FURBEARER MANAGEMENT GUIDELINES

RIVER OTTER *Lontra canadensis*

BRITISH COLUMBIA

Since 1926, separate trapline areas in British Columbia have been assigned and registered to individuals licensed for the purpose of harvesting the province's plentiful fur resources. To obtain a license, 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 river otter is categorized as a Class 2 species, which means that it is considered sensitive to harvest and, because home ranges are large relative to the size of most traplines, population management cannot only be applied at the individual trapline level. Thus, while the input and cooperation of trappers are important, Class 2 species are managed primarily by application of provincial government regulations. Other Class 2 species are lynx, bobcat, wolverine and fisher

This document is intended primarily to provide British Columbia's professional trappers with information on river otter 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.

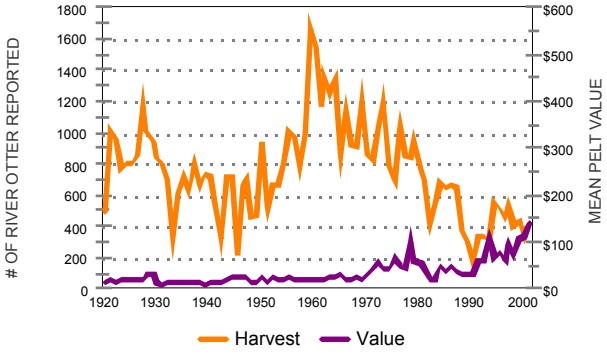
DESCRIPTION

The river otter, an aquatic member of the mustelid (weasel) family, is a medium-sized carnivore. It has a long, thickset body, relatively short legs, and a thick, powerful tail that constitutes approximately one-third of its total length, which ranges from 90 to 135 cm. Body weights of adults range from 7 to 14 kg, with males averaging about 17 percent larger than females. Well adapted to an aquatic existence, otters have large lung capacity and the ability to automatically shut down the blood supply to parts of their body when diving, to allow dive times of up to four minutes. They have thicker fat layers than most other mustelids and their dense fur is highly insulative and well oiled and, with frequent grooming, remains water repellent. The pelage is usually a shade of brown, appearing almost black when wet, although the undersides are often greyish in general tone. All four feet are webbed, but the rear legs and the tail provide the primary propulsion and steering when the animal is swimming. The otter's eyes and ears are high on its relatively flat head, enabling it to see and hear with only a small portion of its head protruding above the water. The ears are closed when the animal is submerged, and an array of sensitive whiskers provides the ability to locate prey in low light or when the water is murky.

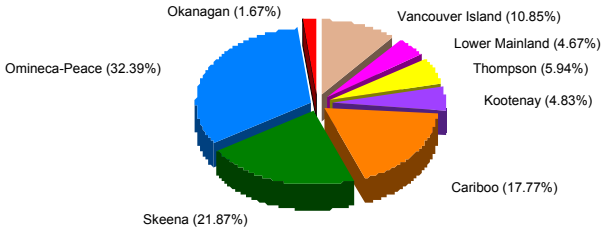
ECONOMIC CONSIDERATIONS

Otter pelage is of exceptional quality, with dense underfur and short, silky guard hairs, and the pelt is highly valued for its beauty and durability. The demand and value have increased steadily since the early 1990s, bringing an average return of almost $140 per pelt in the 2001-02 trapping season. Despite that fact, there has been a general decline in harvest numbers since the peak of 1672 animals in 1959, averaging 904 per year in the 1970s, 571 in the 1980s, and 401 from 1990 through 2001 (see Figure 1). That trend likely reflects the decline in beaver trapping activity over the last few decades, since most trappers targeting otters have done so as a sideline to their beaver trapping. The contribution of otter pelt sales to the overall wild fur revenue of the province ranged from three to five percent between the mid-1950s and the late 1970s, was mostly at or below one percent in the 1980s and early 1990s, but peaked at 6.6 percent ($59,000) in the 2001-02 season. The distribution of the otter harvest is province-wide (Figure 2), but the highest numbers come from the central and northern portions of the province (Cariboo, Skeena, and Omineca-Peace administrative regions).

Reported River Otter Harvests and Pelt Values, 1920-2001.



River Otter Harvest by Region, 1985-2000.



Historically, the river otter has not been a species regularly involved in conflict situations with humans. In their natural habitat, otters prey primarily on non-game or coarse fish and therefore do not impact human recreational or commercial fisheries resources. There have been occasional minor complaints involving the mess of otter feces in boats or on docks, and individual otters have been known to prey on young birds in island seabird colonies. More recently, with the growth of the aquaculture industry, a new form of conflict has arisen in the form of predation by otters on captive-reared fish in farm pens.

River otters are important components of biodiversity in aquatic systems and, because of their position at the top of the food chains in those habitats, are commonly used as bio-indicators in water quality and pollution monitoring.

BIOLOGY

DISTRIBUTION AND HABITAT

The river otter is believed to have occurred historically in suitable habitats throughout North America except in the Arctic and the arid southwest, but populations (possibly small to begin with) were reportedly depleted in much of the mid-continent prairies and plains and in the eastern United States by the end of the 19th century. Many of those populations increased naturally or were restored by reintroductions in the 20th century. The current distribution in Canada is coast-to-coast, with areas of no or low occurrence in the southern prairies. In BC, the species occurs broadly throughout the province, including on all offshore islands, and the distribution is not known to have changed from historic times.

River otters use many kinds of aquatic habitats, including near-shore marine waters along the open ocean, coastal and freshwater marshes and estuaries, and inland streams, rivers, lakes, and ponds of all sizes. The primary requisites for all habitats are the presence of suitable prey, primarily fish, and upland structures that can serve as denning cover. In freshwater stream habitats, most of

their foraging is in areas where fish concentrate such as beaver ponds, eddies, backwater sloughs, the mouths of tributaries, and the pools above or below rapids and falls. However, they cover most of the shoreline within their home ranges while travelling between hunting spots, and do not avoid rough water or rugged shores while doing so. In northern areas in winter, otters may conduct much of their activity beneath the ice, breathing at air spaces wherever they may be found.

Otters regularly benefit from the industry of beavers, utilizing their ponds, channels, and lodges. Occasionally in winter they dig trenches in beaver dams to enable them to easily move into and out of the ponds under the ice. The resulting lowered water levels in the pond may serve to concentrate prey and increase breathing space for the otters, but may have negative effects on the beavers involved, which are not able to repair such breached dams until the spring.

FOOD

In all areas, the river otter's diet is primarily fish, particularly slow-moving species such as suckers, shiners, daces, sculpins, sticklebacks, northern pikeminnows, ciscos, and whitefish in freshwater, and surfperch, sculpins, flounders, greenlings, and rockfish in salt water. They sometimes take more mobile species, such as kokanee and salmon, especially when those species are spawning in shallow waters. Fish species which inhabit deep water, such as lake trout, are rarely eaten.

River otters also eat a variety of invertebrates, especially crabs in salt water and crayfish in freshwater , and sometimes insects such as aquatic beetles and dragonfly nymphs and mollusks such as clams and snails. They also occasionally eat frogs, toads, snakes and turtles, waterfowl and shorebirds such as ducks, rails, and ground-nesting seabirds. The only mammals consistently recorded in otter diets are muskrats and beavers, and those only rarely.

SOCIAL BEHAVIOUR

River otters appear to have a somewhat flexible social system. Individuals maintain distinct home ranges over at least part of the year, but overlapping habitat use both within and between sex and age groups is fairly common. Individual animals avoid confronting each other to the extent possible, but apparently do not rigidly defend or mark territory boundaries. Such a pattern enables the population to distribute itself in relation to seasonal movements and local abundance of prey, rather than requiring individuals to try to subsist in home territories during times in which local food availability is low.

The home ranges of adult males are generally larger than those of females, but the difference varies with the nature and extent of shoreline habitat available, and probably with population density. In an Alberta study, the home ranges of six adult males averaged 231 km^2, which was more than three times larger than those of three females studied (70 km^2). Adult home ranges in a coastal Alaska study were smaller, (9 to 25 km^2), doubtless because of richer, more concentrated food supplies in that habitat. Other studies have expressed home ranges in terms of length of shoreline, with individual ranges varying from 8 to 78 km along freshwater shorelines and 1 to 23 km along the coast. The most stable otter groups are those consisting of an adult female with her dependent young. Adult male otters are usually solitary, but have been observed in small "bachelor groups" of up to seven animals in both marine and freshwater habitats, the latter particularly during the open-water season.

ACTIVITY AND MOVEMENTS

River otters are most active between dusk and dawn, but they often travel and forage during daylight hours, especially in winter. Daily movements can be large, up to 42 km in one study, but averages of 4 to 5 km in summer and 2 to 3 km in winter appear to be the most common. The dispersal of juveniles, which occurs in the spring when they are 12 to 13 months old, proceeds at a rate of about 4 km per day, and total movements of up to 200 km have been recorded. Reintroduced river otters have moved up to 80 km from their release sites.

REPRODUCTION

Adult male otters begin travelling extensively in search of females in about February in most areas, and breeding may take place from then through April. Pregnancy features delayed implantation, with the fertilized eggs floating freely in the uterus for 10 to 12 months (i.e., until the following

winter) before implanting and beginning foetal development. The actual gestation once implantation occurs is about two months, with most young being born in March or April. Litter size ranges from one to five young, but is most commonly two or three.

Both males and females are sexually mature by the time they are two years old, although many males may not mate until they are five to seven years of age. Females usually mate for the first time in the spring of their second year, therefore producing their first young at about age three years. However, there are occasional records of yearling pregnancies. The breeding schedule is such that, once they have begun producing young, females mate shortly after giving birth each year.

CARE AND DEVELOPMENT OF YOUNG

At birth, river otter pups, weigh about 140 g and are fully furred, but are blind, toothless, and helpless. Evidence available to date indicates that all parental care is provided by the mother. The pups develop relatively quickly, opening their eyes at about three weeks of age, beginning to swim at six weeks and to take solid food at eight weeks, and weaning at 12 weeks. However, they remain with the mother, travelling and hunting with her through their first winter, until they are at least a year old. Most probably disperse at about the time their mother is producing the next litter, and the juvenile otters may remain together in sibling groups for some time after that.

MORTALITY, PARASITES AND DISEASE

River otters have been known to live as long as 25 years in captivity, but the oldest known wild otter was a 14-year-old from coastal British Columbia. Otters host a number of parasites, especially internally, but none of those are known to cause health problems that affect populations. Likewise, a number of diseases including canine distemper, hepatitis, jaundice, pneumonia and at least one case of rabies have been diagnosed in individual otters, but are not known to occur commonly anywhere.

In the water, British Columbia river otters are subject to predation only in the marine environment, where they may be attacked by killer whales, but such incidents are believed to be rare. On land, a number of other carnivores including wolves, coyotes, bobcats, and cougars are known to occasionally prey upon otters, particularly juveniles. Natural predation is probably not a limiting factor for river otter populations in most areas. Most detected mortality of otters appears to be human caused, and includes legal trapping, car and boat accidents, entanglement in fishing nets, and accidental capture in crab traps. In addition, otters are especially vulnerable to chronic poisoning from toxic pollutants that have been released into aquatic ecosystems. Because they are top predators in aquatic food chains, otters may accumulate high levels of contaminants such as mercury and PCBs and are often used as bio-indicators in water quality and pollution monitoring.

POPULATIONS

The number of otters present in a particular local area is related to the amount and quality of aquatic habitat present, and to the abundance of food in those habitats. Because shoreline habitats tend to be long and narrow, it is common to express otter density as the number of individuals per kilometre of shoreline rather than by some area-based unit such as km^2. In general, traplines with the most fish-bearing water bodies and wetlands will support the highest numbers of otters. There have been relatively few applicable studies, but densities determined to date have ranged from about one otter per kilometre of shoreline in coastal Alaska to one otter per 4 to 17 km along a freshwater system in Idaho.

HARVEST MANAGEMENT

GENERAL CONSIDERATIONS AND OBJECTIVES

The river otter is officially designated as a furbearer in British Columbia and, as such, can be legally harvested only by licensed trappers. It is also identified as a Class 2 furbearer under BC's Fur Management Program, meaning that its harvests are officially regulated (i.e., methods, seasons, bag limits, quotas) at the regional level, in consultation with local trappers. In 2002-03, there were open trapping seasons province-wide, with season lengths ranging from 3.5 months in portions of the Lower Mainland Region to eight months in the northern (Skeena and Omineca-Peace) regions. To date, there have never been quotas, bag limits, or Compulsory Reporting or Compulsory Inspection requirements for otters anywhere in the province. Those apparently liberal regulations reflect the relatively low demand for otter pelts that has existed until recently, the rather specialized nature of otter trapping, and the relative inaccessibility of the species (beneath the ice) throughout much of the winter in most trapline areas.

Although the final responsibility for management lies with the provincial government, trappers may play a vital role in the management process by maintaining a level of practice that does not generate or contribute a cause for concern, and by providing information and specimen material if and when requested. In regard to the former, it is important to understand that the lack of concern for the species in the past has resulted in a low level of current knowledge about specific features of harvest practice. Much of the following material has been adapted from recommendations for other species, on the assumption that otter populations may function similarly, but some of the associated caveats and uncertainties are highlighted. Ideally, as with most other furbearers, the overall harvest management plan should address three strategic objectives:

1) SUBSTITUTING HARVEST FOR NATURAL MORTALITY WHEREVER POSSIBLE Transient animals, mostly young animals in search of suitable hunting spots and attempting to avoid confrontations with territorial adults, are presumably the least secure component of the population and are therefore the primary targets in relation to this objective.

2) MINIMIZING THE CATCH OF ADULT FEMALES Resident adult females with secure, productive home ranges are the core of population productivity. As described below, protecting them may be partly a matter of the timing, and extent of trapping activity, but may also involve specific knowledge of locations where family groups are operating.

3) MINIMIZING PRESSURE ON PREY POPULATIONS Removal of transient and adult male otters may help maintain a prey base that can provide for better survival of the remaining animals, and better support for females during pregnancy and rearing of young.

PLANNING AND INFORMATION CONSIDERATIONS

With adequate food and suitable habitat conditions, river otters have low natural mortality and are moderately resilient to harvesting pressure, being able to sustain harvest rates of up to 25 percent of the fall population. However, since harvesters and managers will almost never have specific information on local population size, planning and managing for a sustainable harvest involves more indirect considerations. With the above three strategic objectives as the general background for such considerations, the following sections describe some of those 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 the trapper's best judgement.

VULNERABILITY TO HARVEST Addressing the three strategic management objectives while harvesting otters may be assisted somewhat by natural vulnerability patterns within the otter population, particularly if trapping activity is well spaced. The most expendable (transient) members of the population are generally less secure and more likely to be travelling extensively in search of food and living space than are established adults, and are therefore the ones that are most likely to encounter widely spaced traps (Objective 1). At the same time, adult females with young may be somewhat less likely than either transients (both sexes) or adult males to encounter traps (Objective 2), because they generally have smaller

ranges. Finally, removing transient animals and adult males reduces their competition with established adult females for the local food supply (Objective 3).

TIMING River otter pelts are at maximum primeness from early November through early January, but in many areas otters are accessible to open water trapping for only the first few weeks (or less) of that period, and then later after breakup. However, markets have been less sensitive to pelt primeness for this species in recent years, and other considerations may prove to be paramount. For example, targeting transient, mostly young animals (Objective 1) may be best done by concentrating trapping activity during the early season (mid-October through mid-November in most areas), when the previous year's young are beginning to face their first winter alone), and again in the spring (March and April), when the yearlings are beginning to disperse. Adult males may be most vulnerable in late winter (February through March) when they are travelling in search of mates.

TRAPLINE CHARACTERISTICS The potential for otter harvest on a particular registered trapline relates to the amount, quality, and continuity of available habitat, and the extent of harvest pressure on adjacent traplines. Areas in which otters are very localized in occurrence, such as land-locked lakes and wetlands with few or poor corridors for immigration from other occupied areas, have a lower potential and lower harvest resilience than do large expanses of continuous shoreline habitat that may span several traplines. In BC, much of the primary river otter habitat is in or near valley bottoms where human settlements and developments occur. Although otters are fairly tolerant of human occurrence, habitat connectivity may be a particular problem where human density and industrial development is high.

The boundaries of a functional otter population may result in its being harvested on several adjacent traplines. It is the total, combined harvest by all of those trappers, not that of any one of them, that is the reference for local population sustainability, so it is advisable for them to be aware of and in communication with each other and, if necessary, to work out practical ways to avoid negatively impacting each other or the otter population.

HARVEST MONITORING AND ASSESSMENT Currently, the otter harvest is assessed by provincial managers only in reference to fur sales data, and includes no consideration of age, sex, or harvest timing. However, such information may be important for management and will likely be required in the future if the pressure on the species grows to meet the growing demand. Individual trappers will rarely handle enough otters in one season to enable clear and confident assessment of population status at that level. The presence of young animals in a small sample (five or fewer) is an indication of productivity, but their absence in such a sample would not necessarily indicate that local production is poor. Here again, communication and a pooling of information with the owners of neighbouring traplines would be more instructive, providing a basis for collective decisions about when or if harvesting should stop in a particular year. There are four kinds of information that individual trappers are advised to keep track of both for official management purposes in the long-term, and for within-season assessment and ongoing planning of harvest activities in the short term.

SEX AND AGE OF ANIMALS CAUGHT This information is important in helping to determine the degree to which the three strategic objectives (above) are being met. The external sex organs of otters are conspicuous, and sex determination is straight-forward. Determination of age is more difficult, because young otters may attain adult measurements and weights fairly quickly in areas with high food abundance. Adults of both sexes can often be recognized on the basis of greater tooth wear, but adult females are best distinguished by the presence of conspicuous nipples, often ringed by bare patches caused by rubbing during suckling. Among males, in addition to greater tooth wear, adults are generally more robust around the head and neck, and their bacula (penis bones) are thicker and heavier than those of juveniles.

TRAP SET TYPE While there is no official information on this at present, certain trap set systems may be selective for particular classes of animals, or completely unselective,

and can therefore be used or avoided to advantage in helping to meet strategic harvest objectives. The following list covers most sets currently in use: a) beaver dam spillway set, b) incidental in active beaver lodge entrance or channel set, c) inactive beaver lodge entrance or channel set; d) blind set (located to catch traveling otters, with no bait or lure used), e) baited underwater set, f) baited set at or above water surface, g) lure set at or above water surface.

LOCATION AND DATE OF HARVEST, AND OF SIGHTINGS OR SIGN (TRACKS) OF FAMILY GROUPS (FEMALES WITH YOUNG) Both are potentially useful in identifying important patterns of occurrence. For example, time periods and specific locations that consistently produce sightings or catches of adult females can be avoided in future operations, and those that most regularly produce young animals or adult males can be re-used with greater confidence.

PHYSICAL CONDITION OF THE ANIMALS CAUGHT Determined primarily by weight, by the condition of the pelt (density, sheen, scarring), and by the amount of body fat observed on the skinned carcass, this may provide a good indirect measure of how the population is doing. If more than one or two harvested animals are clearly in poor physical condition, and if there are few or no young animals, that may be an indication of a declining food supply. If judged to be a result of heavy otter predation, continued harvesting would be the prescription. If it is believed to be the result of an environmental contaminant, temporary cessation of trapping and reporting to government authorities is recommended.

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 and stored where it will be readily retrievable. That will provide more accurate information and a better record for demonstrating long-term patterns. Trappers are also encouraged to share information about changes in the perceived abundance of otters and their prey by responding to the annual Trapper Questionnaire. Responses are an important component of the management of otters and other furbearers in British Columbia.

HARVESTING STRATEGIES AND SYSTEMS

At the operational level, there are three main approaches that may be used to harvest river otters sustainably, as follows:

QUOTA SYSTEM This system identifies a harvest goal of a certain number of animals, and harvesting activities are stopped when that goal is reached. For cases in which that goal is a limit or quota imposed by government regulation or regional policy, there can be no other consideration. However, some trappers work under self-imposed quotas which are usually based on long-term experience in which a particular number of otters 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 or survival in a particular year, especially if the sex and age of animals caught are not monitored. In years of poor production or survival, even a conservative quota may be too high, and in years of good production it will almost certainly be too low. An underharvest 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 such factors as pelt primeness and normal local freeze-up 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 underharvest in years of high production and survival. That is especially true if used in conjunction with harvest monitoring, which would enable shortening or extending the originally designated schedule based on the sex and age characteristics of the catch.

AREA-BASED SYSTEM Also referred to as a "refuge" system, the basis for this approach is that a portion of the available otter habitat is left unharvested, with the expectation that it will serve as a source for animals dispersing to areas where trapping does occur. In some cases, that function may be provided by large areas of inaccessible or private property habitat, or by adjacent traplines on which otters are not being trapped. The size requirement for an effective refuge has not been determined, but should probably be large enough to fully enclose the home range of at least one adult female, and a block enclosing two or three such ranges would be preferable. That might equate to a section of shoreline as small as 8 to 10 km in good coastal habitat, but will likely be as large as 50 to 60 km of lake or stream shoreline in the Interior.

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 otter habitat on the trapline into two or three roughly equal-sized parcels and trap each only once in a two- or three-year period. A rotating system may have better potential for reducing pressure on local prey populations and maintaining otter productivity.

While the primary focus of a refuge system is providing for the maintenance of a stable breeding stock (mainly adult females), it cannot be safely assumed that those animals will not move out of the refuge areas late in some years. Further, prey populations in refuge areas may become depleted over the long term or in years when the number of transient otters is high. In short, even with the refuge system it is recommended that the characteristics of the harvest be closely monitored and ongoing trapping plans and activities be modified accordingly.

River otter tracks on the upper Nahlin River, northern British Columbia.

HABITAT MANAGEMENT

Riparian management guidelines in place throughout the province will generally provide for the streamside cover, food, and water quality requirements of river otters in most industrial development situations, and trappers are advised to support those guidelines when the opportunity arises. Management initiatives favourable to fish will generally be favourable to otters and should also be supported, and any circumstance in which habitat degradation or unusual fish mortality

is detected should be reported to the nearest conservation officer. Finally, due to the very close association of otters with beavers in most freshwater systems, one of the potentially most beneficial things that trappers can do to foster good otter habitat is to practice good management of the beaver populations on their traplines. That will involve a systematic trapping program to prevent over-use of beaver food supplies and to reduce the risk of population stagnation and disease (see beaver management guidelines).

SUMMARY

The river otter is widely distributed throughout British Columbia, occurring along fresh and salt water shorelines and subsisting primarily upon fish. Despite increasing pelt prices in the 1990s, total harvests have remained fairly low because rugged shorelines and ice cover limit access to the species during the winter trapping season, and because of a general decline in water-based trapping activity generally focussed on beaver. The river otter is a Class 2 furbearer, with functional populations usually spanning several traplines, and it is the combined harvest of all the trappers operating in the area involved that must be considered in relation to sustainability. The species has a low to moderate reproductive potential, with most females producing a first litter at three years of age and litter sizes averaging about three young. Strategies for sustainable harvesting involve substituting harvest for natural mortality wherever possible, minimizing the catch of adult females, and controlling animal numbers to reduce pressure on prey populations. Little is known of harvest patterns or characteristics in BC, and trappers are advised to monitor and record sightings of otters and sign, trapping results (success rates, locations, and timing), sex and age of the catch, and trap set types. Potentially useful harvesting systems may be either time-based, focusing on a balance between pelt primeness and accessibility, or area-based employing untrapped "refuge" areas. Habitat management for otters primarily involves maintenance of conditions favourable to fish, with particular emphasis on water quality. Because otters commonly occur in close association with beavers in fresh water systems, good management of beaver populations in those areas is also important. To contribute to more informed, long-term management of otter populations, trappers are urged to keep accurate personal records of harvest and sighting locations of the species, to respond to Trapper Questionnaires, and to provide information and specimen materials whenever those are requested by government managers.

BY: David F. Hatler, Garth Mowat and Alison M.M. Beal

May 2003
PHOTOGRAPHY: Page 1, Michelle Gilders; pages 4 and 8, David F. Hatler
RESEARCH, LAYOUT AND ALL GRAPHICS: Wildeor Wildlife Research and Consulting

wildeor@ junction.net

SOURCES FOR ADDITIONAL READING

Elliot, J.E., C.J. Henry, M.L. Harris, L.K. Wilson, and R.J. Norstrom. 1999. Chlorinated hydrocarbons in livers of mink and river otter from the Columbia and Fraser River Basins, 1990-1992. Environmental Monitoring and Assessment 57:229-253.

Elliot, J.E., C.J. Henry, M.L. Harris, L.K. Wilson, and R.J. Norstrom. 1999. Chlorinated hydrocarbons in livers of mink and river otter from the Columbia and Fraser River Basins, 1990-1992. Environmental Monitoring and Assessment 57:229-253.

Lariviere, S., and L.R. Walton. 1998. Lontra canadensis. Amer. Soc. Mammalogists, Mammalian Species No. 587. 8pp.

Melquist, W.E., and M.G. Hornocker. 1983. Ecology of river otters in west central Idaho. Wildl. Monogr. No. 83. 60pp.

Melquist, W.E., and A.E. Dronkert. 1987. River Otter. Pages 549-573 in Novak M., J.A. Baker, M.E. Obbard, and B. Malloch eds. Wild furbearer management and conservation in North America. Ontario Trappers Association, North Bay, ON.

Reid, D.G., T.E. Code, A.C.H. Reid, and S.M. Herrero. 1994. Food habits of the river otter in a boreal ecosystem. Canadian Journal of Zoology 72:1306-1313.

Reid, D.G., T.E. Code, A.C.H. Reid, and S.M. Herrero. 1994. Spacing, movements, and habitat selection of the river

otter in boreal Alberta. Canadian Journal of Zoology 72:1314-1324.

Stenson, G.B., G.A. Badgero, and H.D. Fisher. 1984. Food habits of the river otter in the marine environment of British Columbia. Canadian Journal of Zoology 62:88-91.

Toweill, D.E., and J.E. Tabor. 1982. River otter. Pages 688-703 in Chapman, J. A. and G.A. Feldhamer (eds). Wild mammals of North America: biology, management, and economics. Johns Hopkins Univ. Press, Baltimore, MD.

The authors extend their thanks to the Ministry of Water, Land and Air Protection, the Habitat Conservation Trust Fund (HCTF) and the British Columbia Trappers Association for initiating and supporting the development of this Furbearer Management Guideline for river otter. Funding for this publication received from the HCTF.

We also wish to express our gratitude for input received from the following trappers: Bob Frederick, Bob Gibbard, Carl Gitscheff, Mike Green, Dr. James Hatter, Jack Lay, Frank Rad, Tom Sabo, Stan Smith, Terry Stocks, Don Wilkins and Pete Wise. Thanks also to Helen Schwantje and Mike Badry of WLAP and to Frances Backhouse who edited this guideline.

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.