

FURBEARER MANAGEMENT GUIDELINES

RED FOX *Vulpes vulpes*



Since 1926, separate trapline areas in British Columbia have been assigned and registered to individuals licensed to harvest the province's plentiful fur resources. To obtain a licence, trappers must successfully complete a three-day course that focuses on humane trapping methods, fur handling, and trapline management. The trapline management component includes knowledge of, and fosters respect for, provincial trapping regulations, adherence to professional and ethical standards established by the Ministry of Water, Land and Air Protection and the BC Trappers Association, and practices that help to manage and maintain furbearer populations. There are approximately 2900 registered traplines in British Columbia, and 19 mammal species are officially classified as furbearers.

For management purposes, the red fox is a Class 1 species, which means that it has a home range that is small enough for a viable population to be contained within one trapline area and can therefore be managed on an individual trapline basis. Other Class 1 species are beaver, marten, mink, muskrat, raccoon, squirrel, weasel and skunk.

This document is intended primarily to provide British Columbia's professional trappers, government managers and industry with information on fox biology, and on principles to consider in the sustainable management of the species. The material presented is generalized from the results of many studies conducted over a wide geographic area and local variations and exceptions may occur.

DESCRIPTION

The red fox is a small canid (member of the dog family) with a slender, pointed muzzle, prominent erect ears, long slender legs, and relatively small feet. Colouration varies considerably, but is usually categorized in three colour phases (red, cross, and silver; see photo page 6), all of which may appear among members of a single litter. In the red phase, which is the most common, individuals may vary from a pale, coppery golden colour to a rich, dark cherry red on the back and sides, usually with paler underparts (white to grey), and most have contrasting black muzzles, ears, and paws. The cross phase is generally grey to brownish in basic body colour, with darker face and legs, and gets its name from a "cross"-pattern formed by dark (usually black) hairs down the upper back and across the shoulders. The cross pattern is usually set off by lighter, yellowish to pale red patches on the neck and shoulders. The silver phase is generally black all over, but takes on a silvery appearance on the back and upper sides as a result of light-tipped guard hairs in those areas. All three phases have bushy, white-tipped tails that make



up over one-third of the adult animal's 100 to 120 cm length. Adult weights in BC are mostly in the range of 5 to 6.5 kg for males and 4 to 5 kg for females. Juveniles in their first autumn are nearly full-size and may be almost as heavy as adults.

ECONOMIC CONSIDERATIONS

The bright colour and brilliant sheen of fox fur make it one of the finest long-haired pelts used in the fur industry. The popularity of this fur in the first half of the 20th century was reflected in comparatively high prices paid for pelts, which led to the establishment of large-scale fur farming in both Europe and North America. Since that time the large market demand for fox pelts has been maintained and mostly supplied by the farmed product.

In British Columbia, annual harvests of foxes were highest in the 1930s and early 1940s, peaking at almost 10,000 animals in 1944, but then declined sharply as pelt prices dropped to an average value of less than four dollars from then until the mid-1960s (Figure 1). Pelt values increased through the 1970s and 1980s, but to lower levels than previously (on an inflation-adjusted basis) and with year-to-year patterns that were too erratic to attract large-scale trapping effort. Thus, the annual harvest in BC has not exceeded 1000 animals since 1946, and has mostly been in the range of 200 to 400 since the early 1990s. Most of the harvest since 1985 has been in the northern half of the province (Cariboo, Skeena, and Omineca-Peace regions, Figure 2).

Although not in the same league as their cousin the coyote, red foxes do occasionally come into conflict with rural and suburban British Columbians by taking poultry or other small farm animals and livestock. That is often compensated to some extent by the service foxes provide to farmers by limiting rodent populations. The species is also a well-known predator of game birds, particularly during the nesting season, eating eggs, young, and occasionally the adults of waterfowl and upland species, such as grouse and pheasants. Although foxes have been subjected to intensive control in some areas as a result, notably on the prairies, that has not been the case in BC. However, predator control programs aimed at the coyote and wolf, particularly those using large poison baits, may have had a significant impact on fox populations historically and may have been partly responsible for the decreased fox harvests in the 1950s and 1960s.

In eastern North America and parts of Europe, red foxes are an important carrier and potential reservoir of rabies. Infected foxes may transmit the disease to other wildlife, pets, and people, and can become a serious menace to public health, especially because of their propensity to live close to humans.

BIOLOGY

DISTRIBUTION AND HABITAT

The red fox is the most widely distributed carnivore in the world, occurring naturally throughout most of North America and much of Europe and Asia, and as an introduced species in Australia. Over that broad range it occurs in a variety of habitats ranging from hot deserts to arctic tundra, and has adapted well to agricultural systems, suburban areas, and even some urban centres.

Figure 1: Reported Red Fox Harvests and Pelt Values, 1920-2000

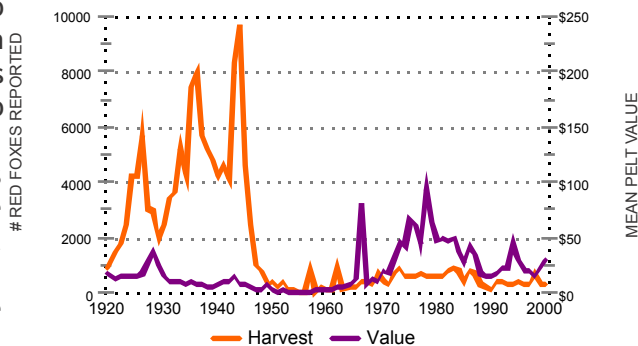
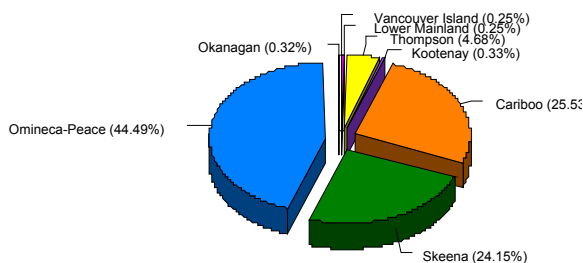


Figure 2: Red Fox Harvest by Region, 1985-2000





In British Columbia, the species is found over most of the mainland, but is most common in the central Interior and northern portions of the province. It does not regularly occur in the wet coastal forests west of the Coast Range, or naturally on any of the coastal islands, although it does appear in agricultural and suburban habitats in the Lower Mainland. There are historical records from Vancouver Island, but those certainly involve animals that were released or escaped from fur farms.

Habitats preferred by red foxes are usually relatively open, often with patches of cover interspersed

with small openings, although large expanses of alpine tundra and subalpine parkland are commonly used by the species in northern BC. Because the fox has relatively low foot-loading and is able to stay on the surface in deep, soft snow, it is better adapted than the coyote for occupation of high elevation areas and is therefore able to avoid winter competition with and exposure to coyotes in those areas. Closer to civilization, the red fox will live in agricultural areas where farmlands alternate with woodlots, cut-over shrublands, and meadows. In large cities, it uses ravines, parks, and golf courses, as well as large, well-vegetated lots among low-density housing.

Coyotes have flourished across the province since their arrival in British Columbia 150 years ago, and have likely displaced red foxes from some areas and reduced fox densities in others. Although coexistence occurs, coyotes will displace or kill foxes, and increases in coyote numbers have been linked to declines in red fox numbers. As a result, foxes tend to live in the perimeter areas around coyote home ranges, or in areas where coyotes are absent.

FOOD

The red fox can be described as a generalist predator, foraging on a wide variety of animal foods which are taken largely in relation to their availability at any particular time and place. Small rodents, particularly voles and mice, are important prey items in most areas, but foxes also take larger mammals (including snowshoe hares, ground squirrels, woodchucks, red squirrels, moles and muskrats), numerous birds (including the eggs and young of game birds and many ground nesting passerines), amphibians, reptiles, and insects. Foxes also eat plant matter, especially berries and other fruits in season, and are efficient scavengers readily locating and consuming carrion when it is available. In rural and urban areas, the diet of individuals may expand to include rats, poultry, other small pets and livestock, such as rabbits, cats, and lambs, and a variety of human refuse.

Slow stalking and rapid pouncing is the usual form of hunting, but the red fox is also capable of a high-speed charge at an appropriate prey. Foxes can often be seen "mousing" for voles and mice, listening for sounds under the snow or grass, then leaping high in the air to pin their prey to the ground with their front paws. As with most canids, foxes possess acute vision and hearing, and a keen sense of smell. When prey is abundant, foxes will kill more than is needed at the moment and will cache excess food items at dens or by burying them at selected locations.

SOCIAL BEHAVIOUR

The family, consisting of an adult pair and their pups, is the primary red fox social unit from spring until juvenile dispersal in the fall. Most studies report non-overlapping territories among family groups, with territorial boundaries defined by scent-marking (with urine or feces) on a regular basis. After juvenile dispersal, the adults are primarily solitary, with overlapping home ranges between males and females, but generally non-overlapping borders within each sex. Related females may occupy adjacent ranges and may share an area of range overlap. Males may trespass

into the territories of other males during the breeding season when they are searching for receptive females.

Home range sizes of foxes vary widely, depending mostly upon the distribution and density of prey. In subalpine habitat in northwestern British Columbia, the summer ranges of eight adults ranged from 3 km² for a female with pups to 34 km² for each of two adult males. Territorial borders are generally the same throughout the year, but intensive use of different areas may shift seasonally in response to changes in food supply and cover.

ACTIVITY AND MOVEMENTS

Foxes are most active from dusk to dawn, moving away from secure den sites primarily during the hours of darkness. When pups are present, activity near the den during daylight is also common. Most of the activity away from the den is related to foraging, but some is apparently also directed to territorial maintenance. Radio-collaring studies have found that the collective movements of the two adults in a family group result in visits to all borders of their territory every one to two weeks, with individual adults travelling 2 to 10 km nightly.

As with most carnivores, the longest movements are characteristically undertaken by juveniles during dispersal from the home range of their birth. Generally all juveniles disperse prior to their first birthday, and most leave in late fall (October and November) when they are six to eight months old. The longest dispersal distances, averaging 30 to 40 km and ranging up to 300 km, are made by males. Dispersal by adults also occurs, usually in response to reduced availability of food on the home range due to climatic factors, or to a more general cyclic crash of an important prey species.

REPRODUCTION

Red foxes generally breed in late winter, probably February and March in BC, and the pups are born in April or May after a 51 to 53-day gestation period. The dens used for birthing and rearing of pups may be burrows dug by the foxes themselves, abandoned ones previously used by other foxes or other species, various natural cavities such as caves, hollow trees and logs, or openings in very thick brush or piles of wood debris. Foxes will also den in structures such as barns and other outbuildings, grain elevators, haystacks, and culverts. Some dens may be reused year after year.

The red fox has a fairly high reproductive potential. Both sexes are sexually mature at 10 months of age, thus yearling females may produce young. Litters as large as 12 have been documented, but the average in most areas is four to five. Litter size and the proportions of both juvenile and adult females that breed may vary with nutritional condition and factors associated with population density. High density results in increased competition for food resources and decreased likelihood that yearling females will find a suitably secure home range and den site.

CARE AND DEVELOPMENT OF YOUNG

At birth, red fox pups weigh about 100 grams and are blind and helpless. Their eyes open and they become more mobile at about three weeks, and are beginning to be weaned at about five weeks. As with other members of the dog family, both parents aid in providing the pups with food and protection, thereby increasing their chances for survival. Juvenile foxes are nearly full-grown and are largely independent by autumn of their first year.

MORTALITY, PARASITES AND DISEASE

Wild red foxes as old as 10 years of age have been documented, but relatively few live longer than five years. Coyotes are their most important natural predator in many areas, taking both adults and juveniles, but predation by bobcats, lynxes, and golden eagles is also known to occur.

Outbreaks of rabies have killed up to 80 percent of the fox population in some areas but, fortunately, that disease has never been detected in British Columbia foxes. Sarcoptic mange, caused by mites that irritate the skin and cause hair loss, may also cause mortality in red foxes, particularly when it occurs in winter in northern areas. Diseases that affect other canids (parvovirus, various forms of distemper) may also cause widespread mortality, particularly when fox populations

are high. The red fox also hosts numerous internal parasites and, although none are known to be chronic in terms of effects on fox populations, one is of potential significance in human health considerations (see Special Note, pages 8 and 9).

In many areas, the primary mortality factors are human-caused. Included are legal harvest by trapping and hunting, animal control activities by land owners or government officials in response to depredations, road kills, and incidents involving uncontrolled domestic dogs.

POPULATIONS

There have been no studies to determine numbers or densities of red fox populations in British Columbia. Extrapolating from other areas of similar habitat where live-capture and marking studies have been conducted, red fox densities in our province may range from less than one fox per 10 km² in northern boreal forests and heavily timbered areas, to perhaps as high as 10 per 10 km² in the best habitats, such as some agricultural areas. Red fox numbers may fluctuate on 8-to-10-year intervals in parts of the province, especially the north, following cyclic changes in snowshoe hare numbers. In parts of Europe, red fox numbers follow a three-to-four-year cycle in response to vole population fluctuations, and that may also be the case in open agricultural areas in western Canada.

HARVEST MANAGEMENT

GENERAL CONSIDERATIONS AND OBJECTIVES

The red fox is officially designated as both a furbearer and a small game species in British Columbia. However, there are currently no open seasons for hunting and the species can therefore be legally harvested only by licensed trappers. The red fox is also identified as a Class 1 furbearer under BC's Fur Management Program, and is therefore to be managed in reference to individual traplines. There is no open season for trappers in Region 8 (Okanagan), or on the island portion of Region 1 (Vancouver Island). In the rest of the province, regulations currently provide open seasons of 18 weeks (15 October to 28 February) in all administrative regions except Region 5 (Cariboo), where the season is 23 weeks (15 October to 31 March). There are no quotas or bag limits and no Compulsory Reporting or Compulsory Inspection requirements in any of those areas.

Those fairly liberal regulations reflect a relatively low level of conservation concern. The intelligence of foxes is legendary and, together with the species' high reproductive potential and high dispersal capability, results in a low likelihood of overharvesting. A more important management consideration is to keep numbers low enough so that they are not conducive to the spread of disease, do not result in widespread conflict situations with humans, and do not result in excessive pressure on local prey populations. Those issues and sustainable harvest considerations are best addressed by two strategic objectives in harvest management planning:

1) SUBSTITUTING HARVEST FOR NATURAL MORTALITY WHEREVER POSSIBLE Dispersing juveniles are the least likely component of the population to survive the winter, and are therefore the primary targets in relation to this objective.

2) CONTROLLING ANIMAL NUMBERS TO MINIMIZE NEGATIVE EFFECTS ON HEALTH AND NUTRITION Harvest of most juveniles and some adults may help maintain a prey base that can provide for better survival of the remaining animals, less chance of those remaining animals being in poor condition and subject to disease, and better support for females through pregnancy and during the rearing of young.

Addressing those two management objectives while trapping is assisted by natural vulnerability patterns within the fox population. Specifically, the most expendable members of the population (the juveniles) are generally less secure and more likely to be travelling extensively in search of food than are adults with established territories, and are therefore the ones that are most likely to encounter traps (Objective 1). They are also less likely to be cautious, because of lack of experience both generally and in the subject area. Transient juveniles are also the primary source of potential competition for the local food supply, and are the most likely to contract and carry diseases (Objective 2).



PLANNING AND INFORMATION CONSIDERATIONS

Given adequate food sources and suitable environmental conditions, foxes are prolific and relatively resilient to harvesting pressure, and are able to sustain harvest rates of 50 to 75 percent of the fall population. However, since managers will almost never have detailed population inventory information, planning and managing for a sustainable harvest and healthy population involves more indirect considerations. With the above two strategic objectives as the general background, the following sections describe some of those considerations that may apply. Note that for any particular local situation, some of these factors may conflict with each other, and decisions about which are the most important will require use of common sense.

TIMING

Fox pelts do not become prime until about mid-November in most of BC, and begin to lose value due to wear and breakage of guard hairs by about the end of January. Thus, they are not at top value during the first full month or the last few weeks of the legal trapping season. Although it generally makes sense to time operations so

that the animals are taken when they will bring the largest return, waiting too long in years with low local prey abundance and severe early winter conditions may result in missed opportunities for juveniles, which may already be dispersing from the area or dying from starvation, predation, or disease. Trapping outside of the period of maximum pelt primeness may also be warranted when population control considerations are paramount. In that regard, it is unwise to leave a fox population unharvested in hopes that it will “build up” while the trapper is waiting for better prices. The more likely results are depleted prey populations, reduced productivity of females and, in some cases, widespread mortality from mange or systemic diseases.

Another consideration in relation to timing is the potential for disruption of the mating season. The later in the season that the harvest is undertaken, the more likely it is to affect the opportunity for females to establish stable, productive territories and to be located by a potential mate.

TRAPLINE CHARACTERISTICS

The potential for fox harvest on a particular trapline relates in part to the amount, quality, and continuity of available habitat. Areas in which foxes are very localized in occurrence (i.e., with few or poor corridors for immigration from other occupied areas) have a lower potential and support lower harvest resilience than do large expanses of continuous habitat that may span several traplines. Trappers are advised to regularly compare notes with their neighbours in regard to assessments of fox and prey abundance and harvesting activities and success.

COMPETING SPECIES

Traplines on which coyotes and red foxes share the same habitats will generally be less productive of foxes than those on which they do not overlap. Coyotes both prey on foxes and compete with them for food resources, so control of the local coyote population is probably the single most effective habitat enhancement that can be undertaken in areas where both species occur.

HARVEST MONITORING AND ASSESSMENT

Assessment of the fox harvest by provincial managers is done primarily in reference to fur sales, although there is potential for acquiring additional information through the provincial Trapper Questionnaire. At the individual trapline level, there are three kinds of information that individual harvesters are advised to keep track of, both for within-season assessment and planning of harvest activities and for long-term management interest:

1) THE SEX AND AGE OF ANIMALS CAUGHT This information is important for determining the degree to which the two strategic objectives are being met. Field determination of age can be difficult, particularly later in the winter as juveniles continue to mature, but is best done in relation to body size and robustness and degree of tooth wear. Among males, juveniles appear more slender than adults, and are likely to have whiter and sharper canine teeth. Canine teeth that are discoloured (grey or yellowish) or are worn flat at the tips are indicative of adults. Among females, adults are best distinguished by the presence of conspicuous nipples, often ringed by bare patches caused by rubbing during suckling.

2) THE LOCATION AND DATE OF HARVEST This information can be useful over the long term in identifying important patterns of occurrence. For example, locations and/or seasonal timing that consistently produce adults can be avoided in future operations, and those that most regularly produce young animals can be re-used with some confidence.

3) THE PHYSICAL CONDITION OF THE ANIMALS CAUGHT Determined primarily by the amount of body fat observed on the skinned carcass, this is a good indirect measure of how the population may be doing. If most of the animals caught have little or no fat, and if that corresponds with observations that prey species are scarce, it is likely that the population is under stress. If there are few or no young animals as well, it may be advisable to stop harvesting so that the breeding stock is maintained. However, if the harvest is primarily juveniles in poor condition, continued harvesting in response to both strategic objectives (substituting harvest for natural mortality and protecting the food base) is advised.

RECORD KEEPING

Although it is possible to conduct the above monitoring and assessments on an informal, non-permanent basis, it is strongly recommended that the information be recorded on paper. That will provide more accurate information and a better record for demonstrating long-term patterns.

Trappers are also encouraged to share information on changes in the perceived abundance of foxes and their prey by responding to the annual provincial Trapper Questionnaire. Such responses are an important component of the management of furbearers in British Columbia.

HARVESTING STRATEGIES AND SYSTEMS

At the operational level on individual traplines, there are three main approaches that may be used to harvest fox populations sustainably:

QUOTA SYSTEM This system identifies a harvest goal of a certain number of animals, and harvesting activities are stopped when that goal is reached. Such self-imposed quotas are usually based on long-term experience in which a particular number of foxes has been harvested without apparent effect on the population year-after-year. The problem with a quota system is that it is not sensitive to actual productivity in a particular year, especially if the sex and age of animals caught are not monitored. In years of poor production, even a conservative quota may be too high, and in years of good production it will almost certainly be too low. An under-harvest both short-changes the trapper and may reduce an area's long-term productivity by failing to help keep the species and its prey in optimal balance.

TIME-BASED SYSTEM Based either on long-term experience in a particular area or on practical considerations relating to time available, pelt primeness, and normal vulnerability patterns, this system develops a schedule in which traps are left set only for a pre-determined period, which is shorter than the actual open season. Although similar to the quota system in most respects, including the potential problems, it is less likely to result in a significant under-harvest in years of high production and juvenile survival. That is particularly true if used in conjunction with harvest monitoring, which would enable shortening or extending the originally determined schedule based on the sex, age, and condition of the animals being caught.

AREA-BASED SYSTEM Also referred to as a “refuge system,” the basis for this approach is that a portion of the available fox habitat is left unharvested, with the expectation that it will serve as a source for dispersing animals to colonize areas where trapping does occur. Too little is known of fox home range sizes in BC to prescribe, with reasonable certainty, the size of refuge area that should be established, but data from elsewhere suggests that 50 km² could enclose three to five home ranges and would likely be sufficient. Although the usual concept is that habitat designated as refuge will remain so permanently, an alternative where most of the available habitat is accessible is to harvest portions of it on a rotating basis. Thus, a trapper might divide the fox habitat in his area into three roughly equal-sized parcels and trap each only once in a three year period. A rotating system may have better potential for reducing pressure on local prey populations and maintaining fox productivity.

HABITAT MANAGEMENT

The best habitats for red foxes feature extensive open areas interspersed with patches of shrub or tree cover. The open areas used by foxes in BC include natural grasslands, meadows, wetlands, agricultural lands, and forest cutblocks, at mid-slope to lower elevations, and subalpine parkland and tundra at high elevations. There is little that fox trappers can do to influence habitat management for the species on private lands, and little that they need to do in high-elevation areas. The primary opportunity for input to benefit foxes is in regard to silvicultural practices on Crown land. The objective is to maintain cover and forage plants for fox prey species (voles, hares, rabbits, squirrels), thus discouraging extensive thinning and herbicide applications and encouraging retention of patches of dense cover.

It would be difficult for trappers to enhance or modify habitat directly on a scale sufficient to benefit populations, but there is some potential for enhancing the living situation of individual animals. Habitat for prey species, particularly hares and rabbits, can be improved by cutting over-mature shrubs to stimulate new growth. In addition, the return of carcasses of trapped animals or road-killed ungulates to the trapline can provide an important food source during late winter and early spring when females are pregnant or caring for newborn young. Finally, the largest single enhancement activity that can be undertaken by trappers on behalf of red foxes is control of the local coyote population.

SPECIAL NOTE: HUMAN HEALTH CONCERNS

Trappers and other people who handle foxes should be aware of the diseases that may affect foxes, especially distemper and sarcoptic mange, both of which can also infect domestic dogs. In addition, mange mites can cause a skin rash in humans who handle affected animals without gloves.

The disease of foxes which is of most concern to humans is hydatid disease, caused by the larval form of the canid tapeworm, *Echinococcus granulosus*. Mammals, including humans, can develop this disease by the accidental ingestion of tapeworm eggs passed in canid droppings. The eggs, which are very resistant and can be viable for months, may be transported in dust or soil picked up on an animal's feet or fur. Once inhaled or ingested by an herbivore (or human), they develop into hollow cysts in the internal organs, especially the liver and lungs. In humans, this is a potentially serious disease and is thought to be most often acquired from infected dogs that were fed uncooked, infected tissues of game animals.

Trappers and hunters are encouraged to bring any animal that looks unhealthy to a local conservation officer, and should always take special precautions to prevent contamination of their hands and clothing with infectious materials. Most importantly, they are advised to handle these animals with gloves and/or wash their hands carefully before handling food, and to avoid inhaling dust that may be raised when brushing or shaking out a fox's fur.

SUMMARY

Because of its adaptability to a variety of habitats and prey, high reproductive potential, and fairly high dispersal capability, the red fox is relatively resistant to loss of habitat and overharvest problems, and its population status in British Columbia is relatively secure. Strategies for sustainable harvesting involve substituting harvest for natural mortality wherever possible, and controlling animal numbers to reduce pressure on prey populations and decrease the likelihood of disease outbreaks. Accomplishing those objectives is assisted by the naturally higher vulnerability of juveniles, which should be the primary targets for harvest. Potentially useful harvesting systems may be either time-based, focusing on a balance between pelt primeness and adult vulnerability patterns, or area-based, employing untrapped refuge areas.

To contribute to more informed, long-term management of fox populations, trappers are urged to keep accurate personal records on harvest and sighting locations of the species and relative abundance of prey species such as hares and voles, to share that information with their neighbours on adjacent traplines, and to respond to government solicitations for information. To help maintain habitat for foxes, trappers are advised to be active in providing information and input to forestry operations, and to assist in the control of coyotes, which are the primary competitors and predators of red foxes.

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SOURCES FOR ADDITIONAL READING

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NOTE: This document has been formatted for insertion into the British Columbia Trappers Association Trapper Education Training Manual and for inclusion in print documents intended for government managers and industry representatives who are involved in furbearer management in British Columbia.