

CHAPTER 4

The Emergence of Conservation NGOs as Catalysts for Local Democracy

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In principle, every government manages the distribution of resources under its jurisdiction for the shared benefit of its people. However, based on the current state of the wild, and the rampant state-permissioned environmental degradation of the biosphere, it has become apparent that the centralized government administration of natural resources has failed, even in countries under democratic rule. As a result, wildlife conservation NGOs have emerged to redress this failure by promoting new public processes that are embedded in the local rural communities that depend on natural resources in order to ensure more effective protection of wildlife and wildlife habitat. Unfortunately, many of these communities do not have either the governance structures or the experience necessary to manage the biodiversity in their midst. They also tend to be disenfranchised from the seats of state power and are in need of a strong advocate to support their skill development, knowledge of how to manage their resources for sustainability, and patriation of management authority. Through the following case study, we will demonstrate how one global NGO, the United States-based Wildlife Conservation Society (WCS), is helping local groups that have been excluded from land-tenure rights, have no tradition of collaborative management, or hold cultural traditions that do not recognize wildlife or natural resources as property to be managed, to develop democratic systems that can be more effective at protecting wildlife and wild places.

NGOs have been part of the government process since the advent of democracy, although their form has become more formalized over the last two centuries. A short history of WCS, where the authors of this chapter

work, reveals that the state of ecological degradation has been the focus of NGO activity for over one hundred years (e.g., Hornaday 1913; Osborn 1948). It also reveals that the solutions to this international problem were embedded in the human dimensions of conservation, such as the need for increased literacy about sustainable management and promotion of a conservation ethic, as was the case for the sponsorship of the field guide series *Our Pacific World*, intended to protect wildlife in the Pacific islands where American GIs were stationed (Osborn 1945). Since the book's publication, NGOs such as WCS have increased their participation in primary conservation biology research around the world and in the development of international wildlife policy. Today, some large international NGOs have become household names, and most have researchers based in areas of conservation concern where traditional communities survive on the wildlife and products from natural resource areas.

The shared knowledge and the social relationships that have developed between traditional communities and community-based NGO staff in these same areas have allowed these NGOs a unique opportunity to participate as significant social actors in the advancement of democratic governance structures. This chapter examines how WCS exemplifies this social action that is helping local communities to assert control over their regional wildlife habitats in order to protect what remains of the wild.

FIELD OF SOCIAL ACTION

Wildlife conservation requires collaborative management strategies that take into account how individuals choose to use or extract flora and fauna from landscape systems. In particular, fragile systems require adherence by individuals to a common code of conduct that will protect species and natural resources from overextraction. This shared-use practice is essentially an agreement to suppress self-interest in favor of collective participation in the management of shared public goods or assets such as wildlife. Unfortunately, trade economies advance community well-being through converting the community's natural resources to commodities, leading to the oft-referenced tragedy of the commons because a common rule of law is lacking.

Lack of democratic process skills permits state or powerful private interests to assume ownership, control, and management of the rural wildlife and natural resources on which those outside the network of patronage depend. Political assessments have shown that separation of

asset ownership from the people living near the resources causes greater economic security concerns than other factors because the asymmetry of central management ignores the lives of those living directly from those resources (Obi 2005). These concerns suggest an increased need for new governance systems that will allow local communities to manage their own natural resources in a manner that is transparent, accountable, and involves local people in the collaborative decision making, essentially, the elements that constitute strong democracy (Barber 1984). Unfortunately, many local people lack democratic self-government skills because their household-level trading practices have not afforded them experience with transparent representative governance; they may have misconceptions about the importance of transparency and accountability in civil society and lack of practice in establishing and enforcing norms (Bienen and Herbst 1996). This is particularly a problem for people living in poverty and outside the network of patronage that is held near to centers of governance (Bhalla and Lapeyre 1997). This isolation from political power permits environmental degradation and species loss to be concealed until after community well-being is compromised (Kousis 1998).

Ostrom (1990) has argued that common-pool resources can be collectively managed if monitoring and supply challenges are resolved. Prabhu (2001) notes that national government as the unrestricted owner who controls natural resources is a change from the local traditions in which resources were treated as common local property managed in structures similar to Ostrom's theory. But claims of ownership do not inherently confer resource rights unless they are acted upon (Ostrom and Schlager 1996), suggesting that lack of clarity to landownership may account, in part, for why government process or local communities have undermined conservation management plans.

Ostrom and Schlager's (1996) taxonomy of the degrees of ownership rights associated with possessions (table 4.1), when interpreted in terms of wildlife and habitat control, suggests a method for seeing how NGOs are engaged in helping communities develop a more nuanced understanding of what is required for long-term sustainability management. Ostrom and Schlager's taxonomy illustrates that individuals with only the right-of-access and the right-to-withdraw-resources do not have a vested interest in sustainability because the resources for these people have only a commodity value. Management control and the right to exclude others from withdrawing resources have been exerted by central governments, but assertion of these rights is potentially sub-

ject to abuse because it is hard to control natural resources if people living in the area do not adhere to the rule of law or have no vested interest if the system becomes degraded. Identity attachment or the right to feel alienated from possessions is potentially the most resilient right because the loss of an asset is also associated with feelings of alienation. In the case of local wildlife where ownership can be contentious, household provisioning through hunting as free-agent traders may be perceived as a right that can usurp the collective interest and undermine any top-down plan that places limits on hunting or trapping. In these cases, only adherence to a rule of law that supports sustainable, shared-resource use for the common good will ensure the long-term resilience of natural resources management plans.

Our experience suggests that national-level democratization and governance efforts may not filter down fast enough to the rural households living in remote areas of rich biodiversity to protect the wildlife and biodiversity that are critical to local livelihoods and global patrimony. We propose that ownership of these communities' natural resources may not be apparent, even though these people may have exercised their rights of access, withdrawn assets, and believed that they can be alienated from these possessions, because these local communities have not taken advantage of their ability to manage or exclude others from withdrawing assets from their lands. It is in this context that NGOs have emerged as social actors who can help local communities to build experience with democratic processes in order to protect what remains of the wild.

TABLE 4.1 **Degrees of Ownership Rights**

	OWNER	PROPRIETOR	CLAIMANT	AUTHORIZED USER	AUTHORIZED ENTRANT
Access	Ø	Ø	Ø	Ø	Ø
Withdrawal	Ø	Ø	Ø	Ø	
Management	Ø	Ø	Ø		
Exclusion	Ø	Ø			
Alienation	Ø				

Source: [AU: Insert source.]

CONSERVATION AND SOCIAL ACTORS

In practice, wildlife conservation requires that people limit their take of depleted resources from natural systems, even if they feel entitled to deplete these resources for personal gain. It is the case that individuals *will* act to protect natural resources when such actions are in their own interests, as would be the case in a society that deems an individual's interest to be in conflict with the interests of society and if that society is willing and able to impose sufficient sanctions on an individual to ensure compliance with society's interests. Leach, Mearns, and Scoones (1999) examined how various social actors assume entitlement to natural resources based on their ability to enforce regularized patterns of behavior between individuals and groups—in essence, how social actors lay claim to Ostrom and Schlager's (1996) different bundles of rights. In applying their analysis to community-based natural resource management projects, Leach, Mearns, and Scoones concluded that the capacity to negotiate power and control will tend to favor the social actors who already have access to power. They suggested that NGOs were uniquely positioned as social actors to advance community-based natural resource management because NGOs have the expertise to augment disenfranchised small community groups in their negotiations for power, NGOs share some common interests with these communities, and NGOs can achieve their goals through mutually beneficial partnerships that help local communities attain direct stewardship over the natural resources to which they have prior claims (Robinson 2007).

AIDING COMMUNITIES IN ASSERTING THEIR MANAGEMENT RIGHTS

Since the 1960s, local people have harvested the understory xate (*Chamaedorea* spp.), a local name for a variety of palm fronds found in the forests of eastern Guatemala, in order to supplement their income and as a form of insurance to pay for unforeseen expenses such as emergency medical treatment over many years. These fronds were traditionally sold to middlemen who transported them to exporters who in turn sold the fronds to the international market as “green background” or filler for floral arrangements in the United States and Europe. Xate harvesting historically occurred under an open access regime, with few barriers to entry. The harvesters had traditionally asserted the right to withdraw xate but had not recognized their right to collaboratively manage the resource.

Recent surveys of xate in the forest of the Petén have shown that all three species are declining in density and that overharvesting for the commercial trade is the likely cause. One reason that xate trade is unsustainable is that buyers typically purchased all fronds from harvesters regardless of quality, subsequently sorting through the bundles to discard all damaged, unmarketable fronds. Buyers incentivize harvesters to strip the plant of its leaves regardless of quality, resulting in a decrease in flowering and fruiting, occasionally the senescence of individual palms, and through time, a progressive depletion of the species throughout the forest.

As part of a collaboration commencing in 1998, WCS's full-time staff in the Petén assisted the Organización Manejo y Conservación (OMYC) in the village of Uaxactún and the Rainforest Alliance in instituting a new trading system for xate that pays harvesters only for high-quality fronds that will receive a price premium through the OMYC's new "green" marketing agreement brokered with Continental Greens Ltd of Houston, Texas. This new system is designed to provide harvesters with an economic incentive to cut only quality fronds, leaving unmarketable fronds on the palm to assist its photosynthesis. For this system to work, *xateros* (palm harvesters) must agree to harvest only quality fronds and to sell them to the OMYC xate bodega where quality controls are enforced and fronds are sold only to Continental Greens. This new process asserted a higher level of right, by supporting a management regime on behalf of the community..

A second level of right of ownership, the right to exclude others, was a key principle to protecting the community's resources. Continuing to gather all fronds and selling damaged ones to other traders, and allowing non-Uaxactún harvesters into the community forest, would cause the new trade system to fail. WCS staff realized from the beginning that helping the Uaxactún community to develop a new democratic, transparent, accountable, and effective governance system for the commercial trade of xate was the key to conserving wild palms in the forest and to ensuring this sustainable source of revenue to support local livelihoods. Shifting toward a democratic, shared-ownership regime from an open-access, household-level trading practice, however, required mentoring and skill development for the community. The new collaborative management program was one of the first occasions that households in Uaxactún came together as a community to develop and enforce agreed-upon norms for access to and withdrawal of a community resource. In the first twenty-six months since the program started,

six successive management committees of the xate bodega failed to manage effectively. By 2007, the community, in collaboration with its NGO advisors, determined that it needed more transparency and more accountability in the management of the xate trade and decided to hire a university forestry graduate to manage its program.

Following the initial mentoring period and experiments in democratic management and ownership, the OMYC is now implementing a xate management plan with the approval of the Guatemalan government, is asserting its ownership rights with independent middlemen, and hired an accountant to audit the financial management of the operation. The conservation NGOs helped this community identify a community ownership right, mentored the process, and offered technical expertise that brought together a group of households into a group. This evolving process is helping the people of Uaxactún gain practical knowledge of the importance of establishing transparent and accountable governance systems, knowledge that can be applied to other natural resources or community enterprises.

AIDING COMMUNITIES IN DEVELOPING SHARED-RESOURCE MANAGEMENT PRACTICES

Our work has also shown that NGOs are also uniquely positioned, as embedded social actors, to help rural communities expand their democratic skills, because NGOs share rural families' interests in sustaining the resources on which everyone depends and are also familiar with the legal processes required to ensure that local-level, democratic decision making is legally recognized under state or regional laws. In the Ruaha landscape of central Tanzania, WCS has worked to empower communities and economically incentivize wildlife conservation on village lands. This has been accomplished primarily through creation of a "Wildlife Management Area" which patriates wildlife-management authority from central government to an association of twenty-one villages. Perhaps most importantly though, the WMA revenue is also received locally, so the benefits of conservation are recognized and realized by the people responsible for protecting and living with wildlife.

In the past, hunters negotiated individually for hunting licenses from the Ministry of Natural Resources and Tourism, leaving villagers and village governments with no formal voice in determining who hunted or even whether village lands would be available to which hunters. As a result, hunters were compliant in paying fees to the min-

istry that issued the licenses, but they neglected to pay the associated local fees to the villages where they hunted.

Asserting the right of local control over access to natural resources, however, was limited by the onerous legal requirements necessary for being recognized as a management authority, requirements that were far beyond the capacity of the village governments acting independently. WCS's local conservation staff worked with the village association, known as MBOMIPA (Matumizi Bora Malihai Idodi na Pawaga, or Sustainable Use of Wildlife in Idodi and Pawaga), as a trusted partner that could technically support the patriation of management by producing collaborative land use planning recommendations, resource inventories, zone-planning recommendations, and management mentoring. In addition to technical support, WCS staff served as trusted mediator between investors and resource users. While WCS, as a conservation NGO, sought to benefit wildlife, its role as social actor helped to build good democratic governance skills that were central to the successful wildlife management strategy.

In 2007, MBOMIPA gained the authority to manage its area and is answerable to its constituent twenty-one village governments. Following collaborative discussions with WCS staff, the village governments insisted that a new and more ethical hunting company come to the area, that higher fees be charged, and that fees be paid in advance. This collaborative process also helped the village governments determine to set aside specific areas for phototourism to equitably provide more local jobs per visitor and more revenue per hectare for the stakeholder villages. In the first year of local management, hunting revenue increased eightfold, despite a 75 percent decrease in the area hunted. These changes resulted from creating a locally representative management authority that was accountable to the stakeholders most strongly affected by their decisions.

New democracies require investment in skill development, and MBOMIPA continues to learn how to improve its governance structures. For example, the twenty-one villages participating in MBOMIPA represent over fifteen ethnic groups with differing horticultural and livestock-keeping practices. The two subsistence options conflict over common access to land because livestock keepers and horticulturalists either are unaware of or disregard each other's traditional land tenure. During the dry season of 2005, the livestock keepers began using the Wildlife Management Area for livestock grazing, undermining the community-determined management strategy. WCS intervened by calling a

village meeting for both types of land users to discuss the problem. During these facilitated discussions, it came to light that large portions of the set-aside grazing area had been cleared for agriculture. The clearing was inconsistent with the land use plans prepared as part of the Wildlife Management Authorization process facilitated by WCS. While the livestock keepers were included in that process, it became clear that they were marginalized in the day-to-day management of village government and chose to take their chances invading the wildlife area rather than challenge their village peers.

While developing skills in democratic management and decision making is difficult, the MBOMIPA project offers a useful case study on how patriation of shared management authority at a local stakeholder level can aid in the practice with transparency and enforcement of the rule of law, the role of peer pressure in assuring the advancement of wildlife protective social norms, and the place of NGOs in capacity development for emerging, local democratic self-governments.

HELPING COMMUNITIES TO CONTROL WILDLIFE EXTRACTION AND HABITAT DEGRADATION

NGOs also appear to be uniquely capable of helping rural communities negotiate effectively with more powerful and experienced actors and providing technical advice through the process of developing more effective representative governance in cases where land tenure is not recognized. In Bolivia, WCS Greater Madidi Landscape Conservation Program has worked with the Tacana people since 2000 in the development and implementation of a management plan for their traditional territories that neighbor and partially overlap Madidi National Park (Painter, Wallace, and Gomez 2006). As a conservation NGO, WCS sought to help promote a local constituency for conservation with a broad range of jurisdictional groups in the Madidi region to protect the rich sources of wildlife and associated biodiversity within and surrounding a globally significant continuous swathe of protected areas in Bolivia and southern Peru (Painter, Wallace, and Gomez 2006). The low population density, the desegregation of jurisdictional actors, the incongruence between these jurisdictions regulatory concerns, and lack of clarity to land-tenure and environmental entitlements had previously created opportunities for nonresident land speculators to assert ownership and dominion over lands traditionally used by the communities.

Following a WCS presentation regarding the potential commu-

nity-based natural resource management in the region, CIPTA (Concejo Indígena del Pueblo Tacana, the Tacana People's Indigenous Council), the Tacana representative organization, formally requested a broader partnership that included assistance in the legal process for land titling in the region and parallel assistance in the design and implementation of an overall management vision for the TCO. Bolivia's Land Reform Law of 1996 permitted legal consolidation of indigenous collective land under an indivisible title; however, CIPTA and the twenty Tacana communities within the Tacana TCO were not able to adequately accompany and participate in this process owing to insufficient resources and the complexity of the legal process. The two-pronged approach adopted by the partnership ensured that CIPTA and the Tacana communities were as focused on building a participatory and overall sustainable long-term development vision for the Tacana TCO (CIPTA-WCS 2002) as they were on gaining legal ownership over their territorial demand and the renewable natural resources therein.

By 2004, the Tacana had secured land title for 372,000 hectares, and the CIPTA-WCS partnership has since concentrated on implementing overall territorial management mechanisms, building a larger portfolio of natural resource management projects, and shifting attention to the legal status of the second Tacana territorial claim in the Greater Madidi Landscape. The partnership has developed a series of methodologies and tools that facilitate the management of the traditional territory, from natural resource access and use regulations to participatory micro-zoning of the TCO, to the installation of administrative capacity in CIPTA and a series of communal and supracommunal productive associations. Many of these processes effectively established CIPTA as the representative agency that could patriate the community's collaborative ownership rights and develop community support for a resilient wildlife management plan for the region.

The CIPTA-WCS partnership has included many community-level activities, and CIPTA has taken responsibility for policies and major decisions regarding the land-titling process and management of the traditional territory, with full participation of the twenty constituent communities. This approach has not only guaranteed transparency and legitimacy in decision making and ensured capacity building that has stretched far beyond the outstanding cadre of young and absolutely committed leaders of the CIPTA directorate, but it has also provided a cornerstone to the development of over twenty communal and supracommunal productive associations across the TCO that are involved in

the sustainable management of a series of natural resources, including native bee honey production, spectacled caiman harvest, commercial fishing, and experimental harvests of ornamental fish. Perhaps most strikingly, this recently established democratic system is developing new activities with formally approved management plans from the relevant national body, as well as adhering to the Natural Resource Access and Use Regulation of the Tacana TCO, with CIPTA as their democratically elected representative.

WCS's bottom-up approach to territorial planning and management in combination with capacity building at the community level is creating local demand for more transparent and democratic governance at other local government levels. Because WCS has a landscape vision for wildlife conservation and as such has developed management planning and implementation processes with many overlapping jurisdictions within the landscape, the CIPTA-WCS partnership has also included capacity-building and integration mechanisms with the Madidi protected area. This has helped crystallize the Tacana's natural sympathy with the objectives of Madidi and on several occasions has resulted in strategic and concrete support for the National Protected Area Service in the face of invasions from politically motivated actors and illegal timber harvesters.

CONCLUSION

Many valuable natural resources, such as water, wildlife, and forests, exist within communal or common-pool areas, and their effective management cannot be achieved without collective action. These resources have three qualities that make them an ideal foundation for building democracy: (1) local people often directly depend on them for their survival, (2) individuals are interested in managing these resources because they have economic value, and (3) these resources cannot be managed effectively by individuals working independently; they require collective management by the larger community. Avoiding depletion of common-pool natural resources is clearly critical for the welfare and economic development of the vast majority of the world's poor families. The need for effective natural resource management can easily be understood by even the most isolated communities, while the mechanism for proper management—democratic principles of collective decision making—is not as easily comprehended.

A key lesson learned from our case studies is that wildlife conser-

vation can be achieved by helping communities develop skills with democracy at local, regional, and national levels. Moreover, the processes and institutions through which access and use rights to natural resources are secured and administered at the local level are the first exposure many subsistence-level rural communities in developing countries have to democratic, transparent, and accountable systems of governance and can lead to more resilient wildlife management plan implementation.

The WCS examples have also shown that development of democratic self-management for wildlife and environmental protection is not without risk. As a democratic self-government emerges, its leadership may not act transparently, the majority may vote for shared short-term gain over sustainability, or the leadership may choose to engage in unsustainable practices because of countervailing economic interests. However, long-term empowerment of collective decision making still offers the greatest opportunity for developing social agreements that can self-police in a manner that can prevent individual traders from degrading wildlife for personal gain.

NGOs like WCS have emerged as social actors that can facilitate the advancement of local democratic institutions that can more effectively manage natural resources and promote long-term conservation. To manage communally shared natural resources and ensure equitable sharing of benefits from these resources, local institutions need mentoring in the principles of democracy in order to patriate their ownership and define and enforce resource use norms that limit access to and meter use of their wildlife and natural resources. By combining local (bottom-up) and national (top-down) approaches, democratic governance systems will evolve more quickly and sustain themselves, allowing economies to grow, wildlife and other natural resources to be managed effectively, livelihoods to improve, and democracy to flourish.

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CHAPTER 5

Imagining the Future: Humans, Wildlife, and Global Climate Change

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Climate change is an enduring, significant, and complex problem facing humans and wildlife. It is now well established that the Earth has warmed over the past century, due mostly to the emissions of greenhouse gases from human activities (Intergovernmental Panel on Climate Change 2007), and that this warming has had impacts on wildlife and their habitats in important ways (Parmesan 2006; Inkley et al. 2004; Root et al. 2003). More serious climate impacts on wildlife are expected this century, especially if significant steps are not taken to reduce greenhouse gas emissions and to help wildlife cope with changing conditions. As stated by National Wildlife Federation president Larry Schweiger (2006), "Like it or not, global warming will be the defining issue of the 21st century."

HUMAN-CAUSED CLIMATE CHANGE IS AFFECTING WILDLIFE

Emissions of carbon dioxide (CO₂) from fossil fuel burning have increased atmospheric CO₂ to 383 parts per million (National Oceanic and Atmospheric Administration 2007), higher than anytime in at least 650,000 years, during which the value did not exceed about 300 parts per million (Siegenthaler et al. 2005). This increase is responsible for most of the global mean temperature increase of about 0.76°C (1.4°F) in the twentieth century (Intergovernmental Panel on Climate Change 2007). Other observed climate changes related to the emission of greenhouse gases include shifts in precipitation and wind patterns, more pronounced droughts and heat waves, and increased intensity of tropical cyclones.

Associated with climate change, during the last century the Earth experienced widespread melting of snow and ice, rising sea levels, decreasing ocean salinity, and increasing ocean acidification (Intergovernmental Panel on Climate Change 2007). The terms *climate change* and *global warming* are often used interchangeably. Herein, we use climate change and in so doing reference increasing temperatures and other changing climate parameters. We use global warming when the referenced source uses that term as a general reference to all aspects of the changing climate.

Meta-analyses of published peer-reviewed papers demonstrate that observed changes in phenology, such as earlier springs and later falls, as well as in distribution, such as northward movement of species' ranges in the Northern Hemisphere, are consistent with expectations from climate change (Parmesan 2006; Root et al. 2003). Furthermore, these changes are disrupting predator/prey and plant/insect interactions.

In North America, impacts of climate change on fish, wildlife, and their habitats are increasingly apparent. Since the mid-1980s, drought and warmer temperatures have caused a four- and sixfold increase in the incidence and the size, respectively, of major fires in western forests (Westerling et al. 2006). In Nevada, especially large wildfires in summer 2006 necessitated implementation of emergency regulations to reduce pronghorn populations to levels commensurate with remaining habitat (Griffith 2006). Researchers point to increasing temperatures as the reason that the moose population of northwestern Minnesota has declined by more than 90 percent in twenty years (Smith 2006). Massive coral bleaching events and die-offs due to increasing water temperatures have occurred worldwide, including the continental shelf of North America (Hoegh-Guldberg 1999).

POSSIBLE CLIMATE FUTURES AND IMPLICATIONS FOR WILDLIFE

Estimates of future warming range from about 1.1°C to 6.4°C (2.0–11.5°F) by 2100, depending upon the levels of future greenhouse gas emissions (Intergovernmental Panel on Climate Change 2007). However, no matter what steps are taken to reduce emissions, it is projected that we are committed to at least about 0.6°C (1.1°F) warming in this century due to the greenhouse gases that have already been emitted. The Intergovernmental Panel on Climate Change (2007) projects that sea level will rise 0.18 to 0.59 meters (10 to 23 inches) by the end of the twenty-first century, although more recent observations of rapid ice melting in Greenland and Antarctica suggest that these projections are too low (Rahmstorf 2007).

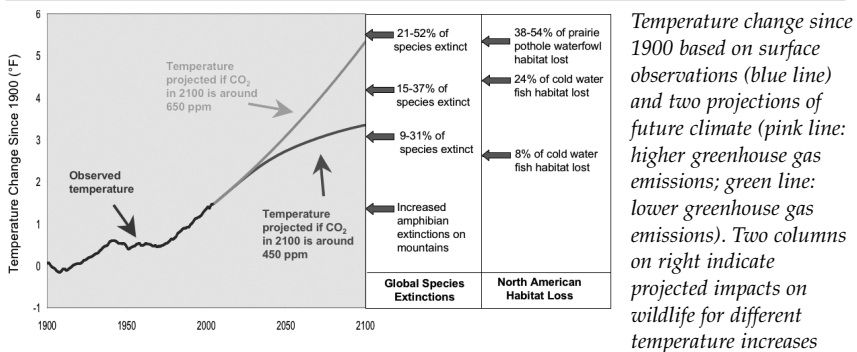
Future climate change will have profound impacts on wildlife, especially if changing climate conditions are outside a species' historical tolerance range, such that it cannot adapt quickly enough to accommodate the new climate conditions or cannot move to more suitable habitat because of natural or human-built barriers. Sophisticated global climate models project potential future climate conditions, which have been connected to possible species extinctions, habitat loss, and other impacts on wildlife (e.g., see fig. 5.1).

Let's imagine two different futures for wildlife. In the first scenario, greenhouse gas emissions are allowed to continue increasing unabated over the next century, allowing

CO₂ levels to reach about 650 parts per million and global mean temperatures to increase by about 2.2°C (4°F) above current levels by 2100. In this scenario, up to half of all species worldwide will be committed to extinction (Thomas et al. 2004). In North America, the prairie pothole region, which serves as a major breeding ground for waterfowl, would be diminished by 38 to 54 percent due largely to drier conditions (Parry et al. 2007). Streams and rivers across North America would also warm up, reducing habitat for cold-water fish by about a quarter (O'Neal 2002; Preston 2006). These habitat changes would pose major challenges for fish and wildlife.

If instead we limit greenhouse gas emissions to achieve CO₂ levels in the atmosphere at about 450 parts per million with associated temperature increases to less than 1.3°C (2°F) above today, the impacts on wildlife will be significantly less dire. In this scenario, there will still

FIGURE 5.1 Title?



Source: IPCC 2007

be some extinctions, such as amphibians in mountainous regions that already have been occurring (Pounds et al. 2006), but the overall fish and wildlife losses are projected to be much less. For example, only some 8 percent of cold-water fish habitat would be lost in North America (O'Neal 2002; Preston 2006). Although the impacts will be less, it is important to note that ecosystems will change even in this more optimistic scenario of less warming. Concerted efforts will still be required to ensure that wildlife species are best able to survive.

HUMAN ATTITUDES ON CLIMATE CHANGE

A public survey in 2003 examining environmental concerns found climate change ranked sixth behind water pollution, destruction of ecosystems, toxic waste, overpopulation, and ozone depletion (Curry, Ansolabere, and Herzog 2007). But by 2006 climate change had become the top environmental concern (Curry, Ansolabere, and Herzog 2007). Furthermore, polls of the U.S. public in spring 2007 indicate that a strong majority of the population is convinced that climate change is real (table 5.1).

In light of the public concern about climate change, it is not surprising that there is also widespread support for taking action to address climate change (see table 5.1). Solutions could include limiting greenhouse gas emissions by fostering development of alternate fuels, setting emissions standards for business and industry, or imposing mandatory controls on greenhouse gas emissions. In addition, Gallup (2007) found broad support for various actions that individuals could take, ranging from using fluorescent lightbulbs in the home (69 percent agreed that they should be doing so) to buying a hybrid car (62 percent) to "spending several thousand dollars to make your home as energy efficient as possible" (78 percent).

Support for taking action to address climate change extends to a primary constituent group of fish and wildlife agencies: hunters and anglers. A strong majority believes that it is an "urgent problem requiring immediate action," such as steps to reduce greenhouse gas emissions and protect fish, wildlife, and habitat (National Wildlife Federation 2006) (table 5.2). This is significant in that hunters and anglers are generally conservative in their political viewpoint; sportsmen voted for President George W. Bush over Senator John Kerry almost two to one in the 2004 presidential election (National Wildlife Federation 2006). Furthermore, the results suggest that hunters and

TABLE 5.1. Results from Selected Polls on Global Warming, 2007

POLL	GLOBAL WARMING VIEWS	GOVERNMENT ACTION VIEWS
January 30-31, 2007 Fox News/Opinion Dynamics Corp. (2007) poll of 900 registered voters nationwide	82% believe that global warming exists.	N/A
March 11-14, 2007 Gallup poll of 1,009 adults nationwide (Saad 2007)	59% think that the effects of global warming have already begun to happen.	N/A
April 5-10, 2007 Washington Post-ABC News-Stanford University (2007) poll of 1,002 adults nationwide	84% think that the world's temperature probably has been going up slowly over the past 100 years.	49% think that the federal government should do much more to deal with global warming, and 20% think that it should do somewhat more.
March 19-22, 2007 Center for American Progress poll of 500 registered voters nationwide (Podesta, Weiss, and Nichols 2007)	76% believe that the effects of global warming are apparent now.	60% believe that we must take action now or it will be too late to stop global warming.
April 20-24, 2007 CBS News/New York Times (2007) poll of 1,052 adults nationwide	49% believe that global warming is having a serious impact now. 36% believe that global warming will have an impact in the future.	52% think that global warming should be a high priority for government leaders.

anglers would be receptive to actions by fish and wildlife agencies to address climate change impacts to fish and wildlife resources.

HUMAN ATTITUDES ON WILDLIFE

Why do humans care about wildlife? To professionals involved in wildlife conservation, it seems so natural to be passionate about wildlife that we may give little thought to why we care or simply attribute it to childhood experiences in the out-of-doors. Wilson (1984) hypothesized

TABLE 5.2. **Results from a Nationwide Poll of Hunters and Anglers on Global Warming**

DO YOU AGREE OR DISAGREE THAT . . .	RESPONSE
global warming is currently occurring.	76% agree
global warming is primarily caused by pollution from burning fossil fuels.	56% agree
global warming is a serious threat to fish and wildlife.	71% agree
global warming is an urgent problem requiring immediate action.	67% agree
the United States should reduce its emissions of greenhouse gases like carbon dioxide that contribute to global warming and threaten fish and wildlife habitat.	78% agree
Congress should pass legislation that sets a clear national goal for reducing global-warming pollution with mandatory timelines because industry has already had enough time to clean up voluntarily.	75% agree
legislation to address global warming should include funding to protect fish, wildlife, and their habitat from the impacts of global warming.	76% agree
Source: National Wildlife Federation 2006. Nationwide opinion survey of hunters and anglers. Conducted by Responsive Management. www.targetglobalwarming.org/files/Toplines_National_FINAL.pdf .	

that the drive to conserve wildlife extends from a deep-rooted connection of humans to wildlife, termed *biophilia*. This instinctive bond or connection between humans and wildlife is, according to the hypothesis, essentially an innate human preference for things in nature. Although the biophilia hypothesis is controversial (Kellert and Wilson 1993), what is clear is that humans care about the environment, wildlife, and wildlife conservation. In a nationwide study conducted by Yale University (2004), an overwhelming majority (95 percent) of Americans said that, in comparison to other issues, the environment was important to them, and more than half indicated that the environment was *very* important. Furthermore, a substantial percentage (13 percent) said the environment was the *most* important issue.

It is also clear that the public enjoys wildlife as part of a healthy environment. Studies in the northeastern and southeastern United States found that overwhelming majorities (91 percent and 90 percent, respectively) of respondents indicated that it was *very* important to them to know that wildlife exists in their state (Responsive Management 2003, 2005). Furthermore, various surveys of residents' opinions on the proposed reintroduction of wolves, panthers, and grizzly bears in their states demonstrated overwhelming public support (Responsive Management 1998).

Sportsmen and sportswomen have demonstrated their concern for fish and wildlife many times by persuading Congress to enact legislation funding wildlife conservation. These laws included the Migratory Bird Hunting and Conservation Stamp Act of 1934 ("Duck Stamp Act"), the Federal Aid in Wildlife Restoration Act of 1937 ("Pittman-Robertson"), and the Federal Aid in Fisheries Restoration Acts of 1950 and 1984 ("Dingell-Johnson" and "Wallop-Breaux," respectively). Combined, these four acts alone have generated more than \$11 billion from sportsmen and sportswomen for conservation purposes (U.S. Fish and Wildlife Service 2007).

Public concern about the disappearance of wildlife led to enactment of the Endangered Species Act in 1973. Now, over thirty-five years later, the continuing passion for wildlife conservation was demonstrated by the response to the U.S. Fish and Wildlife Service's 2007 proposal to list the polar bear as a threatened species owing to declining sea ice from climate change. The U.S. Fish and Wildlife Service received about 600,000 comments (2007a), most in support of listing the polar bear (Woods 2007), even though most respondents likely never will see a polar bear in the wild.

MOTIVATION FOR ACTION: INTERSECTION OF CONSERVATION AND HUMAN SELF-INTEREST

In addition to an innate love for wildlife, the conservation movement grew out of the understanding that a healthy environment is essential for the well-being of humans. For example, widespread public concern over the impacts of polluted air and water on humans and ecosystems led the United States Congress to enact in the 1970s a number of important laws, including the Clean Air Act (1970) and the Clean Water Act (1972, 1977). Similar recognition of the potential harm to humans and wildlife from climate change is a driving force behind calls for action today.

In 2005, the Wildlife Society adopted the position statement “Global Climate Change and Wildlife,” calling for reductions in greenhouse gas emissions and for professional wildlife managers to take actions to help wildlife survive climate change. The American Geophysical Union and the American Meteorological Society, the two professional societies to which most U.S. climate scientists belong, have issued strong position statements on climate change. The U.S. National Academy of Sciences joined the scientific academies of ten other nations in 2005 to affirm that climate change is happening, humans are causing the observed changes, and actions are needed to reduce greenhouse gas emissions and enable humans and wildlife to adapt to some changes that will be inevitable.

Diverse groups have added their voices to the call for action on climate change. The U.S. Climate Action Partnership (USCAP) includes twenty-six large international corporations and six nongovernmental conservation organizations that together are calling on the federal government to enact mandatory legislation to reduce greenhouse gas emissions by 60 to 80 percent by 2050 (U.S. Climate Action Partnership 2007). Many companies cite their financial well-being as a reason to be proactive in their approach to climate change, seeing the opportunities of new green markets as well as the potential liabilities associated with continuing with business as usual. The faith community—including organizations representing Evangelical Christian, Roman Catholic, Jewish, and other religions—have argued that humankind has a responsibility to be good stewards of the Earth and to address international and intergenerational social justice issues.

The increasing engagement among diverse constituencies that have not traditionally been interested in climate change underscores that the issue is no longer the domain of narrow interest groups. Hunters and anglers, business leaders and church leaders, scientists and environmentalists, and liberals and conservatives all share an innate affection for wildlife, a sense of responsibility for stewardship of the Earth, and the recognition that the future of humankind could be profoundly affected if steps are not taken to address climate change.

CONSERVATION ACTIONS FOR WILDLIFE IN A CHANGING CLIMATE

The practical implications of the nexus among humans, climate change, and wildlife are complex but fall into three primary categories. First, the global climate changes that have already occurred are having an impact on fish and wildlife resources and will continue to do so. Wildlife profes-

sionals can mitigate these impacts by taking actions to help fish, animals, and their habitats survive climate change. Second, reducing greenhouse gas pollution can minimize the total impact of climate change on wildlife. Finally, natural ecosystems are an important reservoir of carbon in plants and soils. Strategic efforts to conserve these areas can prevent this organic material from decaying and releasing CO₂ to the atmosphere. Likewise, appropriate habitat restoration can remove CO₂ from the atmosphere.

Helping Wildlife Survive Climate Change

A report by the Wildlife Society (Inkley et al. 2004) describes eighteen actions wildlife managers can implement now to help wildlife survive climate change, even when the potential impacts of climate change to a specific species or area are not precisely known. Their recommendations include:

Maintain healthy, connected, genetically diverse populations.

Small isolated populations are more prone to local extirpations. Although managers already encourage healthy populations, climate change increases the importance of meeting this goal.

Reduce nonclimate stressors on ecosystems. Reducing other human-induced stressors such as toxic pollution and habitat loss will minimize negative impacts synergistic with climate change and increase the resiliency of habitats and species to the effects of climate change.

Prevent and control invasive species. Rapidly changing climates disturb habitats, thereby increasing opportunities for invasive species to spread. Extensive monitoring and control will be necessary to limit the negative impacts of invasive species.

Help wildlife cope with unexpected weather events. As climate changes, the response of wildlife and their habitats may be surprising; therefore, natural resource management must be flexible.

Reduce the risk of catastrophic fires. Although fire is a natural part of many ecosystems, climate change has led to more frequent fires and more damaging catastrophic fires (Westerling et al. 2006). Managers can use prescribed fires and other techniques to reduce fuel load and the potential for catastrophic fires.

Protect coastal wetlands and accommodate sea level rise. Managers can defend against the negative impacts associated with sea level rise through conservation easements and the

acquisition of inland buffer zones to provide areas for habitats and wildlife to shift inland.

Adjust yield and harvest models. As fish and wildlife populations respond to climate change, their productivity and sustainability may increase or decrease. Managers will need to adapt yield and harvest regulations in anticipation and response to these changes.

Consider climate change models as well as historical data when making projections. Managers must be aware that, because the climate is changing, historical climate, habitat, and wildlife conditions are not reliable indicators of future conditions. Projections and planning should take into account expected changes in climate.

Employ monitoring and adaptive management. Owing to uncertainty concerning climate change, wildlife managers must anticipate the impacts on wildlife and use monitoring data to quickly adjust management techniques and strategies.

Look for new opportunities. Managers must be ready to anticipate and take advantage of new opportunities. For example, if climatic conditions leave existing agricultural areas unusable for agriculture, they could become important wildlife conservation areas.

Reducing Global Greenhouse Gas Emissions

Addressing climate change requires extensive changes in the way humans generate and use power. Energy use has grown exponentially (fig. 5.2) since the beginning of the Industrial Revolution, and carbon-based fuels (oil, coal, natural gas) have provided 80 percent of today's energy supply (Nakicenovic, Grubler, and MacDonald 1998). Governments can lead the way by reducing these emissions through legislation and by adopting new energy policies in their own operations. Conservation agencies can and should demonstrate to other government agencies means by which they can reduce agency greenhouse gas emissions in the course of their official duties and actions.

Reducing carbon emissions requires development of more-efficient power generation from fossil fuel sources, as well as the use of noncarbon-based alternative energy sources. Extensive research and development are under way to further develop solar and water power,

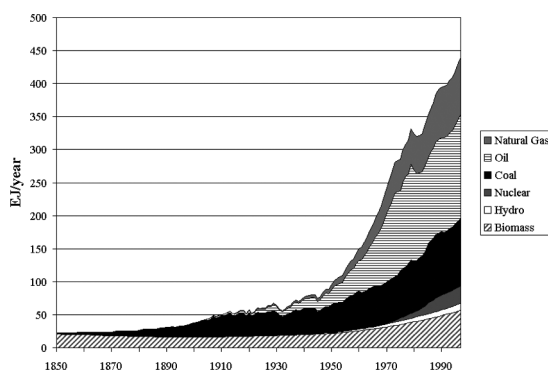
biofuels, wind-generated energy, nuclear fusion and fission, and geothermal energy sources. Wildlife professionals will need to pay attention to minimizing or mitigating the impacts on wildlife of alternative energy sources. For example, Arnett and colleagues. (2007) caution that development of wind power should consider impacts on wildlife, including mortality of birds and bats, as well as the habitat disruption and fragmentation associated with building new sites.

Energy must also be used more efficiently as a part of the overall strategy to reduce greenhouse gas emissions. Opportunities for increased efficiency are available in transportation, manufacturing, building practices, and consumer choices for appliances, lighting, and other electrical devices. Numerous federal, state, and business initiatives are either in place or being considered to promote energy efficiency. Conservation agencies also can reduce their emissions and at the same time possibly reduce costs by exploring ways to reduce everyday power usage. Just two of many possible options are replacing incandescent lightbulbs with compact fluorescent bulbs that consume nearly 70 percent less energy or using vehicles and motors with higher fuel efficiency.

Sequestering Carbon through Habitat Conservation and Restoration

Sequestering atmospheric CO₂ in plants and soils is a third category of conservation actions that can help reduce greenhouse gas levels in the atmosphere, while at the same time providing important benefits for wildlife. Significant amounts of CO₂ and other greenhouse gases can be

FIGURE 5.2 World primary energy source by supply



Currently over 30 billion tons of CO₂ are emitted to the atmosphere from fossil fuel burning each year. As a result, atmospheric CO₂ levels have risen more than 30% from 280 ppm to 383 ppm in the last two centuries.

Source: Nakicenovic et al. 1998

released to the atmosphere when natural forests, prairies, and wetlands are altered either for agricultural uses or for development. Restoring these lands to their natural ecosystems can allow them to begin removing CO₂ from the atmosphere through photosynthesis. Conservation agencies have an important role to play in identifying opportunities to enhance carbon sequestration through land conservation and restoration.

HUMAN DIMENSION RESEARCH NEEDS

Herein we have demonstrated the role of humans in causing rapid climate change, the need to reduce greenhouse gas emissions, some management actions that can be taken to help wildlife survive in a changing climate, and the belief of the majority of Americans that the issue must be addressed. Climate change is now a social issue with the challenge of transforming the scientific facts and prevailing concerns into meaningful actions that reduce greenhouse gas emissions to requisite levels.

There are two aspects of the climate change issue that make it particularly challenging for individuals to move from concern to action. These are the global scope of the issue and the longtime lag between action and results. However, these challenging aspects are not unique to climate change. The ban of chlorofluorocarbons (CFCs) overcame the facts that they were used worldwide and that the first signs of a statistically detectable decrease in the ozone hole will likely not be evident until at least the 2020s (Newman et al. 2006). However, addressing climate change is more challenging because climate change will require action by everyone as individuals rather than implementation primarily by industry, as was the case with CFCs.

Human dimensions research will be critical in achieving meaningful reductions in greenhouse gas emissions. Research should include assessment of the underlying values, attitudes, and knowledge people hold regarding climate change, and the actions people would most likely take to minimize climate change. Especially important is understanding the factors and messages that compel people to action, especially when the perceived or real benefits of their actions may not be realized for decades or even within their lifetimes. Because climate change is a worldwide issue, human dimensions research should include not only North America, but also global populations, especially in the countries that are contributing the most to climate change. This would assist in finding ways to compel unified action across vastly different economic levels and cultures to reduce global warming pollution.

CONCLUSION

We believe that climate change is the greatest environmental challenge for humankind and the greatest threat to wildlife since the evolution of humans. The future for humans and wildlife alike depends on individual and worldwide action to reduce greenhouse gas pollution to minimize rapid climate change caused largely by the burning of fossil fuels. At the same time, concerted actions by fish and wildlife managers will be necessary to help wildlife survive those climate changes that are already inevitable.

The challenge for humankind, in the interest of current and future generations, and in the interest of wildlife conservation, is to address climate change *now*. Compelling factors for addressing climate change are self-interest, humankind's innate attraction for wildlife, and most people's concern for the environment, as evidenced by polls indicating a desire to conserve wildlife, even when that may mean some limitations on human activities. For human dimensions research, the challenge is finding out what makes climate change real to people and motivates the majority to act together, lest climate change become the ultimate "tragedy of the commons."

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