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A Transition in Western Furbearer Policy: Management as a Non-Economic Resource

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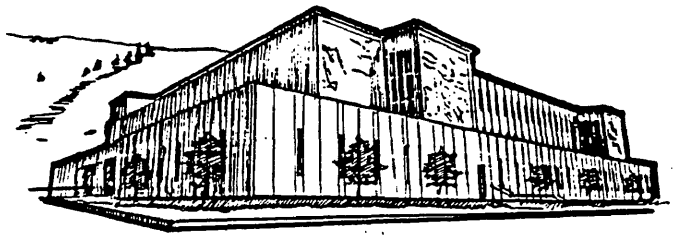

A Transition in Western Furbearer Policy: Management as a Non-Economic Resource

By

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I reviewed the commercial harvest and management history of furbearing mammals in North America, with special focus on the western United States. I combined a literature review with questionnaires sent to furbearer specialists across the western states. My goal was an investigation of the current status of furbearer management programs and the future role of non-consumptive values in furbearer management.

Questionnaire replies indicated that western state furbearer management programs suffer from inadequate funding (Mean = $146,000), staffing (Mean = 1.3 FTE), and public support. Trapping license revenues support approximately 40% of program costs. Most agencies maintain harvest oriented approaches to management. Few non-harvest oriented population survey methods are used; only one third of surveyed states had management plans in place.

Respondents posed grave concerns over future program administration in the absence of harvest. They predicted difficulties in generating revenues, increased animal damage control actions, and increased landowner complaints. They viewed their greatest future challenges as defining the role of harvest, locating funds, and maintaining habitat in the face of human development. While public interest from non-consumptive users is increasing, some respondents remained skeptical of, and occasionally hostile to, non-harvest adherents.

I advocate an increased appreciation of and response to the growing role of non-consumptive wildlife enthusiasts. I conclude that the current commodity orientation in furbearer management will eventually give way to a fundamentally nonharvest framework due to intensifying social and environmental forces. I encourage agency officials to closely examine their responsibilities to the general public, and to review, and where appropriate, assimilate the administrative and philosophical concepts found in existing nongame wildlife programs.

Nine policy recommendations are advanced. They include increased public education and opportunities for wildlife appreciative activities, broadened research, and an active search for new sources of revenue. Officials should develop and distribute management plans, embrace ecosystem management concepts, and increase interagency coordination. They must work for regulatory authority over all resident furbearing mammal species. Finally, I advocate the development of a broadened approach toward the impacts and suitability of harvest; this orientation will engender increased support from the environmental community and the general public.

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Introduction

This study was predicated upon several assumptions that the reader should be apprised of. First, and most importantly, it was initiated based on a strong, but difficult to quantify, hunch that public disapproval and governmental restrictions will gradually diminish the economic and sporting incentive to harvest furbearers. This view engendered concern that new methods of management and valuation would have to be promptly developed in response to these changes.

A second perception held at the outset by the author was that of limited agency attention to furbearer habitat and other needs. This arose from an initial literature review that suggested that most agency efforts were directed at harvest issues, with minimal focus on larger spatial or temporal threats.

Finally, it was based on the concern that a growing rift between "pro" and "anti" harvest adherents is developing, and that positions are becoming more intractable. The futility of effecting sound conservation strategies against the backdrop of a deteriorating sense of cooperation is great; regional examples of such gridlocked situations include the Montana Wilderness debate and the furor surrounding wolf reestablishment in Yellowstone National Park.

The term "furbearer" is a confusing one, with vague and often misused biological and commercial uses. While all mammals bear fur of some type, only about 100 species worldwide are subject to commercial harvest. Of these, nearly 30 species reside in North America (IAFWA, 1978). Adding to the confusing nomenclature is the fact that in some jurisdictions, many species of furbearing

mammals, for example the red fox (*Vulpes vulpes*), badger (*Taxidea taxus*), coyote (*Canis latrans*), weasel (*Mustela* spp.), and raccoon (*Procyon lotor*) in Montana, are legally classified not as furbearers, but as predators, nongame wildlife, or other designations (MDFW&P, 1992). Finally, several species present in the western United States which originally fit the general definition of furbearer, such as the grizzly bear (*Ursus arctos*), wolf (*Canis lupus*), and mountain lion (*Felis concolor*), are now variously managed as threatened or endangered species, or as game animals. As such, these species will be largely excluded from this report. Furbearer species resident in the 12 western states are listed in Table 1.

The conservation and management of furbearer populations has been an integral, if poorly understood, component of North American wildlife management since early in this century. As a specialty, it has largely focused on the production of a sustained yield of fur for commercial exploitation. In this respect, it is more closely related to fisheries science than other wildlife fields (Wolfe and Chapman, 1986). This commodity emphasis was an appropriate one during the developing years of wildlife studies. The fur trade had been an important factor in the settlement and economy of much of the continent for over 300 years (Trefethan, 1976). It remains, in some isolated regions of northern Canada, the most substantive industry available, as well as a significant food source, to local residents (Ray, 1986; ADF&G, 1992). Total Canadian harvest revenues were $600 million annually in the late 1980's (Barrett *et al.* 1988).

Table 1. Commercially harvested furbearing mammal species present in 12 western states (from Burt and Grossenheider, 1976)

Family	Species
Mustelidae	Marten - *Martes americana*
	Fisher - *Martes pennanti*
	Shorttail weasel - *Mustela erminea*
	Longtail weasel - *Mustela frenata*
	Least weasel - *Mustela rixosa*
	Mink - *Mustela vison*
	River otter - *Lutra canadensis*
	Wolverine - *Gulo gulo*
	Badger - *Taxidea taxus*
	Spotted skunk - *Spilogale putorius*
	Striped skunk - *Mephitis mephitis*
Canidae	Coyote - *Canis latrans*
	Red fox - *Vulpes vulpes*
	Arctic fox - *Alopex lagopus*
	Gray fox - *Urocyon cinereoargenteus*
Felidae	Lynx - *Lynx canadensis*
	Bobcat - *Lynx rufus*
Procyonidae	Raccoon - *Procyon lotor*
Castoridae	Beaver - *Castor canadensis*
Rodentia	Muskrat- *Ondatra zibethica*
Didelphiidae	Opossum - *Didelphis marsupialis*
Bassariscidae	Ringtail - *Bassariscus astutus*

The evolution of furbearer management has been predicated on annual harvest in order to generate population data, public support, and funding. During the twentieth century, furbearer management has effectively become equated with harvest

management. Because overharvest had been the major contributor to continent-wide furbearer declines in the 1800's, this emphasis has generally been a successful one. Populations of many species, such as beaver (*Castor canadensis*) and fur seal (*Callorhinus ursinus*) have rebounded under careful harvest strategies.

Throughout much of the twentieth century, furbearer managers worked in a relatively static technical and political environment. They worked mostly in anonymity, using long established procedures, and interfaced primarily with the trapping public.

The 1970's and 1980's brought new technologies, challenges, and public perceptions to the field of wildlife conservation. While harvests of many furbearers, as well as big game species, were at all time highs (Obbard *et al.* 1986), the growing environmental movement began to challenge the traditional approaches of wildlife professionals. Adding to the anti-trapping movement which had ebbed and flowed since the turn of the century (Gentile, 1987), new concerns, such as the management of "non-game" wildlife, threatened and endangered species, and preservation of biodiversity began to be raised by an increasingly knowledgeable and politically savvy public. In the 1990's, environmental organizations concerned with these issues continue to monitor, and increasingly, legally challenge, wildlife decision makers (NWF, 1991).

These forces, though often viewed by wildlife officials in an adversarial fashion, do not fundamentally threaten the established norms and methods of wildlife management. However, other societal trends suggest that furbearer management, a field which even its

proponents state "has not changed significantly since the turn of the century" (Johnson and Phelps, 1986), may soon undergo appreciable review and restructuring. The reasons for this are two-fold.

The trapping industry, and by extension, furbearer management, faces an uncertain future. While trapping efforts and revenues have always varied dramatically with fur prices, and in fact grew substantially during the high pelt price years of the 1970's, increasing costs of fuel and equipment, as well as demographic changes such as an aging, increasingly urban, population, suggest that the trapping public may gradually decrease over the coming decades. Though recreational trapping effort is currently strong in the United States, Todd and Boggess (1986) acknowledged that full-time trapping seems to be declining.

The major catalyst for change in furbearer policy is that of changing public perceptions. Disapproval with fur trapping predates the burgeoning "animal welfare" movement which became highly visible in the 1980's. In fact, as early as the late 1970's, over 70% of Americans surveyed were opposed to the use of the leghold trap (Kellert, 1978). While the lack of more recent survey data may cause this trend to be viewed as merely a transient pendulum swing of public opinion, it can equally be argued that a broad, permanent alteration in society's approach to consumptive use of furbearing mammals is underway. Perhaps the strongest recent evidence that the fur industry faces significant downsizing comes from the 1991 European Economic Community decision to initiate severe restrictions on the importation of furs taken with leghold traps after 1995 (CEC, 1991).

The professional wildlife literature is well stocked with information on furbearer biology and local harvest-oriented management techniques. However, little policy resolution, except for strongly one-sided approaches to the trapping/anti-trapping debate, has been forthcoming. Nor has effective strategic planning been adequately performed by most responsible agencies. The on-going shift in public attitudes towards wildlife, combined with the potential decline of the fur industry, (and hence the loss of the primary "advocates" for effective furbearer management), especially in the western United States, necessitates a reexamination of the fundamental concepts of furbearer policy and management. Future management decisions, perhaps within the next decade, may be largely based on non-consumptive values. In fact, some jurisdictions already focus management concern on aesthetic rather than economic or commercial values (Carrier, 1990).

Maintenance of healthy furbearer populations has always been a challenging task. Population surveys of solitary, isolated animals such as the wolverine (*Gulo gulo*), fisher (*Martes pennanti*), and lynx (*Lynx canadensis*) are difficult and expensive to conduct. Additionally, populations of several species such as lynx and fisher fluctuate dramatically due to prey availability (Barley *et al.* 1986). Most population data have historically been gained through harvest analysis. These data will no longer be available if the trapping industry declines.

The purpose of my report is to examine current approaches and future options in furbearer management, particularly those that would be effective in a potential non-harvest setting. I take neither

a pro-harvest nor anti-harvest stance; rather I examine the following question: How best can furbearing mammals in the western states be managed as a non-economic resource? My goal is not a critique of current agency procedures, but a search for methods that might assure that animal populations remain healthy in the face of increasing non-harvest threats and which might more accurately reflect the public's desires. I hope to spark new ideas and encourage new approaches to the stewardship of the western states' richly varied furbearer resource, and provide a series of recommendations that will help build consensus and cooperation between the often polarized parties interested in the continued survival of this varied group of mammals.

Chapter 1:

Historical Background

The Fur Trade in North America

The commercial trade in furbearing mammals by Europeans in North America began at the turn of the sixteenth century as a sideline to the northeastern cod fishery. The market for pelts, especially those of the beaver, grew rapidly by 1550 with increasing European demand for felt hats (Ray, 1987). The fur trade became a free standing industry by the end of the sixteenth century, and was to be a prime component of the North American economy for over two hundred years.

The early fur trade was conducted against the backdrop of a seemingly limitless resource base and under complex and ever changing political climates. Used by the colonial powers for both political as well as economic ends (Eccles, 1969, in Ray, 1986), it was deeply entrenched in French-British (and later British-American) rivalries and intrigue, and was cultivated as a link with potential Native American military allies.

The early fur trade was largely confined to the eastern and northeastern portions of the continent. Montreal-based traders, following the tradition of the French, long the most aggressive seekers of new sources of fur, first ventured into what is now the western United States and Canadian provinces, trading on the Missouri by 1715 and purchasing furs from the Spanish in Sante Fe by 1739. Alexander Mackenzie brought the industry to the Pacific coast in 1793.

Lewis and Clark's expedition up the Missouri and to the Pacific, conducted one year after the Louisiana Purchase of 1803, brought back reports of extensive fur resources in the western mountains and valleys. This information, coupled with the already established trade in sea otter (*Enhydra lutris*) pelts which had been initiated on the northwestern coast by Captain James Cook a quarter century before, led to the growth of a highly competitive western fur trade. Again complicated by ever changing political and military rivalries, the trade began with fixed posts such as Fort Astoria at the mouth of the Columbia River. By the 1820's, parties of up to 100 men scoured virtually all of the waterways of the Rocky Mountains for fur (Trefethen, 1975).

Not all overharvest was accidental during this period. The North West Company, a British entity operating from Fort George on the Columbia River, intentionally decimated the fur resources of the Snake River region in order to create a "fur desert" that would block expansion of American fur traders into the Oregon country. For the first time in North America, intense harvest pressure began to have a serious impact on several species. By 1820, the sea otter was driven to economic extinction by combined Russian, British and American trade. Beaver populations were severely depleted throughout the West by 1840, and probably avoided actual extinction only due to a combination of decreased demand brought about by market competition from South American nutria (*Myocastor coypus*), a European fashion shift to silk hats, and fur industry reorientation towards trade in buffalo (*Bison bison*) robes.

The collapse of the beaver trade spelled the demise of the "Mountain Men" of the Rockies, who had penetrated every corner of the region in the years since Lewis and Clark. The last fur rendezvous, an annual gathering held to sell and trade furs, was held in the Wind River Mountains in Wyoming in 1838 (Trefethen, 1975). The fur industry in North America did not, however, disappear in ensuing years. In fact, changing fashions caused a growth in the industry throughout the nineteenth century. The trade initially targeted raccoon, skunk (*Mephitis mephitis*), and mink (*Mustela vison*) in the central states; mink exports to Britain increased tenfold between 1860 and 1880 (Ray, 1986). The latter half of the eighteenth century also witnessed the discovery, boom, and collapse due to overexploitation of the Pribilof Islands fur seal industry. The Alaskan fur trade, which had began in the mid-1700's with Russian exploitation of native Aleuts and their virtual enslavement in the pursuit of sea otter, continually expanded into the interior, and by 1847, encountered Hudson's Bay Company competition at Fort Yukon in eastern Alaska. Following the Alaska Purchase of 1867, increased steamboat transportation and non-native population growth spurred by the discovery of gold caused a continued growth of fur harvest effort throughout Alaska, which expanded until the early twentieth century (Melchior, 1986).

Trapping continued to be a substantial North American industry throughout the twentieth century. Now often a recreational as well as commercial activity, harvest records indicate that total take of many species, such as beaver and fisher, was higher in the 1970's than during any previous time frame (Obbard *et al.* 1986).

Early Management by Commercial Interests

The idea of actively managing furbearer harvest in North America predated the groundswell of public concern for declining wildlife populations brought about by the demise of popular species such as the buffalo and passenger pigeon (*Ectopistes migratorius*) during the late nineteenth and early twentieth centuries. As early as 1821, George Simpson, the North American director of the Hudson's Bay Company, established several conservation policies to protect beaver populations in interior Canada. These included the designation of trading districts and harvest quotas, the establishment of open and closed trapping seasons, and the limited designation of beaver preserves. Trading posts were also moved away from areas of low beaver populations; this encouraged local Native Americans, who had become dependent on manufactured goods, to follow the traders (Ray, 1976). While opposition to these measures was strong, beaver populations did begin to rebound in the Churchill River/James Bay region by the 1840's.

Few other examples of furbearer conservation are evident during what could be termed the furbearer mining period of the nineteenth century. The growing conservation movement of the late 1800's was largely focused on big game, avifauna, and forest protection. While the creation of nominally protected areas such as Yellowstone National Park began in 1872, little enforcement or even basic biological survey was conducted. In fact, what little attention that was directed towards furbearers in the western states in the nineteenth century mostly took the form of bounties, poisoning, and

extirpation of such carnivorous native furbearers as the wolf, mountain lion and grizzly.

Origins of Governmental Furbearer Management

Furbearing mammals gradually began to benefit from the fledgling growth of state and federal wildlife programs in the late 1800's. The first state fish and game administration in the nation was established in Massachusetts in 1865 (DiStefano, 1986); paid game wardens had first begun duty in Maine in 1852 (Trefethan, 1975). Institutionalization of wildlife programs quickly moved west with the retreating frontier. For example, Montana enacted laws to protect the beaver immediately upon gaining statehood in 1889, and established a Board of Game Commissioners in 1895 (MDFW&P, 1991). This body delineated Montana's first trapping season, which ran from October 1 to April 1.

The emergence of the science of wildlife management and its subdivision, furbearer management, can best be dated to the publication of the seminal text, Game Management, in 1933, in which Aldo Leopold defined wildlife management as "the art of making land produce sustained annual crops of wild game for recreational use" (Leopold, 1933:3). The term "game management" was an appropriate one during the first fifty years of the discipline. Most monies and energies were directed at the replenishment or introduction of those mammals and fish most desired by sport hunters and fishers. This process was in fact relatively successful. Many large mammals, especially highly prized species such as white-tailed deer (*Odocoileus virginianus*), elk (*Cervus elaphus*), and

pronghorn (*Antilocapra americana*) rebounded under controlled harvests and habitat preservation and enhancement.

Guiding Principles of Furbearer Management

Progress has been made in the understanding of furbearer habitat needs, reproductive biology, population estimation techniques, and the refinement of season setting since the early years of scientific wildlife management. A number of fundamental principles which transfer in varying degrees between species govern most current management activities.

Furbearers can be managed either for presentation, control, or sustained yield (Wolfe and Chapman, 1986). Management programs generally aim to monitor species' biological status to maintain viable populations, minimize animal damage, and optimize harvest for recreational and commercial purposes (Proulx and Barrett, 1991). Furbearer management, perhaps more than other specialties of wildlife management, has traditionally focused on maximum sustained yield. This principle, defined as "the greatest harvest that can be taken from a self-regenerating stock of animals year after year while still maintaining a constant average size of the stock," (Holt and Talbot, 1978), assumes that furbearer populations are self-regulating and respond to human induced mortality in a density dependent fashion. That is, each population has an intrinsic surplus which can be removed by harvest. The additional resources (food, cover, spatial characteristics, etc.) thus freed up for the surviving individuals allow either an increase in the ensuing birth rate or a decrease in mortality to restore the population to its previous level

(Wolfe and Chapman, 1986; MDFW&P, 1991). However, Quinn and Parker (1986) questioned whether the "unsophisticated" state of management of some species, in their example lynx, generated adequate data for sustained yield management.

A necessary component of information needed by furbearer biologists to maintain healthy furbearer populations is the concerned species' response to harvest. At its most fundamental level, harvest mortality response can range across a continuum ranging from compensatory to additive. Mortality is said to be compensatory if losses due to one factor, be it human or non-human caused, offset losses by another factor. For example, Errington (1961) concluded that an annual surplus of muskrats often occurs which, if not harvested, will succumb to other forms of mortality such as disease or starvation. This early research has been supported by recent statistical studies (Clark, 1990). Conversely, additive mortality exists when human caused losses are in addition to naturally occurring mortalities.

While the level of compensation of various wildlife populations has not often been experimentally evaluated due to a lack of direct manipulation of the harvest rate (Clark, 1987), it is generally postulated that r-selected species (those which exhibit high fecundity, early sexual maturity, and short life spans) such as muskrats, hares (*Lepus* spp.), and other herbivores, exhibit compensatory mortality, while k-selected species (those which exhibit low fecundity, increased survival, and long life spans) such as wolverine, lynx, and fisher exhibit additive mortality (Wolfe and

Chapman, 1986). Mortality in intermediate sized, generalist species such as raccoon may be age class specific (Clark, 1990).

Mortality characteristics are not always constant between populations or between time periods. Lynx trapping mortality was judged additive to natural mortality both in Alberta (Brand and Keith, 1979) and Alaska's Kenai Peninsula (Bailey *et al.* 1986). Melquist and Dronkert (1986) also postulated that river otter (*Lutra canadensis*) populations do not readily compensate for trapping-induced losses. Todd (1981) suggested that the biological effects of harvest of many furbearers were largely untested, and that trapping could be a "dominant depressive element" of some furbearer populations.

Some forest dwelling furbearers, such as fisher and wolverine, exhibit characteristics (low fecundity, increased survival, and long generation times) which suggest their propensity towards additive mortality. It should be noted, however, that additive mortality alone does not necessarily trigger long-term population declines. An actual prediction of population responses of any species requires knowledge of other factors, such as immigration and fecundity. (Douglas and Strickland, 1986; Hash, 1986).

Several furbearer species exhibit population cycles which may confound population modeling attempts. Keith (1974) concluded that the 10 year cycle of the lynx and snowshoe hare (*Lepus americanus*) in the boreal forests could be attributed to an interaction between vegetation, herbivores, and their predators. Fisher populations in Canada also exhibit 10 year cycles correlated with snowshoe hare

density (Bulmer, 1974); populations in Maine (Coulter, 1966) apparently do not.

Evolution of Furbearer Management

The evolution of furbearer management has differed substantially from other subdivisions of wildlife studies. Other disciplines, such as big game and upland game management, have been clearly identified by their associated fauna and by their highly visible, well organized human consumer groups for some decades. This clarity of interested public and mission focus has fostered high visibility, strong public interest, and ample funding options. None of this can be said for the subdiscipline of furbearer management. Often of interest only to the trapping public, furbearer management has held little public appeal or agency support. Fritzell and Johnson (1982) stated that the "neotany" of the field of furbearer management was due to a combination of four factors: economic, biological, bio-professional, and slow development. At first glance, the easily recognized economic values of commercially sold furbearers might draw the envy of those scientists tasked with appraising the values of other wildlife, such as non-game or endangered species. However, furbearer managers have struggled with constant variation in fur market prices, which, brought about by the whims of fashion, have led to rapid alterations in human consumptive efforts.

The effective management of furbearers has been hindered by the wide breadth of designated species and their varied biological needs. While waterfowl managers may focus on related species

which use relatively similar habitat types, furbearer managers are often in the unenviable position of maintaining expertise on twenty or more resident species, ranging from aquatic herbivores such as the muskrat (*Ondatra zibethicus*), to midsized terrestrial omnivores such as opossum (*Didelphis virginianus*) and raccoon, to wide ranging carnivores such as lynx and wolverine. The "bioprofessional" enigma of furbearer management revolves around the conflicts, both with the public and within the wildlife management community, which robust furbearer populations may engender. Strong beaver populations may cause increased workloads for conservation officers and animal damage control agents tasked with responding to public complaints. Dense red fox or coyote numbers may hinder waterfowl biologists' attempts to minimize nest predation. These concerns, combined with frequent public fear and misunderstanding of the ecological roles of carnivores, has sometimes limited support for furbearer enhancement or reintroduction activities both within agencies and by the public. Fritzell and Johnson also believed that, in 1982, furbearer management had not reached its full potential because it had traditionally lacked specific agency management objectives, adequate funding, organized communication between managers, and management-oriented university research.

Since furbearer management has focused on the control of human harvest, minimal attention has been placed on habitat requirements or the mitigation of habitat loss (Allen, 1986). While the practice of snag management in timber harvesting and the control of grazing and other riparian/wetland protection activities have been recognized as beneficial to mid-sized forest furbearers

and wetland herbivores, fewer data have been gathered on the needs of wide-ranging carnivores.

Confounding Factors in Furbearer Management

Maintenance of healthy furbearer populations is challenged by two major factors; one economic and the other biological. The first is extreme variability in harvest effort and fur take. Trapper effort throughout North America is strongly correlated with fur prices. Many of the approximately 450,000 (Taylor, 1978) United States and 100,000 (Todd and Boggess, 1986) Canadian trappers turn to other income generating activities when prices are low. Montana's trapping license sales declined from a statewide 1977-87 average of 2500 to 831 in 1990-91 with respective fur revenue declines from $1.9 million to $142,000 (MDFW&P, 1991); fur prices were significantly depressed in 1990.

The second difficulty inherent to furbearer management is the great effort and expense required to conduct population estimates of many species. In general, wildlife population data are gathered in either one or two major methods: censusing or population indexing (Clark and Andrews, 1982). A census is an attempt to estimate population density. It may involve a complete count (though this has rarely been possible for low density, forest dwelling furbearers such as lynx, fisher and wolverine) or a density estimate, as in mark-recapture experiments. Indexes, which are more widely used, attempt to measure relative changes in population size over time. These less costly procedures include harvest surveys, track or den counts, or human observation trends.

The difficulties involved in monitoring furbearer populations cannot be underestimated. Analysis of total trapline captures, which have long been the primary indexing method used by many agencies, has been criticized on socioeconomic grounds (Gilpin, 1973, in Smith *et al.* 1984). A comparison between capture-recapture and removal methods (Smith *et al.* 1984) indicated that total number of opossum, raccoon, and gray fox (*Urocyon cinereoargenteus*) captured annually did not reflect actual trends in population size. Mark-recapture procedures can provide high quality, but non cost-effective density estimates for local populations. However, a very high proportion of the studied population must be marked. While they can be used for a number of species, including fisher, marten and lynx, Leptich (1990) found them unsuitable for statewide population estimates.

A variety of indices have been devised to assess furbearer trends. Road mortality samples have been used for relatively abundant species such as raccoon, opossum, and striped skunk. These indices lack sufficient sensitivity for short-term management decisions (Clark and Andrews, 1982). Other indices used in rural or agricultural regions include night lighting samples (raccoon, opossum), rural resident observations (coyote, red fox, gray fox), and the solicitation of subjective impressions from area biologists and conservation officers (many species). The placement of multi-station scent post transects, first used in the early 1970's, is increasingly used for badgers and canids; data interpretation from this technique is confounded by numerous variables (Clark and Andrews, 1982).

Aerial surveys have proved effective for estimating both population trends and current range occupation of species inhabiting

open habitats, be they upland or wetland. Colony or cache counts are used for beaver (Payne, 1981). These counts are biased low when compared to ground counts, and are insensitive to moderate changes of population size (< 50%), due to exclusion of bank-dwelling individuals and other factors (Clark and Andrews, 1982). Aerial counts of muskrat houses, which are conducted after light snowfall, are considered moderately successful, though differentiation of houses from feeding platforms may be difficult. In prairie terrain, aerial surveys of fox dens are judged to be effective means of population assessment (Clark and Andrews, 1982).

A common index used in the northern and mountain states is track counts. It is used for fisher (Coulter, 1966), wolverine (Golden, 1986), bobcat (Rolley, 1986) and lynx (Quinn and Parker, 1986), among other species. Counts are completed after fresh snowfall, and may be done by snowmobile or from the air.

Chapter 2:

Methods and Results

I used two major information sources. The first source was general information on furbearer management program current status, goals, and on-going activities which was gathered through a mailing sent to the wildlife divisions of the fifty state fish and wildlife agencies, as well as their counterparts in Canada (Appendix I). The second source was a series of three similar questionnaires which queried furbearer program administration, public information, population management, non-economic values, and program goals.

One questionnaire (Appendix II) was sent to the furbearer program manager in each of the twelve western states (Appendix III). These individuals had been identified through prior telephone contact with each state's wildlife division. The second questionnaire (Appendix IV) was sent to the director of the wildlife program at a state university in each of the same states (Appendix V). An accompanying letter requested that the questionnaire be forwarded to that faculty member who was most involved in furbearer management or research. Respondents were encouraged to forward any data on furbearer management that clarified or expanded upon their expressed views. The final questionnaire (Appendix VI) was sent to the four U.S. Fish and Wildlife Service (Wildlife Enhancement) and seven U.S. Forest Service (Director, Wildlife Programs) regional offices (Appendix VII) in the western U.S.

Thirty states (60%) and eight provinces/territories (66%) responded to the general information requests. Many supplied annual reports, harvest summaries, or species management plans.

Several agency officials wrote extensive, and very useful, personal replies.

Ten state furbearer managers (83%), seven university faculty members (58%), three USFS officials (43%), and one USFWS official (25%) responded to the questionnaires.

The goal of the survey was not a statistical analysis of responses, but rather an opportunity for resource professionals to express views in a non-threatening forum. Their views on furbearer policy, management, and research needs were primarily reviewed in a qualitative fashion. Several respondents are cited in this report.

Results

The current status of furbearer management programs in the western states can be gauged through cautious interpretation of questionnaire replies. Montana is a typical example. The Montana Department of Fish, Wildlife and Parks is charged with the maintenance of furbearer populations. The wide variety of native species legally classified as furbearers under Montana law include lynx, otter, fisher, beaver, wolverine, marten (*Martes americana*), and bobcat (*Lynx rufus*). The Department's furbearer management program includes 1.5 staff members and cooperating university researchers (Hash, 1991). Season setting is implemented through collection of recommendations from district wildlife managers, regional review, headquarters approval, and public hearings. Program funding, which originates from license revenues and federally distributed (Pittmann-Robertson) monies, was approximately $49,000 in 1992. Primary management activities

include annual trapper mail surveys and review of houndsmen log books. Limited non-harvest based population estimation methodologies are currently in use. Winter track surveys are conducted for lynx, bobcat, wolverine, and fisher, and aerial beaver cache surveys are flown. Species specific management plans are not in effect though plan preparation is currently in progress. No agency programs which suggest a trend towards non-economic management of furbearers were listed by the agency survey recipient.

State Agency Responses

Nine state agencies surveyed (90%) had furbearer management staffs of two or less. Two states had no dedicated staff positions. Mean staff size was 1.3 full time equivalents (FTE). Eight agencies listed annual budgets for management at $150,000 or less. Alaska, with three full-time staff members and a $340,000 annual budget, was an expected exception. Wyoming also listed an annual budget of $350,000. Mean agency budget was $146,500.

Program funding sources listed by state agency respondents included license sales, Pittmann-Robertson monies, and the sale of permits, tags, and seals. The percent of program costs covered by license revenues averaged 40%, and ranged from 0 to 100%. Several respondents, however, indicated that license revenues were not specifically earmarked for any program.

State agency questionnaire respondents indicated that some non-harvest oriented population survey techniques were currently utilized. In Colorado, hair snags and track surveys have been conducted for lynx and wolverine. Track surveys are conducted for

lynx and marten in Washington and fisher and marten in Oregon, and Alaska has implemented density estimates for wolverine and wolf as well as beaver cache surveys.

Six agency questionnaire respondents listed one or more species in their jurisdictions which are currently designated as varmints or predators, or over which their agency held no statutory authority. Affected species included coyote, skunk, red fox, weasel, badger, wolf, raccoon, and ringtail.

Responses indicated that species-specific management plans were in effect in Arizona, Utah and Alaska in early 1992. The Alaska respondent indicated that plans were not prepared in great detail. Four other jurisdictions stated that plans were currently being prepared. Responses from the remaining states indicated that plan implementation was hindered by low staffing and funding levels.

Fifty percent of state respondents reported that public interest in furbearers was increasing; the remaining fifty percent indicated that interest was stable. One respondent offered the interesting perspective that "net" interest was unchanged over time due to an increase in concern for furbearers by groups that were not willing to provide funding to investigate problems, which the respondent termed "useless" interest, and a decrease in concern by conventional users such as trappers due to sociological and demographic changes.

All state agency respondents indicated that public education programs in their departments included material on furbearers.

Respondents in four states (40%) described current actions which indicate a trend towards non-economic management in their agencies. Oregon has conducted non-lethal damage control actions,

and harvest regulations in Arizona were stated to be so restrictive as to preclude all but the most dedicated trapper. Utah's regulatory structure is now designed for the recreational, not professional trapper. Even in Alaska, some lands adjacent to urban areas have been closed to harvest due to conflicts with non-consumptive users.

Respondents cited numerous program changes which would be required to manage furbearers in a non-harvest scenario. These included the development of new sources of management revenues, increased funding for animal damage control, including non-lethal methods, and changes in state laws. One respondent indicated that sterilization had been tried to control nuisance beaver in his jurisdiction, but that that approach had been deemed not feasible and that lethal control had been reinstituted. Difficulties inherent to these changes included increased damage control actions, potential degradation of wetlands, increased landowner and homeowner conflicts, increased cougar/human interactions, and, in Alaska, the loss of a "way of life".

The commodity pressures incumbent upon state officials were evident in their perceptions of future challenges. Four respondents expressed greatest concern over their agencies' ability to maintain harvest as part of furbearer management. One respondent also listed the increasing problem of damage control, and the difficulty of maintaining habitat integrity in areas of "explosive" human growth. A final respondent was most troubled by the task of determining population numbers and detecting changes in population size.

Academic Responses

Most academic respondents (85%) indicated that furbearer management was not given adequate emphasis by the responsible agency in their states. Most listed low funding levels as the factor which limited management emphasis. One respondent did not critique funding but stated that a more comprehensive perspective was needed on the sustainable use of furbearers relative to extraction levels.

Academic respondents pointed out that some management plans were in effect in addition to those developed by state agencies, mainly those pertaining to rare species or those maintained relative to Convention on International Trade in Endangered Species (CITES) provisions. One respondent emphasized that population surveys of all native species were technically feasible but were limited by funding.

The overwhelming majority of academic respondents (87%) detected increased public interest in furbearers in their regions. All respondents were aware of public information activities conducted by the state agency in their locality. One respondent, however, indicated that most information and education materials were directed towards trappers only. Ideas advanced to engender increased public interest in furbearer biology and conservation included the development of more effective school programs, including "hands-on" programs such as the wolf boxes used in the Northern Rockies, articles in agency periodicals and special publications such as Alaska Department of Fish and Game's Alaska Wildlife Notebook series. Other suggestions included the integration

of furbearer interpretation into related agency programs such as urban wildlife, wetlands preservation and education, and watchable wildlife.

Academic respondents consistently identified two general areas in need of added research: population trend indices and habitat needs. All respondents who specifically answered the question indicated that research funding was more difficult to obtain for furbearers than for big game or waterfowl species.

Academic respondents offered several suggestions for future non-harvest management. These included increased attention to forest management at stand and landscape scales, added protection of late seral stage communities, and investigation of ways to tap funds from non-consumptive users.

When queried about the greatest challenge facing furbearer managers in the next decade, academic survey respondents expressed frustration in acquiring funds to study furbearers and their response to human land uses, pondered the eventual role of harvest in management programs, and discussed the difficulty of maintaining an objective position in the struggle between harvest and non-harvest oriented publics. One respondent summed up the challenge as one of integrating biology, politics, and management.

USFS Responses

Responses from the U.S. Forest Service mirrored that agency's mandate to manage habitat, rather than harvest. The Northern Region of USFS uses habitat suitability guidelines for marten and is preparing similar plans for lynx, fisher, wolverine, and bobcat. Other

USFS regions rely on general standards contained in forest plans and environmental impact documents. The marten is also designated as a management indicator species in nine of thirteen forests in the Northern Region.

USFS respondents were unsure of the eventual role of harvest in furbearer management, but focussed their comments on the need for information on habitat requirements and species associations as well as increased public awareness of the role of furbearers in ecosystems, demonstrating that agency's position as an extensive land manager.

USFWS Response

The U.S. Fish and Wildlife Service prepares extensive management plans for recovery of endangered species; other management actions are delegated to individual refuge managers. The respondent expressed special concern over increased waterfowl nest predation in a non-harvest setting, and viewed non-lethal control as the major challenge to his agency in the coming years.

Chapter 3:

Discussion

The questionnaire responses highlighted in the previous chapter suggest that furbearer management programs, while poorly funded and staffed, are refining techniques to maintain and enhance populations. However, the normal pace of wildlife administrative change may be too slow to successfully adapt to several looming sociological and environmental trends.

These forces, which threaten both the management tradition and the resource itself, are the prime motivations for the policy recommendations which follow (Chapter 4). The first trend, one which furbearer biologists all too often underestimate or ridicule, is rising anti-harvest sentiment.

Changing Perceptions toward Wildlife Harvest

The debate over the ethics and biological necessity of trapping furbearers has existed in the United States since the turn of the century. Since that time, over 450 anti-trapping bills have been introduced in state legislatures or in the U.S. Congress (Gentile, 1987). Less than one percent of these bills were actually enacted, however, partial or statewide bans, mostly on leghold traps, were in effect in seven states in 1987 (Table 2). Additionally, 90 local governments banned some form of trapping between 1968 and 1982 (Gentile, 1987).

Public opposition to commercial wildlife harvest has resulted in several recent harvest restrictions. Eastern Canada take of harp seals (*Phoca groenlandicus*) ended in the mid-1980's due to a European

Table 2. Statewide trapping bans in effect in the United States, 1986 (Gentile, 1987).

State	Year Enacted	Purpose
MA	1969	Quick-kill or livetrap only
FL	1973	Leghold trapping banned
TN	1975	Leghold trapping banned (except water sets)
SC	1976	Leghold trapping restricted
CT	1977	Leghold trapping restricted
RI	1977	Steel jawed trap banned
NJ	1986	Leghold trapping banned

Economic Community import prohibition (Novak, 1986). A much more extensive prohibition, one which would prohibit the importation of furs originating in countries which allow leghold trapping, is scheduled for implementation by the EEC in 1995. This ban would restrict U.S. export of twelve species, including lynx, fisher, marten, and beaver (CEC, 1991).

Tremendous effort has been exerted by wildlife professionals in hopes of negating anti-trapping sentiment. Deems and Pursley (IAFWA, 1978) implied that the Fur Resources Committee of the International Association of Fish and Wildlife Agencies was created mainly to counter trapping opponents. Payne (1980) and Todd (1981) argued for trapping for reasons of economics, biology, and environmental protection. Extensive research into "humane trapping" technologies such as quick-kill or box traps has taken place in Canada since the 1950's, mostly in response to anti-trapping campaigns. Canadian researchers have criticized U.S. trappers' organizations and agencies for their lack of similar research and for

their "uncompromising defensive position in the face of the anti-trapping movement" (Barrett *et al.* 1988).

These minimally effective efforts, as well as more combative stances taken by trappers' associations and the sporting press, have done little to diminish anti-trapping sentiment. This perceived failure has resulted in increasingly strident actions by wildlife researchers, such as the portrayal of anti-harvest organizations as being merely fronts for improper fund raising (Martin, 1982, in Novak, 1986) or avenues for personal gain (Heake, 1985, in Novak, 1986). Equally counterproductive is increasing agency abuse of the environmental review process, such as the expenditure of $1.6 million by the Montana Department of Fish, Wildlife and Parks to prepare a wildlife management Environmental Impact Statement (EIS). While this process is mandated by the Montana Constitution, there are indications that some agency officials view the EIS not as an unbiased analysis of human impacts to wildlife populations, but rather as the preparation of a defense against future anti-harvest litigation (Missoulian, 1991).

These actions suggest that the wildlife profession has not kept pace with changing social values. While the actively anti-trapping public is small but growing, the trapping constituency is diminishing. Kellert (1981) found that only 0.7% of the U.S. public trapped. It seems likely that the increasing urbanization of the population will shrink the trapping public over time. Additionally, urban dwellers tend to take less utilitarian views of wildlife resources (Kellert, 1976). Wagner (1989) argued that the field had failed to "recognize

the full range and weight of social values" and "should have been more oriented to non-consumptive values..."

The concept of "non-consumptive" use of furbearers was historically rejected by many professionals. Kelley (1978) believed that it would "never...come to the point where it would be desirable to forego a regulated (furbearer) harvest". Deems and Pursley (1978) cautioned that "the restriction or curtailment of scientific management of furbearers, as well as other wildlife populations, would result in serious deterioration of habitat quality and destruction of the 'conservation ethic.'" While the difficulties inherent to decreased harvest (increased damage complaints of herbivores such as beaver and skunk, as well as possible impacts on waterfowl and upland game by foxes, etc.) continue to be emphasized, many professionals recognize that a change in the focus of furbearer and other wildlife management is needed. As early as 1974, Shaw found that aesthetic and existence values were replacing consumption as the most important uses of wildlife. The 1980 National Survey of Fishing, Hunting and Wildlife-Associated Recreation demonstrated that nearly 55% of all Americans 16 years old or older participated in some form of non-consumptive wildlife use (Shaw and Mangun, 1984). This use was spread across all age categories, and, unlike hunting or trapping, was nearly equivalently conducted by members of both sexes.

Overall expenditures for trips taken in the U.S. to participate in non-consumptive wildlife activities was placed at $4 billion in 1980 (Shaw and Mangun, 1984), and $4.4 billion in 1985 (Hay, 1988). Total expenditures for non-consumptive wildlife related recreation

was placed at $14.3 billion in 1985 (Hay, 1988). More recently, Melquist (1990) pointed out that with trapping having become largely a recreational activity, the "conservation-consumption" emphasis would necessarily be joined by a growing "conservation-preservation"ethic. Carrier (1990) stated that officials cognizant of "the real world" would recognize that it was a mistake to believe that "good science and education will lead to public acceptance of fur trapping."

Inadequate Appreciation of the Non-consumptive Public

Contributors to both the professional wildlife literature and the sporting press have been quick to denigrate the potential financial contributions of non-consumptive users. They have stressed, correctly, that most revenues for state wildlife programs have historically been generated from license sales, taxes on sporting equipment, and monies raised through private, consumptive-oriented conservation organizations, such as Ducks Unlimited or the Rocky Mountain Elk Foundation. However, they have incorrectly tended to categorize the non-consumptive public as birdwatching "little old ladies in tennis shoes" who are their natural antagonists. These so-called "myths of the non-consumptive user" (Lyons, 1982) are easily debunked. The 1980 survey clarified that nonconsumptive users focused on a variety of wildlife types, including species currently classified as game or furbearers, and were neither predominantly female nor old (Shaw and Mangun, 1984). Additionally, their financial support for wildlife is ill-measured by contributions through typical consumptive routes.

Seventy-three percent of the respondents to one survey (Shaw and King, 1980) contributed to at least two private conservation organizations, and 54 percent contributed to three or more such groups. Nearly half of the survey participants spent over $1000 on equipment specifically purchased for wildlife appreciation; household costs for wildlife appreciation trips averaged $580. This high level of expenditure for non-consumptive use of wildlife demonstrates the growing value of these activities. Future furbearer management and research programs would benefit from a revenue source linked to the purchase of equipment associated with wildlife viewing.

Non-consumptive Values

What exactly are the "non-consumptive" values or uses of furbearers? Defined as those wildlife-associated activities that do not involve the removal or intended removal of animals from their natural habitat (Shaw and Mangun, 1984), the non-consumptive values of wildlife are increasingly acknowledged by resource economists as well as wildlife enthusiasts. They may be of a sporting, biological, economic, or aesthetic nature. Several examples common to the Midwest and which have easily measurable economic benefits, strongly mirror consumptive traditions. These include running seasons, in which hounds pursue red and gray foxes without killing them, and "Night Hunt" events, which are competitive field trails for raccoon hunters (Fox, 1992). Methods for measuring the contribution of all wildlife species to tourism in the western United States have been developed and extensively refined by several researchers (Peterson *et al.* 1992; Randall *et al.* 1990); differences

between consumptive and non-consumptive tourists using wildlife in Alaska were described by Snepenger and Bowyer (1990).

On a far larger scale, and one which is more difficult to quantify, furbearers, along with all members of the biotic community, have value as contributors to global biological diversity. The term "biological diversity" measures the variety inherent in nature, and can be used on a genetic, species, or ecosystem level (McNeely, 1988). The values inherent to biological diversity, which include the maintenance of gene pools for their potential future utility to humans, the provision of clean air, functioning watersheds, and continuing nutrient cycling, though typically linked to the extreme faunal and botanic diversity of the tropics, also apply to individual species or species assemblages in the temperate zone.

It can be argued, however, that the greatest values which can be placed on furbearing mammals in North America are those of aesthetics, options, and existence. An argument geared towards the preservation of fisher, for example, on purely economic grounds, is doomed to failure. The commodity value of the species (approximately 4000 pelts are harvested annually in the United States; the average price paid in Montana during 1985-87 was $85.00 (MDFW&P, 1991)) is minimal when compared to the overriding economic incentives to degrade fisher habitat through timber harvest, road building, or urban expansion. Nor can a strong case be currently made of non-consumptive economic incentives to conserve the species. An inhabitant of dense coniferous forests, and largely nocturnal in nature, the fisher, along with other native mustelids, is seldom seen and less often correctly identified by

members of the public. Nonetheless, since the possibility of uncovering a hitherto unrecognized medical or industrial "use" of fisher seems slight, it remains for conservationists to work to enhance the non-consumptive uses available to the public. This is not a new concept. In fact, methods for increasing public interest and concern for wildlife, if not always willingness to pay, have already been tested. These mechanisms currently reside in "non-game wildlife" programs which now exist in every western state.

Non-game Wildlife Programs

The first non-game wildlife program in the United States was established in 1967 in Arizona. Similar programs were in place in forty-eight states by 1987 (Thompson, 1987). Much like "furbearer," the term "non-game" is on arbitrary one which varies between jurisdictions. It includes those species which are not hunted for sport or trapped for fur (Bury *et al.* 1980).

The philosophical, administrative, and scientific similarities between non-consumptive furbearer management and non-game management are extensive. It is, in fact, arguable that they will eventually be one in the same. While closely linked to the preservation of threatened, endangered, or "charismatic" birds and mammals which are easily recognized and valued by the public, such as bald eagles (*Haliaeetus leucocephalus*) and bluebirds (*Sialia* spp.), non-game programs strive to evaluate, monitor and preserve the entire range of vertebrate and invertebrate fauna and flora. In North America, north of Mexico, this amounts to 83% and 89% of the resident mammalian and avian species, respectively (Bury *et al.*

1980). Thus, one similarity, that of a wide range of associated species, quickly becomes apparent.

A second, unfortunate, similarity between non-game and furbearer management programs is poor funding levels. A recent survey of non-game programs throughout the United States (Thompson, 1987) reported a median annual budget for individual programs of $193,000. In 1980, two highly respected non-game programs, those of Colorado and California, spent only 5 percent and 10 percent respectively of their wildlife budgets on non-game, much of this going to a few endangered species. This level of funding limited staffing to a total of 240.3 full-time equivalents in 47 states (Bury *et al.* 1980).

Non-game programs have used a number of innovative methods of program funding with varying success. Thompson (1987) found that income tax checkoffs were the most commonly used means nationwide, with heavy reliance on general revenue and agency funds. Other major sources of funding included federal monies, reclamation and mining fees, and a number of minor income generating programs such as the sale of non-game stamps and decals, art prints, and personalized license plates. These funding sources have not, however, guaranteed a secure future for non-game programs. While Eubanks and Wyckoff (1989) emphasized the growth of total income tax checkoff contributions nationwide from $350,000 in 1977 to $9 million in 1983, Thompson (1987) pointed out that contributions typically declined after several years and did not maintain "buying power" over time. In some states, such as

Montana, the addition of several competing checkoff options to the tax forms has also limited increases in participation.

Agencies continue to evaluate new sources of funding. The Fish and Wildlife Conservation Act of 1980 (P.L. 96-366), passed but never funded by Congress, was an important step in the right direction, both for non-game wildlife and furbearers. It was designed to provide federal assistance to states in the development of non-game fish and wildlife conservation plans.

The fact that the 1980 bill was allowed to languish emphasizes two key needs which are integral to future furbearer management: the identification of an appropriate funding source which does not rely on license sales, and the necessity to broaden the base of public support for furbearers in order to acquire that funding. New funding sources which rely on consumptive use, such as Illinois' recently established furbearer stamp, which is now mandatory for trappers, while well intentioned, cannot generate appreciable levels of revenue and will decline over time due to the social and demographic forces previously addressed (IDOC, 1990).

The questionable success of non-game funding systems does not diminish the overall rapid growth of the non-game "concept" in the last twenty years. The immense supply of potential advocates for non-game wildlife, and by extension, non-consumptively valued furbearers, is evidenced by the findings of the 1980 USFWS survey (Shaw and Mangun, 1984). At that time, 89 million Americans over sixteen years of age participated in residential wildlife appreciation. Non-residential use totalled 377 million visitor days; residential

wildlife appreciation increased to 105 million participants in 1985 (Hay, 1988).

Non-Harvest Threats to Furbearer Populations

The second concern which has until recently received limited attention by many furbearer managers and will likely change the structure of furbearer management programs in the coming years is increased environmental and habitat degradation and its impacts on furbearer populations.

Furbearer managers have traditionally focused their attention and funds towards perfecting harvest schedules, monitoring take, and, to a lesser degree, basic biological research. They have often left larger scale concerns such as habitat degradation to other resource managers. However, many researchers are beginning to acknowledge that external issues, and not harvest management, should be their primary concern.

The ultimate factor determining furbearer population size and health is habitat quality (Storm and Tzilkowski, 1982). Threats to furbearer populations in the western states include inappropriate timber harvest, road building, hard rock mining and petrochemical drilling, riparian degradation, urbanization, and the spread of toxins. These varied activities all degrade or eliminate habitat, or directly decrease survival or fecundity, and differentially impact each furbearer species. Habitat fragmentation is probably the greatest overall threat (Wilcove, McLellan and Dodson, 1986). Furbearer species with large home ranges, such as wolverine (963 km2; Hornocker and Hash, 1981), or those which tend to be associated

with old-growth forest stands, such as marten, are particularly at risk. Ninety-five percent of all federally managed lands are in the 12 states targeted in this report (Hockstra *et al.* 1983). Much of the remaining habitat for these species in the western states is concentrated on lands administered by the Bureau of Land Management (BLM) and U.S. Forest Service (USFS). The multiple-use philosophy under which these lands are managed has often encouraged actions which are detrimental to wilderness species. Road building for timber extraction is one example. Increased open road densities have been shown to reduce remaining habitat use by elk (Lyon, 1983); roads are indicated to be overall predictors to the absence or presence of several large carnivores (Shafer, 1990). While little is known about specific road density impacts on most furbearers, the 70,000 miles of new roads planned in the next 40 years in USFS Region 1 alone are reason for concern (Bader, 1991).

New concerns stemming from habitat fragmentation and related loss of biological corridors have been advanced in recent years. The processes involved in species extinction described by Gilpin and Soule (1986) may result in either deterministic or stochastic species loss, and are exacerbated by many of the forementioned commercial activities. Habitat fragmentation is of special concern for species with small total populations, such as wolverine and lynx. Unfortunately, minimal research has been directed at quantification of minimum viable populations for most North American furbearers. Only recently has the extreme variation in home ranges of carnivorous species been recognized as a central

factor in planning timber harvest which attempts to maintain biological diversity (Hunter, 1987).

A less obvious threat to furbearer populations is the spread of industrially produced toxins. The susceptibility of furbearers to toxins is evidenced by the effectiveness with which compounds such as strychnine were used in the early 1900's to decimate populations of wolves, fisher, and smaller canids across North America (Douglas and Strickland, 1986; Trefethan, 1975). In the early 1980's, DDT, chlordane, dieldrin, Mirex, and PCBs were detected in fisher in central Canada (Frank, 1983, in Douglas and Strickland, 1986). The same compounds, as well as mercury, were also reported in marten (Frank *et al.* 1979). Melquist and Dronkert (1986) cited several studies which indicated that the piscivorous lifestyle of the river otter caused it to bioaccumulate a variety of compounds. They stressed that the uncertain status of otters in many regions demanded that the effects of toxics and heavy metals be given immediate research priority.

Recent congressional testimony (Plenert, 1992) suggests that declines in several furbearer species along the Columbia River may be due to toxics. The USFWS initially discovered PCBs in mink and otter in the early 1980's. The concentrations found were high enough to cause total reproductive failure in laboratory mink (Henney *et al.* 1981, in Plenert, 1992). A recent attempt to investigate dioxin concentrations in lower Columbia River mink failed because researchers were unable to trap any mink at all in an area that had historically supported a strong population (Plenert, 1992).

Chapter 4:

Policy Recommendations

The following nine recommendations pertain specifically to the goal of improving the biological, economic and social effectiveness of furbearer management programs which, for whatever reason, operate in fundamentally non-consumptive regimes. Harvest is unlikely to disappear overnight in any probable scenario; most of these suggestions would also benefit harvest-oriented programs. An extensive series of management recommendations that address harvest-oriented program improvement by advocating means by which the trapping public would become the primary managers of furbearer resources can be found in Novak (1986) and Wildfur North America (1989). I strongly support a number of the suggestions found in these two reports. However, I believe that a dramatically increased role for trappers in future management systems is unrealistic due to the sociological and demographic changes previously outlined.

1. **Increase public education and exposure**

Public interest in wildlife-oriented recreation continues to grow (Shaw and Mangun, 1984). However, appreciation, with its associated benefits of political clout and insistence upon funding, remains largely focused on a few particularly treasured and well publicized species; examples include the grizzly, American peregrine falcon (*Falco peregrinus*), and the several easily-viewed whales such as the humpback (*Megaptera noveangliae*) and gray (*Eschrichtius gibbosus*). The impact of an aroused and unified public is evidenced

by the recent voluntary self-restrictions that the tuna industry has imposed to minimize incidental take of marine mammals and the groundswell of nation-wide support for western wolf reintroduction. Furbearer managers must actively garner public support. This can be achieved through outreach programs in schools and communities (Project Wild, Aquatic, as well as innovative methods such as "Wolf boxes"), through agency magazines and news releases, and through media spots which make special attempts to interpret the life histories and needs of these seldom-viewed species. All avenues of public involvement should be investigated. A novel program in use in Kansas, which uses school children to observe and census coyotes and endangered Swift Fox (*Vulpes velox*) while riding bus routes, is an excellent example of a program with both biological and public education benefits (KW&P, 1991).

2. **Actively search for new revenues.**

Furbearer programs have relatively little to lose in the way of revenues from decreased future license sales. Currently, these monies amount to only an average of 40% of program costs in the western states. However, each dollar lost must be retrieved in some fashion. A federal surcharge on equipment used in non-consumptive wildlife activities, while typically poorly supported in user polls, is necessary if the current state agency revenue structure continues in place. That is, since most large inputs of funds to state agencies are dedicated to specific activities (Dingle-Johnson, Pittmann-Robertson, etc.), it is unlikely that appreciable portions will be freed up for furbearer research and management. An interesting funding method

advanced by one questionnaire respondent would be a system which "taxes" the sources of perturbation to furbearer and other wildlife populations, such as the timber industry, road builders, or mine developers.

3. **Manage ecosystems, not single species.**

Habitat loss due to commodity extraction is the biggest threat to many furbearers, especially in the Northern Rockies and western Canada (Martin, 1990). Furbearer managers must take a more pro-active role in interdisciplinary reviews and assessments of timber sales, road and powerline developments, as well as mitigation plans. Without an occasionally skeptical presence in these and larger scale land planning processes, impacts and mitigation schemes may be devised that are unsuitable for affected furbearers. Traditional habitat manipulation and improvement plans which increase populations of ungulates or upland game often attempt to maximize edge and habitat diversity through logging, controlled burns, or water manipulation. These procedures are often driven by prescheduled timber harvest, and may be, on a case specific basis, either beneficial or detrimental for forest dwelling carnivores. Recent review has indicated (Bury *et al.* 1980) that "there is no such thing as 'habitat improvement' from a community point of view." This is not to say that manipulations should not be evaluated and sometimes implemented. For instance, Koehler and Brittell (1990) described a series of timber stand practices which, by creating a temporal and spatial mosaic, provided improved hunting and denning habitat for lynx. However, impacts on other wildlife species

should be evaluated prior to any actions targeted towards single species.

As demand for wood products on private lands increases, the need to better manage wildlife habitat on state and federal lands becomes more pressing (Hoekstra *et al.* 1981). Agency furbearer managers must develop plans (See Recommendation 5) which fit into long term multiple resource agendas. These plans will differ depending on land management goals. A generalized scheme which emphasizes management areas, resource goals, habitat criteria, management area scheduling, stand-by-stand management prescriptions, and monitoring and revision has been developed by Salwasser and Tappeiner (1981). Finally, an ecosystem approach to natural resource issues will possibly encourage a new distribution of available funds and research energy which will benefit furbearers.

4. **Broaden research activities.**

Increased research is required to acquire the scientific data needed to better understand furbearer basic biology, population status, and level of susceptibility to human impacts. This is especially true for forest dwelling carnivores which have not historically been given the research attention devoted to wetland and generalist species. Peek (1992) indicated that research must focus on means to more accurately assess population trends. The relationship between population density and indices employed must also be quantified (Rolley, 1986). Habitat needs must also receive further attention. Many species, such as marten and fisher, use "old-growth" forest disproportionately to its occurrence in their range

(Thomas, 1979, in Thomas *et al.* 1988). Because of the extreme commodity pressures to harvest these forest types, this group of species should be targeted for priority research effort. Researchers should also investigate the size and terrain types needed for refuges for some species (deVos, 1951b, in Douglas and Strickland, 1986). One survey respondent voiced the opinion that population monitoring techniques were "a lost cause" for low density species and that conservation schemes such as refuge systems were needed that do not require population monitoring.

Any further decline in the harvest of some furbearers will bring an increase in damage control complaints, and thus require increased control-oriented research. New technologies will need development, such as the "beaver pipe" water stabilizing device, which is increasingly being used in the Northeast. This device, when mounted on a beaver dam, allows water passage and removes the need to destroy or transplant the animals (Distefano, 1986). Fortunately, it is unlikely that decreased harvest would alter low density carnivore populations to the extent that damage control would be needed.

5. **Develop short and long-term management plans.**

The "rule of thumb" approach to furbearer management (Rolley, 1986), one which largely responded to harvest changes in a non-strategic manner, had several serious drawbacks. First, it incorrectly assumed that harvest was the primary factor impacting population integrity, and tended to avoid the monitoring of habitat condition and other externalities. Secondly, its lack of written

guidelines not only restricted the opportunity to share information with other professionals but prohibited prompt response to unanticipated situations which threaten populations such as weather extremes, population cycles, or hasty land management schemes. Finally, and of equal importance, its seemingly casual approach to planning tended to decrease credibility with non-governmental conservationists and members of the general public.

A key step towards more pro-active future management is the development of strategic plans. These documents, which may integrate numerous species in addition to furbearers, provide a framework against which program objectives can be measured over time. They can also concretely demonstrate a holistic approach to management to the interested public. Plans, which might be re-evaluated annually and rewritten each 5-10 years, could be developed with input from extra-agency environment organizations and individuals and could be made available to concerned governmental and non-governmental bodies through mailings.

Some well-researched plans are currently in use. Idaho's plan (Leptich, 1990), while taking a "traditional" harvest-oriented approach, demonstrates a sensitivity to the full range of wildlife values and affected publics. It provides clear rationale for management decisions, and carefully explains future goals. Its development also included ample opportunity for public participation. Its decision-making process in evaluating the reinstitution of a fisher trapping season also shows a keen awareness of public sentiment. In deciding not to allow fisher harvest in 1991, the department utilized a random telephone survey to gather public

opinion. The results of the survey, which were strongly (67%) against harvest, were weighed along with admittedly minimal census data, prior to season-setting.

In this example, Idaho acted in a progressive fashion, one which likely generated disfavor with traditional "allied" private organizations such as trappers associations. Its rationale was, however, clearly presented and quite convincing. In fact, it did not side with an "anti" harvest faction, but simply based its conclusions upon available biological evidence.

Management plans, not environmental review documents, should govern agency actions. The National Environmental Policy Act (NEPA), enacted in 1969, requires federal agencies to evaluate the impacts of their activities on all environmental components (Westman, 1985). Similar statutes, such as the Montana Environmental Policy Act (MEPA), govern state agency requirements (MLC, 1991). Montana Department of Fish, Wildlife, and Parks, which had not at the time completed furbearer management plans, recently conducted an environmental assessment (EA) of its furbearer management program and season-setting procedure (MDFW&P, 1991). Contrary to the useful information provided in Idaho's management plan, this document supplied few quantitative data for public or extra-agency review and supported harvests of two species, lynx and fisher, in the virtual absence of population data. MDFW&P acknowledged a "paucity of information" on lynx population status, thus relying on the "conundrum of unproven absence"(Buskirk, 1992) to advocate harvest. Currently believed to be near the bottom of its 10 year population cycle in Montana, the lynx is viewed to be

extremely sensitive to harvest during periods of low recruitment (Brand and Keith, 1979) and is the object of a endangered species listing petition (NWF, 1991). The minimal data provided in the EA do not convince the general reader of the reasonableness of harvest.

The department's rationale for continued fisher harvest, which relies on the circular argument that a closed season does not imply total species protection, and the lack of adequate legal authority, does have some merit. However, it also demonstrates a rigid position and discounts the concerns of the agencies own researchers (Roy; Heinemeyer-Sutherland, in MDFW&P, 1991) and other scientists (Douglas and Strickland, 1986). The EA, along with agency statements on the purpose of an upcoming Wildlife Management Environmental Impact Statement (Missoulian, 1991) portray a combative attitude which disregards public opinion and threatens the loss of public support.

6. Provide increased opportunities for non-consumptive furbearer use

Increased public concern for furbearers will only arise if more individuals have personal experiences with these wildlife species. Furbearer managers should catalog locations which are particularly suited to observation and photography. These areas should then be managed in a fashion which promotes non-consumptive use. A current example is Alaska's zone management system for wolves (classified as both furbearers and big game), which provides full protection in selected areas, primarily for human enjoyment (ADF&G, 1992). A system of this nature would be very useful in

suburban/agricultural regions where viewing opportunities for a variety of generalist and herbivorous furbearers could be promoted. Viewing areas will require careful monitoring. Wolfe and Chapman (1988) pointed out that nonconsumptive use does not equate to zero impact. Boyle and Sansom (1985) stated that all mechanized and non-mechanized outdoor activities have some effects, and that vulnerable populations could be harmed by even casual intrusion.

7. **Equally valuate all species; expand statutory authority.**

The arbitrary nature of the legal classification of many furbearer species not only confuses management but also ignores the community concept or role of each species within the ecosystem, first discussed over half a century ago (Leopold, 1949). Novak (1986) recommended that seasons be set on all furbearers regardless of their abundance or worth in order to raise the species' value and worth in human terms. Currently, many species, such as the red fox, coyote, badger, raccoon, and weasels are not classified as furbearers in Montana (MDFW&P, 1991). Similarly, Idaho's resource agency does not hold management authority over the coyote, skunk species, or weasels (Leptich, 1990). Furbearer managers should work with interested lawmakers to acquire management authority for all species within their jurisdictions. Legislative changes will require educational efforts geared at both the general public and state legislators. Pursuit of these improvements, in addition to aiding biological decision-making, will greatly enhance the stature of furbearer biologists in the public's eye.

8. **Increase interagency coordination.**

The limited available funding for furbearer research and the trend towards landscape-level management both point towards the need of increased coordination, information sharing, and joint research by state and federal agencies,their academic cooperators, and even foreign officials. The recent multi-agency workshops on fisher, lynx and wolverine in the northern Rockies are a step in the right direction, as is the 1991 Laramie symposium on martens and fishers which drew participants from 14 countries and highlighted forest cutting and unsustainable fur harvest across portions of Eurasia (Buskirk, 1992).

Wide-ranging carnivores may use lands administered by federal, state, and private landowners. While each agency's management mandate is unique, all share a common goal of species integrity and perpetuation. One agency which should play an increased role in research is the National Park Service. Researchers interested in the dynamics of future unharvested furbearer populations can use the relatively unaltered ecosystems of the large parks in the West and Alaska to examine carnivore populations which experience minimal human impact.

Poor funding levels demand that each research dollar be wisely spent. Research redundancy must be kept to a minimum. Journal submission is one method of information transmission. Another is professional conferences/symposia, several of which have been held in the western United States and Canada in recent years. These forums should be supported by agencies, and should be permanent functions, each focusing on a similar geographic region. As a

suggestion, a regional association could be established which would coordinate annual conferences in either the southwest, northern Rockies, or Alaska/northwestern Canada. This would allow agencies with limited budgets to support personnel attendance at least once each third year.

9. **Maintain unbiased approach to the impacts and suitability of harvest**

Harvest dynamics have been well quantified in high density, aquatic furbearers, but the impact of harvest on some furbearers, especially low density carnivores, is poorly understood. Furbearer officials have been slow to acknowledge this dearth of information. When challenged in regard to the necessity and prudence of harvest, they have tended, as pointed out by Rolley (1986), to rehash the arguments that "wildlife populations are not impacted by harvest and that, without harvest, all wildlife species would become overpopulated and starvation would prevail." Rolley concludes that "these arguments are oversimplifications, and managers need to realize that overharvest of long-lived furbearers, with relatively low reproductive potential, may be possible."

Managers have often allowed themselves to fall into the tenuous and increasingly unsupportable position of harvest advocacy. This divisive position, exemplified by seemingly needless support of harvest of limited populations such as sandhill crane (*Grus canadensis*) in Utah (Wagner, 1989), and lynx (MDFW&P, 1991) and grizzly (Cool, 1991) in Montana, is symbolic if not always biologically significant. By exerting blanket support for scientifically

questionable consumptive activities that draw fewer and fewer participants, managers run the risk of increasing isolation from scientific peers and the general public.

Chapter 5:

Conclusion

The history of human intervention with most furbearing mammals in North America has differed significantly from the five-step wildlife management sequence depicted by Leopold (1933). While it originated with overharvest and subsequent harvest restriction, few attempts to bolster populations through control of predators or competitors, or the reservation of lands, have ever been conducted for this group of mammals. Artificial replenishment has, however, been successfully utilized; examples include the continent-wide reestablishment of the beaver, as well as local reintroductions of fisher and marten across the western states. Leopold's fifth step in the sequence, environmental control, while originally directed towards active manipulation of food, cover, and disease, can be interpreted in a broader, more contemporary fashion as an understanding of and reaction to the many external threats directed at furbearers, and as a sensitivity to all wildlife species as "critical components of natural systems" (Bury *et al.* 1980). This is the step at which involved scientists and managers have lagged behind other wildlife conservationists. Their focus on harvest management, as well as their parochial approach towards changing public sentiment, continues to draw scarce human and monetary resources away from critical basic biological needs such as the investigation of sound inventory techniques, habitat requirements, and furbearer role in ecosystem/landscape planning. Overeliance on what might be termed the "semi-honest doctrine" of commercial justification (Leopold, 1947) and resistance to change has confused and

diminished what should be their, and all conservationists, primary goal, that of scientific, ecologically sound management and "maintenance of resource systems" (Holt and Talbot, 1978). Additionally, confrontational defense of harvest has acted to polarize segments of the public, and has alienated the "other constituency" (Lyons, 1982), the millions of non-consumptive wildlife recreationalists who feel disenfranchised from wildlife management agencies because of their perceived subservience to harvest interests (Shaw and King, 1980).

The management of furbearing mammals in the western United States, especially the low density carnivores, has reached a critical juncture. The current situation is accurately summarized by Carrier (1990: 4), an admirer of the harvest tradition, as:

> "... a group of species that are naturally secretive, and even in optimum conditions, are not numerous. We have a group of species which are harvested solely for luxury- for fur to adorn the bodies of the rich and famous. We have a group of species which are harvested in a manner which is considered inhumane by a majority of the public. We have a group of species whose ranges and numbers, according to most studies, have notably declined. We have a group of species whose preferred habitats are in natural forests, a condition that is becoming increasingly reduced and fragmented."

The historic successes of the wildlife management tradition, those of harvest restriction and perpetuation, as well as population reestablishment, cannot be ignored. The survey associated with this

report also demonstrated a growing recognition of new challenges by state and federal personnel. However, furbearer management cannot yet be termed a success story. A review of the literature, as well as the views expressed by a minority of questionnaire recipients, suggests that some management officials continue to hold entrenched, commodity-oriented positions on harvest which cloud their collective views of alternative actions and limit their attention to critical environmental threats.

A unique window of opportunity now exists for furbearer managers. By embracing the idea that "the practice of conservation must spring from what is ethically and esthetically right, as well as what is economically expedient..." (Leopold, 1947:345), they can use their hard-earned knowledge and experience as leaders in integrated, ecosystem-oriented conservation measures which will gain the support of the ever-growing conservation community as well as the general public. However, should they remain as actual, or even perceived, harvest industry advocates, they may well find themselves discredited and their expertise superceded by the growing trend toward wildlife policy litigation.

APPENDIX I: General Information Request

April X, 1992
Michael J. Roy
Environmental Studies Program
Jeannette Rankin Hall
University of Montana
Missoula, MT 59812
(406) 243-4589

Wildlife Division
xxx Fish & Game Dept
XXX, XXX
XXXXX

Dear Sir or Madam:

I am currently conducting thesis research on furbearer policy and management in the western United States, with special emphasis on potential non-harvest oriented management options. Most furbearing mammals in North America have traditionally been managed for sustained yield of fur. However, management concern in some jurisdictions is increasingly focused on aesthetic rather than economic or commercial values. My interest is neither pro nor anti harvest; rather, I wish to identify non-harvest values and program approaches which would be successful if harvest were reduced or eliminated due to biological concerns or increased public disapproval with furbearer take.

I have distributed a specific questionnaire which requests input on future needs and /or goals for furbearer management programs to the state furbearer managers in twelve western states as well as selected faculty members in wildlife biology departments at state universities in the same states.

In order to round out my knowledge of current approaches and goals in western furbearer management programs, I wish to review general program information from other furbearer management programs throughout North America. Please send me any available information on furbearer policy and administration in your jurisdiction. This might include mission statements, annual reports, current regulations, on-going research activities, public education programs, funding, or staffing.

I recognize that much of the information that I have requested may not be readily available. I greatly appreciate the time spent in forwarding whatever current data are accessible. I hope that my findings will encourage increased cooperation between consumptive and non-consumptive parties interested in the future of healthy furbearer populations.

Thank you for your assistance.

Sincerely,

Michael J. Roy

APPENDIX II: State Official Questionnaire

FURBEARER MANAGEMENT QUESTIONAIRE (Agency)

Form #____

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Participant (Title) Agency

Please answer the following questions based on your professional judgement. If you prefer not to be cited individually, please indicate below. Feel free to attach additional sheets and/or supporting material. Thank you for your assistance!

May I reference specific statements provided? Yes____ No____

ADMINISTRATION

1. How many full-time staff members (or equivalents) in your agency work specifically in furbearer management?

2. Approximately what is your furbearer program's annual budget? Does this include salaries, etc.?

3. Where does your program's funding originate? (License revenues, sales tax, use stamps, Pittman-Robertson, etc.)

4. What percentage of program costs are covered by trapping license revenues?

PUBLIC INFORMATION AND EDUCATION

1. What means could be used to engender increased public interest and support for the conservation of low density, infrequently seen carnivorous furbearers? Do public education programs in your agency include material on furbearing mammals?

2. Is public interest in carnivorous furbearing mammals, especially low density species, increasing, decreasing, or remaining stable in your jurisdiction?

POPULATION MANAGEMENT

1. Please indicate the legal status of the following furbearing mammals in your jurisdiction. Are these species currently harvested? If non-harvest oriented population survey techniques are being employed, please indicate survey type and frequency.

F-Furbearer P-Predator V-Varmint E-Endangered O-Other (Specify) NP-Not Present

Species:	Category:	Harvested?	Non-harvest Survey?
Coyote			
Red Fox			
Gray Fox			
Wolf			
Mountain Lion			
Lynx			
Bobcat			
Wolverine			
Fisher			
Weasel			
Otter			
Mink			
Badger			
Beaver			
Muskrat			
Skunk			
Other)			

2. Have written management plans been prepared for all furbearer species in your jurisdiction? If not, are development of such plans limited by funding, staffing, or other factors?

NON-ECONOMIC VALUES

1. Are any furbearing mammals in your jurisdiction designated as "indicator species" for forest or range management or other public or private land activities? Please enclose specifics if possible.

2. Please describe any specific steps taken by your agency to date , if any, which indicate a trend towards non-economic management of furbearing mammals.

PROGRAM GOALS

1. What program changes, if any, would be needed in your agency to most effectively manage furbearing mammals in a future non-harvest scenario? What specific difficulties would this transition entail?

2. In a future non-harvest situation, how should a furbearer management program interface with a non-game wildlife program?

3. What is the biggest challenge furbearer managers in your agency will face in the next ten years?

THANKS AGAIN!

PLEASE RETURN TO:
Michael Roy
Environmental Studies Program
University of Montana
Missoula, MT 59812

APPENDIX III: State agency survey requests

Furbearer Program Manager
California Department of Fish and Game
Wildlife Management Division
1416 9th Street
Sacramento, CA 95814

Jim Gonzales
Assistant Division Chief
New Mexico Fish and Game Department
Division of Wildlife
P. O. Box 25112
Sante Fe, NM 87504

Harry Harju
Supervisor, Biological Services
Wyoming Game and Fish Department
5400 Bishop Blvd.
Cheyenne, WY 82006

Howard Hash
Furbearer Resource Biologist
Montana Department of Fish, Wildlife, and Parks
3201 Spurgin Road
Missoula, MT 59801

Tom Lytle
Terrestrial Resources
Colorado Department of Natural Resources
Division of Wildlife
6060 Broadway
Denver, CO 80216

Herbert Melchior
Furbearer Coordinator
Alaska Department of Fish and Game
1300 College Road
Fairbanks, AK 99701

John Phelps
Arizona Fish and Game Department
2221 West Greenway Road

Phoenix, AZ 85023

Bob Posey
Furbearer Program Director
Oregon Department of Fish and Wildlife
P. O. Box 59
Portland, OR 97207

Randy Radant
Chief, Nongame Management Section
Utah Department of Natural Resources
Division of Wildlife Resources
1596 West North Temple
Salt Lake City, UT 84116

San Stiver
Furbearer Specialist
Nevada Department of Wildlife
P. O. Box 10678
Reno, NV 89520

David Ware
Upland Bird and Furbearer Program Manager
Washington Department of Wildlife
600 Capitol Way North
Olympia, WA 98501-1091

Gary Will
Wildlife, Game, and Research Manager
Idaho Department of Fish and Game
P. O. Box 25
Boise, ID 83704

APPENDIX IV: State university questionnaire

FURBEARER MANAGEMENT QUESTIONAIRE (University)

Form #____

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Participant (Title) University

Please answer the following questions based on your professional judgement. If you prefer not to be cited individually, please indicate below. Feel free to attach additional sheets and/or supporting material. Thank you for your assistance!

May I reference specific statements provided? Yes____ No____

ADMINISTRATION

1. Is furbearer management given adequate emphasis by the responsible agency in your state? If not, what factor limits additional management emphasis? How could it best be resolved?

PUBLIC INFORMATION AND EDUCATION

1. Do public education programs provided by state or federal agencies in your state include material on furbearing mammals?

2. Is public interest in furbearing forest mammals, especially low density species, increasing, decreasing, or remaining stable in your state?

3. Is specific coursework in the management of furbearing mammals available at your university?

POPULATION MANAGEMENT

1. Please indicate which of the following furbearing mammals are present in your state. Are population monitoring techniques technically and financially feasible in your locality for each species which do not rely on harvest data? If so, indicate survey type.

P-Present NP-Not Present

Species:	Present	Non-harvest Survey?
Coyote		
Red Fox		
Gray Fox		
Wolf		
Mountain Lion		
Lynx		
Bobcat		
Wolverine		
Fisher		
Weasel		
Otter		
Mink		
Badger		
Beaver		
Muskrat		
Skunk		
(Other)		

2. Have written management plans been prepared by the responsible agency in your state for all resident furbearer species ? If not, are these plans limited, in your opinion, by funding, staffing, or other factors?

NON-ECONOMIC VALUES

1. In your opinion, how might agencies and members of the public in your state begin to value infrequently seen forest mammals if they are not harvested commercially?

PROGRAM GOALS

1. What types of furbearer research need additional effort to more effectively manage these species in your state? Is it more difficult to acquire research funding and support for furbearers than other wildlife assemblages such as big game, waterfowl, or "non-game" wildlife?

2. What program changes, if any, would be needed by the responsible state agency in your location to most effectively manage furbearing mammals in a future non-harvest scenario? What specific difficulties would this transition entail?

3. In a non-harvest situation, how should a furbearer management program interface with a non-game wildlife program?

4. What is the biggest challenge furbearer managers in your state will face in the next ten years?

THANKS AGAIN!

PLEASE RETURN TO:

Michael Roy
Environmental Studies Program
University of Montana
Missoula, MT 59812

APPENDIX V: University questionnaire requests

Dr. Steve Buskirk
Chair, Wildlife and Fisheries Biology
University of Wyoming
Laramie, WY 82071

Dr. Robert Cook
Head, Fishery and Wildlife Department
Colorado State University
Fort Collins, CO 80523

Dr. Fred Dean
Chair, Program of Wildlife
University of Alaska
Fairbanks, AK 99775-0990

Director, Fishery and Wildlife Science
New Mexico State University
Las Cruces, NM 68003-0003

Dr. Raymond Dueser
Head, Fisheries and Wildlife
Utah State University
Logan, UT 84322

Dr. Robert Eng
Director, Fishery and Wildlife Program
Montana State University
Bozeman, MT 59717

Dr. Gerald Gifford
Chair, Department of Range, Wildlife, and Forestry
University of Nevada
Reno, NV 89512

Dr. John Helms
Head, Forestry and Resource Management
University of California
Berkeley, CA 94720

Dr. John Hendee
Dean, College of Forestry, Wildlife, and Range Science
University of Idaho
Moscow, ID 83643

Dr. Edgar Kendrick
Director, School of Renewable Natural Resources
University of Arizona
Tucson, AZ 85721

Dr. Richard Tubb
Head, Fisheries and Wildlife
Oregon State University
Corvallis, OR 97331

Dr. Stephen West
Advisor, Wildlife Program
University of Washington
Seattle, WA 98195

APPENDIX VI: Federal agency questionnaire

FURBEARER MANAGEMENT QUESTIONAIRE (Federal Agency)

Form #____

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Participant (Title) Agency

Please answer the following questions based on your professional judgement. If you prefer not to be cited individually, please indicate below. Feel free to attach additional sheets and/or supporting material. Thank you for your assistance!

May I reference specific statements provided? Yes____ No____

ADMINISTRATION

1. How many full-time staff members (or equivalents) in your agency or region work specifically in furbearer management?

2. Approximately what is your furbearer program's annual budget? Does this include salaries, etc.?

PUBLIC INFORMATION AND EDUCATION

1. What means could best be used to engender increased public interest and support for the conservation of low density, infrequently seen carnivorous furbearers? Do public education programs in your agency include material on furbearing mammals?

2. Is public interest in furbearing forest mammals, especially low density species, increasing, decreasing, or remaining stable in your jurisdiction?

POPULATION MANAGEMENT

1. Are non-harvest oriented population survey techniques employed in your jurisdiction for any of the furbearing mammals listed below? If so, please indicate type and survey frequency.

P-Present NP-Not Present

Species:	Present	Non-harvest Survey?
Coyote		
Red Fox		
Gray Fox		
Wolf		
Mountain Lion		
Lynx		
Bobcat		
Wolverine		
Fisher		
Weasel		
Otter		
Mink		
Badger		
Beaver		
Muskrat		
Skunk		
(Other)		

2. Have written management plans been prepared for resident furbearer species on the lands in your jurisdiction? If not, is development of such plans limited by funding, staffing, or other factors?

3. Does your agency conduct habitat enhancement or acquisition actions directed specifically at the management of furbearing mammals?

NON-ECONOMIC VALUES

1. Are any furbearing mammals in your jurisdiction designated as "indicator species" for forest or range management or other public land activities? Please enclose specifics if possible.

POPULATION MANAGEMENT

1. What program changes, if any, would be needed in your agency to most effectively manage furbearing mammals in a future non-harvest scenario? What specific difficulties would this transition entail?

2. What is the biggest challenge faced by furbearer managers in your agency in the next ten years?

THANKS AGAIN!

PLEASE RETURN TO:

Michael Roy
Environmental Studies Program
University of Montana
Missoula, MT 59812

APPENDIX VII: Federal agency survey requests

USFS (Director, Wildlife Programs)

Southwestern Region
U. S. Forest Service
517 Gold Avenue SW
Albuquerque, NM 87102

Intermountain Region
U. S. Forest Service
324 25th Street
Ogden, UT 84401

Pacific Southwest Region
U. S. Forest Service
630 Sansome Street
San Francisco, CA 94111

Pacific Northwest Region
U. S. Forest Service
P. O. Box 3623
Portland, OR 97208

Northern Region
U. S. Forest Service
P. O. Box 7669
Missoula, MT 59807

Rocky Mountain Region
U. S. Forest Service
P. O. Box 25127
Lakewood, CO 80225

Alaska Region
U. S. Forest Service
P. O. Box 21628
Juneau, AK 99802

USFWS (Director, Wildlife Enhancement)

Region I
U. S. Fish and Wildlife Service

500 N. E. Multnomah Street
Portland, OR 97232

Region II
U. S. Fish and Wildlife Service
Box 1306
Albuquerque, NM 87103

Region VI
U. S. Fish and Wildlife Service
Box 25486
Denver Federal Center
Denver, CO 80225

Region VII
U. S. Fish and Wildlife Service
1101 E. Tudor Road
Anchorage, AK 99503

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