

How Markets in Wildlife Meat and Parts, and the Sale of Hunting Privileges, Jeopardize Wildlife Conservation

VALERIUS GEIST

Faculty of Environmental Design
University of Calgary
Calgary, Alberta, Canada T2N 1N4

Abstract: *The reintroduction of markets in wildlife meat and parts jeopardizes North America's system of wildlife conservation. This most successful of conservation systems is based on three fundamental policies: denial of economic value to dead wildlife, allocation of surplus wildlife by law, and nonfrivolous use of wildlife. These policies are being undermined by game ranching, market hunting, paid hunting, and advertising of hunting as sport or competition, not harvest. Agriculture in Canada advocates raising wildlife for slaughter; in the United States it supports paid hunting. The policy of removing economic value from dead wildlife paid off in a \$60 billion service and manufacturing industry based on living wildlife. Some understanding of the historical roots of American wildlife management is vital to nature conservation. Making all citizens de facto as well as de jure shareholders in wildlife deserves broad attention.*

"It is in the nature of man that no one learns from experience. The follies of the fathers are lost on their children; each generation has to commit its own."

Frederick the Great (1712–86)

"History is more or less bunk."

Henry Ford (1863–1947)

Introduction

In an essay on science advisers to government, Lord Zuckerman (1980), the former chief science adviser to the British government, painted no flattering picture of scientists in the nuclear arms race. They were more

Resumen: *La reintroducción de mercados para la venta de productos y carne de animales silvestres pone en peligro el sistema norteamericano de conservación de la fauna silvestre. Este, el más exitoso de los sistemas de conservación, está basado en tres políticas fundamentales: la negativa a atribuir valor económico a la fauna silvestre muerta; la asignación, por ley, de excedentes de fauna silvestre y, el uso no-frívolo de la fauna silvestre. Estas políticas están siendo socavadas por los ranchos de animales de caza, la cacería comercial, la cacería cinegética, y la publicidad que se da a la cacería como un deporte o competencia y no como cosecha. El sector agrícola en Canadá aboga por la crianza separada de fauna silvestre para consumo humano; en los Estados Unidos apoya la cacería comercial (cinegética). La política de negar valor económico a la fauna silvestre muerta dio como resultado el surgimiento de una industria de servicios y manufactura, basada en fauna silvestre viva, evaluada en US\$ 60 billones. Un poco de entendimiento de las raíces históricas del manejo americano de la fauna silvestre es vital para la conservación de la naturaleza. El convertir a todos los ciudadanos en accionistas de la fauna silvestre tanto de facto como de jure merece amplia atención.*

victims than masters of political power, quite unable to affect the pursuit of sectorial vested interests, including such in their own ranks. There are parallels in Medwed-jew's (1969) account of the rise and fall of T. D. Ly-senko, a Machiavellian master in the use of power whose ruthlessness all but destroyed biology and hurt his nation. Pitted against him was the futile, tragic, struggle of eminent Russian biologists. Hirsch (1981) revealed charlatanry in some social sciences circles and the ques-

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tionable success established science had in dealing with it. These accounts all raise doubts about scientists' preparedness to deal with policy matters in the public arena. This troubling deficit has emerged in recent events in conservation.

Determined and successful attempts are under way across North America to switch wildlife from public to private control. That switch threatens to replace North America's highly successful system of wildlife conservation with one that, historically, has promoted neither the welfare of wildlife nor that of the public. Yet such efforts are in part supported by biologists concerned with conservation (Swenson 1983, Geist 1985a). Major conservation organizations are silent. We face a "Nero dilemma" (Soulé 1986).

There are three major thrusts by private interests to gain control over wildlife. In Canada it takes primarily two forms: "game ranching" (Geist 1985a) and "commercial caribou and musk ox harvesting." In the United States it is the ranching of native big game for hunting (White 1987); this thrust is also present in Canada (Roseborough 1986), but less emphasized. In all three cases the parties involved have lost income because of failing traditional markets and are acting with some urgency. All hope to profit from luxury markets, selling wildlife as "medicine," as a delicacy, or for entertainment. These thrusts are quietly and effectively supported by agricultural interests in government and universities. Loss of power by agricultural bureaucracies with shrinking agribusiness appears to be also an issue.

In addition, Indians claim in U.S. federal court that they continue to have treaty rights to sell dead wildlife (i.e., *Lac Courte Band v. the State of Wisconsin*, case no. 74-C-313). In Quebec commercial fish raisers are trying to retail native brook trout. In the southern United States the popularization of "blackened redfish" by chef Paul Prudhomme created a sudden demand for redfish, which was instantly and devastatingly exploited commercially, leading to another classic conservation battle (see *Florida Sportsman*, December 1986, pp. 7, 60-61).

These efforts to gain control over wildlife attracted little attention in national wildlife conservation organizations in Washington and Ottawa. A few academics expressed concern (Pruitt 1985; Geist 1985a, 1986), as did some biologists in the public service (more spoke off the record), while many laymen asked relevant questions publicly (Swenson 1983, Cowan 1987; see *Proceedings of the Privatization of Wildlife and Public Lands Access Symposium*, Wyoming Game & Fish Department, March 1987).

I suggest that:

1. Current efforts to legalize retail trade in wildlife and develop paid hunting on a large scale will destroy the basic policies by which North America's system of wildlife conservation operates, and therefore

eventually destroy the most successful system of wildlife management and conservation in existence.

2. Paid hunting imposes a self-defeating deterrent fee that in the long run reduces the public's interest in wildlife, hands wildlife to a wealthy minority for their exclusive use, and at a high cost to the public, including violence and loss of civil liberties.
3. The current raids on public wildlife are, historically, an old game of the elite with dire consequences to wildlife and the public.
4. Private control of wildlife will not increase but decrease the currently high economic return from wildlife.
5. The use of wildlife as exemplified in North America leads to higher economic gain and societal value of wildlife than models based on the sale of dead wildlife.
6. With agriculture shrinking there exists an opportunity to change land from agriculture to wildlife production with a likelihood of increased economic returns.

The North American system of wildlife management is unique in that, with few exceptions, it makes the public both *de jure* and *de facto* owner of the wildlife resources. Here are some of its features important in the following discussion.

A Brief Historic Perspective of North American Conservation

North America's wildlife conservation is based on three primary policies that support the superstructure of laws, regulations, beliefs, and attitudes pertaining to conservation. These policies are 1) the *absence* of market in the meat, parts, and products of game animals, shore- and song birds; 2) the allocation of the material benefits of wildlife *by law*, not by the market place, birthright, land ownership, or social position; and 3) the prohibition on *frivolous* killing of wildlife.

These policies are discussed in historic writings about conservation of wildlife (Hornaday 1913, Hewitt 1921, Matthiessen 1959, Hampton 1971, Lund 1980) and are found in most current regulations passed by legislatures; they predate Aldo Leopold (1933). These policies were not established for reasons of sentiment, but in hard-headed recognition of the potential economic worth of wildlife, well exemplified in the deliberations of the Commission of Conservation (1910-19) in Canada. They were adopted jointly by the United States and Canada after grim battles on behalf of conservation. These policies were the work of North America's intellectual, social, and political elite, highly knowledgeable of markets and entrepreneurs. The leading figures on the United States side were President Theodore Roosevelt and

Gifford Pinchot (chief forester); on the Canadian side were Prime Minister Sir Wilfrid Laurier and Clifford Sifton (chairman, Commission of Conservation [Smith & Witty 1970, 1972]).

The first policy, prohibiting trafficking in wildlife, took economic value away from *dead* wildlife; only activities of *living* wildlife could be sold.

Allocation of wildlife by law is a complementary policy to the first. It presupposes the state as the owner responsible for wildlife. This policy makes every citizen a *de jure* "shareholder" in wildlife in the United States and Canada and a *de facto* shareholder in most jurisdictions.

The policy against frivolous killing is the least visible one. It prohibits the waste of wildlife once such is killed. It recognizes subsistence hunting as a priority. It permits the destruction of noxious wildlife. On sport or trophy hunting, both of which are unpopular with the American public (MacDonald 1987), the third policy is ambiguous. Lund (1980) is explicit: American wildlife management arose because of those who exploited wildlife for entertainment, the sportsmen. Also Leopold (1933) made recreational hunting an integral part of his definition of game management. The literature preceding him (i.e., Commission on Conservation 1910–19, Hewitt 1921) emphasizes that it would be better to *sell* wildlife for "sport" than to slaughter it for sale. That is, it has been historically recognized that some *restrained* hunting for sport that confers desirable social qualities to the hunter was a worthy goal. In the words of Theodore Roosevelt, as quoted on the dust jacket of the seventh edition of the Boon and Crockett Club's *North American Big Game* (1977): "The chase is among the best of all national pastimes: it cultivates that vigorous manliness for the lack of which in a nation, as in an individual, the possession of no other qualities can possibly atone."

In practice these policies ensured that the killing of wildlife was not economically rewarding but a liability. Not only is it costly to kill an animal legally, but the animal must not be abandoned under penalty of law. To hunt requires unrecoverable investment in equipment, effort, and time; that has deterrent value.

From the outset there were exceptions of these basic policies, most notable the retention of markets in wild fur. However, fur bearers are difficult to catch and are not as vulnerable as large mammals or birds to mass slaughter; they offer little incentive to illegal killing. In the northwest territories of Canada the sale of wildlife meat has been legal. There were special case exceptions added in other provinces and states. In time the three basic policies supporting wildlife conservation became deeply eroded. The first policy would be abolished should efforts succeed to sell dead wildlife. The second policy is eroded by hunting leases, shooting reserves, and private trophy and trespass fees, all of which allo-

cate wildlife by the pocketbook, denying many *de jure* shareholders in wildlife access to their resource. The third policy is eroded by the notion that hunting is killing for "sport" or "fun," and that wildlife is consequently a "recreational" resource. Hunting has therefore been attacked as a frivolous blood-sport, as an unworthy exercise of needless destruction and cruelty, and as a degradation of those who hunt (Amory 1974). Current public views do not support killing wildlife for sport, but they do support such killing for food (MacDonald 1987).

Achievements of North American Conservation

The three primary policies, adopted into law well before Aldo Leopold's (1933) ascent, brought about not only the return of wildlife, but also created the most successful, economically productive, and most imitated system of wildlife conservation. North Americans usually do not know of this great achievement.

1. The recovery of wildlife. It had been decimated over most of the southern and central parts of the continent (Hornaday 1913, Hewitt 1921). Today there are about 30 million big game animals in the United States and Canada (Schmidt & Gilbert 1980), despite more than 3 billion head of livestock (Pimentel et al. 1980) and about 270 million people. Bison, musk oxen, pronghorned bucks, and wood duck returned from the verge of extinction; most big game species increased, some were reintroduced. No longer are song- and shore birds regarded as game, or as luxury food in restaurants, as described in detail in Ranhofer's (1893) treatise on culinary art. For the passenger pigeon and eskimo curlew the prohibitions on markets came too late.

2. The recovery of wildlife led to a large, labor-intensive service and manufacturing industry that sprouted about living wildlife (Filion et al. 1983, Bailey 1984, Kruckenberg 1987). The elimination of wildlife markets *increased* the economic return from wildlife. This is at least twice that of the elite German wildlife management system, and the number of jobs created is at least threefold.

3. A system of management and conservation arose based on state-employed wildlife managers responsible to elected representatives at the state, province, and federal levels. In support, there grew institutions of teaching and research and a society to advance a profession of wildlife management. It provides refereed journals, accreditation, and representatives to bodies dealing with conservation (see *Wildlife Society Bulletin* 15[1] 1987). North America became a model for other parts of the world, as evidenced in the creation of national parks, the introduction of university curricula and research in wildlife biology, and the international use of North American wildlife experts as consultants.

4. A large number of conservation societies arose that generated interest in wildlife locally, and were united at the federal, provincial, or state levels to give political expression to their views. The continental scope is illustrated by societies common to the United States and Canada. With a population of 400,000, Wyoming has 104 conservation societies. Canada has some 360 registered conservation groups, 100 of which are represented by the Canadian Nature Federation. There are societies to raise funds for elk, bighorns, grizzlies, turkeys, ruffed grouse, and waterfowl; to regulate trophy competitions; to restore habitat; and to act as watchdogs on governments.

5. Americans taxed themselves on behalf of wildlife (Pitman-Robertson, Dingell-Johnson, and Fish and Wildlife Conservation Acts of 1980; Drabelle 1985b). Canadians pay for wildlife from general taxation or from special funds created from license sales (i.e., Alberta's Bucks for Wildlife Fund).

6. North Americans created an extensive system of protected areas for wildlife such as national parks (Hampton 1971), wildlife refuges (Drabelle 1985a), and ecological reserves, and they made wildlife an object of public lands management. Societies that acquire land for wildlife or protect habitat such as Habitat Canada and The Nature Conservancy were formed. They encourage private landowners to preserve wildlife habitat. The Armed Forces continued their traditional role as protectors of wildlife (Hampton 1971) on military reservations, giving to officers formal conservation responsibilities.

7. North Americans negotiated international treaties to protect wildlife, beginning with the 1911 Fur Seal Treaty (Weber 1985). Better known is the Convention for the Protection of Migratory Birds (1916) between Great Britain and the United States (Hewitt 1921, Chandler 1985). Unfortunately, the Fur Seal Treaty is under attack by the Humane Society of America, and the fur seal may again be subject to sealing on the high seas.

8. North Americans preserved large predators, which is a great achievement when compared with the situation in Europe. We do have viable populations of wolves and black, grizzly, and polar bears. Great public concern surrounds grizzly bears in Yellowstone National Park (Craighead 1979; Knight & Eberhardt 1984; Povititis 1985, 1986), while the reintroduction of wolves is being contemplated in Wyoming or encouraged in Wisconsin (see *Wisconsin Natural Resources* 4(3), 1987, p. 38 suppl.).

9. North Americans developed an inexpensive, civil, and fairly effective system of wildlife protection that allowed wildlife to recover, despite much opportunity for illegal killing, and ready access by the public to firearms.

These are the achievements: now let us turn to the dangers facing North American conservation.

Game Ranching

Game ranching is a complex subject, and even its proponents often fail to differentiate categories. It differs from "Game Farming," a legal designation in Canada that denotes the raising of animals for viewing or live sale. *Game ranching* denotes the raising of *big game* to be *killed* for sale, or by paid hunting. Three variants are as follows.

1. The New Zealand-Style Game Ranch

In this case deer are raised on small, fenced pieces of land similar to other livestock (Yerex 1979). As a strictly agricultural operation it is dedicated to the production of meat and by-products under controlled conditions. Although this is the model advanced in western Canada, it has no conservation function: on the contrary, it crossbreeds deer, producing genetic artifacts. It endangers our indigenous cervids by the release of such deer, accidental or otherwise (Massey 1986b, Rennie 1986), due to diseases or competition from feral populations (Geist 1985a). It endangers conservation because it needs retail markets in dead wildlife.

2. The African-Style Game Ranch

Game in this style ranch is grown for meat, products, and trophies with minimum husbandry, usually on marginal land (Dasmann 1964). Revenues are derived from the sale of guided hunting and accommodations, and from the sale of meat and by-products. Predators may or may not be tolerated, depending on their market value and the efficiency of fencing to keep large mammals confined. Red deer husbandry in Scotland is in part of this type (Bannerman & Blaxter 1969).

Such game ranches, tied to the whims of the market, cannot fulfill a conservation role anymore than can cattle ranches; both types are tied to market, not to ecological objectives (Geist 1985a). No incentive, except the market, exists to keep wildlife that can be replaced by livestock if the latter proves more economical. Such game ranching needs retail markets in venison and a tolerant or disarmed, closely policed public.

The famous German system of wildlife management is de facto game ranching. It is production orientated to favored species, with extermination of large predators and the severe culling of small ones, artificial feeding, agricultural-type habitat manipulation, introductions of nonnative species and strains, and genetic manipulation of wildlife (Beninde 1937, Draskovich 1951, Stahl 1979, Nuesslein 1983, von Eggeling 1983); wildlife is generally not confined to fences. Today Germany's system is struggling with the role of conservation (Schroeder 1986).

3. The Texas-Style Game Ranch

Native and exotic big game animals are raised for paid hunting (White 1987) on this style ranch. In New Zealand "trophy ranching" falls in this category: with venison markets unprofitable, public land has been turned over to create trophy ranches where red deer, bred for antler production, are sold to trophy hunters (Massey 1985a).

The conservation role of this type of operation is limited and ambiguous. White-tailed deer from different regions are being hybridized for trophy antlers, creating genetic pollution (Etling 1985). Exotics and hybrids raised for trophies remain a constant danger to our competitively inferior, disease-prone North American large mammals (Geist 1985b). However, it may preserve some species of nonnative wildlife endangered in their native lands, and it does provide habitat for marketable native species (Teer 1974). Texas-style game ranching would suffer from retail markets in venison.

Game culling is carried out on natural areas with the meats and products variously disposed; unlike game ranching, game culling is *not* tied to the whims of the marketplace. Without trafficking in wildlife and with broad public participation, game culling converts into classic wildlife management, and the land can be managed according to ecological guidelines.

Game ranching (without further distinction) is advertised as more efficient than cattle ranching while producing superior meat. It is praised as a means to diversify a lagging farm economy, as making "marginal" lands productive and giving "land to the landless," as putting land cheaply into the economic cycle, as creating jobs (Hudson & Stelfox 1983), as getting rid of native hunters from public land (Kahdren 1983), and as being a tool of conservation, saving "gene pools." These claims are found largely in the "gray" area of government literature, briefing documents to politicians, newsletters of game ranching organizations, and letters to the editor. No comprehensive position on conservation was developed. However, the World Conservation Strategy (WCS) was invoked in support of game ranching in a 1986 discussion paper circulated by the Alberta government. The WCS explicitly urges a *study* of the social and economic consequences of game ranching, an admonition not fulfilled. Canada is a signatory to the WCS as of October 7, 1981. That it is possible to raise wildlife for luxury market is not disputed here.

In Canada agriculture has capitalized on the stigma of a wildlife management oriented toward sport hunting. It proclaims that wildlife should be for "everybody," not only for hunters.

More tempting than the small, competitive international venison market are Oriental markets in folk medicine. They pay well for the velvet antlers, tails, and sex organs of deer, and the gallbladders, paws, claws, teeth

and milk of bears. "Bear ranches" are being researched (*The Asian-Albertan Exchange Newsletter* 2[3], 1985). Investigative reporting uncovered a growing black market in "wildlife medicines" in North America (Cowan 1987).

The Oriental folk medicine markets are, however, fading in favor of modern medicine. New Zealand deer ranchers are now pinning their hopes for selling velvet antlers on a segment of Western society distrusting modern medicine (Hughes 1986).

Game ranching interests in Canada have their eyes on public land, as revealed by earlier claims (*see* Geist 1985a) and in a briefing document to caucus by Manitoba's Minister of Natural Resources on November 12, 1986. There is precedence in New Zealand (Caughley 1983). To promote game ranching, New Zealand expropriated deer from public in favor of private users and disallowed the public access to large tracts of public land. With ranching for venison in decline (Bryant 1986), trophy ranching was seen as an alternative, and public land in New Zealand is now used for that purpose (Massey 1986a).

Drawbacks of Game Ranching and Market Hunting

Predators

Both game ranching and market hunting are incompatible with predators. New Zealand has *no* deer predators. European countries eradicated large predators to protect livestock and game. Venison markets, supplied initially by Labrador caribou, will lead ultimately to "caribou ranching" from Gander to Nome. It will then extirpate barren ground grizzlies, black bears, wolves, wolverines and probably even eagles and ravens—just as has reindeer herding in Finland (Pruitt 1985).

Exotics

The introduction of exotics and hybridization of species to create "marketable products" endanges North American ungulates in several ways.

Diseases. Issue after issue New Zealand's *The Deer Farmer* laments about deer diseases. Yet North America's large mammals of Siberian origin are most susceptible to diseases of Eurasian relatives (Geist 1985b). Releases of diseased rancher deer, accidental or otherwise, are a virtual certainty, judging from recent New Zealand incidents. Someone armed with wire cutters has "gotten back" at deer ranchers by cutting fences; it led in one case to a release of 4,280 red deer and hybrids (Massey 1986b). We know from recent experience in Canada that it is difficult to control hotheads with wire cutters.

Competition. There is evidence that American deer pitted against Eurasian species do poorly and may even go extinct. In New Zealand, white-tailed deer are re-

duced to two populations, one of doubtful viability; black-tailed deer and American moose died out. The wapiti did establish itself, but spread much less than the red deer. Wapiti were often released in Europe where they also did poorly in competition with red deer (Beninde 1937). Wapiti, white-tailed deer, and moose in New Zealand shrunk in body and antler size; wapiti have thin, translucent skulls (Batcheler & McLennan 1977); red, sika, fallow, and rusa deer and sambar, Eurasians all, became established and grew to fairly large sizes (Wodzicki 1950, Caughley 1983, Harris 1984).

White-tailed deer in Europe have done poorly when pitted against roe deer (Heck 1956, Bojovic & Halls 1984); however, on agricultural land in Finland they are a qualified success in the absence of roe deer (Nygren 1984). Sika deer in America are established in Maryland and fallow deer in Montana (near Sidney) and on some Gulf Islands in British Columbia (Cowan & Guiguet 1965), despite native white-tailed, black-tailed and mule deer.

Genetic Pollution. In Europe feral sika deer have hybridized so extensively with red deer that the red deer may already be lost as a species (Harrington 1973, Lowe & Gardiner 1975, Bartos et al. 1981). The white-tailed deer, at the subspecies level, is already genetically polluted in the southern states due to reintroductions or attempts to breed trophy bucks (Etling 1985). Efforts to establish wood bison in the Yukon Territory are now threatened by feral plains bison in northern British Columbia. Manipulating wild fish stocks genetically for commercial exploitation has been advocated (Moav et al. 1978).

Wildlife Protection. Most damaging is the placing of a market value on *dead* specimens of *vulnerable* wildlife. When meat of such species is openly marketed, when its parts fetch high prices, when retail outlets multiply, when an infrastructure of producers, buyers, processors, and consumers develops, it also attracts criminals. This has happened on this continent historically and currently (Cowen 1987). Protecting wildlife against illegal killing and marketing requires costly policing. Few Americans remember that during the heyday of market hunting the U.S. Cavalry was called up to protect Yellowstone and other national parks. They guarded wildlife from 1886 to 1918 and left after game markets were outlawed (Hampton 1971). The Cavalry's experience in controlling the illegal killing of wildlife may well have been a major factor in generating North America's policies of wildlife conservation.

On November 13, 1984, the province of Alberta passed virtually unopposed a new wildlife act (Bill 85) with provisions for legalizing markets in the meat and parts of wildlife. Subsequent public opposition has delayed implementing the game ranching provisions of the act, but not the passage of regulations that allow, as of April 1, 1987, a retail market in wildlife parts.

An attempt to introduce game ranching in Manitoba (in "Information to Caucus," November 12, 1986, signed by L. E. Harapiak, minister of natural resources, province of Manitoba) led to a grassroots rebellion of citizens in Swan River, the minister of natural resources' own riding. In the absence of enabling legislation, over 100 applications for game ranching were pending early in 1986. A broad cross-section of citizens united into an "Amalgamated Anti-Elk Ranching Group" pooled financial resources and skillfully opposed the minister. Game ranching was defeated by the Manitoba legislature December 3, 1986, and the only experimental elk farm was ordered to disband (reported December 4, 1986, Winnipeg Free Press). Less than a year later this informal citizens' coalition metamorphosed into a new conservation society called "Watchdogs for Wildlife." In British Columbia the "ranching" of fallow deer and bison, but not of native species, was approved in 1987. Ontario considers making the sale of wildlife parts legal (Cowan 1987). Game ranching is under review in Alberta and Saskatchewan, while in the territories export of wildlife meat is a serious goal. There is officially funded research into game ranching in Canada financed by the National Science and Engineering Research Council; there are organizations in support of game ranching (see Geist 1985a) and "experimental game ranches" in three western Canadian provinces.

Some of the most determined support for game ranching comes from unexpected quarters: wildlife biologists. I was one of them. I endorsed Dasmann's (1964) vision of game ranching. With Dr. F. Walther, then of Texas A & M University, I staged a conference in 1971 that dealt in significant part with "game ranching." It attracted over 250 big-game biologists, including game ranchers from Texas, South Africa, and Rhodesia (Geist & Walther 1974 [see papers no. 27, 28, 48-55]). A year later I realized that markets in dead wildlife were unacceptable in North America.

In the Canadian Wildlife Service, Telfer and Scotter (1975) and Novakowski and Solman (1975) considered the possibilities of commercial game ranching in Canada's boreal aspen forests; they realized in a prophetic manner some of the difficulties that were to arise, as did De Vos (1967, in Telfer & Scotter 1975). They asked for studies on the social consequences (none were forthcoming). Their objectives were to save native landscapes from conversion to livestock pastures. I endorse their view and Dasmann's that native landscapes and wildlife have a high commercial potential and deserve the most serious of attention. However, I doubt that big game ranching tied to luxury or trophy markets for an affluent minority, as now advanced by agricultural interests, is the answer (Geist 1985a, 1986).

Game ranching is opposed by the Canadian Nature Federation, several provincial Fish and Wildlife and guiding associations, and provincial conservation

groups. So far Canadian "naturalist" organizations have spoken up stronger than "wildlife" organizations against wildlife markets, game ranching, market hunting, and all their consequences (i.e., Struzik 1987). The Canadian Wildlife Federation, for instance, even has had a policy of endorsing game ranching. This is recorded in a document entitled "Guidelines for Wildlife Policy in Canada" that was adopted in 1980 by all provincial resource ministers. The endorsement remains. Markets in venison are no distant threat.

Markets and Wildlife Protection: The German Example

The Germans, with a retail market in venison, are thorough in wildlife protection. Theirs is a mature system, rich in lore and tradition. German law (Bundesjagdgesetz 28.9, 1976, no. 25) makes every lessee or owner of a hunting territory a deputized policeman responsible for wildlife protection. The law allows him to use firearms in protection against armed poachers. It allows him to shoot to kill in cases of justifiable doubt to his security (Nuesslein 1983). There are about 65,000 of such armed wildlife protectors for about 91,000 square miles of land open to hunting (23,574 million ha [Wiese 1986] divided into 40,000 hunting territories). In addition there are some 1000 professional hunters (Wiese 1986) employed full time to manage and protect hunting leases of clients, while on state land about 5000 foresters are charged with the duty of wildlife protection. Moreover, anyone of the remaining 195,000 of Germany's registered hunters can be so deputized (Nuesslein 1983). The foresters and professional hunters not only carry long-arms (much more effective than regular police weapons), but may be accompanied by dogs. All wildlife protectors are allowed to carry concealed hand guns. In addition, regular police forces are responsible for wildlife protection. Together with stiff food protection laws, food inspectors with policing powers to control the flow of wildlife from kill to the retail market, and stiff gun control laws (Nuesslein 1983, Balse 1968, Wiese 1986), Germany has succeeded in keeping wildlife and a retail market in venison.

By comparison, in the province of Alberta, my home, 115 *unarmed* wardens guard wildlife on 255,285 square miles of land. The costs of wildlife protection in Germany are beyond calculation. Surveillance alone is at least 300 times greater, and while most is done by unpaid deputies, there are still about 40 times more publicly employed wildlife protectors and about 10 times more paid privately. The lack of legal markets in game is probably responsible in North America for a fairly effective, cheap and civil system of wildlife protection.

Table 1 shows some wildlife statistics between East

and West Germany and some North American jurisdictions, allowing a first comparison despite differences in gathering statistics. West Germany gets apparently about half the monetary value from wildlife compared to Wyoming or Wisconsin. Expenditures per hunter in West Germany is almost \$2000/hunter; it is about \$688/resident hunter in Wyoming. West Germany paid out about \$54 million in wildlife damages (Wyoming \$0.24 million). Tourist hunters are not encouraged in Germany. There were some 2300 nonresidents among 265,000 hunters in Germany (Wiese 1986), and 248,000 from 478,000 in Wyoming (Kruckenberg 1987). Nonconsumptive expenditures tend to be three- to fourfold of hunting expenditures in Canada (Filion et al. 1983) and Wyoming, but are not considered by the Germans, as tourism is not wildlife related as it is often in America. This is partly because German wildlife is crepuscular or nocturnal, particularly where well managed (in overpopulated areas roe deer become diurnal. Schaefer 1982). Wyoming does not adequately account for the manufacturing sector benefits from wildlife; Canadian data indicate that this sector's benefits are larger than those of the service sector (Filion et al. 1983).

While delivering only fair wildlife production and economic return (Table 1), the German wildlife management system is a poor conservation system and reflects a history of autocratic rule. It has lost support among the German public (Der Spiegel 1983, 37[4] 91-100, 37[4]102-105); it is a system struggling to adjust as hunting in Europe becomes less popular (Schroeder 1986).

New Zealand, after transferring deer from public to private use, did not even wait for poaching to begin. With the 1977 Wild Animal Control Act, legislation was passed giving foresters powers of policing that exceeded those of New Zealand's regular police forces; it created a new crime—poaching (Caughley 1983).

If retail markets in wildlife become reestablished in North America, wild animals will be beyond protection. How can big game, outnumbered nine to one by humans, and about five to one by firearms in private hands, exist in the presence of a lucrative market?

Criminal activity also affects game ranchers. This was recently illustrated in New Zealand. Someone cut deer fences and released thousands of deer (Massey 1986b). The insurance industry, for the first time, took notice. It increased premiums, tightened conditions and let deer ranchers know that one condition of deer ranching should be a "blameless, enemy-free life" (Rennie 1986).

Market-Hunting

In eastern Canada market-hunting for caribou is being resurrected. The target is the George River herd in Labrador and northern Quebec, a herd variously estimated to be 400,000-600,000 in number. The common de-

Table 1. Comparison of some Canadian, U.S. and German figures on wildlife production and economics.

	Big Game Numbers in millions	Biomass kg/sq. mi.	Small Game Biomass kg/sq. mi.	Income millions \$ US	Land area sq. mi.
ALBERTA ¹	0.35	230	*** ¹¹	580	255,285
NEWFOUNDLAND ²	0.13	800	150 ³	47	42,000
WYOMING ⁴	0.96	752	*** ¹¹	1,000	97,914
WISCONSIN ⁵	0.71	891	283	520	56,154
WEST GERMANY ⁶	1.88 ⁷	530	23	525	95,997
EAST GERMANY ⁸	0.56	340 ⁹	39 ¹⁰	*** ¹¹	41,768

¹ Alberta sold 146,000 licenses in 1985. There were 58 jobs per 1,000 hunters. Figures derived from the Alberta Renewable Resources Letter, November 1986, and Status of the Fish and Wildlife Resource in Alberta, October 1984, Alberta Energy and Natural Resources, Edmonton, Alberta, Canada.

² Newfoundland had 75,000 hunters eligible for licenses in 1985: there were 50,000 applicants for big game licenses and 15,000 were drawn in lottery. The share of big game and small game per hunter was approximately 0.22/30. There were 35 jobs per 1,000 hunters. Figures from J. Mercer (personal communication, 1987) and the minister's message in the 1986-87 Hunting Guide; the income is for 1981.

³ This figure is based on: 1.5 million snowshoe hares killed, times 2 to estimate population size, times 1.35 kg to estimate population biomass, plus 1/2 the resulting figure in grouse biomass = 6.00 million kg, divided by land area.

⁴ Wyoming sold 473,000 licenses in 1985. Figures from pages 3-9 and 25-29 of Proceedings of the Privatization of Wildlife and Public Lands Access Symposium, Wyoming Game and Fish Department, Caspar, Wyoming (1987).

⁵ Wisconsin sold 849,000 licenses in 1980. The share of big game and small game was 0.18/5.4. Figures from Wisconsin 4(3:suppl.) 1980.

⁶ West Germany had 265,000 hunters in 1985. The share of big game and small game per hunter was 2.99/12.59. There were 16 jobs per 1,000 hunters. Figures from Wiese (1986).

⁷ Of this number, 1.7 million are small roe deer (*Capreolus capreolus*).

⁸ East Germany had 41,000 hunters in 1985. The share of big game and small game per hunter was 6.0/12.0. Figures from Briedermann et al (1986).

⁹ This figure is the official plan limit, which is exceeded currently (1986) by about three percent.

¹⁰ This figure is based on the 1984 kill of approximately 200,000 head of small game, times 2 to approximate population, times 4 kg to approximate population biomass, divided by the land area.

¹¹ *** indicates that no data is available.

nominator between East and West is Agriculture Canada's (federal) support for both, game ranching and market-hunting. At a Canadian Arctic Resources Symposium, January 29, 1987, in Montreal, the market-hunting for caribou was declared a necessity to "save" expanding populations from "self destruction." "Domestication" of caribou is to be next in line. One justification for market-hunting caribou was the loss of income from failing markets in seal skins and wild furs. No impact assessment has been made to date, three years after commencement of market-hunting.

Market-hunters in Canada hope for a venison market in the United States. In Canada, land claim negotiators with natives assumed a retail market in wildlife all along. Natives see restrictions on such a market as "southerners" depriving them of income.

Paid Hunting

Landowners in the western United States are trying to convert wildlife to private use, as reflected in the Hageman bill, which was submitted during the 1987 Wyoming legislative session but then withdrawn after strong public protests (Collins 1987). This bill proposed to grant considerable control over hunting seasons, bag limits, license sales, and public land to private landowners. Private interests have made such gains in California, Colorado, New Mexico, and Utah as a 1986 survey by the Wyoming Biological Service disclosed (see also

White 1987). The model is Texas-style game ranching, which arose after a 1925 change in trespass laws that gave landowners de facto control over wildlife.

Historically, the allure of wildlife is so great (Stahl 1979) that throughout Western history the powerful have repeatedly abrogated wildlife from public to private use. It happened in New Zealand in 1977 (Caughley 1983), in Texas in 1925, in Norway in 1899 (Swenson 1983), in England in 1066 with the Norman conquest, and in the Frankish kingdoms in the seventh century, with the Merovingians taking advantage of a loophole in Roman law (Plochmann 1979). That ushered in more than a millennium of tragedy for Europe's commoners and wildlife alike (Roedel 1971, Stahl 1979, Lund 1980). The current attempts in North America to gain private control over wildlife appear to be the beginning of that historically common expropriation.

The elite used wildlife for "conspicuous consumption" (in Veblen's 1899 terminology) as a symbol of their social status (Lund 1980). Hunting became a preoccupation that, historically, took on dimensions large enough to bankrupt rulers and generate peasant revolts (Stahl 1979). Resentment and envy is then directed against the privileged; wildlife becomes a symbol of detested privilege and power. Some, unhappy with the curtailment of personal freedoms, kill wildlife, less for gain than to spite the privileged. Poaching thus gains the support of the public, and poachers become folk heroes (as was Robin Hood). The elite, guarding their privi-

leges, tend to respond draconically. They protect their wildlife, even with force of arms. This does lead to bloodshed (see Ausser 1947). In the long run, an alienated public, unpracticed in regarding wildlife as *theirs* to cherish, use and protect, loses interest (Swenson 1983, Lund 1980) or exterminates wildlife the moment the powers of land and wildlife owners slacken, for which Ausser (1947), Roedel (1971), and Stahl (1979) cite European examples. The ruthlessness and brutality with which the mighty have protected "their" wildlife is startling. Unfortunately, this confrontation is not just ancient history; there is evidence that it is beginning to happen in New Zealand (Massey 1986b, Rennie 1986), and armed patrolling against "trespassers" is current history in the southern United States.

The arguments for paid hunting tend to run as follows: private initiative will provide better hunting for a financial reward and preserve habitat that would otherwise be lost to other land uses; sportsmen are leasing land in increasing numbers, so that one would only continue an existing trend anyway. Since the livestock industry has lost much business, raising wildlife for sport hunting is an alternative or addition to raising cattle (see White 1987). It is argued that in Texas, the transfer of wildlife into de facto private control saved wildlife and increased hunting participation (Jack Ward Thomas, personal communication, 1985).

I suggest that paid hunting is a *deterrent* that excludes those with low incomes (i.e., the young and early married) throttling recruitment; it conditions poor ethnic minorities to forgo hunting. Texas has but half the deer hunters of Wisconsin, yet almost five times the number of deer and three times the human population; few blacks and Hispanics participate. That is, paid hunting reduces *participation rates*, the most important factor supporting our system of wildlife conservation. I concur with Swenson (1983) that leasing of hunting rights to benefit private landowners has, in the long term, deleterious consequences for conservation; I concur with MacDonald (1987) that public opposition to sport and trophy hunting, but endorsement of subsistence and meat hunting, are factors to consider.

Sport Hunting

The third threat to wildlife conservation arises from the notion of *sport* hunting. The view that hunting is "sport" is a medieval European idea, although similar views appear to have existed in other cultures where hunting rights were restricted to the ruling minority. Originally, it had none of the notions of honorable conduct we associate with it today. Medieval and renaissance nobility were not "sportsmen" in our sense. They practiced little "sportsman-like" restraint and brutally slaughtered or systematically tortured for pleasure (Probst 1737,

Doebel 1754). Unfortunately, the notion of hunting as "sport" spread because lower classes notoriously imitate the rich and powerful (Koenig 1970). The ideas of honorable conduct toward wildlife, of self imposed restraint, of "sportsmanship," are of fairly recent vintage, possibly a consequence of nobility discovering the pleasures of shooting game on the wing, as did the father of Frederick the Great early in the eighteenth century (von Eggerling 1983), or British noblemen discovering deer stalking in the late eighteenth century.

To the public, however, sport hunting may mean killing for pleasure. The public accepts subsistence and meat hunting (MacDonald 1987); it also accepts agriculture's arguments that it fulfills the "noble role" of food production, and accepts the ecological havoc raised (Fergusson & Fergusson 1983, Larson et al. 1983). By illustrating hunting as a "noble" form of "recreation," or "sport," the old American idea of hunting for food is losing ground. Hunting for "fun" offends the Protestant work ethic; killing a deer for the family table does not. In the German hunting tradition, the idea of hunting as "sport" is considered offensive (von Raesfeld 1952).

The Losers

Not only wildlife and public stand to lose much from the current drift of events, so have the service and manufacturing industries. Advanced figures from the 1985 National Survey of wildlife-related expenditures by the U.S. Fish and Wildlife Service indicate it to be a \$55 billion (U.S. dollars) business (about \$60 billion with Canada included). Expenditures almost doubled since 1980. In the province of Alberta, wildlife stimulates over \$1 billion in gross business production (two-thirds from nonconsumptive use), contributes \$76 million in taxes, and maintains a minimum of 14,192 jobs. Over half of the direct expenditures went for equipment (Alberta Renewable Resources Newsletter, November 1986). By comparison, the world venison trade, based on Manitoba Agriculture figures is 30,000 tons, worth about \$0.2 billion, about one-fifth to one-seventh of Alberta's or Wyoming's income from wildlife. In Europe 1000 hunters generate 16 jobs (Wiese 1986); in Alberta it is at least 58 (based on 11% of 2.23 million citizens being hunters, and 14,192 jobs). The figures of Filion et al. (1983) suggest about 38,100 full-time wage-earning jobs, plus some 6000 jobs such as those of working owner, partner, or family helper, per billion dollars (Canadian) of wildlife-related expenditures.

A policy giving market value to *living* wildlife generates more income than one giving economic value to *dead* wildlife, even with a cautious interpretation of German, Canadian, and U.S. figures. Not economically efficient, but inefficient exploitation must be the goal of

conservation. To fish inefficiently is to use a dry fly, to fish efficiently is to use explosives.

What To Do?

In his essay on scientists in the arms race, Lord Zuckerman (1980) concluded that vested interests might not have prevailed had there not been a cloak of secrecy over the nuclear arms issue. He emphasized the need for an open, informed public debate, a sentiment endorsed by other senior science advisers. Here is a ray of hope for conservation. Our material normally is not top-secret, certainly not for retail markets in wildlife and paid hunting (even though colleagues in the Canadian public service opposed to these issues were muzzled). The basic policies that form North America's system of wildlife conservation and the nature of economic benefits from public wildlife management should be better known. Teaching wildlife conservation from a historic, comparative perspective is a possible solution, but only in the long term.

In the short term a public debate is vital. It is also vital to ensure public access to wildlife and either to support financially wildlife on private land (a promising solution, D. M. Crowe, Wyoming Fish & Game Department, personal communication, 1987) or work toward increasing public land holdings. In the long term, export markets for agriculture are shrinking as intensive agriculture frees food production from local constraints (i.e., Pedro et al. 1982). Financial returns to agriculture are small in the absence of subsidies, while on marginal land the lack of adequate income despite subsidies lead to abuse (see *Soil at Risk*, Senate Standing Committee on Agriculture, Ottawa). An orderly retirement of agricultural land for use by wildlife under public control is likely to have significant economic benefits.

International wildlife markets are not likely to serve exporters. Wealth is created less by export than by *import replacement* (Jacobs 1984). Venison imports generated over 1000 fallow deer ranches in Germany by 1980 (and pitted conservation against agricultural interests; Ueckermann & Hansen 1983), but ultimately led to a loss of deer ranches in New Zealand (Bryant 1986) and in the People's Republic of China. North Americans have shown how policies ensuring local consumption of wildlife generate wealth while conserving nature. It is a subject worthy of further attention.

Literature Cited

- Amory, C. 1974. *Man kind?* Harper & Row, New York, New York, USA.
- Ausser, C. 1947. *Der Alpensteinbock*. Universum, Vienna, Austria.
- Bailey, J. A. 1984. *Principles of Wildlife Management*. J. Wiley & Sons, New York, New York, USA.
- Balse, R. 1968. *Die Jaegerpruefung*. Verlag Neumann-Neudamm, Melsungen, West Germany.
- Bartos, L., J. Hyaneck, and J. Zirovnický. 1981. Hybridization between red and sika deer. I. Craniological analysis. *Zoologischer Anzeiger Jena* 207:260-270.
- Batcheler, L. C., and M. J. McLennan. 1977. Craniometric study of allometry, adaptation and hybridization of red deer (*Cervus elaphus* L.) and wapiti (*C. e. nelsoni*, Bailey) in Fjordland, New Zealand. *Proceedings New Zealand Ecological Society* 24:57-75.
- Bannerman, M. M., and K. L. Blaxter, editors. 1969. *The husbanding of red deer*. Rowett Research Institute, Aberdeen, Scotland.
- Beninde, J. 1937. *Naturgeschichte des Rothirsches*. Monographie der Säugetiere, vol. 4. P. Schoeps, Leipzig, East Germany.
- Bojovic, D., and L. K. Halls. 1984. Central Europe. Pages 557-560 in L. K. Halls, editor. *The white-tailed deer*. Stackpole, Harrisburg, Pennsylvania, USA.
- Briedermann, L., G. Dittrich, J. Goretzki, C. Stubbe, H. D. Horstmann, R. Schreiber, E. Klier, A. S. Kloster, and S. Mehlitz. 1987. Entwicklung der Schalenwildbestände in der DDR und Möglichkeit der Bestandsregulierung. *Beiträge zur Jagd- und Wildforschung* 14:16-32.
- Bryant, R. 1986. Roger Douglas: medicine man or grim reaper? *The deer farmer*, January issue, pp. 7-10.
- Caughley, G. 1983. *The deer Wars*. Heinemann Publishers, College Road and Kilham Avenue, Auckland 9, New Zealand.
- Chandler, W. J. 1985. Migratory bird protection and management. Pages 26-70 in A. S. Eno and R. L. Di Silvestro, editors. *The Audubon wildlife report 1985*. National Audubon Society, New York, New York, USA.
- Collins, K. 1987. A game ranching bill in Wyoming pits land-owners against hunters. *High Country News*, 19(3)1.
- Cowan, D. 1987. Medicine that kills. *Globe and Mail*, August 22, p. D5.
- Craighead, F. C. 1979. *Track of the grizzly*. Sierra Club Books, San Francisco, California, USA.
- Dasmann, R. F. 1964. *African game ranching*. Pergamon Press, Oxford, United Kingdom.
- Doebel, H. 1754. *Neueröffnete Jaeger Practica. Oder der wohlgeyebte und erfahrene Jaeger*, 2nd. ed. Leipzig, East Germany.
- Drabelle, D. 1985a. The national wildlife refuge system. Pages 150-179 in A. S. Eno and R. L. Di Silvestro, editors. *The Audubon wildlife report 1985*. National Audubon Society, New York, New York, USA.
- Drabelle, D. 1985b. Federal funding for wildlife conservation. Pages 266-279 in A. S. Eno and R. L. Di Silvestro, editors. *The*

- Audubon wildlife report 1985. National Audubon Society, New York, New York, USA.
- Draskovich, I. 1951. Rotwildhege. Roehrer Verlag, Innsbruck, Austria.
- Eggerling, F. K. von. 1983. Diezels Niederjagd, 23rd ed. Paul Parey, Hamburg, West Germany.
- Eno, A. S., and R. L. Di Silvestro, editors. 1985. Audubon wildlife report 1985. The National Audubon Society, New York, New York, USA.
- Ergert, E. B. 1980. Wittelsbacher Jagd. Deutsches Jagdmuseum, Munich, West Germany.
- Etling, K. 1985. Can science produce a race of super bucks? *Outdoor Life* (January):21.
- Filion, F. L., S. W. James, J. Ducharm, W. Pepper, R. Reid, P. Boxall, and D. Teillet. 1983. The importance of wildlife to Canadians. Environment Canada. Supply & Services, catalog no. CW66-62/1983E.
- Fergusson, D., and N. Fergusson 1983. Sacred cows at the public trough. Maverick Publications, Bend, Oregon, USA.
- Geist, V. 1985a. Game ranching: threat to wildlife conservation in North America. *Wildlife Society Bulletin* 13:594-598.
- Geist, V. 1985b. On Pleistocene bighorn sheep: some problems of adaptation, and relevance to days American megafauna. *Wildlife Society Bulletin* 13:351-359.
- Geist, V. 1986. Antlered harvest. *Harrowsmith* 70:13-17.
- Geist, V., and F. Walther, editors 1974. The behaviour of Ungulates and its relation to management. IUCN publication no. 24, new series, vols. 1 & 2. Morges, Switzerland.
- Hampton H. D. 1971. How the U.S. cavalry saved our national parks. Indiana University Press, Bloomington, Indiana, USA.
- Harrington, R. 1973. Hybridization among deer and its implication to conservation. *Institute of Forestry* 30:64-78.
- Harris, L. H. 1984. New Zealand. Pages 547-556 in L. K. Halls, editor. The white-tailed deer. Stackpole, Harrisburg, Pennsylvania, USA.
- Heck, L. 1956. Der Rothirsch. Paul Parey, Berlin, West Germany.
- Hewitt, C. G. 1921. The conservation of the wildlife of Canada. Charles Scribner's Sons, New York, New York, USA.
- Hirsch, J. 1981. To "unfrock the charlatans." *SAGE Race Relations Abstracts* 6(2):1-65.
- Hornaday, W. T. 1913. Our vanishing wild life. New York Zoological Society, New York; reprinted 1970, Arno Press, New York, New York, USA.
- Hughes, D. 1986. Long-term Korean market prospects poor. *The Deer Farmer* (July):33-35.
- Hudson, R., and J. G. Stelfox. 1983. Sound strategy (letter to the editor). *Western Canadian Outdoors* 7(4):11.
- Jacobs, J. 1984. Cities and Wealth of Nations. Random House, New York, New York, USA.
- Kahdren, P. 1983. Dying wilderness. *Western Canadian Outdoors* 7(4):2.
- Knight, R. R., and L. L. Eberhardt. 1984. Projected future abundance of Yellowstone grizzly bears. *Journal of Wildlife Management* 48:1434-1438.
- Koenig, O. 1970. Kultur und Verhaltensforschung. Deutscher Taschenbuch Verlag, Munich, West Germany.
- Kruchtenberg, L. L. 1987. An overview of wildlife privatization and access in Wyoming. *Proceedings of the Symposium on Privatization of Wildlife*, January 9-11, 1987. Wyoming Wildlife Federation, Casper, Wyoming, USA.
- Larson, W. E., F. J. Pierce, and R. H. Dowdy. 1983. The threat of soil erosion to long-term crop production. *Science* 219:458-465.
- Leopold, A. 1933. Game management. Charles Scribner's Sons, New York, New York, USA.
- Lowe, V. P. W. and A. S. Gardiner. 1975. Hybridization between red deer (*Cervus elaphus*) and sika deer (*C. nippon*) with particular reference to stocks in N.W. England. *Journal of Zoology London* 177:553-566.
- Lund, T. A. 1980. American Wildlife Law. University of California Press, Berkeley, California, USA.
- MacDonald, D. 1987. Hunting—an exercise in pluralistic democracy. *Wildlife Society Bulletin* 15:463-465.
- Massey, W. 1986a. The Lilybank safari. *The Deer Farmer* (January):12-13.
- Massey, W. 1986b. Escape! The crisis faced by Robbie and Barbara Oldeman. *The Deer Farmer* (September):6-10.
- Matthiessen, P. 1959. Wildlife in America. Viking Press, New York, New York, USA.
- McTaggart-Cowan, I., and C. J. Guiguet. 1965. The mammals of British Columbia, 3rd. ed. Provincial Museum, Victoria, British Columbia, Canada.
- Medwedjew, S. A. 1969. The rise and fall of T. D. Lysenko. Translated by I. M. Lerner. Columbia University Press, New York, New York, USA.
- Moav, R., T. Brody, and G. Hulata. 1978. Genetic improvement of wild fish populations. *Science* 201:1090-1094.
- Novakowski, N. S., and V. E. F. Solman. 1975. Potential of wildlife as a protein source. *Journal of Animal Science* 40(5):1016-1019.
- Nuesslein, F. 1983. Jagdkunde, 11th ed. BLV Verlagsgesellschaft, Munich, West Germany.
- Nygren, K. F. A. 1984. Finland. Pages 561-568 in L. K. Halls,

- editor. The white-tailed deer. Stackpole, Harrisburg, Pennsylvania, USA.
- Pedro, A. S., D. E. Brandy, J. H. Villachica, and J. J. Nicholaides. 1982. Amazon basin soils: management for continuous crop production. *Science* 216:821-827.
- Pimentel, D., P. A. Oltenacu, M. C. Nesheim, J. Krummel, M. S. Allen, and S. Chick. 1980. The potential for grass-fed livestock: resource constraints. *Science* 207:843-848.
- Plochmann R. 1979. Mensch und Wald. Pages 157-197 in H. Stern, editor. *Rettet den Wald*. Kindler Verlag, Munich, West Germany.
- Povilitis, T. 1985. A citizen's proposal to save the Yellowstone grizzly bear. *Naturalist* 36(2):23-31.
- Povilitis, T. 1986. Is grizzly bear policy in Yellowstone based on false assumptions? *Wildlife Society Bulletin* 14:88-90.
- Probst, G. F. 1737. Besonderes Gespræch von der Par-Force-Jagd. In K. Lindner, editor. *Monumenta Venatoria*. Verlag P. Parey, Hamburg, West Germany.
- Pruitt, W. O., Jr. 1985. Caribou, reindeer and snow. *The Explorer Journal* (March):30-35.
- Raesfeld, F. von. 1952. *Das Deutsche Waidwerk*, 7th ed. Paul Parey, Hamburg, West Germany.
- Ranhofer, C. 1893. The epicurean. Reprinted 1971, Dover Publications, New York, New York, USA.
- Rennie, N. 1986. Good insurance deals are available. *The Deer Farmer* (September):11-12.
- Roedel, J. 1971. Wenn die Hirsche roehren. Kosmos, Fraenckische Verlagshandlung, Stuttgart, West Germany.
- Roseborough, D. J. 1986. Wildlife as a cash crop? *Globe and Mail* (July 17):7A.
- Schaefer, E. 1982. Hegen und Ansprechen von Rehwild, 4th ed. BLV Verlagsgesellschaft, Munich, West Germany.
- Schmidt, J. L., and D. L. Gilbert, editors. 1980. *Big Game of North America*. Stackpole Books, Harrisburg, Pennsylvania, USA.
- Schroeder, W. 1986. Jagd 2000. *Die Pirsch* 38(11):773-777.
- Smith, R. C., and D. R. Witty. 1970; 1972. Conservation, resources and environment. An exposition and critical evaluation of the Commission of Conservation, Canada. *Plan Canada*, part 1, 11(1):55-71; part 2, 11(3):199-216.
- Soulé, M. E. 1986. Conservation biology and the "real world." Pages 1-18 in M. E. Soulé, editor. *Conservation biology*. Sinauer Associates, Sunderland, MA, USA.
- Stahl, D. 1979. *Wild, Lebendige Umwelt*. K. Alber, Freiburg/Munich, West Germany.
- Struzik, E. 1987. Don't fence them in. *Nature Canada* 16(2):15.
- Swenson, J. E. 1983. Free public hunting and the conservation of public wildlife resources. *Wildlife Society Bulletin* 8:75-87.
- Teer, J. G. 1974. Game ranching in Texas. Pages 893-899 in V. Geist and F. Walther, editors. IUCN publications no. 24, new series.
- Telfer, E. S., and G. W. Scotter. 1975. Potential for Game Ranching in Boreal Aspen Forest of Western Canada. *Journal of Range Management* 28(3):172-180.
- Ueckermann, E., and P. Hansen. 1983. *Das Damwild*, 2nd ed. P. Dary, Berlin, Germany.
- Veblen, T. 1899. The theory of the leisure class. Reprinted 1934, Modern Library, New York, New York, USA.
- Weber, M. 1985. Marine mammal protection. Pages 180-211 in A. S. Eno and R. L. Di Silvestro, editors. *The Audubon wildlife report 1985*. National Audubon Society, New York, New York, USA.
- White, R. J. 1987. *Big game ranching in the United States*. Wild Sheep and Goat International, Melissa, New Mexico, USA.
- Wiese, M. editor. 1986. *DJV Handbuch, Jagd 1986*. Deutscher Jagdschutz-Verband. Johannes-Henry-Str. 26, 5300 Bonn 1, West Germany.
- Wodzicki, K. A. 1950. Introduced mammals in New Zealand. Department of Science and Industry Research Bulletin No. 98. Wellington, New Zealand.
- Yerex, D. 1979. *Deer Farming in New Zealand*. Agricultural Promotion Association. Wellington, New Zealand.
- Zuckerman, Lord. 1980. Science advisers and scientific advisers. *Proceedings of the American Philosophical Society* 124(4):1-15.