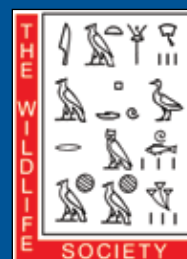


The North American Model of Wildlife Conservation



Technical Review 12-04
December 2012



The North American Model of Wildlife Conservation

The Wildlife Society and The Boone and Crockett Club

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Cover Images

Front cover, clockwise from upper left: 1) Canada lynx (*Lynx canadensis*) kittens removed from den for marking and data collection as part of a long-term research study. Credit: John F. Organ; 2) A mixed flock of ducks and geese fly from a wetland area. Credit: Steve Hillebrand/USFWS; 3) A researcher attaches a radio transmitter to a short-horned lizard (*Phrynosoma hernandesi*) in Colorado's Pawnee National Grassland. Credit: Laura Martin; 4) Rifle hunter Ron Jolly admires a mature white-tailed buck harvested by his wife on the family's farm in Alabama. Credit: Tes Randle Jolly; 5) Caribou running along a northern peninsula of Newfoundland are part of a herd compositional survey. Credit: John F. Organ; 6) Wildlife veterinarian Lisa Wolfe assesses a captive mule deer during studies of density dependence in Colorado. Credit: Ken Logan/Colorado Division of Wildlife.

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Foreword



*Weighing a fawn during studies of density dependence in Colorado.
Courtesy of the Colorado Division of Wildlife.*

Presidents of The Wildlife Society (TWS) occasionally appoint ad hoc committees to study and report on selected conservation issues. The reports ordinarily appear as technical reviews or position statements. Technical reviews present technical information and the views of the appointed committee members, but not necessarily the views of their employers.

This technical review focuses on the set of principles known as the North American Model of Wildlife Conservation and was developed in partnership with the Boone and Crockett Club. The review is copyrighted by TWS, but individuals are granted permission to make single copies for non-commercial purposes. All technical reviews and position statements are available in digital format at www.wildlife.org/. Hard copies may be requested or purchased from:

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Acknowledgments



Commissioners representing Canada, Mexico, and the United States at the 1909 North American Conservation Congress. President Theodore Roosevelt sits at center. Credit: Forest History Society.

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Executive Summary



Bison (Bison bison) in Yellowstone National Park. Credit: Jim Peaco, NPS.

The North American Model of Wildlife Conservation is a set of principles that, collectively applied, has led to the form, function, and successes of wildlife conservation and management in the United States and Canada. This technical review documents the history and development of these principles, and evaluates current and potential future challenges to their application. Describing the Model as North American is done in a conceptual, not a geographical, context. Wildlife conservation and management in Mexico developed at a different time and under different circumstances than in the U.S. and Canada. The latter two were hand in hand. The history, development, and status of wildlife conservation and management in Mexico are outlined separately as part of this review.

It is not the intent or purpose of this review to revise, modify, or otherwise alter what has heretofore been put forward as the Model. Indeed, the Model itself is not a monolith carved in stone; it is a means for us to understand, evaluate, and celebrate how conservation has been achieved in the U.S. and Canada, and to assess

whether we are prepared to address challenges that lay ahead. Simply adding to, deleting, or modifying the existing principles will not in itself advance conservation. Understanding the evidentiary basis for the principles is essential to preventing their erosion, and necessary for the conceptual thinking required to anticipate future challenges. A brief summary of some of the challenges and concerns follows:

1. Wildlife resources are a public trust. Challenges include (1) inappropriate claims of ownership of wildlife; (2) unregulated commercial sale of live wildlife; (3) prohibitions or unreasonable restrictions on access to and use of wildlife; and (4) a value system endorsing an animal-rights doctrine and consequently antithetical to the premise of public ownership of wildlife.

2. Markets for game are eliminated. Commercial trade exists for reptiles, amphibians, and fish. In addition, some game species are actively traded. A robust market for access to wildlife occurring across the country exists in the form of leases, reserved permits, and shooting preserves.

3. Allocation of wildlife is by law. Application and enforcement of laws to all taxa are inconsistent. Although state authority over the allocation of the take of resident game species is well defined, county, local, or housing-development ordinances may effectively supersede state authority. Decisions on land use, even on public lands, indirectly impact allocation of wildlife due to land use changes associated with land development.

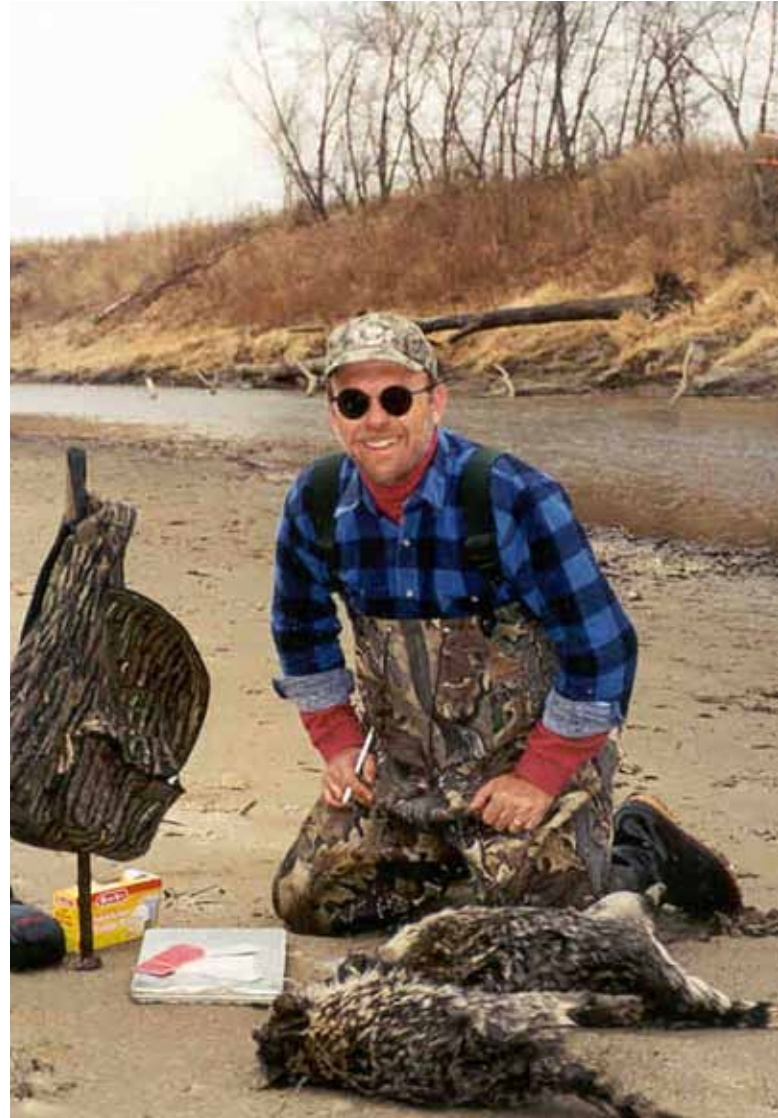
4. Wildlife can be killed only for a legitimate purpose. Take of certain species of mammals, birds, reptiles, and amphibians does not correspond to traditionally accepted notions of legitimate use.

5. Wildlife is considered an international resource. Many positive agreements and cooperative efforts have been established among the U.S., Canada, Mexico, and other nations for conserving wildlife. Many more species need consideration. Restrictive permitting procedures, although designed to protect wildlife resources, inhibit trans-border collaborations. Construction of a wall to prevent illegal immigration from Mexico to the U.S. will have negative effects on trans-border wildlife movements and interactions.

6. Science is the proper tool to discharge wildlife policy. Wildlife management appears to be increasingly politicized. The rapid turnover rate of state agency directors, the makeup of boards and commissions, the organizational structure of some agencies, and examples of politics meddling in science have challenged the science foundation.

7. Democracy of hunting is standard. Reduction in, and access to, huntable lands compromise the principle of egalitarianism in hunting opportunity. Restrictive firearms legislation can act as a barrier hindering participation.

To help address these challenges, this review presents several recommendations. These are offered as actions deemed necessary to ensure relevancy of the Model in the future.



*Trapping raccoons (*Procyon lotor*) in Missouri, biologist Dave Hamilton (now deceased) helped assess traps for the BMP program. Courtesy of Thomas Decker.*

Introduction



International trade in wildlife products came under greater scrutiny with the ratification of CITES by the U.S. in 1975. Credit: John and Karen Hollingsworth, USFWS.

Wildlife conservation varies worldwide in its form, function, and underlying principles. In recent years, efforts have been directed to describe the key attributes that collectively make wildlife conservation in North America unique. Although efforts to articulate wildlife conservation in North America have come of late, awareness among practitioners in the U.S and Canada that their wildlife conservation programs differed from others around the world has existed for decades. Describing these attributes or principles can serve many purposes: foster celebration of the profession's maturation

and accomplishments; serve as an educational tool; and identify gaps, shortcomings, or areas in need of expansion to address contemporary or future challenges. The intent of this technical review is to contribute to all of these purposes.

A model is a description of a system that accounts for its key properties (Soukhanov 1988). The concept that wildlife conservation in North America could be described as a model was first articulated by Geist (Geist 1995, Geist et al. 2001), who coined the term "North American Model of Wildlife Conservation"

(Model). Geist's direct knowledge of and familiarity with wildlife conservation programs of other nations provided a perspective on Canada and the U.S. The concept was further developed by Mahoney (2004). Today, the Model has become the basis for policies developed by the Association of Fish and Wildlife Agencies (Prukop and Regan 2005) and The Wildlife Society (The Wildlife Society 2007). It was the key underpinning for U.S. Executive Order 13443 that led to the White House Conference on North American Wildlife Policy (Mahoney et al. 2008, Sporting Conservation Council 2008a) and fostered the Recreational Hunting and Wildlife Conservation Plan (Sporting Conservation Council 2008b).

Seven components or principles describe the key properties of the Model (Geist et al. 2001, Organ et al. 2010):

1. Wildlife resources are a public trust.
2. Markets for game are eliminated.
3. Allocation of wildlife is by law.
4. Wildlife can be killed only for a legitimate purpose.
5. Wildlife is considered an international resource.
6. Science is the proper tool to discharge wildlife policy.
7. Democracy of hunting is standard.

These seven components formed the foundation for wildlife conservation in Canada and the U.S., but questions have arisen as to the validity of certain components in contemporary times and whether scrutiny of conservation programs would deem many of these operationally intact. Additionally, the question as to whether the Model is inclusive of all wildlife conservation interests or exclusively narrow in its application has been posed (Beuchler and Servheen 2008). To address these questions we describe and analyze each component in terms of its

development, current status, threats and challenges, and differences and commonalities in application within Canada and the U.S. This information is then used to further define the Model.

Wildlife conservation in Canada and the U.S. developed under unique temporal and social circumstances, and the resulting Model reflects that. Had it formed in another time and under other circumstances it would likely be different. Use of the term "North American" to describe the Model is conceptual rather than geographic. Mexico's wildlife conservation movement began its development and evolution at a different time and under different circumstances. It is unrealistic to expect that movement to mirror those of the U.S. and Canada. A description of the evolution and current status of wildlife conservation in Mexico is provided in Appendix I. Further work is warranted to compare how different temporal and social circumstances have led to different conservation approaches, identify what can be learned from those comparisons, and what is needed to advance wildlife conservation within Canada, Mexico, and the U.S.



Peregrine falcons were protected in the United States under the 1973 Endangered Species Act. Recovery efforts succeeded in their restoration and removal from the federal Endangered Species List. Credit: Craig Koppie, USFWS.

Historical Overview

The exploration of North America by the French and English was fundamentally motivated by the wealth of the continent's renewable natural resources and an unfettered opportunity by individuals to exploit them (Cowan 1995). Today, wildlife conservation in Canada and the U.S. reflects this historic citizen access to the land and its natural resources. Indeed, the sense that these resources *belong* to the citizenry drives the democratic engagement in the conservation process and is the *raison d'être* of North America's unique approach (Krausman, P., Gold, silver, and souls, unpublished presentation at The Wildlife Society Annual Conference, 22 September 2009, Monterey, CA, USA).

Resource exploitation fueled the expansion of people across the continent and led to eventual disappearance of the frontier (Turner 1935). As elsewhere, the Industrial Revolution brought changes to North American society that altered the land and its wildlife. In 1820, 5 percent of Americans lived in cities; by 1860 20 percent were urban dwellers, a 4-fold increase that marks the greatest demographic shift ever to have occurred in America (Riess 1995). Markets for wildlife arose to feed these urban masses and festoon a new class of wealthy elites. Market hunters plied their trade first along coastal waters and interior forests. Then, with the advent of railways and refrigeration, they exploited bison (*Bison bison*), elk (*Cervus elaphus*), and other big game of western North America for transport back to cities in eastern North America. The market hunter left many once-abundant species teetering on the brink of extinction. Ironically, the sheer scale of this unmitigated exploitation was to have some influence on engendering a remarkable new phenomenon: protectionism and conservation (Mahoney 2007).

The increasing urban population, meanwhile, found themselves with something their countrymen on the farms did not have: leisure time. Hunting for the rigors and challenges of the chase under conditions of fair play became a favored pastime of many, particularly among those of means. This developed *in situ*, but there can be no doubt that European aristocratic perspectives toward hunting exerted some influence on these emerging trends (Herbert 1849). Threlfall (1995) noted that European commoners never ceased desiring to participate in the hunt, despite the best and brutal efforts of nobility to discourage them. In the U.S., conflicts soon arose between market hunters who profited on dead wildlife and this new breed of hunters who placed value on live wildlife and their sporting pursuit of it. These sport hunters organized and developed the first refuges for wildlife (Carroll's Island Club 1832, Gunpowder River in Maryland; Trefethen 1975) and laws to protect game (e.g., New York Sportsmen's Club 1844; Trefethen 1975).

Representative of these sport hunters was the highly influential George Bird Grinnell, a Yale-educated naturalist who accompanied George Armstrong Custer on his Black Hills expedition and who acquired the sporting journal *Forest and Stream* in 1879. Over the next 3 decades, Grinnell would turn *Forest and Stream* into a call for wildlife conservation (Reiger 1975). In 1885, he reviewed a book written by a fellow New Yorker about his hunting exploits in the Dakotas (Grinnell 1885). Grinnell's review was laudatory, but he criticized the author for some inaccuracies. The author, Theodore Roosevelt, went to meet Grinnell and the two realized that much had changed during the 10 years that divided their respective times in the West, and that big game animals had declined drastically. Their discussion inspired them to form the Boone and Crockett Club

in 1887, an organization whose purpose would include to “take charge of all matters pertaining to the enactment and carrying out of game and fish laws” (Reiger 1975:234).

Roosevelt and Grinnell were also nation builders who felt America was a strong nation because, like Canada, its people had carved the country out of a wilderness frontier with self-reliance and pioneer skills. This harkened back to ideals regarding the impact of the frontier on shaping what it is to be an American; ideals articulated in the late 19th century by Turner (1935). Turner described the romantic notion of primitivism, for which the best antidote to the ills of an overly refined and civilized modern world was a return to a simpler, more primitive life (Cronon 1995). With no frontier and a growing urban populace, Roosevelt and Grinnell feared America would lose this edge. They believed Americans could cultivate pioneer skills and a sense of fair play through sport hunting, and thereby maintain the character of the nation (Cutright 1985, Miller 1992, Brands 1997). The Boone and Crockett Club had many influential members, and this was used to great effect in support of these ideals. Two of North America’s most important and

enduring conservation legacies were written by club members: the Lacey Act (Congressman John Lacey from Iowa, 1900) and the Migratory Bird Treaty Convention (Canadian Charles Gordon Hewitt, 1916). And, of course, President Theodore Roosevelt did more to conserve wildlife than any single individual in U.S. history through the institutionalization and popularization of conservation and by greatly expanding federal protected lands (Brinkley 2009).

Canada did not embrace the policies and practices of wildlife ownership and management as accepted in Great Britain, foremost among these being the tie of wildlife and hunting to landownership, and the sale of wildlife as a commodity in the marketplace. Even more remarkable is the fact that some of Canada’s negotiators and movers who were instrumental in creating this new system of wildlife conservation were Englishmen, immigrants to Canada.

It appears that at the turn of the century, when both nations had become cognizant of wildlife’s plight and grappled for solutions, like-minded elites arose on both sides of the border who knew and befriended each other, learned from each other’s successes and



Early settlers killed wolves and other predators with abandon, blaming them for declines in game populations. Courtesy of Thomas J. Ryder.



Some 40,000 bison pelts in Dodge City, Kansas await shipment to the East Coast in 1878—evidence of the rampant exploitation of the species. The end of market hunting and continuing conservation efforts have given bison a new foothold across parts of their historic range, including Yellowstone National Park. Courtesy of National Archives.

failures, and acted on them with insight and resolve. The Canadian effort revolved around the Commission on Conservation, which was constituted under The Conservation Act of 1909. The Commission was chaired until 1918 by Sir Clifford Sifton and consisted of 18 members and 12 ex-officio members (Geist 2000).

By the early 20th century, considerable wildlife conservation infrastructure was in place, but by the 1920s it was clear that the system's emphasis on restrictive game laws was insufficient in itself to stem wildlife's decline. Aldo Leopold, A. Willis Robertson, and other conservationists published an American Game Policy in 1930 (Leopold 1930) that proposed a program of restoration to augment conservation's legal framework. They called for a wildlife management profession with trained biologists, stable, equitable funding to enable their work and university programs to train them. Within

10 years much of what the policy called for had been realized, with the first game management curricula established at the University of Michigan and the University of Wisconsin and the creation of Cooperative Wildlife Research Units, the formation of The Wildlife Society, and the passage of the Pittman-Robertson Wildlife Restoration and Duck Stamp Acts. These accomplishments were all initially founded in the U.S. but many were endorsed and mirrored by various Canadian policies and programs.

Subsequent decades brought expanded legislation (e.g., U.S. Endangered Species Act, Canadian Species at Risk Act) and programs (e.g., Migratory Bird Joint Ventures, Teaming With Wildlife), but their principles had been set firmly in place. These principles arose amidst social and environmental circumstances that were unique to the world in their temporal juxtaposition.

Implementation in Canada and the United States

Canada

Governance.— Responsibility for wildlife conservation is assigned by the Canadian Constitution and is shared between the provinces or territories and the federal government. Variations on almost all of the following occur in many parts of Canada, but the general situation is described below.

Provincial and territorial authority is detailed in the sub-federal jurisdictions' acts and laws respecting wildlife. Any authority not specified is considered "residual" and falls to the federal government, which is also responsible for wildlife on designated federal lands (i.e., national parks), all migratory wildlife that crosses international boundaries, marine mammals, and, in some instances, where the range or migration of a species occurs in 2 or more provinces or territories. The federal Species at Risk Act (2002) may have application where provincial or territorial measures to protect endangered and threatened wildlife are considered insufficient. The Act authorizes designation of threatened species and identification of measures to recover them. Exceptions and variations to the foregoing exist across Canada – specially in Quebec (civil code derived from French law) and the territories of Nunavut, Northwest Territories, and Yukon (territorial jurisdiction is more limited than is provincial in some matters) – but the basic model is that migratory, marine, and other federal trust species fall to the federal government, and everything else is within the purview of the provinces and territories. Federal, provincial, and territorial governments have established public wildlife agencies (e.g., the federal Canadian Wildlife Service)

to devise and implement conservation programs. Tacitly or explicitly, the fundamental tenets of the Model are accepted and practiced in Canada.

Treaty Indians have jurisdiction over all animals on their Indian Reserves, except where endangered species legislation may be applied, and many aboriginal communities do not accept the legitimacy of any outside authority. In regards to aboriginal communities, courts in Canada are still defining matters of governance. Rights of access to wildlife by aboriginal people (i.e., they are allowed to take wildlife at any time on land to which they have right of access) was confirmed in the Constitution Act of 1982. These rights may be abrogated by government only after extensive consultation, and only for purposes of sustaining wildlife populations. A restriction on access to wildlife on aboriginal lands applies automatically to all Canadians.

Systematic consultation among federal, provincial, territorial, and, more recently, aboriginal authorities is extensive. Complexities of Canadian law and tradition have made apparent to wildlife managers that effective conservation programming requires close consultation among all jurisdictions. For decades, the annual Federal-Provincial Wildlife Conference was a fixture in Canada; it now has evolved into a structured contact among the jurisdictions through regular meetings of provincial, territorial, and federal wildlife-resource directors employed by public wildlife agencies. Other groups such as the Committee On the Status of Endangered Wildlife In Canada (COSEWIC) also operate on a foundation of inter-jurisdictional consultation and cooperation. In general, the goal of such groups is to agree on basic policy and program initiatives,

but leave implementation to the legal authority, where it can be done in keeping with widely varying circumstances across Canada.

Canada is signatory to several international treaties and conventions, including the Migratory Bird Treaty with the U.S. and Mexico, its derivative North American Waterfowl Management Plan, the Convention on International Trade in Endangered Species of Fauna and Flora (CITES), and the Ramsar Convention on Wetlands (RAMSAR) – the international treaty for maintaining wetlands of international importance.

Management authority over wildlife is public. Although laws differ widely among jurisdictions with respect to captive animals, the basic principle is that wildlife is a public trust, and no private ownership is allowed. Landowners may be given special access privileges in recognition of their role in sustaining populations of certain species, but only in accordance with public law. Private conservation organizations have a vital role in conservation and work closely with public agencies. There are advisory boards in some provinces and territories, but public stewardship prevails. The governance model for wildlife conservation decision making is typically at the (elected) ministerial level. Boards and commissions do not have the significant role in Canada that they do in the U.S. Canada's political structure is based on the British parliamentary system, which affords less direct participation in public affairs than does the American congressional system.

Funding.— As mentioned above, Canada is governed under (its derivative of) the British parliamentary system, of which a fundamental aspect is the general revenue system of public finance, meaning no dedicated funds. All tax revenues, regardless of source, go into a central account and are then allocated by government according to its priorities. Canadian political tradition is that representatives are not elected to carry out the will of the people, but to exercise their good judgment on behalf of the

people as to how tax money should be allocated. The peoples' will is expressed at election time. The rule of thumb is, for example, a gasoline tax or any portion thereof does not go to highway infrastructure. Instead, the government will decide how much goes to highways and what goes elsewhere, according to its priorities.

With regard to wildlife, the general revenue system explains why wildlife agencies in the U.S. are, overall, far better staffed and funded than are their Canadian counterparts. Canadian public agencies depend on general revenue tax dollars for their basic operations. Canada has no equivalent to the Pittman-Robertson Wildlife Restoration Program, and no dedicated sales tax. The Canadian funding mechanism also explains why research has all but disappeared from provincial and territorial agencies. Compounding this systemic reality is competition for public funds in Canada at all levels of government. Wildlife therefore must compete directly with health, education, and social services for funds on an annual basis. The result is that wildlife does not, in almost all circumstances, receive what its proponents and managers believe is its due. Usually, there is no provision for carrying over unspent funds from one fiscal year to the next, which tightens finances even further.

Recently, provincial governments are beginning to understand that many wildlife programs (i.e., hunting) generate significant dollars for the public purse. However, those dollars cannot be sustained with wildlife management funded under general revenue financing. Fortunately, certain old rules are gradually being relaxed, and dedicated funds are appearing in some provinces. The future for wildlife management will very much depend on how quickly and effectively the need for a new funding basis is communicated to governments.

At present, investment by non-governmental organizations, federal, provincial, and territorial cost-sharing agreements, and leveraged funds from outside Canada are critical to conservation

programming in nearly all parts of the country. For example, revenues from the U.S. play a large role in Canadian waterfowl management. Provincial and territorial hunting programs usually depend on general revenues to a much higher degree than do endangered wildlife or habitat programs.

Scope.— What wildlife is and who manages it depends on which part of Canada is considered. Wildlife managed by a Wildlife Branch in one province or territory may not be considered wildlife in another, similar to different classifications of wildlife in different states in the U.S. There is general accord, however, on some major groups of species: ungulates, waterfowl, most furbearers, and birds are wildlife and the responsibility of professional wildlife managers everywhere. Wildlife legislation has, overall, become much more inclusive of late, and now commonly includes amphibians, reptiles, plants, and, in some instances, invertebrates. The structure, purview, and emphasis of provincial and territorial agencies vary significantly.

Defining which taxa constitute wildlife is essentially up to each province or territory. There is no overarching federal legislation in this regard, although the federal government does make specific reference to species under its jurisdiction. Species defined as wildlife in the provinces and territories are accorded protection under legislation that differs in scope and type of application.

Wildlife agencies are the sole managers of problem wildlife in some provinces, while sharing or not having this responsibility in others. Always prefaced with the qualifier “generally,” ungulates or waterfowl cannot be killed in defense of property; furbearers such as beaver (*Castor canadensis*) or predatory species that take livestock, including gray wolves (*Canis lupus*), can be. Species such as ground squirrels (*Spermophilus sp.*), pigeons (*Columba livia*), and English sparrows (*Passer domesticus*) are normally not given any protection under provincial or territorial legislation.

Some provinces and territories have outright prohibitions on holding species defined as wildlife in captivity, whereas others allow it for specific purposes, such as elk ranching or roadside zoos. In some provinces, a species is considered wildlife if not confined, and not wildlife if it is legally held. Responsibility for captive wildlife may be vested within a wildlife agency or other division of government such as agriculture.

United States

Governance.— Governance over wildlife management in the U.S. is divided between the federal government and individual states. The Public Trust Doctrine established the states as trustees of wildlife (Batcheller et al. 2010) except where the Constitution provided for federal oversight (Bean 1983). Three clauses of the Constitution provide for federal oversight: the Commerce Clause, Property Clause, and Supremacy Clause (federal treaty-making power). At the federal level, responsibilities for wildlife are assigned to agencies within the Departments of the Interior (Fish and Wildlife Service, Bureau of Land Management, National Park Service, Bureau of Reclamation, Bureau of Indian Affairs, Geological Survey), Agriculture (Forest Service, Animal and Plant Health Inspection Service, Natural Resource Conservation Service), Commerce (National Marine Fisheries Service for certain marine mammals), Environmental Protection Agency, and Department of Defense.

Within states, 2 governance models predominate: boards or commissions that make policy decisions and oversee an agency, and political appointees that make policy decisions and oversee an agency. Both models are products of representative democracy (Jacobson and Decker 2008). Representative democracy is the appointment or election of individuals responsible for making decisions that ostensibly fulfill public trust mandates.



Dead bison. Credit: Wisconsin Historical Society.

Funding.— Fish and wildlife conservation funding in the U.S., at least at the state level, typically is characterized as a user-pay, user-benefit model. From the earliest days of active management and enforcement by nascent state fish and wildlife agencies, hunters, anglers, and trappers have funded restoration and conservation initiatives. License and permit fees, a motor boat fuels tax, and excise taxes on hunting, shooting sports, and angling products provide dedicated funding for habitat conservation, harvest management, research, restoration, and monitoring initiatives by state agencies. The excise tax programs have permanent, indefinite appropriation status, which means that the revenues are automatically distributed to the states each year and not subject to congressional whim.

To this day, the combination of sportsmen-derived funds described above comprise between 60 and 90 percent of the typical state fish and wildlife agency budget (U.S. Fish and Wildlife Service, unpublished data). In addition, sportsmen and women also donate volunteer time and dollars to national, regional, and local conservation organizations (e.g., Ducks Unlimited, National Wildlife Turkey Federation, Pheasants Forever, Rocky Mountain Elk Foundation, Quail Unlimited, Ruffed Grouse Society, The Nature Conservancy), in effect multiplying the conservation power of the agencies. Clearly the success of the Model is in no small measure indebted to hunter- and angler-conservationists and visionary industry leaders.

For more than 2 decades, state fish and wildlife agencies have recognized the need for broader programs in light of new mandates, new threats, enhanced management attention to non-harvested species, and new constituent demands (e.g., bird watchers). Indeed, with the strong support of state fish and wildlife directors, the Association of Fish and Wildlife Agencies initiated the Teaming With Wildlife Program to focus action on securing new funding for wildlife diversity. At the national level, concerted attention has been given to developing a new excise tax on birding, hiking, camping, and other recreational equipment, one that would build off the success of the same tax for hunting, shooting sports, and angling equipment. This has yet to bear fruit, however, given the strong political opposition to new taxes, and potentially because the broader public may lack the vested interest that sportsmen and women have demonstrated in supporting user fees.

More recently, dedicated funding efforts have focused on royalties from energy development and carbon credits from climate change legislation as ways to fund wildlife adaptation programs. Even though dedicated funding has proved elusive, since 2000 the U.S. Fish and Wildlife Service – with congressional authorization – has implemented the State Wildlife Grants program, which has provided more than \$600 million to state fish and wildlife agencies for species of greatest conservation need. At the state level, direct appropriations from the general fund, sales tax and lottery allocations, voluntary contributions via income-tax check-offs, and special license plates have been used to fund new programs by state fish and wildlife agencies.

Funding at the federal level is determined annually through the appropriations process and embedded in legislation such as the Farm Bill and the Interior Appropriations Act. The Land and Water Conservation Fund is an important source of revenue for federal national wildlife refuge land acquisition. Dedicated funding from the sale of federal Migratory Bird Hunting and Conservation Stamps also supports national wildlife refuge acquisitions.

As noted elsewhere, all wildlife species are public trust resources. The Model has thrived in large part because of the support of the hunting, angling, shooting sports, and boating communities, and industries for habitat and species management and conservation. Long-term declines in both hunter and angler participation place into question the sustainability of such a funding approach and beg the need for new funding to address new challenges. A few state fish and wildlife agencies, most notably Missouri and Arkansas, have successfully secured alternate funding to augment traditional sources (Jacobson et al. 2010a). Jacobson et al. (2010b) reflect on the difficult and all-too-real challenges facing fish and wildlife agencies in the midst of stable-to-declining traditional revenues such as hunter and angler license dollars.

Scope.— Wildlife conservation in the U.S. is broad, encompassing most terrestrial, aquatic, and marine vertebrates and invertebrates, and plants. The degree to which a given taxa receives conservation attention depends upon its legal status (e.g., furbearer, game, special concern, nongame, threatened, or endangered), whose jurisdiction it is under (i.e., federal trust species or state), the availability of funding, and its relative priority (e.g., species of greatest conservation need identified in a State Wildlife Action Plan).



Wood turtles and other reptile species are receiving increased management and protection in the U.S. with funding from the federal State Wildlife Grant Program, but international trade in turtles remains a threat to sustainability of their populations. Credit: John F. Organ.

Review of Model Components

1. Wildlife Resources Are a Public Trust

The keystone component of the Model is the concept that wildlife is owned by no one and is held in trust for the benefit of present and future generations by government (Geist and Organ 2004). This is the legal foundation for federal, provincial, and state wildlife agencies. The common law basis in the U.S. is the Public Trust Doctrine, a Supreme Court decision in 1842 that declared certain resources could not be taken into private ownership (Martin v. Waddell; Batcheller et al. 2010).

Historical Development.— The U.S. Supreme Court ruling in 1842 denied a landowner’s claim to exclude all others from taking oysters from certain mudflats in New Jersey (Martin v. Waddell; Bean 1983, Organ and Batcheller 2009). Chief Justice Roger Taney, in determining that the lands under navigable waters were held as a public trust, based the decision on his interpretation of the Magna Carta. The Magna Carta, in turn, had drawn upon Roman law that was first written as the Institutes of Justinian (A.D. 529; Adams 1993). The written codes of Justinian were based upon the 2nd century Institutes and Journal of Gaius, who codified the natural law of Greek philosophers (Slade et al. 1977). The application of this fundamental concept of the public trust to natural resources, first written for posterity by the Romans, is as old as civilization itself. What the Romans recorded was, in part:

“By the law of nature these things are common to all mankind - the air, running water, the sea, and consequently the shore of the sea. No one, therefore, is forbidden to approach the seashore, provided that he

respects habitations, monuments, and the buildings, which are not, like the sea, subject only to the law of nations.” (Roman Law)

The roots of the Public Trust Doctrine in Roman law are complex. Joseph Sax, the pre-eminent scholar of the Public Trust Doctrine, traced these roots so that we may better understand the modern context (Sax 1970, 1999). The Romans had an elaborate property system that recognized different kinds of property serving different functions. Certain property belonged to the gods, certain property belonged to the state, and certain property belonged to individuals. Each of these kinds of property had a special status and had to be treated in a certain way. For example, the property might not be capable of being bought and sold. Other kinds of property included common property (*res communis*). Common property (1) could not be privately owned, and (2) was for common use by everyone. Roman law included wildlife (*ferae naturae*) within the law of things owned by no one (*res nullius*). These categories were probably for what the Romans perceived to be the nature of things that were abundant and not appropriate for private possession and sale (Horner 2000). Ownership of a wild animal occurred only when it was physically possessed, most typically when killed for food.

Roman civil law was adopted in substance by the English after the Magna Carta (A.D. 1215; Slade et al. 1977). English common law also recognized special kinds of property, but provided its own context. English common law disliked ownerless things, so the ownership of public resources was placed in the king (Horner 2000). These properties were owned by the king, but not for his private use. The king was a trustee, owning certain properties for someone else, which became a special responsibility (Sax 1999).

English law applied in the American colonies, yet after independence and the formation of the U.S., there was no king to be the trustee. It was not until 1842 and the Supreme Court decision in *Martin v. Waddell* that trustee status was ascribed to the states. To understand how the ancient concept of public trust and the modern Public Trust Doctrine – neither one specific to wildlife – have both become a pillar of wildlife conservation, we must look at their legal essence.

Public Trust as Law.— Sax (1999) identified 4 fundamental concepts of public trust:

1. Public trust is common law. There is no legal code specific to the Public Trust Doctrine because it has never been officially enacted. It is “judge-made law” that is interpreted and evolves through court decisions. For the last century or so, most of our laws have been statutory coded laws, but for most of the development of the Anglo-American legal system, common law prevailed.

2. Public trust is state law. As such, there is no single law but many. Yet each embodies a unifying principle of the fundamental rights of all citizens.

3. Public trust is property law. One of the great strengths of the Public Trust Doctrine is that in asserting it, the state is asserting its own property rights – property rights that belong to the public – so the issue of “taking” becomes moot as one cannot be taking a property right from another while asserting such right.

4. Public trust is a public right. Trust property is owned by the public and held in trust for the benefit of the public. One does not have to have special status to make a claim but only must be a member of the public.

Because the Public Trust Doctrine is common law, and judge-made, it can never be repealed by a legislature. The traditional applications of public rights under the Public Trust Doctrine were for navigation, fishing, and commerce. The New England

states of Massachusetts, Maine, and New Hampshire added fowling as a right. It was not until 1896 that wildlife became firmly established in law as a public trust resource of the states. *Geer v. Connecticut* became judge-made law that is the “heart and soul of the modern day public trust in wildlife” (Horner 2000:21). While transforming this principle into modern American law, and making the concept of wildlife as public trust resources distinctly American, the court stated:

“Whilst the fundamental principles upon which the common property in game rests have undergone no change, the development of free institutions has lead [sic] to the recognition of the fact that the power or control lodged in the State, resulting from the common ownership, is to be exercised, like all other powers of government, as a trust for the benefit of all people, and not as a prerogative for the advantage of the government, as distinct from the people, or for the benefit of private individuals as distinguished from the public” (161 U.S. 519, 1896).

The trustee status of states in regard to wildlife is transferred to the federal government in the U.S. when wildlife falls within parameters of the U.S. Constitution’s Supremacy Clause (federal treaty-making power), Commerce Clause, and Property Clause. Chief Justice Taney, in articulating the Public Trust Doctrine in *Martin v. Waddell* in 1842 acknowledged this when he wrote that the powers assumed by the states were “subject only to the rights since surrendered by the Constitution to the general government” (41 U.S. 367 1842).

Current Status, Threats, and Challenges.— A review of the Public Trust Doctrine was completed recently, including an evaluation of current and anticipated threats that may weaken this pivotal doctrine (Batcheller et al. 2010). Several threats have been identified that directly or indirectly undermine existing state, provincial, and federal laws (Geist and

Organ 2004). These threats include (1) inappropriate claims of ownership of wildlife; (2) unregulated commercial sale of live wildlife; (3) prohibitions or unreasonable restrictions on access to and use of wildlife; (4) and a value system endorsing an animal-rights doctrine and consequently antithetical to the premise of public ownership of wildlife (Organ and Mahoney 2007, Organ and Batcheller 2009).

In many jurisdictions, domesticated native or exotic animals with recently descended from wild stock may be owned. Typical uses of these animals include game farms and more traditional farms to produce meat from “wild” animals. Some game farms practice genetic husbandry to produce trophy class antlers or horns; others provide shooting opportunities in enclosed and fenced natural or semi-natural settings. The legal status of animals held in captivity under these conditions is equivocal. At its core, the key question is: do wild animals held in captivity, including fenced enclosures, remain as trust resources or are they private property? Is there a distinction between the status of a wild animal held within a fence (e.g., a wild ungulate jumping into an enclosure and then held in pseudo-captivity), and an animal deliberately housed within an enclosure and husbanded via traditional livestock practices? Although these are central issues germane to the Public Trust Doctrine, they have not been widely addressed in case law, thereby raising great uncertainty about its application to these situations. Moreover, commercialization places a monetary value on wildlife or wildlife parts and a concomitant incentive for their use, which threatens the premise of public ownership of wildlife.

From our history, we know that some forms of commercial use of wildlife are unsustainable, especially in the absence of strong legal and regulatory controls on harvest and marketing. However, in most jurisdictions some commercialization of wildlife is permissible under highly regulated legal regimes. For example, trapping is an important wildlife conservation tool and a legitimate use of renewable wildlife resources, but only under a system of strict controls

to limit harvest and to provide for legal commerce. The regulation of commercial furbearer harvest is generally mature, but other forms of wildlife commercialization are poorly regulated, and some evidence suggests that the commercialization of taxa such as amphibians and reptiles may be harmful to native, wild populations. If the Public Trust Doctrine is to be fully applied to all wild fauna, these loopholes in the control of commercial use of reptiles and other taxa would need to be closed. An all-taxa approach to wildlife management would help ensure that all species receive benefits associated with public valuation and public ownership.

A central premise of the Public Trust Doctrine is access to wildlife, yet there is growing evidence that the public has a more difficult time finding places to hunt or trap on private land, and even in gaining easy access to public lands (Responsive Management/ National Shooting Sports Foundation 2008). In some instances, high fees are charged to gain access to private lands, or to use convenient private points of access to public lands. Many public wildlife agencies charge high fees for limited permits to hunt certain big game species. However, a large number of people cannot afford to pay high user fees (Duda et al. 1998). They may stop hunting if they are unable to find a place to hunt, cannot afford the fees, or are discouraged by crowding on public lands (Responsive Management and National Shooting Sports Foundation 2008). Worse, in some states, certain guides use baiting as a means of attracting game from public lands to private lands, where they are shot under an exclusive (and expensive) arrangement with the client. In a manner similar to fencing, these practices jeopardize another tenet, the “democracy of hunting,” and significantly weaken the social benefits associated with the Public Trust Doctrine (Dunkley and Cattet 2003, Ermer et al. 2005).

The foundational notion of public ownership implies that society values wildlife and, by implication, understands the premise of wildness. The growth of certain wildlife populations and

the associated human conflicts stemming from interactions between people and animals may lead to a devaluation of wildlife and wild places. For example, when coyotes (*Canis latrans*) attacked 2 small children in a suburban New York community, tolerance of coyotes diminished among community residents, with 9 out of 10 residents expressing concern about coyotes in their community (Siemer and Decker 2011). If those citizens learn that open and green spaces attracted coyotes in the first place, will they retain their value of wild places and creatures, or will they gravitate toward a devaluation of green spaces altogether? Similarly, the widely discussed notion of nature deficit disorder (Louv 2008) suggests that citizens may be growing increasingly ambivalent toward nature. If that is true, why should they care about maintaining wildlife in perpetual public trust? Finally, persons who accept an animal-rights world view categorically reject the concept of ownership of animals, rendering the central legal principles of the Public Trust Doctrine irrelevant. Strong leadership and concerted efforts on the part of wildlife professionals will be required to make the case that wild places are important, and that wildlife needs to be protected for one and all, as posited by the Public Trust Doctrine.

Batcheller et al. (2010) evaluated the status of the Public Trust Doctrine in the U.S. and Canada. In the U.S., the Public Trust Doctrine in its traditional form is strongly based in statutory and case law, especially as applied to navigable waterways. Recently, the Public Trust Doctrine has been applied to broader applications in case and statutory law, and specifically to other natural resources including wildlife. However, relatively few states have specific case law that clearly recognizes wildlife as a public trust resource. Many states, on the other hand, use either explicit or implicit statutory language to confer public trust status to wildlife resources. Batcheller et al. (2010:22) concluded that “bringing wildlife into the Public Trust Doctrine through statutory measures appears to be the best way to accomplish the goal of extending the Public Trust Doctrine in this area.” To this end, statutory language that clearly puts wildlife in public

ownership is necessary. In Canada, about one-half of the provinces and territories have language on the public ownership of wildlife in their statutes, but Canada’s wildlife conservation institutions also would benefit from a comprehensive strengthening of the Public Trust Doctrine.

Canada, although following Great Britain in modeling much of its legal system, opted for the same basic policies governing wildlife as did the U.S. In Great Britain, wildlife became *de facto* private property of landowners (Threlfall 1995). An account of this effort to protect Canada’s wildlife in cooperation with the U.S. was discussed by Hewitt (1921), including the establishment of wildlife treaties between the 2 countries. Historically, wildlife became a public resource in part by default because the Crown was the ward of huge tracts of land not claimed for settlement and was thus the *de facto* owner of the wildlife it contained. Moreover, as wildlife fed native populations, Canada’s government had little choice but to safeguard that food supply.

Batcheller et al. (2010) provided model statutory language that would give an unequivocal legal underpinning to sustain the Public Trust Doctrine *vis-à-vis* wildlife conservation indefinitely.

2. Markets for Game Are Eliminated

The unregulated trafficking in meat, hides, and other parts of game animals and nongame birds in the 19th century led to drastic and, in some instances, catastrophic declines in populations. Elimination of markets for game animals and nongame birds was an essential step in halting declines of these particular species. It has since been held in principle that markets for game and nongame wildlife are unacceptable because they privatize a common resource and lead to declines. Exceptions have been made for furbearers because there is an active market in Canada and the U.S. for furbearer pelts and in some instances meat

(e.g., muskrat [*Ondatra zibethicus*] and raccoon [*Procyon lotor*]). The underlying premise for fur markets is that they are highly regulated and serve a conservation purpose because harvests are within normal population fluctuation levels consistent with sustainable-use principles, help manage conflicts between furbearers and humans, and foster support for habitat conservation (Boggess et al. 1990, Geist et al. 2001, Prescott-Allen and Prescott-Allen 1996). Markets for taxa other than game, nongame birds, and furbearers exist in North America, but regulations and enforcement vary, and impacts on populations are not well understood.

Historical Development.— The first concerted efforts to eliminate markets for game animals were those of the New York Sportsmen’s Club, formed in 1844 (Trefethen 1975) with objectives confined to protection and preservation of game, and funds appropriated solely for those purposes. The club’s membership included many influential lawyers, judges, and politicians, who often acted in their official positions on behalf of the club. At a time when there was limited or no government oversight on wildlife, they drafted, led efforts to enact, and enforced the first game laws directed against market hunting. These laws were local to New York City, but because of the market that locale provided, the impact was notable.

The Boone and Crockett Club was responsible for important legislation at the state and federal levels. Co-founder George Bird Grinnell used his weekly journal *Forest and Stream* to communicate the need for elimination of game markets (e.g., Grinnell 1894). Club member Congressman John Lacey of Iowa sponsored the Yellowstone Park Protection Act which passed in 1894, becoming the first federal law to protect game from market hunting (Trefethen 1975). The Lacey Act of 1900 effectively made market hunting illegal nationwide and remains the most powerful legal tool to combat this activity. The Migratory Bird Treaty of 1916 between the U.S. and Canada, and subsequently many other nations including Mexico and Japan, provided the

constitutional grounding for the Migratory Bird Treaty Act of 1918 and extended international protection for bird species from the market. The U.S. Endangered Species Act of 1973 and the Canadian Species at Risk Act of 2002 extended protection from the market to a multitude of other species.

Current Status, Threats, and Challenges.—

Commercial trade for reptiles, amphibians, and fish is thriving (Nanjappa and Conrad 2011). In addition, some game species that we would expect to fall under the principles of the Model are actively traded. Deer (*Odocoileus* spp.), elk, ring-necked pheasants (*Phasianus colchicus*), quail, chukar (*Alectoris chukar*), and more exotic wildlife species are commonly bought and sold (Freese and Trauger 2000). Related to wildlife markets are contests and tournaments common in rural areas of the country. Big buck contests, coyote hunts, crow (*Corvus* spp.) hunts, and numerous other commercial contests imply a market-based hunting situation. The sale of furbearers, seal (Phocidae) fur, antlers, reproduced antlers, and a variety of other wildlife parts needs to be considered in light of the principle that markets for wildlife are eliminated. A robust market for access to wildlife occurring across the U.S. and Canada exists in the form of leases, reserved permits, and shooting preserves.

In contrast to hunting contests and tournaments, where a hunting (or fishing) license is required, markets for trade in amphibians, turtles, and reptiles are not consistently regulated (Nanjappa and Conrad 2011). Markets for pets, both native to North America and from international sources, are relatively open (Niraj et al. 2012). In addition, amphibians and turtles, in particular, are traded for meat. Freshwater turtles are declining sharply (Turtle Conservation Foundation 2010, International Union for Conservation of Nature 2009), primarily because of demands from Asian food markets. However, turtle harvests have been difficult to track because regulations are not widespread, and reporting requirements vary across states.

3. Allocation of Wildlife Is by Law

Access to wildlife has been an inherent part of the North American experience, unlike many other nations where access is reserved for those with special privilege (e.g., aristocracy; Manning 1993). Wildlife is allocated to the public by law, as opposed to market principles, land ownership, or other status. Democratic processes and public input into law-making help ensure access is equitable.

Historical Development.— The seemingly unlimited resources of the New World were used to attract colonists from the Old World with prospects of pelts, hides, and feathers for trade and food for survival. These images mitigated the harsh reality of eking out an existence in the unforgiving wilds of North America. It was not long before the colonies began to enact regulations specific to wildlife. The first regulations on record focused on protection of livestock, essential to the survival and livelihood of settlers. In 1630 the General Court of the Massachusetts Bay Colony passed an act offering a reward to anyone who killed a wolf. In 1632 Virginia established a bounty on wolves (Trefethen 1975).

In a relatively short time game animals started to become scarce and protective regulations were warranted. In 1646, Portsmouth, Rhode Island, closed the white-tailed deer (*Odocoileus virginianus*) season from May 1 to November 1 and established a penalty of 5 pounds for hunting out-of-season. Connecticut adopted a law that stated that the killing of deer at unseasonable times of the year would be against the interests of the colony because it would result in decreased production (Trefethen 1975). In 1705, the General Assembly at Newport, Rhode Island, noted that large numbers of deer had been killed out of season, and deemed this detrimental to the future of the colony, and indeed the whole country if not prevented.

Alarming decreases in numbers of deer prompted the General Court of Massachusetts in 1739 to step up enforcement of the deer-season law it enacted in 1698. Each town was instructed to appoint 2 “deer reeves” to enforce the closed season. The fine for a conviction was 10 pounds, probably \$1,000 today, with one-half the fine going to the deer reeve as his fee. Azariah Seldon of Hadley, Massachusetts, was convicted in 1763 of killing a deer out of season and assessed the full fine of 10 pounds. Another individual, unable to raise the fine, was put on the auction block and sold to the highest bidder for 2 months of forced labor. These laws and their enforcement probably served as a deterrent, but the continued habitat destruction and long open season with no bag limit took their toll. By the time of the American Revolution, many towns in the colonies abandoned the deer reeve office because there were so few deer to protect. Nevertheless, these laws and regulations reflected the thinking of the time, highlighted the need to preserve a food supply, and established a mechanism for protecting wildlife.

The efforts of the New York Sportsmen’s Club and Boone and Crockett Club in development of game laws in the 19th century to address market hunting have been noted earlier. In 1897, the New York State Assembly passed the Adirondack Deer Law (sponsored by assemblymen who were Boone and Crockett Club members) that outlawed jacklighting deer at night and shooting deer after using hounds to drive them into deep water. Most notable about this law was that shooting deer in water was outlawed because of potential deleterious effects on the deer population, and jacklighting (e.g., spotlighting) was banned because it was unsportsmanlike (these laws remain intact today). The underlying principle was that a population or species, entirely independent of whether it was increasing or decreasing, should be protected from cruel or unsportsmanlike methods of killing (Sanger 1897). Audubon societies (the first ones were formed by Grinnell) and other nature groups allied with

sportsmen and began to lobby for legislation to curtail the feather trade that was decimating many nongame bird species (Dunlap 1988).

Game laws, game agencies, and game commissions established by states in the late-19th and early-20th centuries focused primarily on eliminating commercial uses of wildlife (e.g., birds and the millinery trade) and on regulating numbers of game legally killed by sportsmen. Hunting methods were regulated to conform to accepted standards of fair chase as outlined by the Boone and Crockett Club, which would ideally minimize opportunities for hunters to exceed bag limits. Federal conservation programs were developed for protection of migratory birds through regulation, law enforcement, and refuge establishment. Federal conservation efforts also focused on predator control in an effort to benefit game populations and livestock ranchers (Meine 1988). At the beginning of the 20th century, game and songbird populations were in decline, and in some instances disastrously so, and both sportsmen and bird lovers felt that control of predators, including raptors, was necessary (Dunlap 1988, Mighetto 1991). As furbearer species such as beaver were restored, states established regulated fur trapping seasons so they could manage furbearers as valued resources while effectively minimizing human property and safety concerns (Shaw 1948).

Passage of the Pittman-Robertson Wildlife Restoration Act in 1937 ushered in an era of restoration, and the increase in scientific management led to fine-tuning the system of seasons and bag limits. Prior to restoration programs, population monitoring was limited. Seasons and bag limits were either by too conservative or too liberal. As more jurisdictions began to monitor harvests, they began to see population trends and responded with regulations designed to increase or sustain populations. Many states that had allowed either-sex deer seasons, for example, initiated male-only (buck) laws. In Massachusetts, where hunters could take 1 deer

of any sex, the reported deer harvest declined until 1967 when a buck law was imposed. Gradually, female (doe) permits were re-issued on a county basis in those areas that could sustain a reduction in growth or had agricultural conflicts. Eventually, during the 1980s, deer management zones were established independent of political boundaries, but representative of deer range differences. This allowed greater control of the deer population through adjusting the doe kill differentially based on habitat and human influences. These examples typify the focus of game regulations in the post-World War II period.

Laws regulating access to species other than game, migratory birds, and furbearers were uncommon until the mid- to late-20th century. Passage of the Bald Eagle Protection Act in 1940 was followed by the Endangered Species Preservation Act of 1966, the Fur Seal Act of 1966, the Endangered Species Conservation Act of 1969, the Marine Mammal Protection Act of 1972, and the 1973 Endangered Species Act. These laws focus on the take of animals, and represent an expansion of the approach taken to stem market hunting toward a broad array of other uses of wildlife. Several state and federal laws protect wetlands, but few laws focus specifically on protection of wildlife habitat. A notable exception is Vermont Act 250, known as the Land Use and Development Act of 1970, which regulates impacts to certain wildlife habitats.

American alligators (*Alligator mississippiensis*) provide a good example of how strictly regulated markets can benefit populations. Because of overharvest of alligators for meat and hides, and resulting population declines, in 1967 (before enactment of the Endangered Species Act) alligators were classified by the U.S. Fish and Wildlife Service as endangered. However, regulations did not accompany this classification and overharvest continued. In 1969, the Lacey Act, which prohibits interstate transport or export of illegally harvested species, was amended to include reptiles, and subsequent enforcement of high profile cases

helped to curtail the illegal trade. Populations quickly showed signs of recovery. In 1973, when the Endangered Species Act was enacted, alligators were listed as endangered. Between 1970 and 1979, certain states implemented controlled or experimental commercial harvests, and in 1979 the federal government began allowing trade in alligator meat while also downgrading alligators on CITES to allow export of their skins. Controlled harvest, including adults or eggs to supplement captive-rearing facilities, continues by permit or tag in the southern U.S. for the use of alligator meat and hides. As a result of this regulated market, American alligator populations have rebounded, the species has since been delisted, and numerous states now allow harvest.

Current Status, Threats, and Challenges.— Clearly defined laws exist regarding seasons, bag limits, methods of take, and areas in which seasons apply. What is not as clearly defined is the applied enforcement of these laws. Enforcement priorities often depend on available resources and societal desires. Does the out-of-season take of a striped skunk (*Mephitis mephitis*) merit the same level of enforcement as a trophy elk? Although state authority over the take of resident game species is well defined, county, local, or housing development ordinances may effectively supersede state authority. *De facto* decisions regarding hunting opportunity and access are routinely made at a level below that of state government. Further, decisions on land use, even on public lands, indirectly impact allocation of wildlife because of land use changes associated with land development. Competing land uses which effectively destroy or degrade wildlife habitat supersede the notion of allocation of wildlife by law. Examples abound where public lands have been dominated by one or more uses, thereby reducing their wildlife value and allocation to the public.

Amphibians and reptiles, especially turtles, may suffer as taxa whose uses are not broadly considered as utilitarian (e.g., those traded or used commercially as pets). In addition, these

species are secretive, often misunderstood, or feared. Perhaps for these reasons, establishment of regulations or enforcement thereof tend to be lower priorities. Lack of specific permits or harvest monitoring have caused some of the members of the user community of these taxa to claim that limits imposed, where they exist, are artificial or not based in science. Further, lack of law-enforcement capacity is another challenge. Herpetofauna are relatively easy to conceal, and several species look similar, thus routine enforcement checks or a lack of identification skills may cause illegally harvested individuals or species to be missed.

Among some members of the commercial pet industry, hobbyist breeders, and photographers of herpetofauna, the current perception is that government is the enemy, harming small businesses or reducing income through regulatory measures. However, just as with game and fur markets, careful and strategic engagement with these stakeholders regarding allocation can provide mutual benefit, particularly when regulated take is based in sound science. Many states use fishing or hunting licenses and permits for the collection or possession of herpetofauna, and specific methods to track herpetofauna, such as a specific license or stamp, combined with reporting requirements, may allow improved monitoring of numbers of animals removed from the wild. Similarly, many states permit or otherwise regulate wildlife rehabilitators. Many species are removed from the wild when perceived to be injured, ill, or orphaned. Some are returned to the wild and some are not. Monitoring or tracking can provide reasonable allocation limits that can be agreeable to stakeholders and can benefit populations.

4. Wildlife Can Be Killed Only for a Legitimate Purpose

Historical Development.— George Hallock, original owner and editor of *Forest and Stream*, wrote that those who killed merely for the fun of killing,

along with “pot hunters” (those who hunted solely for food), debased sport hunting (Reiger 1975). According to Grinnell, true sportsmen were those who hunted for pleasure (never for profit), who in the field allowed game a sporting chance, and who possessed an aesthetic appreciation of the whole context of sport that included a commitment to its perpetuation (Cutright 1985). Grinnell, in a series of powerful editorials, was to articulate what Reiger (1975) referred to as the code of the sportsman. The single most important element in the code was the requirement of non-commercial use, without waste, of all game killed. When this element was combined with dissatisfaction over dwindling game and habitat, an important catalyst in the conservation movement was born.

The concept of a sportsman can be summarized as one who, when hunting game:

- does so primarily for the pursuit or chase;
- affords game a “sporting” chance (fair chase);
- seeks knowledge of nature and the habits of animals;
- derives no financial profit from game killed;
- will inflict no unnecessary pain or suffering on game; and
- will not waste any game that is killed.

Current Status, Threats, and Challenges.— The current examples of broad-scale prairie dog (*Cynomys* spp.) shooting and crow hunting raise the question of legitimate purpose. Reconciling this practice within the principle of legitimate use does not seem possible, given that no food or protective benefits are derived. Pheasant stocking programs that, in effect, create artificial populations may qualify for evaluation in the context of the Model. The culling of overabundant species (e.g., deer and Canada geese [*Branta canadensis*] in urban settings) is an accepted management practice, but how does it

align with the Model? How do longstanding predator removal or control programs fit within this context? How precisely evaluated are the concerns over property protection, and how well justified should such interventions be? Are hunters who secure only the cape, antlers, or horns and discard the meat consistent with our understanding of the Model’s history and intent?

Further, do events such as turtle or frog races or rattlesnake roundups have an impact on populations? In some instances, animals are gathered from various parts of a given state, if not adjacent states, and brought to a race or roundup location where they are either translocated (by release, sometimes illegally) to an area nearby, or killed (either intentionally or accidentally) (Adams et al. 1994, Fitzgerald and Painter 2000, Speake and Mount 1973). Particularly in the case of snakes, directed persecution occurs along with many in the public sharing the perception that “the only good snake is a dead snake,” thus hampering conservation efforts. A lack of monitoring prevents our ability to determine definitive impact on populations.

5. Wildlife Is Considered an International Resource

One of the greatest milestones in the history of wildlife conservation was the signing of the Migratory Bird Treaty Convention in 1916. This was the first significant treaty that provided for international management of wildlife resources. The impetus was recognition that some wildlife migrate across borders, and one nation’s management, or lack thereof, has consequences to its neighbors. Subsequently, international commerce can have significant effects on the status of a species.

Historical Development.— The recognition that conserving waterfowl populations would require coordinated and centralized regulations dates back to the 19th century. Legislation giving the federal

government regulatory control over waterfowl hunting in the U.S. was introduced initially in 1904, but was not passed until 1914 (Presidential Proclamation: Regulations for the Protection of Migratory Birds). The constitutionality of this law was challenged and a district court ruling in Arkansas (U.S. v. Harvey C. Shauver) deemed the law unconstitutional. Supreme Court Justice Elihu Root suggested the constitutional issue could be addressed with a treaty between the U.S. and Great Britain on behalf of Canada. Such a treaty would invoke the Supremacy Clause of the Constitution, which gives federal treaties supremacy over any law of the land. A small group of U.S. and Canadian conservationists drafted the Migratory Bird Treaty and worked both sides of the border to get it ratified in 1916 (Hawkins et al. 1984).

Expansion of international wildlife conservation efforts beyond migratory birds occurred after WWII with passage of endangered species legislation in the 1960s and 1970s. Today, collaboration on a broad suite of wildlife conservation issues among the North American nations is common. For example, the Northeast Association of Fish and Wildlife Agencies is comprised of 13 northeastern states and 6 eastern Canadian provinces, and technical committees under its jurisdiction share management information and collaborate on policy development for most resident non-migratory species.

Current Status, Threats, and Challenges.— Several international treaties exist that prescribe cooperative relationships and management programs between the U.S. and other countries. However, other opportunities exist for international treaties to address species that cross borders into Canada or Mexico. Exporting components of the Model to other countries or continents, in particular to Africa, has been successful in some instances, yet very difficult and time-consuming to implement. Complex permitting processes, traditional economies and cultures, and travel and firearm restrictions stand as barriers to sharing the successful Model and American system of conservation funding with other nations.

Many collaborative actions are occurring for management and conservation of wildlife bilaterally or trilaterally in North America. The overall results are clearly positive, with plenty of examples with migratory birds, waterfowl, and more specific management efforts for the benefit of bighorn sheep (*Ovis canadensis*), pronghorn (*Antilocapra americana*), and more recently the translocation of bison into Coahuila from South Dakota. One important challenge is the construction of the wall between the U.S. and Mexico, which is likely to have severe negative implications for wildlife (Flesch et al. 2010, List 2007, López-Hoffman et al. 2009).

6. Science Is the Proper Tool to Discharge Wildlife Policy

In his classic work titled *Game Management*, Leopold (1933:17-18) stated the following:

“The Roosevelt Doctrine of conservation determined the subsequent history of American game management in 3 basic respects.

- 1. It recognized all these ‘outdoor’ resources as one integral whole.*
- 2. It recognized their ‘conservation through wise use’ as a public responsibility, and their private ownership as a public trust.*
- 3. It recognized science as a tool for discharging that responsibility.”*

Science as a base for informed decision making in wildlife management has become standard in Canada and the U.S. Nevertheless, funding has been largely inadequate to meet the research needs of management agencies, and a trend toward greater political influence in decision making threatens this principle (Wildlife Management Institute 1987, 1997). As Leopold wrote (Meine 1988:359-360):

“One of the anomalies of modern ecology is the creation of two groups, each of which seems barely aware of the existence of the other. The one studies the human community, almost as if it were a separate entity, and calls its findings sociology, economics and history. The other studies the plant and animal community and comfortably relegates the hodge-podge of politics to the liberal arts. The inevitable fusion of these two lines of thought will, perhaps, constitute the outstanding advance of this century.”

The development of human dimensions of wildlife as a discipline has moved us closer to realizing Leopold’s ideal. The integration of biological and social sciences is necessary to meet the conservation challenges of the 21st century.

Historical Development.— The history of scientific management of wildlife began when there was little concern for any form of wildlife conservation until fauna (especially large mammals) were on the brink of extinction. The story is known by most wildlife professionals but not as well by the layman. By the late 1800s, North Americans were seeing wildlife disappear before their eyes, much like we see wildlife habitat disappear today. Thus began the wildlife management experiment in North America. At this point in history, market hunting (i.e., unregulated hunting) was rampant and there was little incentive for management of what was perceived as an unlimited resource. Without a drastic change in attitudes and recognition that wildlife was not unlimited, the great American experiment likely would have been over before it began. Conservation grew from this point, and leaders – such as Theodore Roosevelt, Gifford Pinchot, and William T. Hornaday in the U.S. and Sir Wilfrid Laurier, Clifford Sifton, and C. Gordon Hewitt in Canada – worked together to ensure that their nations had similar policies to protect wildlife in those early days of conservation (Geist 1993).

Their efforts were instrumental in allowing others to begin to take a conservation approach where wildlife was concerned, and when Theodore Roosevelt was president he demanded that science be part of the conservation process (Lewis 1919).

Before 1900, wildlife interests centered on hunting, control of wildlife problems (e.g., predators), stocking, and some conservation of game with very little interest in science or research. Wildlife was considered a source of subsistence and profit only, so action was needed for the proper conservation and management of wildlife species and the habitats they depended on. In the 1930 American Game Policy, Leopold called for restoration of wildlife and a corps of trained wildlife biologists that made decisions based on facts, professional experience, and an underlying set of principles for the emerging profession. This was the true beginning of science being actively used in management of North America’s wildlife resources. Development of wildlife management and all related policies must be based on knowledge, and knowledge is advanced by experience and fact finding (i.e., research and science). Science based on research was required to convert the profession’s newly minted “principles” into policies. Today, limitations on use of wildlife are based on science including surveys, population dynamics, behavior and habitat studies, statistics, and contemporary adaptive management and structured decision making.

The scientific mandate has been followed since, reinforced by the writings of Aldo Leopold and embedded within The Wildlife Society’s code of ethics in that TWS members “recognize research and scientific management of wildlife and its environments as primary goals ...”

When Leopold emphasized the importance of maintaining habitat for wildlife, the idea was relatively new. In pursuing this notion, the new wildlife management discipline applied the scientific method that is the backbone of the acquisition of knowledge. However, it became evident that

simply using the scientific method was not going to be enough. Wildlife belonged to the public, and unless the public understood how wildlife was being managed they would be reluctant to support such management. Simply understanding life history characteristics of wildlife and wildlife habitat was inadequate; people influence the system, and human dimensions had to be an integral part of wildlife management within the profession. Brown and Decker (2001) summarized the evolution of human dimensions into the science of wildlife management through 12 steps:

1. State agencies have been collecting information on wildlife from hunters at check stations since the 1930s, a practice called “surrogate biology” as it used people to obtain information about harvests and traits of harvested animals.
2. Most of the earlier human-dimensions studies concentrated on conflicts between farmers and hunters.
3. In 1955, the U.S. Fish and Wildlife Service began the national survey of hunting and fishing, which is conducted every 5 years. The survey provides data on hunting and fishing trends and has been expanded to provide estimates on non-consumptive activities. Since 1980, the survey has provided state-level estimates and national estimates of wildlife recreation.
4. Although Leopold emphasized the importance of human dimensions in wildlife in the 1930s, it was not until 4 to 5 decades later that the social and economic aspects of wildlife were beginning to be seriously addressed.
5. This interest expanded into wildlife management agencies and university research programs. The Missouri Department of Conservation employed human-dimensions specialists, which stimulated other state agencies to follow.
6. The movement expanded, and the Human Dimensions in Wildlife Study Group was formed in

the 1980s. Additional activity continued to occur in agencies and universities.

7. In the 1990s, as public pressure increased for more public involvement in wildlife management decisions, agencies increased their incorporation of human dimensions into wildlife management, and universities included classes in the arena for wildlife students.
8. Communication related to human dimensions was greatly enhanced in the 1990s and the journal *Human Dimensions in Wildlife* was created.
9. Interest in this new field blossomed in the 1990s: state and federal agency and university partnerships for human-dimensions research were established and universities hired human-dimensions specialists.
10. Since the 1970s the field of human dimensions has increased the understanding of human perception of wildlife and human interactions with wildlife. Specialists in the field have developed conceptual approaches that assist managers in understanding attitudes and behavior of different stakeholders toward wildlife management issues.
11. The entire field of human dimensions continues to grow and gain involvement in restoration projects, human-wildlife interactions, communication between stakeholders and agencies, and in policy and decision making.
12. Wildlife management agencies rely heavily on human-dimensions experts, and the field plays an important role in success of agency policies and practices.

Human dimensions has truly taken its spot as the third leg of the wildlife management triad: wildlife, habitat, and people (Giles 1978). As society struggles with increasing human population and diminishing wildlife habitat, new and different challenges have arisen and will continue to arise, and science

(biological, ecological, and social) will continue to contribute to the basis of effective management so informed solutions can be obtained. Those decisions will be much easier when science and human dimensions are included in the mix.

Current Status, Threats, and Challenges.— Although the U.S. and Canada have led the way in advancing the wildlife profession, wildlife management itself appears to be increasingly politicized. A rapid turnover rate of state agency directors, the makeup of boards and commissions, the organizational structure of some agencies, and examples of politics meddling in science have challenged the science foundation. Examples of the lack of rigor in surveys and analyses, advocacy, and misuse of science have prompted The Wildlife Society to publish a position statement of the use of science in wildlife management (2010). The multitude of environmental and conservation organizations include some organizations that appear to be more focused on developing membership than on proper use of science to advance wildlife policy.

7. Democracy of Hunting Is Standard

Theodore Roosevelt believed that access for all to have the opportunity to hunt would result in many societal benefits (Roosevelt et al. 1902:18-20). Leopold termed this “democracy of sport” (Meine 1988:169), and it sets Canada and the U.S. apart from many other nations where the opportunity to hunt is restricted to those who have special status, such as land ownership, wealth, or other privileges. The greatest historical standing of the public trust is that certain interests are so intrinsically important to people that their free availability marks the society as one of citizens rather than serfs (Sax 1970). The opportunity for citizens in good standing to hunt in Canada and the U.S. is a hallmark of our democracy.

Current Status, Threats, and Challenges.— Roosevelt and Leopold envisioned a nation where all citizens

had an opportunity to engage in conservation and hunting (Roosevelt et al. 1902, Meine 1988). Animal-rights organizations work tirelessly to shift the political debate to exclude hunters and hunting at national, state, and local levels (Francione 1996). Without the political, social, and financial support of hunters and anglers, agencies will be severely challenged to be able to deliver effective conservation programs for all wildlife into the future. Ballot initiatives that often do not include adequate opportunities for public information and debate are offered each election cycle. Our profession has taken a dim view of this form of policy development (Williamson 1998). Are these ballot initiatives undemocratic (Sabato et al. 2001) or do they lack the deliberative process necessary for sound, long-term conservation policy?

Finally, access to firearms and gun control restrictions directly impact the public’s ability to hunt. This was recognized in the early 1900s, when new immigrants in eastern industrial states heavily hunted songbirds. Some states, including Massachusetts and Pennsylvania, passed laws forbidding immigrants from owning firearms or hunting (Trefethen 1975). If such laws were commonplace across the U.S., development of the Model and the funding mechanism for conservation itself might have been altered. These laws were later repealed, but their direct purpose was related to availability of firearms for inhabitants of a state. More recently, federal gun control regulations in Canada have posed challenges for hunters there and led to widely expressed concerns, coming at a time where other impediments to hunting are increasing in that country.

Clearly most North Americans do not hunt in the traditional sense of the word. We believe that our current pluralistic democracy is necessary for the Model’s survival. Without secure gun rights, the average person’s ability to hunt would likely be compromised, along with indispensable sources of funding for implementation of the Model.

Sustaining and Building upon the Model

Our profession embarked into the 21st century using a conservation model that matured during the 19th and 20th centuries. The Model faces challenges described above and perhaps many more. We believe that a robust discussion must take place among wildlife management policy makers and practitioners.

As these discussions continue, we offer a few recommendations. First, wildlife professionals must engage in a campaign to inform and educate leading academic and political entities in Canada, the U.S., and Mexico about a history that has enabled abundant and diverse wildlife on this continent. Aspiring wildlife professionals at universities across the continent must be made to understand and appreciate the ramifications associated with the Model's principles and how these principles currently drive the policy and practice of wildlife management. The Conservation Leaders for Tomorrow program (McCabe 2010) is one such mechanism for informing students and professionals alike about the Model's origins and applications. The public needs to be made aware that fish and wildlife conservation is not an accidental process, but the exercising of a method with established protocols and proven results.

Second, application of the Model must include all fish and wildlife species and their habitats. Conservation has been approached largely by separating wildlife into sport fish, wildlife that is hunted or trapped, and nongame species. The Model should be examined in a comprehensive context of all taxa being part of fish and wildlife management. Greater dialogue is needed among all stakeholders.

Third, as scientists, resource managers, and agents of the trustees of wildlife, wildlife professionals rarely engage in advocacy, and are not particularly adept when doing so. A few key issues warrant advocacy. Legislation should be developed, where necessary, to improve definitions of public trust responsibilities, authorities, and jurisdictions over free-ranging and captive wildlife and their habitats, clarifying any confusion, strategic or otherwise, between such animals and domestic livestock. Similar legislation should be developed to articulate state and provincial authority to set seasons, bag limits, and locales in coordination with local authorities. Firearms and ammunition should not be regulated in a manner that discourages individuals from hunting or diminishes the financial support that commerce in sporting firearms and ammunition provides to conservation programs. The financial support and use of science in policy decision making should be advocated. Insistence from wildlife professionals that policies emerge from scientific investigation and debate – not from a need or desire to enhance membership and dollars – is warranted.

Finally, a mechanism must be found to encourage the non-hunting public to contribute financially to conserve the fish and wildlife resources they enjoy and have an equal responsibility to protect. Adequate permanent funding to conserve all fish and wildlife species must be attained, recognizing the responsibility our profession has for biodiversity in the most inclusive sense. Because hunters and anglers remain the primary source of conservation funding at the state level, recruitment and retention programs have been implemented by many agencies and organizations. These efforts should have clearly

defined objectives and be monitored and evaluated to assess whether these objectives are being met and are contributing to broader conservation outcomes. Other types of wildlife uses and users should be engaged and cultivated.

Funding

Application of the Model to all wildlife for the benefit of all people will require broad-based, substantial funding. Primary funding from hunters, anglers, and trappers at the state level is inadequate to meet current and anticipated wildlife conservation challenges. Jacobson et al. (2010) outlined a vision for broad societal funding in the U.S. independent of special interests or user groups. User-based funding would still be applied to those programs generating the revenues, while broader-based funds would be used to ensure application of conservation equitably. Canada should consider dedicated user-based funding to enhance its conservation programs at the provincial level, while maintaining and increasing general revenue funding.

Wildlife Markets

Elimination of legal markets for game was unquestionably a turning point in North American conservation. Leopold (1919) and Geist (1988, 1993) made compelling arguments against opening markets for wildlife. Many exceptions do exist, and when a conservation purpose underlies the exception (e.g., harvest and marketing of furbearer pelts), it is consistent with the Model. Organ et al. (2010) raised the notion that under limited exceptional circumstances, a highly regulated market for meat and potentially other products from overabundant wildlife could yield conservation benefits. Conceptually, where overabundant game species such as white-tailed deer and Canada geese result in human-wildlife conflicts, and where the opportunities afforded sport hunters have proven inadequate to meet population goals, a cadre of specially certified licensed sport hunters would

be provided access as a means of implementing population control and mitigating conflicts. In return, they could take the meat to a regulated processing facility and get paid. The meat would enter the local market. Benefits of this approach beyond mitigation of conflicts could be a fostering of appreciation of the food value of a species or populations of wildlife perceived as liabilities. Risks in such an approach include the potential for illegally harvested game to enter legal markets. Vercauteren et al. (2011) have taken a different approach and proposed establishment of a commercial deer harvester's license to provide incentive to control overabundant deer.

Any consideration of establishing regulated markets for game must include the strengthening of legal institutions to ensure that the unlawful taking of wildlife is strongly enforced through law enforcement and judicial systems. For example, fines associated with the unlawful taking of wildlife should be commensurate with the seriousness of the offense. In many cases, fines are not adequate to deter violations of law.

The principle that markets for wildlife are eliminated should remain intact, but exceptions do and will occur. These should remain exceptions, and be warranted only where there is a conservation benefit that cannot otherwise be achieved.

Consideration also needs to be given to restricting or eliminating markets for certain taxa, such as reptiles. As unregulated markets for North American game species led to imperilment, other taxa face the same vulnerabilities.

Firearms Rights and Privileges

The ability of private citizens in the U.S. and Canada to own firearms has in no small way shaped the course of conservation and application of the Model. In the United States, the 2nd Amendment

of the U.S. Constitution clearly establishes the lawful basis for firearms ownership and use, including hunting. Suppression of firearms ownership would functionally eliminate hunting as a management concern and as a management tool, and hunters as the primary advocates and funding source for conservation. Reiger (1975) outlined the preeminent role hunters had in shaping the conservation movement. Restrictive firearms laws at the federal level in Canada and in some states (e.g., Massachusetts) may inhibit recruitment and retention of hunters. Legal access to sporting firearms for all citizens in good standing is essential to maintaining a core base of wildlife conservation advocates and a critical funding source.

Habitat Considerations

The U.S. and Canada have an impressive network of public lands, including a significant component managed primarily for wildlife (e.g., national wildlife refuges, state wildlife management areas). Private lands with permanent protection from development also contribute significantly to supporting wildlife populations. The American Game Policy of 1930 (Leopold 1930) and the Pittman-Robertson Wildlife Restoration Act of 1937 both emphasized the need for habitat restoration. This network of protected habitats was critical to restoration of game and conservation of other species.

In articulating the 7 principles of the Model, Geist et al. (2001) did not provide explicit treatment of the importance of habitat conservation to wildlife management in North America nor its foundational influence in conservation history. Organ and Mahoney (2007) reflected on the legal standing of habitat values in terms of the Public Trust Doctrine, and Regan and Prukop (2008) offered examples of the stateside application of the Public Trust Doctrine to contemporary habitat conservation issues. Habitat conservation (i.e., protection, restoration, and management) is a necessary pillar of any successful management paradigm and merits consideration as a precept in future treatments of the Model.

Consensus is lacking within the wildlife conservation and management profession as to whether the concept of habitat conservation and the role of the private landowner rise to the level of a principle, or are considered purely means to achieve the Model's principles. Indeed, consensus is lacking on how to define habitat in other than the most general of terms. Habitat is a relative concept and varies among species. Most programs of habitat conservation are in fact land protection efforts that provide habitat by default. Simple land protection does not equal habitat conservation in a strict sense, but that recognition in no way devalues or demeans those programs and the lands they protect.

Historical Development.— It is self-evident that, for sustainability, wildlife populations require adequate habitat (i.e., food, water, shelter, and security). In *Man and Nature*, Marsh (1864) recounted the impacts to natural landscapes and waterways from the advance of civilization. Subsequently, 19th-century conservationists were eager to reserve large landscapes for wildlife (e.g., Adirondack Park, Yellowstone National Park). President Theodore Roosevelt, with the support of Grinnell, Pinchot, and others, made bison, migratory bird, and big game habitat protection hallmarks of his conservation advocacy (Brinkley 2009). The Boone and Crockett Club (Roosevelt and Grinnell 1893) advocated for a network of public protected game reserves. In other words, habitat protection became synonymous with wildlife stewardship for future generations.

Aldo Leopold (1933) squarely placed the conservation of habitat into an applied management framework – similar to that used for forestry and agriculture. He offered prescriptions or guidance for making parcels of land more productive for wildlife through active manipulation of vegetation structure. The Dust Bowl, extensive loss of prairies and wetlands, and overharvest of northeastern and Great Lakes forests would validate the need for active management of habitat. The American Game Policy (Leopold 1930) advocated for subsidizing private landowners for conservation initiated on their lands for the benefit

of wildlife and hunters. Habitat conservation became a mainstream concept in America, following on the heels of Leopold, when, in 1933, President Franklin Roosevelt initiated the Civilian Conservation Corps, whose outputs all supported improvement and perpetuation of our land and water resources.

With advent of science-based habitat metrics and funding from excise taxes and license fees, government agencies were poised to explore wildlife-habitat relationships, to develop population-habitat models, to pioneer best habitat management practices, and to transfer such information to landowners and land managers. Over time, more attention would focus on human disturbance, fragmentation, development, and other influences on habitat quality and use.

Although the initial focus may have been on independent-parcel management planning, wildlife science embraced emerging ecological principles concerning habitat connectivity, gene flow, and regional or ecoregional planning constructs to meet wildlife needs. The North American Waterfowl Management Plan, signed by the U.S. and Canada in 1986 and by Mexico in 1994, provided a continental-scale approach to habitat conservation and regional delivery of conservation projects via joint ventures. Fisheries managers have embraced a similar approach for aquatic systems.

Current Status, Trends and Challenges.—Habitat is key to wildlife population viability, genetic integrity of species, and a sustainable abundance of animals for hunting, trapping, and wildlife-dependent recreation. The future holds manifold challenges on the habitat front, including fragmentation, suburban sprawl, energy development, transportation infrastructure, and climate change. State Wildlife Action Plans are replete with strategies to address habitat threats, and the Northeast Association of Fish and Wildlife Agencies has pooled resources to examine habitat conditions on a regional scale based on State Wildlife Action Plan information.

Ownership of the landscape (forests in particular) and, by extension, ownership of wildlife habitat, varies across the continent. In the U.S., fully two-thirds of westernmost forests and three-quarters of those in the Rocky Mountain states are owned publicly, primarily by the U.S. Forest Service and the Bureau of Land Management (Law 2007). Both agencies have conservation and perpetuation of lands for wildlife habitat as central tenets in their enabling legislation (USFS; P.L. 86-517, BLM; P.L. 94-579 ss103(c)). Private forest lands, however, have no such direction or guarantee. It is of little surprise then that landscape-level planning to protect renewable resources and wildlife habitat, particularly throughout the western U.S., are underway by both the U.S. Fish and Wildlife Service (through its Landscape Conservation Cooperatives) and the Bureau of Land Management (via Rapid Ecosystem Assessments). Thus the primary governmental land management agencies in the U.S. have recognized and acted upon the value of habitat conservation as a primary function of their public trust responsibilities.

Approximately 60 percent of U.S. land area is privately owned, compared to 11 percent of Canada's land area. Successful stewardship of public wildlife resources is fostered via private and public partnerships. State fish and wildlife agencies often provide management assistance to forest and farm landowners, especially for critical habitat designations. Conservation titles of the Farm Bill (P.L. 110-246, Food, Conservation, and Energy Act of 2008) provide due financial and technical assistance to both landowner communities. Non-governmental organizations, governmental and private landowner partnerships have successfully conserved habitats and provided public access through easements.

As noted above, Organ and Mahoney (2007) have raised concerns about the ability of habitat features to withstand legal challenges to the Public Trust Doctrine, suggesting that government agencies need to advance protection through case law, legislation, and practice.



Instructor Bob Byrne, left, gives an enthusiastic thumbs up for two CLFT participants who each bagged a pheasant during a mentored hunt at the Max McGraw Wildlife Foundation in Illinois. Held in January 2010, this was the first CLFT workshop offered exclusively to non-hunters from state and federal natural resource management agencies. Courtesy of CLFT.

Taxa Inclusivity

The Model is intended to apply to all wildlife taxa, except for those principles specific to game species. Yet application of the Model historically has been much narrower due primarily to restricted funding sources and the primary stakeholder and advocacy base.

Application of the Model in recent decades has broadened as management agencies have expanded programs and new funding sources have emerged. Broader-based funding will ensure greater and more equitable application of the Model to all taxa.

Governance

The Model is implemented continentally by a multitude of federal, state, and provincial agencies that have some common governance attributes, but also vary considerably. Jacobson and Decker (2008) articulated how many current governance models do

not reflect contemporary societal needs. Jacobson et al. (2010) offered a vision for a unifying theme of governance, whereby trustees representing broad societal interests would comprise the decision-making body. Agencies at the federal, state, and provincial level function as agents of the trustees providing the best available biological and social science to the decision makers. Broad, stable, and equitable funding would enable greater focus on biodiversity conservation and landscape approaches. Traditional uses and users would remain an important funding source.

Governance models that are not in concert with contemporary societal needs or address only limited special interests risk having the wildlife management enterprise lose relevance to society. Too much is at stake in terms of biodiversity and human health to warrant this risk. The institution of wildlife management needs to take bold steps to ensure that governance fosters relevance.

The Future of the Model



Application of the Model's principles to landscape conservation will enhance its future relevance. Credit: John F. Organ.

The Model's future rests to a high degree on the adaptability and application of its principles to contemporary wildlife conservation needs. To remain viable in the future, it must remain relevant. To that extent, the Model must be viewed as a dynamic set of principles that can grow and evolve. The underlying principles – established to address particular concerns, some no longer an issue – can serve as bedrock and be applied more broadly, or modified to facilitate expansion to emerging societal needs. Dialogue and collaboration among administrators and key stakeholders within the North American wildlife management institution should be encouraged and be constructive. In particular, the Association of Fish and Wildlife Agencies, The Wildlife Society, and the Wildlife Management Institute, among others, should collectively foster discussions about contemporary issues potentially affecting interpretation or application of the Model.

Key to ensuring relevancy of the Model will be its application to conservation of landscapes. The Model's principles were developed in large part

during an era when the direct taking of wildlife was the preeminent concern in conservation. Increasingly, the maintenance and fostering of landscapes that can sustain viable populations of all wildlife to ensure conservation of biodiversity and human use and enjoyment are of paramount concern. The Model's context must be viewed in the broad sense of its application to this and other emerging needs, rather than in a historic context. This may require evolution and expansion of principles while ensuring that the original principles are not abandoned.

Additionally, the wildlife management institution must not rest purely on successes of the past. DeStefano et al. (2005) discussed demographic shifts in U.S. society, where increasing proportions of the public live in urban vs. rural areas. This shift towards urban demography can have significant wildlife policy implications, as can shifts from traditional based values towards wildlife to broader multi-cultural ones. Ballot initiatives within the last 30 years that have successfully restricted or eliminated traditional wildlife uses have been in states where greater than 70 percent of the public live in urban areas (S. DeStefano and J. Organ, unpublished data, presented at the 2010 Annual Conference of The Wildlife Society). Decker et al. (1996, 2000) outlined the implications of shifts in human dimensions to the wildlife management enterprise and offered approaches for governing effectively in a changing social dynamic. This was addressed further by Jacobson et al. (2010). In short, the Model was formed during a time when wildlife management was implemented under an expert authority approach (Gill 1996). The Model's future will rest on its effectiveness within an institution fostering greater participatory decision making. Riley et al. (2002) offered a vision for how this may be facilitated.

Summary and Recommendations

1. Manage all wildlife under the principles of the Model. The Model is not exclusive to game species. Game species have received greater management attention because of public interest and desires, funding mechanisms, and the management intensity necessary for species that are harvested. Status of game species in North America is generally quite robust. Biodiversity conservation in North America will be enhanced if the Model's principles are applied to all wildlife. Transformative processes will be necessary to enable the wildlife management institution to implement application of the Model to all species as needed (Jacobson et al. 2010).

2. Initiate and expand efforts to inform North Americans about the Model and the importance of citizen engagement in sustaining the future of biodiversity. Current efforts, such as those initiated by Arizona Game and Fish Department (www.azgfd.gov/h_f/documents/NAM%20Brochure.pdf, accessed on 4 May 2011), need to be broadened and expanded continentally. Significant misconceptions exist regarding the Model. It is often considered synonymous with the user-pay, user-benefit funding model, which is purely a mechanism for funding the implementation of the Model's principles. Such misconceptions lead to the notion that the Model is narrow in scope and exclusive of all but game species.

3. Convene key administrators and stakeholders in wildlife conservation and management in the U.S., Canada, and Mexico every 10 years to revisit the key challenges facing wildlife conservation in North America, assess the Model's principles and their application and adequacy, and develop joint

strategies for consistent continental conservation delivery. As part of this process, discussion should address the following:

a. Should limited markets for meat harvested by licensed sport hunters be established to address management of overabundant wildlife? Would this increase public appreciation for wildlife values and foster the image of hunting as a management tool with a civic purpose?

b. Will our programs of private and public habitat conservation meet the needs of the future and lead to conservation outcomes consistent with those achieved historically through application of the Model? With expanding human populations and increased demand for resources, habitat protection and landscape-level conservation will increase as factors limiting biodiversity conservation.

4. Governance models that are not in concert with contemporary societal needs or address only limited special interests risk having the wildlife management lose relevance to society. The Model's future will rest on its effectiveness within an institutional framework fostering greater participatory decision making. The wildlife management institution needs to take bold steps to ensure that governance fosters relevance.

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Appendix: Status of Wildlife Management in Mexico

Mexico contains approximately 10 percent of the world's plant and animal species, making it the third most important country in relation to biodiversity (Toledo and Ordonez 1993). Wildlife management and conservation practices in Mexico are currently dynamic and evolving; managers are engaged in maintaining viable populations and habitat for an array of wildlife. These actions are critical for management of megadiversity and the important habitats that Mexico has for migrating North American wildlife. In addition, the number of wildlife professionals, professors of wildlife, university programs in wildlife, and graduate students studying wildlife are increasing in Mexico. Just as valuable, other professionals are recognizing the importance of these additions to the academic and practical scene. These advances are relatively recent and are found primarily in northern Mexico. Wildlife has been largely ignored in southern Mexico and only recently is wildlife management being incorporated into agriculture, rangeland, and forestry programs throughout Mexico (Valdez and Ortega-S *in press*). Why has there been such a lag in active management between Mexico and the rest of North America? It is important to understand these differences so wildlife conservation in Mexico can be placed in proper context relative to the U.S. and Canada.

There are numerous differences between Mexico and the rest of North America that influence management and conservation of wildlife and began centuries prior to any active forms of management. Even before the Spanish conquest in 1521, Mexico's wildlife had been influenced by land use, socio-economic factors, and politics (Valdez et al. 2006). Europeans arrived in the U.S. and Canada

to escape suppression in their homelands, but they arrived in Mexico much earlier as the suppressors. Land ownership in Mexico (e.g., federal, private, Indian communal landholdings, and ejidos [land distributed to peasants but ownership resides with the community and not the individual]) is dominated by communal land holdings. Because of minimal ownership and a lack of incentives for conservation practices, wildlife was not considered an economically viable resource. Thus, no efforts were made toward management (Guzman-Aranda 1995).

Subsequently, wildlife in Mexico was of little interest. The first comprehensive book on wildlife in Mexico was published in 1959 (Leopold 1959), whereas numerous texts had been written about wildlife in the rest of North America years before that time. In addition, while there were many reports in the popular press about declining wildlife populations in the U.S. and Canada, authors were silent about a similar plight in Mexico. Although the scientific backbone of wildlife management was developing in the U.S. and Canada with universities, societies, state agencies, and non-governmental organizations, the social, economic, and political support necessary for a robust wildlife program in Mexico did not develop because of socio-economic factors and governmental natural resource policies (Valdez and Ortega-S *in press*). Natural history was not incorporated into the educational system, and the government did not recognize the value of wildlife in its policies or planning. In addition, there were restrictions on gun ownership, no public hunting areas, and no wildlife law enforcement to address the unmanaged and depleted wildlife populations, all

resulting in a middle class that was not involved in sport hunting. This hindered development of pro-hunting advocacy groups in Mexico, and the political support for widespread conservation programs lagged behind efforts in the U.S. and Canada (Valdez and Ortega-S *in press*). Without widespread citizen appeal, government support, and recognition of the economic importance of wildlife, large-scale conservation programs in Mexico did not emerge until recently.

Although management of wildlife in Mexico is still in a pioneering stage, the profession is rapidly advancing on all fronts. The number of Mexican wildlife ecologists and managers dedicated to enhancing natural resource conservation is growing, as is the job market in all segments of society. In addition, Mexican universities are teaching wildlife classes to prepare biologists for the job market (Valdez and Ortega-S *in press*). Mexico has now passed through the crossroad and is actively involved in the conservation of North American wildlife. It is meeting the challenge of developing sustainable and economically viable wildlife enterprises in the rural sector to alleviate poverty and curtail the further degradation and loss of habitats in Mexico (Valdez and Ortega-S. *in press*).

The initial steps towards wildlife conservation were not taken until the first quarter of the 20th century. Miguel Angel de Quevedo, a forestry engineer widely credited with establishing many protected areas, the Mexican forest service, and other conservation initiatives, promoted creation of the Bureau of Forestry, Game and Fisheries. The 1917 Mexican constitution already contained elements to protect wildlife and secure its benefits to the nation. But implementation of this law was imperfect and enforcement rare. In the process, species such as pronghorn, jaguar (*Panthera onca*), and bighorn sheep were declining. At the same time the federal government established the Program for Predator Control, which led to the extirpation of Mexican wolf (*Canis lupus baileyi*) and the grizzly bear (*Ursus arctos horribilis*) later in the century.

The first hunting law was not created until 1940, and a modified, improved version was promulgated in 1952. This law remained in effect for nearly half a century. Those 50 years were the most crucial for Mexico's wildlife, because much deforestation and population extirpation occurred in the second half of the 20th century. It was not until 2000 that the Zedillo administration came up with a replacement law, updating and integrating 50 years of improvements into the General Law of Wildlife. This new law is a significant improvement, but it still requires modifications and, importantly, improvement in its application across the country. The document in itself is inclusive and combines many types of wildlife harvesting, from orchid (Orchidaceae) collecting and parrot (Psittacinae) nestling extraction (banned in 2008) to hunting bighorn sheep. But its implementation is still far from adequate.

In 1996, a new program based on the landowners' commitment to conservation through habitat and wildlife management on their lands went into effect under auspices of Units for Conservation, Management, and Sustainable Harvest of Wildlife (UMAs). The UMA program opened innovative alternatives for wildlife conservation and promoted productive diversification and poverty alleviation. The UMA is still in effect and covers more than 15 percent of Mexico's territory, although it does continue to require important improvements to ensure its proper application.

The modern age of wildlife management in Mexico can be considered to have started in 1995 with the creation of the Ministry of the Environment and 1996 with the creation of the Dirección General de Vida Silvestre, which increased its stature to an executive level in the Mexican federal government. A new wildlife program was created to promote landowner interest and direct participation through benefit sharing. This meant that a greater budget and a larger number of human resources were allocated. The obsolete 1952 federal law on hunting was superseded by the General Law of Wildlife in 2000. This new law makes significant improvements

and enhances conservation through sustainable use. But the old problems remain: the budget increase is not enough; the level of training of wildlife managers, biologists, government officials is still not sufficient; and the old, ubiquitous debate between preservation and sustainable use is strongly polarized and radicalized in Mexico to such an extent that it is paralyzing many conservation efforts. For example, the UMA system, conceived to benefit local landowners through sustainable use of their wildlife (SEMARNAP 1997), had enticed the interest of landowners to conserve parrots and their nesting and feeding areas. The landowners had prepared management plans with the aid of scientists and non-governmental organizations, and were ready to begin a legal, sustainable extraction of parrot chicks, when a sudden movement in 2005 froze all efforts by pressing the Senate to change the General Law of Wildlife and ban all parrot harvest and trade soon thereafter. Today many of those former parrot conservation areas have been deforested and are now producing meager corn crops or sustaining low-productivity, erosion-prone cattle ranches.

An important threat that is affecting the future of all wildlife management and conservation efforts in Mexico is that, although in principle the UMA system is clearly opening new hope for this task, it is not yet properly applied, administered, supervised, evaluated, or improved. Additional registration of UMAs should probably cease and a careful program of UMA evaluation, management plan verification, and certification should be initiated to ensure appropriate practices and guarantee benefits to wildlife and landowners. In Mexico – which has the 13th largest economy in the world – making biological diversity a source of sustainable development should be paramount. However, over 47 percent of the population is below poverty line. So people will only see the benefits of wildlife conservation if it has a positive impact on the economy of the nation.

Governance

The structure of the Wildlife Department in Mexico, under the current name of Dirección General de Vida Silvestre (DGVS, or the Federal Wildlife Bureau), has changed continuously since the middle of the last century. It has been variously part of the ministries of Urban Development, Agriculture, and more recently, Environment and Natural Resources (Secretaría de Medio Ambiente y Recursos Naturales, or SEMARNAT). In the Mexican federal government, the lowest executive decision-making position is that of a director general, usually 2 levels below the minister or secretario. Historically, the Wildlife Department never had been at an executive decision level until 1995 when the DGVS was created. Previously, it had been named Dirección de Fauna Silvestre, Dirección de Aprovechamiento de los Recursos Naturales, and Dirección de Caza. The current structure is as follows:

- Secretaría de Medio Ambiente y Recursos Naturales (Ministry of Environment and Natural Resources)
- Subsecretaría de Gestión para la Protección Ambiental (Management Undersecretary for Environmental Protection)
- Dirección General de Vida Silvestre (General Manager of Wildlife)

The DGVS has 3 main direcciones or bureaus under it. Dirección de Conservación de la Vida Silvestre (Bureau of Wildlife Conservation), Dirección de Aprovechamiento de la Vida Silvestre (Bureau of Wildlife Harvesting), and Dirección de Manejo Integral de la Vida Silvestre (Bureau of Integrated Wildlife Management). Although responsibility for wildlife rests with the federal government, some authority has been decentralized to specific states. The first steps for decentralization were taken in 2006 to the states of Baja California, Sonora, Chihuahua, Coahuila, Nuevo León, and Tamaulipas, representing the northern states bordering the

U.S. The main responsibility of DGVS is to allocate, assign, organize, and systematize information and wildlife management practices across the country.

Since 1995, any wildlife harvest in Mexico – from pet birds, reptiles, or invertebrates to ornamental plants, deer, or any other hunting or taking – can be conducted only under the auspices of a UMA. A few similar concepts exist in other countries, such as the CAMPFIRE program in Zimbabwe implemented in the 1990s (Kock 1996). Compared with the protected-areas system, which today encompasses about 11 percent of Mexico after 33 years of history, the UMA system is a significant addition to biodiversity conservation through wildlife management. Unfortunately, its implementation has severe limitations, such as the scarcity of properly trained wildlife managers who could prepare management plans for the UMAs. The harvest rate protocols determined by DGVS are still in need of improvement, verification, evaluation, and follow-up. Also, certification of how these management plans are being implemented is deficient primarily because of a lack of inspection personnel. As a result, some wildlife populations continue to decline in several regions, notably in the south (Weber et al. 2006), although the program clearly is providing important incentives for conservation, and habitat is improving in many areas. In addition, many UMAs are now subjected to additional incentives, such as payments for ecosystem services by the National Forestry Commission (CONAFOR). Overall, the program has had positive impacts for conservation and also for poverty alleviation in certain areas. It is one of many areas where a well-designed, conceived, and implemented collaborative international program would make a major difference.

The DGVS has regulatory responsibilities but not law-enforcement attributes. The latter fall under the sphere of Procuraduría Federal de Protección al Ambiente, or PROFEPA for its Spanish acronym (Federal Attorney General for the Protection of the Environment, similar to the U.S. Environmental Protection Agency). Currently, its responsibilities include determining harvest rates for species

subjected to management of any kind – from cacti to orchids to pet birds and reptiles to hunted species – and granting research permits and, more recently, determining critical habitat for endangered species. It also has responsibility to compile the list of species threatened and endangered in Mexico (NOM-059).

Funding

The DGVS is part of SEMARNAT. This Ministry is weak within the Mexican federal government, and DGVS itself has suffered downsizing in recent years. Most funds are federal and allocated by Congress through each year's budgetary exercise. However, additional resources can be brought in through agreements with the Mexican Commission on Biodiversity (CONABIO), CONAFOR, or other sections of the federal government. Clearly, funding is one of the most severe limitations that prevent full and adequate implementation of a policy that seems promising for the future of Mexican wildlife.

Recognition of wildlife as a source of wealth and an instrument for poverty mitigation is a concept still extraneous in Mexico. The notion has been permeating steadily but slowly, and the Ministry of the Environment is still not robust enough to advocate for it. Funding is growing, but insufficient. More institutions, notably CONACYT (the Mexican equivalent of the National Science Foundation) CONABIO (the National Commission for the Knowledge and Use of Biodiversity), the Forestry Department, and others are investing more and more in the UMA system to promote conservation on private lands. However, funding for related matters such as law enforcement and technical development and training is even more meager and inadequate.

Scope

Wildlife management in Mexico is focused on the UMA system, regardless of whether it is for pet animals (e.g., amphibians, reptiles, birds,

mammals, and even butterflies), ornamental plants, hunting, bird watching, or ecotourism. Most management is for sustainable use, such as hunting or pet markets, but some is also for ecotourism. Management is conducted through UMA management plans prepared by wildlife technicians for the specific purpose established in the UMA registration document. Because of this UMA focus, the management focus is not on the population, but on the individuals living in a particular UMA, most often a subsection of a population. Efforts have been initiated to promote population-focused management by working in cooperation with neighboring UMAs (a few UMAs harbor strong viable populations, but this is far from the norm). In all instances, wildlife management for purposes of issues related to terrestrial wildlife and those species protected under Mexico's Federal List of Endangered Species or NOM-059-2001 (a new list is forthcoming) are handled by DGVS. It is the agency responsible for granting hunting and scientific collecting permits, determining harvest quotas, and organizing and administering the UMA system entirely. Exceptions to these responsibilities are those under the decentralization program to the northern border states. The protocols to determine take quotas are revised every few years, but the UMA unit assigned by landowners rarely incorporates a regional scope or wildlife populations, but rather population sections contained in the individual UMA to be assigned a quota. Fishing permits and other biological diversity-related responsibilities are managed by other agencies. The Program of Priority Species was removed from DGVS and transferred to the National Commission of Protected Areas (CONANP) in 2005. The Priority Species program includes 25 species and is in the process of revision, but some representative species include sea turtle (*Chelonioides*), black bear (*Ursus americanus*), jaguar, Mexican wolf, pronghorn, red macaw (*Ara macao*), tapir (*Tapirus bairdii*), blue whale (*Balaenoptera musculus*), and golden eagle (*Aquila chrysaetos*). Other endangered or threatened species included in the federal list NOM-059 are also the responsibility of DGVS, although no specific actions

are conducted on particular species unless they are initiated by an academic institution, non-governmental organization, or individuals. The General Law of Wildlife simply defines what an endangered species is as part of the species and populations at risk of extinction ("Those defined by the Secretary as probably extinct in the wild, endangered, threatened, or subject to special protection;" General Law of Wildlife, Article 3, Section XIX). Thereafter, the only reference to endangered species is the indication of whether harvesting, collecting, damaging, or otherwise affecting an endangered species without a permit is a felony.

Wildlife as Public Trust Resources in Mexico

The concern for wildlife and other natural resources in Mexico can be traced back to 2 origins. Native Mexican cultures had a concern for biological diversity, although primarily from a feudal point of view, where protection of biodiversity was justified simply to ensure Emperor Montezuma's enjoyment, and not as a public resource. Many pre-Hispanic Mexican peoples used to benefit from wildlife as a source of food, ornaments, and dress, or for the pleasure of listening to songbirds or simple contemplation, and were quite enthralled with wildlife that surrounded them (Hernandez 1959). One of the strongest hypotheses to explain the collapse of the great Maya empire in the 10th century is the depletion of their natural resources, including forests and wildlife (Deevey et al. 1979), in combination with other factors such as drought (Hodell et al. 1995).

Wildlife remains a public resource in Mexico, but public trust status is complicated by lack of clear designation of user rights and a land-tenure system affording particular rights to landowners (Valdez et al. 2006).

In Mexico (and much of the U.S. that once was Spanish territory), lands were ceded through Spanish and Mexican land grants. There were various types of Spanish and Mexican land grants; 3 of these types are particularly relevant herein (Torrez 1997, Ebright 1997).

1. Community Grants. These were grants of large tracts of land to a substantial number of people. Each individual in the group was given a parcel of land on which to build a home. The remainder of the grant was not allocated to individuals, but reserved for the common use and benefit of all settlers. Each person in the grant had access to lands; hunting was specifically provided for.

2. Private Grants. Private grants were made to individuals for their personal use. The lands became private property. Apparently wildlife was not considered part of the property, although access to wildlife was controlled by the landowner.

3. Quasi-Community Grants. These were large tracts of land granted to one or a few individuals with the requirement that the land be settled. After settlement, the land would be operated like a community grant.

The fundamental principles that date back to Roman law regarding things that could be owned by no one appear to have applied to wildlife under Spanish land grants. Further research is warranted to confirm this. Whereas the English explicitly gave the king trustee status, and the Romans were mute on this issue, in the Spanish territories the Governor appears to have been the trustee.

Markets for Wildlife

The markets of ancient Mexico were abundantly stocked with fresh meat from a variety of animals, from axolotl (*Ambystoma mexicanum*) and iguanas (Iguanidae) to curassows (Cracidae), turkey (*Meleagris gallopavo*), deer, and collared peccary (*Tayassu tajacu*), and many edible invertebrates

from snails (Gastropoda) and spiders (Arachnida) to grubs (Scarabaeidae, grasshoppers (Caelifera), and ants (Formicidae). These prodigious markets also offered hides and feathers of valued animals such as jaguars, ocelots (*Leopardus pardalis*), otters (*Lontra* spp.), quetzals (*Pharomachrus* spp.), macaws (*Ara* spp.), and more (Díaz del Castillo 1943). Obviously, with no cattle previous to the Spanish conquest, native Mexicans would have to use local animal species for protein ingestion, so hunting vertebrates and gathering invertebrates was an important economic activity (Díaz del Castillo 1943). Currently, native cultures in Mexico use wildlife extensively (Valdez et al. 2006), and markets for some products exist.

The Spanish conquistadors, by contrast, had witnessed mass destruction of natural resources in their homeland, where forests were subjected to a very heavy exploitation for 3 main reasons: to continue building numerous huge ships as part of the Spanish empire expansion policy under Fernando and Isabella, to expand the agricultural and cattle frontier, and to drive the Moors out of the Iberian peninsula. Huge tracts of forest were burned and cleared then and in subsequent centuries, many of which remain deforested today (Fernandez 1990).

Allocation of Wildlife by Law

During the colonial period, wildlife was used by many under no specific organizational plan, but often the government placed restrictions for the wildlife to be used only by rulers. In 1540, a great hunt was organized to honor the first viceroy of the New Spain, Antonio de Mendoza (Leopold 1959). The hunt for pronghorn and deer was organized just northeast of Mexico City. To find the pronghorn nearest to this area now, one would have to travel north about 1,000 km. Hunting remained an activity exclusive to the upper classes in Mexico for centuries. The first law protecting Mexican wildlife and establishing the first attempts to regulate hunting was promulgated in 1894, although little was done to enforce and apply this law (Leopold 1959).

Not until the early 20th century did a major legal instrument contemplate conservation of natural resources in Mexico. Article 17 of the Mexican Constitution (promulgated in 1917) defines wildlife as “all natural elements,” including water, land, forest, and other natural resources, and determines that these natural resources are owned by the nation for the benefit of all Mexican citizens. By 1922, the decline of several species was so severe and evident that President Alvaro Obregon decreed a total ban on hunting bighorn sheep for 10 years and a permanent ban on pronghorn hunts. In 1933, President Emilio Portes Gil extended the bighorn ban for 10 more years, and in 1944 President Manuel Avila Camacho made it permanent, given that the species continued to decline. Unfortunately, virtually the only effort to protect the species was the ban itself; no enforcement of any kind, nor any increase in budget or enforcement personnel was granted. Bighorn sheep continued to decline, together with other species, including pronghorn.

Some progress was made, however, in the Mexican conservation movement in the first half of the 20th century. One individual, Miguel Angel de Quevedo, nicknamed “the tree apostle,” carried out extraordinary efforts to promote conservation and environmental sustainability. He created the first forestry schools in Mexico and the Mexican Forestry Society, increased the green surface in many Mexican cities, and directed the Mexican Committee for the Protection of Wild Birds. Under the auspices of President Lázaro Cárdenas (1934-1940; recognized for the nationalization of oil), de Quevedo also created the Mexican National Park System, having declared “green belt” parks surrounding every major city reaching up to more than 20 percent of the Mexican territory as protected areas, compared to about 11 percent today. Unfortunately, many of his parks were not protected after Cardenas left office and were later urbanized (Simonian 1995).

Hunting of big game and birds is allocated through a licensing and permit system. Protective laws for vulnerable species exist, but resources for

enforcement are greatly lacking, and illicit trade is problematic (Valdez et al. 2006).

The Mexican agency for environmental law enforcement, PROFEPA, is grossly surpassed by the needs of the country, not only in the context of wildlife issues such as poaching, management plan implementation, and protected area invasions, but also in environmental impact assessment violations, implementation of mitigation measures, and many more. A crucial step to secure the future of wildlife in Mexico would be to substantially strengthen PROFEPA in all lines within its responsibilities.

Wildlife Can be Killed Only for a Legitimate Purpose

At the beginning of the 20th century, predator control in Mexico became an important activity within the wildlife sector of the government as a result of the concern of cattle ranchers primarily in the north and likely as a reaction to the U.S.’s predator control program itself. At that time many wolves, mountain lions (*Puma concolor*), and grizzlies were killed in the context of the predator control program. Not until the 1960s, after the grizzly had become extirpated and the Mexican wolf virtually so, did the government ban predator control and consider these species at risk of extinction.

Other wildlife, particularly game species such as deer, pronghorn, bighorn sheep, waterfowl, and doves, had been taken for many centuries by the common Mexican (back to the pre-conquest times) primarily for food but also for other purposes. Some organization was necessary, and that led to the creation of 3 versions of wildlife laws. The legitimate purpose for killing wildlife then became the benefit of the nation. Article 5 of the General Law of Wildlife states: “The objective of the national policy in matters related to wildlife and its habitat is its conservation through the protection and the optimal sustainable harvest so that its diversity and integrity are maintained and promoted, simultaneously with

promoting the well-being of all Mexican citizens.” There are still, of course, conflicts with this statement. For example, recently, scientists and non-governmental organizations have been pointing at the unsustainable, illegal killing of jaguars across Latin America as the single most important factor in continued declines and extirpation of this species (Manzanos 2009, Alatorre 2009). The reasons to kill jaguars are diverse – from revenge of the cattle rancher who has had losses, to simply a desire for a jaguar pelt or its canines, or to kill the largest cat of the Americas – despite the fact that killing a jaguar, at least in Mexico, is a federal offense punishable with jail time (Manzanos 2009, Cárdenas 2009).

Wildlife Is Considered an International Resource

Mexico’s international wildlife policy dates back to about the middle of the 20th century, although some specific agreements had occurred before. The oldest international agreement for wildlife between Mexico and the U.S. was signed in 1936. The Convention for the Protection of Migratory Birds and Game Mammals was a first attempt to join forces on behalf of wildlife conservation. In 1971, another international treaty was signed between Mexico and the U.S., related to protecting wetlands as habitat of migratory waterfowl. Several other treaties came into effect in the second half of the 20th century. The primary objective of these treaties was to cooperate for the conservation of shared and migratory populations of wildlife moving between Mexico and the U.S. Besides bilateral or trilateral agreements in North America, probably the most relevant international treaty was CITES. Mexico did not become a signatory of this treaty until 1991. It restricts international trade of species considered threatened by trade itself (Appendix I) or those species that, although not threatened, may become threatened if the trade is not controlled. Clearly, populations shared between any 2 countries should be managed jointly between both countries for the benefit of both.

Science Is the Proper Tool to Discharge Wildlife Policy

Wildlife science as a discipline has a very short history in Mexico. Forestry began around the turn of the 20th century with Miguel Angel de Quevedo’s formidable influence (Simonian 1995). Biology began with Alfonso L. Herrera in the second half of the 19th century, and ecology with the triad of José Sarukhán, Arturo Gómez-Pompa, and Gonzalo Halffter. Wildlife ecology was not established as a discipline until late in the second half of the 20th century. Even now, few Mexican universities carry a conservation biology program or courses (Méndez et al. 2007), and much fewer carry any wildlife management related curricula. Use of science as a tool to determine wildlife management practices, primarily those related to harvest rates of game species, is still a very nascent discipline in Mexico. Endangered species determination and recovery programs, on the other hand, are widespread, diverse, and successful, and have placed Mexico at the leading edge in many ways. The Mexican protocol for determination of endangered species (MER) was a science-initiated, science-driven process that was later turned into federal law. The NOM-059 – the official list of endangered and threatened species – is based on the MER protocol (Sánchez et al. 2007). Furthermore, this protocol is currently being adapted and tested in other Latin American countries and beyond.

Wildlife harvest rates are established by the government, primarily by DGVS but also by the state governments to which this responsibility has been decentralized, (e.g., the northern border states). However, these protocols are still far from being fully science-based. Information on population trends, effects of management, habitat models, genetic viability, and more are still necessary to strengthen these harvest rate calculation protocols.

Currently, a severe shortage of wildlife professionals exists in Mexico in the government and academic sectors. Similarly, NGOs have a shortage of wildlife professionals. Ecology and evolutionary biology are the primary disciplines of most biologists in Mexico, and many people working on wildlife issues come from these disciplines and, therefore, must adapt their knowledge to be able to address Mexican wildlife management needs. Wildlife science is beginning to gain traction in Mexico. Historically, few publications or books on wildlife ecology were produced, but in the last 2 decades many books and papers, some of them with a high impact factor in Mexico and abroad, have been published. The Mexican community of wildlife biologists is still growing, and it needs much more attention, support, and collaboration within Mexico and outside to become truly established and to have a strong presence in the arena of wildlife management and conservation.

Democracy of Hunting Is Standard

In Mexico, all hunting is required to be conducted through a hunting outfitter, or *Organizador Cinegético*. This adds another step to the process and promotes monopolies for a few well-established, well-connected individuals. This greatly affects benefits coming from hunting, because outfitters act as middlemen, often renting UMAs for a fixed price and depleting game in those areas. The law has been clear about the need for outfitters, who are registered with the Secretary of Defense and Secretary of the Environment. Still, not enough outfitters are registered, so the process is dominated by a few.

Historically, wildlife in Mexico was a common resource, without any sort of governing authority, although some Aztec rulers issued regulations to protect certain species in certain areas for the benefit of the rulers themselves. But in 20th century Mexico, wildlife was acknowledged as a public good,

owned by the nation. The first hunting law, dating from 1940, defined it as such. The 1952 updated hunting law and the current General Law of Wildlife (2000) also contemplate wildlife as a public good owned by the nation. This definition of wildlife broadly includes “all organisms living subjected to the processes of natural evolution and existing freely in their habitat,” which obviously encompasses all animals and plants. All Mexicans are entitled by law to enjoy wildlife, but profiting from wildlife through hunting, wildlife watching, harvesting, or collecting for commercial purposes can be done only under the UMA.

Current law in Mexico defines wildlife as all plants and animals subjected to management by landowners through the UMA system. Once the landowner has proven that he or she has invested in habitat protection and improvement for the benefit of wildlife, the government (DGVS) assigns the landowner a harvest quota, in effect establishing a partnership with the nation. But if each of these steps is not carefully monitored, (e.g., if a landowner’s investment in habitat protection is not correctly conducted and actually supervised) and if the harvest quota is not accurately calculated on real data or appropriately administered, a risk of depleting wildlife develops. In many situations, however, simply declaring a piece of land as a UMA determines that the habitat is not likely to be converted to agriculture or cattle production, which, at the very least, buys time for wildlife protection. Much monitoring, evaluation, and certification of UMAs are necessary before the program can be deemed successful for wildlife management.

Gun ownership in Mexico is regulated through the Ministry of Defense, which has jurisdiction over guns and ammunition. Only a handful of shops, strictly regulated by the Defense Ministry, provide ammunition that can be purchased. Importing a gun into Mexico requires Defense Ministry permits, coupled with a hunting license obtained through an outfitter. Despite this apparent control (which is rather strict in many instances, especially for large-caliber guns), .22-caliber rifles, .410 shotguns,

handguns, revolvers, and automatic firearms of smaller calibers are common in rural areas of Mexico. Local people commonly carry their guns while working the fields, so much hunting happens on the fringes of regulation.

Mexican Habitat Considerations

As a megadiversity country, Mexico contains significant habitat diversity on a global scale. Some habitat models have been prepared for game species and many more for threatened and endangered species, but they have been prepared primarily for northern species. Although most habitat types have been severely depleted (notably the tropical dry and tropical rainforests and the cloud forest), some others (notably the Sonoran and Chihuahuan deserts) are less impacted. However, exotic invasive species are entering these deserts. Buffelgrass (*Pennisetum ciliare*) is pervasive in the Sonoran Desert with only limited pockets outside of it. The most severe threats to many species are habitat fragmentation and deforestation. With the advent of UMAs, the habitat in many regions is improving and remaining conserved, although wildlife has yet to recover fully. This effect, known as the “empty forest” (Redford 1992), threatens entire ecosystems if a solution is not implemented in the near future to secure habitat processes, such as forest regeneration, grazing, browsing, and seed dispersal.

Because of the definition of wildlife in the Mexican constitution, all taxa of plants and animals are included in all legislation and regulations pertaining to wildlife. In practice and in the context of the federal government, wildlife is generally referred to as vertebrates (primarily terrestrial), cacti, orchids, cycads, palms, and other similarly ecologically or economically important groups. Wildlife management of mammals per se is focused primarily on game species, although much research, management, recovery, and conservation actions are conducted on rodents, bats, primates, carnivores,

and other groups. Management models exist for many species in many groups.

Public education about wildlife is very active in Mexico for specific taxa and particular objectives. Primarily in terms of sustainable development and preservation of ecosystem services, public education is mostly in the hands of the government, the academic sector, and, notably, NGOs. A few years ago, reintroduction of the Mexican wolf was thwarted because many landowners had no desire or awareness of the importance to have the wolf back in their lands (Norandi 2008). Local campaigns raise awareness and participation on the conservation of black bears, pronghorn, jaguars, bats, birds of many species, reptiles, and plants. However, public awareness related to game species, notably deer and collared peccary, is not common or strong. Some basic information on large mammals and birds is included in the free textbooks distributed in all elementary schools in Mexico by the office of the Secretary of Public Education.

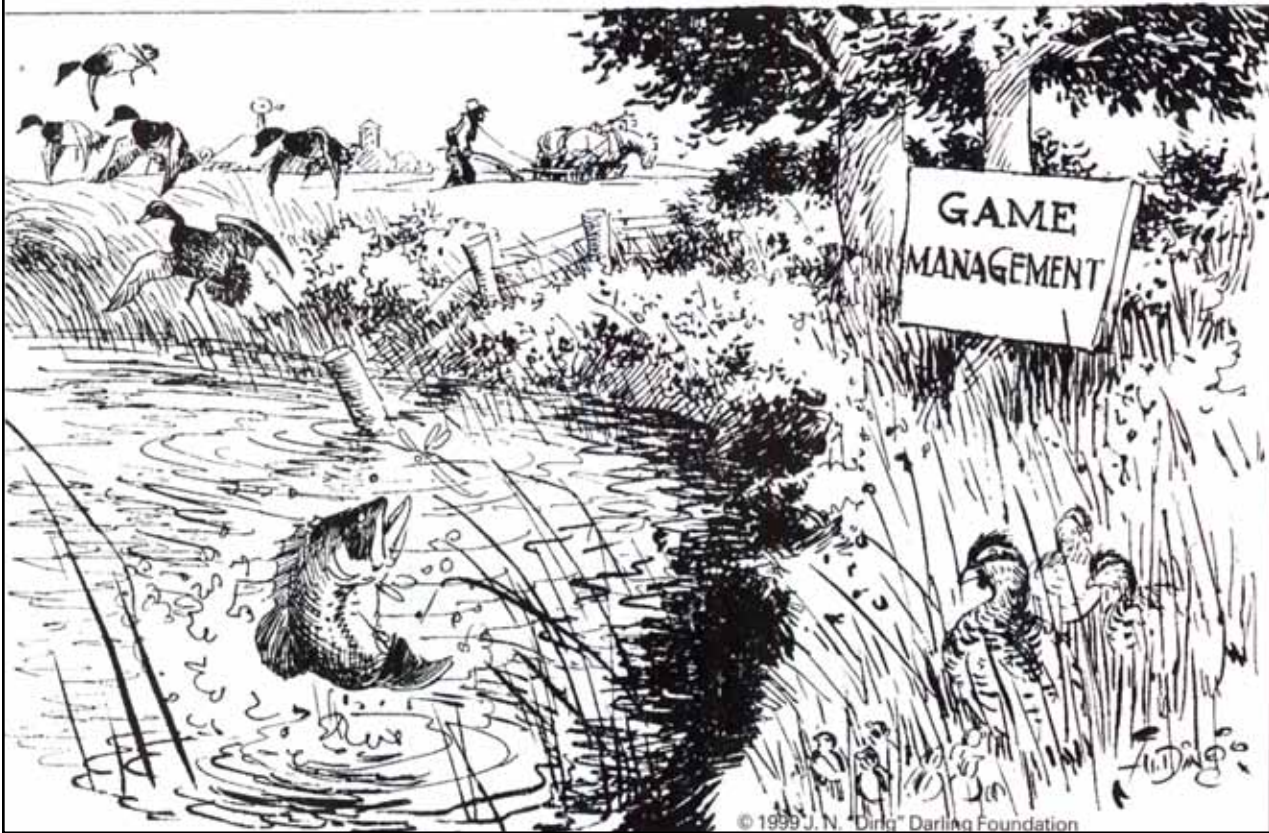
Recommendations

1. Enhance the profile, the vision, and the potential that wildlife represents as a source of wealth for all Mexicans, both for contemplative, non-consumptive uses, and for consumptive uses such as hunting.
2. Strengthen the academic programs related to wildlife management across Mexico as an educational priority. Given the vast proportion of Mexico under the concept of UMAs, and the needs of these UMAs to have adequately trained wildlife professionals in charge of the management plans, all academic institutions should be preparing cadres of wildlife professionals at all levels. Only with a strong critical contingent of well-trained wildlife professionals as well as the rest of the elements (political commitment, adequate law enforcement, strong public awareness, involvement and support, and substantial improvement in funding) will the UMA system finally succeed and show its full potential.

3. Continue to intensify and diversify the national, international, and inter-sectorial collaboration for wildlife. Some framework agreements already are in place, but more specific and practical implementation of these collaborative efforts and others can make the difference. International collaboration is a clear win-win situation if properly implemented, and it can open new opportunities to learn and improve conservation and management practices.
4. Increase collaboration, information sharing, and interjurisdictional agreements with Canada and the U.S.

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The cartoons of avid hunter and conservationist Jay "Ding" Darling spoke powerfully of the need for active game management to ensure the health of species and habitats. A Pulitzer Prize-winning cartoonist, Darling designed the first Federal Duck Stamp in 1934. Courtesy of the J. N. "Ding" Darling Foundation.



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