic attempt to both enforce Michigan's law...and simultaneously highlight its weaknesses," Roney and friends went in 1878 to Petoskey, where, Roney wrote, "wagon load after wagon load of dead and live birds [were] hauled up." To find out what was going on in the face of hostility, silence, and threats, Roney pretended once to fall asleep in the hotel's lobby. While he and his friends actually managed to secure the indictment of one lawbreaker (who received a $50 fine) and the expulsion of Native American hunters from the nesting grounds, their wings were clipped while trying to convict a richer, more influential man. Yet, according to Cokinos, they succeeded in bringing about "a steep decline in the market for Petoskey pigeons," probably by spreading the false rumor that the birds ate poisonous berries.

**Cokinos deftly recreates a sense of place by portraying the creatures who still reside there and reflecting upon the gaps left by the absent ones.**

In view of Roney's failure to save the passenger pigeon—his good will, creativity, and spunk notwithstanding—and in view of our collective failure to stave off massive current extinctions, it is hard to be optimistic about Cokinos's call to "save what is left and restore what we can" by such brushfire tactics as writing politicians and speaking up at commission meetings. As an exgeneticist, I find it even harder to share Cokinos' qualified hope that fairly soon science (through cloning) will be able to raise from the dead the very species its railroads, steamboats, guns, refrigerators, chainsaws, and expanding populations unwittingly destroyed.

One hopes that the next printing of this touching book will offer higher quality, colored photographs (not just black and white), and that it will remove the many distractingly clumsy or ungrammatical sentences.

Some trivia could be edited out as well. An entire chapter is devoted to the saga of the luckless boy who may have shot the last wild pigeon. Will readers be interested in the countless details of this boy's life, his two photographs, his friends and descendants, his scrapbook entries? Will readers be interested in the page after page of Cokinos' own quest for the place where, a century ago, this particular boy killed that lone bird? Similarly, do the interminable controversies about the date and location of the death of every last specimen merit our close attention? Most readers, I suspect, would have preferred knowing more about the lost birds themselves, the circumstances that led to their demise, and the many conservationists who—like the indomitable Roney—spoke for them.

*Moti Nissani is associate professor in the interdisciplinary studies program at Wayne State University. (www.cll.wayne.edu/isp/mnissani>www.cll.wayne.edu/isp/mnissani/)*

*Reprinted with permission. This review was originally published in the spring 2000 issue of* The Workbook *magazine (Southwest Reasearch and Information Center, P.O. Box 4524, Alburquerque, NM 87196.*

## Vampiro, The Vampire Bat in Fact and Fantasy

**by David E. Brown**

Salt Lake City: University of Utah Press, 1999
147 pp; 50 illustrations and photos, drawings and maps by Randy Babb; $10.95 U.S.

*Reviewed by Tom Silva*

Did you know that a vampire bat consumes at least 40 to 60 percent of its weight in blood at one feeding?

This is an example of one of the numerous facts that are found in *Vampiro*. David Brown, an adjunct professor with the zoology department at Arizona State University, has consolidated facts and myths from a variety of

sources into one very readable and entertaining book about vampire bats. Although not as comprehensive as *The Natural History of Vampire Bats* by Arthur M. Greenhall and Uwe Schmidt, *Vampiro* does provide easily understood facts for the nonbiologist as well as additional historical and mythological information for those knowledgeable about vampire bat biology.

Vampire bats have long fascinated us because of the myths surrounding them and because they are the only flying obligate blood-feeding mammals. Medical science is interested in desmokinase, the enzyme responsible for the bat's ability to prevent blood from clotting when feeding, as a possible means of preventing strokes. In 1967 vampire bats were described by the World Health Organization as the most significant wildlife disease vector in Latin America, with an estimated 500,000 cattle deaths that year due to rabies. The ingenious methods of controlling bats and the diseases they carry that were developed are described in this book.

Unlike other species, these animals have flourished as new ranches are carved out of tropical forests and domestic animals are introduced. They are survivors, unlike the wolves and grizzlies that were extirpated from other shared ranges.

While the first half of the book concentrates on natural history, the second half is devoted to the vampire bat in literature, movies, Indian mythology, and worldwide cultural legends. The word *vampyre* made its way into the English Oxford dictionary in 1734 after waves of vampire hysteria spread throughout eastern Europe. Vampires in various forms were often blamed for any unexplained event, especially the sudden deaths of people and animals. Most of these events occurred before knowledge of microbes, and correlate with epidemics of deadly diseases such as bubonic plague, cholera, or rabies.

*"No use wasting your bullets, Martin. They cannot harm that bat."*
*–Dracula*, 1931

Bram Stoker's *Dracula*, published in 1897, elevated the vampire mystique to a new height from which it has never descended. Stoker's story, based on Vlad Tepes, a 15th century Romanian nobleman also known as Vlad the Impaler, has never been out of print and has served as the basis for numerous movies about vampires; it is the first story to ease into the bat transformation role played so memorably by Bela Lugosi.

All facets of information about vampire bats are described in this book and I would recommend it to anyone who has an interest in these animals.

*Tom Silva is the general curator of the collection at the Albuquerque Zoological Society, specialist in mammals.*

## Healers of the Wild:
### People Who Care for Injured and Orphaned Wildlife
**by Shannon K. Jacobs**

Denver: Coyote Moon Press, 1998
214 pp; $19.95 U.S.

*Reviewed by Sandra Gracie*

Intended as a classroom textbook for fourth to sixth graders, this book deals with students who are leaving behind the realm of A. A. Milnes's Winnie the Pooh and Beatrix Potter's fanciful animal tales for the more realistic world of Marjorie Rawling's *The Yearling* and Jack London's *Call of the Wild*. *Healers of the Wild* deals with this transitional phase from people living happily in the animal kingdom to the reality of human/animal relationships, and deals with it thoroughly. Rather than a glorified overview of rehabilitation, the topics covered range from rescue (and the often unintentional "rescue" of animals not in distress) to zoonoses and euthanasia. It covers all aspects of rehabilitation, from funding—or the lack thereof—to feeding requirements. Equal attention is paid to avian, mammal, and marine rehabilitation with an in-depth look at a center for each. The numerous illustrations are of real people handling real situations with names and locations given. The most frequently used phrase in the book is the admonition for students to *not* deal with a situation themselves, but to contact a rehabber who will know what to do.

While this book is intended for 10 to 12 year olds, it would be very informative for the average uninitiated adult into the workings of the rehabilitation world. Especially useful are the flow charts that show actions to be taken when an animal or bird is encountered. The information listed in the "For More Information" section is especially helpful, providing the regulatory agency for each state and federal offices to contact for federal permits, in addition to other reading materials. There is also an extensive glossary. As one of the uninitiated, I learned a great deal from this book and did not feel as though I was being talked down to.

This book would be an excellent source of information for the young child in the classroom—or as in introductory manual for the novice rehabber of any age.

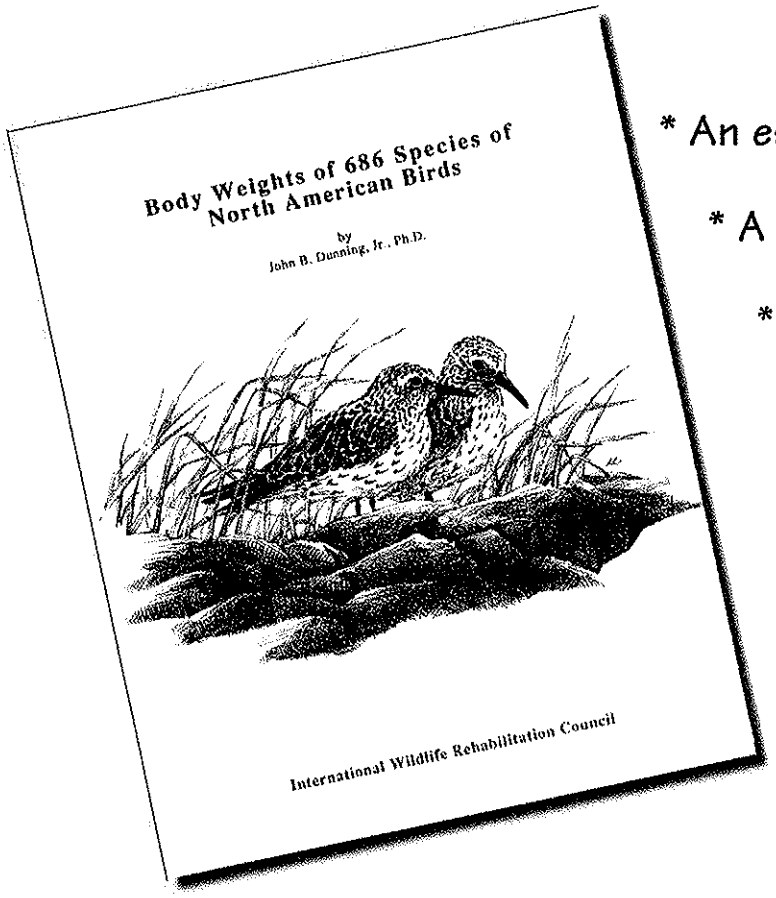
*Sandra Gracie is the IWRC's administrative assistant.*

**To the Editor:**

I am writing to inform your readers that the booklet, *The Red Fox and Wildlife Rehabilitation*, reviewed recently by P.C. Hanes in the winter issue of the *Journal* was in draft form only, and due to the death of the editor, was printed prematurely. The finished color product should be ready next year.

*–Jeannie Lord*

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## MAMMALIAN SPECIES

### "Bat Activity in Thinned, Unthinned, and Old-Growth Forests in Western Oregon"

Marcia L. Humes, John P. Hayes, and Michael W. Collopy
*Journal of Wildlife Management* 63(2): 553–61

Many aspects of the influence of forest management activities (logging) on bats in the Pacific Northwest are poorly known. The authors compared thinned and unthinned forest stands of the same age and old-growth forest stands to determine potential differences in structure and amount of use by bats. They used automated ultrasonic detectors (Anabat II) to record calls of bats in 50- to 100-year-old thinned and unthinned stands, and in old-growth ( ≥200 years old) stands in the Oregon Cost Range during the summers of 1994 and 1995. The median index of bat activity was higher in old-growth than in unthinned stands and higher in thinned than in unthinned stands. The authors were not able to detect a significant difference between the index of median bat activity for old-growth and thinned stands. More than 90 percent of identifiable passes were identified as calls from *Myotis* species. The 3 stand types examined differed in certain structural characteristics such as density and size of trees, and amount of over-story and under-story cover. They conclude that the structural changes caused by thinning may benefit bats by creating habitat structure in young stands that bats are able to use more effectively.

### "Effectiveness of Hot Sauce® and Deer Away® Repellents for Deterring Elk Browsing of Aspen Sprouts"

Dan L. Baker, William F. Andelt, Kenneth P. Burnham, and Wayne D. Shepperd
*Journal of Wildlife Management* 63(4): 1327–36

In western North America, large concentrations of elk (*Cervus elaphus*) can have detrimental effects on aspen (*Populus tremuloides*) regeneration and clone survival. In some situations, management intervention to protect aspen sprouts is needed. The authors conducted an experiment to evaluate the effectiveness of Hot Sauce Animal Repellent" (HS) and Deer Away" (DA) in deterring elk from browsing aspen sprouts during summer. The authors conclude that HS (6.2 percent) and DA will provide protection of aspen sprouts from browsing by elk for at least 5 weeks during the growing season, but current economic costs limit the practicality of large-scale use of these repellents.

### "Repellents to Reduce Cable Gnawing by Northern Pocket Gophers"

Stephen A. Shumake, Ray T. Sterner, and Stanley E. Gaddis
*Journal of Wildlife Management* 63(4): 1344–49

There is a continuing need to develop improved repellent formulations to protect buried cable installations from damage by problem wildlife. The authors evaluated 2.0 percent mass/mass levels of capsaicin and denatonium benzoate in a polybutene carrier material (Indopol®) and an above-ground, rodent-deer plastic mesh barrier (Vexar®) for reducing gnawing by northern pocket gophers (*Thomomys talpoides*) on communications cable (RG-8U). The authors conclude that although capsaicin and denatoneum benzoate appear to be completely ineffective when applied as a surface coating to cable, the same agents became effective cable gnawing repellents when encased in electrical shrink tubing.

## AVIAN SPECIES

### "Post-Release Survival of Hand-Reared and Parent-Reared Mississippi Sandhill Cranes"

David H. Ellis, et al
*The Condor* 102(1): 104–12

The Mississippi sandhill crane (*Grus canadensis pulla*) reintroduction program is the largest crane reintroduction effort in the world. Here the authors report on a 4-year experiment in which they compared post-release survival rates of 56 hand-reared and 76 parent-reared Mississippi sandhill cranes. First-year survival was 80 percent. Surprisingly, hand-reared cranes survived better than parent-reared birds, and the highest survival rates were for hand-reared juveniles released in mixed cohorts with parent-reared birds. Mixing improved survival most for parent-reared birds released with hand-reared birds. These results demonstrate that hand-rearing can produce birds that survive at least as well as parent-reared birds and that improved survival results from mixing hand-reared and parent-reared birds.

### "Diet of Nestling Red-Cockaded Woodpeckers at Three Locations"

James L. Hanula, Donald Lipscomb, Kathleen E. Franzreb, and Susan C. Loeb
*Journal of Field Ornithology* 71(1): 126–34

The authors conducted a 2-year study of the nestling diet of red-cockaded woodpeckers (*Picoides borealis*) at 3 locations to determine how it varied among sites. They photographed 5939 nest visits by adult woodpeckers delivering food items for nestlings. The nest cavities were located on the Lower and Upper Coastal Plains of South Carolina, and on the Savannah River Site and in the Piedmont National Wildlife Refuge, Georgia. The cameras recorded adults bringing 33 different types of food to nestlings. Wood roaches were the most common food, composing 50 percent of the diet overall. They were also the most common prey at each location and for all but one of the woodpecker groups studied. Woodpeckers on the Lower Coastal Plain used blueberries and sawfly larvae, two dietary items not commonly used at the other locations. Adults at two locations providing snail shells to nestlings, possibly as an additional source of calcium. Because diet overlap of red-cockaded woodpecker nestlings at different geographical locations was within the

range that occurred among groups at the same location, the authors conclude that nestling diets are similar across the geographical area studied, and that it varies little from year to year.

### "Copulation Exposes Female Red-Winged Blackbirds to Bacteria in Male Semen"

D. F. Westneat and T. B. Rambo
*Journal of Avian Biology* 31(1): 2000

The authors examined the ejaculates of male red-winged blackbirds (*Agelaius phoeniceus*) to determine if exposure to bacteria from males was a potential consequence of copulation for females. Ejaculates were collected in the field using a model female fitted with a sterile artificial cloaca. The authors found that 11 of 18 sampled males left ejaculates containing bacteria (compared to 3 of 18 control swabs of a sterile cloaca similarly exposed to the environment). Little information is available on how the strains identified might affect birds, but several types have known debilitating effects in humans or domesticated mammals. Two bacterial types isolated from blackbird semen are reported to produce chitinase, an enzyme with possibly beneficial consequences if produced by bacteria entering the gut of an insect-eating bird. These results suggest that exposure to new bacterial types is a consequence of extra-pair copulations to females. This exposure could have beneficial and/or detrimental effects on female fitness.

### "Field Testing the Suitability of a New Backpack Harness for Radio-Tagging Passerines"

I. F. Hill, B. H. Cresswell and R. E. Kenward
*Journal of Avian Biology* 30(2): 1999

Attaching radio-tags to highly dynamic organisms can bias the data collected. The suitability of a new backpack harness design was field tested on 39 adult thrushes (33 blackbirds, *Turdus merula*) and (6 song thrush, *T. philomelos*) at a study site in England. Direct chronic effects were assessed by examination of recovered corpses and recaptured birds. The harness caused the development of a small subcutaneous lipid mass on the patagium, but no epidermal abrasion or interscapular blistering or bruising. Indirect measures of possible chronic effects came from behavioral observation and breeding performance measures. For female birds, the attachment of a backpack tag did not significantly reduce clutch size or egg volume compared with untagged females. Nest survival rates were also unaffected. The number and quality of young fledged by tagged females were as high as those for untagged females. Video data showed that provisioning rates of the nestlings did not differ significantly between tagged and untagged parents. The proportion of time spent brooding by tagged female blackbirds was nonsignificantly higher than for untagged birds.

## HERPETILE SPECIES

### "Distribution and Prevalence of Upper Respiratory Tract Disease in Gopher Tortoises in Florida"

Joan E. Diemer Berish, Lori D. Wendland, and Cyndi A. Gates
*Journal of Herpetology* 34(1): 5–12

Blood samples were collected from 386 gopher tortoises (*Gopherus polyphemus*) on 53 sites in Florida to determine exposure to a pathogen (*Mycoplasma agassizii*) that causes upper respiratory tract disease (URTD). One-hundred fourteen (30 percent) of the tortoises were seropositive, indicating that they had been exposed to mycoplasma and had developed a detectable immune response. Another 20 (5 percent) were considered suspect. The remaining 252 (65 percent) tortoises were seronegative. The 114 seropositive tortoises were from 14 locations, 12 of which were public lands. Thirty-nine percent of the 386 tortoises showed one or more clinical signs of URTD. Nasal lavage samples were collected from 89 tortoises on eight of the 53 sites. Four tortoises (4 percent) from three sites were positive, indicating presence of mycoplasma. A different mycoplasma was indicated on each of the three sites.

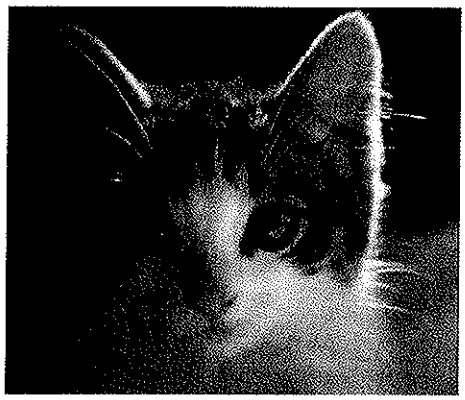
## NUTRITION

### "Whole Body Cholesterol, Fat, and Fatty Acid Concentrations of Mice Used as a Food Source"

Susan D. Crissey, PhD, Kerri A. Slifka, MS, and Barbara A. Lintzenich, MS
*Journal of Zoo and Wildlife Medicine* 30(2): 222–27

The concentrations of dry matter, cholesterol, saturated fat, monounsaturated fat, and 29 fatty acids were measured in four size categories of whole mice (*Mus domesticus*). Dry matter increased with age/size of mice, whereas cholesterol decreased with age/size. Significant differences in fatty acid content were found among mice categories with capric, lauric, and myristic acids. Mice categories had similar levels of palmitic, palmitolic, heptadecenoic, stearic, oleic, linoleic, gamma linolenic, alpha linolenic, eicosenoic, eicos-adienoic, arachidonic, docosahex-aenoic, and lignoceric acids. Analyzed lipid content of mice exceeded domestic carnivorous animal requirements for linoleic and arachidonic acids. The fatty acid levels in mice were high, falling between published values in beef and fish. Generally, mice contained higher levels of polyunsaturated fatty acids, including the omega-3 fatty acids, and lower levels of saturated fatty acids than beef. Although fatty acid levels met or exceeded some dietary requirements for carnivores and omnivores, a possibility of excessive levels exists that could lead to eye and tissue abnormalities. Furthermore, as the intake of dietary polyunsaturated fatty acids increases, the dietary requirement for vitamin E increases. Thus, it is important that lipid profiles of feeder mice be known and considered when examining captive animal diets.

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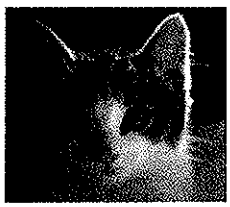


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## Amphibians Populations Threatened

In the largest such study to date, researchers have reported in the journal *Nature* that the world's frogs, toads, and other amphibians are disappearing, and the decline began long before scientists first sounded the alarm in the 1980s.

Overall numbers of amphibians dropped 15 percent each year from 1960 to 1966, and continued to decline about 2 percent annually through 1997. The findings were compiled by a University of Ottawa researcher, using Internet contacts with some 200 scientists around the world. Because they are more vulnerable than many other creatures, amphibians are considered a "canary in the coal mine" for environmental damage.

Scientists have yet to zero in on the causes, but suspect a combination of factors: loss of wetlands to development; increased ultraviolet light from an ozone layer thinned by industrial pollutants; the introduction of exotic predators; and use of fertilizers and pesticides. In addition to the decrease in numbers, there has been an increase in the number of amphibian deformities.

At the National Wildlife Health Center in Madison, Wisconsin, researchers examined 180 damaged northern leopard frogs collected at 16 sites in Maine, Vermont, and Minnesota. Now they are investigating a variety of causes for the deformities, including chemicals in the environment, the sun's ultraviolet rays, and infection from a parasitic worm.

In Maine, frogs were found with an extra third leg, 12 toes, additional bones in their feet, and increased sheaths of skin. Deformed frogs from Vermont were missing bones, and in some cases there was no evidence of hip development. In Minnesota, scientists found a parasitic worm, also discovered in Maine. The immature worm penetrates the skin of tadpoles, arresting their normal development.

The results of a 2-year United Nations study on the world's environmental health will be presented to the U.N. General Assembly in September. Reflecting on the findings of 197 scientists, the report is expected to shed light on the current health of the world's ecosystems and the creatures, such as the amphibians, that are in danger.

## Indiana Fights TB Outbreak

In an unprecedented move, members of the Indiana State Board of Animal Health voted on 27 April to prevent a tuberculosis outbreak by adopting an emergency rule restricting the importation of Michigan cattle, bison, goats, cervids (species such as elk, deer) and camelids (species such as llamas, alpacas) into Indiana. Indiana law prohibits the import of any domestic animal originating from a quarantined area, although dogs and cats traveling with their owners will be allowed into the state. (These animals are at low risk of contracting TB.) California, Montana and Minnesota have already adopted similar emergency measures. This emergency rule will remain in effect for 90 days, and may extended for a additional 90 days. This will allow the Board to adopt a permanent rule through regular processes. A second reading of the permanent TB rule, followed by a public hearing, will be held on 13 July at the BOAH office.

The bovine tuberculosis bacteria can be contracted by humans and any other warm-blooded creature, but people would need to inhale mucous coughed or sneezed from an infected animal. Pasteurization kills the bacteria in milk. Indiana has enjoyed its tuberculosis-free status for nearly 20 years. An outbreak would end that standing and almost certainly result in other states slapping their own restrictions on Indiana livestock.

Michigan's problem was highlighted in the mid-90s, when deer killed by hunters began showing lesions characteristic of the disease on the lungs and inside the rib cage. Last year alone, Michigan recorded 58 cases. Tuberculosis has moved into several cattle herds in the northeastern section of the lower peninsula.

Experts think the disease is spreading through sneezing and other exchanges of mucous when deer congregate around piles of feed set out by hunters and wildlife watchers during Michigan's harsh winters. Deer might not be the only wildlife capable of spreading tuberculosis. Evidence suggests coyotes and other carnivores can be infected by eating deer carcasses.

## Ecology List Created

A new mailing list has been created to allow students, professional ecologists, and veterinarians interested in wildlife to discuss the ecology of disease in natural populations. If successful, the listserve could provide an excellent opportunity for discussion of ideas, statistical techniques, published literature, software, websites, etc. related to the ecology of disease in natural populations. Damien Joly, a PhD candidate at the University of Saskatchewan's Department of Biology, created the list with the intent of keeping the discussions academic in nature. Other acceptable posts include conference announcements and job postings. There are approximately 20 MB of storage space available for distributing software applications. In the future, the list may expand to include virtual conferences and manuscript distribution. Commercial e-mail and SPAM will not be tolerated.

To subscribe, send an e-mail to: DiseaseEcology-subscribe@egroups.com.

## Seal Die-Off in Caspian Sea

According to a ProMED-mail post, a mass die-off of seals on Kazakhstan's coast of the Caspian sea and adjacent islands has been caused by a pasteurellosis epidemic. An official at the Kazakhstan Ministry for Environmental Protection and Natural Resources told Itar-Tass the disease was provoked by a sharp decline in the animals' immunity due to poisoning with petroleum toxins and agricultural pesticides. Expert opinion is the epidemic is now on the downturn. The situation in the area of the ecological disaster is under control.

Last year alone, the high extent of the Caspian pollution led to the death of 6,000 seals on the Azerbaijani island of Apsheron, 100 seals in an area adjacent to Turkmenistan, and 200 in the area of the Russian Malaya Zhemchuzhina island.

# TAIL ENDS

by Astrid MacLeod



PHOTO: YVONNE WAGONER/EDITED BY JIM ISAACS

"Look, Ma—four hands!"

## GUIDELINES FOR AUTHORS

THE JOURNAL OF WILDLIFE REHABILITATION invites submissions in several categories, including feature articles, case studies, brief pieces sharing practical tips, and book reviews. The *Journal* publishes articles on natural history, rehabilitation, wildlife policy issues, and other relevant topics. Articles on veterinary medicine as it relates to wildlife rehabilitation are also welcome. To expand the international scope of the publication, individuals from countries outside the United States are especially encouraged to contribute.

All submissions to the *Journal* will be evaluated by the editors and anonymous reviewers with expertise in the relevant subject matter. The editors will consider clarity, conciseness, accuracy, and overall thoroughness when determining if the work is appropriate for publication. Authors should strive to present their work succinctly and with minimal jargon. Normally, work submitted for review should not exceed 5,000 words.

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5. The *Journal* publishes high-quality black and white photographs as available. Color slides and prints are acceptable as well, though all images will appear in black and white only. Please include photo credits.


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