Endangered Cats of North America

From the forests of eastern Canada to the scrublands of Mexico, wild cats were once prevalent throughout North America. These creatures were among the most beautiful, graceful, and revered animals found on the planet.

Today, however, the future of many North American cats is uncertain. Humans have rapidly populated and developed many areas of the continent, destroying natural areas to build roads and cities, converting wild lands for agriculture and grazing, and degrading habitats to extract natural resources. Fear and intolerance, the sentiments that fueled historic predator extermination programs, still complicate efforts to conserve North America's wild cats and to find solutions that accommodate both wildlife and human needs.

Conserving wild cats offers the opportunity to protect some of North America's most beloved animals, the wild places they inhabit, and the many diverse species that share their homes. As we enter the twenty-first century, humans hold the power to influence the future of North America's felines and the unique places they inhabit.

The *Endangered Cats of North America* report takes a thoughtful look at the different wild cat species of North America and the most pressing threats to their survival. Even more importantly, the report provides concrete suggestions for what can be done to save these cats. These recommendations were generated by leading wild cat specialists, biologists, educators, and conservationists in Canada, Mexico, and the United States.

But the significance of this report goes beyond its potential benefits for wild felines. As part of NWF's ongoing effort to "keep the wild alive" in our world, this publication is designed to educate concerned citizens about the important role *everyone* can play in determining the fate of wildlife and habitat.

Working with the National Wildlife Federation, citizens have already been able to craft common sense approaches that have successfully restored wolves to Yellowstone National Park, initiated the resurgence of the Everglades and its countless wildlife residents, and spearheaded a process for reintroducing grizzly bears to the Selway-Bitterroot wilderness of Idaho and Montana. Elsewhere, activists are addressing the challenge of conserving healthy habitat and natural resources to support wildlife and human communities, too. It's not easy, but it all begins with knowledge and the understanding that our choices do make a difference.

Perhaps your own personal conservation efforts will blossom from the seeds of information and understanding contained in these pages. That is our hope. We urge you to get involved and to use this information to make tangible contributions toward the conservation and recovery of North America's wild cats and the wild places they inhabit.

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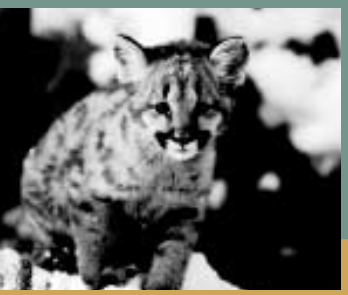
EXECUTIVE SUMMARY



Conserving North America's cats is integral to protecting the continent's wildlife heritage and to saving many of the pristine, wild places that still remain.

While the North American continent was once home to healthy populations of a variety of cat species and subspecies, most of these cats now exist in greatly depleted numbers. Historic predator control programs and exploitation for the fur trade, as well as continuing large-scale habitat loss, have taken their toll on each of North America's feline species. As we enter the twenty-first century, cougars have been virtually eliminated from the eastern United States and Canada; the eastern cougar subspecies is presumed extinct; ocelots, jaguarundis, and jaguars have declined throughout their ranges; and Canada lynx are now rare in the southern parts of their range.

The significance of these losses is not limited to just aesthetic or ethical concerns. The loss of top predators also causes imbalances in the ecosystems from which they have been removed, allowing overpopulation and declines among other species that share their habitats. Thus, conserving North America's cats is integral to protecting the continent's wildlife heritage and to saving many of the pristine, wild places that still remain.

Stemming from an international workshop held by the National Wildlife Federation in February 2000, *Endangered Cats of North America* takes a comprehensive look at the issues facing cats in the United States, Canada, and Mexico and offers recommendations that address some of the most critical of these problems. The report also assesses conservation needs and offers recommendations for moving several specific cat species and subspecies closer to recovery. The recommendations listed throughout the body of the report reflect the proceedings of the Endangered Cats of North America workshop. The report concludes with priorities that the National Wildlife Federation identifies as critical to moving North America's cats toward recovery.

Common Issues in North American Cat Conservation

Habitat Loss, Degradation, and Fragmentation: Habitat loss, due to a variety of human activities, is now the single greatest threat to the persistence of North America's cats. Ensuring the long-term health of North American cat populations depends upon successful efforts to: 1) conserve and manage current occupied cat habitat; 2) protect areas of historic habitat that might one day support cat populations again; 3) create wildlife travel corridors between the areas of habitat that currently exist; and 4) manage human activities to conserve cat habitat.

Roads and Road Mortality: Roads are a significant — and perhaps the most underpublicized — threat to North American cats. Not only do they place individual cats at risk of mortality, but they can threaten entire populations by isolating cats into fragments of habitat, limiting opportunities for dispersal, and even increasing risk of inbreeding or territorial competition between cats. Including wildlife culverts, bridges, and underpasses on both new and existing roads is central to reducing these impacts. But success in reducing the negative effects of roads on cats will also demand cooperation between wildlife and transportation agencies. The public must also play a key role, both by opposing road alignments that directly threaten cat populations and by advocating for the inclusion of proper wildlife passages.

Public Perception of Cats: Many people actively support efforts to protect cats in North America; however, fear and misunderstanding of cats still complicate efforts to conserve them throughout the continent. People and cats can co-exist peacefully, but broadening the base of sup-

port for cat conservation will require addressing human concerns. Educating people about how human activities influence cat behavior and encouraging community involvement in government cat conservation efforts will be critical to building this support.

Reintroduction of Endangered Cats: In some cases, reintroducing cats to former habitat areas is critical to their recovery. These efforts, however, can be very controversial. Furthermore, lack of adequate habitat can hinder reintroduction efforts, especially in areas from which cats have already been eliminated. Successful reintroductions will thus depend upon: 1) adequate public outreach to address concerns about the presence of imperiled cats; and 2) land conservation efforts in both present and historic cat habitats.

Working With Private Landowners: Because a significant portion of cat habitat in the U.S., Canada, and Mexico is privately owned, addressing the needs and concerns of private landowners is essential to successful conservation of North America's endangered cats. Both protections for cat populations that rely upon private lands and landowner support for conservation efforts on their property can be improved by: 1) identifying the presence of imperiled cats on private lands; 2) addressing landowner concerns about cat interactions with livestock; 3) creating incentives to conserve native habitat on private lands; and 4) identifying the private landowner's role in conserving cats.

Conservation Recommendations for Individual Cats

Florida Panther: With only roughly 60 individuals surviving in the wild, the Florida panther is the most immediately endangered of North America's remaining cats. Habitat loss is the most critical threat facing this subspecies. Recovering the panther will require aggressive protections that will significantly change current approaches to land management practices in south Florida. Other concerns include: 1) preserving the unique genetic traits of this subspecies; 2) improving the use of resources to protect panthers; 3) reestablishing additional populations of panthers in historic habitat—as the U.S. Fish and Wildlife Service calls for in its recovery plan; and 4) improving political leadership to ensure that the subspecies is properly protected.

Border Cats: All three cats that cross the U.S.-Mexico border—the ocelot, jaguarundi, and jaguar—rely upon protections on both sides of the border to help their populations recover. Key conservation efforts for ocelots and jaguarundis along the south Texas border include the following: 1) addressing habitat loss and fragmentation, particularly conversion for agriculture, urban sprawl, and large-scale destruction for charcoal production in Mexico; 2) minimizing fragmentation and mortalities due to roads; and 3) research, public education, and outreach to raise the public profile of these cats and their conservation needs. Conservation priorities for jaguars include: 1) slowing habitat loss due to deforestation, agriculture, and urban development; 2) improving public perception of jaguars and helping ranchers in Mexico to reduce risks of livestock depredation; 3) research and public outreach concerning the jaguar's historic range, especially in the U.S.; and 4) increased international cooperation in research and conservation efforts.

Canada Lynx: The greatest barrier to recovering Canada lynx in the southern part of their range is insufficient scientific knowledge about their life history and habitat requirements. Major questions remain about the primary causes for lynx decline and the most pressing actions needed to recover the species. Clear conservation needs include: 1) developing new forest management protocols that minimize the impacts of forestry on lynx and their prey species; 2) cooperating with private landowners to encourage voluntary habitat conservation for lynx; and 3) increasing international cooperation to protect lynx across the U.S.-Canada border.

Cougars: Although cougar populations are generally considered to be increasing in the western U.S., these cats still face

significant threats to their long-term survival in North America—primarily the loss of habitat. In addition, public perception of cougars and a lack of baseline information on cougar populations complicate efforts to conserve this species in western North America. In the long-term, conserving cougars throughout the West will require proactive, conservation-minded management of the species and citizen involvement in the process. Key steps toward better protecting cougars in the West include: 1) monitoring development to avoid fragmenting habitat or increasing human presence in cougar habitats; 2) improving public understanding about factors that may contribute to cougar-human or cougar-livestock conflicts; 3) comprehensive studies of cougar populations throughout the West to determine population viability; and 4) increased citizen involvement in cougar management decisions. While the eastern cougar subspecies is presumed extinct, confirmed cougar presence in the East raises conservation questions regarding these cats and their habitat. Conservation efforts for cougars in the East should stress public education campaigns and research to determine the true status of these cats.

NWF Recommendations

The National Wildlife Federation has identified the following actions as critical to helping North American cats toward recovery:

- Incorporate habitat protection and wildlife-corridor protection into development and transportation plans.
- Increase activist involvement in protecting cats and their habitats at both local and national levels.
- Increase public access to tools that can help cats toward recovery at the local level.
- Adopt pro-active, conservation-based approaches to the management of cats that are currently less endangered.
- Stress cross-border protections for cats and landscape-scale habitat conservation through national legislation, collaborative research, and cooperative, international conservation efforts.
- Increase funding and research for in-depth studies of feline conservation needs.
- Increase public awareness about North American endangered cats and their conservation needs.

Ensuring the survival of North America's endangered cats will require bold and aggressive conservation efforts throughout their ranges in Canada, the U.S., and Mexico. Protecting these cats for the long term requires vigilance and commitment from governments and national and regional wildlife agencies; innovative conservation strategies for managing both public and private lands; international strategies for protecting cats across political borders; and a rigorous approach to managing human activities that affect cats and their habitats. Making progress on most of these goals will require broad and vocal public support for cat conservation. Thus, citizens throughout North America play a critical role in conserving native wild cats—from advocating for their protection to contributing individually to their recovery.

The *Endangered Cats of North America* report offers a long list of critical next steps to save North America's wild cats. We hope this report will help organizations and individuals to identify ways they can contribute to cat conservation and spur broader public involvement in ongoing efforts to protect this continent's precious wildlife heritage.

COMMON ISSUES IN NORTH AMERICAN CAT CONSERVATION

Habitat loss is now the single greatest threat to the existence of North America's cats. The destruction of forests for charcoal production has become an increasing problem for cats in northeast Mexico.

Why Care About Cats?

Panthers, ocelots, jaguarundis, lynx: Cats are among the wildest and most powerful creatures that inhabit our landscape, at once sleek and powerful, mysterious and breath-taking. Throughout North America, wild cats have left their mark on our landscapes, our folklore, and our experience of the wild. Those who have glimpsed a jaguar in the wild or heard a cougar's scream carry over a silent landscape might say these experiences are some of the last echoes of true wilderness in America. Cats are powerful icons for pristine, wild space in the United States, Canada, and Mexico, and, for many, they conjure up ethical, spiritual, and aesthetic reasons for preserving their place in the American landscape.

Beyond these more subjective arguments for conserving cats, there is also increasing scientific evidence that points to the critical role large carnivores play in regulating the ecosystems they inhabit. As top-level predators, these cats exert a force on their ecosystems which balances populations of their direct prey and helps to maintain native biodiversity at multiple levels of the food chain. When top carnivores disappear, this delicate balance is destroyed.

The loss of cougars and other top carnivores in the eastern U.S., for instance, has likely contributed to the exploding numbers of white-tailed deer in this region. Elimination of dominant carnivores can also lead to growing populations of small- and mid-sized carnivores, such as raccoons, opossums, and skunks. Overpopulation among these animals puts greater pressure on a variety of other wildlife, such as songbirds, ground-nesting birds, and many other small animals, many of which play critical roles in dispersing seeds and preserving the diversity of ecosystems.

Most of North America's top carnivores are now restricted to small fractions of their original ranges. Cats are no exception. Even the cougar, which is still quite numerous in some regions, has been eliminated from roughly two-thirds of its historic range on this continent.[1] The bobcat, too, is beginning to show signs of decline in regions where its habitat has been most heavily impacted. Populations of North America's other cats are yet more imperiled. Some, like the Florida panther, have been pushed to the very brink of extinction. Most of North America's cats are protected by law in one or more countries, but in almost every case, their populations continue to struggle against a variety of threats.

Unfortunately, as science sheds more light on the crucial role these predators play in the natural world, the question of how best to save them remains largely unanswered. Because these cats rely upon a variety of private, public, and indigenous lands, their conservation demands cooperation between governments and individuals as well as across international boundaries. Because they are wide-ranging, their conservation requires innovative means of protecting their habitats, from land preservation to sustainable land uses to selective human development and urban growth. Scientists still have much to learn about cats' precise ecological needs, and efforts to conserve cats and the landscapes they inhabit will demand bold actions. But these challenges also represent a great opportunity to conserve not only North America's cats but also the ecosystems they depend upon. Protecting these predators will help to ensure the health of the many landscapes they inhabit and extend conservation benefits to all the species that share these habitats.

Losing top carnivores alters the ecological balance of native landscapes. Their disappearance could set off a range of ecological effects that pushes other species toward extinction and changes the biodiversity of our world. Successful efforts to save these important, wide-ranging carnivores, however, will benefit hosts of species that inhabit the same ecosystems.

HABITAT LOSS, DEGRADATION, AND FRAGMENTATION

North American cats need a lot of space to survive. Whether big or small, these wild cats are wide-ranging animals that require substantial territory to support them and their prey: Jaguars, the largest North American cat, can require home territories of roughly 10 to 20 square miles,[2] depending upon habitat conditions; ocelots, which are significantly smaller cats, still typically need around six square miles per cat.[3] Because they are all solitary animals, North American cats also require sufficient habitat for juveniles to disperse and establish new territories. For these reasons, preserving substantial wild areas is essential to the long-term survival of all North America's cats— whether they currently have stable populations or they are critically endangered.

Increasing human activities, however, continually encroach upon previously wild areas, reducing viable habitat for cats and limiting their ability to hunt, den, and disperse. Habitat loss is now the single greatest threat to the existence of North America's cats. Destruction of habitat often isolates cat populations that previously inhabited connected territories. Fragmenting populations can lead to genetic depression, competition for territory, and, ultimately, extirpation or extinction. Wild cats' ability to flourish in North America over the long-term depends largely on efforts to: **1) conserve and manage current occupied cat habitat; 2) protect areas of historic habitat that might one day support cat populations again; 3) create wildlife travel corridors between areas of habitat that currently exist; and 4) manage human activities to conserve cat habitat.**

Wildlife agencies face the double challenge of first identifying key cat habitats and then protecting them. It is often difficult for scientists and wildlife managers to determine precisely how much cat habitat is "enough." Determining dispersal and use patterns, counting populations accurately, and modeling habitat needs often requires extensive scientific research and enhanced resources. Comprehensive studies can take years to complete.

Ideally, habitat conservation would protect both core habitat areas and wildlife travel corridors that permit cats to disperse; however, enacting such broad land conservation strategies requires coordinating wildlife habitat protections with myriad demands on wild spaces—from agricultural needs to urban development to private and industry land-use decisions.

Strategies for Addressing Habitat Loss

Conserve Existing Cat Habitat

Although many acres of wild lands have been degraded or destroyed in the United States, Canada, and Mexico, important areas still do support cats. Conserving these lands is vital to helping North America's wild cats survive. In areas like Florida, Texas, and California, where native habitat has been so greatly reduced that it may limit the size of panther, ocelot, and, in some cases, cougar populations, conservation efforts must focus on preserving what little native land is left and then protecting additional wilderness areas. Where extensive cat habitat still remains, conservation efforts should target strategic protection of these areas in order to maintain their integrity.

Conserving habitat in areas from which cats have been eliminated is often equally important. For example, the recovery strategy for the Florida panther calls for the establishment of three viable populations of the subspecies throughout its historic range. This will require that the cats colonize more habitat than they currently occupy, whether independently or with human assistance. Similarly, if cougars are ever reestablished in the eastern U.S. and Canada, or ocelots, in southern Arizona, these cats will require core areas and travel corridors between populations to sustain themselves.

Protect Wildlife Travel Corridors

Establishing wildlife travel corridors is an effective way of mitigating habitat loss and fragmentation. Ranging from a few feet wide to hundreds of yards across, these corridors provide cats with safe, natural areas for travel along common routes,

permit cats to disperse into new areas, and maximize the exchange of genetic material between populations. Corridors also provide valuable habitat for a variety of other wildlife species, including prey species.

In Texas, U.S. Fish and Wildlife biologists have used geographic information systems (GIS) to map areas of important ocelot habitat and identify optimal links between these larger tracts of land. The Fish and Wildlife Service is currently working to purchase and protect the identified areas in order to permit now-isolated ocelot populations to expand and disperse into additional areas. The agency is also working with private landowners in the region to maintain existing wildlife corridors and key habitats for ocelots on their lands.

Manage Human Activities to Conserve Cat Habitat

Resource extraction and the conversion of cat habitat for agricultural, industrial, and urban uses puts substantial pressure on North American cats and their prey. Unsustainable forest management practices, for instance, lead to the destruction of primary forest across southern Canada and much of the northern U.S., with potential impacts on lynx and their prey. In parts of northern Mexico, large-scale cattle ranches impact the native vegetation and may have contributed to the decline of jaguars in this area. And in regions of all three North American countries, expanding urban areas destroy and fragment cats' ranges.

Efforts that promote sustainable growth and uses of natural resources are essential to preserving large, contiguous habitat areas for cats — as well as many other species that depend upon these ecosystems. For example, agriculture and livestock producers can help cats by maintaining areas of native habitat on their lands and avoiding overgrazing. Sustainable forestry practices can also help to reduce impacts on cats and their prey. In Florida, citizens are fighting destructive sprawl by pressuring county governments to honor established urban boundaries and restrict development in outlying areas — some of the last fragments of remaining panther habitat.

Saving Wild Spaces for Cats

Action: Identify important habitats for specific cat populations through studies of population demographics, habitat needs, and dispersal patterns. These studies should form the basis for recommendations that will ensure the long-term viability of cat populations. Projects should focus primarily on imperiled populations and all cats living near areas intensely affected by human activities.
Who: Scientists, wildlife agencies.

Action: Give priority to financing habitat identification projects.
Who: Conservation funders.

Action: Conserve cat habitat on private lands and establish programs to assist landowners in balancing their land uses with cat needs. Efforts should target conserving core areas and wildlife travel corridors.
Who: Government agencies, environmental groups, private landowners.

Action: Examine ideal paths for corridors between core habitat areas in both present-day and historic range.
Who: Government agencies, scientists, the public.

Action: Provide funding for projects that protect large-scale reserves and wildlife travel corridors.
Who: National and regional governments.

Action: Manage urban growth and other human activities to conserve key habitats and wildlife corridors for cats.
Who: Permitting agencies, local governments.

Action: Protect historic cat habitat in order to preserve opportunities for reintroduction or reestablishment and to guard against other environmental factors that require cats to disperse into new areas.
Who: Government agencies, scientists, environmental groups.

ROADS & ROAD MORTALITY

Roads are a significant impediment to the survival of endangered cats, threatening both individual animals and the integrity of entire populations. Roads and highways create barriers to dispersing cats by fragmenting core habitat areas and bisecting important wildlife travel corridors. They can deter individuals from trying to cross, effectively trapping these cats into smaller parcels of habitat. Roads can also exacerbate the problems of already shrinking habitat by driving cats away from the noise and lights associated with busy thoroughfares. Even small, less-traveled roads can be barriers: Ocelots tend to avoid open spaces and may not choose to cross roads even in the absence of traffic, and studies have shown that cougars and bobcats both prefer unimproved roads and trails over paved or improved roads.[4] As fragmentation increases, cats isolated to a piece of land approach carrying capacity: The prey base may become insufficient, and, for cats such as cougars and ocelots, pressures to disperse and establish home ranges may lead to competitive fights between individuals over territory, which can end with the death of one or both cats. Additional indirect impacts of roads can include incidental trapping and targeted poaching of both cats and their prey, as these byways permit humans into previously sheltered areas.[5]

Roads also bring the direct threat of collisions with motor vehicles—a leading cause of death in many of North America's endangered cat populations. Road-caused mortality can have a significant impact on the viability of cat populations. In Texas, for example, ocelots face such high road-kill mortality that they may not be able to reproduce fast enough to compensate for annual losses. Road kill is the primary human-caused reason for mortality in Florida panthers, responsible for at least 20 documented deaths between 1978 and 1994.[6] Even more numerous cougar populations in the West are impacted by vehicle-caused mortality. For example, the state of Montana documented 43 cougar fatalities due to collisions with cars, trucks, and trains between 1988 and 1994, making vehicle collisions second only to hunting as a cause of mortality in the state's mountain lion populations.[7]

Strategies for Minimizing the Impacts of Roads on Cats

Include Wildlife Culverts, Bridges, and Underpasses

Properly designed wildlife bridges, culverts, and underpasses (see photo, p.17) have proven to be effective in reducing road kills in several regions, including south Florida and Banff National Park in Alberta, Canada. These passages help to protect individual animals, improve the safety of drivers, and encourage cats to disperse into new habitat. If wildlife passages are strategically placed, they can encourage cats to travel along established dispersal routes and into areas of prime habitat and can be a tool for preserving and even protecting important wild areas for cats.

Unfortunately, wildlife passages are often excluded from new road-building projects or not added to existing roads. When they are created, these manmade corridors are often built or placed ineffectively. If culverts are to be effective in protecting wild cats, they must be strategically situated and appropriately constructed. For example, culverts for ocelots in south Texas have typically been too small, poorly located, hidden from view, or filled with water. All of these factors deter cats from using them. Fencing or other barriers must also be provided to encourage cats to use the passages and not to go around them.

In order to be effective deterrents to road kill, wildlife passages should be built at locations that cats are already known to use. For example, in Florida, where vehicles have long been a primary cause of panther mortality, panthers use only five of the 20 underpasses that have been constructed along Interstate 75. The most frequently used underpasses are those that were intentionally constructed along established panther travel corridors (i.e., areas that panthers were already using). These five passages have been extremely effective in keeping cats and other wildlife off the highway.

Increase Interagency Cooperation

Reducing the impact of roads on imperiled cats will require cooperation between wildlife agencies and transportation agencies on local, national, and international levels. State transportation departments are sometimes reluctant to include culverts, bridges, or underpasses in road-building plans—or to construct passages along established roads in areas used by cats—because of increased costs. Including adequate wildlife passages at the outset of road construction or improvements, however, can prevent massive expenditures and delays that arise if culverts are required at a later time.

Increase Public Involvement

A lack of public support for the impacts of road kill on imperiled wildlife often leaves wildlife management officials alone in calling for solutions to this problem. In truth, a variety of other groups can lend their support to this issue, helping to raise awareness about this issue and the significance of roads and road kill on cats. As wide-ranging, top-level predators, cats are the keystone species for many North American ecosystems and an excellent illustration of the negative impacts of roads.

Educating and involving the public must be a regional and national priority for environmental organizations. Private environmental groups should initiate campaigns to raise awareness about roads and imperiled wildlife. In areas such as Texas and Florida where road kill has a significant impact on endangered cats and other animals, environmental organizations, wildlife educators, zoos, and state and national parks can conduct campaigns to raise public awareness about road kill and its impacts on native wildlife (e.g., educational signs, brochures, and programs). Citizens can write letters to state and federal transportation departments and to local elected officials to request additional and improved culverts or underpasses for cats and other species. Citizens and environmental groups might also work to emphasize the effectiveness of culverts and underpasses in reducing driver injuries from automobile collisions with cats or other wildlife.

Reducing the Effects of Roads on Cats

Action: Identify road projects that may have a negative impact on cats and other wildlife. New road locations should be carefully assessed for their impacts on large-scale habitats.
Who: Wildlife management agencies, environmental organizations, the public.

Action: Encourage interagency consultation in aligning and constructing roads.
Who: National governments.

Action: Locate routes currently used by cats for travel through GIS and radio-tracking.
Who: Scientists, wildlife agencies.

Action: Use GIS ad radio-tracking data to identify optimal locations for wildlife passages.
Who: Wildlife agencies, transportation agencies.

Action: Encourage regional or national governments to require properly sited and well-maintained wildlife passages for all new roads that affect endangered species' dispersal or travel patterns.
Who: Environmental groups, citizen activists.

Action: Employ proven methods for reducing road kill along new and existing roads in cat habitats.
Who: Transportation agencies, planning agencies, wildlife agencies.

Action: Publicize the impacts of roads on wildlife.
Who: Environmental organizations.

Action: Encourage public involvement in road-building processes, including holding agencies responsible for the impacts of federally funded projects on endangered cats.
Who: Environmental organizations.

PUBLIC PERCEPTION OF CATS

Although many people actively support protections for North American cats, some still view large wild cats as threatening and deadly predators. In some regions, people tend to fear cats rather than accept their presence as part of the native landscape. In Mexico, for example, where jaguars are known to prey on livestock, ranchers often shoot these cats on sight. A recent rise in human-cougar conflicts in the western United States and Canada—all well-publicized—has contributed to some people's fears of these cats. Unfortunately, human activities that increase the chances of these incidents are less well published. In rare cases of human mortality, offending cougars are typically caught and killed. While there are defensible arguments for removing "problem" cats that pose a direct threat to human safety, the public is generally unaware of the role that their own activities play in exacerbating human-cat conflict, much less the ecological impacts of removing cats from wild populations. While ensuring human and livestock safety will always be fundamental to building public support for cat conservation, helping people to understand how their actions can reduce human-cat conflicts, and thus cat mortalities, is equally important to preserving cats over the long term.

Smaller cats, such as ocelots, jaguarundi, lynx, and bobcats, do not give rise to the same fears for human safety. Along with their larger feline cousins, however, the presence of these cats raises concerns about burdensome government interference. Private landowners in the U.S. often fear that having a federally listed cat on their property will invite federal government involvement in all their future land use decisions. Despite indications that much of the general public supports cat conservation, opponents of these efforts tend to be the most organized and vocal in their concerns. Thus, endangered cats often suffer from the absence of a strong constituency that advocates for their protection in response to aggressive opposition.

Strategies for Building Public Support for Cats

Initiate Educational Campaigns

Public perception of cats is often based in fear or misunderstanding. Press coverage often contributes to these perceptions by portraying cats as vicious stalkers and heavily publicizing attacks without addressing the role human activities play in human-cat conflicts. By contrast, increasing media coverage of endangered cats and the threats they face might help to build understanding—and ultimately support—for North American cat conservation. From television documentaries and large-format films to radio stories and editorials in local newspapers, increasing the general public's knowledge about North American cats and the threats they face could help build public support for their conservation. Broader educational campaigns can also contribute to increased public support for cat conservation. Many experts believe that reaching children and young adults with conservation messages will eventually change common public perceptions of cats. Environmental groups can also help to raise awareness about cats by promoting them as keystone species for ecosystem conservation and encouraging public support for protection and recovery.

How Media & Education Strategies Can Help Cats

- *Reduce public fears by explaining how increasing human activities affect cats, their behavior, and their habitat.*
- *Avoid exploiting human-cat conflict incidents by presenting them as sensational news. Be sure to provide balanced information about the factors that contribute to such attacks.*
- *Make an effort to retract stories of alleged cougar or jaguar attacks that were later disproved.*

Finally, in coordinating campaigns to capture public attention and support for cat conservation, scientists and conservationists must increase their efforts to collaborate and share research about wild cats. While activists and researchers often work on the same cat conservation issues, they rarely work together. Environmental groups and researchers should prioritize efforts to support each other by sharing data, increasing communication to reduce replication of studies and efforts, and by properly using and explaining scientific data in conservation campaigns.

Increase Community Involvement in Government Decisionmaking

Whether setting hunting limits or planning for reintroductions, many experts believe it is imperative that government agencies make cat conservation decisions more transparent and incorporate public involvement into the decision-making process. Management decisions for cats in North America often do neither. For example, some researchers and environmental nonprofit organizations claim that it is difficult to uncover how state wildlife agencies set hunting limits for cougars in the West; some claim that these limits are determined unscientifically and arbitrarily. Similarly, decisions about road alignments or suburban developments may be made without opportunities for public comment. Government agencies should make information that affects cat conservation available to the public, including data used to determine hunting limits or assess the viability of certain populations. Greater transparency in cat-management decisions—including reintroduction plans that might affect private landowners or raise public safety issues—would foster greater trust and collaboration between researchers, state wildlife agencies, and environmental organizations and help clarify the conservation goals of wildlife agencies.

Building Public Support for Cats

Action: Create and disseminate educational materials about cats to school libraries and educators. Send cat experts to local schools to talk about cats and their conservation needs.
Who: Environmental groups, wildlife agencies, zoos.

Action: Reach out to the public through children's books, articles, and television shows about cats.
Who: Artists, writers, citizen activists.

Action: Create exhibits that teach visitors about endangered cats in their region.
Who: Zoos, science museums.

REINTRODUCTION OF ENDANGERED CATS

Reintroducing cats is not always necessary to recover their declining populations in North America; however, in some instances, reintroduction is needed to conserve cats or specific populations. In cases where the species or subspecies has been reduced to unsustainable levels or in areas where cats have been extirpated over large portions of their historic range and adequate habitat exists to reestablish populations, reintroduction is often a high priority. Nonetheless, reintroduction efforts for large carnivores are often extremely controversial. Attempts to reestablish lynx in Colorado and to assess the viability of panthers in north Florida have demonstrated both the potential problems associated with reintroduction and the success that such efforts can produce in returning a species to its former habitat.

Reintroduction raises a number of challenges, ranging from coordination between a variety of government agencies to disputes among various stakeholders regarding how or whether a species should be reintroduced. Experts identified public concern about cat presence and land conservation as the most critical challenges in reintroduction efforts.

Strategies for Building Support for Reintroductions

Address Public Concern about the Presence of Cats

Public opposition to cat reintroduction is based on a variety of factors: fear for the safety of people, their pets, and their livestock; concerns about the potential for increased government interference in private-sector land management decisions; and resistance to any action that might increase governmental presence in the region.

Improving public acceptance of reintroduction efforts for imperiled cats will rely largely upon effective public education and outreach. Failure to inform the public adequately about reintroduction projects and expectations for their success or failure can be damaging to efforts to reestablish cats and can undermine public support for these bold conservation actions. For example, when the Colorado Division of Wildlife released 41 Canada lynx into the San Juan mountains in 1999, the agency was criticized by the public for some aspects of the reintroduction. The entire project, from capturing lynx in Canada to releasing them in Colorado, happened very quickly. Although the agency attempted to involve the public in the reintroduction process through a series of meetings in 1998 and did build some support through this process, their efforts were not extensive enough to alleviate many public concerns about lynx presence—a species that was on the verge of receiving federal protection. In addition, when several of the lynx died over the first few months of the reintroduction, due primarily to a hasty reintroduction schedule and a release protocol that did not allow time for the cats to recover from the stress of capture before they were released, much of the public was outraged, and the initial effort received very negative press.

Similar problems arose around an experiment in north Florida to assess the viability of panther habitat in the Okefenokee ecosystem. Several Texas cougars were released into the area in 1993 and carefully tracked in order to document available range, sufficiency of prey, and the potential for human-panther conflicts. Biologically, the project was a success, but there were some small, vocal groups that opposed the project locally, complicating the political success of the experiment.

In both of these cases, negative public reception might have been averted through more extensive education and outreach prior to the arrival of the cats. Specifically, experts believe that citizens in the affected region need to be involved in crafting management plans and made aware of objectives and possible outcomes of the reintroduction efforts. By increasing opportunities for citizen involvement in the development of reintroduction plans, wildlife managers can greatly improve people's acceptance of reintroduction efforts.

Conserve Land in Present and Historic Habitats

Wildlife managers and agencies have experimented with reestablishing cats in two ways: by encouraging individuals to disperse and colonize former areas naturally and by physically placing cats in a former habitat. Facilitating the natural dispersal of cats is usually preferable because it is less costly and less politically controversial than releasing captive or wild-caught cats. Natural reestablishment only works, however, where suitable land and migration corridors exist and where populations are numerous enough to spread out and colonize new areas. In some regions, cats have been so effectively extirpated that physically placing cats is the only way to bring them back. For example, if cougars were to be reestablished in wild lands along the East Coast, they would need to be brought in and released. Similarly, lynx could not have recolonized Colorado on their own, since no corridors existed to permit the cats to cross the Red Desert in southwest Wyoming. Furthermore, because lynx are relatively rare in the southern regions of their range, and because their numbers fluctuate so greatly in response to various ecological factors, scientists do not expect them to repopulate much of their former southern range naturally for many years, if ever. They simply cannot reproduce and disperse quickly enough. If conservationists wish to take meaningful steps to reestablish lynx in their southern range, the species must be reintroduced by humans.

In either case, sufficient core areas must be maintained to support cats, taking into account feline population growth and future dispersal needs. Government agencies and private environmental organizations should work strategically to protect key core habitats and wildlife corridors in order to promote natural dispersal of existing endangered cat populations. Where specific cats have been entirely extirpated from the landscape—such as in the Appalachian mountain range and other lands along the East Coast or in regions of south Texas and Arizona—wildlife managers and local and national governments must work to conserve pristine historic habitats with an eye towards future or potential colonization or reintroduction.

Building Support for Reintroduction Efforts Within Local Communities

Action: Make strong efforts to reach out to local communities and explain why reintroducing cats is necessary and positive for the region.
Who: Wildlife managers, scientists.

Action: Explain to the public the goals of the reintroduction, the activities wildlife agencies will be undertaking, and any anticipated obstacles. Identifying problems before cats are brought in will reduce negative media and potential public resistance to the reintroduction.
Who: Wildlife managers.

Action: Address stakeholder concerns in order to alleviate fear and resentment towards the cats.
Who: Wildlife agencies.

Action: Create a clear, public plan for addressing human-cat conflicts or livestock depredation incidents. Assure local communities and stakeholders that they will be responsive to any management problems that may arise.
Who: Government agencies.

WORKING WITH PRIVATE LANDOWNERS

Addressing the needs and concerns of private landowners is essential to successful conservation of North America's endangered cats. A significant portion of cat habitat in the United States, Canada, and Mexico is under private ownership, and private landowners are often a vocal constituency in response to cat conservation initiatives. Some private landowners are reluctant to report sightings of endangered cats on their property out of concern that the cats' presence may lead to restrictions on their land-use decisions. Others oppose efforts to restore or reintroduce cats because they fear impacts on their livestock, pets, agricultural practices, or even on human safety. Yet others are willing to maintain and expand cat populations on their land, but have neither the knowledge nor the resources necessary to help endangered cats. Because so much important cat habitat lies on private lands, it is important for conservationists and wildlife agencies to work with landowners towards the goal of preserving cats and the ecosystems they inhabit.

Strategies for Improving Cat Conservation on Private Lands

Identify Cats' Presence on Private Lands

Many private landowners in the U.S. are reluctant to report cats on their land or to allow government wildlife officials to identify endangered cats that reside on their property out of fear that the government will impose cumbersome restrictions on their land uses. In truth, endangered species legislation in the U.S. permits a great deal of flexibility for private landowners to control how their lands are managed, even when endangered species are present. Furthermore, wildlife agencies in the U.S. are increasingly working to involve private landowners in voluntary conservation. Wildlife managers can play an important role in building affinity for wild cats and their conservation by acknowledging that the presence of endangered cats on private land is a sign of responsible land management. Officials should approach private landowners constructively, stressing how certain land-use decisions support endangered cats and taking time to explain how cat presence on private lands might affect management decisions.

Locally, wildlife managers and agencies should make it a priority to work cooperatively with landowners to monitor and protect cats on their land. For example, using noninvasive techniques such as infrared cameras or hair snags (see p. 43) to identify the presence of cats on private land requires minimal government presence and is thus less threatening. In south Texas, a state where approximately 97 percent of the land is privately owned, ocelot biologists have worked successfully with private landowners to monitor ocelots on private lands and encouraged some landowners to manage their land to protect areas of native habitat.

Address Concerns About Cat Populations and Livestock

In order to promote large-cat conservation among private landowners, wildlife managers and environmental groups must address landowner concerns about cats' preying on livestock. Education, management flexibility, and building public trust in the government's wildlife management strategies are fundamental to reducing opposition to cat presence among the agricultural communities in the U.S., Mexico, and Canada. Experts suggest several strategies to build private-landowner tolerance for feline presence, which range from teaching landowners how to support cats' natural prey base to reducing chances of livestock-cat conflicts to creating depredation funds that reimburse ranchers for livestock killed by cougars or jaguars.

Create Incentives to Conserve Native Habitat

Many landowners would prefer to keep a portion of their land in a natural state, but they cannot afford to maintain large tracts of unproductive land. Furthermore, in many areas—notably key regions for panthers in Florida and for ocelots in south Texas—it has become less profitable to keep land in agriculture than to sell it for development. Despite some landowners' best intentions, when faced with a decision about land use, financial gain often wins out over helping wildlife.

Most cat conservation experts agree that financial incentives to promote habitat conservation on privately owned lands are

necessary. Such incentives would be helpful in amassing protected lands for cats as well as in protecting specific core areas and wildlife linkages that are of particular importance to cat populations. Both government agencies and private sources can play a role in creating positive incentives for preserving cat habitat. For example, governments could offer tax incentives to individuals who inherit land and are willing to preserve it for conservation purposes, and either government or private entities could create conservation funds for the purchase of wildlife corridors on private land in key areas designated by state and federal wildlife management agencies.

Increase Private Landowner Role in Conservation

Many landowners simply do not realize there are cost-effective ways to manage their land while also providing suitable habitat for cats. Cat conservationists and scientists must work to educate private landowners about the ecological importance of preserving cats and offer them low-cost or government-funded options for helping these endangered species. For instance, agencies should provide literature to ranchers and other landowners that teaches them to incorporate conservation activities into the management of their land at little or no cost.

Initiating regional and local conservation projects that focus on native species can be an effective way to increase support for private landowner involvement in conservation. For instance, Texas administers a landowner incentive program through the Texas Parks and Wildlife Department, which offers grants to landowners for voluntary conservation actions that enhance habitat for imperiled species. The state also provides free technical assistance to landowners who wish to improve natural habitat on their lands. Many landowners are unaware that these programs exist. In order to make these programs more effective, they must be widely publicized and funds must be readily available. Local and regional wildlife managers must promote these opportunities to private landowners in their areas and help make the funds available to them.

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FLORIDA PANTHER

Without aggressive measures to conserve the Florida panther's habitat and protect the few remaining individuals, this rare cat will not continue to survive.

With only roughly 60 adults surviving in the wild, the Florida panther (*Puma concolor coryi*) is the most endangered of North America's remaining cats. Once quite numerous across the Southeast, these cats have been virtually eliminated due to historic overhunting and continuing habitat loss and degradation. The panther has also been the subject of more controversy and attention than any other North American cat, from its prominence on license plates to the heated debates it sparks about the rights of private landowners. Yet despite its high profile, without aggressive measures to conserve the Florida panther's habitat and protect the few remaining individuals, this rare cat will not continue to survive.

Already, many experts believe that the health of the Florida panther subspecies has suffered due to inbreeding, as problems such as infertility and heart abnormalities have emerged in wild panthers. The introduction of eight Texas cougar females into the Florida panther population in 1995 has brought new genetic material to the population and seems to have corrected some of the problems generally attributed to inbreeding. Without careful management, however, the Florida panther may risk the loss of its genetic integrity, as the *coryi* subspecies mixes with its closely related subspecies, *Puma concolor stanleyana.*

Preserving quality habitat and sufficient space for the Florida panther is essential to its survival. The remaining area of southwest Florida that panthers now inhabit—a region lying almost exclusively south of the Caloosahatchee River—is under intense pressures from agriculture, urban and industrial development, resource extraction, and road construction. As prime habitat is developed, the panther is increasingly pushed into lesser-quality habitat. Marginal habitat does not support the panther's prey base adequately, and at a certain point, poor habitat becomes insufficient to support the panther itself.

The loss of the Florida panther would have significant ecological and social implications for the region. While conservationists have already undertaken some bold initiatives to save the panther, the panther's conservation still requires aggressive protections that will significantly alter the current approach to land management practices and panther recovery in south Florida. In the longer term, the subspecies' survival will depend upon the cats' ability to expand into additional parts of their historic range, whether through natural dispersal or reintroduction.

Key Issues in Florida Panther Recovery

Habitat Loss and Fragmentation

Loss and degradation of habitat is the single most significant threat to the panther's survival in south Florida. Habitat loss primarily harms panther populations by reducing feeding and denning areas, prey populations, and, ultimately, the carrying capacity of the habitat, which means fewer individuals can survive in a given region. Excessive habitat loss can also exacerbate conflicts between cats over territory and mates. While such conflicts are normal among male panthers as they establish the boundaries of their ranges, these fights—termed intraspecific aggression—are the leading natural cause of panther mortality.[8] Habitat fragmentation is also a critical problem for panthers as it can separate cats from one another, which could lead to genetic depression in smaller subpopulations.

Panthers used to occur throughout most of the Southeast, reaching as far west as eastern Texas and north into Tennessee. Today, the panther's range has been reduced to roughly 2 million acres in southwest Florida, where rapid habitat loss continues to threaten this cat.

While the *coryi* subspecies used to range throughout Florida and most of the Southeast, reaching as far west as eastern Texas and into parts of Tennessee, panthers today inhabit only some 2,176,000 acres in southwest Florida.[9] Roughly half of this occupied range lies in three counties south of the Caloosahatchee River—Collier, Lee, and Hendry. Private lands currently constitute roughly 50 percent of occupied panther habitat,[10] and a majority of this land is held by only a dozen landowners. Meaningful efforts to improve the status of panthers in south Florida must therefore include conservation efforts on private lands.

In 1993, the U.S. Fish and Wildlife Service's *Florida Panther Habitat Preservation Plan* found that the panther's habitat had already reached "minimum threshold levels necessary to prevent extinction."[11] Yet human activities continue to chip away at the panther's last fragments of habitat. Agriculture claims a large portion of panther habitat, as wild lands are converted for cattle grazing, crop, sugar, and citrus production. Land developed for some of these agricultural uses can continue to support panthers and their prey, provided that adequate habitat criteria are met (primarily sufficient natural food sources for panther prey species and cover to permit cats to hunt and den). But as each progressive development claims more native land, clearing brush that is critical to panther denning, travel, and foraging, panthers are increasingly pushed out of remaining habitat. Development for mining similarly impacts the panther by removing crucial habitat and foraging areas—and often paving the way for future housing developments. A group of U.S. Fish and Wildlife Service-appointed experts is currently working to assess the amount of habitat that now remains for panthers in south Florida and to identify the part of this habitat that has already been permitted for development.

As human populations increase along the southwest Florida coast, residential and commercial development increasingly encroaches upon the panther's strongholds, limiting habitat available for feeding and dispersing. For example, both the Fort Myers and Naples metropolitan areas are some of the fastest-growing areas in the U.S. Rapidly developing areas abut the primary protected public lands for the subspecies—the Florida Panther National Wildlife Refuge and Big Cypress National Preserve. Lee and Collier counties are growing at a rapid rate and have traditionally permitted development to sprawl beyond their established urban boundaries, placing the panther at ever-greater risk of extinction.

Road construction poses a direct threat of mortality from vehicles and the attendant threat of sprawling development. Between 1978 and 1994, 20 panthers were killed and six were injured by collisions with cars and trucks.[12] Given that road kill is such a significant cause of panther mortality, building any new road in panther habitat poses a risk to the cat's survival. Such projects must be carefully analyzed for immediate and future impacts on panther recovery.

Unfortunately, economic pressures and inconsistent or poor enforcement of existing regulatory safeguards promote the destruction rather than the conservation of panther habitat in southwest Florida. Increasing human population drives the market for urban development, making it far more lucrative for rural private landowners to sell their land to developers than to leave it in lower-impact agricultural or livestock production or to sell it for conservation purposes. Unless land acquisition for panther conservation can be made a priority, whether through fee title or easement, the Florida panther may be rapidly edged out of existence.

Projects such as the Florida Greenways Program, a statewide effort to preserve Florida's biodiversity by protecting and connecting open spaces, have significant implications for panther conservation. Although no lands have yet been purchased, one panther has already dispersed along the path of proposed land acquisition, indicating the conservation potential of protecting vast, contiguous lands for panthers.

Recommendations:

- **Wildlife agencies** should identify remaining panther habitat in southwestern Florida. Priority habitat areas could be evaluated with the help of geographic information systems (GIS).
- **Wildlife agencies** should acquire priority panther habitat through purchase, easement, or other methods. Agencies should take future reintroduction and dispersal needs into consideration when prioritizing acquisition of Florida panther habitat.
- **Agencies** should develop a coordinated strategy to use mitigation dollars from projects affecting wetlands and Florida panther habitat to acquire new panther habitat.
- Through the Florida Greenways Project, **the state of Florida** should protect linked panther habitats stretching from Collier County to Ocala and the Okefenokee complex. Ideally, all existing habitat south of the Caloosahatchee River should be protected.
- **Environmental organizations** and citizen groups should advocate for meaningful state and local growth management plans that improve existing plans to protect Florida panther habitat.
- **Citizens' groups** should collaborate with activists to organize letter-writing campaigns promoting effective growth-management policies. Letters should target elected officials and developers in Florida.
- **Citizens' groups** should lobby for reevaluation of the cumulative environmental impacts of the Florida interstate highway plan.
- **Government agencies**, **environmental organizations**, and **foundations** should use long-term lease agreements and land acquisition to protect areas under private ownership that can serve as core areas and buffer zones between cat habitat and existing development.

Recovery Plan Basics

The U.S. Fish and Wildlife Service Recovery Plan for the Florida panther has long targeted three main goals for panther recovery. These are:

1) *Preserve the sole remaining populations of panthers in south Florida and protect viable habitat for panthers;*
2) *Establish at least three viable, self-sustaining populations of panthers throughout their historic range; and*
3) *Establish broad, positive public support for Florida panther conservation.*

All three of these objectives are vital to the survival of Florida panthers. While federal agencies have arguably been successful in raising public awareness of the panther's plight, they have been much less aggressive in pursuing the goals of protecting adequate habitat for the single remaining panther population, and they have made minimal progress towards establishing additional populations.

- **Environmental organizations** should design a coordinated campaign to partner with the major private landowners who control panther habitat in south Florida. The campaign should advance better management of lands that support panther populations. The actions of these landowners could serve as a model for demonstrating responsible and cost-effective management of private land in compliance with an effective conservation plan.
- **Environmental organizations** and citizens should advocate for inheritance tax reform to create incentives for the conservation of Florida panther habitat under private ownership.

Preserving the Coryi Subspecies

In the early 1990s, many biologists and wildlife managers working with panthers feared that the *coryi* subspecies would inbreed to the point of extinction. Due to the extremely small number of breeding adults, traits that may be associated with inbreeding appeared—including heart deformities, low sperm count, malformed sperm, and cryptorchidism, a condition by which one or both testicles fails to descend. Fearing that the Florida panther population would go extinct without new genetic material, experts introduced eight female Texas cougars into southwest Florida. By introducing the closest remaining cougar subspecies that historically shared the Florida panther's range, panther biologists hoped to mimic natural dispersal and restore a diverse gene flow within the Florida panther subspecies.

Most experts contend that the project has been successful, already reducing instances of infertility. But others fear that as Florida panthers, Texas cougars, and their offspring breed, the genetic makeup of the *coryi* subspecies may become diluted. They believe that the Texas cougars' presence could eventually harm the Florida panther by creating an artificial population of cross-breeds (arguably destroying the unique biology of the Florida panther subspecies) and thus ultimately jeopardizing the panther's protection under the federal Endangered Species Act. Furthermore, many experts believe that, having served their genetic role, Texas cougars are now taking up valuable habitat in southwest Florida, areas that could be inhabited by "full" Florida panthers. In any case, panther biologists and agencies need to monitor breeding between the cats in south Florida, assess the continued needs for the Texas cats in the panther population, and be proactive about removing the Texas cats if and when this is deemed appropriate.

Recommendations:

- **Environmental organizations** should encourage state and federal wildlife agencies (especially the Florida Fish and Wildlife Conservation Commission) to investigate the appropriateness of introducing captive-bred Florida panthers into the wild as a means to increase genetic diversity.

Reintroduction and Reestablishment

Reintroduction or reestablishment of Florida panther populations north of the Caloosahatchee River is critical to the long-term survival of the subspecies. A single population of panthers can never be considered secure, especially in the face of continual habitat loss. The U.S. Fish and Wildlife Service Recovery Plan calls for establishing at least three viable populations of Florida panthers throughout their historic range in order to reach recovery. Because the extremely limited habitat in south Florida cannot support these cats alone, additional populations would need to be established in other areas of the panther's historic range, which stretches from north Florida, Arkansas, and southern Tennessee to the Atlantic coast.

Natural dispersal north of the Caloosahatchee should also be encouraged in order to alleviate the pressures on the current Florida panther population due to restricted habitat. Between 1998 and early 2000, three male Florida panthers crossed the Caloosahatchee on their own. None, apparently, found females. If females were to be released north of the river, males would most likely remain in this "new" territory, effectively expanding the range of the south Florida population. Dispersal would

ultimately permit the panther population to grow through colonization of available habitat, decreasing crowding of panthers in southwest Florida, and reducing mortalities due to territorial conflicts.

Public education and activism are critical to successful reintroduction and reestablishment efforts. Although opponents to reintroduction in northern Florida are a minority, they are a vocal group. Solid and visible support for establishing additional panther populations within historic range will be necessary to make reintroduction a reality.

Recommendations:

- **Environmental organizations** should organize supporters of Florida panther reintroduction to create a united and vocal coalition to lobby for this effort.
- **Environmental organizations** should develop outreach programs to prepare communities for potential reintroduction of the Florida panther. These programs should: 1) explain management flexibility in reintroduction efforts; 2) build trust with local constituencies; and 3) educate communities about the Florida panther.
- **Environmental organizations** should form partnerships with nontraditional use groups and local citizens to manage land for future panther occupation and allay fears about reintroduction.
- **State and federal wildlife agencies** should utilize geographic information systems (GIS) to evaluate optimal reintroduction sites for the Florida panther, including those that lie outside Florida. The U.S. Fish and Wildlife Service should explore options for reintroducing Florida panthers into the most ecologically and politically appropriate sites within the panther's historic range.
- **States** within the panther's historic range should examine the appropriateness of introducing panthers into additional regions. Wildlife agencies should work with citizens of these states to establish separate populations of Florida panthers within the panther's historic range, as dictated by the recovery plan.

Education / Advocacy Recommendations

Education is an important step towards recovery for all of North America's endangered cats and a key to garnering public support for cat conservation. Because recovery efforts for the Florida panther are politically charged, they will never be successful without dedicated and vocal support from the general public. The following recommendations aim to increase public knowledge about the panther's conservation needs, decrease people's fear of its presence, and help activists become engaged in preserving this important cat.

Environmental organizations should educate people who live in close proximity to Florida panther habitat about living with wildlife and reducing potential human-panther interactions. Educational efforts should also be undertaken in communities that live in potential reintroduction areas.

Educational materials should integrate the needs of other species found in panther habitat into the Florida panther conservation message.

Environmental organizations should organize workshops to address the issues of large-carnivore reintroduction and to share lessons learned from previous reintroduction efforts.

Activists should establish a coalition for panther recovery, incorporating local, state, and federal groups. This coalition could cultivate a strong relationship with a high-ranking, effective panther advocate within the state government.

Educators in the southeastern U.S. should teach students about the Florida panther's history, ecology, and conservation needs as a means of building support for the panther and its restoration.

- **State and federal wildlife agencies, scientists, and environmental organizations** should protect historic panther habitat for future reintroduction and natural dispersal.
- **State and federal wildlife agencies** should facilitate the natural dispersal of the Florida panther from southwestern Florida into areas north of the Caloosahatchee River. Options such as constructing wildlife bridges, expanding wildlife corridors, and releasing females north of the river should be considered a priority in order to encourage natural dispersal and colonization.

Political Will and Leadership

The Florida panther is a charismatic species that has won broad support throughout the state for its recovery. According to a 1995 statewide survey regarding Florida panthers, 91 percent of respondents supported efforts to recover Florida panthers and 83 percent supported reintroduction efforts.[13] A similar survey targeting counties near a proposed panther-reintroduction area in north Florida found 75 percent of residents in favor of reintroduction.[14] Despite broad support for panther recovery, however, both the state and federal governments seem unable to commit to aggressive conservation measures to ensure the species' survival. The 1995 recovery plan for the Florida panther echoed the initial recovery plan in setting a recovery objective of "three viable, self-sustaining populations within the historic range of the [panther]."[15] Yet, aside from the 1995 reintroduction feasibility study, agencies have failed to initiate the reintroduction of even one population into the panther's historic range within the past 20 years.

Furthermore, there is considerable evidence that agencies have failed to protect the panther's habitat adequately. According to a recent National Wildlife Federation lawsuit, the Fish and Wildlife Service, the Army Corps of Engineers, and the Federal Highway Administration have consistently permitted development within panther habitat, including areas that were designated as Priority 1 and Priority 2 habitat by the Florida Panther Interagency Committee's 1993 *Habitat Preservation Plan* (HPP) for the panther. The HPP identifies these Priority 1 and Priority 2 habitats as "essential to maintaining a minimum viable population of 50 breeding adult panthers in south Florida."[16]

In order for the Florida panther to recover, both state and federal agencies will need to commit to pursuing the recovery goals as laid out in the recovery plan and observe the recommendations detailed in the HPP and the U.S. Fish and Wildlife Service's Multi-Species Recovery Plan for South Florida.

Recommendations:

- **Environmental organizations and activists** should target specific political leaders to assess their stance on Florida panthers and encourage them to support Florida panther recovery openly.
- **The federal government** should partner with state agencies, especially the Florida Fish and Wildlife Conservation Commission, to realize the three goals of the Florida Panther Recovery Plan.

Improved Use of Resources

Activists and government officials in Florida have been effective in securing some funding for panther recovery; however, many experts believe that these funds are often utilized in an ineffective or inefficient manner. Activists have been especially critical of the Florida panther license plate program, which funds the Florida Panther Research and Management Trust Fund. Launched in 1990, the license plate has generated significant funding for Florida panthers: License plate sales raised $2.66 million in 1998-1999 and $2.49 million in 1999-2000. According to state statute, the Florida Panther Research and Management Trust Fund should be used to increase panther food sources, determine conflicts between public use and panther survival, maintain genetic variability, and support management and

enforcement activities that protect panther habitat, in addition to educating the public about panthers and their conservation and working towards reestablishing panthers. These funds, however, are often used for other, non-panther efforts. When they are invested in panther conservation, experts contend that they are not directed to the panther's most immediate needs—such as preserving and acquiring habitat or furthering objectives for establishing additional panther populations.

The Auditor General for the state of Florida has undertaken an audit of the Florida Panther Trust Fund to assess whether the Trust monies have been used appropriately. The results of this audit will be made available to the public as of December 2000.

Recommendations:

- **Environmental organizations and citizen advocates** should work to ensure that funds from the Florida panther license plate program are used for the species' most immediate needs, such as acquiring habitat through purchase or easement and managing existing habitat more effectively.

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BORDER CATS

Conservation success for ocelots, jaguarundis, and jaguars in the U.S. depends upon sufficient protections for both the cats and their habitat in Mexico and upon aggressive conservation measures in the U.S.

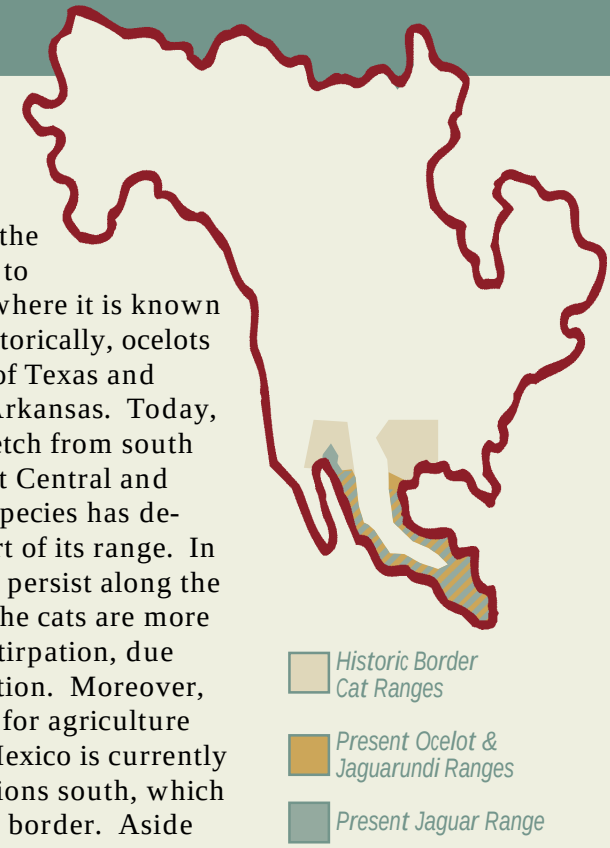
Three imperiled cats share the U.S.-Mexico border—the ocelot, jaguarundi, and jaguar. These cats have become so rare in the northern parts of their ranges that most of the general public is probably unaware of their presence in the U.S. These cats, however, were once common in the ecosystems of the southern U.S. Ocelots once inhabited several southwestern states, with some populations reaching as far as Louisiana and Arizona; jaguarundis were present at least in the Lower Rio Grande Valley region of Texas; and jaguars once ranged into much of the southwestern United States.

The border cats face many of the same issues that threaten other felids throughout North America, such as reduced, degraded, or fragmented habitat due to human activities. They also face a set of unique problems that stem from their international presence. The viability of U.S. populations is intimately tied to the success of populations in northern Mexico, and U.S. lands provide important dispersal areas for Mexican cats. Currently, agricultural and urban development on either side of the border destroy core habitat areas and essential corridors for ocelots, jaguarundis and jaguars. Conservation success for all three of these cats in the U.S. is dependent upon sufficient protections for both the cats and their habitat in Mexico and upon aggressive conservation measures in the U.S. The destruction of wilderness in the borderlands could reduce populations of resident cats to unviable levels or prohibit the continued dispersal of additional cats, thereby robbing the borderlands ecosystem of these integral predators, as well as putting additional stress on populations in more southern regions.

OCELOT & JAGUARUNDI

A federally listed endangered species, the ocelot (*Leopardus pardalis*) is struggling to survive in south Texas, the sole place where it is known to persist within the United States. Historically, ocelots roamed the forests and scrub habitats of Texas and Arizona, and possibly Louisiana and Arkansas. Today, although world ocelot populations stretch from south Texas and northern Mexico throughout Central and South America (excluding Chile), the species has declined considerably in the northern part of its range. In Texas, only about 80 cats are known to persist along the Mexican border. In northern Mexico, the cats are more numerous but still face the threat of extirpation, due primarily to increasing habitat destruction. Moreover, rapid and rampant habitat destruction for agriculture and charcoal production in northern Mexico is currently driving ocelot and jaguarundi populations south, which could affect populations along the U.S. border. Aside from cats that may occasionally wander up from Mexico, ocelots have been extirpated from Arizona.

The only breeding populations of ocelots remaining on protected public lands in the United States are located on three national wildlife refuges—the Lower Rio Grande Valley, the Santa Ana and the Laguna Atascosa. These lands are managed by the U.S. Fish and Wildlife Service. Private lands play an equally critical role in ocelot conservation in the U.S. At least half the ocelots in Texas occur on private lands, and many individuals' home ranges exist on both private and national refuge lands. Conserving ocelots on private lands, however, depends upon the cooperation of individual landowners.



Three imperiled cats share the U.S.-Mexico border—the ocelot, jaguarundi, and jaguar. Once common in the ecosystems of the southern U.S., these cats have now become so rare in their northern ranges that most of the public is propably unaware of their presence in the U.S.

In North America, ocelots primarily inhabit semi-arid thorn scrub habitats and rely particularly on areas with a dense cover near the ground. They typically avoid open areas, traveling instead through vegetation that grows along riparian areas and drainages. While mortality from collisions with vehicles is likely the most immediate population-limiting factor for U.S. ocelots, large-scale destruction of habitat—traditionally land clearing for crop agriculture and cattle grazing, and now burgeoning urban development—is the greatest long-term threat to the continued survival of ocelots in the southern U.S. and northern Mexico. Remaining habitat for ocelots in the U.S. and northern Mexico is sparse and fragmented. The protection of core areas and biological corridors with dense, natural vegetative cover that will allow natural migration between islands of optimal habitat is paramount to the conservation of the species.

Jaguarundis (*Herpailurus yagouaroundi*) inhabited the southern U.S. (primarily southern Texas) until quite recently, although they were probably never as widespread as ocelots. They have been reported in Arizona, but no physical evidence has ever substantiated this claim. Most experts believe that these cats have probably now been extirpated north of the international border, due most likely to habitat loss and perhaps even predation on jaguarundis by other carnivores, such as coyotes or bobcats. This small, weasel-like cat is still frequently reported in south Texas and occasionally in Arizona, but confirmed evidence of jaguarundi in the United States has been rare since the mid-1900s. The last confirmed sighting of a jaguarundi was a road-killed cat in Texas in 1986. North American jaguarundi populations are more prevalent in Mexico; however, the actual status of the species is unknown due to lack of research. Experts fear that populations in northern Mexico are declining, primarily due to habitat destruction by the charcoal production industry and land conversion for agriculture. Jaguarundis prefer the same dense ground vegetation that is ideal for ocelots (although they do persist in a variety of habitats throughout their Central and South American range) so that in North America, their conservation needs overlap significantly with those of the ocelot.

*Key Issues in Ocelot and Jaguarundi Recovery**

Habitat Loss and Fragmentation

Habitat loss and fragmentation, especially along the Lower Rio Grande, pose the greatest long-term threats to the survival of ocelots in Texas. Primarily nocturnal, ocelots depend upon dense undergrowth to live, travel and feed. Ocelots also require protected areas of thick vegetation along natural drainages, riparian areas, and shorelines to move between core habitat areas. These corridors are vital for natural dispersal of ocelot populations and their prey. The semi-arid thorn-scrub ecosystem that typifies south Texas is ideal for ocelots; however, it has been largely destroyed due to urban and agricultural development and road construction, leaving little habitat to support ocelots and few options for dispersal. Much of the native chaparral and riparian forests that typify the Lower Rio Grande Valley ecosystem have been destroyed. With adult males requiring home ranges of roughly six square miles,[17] there is little room for the small U.S. population of ocelots to grow.

Agriculture and unsustainable cattle practices have long been the primary cause of native habitat destruction in both Mexico and south Texas. The ground that supports thorn-scrub habitat is very productive soil. In northeast Mexico, charcoal production is another major cause of habitat destruction. Each year, vast tracts of native forest are burned to produce charcoal, which has become an important source of income for many Mexican citizens. This industry destroys habitat for ocelots and jaguarundis at a rapid rate.[18] In Texas, habitat degradation has occurred on an even larger scale than in Mexico. Over the past 60 years, much of the native vegetation has been burned, cleared, and converted for crops and cattle grazing. These practices destroy both core habitat areas and critical travel corridors. Poverty in south Texas has also resulted in habitat degradation, as people dump household and industrial wastes in brushy habitat areas that border cats use. Furthermore,

because approximately 97 percent of Texas is privately owned, the U.S. government is limited in its efforts to protect habitat for the federally listed ocelot in much of south Texas.

Both the Texas Parks and Wildlife Department and the U.S. Fish and Wildlife Service have had some success working with private landowners to manage their lands to conserve native vegetation and to maintain core areas and corridors for ocelots. Such efforts, however, are entirely voluntary. While some private landowners are interested in taking steps to protect ocelots and native wild lands on their property, others resist managing their lands for endangered cats and are reluctant to allow biologists on their property to survey for ocelots or jaguarundis, fearing government interference in their future private-land-use decisions. Other landowners are unaware of the ocelot's conservation needs or how they can manage their own land to help conserve the cats. Yet more limiting for conservation efforts, however, is the rapid growth in the Lower Rio Grande Valley, which makes it more profitable for landowners to sell their property to developers than to protect wild lands for ocelot conservation.

As a booming economy and growing population drive commercial and suburban development in the region, urban sprawl has overtaken agriculture as the primary cause for native habitat destruction in south Texas. The U.S.-Mexico border population, which numbered 9.2 million in 1990, is projected to double by 2012, due largely to the rapid industrialization, urbanization, and population growth facilitated in part by the Border Industrialization Program (maquiladoras) and the North American Free Trade Agreement (NAFTA). Economic growth has contributed to the demand for international bridges, road construction, and urban development, all of which destroy habitat. Along the south Texas border from Brownsville to Laredo, there are 13 existing international bridges and at least five more proposed or in planning. Because roads and bridges demand the removal of native thorn brush habitat, they disrupt the continuity of the wildlife corridor that permits ocelots to cross the international border and maintain a broad gene pool. Encroaching urban areas and roads also bring feral dogs and cats closer to ocelot populations, introducing competition for prey and the threat of diseases that can be fatal to these wild cats.

Even ocelot habitat on protected public lands suffers significant degradation. Recreational and agricultural uses on national wildlife refuge lands have resulted in open areas and brush clearing. Correcting former management problems takes time: In Laguna Atascosa National Wildlife Refuge, for example, several retired farm fields have been planted with native brush to benefit ocelots and other wildlife, but restoring these areas for ocelot use will take an estimated 20 to 40 years. Roads, also a significant threat to ocelots, cut through all three of the refuges that support ocelots in south Texas. Some of these roads are slated to be improved and expanded, which will only bring the threat of faster, more deadly traffic to the cats. Plans to expand the national wildlife refuges through land purchases and conservation easements will increase the protected areas available to ocelots, but, in order to persist in south Texas, the cats will still need protected corridors and core areas on private lands, as well as safe avenues for dispersal.

The U.S. Fish and Wildlife Service is currently working to purchase, parcel by parcel, pieces of private land that will allow now-isolated ocelot populations to breed, expand their populations, and disperse into new areas of suitable habitat. Acquisition of new habitat and the creation of wildlife corridors between core habitat islands will be central to ocelot recovery

** The directives highlighted in this report follow the precedent set by the U.S. Fish and Wildlife Service's Listed Cats of Texas and Arizona Recovery Plan (1990), which aims to provide common goals that will further the conservation of both ocelots and jaguarundi. Most of the key issues and directives listed here are aimed at ocelots. Very little is known about the jaguarundi's current status in the U.S.; thus, it is difficult to describe the most-needed conservation actions. Many of the suggested conservation measures for ocelots (such as habitat protections, fenced culverts, educational initiatives, et cetera), however, are assumed to contribute to the conservation of jaguarundis in the U.S.-Mexico borderlands as well.*

and will help to prevent ocelot populations in Texas from becoming geographically isolated from Mexican populations.

Recommendations:

- **Government agencies** involved in land acquisition should continue to partner with land trusts or private land management operations to allow for faster purchase of critical ocelot habitat.
- **Wildlife agencies** should create a certification or award system that acknowledges and rewards private landowners or citizens who take active steps to help protect the ocelot and its habitat.
- **Texas Parks and Wildlife Department** (TPWD), the **U.S. Fish and Wildlife Service**, and **private land organizations** should use funds from private lands incentive programs to target the protection of ocelot core areas and landscape corridors in the Lower Rio Grande Valley ecosystem. **Activists** and **environmental organizations** should partner with TPWD to educate south Texas residents about state and federal programs that provide financial assistance for conserving native lands.
- **Federal and state wildlife agencies** should make it a priority to conserve ocelot habitat in former range states as appropriate. **Private conservation** organizations can also support these efforts.
- Aided by state and national wildlife agencies, the **U.S.** and **Mexican governments** need to collaborate to develop a plan to restore brush on both sides of the border to create essential corridors for ocelots, jaguarundis and jaguars.

Road Kill

Collisions with motor vehicles are the primary cause of ocelot mortality in south Texas. Since 1984, 22 ocelots have been discovered as road kills in south Texas.[19] Experts believe that actual road kill mortality may be higher: A disproportionate number of road-killed ocelots are collared, suggesting that drivers may be reporting these cats to biologists in recognition that officials are trying to monitor them. Thus, a significant percentage of ocelot mortalities due to road kill may go unreported altogether. As road improvements and new developments increase the amount and speed of traffic passing through core ocelot areas, ocelot mortality due to vehicles can be expected to increase. Furthermore, at Laguna Atascosa National Wildlife Refuge—which harbors the most ocelots of all three refuges—the ocelot population has already exceeded the refuge's carrying capacity, which means that juveniles are under intense pressure to disperse across the roads that cut through the refuge.

Road kill is not quite as severe a problem in northern Mexico, where ocelot populations generally live further from paved roads and areas of dense human development. Collisions with vehicles are still a factor, however, and some experts believe that this problem maybe more prevalent than it appears, as drivers may take road-killed ocelots away with them in hopes of selling their pelts.

Experts currently look to culverts as the most promising short-term solution to vehicle-caused mortality in ocelots. Unfortunately, the majority of culverts that have been constructed to help ocelots and other small wildlife pass under roads have been poorly designed and are ineffective: They typically have narrow openings, sit low under the roads, and often fill with water. They also typically lack fencing to direct cats into the culvert: In one instance, a road-killed ocelot was found within 100 yards of a culvert on Laguna Atascosa. The U.S. Fish and Wildlife Service is working on a number of projects in order to minimize the incidence of road kill at the refuge, including building better culverts and providing fencing to direct cats to the crossings, lowering speed limits within key areas of the refuge, and creating speed bumps along refuge roads to slow traffic. Experts believe that adequate culverts can facilitate safe dispersal of small cats; however, without adequate science to demonstrate the impacts of road mortalities on ocelot popula-

tions and the effectiveness of culverts, it has been difficult to require federal and state highway agencies to include funding for building or improving culverts in road and highway projects that have the potential to limit ocelot populations.

Recommendations:

- **Activists** and **environmental organizations** should combat the impact of road kill on the ocelot by pressuring government agencies—especially transportation departments—to include effective culverts or underpasses in new road building projects and improve culvert designs on established roads.
- **Environmental organizations** and **agencies** should petition NAFTA for funds to finance culvert projects for new roads built due to the increased development in southwest Texas.
- **Scientists**, **funders**, and **academic institutions** should make it a priority to support work that examines the impacts of road kill on ocelot populations in south Texas.

Border Cats Recommendations

Public education is fundamental to the conservation of all three U.S.-Mexico border cats. Effective education programs must reach a variety of age and economic groups and must aim to increase the public's basic understanding of the historic distribution, present status, and most pressing conservation needs for each species. Experts have suggested some of the following techniques for spreading information about preserving ocelots, jaguarundis, and jaguars and for building regional and national pride in the ecological importance of these cats:

Environmental organizations, wildlife agencies, and *private funders should launch public relations campaigns to build pride and awareness of border cats. Tools in these campaigns could include posters, comic books, lesson plans for schools, and traditional media outreach.*

Environmental organizations and *educators could design border-cats education kits for schoolchildren. Kits could be bilingual and could stress multidisciplinary, interactive studies and lesson plans and target issues specific to local wild cat populations.*

Environmental organizations or *communities in the U.S.-Mexico borderlands could partner with local authors/illustrators to create a series of children's books on border cats.*

Environmental organizations, citizens, communities and *educators could develop a comprehensive website on border cats that would: 1) feature basic information about the ocelots, jaguarundis, and jaguars; 2) provide a warehouse for posting research information about border cats; 3) broadcast live video of these cats in natural-setting exhibits from a local zoo; and 4) provide a message board for reporting of border cat sightings.*

Increased Activities along the United States-Mexico Border

Increased efforts by the U.S. Border Patrol to stop illegal immigration into Texas from Mexico has degraded native habitat along the border. Some experts fear that the use of high-powered "stadium" lights, brush clearing, fencing and road paving by Border Patrol operations in border areas has been detrimental to both the ocelot and its prey and threatens to inhibit ocelot and jaguarundi dispersal. The lights, which are used at night when ocelots and jaguarundis are most active, threaten to disturb the cats' nocturnal behaviors, including hunting and traveling. Boat ramps have been cut into river banks that ocelots use to travel. The Border Patrol has also removed natural vegetative cover in order to increase the chances of detecting illegal immigrants. Some experts believe that this habitat destruction could harm the entire Lower Rio Grande Valley wildlife corridor by creating an unnatural barrier that prevents populations that occur on both sides of the U.S.-Mexico border from mingling.

Recommendations:

- The **U.S. Fish and Wildlife Service** should continue its efforts to work with the U.S. Border Patrol to reduce the number of roads built to patrol the south Texas area and to restore unused roads to help support ocelots.

Research, Public Education, & Outreach

A severe lack of public understanding for the conservation needs of border cats underlies the struggle to conserve them. Many citizens living along the southern U.S. border or in Mexico have little or no knowledge of these cats: They are unaware of their presence and do not understand the ecological benefits of conserving them. Efforts to acquire and protect habitat, improve private land management, and prevent fragmentation and road kill all suffer due to these cats' relative obscurity. Vocal public support for ocelots would help to raise awareness about their struggle for survival, generate public and private funds for research and conservation projects, and place increased pressure on government officials to ensure their protection. By the same token, additional research is needed on the historic and present-day distribution of small border cats and on the most pressing factors contributing to their decline. Reaching out to local communities through educational initiatives may be the most effective way to generate grassroots support and to bolster resources for ocelot and jaguarundi conservation and research efforts. In addition, experts believe that broader outreach to regions beyond the U.S.-Mexico border will help to raise the profile of these cats and promote funding for research, habitat acquisition, and recovery efforts.

Recommendations:

- **Environmental organizations** or **citizens** should create a specifically targeted organization or campaign to address the issues of ocelots and other border cats (i.e., jaguar and jaguarundi). This organization/campaign could lobby local and state officials for increased legislative protection of cats along the United States-Mexico border.
- **Educators** (especially in Texas) should incorporate into curricula lessons on the ocelot and jaguarundi's historic ranges, ecology, and conservation needs.
- One or more **environmental organizations** should employ full-time educators in Texas, Arizona, and Mexico to visit local schools and teach students about the importance and value of ocelots and jaguarundis.
- **National and state wildlife agencies** and **researchers** should expand their current efforts to determine ocelot distribution and status in Arizona and northern Mexico and evaluate new areas for habitat restoration and potential ocelot reintroduction in Arizona as appropriate. In the United States, extensive assessment of the viability of ocelot populations beyond areas currently considered suitable habitat should be a priority, as there are indications that cats are found outside of studied areas.

- **Government and university researchers** should work together to improve knowledge about border cats in the United States and northern Mexico. **Wildlife agencies** and **environmental groups** should encourage new and broader participation from academia in researching the border cats in order to help fresh data and innovative theories emerge. **Activists** should encourage **wildlife agencies**, **scientists** and **academic institutions** to release and analyze research data on the ocelot.
- **Environmental organizations** should promote an ocelot-conservation funding initiative in Texas, such as a lottery revenue fund.
- The existing Adopt-an-Ocelot program should be expanded and supported by a corporate sponsor or **funder**, publicized through media, and promoted through a border-cats website.

Margay

The margay (Leopardus wiedi), also known as the long-tailed spotted cat, is one of the smaller wild cats in the Americas. With its tawny coat, covered with dark splotches, it is often confused with the ocelot. Margays are secretive, solitary, nocturnal cats that spend the majority of their time in trees. Especially adapted to arboreal life, margays have a flexible ankle joint that can rotate 180 degrees, which allows them to run down trees head first and hang from branches by one foot.

Like other wild cats, the margay faces a variety of threats to its survival, including habitat loss through deforestation and exploitation for the fur and exotic-pet trades. International trade in margays or their parts is prohibited under CITES, an international treaty that extends the highest level of protection to this species, but these cats continue to be the targets of both domestic and underground markets. Deforestation is currently the greatest threat to remaining margay populations. Because of the margay's secretive nature and its remote habitat, biologists still struggle to find the best strategy to protect this species.

Margays once ranged into northern Mexico and the extreme south of Texas, but today they are thought to inhabit only tropical and subtropical forests. They range from southern Mexico through Central America into parts of Paraguay, Uruguay, Brazil, and northern Argentina. As the margay's range no longer extends significantly into North America, this report does not cover conservation recommendations for this species.

JAGUAR

The jaguar (*Panthera onca*)—the largest of the North American cats—ranges from northern Mexico to Argentina in South America. Found in a variety of ecosystems throughout the Americas, its status and distribution is still not fully known, especially in large areas of potential habitat in Central America and Mexico. Throughout their present-day range, 75 percent of jaguar populations exist in depleted numbers. Since 1900, jaguars have been extirpated or are unknown in more than half of their range, with most of the loss occurring in Mexico and the U.S. in the north and in Brazil and Argentina in the south.[20] In 1997, the jaguar was listed as endangered throughout its entire range under the U.S. Endangered Species Act. The U.S., however, has never developed a recovery plan for the species.

While jaguars were present in the regions of the southern United States through the late-1800s and mid-1900s, experts now believe these cats have been extirpated north of the Mexican border. Jaguars were probably eliminated from the U.S. by a combination of factors including extensive land conversion for cattle ranching in the West, predator control programs, and perhaps a reduced prey base due to overhunting. Individual jaguars, however, are still occasional visitors north of the Mexico border. A minimum of 60 jaguars have been killed in Arizona since 1900,[21] including one in Cochise County in 1986.[22] In 1996, two jaguars were sighted on separate occasions in Arizona; both of these animals were photographed. Despite occasional, unconfirmed sightings, primarily in Arizona, throughout the 1980s and 1990s, experts believe that jaguars are now only transient in the southwest United States. These wanderers do indicate, however, that jaguars can disperse into the U.S. from established populations in northern Mexico, and they may indicate that sufficient wild areas still exist to support some jaguars in the southwestern states.

Beyond issues regarding their historic range, jaguars are also threatened by increasing human activities, which, if not curtailed, could gradually eliminate the species from its northern range. Even though jaguars in the U.S. have probably always been on the fringe of their preferred habitat, northern Mexico falls squarely within their range. Jaguars in northern Mexico now constitute the northernmost known breeding populations and are likely the source of the transient individuals recently seen north of the border. Jaguars in northern Mexico, however, now face the threat of local extinction. In northeast Mexico, their habitat is threatened by deforestation and fragmentation due to forest management practices; in northwest Mexico, predator control and overhunting are the primary issues threatening their long-term persistence. Losing jaguars in the northern reaches of their range could threaten the long-term viability of this already endangered cat. Furthermore, these top-level carnivores play an important role in the balance of the ecosystems they inhabit and are indicators of general biodiversity in these regions. Based upon current patterns of decline, jaguars could conceivably be lost from most or all of North America if the cats and their habitat are not sufficiently protected.

Successful jaguar conservation in North America will require efforts on both sides of the border. Mexican populations must be maintained at viable levels and remaining habitat that could support jaguars must be protected. In the U.S., efforts to bolster jaguar conservation should focus on preserving large tracts of wilderness lands that can support the cats should they disperse north of the U.S.-Mexico border. These actions will demand significant public education in order to build understanding of the cat and its conservation needs and to address public concern about livestock depredation, as well as research and public outreach concerning the jaguar's historic range.

Key Issues in North American Jaguar Conservation

Habitat Loss

North American jaguars are threatened by habitat loss in both Mexico and the southwestern U.S. due to a variety of human activities, including deforestation, land clearing, overgrazing,

and urban development. For example, along the Sonora-Arizona border, the construction of new subdivisions destroy and fragment previously wild areas. In southern Arizona, these developments may in part prevent those jaguars that do cross into the U.S. from establishing home ranges in this region. Near Nogales, in the Mexican state of Sonora, rapid urban sprawl poses a significant threat to jaguars. Destruction of jaguar habitats throughout these areas may threaten the long-term viability of North American populations.

Because jaguars in Mexico have not been well researched, however, habitat protection efforts in Mexico suffer from a lack of data about where jaguars exist and how best to protect them. In 1999, the Wildlife Conservation Society initiated efforts to identify known jaguar habitats and survey additional areas from southern Arizona to northern Argentina for jaguar presence. Further conservation strategies will need to move beyond land protection and focus on modifying human activities that impact jaguars and their habitat.

In the U.S., some wild areas still remain that can support jaguars. In Arizona, for example, historically reduced prey populations have now rebounded, and large, intact areas of brush and wooded canyons may be sufficient to provide needed cover for jaguars.[23] Unfortunately, scientists know very little about the jaguar's habitat requirements in the U.S. Many experts believe that the southwestern U.S. does not have ideal jaguar habitat; however, other experts contend that some areas—for example, southeastern Arizona—could potentially support small populations of jaguars. While many experts believe that the marginal habitat of the southwestern U.S. has probably only supported dispersing individuals in past decades, others believe that Arizona might have been home to a small population of jaguars relatively recently. (The last female jaguar killed in Arizona, for example, was reported in 1963.) At a minimum, U.S. lands may still provide important dispersal areas for jaguar populations in Mexico. While aggressive steps to designate and protect jaguar habitat in the U.S. may not be warranted at this point, conserving large wilderness areas in the southwestern U.S.—both

The Importance of Saving Cats

Managing land for animals that share their habitat with a variety of other species – particularly species that are rare or endemic – brings ecological benefits not just to the target species but to many other plants and species within the ecosystem. Animal or plant species that provide these opportunities are often called "umbrella species," as their protection shields other species in their range from habitat loss or other threats. The endangered cats of North America share their ranges with an array of important plant and animal species, so making these felines a conservation priority helps more than just the cats themselves. For example, if efforts are made to protect the jaguar's northernmost range in the southwestern U.S. and northern Mexico, conservation benefits will come to many other plant and animal species, including mountain lions, Mexican gray wolves, black bears, ocelots, jaguarundi, javelina, wild turkey, songbirds, grassland birds, coatimundi, bats, mollusks, and fish, in addition to numerous plants. So saving a place for jaguars can be about more than helping this magnificent cat survive. It can mean saving entire ecosystems and the varied life they contain.

through protected public lands and through sustainable ranching practices— is important to ensuring that jaguars can continue to disperse northward and, perhaps, reside in this area again some day.

Recommendations:

- In the U.S., **federal** and **state wildlife agencies** should conserve potential jaguar habitat on public lands and work with private landowners to conserve private lands for jaguar dispersal occurrences. Scientists, agencies, and environmental groups should focus habitat conservation efforts in North America on creating wildlife corridors and expanding the jaguar's current range in Mexico.
- **Scientists**, **activists**, and **environmental organizations** working in Mexico should work with private landowners to explain jaguar habitat needs and encourage private landowners to coexist with jaguars, including managing livestock and agricultural lands in ways that support jaguars.
- **Scientists**, **academics**, and **funders** should focus on researching key conservation needs and strategies for jaguars in both northwestern and northeastern Mexico.

Public Perception

Public perception is a major barrier to jaguar conservation efforts. Throughout much of their range, jaguars are known to prey on livestock. In some areas, cattle constitute a large proportion of the jaguar's diet—as much as 56 percent, for example, in the seasonally flooded savanna woodlands of Venezuela. Healthy jaguars and livestock can co-exist with negligible depredation: Jaguars are opportunistic feeders that may prey on many different species throughout their extensive range. Despite this fact, public fear that jaguars threaten the safety of both livestock and humans continues to deter jaguar conservation efforts in both the U.S. and Mexico. In livestock producing areas in Mexico, for example, jaguars are often shot indiscriminately, regardless of whether or not individual cats are responsible for livestock depredation.[24] Predator control aimed at cougars can also result in jaguar mortality through traps, poison, or shooting.[25]

Some scientists believe that jaguar predation on livestock increases in some areas as habitat is destroyed, cattle are introduced, and the cats' natural prey species are overexploited.[26] Poor cattle-management practices are a significant factor in jaguar depredation. For example, jaguars are much more likely to take cows when they are spread out over range areas; synchronizing calving and fencing cows into smaller, guarded areas can greatly reduce depredation incidents. Public misperception of jaguars also inflates the significance of their role in livestock depredation: In many areas where both cougars and jaguars live, jaguars are blamed—and often killed—for depredation incidents for which they are not responsible.

Public education campaigns in the U.S. and Mexico that stress techniques for reducing depredation will be critical to helping ranchers coexist with jaguars. Jaguar management strategies that protect the cats from indiscriminate killing while safeguarding ranchers' lifestyles in Mexico—such as a controlled removal program for jaguars that do prey on livestock—may also help build public support for the species' conservation. In the end, jaguar conservation efforts in North America will only succeed if they address the concerns of private property owners, involve rural community members, and educate the public about the challenges and importance of conserving these cats.

Recommendations:

- Mexican and U.S. **environmental organizations** should launch campaigns to build public knowledge and goodwill for the jaguar within Mexico. Such campaigns could include materials that could be widely distributed and should target younger generations as well as adults.
- Mexican **environmental organizations** should evaluate the appropriateness of creating depredation programs to repay ranchers for livestock lost to jaguar attacks. Some experts suggest that jaguar depredation funds in Mexico might offer replacement livestock rather than cash to ranchers.

Both Sides of the Border

The dynamics of endangered species protections in Mexico and the U.S. differ significantly, which has an impact on how cats are conserved on either side of the border. Under Mexico's endangered species rule ("NOM-059-ECOL-1994"), species are listed as endangered, threatened, rare, endemic or "specially protected." Although listed species are legally protected from some specific activities that threaten their populations, there is little effort to enforce these protections. Until recently, most habitat protections for imperiled species have been restricted to designated protected natural areas. Most of these protected areas are special ecosystems that contain high biodiversity or specific endemic species, and they typically encompass too little land to offer meaningful habitat conservation for North America's wide-ranging wild cats. Mexico's new General Law of Wildlife, however, includes the protection of habitat for species listed under the official rule.

A coalition of environmental groups, academic institutions, and the Mexican government are currently preparing a national strategy for the conservation of the jaguar, which includes identification of key areas, research needs, management, and education. But even with official strategic plans to conserve habitat for these cats, the foundation of Mexico's protections for cats will rest with Mexican citizens. Most of Mexico's lands are held by private, indigenous, or communal groups ("ejidos"). Conservation actions on these lands must take place with the approval of the people who own them. Ejidos comprise approximately half of Mexico, and in these areas, conservationists must have the consensus of the whole community in order to alter land-use practices. Most natural protected areas in Mexico have been established in private or ejido lands, which has imposed restrictions on use without paying compensation to the owners, so efforts to protect cats in these areas also rely on public cooperation. Thus, while the U.S. government can play a fairly active role within its border in protecting endangered cats and their habitats, protecting habitats for wild cats in Mexico lies much more with the people.

Because citizen cooperation is the key to protecting imperiled cats across their range, scientists and conservationists working in Mexico face the challenge of working directly with landowners to develop strategies for protecting cats and their habitat. This means working directly with ranchers to manage cattle in ways that can reduce depredation, collaborating with communities to protect areas of undisturbed habitat, and encouraging landowners to reduce their impact on cat habitats and prey. This approach may enable greater community involvement in protecting cats; however, it also limits how quickly and effectively cats can be protected across their range.

- Jaguar **conservationists** and **wildlife managers** in Mexico should work directly with ranchers to implement ranch-management practices to reduce depredation. Strategies should include conservation of jaguar prey species and improved management of cattle to discourage jaguar predation.
- U.S. **environmental organizations** and **activists** should create education campaigns that target U.S. citizens—both in the borderlands region and nationally—and focus on the significance of conserving jaguars in their northern range.
- **Educators** should incorporate lessons on the jaguar's historic range, ecology, and conservation needs into standard curricula in both the U.S. and Mexico.

Questions Regarding the Jaguar's Historic Range

Many researchers and wildlife management officials contend that the jaguar has never been resident in the United States; however, there is substantial evidence to document that jaguars were a significant fixture in the U.S. landscape until relatively recently. Historically, jaguars have been documented in Arizona, New Mexico, Texas, and southern Louisiana.[27] The last recorded jaguar in Texas was killed in 1948. Confirmed sightings in Arizona in 1996 prove that habitat between Arizona and Sonora still allows jaguars to disperse into the U.S. Most experts believe that the Arizona cats wandered into the U.S. and are not part of a resident, breeding population, since most of the jaguars reported or killed in the U.S. in the last 100 years were male. Other experts, however, suggest that the pattern of earlier jaguar kills in Arizona between 1900 and 1979 indicates the decline of an overexploited population rather than erratic travels of nomadic cats from Mexico.[28]

Regardless of uncertainty about the jaguar's historic range, conserving jaguar populations in both northeastern and northwestern Mexico should be a priority. As late as 1987, the jaguar was still considered to be common near Guaymas, Sonora in Mexico, approximately 200 miles south of Arizona, and regularly present in central Tamaulipas, about 150 miles from the Texas border. Populations in these areas could certainly be the source of individuals in the U.S., since jaguars are known to disperse over great distances. And while much of the current research on jaguars focuses on Sonora in northwestern Mexico, less effort has been made to assess their status in the northeastern states of Tamaulipas and Nuevo Leon. Lack of knowledge about jaguar presence and viability throughout their northern range hinders conservation efforts for the species in both Mexico and the United States.

Recommendations:

- U.S. and Mexican **wildlife agencies** and **environmental organizations** should encourage new and broader participation from **academia** in researching the jaguar in its northernmost range (especially Sonora, Mexico) in order to promote new theories and data on jaguar distribution. **Environmental organizations** and **funders** in the U.S. and Mexico should collaborate to support research on the present distribution and conservation needs for jaguars throughout their range.
- **Research scientists** and **funders** should place increased emphasis on determining the historic range of the jaguar in the United States. Such studies should assess present dispersal needs for the species and examine whether reintroduction is ecologically appropriate.

Cross-Border Cooperation

Successful conservation of the jaguar in North America demands cross-border cooperation—through efforts to protect the cat and its habitat and through partnerships to fund research and education campaigns that support the species' conservation needs. Some groups have already initiated such partnerships: The Malpai Borderlands Group—an organization established by ranchers in southeastern Arizona and southwestern New

Mexico and supported by scientists and private individuals — finances jaguar research in northern Mexico, including surveys for jaguar and studies of source populations of jaguars entering the southwestern U.S. The Wildlife Conservation Society has partnered with biologists throughout the Americas to survey for jaguars and prioritize key areas for jaguar conservation efforts. The Jaguar Conservation Team is also working in conjunction with affiliates in Mexico to provide information on the jaguar in the borderlands. Cooperative research allows Mexican and American researchers to share ideas and techniques surrounding jaguar conservation. Efforts like these are necessary to learn more about the status, habitat needs, and dispersal of the jaguar in its northern range. Continued U.S.-Mexico cooperation, spanning state and national wildlife agencies, ranchers, and private landowners, scientists and conservationists, and the general public, will be critical to establishing appropriate management strategies for this species in North America.

Recommendations:

- U.S. and Mexican **environmental organizations** should foster greater cooperation to develop joint educational materials about jaguar conservation for school children in English and Spanish.
- **Researchers** in both countries should collaborate on a variety of international projects.
- U.S. **wildlife agencies** and **environmental organizations** should support efforts that protect jaguar habitat and prey base in Mexico. Such efforts are particularly important for biodiversity in the U.S., as jaguar, ocelot, and jaguarundi populations in Mexico provide the genetic base and primary sources for populations that exist in the United States.

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26. Valdez, R. 2000. Jaguar. Pages 378-388 *in* S. Demarais and P.R. Krausman, eds. *Ecology and Management of Large Mammals in North America.* Prentice Hall, Upper Saddle River, New Jersey.

27. Ibid.

28. Ibid.

CANADA LYNX

Biologists release a translocated Canada lynx into the southern Rocky Mountains as part of the Colorado reintroduction effort.

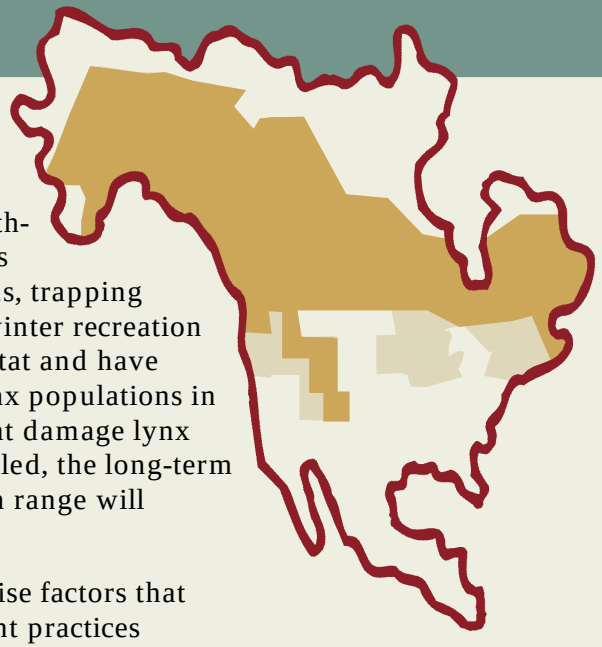
The Canada lynx once inhabited forested areas throughout Alaska, Canada, and parts of the northern United States, with its distribution stretching down through the Rocky Mountains. Today, Alaska and northern Canada still host relatively stable lynx populations, while lynx in southern Canada and the northern U.S. appear to be in a more precarious state. Biologists have established that the species inhabits Washington, Montana, Wyoming, and Maine, and that lynx populations in these states have declined below historic levels. Throughout the rest of southern Canada and the northern U.S., however, the current and historical status of lynx populations remains uncertain.

Lynx occur at lower densities in the U.S. and southern Canada than in northern Canada and Alaska.[29] Research suggests that the primary factor responsible for this phenomenon is the naturally low density of snowshoe hares (the lynx' primary prey) in the species' southern range. The northern contiguous U.S. and southern Canada typically support fewer snowshoe hares than areas in northern Canada and Alaska. This rarity is compounded by the fact that snowshoe hare populations cycle naturally. When hare populations are crashing, lynx may travel long distances in search of areas with a sufficient prey base. Hare scarcity in certain areas may cause the decline or elimination of local lynx populations. Furthermore, simply finding an area with an adequate prey base may not be enough to sustain lynx in the south; these individuals often must compete with other carnivores for hares and other prey species such as red squirrels.

The natural rarity of lynx in the contiguous U.S. and southern Canada, coupled with declines and extirpations of lynx populations in several states over the past few decades, raises significant concerns about the future of lynx in the cat's southern range. Meanwhile, human activities such as some timber harvesting methods, trapping (both intentional and incidental), and winter recreation activities may alter important lynx habitat and have uncertain impacts on the viability of lynx populations in this region. Unless human practices that damage lynx habitat and directly kill lynx are controlled, the long-term persistence of the species in its southern range will remain in question.

Although little is known about the precise factors that threaten lynx, certain forest management practices including suppressing fire, some timber practices, and converting forest lands for agriculture, recreational areas, and roads, may have an effect on lynx by reducing the cat's prey base and increasing the presence of other carnivores that compete with lynx for prey. Historically, trapping also placed substantial pressure on lynx populations. While trapping lynx is now illegal in the lower 48 states, it is still practiced in some areas in Canada, and illegal poaching and incidental trapping continue to cause lynx mortality in the U.S.

The cat's apparent decline in the U.S. has led state and federal agency officials to take action to protect and restore remaining lynx populations in the lower 48 states. In 1999, the Colorado Division of Wildlife began a lynx reintroduction program in the southern Rockies. Over the following two years, the Division released nearly 100 lynx into Colorado's high country, with mixed results. In March 2000, the U.S. Fish and Wildlife Service listed the Canada lynx as "threatened" under the Endangered Species Act (ESA). This listing should result in increased research funding for studies of lynx behavior and status.



Historic Canada Lynx Range

Present Canada Lynx Range

(see p.45 for more detailed U.S. range information)

Although lynx biologists lack a complete picture of the historical and current status of the cat, they are gradually piecing together trends in lynx populations, as well as identifying areas from which lynx appear to have been extirpated and places where existing lynx populations have not recovered to their previous densities.

In the meantime, however, state, provincial, territorial, and federal agencies must work in conjunction with conservation organizations and local communities in the U.S. and Canada to ensure that adequate protection is afforded to lynx and lynx habitat in forests in the southern part of their range.

Key Issues in Lynx Conservation

Lack of Understanding of Lynx Life History and Status

The greatest barrier to lynx conservation today is the lack of adequate data and information available on the species—especially its southern populations. Researchers have completed a number of lynx studies on populations in the cat's northern range, but there are significant differences in the ecology of northern and southern populations, many of which may affect lynx survival. For example, while deep snow cover in the north limits the possibility of competition from other carnivores for snowshoe hares, southern populations of lynx range through areas of varying snow levels, sharing their habitat with a more diverse suite of predators—including cougars, bobcats, and coyotes—all of which prey on the same species as lynx.[30] Researchers have not determined the extent to which this competition affects southern lynx populations and therefore whether it should be considered a significant factor contributing to the viability of these populations.

Researchers have yet to draw conclusions about a number of other factors that may affect lynx populations in the cat's southern range—from determining the basic tenets of the cat's life-history, including preferred habitat and breeding and dispersal habits, to quantifying the probable effects that road-building and timber harvesting have on individual populations.

Lynx biologists also lack a complete picture of the historical and current status of the cat throughout its range. Historical records of lynx population numbers are primarily based on trapping records, which did not always distinguish between lynx and bobcat kills. Thus, in many instances trapping records do not present an accurate picture of historic lynx numbers. Additionally, past techniques used to survey for lynx were not very effective, so the results of many of these surveys are useless. Nonetheless, researchers are gradually piecing together trends in lynx populations as well as identifying regions that may host historic levels of lynx, areas from which lynx appear to have been extirpated, and places where existing lynx populations have not recovered to the densities of previous decades.

Assessing the current status of lynx is complicated by three primary factors: First, the cat's elusive nature makes it challenging for surveyors to find and count individual cats; second, the natural cycles that lynx and hare populations undergo make it difficult for biologists to determine whether a declining lynx population is a sign of trouble for the lynx, part of the population's natural cycle, or merely a reflection of the cats traveling to find adequate prey; and finally, because lynx populations in the northern tier of the lower 48 constitute the southernmost edge of the cat's range, fluctuations in numbers and distribution are difficult to interpret. Biologists trying to quantify lynx populations and distribution in the U.S. must also account for natural variations that occur throughout snowshoe hare cycles and their effects on the presence of lynx.

The issue of lynx dispersal from Canada into the U.S. is at the forefront of the debate over lynx protection in Maine. In 1999, the discovery of lynx kittens in Maine's wilderness suggested the presence of a breeding population. Officials for the state's Inland Fisheries and Wildlife office, however, disputed this classification, insisting that the kittens were born to individual lynx that dispersed from populations that reside primarily in Canada. Until recently, the state agency had officially refused to recognize these cats as a resident population, leading some environmental organizations and scientists to fear that lynx habitat in Maine's forests will not be properly managed for the species' continued survival.

It is difficult for state and federal agencies to develop credible recovery plans without knowing more about the current status of lynx and what the cats require to survive and successfully reproduce. To date, the greatest obstacle to further research is lack of funding. The recent listing of the lynx under the Endangered Species Act should generate increased funding for lynx research and, consequently, greater opportunities for effective conservation.

Recommendations:

- **U.S.** and **Canadian government agencies** should increase funding for lynx research in southern Canada and the lower 48 U.S. states to help close the gaps in current knowledge on issues such as: interspecific competition between the lynx and other carnivores, foraging habits of snowshoe hares, habitat requirements of other lynx prey, and lynx habitat use, demography, dispersal, and denning requirements.
- **Environmental** and **community organizations** should lobby for greater state, federal, and private funding for lynx research.

Tracking Cats through DNA

Often cat conservationists' lack of the most basic information about the animals they are trying to protect—information like population numbers, distribution, and range. The secretive, elusive nature of North American felids has made it difficult for researchers to learn about cats' behaviors without capturing and drugging them and monitoring them with radio-transmitter collars. Furthermore, because most North American cats are solitary and wide-ranging, it is difficult for scientists to establish population sizes. But a new technique, developed for detecting lynx by Wildlife Conservation Society biologist John Weaver, is now making it easier for researchers to find out vital information about cats in the most noninvasive way.

Weaver's innovative technique relies on some of the most basic feline qualities: curiosity, a strong sense of smell, and the need for a good scratching. Researchers use shiny aluminum pie plates or other visual attractants, catnip, and cologne to entice lynx to a piece of carpet that has been nailed to a tree and studded with small tacks. Attracted by the smell, cats rub their cheeks on the patch, leaving a few strands of hair behind. Researchers then study the DNA in these hairs to establish the presence and abundance of lynx, map the genetic relationships between individual cats, and identify the relative gender distribution of individuals in an area. This information can also shed light on cats' habitat preferences.

The hair-snag technique has proven effective with lynx, and cat biologists have recently begun testing it on other species. Initial tests with ocelots and jaguarundis have yielded some useful data, but the cats' hair may be too short to provide a sufficient number of usable DNA samples. Nonetheless, snagging hair from cats may help scientists to determine the presence of rare cats in specific areas—a vital first step in protecting habitat for these important carnivores.

- **Communities** should work with local wildlife agencies to assist in public research and/or tracking programs to record snowshoe hare tracks and/or scat. While these programs will necessitate training of participants, experts believe that long-term hare-population monitoring through track surveys and pellet counts may help scientists to determine hare trends and consequently to assess the likelihood that a region could support lynx.
- State and federal **wildlife agencies** and lynx **biologists** should work with local trapper communities to gain information about lynx sightings and incidental trappings.

Habitat Loss and Fragmentation

Human alteration of forests through certain forest management practices and human recreational activities poses a major threat to Canada lynx throughout the cat's range. Lynx require large forested areas of land with a high density of snowshoe hares and other prey, as well as adequate woody debris that the cats use for denning and protection.[31] Throughout North America, lynx occupy boreal, sub-boreal and western montane forests including the taiga in northern Canada and Alaska, subalpine coniferous forests in the western U.S., and forests combining coniferous and deciduous trees in the Great Lakes Region and the Northeast. Snowshoe hares thrive in earlier successional forests with dense understory that provides food and protection.[32] Given these differing habitat requirements, a mix of forest stand types—from mature coniferous to early successional—is necessary to support the lynx and its prey.

Timber extraction practices typically reduce the diversity of forest stand types and therefore may have a variety of detrimental effects on lynx and snowshoe hare habitat. For example, clearcutting creates exposed areas that lynx, hares, and other prey will not inhabit and are reluctant to cross. Intensive management of regenerating forests in an effort to maximize timber values is very problematic for lynx habitat, as this type of management creates monotypic forests that lack sufficient woody debris and underbrush to support lynx denning practices and the animals upon which lynx prey. Selective thinning, a less extreme practice, can have the same effect. Not all logging practices, however, are detrimental to lynx; management protocols that maintain or create areas with dense understory may provide favorable conditions for snowshoe hares.

The effect of fire suppression on lynx habitat varies from region to region. Different forest types have different natural fire intervals, ranging from a few years to hundreds of years. For example, in the Cascades, the natural fire interval is 200 to 500 years, so recent fire suppression has not affected the life cycle of lynx or hares. In the Great Lakes Region, however, natural fires occur more frequently, so it is likely that fire suppression in this region is having a significant impact on the quality of habitat available for lynx and hares.[33]

Roads and trails may also pose a threat to lynx. High-traffic roads may discourage lynx dispersal and are a direct cause of lynx mortality, although it is unclear whether road kill has a significant impact on the long-term viability of lynx populations. Forest roads, while not directly impacting lynx, make lynx habitat more accessible to humans, increasing risks of poaching, incidental trapping, and further fragmentation of pristine forest areas.[34] Snow trails packed by snowmobile use and winter hikers may allow coyotes, cougars, bobcats, and other competitors into areas of deep snow that were previously inaccessible, facilitating possible competition with lynx for prey.[35] Other carnivores may also compete with lynx by directly displacing them or increasing their risk of mortality. To date, no studies have been conducted on the impact of such competition on lynx populations; however, this dynamic may affect lynx numbers in the southern part of their range.

In addition to the challenges posed by the varied habitat requirements of lynx and hares and the knowledge gaps that exist in the identification of these requirements, lynx conservation is further complicated by the fact that lynx habitat occurs on federal, state/provincial, county, tribal, and private lands in both the U.S. and Canada. For example, throughout the Cas-

cades and the northern U.S. Rockies, lynx primarily occur on federal land, much of which is open for logging and recreational development. Additionally, lynx move freely across the U.S.-Canada border, yet the extent of protection afforded to forested federal and provincial lands varies greatly between countries. In the northeastern U.S., more than 80 percent of lynx habitat is on private land—land that is primarily managed by timber companies. The large number of agencies, tribes, individuals, and corporations that manage land with lynx habitat throughout the U.S. and Canada necessitates that these entities develop unique land management plans for each area and presents another challenge in efforts to protect the cat.

Missing Lynx

Scientists still have many questions about the historic and current status of Canada lynx throughout the lower 48 U.S. states. The following list summarizes what lynx experts currently know — and don't know — about the distribution of these elusive cats south of the Canadian border:

Northwest / West

Colorado	Present historically. Extirpated. Reintroduced in 1999.
Idaho	Historic and current status unknown.
Montana	Present. Current population size unknown.
Oregon	Historic and current status unknown.
Utah	Historic and current status unknown.
Washington	Present. Current population size unknown.
Wyoming	Present. Current population size unknown.

Midwest

Michigan	Historic and current status unknown.
Minnesota	Present historically. Current status unknown.
Wisconsin	Historic and current status unknown.

Northeast

Maine	Present in low numbers.
New Hampshire	Present historically. Current status unknown.
New York	Present historically. Reintroduced between 1989 and 1991. Extirpated.
Vermont	Historic status unknown. Currently not present.

Sources

United States Department of the Interior, Fish and Wildlife Service. March 24, 2000. *Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Contiguous U.S. Distinct Population Segment of the Canada Lynx and Related Rule; Final Rule.*

McKelvey, K.S., Aubrey, K.B., and Ortega, Y.K. 2000. History and Distribution of Lynx in the Contiguous United States. Pages 207-264 *in* L.F. Ruggiero *et al*, eds. *Ecology and Conservation of Lynx in the United States.* University Press of Colorado / USDA-FS Rocky Mountain Research Station, Colorado.

Recommendations:

- **Forest management agencies** in the U.S. and Canada should develop new forest thinning practices that minimize forestry impacts on lynx, snowshoe hares, and overall forest health. These new practices should be based on current studies that are analyzing optimal ways to extract wood from forests without harming lynx or snowshoe hare populations.
- **Environmental organizations** and **activists** should encourage agencies and the timber industry to incorporate future recommendations from studies on the effects of forest thinning practices on lynx and lynx prey into forest-management strategies.
- **Forest managers** should maintain diverse landscapes that include forests of all size and age classes, as lynx data suggest that the species uses both young and old forest to meet habitat needs throughout the year.
- **Scientists**, **environmental organizations**, **community organizations**, and **government agencies** in the U.S. and Canada should collaborate to ensure that lynx and snowshoe hare habitat is protected and managed in a sustainable manner on both sides of the border.
- **Environmental organizations** should work with private landowners in Maine and other key states to create habitat for the snowshoe hare and conserve current lynx habitat.

Trapping / Poaching

Historically, trapping has been a significant source of lynx mortality throughout the U.S. and Canada. As conservation concern for lynx grew markedly throughout the 1970s and 1980s, states placed restrictions on trapping. The recent listing of the lynx as threatened under the Endangered Species Act has made it illegal to trap the cats in the lower 48 states, with the exception of certain tribal allowances. Nonetheless, illegal poaching and incidental take of lynx continues to be a problem in the U.S.

Trapping and hunting (including hunting with hounds) for a variety of animals are still common practices throughout much of the lynx' Canadian and Alaskan range, and these activities can contribute to lynx mortality in areas where the cats occur. Although provinces in Canada either prohibit lynx trapping or regulate it through limited seasons and quotas, incidental trapping and poaching can still cause lynx mortality beyond the legally permitted limits. Although lynx populations throughout Canada appear to be withstanding pressures from trapping activities at this time, it is unclear how direct lynx mortalities—whether intentional or incidental—from trapping or hunting will affect these populations as they are stressed by further habitat destruction, the lack of a dynamic prey base, and natural factors that affect lynx populations. In comparison with the destruction of adequate forest habitats for lynx, current rates of exploitation may have a relatively minor impact on the viability of the species; however, both activities could threaten lynx populations over the long term by increasing the risk of localized overexploitation or extirpation.

Recommendations:

- U.S. state **wildlife agencies** should work with the U.S. Fish and Wildlife Service to expand "trapper alert" and "accidental catch" programs to all states with known or suspected lynx populations. Through these programs, trappers who inadvertently catch lynx in their traps or snares are encouraged to notify their state wildlife department about the catch. State officials will verify that the cat is a lynx, record its presence, and exonerate the trapper from liability.
- **Environmental organizations** and **wildlife agencies** should undertake greater outreach to trapper communities to explain lynx-related conservation issues and to emphasize steps to avoid accidentally killing lynx.
- In regions where trapping wildlife is legal, **wildlife agencies** should encourage trappers not to use "instant-kill" traps (such as neck snares, for example) in subalpine forests where lynx might be accidentally snared.
- The **U.S. government** should increase and enforce penalties for poaching lynx.

Bobcats: Cause for Concern?

Bobcats (Lynx rufus), the southern cousins of Canada lynx, occur in greater numbers today than other North American cats. Bobcats inhabit central and northern Mexico, southern Canada, and the lower 48 states. They prey on a range of animals—from rodents, birds and bats to large ungulates—and live in a variety of habitat types, including deserts, prairies, forests and coastal swamps. Bobcats are also often found on the fringes of urban areas, where development has spread into their habitat. Because they are highly adaptable, bobcats have been able to survive in spite of the extensive habitat loss that has occurred throughout their range. There are signs, however, that this loss is beginning to take its toll on the species. Bobcats have been eliminated from a large area in the Midwest that has been intensively cultivated for agriculture. Human development throughout the eastern U.S. has also contributed to local extirpations.

Because bobcats live in a variety of habitat types, they are susceptible to a number of different threats. For example, logging activities in the Pacific Northwest degrade forests in which bobcats live; cats in the Midwest must contend with agricultural practices that often turn native grasslands into an uninhabitable monoculture; and, throughout much of their range, urban sprawl is destroying or degrading areas of former habitat, making it uninhabitable. Trapping can also pose a threat to individual bobcat populations throughout North America. Historically, increases in the demand for bobcat pelts have triggered higher trapping levels. As bobcats face continual pressure from habitat loss, fragmentation, and degradation, the added threat of trapping may cause additional extirpations in some areas.

Despite the fact that hundreds of thousands of bobcats still range throughout North America, local extirpations of populations should serve as a warning that the future of this cat and other species that share its habitat could be at risk. Because they are able to adapt to such varied conditions, bobcats serve as an excellent indicator species for ecosystem health: In habitats that have been so reduced or degraded that these generalists are unable to survive, it is likely that more specialized species are also under pressure.

Recommendations:

- **Scientists** and **wildlife agencies** should monitor the status of local bobcat populations and identify general threats and specific human actions or projects that may threaten the health of local populations.
- **Local planning agencies**, **wildlife agencies**, and **biologists** should examine the impacts of development projects on individual bobcat populations. **Agencies** should consider the long-term, cumulative effect of development or resource-extraction projects on populations of bobcats or other North American cats.
- **Environmental organizations** should work with local planning boards to ensure that development in areas inhabited by bobcats or other North American cats will have a minimal impact on cats.
- **Educators** should highlight the ecological importance of bobcats, stressing their key role as top predators and indicators for ecosystem health.
- National and regional **governments**, cooperating with **wildlife agencies**, **scientists**, and **environmental organizations**, should consider key bobcat habitats and travel corridors as indicators for where to target land conservation efforts.

Colorado Reintroduction Effort

Between the springs of 1999 and 2000, the Colorado Division of Wildlife released 96 lynx from Canada and Alaska into Colorado's high country. Prior to these releases, no lynx had been positively confirmed in the state since 1973. To date, the results of these reintroduction efforts have been varied. Some of the lynx that the Division released in 1999 died of starvation. In an effort to improve lynx survival in later releases in 1999 and 2000, state officials held the captured cats longer before releasing them. This allowed them a greater chance to recover from handling during transport and ensured they were in better physical condition and healthy enough to survive the winter. As all of the introduced cats are radio-tagged and closely monitored, the new population will provide lynx biologists with valuable information about lynx behavior, ecology, and the success or failure of the reintroduction effort.

The Colorado effort has raised a number of questions about lynx reintroduction, among them whether there are significant genetic or ecotypic differences between cats from northern Canada, British Columbia, and Alaska and those that once inhabited Colorado, and whether a sufficient prey base exists in Colorado to support a new population. The reintroduction also exposed shortcomings in the state agency's efforts to prepare local communities, the public, and the media adequately for the reintroduction effort. The Division executed the reintroduction at an accelerated pace, for political, financial, and biological reasons (the lynx was pending federal listing; private funds had been offered for a statewide lynx recovery program; and the translocated lynx were at the peak of their population cycle). A compressed schedule left state officials little time to prepare the public and the media for the possibility of some lynx mortality or to address private landowner concerns about the ramifications of bringing a rare species—which was pending federal listing at the time—into the state. As a result, the 1999 reintroduction met with criticism from the press and some of the public. Later releases, after the Division changed its release protocol for lynx, have been more successful, both biologically and politically.

The Colorado reintroduction effort may prove significant to lynx conservation: If successful over the long term, it will establish a population of cats in Colorado and restore the species to an area that it would not likely have been able to recolonize on its own. The successes of the Colorado reintroduction may serve as a model for other potential efforts to reestablish or expand lynx populations within historic and current range areas. Some experts, however, remain uncertain that the reintroduction will contribute significantly to lynx conservation. Because questions concerning ecotypic variation in lynx populations and the long-term effectiveness of reintroduction efforts remain unanswered among lynx biologists, some experts suggest that translocating lynx should be a last resort to conserve the species, and they stress that primary conservation efforts should be directed at preserving existing native populations.

Recommendations:

- The **Colorado Division of Wildlife** should continue its careful monitoring and analysis of data from the reintroduction efforts and make this data available to researchers and activists nationwide.
- **Federal** and **state agencies** planning to reintroduce lynx should maximize their outreach efforts prior to the cats' arrival in order to prepare the public, press, local communities, and affected landowners for the reintroduction. Although total consensus may never be achieved for such reintroduction projects, ensuring maximum outreach and opportunities for public input can improve public acceptance of these efforts.

Protecting Lynx Across International Borders

Many wide-ranging species inhabit the forests of the northern U.S. and southern Canada, including the Canada lynx. Lynx respond to ecological boundaries rather than political ones, and they often migrate across the U.S.-Canada border in search of suitable habitat and an adequate prey base. Species protections and land-management practices in the U.S. differ from those in Canada, however, and the varying levels of protection often have a direct impact on migrating animals. For example, the U.S. uses the federal Endangered Species Act (ESA) to protect imperiled species throughout the nation, while Canada leaves species protection up to individual provinces and territories.

Unequal protections create problems for conservationists' ongoing efforts to conserve animals like the Canada lynx throughout their range. While populations of lynx in northern Canada are relatively healthy, lynx experts have expressed concern about the future of those in the south, which include populations in southern Canada and the U.S. With the recent listing of the lynx as a threatened species under the ESA, the U.S. government now regulates certain habitat uses and has outlawed lynx trapping in the lower 48 states. In Canada, however, the government still allows limited lynx trapping seasons, and there are no regulations on the use or management of the cat's habitat throughout its Canadian range. The absence of restrictions in Canada could affect the health of lynx populations in the U.S. and could ultimately hinder recovery efforts for the cat throughout its entire southern range.

29. United States Department of the Interior, Fish and Wildlife Service. March 24, 2000. *Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Contiguous U.S. Distinct Population Segment of the Canada Lynx and Related Rule; Final Rule.*

30. Ruggiero, L.F. et al. 2000. The Scientific Basis for Lynx Conservation: Qualified Insights. Pages 443-454 *in* L.F. Ruggiero et al, eds. *Ecology and Conservation of Lynx in the United States.* University Press of Colorado / USDA-FS Rocky Mountain Research Station, Colorado.

31. United States Department of the Interior, Fish and Wildlife Service. March 24, 2000. *Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Contiguous U.S. Distinct Population Segment of the Canada Lynx and Related Rule; Final Rule.*

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35. Ibid.

COUGARS

Although the eastern cougar is now presumed extinct in the U.S., cougar presence has been confirmed in the region, raising questions about whether a few cats still exist—or whether they could one day return.

The cougar (*Puma concolor*) once ranged across most of the Americas, from the tip of Patagonia in Chile to northern British Columbia and east to the Atlantic seaboard. Today, it has been eliminated from about 50 percent of its historic range[36] and from roughly two-thirds of its North American range.[37] In the western U.S. and Canada, most states and provinces classify the cougar either as unprotected or as a game species; however, several cougar populations already exhibit signs of decline in these regions. Cougars in Texas, the northern U.S. Rockies, and southern California, for example, have been eliminated from much of their former range. Until 1999, the Yuma puma (*Puma concolor browni*) of southern California, Arizona, and northern Mexico, was listed as a candidate species by the U.S. Fish and Wildlife Service.

Cougar management in the western United States and Canada has become highly controversial: While the wildlife agencies in most western states report that cougar populations are increasing, some scientists and conservationists contend that the methods used to assess cougar population numbers and viability are inadequate, and, as a result, traditional cougar management strategies may not serve to protect the species over the long term. Experts typically agree that the institution of hunting restrictions and the elimination of bounty hunting in most states has bolstered cougar numbers in some areas. As recently as 1996, 9 of the 12 western states in which cougars reside reported that cougar populations had increased within their borders since 1990;[38] however, there have been few comprehensive studies to determine the viability of specific cougar populations, much less metapopulations.

As wide-ranging, solitary animals, cougars are difficult to count, and many of the common methods used to estimate cougar numbers are controversial among the scientific community. Thus, some conservationists claim that state management agencies often lack sufficient data for assessing the status of cougars in their region.

Setting the controversy over numbers aside, cougars still face significant threats to their long-term survival in North America. These threats include habitat loss and fragmentation; insufficient baseline data to determine the viability of populations; localized or regional management strategies that do not adequately address long-term conservation needs; and human fear of cougar presence, which often leads to unnecessary cougar mortalities. Where the species remains, public opinion is divided. Many people fear cougars will threaten human safety, prey on commercially valuable livestock, and reduce populations of big-game species; however, there are also many people who actively and vocally support cougar protection.

Western cougars will require conservation-minded management if healthy populations are to persist in North America. Foresight will be required in urban planning, so as to prevent habitat loss, fragmentation, and excessive road kills, and the viability of regional cougar populations must be assessed in determining sustainable hunting limits. Efforts to educate the public about the causes for cougar-human conflicts will also be critical to building support for conserving these important cats.

Historic Cougar Range

Present Cougar Range

The cougar once ranged across most of the Americas, from the tip of Patagonia in Chile to northern British Columbia and east to the Atlantic seaboard. Today, it has been eliminated from about 50 percent of its historic range[36] and from roughly two-thirds of its North American range.[37]

Habitat Loss and Fragmentation

Habitat loss poses a long-term threat to the viability of cougars in the West. Increased suburban expansion into cougar habitat is the main cause of habitat loss and fragmentation for western cougars. New suburban developments shrink cougar habitat and create habitat islands, placing a greater number of cougars in close contact with humans. Furthermore, as humans move into former wilderness areas, cougars often become habituated to humans and can come to depend upon suburban deer populations for their prey. Residences adjacent to wilderness areas pose a particular threat to cougars and the integrity of their habitat for these reasons. Roads, usually attendant to urban growth, also present significant threats to cougars by creating barriers to dispersing cats and increasing direct cougar mortality from vehicles.

Development is a particular problem in the western states where cougars range. The West is the fastest-growing region in the U.S., with an annual population increase of 1.8 percent.[39] As people increasingly choose to live at the interface between urban and wilderness areas, they unwittingly encroach upon prime cougar habitat. In Colorado, for example, suburban expansion around areas such as Denver, Boulder, and Colorado Springs creeps into cougar habitat, converting wild areas, displacing cougars and their prey, and putting humans in closer proximity to the cats. Expanding human development into pristine valleys or lower mountain areas in cougar habitats is especially problematic, since young cougars often disperse into these territories, and cougars generally move into lower-elevation areas in winter as their prey species descend the mountains to escape harsh conditions. People frequently choose these fringe areas around mountains to build winter recreation homes or residences, a development pattern that both fragments pristine habitats and increases the probability of cougar-human interactions.

Because cougars are flexible in their habitat choice, they are initially able to adapt as human development encroaches upon habitat areas. In California, for example, cougar populations currently exist on the outskirts of San Francisco, San Diego, and Los Angeles, adapting their ranges and to some extent their prey base to accommodate human expansion. But while cougar presence in urban areas seems to illustrate the cats' flexibility, the constant pressure from these burgeoning urban areas actually puts cougar populations at significant risk.

Cougars require significant areas of wild land to establish home ranges and permit juveniles to disperse. Cougar home ranges typically vary from 25 to 500 square miles for males and from eight to 400 square miles for females.[40] Adult males are highly territorial and will fight and even kill other cougars that enter their territory—especially young, dispersing males. With increasing habitat fragmentation and destruction, areas available for dispersal and feeding are limited. In the extreme, such isolation can lead to inbreeding depression, mortality from intraspecific aggression, and road kill, all three of which now threaten the remaining, isolated population of Florida panthers in their limited south Florida habitat. Habitat loss and degradation can also lead to more frequent conflicts between cougars and humans—or their pets—and to the direct killing of nuisance cats.[41]

Fragmentation is just as significant a threat as outright habitat destruction. According to cougar biologist Paul Beier, an isolated population of 15 to 20 adult cougars requires a minimum 1,000 to 2,200 square kilometers (roughly 620 to 1,364 square miles) to survive for 100 years. For cougars restricted to the minimum area where no new genetic material can be introduced, extinction is almost inevitable.[42] But cougar management in the West rarely takes such habitat needs into account. Urban areas and roads are planned and constructed with little or no attention to where cougars live and what corridors they use to travel. The result is fragmented natural areas that prevent cougars from dispersing and maintaining a diverse gene pool. Over time, cougars in highly fragmented areas may face even-

tual extirpation. In fast-growing suburban areas, such as those in southern California, cougar populations will only be maintained if state and local governments, private landowners, and cougar experts collaborate to plan sustainable development around cougar needs and conserve core habitat areas and critical travel corridors.

Recommendations:

- **Urban planners** should work with **community groups** in western states to develop improved zoning regulations that limit development in cougar habitat.
- **Wildlife agencies** should place a priority on protecting and/or acquiring wintering areas for cougar prey species. Protecting winter habitats for prey, such as deer and elk, is especially critical for cougars in the Northern Rockies and the intermountain West where harsh winter weather often drives the cats and their prey closer to residences or livestock grazing areas. **Activists** and **environmental organizations** should support state agency efforts to secure winter ranges for cougars and their prey species.
- **Wildlife agencies** and **environmental organizations** should work directly with private landowners to address their concerns about cougar-livestock conflict and to secure easements for wildlife corridors.
- **State and federal agencies** and **environmental organizations** should take a more aggressive approach in helping ranchers and farmers to manage their livestock in cougar-safe ways, using techniques such as guard dogs, fencing, and better management strategies to make livestock less attractive to cougars.

Reducing Cougar-Human Conflicts

Education about cats and their behavior is the key to reducing cougar-human conflicts in suburban areas close to cat habitat. As cat habitat is decreased due to new subdivisions and habitat fragmentation, wild cats often begin to consider populated areas as their territory. For example, cats follow deer into lush subdivisions and quickly become accustomed to human presence, in part due to common human actions that make neighborhoods inviting to cats. Feeding domestic pets outdoors and leaving them alone outside in cougar territory, for instance, can make them easy targets for habituated cats to prey on. Efforts to reduce negative interactions between cougars and people need to focus on eliminating human actions that habituate these cats

Here are a few strategies to help reduce human-cougar conflicts in suburban areas:

Environmental organizations and wildlife agencies should circulate homeowner manuals to suburban residents in or near cougar habitat in order to teach residents how to discourage cougar presence and what to do if a cougar is sighted.

Citizens should reduce activities that attract cats to suburban developments, such as over-watering lawns, feeding deer, or leaving pet food outside overnight. Residents of suburban communities in cougar habitat should also make every effort to scare away wild cats that enter their neighborhoods.

Educators and environmental organizations should work together to design local school programs that teach children about the important role cougars play in their regional ecosystems.

Citizens, educators, and environmental organizations should attempt to work with local media through letters, story suggestions, and editorials to highlight the ecological importance of wild cougars and offer precautions for those undertaking recreational activities in cat habitat.

Public Perception and Cougar-Human Interactions

Where it exists among the general public, fear and misunderstanding of cougars presents a substantial barrier to effective cougar conservation and management. In rural areas, ranchers often dislike cougars because they fear the cats will attack their livestock. The general public too often views cougars as a threat to both the lifestyles of those in rural areas and the safety of hikers, children, and pets in suburban areas. Despite significant public support for cougar protections, a handful of well-publicized cougar attacks on humans in recent years has drawn attention to these cats and has created fear of mountain lions, especially in some regions of the country. Unfortunately, the media-hype surrounding these attacks has overshadowed their relative rarity: Between 1890 and 1996, there have been only 15 documented deaths and 59 nonfatal injuries due to cougar attacks throughout the U.S. and Canada.[43] By comparison, the chances of being killed by a rattlesnake, a bee sting, or a domestic dog are far greater.[44] Admittedly, incidents of cougar-human conflicts have increased over the last 30 years, but experts attribute this rise to growing populations of both humans and cougars and increasing human use of cougar habitats.[45]

Experts believe that the increase in cougar-human conflicts primarily reflects changes in human behavior and demography, not that it suggests aggressive, dangerous cats. As people choose to live and recreate in formerly wild areas, they put themselves in proximity to cougars, thus increasing the chances of conflict. Furthermore, in suburban areas, human activities often tend to attract cougars. For example, watering lawns and planting shrubs bring deer, which in turn invite cougars into residential areas. Cougars have been known to make deer kills in populated suburban areas. Once present, the cats can become habituated to human presence. Feeding domestic pets outside can make them attractive prey for habituated cougars. "Problem" cats are typically young males that are dispersing or are trying to establish home ranges in areas that have become fringe habitats due to encroaching human uses.[46]

In most cases, experts contend, cougars would prefer to avoid people than to confront them. But encroaching human activities, combined with growing cougar populations in some areas, create more opportunities for cougar-human interactions. Unfortunately, the recent increase in reported human-cat conflicts has exacerbated public fears about these charismatic animals. If cougar populations are to be protected in the West, the general public needs to understand the factors that lead to such incidents. Targeted education programs will be necessary to teach people how to live safely near cougars, and public activism will be necessary in some regions to convince local urban planning boards to consider the role human development plays in provoking cougar-human conflicts.

Recommendations:

- **Wildlife agencies** and **environmental organizations** should educate people and the media through handouts, fliers, and editorials about the relatively minimal threat that cougars present to humans. Campaigns should be created that emphasize the relative rarity of cougar attacks and how people can reduce their risk of being attacked.
- **Wildlife agencies** and **environmental organizations** should initiate education campaigns, displays at nature centers, and presentations at local schools to teach the public about the ecological importance of the cougar and other large predators.
- **Wildlife agencies** and **environmental organizations** should work directly with private landowners and other government agencies to establish depredation programs where appropriate.
- **Educators**, **environmental organizations**, and **wildlife agencies** should teach citizens living in cougar regions how to tailor their behaviors to avoid negative encounters with cougars. These groups should also pursue opportunities to

work with the media to communicate this information (i.e., through suggested stories, editorials, and articles). In areas where cougar and human uses overlap, people should be taught how best to react in the event that they do encounter a cougar.

- **State** and **provincial governments** in cougar areas should develop and publicize protocols for reporting cougar incidents to wildlife management agencies or other appropriate authorities.

Lack of Baseline Information on Cougar Populations

Gathering extensive data on cougars is a difficult process. Comprehensive studies require significant resources and may take years to complete. As a result, wildlife managers designing management strategies for *Puma concolor* in the West often lack basic information on the cats, such as population numbers, minimum habitat requirements, and rates of recruitment. Most states and provinces in western North America have undertaken studies of their mountain lion populations,[47] and numerous papers have been published on the species; however, these studies have rarely been comprehensive enough to generate conclusive management data. Often, wildlife managers do not know how many cats exist in individual populations or in the state as a whole. Typically, cougar population estimates are derived from documented trends in hunter

How Different Are They?

For the better part of the 20th century, scientists have divided cougars into some 32 subspecies. The subspecies classifications reflect physical and geographic differences between the cats in different regions, distinguishing, for example, Florida panthers (Puma concolor coryi) from cougars that occur on Vancouver Island (Puma concolor vancouverensis).

A recently published study from the National Cancer Institute's Laboratory of Genomic Diversity, however, proposes to reclassify all cougars throughout the Americas into only six distinct subspecies. The study took samples from over 300 present-day cats and museum specimens and analyzed the genetic structure of their DNA to determine how similar—or different—cougar subspecies really are. Based on similarities in the cougars' genetic make-up, the study suggests that all subspecies north of Nicaragua be reclassified as one North American subspecies—Puma concolor couguar (the eastern cougar).*

This study could have implications for cougar conservation, especially in the eastern United States where the Florida panther is the only known breeding population of cougars that remains. On the one hand, reclassifying cougars alleviates the controversy over introducing Texas cougars into south Florida to help correct inbreeding in panthers. On the other hand, if the scientific community were to reclassify cougars as proposed by the National Cancer Institute study, the U.S. Fish and Wildlife Service could potentially be asked to remove the Florida panther from the Endangered Species List. Opponents of ESA-protection for panthers in Florida would probably argue that the North American cougar subspecies (Puma concolor couguar) is not legally threatened or endangered across a significant portion of its range. Advocates for maintaining protections for panthers would probably contend that the Florida cats should be protected as a "distinct population segment." Although the U.S. Endangered Species Act can extend legal protections to distinct population segments, the U.S. Fish and Wildlife Service has narrowly interpreted this provision in the past and rarely finds that species qualify for protection under it. Thus, the case for saving an isolated population of cougars in south Florida—much less working to establish them in additional parts of their historic range—could be complicated by a reclassification of cougar subspecies.

* Culver, M. *et al.* 2000. Genomic ancestry of the American puma (*Puma concolor*). *Journal of Heredity*, 91:186-197.

kill, depredation incidents, nuisance animal reports, or confirmed sightings.[48] As a result, the accuracy of population estimates in much of the western U.S. and Canada is highly variable.[49] Even less is known about populations in Mexico and Central and South America. The fact that managers lack sufficient data on the cougars they must manage is not unique to this species, and most agency scientists point to scarce resources as the primary factor limiting their cougar research. Nonetheless, cougar management decisions are often based on rough population estimates rather than scientific analysis of what a given population can bear.

Despite scientific uncertainty, controlling cougar populations remains a priority for many people throughout the West. Most states and Canadian provinces currently allow regulated sport hunting of cougars in order to control their numbers, with the exception of California and South Dakota, where cougars are protected from all hunting. Texas is the only state that allows unlimited year-round hunting of cougars.[50] Some experts state that western game agencies are conservative in determining hunting limits for cougars, and many believe that the institution of hunting regulations has helped to protect cougar numbers in the West. Some scientists and citizen advocates, however, claim that agencies allow too much cougar mortality: They claim that agencies set hunting limits with more attention to hunters' interests than to the viability of the cats. As a result, these conservationists fear that management strategies based on rough data may imperil the long-term survival of individual cougar populations. For example, during the 1996 - 1997 season, Utah hunters killed an estimated 19 percent to 29 percent of the state's puma population, based on Utah's rough population estimates. Given that cougar populations are typically estimated to increase at 5 percent to 28 percent per year, this mortality rate may well have outpaced the population growth of Utah's cougars in that year.[51] Furthermore, there is no scientific proof that hunting cougars actually reduces cougar-human conflicts or depredation.[52] Thinning the overall population does not necessarily decrease the odds that individual pumas will prey on livestock or wander into urban areas. Rather, these problems are typically symptoms of humans' encroaching on cougar habitat; killing a percentage of the overall cougar population may have little or no effect on reducing onflicts between cats and people or their animals. On the other hand, hunting and predator control efforts may have a negative effect on the long-term survival of cougars in the West—reducing both individual populations and metapopulations.

Making management decisions in the absence of hard science could be very detrimental to cougar populations in the long run. If cougar mortality levels exceed productivity, populations will begin to decline. Over the long-term, accurate monitoring of cougar population trends will be vital to ensuring that mountain lion populations remain healthy throughout western North America. Studies of the effects of hunting and predator control may also be critical to finding a means of managing cougars in the West without leading to their ultimate extinction. When lacking scientifically defensible data on population viability, cougar management strategies should be overly cautious rather than insufficient in protecting these important predators and their habitat.

Recommendations:

- **Scientists** should undertake careful, comprehensive research projects throughout cougar range states in the West. These studies should aim to assess the needs and long-term viability of cougar populations. Studies could be modeled on the ten-year study of cougar populations in the San Andreas Mountains of New Mexico conducted by K. Logan and L. Sweanor (1985-1995).[53]
- **State wildlife agencies** should set aside increased funding for research and conservation-based management of western cougars. Additionally, **state governments** should expand the use of revenue collected from hunting licenses to help pay for studies of cougar populations and their viability.
- **State and provincial governments** should develop additional revenue sources to fund cougar monitoring, research, conservation, and education programs (e.g., a wildlife license plate program, such as that developed in Florida).

EASTERN COUGAR

With the exception of the Florida panther subspecies, there are currently no known breeding populations of cougars east of the Mississippi River. Once plentiful from Tennessee to eastern Canada, the eastern cougar (Puma concolor couguar) is now presumed extinct in the wild, primarily the victim of eradication campaigns and habitat loss. Legally, however, eastern cougars remain protected as endangered under the U.S. Endangered Species Act.

According to cougar expert Dr. Kenneth Logan, there is not sufficient evidence to indicate that any breeding populations of cougars exist in eastern North America outside of Florida.[54] Cougar presence in the East, however, has been confirmed on a number of instances over the past several years. Cougar tracks and other signs have also been detected in areas throughout its historic range, including Vermont, Massachusetts, and West Virginia. While it is unclear whether the wild cats that are being reported in the East are surviving eastern cougars or captive cats that have been released into the wild, their presence has sparked support for reexamining the eastern cougar's status.

Lack of knowledge is one of the primary hurdles to recovering cougars in the East. Many people are not aware that cougars were once common in this region. Furthermore, although the eastern cougar is still listed as endangered under the U.S. Endangered Species Act, the U.S. Fish and Wildlife Service officially considers it to be extinct, which complicates efforts to pursue conservation efforts for this subspecies and its habitat. For these reasons, it is often difficult to bolster public support for cougars in the East, much less obtain state and federal funds to analyze the true status of these cats. Despite recent sightings of large cats in former eastern cougar habitat, federal, state, and private resources are often directed towards the recovery of better-known cats in other regions rather than to helping determine whether any populations of eastern cougars remain. Determining the presence of eastern cougars and assessing the political and ecological viability of reestablishment will be necessary before any major conservation efforts can succeed.

Recommendations:

- **Agencies** and **funders** should support more scientific studies to determine the presence or absence of eastern cougars in the Appalachian Mountains.
- **State governments** should create tax incentives and land trusts to promote conservation of eastern cougar habitat.
- **Agencies** and **environmental organizations** should establish an Eastern Cougar Working Group to assess the political and ecological viability of reestablishing cougars in the eastern U.S. The group should be comprised of government officials, eastern cougar activists, private landowners, and local community members.
- **Environmental organizations** and **educators** should initiate efforts in local communities to increase understanding about eastern cougars.
- **Environmental organizations**, **scientists**, and **activists** should encourage the U.S. Fish and Wildlife Service to resolve current confusion over the status of wild cougars in the East by officially recognizing all such animals as protected.
- **Governments**, **wildlife managers**, and **environmental organizations** should work together to protect large areas of historic cat habitat to preserve opportunities for reintroduction or reestablishment of cougars in the East, focusing land protection efforts on creating a large-scale reserve design. In addition, they should work to connect these areas with additional protected lands in order to allow cougars to disperse freely through eastern and Midwestern states.

- **State and federal wildlife agencies** and **environmental organizations** should work with herders and ranchers to assist them in reducing depredation from cougars.
- **Wildlife agencies**, **scientists**, and **environmental organizations** should identify critical corridors and habitats for cougars and work to protect these areas, particularly in the absence of adequate population-viability studies.

Public Involvement in Cougar Management Decisions

Cougars in western North America will not be adequately protected without public advocacy for their conservation. Preserving cougars will require protecting key habitat areas and critical travel corridors on public and private lands, managing urban sprawl and human wilderness uses to avoid cougar conflicts, and monitoring populations to ensure that cougar control methods do not place the long-term viability of populations at risk.

Such foresighted management, however, is difficult to realize when most remaining North American cougar populations are perceived to be thriving. Many cat conservation experts believe that state wildlife agencies need to work harder to include more citizen input into their cougar management processes. For example, if wildlife agencies are not undertaking comprehensive studies to determine hunting limits for cougars, the public has a right to know this. Citizen activists can play a key role in encouraging wildlife management agencies to pursue additional cougar studies and in advocating that governments appropriate additional funds to wildlife agencies for cougar research, habitat protection, and conservation management. The general public that supports cougar conservation can play a key role in supporting the use of public funds for research and conservation strategies that address the long-term viability of cougars.

Some states, including Utah, Colorado, and Wyoming, do offer opportunities for public input into cougar management through open public meetings and public websites and by making wildlife managers available to the public. Nonetheless, some activists believe that cougar management decisions do not fully represent public opinion but tend instead to favor the priorities of special interest groups who prefer to limit cougars. Citizen advocates for these cats claim in some cases that their concerns have not been adequately considered in formulating cougar management strategies.[55] Many cougar advocates believe that there must be greater opportunities for conservationists to have early and meaningful involvement in the creation of cougar management policies. On the other hand, some experts claim that interest groups typically take a more active interest in cougar management strategies, so their perspectives may be expressed more vocally. Because population objectives reflect a combination of biological factors and the demands of interest groups,[56] conservation interests may not be adequately represented in current cougar policies. Conservation-minded cougar management needs to be a priority for scientists, agencies, and citizen activists alike. Action now can help create strategies that protect the cougar's long-term viability and avoid emergency measures to protect these cats in the future.

Recommendations:

- **State wildlife agencies** should actively encourage increased community involvement in western cougar management decisions. In states that do offer opportunities for public input into cougar management decisions, **wildlife agencies** need to work to reach out to a broad public audience and to integrate citizen input to the greatest extent possible. Opportunities must exist early on for conservationists and citizen activists to play a meaningful role in the formulation of cougar management policies.
- **Wildlife managers** and **agencies** should ensure that current data about cougar populations is made available to the general public via the Internet or published reports.

- **Wildlife managers** should actively seek to incorporate the most current data available into western cougar management strategies, with special attention to data from in-depth studies of the dynamics and viability of specific populations. To help bolster these efforts, citizen advocates and conservationists should encourage state governments to increase funding for in-depth cougar research.
- **Cougar conservation advocates** should make it a priority to attend public meetings and participate actively in management strategies that affect these cats in order to ensure that conservation concerns are continually factored into cougar management.

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NWF RECOMMENDATIONS

The Endangered Cats of North America report offers a long list of critical next steps in the effort to save North America's wild cats. We hope this report will help organizations and individuals to identify ways they can contribute to cat conservation and spur broader public involvement in ongoing efforts to protect this continent's precious wildlife heritage.

The directives listed throughout this report represent the perspectives of a variety of cat conservation experts. They illustrate the many issues that threaten the survival of North American felids and offer both broad and targeted suggestions for better conserving these important predators. The directives implicate not only wildlife agencies and national governments, but also local and regional governments, planning entities for urban development and transportation, private organizations, academic institutions, scientists, educators, private landowners, advocates, and the citizenry of North America. In order to conserve wild cats — ensuring their survival for future generations and protection of the ecosystems they represent — each of these groups must make its contribution.

Based upon the proceedings of the Federation's Endangered Cats of North America Workshop in February 2000 and the recommendations raised in this report, the National Wildlife Federation identifies the following key priorities as essential to moving this continent's imperiled cats closer to recovery:

Incorporate habitat protection and wildlife-corridor protection into development and transportation plans.

Many cat populations in North America are directly affected by urban development and road construction. Citizen advocates and environmental organizations should pressure the responsible agencies to ensure that the negative effects of such projects on imperiled cat populations are assessed — and ultimately avoided or minimized — before projects are approved. For example, local governments and city-planning agencies should take cat conservation issues into account in planning urban developments. In the U.S., federally-funded and federally permitted projects that affect cats that are listed under the Endangered Species Act are legally subject to review by the Fish and Wildlife Service. Environmental organizations and citizen activists can serve as watchdogs to ensure that cats are properly protected throughout these processes. Federal, regional, and local transportation agencies need to work with wildlife managers to ensure that roads are designed to avoid harm to cats. Environmental groups, wildlife agencies, scientists, and activists should also work to identify potentially negative projects and strive to remove or mitigate their impacts on cat populations.

Increase activist involvement in protecting cats and their habitats at both local and national levels.

Although citizens who value cat conservation may outnumber those who are indifferent or who oppose it, activists are often a minority at public events that address cat conservation issues. For example, in western states where state agencies have held public hearings to discuss cougar management policy, advocates for cat conservation were often outnumbered, *despite* indications that a majority of citizens supported cougar conservation. In order to make their concerns heard, citizen advocates must take an active role in decision-making processes that affect cat populations, especially on local, regional, or state/provincial levels. Activists and environmental groups working on cat issues should attend meetings on issues that directly affect cats — from cat management policies to urban development planning — and make their voices heard.

Increase public access to tools that can help cats toward recovery at the local level.

Cooperation between government and private landowners is integral to protecting habitat for North American cats. Several U.S. government programs, such as the U.S.

Fish and Wildlife Service's Partners for Fish and Wildlife program and some of the U.S. Department of Agriculture's Natural Resources Conservation Service programs, offer financial or technical assistance to private landowners who want to conserve lands or use them in a sustainable manner. Some U.S. states offer similar programs. Government departments or offices that administer these programs should ensure that opportunities for assistance are well publicized. Simultaneously, wildlife agencies and environmental organizations should work regionally to connect landowners with these programs. Wildlife agencies, environmental organizations, and citizen advocates that work on cat conservation should also ensure that private landowners are aware of other options to protect habitat, such as conservation easements, land exchanges, concessions, or sale or bequest to the government for conservation purposes.

Where appropriate, wildlife agencies and public land organizations, such as national and state parks and wildlife reserves, should seek out and publicize opportunities for citizens to become involved conserving cats on the ground. Such outreach could include habitat restoration events or informal surveys for cats or prey species. Making tangible conservation opportunities available to the public can raise awareness of imperiled cats, increase support for their conservation, and ultimately help to bolster efforts to recover them, whether through legislation, conservation advocacy, or cooperation with private landowners.

Adopt pro-active, conservation-based approaches to the management of cats that are currently less endangered.

Some of North America's cat populations are doing better than others. For wildlife agencies and conservation groups, faced with low budgets, over-worked staffs, and the need for urgent actions to recover many critically imperiled species, it is difficult to devote limited resources to conserving them. But while cats such as bobcats and cougars have managed to persist in some areas despite human intrusions, it is not too soon to be thinking about their long-term viability. These cats already face shrinking habitats, intrusive human activities, and other threats that affect the health of their populations. The time to work proactively toward conserving these cats and their habitats is now, before their populations become critically endangered.

Wildlife agencies can take significant steps toward conserving North American cats and their habitats by closely monitoring population levels, dispersal and travel patterns, and the availability of habitat. Wildlife agencies, conservation organizations, and activists should work toward protecting key habitats for these cats — both core areas and travel corridors — and monitor the spread of human activities that may negatively affect their status and populations.

Stress cross-border protections for cats and landscape-scale habitat conservation through national legislation, collaborative research, and cooperative, international conservation efforts.

North America's cats range across the political boundaries of three separate nations and multiple state, provincial, and indigenous lands. Effective conservation requires that they be protected across these borders. At present, many cats are not uniformly protected throughout their ranges. Achieving equivalent protections across all international, state, and provincial borders for each of these cats is an ambitious goal. Nonetheless, the governments of North American nations, supported by citizen activists and wildlife conservation organizations, should work toward designing and implementing conservation strategies that will protect critical, connected habitats for felids and ensure the health of cat populations throughout their ranges. Governments, cat scientists, and wildlife agencies should work collaboratively with development agencies and interest groups along international borders to ensure proper protection of cats across these boundaries. This includes monitoring development projects that threaten cat habitats and limiting activities that lead to exploitation or unnecessary killing of cat species. Cat scientists and researchers should also continue to collaborate in their efforts to study the ecology of North American felids. Similarly, conservationists, scientists, and wildlife managers should seek to learn from the conservation efforts of other countries.

Increase funding and research for in-depth studies of feline conservation needs.

Scientists and wildlife managers point to lack of information as a factor that limits effective conservation for almost every single North American cat. In most cases, strategies to protect cats and their habitat would be significantly aided by long-term studies of cat behavior, biology, and ecology. Unfortunately, these kinds of studies require extensive financial and human resources, both of which are hard to come by. Public and private funders who are interested in helping North American cats can help bolster conservation efforts by supporting comprehensive research projects in addition to vital cat conservation efforts. In the short term, funders, academics, and scientists should give priority to research projects that will contribute directly to cat conservation efforts, such as projects that can shape cat recovery strategies through natural resource management, sustainable land use, and conservation-based planning of urban areas, roads, and other human developments. Studies that monitor felid populations and metapopulations over the long-term are also critical, as they may yield important information about cats' dispersal patterns and habitat needs. This data could then be used both to influence cat conservation strategies and to help lower the impacts of human activities and development.

Increase public awareness about North American endangered cats and their conservation needs.

Building public support for the imperiled cats of North America is the first step toward improving conditions for them. Support must come through basic education and outreach about cats: their biology and habitat needs, the ecological role they fulfill, and the human activities that threaten their survival. Environmental educators can focus on cats and their regional importance in classroom activities. Wildlife agencies, environmental organizations, and educators should work together to ensure that citizens are aware of the cats present in their regions and the effects local human activities are having on these species. Educational materials for all audiences should stress appropriate conservation themes for cats whether focusing on highly imperiled cats or those at less immediate risk.

Raising general public awareness about the presence of cats, the important roles they play in North American landscapes, and the need for concern about cat conservation will lay the groundwork for more effective conservation campaigns as well as for critical partnerships between groups and individuals who can help to protect North America's cats.

CONCLUSION

Ensuring the survival of North America's endangered cats will require bold and aggressive conservation efforts throughout their ranges in Canada, the U.S., and Mexico. Protecting these cats for the long term requires vigilance and commitment from governments and national and regional wildlife agencies; innovative conservation strategies for managing both public and private lands; international strategies for protecting cats across political borders; and a rigorous approach to managing human activities that affect cats and their habitats. Making progress on most of these goals will require broad and vocal public support for cat conservation. Thus, citizens throughout North America play a critical role in conserving native wild cats — from advocating for their protection to contributing individually to their recovery.

The *Endangered Cats of North America* report offers a long list of critical next steps in the effort to save North America's wild cats. We hope this report will help organizations and individuals identify ways they can contribute to cat conservation and spur broader public involvement in ongoing efforts to protect this continent's precious wildlife heritage.

Endangered Cats Of North America

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The National Wildlife Federation's **Keep the Wild Alive** campaign was designed to help endangered species on the ground, while simultaneously creating a broad and enduring base of national support for endangered species.

For more information about the National Wildlife Federation or the Keep the Wild campaign, or to learn how you can become involved in our conservation work, please contact: Keep the Wild Alive, National Wildlife Federation, 1400 16th Street, NW, Washington, DC, 20036, or visit our Web site at www.nwf.org.

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NWF Mission

The mission of the National Wildlife Federation is to educate, inspire and assist individuals and organizations of diverse cultures to conserve wildlife and other natural resources and to protect the Earth's environment in order to achieve a peaceful, equitable, and sustainable future.

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Due to the inherent scarcity of these animals in the wild, some of the photos used in this report are of captive cats.