A Study of the Benefits of Raptor Rehabilitation to the Public

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INTRODUCTION

Treatment for injured or sick birds of prey has been a focus of interest for more than two decades. The past five years have seen a worldwide increase in the establishment of raptor centers involving veterinarians and biologists in the rehabilitation processes (Cooper 1987). Rehabilitation programs found their beginnings in nature centers as a response to public concern for injured wildlife (Frink et al., n.d.). Today, rehabilitation of injured wildlife takes place at nature/zoological gardens, backyard facilities, veterinary offices, and rescue facilities. All rehabilitators must hold rehabilitation permits from the United States Fish And Wildlife Service and their state wildlife agency.

Across the southeast the number of federal "Special Use-Rehabilitation Permits" has decreased. A total of 626 special use permits were issued in 1993 by the Department of Interior, United States Fish and Wildlife Service. This number dropped to 576 in 1997 as the result of smaller "backyard" facilities becoming associated or merging with larger facilities (personal conversation R. Coon, USFWS). The Tennessee Wildlife Resources Agency issued 77 Class II wildlife permits in 1996-97, 32 of which were for "backyard" facilities. Raptors are classified by TWRA as Class II wildlife. Tennessee's rehabilitation centers are defined as those facilities that house and treat injured, diseased, and displaced Class II and Class IV wildlife (except wild turkey and bobcat) that are temporarily incapable of surviving in the wild. Class IV wildlife includes those native species such as: Black bear (*Ursus*

americanus), White-tailed deer (*Odocoileus virginianus*), Wild turkey (*Meleagris gallapavo*), Bobcat (*Lynx rufus*), hybrids of a class IV species other than bobcats, and animals that are morphologically indistinguishable from native class IV wildlife. Class IV wildlife can be possessed only by zoos, temporary exhibitors, and rehabilitators (section 70-4-403 TWRA wildlife and boating safety laws of Tennessee). A rehabilitation center's primary objective is to return such wildlife to their natural habitat(s) (Section 1660-1-.05 Select Rules of the Tennessee Wildlife Resources Agency).

Justification for the treatment of raptors can be categorized in one of three ways: 1) humanitarian acts, 2) conservation measures, and 3) research advances (Cooper 1984). Most injuries to raptors occur when they come into direct contact with man or human related structures (Redig and Duke 1995). The purpose of this paper is to highlight the services that raptor rehabilitation centers provide to birds of prey and to the pubic.

METHODS

Library Searches

The following databases were used at the University of Tennessee Agriculture/Veterinary Library: Wildlife Worldwide and Infoseek. Key words were: raptors, birds of prey, rehabilitation, methods, and centers. Journal articles, symposia, and books dated after 1980 were selected for current rehabilitation methods and techniques. Materials that were not available at the University of

Tennessee were acquired through the Interlibrary Loan system located in Hodges Library on the University of Tennessee, Knoxville's main campus.

The University of Tennessee Law Library On Line Catalog was used to locate information concerning international and American wildlife laws. Key words were: wildlife, laws, endangered species, American, legislation, eagles, birds of prey, and Tennessee.

Interviews

Mr. Walter Cook of the Tennessee Wildlife Resources Agency, Law Enforcement Division was interviewed by phone and later in person. Mr. Cook provided information concerning application procedures, rules and regulations concerning raptor rehabilitation, a list of all rehabilitators in Tennessee, and annual reports of raptor centers from 1991-1996 across the state of Tennessee. Annual reports were chosen from each region based on the following criteria: listing of species, date admitted, cause of injury or reason for admittance, disposition, and date of disposition. Mr. Richard Coon of the United States Fish and Wildlife Service, Department of Interior provided information concerning federal permit requirements and permit trends from 1993-1997.

Field Research

Field research was conducted at The Clinch River Raptor Center and Creso Biological Site, Anderson County, Tennessee under the direction of Mrs. Cottrell and Mrs. Strunk. Both individuals are

the directors for the Clinch River Raptor Center. While working at the center I was given the opportunity to learn the proper handling and training techniques for a non-releasable Red-tailed Hawk (*Buteo jamaicensis*). Mrs. Cottrell outlined the training techniques that I used to train "Mildred" for educational use. Mice were weighed daily to keep record of the amount of food eaten by the hawk during the training process. Mrs. Cottrell fitted the hawk with a pair of jesses prior to the training process. A signal to call the hawk to the gloved hand for feeding was decided to be 3-4 pats on the gloved hand.

Steps for Training a Red-tailed Hawk to Feed From a Gloved Hand

1. Force the hawk to step onto the gloved hand by pressing the gloved hand firmly against the hawk's legs.
2. Once the hawk steps on the glove, hook a lead line to the jesses to keep the hawk on the gloved hand while you walked around the enclosure.
3. Return the hawk to the perch and place a spare glove on the perch beside the hawk.
4. Place a piece of mouse beside the hawk on the spare glove.
5. If the hawk does not take food from the placed glove it does not eat for that day.
6. Remove the spare glove from the perch once the hawk begins regularly taking the mouse placed on the glove and move to the next training step.
7. Offer food from the gloved hand in one of two ways.

being handled for extended periods of time. After becoming comfortable with sitting for an extended period of time, various tasks around the center were accomplished with the hawk still hooked to the glove. Such tasks included: weighing mice for the next day, writing information on her chart, and cleaning the counters. The average handling time was two hours per day, weather permitting. Thunderstorms or high winds are not conducive weather conditions for handling a bird of prey. On these days the only handling occurred when the hawk would come to the glove for food.

Additional Case Studies

Two Cooper's Hawks (*Accipiter cooperii*) were admitted to the center during the research period. The first Cooper's Hawk was brought in to the University of Tennessee Veterinary Clinic with a broken wing. The second Cooper's Hawk came from Dollywood with a dislocated shoulder. The cases were followed once they arrived at the Creso biological flight cage for physical therapy. I was in charge of feeding both birds daily, monitoring feeding habits, and monitoring flight ability and behavior. Both Cooper's Hawks were released on the Creso biological site.

One Red-tailed Hawk was admitted with a broken wing due to an unknown cause. The Hawk's food was monitored daily as was her flight ability. It was determined shortly after the wing was unwrapped that the hawk would be unable to fly and was to be returned to the University of Tennessee Veterinary College. It was recently placed with another rehabilitation facility while the

veterinary school located a permanent home.

Two Barn Owls (*Tyto alba*) were transferred to the Creso biological site from Ms. Teubner, a veterinarian and founder of the Foothills Raptor Center, for physical therapy. Both owls had been shot, location unknown. Three days a week I took care of their feeding and flight analysis.

RESULTS

The protection of all birds of prey has been the result of many years of various international and national wildlife legislation. In order to extend legislative protection for birds of prey into the community rehabilitation centers, federal and state agencies began issuing rehabilitation permits. These permits are simply another step towards the preservation of wildlife. The Accipiters and Great Horned Owl (*Bubo virginianus*) were the last to be protected (Hilton 1975).

International Legislation

Birds of prey were among the last wildlife species to be protected by any international legislative act. The first international acts "set the stage" for the eventual protection of birds of prey in Europe and America.

The Convention for the Protection of Birds Useful to Agriculture

The Convention for the Protection of Birds Useful to Agriculture was the first major European document protecting

wildlife. In 1868 the 26th General Assembly of German agriculturalists and foresters met in Vienna, Austria. It took many years of further negotiations before a treaty was concluded. In 1902 twelve European countries finally signed the Convention for the Protection of Birds Useful to Agriculture. The end result entered into force on 6 December 1905 with the protection of 50 species that were considered "useful to agriculture". Eagles, hawks, most falcons, pelicans, herons, and pigeons were not considered "useful" and therefor were not protected (Lyster 1985).

Migratory Bird Treaty Act with Great Britain

President Wilson signed the Migratory Bird Treaty Act with Great Britain in 1916. This act protected "many species of birds which in their annual migration traverses certain parts of the United States and Canada" (Littell 1992). The term migratory bird included whole birds and parts of birds. Congress incorporated the treaties with Mexico, Japan, and the USSR into the statute through amendments. In 1974, congress extended the statute's protection to "any product, whether or not manufactured, which consists, or is composed in whole or part, of any such bird or any part, nest or egg thereof" (Littell 1992).

The International Convention for the Protection of Birds

The improved protection of birds in Europe was accomplished on 18 October 1950. This convention highlighted the concepts that endangered and migratory species merit special attention and that

"all birds should in principle be protected" (Lyster 1985).

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1973

CITES produced a set of restrictions on the import and export of threatened and endangered species. Today CITES contains three appendices. Appendix I lists species threatened with extinction, Appendix II is those species not currently endangered but may become so if unrestricted commercial trade occurs, and Appendix III lists those species that a country has identified as in need of protection (Littell 1992).

The Council of the European Economic Community (EEC)

On 2 April 1979 the EEC adopted a directive on the conservation of wild birds. This directive imposed strict legal obligations on member states to maintain populations of naturally occurring wild birds at levels corresponding to ecological requirements, to preserve a sufficient diversity and area of habitats for their conservation, to regulate trade in birds (including their parts and products), to limit hunting to species able to sustain exploitation, and to prohibit certain methods of capture and killing. Exceptions can only occur under carefully limited circumstances. The Directive's system of administration should ensure that the level of enforcement is better than that of the older European legislation (Lyster 1985).

Annex expansions

The expansion of the annex to the "Convention between the United States of America and the United Mexican States for the Protection of Migratory Birds and Game Animals" (50 Stat. 1311) and the Migratory Bird Treaty Act (83 Stat. 282) required the Department of Interior to protect North American birds of prey as of 10 March 1972 (Hilton 1975).

Canadian Legislation

Canadian legislation concerning the protection of birds of prey is less encompassing than the European legislation. Birds of prey are under provincial jurisdiction except for the Peregrine Falcon (*Falco peregrinus*) and Gyrefalcon (*F. rusticolus*). Their export is prohibited by the protocol on "International Trade of Rare and Endangered Species", a forerunner to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Falconry harvesting, the gathering of birds for falconry purposes, is permitted in British Columbia and Saskatchewan (Hilton 1985).

National Legislation

United States legislation was modeled after the European and Canadian legislation. Today, the United States is the leading country in wildlife protection acts both nationally and internationally.

The Lacey Act

In 1900 the United States Congress passed the Lacey Act in the wake of the demise of formerly abundant species. The original act authorized federal enforcement of state wildlife laws and gave the Secretary of Agriculture the power to take the necessary steps toward preserving and restoring game and other wild bird populations (Bergoffen 1995). The Lacey Act intended "to outlaw interstate traffic in birds and other animals illegally killed in their state of origin" (Littell 1992). It also prohibited the further importation of specific birds or animals that were considered to be injurious.

The Bald Eagle Protection Act

In response to public outcry, Congress enacted protective legislation in 1940 to reduce human-caused mortality to Bald Eagles. The Bald Eagle Protection Act of 1940 prohibited the taking or possession of bald eagles, their eggs, and their nests without a permit (Millsap 1987).

The Bald Eagle and Golden Eagle Protection Act of 1962

Congress extended the Bald Eagle Protection Act to cover Golden Eagles in 1962 for two reasons: 1) concern for the Golden Eagle and 2) similarity in appearance of juvenile Golden Eagles and juvenile Bald Eagles (Millsap 1987).

The Endangered Species Preservation Act of 1966

The Endangered Species Preservation Act of 1966 was the first comprehensive endangered species bill that was passed by the U.S. Congress in 1966. The act declared it national policy to protect species that are threatened with extinction, but only native fish and wildlife. The Secretary of the Interior was authorized to acquire lands in order to protect threatened wildlife. The 1966 Act failed to prohibit the taking of endangered species except on federal lands (Littell 1992).

The Endangered Species Conservation Act of 1969

Due to continued public pressure, congress expanded protection for endangered species in the Endangered Species Conservation Act of 1969 (Bergoffen 1995). The new act mandated the lists of species to include both native and international wildlife threatened with worldwide extinction. The legislation's main impact was international, not domestic. For the first time, Congress prohibited the importation of endangered species. The Secretary of the Interior could still permit imports to avoid undue economic hardship (Littell 1992).

The Endangered Species Act of 1973

President Richard Nixon signed The Endangered Species Act of 1973 which applied to all plants and animals that were either endangered or threatened. It also directed federal agencies to consult with the Secretary of Interior to insure that their actions

did not jeopardize the continued existence of protected species or degrade their habitat (Littell 1992).

Endangered Species Act Amendments

The final Endangered Species Act was written in 1973. There have been four amendments added to the final 1973 Act as the result of public environmental concern. The first amendment was passed in 1978.

The 1978 Amendments

The 1978 Amendment contained three significant provision for wildlife: 1) the formation of The Endangered Species Committee, 2) protection of critical habitat, and 3) new procedures for habitat designation.

The Endangered Species Committee. The Endangered Species Committee was established by Congress in the wake of the Tellico Dam project in 1978. The Endangered Species Committee is composed of six members drawn from the President's cabinet and subcabinet, plus a representative from each affected state. The committee's purpose was to grant exemptions from the Endangered Species Act. The process of appealing to the committee for an exemption was to be used as a last resort. Exemptions are granted only if: 1) there are "no reasonable or prudent alternatives to the agency action", 2) the project's benefits "clearly outweigh" the pro-conservation alternative, 3) the project is in the public's interest, and 4) the project is of regional or national

significance (Littell 1992).

Protection of Critical Habitat. The Secretary of the Interior was required to specify all critical habitat to the maximum extent prudent for any newly listed endangered species. More importantly, the Secretary had to make economic assessments at the time of listing.

New procedures for Habitat Designation. New procedures were also outlined for habitat designation. These included notifying affected local governments, publishing notices in local newspapers, and holding public hearings (Littell 1992).

The 1979 Amendment

The 1979 amendment continued funding for three years and strengthened the program's protection of plants (Littell 1992).

The 1982 Amendment

In 1982 Congress nullified the 1978 legislation's most significant feature, the requirement to make economic assessments about critical habitat at the time any new species was listed. This was done as the result of the Republican administration using economic considerations as a means to slow down the listing process. Congress also cut the timetable by nearly one-half for the process of determining exemptions to the Endangered Species Act by the Endangered Species Committee. Through this amendment, Congress granted the Secretary of the Interior power to permit the "incidental" taking of endangered species by private landowners (Littell 1992)

The 1988 Amendment

The last amendment occurred in 1988 with plant protection being increased. It also instituted a monitoring system so that candidate species for listing were less likely to become extinct before being listed (Littell 1992).

Special-Use Permits

Special-use permits are a step towards the protection of birds of prey within a community when individuals are removed from their natural habitat. The United States Fish and Wildlife Service grants special purpose permits for rehabilitation facilities (section 21.27 or 50 CFR 21, Migratory Bird Permits) (telephone interview February 6, Richard Coon, USFWS). However, the most basic level of protection within a community for birds of prey can be found through state legislation.

State Legislation

Additional permits for rehabilitation are needed from most state wildlife agency. Interested individuals in Tennessee are granted Class II wildlife rehabilitation permits by the Law Enforcement division of the Tennessee Wildlife Resources Agency.

Admission records for Tennessee

Annual reports for 14 centers across Tennessee were divided into four categories: zoological/nature center, backyard center, wildlife rescue center, and veterinary/animal clinic. Yearly

admission numbers were tallied for each facility type. Causes for admission and final disposition were then tallied on a yearly basis for all of Tennessee.

Total birds of prey admitted from 1991 thru 1996

The trend in admissions of injured or sick birds of prey has been increasing since 1993 in all four categories (Figure 1) as reported by the 14 selected centers. Zoological/nature centers and wildlife rescue centers have had the highest admission rates of birds of prey among the four categories. Veterinary/animal clinics have been the third largest receiver of birds of prey with backyard centers being last. A combined yearly average of 425.5 birds of prey were admitted for care to the 14 centers chosen in the state of Tennessee.

Cause of injury to birds of prey

The causes of injury were categorized into three types: man, natural, and unknown (Figure 2). Man caused injuries consisted of collisions (car, window, power line, fence, etc), shooting, trapping, poisoning, removal from nest, habitat destruction, and pet stores. Natural causes of injury consisted of storms, trees falling, parasite infestation, and animal attacks. Unknown injuries could not be classified as being caused directly by man or natural events. The types of "unknown" injuries were: broken wings, legs, feather damage, starvation, eye damage, stunned, and orphans. It is understood that the majority of those in the "unknown" category are

Figure 1
Total Admissions of Birds of Prey to Four Rehabilitation Facility Types Across Tennessee from 1991 to 1996

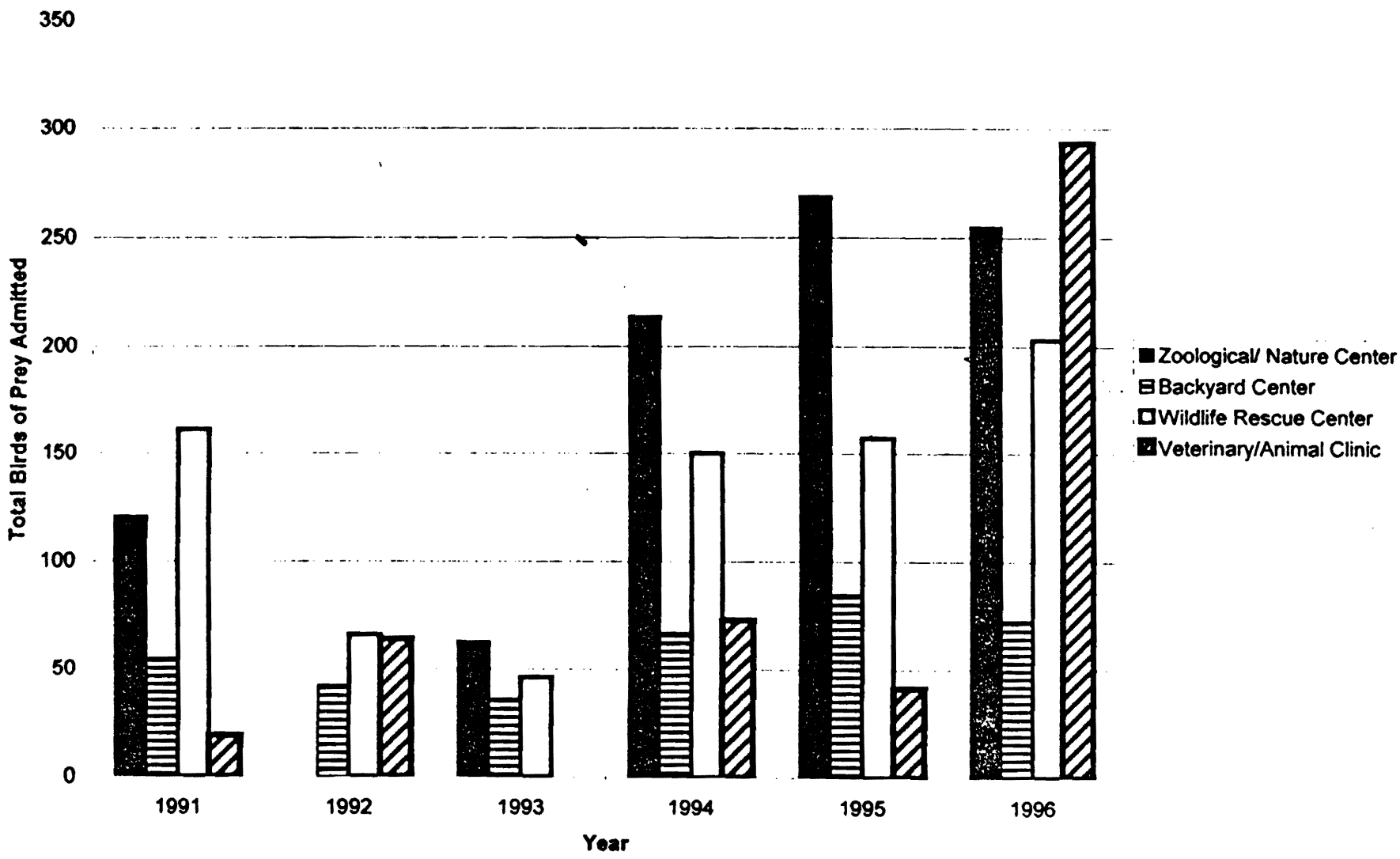
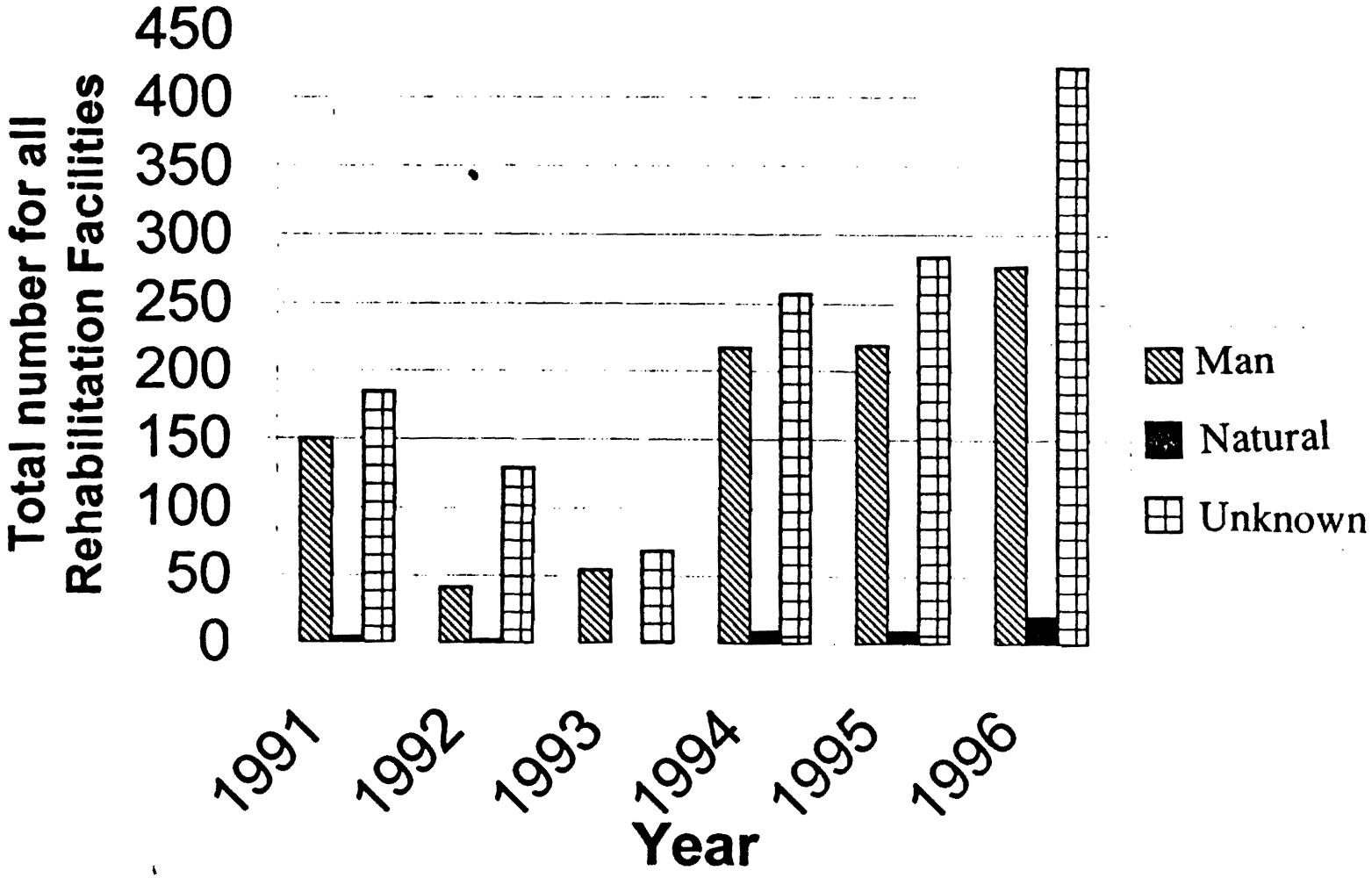


Figure 2
Nature of Injuries Sustained by Birds of Prey as Reported by Rehabilitation Facilities Across Tennessee from 1991 to 1996

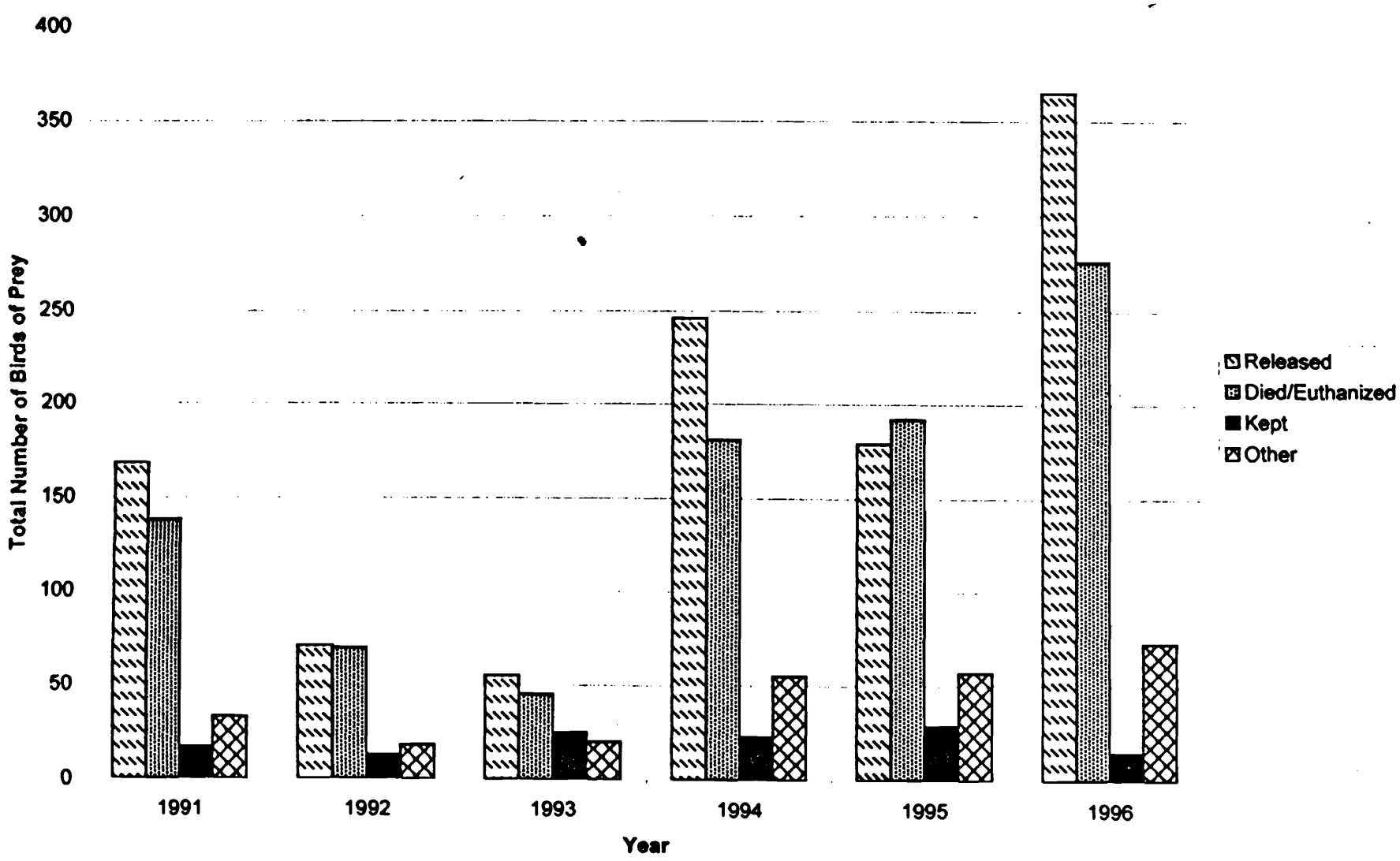


in some way related to man (personal conversation with K. Cottrell of The Clinch River Raptor Center). The trend in man-caused injuries reported by the 14 selected centers increased from 54 birds in 1993 to 277 birds in 1996. The increase in cases may be the result of increased public awareness about rehabilitation center locations and purpose. However, the increase could also be the result of more birds being injured on a yearly basis. By averaging all man-caused injuries reported from 1991 to 1996 by the selected 14 centers across Tennessee, 159.6 birds of prey each year were injured by man or man related activities.

Final disposition

The final disposition of birds of prey was categorized as follows: released, died/euthanized, kept (educational purposes), and other (Figure 3). Those birds classified as "other" were not reported on the next year's annual report for the final disposition. The total number of birds of prey that are released every year by the 14 centers has not been steadily decreasing or increasing. The overall number of released birds has been greater than the total number that died or were euthanized, except in 1995. The total number of birds that died or were euthanized has been steadily increasing since 1993. The average number of birds released every year for the 14 centers in Tennessee is 180.7 birds. A mean of 150.3 birds died or were euthanized every year in those same facilities. Those individuals that were kept were not classified as total losses. Those individuals provide a means for

Figure 3
Final Disposition of Birds of Prey as Reported by Rehabilitation Facilities Across Tennessee from 1991 to 1996



public education or foster parents for orphaned or imprinted birds.

Training a Non-releasable Red-tailed Hawk

The Red-tailed Hawk that was trained is non-releasable due to permanent wing damage. The entire training process took 7.5 weeks (2-3 hours/day, 6 days/week) from start to finish. The hawk was forced into feeding from the glove through hunger. The first step, training the hawk to feed from a placed glove, was the most involved. Two weeks passed before she would eat from the glove placed on the perch beside her. The next step, feeding while perched on my gloved hand, took one week. I spent an additional week with her stepping onto my gloved hand for food before starting the next step of training her to jump to the glove. She finally jumped to the glove for the first time after another week and a half. Occasionally I would initiate feeding by having her first step onto the glove for the mouse. Then I would return her to the perch and add distance between me and her. Then I would again offer her food. After two weeks she did not hesitate to jump after the signal was given. Training was complete at this time and she was moved into a cage with a male Red-tailed Hawk and placed in the care of the volunteers at the center.

Care of releasable birds of prey

I learned to care for releasable birds of prey at the Creso biological study site. Mice were placed daily within the flight cage. This disturbed the birds enough to offer them exercise.

This also provided me with a way to assess their flight ability for release without having to handle either bird. Both Cooper's Hawks were released on site within three weeks of being moved from the smaller facility to the larger flight cage. The Barn Owls' dispositions are currently pending. According to Mrs. Cottrell, one of the owls will be released. The other's flight ability is still being assessed.

Discussion

Legislation

The most noteworthy acts that have helped in the protection of birds of prey are: The Migratory Bird Act, The Bald Eagle and Golden Eagle Protection Act, the Endangered Species Act, and CITES. The Endangered Species Act and CITES both came into being within the last 24 years, and have had the most extensive impact on wildlife conservation and preservation. There have been four amendments to the Endangered Species Act since 1978 showing an increase in government action towards environmental and wildlife protection. Today it is illegal to shoot, trap, keep as pets, or otherwise disturb any bird of prey. Strictly regulated permits must be obtained to keep a bird of prey for the purposes of rehabilitation, research, education, or falconry from both federal and state agencies. These permits are another step forward in the protection and conservation of wildlife.

Until the number of birds of prey admitted with injuries caused by man or his activities decreases, improved legislative

acts are needed. An increase in public education about wildlife protection laws, the penalties of taking or harming wildlife, and the benefits of birds of prey should aid in the decrease of man related injuries suffered by birds of prey.

Conditioning and Release Techniques for Raptors

The most successful rehabilitation techniques are those that have been developed by falconers and modified by rehabilitators (Crawford 1984). The use of traditional falconry methods is not designed for use in large scale reintroduction efforts. The most practical method for large rehabilitation centers is the use of flight cages. Live prey can be introduced into the enclosure to provide "hunts" for the rehabilitating raptor. This provides minimal contact with man, decreasing the chances of imprinting or acclimation to man, allowing room for free flight by the bird, and a safe way for the rehabilitator to monitor flight ability without having to use falconry techniques. Smaller facilities, such as the backyard rehabilitator, can use such falconry techniques as flying the bird on a creance line. This is possible since they are typically not caring for large numbers of injured birds of prey. Using creance lines involves fitting the bird with jesses, locating a large area free of obstacles that could tangle the line, conditioning the bird to a signal, and time.

The use of flight cages for rehabilitation appears to be the best rehabilitation method. The rehabilitator does not have to spend the amount of time required flying the bird, nor does he, or

she, have to handle the bird. This reduces the chances of the rehabilitator being injured by the raptor. The use of flight cages also decreases the amount of stress to the raptor caused by frequent handling or by being attached to a creance line, which could prolong the rehabilitation process.

Admissions of birds of prey to rehabilitation facilities

The number of injured or sick birds of prey admitted to centers in Tennessee has been increasing since 1993. This shows that there is a need for rehabilitation centers. Without rehabilitation centers working towards the healing of injured or sick birds of prey, large numbers of birds could be lost. This could result in the eventual listing of raptors to the endangered species or threatened species list. Information such as where and when the bird was found, what the situation was, types of medication or drugs given to the bird and by whom, and what the bird has been fed are vital for a good beginning in the rehabilitation of injured or sick birds of prey (Garcelon et al. 1977). Injuries need to be assessed in terms of degree and nature, and whether or not the bird will ever be biologically viable in the wild (Harris 1983).

Nature of injuries sustained by bird of prey 1991-1996

The increase in injuries to birds of prey caused by man is the result of human populations increasing and cities encroaching into the habitat of birds of prey (Ingram 1988). Since 1993, the number

of injuries in Tennessee that could be identified as man related has been increasing. Rehabilitation facilities compensate for the numbers of birds injured by man through their efforts to save and release as many victims as possible. The rehabilitator's focus is on the individual bird, instead of the overall species population. In the case of endangered species, focusing on saving one individual could benefit the overall population (Redig and Duke 1995).

Final disposition

There are some necessary qualifications when considering a site for the release of a rehabilitated bird of prey. These include: density of prey species, density of competing predators, and suitable cover for birds of prey (Aikin 1983). Areas that allow hunting, use pesticides, or have such areas adjacent to them should be avoided as potential release sites. Before a bird can be released its physical condition should be re-evaluated by a veterinarian or experienced rehabilitator (Redig and Duke 1995). The numbers of birds released in Tennessee remained relatively stable 1991 to 1996. The overall number of birds released back into the wild needs to be significantly higher than those that die, are euthanized, or institutionalized. Currently, the numbers of birds that either die or are euthanized has been increasing since 1993. This shows a need for improved medical attention and public education. Through the work done at rehabilitation centers, advances in medicine and rehabilitation techniques are possible.

Education

Raptor facilities of all kinds provide a means for public education either by on-site programs or community outreach programs. They also provide a location for individuals to volunteer and receive first hand experience in the rehabilitation process. The most outstanding problem we face today is the public's lack of knowledge (Meehan 1982). Information should always be factual and never exaggerated to impress the group(s). The exposure of animals to the public should reinforce in the public's minds the idea that birds of prey have a purpose in the environment (Meehan 1982).

Rehabilitation centers provide many benefits to man and birds. Raptor rehabilitation aids in identifying situations in the natural environment that are harming the wildlife/natural community (Redig and Duke 1995). Biologists can then work with the public towards correcting the problem, continuing public education. Raptor rehabilitation programs also have potential for contributing to the overall welfare of populations through public education about raptors and their habits (Ingram 1988). They offer a place for the public to learn about birds of prey through volunteer opportunities and community programs. The care offered to birds of prey while in the centers provides the veterinary community with a chance to improve surgical and medical techniques. This could increase the numbers of birds released back into the wild. Overall, through their efforts, rehabilitators provide a service to biologists, the public, veterinarians, and birds of prey.

Management Implications

An already successful service in Tennessee could be enhanced by making a few additions and changes. Birds that are released back into the wild should be banded with a USFWS leg band. This increases the possible information gathered at later dates as to the cause of injury, longevity of rehabilitated raptors, and the benefits of raptors (Aikin 1983). Those birds that die or are euthanized should be necropsied to aid in medical advances for raptor treatment. Changes could also be made in the annual reports filed by each rehabilitation facility to aid TWRA in wildlife issues concerning birds of prey. One standard form should be issued to all facilities requesting the following information: species, date admitted, cause/nature of injury, treatment provided, final disposition, and disposition date. Those birds that are kept from the previous year as pending disposition should be reported on a separate page at the end of the annual report for the year. Individuals interested in becoming rehabilitators should have to fulfill one basic requirement. They should have to spend six months to one year in an apprentice status with a veterinary facility and/or a rehabilitation facility that works with injured or sick birds of prey. This would ensure that the individual rehabilitator is experienced in handling, caring, and assessing injuries of birds of prey prior to opening their rehabilitation facility.

Literature Cited

Aikin, J. 1983. Criteria for release. Pages 128-134 in N. Venizelos and C. Grijalva, eds. Proc 7th Annu Wild Conference, Raptors. S. Franc. Zool. Soc., Sloat Blvd., Pacific Ocean, San Francisco, California.

Bergoffen, M. 1995. Endangered Species Act reauthorization: a biocentric approach. Amer. Bar Assoc. Washington, DC. 357p.

Cooper, J. E. 1984. Recent advances in the treatment of wild casualties. Pages 23-28 in T.A. Geer, ed. Birds of prey management techniques. Huntingdon Res. Center, Huntingdon, Cambridge PE18 G5E, England.

Cooper, J. E. 1987. Raptor care and rehabilitation: precedents, progress and potential. J. Raptor Res. 21(1):21-26.

Crawford, W. C. 1984. Conditioning and release techniques for birds of prey. Wild. Rehab. 2:93-97.

Frink, L., J. White, B. Jones, C. Odell, P. Adams, M. Green, S. Kelly, P. Goodrich, R. Goodrich, and K. Thorne. (n.d.) Program description. Page 1 in D. Marcum, ed. Wildlife rehabilitation minimum standards and accreditation program. International Wildlife Rehabilitation Council and National Wildlife Rehabilitators Association. Unpublished handbook. Sartell, MN. 39p.

Garcelon, D., the 1975-76 Raptor Rehabilitation Team, The Alexander Lindsay Junior Museum, G.L. Gogue, and Wildlife Rescue Team. 1977. Raptor care and rehabilitation. Walnut Creek, California. Published handbook. 142p.

Harris, J. M. 1983. Raptors for rehabilitation. Pages 111-113 in N. Venizelos and C. Grijalva, eds. Proc 7th Annu Wild Conference, Raptors. S. Franc. Zool. Soc., Sloat Blvd., Pacific Ocean, San Francisco, California.

Hilton, R. J. 1975. The legal status of birds of prey in other parts of the world. Pages 193-197 in R. D. Chancellor ed. Proc. World Conference On Birds Of Prey, Vienna, Austria.

Ingram, K. 1988. Survival and movement of rehabilitated raptors. Natl. Wildl. Fed. Sci. Tech. Ser.: No. 11. p. 277-281.

Littell, R. 1992. Endangered and other protected species: federal law and regulations. The Bureau of National Affairs Inc. Washington, D.C. 569 p.

Lyster, S. 1985. International wildlife law: an analysis of international treaties concerned with the conservation of wildlife. Grotius Publications. New York, N.Y. 470 p.

Meehan, J. 1982. Raptor education: a moral and ethical obligation. Annu. Symp. Natl. Wild. Rehab. Assoc. 1:170-175.

Millsap, B. A. 1987. Introduction to federal laws and raptor management. Pages 23-33 in B. A. G. Pendleton, B. A. Millsap, K. W. Cline, and D. M. Bird eds. Raptor management techniques manual. National Wildlife Federation, Washington, D.C. 429 p.

Redig, P. T., and G. E. Duke. 1995. The effect and value of raptor rehabilitation in North America. Trans N Amer Wild Nat Res Conf. 60:162-172.