by key members of Congress, the Department of the Interior, and several major retailers and manufacturers of outdoor equipment, it met stiff resistance and ultimately failed. Key opposition included the Outdoor Recreation Coalition of America and members of Congress that had pledged "no new taxes."

In 2000, the Conservation and Reinvestment Act, which proposed to dedicate drilling royalties on offshore oil and gas development to wildlife conservation, met a similar fate. However, a year later Congress did appropriate funding for two new programs proposed by the Conservation and Reinvestment Act, namely the Wildlife Conservation and Restoration and State Wildlife Grants programs. Initial annual funding was $50 million each, with a commitment to annually increase funding up to $350 million each. However, Wildlife Conservation and Restoration funding lasted only one year, and State Wildlife Grants funding peaked at $90 million and was subsequently cut by 35% (AFWA 2016).

The Teaming with Wildlife coalition tried again in 2008 to secure funding for implementing State Wildlife Action Plans by introducing the Teaming with Wildlife Act in the U.S. Senate. The act requested $350 million annually in dedicated funding to be paid for by outer continental shelf drilling royalties and revenues under the Mineral Leasing Act (AFWA 2016). Ultimately, this effort failed to pass. A year later, the American Clean Energy Security Act passed the U.S. House of Representatives with up to $500 million dedicated funds to support the defunct Wildlife Conservation and Restoration program. Again, this effort ended in failure.

These unsuccessful efforts have underscored the difficulty of securing funding to conserve and protect species that are not deemed a resource to exploit. The value of our natural resources infrastructure and the ecosystem services it provides is immense, yet it is extremely difficult to leverage the financial resources to protect it. It is widely recognized that as species decline and habitats deteriorate, benefits provided by nature, such as water purification, pollination, and food production, are being compromised. Protecting natural systems makes fiscal sense, as we know that preventing problems is almost always less expensive than fixing them, yet we have largely failed to do so. Perhaps it is time to rethink our approach to fish and wildlife management in North America to be more inclusive and forward thinking.

1.5.2 A Fisheries Philosophy for a Modern Age

Modern threats to natural resources are considerably different than those of the 1800s. The North American Model of Wildlife Conservation, like any paradigm, must be adaptable to remain relevant to the changing needs of society and environment. The world is a much different place today than when the framework of the model was evolving. Anthropogenic climate change threatens habitats and fish and wildlife species in ways we have only begun to understand. The populace has shifted dramatically toward an urban demography, with significant changes in attitudes toward wildlife policy and management (DeStefano et al. 2005). Human populations are much larger, and fewer truly wild places still exist. For many people, meat is a product of the grocery store with little connection to or understanding of the human food chain. The model must be dynamic and fluid to meet these issues; it must grow and evolve to contemporary fish and wildlife conservation needs.

Further, the model was never intended to represent fisheries. There were similarities in the historical development of both fish and wildlife policy, but there are significant differences as well. For example, many of the current protections afforded to aquatic ecosystems, and ergo fish and fisheries, stem from nonangling derived legislations like the Clean Water

Act. There is no singular law that has as much impact on game species as the Clean Water Act, and related legislation, has for fisheries and aquatic systems. This and similar laws have literally transformed streams, rivers, and lakes from dead, open sewers to viable fisheries. But these laws were not primarily conceived by and designed to benefit recreational anglers, nor do they directly fund sport fish conservation efforts, although "fishable and swimmable" was established as a clear objective for the nation's waters. These laws spring from the fundamental notion that we all have a right to clean water and healthy rivers, regardless of how we choose to enjoy them. Perhaps it is time to develop aquatic conservation philosophy to guide fisheries management for the future.

First, we must dispel the notion that anglers are the sole benefactors of conservation. There is far more to the conservation equation than that of Dingell–Johnson and license dollars. Programs like Farm Bill conservation programs, the billions of dollars of local funds spent on land protection, and effective management and protection of federal lands are just a few of the other players. Anglers and management agencies must recognize that fishing licenses and federal formula funds will simply not keep traditional fish conservation programs operational and relevant for too far into the future. The role of traditional sportsman organizations nationwide has changed substantially, and while many are likely far weaker than they were 50 years ago (e.g., local sportsman's clubs and state-based hunting and fishing groups), newer national organizations have entered the game or matured and become more sophisticated. For example, nonprofits such as The Nature Conservancy, which is far larger than many state agencies and even some federal agencies (4,000+ staff and more than a billion-dollar budget), provide an increasing amount of conservation science, funding, and land and water protection. Relatively new groups such as the Theodore Roosevelt Conservation Partnership provide a forum for collaborative approaches among many partner conservation organizations that share a common interest and recognize the need to work collectively to have a greater impact. Similarly, the substantial hunting and sportfishing industries are beginning to recognize their roles in increasing participation, as well as in conservation of aquatic resources. While nonprofits and industry may not be directly funding fish stocking efforts or building boat ramps, all species benefit from good, holistic, landscape management approaches promoted by the nonangling sector.

All people benefit from healthy environments. Whether a hiker, mountain biker, camper, or kayaker, or if you prefer to sit in your apartment on your phone, you are directly benefiting from healthy ecosystems and the services they provide, such as clean air and water. Nonconsumptive users and advocates of wildlife must be brought into the fold. The challenge for us is to demonstrate and better understand the benefits nonconsumptive users enjoy and to more effectively use media to increase their awareness and support. Although some groups will likely always be adversarial toward consumptive taking of natural resources, most nonconsumptive users understand hunting and angling and support most aspects of consumptive use. These groups could be treated as partners in conservation and rightly should have a voice in the process. Riley et al. (2002) offered a vision of how incorporate participatory decision making into management.

However, a seat at the table for broader stakeholders should coincide with these groups contributing to funding models. For example, the taxable Wildlife and Sport Fish Restoration commodities could be expanded to include equipment common to nonconsumptive users as originally proposed by the Wildlife Diversity Funding Initiate in 1990. Optics, snorkel and scuba gear, Global Positioning System units, kayaks, all-terrain vehicles, tents, and more

are used by consumptive and nonconsumptive outdoor enthusiasts alike and could help fund conservation efforts of the future. Further, states like Missouri, Arkansas, and Minnesota have created programs to directly include the general public in funding fish and wildlife conservation using a general sales tax appropriation. When nonconsumptive users pay their share, they gain a seat at the table in decision making.

Other innovative approaches, such as that proposed by the Blue Ribbon Panel (AFWA 2016), have been created to identify new funding solutions. The Blue Ribbon Panel is a committee composed of distinguished business and conservation leaders that was formed to tackle the funding crisis facing the conservation community. Their recommendation submitted to Congress was the dedication of up to $1.3 billion annually in existing revenue from the development of offshore energy and mineral resources on federal lands and waters to the Wildlife Conservation Restoration Program (via the proposed Recovering America's Wildlife Act). Although the funding source has been modified in subsequent bill language, if passed, this fiscal injection would provide states with the much-needed resources to implement State Wildlife Action Plans designed to conserve 12,000 species in greatest conservation need.

Next, we must recognize that conservation must be focused at greater spatial scales, aiming to protect landscapes, ecosystems, and biomes for the good of all living things. We are rapidly moving away from population-level management in favor of holistic approaches that can benefit all flora and fauna, especially those not directly pursued by hunters or anglers. The traditional model is not exclusive to game species, but harvested species have received disproportionate attention for several reasons. Public pressure has historically mandated a harvest-oriented focus, and direct funding sources have generally been harvest-derived. In addition, harvesting game species increases the management intensity required to maintain healthy populations. It has been argued that management of game species promotes conservation for nongame species, but this is not always accurate. In fisheries, environmental effects of species introduced outside of their native range or habitats for sport fishing is a prime example; the literature is full of examples with Flathead Catfish *Pylodictis olivaris* (Brown et al. 2005), Rainbow Trout *Oncorhynchus mykiss* (Muhlfeld et al. 2014), and Largemouth Bass *Micropterus nigricans* (Takamura 2007), to name a few. A landscape-level approach to maintain a more natural system might not produce as many trophy fish, but biodiversity as a whole will likely benefit.

A multidisciplinary approach will be required, with as much effort placed on understanding human perceptions, attitudes, and actions as placed on biological sciences. Most of the dilemmas facing fish and wildlife in modern North America are human-induced but not harvest-related. Many of today's conservation issues will require changing human behaviors and attitudes to improve fish, wildlife, and habitat. Conservation will require biology, human dimensions, psychology, anthropology, and a host of other disciplines working together. For example, modern biologists face threats from human-induced climate change, urbanization, and human population growth, which affect biota, water, ecosystems, cultures, and economies. To combat such threats, we will need more than biological research and in situ fish management; a systemic and cultural transformation in the human existence is required.

The North American Model of Wildlife Conservation has been helpful in conceptualizing North America's approach to conservation of wildlife and, indirectly, fisheries resources. However, as we move into the next century of conservation, it becomes necessary to view the original tenets for what they are—a historical recount of legislation and policy that led to modern

wildlife management. Although they parallel the development of fisheries management, the model was never intended to represent fisheries and certainly is not intended to be prescriptive to the trajectory of the future of fisheries management. Therefore, the authors propose the following philosophy for the future of our aquatic resources (Figure 1.1):

1. **Aquatic resources are a societal responsibility.** Human society and our long-term sustainability are inseparably connected to water abundance and quality. Consequently, all citizens have a stewardship responsibility to this public trust resource. The Clean Water Act allows us to extend public trust protections to habitats as well as organisms. Public trust is still common law and state law unless circumstances dictate that federal rule supersedes, but property law and public rights must be reconsidered. Aquatic resources and habitats on public lands are indeed public property and a right of the people, but this convention breaks down on private ponds, lakes, and nonnavigable streams and varies from state to state. Still, activities on private property could fall under property law if those activities violate environmental standards or have the potential to trespass on neighboring property, or if the resources are mobile and have potential to leave the property. Importantly, enhanced recognition of the connectivity of waters across ownership categories is fundamental. It is also fundamental that landowners understand and respect the impact of their actions on others. The critical importance of this connectivity should be enhanced through measures such as a Clean Water Rule that ensure appropriate protection of our public waters throughout the watershed.
2. **A balanced approach to resource use is essential.** Aquatic resources have a wide variety of values, including recreational use, commercial harvest, and ecosystem services, as well

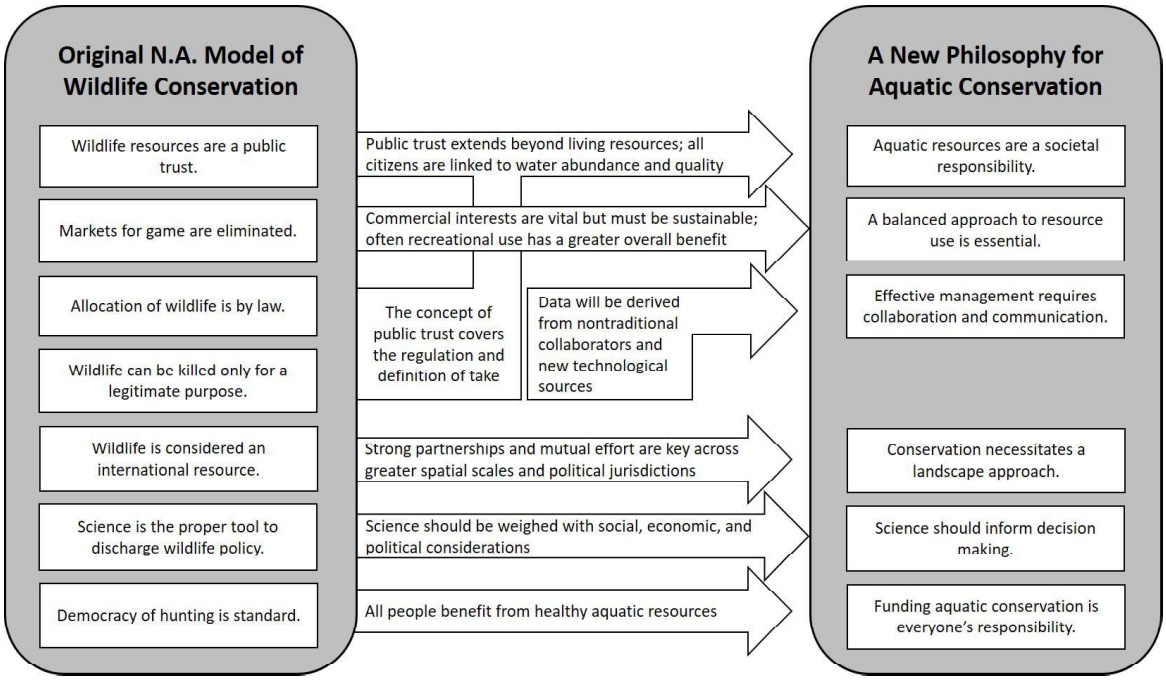

Figure 1.1 Proposed philosophy for aquatic conservation. The philosophy is intended to build upon the North American (N.A.) Model of Wildlife Conservation but recognizes that differences in the histories of both disciplines exist.

as spiritual and existential benefits, and all of these values need to be appropriately recognized in resource management. For example, commercial harvest of our fisheries resources is a critical economic and human nutrition need. Indeed, much of modern fisheries management is based on the development of approaches to manage commercial harvest in a sustainable manner. However, it should also be recognized that the economic value of recreational fishing may exceed that of commercial exploitation. Southwick Associates (2013) reported that U.S. angler catch of marine recreational fish species by biomass was only 4.2% that of U.S. commercial landings for the same species, yet the economic value of angling was more than three times that of commercial fishing for inland systems, sportfishing tournaments, guides, fish watching, and many other ecosystem services all have economic value. Thus, both commercial and recreational activities represent valid uses of aquatic resources and must be included within the context of the broader management scheme in a fair and balanced manner. Similarly, many nonfishery-focused conservation groups recognize and value stable fish communities and the ecological value that they represent and are willing to expend substantial resources on restoration and protection of such resources. A comprehensive and successful fisheries and aquatic management program needs to recognize the variety of values placed on these systems and employ and balance them effectively in management programs.

3. **Effective management requires collaboration and communication.** As resource challenges become more complicated, resulting from largescale issues such as climate change, invasive species, and other impacts, and as we rely more increasingly on highly collaborative approaches, the sharing and access to resource data and other information will become central to effective conservation. We will also see an exponential increase in the types of data available from commercial fishers and recreational anglers, citizen scientists, and an accelerating array of remote sensing and autonomous data collection tools. Access to and sharing of these data in an open environment will be key to effective and efficient utilization to inform conservation decisions.
4. **Conservation necessitates a landscape approach.** The simple fact that aquatic systems, whether freshwater or marine, span boundaries of local government, states, and countries mandates that we manage them from a broad perspective. For example, the international nature of many aquatic species and habitats have led to numerous intergovernmental structures that support nations working collaboratively to manage shared resources. Similarly, watershed associations, river basin management commissions, and other such entities work to provide a more holistic approach to aquatic conservation. We must support the development of effective governments and conservation institutions in all nations, as we are only as strong as the weakest link. Climate change, increasing human populations, and competing water uses are a few examples of threats to aquatic ecosystems that are global in scale. Without consensus and cooperation among nations, we are unlikely to succeed in management efforts.
5. **Science should inform decision making.** The biology and ecology of the biotic community must be considered in concert with social, economic, and political considerations and values. Nonbiological factors can yield greater influence in circumstances when human life and property considerations outweigh conservation considerations or when the needs of the public majority outweigh best environmental practices. However, scientific approaches should inform management of aquatic resources. Researchers and manage-

ment agencies will need to increasingly employ approaches such as coproduction of science, adaptive management, decision support tools, and others to ensure that research efforts and management needs are well defined and working collaboratively to better inform decisions.

6. **Funding aquatic conservation is everyone's responsibility.** All citizens benefit from clean water and healthy ecosystems and should be a part of supporting their conservation. Funding models should reflect this shared ownership. Excise taxes on angling gear and license dollars are not and should not be the sole sources of conservation funding. Allocations from general funds and conservation taxes are potential means of incorporating nonanglers into the funding process. Importantly, the nonangling public can provide support for conservation in nonfinancial ways. Anglers still play a central role in conservation of aquatic resources, but all people benefit from ecological services provided by healthy aquatic resources and need to be involved and engaged partners in the conservation process.

1.6 CONCLUSIONS

The North American Model of Wildlife Conservation was not intended to represent fisheries but does provide an important historical perspective that fisheries scientists should contemplate. In many ways the model paralleled fisheries development, and indeed both disciplines have more in common than not. But both wildlife and fisheries professionals must recognize that the model is an articulation of the policy, laws, and legal precedents that has led us to modern management, not a prescription or philosophy for the future. Consequently, we have proposed six philosophical principles to guide fisheries management moving forward. Whereas the model represents the historical and legal framework of wildlife management, our proposed philosophy should be viewed as canons to strive toward. As such, our philosophy represents an extension of the model for future fisheries conservation and management, not a replacement.

Anglers have a role to play in this philosophy. Participation in outdoor recreation has been declining in recent decades, and some have interpreted this trend as a growing public detachment from the natural world (Mahoney et al. 2008). If this interpretation is accurate, future generations will value natural resources even less so than today. Many conservation agencies have attempted to address this trend with programs geared toward recruitment, retention, and reactivation of anglers. Although the angling public is arguably an important player in the future conservation of fisheries and aquatic resources, this is not a burden that anglers should bear alone. All people share responsibility for conservation of our natural resources, regardless of whether they choose to catch, shoot, watch, ride, paddle, camp, or just enjoy the intangible benefits provided.

1.7 REFERENCES

AFWA (Association of Fish and Wildlife Agencies). 2016. The future of America's fish and wildlife: a 21st century vision for investing in and connecting people to nature. AFWA, Washington, D.C. Available: www.fishwildlife.org/application/files/9915/1856/1358/Blue_Ribbon_Panel_Report.pdf. (November 2020).

Anderson, R. F., D. Gatton, and J. Sheahan. 2013. Growth in local government spending on public water and wastewater—but how much progress can American households afford? United States Conference of Mayors, Washington, D.C.