TRAPPING AND FURBEARER MANAGEMENT

IN NORTH AMERICAN WILDLIFE CONSERVATION

Trapping and Furbearer Management in North American Wildlife Conservation

is a compilation of the knowledge, insights and experiences of professional wildlife biologists who are responsible for the conservation of wildlife resources throughout the United States and Canada. It is based on the original *Trapping and Furbearer Management: Perspectives from the Northeast* published in 1996 by the Northeast Furbearer Resources Technical Committee. An expanded North American edition was published in 2001. This second edition of that publication was authored by the following subcommittee of the **Northeast Furbearer Resources Technical Committee** (NEFRTC): Dr. John F. Organ, Subcommittee Chairman, U.S. Fish and Wildlife Service; Thomas Decker, Vermont Department of Fisheries and Wildlife; Susan Langlois, Massachusetts Division of Fisheries and Wildlife; and Peter G. Mirick, Massachusetts Division of Fisheries and Wildlife.

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The Northeast Furbearer Resources Technical Committee
is comprised of professional wildlife biologists from the northeastern United States and Provinces of eastern Canada, and is committed to the study and responsible management of our furbearer resources.

The Northeast Section of The Wildlife Society
is comprised of professional wildlife biologists and resource scientists and managers from eleven northeastern states and six eastern Canadian provinces, and is committed to excellence in wildlife stewardship through science and education.

For further information on Furbearer Management and Trapping in your state or province, contact your local Fish and Wildlife or Natural Resources Department.

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Cover photo of muskrats by Bill Byrne.

Pictographs on cover portray cave drawings of methods ancient peoples used to capture wild animals.

Introduction

The trapping of furbearers – animals that have traditionally been harvested primarily for their fur – has been an enduring element of human culture ever since our prehistoric hunter-gatherer ancestors devised the first deadfalls, pit traps, snares, and capture nets. People were dependent upon furbearers to provide the basic necessities for survival – meat for sustenance, and fur for clothing, bedding and shelter – throughout most of human history. Defining and defending territory where furbearers could be captured to acquire these critical resources united families, clans and tribes long before the invention of agriculture and animal husbandry gave rise to ancient civilizations. While modern technology and agriculture have significantly reduced human dependence on furbearers for survival, people in both rural and developed areas continue to harvest furbearers for livelihood and personal fulfillment. The taking and trading of furbearer resources remain on the economic and environmental agendas of governments throughout the world.

Photo by Bill Byrne

Trapping furbearers for their fur, meat and other natural products presumably began with our earliest ancestors on the African continent. It has a long tradition in North America, dating back to the time the first aboriginal people arrived on the continent. Several thousand years later, fur was the chief article of commerce that propelled and funded European colonization of the continent during the 17th and 18th centuries. Numerous cities and towns founded as fur trading centers during that period still bear witness to the fact that furbearer trapping had a major influence on the history of the United States and Canada.

The utilization of furbearer resources was an unchallenged activity throughout that history until early in the 20th century, when the first organized opposition to furbearer trapping emerged. The focus of that opposition was primarily on the development of more humane traps and curtailment of trapping abuses, rather than against trapping itself or the continued use of furbearer resources. During the 1920s opposition magnified to challenge the use of steel jaw foothold traps and the wearing of fur.[1] In response to this development, proponents of trapping and the fur industries began organizing to defend themselves. By the 1930s, furbearer trapping had become a recurrent public issue. Since then, the pro- and anti-trapping factions have disseminated enormous amounts of generally contradictory information.

During this same period, new technologies and advances in ecology, wildlife biology, statistics and population biology allowed wildlife management to develop into a scientific profession. State, provincial and federal agencies were created to apply this science to protect, maintain and restore wildlife populations. The harvest of furbearers became a highly regulated, scientifically monitored activity to ensure the sustainability of furbearer populations. Trapping and furbearer management – one steeped in ancient tradition, the other rooted firmly in the principles of science – allowed furbearer populations to expand and flourish.

Today, as controversy over the use and harvest of furbearers continues, professional wildlife managers find themselves spending considerable time trying to clarify public misconceptions about trapping and furbearer management. The complex issues involved in that management – habitat loss, animal damage control, public health and safety, the responsible treatment of animals – cannot be adequately addressed in short news articles or 30-second radio and television announcements.

This booklet is intended to present the facts and current professional outlook on the role of trapping and furbearer management in North American wildlife conservation. It is the combined work of many wildlife scientists responsible for the successful conservation of furbearer populations in the United States and Canada.

The Furbearer

Technically, the term **furbearer** includes all mammals, all of which, by definition, possess some form of hair. Typically, however, wildlife managers use the term to identify mammal species that have traditionally been trapped or hunted primarily for their fur.

North American furbearers are a diverse group, including both carnivores (meat-eating predators) and rodents (gnawing mammals). Most are adaptable species ranging over large geographic areas. They include beaver, bobcat, badger, coyote, fisher, fox, lynx, marten, mink, muskrat, nutria, opossum, raccoon, river otter, skunk, weasels, and others. A few animals that are normally hunted or trapped primarily for their meat or to reduce agricultural or property damage may also be considered furbearers if their skins are marketed.

*A magnified view of red fox fur shows the short, dense **underfur** that provides insulation and water repellent qualities, and the longer **guardhairs** that resist abrasion and protect the underfur from matting.*

Most furbearers possess two layers of fur: a dense, soft **underfur** that provides insulation and water-repellent qualities; and an outer layer of longer, glossy **guardhairs** that grow through the underfur, protecting it from matting and abrasion. A fur is said to be **prime** when the guardhairs are at their maximum length and the underfur is at its maximum thickness.

Fur generally becomes prime in midwinter when the coat is fresh and fully grown; the timing for primeness is governed by photoperiod and may vary somewhat depending on species, location (latitude) and elevation.

Furs are generally "dressed" (tanned with the hair on), then trimmed and sewn into garments, rugs, blankets, and ornaments, and sometimes dyed in a variety of colors and patterns. Furs are also used in fishing lures, fine brushes and other products. Some furs are shaved, and the hair processed into felt for hats and other garments.

Fur is a renewable (naturally replenished) resource, a product of long traditional use, valued by many for its natural beauty, durability and insulative qualities. Fur is only one of many values that people ascribe to furbearers (see page 38).

Photo by Bill Byrne

Photo by Jack Swedberg

Furbearers are a diverse group including several rodents and numerous carnivores (meat-eaters). The muskrat (above, left), a wetland herbivore (plant-eater), is the number one furbearer in the United States and Canada based on the number of pelts harvested each year. The beaver (above, right) is the largest native rodent in North America, best known for its ability to fell trees and dam streams. Facing page, top, the fisher, a member of the weasel family, is an opportunistic predator equally at home in the trees or on the ground. Below, the red fox, like the beaver, has achieved considerable success in adapting to suburban environments.

Photos by Bill Byrne

Photo by R. Brady

Photo by Tom Harrison

Other furbearers of conservation interest include the American badger (above), raccoon, and bobcat (below). These are all common and abundant species over large areas of their respective ranges. Their populations are managed sustainably, ensuring they remain healthy and abundant while allowing their continued utility as valuable furbearer resources.

Photo by Bill Byrne

Issues in Furbearer Management

There are three major issues involving the conservation and management of furbearers today: human population growth with its inevitable degradation and destruction of wildlife habitat; increasing public intolerance of furbearers in populated areas; and opposition from animal rights activists to any harvest or use of wildlife.

Loss of Habitat

The first and most critical issue challenging furbearer conservation today is human population growth and the resultant degradation and destruction of wildlife habitat. Without adequate habitat, wildlife populations cannot be sustained. While no furbearer species is in immediate jeopardy due to habitat loss in North America (because furbearers are typically abundant, adaptable species often covering large geographic areas), the range of some populations has been reduced. Habitat destruction has eliminated the option to restore some species to areas where they once existed.

Among wildlife scientists, ecologists and biologists, no issue is of greater concern than the conservation of wildlife habitat. Every government wildlife agency is directing significant educational and/or financial resources to the conservation of habitat. Habitat conservation is the key to maintaining the viability of all wildlife populations and the ecosystems on which they depend. Unlike habitat destruction, modern regulated trapping is a sustainable use of wildlife resources, and it is highly unlikely to jeopardize the continued existence of any wildlife population.

Photo by Bill Byrne

The continuing loss of wildlife habitat is the most critical issue in wildlife conservation today. Unlike regulated trapping, habitat destruction threatens the existence of wildlife populations and the ecosystems on which they depend. Further, as development encroaches on wildlife habitat, adaptable furbearer species create problems for homeowners, increasing public intolerance of these valuable wildlife resources.

Public Intolerance

While habitat loss is a direct threat to wildlife populations, it also has indirect consequences. As wildlife habitat continues to be fragmented and eliminated by development, wildlife managers are confronted with new challenges: coyotes killing pets, beavers cutting ornamental trees and flooding roads and driveways, raccoons invading buildings and threatening public health with diseases and parasites. These kinds of human-wildlife conflicts reduce public tolerance and appreciation of furbearers.

While **Biological Carrying Capacity** (population level an area of habitat can support in the long term) for a furbearer species may be relatively high, the **Cultural Carrying Capacity** (population level the human population in the area will tolerate) may be lower.[2] Wildlife managers, responding to public concerns, have implemented furbearer damage management programs at state and federal levels.

A growing dilemma is that some furbearers, while of great utilitarian, economic, and intrinsic value to society, are also increasingly a public liability. The challenge – magnified in and near areas of dense human population – is to satisfy various constituents with different interests and concerns while conducting sound wildlife management. Wildlife agencies typically use an integrated approach involving education, barriers, deterrents and lethal techniques to address specific problems, while fostering public tolerance for wildlife that causes damage. The combination of as many feasible options as possible provides for the most successful program. Wildlife agencies have long relied on the free services provided by the public who trap to assist landowners suffering damage caused by furbearers. Unfortunately, due to various environmental, economic and sociological factors, traditional fur trapping – which can reduce animal damage at no cost to the public – tends to be a rural activity. The number of people involved in this cultural activity is a minority group, particularly in suburban and urban areas.

Photo by Coleen Olfenbuttel

Nuisance animal control has become a growth industry in many areas as development fragments wildlife habitat and traditional fur trapping declines. This trend is of concern to wildlife biologists, for it indicates that a growing segment of the public is losing its tolerance and appreciation of some wildlife species, viewing them as problems that should be removed and destroyed, rather than as valuable resources that should be utilized and conserved.

With the decline of traditional fur trappers, "nuisance animal control" has become a growth industry. Businesses specializing in trapping and removal of "problem" animals are thriving in many areas. This trend is of concern to wildlife biologists, for it indicates that a growing segment of the public is coming to view furbearers as problems that should be removed and destroyed, instead of valuable resources that should be conserved and can be utilized. Regardless, regulated trapping provides an important and effective method to meet the public's demand for reduction of furbearer damage.

Animal Rights

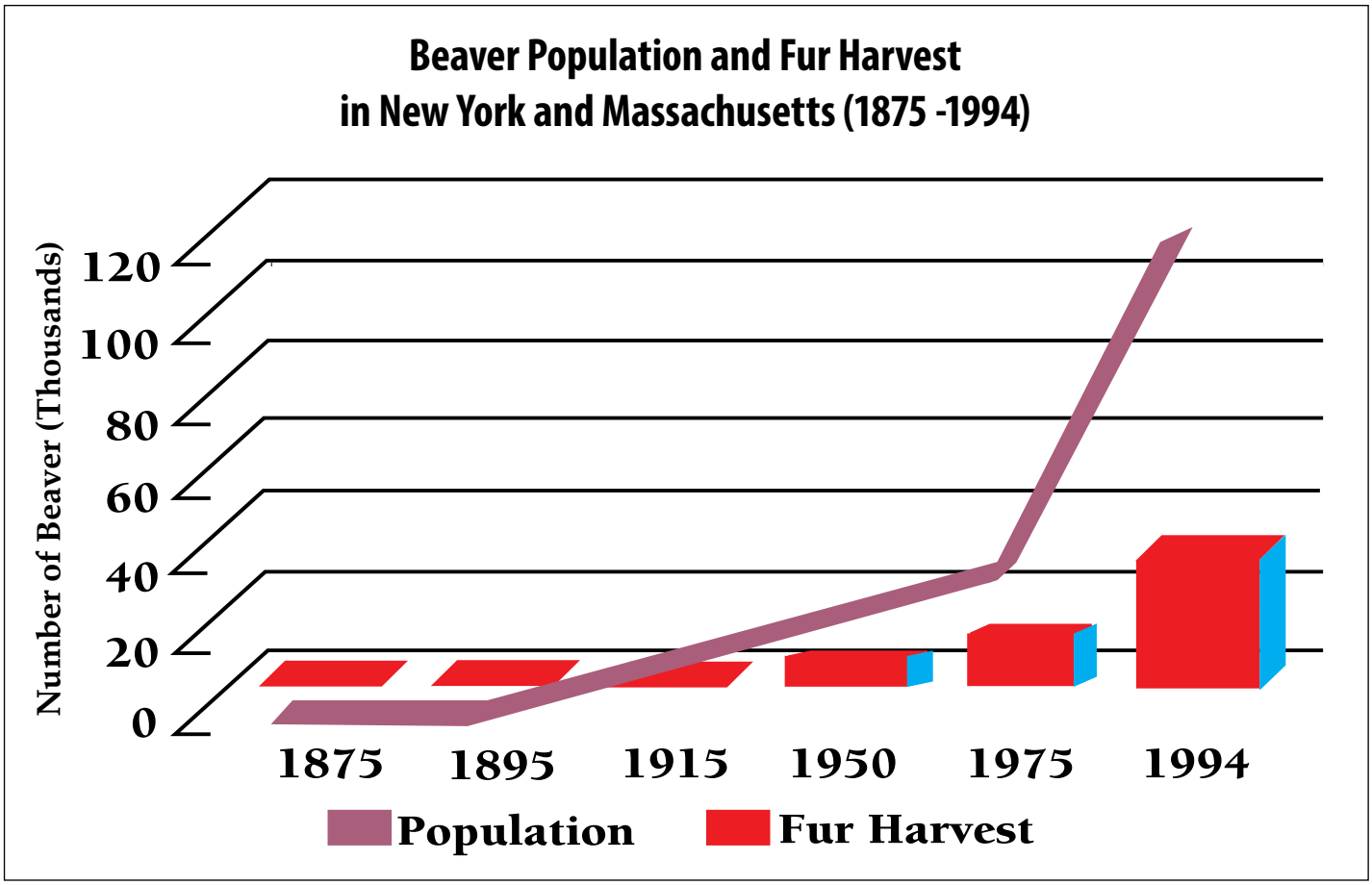
As wildlife managers are faced with having to rely more on regulated trapping for furbearer population management and damage control, animal rights activists demanding an end to trapping are appealing for public support. Those advocating "animal rights" would eliminate all trapping and use of furbearers. Without regulated trapping, the public would have far fewer reliable and economically practical options for preventing and solving wildlife damage problems associated with furbearers.

Public Wildlife Agencies Manage Our Wildlife Resources

Furbearer management programs in the United States and Canada are primarily conducted by state and provincial wildlife agencies. Current management programs respond to and respect the diversity of people and cultures and their values toward wildlife resources. In the United States, most funding for furbearer management comes from two sources: hunting and trapping license fees, and federal excise taxes on firearms, ammunition and archery equipment (federal aid). Most wildlife management is not funded with general tax dollars.

Federal aid – now amounting to over 200 million dollars in some years among the 50 states, territories and the Commonwealth of Puerto Rico – has been provided since passage of the Federal Aid in Wildlife Restoration Act (also known as the Pittman-Robertson Act) in 1937. Federal funds and the assistance of certain federal agencies are also available for wildlife damage management programs within each state.

State and provincial wildlife agencies manage furbearer populations for the benefit of a public with diverse opinions. Wildlife managers must therefore balance many objectives simultaneously. These objectives include preserving or sustaining furbearer populations for their biological, ecological, economic, aesthetic, and subsistence values, as well as for utilitarian, scientific, and educational purposes. It is sometimes necessary to reduce furbearer populations to curtail property damage or habitat degradation, or to increase furbearer populations to restore species to areas where they have been extirpated (eliminated within an area).



Although the species had been nearly extirpated prior to the start of the 20th century, beaver populations responded to applied wildlife management in a dramatic fashion as shown by this vintage graph.[3] Like many other furbearer species, the beaver has been restored to much of its former range while sustaining considerable, scientifically regulated, public fur harvests.

Photo by NYS DEP

Many states and provinces require that the pelts of certain species of furbearers taken by trappers must be officially examined and tagged (sealed or stamped) before they may be sold. Note the orange seals on certain pelts being offered at this fur auction. This allows wildlife biologists to monitor harvest rates of some species while collecting invaluable data on population trends. When biologists need more information, regulations may be adjusted to require that trappers turn in the carcasses or certain parts of their harvested animals. This allows biologists to examine such things as reproductive rates, food habits, sex and age ratios, presence or prevalence of parasitic and/or infectious diseases, and other information that is often useful in managing furbearer and other wildlife resources.

Professional wildlife biologists meet the public's diverse objectives by monitoring and evaluating the status of furbearer populations on a regular basis, and responding with appropriate management options. Much of the information known about furbearer populations – as well as the management of furbearer populations – has been derived from trapping. Accounting for yearly variation in the numbers, sex, and age of animals caught by licensed trappers, along with variation in effort provided by trappers, is an economical way to monitor population fluctuations. In many cases, biologists acquire information directly from harvested animals. More intensive (and expensive) research projects are initiated when additional information essential to management is needed. Many jurisdictions adjust trapping regulations in response to furbearer population changes to either increase or decrease the population in response to the public's desires.

Management plans and regulations typically restrict trapping seasons to periods when pelts are prime and the annual rearing of young is past. Historical records demonstrate how applied wildlife management sustains regulated harvests: populations and harvests of most furbearing species have generally increased in North America during the last 100 years. Beaver, for example, were almost eliminated from the eastern United States and greatly reduced in parts of eastern Canada by the middle of the 19th century. Today they number in the millions, thriving throughout that range wherever sufficient habitat remains and the public will

Photo by Bill Byrne

Multiple Uses of Furbearers

If we look back in human history, all of our ancestors once depended on furbearers for survival. Native peoples traditionally used furbearers for food, clothing, medicines, perfumes and other items. Today, many people living in rural and suburban environments throughout North America continue to live close to the land, utilizing furbearers to maintain a sense of self-reliance, remain in touch with their heritage, and participate in a favorite, challenging, outdoor activity. In a free society, such lifestyle decisions are a matter of personal choice.

allow their presence. They have been restored to this level while sustaining a substantial, annual, regulated public harvest.[4]

Wildlife managers in many states and provinces have reintroduced extirpated furbearer species using traps and licensed trappers. Extirpation was ultimately caused by widespread degradation and loss of habitat associated with the colonization of North America and subsequent growth of human populations. In some instances this was combined with excessive exploitation because there were no wildlife agencies to establish and enforce regulations designed to protect furbearer populations. Where habitat and public support are available, the reintroduction of extirpated furbearers has been remarkably successful. In both the United States and Canada, species such as beaver, river otter, fisher, and marten have been reintroduced and restored throughout much of their historical range.

The time when furbearer species could be extirpated due to excessive, unregulated harvest is long past. Today, professional wildlife biologists are responsible for furbearer management. Most have devoted years of academic, laboratory, and/or field research to the study of furbearer species. Their mission is the conservation of furbearer populations. They have been highly successful in that mission as evidenced by the restoration and current abundance of furbearer populations.

Harvested furbearers have many uses today, reflecting the utilitarian values of many of the people who harvest them. Pelts are used for clothing such as coats, hats, mittens (made by craftspeople in Maine, left) and blankets, and are also used to make moccasins, banjos, rugs, wall hangings, and other forms of folk art. Fur is also used in fine art brushes, water repellent felt for hats, and high quality fishing lures.

Some people use the meat of furbearers such as raccoon, beaver, nutria (prepared by a Louisiana chef, above) and muskrat for tablefare or as a food source for pets. It is delicious and nutritious, high in protein and low in fat.

The glands of beaver are used in perfume, and glands and tissues from these and other furbearers are used to make leather preservatives, scent lures, and holistic medicines, salves, and moisturizers. Even the bones, claws, and teeth of harvested furbearers are sometimes used to make jewelry.

• Nutria dish photo courtesy of Louisiana Dept. of Wildlife & Fisheries

Principles of Furbearer Management

The goal of furbearer management is the conservation of furbearer populations. The main tenet of conservation is this: **Native wildlife populations are natural resources – biological wealth – that must be sustained and managed for the benefit of present and future generations**. If those wildlife populations are furbearer species, one important public benefit conservation provides is the opportunity to harvest some animals for food, fur, or both. The harvest of animals for these purposes is among the most ancient and universal of human practices. Today, under scientific wildlife management, harvests are controlled and regulated to the extent that the survival of furbearer populations is never threatened. No furbearer species is endangered or threatened by regulated trapping. **North American wildlife conservation programs apply three basic principles in establishing and managing harvest of wild animals: (1) the species is not endangered or threatened; (2) the harvest techniques are acceptable; and (3) the killing of these wild animals serves a practical purpose**.[5]

It is important to understand that the aim of professional wildlife management is to perpetuate and ensure the health of wildlife populations; not the survival of individuals within those populations. Wildlife management does not generally focus on individuals because individuals have short life spans. On the time scale that conservation is pledged to address, individuals do not endure. Populations *do*. Populations – provided with sufficient habitat

and protected from excessive exploitation – are essentially immortal. Wildlife managers apply scientific methods to maintain furbearer species as viable, self-sustaining populations.

Population Dynamics

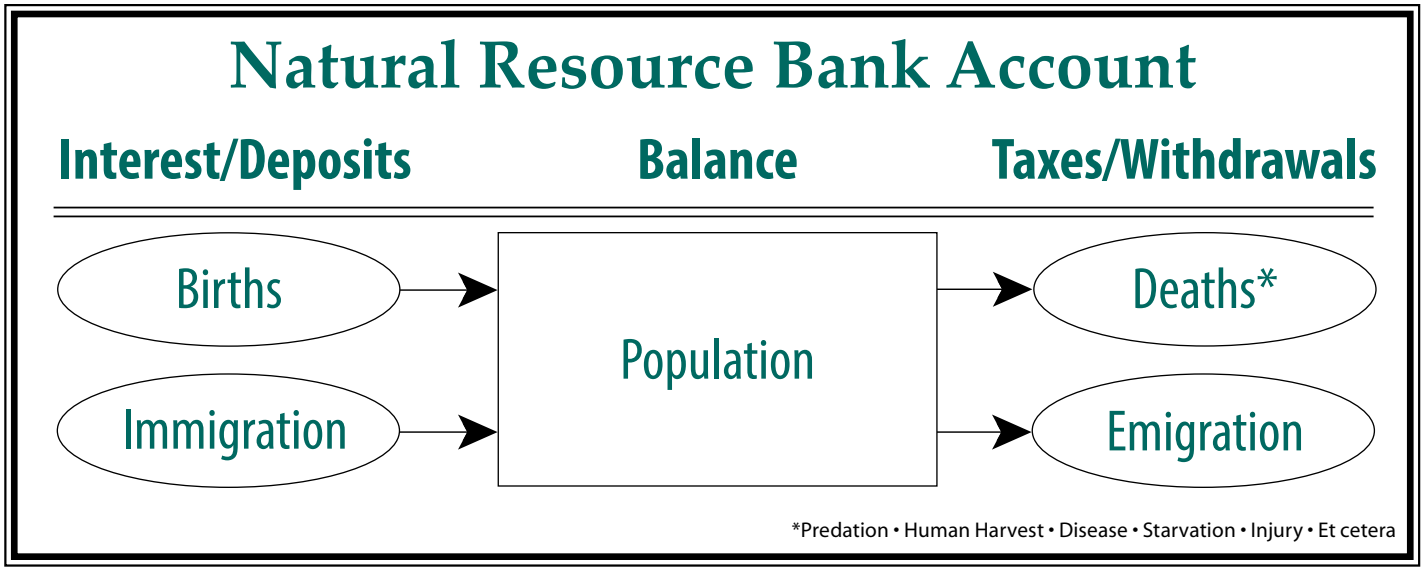
Like all populations, those of furbearers are dynamic. They are always in a state of flux, interacting directly and indirectly with other animal, plant, bacterial, and viral populations. In response to these interactions and a host of other environmental factors – many of which are today related directly to human actions – furbearer populations increase and decrease in density (number of individuals in any given area) and range. Wildlife managers monitor wildlife populations to determine if they are increasing, decreasing, or stable; to identify factors that affect those population trends; and to manipulate some of those factors to achieve the goals of conservation.

The laws of evolution and survival demand that the reproductive rate (the number of individuals born) of any population must equal or exceed its mortality rate (the number of individuals that die). If, over time, births do not equal or outnumber deaths, the population will become extinct. As a result, all species have evolved to produce a surplus of young during each generation. Furbearer species are no exception; many are capable of *doubling* their populations within a single year.

Because they produce a surplus of young, populations should theoretically grow continuously. The reason they do not is because as populations grow, various **limiting factors** slow or stop population growth. Resources required for survival – food, water, shelter, and living space – are limiting factors. As a population grows, one or more

Photo by Coleen Olfenbuttel / North Carolina Wildlife Resources Commission

Professional wildlife biologists are responsible for furbearer management today. They have been highly successful in their mission because they use the best scientific information available to ensure the present and future health of furbearer populations. Here a state furbearer biologist records physiological data collected from an anesthetized otter captured during an ongoing research project.



In a simple example (excluding habitat-related factors such as carrying capacity), a stable furbearer population can be compared to a bank account: interest and deposits (births and immigration) increase the balance (population) every spring and summer; taxes and withdrawals (mortalities and emigration) decrease it by roughly the same amount every fall and winter. Accountants (wildlife biologists) monitor the bank statements and advise the owner (the public) on when and how much of the balance can be withdrawn (harvested) that would otherwise be lost to taxes (other forms of mortality).

of these resources may become scarce to the point that some members of the population fail to acquire them and therefore die, disperse, or fail to reproduce.

Other limiting factors include most communicable diseases and predation. The former (and often the latter) is a **density-dependent** factor – that is, it increases as the density of the population increases.

Other limiting factors are **density-independent**. These include weather extremes, habitat destruction, and other catastrophic events. These reduce populations regardless of density. Some limiting factors such as road mortality (killed by vehicles) may be both density dependent and independent. Road mortality, for instance, is likely to increase as population density increases; however, it also will increase as more roads are built, regardless of population density.

Healthy furbearer populations cycle (increase and decrease about equally) on an annual basis. Most increase in the spring and summer with the birth of young; decrease in the fall and winter as natural mortality and emigration increase. Annual cycles are most dramatic in furbearer populations with high reproductive rates. Muskrat populations, for example, can decline by 75 percent during winter – and rebound completely by the following fall![6]

Banking Resources

Wildlife managers normally set furbearer trapping seasons to allow use of a portion of the individuals that would otherwise be lost to disease, starvation, predation, and other mortality factors. The standard regulated harvest is **compensatory** mortality: it replaces mortality factors that would otherwise have reduced the population by a similar amount. A scientifically regulated, annual harvest can be sustained indefinitely because it removes only the surplus, leaving sufficient reproducers to restore the surplus.

As a simplified example, imagine a stable furbearer population as a bank account. The balance (population) is a continually shuffled stack of bills (individuals). The account accumulates interest (the birth of young) every spring. Taxes (predation, disease, etc.) are always taking a few bills out of the pile. If the interest is allowed to accumulate, taxes increase every winter. However, if the interest is withdrawn (hunted or trapped) by the owners (the public), taxes do not increase. Either way, if taxes and withdrawals do not exceed interest, the balance stays about the same or increases from year to year. Wildlife managers are the accountants who advise the owners on when and how much interest can be withdrawn from the account.

Year	1	2	3	4	5	6	7	8	9	10
Adults	2	2	2	6	10	14	26	46	74	126
2 Yr Old	0	0	4	4	4	12	20	28	52	92
1 Yr Old	0	4	4	4	12	20	28	52	92	148
Kits	4	4	4	12	20	28	52	92	148	252
Total	6	10	14	26	46	74	126	218	366	618

In the absence of limiting factors such as inadequate habitat, disease, predation, and human harvest, beaver populations are capable of very high rates of growth. Regulated trapping helps control furbearer population growth and reduce furbearer damage at no cost to the public, and does not threaten the viability of furbearer populations.

Furbearer Population Management

Wildlife biologists manage furbearer populations in much the same way they manage other fish and wildlife populations such as bass, deer, and bears: they monitor the populations, determine the best management goals for each population (i.e. should it be increased, decreased, or stabilized in the best interests of the public and conservation), and then set harvest regulations/restrictions accordingly. Under most circumstances, the aim is to prevent population declines over time.

Under some circumstances – when a furbearer population is causing damage by threatening the survival of endangered species, damaging fish and wildlife habitat (as often occurs with introduced invasive species), or creating a hardship for landowners or agricultural producers – it may be desirable to reduce furbearer populations within some areas. In these situations, wildlife managers may adjust trapping and hunting regulations to increase the harvest beyond surplus production. When population reduction is the objective, the harvest adds to the annual mortality rate. This controlled **additive** mortality will cause the population (or at least its growth rate) to decline.

Conversely, there are situations when it is desirable to increase furbearer populations. These occur when efforts are being made to restore an extirpated species, or when a severe population reduction has taken place. In such cases wildlife managers might restrict or prohibit harvests for a time to encourage a rapid population increase.

The beaver is an excellent example of a furbearer that warrants intensive management. Wetlands created by beaver are highly productive systems with an abundance of water and nurients. They support a huge diversity of plants and invertebrates, and provide habitat for hundreds of fish and wildlife species. If the management objective is to maintain species abundance and diversity, it is prudent to manage beaver for its positive wetland values.

However, beaver populations often require control to reduce conflicts with humans. Although problems with beaver flooding roads and damaging property are widespread, the problems would be more intense, and the economic impacts greater, without the harvests of beaver during regulated trapping seasons. Almost half a million beaver are harvested from the states and provinces in any given year.[7] This reduction is important in controlling the growth of beaver populations and reducing property damage. It does not threaten the viability of beaver populations or their positive wetland values.

Muskrat, nutria, and beaver are the only furbearers in North America that, like deer, can significantly lower the quality of their habitat (by consuming a high percentage of the vegetation) if their populations are not maintained at an appropriate level. Additionally, lowering or even eliminating nutria populations may be a legitimate goal in making marsh habitats more suitable for native wildlife species (nutria are not native to North America) and in preventing

erosion and the loss of marsh vegetation.

Regulated trapping is the most efficient and practical means available to accomplish regular population reductions, and it does so at no cost to the public.

Although the populations of some furbearer species are prone to attain high local densities and then to "crash" dramatically as density-dependent limiting factors (e.g., food availability and disease) are activated, most furbearer species become relatively stable once their populations reach a given density. However, that density may be beyond what the human population can tolerate. If the level of human-furbearer conflicts (or conflicts with other wildlife species and habitats) becomes too great, population reduction can be a responsible management alternative.

While furbearer population reduction is not a goal for most furbearer management programs, population reductions in specific areas can control the frequency of furbearer conflicts with humans, lessen predation on rare, threatened, or endangered species, or reduce negative impacts on habitats and property.

The case of the piping plover, a beach nesting bird, provides a good example of how furbearer population reductions can assist in the restoration of a rare species. The piping plover, a federally listed threatened shorebird protected by both U.S. and Canada endangered species legislation, is vulnerable to predation by foxes and other predators while nesting. Trapping in and around piping plover habitat has reduced local predator populations, allowing enhancement of the dangerously low plover population, while the predators can be utilized as valuable, renewable, natural resources.[8]

Trapping Protects Rare & Endangered Species

Foothold traps are sometimes used to capture rare or endangered species unharmed so that the animals can be introduced into favorable habitats to reestablish healthy populations (see page 48). However, foothold and cable restraint traps also play an important role in protecting the health and viability of many established or newly re-established populations of rare and endangered species. These traps are particularly important management tools for protecting rare or endangered species from undesirable levels of predation caused by fox and coyote; neophobic predators that will typically avoid entering box or cage traps.

The following is a partial list of endangered or threatened species in North America and the furbearer species that have been managed to protect them through the use of modern foothold or cable-restraint traps:

Rare Species Under Restoration	Species Trapped to Aid Restoration
American Marten	Fisher, Bobcat, Coyote
Black-footed Ferret	Coyote, Badger
Blanding's Turtle	Raccoon, Striped Skunk, Opossum
Columbian White-tailed Deer	Coyote
Desert Bighorn Sheep	Cougar
Aleutian Canada Goose	Arctic Fox
Attwater's Prairie Chicken	Coyote
Brown Pelican	Coyote
Sandhill Crane	Coyote
Louisiana Pearlshell	Beaver
Mule Deer	Coyote
Sage Grouse	Coyote
Steller's Eider	Arctic Fox
Whooping Crane	Coyote, Red Fox
Least Tern	Red Fox, Raccoon, Coyote, Opossum
Piping Plover	Red Fox, Raccoon, Coyote, Opossum
Spotted Turtle	Raccoon, Striped Skunk, Opossum

Photo by Linda Welch

Tern and Chick

The target animals trapped during these operations to reduce habitat damage or predation on the rare species are either removed or relocated after capture. The trapping may be carried out by federal, state, or provincial wildlife biologists and animal control agents, or by private, regulated trappers.

The Role of Trapping in the Conservation and Protection of Seabird Nesting Colonies in Maine

Many islands along the coast of Maine provide critical habitat for colonial-nesting seabirds. The Maine State-threatened Atlantic Puffin, Razorbill, Great Cormorant, and Arctic Tern, plus the federally-endangered Roseate Tern, rely on abundant food resources and suitable nesting habitats to maintain their populations. In addition, other species of conservation concern that nest on Maine's coastal islands include the Laughing Gull, Leach's Storm-petrel, Common Eider, Common Tern, and Black Guillemot. The Maine Legislature has designated many of the seabird nesting islands in Maine as "Significant Wildlife Habitat," an indication of the conservation value of these nesting islands.

In recent years, mammalian predators such as mink and river otters have made their way out to several of these key seabird nesting islands, located 2-5 miles from the mainland. The response of the birds to the arrival of the mammalian predators on the breeding colonies often varies with the stage of nesting. For example, mammalian predators that arrive at seabird colonies during the incubation period will typically cause the birds to abandon the island for the entire season. However, mink and river otters that arrive on the island during the chick-rearing period can cause significant mortality to chicks and adult seabirds, as by this stage the adults are committed to remain on the island and try to raise their chicks. At National Audubon Society-owned Stratton Island, this situation resulted in more than 500 terns (adults and chicks) being killed by mink in less than a week.

Photo by Linda Welch

The conservation of colonial-nesting seabirds, particularly those on isolated islands such as this Atlantic Puffin, may sometimes require the local reduction of predatory furbearers that gain access to these crucial habitats.

The U.S. Fish and Wildlife Service's Maine Coastal Islands National Wildlife Refuge (NWR) was established in the early 1970s in an effort to protect and restore nesting seabird populations and help contribute to regional and international seabird conservation goals. Factors limiting seabird population growth and recovery include: availability of food resources, habitat degradation, competition, human disturbance, and avian and mammalian predation.

Between 2007-2014, Maine Coastal Island NWR personnel trapped 14 mink on Eastern and Western Brothers Islands. Common Terns, Black Guillemot, Common Eider, and Leach's Storm-petrels nest on the Brothers Islands. Mink have preyed upon all four species and have destroyed hundreds of nests. Burrow-nesting seabirds such as Atlantic Puffins, Razorbills, Black Guillemots, and Leach's Storm-petrels are highly susceptible to mink predation, as adult birds are easily killed in their burrows. With the exception of the Black Guillemot, these species only lay one egg per year and will not renest in a given year even if the nest-predator is removed. The trapping effort on these two islands has successfully maintained an average of 350 nesting pairs of seabirds over the course of the management period.

Another important island seabird nesting colony is located on Eastern Egg Rock, owned by the Maine Department of Inland Fisheries and Wildlife and cooperatively managed with National Audubon Society. Eastern Egg Rock, 5 miles from the mainland, supports approximately 800 pairs of Common and Arctic terns and federally endangered Roseate Terns, including 45% of the total number of Roseate Terns that nest in Maine. Eastern Egg Rock is also one of only four Atlantic Puffin colonies in the U.S.. During 2012, an adult otter and her pup were observed denning in what had recently been an active puffin burrow. When the otters were removed, it was determined that the young otter had puffin feathers in its stomach.

The use of modern traps and trapping systems has been a valuable tool in helping to support the long-term investment of state and federal agency staff who have been working effectively to protect and restore nesting seabird populations and help contribute to regional and international seabird conservation goals.

Regulated Trapping on National Wildlife Refuges

In 1903, President Theodore Roosevelt ordered that a small shell- and mangrove-covered island in Florida's Indian River be forever protected as a "preserve and breeding grounds for native birds." Paul Kroegel, a sometime boat builder, cook and orange grower, was hired to watch over this three acre sanctuary. His mission was clear: protect the island's pelicans from poachers and plume hunters. With this simple promise of wildlife protection, the National Wildlife Refuge System was formed.

The System now encompasses more than 92 million acres in the United States managed by the U.S. Fish and Wildlife Service as wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other designations for the protection and conservation of fish and wildlife, including those that are threatened with extinction. The mission of the National Wildlife Refuge System is:

"To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

Regulated trapping is recognized as a legitimate activity and sustainable use of wildlife resources within the Refuge System, and has been an important tool for the accomplishment of refuge management and restoration programs for many years. A comprehensive evaluation of Refuge trapping programs conducted by the Service in 1997 documented the importance of this activity in helping Refuges meet the mission stated above. The study examined mammal trapping programs on the Refuge System that occurred between 1992 and 1996.[12] The study identified 487 mammal trapping programs on 281 National Wildlife Refuges during the 5-year period.

The Service report went on to say: ***"This report demonstrates the importance of trapping as a professional wildlife management tool"*** and ***"Mammal trapping also provided important benefits for public health and safety and recreational, commercial, and subsistence opportunities for the public during the period."***

Eleven reasons for trapping on Refuges were identified in the following order (most common to least common):

1. recreation/commercial/subsistence
2. facilities protection
3. migratory bird protection
4. research
5. surveys/monitoring
6. habitat protection
7. endangered species protection
8. public safety
9. feral animal control
10. population management
11. disease control

A variety of trap types were used in these programs: quick-kill traps were used on 171 refuges, cage traps were used on 157 refuges, foothold traps were used on 140 refuges, cable restraint devices were used on 74 refuges, and other devices were used on 66 refuges.

The variety of trap types used reflects the diversity of environmental and weather conditions; refuge-specific needs, objectives and regulations; and of course the different wildlife species which are found from the Arctic National Wildlife Refuge in Alaska to wetland areas of Gulf Coast Refuges to the forest lands of Refuges in Maine. Trapping activities on Refuges are regulated; the public who participate are required to be licensed and to follow many enforced rules to ensure that their activities are conducted appropriately and in accordance with existing laws and regulations.

Photo by Tom Decker

Protecting America's Important Wetlands with Regulated Trapping

Wetlands represent some of the most vital and diverse types of fish and wildlife habitat, and also provide a multitude of benefits for society, including water purification and flood storage and prevention. Two of America's most eminent wetland systems – coastal Louisiana and the Chesapeake Bay – have been threatened by the expansion of of a non-native rodent, the nutria, native to South America. Nutria are large, semi-aquatic rodents with high reproductive rates.

The coastal wetlands along the gulf coast of Louisiana are among the most productive and important fish and wildlife habitats found in the United States. The largest expanse of wetlands in the contiguous U.S. occurs in Louisiana, comprising 25% of the freshwater marshes and 69% of the saltwater marshes of the Gulf Coast. This translates, respectively, to 15% and 40% of the total amount of these important ecological areas remaining in the United States. Louisiana's wetlands provide a multitude of functions and important values including:

1. Habitat for a diverse array of fish and wildlife species including **15 million water birds**, **5 million wintering waterfowl**, **1.5 to 2 million alligators**, and **17 threatened or endangered species**;
2. Groundwater recharge, reduction of pollution, and nutrient and sediment reduction;
3. Storm buffer, erosion control, and protection from floods;
4. Commercial and recreational marine fisheries with a total economic effect of $ 3.5 billion

In the State of Louisiana over 3 million acres of coastal marshes now exist. However, these coastal wetlands are threatened by degradation and destruction through overpopulation of nutria, an exotic rodent found throughout these wetlands. The Gulf Coast nutria population originated during the 1930s when captive animals were released or escaped into the wild. These animals established a population and began to thrive in coastal wetlands. Nutria weigh an average of 12 pounds each, average 4-5 young per litter, and have several litters each year. They are herbivores that eat wetland plants and vegetation, and they will pull and eat plant roots that anchor into the marsh. High populations of nutria foraging on marsh vegetation have resulted in vast areas of marsh becoming entirely void of plants. When a marsh is denuded of plant life by nutria, it is called an "eat-out" that may result in catastrophic damage to the habitat. When vegetation is removed from the surface of the marsh, the very fragile organic soils are exposed to erosion through tidal action. If damaged areas do not revegetate quickly, they will become open water as tidal scour removes soil and thus lowers elevation. Frequently, the plant root systems are also damaged, making recovery through regrowth of vegetation very slow.

Photos courtesy Louisiana Dept. Wildlife & Fisheries

Coastal wetlands in Louisiana are threatened by high populations of nutria, which can denude or "eat out" large areas of vegetation (above), leaving fragile marsh soils susceptible to erosion and destruction. Inset of fenced area shows what healthy marsh vegetation should look like.

Photo courtesty Louisiana Dept. Wildlife & Fisheries

Nutria are large, semi-aquatic rodents with prodigious appetites. They are not native to North America and are an invasive species. Regulated trapping of nutria helps prevent erosion of fragile wetlands while providing trappers with valuable food and fur.

The first region-wide aerial survey to estimate nutria herbivory damage was conducted in 1993 because reduced trapping resulting from lower fur prices allowed nutria, and eat-outs, to increase. In 1998, the coast-wide aerial surveys were implemented on an annual basis in the spring of each year following the trapping season. The number of eat-outs and the severity of the damage continued to increase, with only a small portion of the damaged acres demonstrating vegetation recovery. In 1999, wetland damage in Louisiana attributable to nutria was conservatively estimated to exceed 97,271 acres. The estimate is conservative because only the worst, most obvious damage can be detected from aerial surveys. The number of acres being impacted was certainly much higher.

The long term effect of these eat-outs is permanent. Vegetation damage caused by overpopulation of nutria aggravates other erosional processes. Coastal marshes are being lost at an alarming rate as a result of erosion, subsidence (lowering of land), saltwater intrusion, and the lack of silt-laden river water available to continue the process of marsh-building. Once gone, these acres of productive marsh cannot be replaced, and all their positive benefits and values are lost with them. Nutria also cause damage to rice and sugarcane fields, as well as to drainage canal dikes and roadways. In some areas they have severely reduced the success of wetland restoration efforts by feeding on planted grasses and trees.

Because of the tremendous destruction of this important habitat type that is home to literally hundreds of species of birds, mammals, reptiles, and amphibians, control of nutria is among the top priorities of the Louisiana Department of Wildlife and Fisheries (LDWF). Regulated trapping is the predominant method used in management of nutria populations. Licensed trappers harvest nutria during regulated seasons. If nutria are valuable enough, licensed trapper effort – and therefore nutria harvest – increases, resulting in reduced herbivory damage to the coastal wetlands.

To enhance this economic incentive, LDWF implemented a coast-wide program through the Coastal Wetlands Planning Protection Restoration Act (CWPPRA) in 2002 to reduce the nutria population in the wake of a worldwide fur market collapse. The methodology of this program was to offer a $5.00 incentive payment to registered trappers during the nutria trapping season for every nutria tail turned in to a certified collection station. The goal of this program was to harvest 400,000 nutria annually to reduce nutria herbivory in coastal wetlands. The program has been very successful in reducing nutria populations and damage to wetlands in coastal Louisiana. Since the first year of the control program, 2002-2003, an average of 331,987 nutria have been harvested per year and the number of damaged acres continues to decrease in areas of high hunter/trapper effort. Since the program's implementation, the 82,080 damaged acres documented in the 2002-2003 season have been reduced to 4,624 after the 2012-2013 season. The total harvest of nutria over the 11 seasons has reached 3,570,163. Such controlled and managed utilization of wildlife allows managers to protect coastal wetlands by keeping nutria populations at levels suitable with existing habitat conditions.

Trapping to Eradicate an Invasive Species

While regulated trapping conducted primarily by licensed members of the public for cultural, utilitarian, and management purposes was used to control nutria in Louisiana, professional government agents charged with resolving wildlife-human conflicts were employed to eradicate nutria from the Chesapeake Bay. Trapping by government agents is typically directed at quickly reducing the density of a local furbearer population (or sometimes to remove a specific animal or two) that is causing significant property, livestock, and/or other kinds of damage; presents a significant threat to public safety; or directly threatens the continued survival of rare or endangered species. Because it is conducted by government personnel for animal control or wildlife research purposes, is not typically subject to season or harvest restrictions, and does not involve the sale of pelts, this type of trapping is not comparable to conventional regulated trapping. However, the tools and the skills involved are essentially identical.

The U.S. Department of Agriculture's Wildlife Services (WS) program provides leadership to help resolve wildlife conflicts (see page 24). In 2002, the agency was recruited to participate in a Chesapeake Bay Nutria Eradication Project. Nutria are invasive, non-native, South American rodents first released into Dorchester County, Maryland in 1943. Nutria did not evolve in Maryland's wetland ecosystems, therefore no natural controls (nutria predators/diseases/browse-resistant plants) exist to limit their growth and expansion. Consequently, succeeding population increases and range expansion resulted in established populations in at least eight Maryland counties and unknown expanses of Delaware and Virginia. Populations on 10,000 acres of the Chesapeake Marshlands National Wildlife Refuge Complex (CMNWRC) Blackwater Unit grew from less than 150 animals in 1968 to as many as 50,000 in 1998. Populations found in the remainder of the Chesapeake Bay region were incalculable, but may have exceeded several hundred thousand nutria.

Loss or degradation of Maryland's coastal marshes has expanded to alarming proportions, not only affecting wildlife, but also citizens of the Chesapeake Bay region. It is estimated that between 45 - 65% of Maryland's wetlands have been lost since the 1700s. Several factors influence wetland loss in the Chesapeake Bay watershed including sea-level rise, salt water intrusion, land subsidence, groundwater withdrawal for irrigation, erosion (flood, tide, and wind driven), and herbivory by overabundant wildlife including invasive species. Nowhere has this trend been more dramatic than at Blackwater National Wildlife Refuge (NWR) where approximately 50% of its emergent marshes (5,000 acres) have been converted to shallow open water habitats since the introduction of nutria.

Nutria foraging behavior damages or destroys the root mat that binds the marsh together and maintains existing elevation levels. When this fibrous network is compromised, emergent marshlands are quickly reduced to unconsolidated mudflats. These areas, in turn, are highly susceptible to erosion, and are eventually converted to open water systems. This downward-spiraling progression influences the distribution and status of hundreds of other marsh species.

The region's marshlands function as sediment and contaminant traps, and are nursery grounds for the largest and most productive estuarine ecosystem in North America. The health of the Bay proper is chiefly dependent on the quality of its marshes and tidal wetlands, hence the degradation of these habitats was estimated to cause millions of dollars in lost fisheries and related revenue every year. In an effort to determine the relative impact of nutria versus other factors contributing to marsh loss, fenced exclosures (30 meters square) designed to exclude Nutria were erected in damaged marshes throughout Blackwater NWR in the mid-1990s. Very quickly, damaged wetlands protected from continuous nutria herbivory began to recover, while adjacent wetlands continued their precipitous decline. This experiment identified nutria herbivory as a key catalyst leading to the rapid conversion of emergent marsh to open water habitat. It also suggested that eradicating nutria could enable some partially damaged marshes to recover on their own.

In 1993, the Maryland Department of Natural Resources (DNR) and the United States Fish and Wildlife Service (USFWS) established the first multi-agency task force to investigate potential approaches to combat feral nutria populations. During the following 10 years, the task force established a Nutria Control Partnership and developed a draft eradication plan. Passage of the the Nutria Eradication and Control Act of 2003 authorized sustained federal funding of the Project. From 2002 until 2006, the WS program

Photo by USDA Wildlife Services

An aerial view of a fenced enclosure designed to exclude nutria demonstrates that marsh recovery is relatively rapid if the nutria are removed from the system. Such results provided scientific proof that eradicating the invasive species could help restore the marshlands.

was recruited to assess the feasibility of eradicating nutria. WS employees successfully applied eradication tools (trapping and hunting) and strategies across 100,000 acres in Dorchester County. Since then, WS has expanded the eradication zone to include portions of several counties in Maryland and adjacent sections of Delaware and Virginia. To date, all moderate to high-density populations have been reduced to near zero on over 150,000 wetland acres. The Project now includes the entire Delmarva peninsula and has been renamed the Chesapeake Bay Nutria Eradication Project (CBNEP).

Emphasis has now (2014/2015) shifted from large-scale aggressive reduction of high-density populations to a more focused detection and removal of remaining low-density populations on the Delmarva Peninsula's remaining 350,000 acres of potential nutria habitat. After this is accomplished, all areas will be monitored vigilantly for 2-3 years before eradication can be proclaimed.

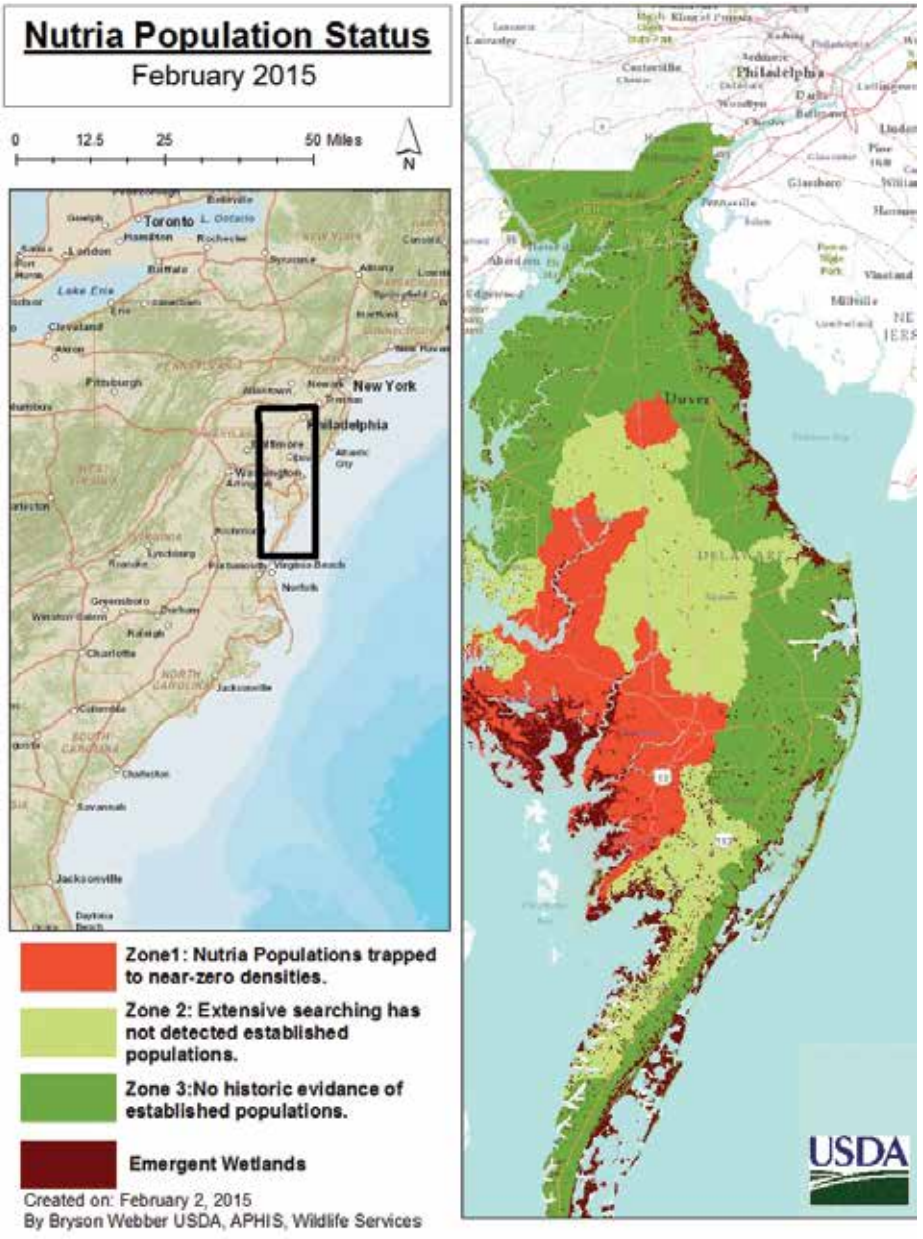
The Project combines modern technology and science with the traditional skills of hunting and trapping. Trapping has proven the most efficient and effective control tool available, and accounts for over 80% of nutria harvested by the CBNEP. Hunting accounts for the remaining animals taken. After populations have been dramatically reduced by trapping, hunting with the aid of dogs is an important strategy to remove isolated individuals.

Although demanding, it is not difficult to quickly trap large numbers of animals in areas with established populations. Conversely, it is extremely challenging to locate and remove the last few nutria. Not all nutria are susceptible to capture in each trap device and no single trap type or harvest tool will take all individuals. To accomplish the goal of eradication, a variety of tools and strategies are necessary. Of the nutria that were trapped, approximately 79% were taken with quick-kill traps and 19% with foothold traps. The remainder were captured in cage traps or with cable restraints. Although quick-kill traps account for the majority of captures, foothold traps are irreplaceable in some environments and situations. After the bulk of a population is

eliminated with kill traps, foothold traps become crucial in the removal of remaining animals.

The CBNEP is now entering its final phase. Efforts are concentrated on identification and removal of small, disjunct populations and isolated individuals. It has become glaringly apparent that regardless of all the technological advances in modern society, eradication would not be possible without the systematic utilization of time honored and tested trapping skills and equipment.

Below, photos of the habitat at Cod's Point Marsh on Chesapeake Bay taken before (left) and after (right) the successful nutria eradication program show the drastic damage the invasive species was causing, and the dramatic recovery of the habitat following elimination of that species. While trapping was not the only technique used to remove the rodents, it played a very significant role. In this case, traps and highly experienced trappers proved to be a very effective tool in the eradication of the invasive species and the habitat damage it caused. It must be understood, however, that the year round "eradication" trapping (and shooting) required to achieve this accomplishment has a far different goal than standard regulated furbearer trapping.



Photos by USDA Wildlife Services

Wildlife Services – A Leader in Managing Human-Wildlife Conflicts

The U.S. Department of Agriculture's Wildlife Services (WS) program provides leadership to help resolve human-wildlife conflicts. Program activities include agriculture, property, and natural resource protection; threatened and endangered species conservation; public health and safety; and wildlife disease surveillance and management. WS managers, biologists, and researchers address conflicts using an integrated approach and rely on a variety of methods and techniques, including trapping (see pages 22-23).

Historically, most WS trapping activities were focused on livestock protection, but today the program's biologists and technicians also use a wide variety of traps to protect native species, remove wildlife from areas where they cause damage or pose a risk (such as at airports), and conduct monitoring, disease surveillance, and research. For instance, WS airport biologists often trap and relocate raptors from airports; field specialists trap predators to enhance the survival rates of endangered and threatened species such as the California least tern, sea turtles, and Steller's eider; researchers trap and radio-collar a variety of species for ecological and behavioral studies, and rabies biologists may trap, sample, and release as many as 7,000 meso-carnivores annually to monitor rabies management activities.

Foothold traps remain one of the most important capture techniques used by wildlife professionals. WS field biologists and technicians rely on trap research conducted by the WS National Wildlife Research Center and others to enhance efficiency and to conduct successful wildlife damage management projects throughout the United States. For more than 50 years, WS has engaged in collaborative research to improve animal traps and trapping systems. Most of this effort has focused on improving the humaneness, efficiency, selectivity, and safety of traps, with results leading to greatly improved designs for foothold and box traps, snares and cable restraints, trap monitors, and trap tranquilizers.

Beginning in 1983, WS researchers tested padded jaw traps and subsequently worked with a trap manufacturer to produce a trap for coyotes that reduced injuries while still effectively capturing animals. During the 1960s, researchers, field specialists, and others recognized an occasional need to sedate animals captured in foothold traps. WS researchers identified and tested a variety of drugs for use in a tranquilizer trap device that could reduce stress and potential injury to the animal caused by the trap, and also prevent animals from escaping. From that research, the sedative propiopromazine hydrochloride (PPZH) was registered and is currently used in some areas where coyotes and wolves are caught in foothold traps for research purposes.

Researchers and field specialists have also worked with trap manufacturers and others to assess and modify pan tension devices for traps, improve predator capture devices using cable restraints, and develop trap monitoring systems. WS also funds and is actively involved in the national effort to evaluate traps according to international standards for animal welfare and to develop "Best Management Practices" guidelines for trapping furbearers in collaboration with state wildlife management agencies and the Association of Fish and Wildlife Agencies.

WS and various partners continue efforts to develop, improve, and effectively use traps and capture devices to help ensure that trapping remains a valuable and effective wildlife management tool.

Photo by USDA Wildlife Services

Wildlife Services experts use a variety of traps, including foothold traps like this one, for wildlife management and research. During Nutria eradication efforts (see following section), quick-kill, foothold, and cage traps all played a part in the success of the program.

Trapper/Agency Cooperation Protects Canada Lynx and Trapping Traditions

Trapping in areas where furbearing animals co-occur with threatened or endangered species presents unique challenges and requirements for both the trapper and the state wildlife agency that issues the trapping license. Under the federal Endangered Species Act (ESA), the unintentional or incidental trapping of a federally protected species, even if the animal is not injured, is prohibited and considered a "take". The ESA defines take as: "To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct ...". The trapper, state agency, and the federal government all have responsibilities for minimizing the take of a federally protected species. These responsibilities can be formalized through agreements with the U.S. Fish and Wildlife Service (USFWS), typically with a Habitat Conservation Plan Permit. This permit is issued when the USFWS is assured that sufficient measures will be undertaken to minimize and mitigate for the incidental take of a federally listed species.

The Canada lynx (*Lynx canadensis*) is a federally threatened species. Thirty-three years before the Canada lynx was listed as threatened, the State of Maine, through its legislature, took the first step to protect this species by closing the bounty on lynx and prohibiting the hunting and trapping of lynx. Since that time, the Maine Department of Inland Fisheries and Wildlife (MDIFW) initiated a number of measures to decrease the chances that a lynx will be incidentally trapped, including modifying its trapper education program, providing outreach materials to trappers, and instituting regulatory changes that modified how traps can be set or placed. Maine trappers have worked hand-in-hand with MDIFW in developing methods to reduce incidental take and in promptly reporting lynx that are incidentally trapped.

In Maine, lynx are most likely to be incidentally caught by trappers targeting coyotes and fox with foothold traps, and occasionally by trappers pursuing marten and fisher with quick-kill traps. To minimize the chances of lynx being caught in traps, MDIFW biologists worked with the USFWS and the Association of Fish and Wildlife Agencies to

Photo courtesy of John Organ

Biologists with Maine's Department of Inland Fisheries and Wildlife examine lynx kittens during research work to monitor the population and reproductive status of the species in the state.

develop the booklet "How to Avoid the Incidental Take of Lynx"[12a]. MDIFW also passed regulations that restricted the size and placement of quick-kill traps and the use of visible bait and attractants when trapping. Even with these efforts, a few lynx are incidentally caught each year in foothold traps. Most lynx can be released with little or no injury thanks to the foothold trap design, the trappers' immediate notification of a capture, and MDIFW's deployment of wardens and biologists to assist with the release and examination of captured lynx. Perhaps the best example of the trapping community working with MDIFW to minimize the take of lynx is the development of lynx exclusion devices, which further protect lynx from quick-kill traps while providing more options for trap placement (i.e., on the ground or in elevated sets). The Maine Trappers Association approached MDIFW with the idea of building a box or cage over the quick-kill trap that had an opening that would allow a marten or fisher to access the baited trap, but would prevent a lynx from reaching the trap. MDIFW tested various configurations of this device and found them to effectively exclude lynx. These exclusion devices are now being legally used in Maine.

Photo by Maine DIFW

Maine's wildlife biologists conducted a 12 year research project starting in 1999 during which 85 adult lynx were captured with foothold traps, fitted with radio collars, and released unharmed. As a result, biologists were able to learn much about lynx habitat use, movements, home range, reproduction, and survival. They also discovered that fisher –a species harvested by trappers in the core lynx range during a regulated season – killed about 10% of the collared lynx. This information would have been unobtainable if traps were not allowed for harvesting furbearers or research.

MDIFW has been sued twice by groups who wished to stop the further incidental trapping of lynx. In response to these lawsuits, MDIFW developed an Incidental Take Plan and received a Habitat Conservation Plan Permit in fall 2014. For lynx, this Plan provides assurances that the measures MDIFW already had in place to minimize the take of lynx will be maintained, and it also provides provisions for MDIFW, in consultation with USFWS and trappers, to further protect lynx if necessary. Maine's trappers have been consulted throughout this process and have provided valuable input. The Incidental Take Permit, in combination with MDIFW's Plan, provides assurances to the general public and to Maine's trapping community that trappers can continue to pursue their avocation without detriment to Maine's lynx population.

Photo courtesy of John Organ

Photo by Bill Byrne

A red fox displays the fatal results of sarcoptic mange. The disease is density-dependent in that the mites which cause it must be spread by direct contact with an infected animal or its bedding. When population densities are high, animals come into contact more frequently, and diseases such as mange spread rapidly.

Disease Control

The influence of trapping on the occurrence and spread of wildlife diseases has not been established definitively, despite claims by both opponents and proponents of trapping. However, disease occurrence in wildlife populations is often associated with high densities of animals.[9] Reducing local densities of furbearer populations through harvests can reduce disease transmission and potential for human contact. While the disease may persist in the population, the intensity of outbreaks may be reduced. In a study conducted in Canada, severity of fox rabies outbreaks were reduced by heavy, government-funded trapping, while normal furbearer harvests showed little effect. However, it was also noted that high levels of regular trapper harvest in southern Ontario decreased the severity, if not the frequency, of rabies outbreaks in red foxes.[10] Intensive, government-funded trapping was also shown effective in controlling an epizootic of skunk rabies in Alberta.[11]

The only definitive statements that may be made on the subject of disease control at this time are that regulated trapping will not (and is not designed to) eradicate diseases; very intensive trapping may help control diseases; and the relationship of normal furbearer harvests to disease occurrence and intensity in wildlife populations is not yet well understood.

Photo by Coleen Olfenbuttel / North Carolina Wildlife Resources Commission

The Facts on Regulated Trapping

People have continuously used furbearers in North America for clothing, food and religious ceremonies for the past 11,000 years. Furbearer resources had a greater influence than any other factor on European settlement and exploration of the continent. Many cities and towns in North America, including Quebec, P.Q., Albany, NY, Chicago, IL, St.Louis, MO and Springfield, MA, were founded as fur trading centers where Europeans bartered with Native Americans for furs. The trapping and trading of furbearer resources is a heritage that still continues as an important component in the lifestyles of many people in our society. Whether in an industrial, urban, rural, or remote setting, trapping and fur are still of cultural and economic importance and furbearers continue to be utilized and managed as abundant, renewable natural resources.

The economic impact of managing furbearer resources is enormous: the multi-billion dollar fur industry annually generates millions of dollars to North American trapper households, wholesalers, processors, garment makers and the retail clothing industry. There are also economic values derived from reduced damage to property and agriculture; personal uses of fur, hides, meat and other products; license revenues; goods and services sold to the public who trap and hunt; and the enhancement of economic activity and the redistribution of money into rural communities. Many remote communities in Alaska and northern Canada are dependent on the sale of pelts.[13] Trappers in South Carolina report that 9.3 percent of their family income is derived from trapping.[14] The food value of furbearers can be equal to or greater than the market value of their pelts. Even in an industrialized state like Massachusetts, 28% of trappers report they use furbearers as a food source for themselves or their pets.[15]

In addition to economic values, trapping has many social values. In Vermont for example, gardening, child care, fire wood gathering, harvesting of wild foods, home and automobile maintenance, animal husbandry, and community volunteer work are bartered for trapping and furbearer products in

Trapping is a Lifestyle

Historically, people in the United States and Canada looked to the land to secure food and provide for their households. Being independent, self-sufficient and hard working, providing for one's family, being a steward of the land — these values and lifestyles are traditionally and distinctly part of the fabric of our society and culture, and they remain present today.

Trapping is an annual seasonal activity in which many people in North America currently participate. Sociologists and other researchers have begun to document the importance of trapping in the lives of these people who still look to the land — including the utilization of wildlife — as part of their lifestyle. This lifestyle is often not understood by the larger segment of society whose members no longer hunt, trap, fish, raise their own vegetables, cut their own firewood or look to the land in other ways to provide for their households.

People who trap in the arctic and sub-arctic regions of the continent often fit our image of traditional trappers. In Canada and Alaska more than 35,000 aboriginal people participate in the trapping of furbearers. These trappers are motivated by the need to secure sustenance (food and clothing) for their families. Fur trapping can be particularly important to them due to the remoteness of their communities, and may provide an essential source of income during certain times of the year. Many of the cultural values and traditions of these people are passed along from generation to generation through the seasonal rituals of trapping. Trapping teaches their youngsters survival and subsistence skills and provides a meaningful fall and winter activity that helps instill a sense of responsibility to their families and communities.

Photo by Scott Smith, NYS DEC

The attitudes of trappers in the more developed areas of North America mirror the motives of their northern contemporaries. Approximately 270,000 families in the United States and Canada derive some income from trapping, but households that embrace a trapping lifestyle are often not apparent in suburban areas with a diverse mix of cultures. Researchers have documented and described a very vibrant trapping culture even within the urbanized northeastern United States. People who trap in this region list several motives for why they participate in trapping: lifestyle orientation, nature appreciation, wildlife management, affiliation with other people, self-sufficiency, and income (sometimes complimentary, sometimes critical, to the household budget). A universal theme expressed by many trappers is that trapping is a principal component of their lifestyle: it defines them and has deep meaning as an enduring, central life interest.

Trapping in today's society has often been referred to as "recreational" in the context of a "sport," yet as the sociological studies have revealed, the term is a misnomer. It fails to consider the motives of the hundreds of trappers surveyed. People who trap tend to express strong support for conservation programs and environmental protection. They may also cut firewood, raise their own vegetables, hunt and fish. For these people, the opportunity to harvest fish and wildlife contributes to a sense of self-reliance and independence. Studies in New England and elsewhere reveal that trappers barter furbearer pelts, products and trapping services (to remove nuisance wildlife causing property damage) in exchange for childcare, automobile repair, vegetables and other goods and services.

Whether they are aboriginal people living in Canada and Alaska, or people living in suburban or rural areas of New England, Louisiana, or industrialized southern Ontario, a common link among all trappers is that they value the capability of the land to produce wild animals and plants they can use to bring sustenance into their households (e.g. meat for food, pelts for clothing, and/or money to buy household goods). For many, trapping is an integral part of their life, a link to the land, a crucial element in their relationship to nature. With proper management of wildlife resources, people today can still choose to participate in this lifestyle as societies have done since the beginning of time. This is a unique opportunity and experience for people in the United States and Canada that can no longer be pursued throughout most of Europe or the rest of the industrialized world.[16]

some communities.[17] This "hidden economy" may have social and economic significance in many rural communities all over the continent.

Trapping, along with the heritage and self-sufficient lifestyle it represents, has a cultural and social role in today's society and is much more than a "consumptive use" of wildlife. **Trapping can instill a strong appreciation for wildlife and the environment**. Sociological studies show that trappers have an exceptional degree of factual understanding of animals and are outstanding and unusual in their knowledge of wildlife. Trappers, through their outdoor experience and use and knowledge of wildlife, are unique. The relationship they have with land and wildlife underlies a strong sense of stewardship for the environment.[18]

Traps & Technique

The capture and harvest of furbearers has changed markedly since early times. Modern trapping is not comparable to the reckless exploitation of the 17th, 18th and 19th centuries. Today trapping is heavily regulated, involving some of the most complex laws that deal with wildlife, enforced with stiff fines and penalties that ensure the integrity of the activity. Overall, the regulations are designed to protect furbearer populations and make trapping as humane and efficient as possible.

Many people unfamiliar with modern trapping think of traps as big, powerful devices with jack-o'-lantern teeth on the jaws. This stereotypical image of the trap is based on the obsolete designs that were used to capture bears many years ago. Those old bear traps are collector items today. Such dangerous and destructive devices have no use in modern furbearer trapping. Today, sizes and types of traps and their use are regulated, and many sizes and types of traps are no longer allowed. Trappers must check their traps within specific time intervals and are restricted or prohibited from setting traps in certain areas. Most jurisdictions require that live-restraining traps be checked daily.

Photo by Bill Byrne

Environmental Police Officers, Conservation Officers or Game Wardens enforce trapping laws and regulations throughout the United States and Canada.

Trapping is Highly Regulated

Within the United States and Canada, state, provincial or territorial fish and wildlife agencies have legal authority and pass laws governing furbearer resources. There are various types of laws that apply to trapping within each jurisdiction, and they are enforced by local environmental police, conservation officers and/or game wardens. Laws that regulate trapping by various means include the following:

- Mandatory licensing of trappers
- Mandatory daily checking of traps
- Mandatory trapper education
- Restricted seasons for trapping
- Restrictions on the size of traps
- Restricted areas for trapping certain species
- Restrictions on the types of traps
- Mandatory tagging of traps to identify owner

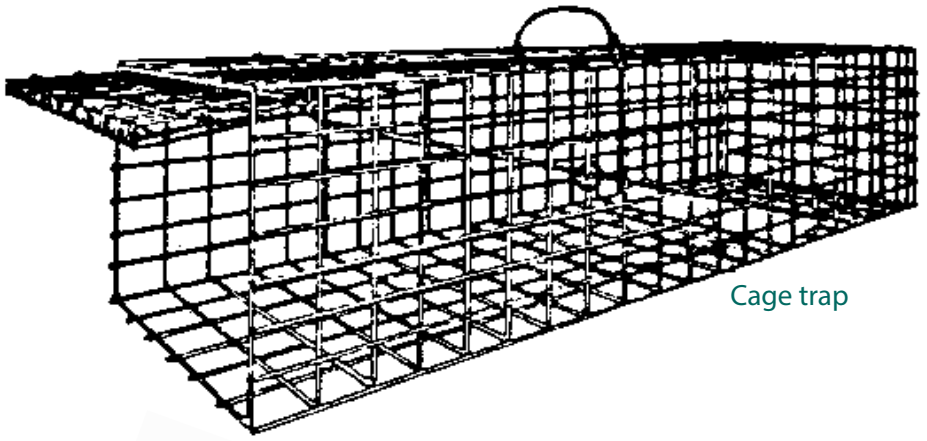
Professional wildlife biologists monitor the populations of furbearing animals. Scientific studies are conducted to ensure that these species are managed properly. In addition, research focused on the traps themselves identifies which traps work best with each species, and which need improvements. New and improved traps are continually being developed.

Basic Trap Designs

Modern traps fall into two main categories: quick-kill type traps and live-restraining traps. Kill type traps are designed to quickly kill the captured animal, much like a common mousetrap. Live-restraining traps can be separated into cage traps, foothold traps, and cable restraint systems.

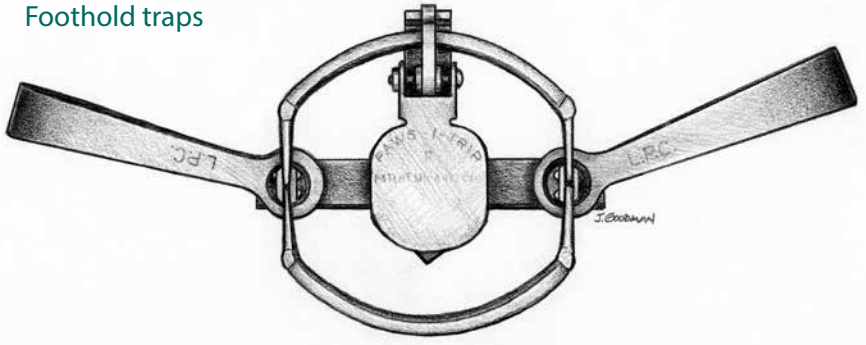
Cage traps: Cage traps are baited wire enclosures with one or two doors that close and lock when the animal steps on a pan or treadle. They work well for animals that are not averse to entering holes or cages, but are ineffective for capturing wary species such as foxes and coyotes. Cage traps come in a variety of sizes designed to catch animals from mice to raccoons. They are, however, expensive, bulky, heavy to handle, and are not practical or efficient in many trapping situations.

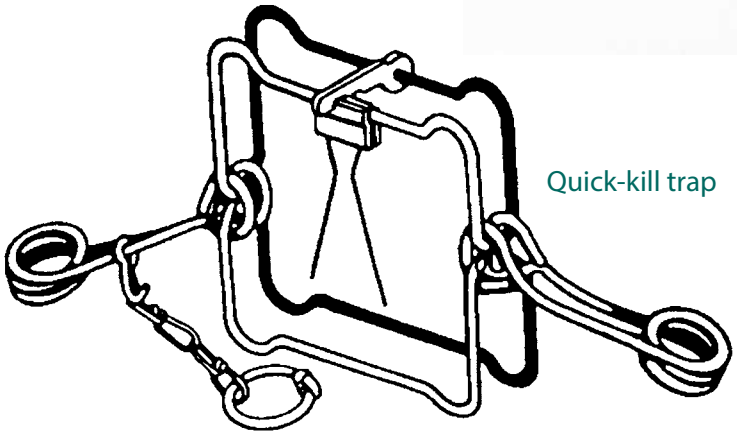
Foothold traps: Foothold traps typically have two metal jaws, sometimes covered with rubber, that are closed by springs released when the animal steps on the trigger pan. Other specialized foot encapsulating devices – such as the "EGG" trap and other species-specifc designs (see pages 32 and 34) as well as passive or spring-loaded cable restraint devices – are also available for use in certain states and provinces.



Cage trap

Foothold traps





Quick-kill trap

There are four basic trap designs – cage, quick-kill, foothold, and cable restraint – and many variations of each. Cage traps (top) are live holding traps that restrain an animal in a portable cage. Kill-type designs (left), also known as quick-kill traps, dispatch furbearers quickly with a hard blow to the head, neck or body in the same manner that a common mouse trap kills a mouse. Foothold traps (three models above) are live-restraining traps that typically have a set of spring-activated jaws designed to close on an animal's foot across or just above the foot pad. They are not designed to close on an animal's leg, as is commonly believed, and hence are properly called foothold, rather than leghold, traps. Set under water, they can also function as kill traps.

Typical foothold traps are categorized by the type of spring (e.g. coil, jump, or long spring), and are made in different sizes appropriate for catching animals as small as weasels and as large as coyotes and lynx. When set, the jaws of foothold traps typically range from 3 1/2 - 7 inches in spread. These traps are designed to hold an animal by gripping the toes or foot (not the leg, as is commonly believed) across or just above the foot pad. This prevents the captured animal from slipping the trap off its foot. As an option, foothold traps can be set in water to submerge a captured animal, and can thereby function as kill traps.

Cable restraints: Cable restraint devices are specialized types of snares that employ modern modifications such as flexible cable, relaxing locks, and breakaway stops and fasteners to restrain animals without injury. Trappers use cable restraints to capture fox, coyote, and wolf by suspending the loop within a travelway used by the species of interest. The loop is usually held inplace by a piece of light wire. As the animal enters the device, its own forward progress draws the loop tight around the body. The animal is then held alive when the trapper arrives to check the set. These devices can also be set underwater to function as kill sets.

Choosing the Appropriate Trap

Choice of trap style depends on the specific situation and the furbearer species that is being targeted. Cage traps or foot-encapsulating traps are an excellent choice for raccoon, skunk and opossum when trapping near residential areas in wildlife damage management situations. Quick-kill type traps are very effective when used for marten, mink, fisher, muskrat, otter, and beaver. Kill-type traps are considered to be efficient and humane because animals rarely escape, and loss of consciousness and death are rapid. However, kill-type traps do not allow for release of "nontarget" animals (animals the trapper does not want to harvest). Also, fox and coyotes will rarely enter kill-type traps. For these species especially, foothold traps remain the most effective trap (and allow for release of nontarget animals).

Foothold traps do not have to be big and powerful in order to hold an

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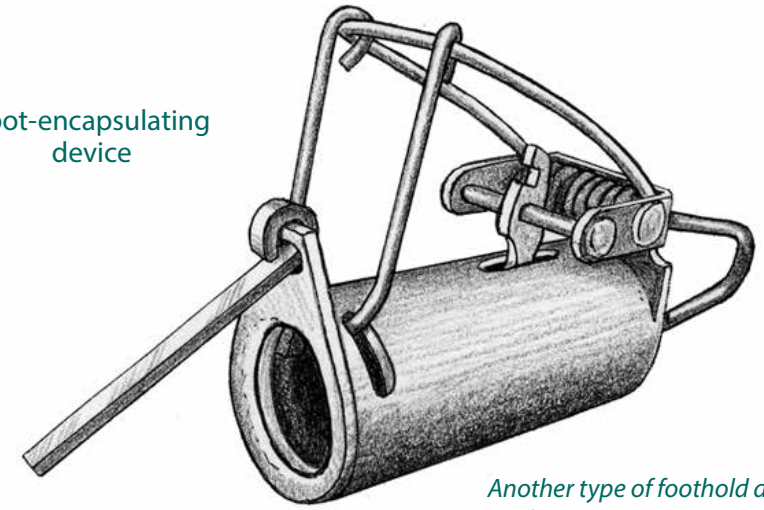
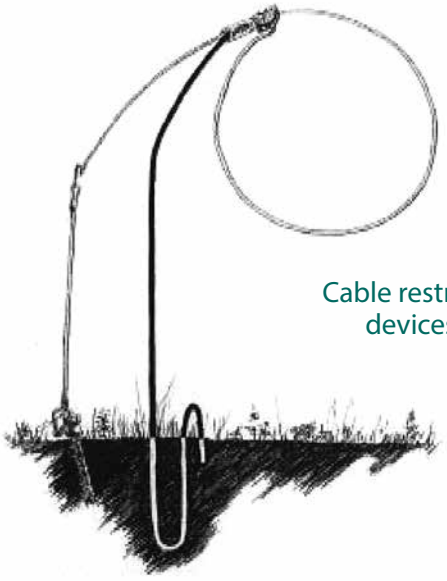
Foot-encapsulating device



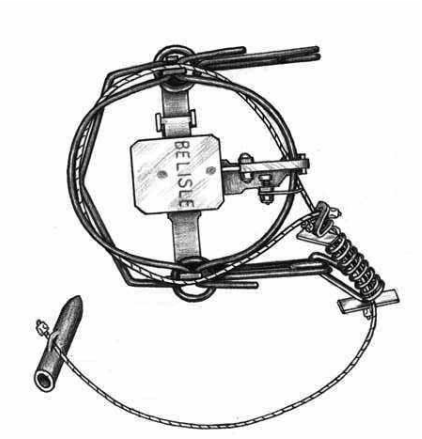
Another type of foothold design is the foot-encapsulating trap. These include the egg trap pictured on page 34, as well as the design illustrated above. They are very effective for capturing furbearers such as raccoons that will readily reach into cavities.

Cable restraint traps, like those illustrated below, are specialized types of snares designed to restrain furbearers until the trapper arrives to check the set. They are particularly effective for capturing coyotes, foxes, and other canids that won't enter cage traps, and may be suspended at specific heights to collar individual species, or can be incorporated into a spring device (below, right) to catch and hold animals with a foot cable that functions in much the same way as a foothold trap.

Each trap design is superior to the others for specific applications, species, and situations.



Cable restraint devices



Research & Development
Improving Traps with Science

Wildlife agencies, as well as the public who trap, have long been interested in developing and refining traps and trapping techniques to further improve the welfare of furbearers captured for research, wildlife damage and disease control, fur and food. The overriding goal has been to design traps that will hold target species unharmed, or in the case of kill-type traps, dispatch them as quickly as possible. Foothold, cable restraint, cage and kill-type trap designs have all been improved substantially in these respects over the past 100 years, and new and improved models are replacing older designs. While the production of a new trap once required little more than some imagination, engineering and marketing skills, today most trap improvements are confirmed using sound scientific information.

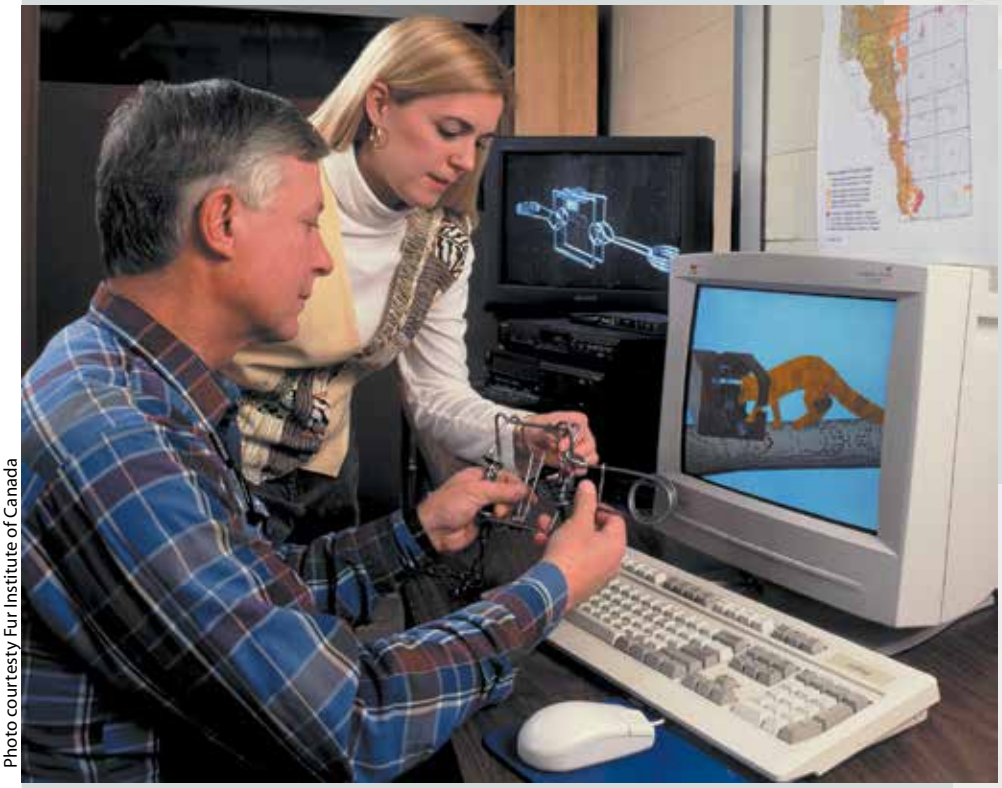


Photo courtesy Fur Institute of Canada

Modern trap evaluation is a comprehensive process that typically begins with mechanical evaluation, followed by computer simulation (left). Continual research has resulted in design modifications. These include double jaws (above), offset jaws and wide-edge jaws (combined on the trap below).

Trap performance can only be verified through a comprehensive process that evaluates all components of a trapping system. In order to ensure the scientific credibility of results, trap research programs must incorporate appropriate study designs and include rigorous multi-stage testing. Today, various stages of trap research may include: (1) mechanical evaluation of traps; (2) trap performance testing using computer simulation models; (3) study of how animals approach traps; (4) trap performance testing in fenced enclosures; (5) trap performance testing in the field; and finally (6) confirmation tests utilizing independent trappers. Many trap designs have been evaluated to this degree and tested under a variety of conditions throughout the United States and Canada. These evaluation studies have provided important contributions to animal welfare by improving the performance of trapping systems.

Ongoing scientific research aimed at the development of improved traps has resulted in entirely new designs such as the egg trap (at left in photo), a modern foot-encapsulating design used specifically to take raccoons and other predators that will readily reach into cavities. Soft-catch (at right in photo) is a modern update of a traditional foothold design. This trap system not only incorporates specially padded jaws, but also a shock-absorbing spring and double swivels proven to reduce the chance of injury to captured animals.

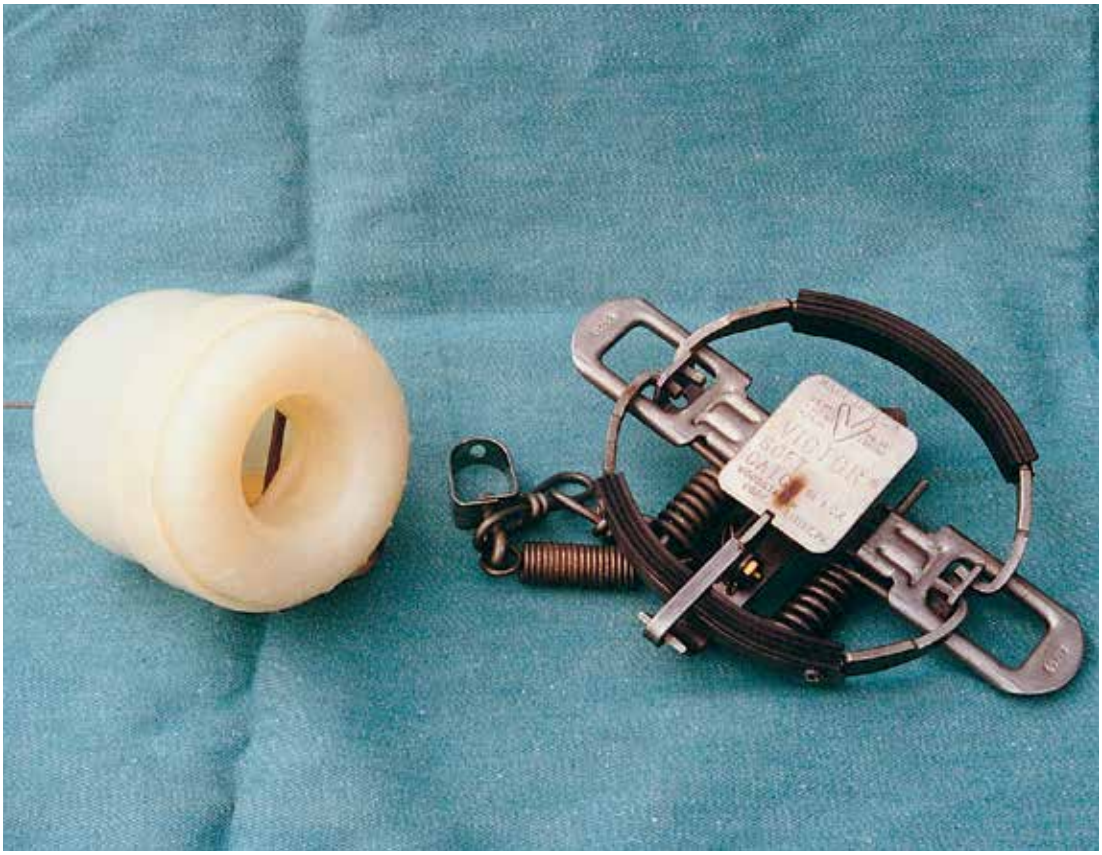


Photo by Bill Byrne

While many people and organizations talk about improving trapping, only a few have provided funding for developing new traps and improving older designs. Trap research in North America has been funded jointly by the governments of Canada and the United States, the International Fur Federation, state and provincial wildlife departments, and the Fur Institute of Canada. Wildlife agencies utilize the research findings of trap studies funded by these organizations to assess and incorporate new information into trapping regulations and trapper education programs. While research has provided the information to develop and test entirely new trap designs (such as the "EGG" trap , the synthetic (non-metal) jawed Rudy trap, and the Belisle foot snare) for particular species, modifications to existing kill traps and foothold traps are also of great importance. Adjusting chain length, adding swivels and shock absorbers to the chain, providing for adjustable pan tension, and/or replacing jaws with offset, laminated or padded jaws can improve the welfare of captured furbearers, and researchers continue to explore other new and innovative design possibilities. Everyone is interested in using the best technology available for the responsible capture of furbearers.

Performance evaluation and the testing of killing and restraining traps in both the United States and Canada follow methods approved by the International Organization for Standardization (ISO). These testing standards ensure that countries have internationally comparable data for evaluating trap performance. Modern trap evaluation is conducted in a framework that applies science to ensure the use of humane and safe traps whether for scientific study, animal management programs, protection of endangered species, or the sustainable utilization of wildlife resources by the public.

Trap research efforts today are well coordinated among the state and provincial wildlife agencies, cooperating Universities and federal agencies in the United States and Canada. Wildlife biologists, statisticians, engineers and specially trained wildlife technicians oversee trap-testing efforts conducted in North America. In the United States, 41 state wildlife agencies have participated in a coordinated national trap-testing program. In addition, the United States Department of Agriculture Wildlife Services program has conducted important research on improving trapping devices. In Canada, trap-performance testing, research and development is coordinated by the Trap Research and Development Committee (TRDC) of the Fur Institute of Canada (FIC) with participation of all provincial/territorial wildlife agencies and trappers from across Canada. Much of this work is conducted at the Fur Institute of Canada's Trap Research Center which is located within the Alberta Innovates Technology Futures research facility in Vegreville, Alberta. This is the most comprehensive and extensive trap research center in the world. Trap evaluation and testing programs under field conditions are often conducted in cooperation with provincial/territorial wildlife agencies and cooperating trappers. Research findings from the FIC-TRDC program are used both in the United States and Canada.

Using Science To Identify the Best Traps for Animal Welfare

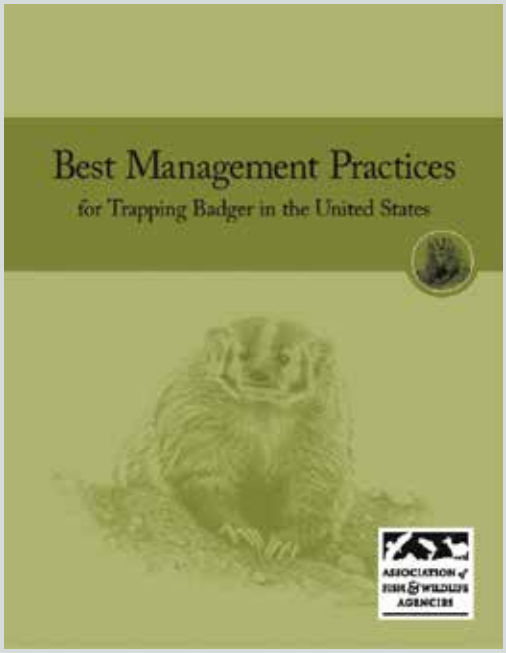
Best Management Practices

State fish and wildlife agencies and USDA's Wildlife Services program are conducting a national effort to develop Best Management Practices (BMPs) for regulated trapping in the United States. This effort is identifying and promoting the very best technology available to capture wildlife.[19] These BMPs address five specific points relative to the use and performance of traps. These components are: the welfare of animals, the efficiency of the traps, the selectivity of the traps, the safety of trappers and other members of the public, and the practical application of various types of traps.

BMPs provide the information that will help make a trap and trapper function together in a manner that is safe, humane, effective, and selective. These documents describe the different types of traps and what training may be needed for people who trap with them. BMPs are being recommended to all state fish and wildlife agencies for incorporation into regulated trapping programs and trapper education.

State wildlife biologists cooperating with specially trained wildlife veterinarians are designing and conducting trap research projects to identify the best traps available. All types of traps are being tested, including cage traps, cable restraint devices, foothold traps and killing type traps. Trap testing programs involving dozens of trapping systems are being conducted from Alaska to Maine to Louisiana. Since 1997, millions of dollars have been spent on trap testing programs to initiate the development of BMPs. State fish and wildlife agencies have dedicated thousands of hours of wildlife professionals' time to the successful completion of these projects. The testing is conducted under actual trapping conditions, on working trap lines, by experienced trappers accompanied by trained wildlife technicians.

Everyone — managers, biologists, veterinarians and the public who trap — is interested in using the best technology available for the responsible capture of furbearers. Working towards this goal, state wildlife agencies will persist in their trap research efforts and continue developing BMPs. Basing BMPs on sound scientific and biological data will measurably improve the welfare of captured wildlife in the United States. As of 2014, 23 BMP documents have been developed. They are available at ***http://fishwildlife.org?section=best_management_practices***.



Traps are subjected to intensive scientific evaluation in a continual effort to develop the best possible designs. As of 2015, 41 state fish and wildlife agencies have participated in the effort to develop BMPs. All 50 state fish and wildlife agencies support the development of trapping BMPs.

Testing Traps in Canada

Canadian wildlife authorities are undertaking an approach similar to the BMPs through a cooperative effort among provincial/territorial agencies. The Canadian Trap Certification Protocol uses parameters of trap efficiency, humaneness and safety to approve traps for use in Canadian trapping and furbearer management programs. This program is coordinated by provincial wildlife agencies. Under the program, any provincial government authority may certify a trap according to the procedures prescribed in the Protocol. All traps used to capture furbearing species in Canada were certified according to the Protocol by 2007. The provincial/territorial agencies have agreed that all other authorities will mutually recognize the certification of a trap by any one authority. As trap testing results become available, additional traps will be certified for use in capturing various species.

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animal. A foothold trap of the right size, correctly set, will typically catch and hold the target animal without significant injury. Cable restraints are often the best tool during late winter months when snow and freezing conditions may render traditional foothold traps ineffective.

Trappers Are Selective

The placement of the trap in relation to the lure and/or bait (as well as the type of bait or lure) greatly affects the selectivity of the trap set. An effective trapper wants to catch the animal targeted, instead of a nontarget species. Knowledge of animal behavior allows placement of traps on the target animal's line of travel such that, in many cases, the trapper needs no bait or lure at the set (blind set). Different lures used at other sets are usually attractive only to certain species of furbearers, and can be used to draw the target animals to the set. Trappers strive for knowledge of the target animal's habits to allow efficient capture while avoiding nontarget animals. This is the essence and challenge of trapping. The personal satisfaction and even the economic return depend on having this knowledge and efficiency (see "Trapper Education", facing page). With the selection of the right size trap, trapping location, the correct setting of pan tension, and the proper use of the device in concert with lure and bait, trappers are extremely selective in what species their traps will capture. So, while traps as devices have some degree of selectivity, trappers further improve that selectivity.

Photo by Dan Harrison

Foothold traps need not be large to be effective, as demonstrated by the trap used to capture this coyote. Foothold traps typically capture and hold animals with little or no injury and have been used to capture river otter, red wolves, and gray wolves (below) for reintroduction and restoration efforts in portions of the United States. The foothold trap is the only effective device, except for snares, for capturing certain furbearers such as coyotes, wolves, and foxes, and it remains one of the most important and effective capture devices used by wildlife professionals and fur trappers alike.

Photo courtesy of U.S. Fish & Wildlife Service

Concern has been expressed over the relative risks of trapping to pets. As stated above, proper trap selection and placement will minimize nontarget captures. Trappers generally seek landowner permission (required in many jurisdictions) when trapping on private land, and scout for animal sign and presence before the trapping season. Most trappers avoid areas with evidence of domestic animal use because it interferes with opportunities to capture target species. Pets that are allowed to range freely and unsupervised are at greater risk from predators,

Photo courtesy of New York State Dept. of Environmental Conservation

The art of trapping is often a family tradition, handed down from generation to generation.

automobiles and other health threats than they are from traps. Regardless, in the few instances when pets or domestic animals are accidently caught in foothold or box traps, they can usually be released unharmed.[20]

Trapper Education

There was a time when new or young trappers could easily find a friend or relative to teach them how to trap. To become effective, the trapper must learn animal behavior, wildlife habitat, types of traps, trap preparation, sets and lures for different animals, and care of the pelts. This knowledge allows the trapper to become efficient; that is, to be able to set the proper trap in the appropriate manner and catch the intended animal. Certainly trappers are continually learning, but there is a base level of knowledge that is much easier to learn from an experienced trapper than by trial and error on one's own. Trapper education programs have been instituted across North America and

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Photo by Coleen Olfenbuttel

Acquiring the base knowledge from experienced trappers starts beginners off right. To ensure that all new trappers know the proper skills and understand the activity, its many regulations, and their role in scientific wildlife management, first-time trappers in many states and all Canadian provinces and territories are now required to complete an official trapper education program.

Values* of Furbearers

Economic Values:

Many people benefit economically from the use of furs and other furbearer products.

Many people suffer economic loss from damage or depredation caused by furbearers.

Ecological Values:

Furbearers as predators and as prey help keep ecosystems in balance.

When ecosystems become unbalanced and the existence of certain species is endangered, predation by furbearers may increase their risk of extinction.

Beaver, and to a lesser extent, muskrats, alter habitat, often to the benefit of many other wildlife species. They, along with nutria, can also degrade habitat to the detriment of fish and other wildlife.

Cultural Values:

Trapping is a part of our cultural heritage. Its traditional skills, including respect for and knowledge of the outdoors, are passed along in many families from generation to generation.

Some members of the public retain a cultural heritage of utilizing furbearer meat to directly sustain their families and pets. Many use furbearer products and trapping to barter for other essentials.

Biological Values:

Furbearers can help us better understand human health problems, such as effects of environmental pollutants.

Furbearers can pose risks to humans through exposure to diseases and parasites.

Aesthetic Values:

Many people enjoy fur and furbearers.

Many people enjoy observing and photographing furbearers and their works (beaver ponds).

**Values can be both positive and negative.*

Photo by Thomas Decker

The art of trapping is a lifelong learning experience, often requiring trappers to enter habitats few people ever visit. Trapping may instill a strong appreciation toward wildlife and the environment. It typically fosters an exceptional understanding and knowledge of animals and a close relationship with the land. Here a trapper in New England checks a quick-kill trap set underwater in a beaver pond

Selectivity of the Trap-Trapper Unit

A trap is a mechanical device that, once set, will close only on objects heavy enough to release the pan or trigger. Observing this, those unfamiliar with trapping may assume that traps are not selective; that they will catch anything. This is not a correct assumption unless the trapper — the person required to set the inanimate device in the first place — is removed from consideration. Trap and trapper are part of the same equation; one cannot function without the other. Once this relationship is acknowledged, it is recognized that the trap-trapper unit is actually very selective in terms of what it will catch. Regulated trappers and wildlife researchers invariably set their traps in such a way that only the species (or sometimes even only the individual animal) they are targeting is likely to be captured. The numerous techniques trappers use to ensure their trap sets are selective include the following:

- **Location:** Where a trap is located determines to a great extent what animals are likely to enter it. Traps may be located underwater, in trees, near den sites, travel routes and loafing areas, or within other specific habitat types where nontarget species are never found or are unlikely to be found.
- **Type of Trap:** The use of certain types of traps virtually eliminates the chance that certain species will be captured. Foxes and coyotes, for instance, will rarely enter cage or kill-type traps. Foot-encapsulating devices are generally effective only for racoon, skunk, and opossum.
- **The Size of Trap:** The size of the trap determines to some extent what size animals it will capture.
- **Pan Tension:** Pan or trigger tension is adjustable on many traps. As a result, traps are often set so that only relatively heavy animals (such as beavers or coyotes) can spring them. Conversely, tension adjustment (and "breakaway" devices on cable restraints) may be set to release larger animals while safely holding smaller ones.
- **Lure or Bait:** Specific baits and lures, often used in conjunction with trap sets, are attractive to specific species of animals. Sweet corn, for instance, is attractive to raccoons, but not to bobcats. Lures in the form of urine or scent gland extracts are particularly attractive to the species from which the scent is derived; may even repel other species.
- **Position of Trigger:** Trigger configuration on kill-type traps can be set to allow nontarget species to pass through without setting off the trap.
- **Trap Set:** How a trap is handled or placed influences what animals can be captured. Wary species will avoid any trace of human scent, while others such as raccoons and skunks may be attracted to it. Fencing or other obstructions placed around a trap can prevent some species from approaching the trap.
- **Timing:** The timing of when traps are set during the trapping season can influence which gender and what age class of animals will be captured.

These same elements, all of which make traps highly selective in terms of what animals they will capture, are used not only in fur harvest trapping, but also in the live capture of animals for research and conservation programs, and for problem animal control and property damage situations.

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are mandatory in half of all states and all Canadian provinces and territories to ensure that beginning trappers acquire this fundamental knowledge before they set traps on their own.

In 2005, the Association of Fish and Wildlife Agencies (AFWA) standardized the curriculum by developing performance guidelines recommended for all first time trappers and producing course materials and videos to implement the course. Standardizing the course allows for reciprocity across North America so that a government issued certificate from any jurisdiction is accepted as proof of successfully completing the course in any jurisdiction.

Photo by Serge Lariviere

A Cree trapper from Mistissini, Quebec, prepares an underwater trap set for beaver. Trapping is a crucial income producer in many remote communities.

The AFWA Trapper education program teaches basic trapping techniques in both field and classroom situations with a strong focus on the responsible treatment of animals, trapping regulations, the avoidance of nontarget animals, safety, selective trapping, trespass laws, ethical trapper behavior, and best management practices for trapping or BMPs (see page 35), which specify the most-effective outdoor trapping techniques and

A novice trapper learns how to set a foothold trap during a state trapper education class.

Photo by John Olson

give practical tips on managing equipment.

Trappers are taught how to select and set the smallest and most effective traps for whatever furbearer species they wish to target. Many resources are available for free on the AFWA website (www.fishwildlife.org/) including the trapping BMP documents, the student manual, and an online course which covers the entire curriculum in Trapper Education. These programs are strongly supported by experienced trappers who often teach the courses in conjunction with wildlife agency personnel. The ethical and even spiritual ideals of trapping to take every animal with dignity, admiration, and respect are widely embraced. Information taught to beginning trappers provides them with a larger view of their role and the importance of trapping in an effective, responsible, and ethical manner.

Trapping and Public Safety

Opponents of trapping frequently charge that people, especially children, are in danger of being caught and injured in traps. These charges naturally tend to heighten public concern about trapping. However, a nationwide search for all recorded incidents of human injuries resulting from traps during the past 20 years documented only three that were associated with legal furbearer trapping.[21] None resulted in serious injury. Trapping does not threaten public safety because the size, placement and use of traps are regulated to ensure the safety of humans and animals (see box, page 30).

The art of trapping frequently involves family and always requires a great deal of healthy, outdoor activity.

Photo by John Olson

Furbearer Management Options

The use of traps and trapping in furbearer management programs other than traditional fur harvesting can be divided into three major categories: **Wildlife Damage Management**, **Wildlife Research**, and **Reintroduction of Extirpated Wildlife**. Among these categories, which may be broad or narrow in geographic scope, there are a number of options, along with trapping, that wildlife biologists can consider to achieve the management objective. Selection of any option must take into account its practicality, effectiveness, legality, safety and cost. Typically, a combination of two or more techniques is used in most management situations in order to achieve maximum effectiveness and cost efficiency. The various technique options available to wildlife biologists for the three categories of furbearer management programs are presented below:

Options for Wildlife Damage Management

Wildlife damage management is typically undertaken as a response to a citizen's concerns over animals causing loss or other damage to personal property or resources. Livestock predation by coyotes and foxes, flooding by beavers, and agricultural crop damage by raccoons and muskrats are common examples of wildlife damage. Several management options, both lethal and nonlethal, are available, but no single method or combination of methods is applicable in all damage situations.[22]

Management options to curtail various forms of wildlife damage include the following:

Guard Animals

Animals, such as guard dogs, llamas and donkeys, have been used to protect livestock from coyotes and other predators. Guard dogs are typically special breeds, such as Great Pyrenees and Komondor, that are imprinted after birth on the livestock breed they are assigned to protect. Neutered males are most commonly used. Success has been achieved in some areas with guard dogs, although they are expensive and last an average of only 3.3 years due to the rigors of life in the outdoors. Their effectiveness is best in a paddock situation, and diminishes on open pastures. Use of guard dogs can require a great deal of attention by the herder, particularly on an open range, where more effort is required to ensure the dog is properly fed and attended. Guard dogs may indiscriminately kill other species of wildlife (such as deer fawns) they encounter.[23]

Llamas and donkeys have an advantage over dogs in longevity and feeding, but have also been documented injuring and killing sheep. More research and experimentation is necessary before their effectiveness can be fully evaluated.[24]

Risk to humans from all types of guarding animals can increase a livestock owner's liability.

Exclusion / Habitat Modification

There are a number of management techniques that, under the proper conditions and with adequate funding for installation and routine maintenance, can be used to prevent or reduce various types of wildlife damage.

Water Flow Devices:

Specially designed "beaver pipes" are placed in road culverts or through beaver dams to reduce water level and associated flooding. These pipes must be placed in such a manner that the beaver cannot sense the sound or flow of water (which triggers their instinct to dam the flow), or must have adequate baffles to prevent the animals from blocking the flow. In situations where the gradient allows installation and function, beaver pipes can be effective at reducing beaver flooding. The devices may be expensive, however, and require routine cleaning and maintenance. Site characteristics may nullify the effectiveness of these devices in some situations.[25]

Exclusionary Fencing:

Fencing can be installed in front of, or around, the intake of road culverts to physically prevent beaver from plugging the culverts. Exclusionary apparatus is a preventive measure that varies markedly in expense and ease of installation, requires regular maintenance, and does not regulate water level.[26]

Livestock Fencing:

Permanent or portable fencing, including electric fencing, can be used as a barrier to prevent predators from killing or damaging livestock. Fencing must be a minimum of 5.5 to 6 feet high and frequently maintained in order to exclude coyotes.[27] The cost of fencing has limited its application because many people who own sheep or other livestock simply cannot afford to fence an area large enough to adequately pasture their animals.

Photo by Guy Connolly USDA/APHIS

Photo by Thomas Decker

Photo by Bill Byrne

There are many options to deal with damage caused by furbearers, but the effectiveness, efficiency, and cost associated with a particular option will determine its appropriateness for a given damage situation. When coyotes kill sheep and other livestock , farmers may resort to fencing (exclusion), but it must be high, or it will be ineffective (above).

When fencing is impractical (as it can be due to cost) specially bred guard dogs (above, right) or other guard animals are options, but these too have their drawbacks (see text).

A well constructed baffle pipe (right) can help control flooding damage caused by beaver, but it requires regular maintenance and will not work in many situations.

Contraception

Past research has shown that hormone injections or implants can be successful in controlling the reproduction of individual animals. The technique requires repeated injections or surgery; consequently it is extremely expensive and difficult to apply to large numbers of animals. Some fish and wildlife agencies and animal welfare groups are now supporting research to develop a wildlife contraceptive that is inexpensive, relatively easy to administer, and long lasting.

New advances in genetic engineering have opened the door to *immunocontraception* as a possible solution. Immunocontraception uses vaccines that target specific hormones or reproductive tissues. This research is in its infancy, and field experiments have been limited. While immunocontraception may have some value as a wildlife management tool in the future, it is not available today and will remain a rudimentary tool in the near future.[28] To put this in perspective, zoo veterinarians and reproductive biologists interested in controlling the reproduction of captive animals have not yet developed an effective contraceptive vaccine for most species. Some of the technical problems include:

- Safe and effective application requires animals to be individually vaccinated.
- Delivery systems (e.g. dart guns and blow guns) have limited range, making it necessary to

get within close range of every animal targeted for the vaccine.

- Two or more boosters may be required to cause infertility.
- Application that would be extensive or effective enough to control population growth may never be possible.
- Legal hurdles of government environmental and drug regulatory agencies and assessment of overall environmental impacts may delay availability for many years.

Most wildlife damage situations require immediate control of offending animals. Immuno-contraception will not eliminate damage in the short term: sterile beavers still have functional teeth and will cut trees and build dams.

Oral Vaccines

Oral vaccination programs have been conducted in the U.S. since the mid-1990s for the purpose of reducing the number of terrestrial mammals infected with rabies. The ultimate goal is to eliminate specific variants of the rabies virus to prevent their spread. Oral vaccination has been successfully used in Canada and Europe, and to date has resulted in the elimination of canine rabies in coyotes, the near-elimination of a variant of rabies in gray foxes, and has prevented the appreciable spread of raccoon rabies in the U.S..[29] Field tests with a new vaccine continue to refine our understanding of the benefits and risks of oral rabies vaccination.

Determining the safety, cost, and overall effectiveness of the oral vaccine approach to control the spread of rabies, as well as the effect of using trap-vaccinate and trap-euthanize programs around local outbreaks of raccoon rabies, is important to science-based wildlife disease management, and assessing the effectiveness of oral vaccination programs during epizootic and enzootic outbreaks is also important in evaluating management approaches.

Various rabies vaccines and delivery systems have been evaluated throughout North America with differing degrees of success. Currently, oral rabies vaccination (ORV) field trials continue in the eastern United States,[28a] where rabies in raccoons has proven more complex and difficult to control than rabies in coyotes and gray foxes in Texas. ORV zones to create barriers to prevent the spread of rabies in raccoons have had mixed results.[28b]

For example, the ORV zone to prevent raccoon rabies from spreading to Cape Cod (MA) was breached in 2004, as was a portion of the ORV zone in northeast Ohio. Intervention in both incidents has proven successful, with no rabies detected for 4 years in the Ohio contingency action zone where the outbreak occurred. However, further research is required to continue to test new bait-vaccine combinations and baiting strategies that increase the chance for improved performance to address rabies reservoir species in selected areas in the U.S..

In addition to protecting public health and safety, ORV programs may also directly influence population levels of predator species. Predator-prey interactions, and the indirect long term survival strategies of prey species, remain unknown. As such, predator-prey relationships warrant consideration regarding the use of ORV. Although raccoon rabies is a relatively new disease (first appearing in West Virginia in 1977) in much of the eastern U.S., it is unknown if it is additive or compensatory to other known historic disease mortality factors such as canine distemper.

Toxicants

The use of toxicants (poisons) to control wildlife damage involves killing animals causing damage with specific, Environmental Protection Agency-registered pesticides. Historically common in use, toxicants were misused widely enough to create public concern that has now greatly restricted their availability and use.[30] There is a great deal of variation in how individual states and provinces regulate and control toxicant application, in addition to federal oversight. There are some toxicants that can be applied by private citizens, but concerns over public health and safety and nontarget animal exposure restrict many applications to licensed government officials. Despite limited use, toxicants remain a valuable tool to wildlife managers for special projects and emergency situations.

Shooting

Shooting the depredating animal or animals requires one or more shooters to stake out the area where the damage is occurring. Shooting can be a highly selective control method, provided that the shooter correctly identifies the offending animal, and is positioned for an accurate, killing shot. Shooting nocturnal animals such as coyotes, raccoons and beavers is difficult and may require expensive night vision equipment to maximize efficiency. Shooters – particularly those targeting coyotes – must also be skilled hunters: the wary nature of the animals requires a shooter to have considerable knowledge of the animal's sign and habits in

order to be in position for a shot without the animal being aware of the shooter's presence. Shooting often requires several days of effort for each damage situation, making it costly and limiting the number of damage situations that can be dealt with. Where damage occurs in close proximity to roads or buildings, shooting may not be a legal option, particularly at night.

Trapping

Use of traps to solve wildlife damage problems involves the capture of the animal or animals causing damage. The effectiveness of trapping to solve wildlife damage problems can depend on the skill and experience of the trapper. Knowledge is required to accurately determine what species is causing the damage; what trap type is required to ensure effective capture with minimal potential for injury to the animals; and where and how the trap(s) should be placed so as not to capture nontarget species. Trapping does not require the trapper to be present when the damage occurs, allowing several damage situations to be addressed simultaneously. If the species causing damage is a furbearer and the damage occurs during the legal fur trapping season, a licensed fur trapper may be willing to remove the offending animals at no cost. If foothold, cage, or cable restraint traps are used, the trapper has the discretion of releasing trapped animals unharmed.

Traps used by either agency personnel or registered trappers recruited to assist with programs, may be used in conjunction with other techniques to address wildlife damage problems. Trappers from Ontario have played a key role in efforts to prevent the spread of raccoon-strain rabies into Ontario.

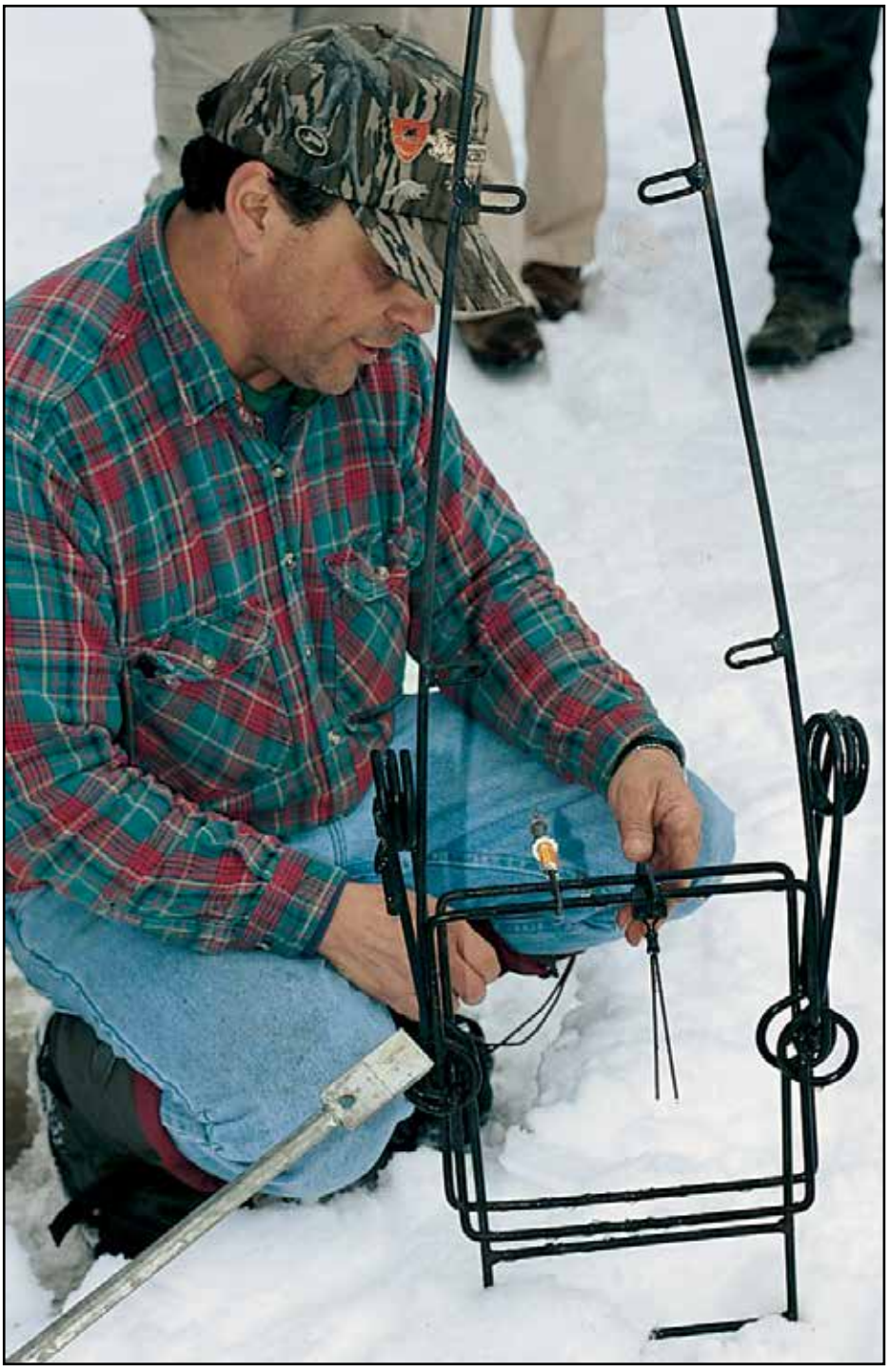

Photo by Bill Byrne

A certified trapping instructor demonstrates how to set a quick-kill beaver trap beneath the ice. This set includes a special frame that allows the trapper to raise and lower the trap to various depths.

No Action / Tolerance

This would be a decision to let the damage occur uncontested; "live with the damage" so to speak. Such a decision would have to balance many factors. In some cases, the wetlands created by beaver provide valuable functions to society and wildlife, and these must be balanced against economic losses to individuals and communities. Rabies outbreaks that periodically reduce certain furbearer populations may temporarily reduce property damage and benefit some wildlife populations (such as birds and

turtles that incur heavy nest predation by furbearers), but also present a public health threat requiring public education programs and expensive medical treatment for individuals thought to be exposed to the disease. Ultimately, society's level of tolerance towards wildlife damage will determine where no action can prevail.

An increased public understanding of wildlife natural history and behavior will often lead to a more tolerant view of wildlife. Providing information regarding wildlife species causing damage may decrease the need and urgency for corrective action. However, the magnitude and tolerance of damage is highly variable among the public. Threats to public health and safety or substantial damage to public and private property often reach unacceptable levels. When this threshold is crossed, management techniques must be employed. Wildlife managers do not want to see society's tolerance reach the point that furbearers become perceived as pests and threats, rather than as valuable natural resources that should be enjoyed, appreciated and perpetuated.[31]

Options for Wildlife Research

Research on movements, survival rates, habitat use and other life-history factors is often needed to develop management programs to ensure a population's continued existence, or to find solutions to wildlife damage problems. This may require the capture, marking, and immediate release of animals that are subsequently monitored for extensive time periods. Options for capturing wildlife include:

Photo by Coleen Olfenbuttel

Professional wildlife biologists conducting research and restoration programs involving various furbearers often use foothold traps as their primary capture devices due to this design's effectiveness, reliability, affordability, and proven record of causing zero or insignificant injury to captured animals.

Live-Trapping

Cage Traps: Cage traps are the largest, heaviest, and most expensive capture devices, limiting the number that can realistically be used on any given research project. Though generally less useful than foothold and kill traps, cage traps have proven effective for capturing fisher, marten, raccoon and beaver, less effective for capturing bobcat. They are ineffective for capturing coyotes, foxes, wolves and river otter, although a specially designed cage trap for beaver equipped with additional modifications has had limited success in capturing otter.[32]

Foothold Traps: Foothold traps have proven effective for capturing fisher, bobcat, lynx, raccoon, beaver, river otter, foxes, coyotes, and wolves unharmed. In the Northeast, over 343 coyotes, 844 red and gray foxes, 76 bobcats, 49 fishers and 79 river otters have been live-captured with foothold traps and released unharmed during research projects conducted from 1980 to 1994.[33] Eighteen lynx and over 50 coyotes were captured in foothold traps and released unharmed during a multi-year research study in Maine. The small size, light weight and relatively low cost of foothold traps makes them highly desirable for field research. Recent advances in foothold trap design and use have enhanced selectivity and minimized injuries related to capture. This includes cable restraints designed to capture and hold animals such as wolves, coyotes, and bobcats by the foot or body.

Chemical Immobilization

Chemical immobilants have been used successfully to safely handle wild animals. In many cases the animals are restrained prior to

injection of the chemicals. Restraint methods include trapping the animal or treeing it with hounds.

Dart guns, powered by compressed air or powder charges, provide an effective remote delivery system for chemical immobilants, but they are much more limited in range and accuracy than conventional firearms, while having similar constraints (see *Shooting*, page 43). It is generally easier and less costly to capture animals with other techniques. Dart guns are efficient for animals that predictably gather in specific areas.

Alternatives to Capture

Significant advances in mammal survey techniques that do not involve capture and handling of animals have been made in recent years. The appropriateness and efficacy of these techniques (more information can be found in Long et al.[33b]) vary depending on the species being studied and the objectives. The most substantial information on a population of wildlife is obtained through monitoring animals fitted with GPS collars. With an adequate sample of animals (number of animals monitored for an extensive time period), information on birth rate, mortality, survival rate, density, habitat use, and other life history factors can be estimated with a reliable level of precision. This technique does, however, require the capture (and typically annual recapture) of animals.

Field research techniques that do not require the capture and handling of the animals include:

Camera Trap Surveys: Remote camera traps have seen increasing use in wildlife studies as cost per camera unit has become more affordable and monitoring techniques have been developed. Typically, a camera is strapped to a tree or other object and a sensor in the camera unit will take a photograph when triggered by movement. They are most often used to determine distribution of a species and movement patterns. Camera traps, ranging from several to dozens, are placed on the landscape. Attractants are often used to lure the animals to the cameras, but they can also be deployed without attractants. Population estimation is possible. Traditional methods require each animal to be individually recognized. This is difficult to accomplish with most mammal species, particularly since movements are mostly nocturnal, making distinguishing features difficult to discern. Some studies have been able to use optical recognition software to identify individual animals. Scientists have developed sophisticated modeling techniques to estimate population density that do not require individual recognition, thereby increasing the ability to estimate populations with cameras.[33a]

Hair Snares: Advances in DNA extraction have made the identification of individual animals from hair samples possible. Typically, bait stations are established on the landscape to attract carnivores. To get to the bait, the animals have to pass through barbed wire that will snag hairs. Recovery rate of DNA from hair samples can vary from quite low to reasonably high depending on the age of the sample, presence of intact hair follicles, and environmental conditions. Some species, such as bears and fisher, are readily attracted to hair snare stations; others, like coyotes, are difficult to attract to them. Establishing hair snare stations and collecting samples is labor intensive, and the genetic analysis is relatively expensive.

Scat Dogs: Advances in DNA extraction have also made the identification of individual animals from scat samples possible. Specially trained dogs will traverse the landscape with a human handler, searching for the scats of certain

Photo by Serge Larivière

Trapping has long been a cultural tradition in many Native American communities, and it continues to provide income and self-sufficiency for many like this Cree couple.

Photo by Bill Fournier

Traps of several designs have proven crucial in the restoration of many furbearer species to parts of their range where they were formerly extirpated. Examples include river otter (above), gray wolf, and red wolf. If animals cannot be captured and transported, they must expand their ranges on their own, a task that may be impossible given topography and man-made barriers. If furbearers cannot be captured for biological examination, it is virtually impossible to determine basic population data such as sex ratio and age structure, crippling the ability of government wildlife agencies to meet their public resource protection mandates.

species. The scats are collected and locations recorded with a GPS unit. Subsequent recovery of DNA will vary with age and condition of samples, and environmental conditions. Training and preparation of the dogs is labor intensive, but this can be a very effective technique for determining food habits and estimating population size.

Bowhunter Surveys: A number of state fish and wildlife agencies have recruited bowhunters to report the occurrences of furbearers they observe while big game hunting from elevated tree stands. Because of their cryptic nature, bowhunters are often able to observe a variety of wildlife species. Observations of species such as bobcat can be used as a crude index to population and abundance trends over time. Data from these surveys cannot be used to estimate population size, however. A major drawback is that these surveys are diurnal, and carnivores and other furbearers are most active at night.

Use of these survey methods that do not require actual capture and handling of animals is increasing and we can expect more sophisticated techniques to emerge in the future. However, species conservation will still require us to instrument animals with monitoring and location devices such as GPS collars in order to generate more reliable data.

Ultimately, if no effort was made to capture wildlife for research or fur harvesting, wildlife biologists would have to rely on information derived from the number of road kills and damage complaints, and/or from the "remote survey" techniques described above, to draw inferences about furbearer population characteristics. This can be analogous to assembling a puzzle with many missing pieces. Management actions would have to be extremely conservative because available information would lack the sensitivity needed to detect shifts in population trends in a timely enough manner to allow responsive actions. An inability to capture wildlife would greatly reduce the ability of government wildlife agencies to meet their public resource protection mandates that have been established by law.

Options for Wildlife Reintroductions

In some areas the public desires to reestablish wildlife species. Fisher, marten, river otter, wolf, and beaver are some of the species that were once extirpated from many parts of North America and subsequently reintroduced by capturing individuals from areas where they are abundant, and releasing them in suitable but unoccupied habitat.

These reintroductions involved the use of foothold and cage-type traps. For instance, since 1976, more than 4,000 river otters have been captured in foothold traps, relocated, and released to restore populations in 21 states.[34] If biologists did not facilitate expansion, species would have to enlarge their current ranges into unoccupied habitat on their own. The length of time necessary for this depends on species mobility and distance. In many cases range expansion is difficult or impossible due to insurmountable geographical features or human-created barriers such as major roadways and urbanized landscapes.

Trapping for Research and Reintroduction Programs

Modern foothold traps have been – and continue to be – used successfully to capture a wide variety of wildlife species in order to study the characteristics of individuals and populations. In fact, research conducted with the use of foothold traps has provided much of the information leading to our present understanding of biological and ecological phenomena. Wildlife biologists typically use these traps to capture animals that are then instrumented with radio-collars and released unharmed. The released animals are then carefully monitored, revealing information on their movements, habitat requirements and reproduction that can be acquired in no other way. The coyote pictured on page 36 is one of many captured with foothold traps, examined and released.

The river otters pictured right were all caught with foothold traps in marshes in Louisiana where they are abundant, and were released unharmed into areas of Missouri to restore otter populations where they no longer occurred. Similar otter restoration programs have been successful in 22 other states including Alaska, Arizona, Colorado, Kentucky, Iowa and New York. Many states now have thriving river otter populations thanks to capture and reintroduction efforts made possible by the use of foothold traps. These are the same traps used by the public to harvest furbearers.

Foothold traps and cable restraints are generally the only effective traps for catching elusive species such as wolves, coyotes, and foxes. As a result, they are almost always the trap of choice when any of these famously wary species are targeted for capture by either the public or wildlife researchers. Lynx reintroduced in some western states were captured with foothold traps in Canada (Yukon). Another example is the ongoing, important role foothold traps are playing in the restoration of several endangered wolf populations. Red wolves are captured, examined and relocated to reestablish new populations; Mexican wolves are captured for a captive breeding program that will provide healthy animals for a reintroduction program; and stock-killing gray wolves are captured and relocated to reduce damage and maintain public support for their continuing restoration.

Photo by Jim Rathert Missouri Dept. of Conservation

These live-trapped river otters, about to be released as part of a restoration program, were captured unharmed using long-spring foothold traps (below, left) with offset jaws.

Otter Restoration Around the Nation

State	Number Released	Years
Missouri	845	1982-1992
Tennessee	487	1983-1994
Kentucky	355	1991-1994
Illinois	346	1994-1997
Indiana	303	1995-1999
North Carolina	267	1990-1995
Iowa	261+	1985-2000
West Virginia	249	1984-1997
Nebraska	159	1986-1991
New York	279+	1995-2001
Ohio	123	1986-1992
Pennsylvania	153	1982-2000
Colorado	86	1976-1991
Maryland	80+	1990-2000
Arizona	46	1981-1983
Minnesota	21	1980-1982
Oklahoma	20	1984-1985
Kansas	19	1983-1984
Virginia	17	1988-1989
Vermont	58	1989-1992
South Dakota	34	1998-2000
New Mexico	33	2008-2010

Midwest Wolves - Once Endangered, Now Recovered!

An amazing wildlife success story involves the gray wolf (*Canis lupus*) of the Great Lakes region. Within the lower 48 states, this is the only place where wolves were never totally extirpated. The presence of this mysterious wild carnivore led Midwestern conservationists such as Aldo Leopold, Sigurd Olson, and Durward Allen to voice concern and promote conservation efforts toward their protection and recovery. Such interest provided the foundation of research on wolf-prey relations and the initial use of radio telemetry with wolves. Public awareness and support, combined with a better understanding of the species, established the foundation for recovery and management.

Under the federal Endangered Species Act of 1973 wolves in northeastern Minnesota were classified as endangered which eventually led to the 1978 Eastern Timber Wolf Recovery Plan and a revision of the same in 1992. This plan outlined levels of protection, conservation efforts, and criteria for what was hoped to be full recovery of Great Lakes wolves. As wolves dispersed from Minnesota and began to appear in northern Wisconsin and the upper peninsula of Michigan they held full endangered species protection. Key to understanding birth and death rates, dispersal movements, and home range size, individual wolves were captured, fitted with radio collars, and tested to answer an assortment of biological questions. Foothold traps were crucial to this effort and resulted in the restraint and safe release of hundreds of wolves over the last half-century. Experienced trappers learned how to selectively capture wolves and to do so without harm to the animals.

Wolf Classification in Wisconsin

Federal Classification		State Classification
Endangered	1967	
Endangered	1974	
	1975	Endangered
	1999	Threatened
Threatened	2003	
	2004	Protected
Endangered	2005	
Delisted	2007	
Endangered	2008	
Delisted	2009 (May)	
Endangered	2009 (July)	
Delisted	2012	Game species

An important issue in the recovery of a species like the gray wolf is public acceptance of the animal. This is especially true of those individuals and families that could be affected by its presence. As predators, wolves use other mammals for food, and a few individual packs may resort to the occasional take of domestic pets or livestock. It was apparent that public support for recovery would hinge upon the flexibility to address individual problems. When the wolf's classification in Minnesota was shifted from federally endangered to threatened, state agencies, when necessary and under federal permit, could selectively trap and dispatch problem wolves. Once Wisconsin and Michigan wolf populations exceeded minimum restoration goals, a change in classification from endangered to threatened allowed for similar control programs across all three states.

Wolves in the Great Lakes region are now the responsibility of the individual states' fish and wildlife agencies and tribes. Although close monitoring of this low density species will continue far into the future, each state has approved management plans that include public outreach efforts, research needs, and conservation efforts such as surveys, habitat management, reasonable control of problem wolves, and regulated harvest.

One of the key components of research and management of wolves is the foothold trap. Through wolf trapper education workshops, citizen trappers learn about trapping ethics, trapper responsibility, how to set their traps most effectively to minimize injury to the animals, and respect for fellow trappers. To show respect for the animal and respect for others is critical to the future of regulated harvest by citizens. Wolf restoration in these Lake States is truly a success story, the first of complete recovery of the "Endangered" gray wolf in the lower 48 states. Through continued, careful management, this once endangered animal will remain an important and charismatic component of the natural ecosystems of the Great Lakes region.

Photo by Mark Loka

Regulated trapping may play a role in reducing conflicts and maintaining wolf populations at levels closer to social carrying capacity, while also allowing the utilization of this sustainable resource.

Animal Welfare

The concept of "Animal Rights" is distinct from the concept of "Animal Welfare." Animal Rights is based on personal values and philosophy, while the agenda for Animal Welfare is based on science. The Animal Rights and Animal Welfare agendas represent entirely different perspectives on human/animal coexistence.[35]

Animal Welfare proponents believe that human use of animals is appropriate as long as practical measures are taken to ensure that human use does not cause any undue pain and suffering to animals. Wildlife biologists and all responsible trappers and hunters are staunch supporters of Animal Welfare.

Animal Rights proponents oppose any human use of animals. They believe animals have the same rights as humans, and therefore should not be used, eaten or owned by people.[36]

The primary concern of Animal Welfare advocates is the well-being of animals. The primary concern of Animal Rights advocates is the moral obligation of people. The well-being of animals is a secondary concern for Animal Rights advocates.[37]

Professional wildlife biologists advocate Animal Welfare. The Association of Fish and Wildlife Agencies (AFWA), noting that "the worldwide growth of the animal rights movement threatens all traditional uses of animals," adopted the following position in 1989:

"The AFWA acknowledges that humans have an inseparable relationship with all other parts of the natural world. Furthermore, humanity is answerable to another

Photo by Bill Heatherly Missouri Dept. of Conservation

Adaptable and always ready to take advantage of any food sources, raccoons can reach extraordinarily high population levels in developed areas, a situation that increases public health problems, property damage and predation on other wildlife species.

Photo by Guy Connolly USDA/APHIS

Coyotes frequently prey on livestock and house pets throughout North America. Regulated trapping helps to minimize this depredation by removing individual problem animals, and the animals that are removed are utilized as valuable natural resources rather than destroyed as useless pests.

set of laws and concepts that is uniquely a product of human society. Animals cannot be subject to those laws and concepts and therefore do not have the rights of humans. It is agreed, nonetheless, that animal welfare is a realistic and desirable concept which we support. Humanity does have responsibilities to animals: ensure ecological integrity, preserve genetic diversity and sustain species and ecosystems. All animals use other animals for their existence. The responsible human use of animals is natural and appropriate."

Professional wildlife biologists have concerns about the implications of the Animal Rights philosophy. Human use of, and dependence on, renewable natural resources, including animals, may foster stewardship over those resources. Millions of acres of wildlife habitat have been acquired, protected and managed for wildlife by public and private natural resource management agencies. Much of this has been made possible through funds generated by licensed hunters, trappers and anglers who collectively have a stake in the perpetuation of wildlife resources. Under the Animal Rights agenda, there would be no wildlife management, and subsequently, many species of wildlife would decline or become extirpated without the protection afforded by management. Other species would explode into burgeoning populations, escalating human-wildlife conflicts.

As our society becomes more urban, we become removed from natural systems and the processes that function within them. Our understanding and appreciation of those natural processes diminishes. We no longer have to harvest our own food, and as a result, we do not see the death involved in processing meat. We do not notice the loss of habitat, pesticide use or lethal control of animals required to produce crops and livestock. We do not witness the destruction of habitat required to extract nonrenewable natural resources that are the basis for most of the synthetic materials we use.

Rural components of our society recognize the high turnover in many wild animal populations that have naturally high death rates. The death of an individual animal is not shocking when one realizes that it is a normal, natural, and regularly occurring event, and that species have adapted reproductive strategies to compensate for these natural losses. These reproductive strategies evolved over millennia under a suite of mortality factors, including human predation. When a human uses a wild animal, the death is therefore natural, and an interest in the preservation of the wild animal population is often fostered.

We should all be aware that our lifestyles – regardless of where we live, our economic status, or our degree of "environmental correctness" – are closely and inexorably linked to animals. Animals have always provided the material and spiritual sustenance that maintains us as individuals and societies. Our need and use of them for food, clothing, art, medicine and companionship are eternal, our dependence on them complete. We must continue to support conservation efforts that ensure sustainable use.

Calamity by Design: The Prohibition of Regulated Trapping

In 1996, following a "model" developed by a national animal rights organization for getting trapping ban initiatives passed by town, county, and state governments, a coalition of animal rights organizations gathered the signatures required to place a statewide anti-trapping referendum before the voters of Massachusetts on the November ballot. The coalition spent $1.2 million on an ad campaign featuring graphic images that presented a misleading representation of regulated trapping in the state. The campaign further implied that traps in common use in Massachusetts had teeth and were a threat to pets and children, despite the fact that toothed traps had not been legal to use for many years; only softcatch (padded jaw) foothold traps were allowed for use on land; and no case of an adult or child being caught or injured in a legally set trap had ever been recorded in Massachusetts.

The referendum passed overwhelmingly in the eastern, more developed part of Massachusetts, and also in scattered urban centers throughout the state. The new law drastically limited the types of traps that could be used, essentially making box or cage traps the only legal trap type. It even banned the use of effective trap types (such as softcatch footholds) for research purposes.

Prior to 1996, the Massachusetts Division of Fisheries and Wildlife (MDFW) managed the beaver population through education, research, and regulated trapping. Following passage of the anti-trapping referendum, the beaver harvest dropped from 1,136 beaver (1995-1996 season) to 98 beaver (1997-1998 season). Consequently, over the next 5-6 years, the beaver population went from an estimated 24,000 beaver to nearly 70,000 beaver statewide.

Photo by Bill Byrne

The flooding of roads is a common form of beaver damage, but the activities of this furbearer may also result in loss of timber resources and the flooding of septic systems, basements, and croplands. All of these can be safely and efficiently addressed through the use of sound management programs that incorporate the use of traps and trappers.

The massive increase in the beaver population also resulted in a drastic increase in beaver-related complaints. In response to the increased number of complaints and concerns regarding public health, safety, and property damage, the Massachusetts Legislature passed – and the Governor signed – a new law in July of 2000. It modified the restrictions on beaver and muskrat traps in an attempt to provide relief for residents suffering from flooding impacts caused by these species.

Photo by Bill Byrne

Beaver are considered a "keystone species" in that their tree-felling, dam-building activities create an entire succession of habitats crucial to the success of a great variety of wildlife species. This is why it is important to wildlife conservation that the pubic value beaver as furbearer and ecological resources, rather than perceive them to be expensive pests.

The new law established an emergency permitting process through local Boards of Health to allow certain people to use "restricted traps" to address public health or safety problems caused by beaver or muskrat. Management authority was essentially removed from the MDFW and given to local Boards of Health. Emergency permits to remove beaver using quick-kill traps (traps that were among the specific targets of the original ballot referendum) are now issued at the town level, with no reporting requirements to the state's wildlife management authority. The permits can only be issued after damage has occurred. the restricted traps cannot be used to prevent damage.

There are many consequences to the sequence of events that occurred in Massachusetts. The most obvious was the drastic expansion of the beaver population and the resulting increase in complaints. Due to the proliferation of beaver, many residents of Massachusetts now view the animal as a pest that needs to be eliminated, rather than a valuable natural resource. The MDFW can no longer proactively manage the beaver population; instead, the law established a re-active approach to damage and public health or safety concerns. In 2003, the MDFW conducted a survey of local Boards of Health and found that 86% of the Boards that responded to the survey saw evidence of increased illegal activity (such as illegal destruction of beaver dams/wetlands) due to beaver-related issues since 2000.

Since management authority was essentially transferred to local Boards of Health and there are no requirements to report their statistics back to the MDFW, the MDFW can no longer even estimate the statewide beaver population due to a lack of accurate harvest information. Also, prior to the trap ban, beaver could only be harvested during a specific season. The current system allows year-round take, even when young are dependent and the fur is not prime, thus encouraging the waste of the resource and likely decreasing animal welfare. What is known is that from 2008 to 2012 an estimated 63-70% of the beaver taken in Massachusetts each year were harvested under emergency permits from local Boards of Health, under which quick-kill traps are legal to use. Thus we now have a situation where the traps banned for public use are still taking the majority of beaver in Massachusetts!

Photo by Bill Byrne

The law that was established in 2000 to alleviate some of the problems caused by the initial referendum only addresses the use of quick-kill traps for beaver and muskrat, and only allows for the use of those traps when an immediate threat to public health and safety exists. There are many other species for which quick-kill traps are an effective trap type, but these traps are not legal to use in Massachusetts and their use – and the use of all other traps that restrain an animal by gripping any part of its body – can no longer be authorized by the MDFW.

For example, a trapper can use only box or cage traps to capture coyotes during the trapping season. Canids are notoriously wary of anything new in their environment – meaning they cannot be readily induced to enter a cage of any kind – so it is not surprising that from 2001-2012 an average of just 2.5 coyotes per year were harvested statewide by trapping. Soft-catch footholds or other live-restraining devices such as cable restraints are not legal for the MDFW to use for coyote research or to help manage problem coyotes in urban settings, where shooting is often the only method available to remove problem animals.

Until the ability to regulate all trap types is returned to the state agency with wildlife management authority, Massachusetts will continue to experience problems related to furbearer population management, research, illegal beaver destruction, and nuisance wildlife management.

The North American Model of Wildlife Conservation

The North American Model of Wildlife Conservation is a concept described by Dr. Valerius Geist of the University of Calgary. It is a retrospective look at the key principles that collectively led to the unique successes in wildlife conservation in the United States and Canada. The Model has seven principles:

Wildlife Resources are a Public Trust

Markets for Game are Eliminated

Allocation of Wildlife is by Law

Wildlife Can Only Be Killed for a Legitimate Purpose

Wildlife is considered an International Resource

Science is the Proper Tool to Discharge Wildlife Policy

Democracy of Hunting is Standard

Furbearer management and conservation fits squarely within the parameters of the Model. Some may question why markets for game species such as deer and elk were eliminated, while markets for furbearers were developed. Unregulated market hunting in the late 19th and early 20th centuries, coupled with habitat destruction, led to the near extinction of many game species and it was necessary to eliminate markets in order to save them. Unregulated trapping led to the reduction and local extinction of many furbearer species by the mid-19th century. Furbearer populations rebounded and expanded their ranges in the 20th century due to recovery of habitats, including cleaner water, and protections on species. In Massachusetts, for example, beaver were extirpated prior to the Revolutionary War. They reentered Massachusetts in 1928, and by that time people had settled areas that previously were prime beaver habitat. Conflicts between beaver and humans ensued, and the Massachusetts Division of Fisheries & Wildlfe (MDFW) had a choice to treat individual offending animals as pests and destroy them, or allow regulated trapping as a means to keep the beaver population at levels compatible with coexistence with humans. The MDFW chose the latter approach consistent with the principle that wildlife is a public resource, regulated fur markets and legal harvest seasons in the 20th century didn't pose a risk to species survival, and the use of fur for fiber and clothing is considered legitimate in society. During the course of the 20th century most bounty systems for "nuisance" wildlife were eliminated and replaced with scientifically managed harvest seasons. State furbearer biologists in different regions of the U.S. meet annually with Canadian counterparts to collaborate on management challenges. The result has been the elevation of furbearer species from pest status to that of valued resource in many instances. The conservation and sustainable use of furbearers is one of the hallmarks of the Model.[38]

Ballot Referendums: Confounding Wildlife Management

Ballot initiatives are a process by which voters can adopt laws outside the legislative process (often referred to as "direct democracy") separate from the manner in which elected officials form laws in the legislative process (referred to as "representative democracy"). Ballot initiatives are an allowable mechanism for passing laws in approximately 24 U.S. states[39]. The founding fathers contemplated the merits of having a national ballot referendum process when drafting the U.S. Constitution, but decided upon representative democracy at the national level. One of the reasons they did not adopt a referendum ballot process is they believed the voting public did not possess the knowledge or expertise to understand the measures they were voting on (both the intended and unintended consequences). They expressed concern that important unanticipated effects of referenda may not be discovered due to lack of deliberative debate. They also believed that a national referendum system would abuse minority rights of citizens, often described as the "tyranny of the majority"[40,41].

Direct democracy as a means of legislating has been fiercely debated for over a century in the U.S.. Some view these initiatives as a last resort to pass laws if legislators fail to act on an issue. Ballot initiatives begin with proposed language crafted by groups or individuals outside the legislature and are placed on an election year ballot for a Yes or No vote.

Photo by Coleen Olfenbuttel

An insidious aspect of referendums, aside from introducing politics to scientific wildlife management, is that they can deprive cultural minorities (such as trappers and farmers) of traditional, sustainable, income-generating activities.

The Wildlife Management Perspective

State fish and wildlife agencies have principal authority over wildlife, including the establishment of seasons, bag limits and the manner and method of devices used to take wildlife. During established open seasons species such as beaver, raccoon, coyote, foxes, muskrat and others are harvested in a manner designed to achieve objectives including sustainable population levels, limited human-wildlife conflicts, and other goals. Landowners generally have legal authority to protect their property from wildlife doing damage once damage has occurred. However, most of the population control designed to limit damage occurs during the regulated open seasons where wildlife is harvested for their pelts, meat, bones, or glands. Control of animals causing damage occurs during regulated seasons as well.

Colorado, Oregon, California, Arizona, and Massachusetts have passed ballot initiatives that prohibit particular trapping or hunting techniques, often under the pretense of protecting the public and pets[42]. Foothold traps were banned in Massachusetts after a campaign portraying them as cruel and a danger to pets, even though all foothold traps with the exception of one (a rubber-padded trap) were already illegal to use on land.

Ballot initiatives as a means of prescribing wildlife management, however well intentioned, will typically generate unfavorable results for both the public and wildlife because the deliberative process of weighing costs, benefits, and collateral effects is eliminated. Unintended consequences such as increased wildlife damage and safety concerns have resulted (e.g., Massachusetts page 52). Hunting and trapping is heavily regulated with laws, the public (hunters and trappers) exhibits high compliance with those laws, and they are enforced by state and federal officers. Trapping and hunting techniques are not generally familiar or known to the voting public. An unintended collateral effect to limiting wildlife management by ballot initiative can be increased wildlife damage, with the additional effect of removing the best means to control the damage. This can result in frustration by some who may resort to vigilante actions to remove wildlife they perceive as pests. Unregulated vigilante-style responses are detrimental to public trust mandates of state fish and wildlife agencies who strive to maintain sustainable wildlife populations for the benefit of current and future generations. Ballot initiatives are not only contrary to our model of democracy, they can be devastating to scientific, responsible wildlife management.

A Final Word

Professional wildlife management has successfully restored, preserved and ensured the continuing viability of wild furbearer populations in North America. The harvest and utilization of some individuals within those populations by the public does not threaten the continuing survival of those populations. In fact, the harvest and use of some individuals has contributed most of the funding to study and manage those populations, including protecting the habitats and ecosystems critical for their survival.

Without regulated trapping, wildlife managers could not adequately or economically monitor furbearer populations; they could not undertake the restoration programs that have restored so many species to areas where they have not prospered for centuries; they would have fewer options to offer the public significant relief from agricultural and property damage, or to protect human health and safety; and they could not ensure the continued public use of furbearer resources.

Furbearer management is a complex scientific subject. The Wildlife Society — an international nonprofit scientific and educational organization serving professionals in all areas of wildlife ecology, conservation, and management — has published a policy on traps, trapping, and furbearer management that best represents the views of wildlife biologists.

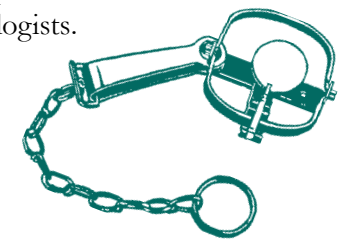

Photo courtesy North Carolina Trapper's Assoc.

The Wildlife Society Position on Traps, Trapping, and Furbearer Management

Internationally accepted principles of natural resources conservation stipulate that resource management activities must maintain essential ecological processes, preserve genetic diversity, and ensure continued existence of species and ecosystems. Government-regulated trapping in North America is consistent with all three criteria and is a versatile, safe, effective, and ecologically sound method of harvesting and managing furbearers.

Trapping is part of our cultural heritage that provides income, recreation, and an outdoor lifestyle for many citizens through use of a renewable natural resource. Both trapping and hunting provide opportunities for fostering stewardship values and connecting to the out-of-doors. Trapping is often vital to the subsistence or self-sufficiency of peoples in remote regions who have few other economic alternatives. It is also a primary tool of most wildlife damage management programs and an important technique in wildlife research. Regulated trapping is an important way for biologists to collect information about wildlife, including information about wildlife diseases such as rabies that can also affect people. Threatened and endangered species also benefit from regulated trapping. For example, foxes, coyotes, and nutria are trapped in certain locations in order to protect sea turtles, black-footed ferrets, whooping cranes, and other rare species from predation or damage to their habitats.

Despite the values of trapping, portions of the public oppose it, or at least perceive problems with some aspects of it. Some object only to certain trapping methods, particularly foothold traps on land, but others have moral objections to killing animals. Much opposition to trapping is associated with urban-oriented cultures, particularly those dominated by tertiary (service oriented) employment. Those who approve of, practice, or benefit from trapping are primarily from rural cultures or areas where primary (land-based) employment predominates. This dichotomy of lifestyles and values, combined with a general lack of objective information about trapping, creates barriers to understanding and resolving controversial issues associated with trapping.

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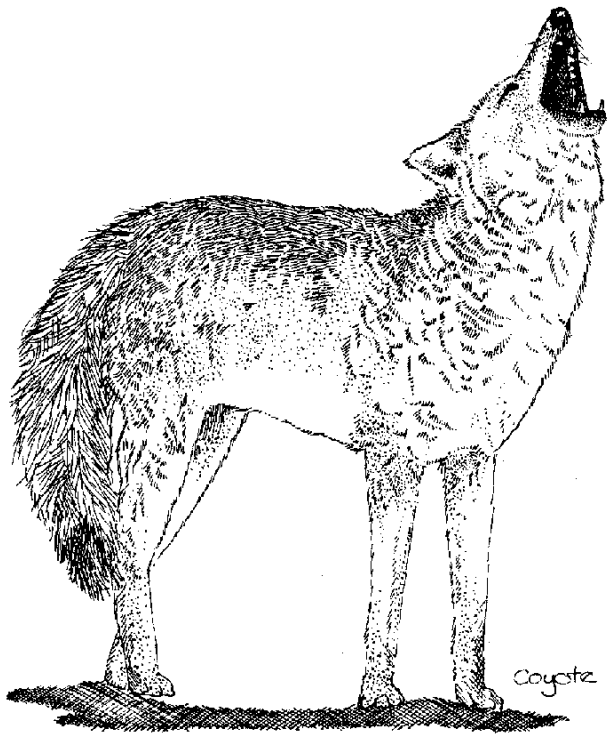

Photo by Coleen Olfenbuttel / North Carolina Wildlife Resources Commission

Furbearers are an abundant, sustainably managed resource. Harvesting them and preparing the pelts properly for market is challenging, time-consuming work, but for many living in rural and suburban economies it can be an important source of annual income, a way to maintain a sense of self-reliance, and a method to develop and retain a strong bond with our human heritage and the natural world.