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Recreational Hunting and Sustainable Wildlife Use in North America

Shane Patrick Mahoney

Sustainable Development and Strategic Science Branch,
Department of Environment and Conservation,
Government of Newfoundland and Labrador, Canada

Introduction

As with any long-distant event the timing and means of humanity's first appearance in North America remains a subject for debate, but it probably occurred no more than 40,000 years ago, and the weight of evidence suggests considerably less. What is more certain is that these first North Americans were sophisticated hunters who are believed to have assisted in the great wave of large-mammal extinction that so markedly affected the North American landscape by about 11,000 years ago (Martin, 1967). If true, this hunting-assisted decline of wildlife was to repeat itself upon the arrival of modern Europeans some 10,000 years later.

In the intervening time American Indian and Inuit peoples relied continuously on the wild animals around them, developing sophisticated religious and mythological cultures that emphasised their relationship with the natural world and their dependence on the animals they hunted. These traditions placed some restriction on the taking of wild animals and, in combination with low human numbers and experienced prey, may have helped prevent a

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repeated large scale extinction of animal populations (Krech, 1999). A more systematic and deliberate approach to wildlife depletion would eventually emerge, however, as markets and 'progress' laid a heavy hand on the wildlife of North America.

Wildlife slaughter and rescue in North America

The first historically evidenced European contact with North America was the failed attempt at Norse settlement at L'Anse aux Meadows, Newfoundland, in the year 1000. Five hundred years later western European nations were sending flotillas of ships to prosecute the whale and cod fisheries off North America's great eastern island, a frenzied engagement that spawned the slaughter of coastal seabirds such as the Labrador duck *Camptorhynchus labradorius* and great auk *Pinguinus impennis* for fish bait, oil and food.

This perverse wave crashed inland with the fur trade. The French, Dutch and English all entered the game early, collectively laying claim to a landmass already occupied by millions of native residents (Wilson, 1999). Eager for the metal trade goods the foreigners offered, aboriginals turned their talents to the task of providing furs. But this traffic also included a virulent brew of diseases, together with cultural and religious elements, that devastated the traditional societies, killing millions and destabilising long-developed relationships with nature and between tribes (Wilson, 1999). Increasingly, for those who survived, a new and competitive race developed to acquire as many furs and as much trade goods as possible. Firearms and alcohol became coveted possessions.

The weakening of native populations helped open up the continent's interior, providing access to increasing numbers of explorers, trappers, traders and, finally, settlers. Moving ever westward, these conquering citizens cleared the land and altered wildlife abundance, killing for food, profit and protection. Predators were always targeted, but invariably all wildlife was taken without limits. Descendants of Europeans in Canada and the US thought wildlife theirs for the taking, to use for personal consumption or to supply any developing market. Few laws stood in their way and those that did were largely ignored (Trefethen, 1975).

As cities prospered along the New World's eastern seaboard a great flow of wildlife moved from out of the west to ready markets, its transport greatly facilitated by railroad expansion in the mid-19th century. Systematically this market system extirpated game species from each newly accessible region,

a pattern best exemplified by the demise of the once teeming herds of bison *Bison bison*. Within a matter of decades 30 million or more of these animals were reduced to a few hundred in Canada and the US (Lott, 2002). Along with the fur trade's decimation of the beaver (*Castor canadensis*), the bison's demise proved how rapidly unrestricted hunting could reduce wildlife abundance. Its slaughter was well publicised by journalists, however, and helped engender a vague notion of non-wasteful use of wildlife that would eventually mature into a profound conservation movement.

This slow awakening was energised in the late 19th century by an evident general decline in wildlife abundance in both Canada and the US and was spurred by a rising class of hunters committed to sustainable wildlife use, the elimination of market hunting, and a fair chase ethic borrowed largely from European hunting enthusiasts. This citizens' movement eventually matured into what we recognise today as the 'North American Model' of wildlife conservation (Geist, 1985). Its first origins may be traced to a complex intersection of intellectual and cultural developments that included an elevated notion of civic responsibility in North American society, and the rise of hundreds of local sportsman's clubs that fomented debate and public discourse on the wild resources of North America.

Remarkably, despite Canada's position within the British Empire (and later British Commonwealth), it opted for congruency with the conservation policies and laws of the US, enabling a continental constitution that rescued wildlife in North America, and has coordinated its use and protection, for over one hundred years. As such it helped to form the only continental, as well as the longest surviving, science-based conservation movement in the world.

Principles of the North American Model

Given the breadth and diversity of North American landscapes and regional cultures, it was inevitable that some nuances in wildlife conservation approaches would arise geographically. Nevertheless, across the continent several basic tenets are now generally applied. The Model is guided by seven pragmatic principles (Geist *et al.*, 2001), which have become colloquially referenced as the 'seven sisters for conservation' (Mahoney, 2004). Each of these is seminal to an array of policies, management prescriptions, legislative instructions and organisational diversity that have collectively supported and maintained open citizen access to a common property resource. The Model is not a product of a single time or intellect, and it has withstood many debates and

trials; and continues to face challenges today. But understanding its structure and history offers the world one approach for conservation and sustainable use that has surely succeeded. Regulated hunting has been at the movement's heart since its inception.

Maintain wildlife as a public trust resource

Since Roman times the question of who owns wildlife has been the subject of legal debate, and while colonial North Americans considered individual access to wildlife a sacred right, the specific issue of who could own wild creatures was not addressed under law. This changed with a US Supreme Court decision in 1842 which clearly established wildlife as public property, held in trust for all citizens by the state.

The implications of this 'public trust doctrine' are many. Not only does it place great restriction on the privatisation of wildlife, it also engenders a system of paid professionals who manage, for the public good and in a coordinated manner, the wildlife resources of Canada and the US. Most importantly, however, it ensures that the public has a right to comment and actively work on behalf of the resource, as and when they choose. The wildlife is, after all, theirs. In North America, ownership of wildlife is not devolved to individuals, landowners, or occupiers of land.

Prohibit commerce in dead wildlife and its products

The scale of commercial exploitation throughout the 19th century was such that all North American wildlife of any economic value was threatened. Even after game laws were developed the financial incentives for marketing wildlife remained, the trade being vast and highly lucrative. Thus the decision to end commercial traffic in dead wildlife was neither easy to conceive nor simple to enforce. This radical assault on the free wheeling slaughter of wildlife came too late for species such as the passenger pigeon *Ectopistes migratorius*, heath hen *Tympanuchus cupido cupido* and Carolina parakeet *Conuropsis carolinensis*, but there can be no doubt that it pulled numerous others from the brink of extinction.

In terms of colonial history and long-held frontier attitudes towards wildlife, the suffocation of markets categorically changed the relationship between people and wildlife in the New World and engendered policies and laws that, until recent decades, have gone almost unchallenged. While its origins lay in

the exhortations of concerned citizens, confident now that the wildlife indeed belonged to them, hunters and anglers were especially engaged, gaining their voice through publications and hunting club forums (Trefethen, 1975).

Allocate wildlife democratically and by law

Despite the drive to eliminate wildlife markets there was no intention to eliminate wildlife use. This was a profound subtlety which inspired calibration, but did not lead to preservationist approaches. The question was *how* to allocate wildlife and ensure its reasonable use. The answer lay in democratically structured legislation that would safeguard against the rise of elites and give every citizen equal say and access to the wildlife resource.

In combination with the public trust doctrine, the network of legislation that emerged to safeguard citizen rights was crucial to developing an ethic for conservation and sustainable use of wildlife in North America. North Americans have developed an extraordinary array of foundations, societies, clubs and conservancies to advocate for wildlife, conserve habitat and safeguard a myriad of wildlife experiences, including hunting and angling. Collectively these non-governmental organisations have raised billions of dollars in support of wildlife and sustainable use programmes. Some have been the mechanisms for wildlife reintroductions and recovery on a continental scale.

At the individual-citizen level the North American legal framework for wildlife use and access has inspired financial and political support that has no equal. It cannot be overemphasised that the equitability of wildlife allocation lies as the cornerstone of the entire North American Model. The citizenry, en masse, truly understand that wildlife is theirs, *de facto* and *de jure*. They act as though they own it.

Ensure wildlife use is for legitimate purpose

Although laws could govern access to wildlife there also had to be guidelines as to its appropriate use, especially given the origins of North American conservation. Eventually, the legitimate taking of animals came to mean killing for food and fur, self-defence and property protection.

Not surprisingly, the wastage of animals is directly addressed in North American legislation and policy, and is particularly stringent where hunting is involved. The image of thousands of bison carcasses rotting in the sun has

cast a long shadow over the conscience of North America's citizenry. Today, perhaps no breach of ethics in hunting is more despised than the wanton killing of an animal and the wastage of its meat.

This principle of the North American Model has also eliminated other wasteful practices such as the killing of shore and wading birds for their feathers (to supply the haberdashery industry) and elk *Cervus elaphus*: in Europe, red deer) for their canine teeth (ivory for the jewellery market). It has led to the emphasis on harvesting wild animals as a source of high quality meat that is a characteristic, though not exclusive, motivation of hunting in North America.

Preserve hunting opportunity for all

In addition to the general application of law to wildlife use and disposition, the Model specifically addresses and heavily emphasises the issue of hunting. This is in no way surprising, as hunters and anglers were the leading spokesmen for conservation reform in the seminal late 19th century period. While the North American hunting movement borrowed from European experience in matters of 'fair chase' and the 'sport' terminology, its codification of every individual's access to and responsibility for wildlife was distinctly New World and revolutionary, certainly for its time. It has resulted in a relentless participation by hunters from all walks of life in wildlife management and conservation issues that not only affect their cherished activities, but the sustainability of wildlife for its own sake. The result is that hunters and anglers wield great muscle in the political arena of North America, and especially in the US. The North American Model has ensured that hunters are a force to be reckoned with, despite representing only about 6 per cent of the North American population.

Furthermore, hunting still enjoys widespread support from the North American public. The latest survey in the US, for example, shows that 77.6 per cent of citizens support legal hunting (Responsive Management, 2006), an actual increase of 4 percentage points from 1995.

Recognise and manage wildlife as an international resource

The special status of migratory wildlife was recognised early in North America. The international approaches required for its conservation and use, such as the 1911 Fur Seal Treaty and the famous and effective Migratory Bird Protection

Act of 1916, provided the legal frameworks to ensure consistency in Canadian and American approaches to the conservation of these species. Russia and Japan were also signatories to the Fur Seal Treaty.

The inclusion of wildlife in treaty law was one of the clearest signals that North American conservation had matured well beyond ensuring equal access to wildlife and the prescription of hunting privileges and practices. It signified that conservation of wild animals was the core ethic of the movement and that this responsibility was of national significance and a matter of national pride. This notion of transboundary responsibility and coordinated management of wildlife has become deeply ingrained in the North American Conservation Model, and is responsible for a dizzying array of ancillary policies, committees, colloquia, strategic approaches, and publications. This active networking helps ensure that governments at all levels remain cognizant of their treaty responsibilities.

The level of cooperation engendered under these agreements is also indicative of the sinewy strength of the Model. In recent years, under the North American Waterfowl Management Plan, millions of dollars derived from hunting activity in the US are actually diverted to conservation programmes for waterfowl enhancement in Canada. Thus provincial and state waterfowl managers not only share their expertise and talents, and coordinate their policies; funds are actually transferred between the Model's founding nations based upon where they are needed, regardless of where they are generated. Such arrangements are only possible where mutual trust and commitment are manifest and acknowledged. The long tenure of the North American Model has made such conditions secure.

Ensure science is the basis for conservation management and policy

During the 19th century interest in natural history and science flourished in North America, as it did in many European nations. Thus it was not surprising that early in the Model's formulation science was identified as crucial to safeguarding wildlife and ensuring against the overkill that was so evident at that time. The process was helped measurably by the focus given to this issue by President Theodore Roosevelt, an icon of North American conservation and a keen observer of wildlife throughout his life. Indeed the premise that science should form the basis of wildlife management is known as the Roosevelt Doctrine.

Although Roosevelt and others articulated this vision in the late 19th century, it was not until the 1930s and the writings of Aldo Leopold that this principle of the Model was aggressively exercised (Leopold, 1933). Quickly thereafter wildlife science became foundational to the North American Model, not only in theory but in practice as well. Its application is seen as one of the few safeguards against the politicisation of wildlife policy, and has generated an immense knowledge base upon which to evaluate best practices in conservation. Acquiring such knowledge has fallen to a diverse consortium state, provincial and federal officials, together with academics, all engaged in professional approaches to science, and doing so as their primary mandate.

Securing this knowledge has required massive financial commitment to wildlife research. Such funding is another success of the Model but its appropriation requires constant attention and encouragement. Furthermore, the marketability of scientific knowledge remains an ongoing challenge and seeking ways to ensure its application to decision-making processes often meets with obstacles and challenges. Nevertheless, wildlife science remains an integral and vibrant part of the North American Model.

Allocating and monitoring wildlife harvests in North America

The role of wildlife agencies

In North America provinces and states have primary responsibility and authority over the hunting of wildlife residing within their boundaries, with Federal Government responsibilities largely pertaining to international treaties and migratory species. In both Canada and the US Government wildlife agencies establish hunting zones and seasons, determine quotas and bag limits, prescribe rules for the age and qualifications of hunter applicants, administer hunting licence sales (usually with discriminatory prices for non-resident hunters), conduct wildlife research, enforce hunting laws and regulations, deliver various kinds of wildlife education programmes, and manage various kinds of wildlife refuges and sanctuaries where hunting may be prohibited or more tightly controlled.

In the US many wildlife agencies are responsible to a commission, board or council typically made up of governor-appointed members.

The commission has final authority to promulgate regulations, but in reality routinely ratifies most recommendations of the agency (Lueck, 2000). Similar structures do not exist in Canada, where final executive authority rests with the (appointed) deputy minister and (elected) Minister responsible for the provincial or territorial agency. In both countries agencies are staffed by professional wildlife managers and scientists, all of whom are Government employees.

Funding for wildlife management programmes

The funding for Government wildlife agencies in the US derives principally (approximately 65 per cent of all programme dollars) from hunters and anglers, either directly through within-state licence sales (35 per cent) or indirectly through federal taxes on hunting and fishing equipment (30 per cent). Additional funds are derived from a wide variety of sources including income tax check-off programmes, motorists who purchase wildlife licence plates, and even dedicated within-state taxes on commodities such as cigarettes. General tax revenues from the treasury are also provided to some state agencies, although the proportions vary considerably from state to state and approximately 21 agencies receive no funding at all from general tax sources (Lueck, 2000). While hunter-generated dollars are largely dispersed in programmes for game (hunted) species, hunter revenue also supports biodiversity programming in the broad sense.

In Canada the funding situation is quite different. In all provinces and territories funding to wildlife agencies is largely derived from the general treasury. Hunter licence fees are usually not directed towards wildlife management generally or hunting programmes specifically, but rolled into provincial coffers in combination with other Government revenues. Allocations to the wildlife agency are then determined in competition with the other demands on Government finances, such as transportation, health and education. In recent years exceptions to this general rule have emerged in a few Canadian jurisdictions.

The US agencies were in a funding situation comparable to Canada's, prior to 1934. In that year the head of the US bureau of Biological Survey, J.N. 'Ding' Darling, originated the Migratory Bird and Conservation Stamp (duck stamp), essentially a federal licence required annually by waterfowl hunters in that country. Since that time more than half a billion dollars

derived from this stamp have been used to acquire and preserve millions of hectares of waterfowl habitat.

Only three years after the duck stamp initiative Carl Shoemaker, conservation director of the American National Wildlife Federation, drafted legislation (PittmanRobertson Act) authorising a tax on sporting arms and ammunition to assist states in wildlife management and restoration. The legislation stipulated that monies raised by state wildlife agencies from hunter licence fees could not be diverted to any other purpose but support of wildlife (principally game species), if Pittman–Robertson monies were to be made available to the state in question. In so doing, this legislation ensured some federal influence on American state wildlife programmes, and has certainly helped maintain wildlife agency loyalty to their hunter clientele. Nothing comparable to this legislation exists in Canada.

Quota setting techniques

Until early in the 20th century wildlife conservation in North America focused on game laws and protection, but by the 1920s it was clear that better information on the abundance of wildlife and the factors controlling animal (especially game) populations was required. Crucial in this regard were the investigations of Aldo Leopold (1928–1930) in the agricultural Midwest of the US, which strongly influenced the American Game Policy in 1930 and resulted in his book *Game Management* in 1933. Both these initiatives emphasised the need for improved biological information and for trained professionals to conduct game management programmes. Similar sentiments were developing cooperatively in Canada (Hewitt, 1921).

From these beginnings spread a continent-wide programme of wildlife research and monitoring that has massively increased our understanding of wildlife population dynamics, and greatly improved our abilities to manage both hunting efforts and wildlife abundance. Presently in North America virtually every state and provincial agency, supported by wildlife researchers at universities, establishes wildlife quotas utilising accepted scientific procedures appropriate to the species in question.

Wildlife quotas are usually established through population inventories using census information as well as hunter-trend statistics, and then allocations provided to resident and non-resident hunters based on some ratio that varies by jurisdiction. Depending upon the abundance of the species in question and

the demand by hunters for licences, either an open access or draw system is employed to ensure fair opportunity for every qualified hunter to obtain a permit. This process is generally followed for all public lands in Canada and the US, with the major exceptions of national parks and certain wildlife refuges where hunting is prohibited. It is also generally true of much private land within registered hunting zones, except that access to private property is at the discretion of the landholder.

Challenges to the North American Model

Privatising wildlife ownership and developing wildlife markets

While wildlife is considered a public trust resource in North America, legally enshrined trespass rights result in *de facto* control (but not ownership) by landowners of wildlife on their property. This indirect authority is of major significance when we consider that more than 70 per cent of land in the US is privately owned (Butler *et al.*, 2005), as is a growing percentage in Canada. Obviously the attitudes of land owners will have major implications for the future of the North American Model and there is already growing demand to make wildlife a private resource, allowing landowners to manage it in accordance with market demands.

These social tendencies are encouraged by established industries such as agriculture and forestry, which have witnessed failures in traditional markets and see the 'natural' advantage of having a varied income from the lands they lease, own or manage. Quite predictably, some of the Government bureaucracies developed in support of these industries also view the private commercial use of wildlife as reasonable, and see its administrative guidance on such lands as an extension of their normal responsibilities. Seen from these perspectives agricultural or forest lands can produce many crops for the market, one of which is wild animals. The products derived from wildlife might vary from entertainment or wildlife-viewing to hides, meat and other body parts sold for consumption, to paid hunting.

Not surprisingly, the idea of managing wildlife for the two latter markets (especially) is highly controversial in North America, colliding as it does with some crucial underlying principles of the Model (Geist, 1988). Regarding fee hunting the principle concern is that hunting will become a more elitist activity with concomitant loss in broad participation and the social and

political support this generates. There are also ethical concerns about the 'fair chase' standards that would apply to hunting animals on private lands and behind fences, an issue exacerbated by the increased probability of modifying wildlife behaviour under such circumstances (Butler *et al.*, 2005).

It is also felt that marketing pressures will encourage genetic manipulation of fenced wildlife to increase trophy hunting opportunities, distancing further this kind of hunting experience from the traditional hunting culture that has long supported wildlife recovery and management in North America. Meanwhile the creation of a commercial market for dead animal products is considered tantamount to a return of 19th century conditions that fostered wildlife's historical demise (Geist, 1989).

Despite the controversy, some means of landowner compensation is necessary, as tolerating wildlife on their property often has costs for owners. Furthermore, by rightfully denying hunter access, landholders can effect declines in hunting participation, something that would in itself surely undermine the North American Model as we know it. As a result, various mechanisms have developed to accommodate landowner demands and appeals from commercial interests.

Fee hunting and leasing of land for hunting are the most common forms of compensation and both have been ongoing for some time. In the mid-to-late 1980s Oregon, Colorado, California and Texas all introduced programmes whereby landowners could, with approval of the wildlife authority in their state, not only sell hunting permits and tags to hunters but also, by following state habitat management guidelines, increase harvest quotas on their land (Freese & Trauger, 2000). While programmes vary, at least seven states are now involved and corporations such as International Paper have also developed business models that include fee hunting and leasing programmes on their forest properties (Rasker *et al.*, 1992). Significant fee hunting also occurs on some American Indian lands (Czech, 1999).

Not all such initiatives are of recent origin. Leasing of private land for hunting access in Texas dates back to the 1920s (Teer & Forrest, 1968) and is a well established and accepted practice in that state. It is important to understand that, to date, these various programmes do not confer *de jure* ownership of wildlife to the land owner or corporation, but they come close to *de facto* privatisation, and as such are strongly opposed by supporters who fear the Model's public trust doctrine will be undermined (Ernst, 1987; Geist, 1989).

In addition to the fears that such programmes can disenfranchise the principle of full democratic access to hunting opportunity, the private ownership

and market development for wildlife has raised additional concerns over exotic game species being introduced for hunting or game farming purposes. In Texas over seventy exotic ungulate species have been introduced to increase the fee hunting market, and at least six of these have established free-ranging populations (Freese & Trauger, 2000). While the biological perils of these exotics running free in the North American wild are largely unstudied, experience suggests that the consequences for native wildlife could include disease, genetic pollution and competition.

Regardless of these concerns, fee hunting and leasing of private lands for hunting purposes are supported by many who see market forces and secure private property rights as the future to wildlife habitat conservation in large areas of North America (Burger & Teer, 1981). This issue is complex and threatens to strike a potential fault-line between upholding the principles of a highly successful conservation programme (the North American Model) and preserving, in the face of social and economic change, the very wildlife the original programme was designed to protect.

Declining hunter numbers

Simultaneous with the pressures for wildlife privatisation is a second forceful challenge to the North American Model; namely, the decline in hunter numbers. Latest statistics indicate that hunter numbers continue to fall gradually and that currently in the US only 6 per cent of the population participates in this activity (Responsive Management, 2006). Numbers are similar in Canada. Many social, political and economic factors impinge on this trend, but the impact of a sharp decline in hunting activity on conservation programmes would be catastrophic for many state wildlife conservation programmes, some 65 per cent of which are directly funded by hunter expenditures.

The financial implications for conservation are not the only concern however. In both Canada and the US hunters represent one of the most consistently supportive and vocal constituencies in wildlife conservation efforts and a decrease in their numbers will seriously affect the social and political debates around such issues. While there is no question that a broad public constituency considers wildlife conservation important, there remains the crucial question of whether the non-hunting community could ever replace bot the financial and political investments of wildlife's consumptive users in the ng term. What is clear is that presently hunters barge a huge proportion of ıe

conservation freight in North America, and declines in their numbers pose a direct and substantive challenge to conservation on this continent.

North American and southern African approaches compared

While land tenure and wildlife ownership are the focus of an escalating debate in North America, they have always been central to policies of wildlife use and conservation in southern Africa (Booth & Cumming, this volume). Thus, while it is true that responsibility for wildlife rests generally with the Government, landowners in southern Africa may exert considerable control over its use depending upon the land tenure system in place. In Zimbabwe, for example, landowners and rural district councils are largely free to utilise wildlife on their land, while in Botswana fewer ownership rights over wildlife have been devolved from Government to individuals or collectivities. Varying policies apply in Zambia and Malawi. In South Africa, landowners with certified enclosed lands have wide authority to commercially utilise wildlife, not just for hunting but also for sale of carcasses or captive breeding.

Southern African countries generally agree that where considerable private or communal access to wildlife occurs, wildlife is better served than where strong state controls are exercised. The latter circumstance serves, in their experience, to remove incentives to conserve the resource, an approach at odds with North American policy and experience. As in North America, southern African countries recognise the importance of hunting for wildlife conservation; however, they also support game ranching and farming, and the sale of meat and other products from wildlife culling operations, practices that in manner and extent differ appreciably from North American approaches.

One of the great challenges to southern African wildlife policy has been how to best establish quotas and ensure appropriate harvest controls for wildlife that is managed by private or communal landholders. In general, few of these operators are in a position to undertake rigorous scientific assessments of the wildlife they market, and best guesses are frequently used to establish off take. Where aerial surveys or statistical models are used, they are usually provided by state-operated agencies. In North America scientific application to wildlife harvest is extensive, highly developed, and in many cases, legislated as a prerequisite to harvest. The provision of such scientific expertise is considered a

Government responsibility, and vast monies are spent annually by Canada and the US in this regard.

Conclusion

One of the reasons conservation history is so complex is that it is born out of the political and social evolution of nations, while at the same time reflecting a deeply founded human fascination with nature. Conservation approaches, or models, must be viewed in this light. The vastly different histories of North American and southern African nations have inevitably led to markedly different conservation strategies, and neither should be viewed as better than or a suitable replacement for the other. Each has its advantages and its problems.

Nevertheless, there is great merit in the mutual exploration of both. Opportunities will stem from our realisation that while all nations are in a constant state of flux, providing for nature's conservation is humankind's ongoing, shared and daunting challenge. What has worked in the past to maintain our cherished hunting traditions, and those creatures which inspired them, may not work in the future. What we once set aside may need to be rediscovered, modified and reapplied. We have too little time to learn from just our own successes, or defeats. People and nature have always been in a race with themselves.

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