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JOURNAL OF WILDLIFE REHABILITATION



IN THIS ISSUE

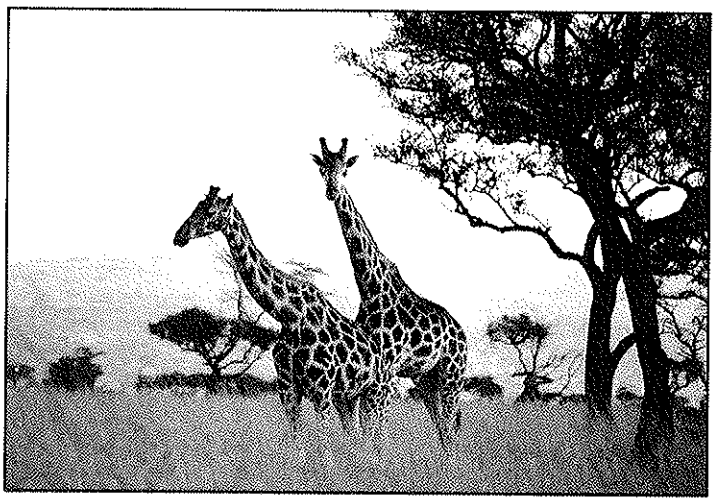
Optimizing recovery and release while minimizing disease risks associated with raptor rehabilitation ... The impact of giraffes in Kenya's Ruma National Park ... A new flooring option for wire-bottom cages ... Building your rehabilitation network ... The books of Thornton W. Burgess ... abstracts, news, 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 issue. 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: An immature peregrine falcon (*Falco peregrinus*), a raptor of high conservational value. See page 4. [photo: Tim Greenfield]

BELOW: Two Rothschild giraffes (*Giraffa camelopardalis rothschildi*). Approximately 75 currently live in Ruma National Park in Kenya. See page 16. [photo: OSIENALA (Friends of Lake Victoria) Kenya]



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EDITORIAL

An Open Letter to Wildlife Rehabbers

With the last of the peak season work days upon us, I'd like to thank you for the wonderful job that you've done.

You've endured encounters with some pretty amazing (both negative and positive) individuals from the public. There have been new volunteers asking a gazillion questions, sad outcomes for many innocent creatures, finders of injured animals in tears, boxes stacked up at the exam table, and not enough help to make a dent in what needs to be done—but you get it all done anyway.

You've dealt with the distressed public with skill and restraint. You've collected and recorded all the information relevant the animal incident and have had educated scores of folks on how to avoid the same accident next time. You've encouraged rescuers of injured animals that they have done the right thing by following their humane instincts. You've made them feel good about taking the trouble, giving them an investment in wildlife. You have extracted funds from them on the spot and laid a good foundation for future support of your organization. You've worked cooperatively with officers from the agencies that bring us animals. You've managed to get through another season without strangling any person who brought in their seventh cat-caught bird. You didn't even threaten to euthanize the cat! That's self-control—and it's something to be proud of.



There were the rescues you volunteered for: the bats and hummingbirds caught in buildings; the duck stuck between a fence and the building; the 3-gram quail chicks washed into the drain that required calling the Highway department to remove the manhole cover; climbing into the drain even though you considered that perhaps you were past your prime; investigating the stinking pond on which hundreds of birds were dying, and working with the right agencies to get help; driving 100 miles to meet a person bringing an injured kestrel halfway.

You've managed to save a bunch of lives and make fellow volunteers feel valuable and competent. There are far too many things to thank you for. Besides all the shifts you put in, there were the times when you filled in for someone or came in to help because the clinic was short of volunteers. There were the times your arm was twisted to take home just one more bird or bunny because it needed a little extra TLC. There was making one more blessed batch of FoNS so that the next shift would have food ready to feed all the gaping mouths. There was the time you took to listen to yet another person tell you their life story. There were the times you all got along with each other even though you disagreed with how something should be done. The list goes on and on.

We all have our own reasons for helping sick and injured wildlife. The one thing we have in common is that we care and are willing to show it.

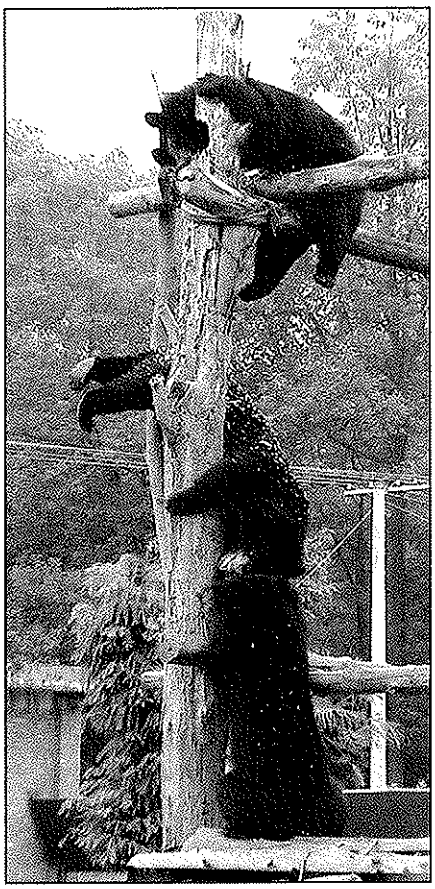
—Denise Coil
Wildlife Rescue of New Mexico

Chinese Farm Bears Touch our Readers; More on Stayin' Alive

Dear Dr. Li,

I was greatly disturbed by the plight of the Chinese farm bears, as detailed in your article (Li, P. J. "Rehabilitating rescued Chinese farm bears *[Ursus thibetanus]*: Results, limitations, and implications. *J. Wildlife Rehab.* 27[1]: 4–15) and would like to do something to help their situation. Is there an organization you would recommend where I could send a donation to specifically assist in the rescue and rehabilitation of these bears as outlined in your article? I know that it is a political and cultural situation and, therefore, hard to resolve, but I would like to assist monetarily in improving the bears' lives if possible.

—Michelle H. Brown



ANIMALS ASIA FOUNDATION

Greetings, Dr. Li,

I am writing in regards to your recent article in the *Journal of Wildlife Rehabilitation* on the topic of the Asiatic black bear farming in China. When I finished it, I was compelled to contact you. I had such a hard time seeing the photographs and reading the details of the how these bears are treated. Is there anywhere you could recommend if a person wanted to contribute financially to the ongoing effort to rescue these bears or help to support those that are currently involved in this effort? I'd like to do something from my small corner of the globe.

—Christina M. Sherman
Bay Beach Wildlife Sanctuary
Green Bay, Wisconsin

Several readers wrote to tell us how deeply affected they were by Dr. Li's article on the plight of black bears in China, and the rehabilitation work done at the Chengdu Asiatic Black Bear Rescue Center, operated by the Animals Asia Foundation.

The Animals Asia Foundation may be reached through their website, http://www.animalsasia.org. To make a donation to support their work, click on the "Donate Now" button. You can also click on the "China Bear Rescue" button and follow links to write a letter to the China Wildlife Conservation Association and/or download a petition calling on the Chinese government to end Asiatic black bear farming by the 2008 Beijing Olympics.

Dear Janine and Astrid:

Thank you for your article, "Stayin' Alive, Stayin' Alive: Feeding Ill and Emaciated Birds" (*J. Wildlife Rehab.* 26[4]: 8–20). So far, we're very pleased with the results we're seeing. As we've used the protocol, however, a few questions about the Rehydration Solution have arisen.

1. We're having trouble dissolving the L-Glutamine. Do you have any suggestions on how to resolve this?
2. How long is the Rehydration Solution good? How should it be stored?
3. Can brewer's yeast be substituted for the B-complex?

Janine Perlman and Astrid MacLeod respond:

1. L-Glutamine dissolves in hot water or rehydration fluid (i.e., LRS, Pedialyte, etc.). Before addition of vitamins and yogurt, mix the glutamine in a small volume of water or fluid, and heat in a microwave oven just until the powder dissolves. Mix this solution with the remainder of the rehydration fluid, and then add vitamins and yogurt.

2. The Rehydration Solution should be stored in the refrigerator. It will remain safe to use for two days.

3. Brewer's yeast cannot be substituted for the B-complex because its levels of the B vitamins are very low, compared to B-complex tablets.

The Editors encourage readers to respond to the articles, columns, and other items featured in the *Journal of Wildlife Rehabilitation*. Please direct general questions and comments to the Editor at runmuki@earthlink.net (USPS address on the journal's inside back cover). To respond to a specific article or column, please contact the author directly. (NOTE: Letters may be edited for clarity and length.)

Suggestions to Optimize Recovery and Release While Minimizing the Disease Risks Associated with Raptor Rehabilitation

by H. Petra Zsivanovits and Neil A. Forbes

ABSTRACT: When considering disease control, rehabilitation facilities must work on three distinct levels: individual patient care, welfare and disease control within the facility, and environmental care. When wild injured raptors are presented to rehabilitation facilities the severity of existing injuries must be triaged, assessing the bird's potential for rehabilitation. Measures to identify underlying disease and to prevent the spread of infection or contamination within a facility and, in due course, back into the natural environment are crucial. Quarantine and screening are the first line of defense. Strict compartmentalization of captive birds, disinfection, and sanitation are as important in disease control as the design of aviaries and pest control. A management plan should include preventive care programs and a detailed record-keeping system. Minimizing stress contributes to a well-functioning immune system. A species-appropriate, balanced diet must be offered to avoid nutritional deficiencies.

KEY WORDS: disease control, raptor, rehabilitation, falconry center

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Introduction

When considering disease control, rehabilitation facilities need to work on three distinct levels: the level of individual patient care, the level of welfare and disease control within the facility, and the level of environmental care to avoid exposing naïve free-living populations to "new" diseases.

Free-living injured raptors are often considered to have failed the "fitness for life" test. This may occur as a result of an acute traumatic injury, but it is entirely possible that the bird has suffered the injury due to a pre-existing disease. Birds that are debilitated due to infections or infestations with parasites are predisposed to accidents (Hatt et al. 1996). Other birds, such as corvids, are more likely to mob debilitated raptors. Healthy birds carry and cope with a certain parasite burden, but when weakened the host-parasite balance may be altered in favor of the parasite—and so debilitated birds can often suffer from heavy parasite infestations. In a study on 84 ex-free-living raptors presented for rehabilitation in Germany, 59.5% were suffering from an infectious disease. The most common reason for presentation was trauma (63.1%), but 83% of traumatized birds had further disease or pathological findings (Lierz 2000). Careful screening of incoming rehabilitation patients will detect those birds suffering from subclinical infections or infestations.

The admission of any patient of uncertain health status creates a risk for other birds in the facility. It is imperative that the accommodation to which they are admitted does not become contaminated, as this could in turn create additional risks for future birds that pass through the facility. Many facilities maintain relatively large numbers of individuals of the same or similar orders. As such, many of the residents are likely to be susceptible to the same pathogens. Orders vary in susceptibility to different diseases. A pathogen that is innocuous in one order may cause serious disease in another order.

In turn, any bird that is rehabilitated or translocated with a clinical or subclinical infection contracted from that facility (from food fed or other patients, past or present), not only has its own welfare compromised, but endangers the health and welfare of the ecosystem to which it is released. It cannot be overemphasized that rehabilitated individuals released back to the wild may potentially take with them infectious agents that may damage or destroy a delicate ecosystem (Forbes and Simpson 1997, Forbes and Fox 2000).

These factors must be considered when planning aviary designs, disinfection, admission, screening, quarantine, therapy, and rehabilitation prior to screening and release of free-living raptor casualty cases.

Assessment and Screening of Injured Raptors

The bird should be thoroughly examined, shock recognized and treated, the extent of the injuries quantified, and any underlying diseases investigated. Injuries that might preclude survival or release must be assessed, and ophthalmological examination is essential. Korbel (2000) screened a population of free-living birds (including raptors) and found an overall 11.7% (239/2036) incidence of ocular disorders. The highest incidence was seen in Accipitriformes

(26.1%), Strigiformes (20%), and Falconiformes (19.7%). The incidence of disorders of the posterior segment of the eye (fundus and vitreous body) in free-living raptors (67.5%) was 5–10 times higher then in other patient groups (pet birds, including psittacine birds and passerines, 6.7%; falconry raptors 14.3%). Disease of the posterior segment can only be detected ophthalmoscopically. The etiology of ocular pathology in free-living raptors was typically trauma (88.2%), while only 10.8% was due to bacterial, viral, or parasitic infections or other causes. Following initial triage, fluid therapy should be administered, together with any necessary antibiosis and analgesia, and the bird should be placed in a warm, quiet, and darkened accommodation. If in doubt, seek the advice of an avian veterinary surgeon.

A cost-risk assessment should be made to determine the scope of screening undertaken on any individual case. The genetic or conservation value of the bird, the susceptibility to disease, and the findings of the physical examination should be assessed according to a pre-determined protocol. Screening programs may include physical examination, hematology and blood chemistry analysis, fecal examination including acid-fast staining, and evaluation of a blood smear (for blood parasites and other abnormalities), as well as radiographic and laparoscopic examinations if indicated. Blood plasma may be tested for antibodies against paramyxovirus 1, avian influenza, and falcon herpesvirus. Air sac biopsies, tracheal or choanal swabs can be collected to test for mycoplasma. Cloacal and choanal swabs can be submitted for Chlamydophila psittaci PCR DNA testing or serum can be screened for antibodies using an antigen-enzyme–linked immunosorbent assay. If a bird is found to be normal, the complete blood count, biochemistry profile, and radiographs may be taken as "bench mark normal results" for individuals of that species. Collecting and pooling (sample size of >20 yields useful results) of such "normal values" may provide an extremely useful reference range to assist in differentiating "pathological values" at a later point. Extended screening for other viral and bacterial diseases (subject to financial constraints) is invaluable for the epidemiological assessment of disease prevalence in free-living raptor populations. Even following full evaluation at the time of admission, any rehabilitated bird should undergo repeated screening to detect any disease state that might have been triggered by the stress of admission and rehabilitation.

A survey investigating the health status of raptors presented to rehabilitation centers in Germany demonstrated ecto- and endoparasite infestations and infections by *Salmonella* spp., *Trichomonas* spp., paramyxovirus, and adenovirus (Lierz 2000). Falcon herpesvirus and owl herpesvirus have been isolated from free-living raptors, owls, and pigeons (Forbes 2000; Lierz et al. 2002). Falcon herpesvirus serological surveys of free-living raptors in Germany have generated conflicting results, 35.5% (Lierz 2000) compared to 2.4% (Johannknecht et al. 2001). A survey in the United Kingdom using virus neutralization testing demonstrated a seroprevalence of 3.97% for falcon herpesvirus and 12.3% for owl herpesvirus (Zsivanovits et al. 2003). Any bird contracting herpesvirus and surviving will become a carrier and is likely to shed virus when stressed. The admission of such birds to a rehabilitation center renders susceptible residents at risk. *Mycobacterium* spp. infection has been frequently diagnosed in hawks and owls (Piechocki et al. 1981). Diseases such as avian tuberculosis present a particular risk as the bird may be infected, shedding the organism in its feces and contaminating the environment for up to 18 months before becoming clinically ill (Gerlach 1994, Derrickson and Pickett 1991). Any such environmental contamination may, in turn, infect subsequent patients, without staff ever appreciating that a bird that had been in care had been ill.

Necropsy examination should be performed on any bird that dies at the facility to enable early detection of any infections. Once detected, control measures can be tightened so that the risk of cross transfer of infectious or contagious organisms can be minimized.

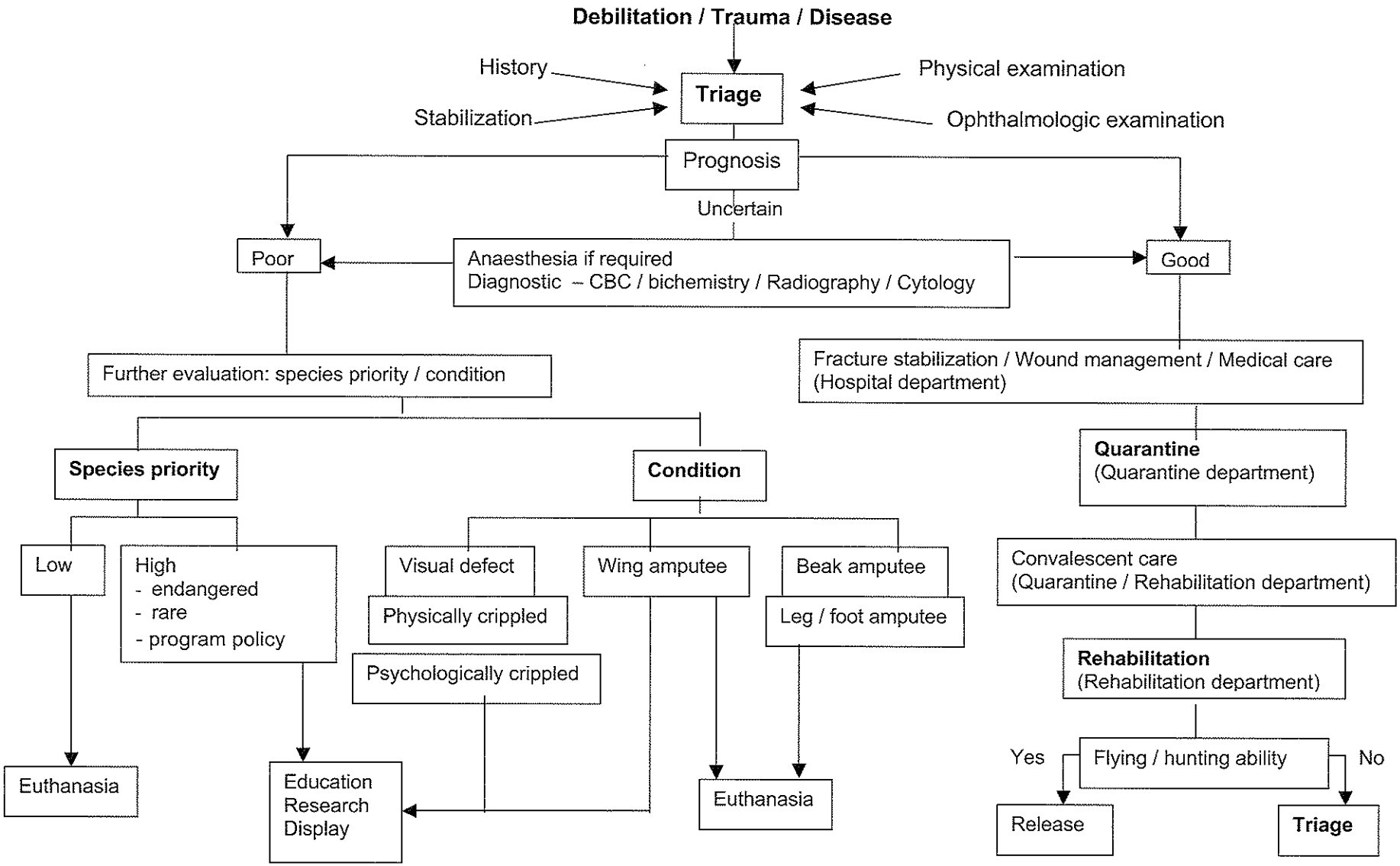
In the authors' opinion, all incoming birds should be tested and, if necessary, treated for endo- and ectoparasites. Fecal samples should be collected over 3–5 days to increase the chance of detecting endoparasites that may be excreted intermittently. After initial screening—and, if necessary, treatment—fecal testing should be repeated after 2 weeks to address potential resistant endoparasite infestations. Repeat fecal screens should be performed every 6–8 weeks to detect recurrent endoparasitic infestations. A final fecal screen needs to be performed prior to releasing the bird back to the wild. Treating birds routinely (without fecal examination) may lead to ineffective treatment or the creation of drug-resistant parasites. Such parasitic infections may require alternative therapy or indicate the need for husbandry changes or environmental decontamination.

Initial triage and screening determines the prognosis for recovery and release of the bird. If after very careful assessment of the injuries a complete recovery of the bird is unlikely, then euthanasia should be considered. If a bird can potentially be rehabilitated, it should be maintained in hospital for surgical or medical supportive care or quarantined prior to entering the rehabilitation facility (as illustrated in Figure 1).

Disease Control by Compartmentalization and Quarantine

A rehabilitation facility should be divided into three main departments: a hospital department, a quarantine department, and a rehabilitation department. Hospital and quarantine facilities need to be situated separately from the

FIGURE 1. ASSESSMENT AND TRIAGE OF RAPTORS PRESENTED TO REHABILITATION FACILITIES



rehabilitation facilities and operated independently. Any interaction or traffic between departments should be minimized. No cleaning tools, other tools, or equipment should be transferred between departments. Footwear, barrows, buckets or other cleaning equipment, and feed boxes are potential fomites for the transfer of pathogens. Staff must be aware of the potential for humans to act as mechanical vectors for disease transmission between individual birds or different collections, and must therefore maintain high standards of hygiene. Each facility should provide overalls, scrubs, and overshoes that remain at that facility. Such precautions should be considered when people are entering areas of particular risk, such as quarantine buildings, nurseries, or hospital buildings. Nonessential visitors should not be permitted to enter quarantine or hospital areas.

Critically ill and injured raptors are initially admitted to the hospital department, where supportive care can be provided and medical and surgical procedures undertaken. Hospital accommodation and furniture should be easily and effectively cleaned or disposable. Debilitated and injured raptors have often been deprived of sufficient food and water for a considerable period prior to presentation and are typically dehydrated and hypoglycemic. Rehydration is possible via gavage, subcutaneously, intravenously, or by intraosseous fluid therapy. The latter two options have greater efficiency in severely dehydrated patients. If the bird is dehydrated, fluid deficits should be corrected before offering food. Rehabilitation staff must be familiar with gavage techniques used for the initial administration of fluids and subsequent nutritional support to raptors that do not feed voluntarily. Staff must also be conversant with the nursing requirements of debilitated birds, including intramuscular and intravenous administration of medication. Food and water consumption must be carefully monitored, as ex–free-living patients typically do not initially eat voluntarily in captivity.

Patient weights should be recorded daily. Any weight loss in a sick or injured bird, or loss of more than 15% of the initial weight in an originally healthy bird, indicates the need to commence crop tube-feeding (Clubb and Flammer 1994). If a raptor is emaciated, its first meals should be in a liquid form such as an electrolyte solution (e.g., Lectade). Thereafter, a/d (Hill's Pet Nutrition) can be fed, initially diluted with water, and later without dilution. The bird should then be offered skinned and chopped day-old chicks. This "cast-free" food serves as initial bland and highly digestible diet. If the bird digests those without problems, one can start feeding complete day-old chicks or other food with casting material to gradually build up gastrointestinal activity. It is crucial to ensure that a raptor empty its crop prior to every further feed. If this is not the case, gastrointestinal motility disturbance and its underlying causes need to be addressed.

If active veterinary attention is no longer required, the bird should be transferred into the quarantine department. The quarantine department functions as a safety net, housing birds that need either reduced medical attention in the form of daily administration of medication in food, or physical therapy after osteosynthesis (surgical fracture repair leading to growth and remodelling of bone). At the same time, the birds can be observed for signs of other underlying diseases. The correct use of the quarantine department can prevent disease spread from newly introduced birds to the rest of the rehabilitation facility, especially to birds that have already completed the rehabilitation process. Quarantine as the first line of defence against infectious disease is a fundamental and vital concept that is all too often ignored. Each bird should be isolated within the quarantine department. As a general rule, new birds should be housed in quarantine for a minimum of 35 days (Forbes 2000) or 60 days (Clubb and Flammer 1994), depending on present diseases, disease susceptibility of the birds, or risk analysis. The number of birds managed within this system and their distribution within the facility should be determined in advance and should be strictly followed.

The quarantine block should consist of isolated, roofed buildings. The facility should be a sufficient distance from buildings of the rehabilitation department, such that wind spread of infectious agents is highly unlikely, with a suggested distance of 400 m (Forbes, pers. comm. 2002). Quarantine accommodations and furniture should be easily cleaned or disposable. Ideally, separate staff, who do not enter other departments, should be employed for the quarantine facility. Where this is impossible, (clean) staff should always attend to the resident population before the quarantine birds, with a change of clothing after treating the latter group. Staff clothing and all equipment used in the quarantine facility should not be used in the other departments. Hygiene practices should include footbaths, and weekly power hosing and regular cleaning and disinfection of equipment specific to the quarantine section.

A quarantine time of 35–60 days can pose a considerable problem when dealing with nestlings that cannot be returned to the nest. Isolating these birds with no contact with birds of the same species will result in mal-imprinting. For the well-being of those orphans and to ensure their successful release, rehabilitation centers have to compromise, being aware of the attendant risks. These nestlings should be put with foster parents or kept in conspecific groups. Rehabilitation centers can consider creating a subdivision in the quarantine department in the form of nurseries. Here nestlings could be cared for in groups and/or potential foster parents could be kept and used when needed. These foster parents should never mix with other birds at the center. Nonreleasable birds may be appropriate foster parents. If human contact cannot be avoided, measures should be taken to obscure this by using puppets for feeding or feeding-pipe systems. Handling should be absolutely minimized. Screening, hygiene, and



LOUISE SHIMMEL

A nonreleasable redtail hawk (*Buteo jamaicensis*) fosters two orphaned young hawks.

compartmentalization from the remaining collection must be particularly emphasized in this subdivision.

The rehabilitation department consists of aviaries housing birds during the last part of their rehabilitation. There should be flight aviaries to assess the birds' flying abilities, and to give them space for exercising and for developing their musculoskeletal and cardiovascular systems. Staff need to be well trained in recognizing signs of illness and providing emergency care. They should assess each bird daily during routine feeding procedures. Normal behavior and food consumption should be recorded daily, so that abnormalities are noted and acted on as soon as possible. In addition to the health, behavior, and attitude of the bird, staff should also evaluate the enclosure for signs of bleeding, feather loss, or other signs of a traumatic episode. Fresh droppings should be observed for color, consistency, and amount of feces, urine, and urates. Sick birds should be immediately removed from the rehabilitation department and a thorough diagnostic evaluation should be performed.

Disease Control by High Standards of Hygiene and Aviary Design

Disinfection, sanitation, and maximal standards of hygiene are crucial for maintaining good health in a collection of birds. All equipment used in the hospital and quarantine facilities should be regularly—preferably daily—disinfected. Disinfectants commonly used and effective against most bacteria and viruses are sodium hypochlorite, quaternary ammonium, phenol, chlorhexine, cresols, and organic acids (Clubb and Flammer 1994). Material should always be cleaned before disinfection, as few disinfectants are effective in the presence of organic debris. Disinfectants should be used according to the manufacturer's recommendations, as stronger solutions are not necessarily more effective and may be toxic. Birds should not come into contact with disinfectants. Therefore, it is essential to rinse food trays, water bowls, and bathing bowls thoroughly before re-introducing them into the aviary. Each aviary should undergo cleaning and sanitation according to a strict schedule. Sanitation should include the removal of ground substrate and reduction of organic matter, thus creating suboptimal environmental conditions for the survival of most bacteria. Plant material, soil, or mud removed from one aviary should not be used in another aviary. It should be burned or buried to prevent the potential spread of pathogens and to avoid exposing free-living birds to these pathogens. Cages in the hospital department need to be cleaned daily. If there is still some interaction with birds in the quarantine department (e.g., physical therapy or medication), the aviaries should also be cleaned on those occasions when the bird is absent. Depending on the species housed in the rehabilitation department's different aviaries and its stress susceptibility, cleaning can be performed daily or weekly. The level of cleaning must be balanced against the level of disturbance that it creates. Food and water containers obviously need to be cleaned daily. Every time a bird permanently leaves its aviary either for release or for translocation into another aviary, complete cleaning, disinfection, and sanitation must be performed prior to placing another bird in that aviary.

An aviary should be designed to be easily maintained and cleaned while providing safe, secure, and sanitary conditions for its inhabitants. Enclosures must be visually separated from each other. Louder, more boisterous birds should be kept widely separated from quieter, more timid birds (Clubb and Flammer 1994). Solid-sided walls should be used as separations to avoid injuries and to serve as a visual barrier to reduce stress. Observation holes discreetly placed into the walls of the aviary enable proper observation of the birds without disturbing them, although such holes must be large enough to enable observation of any area of the aviary. The wire mesh of the open front wall should be covered on the inside with vertical battens (wood, bamboo, or plastic conduit piping) or some soft nylon netting that will act as a soft inner protective lining. More importantly, this will also act as a visual barrier that will prevent the occupants from flying against the wire and traumatizing their head or cere. Precautionary measures are necessary so that birds cannot be caught behind netting.

Aviary floors must be impervious and sloped (preferably concrete) to enable drainage. Effluents from one aviary must not flow through another in an uncovered manner that may allow transmission of infection. A concrete floor may be over-laid with pea gravel or sand. In the event of an infection occurring in an aviary, the gravel or sand can be removed, and the impervious floor power-hosed and disinfected prior to re-stocking the aviary. A less costly alternative is to remove the top soil from an aviary floor, to place a thick

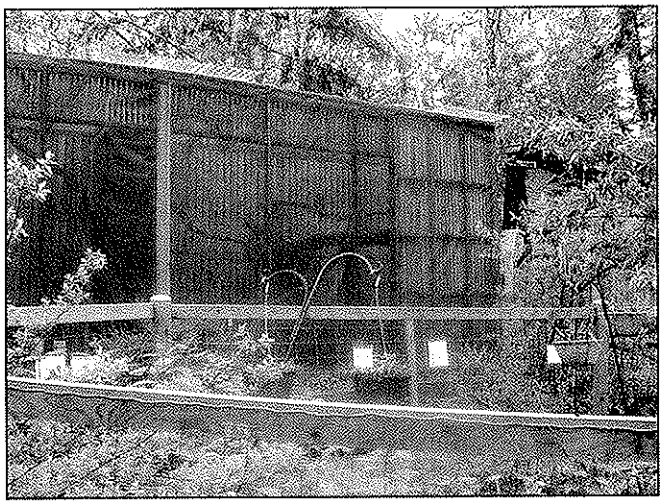
industrial vapor membrane and then to back-fill this with gravel or sand.

A double-door system to prevent birds from escaping when the keeper enters the aviary is recommended. Plants or bushes provide very useful cover for timid birds; placing them in pots enables their periodic removal for thorough cleansing. Perches should be secure and nonmovable, apart from specifically designed swing perches. Offering perches and blocks of varying diameter and covering all perching sites with Astroturf™ helps prevent "bumble foot." Perches should be cleaned weekly. One or more high perches enable birds to rest in a psychologically safe situation and assist in reducing stress. Offering natural daylight in outdoor aviaries is recommended, as daylight is essential for vitamin D_3 synthesis, which in turn is a requirement for calcium metabolism. Photoperiodicity influences the regulation of reproduction and moulting (Ryan 1999). Additionally, exposing perches to direct sunlight helps control residual bacterial contamination (Miyamoto et al. 2000).

Minimizing the contact between other inhabitants or free-living birds and exposure to their feces or to insects that can function as potential vectors for diseases is crucial to disease control. Trees overhanging aviaries have been shown by one of the authors to increase the incidence of tick-related diseases and associated deaths within the aviaries. Therefore, aviaries should be roofed with only one side open, and sealed with wire mesh as described above to allow access to sunlight. Biting flies, mosquitoes, and gnats transfer blood parasites such as *Haemoproteus* spp. and *Plasmodium* spp., or act as vectors for viral infections such as poxvirus, west Nile virus, or eastern equine encephalitis virus. In endemic areas the use of mosquito netting should be considered. Additionally, rodents may disturb and irritate the birds. A solid base of aviary walls and concrete aviary floors greatly assists in preventing rodent and vermin invasion and, by that, transfer of disease and parasites. Traps, poisons, and pesticides are valuable in controlling rodents, but precautions to avoid poisoning the birds are vital. It is recommended that only the amount of food that will be immediately consumed by the aviary's inhabitants should be fed, as leftover food can attract vermin.

Maintaining Good Health and Optimizing Recovery

Stress reduction contributes to a well-functioning immune system. Stressors include captivity, the associated change of diet, proximity to other raptors and humans, and possible differences in humidity and climatic conditions. Among raptors, goshawks (*Accipiter gentilis*), gyr falcons (*Falco rusticolus*), immature red-tailed hawks (*Buteo jamaicensis*), golden eagles (*Aquila chrysaetos*), and snowy owls (*Nyctea scandiaca*) are particularly susceptible to stress-induced infections and are more prone to develop diseases such as aspergillosis (Redig 2000). These birds should receive preventative treatment in the form of itraconazole



LOUISE SHIMMEL

Mosquito netting should be considered in areas where biting flies, mosquitoes, and gnats are endemic.

(10 mg/kg twice a day per os, Sporanox®) for the duration of increased susceptibility.

Good food hygiene is important to prevent the spread of food-borne pathogens or the spoilage of food within an enclosure. Food that remains on the floor of an enclosure can be a source of bacterial and fungal pathogens and should therefore be removed daily, especially in a warm climate. Ideally, the daily ration of meat should be thawed in the morning and then kept refrigerated until fed that day. Food should be purchased from a reputable source, and should not be stored for more than 3 months (Forbes and Rees Davies 2000). Day-old chicks should be blast-frozen separately prior to packing. Prolonged freezing times, thawing, and subsequent re-freezing enables the proliferation of bacterial contaminants, toxins, or spore formation.

Supplying food in a drawer system enables staff to easily remove excess food and to clean the food tray daily without disturbing the birds. Any change in food consumption is readily apparent and should be noted. The food drawer should not be positioned in direct sunlight and access by vermin should be prevented. Excess food consumption may lead to hepatic lipidosis, arteriosclerosis, and other health problems.

Provision of fresh water daily in a clean bowl is mandatory. If a hose or stand pipe is used to fill water/bathing bowls, the water should be left to run for several minutes before it is used, as the first water will have a significantly higher bacterial loading (Clubb et al. 1997). Food and water/bathing bowls should be made of stainless steel, hard plastic, or crockery (Clubb and Flammer 1994). In hot weather, it may be necessary to sanitize the drinking/bathing water with a diluted disinfectant such as chlorhexidine or F10 (diluted 1:1000) to control *Pseudomonas* spp. or other infections (Forbes and Rees Davies 2000). Well or spring water can be a source of bacterial or toxin contamination (Coles 2001, Clubb et al. 1997).



R. BERGMAN/USFWS



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Gyr falcons (*Falco rusticolus;* above) and goshawks (*Accipiter gentilis;* right) are among a number of raptors that are particularly susceptible to stress-induced infections and diseases such as aspergillosis.

It is important to offer raptors as great a variety of food as possible to ensure a balanced diet. Feeding just one food type increases the risk of Ca:P ratio imbalances, excessive fat intake, and deficiencies in vitamins and minerals. These nutritional shortfalls may lead to arteriosclerosis, metabolic bone disease, "angel wing," inward curling of the toes, or opisthotonus ("star gazing"; Forbes and Rees Davies 2000). It is mandatory that a whole-carcass diet is fed: a diet of only meat is never acceptable. If meat without bones exceeds 10% of the daily food intake it will inevitably lead to a Ca:P:Vit D_3 imbalance (Forbes and Flint 2000). In that case, supplementing with minerals and vitamins is essential. When feeding larger carcasses to smaller or young birds, the bones must be broken to ensure the birds eat the whole carcass and not just the meat. It is essential to appreciate that it is not the diet that is offered that is critical, but rather the diet that is *eaten*. Some free-living birds might not be familiar with some readily available commercial food sources such as day-old chicks.

Avian-derived food can harbor pathogens such as *Mycobacterium* spp., *Salmonella* spp., *Campylobacter* spp., *E.coli,* Trichomonas, paramyxovirus, falcon herpesvirus, or rotavirus. In contrast to wild prey species, poultry are screened for most of these pathogens. Often viruses are pathogenic to only a certain species. Many serotypes of adenovirideae are, for example, nonpathogenic for poultry and are therefore not controlled. However, they can cause severe diseases in individual raptor species. Similar sources have been shown to be responsible for fatal adenovirus outbreaks in Mauritius kestrels (*Falco punctatus*) (Forbes and Simpson 1997). Wild prey species can be also infested with internal (*Caryospora* spp., *Syngamus* spp.) or external (lice) parasites. Caryospora species present another example where pathogenicity varies with respect to host species. Columbiformes pose a particular risk to raptors due to their high subclinical incidence of the protozoal infection trichomonas. Discarding head, crop, and esophagus is not sufficient. Freezing and thawing pigeons prior to feeding will kill Trichomonas. However, pigeons can carry other pathogens such as falcon herpesvirus, owl herpesvirus, paramyxovirus, poxvirus, adenovirus, and circovirus, which will not be killed by freezing (Hooimeijer 1999, Forbes and Flint 2000). Therefore, it is advisable to refrain from feeding free-ranging pigeons. Infectious disease transfer is less likely if mammalian rather than avian-derived food is used, as few pathogens cross between classes (Forbes and Rees Davies 2000).

A high percentage of raptors presented to rehabilitation facilities suffer from fractures and require osteosynthesis. While it is widely understood that fractured bones must be immobilized, it must also be recognized that both the original injury and prolonged immobilization of a limb can lead to loss of function. "Fracture disease" is a term used to describe the consequences of a fracture and its treatment. It is usually characterized by atrophy, fibrosis, and degenerative joint disease. Contraction of the propatagium is a common consequence of wing immobilization (Welle 1999, Redig 2000). Such contractions yield at best a severe defect in the contour of the leading edge of the wing and, at worst, a wing incapable of full extension (Redig 2000). Physical therapy aims to minimize the loss of range of motion, prevent changes in soft tissue flexibility, improve muscular strength, and improve muscular and cardiovascular endurance. Additionally, it serves to promote neuromuscular re-education, allowing the patient to regain coordination for normal active daily living (Martin et al. 1993). Fracture repair should be achieved so that the joints of the limb can function normally within 48 hours of treatment. This is the most important step in minimizing fracture disease (Forbes, pers. comm. 2004).

Steps to provide physical therapy include passive range of motion, active range of motion, active-assisted range of motion, and adjunct techniques such as cold therapy, heat therapy, and massage (Taylor 1995). Passive range-of-motion

exercises are performed by manipulating the limb through its entire range of motion, bringing it from maximum flexion to maximum extension. It is held in each position for 15–20 seconds. Sessions should be increased in intensity, in number of repetitions, and in frequency as each level is readily tolerated (Martin et al. 1993). Active range-of-motion exercises are the usage of the limb by the bird, as in flying or walking, depending upon the affected limb. Active assisted range of motion can be performed by providing a gently rocking perch, which forces the bird to move, flex, and grip in order to maintain balance. By holding the bird on the fist and gently moving the hand up and down, the bird is forced to use its wings, and many birds will paddle the legs if held just above a surface, in an attempt to walk or perch (Welle 1999).

Identification and Record-Keeping System

An accurate record-keeping system for birds entering the facility, remaining in the facility, and leaving the facility is a fundamental requirement. Breed, sex, and age of every individual should be noted. Furthermore, the location where the bird was found and where it was released need to be recorded, as well as all its screening and test results. Each bird should be permanently identified. If the bird has not already been fitted with a closed or open band, a microchip transponder can be placed into the pectoral muscles. There are several disadvantages to relying on bands as a mean of identification: the numbers can become illegible with time, and birds can destroy bands. There is also the risk of injury to the bird. Furthermore, metal bands left on the legs of birds exposed to subfreezing temperatures can contribute to frostbite (Clubb and Flammer 1994). On the other hand, the use of bands for clear marking prior to release (e.g., BTO ringing) permits identification of postrehabilitated birds. In this way, valuable information about the birds' movements and successful rehabilitation, as well as the possibility of subclinical infection that has become overt on release, can be detected. Records should also note which bird has been in which aviary at any time, such that retrospective disease risk data can be calculated if a bird is subsequently found to be carrying an infectious organism.

A computer program such as the Animal Record Keeping System (ARKS; Derrickson and Pickett 1991) allows individual birds to be located; records where birds have previously been housed; maps the movement of diseased birds within the rehabilitation facility; facilitates identification of potential problem areas; prepares preventative medicine protocols; and establishes emergency disaster relief plans. Epidemiologic analysis suggests that disease occurrence is generally not random, but that endemic disease is associated with underlying features characteristic for a facility. MEDARKS, the software that interfaces with ARKS, may also be useful. Other popular geographical information systems are ArcView, ARC/INFO, and MapInfo (Bright 2000).

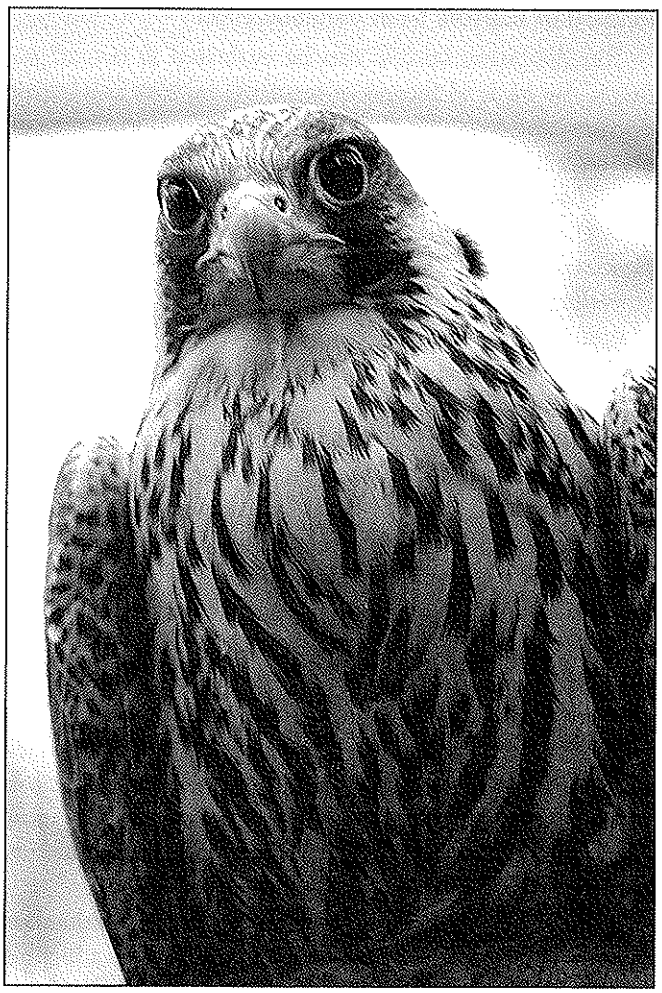
Release of Raptors from Rehabilitation

Rehabilitation success can be evaluated at two stages: firstly, the medical success of repairing injuries and curing diseases; and secondly, the successful integration of the animal back into the population after release. Some argue that a bird has only been successfully released if it becomes integrated into the breeding population and produces offspring. However, in natural populations not all adults contribute to reproduction and in many species there is a constant surplus of nonbreeding birds (Csermely 2000).

The authors believe ethically that a bird must not be released if there is any concern that its injuries are contrary to its survival in the wild. In addition, it is illegal in the United Kingdom under the Abandonment of Animals Act (1960) to release any bird that is not likely to survive. The following injuries prohibit the release of a free-living bird as they interfere with the bird's ability to fly, hunt, kill, and eat: loss of any limb, loss of eye/sight, loss of a hind talon, and permanent loss of any part of the beak. Furthermore, the effect of transiently losing any primaries or tail feathers is different in buzzards or hawks compared to falcons that require greater acrobatic skills when hunting (Heidenreich 1995). It is likely that fitness will play a more important role in birds that actively attack during hunting than in more sedentary birds or birds that consume a significant quantity of carrion (Fox 1995).

If an ex-free-living bird is not to be released, euthanasia is often preferable, in terms of the bird's welfare, to a lifetime of impaired aviary dwelling. There are exceptional circumstances, concerning birds of high conservational value, localized populations, or those on the edge of extinction. In these cases, long-term maintenance in a captive breeding project is not only justified but, on occasion, invaluable.

An analysis screening 84 raptors and owls presented for rehabilitation in Berlin, Germany, showed that 45.2% of all the raptors could be released back to the wild (Lierz 2000). Of the presented injured raptors, 51.9% could be released, while only 33.3% of the presented debilitated raptors could be reintroduced to the wild. Illness appears to have a greater impact on release rates than traumatic injuries (Lierz 2000). A survey in a rehabilitation center in Italy over the last 30 years showed that only 30–40% of the birds could be released back to the wild (Csermely 2000). Prolonged captivity can reduce release success in some species, as it promotes habituation to humans and reduces flight ability and responsiveness to natural prey. Close contact with staff can induce some form of socialization or lack of fear, particularly in juvenile birds. The released bird may not choose the optimal habitat and may stay in areas with human presence (Csermely 2000). An imprinted bird is unlikely to breed in the wild, but may occupy a nest site, thereby preventing a potentially fertile pair from using it. Birds cannot only become imprinted on humans, but also on unsuitable prey/food or a novel nest



TIM GREENFIELD

For birds of high conservational value, such as the peregrine falcon (*Falco peregrinus*), long-term maintenance in a captive-breeding project is not only justified but, on occasion, invaluable.

site (Forbes, pers. comm. 2002). A further study analyzing data from 1550 rehabilitated birds in Minnesota, U.S.A., demonstrated no correlation between long-term survival and the nature of the injury or the amount of time spent in the rehabilitation center (Martell et al. 2000). The range of survival time was 1–458 weeks, with 24 weeks being the median survival time and 14.4% of birds surviving fewer than 6 weeks.

When releasing raptors back to the wild it is important to either return them back into their own territory (preferable if releasing within 2 weeks), or into "free territories" in cases of delayed release following prolonged rehabilitation. Territories should be chosen according to suitable geographical position, vegetation type, prey species, and time of year. Release should be timed according to availability of prey (summer and fall) and good weather conditions to optimize the chances of the bird adapting back to the wild.

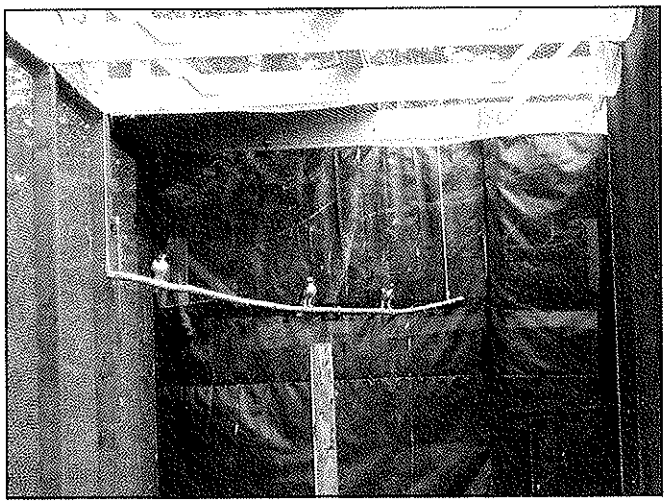
It is important to assess raptors' flight abilities before they are released. Flight is judged according to symmetry and strength of wing beats, balance during flight, position of legs, height and speed of flight, and the way of landing (Heidenreich 1995). Spacious flight aviaries can be used to observe flight ability; they also encourage the birds to exercise and, by that, to train their cardiovascular system and musculature. Falconry techniques such as hack board, hack flight, or hack to the lure allow superior fitness and stamina development compared to simply exercising raptors in aviaries. Fitness is considered a contributing factor to a bird's survival postrelease. A 1993 study has indicated that blood lactate concentrations may be an accurate measure to test the level of fitness in raptors (Chaplin et al. 1993). Holz and Naisbitt (2000) showed, by measuring blood lactate concentrations before and after a standardized exercise regime, that raptors trained by standard falconry techniques were fitter when released and experienced less weight loss when recaptured than raptors that were exercised in aviaries. The use of traditional falconry methods enables the assessment of the bird's mobility and ability to maneuver in the air, as well as its ability to catch and kill prey (Holz and Naisbitt 2000). Raptors that are trained with falconry techniques can easily adapt back to the wild (Heidenreich 1995).

Infectious Risk to Humans

Treating and handling birds infected with zoonotic diseases represent a risk to the handler, and people working with birds must be educated about potential zoonotic diseases. Additional important sources of infection are food preparation for raptors and the performance of necropsies. Zoonotic diseases of special interest include chlamydophylosis, mycobacteriosis, salmonellosis, campylobacteriosis, cryptosporidium, and Newcastle disease (Latimer and Rakich 1994, Gerlach 1994). Further viruses that infect both birds and humans are bunyaviridae, flaviviruses, influenza A virus, arboviruses, and togaviruses (Ritchie 1995). Appropriate protective measures such as disinfection and high standards of hygiene when handling birds and food, including gloves and surgical masks if indicated, are recommended.

Conclusion

It is important to emphasize that screening is crucial not only when birds enter a facility, but also when they leave. Rehabilitation centers can be described as "bottle necks," with a large number of birds being introduced to the facilities. In these facilities birds are often kept in a high concentration in limited space with the potential for direct or indirect contact with each other. These are ideal conditions for the accumulation of pathogens and infection of individuals. When releasing such birds, the pathogen can be spread back into the ecosystem, subsequently endangering the ecosystem as a whole. The principles outlined in this article minimize the risk of disease spread. Successful rehabilitation of raptors includes critical triaging of the



LOUISE SHIMMEL

A large prerelease flight conditioning aviary with three red-tail hawks (*Buteo jamaicensis*).

incoming diseased birds, treating their injuries and diseases, and ensuring the maintenance of their health while regaining their fitness prior to release.

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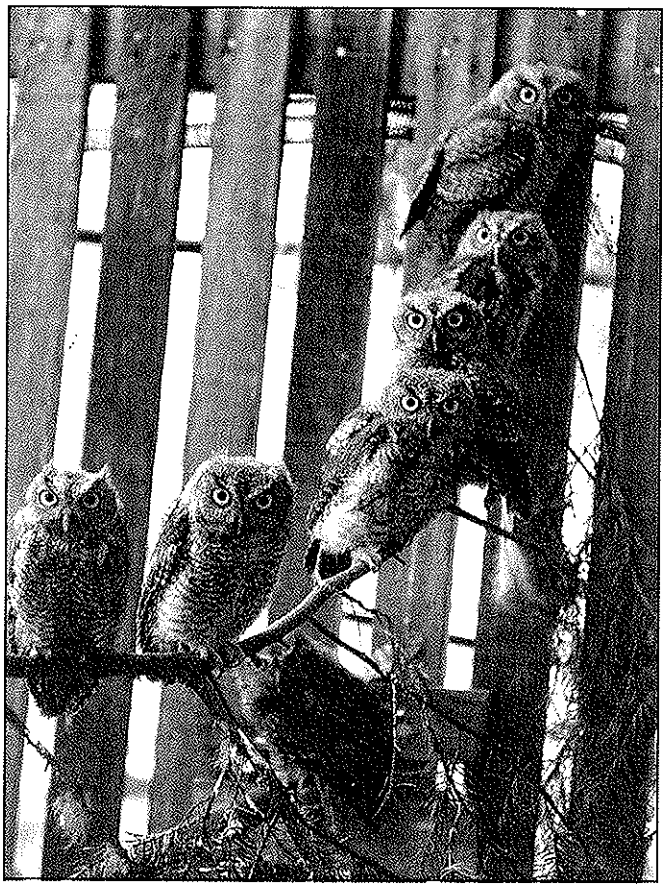
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Young saw-whet owls (*Aegolius acadicus*).

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A Case Study on the Impact of Giraffes in Ruma National Park in Kenya

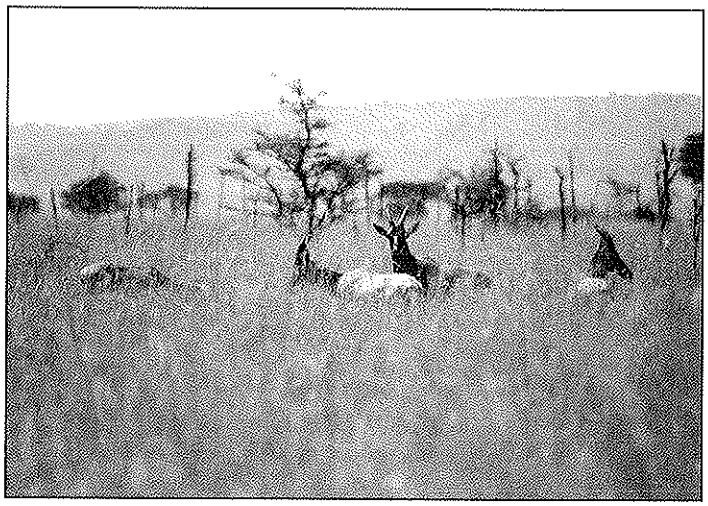
by J. L. Awange, Oyugi Aseto and Obiero Ong'ang'a

Introduction

In the late 1970s and early 1980s the Rothschild species of giraffes (*Giraffa camelopardalis rothschildi*) was relocated from Soi Ranch in the Rift Valley of Kenya to two national parks. This measure was taken to both conserve the giraffes, which were threatened by the spread of human settlements, and to enrich Ruma NP with new species (Njuguna 2001). Twenty-seven (27; five males and 22 females) of these Rothschild giraffes were relocated to Ruma National Park (NP), and 17 were relocated to Lake Nakuru NP. This article describes a study conducted at Ruma NP in July 2002 that sought to determine the current giraffe population and to measure the impact of the giraffes' 1983 introduction on the park's other animal species, on park flora, and on human habitat.

Ruma NP park is located in South Nyanza, about 140 km from Kisumu City, Kenya. It is about 120 km^2 and can be accessed from Kisumu via Homabay, Kisii, or Migori. Both roads leading to the park are tarmac. The park has three circuit roads and a functioning airstrip.

Ruma NP was established in 1966 and gazetted as Lambwe Valley Game Reserve. (The River Lambwe is the area's dominant geographical feature.) In 1983 it was renamed Ruma National Park after the River Ruma, a permanent stream that flows underground toward Lake Victoria. The decision to make Ruma a national park was driven by the urgent need to conserve the roan antelope (*Hippotragus equinus*), locally called "Omoro." Roan antelope are not endangered in the strict classification of endangered species; rather, they are classified as a low-risk, conservation-dependent species by the International Union for the Conservation of Nature and Natural Resources (IUCN) or World Conservation Union. They range across sub-Saharan central Africa from Guinea to Ethiopia and south across Angola to South Africa. In Kenya, roan antelope are only found in Ruma NP, where habitat factors could potentially enable them to thrive. However, poaching and drought have caused their population to dwindle in recent years: in 1994 research scientists from the Kenya Wildlife Society found only 34, and the census of September 1999 put the number at 25 (see e.g., Table 1). All human activities



PHOTOS: OSIENALA (FRIENDS OF LAKE VICTORIA) KENYA

In Kenya, roan antelope (*Hippotragus equinus*) are found only in Ruma National Park. Their survival, however, is threatened by poaching and drought.

ABSTRACT: In 1983, 27 Rothschild giraffes (*Giraffa camelopardalis rothschildi*) were translocated from Soi Ranch in Kenya's Rift Valley to Ruma National Park (NP). This measure was taken to both conserve the giraffes, and to enrich the park with new species. In July 2002 a team from OSIENALA (Friends of Lake Victoria) conducted a survey at Ruma NP to determine both the current giraffe population and the impact of their introduction. The study found the giraffe population to be approximately 75. The giraffes' presence at Ruma NP was found to have an impact both on the environment and the human communities that surround the park.

KEY WORDS: Rothschild giraffes, *Giraffa camelopardalis rothschildi*, Ruma National Park, Kenya, conservation

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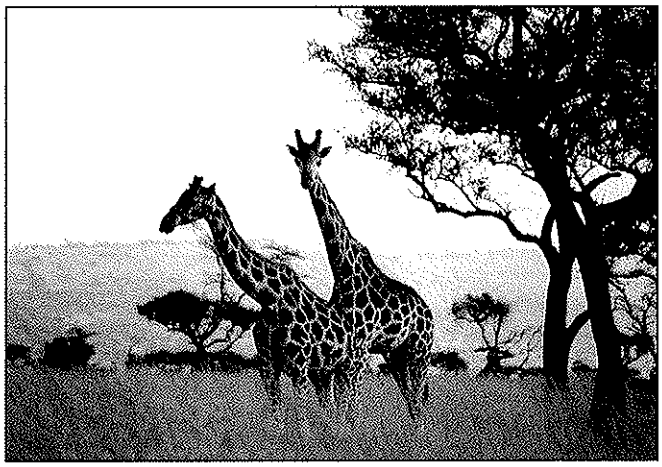
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TABLE 1. SOME OF THE MAIN WILDLIFE SPECIES FOUND IN RUMA NATIONAL PARK IN SEPTEMBER 1999.

(Lambwe Report 1999, Ruma National Park 1999; Names in parentheses are given in the local Luo language.)

Species Name	Approximate Population
Impalas (*Nyakech*)	563
Topis (*Ten'g*)	489
Kongoni (*Ngau*)	188
Waterbuck (*Apul*)	156
Reedbuck	62
Oribis	134
Buffaloes (*Jowi*)	31
Hyenas (*Ondiek Otoyo*)	6
Bush pig (*mbeche*)	6
Rothschild giraffe (*Tiga*)	69*
Roan antelope (*Omoro*) (translocated from Soi)	25
Leopards (*Kwach*)	2
Ostrich (*Udo*)	Not counted (NC)
Guinea Fowl (*Awendo*)	NC
Weaver birds (*Osogo*)	NC
Vultures (*Achuth*)	NC
Hawk (*Ongo*)	NC
Owl (*Tula*)	NC
Sterling birds	NC
Python (*ngielo*)	NC
Puff Adder (*fu*)	NC
Black Mamba	NC
135 plant species	several per species

* Includes Rothschild giraffes originally at Ruma NP *and* the 27 giraffes translocated from Soi



In 1983, 27 Rothschild giraffes (*Giraffa camelopardalis rothschildi*) were translocated from Kenya's Rift Valley to Ruma National Park as a conservation measure.

in Ruma NP park are prohibited except those aimed at the conservation of the varied wildlife species.

It is against this background that between 7–10 July 2002 a team from OSIENALA (Friends of Lake Victoria), a leading nongovernmental organization (NGO) in the region, conducted a survey at Ruma NP to determine the impact of the Rothschild giraffe on the park.

The five-person OSIENALA team was composed of the late Professor Oyugi Aseto, a social-economist and the deputy director at OSIENALA; Dr. Ing. Joseph L. Awange, an environmental, land use, and surveying (GIS) expert of OSIENALA and a senior lecturer at the Department of Environmental Studies, Maseno University; Dr. Obiero Ong'ang'a, executive director of OSIENALA, and former regional coordinator of western Kenya for the Kenya Wildlife Society; and two OSIENALA staff members. For the field survey, this team was joined by staff from the Kenya Wildlife Society: Thadeus Obari, a research scientist in western Kenya; Francis K. Mbaka, a game warden at Ruma National Park; and A. Oyier, principal of the Lambwe Secondary School.

Field Survey

The 1-day field survey was designed and conducted to authenticate the following:

- The present number and state of the Rothschild giraffes since their introduction to the park, 19 years earlier
- The stress problems that might be observed on the giraffes
- The relationship between giraffes and other animal species in Ruma NP
- The impact of the giraffes on the surrounding environment (e.g., on acacia)
- The land-use patterns that have had an impact on the wellbeing of the animals at the park

TABLE 2: ROTHSCHILD GIRAFFES CENSUS DATA

The following abbreviations are used in Table 2: AM = Adult Male (older than 2 years), AF = Adult Female (older than 2 years), SAM = Sub-Adult Male (between 1–2 years), SAF = Sub-Adult Female (between 1–2 years), YM = Young Male (younger than 1.5 years), YF = Young Female (younger than 1.5 years). Question marks (?) indicate that the sex of the giraffe could not be established.

CENSUS DATA SHEET FROM BLOCK 1

Location	AM	AF	SAM	SAF	YM	YF	?	Total	Remarks
Bwoye	3	10	1	1	2	6	2	25	1 AF has an injured right leg; 1 AF pregnant
Lambwe River thicket	2	3		1		2	1	9	1 AF pregnant; young < 1 wk sucking its mother
Kamato Dam	1							1	
Lambwe River thicket Near road	1	6		2				9	1 limping on left leg
Total	7	19	1	4	2	8	3	44	Healthy population

CENSUS DATA SHEET FROM BLOCK 2

Location	AM	AF	SAM	SAF	YM	YF	?	Total	Remarks
Nyatoto North	3	2				1	1	7	3 pregnant AF
Nyatoto Gate	1	7	1	2				11	
Nyatoto West	1	1					2		
Total	4	10	2	2		1	1	20	

CENSUS DATA SHEET FROM BLOCK 3

Location	AM	AF	SAM	SAF	YM	YF	?	Total	Remarks
Nyadena		2		1				3	healthy
Total		2		1				3	

CENSUS DATA SHEET FROM BLOCK 4

Location	AM	AF	SAM	SAF	YM	YF	?	Total	Remarks
Airstrip		1						1	lone giraffe
Total		1						1	

CENSUS SUMMARY FROM THE FOUR DATA SHEETS

AM	AF	SAM	SAF	YM	YF	?	Total	Remarks
11	32	3	7	2	9	4	68	ca. 12 lone males not sighted where they normally graze

- Security factors
- Community activities

The field survey included:

- Physical counting of the giraffes
- Photography to document the giraffes and other animals and features of interest
- A questionnaire given to 100 residents of the park's surrounding communities
- Oral interviews (i.e., direct questioning of 100 residents in communities surrounding the park)
- Reading relevant publications in the park's main office

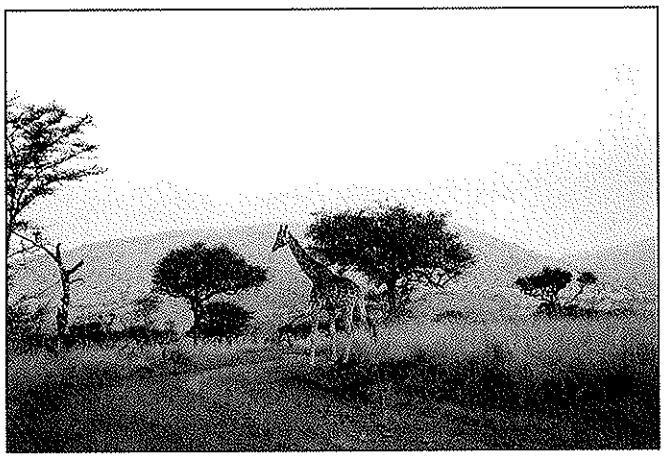
Physical Counting of the Giraffes

For the purpose of the survey, the park was partitioned into four "blocks" by experts from the Kenya Wildlife Service, which had undertaken a similar survey a decade earlier. The blocks were chosen according to vegetation. The lower part of Ruma NP is a thick forest that borders a river where the park's animals drink, bathe, and cool themselves. The upper part is a savanna—dry with isolated tall trees. Block sizes were delineated by the park's roads. They were, therefore, not uniform in size, but randomly chosen based on the park's geographic features.

Each of the blocks was assigned to three or four people, who traveled through Ruma NP in Land Rovers to conduct the physical count of the animals. The count was guided by a detailed set of questions provided by the Kenya Wildlife Service. The task involved locating the giraffes; counting the number of adult males, adult females, sub-adult males, sub-adult female, young males, and young females; and noting the condition of the giraffes sighted. Block and the total giraffe counts are given in Table 2. The exercise was completed in 1 day. The time of the count was selected to coincide with when the giraffes were expected in various locations (based on the park wardens' experience).

Giraffes and Their Surroundings

According to Ruma NP officials, immediately after the introduction of the Rothschild giraffes in 1983, one died of natural causes and the rest survived. In 1992 seven giraffes were struck by lightening and died immediately. Based on routine random counts conducted by the park's wardens and a average annual population increase of three giraffes, approximately 75 giraffes were expected to be at the park, although only 68 were sighted at the time of the survey. (The authors attribute the seven-giraffe discrepancy to these seven being in places where they could not be sighted during the count.) In addition to physically counting giraffes, the survey deduced the following with respect to the relationship between the giraffes and their surroundings:



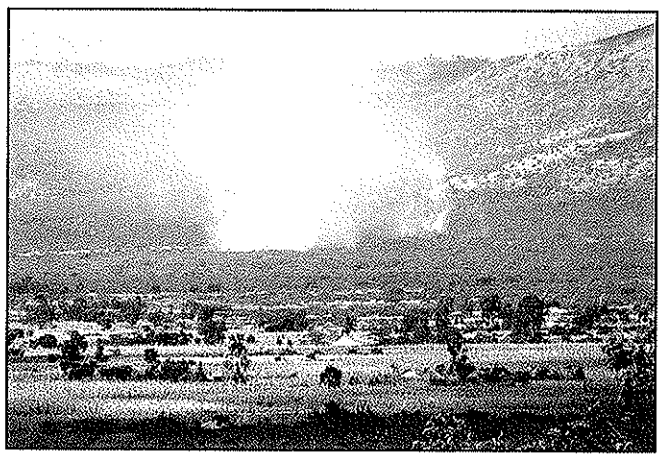
The survey's "Block" sizes were delineated by the park's roads.

Stress problems observed: The major predators on giraffes at Ruma NP are hyenas, leopards, and pythons. The giraffes do not roam throughout the park but are instead localized due to the position of watering points, security fences in Nyatoto Camp (a camp for wildlife scouts), and the location of their preferred forage, Acacia *dripanolobium*. While they do not compete with other animals for food, they do compete for water. When giraffes destroy crops such as sorghum and sunflower, they come into conflict with local farmers.

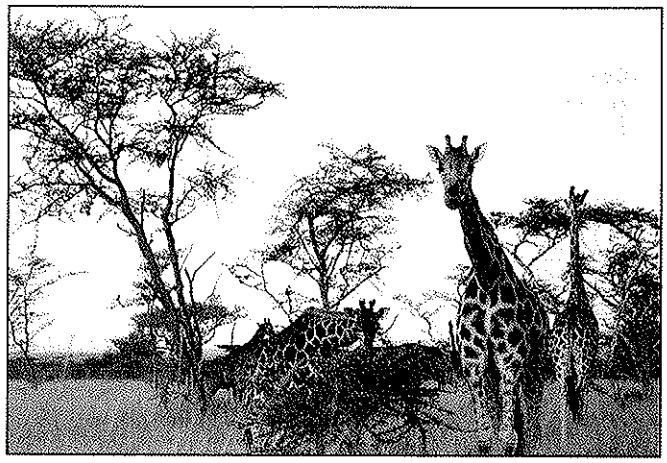
The giraffes had no visible diseases, and no disease has been detected on the giraffes at Ruma NP since their relocation there. Visible abnormalities on the growth of their hooves have, however, been noticed. An annual census needs to be conducted in order to fully determine the giraffes' survival rate.

Relationship between giraffes and other animal species in Ruma NP: No species shares the ecological niche with giraffes. Species that depend on giraffes at this park include oxpeckers, African starlings of the genus *Buphagus*, which pick ticks and clean wounds. There has not been a significant increase in the number of oxpeckers since the introduction of the giraffes. Giraffes are vulnerable to predators such as hyenas until they reach 2 years of age, however, the number of predators has apparently not increased. Although the giraffes compete with other species for habitat at the park, this does not appear to have affected the other species.

Environmental factors: Since the introduction of giraffes to Ruma NP, species of plants such as Acacia *dripanolobium* have decreased. These species are well distributed in the park and are common browse for giraffes. Some look healthy, but in places frequently visited by the giraffes, the trees appear affected.



Residents of communities just outside Ruma NP's borders occasionally start wild fires to express their dissatisfaction with the park's administration. These fires compromise enviromental management efforts and destroy vital habitat.



Water sources at the park include four dams: Kamato, Korlang'o, Nyatoto Rangers Camp Dam, and Nyadenda. There are also rivers, springs, seasonal streams, and three alternative boreholes. At this time there is a continuous supply of water, with the quantity being stable year round. Water catchments for the park include the Kanyamwa and Gwasi hills, however, these are unstable owing to heavy tree felling done both to clear the land for agricultural uses and to create charcoal for domestic use. This watershed also suffers from agricultural use, human settlement, and soil erosion. Although tree felling within the park was not observed during the survey, heavy felling was noticed in the hills.

Security factors: Both the animals at Ruma NP and the people who live in the communities surrounding the park encroach on each other's habitat. Humans poach wildlife, and wildlife encroach upon humans and their activities. The Kenya Wildlife Society is making successful efforts to control poaching where a fence separates the park from villages outside the park's boundaries. However, the 10-km stretch from the Korlango path to the village of Gendo is not fenced, thus allowing access to poachers. Although there are three outposts and approximately 16 game rangers stationed in the park, transport facilities are inadequate, as there is only one vehicle available for patrolling the giraffes' range.

Community activities: Ruma NP is bordered by five communities: Kanyamwa West, Lambwe East, Ruma, Gwasi East, and Kaksingiri East. These communities have been approached on co-management of the park, but there is no active program in place. This is in part due to inadequate local support for the park's warden.

Heavy land use around Ruma NP comprising agriculture, livestock farming, forestry, and settlement was observed. Visible conflicts between Ruma NP and these land uses include cattle grazing in the park, siltation and soil erosion to the River Lambwe, and farming that led to the destruction of the park's fence. The study concluded that farming habits, heavy deforestation, vandalization of the fence, poaching, and wild fires must be addressed in order to make the communities surrounding Ruma NP aware of environmental management

for their own benefit as well as that of the park. In a meeting of the park warden, the principal of Lambwe Secondary School, and OSIENALA, the recommendation was made to involve schools in the process of increasing local residents' awareness of the benefits of improved land use management; to post local people to Ruma NP in wildlife management positions; and to sensitize local communities to the need for collaborative co-management by providing educational materials and through meetings with local chiefs.

Specific problems facing the park that have an impact on giraffes: The following factors may have direct or indirect effects on the wellbeing of the giraffes, and may have hampered their population growth.

- Of late, there has been a call by some members of Kenya's parliament for the degazettement of Ruma NP owing to the tsetse fly menace. Should this threat be carried out, survival of the giraffes and other park inhabitants will be severely threatened.
- Inadequate personnel to staff and patrol the park, making poaching possible and even easy.
- Destruction of wildlife habitat by persistent droughts in the years following the El Niño rains in 1997–98. This perhaps explains the diminishing roan antelope population and may have contributed to the poor population growth of the giraffes.
- Destruction of the perimeter fence. The El Niño rains helped bring down the park's perimeter fence, allowing animals to leave the park. Many did not return. This also gave local herdsmen a chance to encroach into the conserved area and wildlife to enter human settlements.
- Poor conditions of roads leading into the park. Although the road network and the drainage system in the park are excellent (i.e., all-weather murram surface), the two main roads leading to the park are not. During the rainy seasons, the Ka D.O–Kamato and Koguta Gwasi roads are virtually impassable.
- Efforts to control poaching bring the park warden into confrontation with the local people. Local dissatisfaction is sometimes expressed in wildfires set by park's neighbors, which result in habitat destruction.

Conclusions

In general, the numbers of giraffes were seen to increase steadily, however the slow rate of increase needs further investigation. Human population increase in the surrounding communities is resulting in increased demand for land and destruction of watershed. The degazettement of the park, if implemented, out is an issue that may confine the species within this park to extinction.

Acknowledgement

As this article was in press, one of our co-authors, Professor Oyugi Aseto, left us to be with his maker. We greatly appreciate his contribution and dedication to the wellbeing of the animals of Ruma National Park. The authors wish to acknowledge the financial support of AFEW USA, which enabled the successful undertaking of this survey. This support, provided courtesy of Rick Anderson, director of AFEW USA, is much appreciated. We are indebted to the game warden of Ruma National Park, Mr. Francis K. Mbaka, and his entire staff for the cooperation, protection, and guidance that they provided. We sincerely wish to thank Thadeus Obari (research scientist, Western Kenya) and A. Oyier (principal, Lambwe High School) for the technical assistance and expertise that they offered.

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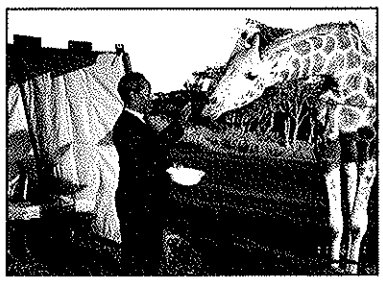
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Feeding a giraffe at the Giraffe Center in Nairobi, Kenya.

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PHOTO: TOURISM TORONTO

Vinyl Flooring Tile as an Overlay Material for Wire-Bottom Cages

by Susan Birch

Wild Wings Rehabilitation Center, Inc. has two small bird enclosures that are built off the ground. Both have 1.3 cm (0.5 in) vinyl-coated wire bottoms. Wire-bottom cages are nice because they are easy to clean. Droppings and other debris are simply washed through the wire to the stone base below, where they are then hosed away.

However, in my opinion wire flooring alone is not a suitable substrate for birds. Over the years I have used a number of products like Astroturf™, indoor/outdoor carpet, and perforated shelf liner as an overlay for the wire, leaving the areas directly under perches uncovered to facilitate cleaning. Even so, droppings, seed, dander, and molted feathers would accumulate, and the overlay material had to be removed each day for cleaning. This, of course, was time consuming and somewhat stressful for the birds.

I have been searching for a perforated rubber-type mat that could be used as an overlay. I did find some, but it was very expensive. Recently, we installed a recycled, solid vinyl flooring product called Multy~Tile™. The interlocking tiles are easily put together with the tap of a hammer. Multy~Tile™ can be cut with a utility knife for an exact fit to any cage configuration. The nonporous vinyl surface of the tile and ample perforation pattern allow droppings and other debris to be easily and quickly washed down through the wire. The tiles drain and dry quickly and thoroughly.

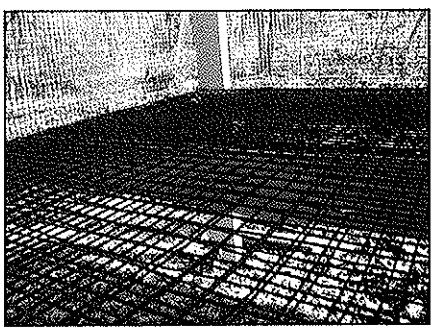
Communication with the manufacturer assured me that Multy~Tile™ would withstand cleaning with a 10% bleach solution and that Multy~Tile™ is resistant to most chemicals. Simply clean and disinfect, then rinse thoroughly with water and Multy~Tile™ should last for many years. These 0.3² m (1² ft) square anti-slip, anti-fatigue vinyl tiles can be purchased at building supply and hardware stores in packs of 10 for about U.S.$8.

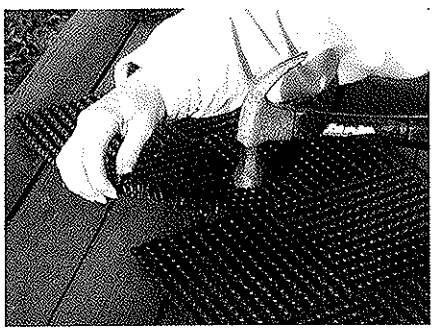
This affordable, high-quality, all-season product is recommended for multiple uses and may solve some of your flooring dilemmas. I can see it used in enclosures, in the clinic, at oiled bird wash stations, as standing mats for waterfowl, or anywhere there is a need for safe, dry, comfortable footing.

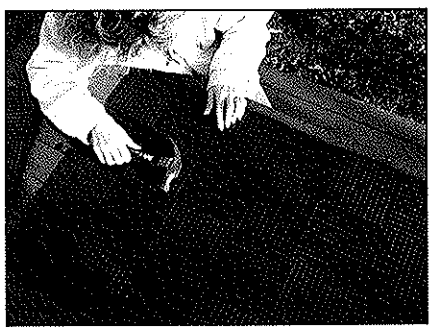
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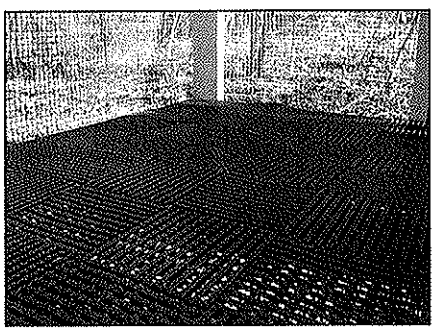
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Susan Birch is founder/director of Wild Wings Rehabilitation Center, Inc., a small, home-based center specializing in small birds and waterfowl. She has been rehabilitating wildlife since 1993. Wild Wings is a 501(c)(3) nonprofit organization.











AN IMPROVEMENT OVER A PLAIN WIRE FLOOR: Multy~Tile™'s interlocking tiles are quickly joined together with a hammer.

The (Other) Value of Rehabilitators

PART II: IS THERE ANYBODY OUT THERE?

by Jennifer Hill

In the last issue of the *Journal of Wildlife Rehabilitation*, I began a series of columns titled "The (Other) Value of Rehabilitators" to remind you that we—that is, rehabilitators—may be generating materials (data, information, carcasses, etc.) that may not be utilized as efficiently as possible (Hill 2004). This installment will focus on the variety of organizations, agencies, and information sources that should be a part of your rehabilitation network. I titled this article, "Is There Anybody Out There?" to remind you that we are not alone. With many of these sources, the exchange of ideas and materials should be reciprocal. Therefore, you should be receiving "goods" as well as giving. Who wouldn't be interested?! Read on!

In the last column, I mentioned a raptor listserv (mailing list server) of which I am a member. For anyone who has yet to make it into the 21st century, a listserv is a discussion forum with a specific focus, which is typically determined by the group moderator or owner. A listserv exists for any topic you can imagine: hybrid car owners, breast cancer survivors, border collie enthusiasts, etc. There are several listservs or groups dedicated to discussions of wildlife, rehabilitation, and other issues related to wildlife rehabilitation. Here are some listservs I have found through Internet searches or know from personal use. Several listservs (including the first four listed below) are offered through Yahoo Groups and can be accessed at the Yahoo Groups website (www.groups.yahoo.com) and by typing in the group name in the box under "Join A Group" and clicking the "search" button.

wlrehabprofessional is restricted to professional wildlife rehabilitators. This group is a bit unusual in that you must apply and will be considered based on your qualifications and credentials.

wildrehab focuses on the care of orphaned, injured, or sick wildlife in captivity.

WildlifeCareSupport is for anyone who needs help or advice on basic or expert care for orphaned and injured wildlife.

Mich_Wildlife_Rehab_Assoc is sponsored by the Michigan Wildlife Rehabilitators Association. More on local rehab groups later.

WLREHAB is not sponsored by Yahoo Groups. To subscribe, send the following command to listserv@listserv.nodak.edu in the *body* of your e-mail message (not in the subject line): "subscribe wlrehab yourfirstandlastname".

Many of these listservs focus on answering rehabilitation or wildlife questions without berating the inquirer. Individuals new to wildlife rehabilitation should feel "safe" asking even basic questions to these veterans. I have never received a hostile response, but only clear, concise advice and opinions. I encourage veterans to also join these groups and share your successes, failures, frustrations, and good advice with your colleagues.

I have only listed a few Internet resources with which I am familiar. There are other sources out there. Do a search on Google or Yahoo. Query individuals on these lists. The sky is the limit!

There is, however, one major caveat to Internet information: just because it is online does not necessitate that it be true. For good or bad, anyone anywhere can publish a website with little or no censure. Therefore, you must take what you read with a grain of salt unless you are confident your source is reliable. This sounds easy enough, but how can you discriminate between a reliable source and those less reliable? I utilize websites sponsored by individuals whom I know and trust and websites sponsored by state, national, or international organizations. These websites are wonderful places to meet other rehabilitators, get information, and exchange ideas. Additionally, information gleaned from these sponsored listservs is likely to be self-correcting (more reliable) than information from an unknown website, because others reading the list will correct misstatements as well as suggest other possible solutions or ideas. Furthermore, if you read or hear a suggestion that just doesn't sound quite right to you, post the information to one of the above listservs to get a second (and third, and forth) opinion. Misinformation will continue to spread until someone provides the correct information to replace it.

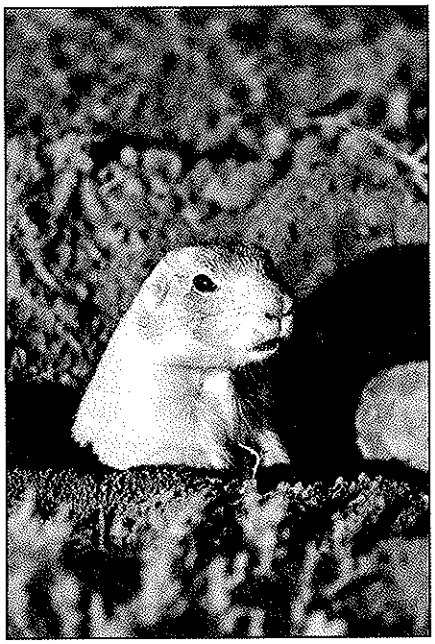
Two renowned rehabilitation organizations are the IWRC (International Wildlife Rehabilitation Council) and the NWRA (National Wildlife Rehabilitators Association. These organizations offer so many wonderful resources that I hesitate to attempt to list them all. I encourage you to visit their websites—www.iwrc-online.org and www.nwrawildlife.org—and see for yourself all they offer. These organizations receive much of their funding through memberships. If you want to continue utilizing this valuable information, become a member and show you support for the work they do. Read the publications, attend the conferences, attend professional development seminars and workshops, and encourage other rehabilitators to do the same.

In addition to joining a national or international rehabilitation group,

you should also network with rehabilitators in your state through local or state organizations. I am a member of MWRA (Michigan Wildlife Rehabilitators Association) and Michigan Raptor Connection. Again, these groups of people provide invaluable support and information. However, don't count on others to do all the work...join your local groups and get involved!

Hopefully, most of you are familiar with your local permit agencies (DNR, G&FD, DOW, etc.) and your federal permit agency (USFWS), and utilize these resources for information. Additionally, you should query other local groups (Audubon, mammal groups, etc.) to widen your network of resources. These individuals and groups may provide you with information specific to your locality. For example, when releasing rehabilitation patients, it is always a good idea to check with local officials and experts to determine if you've identified a good time of year and location for the release. These individuals may know more than you about migration, territoriality, and other local issues (e.g., hunting and trapping seasons, habitat manipulation, and so forth) that should factor into your release.

Another source of information exchange can occur with local teaching institutions. Institutions of higher education may maintain specimen collections or collection managers for species identification. Many rehabilitators use field guides for species identification. However, often your critter may not look exactly like the critters in the book. There are an enormous number of variables that might affect your ability to identify the animal: where in the species' distribution the animal was found, the age and sex of the animal, etc. It is very helpful to have several dozen or even hundreds of actual specimens for comparison. Additionally, the individuals who prepare and maintain these specimens should also be able to assist with troublesome identifications. There are many examples of "routine" species that turned out to be very rare after consideration by an expert. These records may be first or second records for a particular county or state. Additionally, if you have consulted an expert and have determined that you have an unusual siting for your area, these people will know whom to contact next to insure the information is properly recorded and documented. This documentation raises the value of rehabilitation in the eyes of other professionals.



I cannot overemphasize the need to network with other professionals. Networking will increase you abilities as a wildlife rehabilitator while building the visibility and professionalism associated with rehabilitation. Contact your local institutions of higher education and meet professors that teach relevant subjects (ecologists, ethologists, mammalogists, ornithologists, immunologists, pathologists, etc.).

These institutions or professors may also offer classes or workshops of interest to you. For example, you may not understand how much the incisions you make during a necropsy affect later preparation until you attend a workshop by a mammologist on museum specimen preparation. Perhaps an immunologist is offering a seminar on West Nile virus.

Another way rehabilitators can work with teaching institutions is through the exchange of carcasses. Many larger higher education institutions add to their specimen collections by "collecting": animals are taken from the wild specifically for this purpose. However, many institutions would rather limit the number of specimens that must be taken from the wild, and donations of carcasses from rehabilitators can help. sIn order for your specimens to be useful, they must be accompanied by reliable data. You haven't forgotten all the helpful tips on collecting data mentioned in the last column, have you (Hill 2004)?

Many elementary, middle, and high schools would also like to have a limited number of animal specimens available for teaching purposes. However, typically the school will need a state and/or federal salvage permit to maintain these specimens. Encourage your local schools to apply for the relevant permits, and donate some of your specimens for use in schools.

I hope this article has shown you some of the ways in which you can exchange information and materials with other members and professionals in the community. By increasing awareness of rehabilitation and by networking with others, we will continue to improve the quality of care provided to wildlife. JWR

Hill, J. 2004. The (Other) Value of Rehabilitators. Part I: Where, Oh Where, Did the Data Go? *J. Wildlife Rehab.* 27(1): 27–28.

Jennifer Hill completed her Ph.D. in animal behavior at the University of New Mexico. While at UNM, she worked at the Museum of Southwestern Biology in the Division of Birds as a curatorial assistant. Currently, she is the Director of NorthWings, a raptor rehabilitation and education program at SEE-North, a nonprofit environmental education center.

MAMMALS

A Reliable Molecular Method of Gender Determination for Mammals
by C. N. Shaw, P. J. Wilson, and B. N. White
J. Mammalogy. 84(1): 123–28.

A polymerase chain reaction–based method was developed for gender determination in a wide variety of marine and terrestrial mammals, including cetaceans, pinnipeds, ungulates, canids, and ursids. An intron within the zinc-finger x (Zfx) and zinc-finger y (Zfy) genes was amplified. Size variation between the Zfx and Zfy introns results in a Y-specific band in males. Size of the Zfy intron varies more across species than that of the Zfx intron. This technique is simple and rapid, requires small amounts of DNA, and can be applied to a variety of mammalian species. In contrast to previous methods, only 1 primer set is needed for both gender determination and internal verification of amplification.

Genetic Variation in Black Bears in Arkansas and Louisiana Using Microsatellite DNA Markers
by I. Csiki, et. al
J. Mammalogy. 84(2):691–701.

In the 1950s and 1960s, translocation projects reintroduced black bears (*Ursus americanus*) from Minnesota and Manitoba to Arkansas and Louisiana. Today, several geographically disconnected populations exist in Arkansas and Louisiana, but their origins are unclear. Same populations may represent a separate subspecies, *U. a. luteolus*, which is federally protected. The authors characterized 5 microsatellite loci in 5 isolated populations in Arkansas and Louisiana and compared them with genotypes from Minnesota. The data indicate that bears of the Ozark and Ouachita mountains of Arkansas, an inland area of Louisiana, and those of Minnesota are similar in overall genetic diversity and allele frequencies, consistent with these populations being wholly or mostly descended from bears from the reintroduction programs. In contrast, bears from southeastern Arkansas and the coastal region of Louisiana genetically are more restricted and homogeneous. Because they exhibit a limited set of genotypes found in the other black bear populations, they represent isolated fragments of a single North American black bear population. Furthermore, genetic distance estimates indicate that the bears in southeastern Arkansas are more genetically distinct from bears in Louisiana, which are currently federally protected.



LOUISIANA BLACK BEAR PHOTO: GARY M. STOLZ

Impact of Bovine Tuberculosis on a Population of Brushtail Possums (*Trichosurus vulpecula*) in the Orongorongo Valley, New Zealand
by A. Arthur, D. Ramsey and M. Efford
Wildlife Research. 31(4): 389–95.

Brushtail possums (*Trichosurus vulpecula*)are the main wildlife vectors of bovine tuberculosis (Tb) in New Zealand. Possum-Tb models form the basis of possum control aimed at eradicating the disease, yet competing models show different behavior and are highly sensitive to parameters about which there is considerable uncertainty. One area of great uncertainty is the impact of the disease on possum populations. The authors investigated the impact of Tb on a local population of brushtail possums in the Orongorongo Valley, Wellington. Bovine Tb was first detected in 1997 at one site within an intensively studied population, but has not been detected in another intensively studied population 3 km away since the early 1980s. Using a Before-After-Control-Impact (BACI) analysis, detection of Tb coincided with a 42% (95% CI = 23–56%) reduction in the odds of apparent yearly survival of a possum >17 months of age (i.e., a decrease in yearly survival from 0.85 to 0.77 in "good" years, and a decrease from 0.71 to 0.60 in "bad" years. This suggests that Tb had a significant impact on overall survival. However, there was no impact on local population density in September each year due to compensatory recruitment.

HERPETILES

Wildfire, Fuel Reduction, and Herpetofaunas across Diverse Landscape Mosaics in Northwestern Forests
by R. B. Bury
Conservation Biology. 8(4): 968–75.

The herpetofauna (amphibians and reptiles) of northwestern forests (U.S.A.) is diverse, and many species are locally abundant. Most forest amphibians west of the Cascade Mountain crest are associated with cool, cascading streams or coarse woody material on the forest floor, which are characteristics of mature forests.

Extensive loss and fragmentation of habitat resulted from logging across approximately 50% of old-growth forests in northern California and approximately 80% of stands in Oregon and Washington. There is a complex landscape mosaic and overlap of northern and southern biotic elements in the Klamath-Siskiyou Region along the Oregon and California border, creating a biodiversity hotspot. The region experiences many low-severity fires annually, punctuated by periodic major fires, including the Biscuit fire, the largest in North America in 2002. In the fire's northern portion, severe fire occurred on >50% of stands of young, managed trees but on only about 25–33% of old-growth stands. This suggests that the legacy of timber harvest may produce fire-prone stands. Calls for prescribed fire and thinning to reduce fuel loads will remove large amounts of coarse woody material from forests, which reduces cover for amphibians and alters nutrient inputs to streams. Our preliminary evidence suggests no negative effects of wildfire on terrestrial amphibians, but stream amphibians decrease following wildfire. Most reptiles are adapted to open terrain, so fire usually improves their habitat. Today, the challenge is to maintain biodiversity in western forests in the face of intense political pressures designed to "prevent" catastrophic fires. We need a dedicated research effort to understanding how fire affects biota and to proactively investigate outcomes of fuel-reduction management on wildlife in western forests.

CONSERVATION

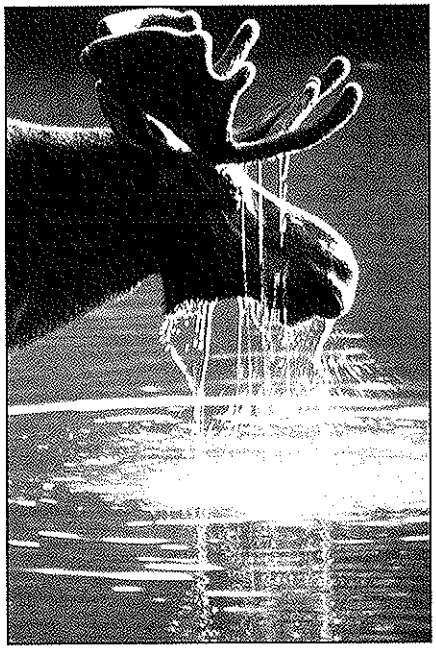
Can We Mitigate Animal-Vehicle Accidents Using Predictive Models?

by J. E. Malo, F. Suarez, and A. Diez

J. Applied Ecology. 41(4): 701–10.

Vehicle collisions with wild animals are a serious problem that justifies the widespread application of mitigation measures such as road fencing and provision of crossing structures. Models that predict the best location for mitigation measures can improve wildlife survival and road safety.

A database of 2067 records of animal-vehicle collisions was used to create two data sets at different spatial scales. The first comprised records of road sections of 1 km length with high rates of collision in combination with road sections with a low number of collisions. The second comprised records of collision and no collision incidence at points on the road system at a 0.1-km scale. Logistic regression was used to investigate the relationship between incidence of collision and measured habitat features in each data set.



MOOSE PHOTO: RONALD C. BELL/USFWS

Road sections with high collision rates were associated with areas having high forest cover, low crop cover, low numbers of buildings and high habitat diversity. The fitted model achieved a significant predictive success during validation, with more than 70% correct classification of cases. Specific collision points typically had no guardrails or lateral embankments, were not near underpasses, crossroads or buildings, and featured hedges or woodland near the road. The fitted model also showed a significant predictive power in validation and accurately predicted 85.1% of collision points.

Predictive models of animal-vehicle collision locations should be used at both a landscape level and a local scale during the process of road design and implementation of mitigation measures. Modelling of collision risk could inform decisions on road alignment and on the exact location of crossing structures for mammals, to improve wildlife survival and road safety. This is the first study integrating both landscape and local scales of analysis for the variables associated with animal-vehicle collisions.

Functional Wildlife Parks: The Views of Kenyan Children Who Live with Them

by I. M. Ali and R. Maskill

Natural Resources Forum. 28(3): 205–15.

This study reports on Kenyan school children's ideas about wildlife parks in their country. A comparison is made between the responses of school children in primary school, before they receive any science education, and those of secondary school pupils at the end of the secondary cycle. The findings show little difference between the two groups of students in terms of their ideas about wildlife parks. This has serious implications for science and environmental education in Kenya. Parks are understood by these pupils in terms of real life issues, as derived from social consequences. The children's ideas are all based on the role that parks play in society, but the function of parks to support biodiversity conservation does not seem to be important to the students. While it is satisfying to note that the school children have a good understanding of parks in their social context, it is essential to address fully the scientific and ecological role of parks in order that biodiversity becomes more valued in our society. JWB

IWRC
International Wildlife Rehabilitation Council

CALL FOR PAPERS

28th Annual Wildlife Conference
Hosted by the Toronto Wildlife Centre

10–12 November 2005
Toronto, Ontario, CANADA

The International Wildlife Rehabilitation Council invites rehabilitators and associated wildlife professionals to participate in its 28th Annual Wildlife Conference. Our audience includes new and experienced wildlife rehabilitators, veterinarians, biologists, naturalists, educators, administrators, and government, conservation and environmental agencies.

Presentation categories may include, but are not limited to:

- Rehabilitation (specific species requirements, release criteria, zoonotics, etc.)
- Natural History (diet, nutrition, behavior, identification, etc.)
- Conservation (habitat, banding, pesticides, etc.)
- Veterinary Medicine (emerging diseases, diagnostics, treatments, medications, etc.)
- Education (program development and content, use of nonreleasable wildlife, etc.)
- Administration (fundraising, volunteer management, interns, staff, etc.)
- Communication (networking, hotlines, Internet, etc.)
- Wildlife Husbandry (health policies, cage design, enrichment, etc.)

All submissions are subject to committee review and presenters will be notified in writing regarding the acceptance of their proposal(s). The deadline for submission **31 March 2005.**

CATEGORIES OF PRESENTATIONS

PAPER: An oral presentation of a new and proven technique(s), a new look at an old method, original research, case studies, or species paper.

WORKSHOP or TUTORIAL: This "hands-on" session demonstrates techniques or skills in a particular area of study. They should conclude with a finished product, completed project or a learned skill.

DISCUSSION GROUP: A moderated discussion group amongst peers on a specific topic or area of concern.

POSTER PRESENTATIONS: A visual display presentation on a particular project, plan or case study. May include photographs, diagrams, blueprints or drawings.

PRESENTER ABSTRACT GUILDLINES

The title should be short and concise. Abstracts should contain a summary of the information to be presented. The abstract should include a statement of purpose, study design, findings and/or conclusions. Supporting information should be provided whenever possible.

A short biography of all presenters, and/or co-authors, should be included with your application. It should describe all relevant experiences in your field and on the topic being presented. Any published materials on this subject should be included in the biography.

Individuals may submit more than one abstract. Please submit separate proposals for each abstract.

The material presented must be based on the same information submitted in the abstract.

For more information or to submit a proposal, please go to www.iwrc-online.org and click on the 2005 Conference link, or phone 408/271-2685.

Forester's Log

SHE RAN CALLING "GODILTLA"

by Mary Stuever

When some people have a mid-life crisis, they dream of owning fancy sports cars. My mid-life day dream is a horse. Not just any horse, and certainly—similar to the fantasy sports cars of my peers—not a practical horse. No, I fantasize about owning a wild horse captured in the Rodeo-Chediski Burn on the White Mountain Apache tribal lands in east-central Arizona. It's something of an office joke that I am afraid has the potential to go a bit too far.

In order to allow the vegetation in the burn area to recover, we try to keep browsing and grazing to a minimum. The area is excluded from livestock grazing for at least two years—longer if our plant surveys show we need to extend the furlough—and we try to keep the feral horse and maverick cattle populations in check. Feral horses have a long history of running wild in these woods.

Horses were often released by early settlers and historic road construction operations, and occasionally horses were lost and never recovered. Over the last century a wild population of horses had expanded on the reservation. Apaches hold high regard for horses, and often tolerated large herds. In fact, the feral horse population had grown so large it was affecting vegetation years before the burn occurred.

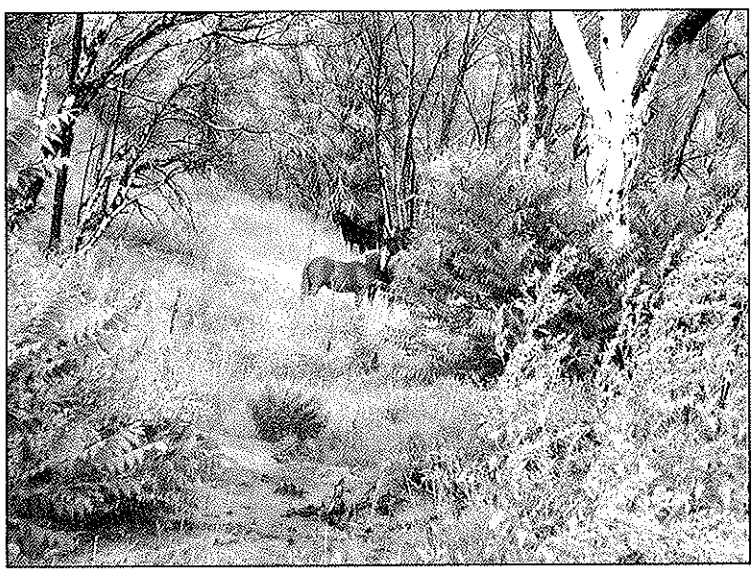
Vegetation is the key to holding an ecosystem together. If too much plant tissue is removed too often, plants are no longer able to bind soil, protect hillsides, and assist water in soaking into the ground. Fortunately, the tribal range program had already taken action. In 1998 they trapped 700 feral horses and 130 maverick cattle from the same area that burned four years later. If the numbers of these animals were this high following the burn, vegetation in the area would have a slim chance of recovering, which would impact soil loss, water infiltration, and a host of other ecological recovery processes.

Although there was some mortality in the feral horse population during the fires, the majority of the remnant herd survived the flames and was poised to threaten vegetation recovery if left unchecked. Once again the tribal range program stepped up to the plate and, since the burn, has captured 61 feral horses and 30 maverick cattle.

Captured horses with brands are turned over to the appropriate livestock association responsible for managing the land. The captured feral horses must be sold off reservation to ensure that they do not escape and find their way back into the burn. As the coordinator of the overall Burn Area Rehabilitation Program, I make sure the cowboys get paid for the horses removed. Here's where I get in trouble.

One day I just happened to mention that I would love to own a black and white paint I saw months ago...and now the cowboys are chasing it down, aiming to please. I've tried to explain this possibility of me bringing home a wild horse to my friends and family as a simple mid-life crisis. My kids are horrified. My friends laugh. "Will you call him 'Wildfire'?" one friend asks referring to a Michael Murphy song popular in our youth. I ponder. "Well, since the horse is clearly Apache," I muse, "I guess I'll call him 'Godiltla"—an Apache word that loosely translates to 'forest fire'."

Like most mid-lifers, my day dream is totally impractical. I currently live on the reservation involved in a job that consumes all the hours a day has to offer...I have no time for a horse that would not be allowed to return to this land. However, when I think that most of these wild ponies bound to the livestock auctions have uncertain futures, I hope someone will be there to offer them a home that honors their wildfire heritage. JWR



MARY STEUVER

Mary Stuever is a consulting forester specializing in forest ecosystems of the American Southwest. She can be reached at sse@nmia.com.

The Books of Thornton W. Burgess

Reviewed by Elsa C. Bumstead

"How few there are who know their neighbors
Their pleasures, fears and joys, and labors."

—Jerry Muskrat

How does one choose just one book, from the more than 170 books that Thornton Waldo Burgess wrote over the course of his 91 years, to have in a collection of must-have wildlife and ecology reference books? I have not been able to choose just one. Reading about the adventures of Jimmy Skunk, Peter Rabbit, Reddy Fox, Buster Bear, Old Mr. Toad, Paddy the Beaver, Sammy Jay, Jerry Muskrat, Lightfoot the Deer, Farmer Brown, Mother West Wind, and the Merry Little Breezes was such a joy as a child. The Burgess stories transported me to a world where animals came alive with personalities, and had cares and woes as real as those of human beings. I was raised in a hunting family, went with my grandfather on his traplines, watched him dispatch the skunks, muskrats and woodchucks caught in the steel traps, and I wondered. I wondered why they needed to be killed. The Burgess stories presented me with an alternative world, where animals were respected and loved. I learned to understand each animal's ways of living, being and doing. There were wonderful lessons in survival.

Thornton Burgess was born in 1874 in Sandwich, Massachusetts, and died in 1965. His father died when he was young, so he was raised an only child by his mother. As a boy he worked year round at various jobs to earn money to help support them. He tended cows, picked berries, sold candy, and trapped muskrats. Discovery Hill, owned by one of his employers, was filled with woodland and wetland habitats, places that later became the inspiration for Smiling Pool and Old Briar Patch, and the settings for so many of his stories.

After graduating from high school in 1891, Burgess attended a business college in Boston. He then moved to Springfield until he purchased a home in Hampden in 1925. This became his permanent home in 1957. Over the years he returned frequently to Sandwich, claiming it not only to be his birthplace but his spiritual home as well.

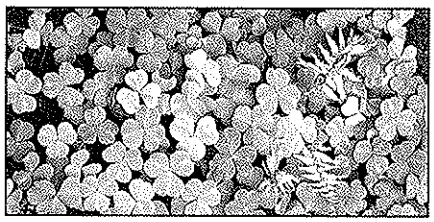
After his death, the Massachusetts Audubon Society bought the Hampden property and created the Laughing Brook Nature Center. His mother's home in Sandwich became the Burgess Museum. In 1979 property on Discovery Hill Road became a nature center. All implement the Burgess philosophies and honor his lifetime involvement with conservation efforts, using children's stories to teach about the importance of understanding Nature, reverence for and love of wildlife.

It was Burgess's outdoor observations that provided the plots for his stories. His characters live the Purple Hills, Green Forest, Green Meadows, Laughing Brook and Smiling Pool. At first it seems that everyone lives happily. But, as one reads each story, there are lessons to be learned. Jerry Muskrat learns to outwit Reddy Fox, who is determined to have him for his dinner. Farmer Brown plants his fields with tasty crops, which, on occasion lure some of the animals out of the forest, and into danger. Mr. Goshawk steals a chicken that Ole Granny Fox had stolen and left untended for a minute. Farmer Brown's boy takes Bowser the Hound with him as he hunts Reddy Fox in retaliation for stealing his chickens. Unc' Billy Possum and Jimmy Skunk work together to warn everyone in the Green Forest, so they can hide from Farmer Brown's boy and his dreadful gun. Little Joe Otter and Billy Mink can be found on the Big Rock in Smiling Pool planning mischief. Mr. Redwing sings in the rushes at the edge of Smiling Pool. Mr. Night Heron is so quick he beats Billy Mink to a fish dinner. Blacky the Crow is the gossip of the woods and fields, ready to anything to anyone. His cousin, Sammy Jay, is the harbinger of danger, always ready to cry "Thief! Thief!" Ol' Mistah Buzzard sails overhead, seeing all that is going on. The Merry Little Breezes laugh and play among the tree tops.

There's Happy Jack Squirrel, Digger the Badger, Johnny Chuck and Unc' Billy Possum, Danny Meadow Mouse, Old Man Coyote...oh, so many characters to enjoy. And, oh yes, the pictures. Harrison Cady began working with Thornton Burgess in 1913, illustrating the Burgess books and stories. His simple black and white drawings bring each character to life. You really must pay a visit to your local library or bookstore to see for yourself. Really...you must! JWR

Reviewer Elsa C. Bumstead is an interpretive naturalist, writer, environmental scientist, and sometime wildlife rehabilitator who is based in Albuquerque, New Mexico.

"Conservation Classics" *is intended to provide our readers with suggestions for building a collection of must-have wildlife and ecology reference books.*



Parasitic Diseases of Wild Mammals

Second Edition

by William M. Samuel, Margo J. Pybus, and A. Alan Kocan, editors

Ames, Iowa: Blackwell Publishing Co. (formerly Iowa State University Press), 2001; 569 pp.; U.S. $99.99 (hardcover). http://store.blackwell-professional.com/081382978x.html
ISBN: 0-81382-978-X

It has been 30 years since the publication of the first edition of *Parasitic Diseases of Wild Mammals*, and as the editors point out, much information has accrued in the interim on the ecology and epizootiology of mammalian parasites, as well as the significance of parasites in conservation biology. It is important to note that, similar to the first edition, this book is not intended as a general reference on parasitology, but instead deals with specific topics related to wildlife diseases. For example, the only trematodes mentioned are the liver flukes. In addition, a number of parasite groups (e.g., Acanthocephala, pentastomes, fleas) and diseases (e.g., bighorn sheep lungworm-pneumonia complex) covered in the first edition are absent from the second. In their place, a number of new topics are introduced.

The second edition presents summaries of five groups of ectoparasites, 10 groups of helminths, and 9 groups of protozoans, including enteric forms, tissue invaders, and blood-inhabiting forms. For each group, details are given of classification, taxonomy, and morphology, life history, hosts, epizootiology, clinical signs and pathology, vectors, intermediate hosts, diagnosis, immunity, control and treatment, public health and domestic animal health concerns, and management implications.

Potential purchasers of this book should be aware that some groups of parasites are treated in exhaustive detail while others are only briefly summarized. As examples, the chapter on Taeniasis and Echinococcosis is 43 pages long, while Amebiasis, Balantidiasis, and Enteric Trichosomiasis are covered in three pages, and Opportunistic Amoebae in only two pages. Wildlife rehabilitators will be particularly interested in (and perhaps badly frightened by) the detailed chapter on *Baylisascaris procyonis*, one of the best written in the book. Careful attention should be paid to suggestions for the disposal of fecal material from raccoons and the sterilization of cages and equipment. Rehabbers will also find the coverage of *Sarcoptes scabei* and Sarcoptic Mange, *Giardia* and Giardiasis, and toxoplasmosis and related infections very useful, as they relate to both the health of their hosts and their handlers. As a helminthologist, I was most impressed with the chapter on tapeworms, which summarized data on 33 species of *Taenia* and four species of *Echinococcus*. Many rehabbers may not be aware that, in treating carnivores like foxes and coyotes, they may be exposing themselves as potential intermediate hosts of *Echinococcus* spp. The chapters on extrapulmonary lungworms of cervids, hepatic capillariasis, and trichinellosis are also extremely well done.

With the exception of the chapters on protozoan diseases, this book is not as profusely illustrated as the first edition, but this deficiency is compensated by its much more extensive Tables and the greater volume of literature cited. In summary, it is a "must have" for students and researchers in wildlife disease, but those in wildlife rehabilitation should scan the Table of Contents before deciding to make the investment.

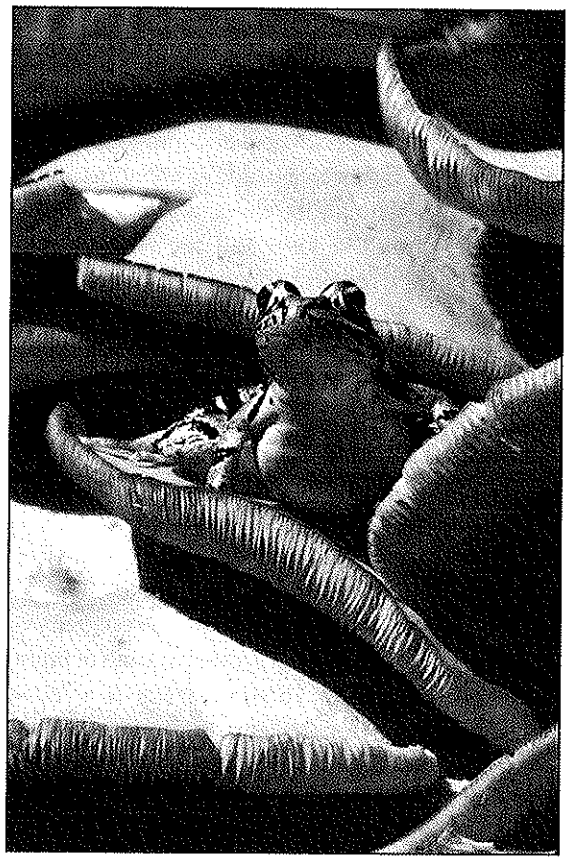
Plans are also under way for the long-awaited second edition of *Infectious and Parasitic Diseases of Wild Birds*, which may be split into two volumes, and was projected to be published in 2004 (famous last words).

On a personal note, this writer is a retired parasitologist who identifies helminths from both mammals and birds in his spare time. Rehabbers are welcome to submit helminths for identification to the address below. There is no charge. JWR

J. M. Kinsella
HelmWest Laboratory
2108 Hilda Avenue
Missoula, MT 59801
USA
E-mail:
wormdwb@aol.com



DESERT BIG HORN SHEEP PHOTO: PETER J. CARBONI/USFWS



PICKEREL FROG PHOTO: USFWS

There's a Hair in My Dirt! A Worm's Story

by Gary Larson

New York: HarperCollins, 1998; 60 pp; U.S. $10.95 (paperback)
ISBN 0-06-093274-0

Gary Larson brings an earthworm family to life in *There's a Hair in My Dirt! A Worm's Story* to teach important biological and ecological concepts. Since Larson retired from penning cartoons (The Far Side®) for daily newspapers, many of us have gone through Gary Larson withdrawal. Larson always seemed able to probe and translate the minds of animals—and he has done that again with this book. With big, broad concepts covering topics ranging from physiology, reproduction, and the importance of habitat, as well as specific and useful information such as "Kissing out of your species is not really recommended, Son, but if you have to, always choose a gastropod over an amphibian," this book is an important one for wildlife educators everywhere.

This book is the story of Harriet, from the worms' point of view. It outlines misunderstandings common in today's world and how we sometimes lose a connection with the natural world. "But loving nature is not the same as understanding it. And Harriet not only misunderstood the things she saw—vilifying some creatures while romanticizing others—but also her own connection to them."

With a forward by Edward O. Wilson to make sure we understand this book is legitimate, *There's a Hair in My Dirt! A Worm's Story* is one of the easiest ways to learn about some important biological concepts. Humor and absurdity have a way of making serious information extraordinarily palatable. The message in this book is very close to the message many rehabilitators and environmental/humane educators are trying to pass on. It doesn't really matter that worms don't have arms and worms can't talk. If we could all get our messages across with this much humor, we might have an easier go of it. JWR

Reviewer Susan Heckly is the wildlife rehabilitation director at Lindsay Wildlife Museum in Walnut Creek, California.

Editor's Note: *The* Journal of Wildlife Rehabilitation *welcomes reviews of books of interest to IWRC members, including veterinary reference books, memoris, natural history, and novels. Please include the book's title and author, as well as publisher, date of publication, number of pages, and cost of the book. Reviews should run no longer than 650–700 words and should be e-mailed to runmuki@yahoo.com.*

NEWS BRIEFS

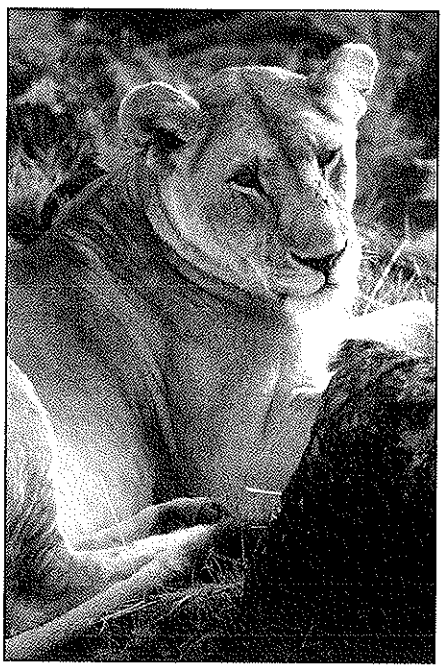
New Kenyan Wildlife Law Will Harm Conservation

On 9 December 2004 the Kenyan parliament amended the country's 1977 Wildlife Conservation and Management Act—which banned poaching and reckless killing of wild animals—to allow sport hunting and to permit private ranchers to kill wildlife that stray into their land.

"Just a few words of legislation could spell doom to wildlife conservation, or at least cause a major setback in the country, where flora and fauna play a key role in attracting tourists," noted Maasai wildlife activist Godfrey ole Ndopaiya.

Several sources said the bill was "sneaked into parliament" by a lawmaker serving the interests of ranchers when most members were absent and those present did not know anything about wildlife.

Since 1999, Maasai tribesmen have killed around 50 lions in Nairobi National Park that had attacked their livestock and up to 10 elephants have also met their deaths after straying into private farmlands, a Kenya Wildlife Service official said. JWR



AFRICAN LION PHOTO: KEN STANSELL/USFWS

A Decade of Wolves in Yellowstone

January 2005 marks the 10th anniversary of the return of the grey wolf (*Canis lupus*) to Yellowstone National Park, following a forced absence of some 70 years. After years of legal wrangling and delays, the wolves were reintroduced in January 1995 in what has become perhaps the United States' greatest wildlife conservation success story.

Today the Yellowstone ecosystem—which includes the park itself, plus parts of Montana, Wyoming, and Idaho—is home to almost 800 wolves in more than 50 packs.

Prior to the wolves' return, Yellowstone's abundant elk population browsed excessivly in the sensitive wetlands of the park's river valleys, severely restricting willow and cottonwood tree growth along the river banks. Wolf predation forced the elks to move from the river valleys—and this has had a profound effect on the entire area. Tree growth has surged, shading the river and creating improved habitat for trout. The trees also attract additional migratory birds and provide new food sources and building materials for beavers. The beavers' dams create new marshes and wetlands that, in turn, attract otters, ducks, and other species.

Wolf kills provide an abundant and reliable source of food for scavengers. And their predations on old and sick elk have had a positive effect on the viability of the elk population itself.

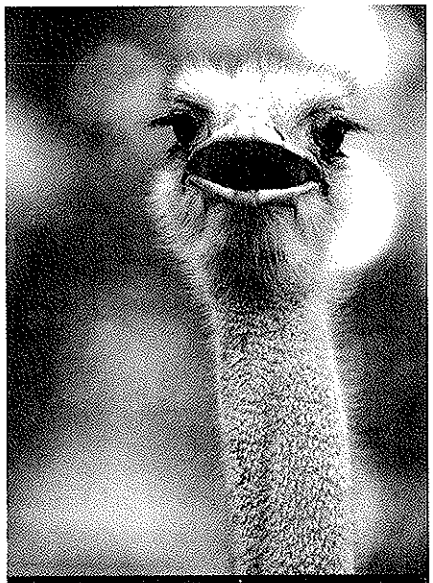
When Europeans first set foot in North America, the grey wolf ranged across the continent, from Mexico up to Canada and Alaska, and from the Pacific to the Atlantic. The combined numbers of the grey wolf and the smaller red wolf, then found throughout the Southeast, may have been as high as 400,000 at their peak.

By the 1970s, after three centuries of extermination, the wolf was essentially eliminated from the wild everywhere in the contiguous United States except northeastern Minnesota.

Today, wolves are making a comeback in the lower 48 states. In addition to the Yellowstone/Central Idaho wolves, wolf populations have increased substantially in Minnesota, and wolves have recolonized parts of Wisconsin, Michigan, and Montana. U.S. Fish and Wildlife Service reintroductions have also returned the Mexican gray wolf to Arizona and red wolves to North Carolina.

Even with these gains, however, wolves still occupy less than five percent of their original range in the lower 48

(continued on page 34)



Do you have an easy answer to a frustrating rehab issue? A new way to resolve a common problem?

Share it!

Please send your "Simple Solution" to the Editor at runmuki@yahoo.com. If possible and appropriate, include high-resolution digital images, as well as a brief note about yourself.



GREY WOLF (CANIS LUPUS) PHOTO: LURAY PARKER/USFWS

Grey wolves (*Canis lupus*) were captured in Canada and released into the United States in an effort to establish self-sustaining populations of wolves in Yellowstone National Park and the surrounding area, and to remove the species from the Endangered Species List. Here a wolf is prepared for transport via helicopter to a staging area, where a health examination will be performed before its release.

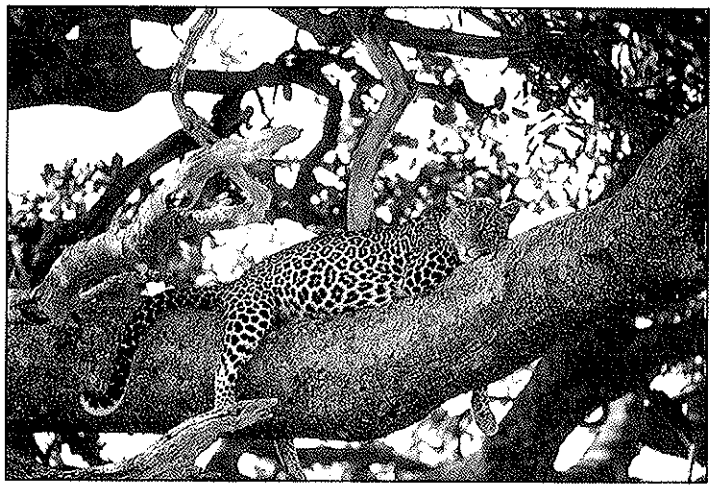
states, and wolf populations in Alaska face serious new threats. The advocacy organization Defenders of Wildlife notes that "Restoring the wolf to its original numbers and range is neither realistic nor desirable, but there are still significant possibilities for wolf recovery in major, currently unoccupied ecosystems that would benefit from the wolf's presence." JWR

Many Wild Animals Escaped Deadly Tsumani

Wildlife officials at Sri Lanka's Yala National Park found no evidence of large-scale wild animal deaths in the wake of the the deadly tsunami that killed an estimated 150,000 people in Asia and East Africa in December 2004.

At 391 square miles, Yala is Sri Lanka's largest wildlife reserve. It is home to 200 Asian elephants, crocodile, wild boar, water buffalo, and gray langur monkeys. The park has Asia's highest concentration of leopards.

"No elephants are dead, not even a dead hare or rabbit," said H. D. Ratnayake, deputy director of Sri Lanka's Wildlife Department, in a Reuters report.



LEOPARD PHOTO: GARY M. STOLZ/USFWS

Animals rely on senses such as smell or hearing to avoid predators and other dangers. Many speculate that they also have a "sixth sense" that alerts them to natural disasters and other dangers.

Floodwaters from the tsunami swept into the park, uprooting trees and toppling cars, but the animals apparently were not harmed and may have sought out high ground.

Wildlife has not escaped the aftermath of the disaster, however. Joe Heffernan, a senior member of the conservation organization Fauna and Flora International, fears there will be substantial poaching in coming months, as dislocated communities struggle to make a living out of Indochina's ruined forests. Additionally, diseases are spreading throughout animal as well as human populations.

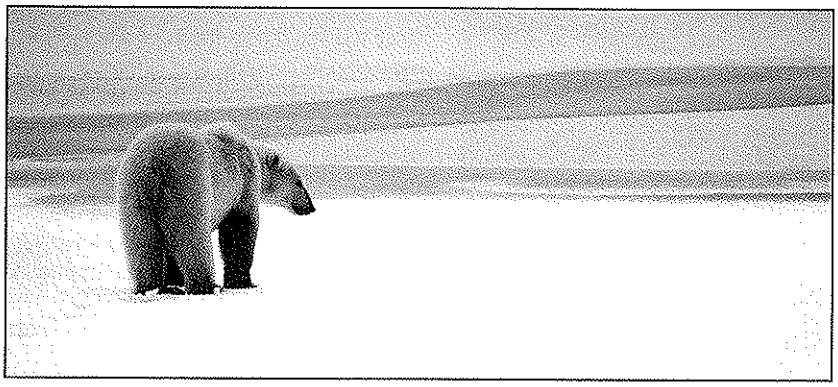
Companion, working, and farm animals were greatly affected by the disaster. In India, Sri Lanka, and Thailand international animal welfare organizations are working with local groups to provide food, water, and shelter, and to vaccinate animals against a range of infections. JWR

Climate Change and the Arctic

The Arctic Climate Impact Assessment, produced by more than 250 scientists, has found that climate change is happening in the Arctic—and that it will quickly worsen unless carbon dioxide emissions are cut worldwide. A warmer Arctic will have impacts around the world, contributing to global warming and sea level rise.

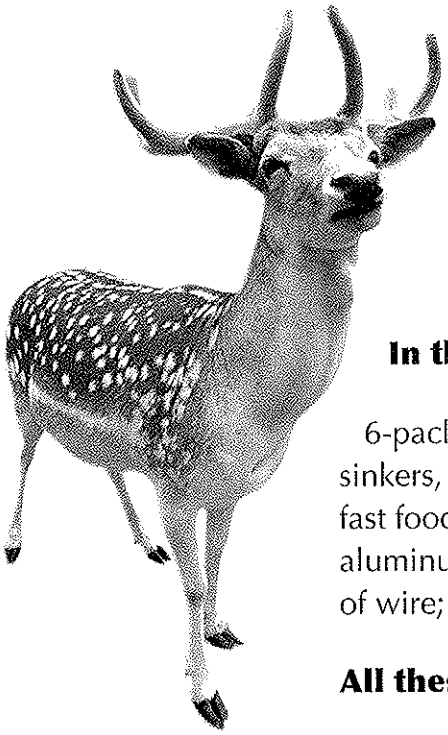
Key findings in the report include:

- Human-induced changes in arctic climate are among the largest on earth. Warming in the Arctic will be two or three times greater than the rest of the world.
- Polar bears could become extinct by the end of this century. The species is very unlikely to survive if there is an almost complete loss of summer sea ice cover.
- Glaciers, sea ice, and tundra will melt, contributing to a rise in sea level throughout the world. This rise could reach nearly one meter by the end of the century.
- As snow and ice melt, the ability of the Arctic to reflect heat back to space is reduced, accelerating the overall rate of global warming.



"Polar bears are walking on thin ice," noted Samantha Smith, director of the World Wildlife Fund's International Arctic Programme.

To download the report, visit http://amap.no/workdocs/ and click on the "ACIA" folder. JWR



What is litter?

Litter is "carelessly discarded refuse"—waste materials that humans toss aside. In your house, your mother complains.

In the wild, wildlife is injured and killed.

6-pack tops, lengths of fishing line, old sinkers, old fish hooks, plastic bags, fast food containers, bottles, aluminum cans, nails, pieces of wire; spilled antifreeze...



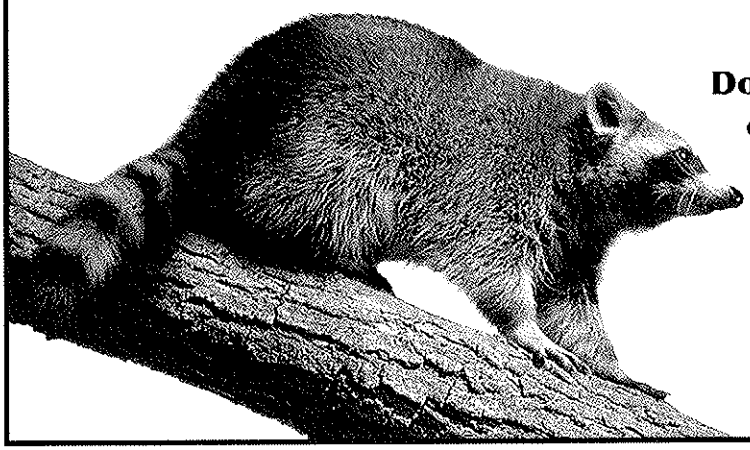
All these things can be lethal.

Litter kills...

All over North America there are programs encouraging people to reduce litter in the "outdoors": Toss No Mas; Cast No Trash; Pack It In, Pack It Out; Give a Hoot, Don't Pollute; Ponga la Basura in Su Lugar...

What's it called in your area?

_____

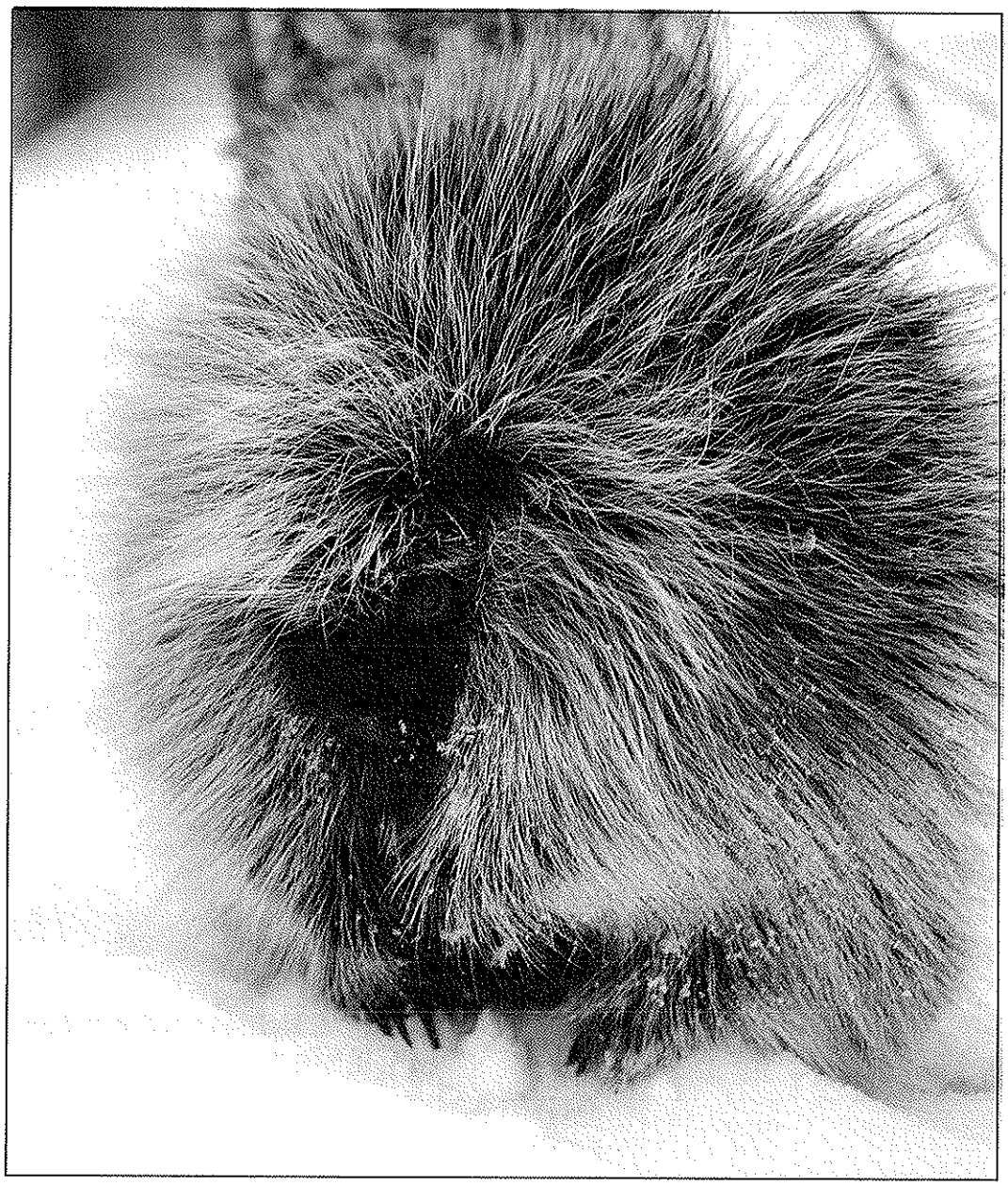


Do you participate in this defense of wildlife?

(This space for your organization's name, address, website, and phone number.)

TAIL END

by Kieran Lindsey



"Yes, as a matter of fact it IS that time of the month!""

INSTRUCTIONS FOR AUTHORS

POLICY Original manuscripts concerning any aspect of wildlife rehabilitation are welcome. Articles on topics including administration, law, education, veterinary medicine, animal husbandry, and public relations as they relate to wildlife rehabilitation are all invited. Book reviews are also welcome. Submissions are not confined to the North American continent.

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