responsible course of action. Our nation has greatly benefited from antilittering campaigns and actions. We must similarly seek to make it politically incorrect and socially unacceptable to engage in biological littering resulting from irresponsible cat ownership and promotion of TNR programs.

Veterinarians, with help from organizations like The Wildlife Society and the American Bird Conservancy and its "Cats Indoors!" program, should join hands on a nationwide campaign to educate the public as to the importance of keeping their cats confined. Just as client education brochures inform on health-related issues, factual, objective information presented in a similar fashion can advise as to why cats should be confined for the sake of the cat, the environment, other animals, and the public. The "Cats Indoors!" concept should be promoted by professional veterinary organizations, in veterinary curricula, in elementary and high schools, in pet shops, among cat fanciers, and by humane groups.

If a fraction of the millions of dollars being expended to neuter, reabandon, and feed cats was directed toward enhancing education and supporting more effective animal control ordinances and their enforcement, we would be much farther down the road toward effectively reducing the problem of free-roaming cats than we are today.

[a]Storts C, Atlantic Animal Hospital, Cape Canaveral, Fla: Personal communication, 2003.
[b]AVMA-PLIT. Chicago, Ill: Memorandum from PLIT to the CEI, Apr 28, 2003.

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Trap-neuter-release programs: the reality and the impacts

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American Bird Conservancy (ABC), conservationists, and wildlife biologists are often accused of making domestic cats *(Felis catus)* the scapegoat for bird population declines and ignoring the "real" causes of bird mortality, such as habitat loss and fragmentation, pesticides, pollution, window strikes, and collisions with communication towers. In fact, through the Bird Conservation Alliance,[1] ABC is working with a broad coalition of conservation groups as well as state and federal wildlife agencies in North, Central, and South America to address all issues related to bird mortality. However, as remaining wildlife habitat becomes fragmented and isolated by human development, domestic cat predation on native birds, especially rare and endangered species, has become an important factor in bird mortality that cannot be ignored.

How many birds do pet, stray, and feral cats kill each year in the United States? Exact numbers are not

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known, but on the basis of their 4-year study and those of others, Coleman et al[2] estimated that free-roaming cats kill at least 8 million birds/y in rural Wisconsin and that nationwide rural cats probably kill hundreds of millions of birds each year. Suburban and urban cats add to that toll. In their ongoing, but unpublished, identifications of cat prey items in Wisconsin, including stomach contents, scat analyses, observations of kills, and prey remains, 19.6% of 1,976 animals captured by 78 free-ranging cats were birds.[a]

Numerous cat predation studies show that birds can comprise between 0% and 100% of a cat's prey, depending on the individual cat, its location, time of year, and availability of prey.[3] For example, in a study[4] of feral cat stomach contents in Sacramento Valley, Calif, birds comprised 25% by volume for the year but varied from just a trace in October to 70% in June. A study[5] by The Mammal Society in England found that a minimum of 44 species of wild birds comprised 24% of the prey that cats brought to their owners. In a study[6] of pet cats in an English village, birds comprised 35% of the prey brought home. Studies of prey items that pet cats bring home reveal only the bare minimum of what those cats actually kill. Animals killed by cats but consumed or left elsewhere, animals that escaped the cat but died later because of trauma or secondary infection, or young animals that starved to death or died of exposure because cats killed 1 or both parents are not counted in such studies. Moreover, eggs eaten by cats are not detectable in the digestive system, and because of the lack of feathers, nestlings are not detectable in scat analyses. In addition, cat predation studies do not indicate impacts on wildlife populations—only what cats killed at that particular time and location. Given the wide variety of animals killed by cats, what cat predation studies do indicate is that cats are opportunistic hunters.

Rural outdoor cats kill larger numbers and varieties of birds than cats in suburban or urban areas.[2] Scientific studies[7] have also documented that declawing cats, putting bells on their collars, or keeping them well fed do not prevent them from killing animals. Adamac[8] showed that hunger and hunting behavior are controlled by different portions of a cat's brain. In her study of pet cats in Wichita, Kan, Fiore[b] found that 83% of cats enrolled in the study killed birds. In all but 1 case in which feathers were found in scat, the owner was unaware that their cat had ingested a bird. This appears to refute Patronek's[9] assertion that "cats tend to bring prey home." In fact, most volunteers reported that their cats did not bring prey to them. Instead, owners observed the cats with the bird or found remains in the house or other locations. Cats often kill but do not eat their prey, so studies analyzing scat or stomach contents alone would underreport the number of birds killed by cats.

The American Pet Products Manufacturers Association's 2003/2004 National Pet Owner Survey[10] estimates that there are 77.7 million pet cats in the United States. A 1997 nationwide random telephone survey[11] indicated that 66% of cat owners let their cats outdoors some or all of the time. No one knows how many stray and feral cats there are, but estimates range from 60 to 100 million. Conservationists and wildlife biologists in the United States are concerned about domestic cat predation on native wildlife because *Felis catus* is not native to North America, occurs here in large concentrated numbers, and kills common as well as rare species. Our job is to keep common species common and to prevent rare species from becoming extinct. As the famous conservationist Aldo Leopold[12] stated, "the last word in ignorance is the person who says of an animal or plant: 'what good is it?' If the biota, in the course of eons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts. To keep every cog and wheel is the first precaution of intelligent thinking."

Cat Predation Impacts on the Mainland

In his review of cat predation studies up to 1988, Fitzgerald[13] stated that "any continental population of birds that could not withstand predation by cats would have been extirpated long ago." His statement ignores the fact that the status of a species can change over time. Sixteen years later, after additional habitat loss and new scientific studies, scientists now list invasive species, including cats, as the second most serious threat to declining and rare wildlife.[14,15] The domestic cat is included in the Invasive Species Specialist Group's list of 100 of the worst alien invasive species.[16] Recent studies indicate that cat predation can impact populations of birds in isolated habitats, especially species that are rare or specialized in their habitat requirements. Species that nest or feed on or near the ground are especially vulnerable to cat predation, regardless of whether they exist on islands or the mainland. Although the science suggests otherwise, advocates of **trap-neuter-release (TNR)** often state that well-fed cats do not kill wildlife or they only kill pest species such as house mice (*Mus musculus*). This claim was tested in 2 grassland parks in the East Bay Regional Park District in California: 1 area where more than 25 cats were being fed daily and 1 area without cats.[17] Feeding animals in these parks is illegal. Almost twice as many birds were seen in the area without cats, compared with the area with cats. Breeding birds were seen more often in the area without cats. California Quail (*Callipepla californicus*) and California Thrasher (*Toxostoma redivivum*) were present in the area without cats but absent in the area with cats. California Thrasher is listed on ABC's Green List because its population is declining.[18] In addition, more than 85% of native western harvest mice (*Reithrodontomys megalotis*) and deer mice (*Peromyscus* sp) were trapped in the area without cats, whereas 79% of house mice, an exotic pest species, were trapped in the park with cats. The researchers concluded that "cats at artificially high densities, sustained by supplemental feeding, reduced the abundance of native rodent and bird populations, changed the rodent species composition, and may have facilitated the expansion of the house mouse into new areas. Thus we recommend that the feeding of cats in parks should be strictly prohibited."[17]

In a study of relationships between coyotes (*Canis latrans*), midsized predators such as cats, and scrub-dwelling birds, cat owners living along the rims of

steep-sided canyons in San Diego were asked to collect all of the prey their cats brought home.[19] These canyons are isolated pockets of habitat with species that may not exist elsewhere. Cat owners reported that as a mean, each outdoor cat that hunted returned 24 rodents, 15 birds, and 17 lizards to the residence each year. Depending on the size of the canyon, there may be tens to hundreds of outdoor cats with access to each canyon. In comparison, the canyons often harbor only 1 or 2 pairs of native predators such as coyote or gray fox (*Urocyon cinereoargenteus*). The researchers estimated that cats surrounding a moderately sized canyon return approximately 840 rodents, 525 birds, and 595 lizards to residences each year. Existing population sizes of some birds do not exceed 10 individuals in small to moderately sized canyons, so even modest increases in predation pressure from midsized predators, in conjunction with other habitat fragmentation effects, may quickly drive native prey species (especially rare ones) to extinction. The study[19] also found that in small canyons where the coyote was absent, there was an increase in midsized predators, such as cats, raccoons (*Procyon lotor*), and opossum (*Didelphus virginiana*), and a drastic decline in diversity (and in some cases elimination) of scrub-breeding birds. However, in the larger canyons where coyotes were still present, the scrub-breeding birds were also present. Coyotes are known to eat cats and other midsized predators.

Cat Predation Impacts on Islands

The devastating impacts domestic cats can have on island bird populations are well known. Jackson[20] estimated that cats are primarily responsible for the extinction of 33 species of birds worldwide. Veitch[21] attributed cat predation as primarily responsible for the extinction of 8 island bird species, including Stephen's Island Wren (*Traversia lyalli*), Chatham Island Fernbird (*Bowdleria rufescens*), and Aukland Island Merganser (*Mergus australis*), and the eradication of 41 bird species from New Zealand islands alone. He also noted that "the subsequent eradication of cats from several islands in the New Zealand region has allowed birds to increase in both numbers and species diversity."[21] Moors and Atkinson[22] state that "probably no other alien predator has had such an universally damaging effect on seabirds."

In a recent study,[23] wildlife biologists investigated the effects of domestic cat predation on 3 small nesting colonies of Wedge-tailed Shearwater (*Puffinus pacificus*) at Malaekahana State Recreation Area on Oahu, Hawaii, where stray cats were fed by the public. These seabird colonies were compared with a large Shearwater colony at nearby Mokuauia Island State Seabird Sanctuary, where cats were absent. During the study, feral cats were fed daily at Malaekahana at a site that was located only 30 m from the closest Shearwater nesting colony. Many more burrows produced chicks at Mokuauia (62%) than at Malaekahana (20%). At Malaekahana, reproductive success was 0% at the colony closest to the cat feeding site and almost all breeding adult Shearwaters in that colony were killed. Populations of long-lived seabirds such as Shearwaters, which do not breed until they are ≥ 5 years old and produce only 1 egg/y, are highly sensitive to the loss of breeding adults. Depending on how old the chick is when a parent bird is killed, the chick may die of starvation because 1 parent cannot keep up with the chick's feeding demands.

Cat predation impacts on island bird populations are not limited to ground-nesting seabirds. The federally endangered Palila (*Loxiodes bailleui*), a Hawaiian Honeycreeper, is threatened by feral cats in its protected, but limited, habitat of mamane and mamane-naio forest at 6,000 to 9,000 feet on Mauna Kea. Wildlife biologists have been monitoring the Palila population and have found that since 1998, 8% to 11% of monitored Palila nests were depredated annually by cats.[24] This level of cat predation inhibits efforts to restore the Palila population.

TNR—The Reality

Articles have recently appeared in the *Journal of the American Veterinary Medical Association* on intensive TNR efforts with unlimited spay/neuter services available to volunteers. These efforts were conducted on private property or on college campuses with small numbers of cats in each colony. However, data collected in these studies are problematic because they rely on anecdotal recollections of cat feeders of the numbers of cats in the colonies before and after TNR. In a survey[25] of 101 cat feeders in north central Florida, the total surveyed cat population was reportedly 920 before participation in TNR and 678 after TNR. However, the total number of cats (n = 920) minus deaths (151), disappearances (149), and adoptions (238) and plus births (498) and immigrations (103) equals 983, not 678. The authors wrote, "the fact that the numbers do not add up is attributable to fluctuations in colony members and the fact that these numbers were estimates based on the recollections of individual caretakers. These numbers should not be interpreted as precise data based on accurate record keeping."[25]

Examples abound[26] of larger cat colonies maintained for 10 or more years in public parks, on public beaches, on college campuses and military bases—some with sensitive species present—and in areas adjacent to critical wildlife habitat, despite the AVMA's recommendations in its 1996 position statement on "Abandoned and Feral Cats" that states, in part, "the colony should be restricted to a well-defined relatively safe area, and not on lands managed for wildlife or other natural resources (eg, state parks, wildlife refuges, etc)."

Florida—Advocates of TNR claim that managed cat colonies decrease in size and are even eliminated in just a few years through attrition. This assertion was tested through photographic and observational capture-recapture techniques in 2 Miami-Dade County, Fla, parks: A.D. Barnes Park and Crandon Marina.[27] The A.D. Barnes Park is a popular bird watching site, especially during spring and fall migration. Crandon Marina contains a protected coastal beach area that has been designated as nesting grounds for the Least Tern (*Sterna antillarum*), a species in serious decline. During the study, 37 cats were observed at A.D. Barnes Park and 91 cats were observed at Crandon Marina. Although kit-

tens were abandoned at both colonies (22 kittens at A.D. Barnes Park and 14 kittens at Crandon Marina), they were not included in the capture-recapture analysis. The number of original colony members decreased over time in both colonies. However, illegal dumping of unwanted cats and the attraction of stray cats to the abundant food offset reductions in cat numbers caused by death and adoption. Furthermore, the overall population of the colony increased at A.D. Barnes Park and remained static at Crandon Marina. Consistent with other scientific studies[28,29,c] that show cats in colonies are not territorial, the existing cats did not keep new cats from joining the colony or from food. Although it was not the purpose of the study to determine cat predation effects on native wildlife, well-fed cats were observed stalking and killing birds protected by the Migratory Bird Treaty Act, including a Common Yellowthroat (*Geothlpsis trichas*) and other native wildlife. Other animals were also observed eating the abundant cat food, including a stray dog (*Canis familiaris*), raccoon, and spotted skunk (*Spirogale putorius*). Subsidizing these predators may increase predation pressure on native wildlife, and the proximity brought about through communal feeding may increase risk of disease transmission within and across species. Castillo and Clarke[27] concluded, "our study suggests that this method is not an effective means to control the population of unwanted cats and confirms that the establishment of cat colonies on public lands encourages illegal dumping and creates an attractive nuisance."

Clarke and Pacin[30] compared 2 TNR groups operating in south Florida. The Cat Network is a volunteer-based group whose members have been practicing TNR in the Miami-Dade County area, including public parks such as Greynolds Park, for years. Because the group does not actively maintain records, it is not possible to determine with accuracy how many cats and colonies are managed by Cat Network volunteers. During a 10-month period in 1999, 2,009 certificates for spay/neuter surgeries were returned to the Cat Network by veterinarians. Although this may have reduced stray and feral cat reproduction, without systematic collection of data, it is impossible to determine whether the Cat Network had reduced the size of its colonies over time. However, the certificates did reveal that few of these cats were vaccinated against diseases other than rabies.

Greynolds Park was once famous for its heron rookery and as an important stopover site for migratory songbirds. Dalrymple[d] conducted a bird survey from 1997 to 1998 and found that upland bird species counts had significantly declined in the park since 1987, when he had last conducted a similar survey. Although the causes of the decline are uncertain, stray and feral cats likely contributed. Dalrymple[d] saw few feral cats in Greynolds Park in 1987 but observed 30 to 50 cats in the park each day in 1998. Raccoons were also seen eating at numerous feeding stations throughout the park. Raccoons are the wildlife most commonly found to be rabid in the eastern United States, and cats are the domestic species most commonly found to be rabid by the CDC.[31] Rabies has been confirmed in cats and raccoons in Florida.

After ignoring the cat overpopulation problem for years and over the objections of members of the Cat Network, Commissioners in Miami-Dade County strengthened and enforced laws, making it illegal to feed or abandon animals in parks and authorizing park staff to undertake humane removal of nuisance animals. In Greynolds Park, a public education campaign called "Be a Park Pal" was initiated and park staff sponsored adoption days for cats removed from the park. Approximately 20 to 25 unadoptable cats have been placed in an enclosure away from natural resource areas. Organized feeding has stopped, the cat population has been reduced to an innocuous level, and park staff monitor and remove occasional newly abandoned cats as needed.[e]

Another TNR group that Clarke and Pacin[30] studied is the well-funded and well-organized **Ocean Reef Cat Club (ORCAT)** at Ocean Reef Club residential resort on North Key Largo, Fla. Beginning in 1989, ORCAT volunteers reportedly trapped and had sterilized approximately 200 cats/y for 5 years. However, the cat population grew larger. More intense efforts were needed, which led to the community association-sponsored Feral Cat Center in 1995 with an annual budget of $100,000 and paid staff. As of 1997, the cat population was considered stabilized at about 1,000. The ORCAT's employees maintain a detailed history of each cat within the colony. By June 1999, ORCAT had reduced the cat colony to approximately 500 cats. These cats are fed in approximately 40 subgroups throughout the property. Even with considerable resources and efforts to reduce this stray and feral cat population, 500 cats is still a large population. This effort is also not representative of most TNR operations. Adjacent to the Ocean Reef Club is the Dagny Johnson Key Largo Hammock Botanical State Park, and across the road is the Crocodile Lake National Wildlife Refuge. These areas provide the last remaining habitat for the highly endangered Key Largo woodrat (*Neotoma floridana smalli*) and Key Largo cotton mouse (*Peromyscus gossypinus allapaticola*). Despite this protected habitat, the woodrat population has plummeted from an estimated 6,500 woodrats in 1988 to fewer than 80 today.[33,f] Stick nests characteristic of the woodrats, which may be used for several generations and become as large as 4 feet high and 6 to 8 feet in diameter, can no longer be found. Cats have been observed roaming through the park. Cats are being trapped and removed from the National Wildlife Refuge, and efforts are underway to captive breed woodrats in the hope that they can later be released back at the site.

In addition to the Key Largo woodrat and Key Largo cotton mouse, domestic cats are threatening other rare species in Florida, including the Florida Scrub Jay (*Aphelocoma coerulescens*), subspecies of beach mice (*Peromyscus polionotus* ssp), Lower Keys Marsh Rabbit (*Sylvilagus palustris hefneri*), Roseate Tern (*Sterna dougallii*), and Silver Rice Rat (*Oryzomys palustria natator*). Only 100 to 300 Lower Keys Marsh Rabbits exist today. A 1999 study[34] found that free-roaming cats were responsible for 53% of the deaths of these rabbits in 1 year, and scientists predict the species could be extinct in a few decades at this rate of

predation. Populations of beach mice are already at risk because of habitat loss, disease, and loss of genetic diversity. Domestic cat predation has applied additional pressure to these fragile populations. Found only in the southeastern United States, beach mice are important for maintaining native grasses that help stabilize dunes. Six of 8 beach mice subspecies are federal- and state-listed as endangered or threatened, and 1 is extinct. Scientists consider predation to be the most important factor now affecting beach mouse survival. A cat colony had a negative effect on a population of Choctawhatchee beach mouse (*Peromyscus polionotus allophrys*) near Grayton Beach State Park. During a radiotelemetry study,[g] 8 of 14 radio-collared mice were lost in the first 2 days. One radio was tracked and located in the digestive tract of a cat. Another radio was found in cat feces near the campground. At the time, there were at least 2 nearby feeding stations where large amounts of cat food were regularly dropped.

Brevard, Palm Beach, Volusia, Gilchrist, and Okaloosa counties in Florida have amended their ordinances to make TNR legal.[35] Orange County's Animal Control Department provides spay/neuter services for those who register their cat colonies. After 3 years of legalized TNR and $100,000 of taxpayer funds to help pay for it in Brevard County, the free-roaming cat population had grown so out of control that a Feral Cat Advisory Committee was formed to make recommendations on how to solve the problem. Cat colonies are common along the Space Coast and even exist in parks with designated endangered sea turtle nesting sites. Domestic cats kill sea turtle hatchlings.[36] Despite reams of documents and hours of meetings and discussions, Brevard's Feral Cat Advisory Committee was not able to reach an agreement and disbanded without making formal recommendations. Federal and state wildlife biologists were not consulted when county commissioners passed ordinances allowing TNR. Therefore, on May 30, 2003, the **Florida Fish and Wildlife Conservation Commission (FWC)** unanimously passed a policy to "protect native wildlife from predation, disease, and other impacts presented by feral and free-ranging cats."[37] Under the policy, TNR will not be allowed on lands managed by the FWC, and it indicates their strong opposition to programs and policies that allow release, feeding, or protection of cats on public lands that support wildlife habitat. This policy received broad support from conservation groups, federal and state agencies, and wildlife rehabilitators. A petition filed against the FWC claiming that it had not conducted adequate research, failed to allow sufficient time for public comment, and did not consider more humane alternatives in the drafting of its policy was dismissed by an administrative law judge on August 29, 2003.

California—Most of California's threatened or endangered birds and land mammals are vulnerable to domestic cat predation.[38] Although loss and fragmentation of habitat are the main causes of these wildlife population declines, large numbers of pet, stray, and feral cats roaming the remaining habitat impose additional stress on remnant wildlife populations. Some counties have amended their ordinances to legalize maintenance of cat colonies if volunteers register their colonies with animal control. In 1994, San Mateo County exempted from the "ownership" definition people who register as caretakers of feral cat colonies and "who trap or make a reasonable effort to trap all feral cats over the age of 8 weeks in his/her care, and has them spayed or neutered."[39] Santa Cruz[40] and Santa Clara[41] Counties also approved ordinances legalizing domestic cat colonies. Environmental reviews were not conducted before these ordinances were passed. Maddie's Fund gave a $9.5 million grant to the **California Veterinary Medical Association (CVMA)** to reimburse more than 1,000 veterinarians who spayed or neutered 170,334 cats for release. The CVMA did not consult with the California Fish and Game Commission on this project, nor were cat feeders advised to avoid releasing cats in sensitive wildlife areas.

California Quail, a species that nests, feeds, and runs on the ground, have resided in San Francisco's Golden Gate Park since the late 1800s.[42] Quail chicks are flightless for 10 days after hatching and stay on the ground for a month before beginning to roost in trees at night. Twenty-five years ago, cats in San Francisco's Golden Gate Park were routinely removed and California Quail, White-crowned Sparrows (*Zonotrichia leucophrys*), and native brush rabbits (*Sylvilagus bachmani*) were numerous. However, in the early 1990s, advocates of TNR objected to euthanasia of stray and feral cats trapped in the park and requested that the cats be managed by TNR instead. Ornithologists at the California Academy of Sciences and the City College of San Francisco noticed that the decline in wild bird species directly paralleled a rise in the population of feral cats.[43,h] After 12 years of TNR, there are still at least 7 active feeding stations in Golden Gate Park and only a handful of Quail have survived.[i] The brush rabbit has been extirpated.

Hawaii—Hawaii is considered the endangered species capitol of the world, with more endangered plant and animal species per square mile than any other place on the planet. By the late 18th century, at least 45 species of endemic birds had become extinct.[44] Cats were probably brought to the islands in the late 1700s. Given the mild climate, cats can breed year-round in Hawaii, with 3 litters/y of 4 to 6 kittens/litter. Rabies does not exist on the islands, and there are no wild predators of cats, such as coyotes, to help keep the free-roaming cat population in check. Although domestic cats are not the only threat to endemic Hawaiian birds, they are an important factor, even in higher elevations away from lands occupied by humans.

Approximately 21% of Oahu's households have cats, totaling approximately 150,000 pet felids.[45] Oahu's Cat Protection Law of 1995 mandates that all outdoor cats 6 months or older be sterilized and wear identification, and the **Hawaiian Humane Society (HHS)** offers a low-cost spay/neuter program. Abandoning any animal is also illegal. A TNR program was begun in Hawaii in

1993 and was supported by the HHS and the Hawaii Cat Foundation. In 2002, HHS performed 2,609 free sterilization surgeries for cats in managed colonies. From 1993 to 2002, 19,786 cats were sterilized for release on Oahu.[46] There are more than 2,000 cat caregivers registered with the HHS feral cat program on that island. Despite these efforts, the HHS annually euthanatizes more than 11,000 cats on Oahu.[j]

Managed cat colonies occur in many places in Hawaii where stray and feral cats have congregated, including public parks, beaches, and sites adjacent to sensitive wildlife habitat, such as seabird nesting colonies. In 1999, researchers found that a Wedge-tailed Shearwater colony at Waiehu on Maui near a managed cat colony lost 23 adult birds to cats during a 10-day period. A Shearwater colony at Hookipa lost 59 adult birds and 27 burrow-fledged chicks to cats. At a small Shearwater colony east of Kuau, 6 adult birds were killed by cats, causing the total loss of all chicks at 5 burrows. At Pauwalu, remains of Bulwer's Petrel *(Bulweria bulwerii)* chicks were found near a cat colony during each of 3 years and there was no evidence that any chicks had successfully fledged from the colony during this time. According to researcher Duvall,[k,l] "small colonies (of seabirds) were vulnerable to total failure and larger colonies to losses of returning adults and late-stage chicks and adults. Comparison of cat-free Molokini islet illustrated cat predation has a sustained negative impact on established Maui native seabird colonies, expansion of colonies, and colonization of new areas by native seabirds."

Cat Removal Does Work

Proponents of TNR maintain that trapping and permanent removal does not work and that more cats will come to fill the void left by cats that were trapped. The following examples show that trap and removal does work if the source of food is also removed.

Virginia—In 1993 at Riverside Park, Va, cats were being fed around picnic tables where families came to enjoy a view of the Potomac River. By law and policy, pets, including cats, must be kept under physical restraint at all times in areas administered by the National Park Service. Staff from the National Park Service told feeders the cats had to be removed. Amid public protest from cat feeders and a lawsuit, 28 adult cats and 3 kittens were trapped and taken to Fairfax County Animal Control. The lawsuit was dismissed as moot in September 1994, and no cats were euthanatized.[47] Cats are no longer found on that site. However, I have personally observed a large rat hole marking the site of the former cat feeding station. It appears that both cats and rats were being fed.

California—Cat removal has also worked well in Bidwell Park in Chico, Calif. In 1997, several hundred stray and feral cats roamed the park and the park's historic California Quail population had been decimated. Alta Cal Audubon Society and others asked the city's Park and Playground Commission to take action. The Commission began to enforce the state's antiabandonment law and the city's antilitter law. A citation was issued to 1 cat feeder for deliberately violating these laws, and he was ordered to do 80 hours of community service by helping to trap and remove cats from the park, which the community supported. Although TNR advocates asked that a TNR program be started in the park, the Commissioners refused. In response, the **Chico Cat Coalition (CCC)** was formed to rescue the cats. Since February 1998, the CCC has trapped and removed more than 638 cats and kittens, found homes or foster homes for more than 510 of them, and returned 11 cats to their owners. Forty cats died, 8 of which were euthanatized. Approximately 71 cats not suitable for adoption are living out their lives in the comfort of a fully enclosed barn with free access to an outdoor enclosure on private property.[m] The City of Chico pays for spay/neuter services. California Quail are once again seen in the park, and it is unusual to see a stray cat. The CCC and the Park Commissioners appear to have found a humane solution for both cats and native wildlife.

Morro Rock Ecological Reserve is a popular area with a spectacular view of Morro Bay and nesting Peregrine Falcons *(Falco peregrinus)*, a species protected by federal law. Despite policies and regulations prohibiting abandonment and feeding of domestic animals in state parks, a large group of stray and feral cats had been fed in the parking lot daily for years. Over the objections of a local cat rescue group, approximately 50 cats were trapped in the park and taken to the local humane society between 1995 and 1997. Some cats had to be removed twice because individuals would go to the humane society, buy the cats back, and release them at the Rock. According to observations by local birders, Canyon Wrens *(Catherpes mexicanus)* had all but disappeared at the Rock but are now common. The presence of the cat colony caused many cat owners to dump unwanted cats there. Since the cats were removed and the feeding stopped, cat abandonment and feeding are no longer problems at the park.[n,o]

In 1997, a group of stray cats abandoned by Alameda Naval Air Station personnel were being fed near a colony of California Least Tern (*Sternum antillarum browni*), a federally listed endangered species. Cats are known to prey on Least Tern, and it was illegal to feed cats on the base.[48] Groups advocating TNR protested the Navy's effort to trap and remove the cats and asked that feeding cats on the base be legalized. However, the Navy continued to trap and remove cats and other predators as required under the Endangered Species Act, and this effort paid off. Prior to removing predators, there were only a few nesting pairs of terns; however, by the summer of 2001, an estimated 275 nests fledged approximately 320 chicks.[p] This area is now managed by the US Fish and Wildlife Service as a National Wildlife Refuge.

The East Bay Regional Park District manages 96,000 acres with 14 state or federally listed threatened or endangered species and at least 27 species of special state concern. Rare ground-nesting birds found in the East Bay Regional Park District, such as California Clapper Rail (*Rallus longirostris obsoletus*), California Least Tern, and Western Snowy Plover (*Charadrius alexandrinus nivosus*), are especially vulnerable to cat predation. Abandoning cats and feeding them and their offspring have been substantial problems in some of the district's parks, despite laws prohibiting these activities. Huge public controversies erupted and were highlight-

ed by media whenever the district removed cats from the parks by humane trap and removal or by lethal control. To resolve this issue, in 1999, the district proposed the "Feral and Abandoned Volunteer Program," which would allow cat colony advocates who signed a liability waiver and agreed to adhere to volunteer guidelines to trap and permanently remove cats on EBRPD lands. Although 10 volunteers signed the waiver, only 1 actually removed cats. The volunteer program has since been disbanded, and park staff is successfully trapping and removing cats from the parks.[q]

Ohio—Advocates of TNR believe that the general public does not support large-scale trap and remove programs and that they are cost-prohibitive. However, in response to complaints from citizens about numerous stray and feral cats, the Akron City Council passed an ordinance on March 25, 2002, prohibiting domestic cats from running at large. As of August 31, 2003, a total of 2,495 stray and feral cats had been trapped by citizens as well as by 4 wardens on an on-call basis and taken to Summit County Animal Control. Of those cats, 530 were redeemed or adopted and 1,965 were euthanatized because they were feral, injured, or diseased. The cost to the City of Akron was $26,546. If the public did not support this program, far fewer cats would have been trapped because private citizens did most of the trapping.[r]

Mexican islands—Collaborative efforts by the Mexican Natural Resources Ministry, conservation groups, and island residents have resulted in successful removal of domestic cats and all other exotic species from 15 Mexican islands at a cost of < $1 million.[s] Fishermen commonly brought cats onto the islands as a way to control native rodents attracted to their homes, but the cats were later abandoned. Unfortunately, shearwaters and other seabirds that nest in burrows in the ground became easy prey for these cats.

On Natividad Island, researchers determined[49] that domestic cat predation was the main threat to the Black-vented Shearwater (*Puffinus opisthomelas*). Natividad is the breeding ground for more than 95% of this species' world population, and shearwaters were estimated to comprise 90% of feral cats' diets on the island. After 25 feral cats were removed from Natividad, mortality of Black-vented Shearwater decreased dramatically, from 1,012 dead birds/mon to only 88 dead birds/mon. This rate of mortality is typical and sustainable by the shearwater population.

Better Alternatives

The ABC believes that trap and removal programs can be effective in eliminating stray and feral cat populations and that they are the only acceptable option for public parks, beaches, and other areas managed for wildlife. Cat sanctuaries, such as those run by Best Friends in Utah, Rikki's Refuge in Virginia, the Humane Society of Ocean City in NJ, the CCC in California, the Delaware Humane Association in Delaware, and the Habitat for Cats Sanctuary in Massachusetts, keep cats sheltered, safe, and well fed; provide access to routine veterinary care; protect wildlife; and reduce health risks for cats and people. The ABC strongly supports sanctuaries for stray and feral cats as an alternative to TNR that is more humane to both cats and wildlife.

Veterinarians Can Make a Difference

The first step in controlling free-roaming cat overpopulation starts with educating the public on responsible pet ownership. In 1997, ABC initiated a citizen education campaign called "Cats Indoors!" to encourage cat owners to keep their cats indoors and to support humane, permanent removal of cats from wildlife areas. Campaign materials include a brochure, posters, fact sheets, an educator's guide for grades kindergarten through 6, print and radio public service announcements, and computer-aided slide presentations.[50] The AVMA also strongly encourages owners of domestic cats in urban and suburban areas to keep their cats indoors.[51] As a primary source of information for cat owners, veterinarians should take every opportunity to encourage responsible ownership of their feline patients.

In conclusion, for solutions to the free-roaming cat overpopulation problem to be viable, they must do the following: protect native wildlife, especially vulnerable species; be humane to native wildlife as well as cats; protect human health; comply with federal, state, and local laws; effectively reduce the free-roaming cat population; and be scientifically defensible. In the opinion of the ABC, TNR as presently practiced has not met these objectives.

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