A Review of the Canada Lynx, *Lynx canadensis*, in Canada*

KIM G. POOLE

Aurora Wildlife Research, 2305 Annable Rd., Nelson, British Columbia V1L 6K4 Canada

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The Canada Lynx (*Lynx canadensis*) is the most common and widespread member of the cat family in Canada. Lynx are distributed throughout forested regions of Canada and Alaska and into portions of the northern contiguous United States, closely paralleling the range of its primary prey, the Snowshoe Hare (*Lepus americanus*). They are most common in the boreal, sub-boreal and western montane forests, preferring older regenerating forests (>20 years) and generally avoiding younger stands, and occupy roughly 95% of their former range in Canada. Lynx population size fluctuates 3–17 fold over an 8–11 year cycle, tracking the abundance of Snowshoe Hares with a 1–2 year lag. During increasing and high hare abundance, lynx have high reproductive output and high kit and adult survival. The decline phase is characterized by reproductive failure, increased natural mortality, and high rates of dispersal. Dispersal distances of over 1000 km have been recorded. During the cyclic low, kit recruitment essentially fails for 2–3 years, and is followed by several years of modest reproductive output. Reproductive parameters in southern lynx populations appear similar to those found during the cyclic low and early increase phase in more northern populations. Trapping is a significant source of mortality in some areas. Field studies have documented from 2–45 lynx/100 km^2 at various times in the cycle and in various habitats. Although the amplitude of the cyclic fluctuations in lynx numbers may have decreased somewhat in recent decades, there is no evidence to suggest a significant decline in numbers in Canada. Lynx are managed as a furbearer in Canada, with harvest regulated primarily by seasons, quotas, and closures. The harvest over the past decade has declined concurrent with declining pelt prices, and is currently a fraction of historic levels. Lynx are fully protected in less than 2–3% of their range in Canada. There is no evidence to suggest that overall lynx numbers or distribution across Canada have declined significantly over the past two decades, although loss of habitat through increased urbanization and development and forestry is likely affecting lynx populations along the southern fringe of its range. Its high potential to increase in numbers and propensity to disperse long distances suggest that the species is relatively resilient to localized perturbations and reductions, given time and removal of the factors that cause the initial decrease. Lowered lynx harvests, coupled with a greater awareness of the need for proactive lynx management, suggests that the overall future of lynx in Canada is secure.

Key Words: Canada Lynx, *Lynx canadensis*, COSEWIC, Canada, status, review, ecology.

The Canada Lynx (*Lynx canadensis*), the most common wild felid in Canada, is an elusive inhabitant of the forests across much of Canada. Its cyclic fluctuations in numbers, tied closely to those of the Snowshoe Hare (*Lepus americanus*), have long fascinated trappers and biologists alike. This report summarizes the ecology and current status and management of the Canada Lynx in Canadian jurisdictions. It is based on a report requested by the Terrestrial Mammals Specialist Group of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (Poole 2001*), and updates information provided in the original COSEWIC status report by Stardom (1989*).

The Canada Lynx has been considered by some authors as conspecific with Eurasian Lynx *Lynx (Felis) lynx* (Linnaeus 1758) (Kurtén and Rausch 1959; McCord and Cardoza 1982; Quinn and Parker 1987; Tumlison 1987); however, large differences in size and marked adaptive differences in prey selection (Nowell and Jackson 1996) and mitochondrial DNA analysis of the *Lynx* taxa (Beltrán et al. 1996; O'Brien 1996) tend to support full species status for the Canada Lynx (Hall 1981; Wozencraft 1993). The taxonomy of the cat family is an area of much disagreement (Werdelin 1996), and further debate will surely occur.

Two subspecies have been recognized (Banfield 1974; Tumlison 1987), *L. c. canadensis* (Kerr 1792) from mainland northern United States and Canada, and *L. c. subsolanus* (Bangs 1897), a smaller brownish race restricted to the island of Newfoundland. However, van Zyll de Jong (1975) concluded that there was no support for treating the Newfoundland population as a distinct subspecies based on traditional morphological traits, suggesting that the species is monotypic in North

* This paper is condensed from the official COSEWIC status report submitted to COSEWIC by the author on which a Not at Risk status was assigned by COSEWIC in May 2001. For access to the official report, contact the Committee on the Status of Endangered Wildlife in Canada at the Canadian Wildlife Service, Ottawa, Canada, or the author.

America. The evolutionary history of the Canada Lynx is unclear. The Canada Lynx and Bobcat (*Lynx rufus*) probably resulted from separate invasions of the Eurasian Lynx across the Bering Land Bridge during interglacial periods of the Pleistocene; the first resulted in speciation to the more southern Bobcat, and the second invasion in speciation into the Canada Lynx (Werdelin 1981, 1983).

Description

The Canada Lynx (hereafter lynx) is a medium-sized cat with a flared facial ruff, black ear tufts, large padded feet, and a short, black-tipped tail (Banfield 1974; Quinn and Parker 1987). Their pelage is reddish to grey-brown, being lighter during winter; the hairs are generally tipped in light grey or white. A rare colour phase, the "blue lynx", has pallid, bluish grey fur that suggests partial albinism. Lynx show mild sexual dimorphism in size, males (averaging 80–90 cm long and 9–14 kg) being 15–25% larger than females (76–84 cm long and 8–11 kg; Quinn and Parker 1987; K. Poole, unpubl. data). Their long hair, especially during winter, makes them appear much larger. Subtle differences in size of lynx occur across Canada with the largest individuals found in northern areas.

Distribution

The lynx has a wide distribution covering most of northern North America, with the species currently occupying roughly 95% of its former Canadian range, approximately 5 500 000 km^2 (Figure 1). In contrast to the Canadian distribution, lynx distribution in the northern contiguous United States has been greatly reduced and fragmented, largely as a result of human-induced mortality, human settlement and likely habitat alteration during the past 2 centuries (McKelvey et al. 2000). Due to cyclic pulses of dispersal, lynx occasionally occur to varying degrees in areas peripheral to its primary range.

The northern extent of lynx distribution in Canada appears to have changed little compared to historic distribution (Figure 1). Treeline defines the northern boundary throughout Alaska, Yukon, Northwest Territories, Nunavut, Québec and Labrador. Lynx are absent or uncommon in the wet coastal forests of the west coast. Lynx are absent from the southern third of the Prairie Provinces where their southern limit has likely been pushed slightly northward because of conversion of land to agriculture. Lynx were extirpated from Prince Edward Island during the latter half of the 1800s and mainland Nova Scotia in the early 1950s, and occur

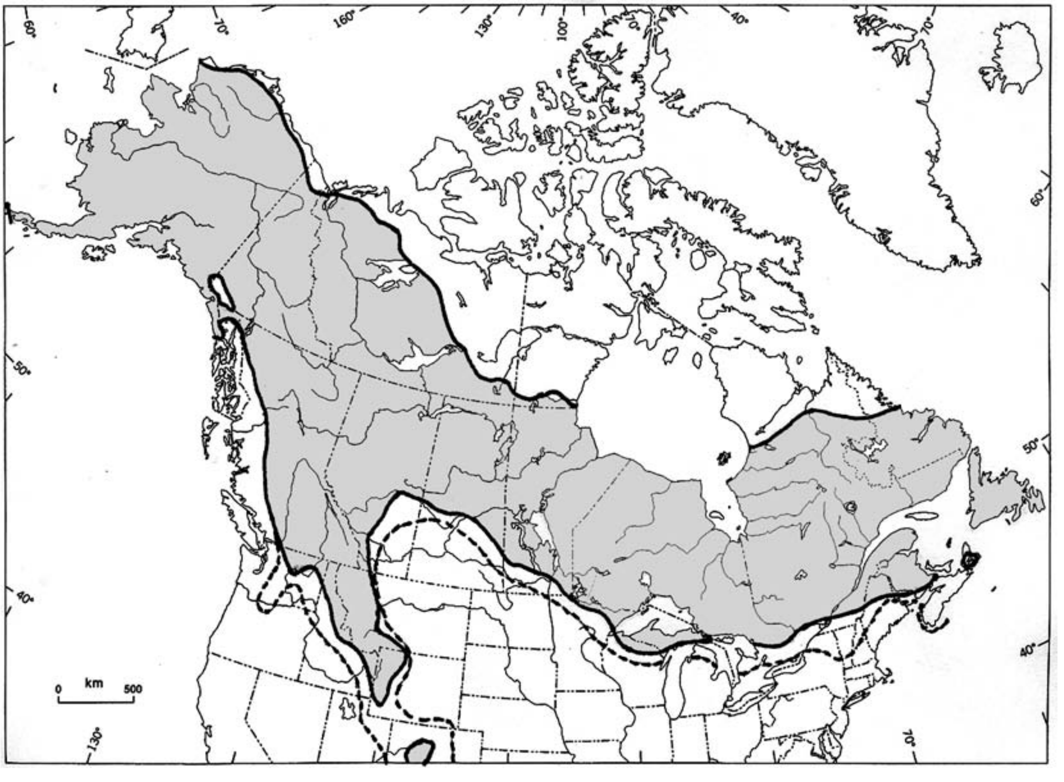

FIGURE 1. Historic (dotted lines) and 2001 (shaded areas) distribution of the Canada Lynx in North America. Historic distribution in Canada from de Vos and Matel (1952) and van Zyll de Jong (1971) (see text). Current Canadian distribution from jurisdiction biologists, and Alaska distribution from H. Golden (personal communication). Historic and current distribution in the contiguous United States from Maj and Garton (1994) and McKelvey et al. (2000).

in very low numbers throughout New Brunswick, with their greatest numbers in the northwest corner of the province. Their range on Cape Breton Island, Nova Scotia, has been reduced to highland habitat. Settlement and conversion of forest to farmland has eliminated lynx from much of the once extensive mixed deciduous and coniferous forests of the southern half of southern Ontario and portions of Québec in the Eastern Townships bordering the New England states. The map in de Vos and Matel (1952) as redrawn from Seton (1929) may not have accurately depicted the historic southern boundary of lynx distribution because large portions of the Prairie ecoregion were included (Bailey 1998); this was likely poor lynx habitat even in historic times. Extensive surveys by Maj and Garton (1994) and McKelvey et al. (2000) do not support this historic distribution in the Prairie biome in the contiguous United States.

Most lynx populations cycle dramatically on an 8–11 year basis (see General Biology, below). Some areas within the normal distribution of the species may become devoid of lynx for several years during population lows. Lynx often undertake large dispersal movements, primarily in response to region-wide cyclic reductions in Snowshoe Hare populations (see Movements, below). These pulses of dispersal, with some individuals moving >500 km (Ward and Krebs 1985; Slough and Mowat 1996; O'Donoghue et al. 1997; Poole 1997), result in periodic shifts of distribution into the periphery of areas where they do not normally occur (Banfield 1974; Mech 1973, 1977). These populations may persist for only a few years or, given the right circumstances, may establish breeding populations. The cyclic fluctuations in density and dispersal patterns result in a distribution pattern that is difficult to accurately depict.

Habitat

Lynx occupy the boreal, sub-boreal and western montane forests of North America (McCord and Cardoza 1982; Quinn and Parker 1987). Although they occur in many forest types that are not truly boreal, lynx reach their highest densities in boreal and mixedwood forests dominated by spruce (*Picea* spp.), pine (*Pinus* spp.) and Balsam Fir (*Abies balsamifera*) with a variable deciduous component (Legendre et al. 1978; Quinn and Thompson 1987; Hatler 1988; Dwyer et al. 1989; Mowat et al. 2000). Lynx also occur in subarctic forests dominated by Balsam Fir and Paper Birch (*Betula papyrifera*) (Legendre et al. 1978). In the Maritimes and New England states, lynx are found in Balsam Fir and Black Spruce (*Picea mariana*) forests, and are often associated with spruce bogs (Parker 1981; Litvaitis et al. 1991; Aubry et al. 2000). In parts of western Canada (i.e., central and northern Alberta) lynx occur in upland aspen (*Populus tremuloides*) forests. In the western mountains, they occur in a more patchy distribution predominantly within the subalpine forest zone at elevations of 1200 to 3000 m, in spruce-Subalpine Fir (*Abies lasiocarpa*), Douglas-fir (*Pseudotsuga menziesii*) and fir-hemlock (*Tsuga* spp.) forests (Koehler and Aubry 1994; Aubry et al. 2000). Lodgepole Pine (*Pinus contorta*) is found in these montane forests as a seral species on drier sites.

Stand level preferences by lynx follow closely those of its main prey, the Snowshoe Hare (Hodges 2000a, 2000b; Mowat et al. 2000). Lynx prefer older regenerating forest stands, greater than about 20 years of age, and generally avoid younger stands (Parker 1981; Kesterson 1988; Thompson 1988; Major 1989; Thompson et al. 1989; Perham 1995; Staples 1995; Mowat and Slough 2003). Many authors have demonstrated use (though not selection) of mature forest stands, especially those included within burns (Kesterson 1988; Staples 1995; Poole et al. 1996). The use of habitat edges (Kesterson 1988; Major 1989; Staples 1995) may be an important hunting strategy for lynx, which may allow them to hunt hares that live in habitats that are normally too dense to hunt effectively (Mowat et al. 2000). Although lynx select against use of openings such as meadows, farmland, and water bodies, they occasionally cross them (Murray et al. 1994; Fortin and Huot 1995; Poole et al. 1996; Mowat et al. 2000).

Lynx den sites described in the literature have similar structural attributes regardless of stand type or age. Denning habitat ranges from regenerating to mature stands, but most sites are associated with relatively dense vegetation in a tangle of wind-felled trees and deadfall or roots providing some form of overhead protection (Berrie 1974; Stephenson 1986*; Kesterson 1988; Koehler 1990; Slough 1999).

Wildfire, which is the most important factor in the dynamics of the northern boreal forest ecosystem (Kelsall et al. 1977; Viereck 1983), is a major habitat modifier (Johnson et al. 1995; Paragi et al. 1997). Logging, which is also an important factor in the dynamics of many boreal and montane forests, restarts the succession necessary to create optimum hare and lynx habitat, but often removes the structure needed for denning by lynx and the dense understory resulting from wildfire (Mowat and Slough 2003). Suppression of wildfire has likely reduced lynx habitat quality in some areas, especially in the south, by reducing the amount of early successional stands (Mowat and Slough 2003); however, at the landscape level the degree of impact is unknown. However, vast areas of Canadian forest burn each year despite suppression efforts. In western montane and southern landscapes, lynx habitat is fragmented by low elevation valleys and interspersions of unsuitable habitat (i.e., urban areas, transportation corridors, and agricultural lands). Habitat loss coupled with intensive settlement is probably the major cause of reduced lynx range in southern Ontario and Québec.

General Biology

The biology of the lynx is closely tied to the biology of the Snowshoe Hare. Lynx numbers fluctuate in synchrony over vast areas in response to population levels of hares; the decline in lynx numbers generally lags 1–2 years behind the decline in hare numbers (Elton and Nicholson 1942; Butler 1953; Keith 1963; Brand and Keith 1979; Boutin et al. 1995). Lynx densities in most central and northern populations change 3 to 17-fold during a cyclic fluctuation (Keith et al. 1977; Poole 1994; Slough and Mowat 1996; O'Donoghue et al. 1997). In the southern boreal and montane forests Snowshoe Hare populations fluctuate, but at much lower amplitudes (Hodges 2000b). Southern lynx populations are not believed to exhibit cyclic fluctuations in density (Koehler and Aubry 1994); however, other than trapping records, which can be influenced by lynx dispersal from great distances and trapper effort, little objective data are available (Koehler 1990; Aubry et al. 2000). During the 1900s, lynx cycles appear to initiate and emanate from central Canada, following similar trends in the hare cycle (Smith 1983; Hodges 2000a), such that peak lynx harvests in Saskatchewan and Manitoba from 1960 to 1980 occurred around the turn of the decade, and 2–4 years later in Yukon, Alaska, and Québec.

The cycle in lynx numbers is often broken into phases (Poole 1994; Slough and Mowat 1996; O'Donoghue et al. 1997). The low period typically lasts 3–5 years and is denoted by low population density and a mild decline and recovery in numbers through the period. During the increase phase, about 3 years in duration, lynx numbers increase quickly, a result of high fecundity, high kit survival, and low adult mortality. The peak phase is usually a 2-year period of high lynx density with modest or no population growth. The decline or crash phase of the hare cycle is 1–2 years in duration; after a 1–2-year lag in timing, lynx numbers also decline dramatically during this phase of the cycle due to increased dispersal, high natural mortality, and a collapse in recruitment.

Reproduction

When hares are abundant, lynx have high reproductive potential; adult fecundity is high, litter size averages 4–5, kitten survival is high, and yearling lynx reproduce. During the cyclic low, recruitment essentially fails for about two years, and is followed by several years of modest recovery. Reproductive parameters in southern lynx populations appear similar to those observed during the later part of the cyclic low in more northern populations (Aubry et al. 2000).

Lynx breed through March into early April (Quinn and Parker 1987) and breeding pairs may remain together for several days (Poole 1994; Mowat and Slough 1998). During periods of high hare density essentially all adult female lynx ovulate each year, but this proportion declines during periods of hare scarcity (O'Connor 1984; Quinn and Thompson 1987). Gestation is approximately 60–65 days (Quinn and Parker 1987; Koehler and Aubry 1994). Most births occur in the later third of May and into early June (Mowat et al. 1996b; Slough and Mowat 1996; K. Poole, unpubl. data). Den sites are usually surface scrapes (Mowat 1993; Slough 1999).

Yearling females reproduce when hares are abundant (Brand and Keith 1979; Quinn and Thompson 1987; Slough and Mowat 1996); parturition by yearling lynx may be delayed approximately 2–3 weeks compared to adults (Mowat et al. 1996b; Slough and Mowat 1996). Few if any yearlings conceive during periods of low hare density (Parker et al. 1983). Male lynx are thought to be incapable of breeding in their first year (McCord and Cardoza 1982; Quinn and Parker 1987). Breeding may continue into old age; the oldest lynx recorded in the wild were 13–14 years of age (Quinn and Thompson 1987; Chubbs and Phillips 1993).

Placental scar counts suggest that at high hare densities pregnancy rates of lynx range from 73–93% for adults and 33–100% for yearlings (Brand and Keith 1979; Parker et al. 1983; O'Connor 1984; Quinn and Thompson 1987; Slough and Mowat 1996). Field observations suggest that birth rates range from 73 to 100% for adults and 33 to 100% for yearlings during this period (Poole 1994; Mowat et al. 1996b; and see Table 3 in Mowat et al. 1996a:438). During the increase and peak phase of the hare cycle, litters produced by adult females average 4–5 kittens, and juvenile survival is high (50–83%) (Brand et al. 1976; Poole 1994; Mowat et al. 1996a; Slough and Mowat 1996). Yearling lynx may contribute little to recruitment; even in high quality habitat when hares peaked in south-central Yukon survival of kittens of yearling mothers was low (<26%; Mowat et al. 1996b; Slough and Mowat 1996). In southern populations few kittens are born or survive until winter and litter size is small; in north-central Washington only four litters averaging two kittens each were observed among 12 resident females over four winters (Brittell et al. 1989). Similarly low birth rates and litter sizes have been recorded in other southern lynx populations, although sample sizes are small (Aubry et al. 2000).

Adult and yearling lynx birth rate is reduced the spring following the hare decline (Poole 1994; Slough and Mowat 1996). Kitten survival also declines to near zero the year after (Brand et al. 1976; Parker et al. 1983; Poole 1994) or two years after (Slough and Mowat 1996) hare numbers crash. Adult females continue to conceive during the cyclic hare low in northern lynx populations, but live births are few or none, a result of lower reproductive rates, preimplantation and intrauterine losses, and neonatal mortality (Nellis et al. 1972; Parker et al. 1983; O'Connor 1984; Poole 1994; Slough and Mowat 1996). No studies have reported kittens present during the second winter following the hare crash (Brand et al. 1976; Poole 1994;

Slough and Mowat 1996; O'Donoghue et al. 1997). However, there are anecdotal reports of kittens present throughout the cycle in the north in pockets of optimum hare and lynx habitat (Mowat et al. 2000). Recruitment essentially fails for 3–4 years (Brand and Keith 1979; Parker et al. 1983; Poole 1994; Mowat et al. 1996b), but female lynx may begin to give birth before an appreciable recovery in hare numbers, as shown by observations of live litters or kittens in carcass collections conducted prior to the hare increase (Brand et al. 1976; Slough and Mowat 1996). Thus, northern lynx populations do recruit some individuals when hares are scarce and these individuals may be important in maintaining lynx populations through a hare low phase (Mowat et al. 2000). As hare numbers increase, yearling females begin to breed and adult litter size increases (Brand and Keith 1979; O'Connor 1984; Slough and Mowat 1996).

Survival

Survival of lynx varies greatly as Snowshoe Hare abundance changes throughout the cycle in northern populations, and is influenced by the level of trapping in and around the population under study. In the Yukon and NWT, annual survival rates of adults during the increase and peak phase of the hare cycle were >0.70 in a lightly trapped population and >0.89 in largely untrapped populations (Poole 1994; Slough and Mowat 1996; O'Donoghue et al. 1997). Annual survival rates of adult lynx remained high (0.78–0.95; Poole 1994; Slough and Mowat 1996) or declined moderately (0.45–0.63; O'Donoghue et al. 1997) through the 1 or 2-year hare decline. The first year of very low hare numbers was characterized by low adult survival (0.09–0.40), followed by higher survival in the subsequent 1–2 years of low hare densities (0.63–0.82; Poole 1994; Slough and Mowat 1996; O'Donoghue et al. 1997). Survival rates in areas of high trapping pressure are generally lower; on the Kenai Peninsula in Alaska, Bailey et al. (1986) found that trapping removed 80% of individuals over one year. Kitten survival was high (50–83%) during the increase and peak phase of the hare cycle but declined to near zero 1–2 years after hare numbers crashed (Brand et al. 1976; Parker et al. 1983; Poole 1994; Slough and Mowat 1996). In southern lynx populations, kitten survival rates appear to be low (0.12; Koehler 1990), but data are limited.

Survival tends to be lowest in winter; most mortality during low hare abundance occurred during mid-December to mid-February, and most natural mortality (primarily starvation) appears to coincide with <-35°C temperatures, when metabolic requirements increase (Poole 1994; O'Donoghue et al. 1995).

Earlier studies showed high trap-related mortality and essentially no natural mortality in lynx populations (Brand et al. 1976; Ward and Krebs 1985). Recent studies suggest a higher incidence of natural mortality. All adult deaths recorded in Washington were from natural causes (Brittell et al. 1989; Koehler 1990). In southwestern Northwest Territories the annual death rate from trapping (0.08) was higher than from natural causes (0.02) during peak and declining hare numbers; however, during low hare numbers the death rate was far higher from natural causes (primarily starvation; 0.48) than from trapping (0.20) (Poole 1994). All detected mortality of resident lynx was from natural causes during the first full year of low hare densities in south-central Yukon, although 20 marked lynx (27% of all emigrants) were trapped after dispersal (Slough and Mowat 1996). These results suggest that during the first two winters of hare scarcity, trapping mortality may be primarily compensatory to natural mortality, at least in lightly trapped areas.

Causes of natural mortality of lynx are difficult to determine; a radiocollar and tufts of hair provide little basis for inference. Ideally, mortality factors should also be identified as proximate or ultimate causes. Starvation (and related conditions) and cases of cannibalism have been recorded, primarily during low prey abundance (Poole 1994; O'Donoghue et al. 1995; Slough and Mowat 1996). Predation on lynx by Wolverine (*Gulo gulo*), Wolf (*Canis lupus*) and Coyote (*C. latrans*) has also been confirmed (Slough and Mowat 1996; O'Donoghue et al. 1995, 1997; Buskirk et al. 2000). Lynx harbour a diverse parasite fauna, including nematodes, cestodes, trematodes, lice and fleas (van Zyll de Jong 1966a; McCord and Cardoza 1982; Smith et al. 1986; Quinn and Parker 1987), but their influence on lynx health and survival is unknown.

Movements

Recent studies have documented numerous examples of long distance (>100 km) movements (Ward and Krebs 1985; Brittell et al. 1989; Perham et al. 1993; O'Donoghue et al. 1995, 1997; Slough and Mowat 1996; Poole 1997). Straight-line dispersal distances range up to 1100 km, with 15 documented cases from northern Canada of dispersal >500 km (Ward and Krebs 1985; Slough and Mowat 1996; O'Donoghue et al. 1997; Poole 1997). Three dispersals of 100–616 km have been documented from southern populations, all in a northward direction (Mech 1977; Brainerd 1985; Brittell et al. 1989). Dispersing lynx have crossed roads, multilane highways, and large rivers and lakes, sometimes during the snow-free season (Aubry et al. 2000; Mowat et al. 2000). Steep terrain and multilane highways may affect dispersal movements (Apps 2000). Note that all reported dispersal rates and distances must be considered potentially biased. Trappers supply most information on long-distance movements by lynx. Trapping returns are affected by the density and distribution of trapping around study areas, and by behavioural differences in trap vulnerability among age and sex classes of lynx (Bailey et al. 1986; Quinn and Thompson 1987; Slough and Mowat 1996; Poole 1997).

Emigration and immigration of lynx occurs throughout the hare cycle (Slough and Mowat 1996; O'Donoghue et al. 1997). Immigration rates balance or exceed losses to emigration during the rapid increase phase in lynx populations, while emigration rates increase and exceed immigration during the decline in hare abundance and the first full year of low hare densities (Slough and Mowat 1996). In southwestern NWT the annual probability of dispersal for adult lynx was low (<24%) at peak hare densities and during the hare decline, very high during the first 2 years of low hare numbers (78–100%), and then stabilized during the third and fourth years of low hare densities (<20%; Poole 1997). In southwestern Yukon, all long-distance dispersals of resident adults occurred during or at the end of the Snowshoe Hare decline (Ward and Krebs 1985; O'Donoghue et al. 1995).

Lynx dispersal may be characterized as either juveniles dispersing from natal areas ("innate dispersal"), or adults dispersing in response to an environmental "catastrophy" ("environmental dispersal"; Howard 1960) such as the hare decline faced by northern populations approximately every 10 years. Annual timing of dispersal varies. Juvenile lynx tend to disperse primarily in the spring, soon after independence. Most environmental dispersal occurs during the period of greatest nutritional stress, generally mid-winter to spring during or after a decline in hare density. The period of greatest dispersal in recent northern studies was March–June during the winter hare decline and during mid-winter of the subsequent 1–2 winters (O'Donoghue et al. 1995; Slough and Mowat 1996; Poole 1997). Dispersal rates or distances are generally greater for males than females of most mammalian species (Greenwood 1980; Wolff 1994); trapping returns are inherently biased towards males (Bailey et al. 1986; Quinn and Thompson 1987).

Initiation of dispersal in northern populations appeared to coincide with temperatures <-35ºC (O'Donoghue et al. 1995; Poole 1997). Some dispersing lynx survived the hare crash and re-established home ranges some distance from their point of dispersal (verified at 65–85 km, potentially up to 1000 km; Slough and Mowat 1996; O'Donoghue et al. 1997; Poole 1997). These successful re-establishments are difficult to detect using conventional study methods, and are likely under-reported. In southern lynx populations, no cases of successful dispersal (defined as breeding at the new location) have been reported, although again sample sizes are small (Aubry et al. 2000).

Nutrition

Snowshoe Hares are the key component of the diet of lynx across North America, comprising from one-third to nearly all of prey items identified (for food habit summaries see Quinn and Parker 1987:686; Koehler and Aubry 1994:75; O'Donoghue et al. 1998b; Mowat et al. 2000). Estimated maximum kill rates were about 0.8 hares (Keith et al. 1977) to 1.6 hares per day (O'Donoghue et al. 1998b, 2001). Other common prey items include Red Squirrels (*Tamiasciurus hudsonicus*), mice and voles, flying squirrels (*Glaucomys* spp.), ground squirrels (*Spermophilus* spp.), Beaver (*Castor canadensis*), Muskrat (*Ondatra zibethica*), grouse and ptarmigan (Galliformes and *Lagopus* spp.), and occasionally other birds and mammals. Ungulates, primarily young-of-the-year, are eaten as carrion and occasionally killed, most often during winter and at cyclic low hare abundance (Saunders 1963a; Bergerud 1971; Parker et al. 1983; Stephenson et al. 1991; Apps 2000; K. Poole, unpubl. data). Predation by lynx on Red Fox (*Vulpes vulpes*) and other lynx also occurs, again mostly during periods of low hare densities (Stephenson et al. 1991; O'Donoghue et al. 1995). Caching of food by lynx is rare (O'Donoghue et al. 1998b).

In lynx populations reliant on highly cyclic Snowshoe Hare populations, the proportion of hares in the diet of lynx generally declines and use of alternative prey increases as hares become scarce (Brand et al. 1976; Parker 1981; Parker et al. 1983; Stephenson et al. 1991; O'Donoghue et al. 1998b; K. Poole, unpubl. data). Red Squirrels in particular appear to be an important alternative food source for lynx during periods of low hare abundance. Red Squirrels became increasingly important (20–44% biomass) at the lowest hare density compared to almost no use (0–4% biomass) during years of high hare densities in southwestern Yukon (O'Donoghue et al. 1998b). Similarly, during years of hare scarcity, use of carrion, Red Squirrel, Ruffed Grouse (*Bonasa umbellus*), and other birds increased in central Alberta (Brand et al. 1976). Lynx generally take fewer Snowshoe Hare and more alternative prey in summer than in winter (Quinn and Parker 1987; Koehler and Aubry 1994). Most studies suggest that hares contribute about 25% less to lynx diet during summer compared to winter (van Zyll de Jong 1966b; Parker et al. 1983; Fortin and Huot 1995; Staples 1995). In southern lynx populations that contend with consistently low densities of hare, Red Squirrels may form about one-third of the diet (Koehler 1990; Apps 2000), and use of ground squirrels has been observed (Aubry et al. 2000).

Where Coyote and lynx are sympatric and share a limited resource base, dietary overlap during winter has been shown to be high; however, there is no evidence of interspecific or exploitation competition (Murray and Boutin 1991; Fortin and Huot 1995; Murray et al. 1995; Staples 1995; O'Donoghue et al. 1997, 1998a, 2001). Parker et al. (1983) postulated that Bobcats may exhibit competitive exclusion over lynx on Cape Breton Island.

Behaviour

Lynx have a social organization similar to that of other North American felids, consisting of social intolerance and mutual avoidance (Seidensticker et al. 1973; Bailey 1974; Brittell et al. 1989). This land tenure system has been described as "intrasexual territoriality" (Powell 1979; Kesterson 1988), where resident individuals maintain exclusive territories within each sex and males often but not always have larger home ranges than females. Lynx are passively territorial, and use feces, sprayed urine, or anal secretions to mark home ranges and provide both spatial and temporal information that may reduce confrontations (Saunders 1963b; Mellen 1993; Staples 1995). Some sort of spacing mechanism may operate to keep same-sex animals separated in time and space, but little or no active avoidance or overt defence of areas between overlapping or adjacent pairs has been detected, suggesting that this spacing is upheld by relatively passive means (Poole 1995). Male and female home ranges overlap completely while within-sex overlap is usually modest or may be confined to pairs of possibly related individuals per study (e.g., Poole 1995). Home range exclusiveness may be a function of degree; some overlap may occur at the 90 or 95% home range contour level, but little may occur among the 50% contour core areas (Poole 1995). Conflict among individuals is rare in lynx, but aggressive intra-species encounters do occur, primarily during years of food shortage (Poole 1994, 1995; O'Donoghue et al. 1995; Mowat and Slough 1998).

Lynx home range sizes vary among areas, sexes, seasons, and cyclical phases, although different methods of data collection, sample sizes and analysis techniques make it difficult to compare home range sizes among studies. Dramatic variation in home range size has been reported for lynx across their North American range (8–738 km^2; summarized in Quinn and Parker 1987; Koehler and Aubry 1994; Aubry et al. 2000; Mowat et al. 2000). During high hare density in northern lynx populations, annual home ranges of males often cover 20–45 km^2, and female 13–21 km^2; these increase 2–10 fold during low hare densities. Relatively large home ranges appear to be characteristic of southern lynx populations, similar to those found in the North during periods of low hare abundance. Male home range sizes are usually larger than female ranges (Kesterson 1988; Koehler and Aubry 1994; Fortin and Huot 1995; Perham 1995; Slough and Mowat 1996; O'Donoghue et al. 2001), but not always (Ward and Krebs 1985; Poole 1994). Both sexes show strong range fidelity, often over many years (Poole 1995; O'Donoghue et al. 2001), but home range shifts and abandonment are also common (Parker et al. 1983; Brittell et al. 1989; Koehler 1990; Poole 1994; Perham 1995; Slough and Mowat 1996; O'Donoghue et al. 2001).

Lynx home range size changes little before the hare crash but increases dramatically after the crash in northern Canada (Brand et al. 1976; Ward and Krebs 1985; Poole 1994; Slough and Mowat 1996; O'Donoghue et al. 2001). However, a linear relationship between lynx home range size and hare abundance has not been demonstrated (Brand et al. 1976; Slough and Mowat 1996), even when compared against hare abundance the previous year (to accommodate the 1-year lag in response; O'Donoghue et al. 1997; Mowat et al. 2000).

Lynx home ranges vary seasonally, although the observed seasonal differences are inconsistent (Aubry et al. 2000). Females with kittens have smaller ranges and males during the breeding season have larger ranges (Kesterson 1988; Mowat and Slough 1998). Kittens remain with the mother throughout the winter; family groups begin to break-up in early March (Saunders 1963b; Brand et al. 1976; Parker et al. 1983; Poole 1995; Mowat et al. 1996b). Natal dispersal begins in late April to early May; some juveniles disperse immediately, while others remain in the natal area for up to one year after their first winter (Kesterson 1988; Poole 1994, 1995; Mowat et al. 1996b; Slough and Mowat 1996).

There is evidence to suggest that female pair bonds, either mother-daughter or sibling pairs, persist in lynx, and provide for a social system based on matrilineal descent (reviewed in Mowat et al. 2000). Female kittens sometimes establish home ranges within those of their mothers (Kesterson 1988; Slough and Mowat 1996), and adult females may retain contact with their female offspring throughout their life (Carbyn and Patriquin 1983; Staples 1995; Mowat and Slough 1998). Observations of some female home ranges with large overlap, possibly signifying related individuals, have been reported (Poole 1995; O'Donoghue et al. 1997). The persistence of female kin bonds in lynx populations may reduce investment in territorial defence (Mowat et al. 2000). Territoriality may be relaxed among relatives so that populations with related individuals may attain higher density (Mowat et al. 2000).

Other than direct influence through trapping activities, humans may exert potentially negative influences on lynx by building residences and roads in and through lynx habitat, by altering and modifying existing habitats, and by direct disturbance through recreation or travel in areas inhabited by lynx. Although much of the data are anecdotal, evidence suggests that lynx can tolerate at least some human disturbance and even continued presence of humans, including moderate levels of road and snowmobile traffic (Staples 1995; Mowat et al. 2000). Lynx occur at moderate densities in areas with dispersed agricultural areas and reasonably dense rural human populations (Brand and Keith 1979; Fortin and Huot 1995), and are observed crossing and alongside roads and residential areas in both Yukon and NWT (Mowat et al. 2000). Although lynx will generally flee when closely approached, they appear to become bolder and less wary of people during periods of low prey abundance. They are relatively easy to attract and capture, having little fear of human scent. Lynx may tend to avoid areas with higher levels of disturbance or greater fragmentation of habitat from development, although this hypothesis has not been rigorously tested.

Population Size and Trends

An accurate estimate of lynx population size is impossible over large areas. However, considering the extent of lynx habitat in Canada (roughly 5 500 000 km^2), densities during the low of 2 lynx/100 km^2, and a safety factor of 50%, there may be roughly 50 000 lynx in Canada during the cyclic low and over 500 000 during some cyclic peaks. The few intensive radio telemetry studies conducted in North America provide the data for most density estimates. Considering that many of these studies were conducted over relatively short time frames, with small sample sizes within poorly bounded study areas, and often for reasons other than density estimation, even these density estimates must be considered imprecise. Regional estimates are generally conservative extrapolations from intensive radio telemetry studies within different broad biophysical areas. Relative changes in lynx populations may be indexed using a variety of methods, such as snow track counts for Snowshoe Hares and/or lynx (Poole 1994; Labonté et al. 1999*; K. Poole, unpublished data), tracking changes in kits in the harvest using pelt length measurement (Quinn and Gardner 1984; Slough 1996) or carcass collections (Slough and Mowat 1996), and trapper questionnaires (Slough et al. 1987).

Peak densities of 30–45 lynx/100 km^2 have been observed in regenerating stands in the north (Poole 1994; Slough and Mowat 1996), and 8–20/100 km^2 in mature forests in the north and more southern ranges (Parker et al. 1983; Banville 1986; Noiseux and Doucet 1987; Kesterson 1988; Fortin and Huot 1995; O'Donoghue et al. 1997). Population densities during the low in all populations are typically 2–3 lynx/100 km^2. The few published studies in southern boreal forests suggest relatively static lynx densities of 2–3/100 km^2 (Koehler 1990; Aubry et al. 2000), typical of northern populations during the low in the hare cycle.

Fur harvest returns have provided records of lynx harvests for two centuries, and show dramatic changes in the amplitude in the cycle (Figure 2). Harvest returns, however, do not directly represent real population change. Harvest returns are affected by the host of factors influencing trapper effort and success, including changes in socio-economic conditions, season length, quota and trap type restrictions, fur prices, subsidies, mode of transportation, and access. Fur prices likely affect harvest effort over the short term (Brand and Keith 1979), but it may not be valid to compare inflation-adjusted prices and harvests that occurred decades apart.

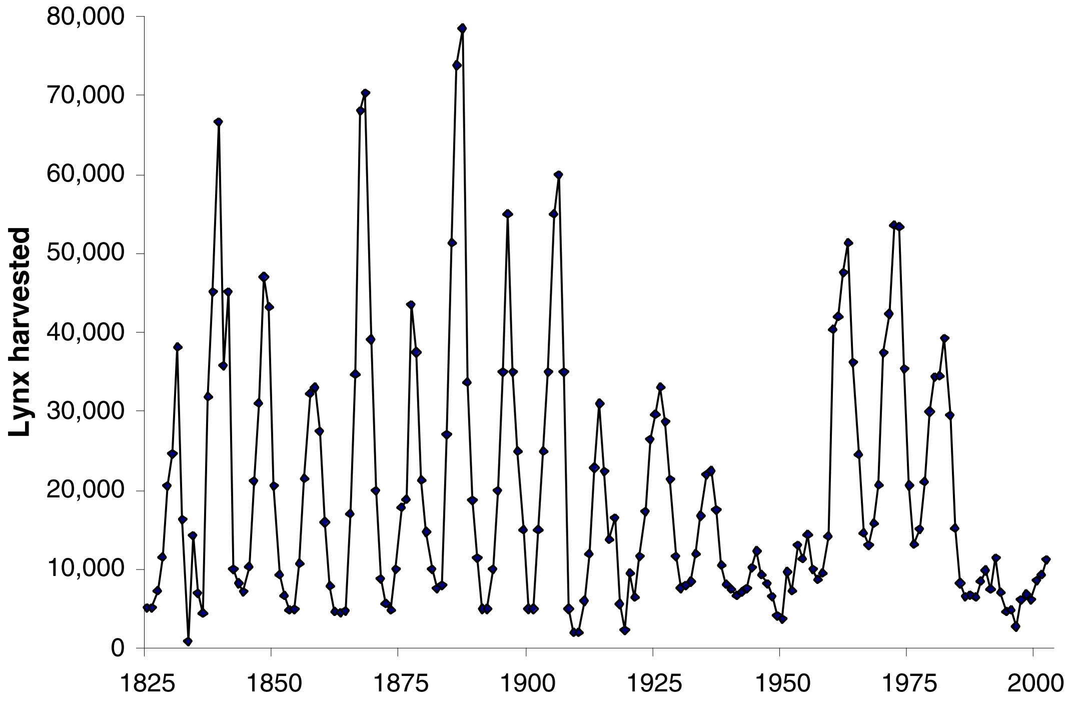

FIGURE 2. Canada Lynx harvest in Canada from 1825 to 2002, from Mowat et al. (2000:Figure 9.4) and Statistics Canada, updated to August 2003.

Citing declining harvest returns and anecdotal information, de Vos and Matel (1952) noted a decrease in lynx numbers and distribution in Canada between 1920 and 1950. They cited overtrapping and ecological changes in habitat, primarily as a result of forest harvesting, as the main factors responsible for the decrease. Several authors have suggested local populations also were overexploited during the cyclic low of the 1980s (Todd 1985; Bailey et al. 1986; Hatler 1988; Nowell and Jackson 1996). This period came after three cycles from 1960 to 1980 characterized by relatively high peak harvests, and, possibly more importantly, relatively high harvest levels during the cyclic lows (Figure 2). Peak harvests (summing the five-year harvest around each peak) from 1960 to 1980 were similar to peak harvests during the classic cycles of the late 1800s, but the five-year harvest during the lows of 1960 to 1980 were about 25% higher than the lows of the late 1800s. Snowmobiles became readily available in the late 1950s and early 1960s, likely influencing trapper access and coverage. Whether or not these increased harvest levels during the cyclic lows cumulatively had a significant impact on subsequent population levels is unknown. Harvest levels during the 1990 peak were about one quarter of peaks observed during the 1960s and 1970s, perhaps not unexpected given the 10-fold decrease in pelt prices over the last half of the 1980s, and hence lower trapper effort. In addition, subsequent to the late 1980s most Canadian jurisdictions enacted more restrictive trapping regulations in reaction to perceived overharvest, which also restricted harvest levels.

Provincial and territorial management agencies were questioned in late 1999 about the status and trend of lynx populations in their jurisdiction over the past two decades (Tables 1 and 2). Half of the 12 jurisdictions with lynx populations reported a stable population trend, one reported an unknown but likely stable trend, and three reported an unknown trend. On Cape Breton Island, Nova Scotia, a decreasing population trend and distribution was noted during the 1960s and 1970s concurrent with the invasion of Bobcats (Parker et al. 1983). Over the past two decades, lynx numbers in the highlands of the Island appear to have changed little, fluctuating with changes in the availability of Snowshoe Hare (G. Parker, personal communication). In Alberta, lynx numbers may be depressed in portions of their range, attributed to overharvest during the previous two decades (A. Todd, personal communication).

Despite the dramatic decrease in harvest through the 1990 cyclic peak, there is evidence that lynx populations in much of the northern range were cycling normally. The highest lynx densities recorded to date were obtained during the 1990–1992 peak in the southwest-

TABLE 1. Provincial and territorial Conservation Data Centre rankings[a] and jurisdiction status for Canada Lynx, as provided by agency biologists in fall 1999 and updated in 2003 from government websites.

Province/territory	Conservation Data Centre ranking[a]	Wild species 2000 general status[b]	Additional Provincial/territorial status
Newfoundland	Nfld island: S3S4 Labrador: S4	Secure	–
Prince Edward Island	Extirpated	Extirpated	–
Nova Scotia	S1	May be at risk	Red (species at-risk)
New Brunswick	S1	At risk	Regionally endangered (threatened with imminent extirpation)
Québec	S5	May be at risk	On list of species likely to be designated threatened or vulnerable
Ontario	S5	Secure	–
Manitoba	S5	Secure	–
Saskatchewan	S5	Sensitive	–
Alberta	–	Sensitive	–
British Columbia	S4	Secure	Yellow (species that are apparently secure and not at risk of extinction)
Yukon	–	Secure	–
Northwest Territories	–	Secure	–
Nunavut	–	Sensitive	–

[a] **S1**: Extremely rare throughout its range in the province. May be especially vulnerable to extirpation.
S2: Rare throughout its range in the province. May be vulnerable to extirpation due to rarity or other factors.
S3: Uncommon throughout its range in the province, or found in a restricted range, even if abundant in some locations.
S4: Frequent to common; apparently secure but may have a restricted distribution or there may be perceived future threats.
S5: Common to very common; demonstrably secure and essentially ineradicable under present conditions.

[b] Canadian Endangered Species Conservation Council (CESCC) 2001.
At risk: at risk of extirpation or extinction (i.e., endangered or threatened).
May be at risk: may be at risk of extirpation or extinction.
Sensitive: a species is not believed to be at risk of immediate extirpation or extinction but may require special attention or protection to prevent it from becoming at risk.
Secure: a species that is not at risk or sensitive.

ern Northwest Territories and southern Yukon (Poole 1994; Slough and Mowat 1996). Although the amplitude of lynx abundance may have decreased in some regions through the 1980s and 1990s, there is little evidence to conclude that harvest during the low of the 1980s had a long-term impact on contiguous northern lynx populations.

Temporal trends in the distribution and abundance of lynx are difficult to identify given the wide natural fluctuations in population size driven primarily by the 8–11 year Snowshoe Hare cycle and the difficulty in estimating population size. Areas occupied during the peak in lynx abundance may be abandoned during the cyclic low, only to be re-occupied in the subsequent increase. The amplitude of lynx abundance may be closely linked to the amplitude of peak densities of hares. No studies have monitored lynx densities over more than one complete cycle. However, hare densities may differ 2–3 fold among peaks (Hodges 2000b: Table 6.1) and lynx densities may also be expected to differ among peaks under natural situations. Anecdotal information based on community fur returns and local knowledge suggests that there has been no decrease in range detected in the Northwest Territories, Yukon, or Alaska through the 1980s and 1990s (K. Poole, B. Slough, H. Golden, unpublished data).

Over the past two decades lynx distribution may have been reduced along the southern edge of its range in Canada. Some areas may still be recovering from excessive harvest of the 1970s and 1980s, but these appear to be showing signs of recovery and are few in number. Over the vast majority of the country there is no evidence to suggest that lynx distribution or numbers have changed substantially.

Limiting Factors and Threats

Removal of lynx by trapping is a major cause of mortality in some lynx populations in Canada. Trapping may be primarily compensatory to natural mortality only during the dramatic decline in populations in lightly trapped areas (Poole 1994; Slough and Mowat 1996). Lynx are relatively easily trapped, and with extensive access and pressure, trapping can remove a large proportion of a population (Todd 1985; Bailey et al. 1986). On the other hand, lynx are relatively fecund and populations can increase rapidly during periods of increasing or abundant prey (Mowat et al. 1996b; Slough and Mowat 1996). Lynx also have been shown to disperse great distances, and therefore have the ability to re-colonize vacant habitats.

Incidental or illegal harvest of lynx may occur throughout its range, and have been raised as potential threats to Cape Breton Island animals, exacerbated by the increase in use of snares for sympatric species (M. Elderkin, personal communication; D. Banks, personal communication). No data are available on the extent of illegal harvest of lynx in Canada. In areas with short trapping seasons or quotas, the degree of incidental or illegal trapping may be substantial. However for most of Canada where relatively liberal trapping seasons and open quotas are the norm, incidental and illegal harvests are likely a very small proportion of the overall harvest.

Fire suppression in much of North America over the past century may have reduced the amount and quality of early to mid-successional hare and lynx habitat, and may place forests at risk of large, intensive burns that fail to mimic natural fire history (Mowat and Slough 2003). A trend in government is surfacing towards a "let it burn" policy in some areas, which may ultimately rebalance fire-driven succession in parts of the country. Logging restarts the succession necessary to create optimum hare and lynx habitat, but often removes the structure needed for denning by lynx. The logging, site preparation and silviculture techniques used for and after harvest influence the quality of lynx and hare habitat that results (Mowat and Slough 2003). Changes to forestry practices in recent years to provide habitats and structure post-logging more conducive to wildlife may reduce the impact of logging on lynx habitat.

While threats to habitat may affect lynx populations to varying degrees throughout its range, especially in more southern populations, the isolated Cape Breton Island lynx were the only animals identified in this review that may be negatively and directly influenced by threats to habitat. These perceived threats include habitat fragmentation and loss of mature softwood stands suitable for denning through forest pathogens, fire and forest harvesting (M. Elderkin, personal communication). As noted by Parker et al. (1983), large-scale forest harvesting operations, although initially reducing densities in specific areas, should ultimately benefit the population by producing productive mid-successional habitats.

Clearing of forested lands for agriculture and urban development should have a minor influence on lynx distribution since these primarily influence the southern fringe of lynx range in Canada. However, little data are available on changes in lynx distribution in more southern ranges in Canada. Development and human activity may render some habitat as unsuitable for lynx.

Interspecific competition, primarily with Bobcats and Coyotes, may influence the distribution and abundance of lynx, although direct evidence is lacking. The reduction in lynx distribution on Cape Breton Island occurred concurrent with the invasion of the island by Bobcats, and although a direct causal link has not been established, the circumstantial evidence for interspecific competition is compelling. Both Bobcats and Coyotes are poorly adapted to deep snow. Buskirk et al. (2000) suggested that man-made trails facilitate access by Coyotes and Bobcats into areas usually inhabited by lynx, and may be the cause of reductions in lynx distribution through its southern range in North America, but again evidence to support this statement is lacking. The recent invasion of Cape Breton Island by Coyotes and their access on packed roads and trails into high elevation winter habitats have been suggested as an additional potential threat to the island's lynx (M. Elderkin, personal communication; D. Banks, personal communication). However, field studies conducted where lynx and Coyote are sympatric have not identified exploitation competition between the two species (Murray and Boutin 1991; Murray et al. 1995; Staples 1995; Slough and Mowat 1996; O'Donoghue et al. 1997, 1998a).

Although purely speculative, global warming may cause reduced habitat quality for lynx by reducing snow depths, primarily at the southern edge of its range. Reduced snow depth may favour Bobcats and Coyotes over lynx in these areas.

Lynx Status and Management in Canada

Canada Lynx are listed under Appendix II of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), primarily because it is a "look-alike" species that could be confused with other endangered felids. Global ranking assigned by The Nature Conservancy is G5 (common to very common; demonstrably secure and essentially ineradicable under present conditions). Lynx are classified as endangered or threatened in most states in the U.S., with the exception of Alaska where lynx are classified as a furbearer and trapping is permitted. Lynx south of the 49^{th} parallel were listed as threatened in 2000 under the U.S. Endangered Species Act. Legal harvest in the contiguous states is allowed only in Montana, which has a state-wide quota of two.

The COSEWIC status assigned to lynx in 1989 was "Not At Risk" (Stardom 1989*), which was reaffirmed in 2001 (Poole 2001*). Subnational Conservation Data Centre (CDC) rankings and status designations vary (Table 1), with the greatest concern a result of reduced range, low population levels and threats to the population discussed above. Lynx harvest is regulated in each jurisdiction by provincial/territorial laws. Lynx are fully protected (including from First Nations harvesters) in only a small proportion of their range in Canada. These areas include most, but not all, national and provincial parks, and some federal lands such as military testing areas and bases, and are estimated to be less than 2–3% of lynx range in Canada.

The lynx is classified as a furbearer in all Canadian jurisdictions with the exception of British Columbia, where it is now also classified as a big game species to facilitate licensing (M. Badry, personal communication; Table 2). All jurisdictions in Canada allow harvesting of lynx, except in the Maritime Provinces. Season length varies up to five months, with the longer seasons generally occurring in the more northern jurisdictions. Most provinces vary season length during the lynx cycle, and all jurisdictions reported regulating the harvest using seasons (Table 2). Additional regulation techniques included quotas and temporary closures, either regional or jurisdiction-wide. All jurisdictions also reported monitoring the harvest by tracking harvest levels from trapper returns. Additional harvest monitoring techniques included compulsory inspections (the pelt has to be brought to wildlife official and is sealed or tagged), and compulsory reporting (the trapper has to file a report of harvest at season end). Population monitoring techniques include tracking the hare cycle (through track counts [Labonté et al. 1999*] or pellet plots [Krebs et al. 1987, 2001]), monitoring the proportion of kits in the harvest through pelt measurements (Quinn and Gardner 1984; Slough 1996) or carcass collections, and trapper questionnaires (Slough et al. 1987) which provide catch per unit effort and index population trends. Nova Scotia has been experimenting with track counts at bait sites and using aircraft to monitor lynx numbers on Cape Breton Island (M. Elderkin, personal communication).

The number of lynx taken by licensed trappers has declined since the early 1980s (Figures 2 and 3). Pelt prices peaked in the mid to late 1980s, concurrent with the low in the cycle, and declined by 80–90% through to the early 1990s. Alberta has generally produced the largest number of lynx pelts, up to one quarter to one third of the Canadian total (Table 3). Excluding the Maritime Provinces, the remaining provinces and territories each produce 8–14% of the annual harvest, with British Columbia and the Northwest Territories generally producing higher numbers than most. Harvest data are derived primarily from compulsory inspection and pelt marking or through auction house records, and can be considered to be a relatively accurate indication of actual harvest level. Game hunters in British Columbia have harvested an average of 16 lynx annually over the past 15 years (M. Badry, personal communication). The number of lynx harvested illegally is unknown but may be insignificant on a national scale, given current low fur prices and declining interest in trapping. Almost all lynx trapped in Canada are exported (Stardom 1989*). The trade in live specimens is insignificant, totalling less than 0.05% of the total harvest (Stardom 1989*).

Concern for lynx populations in most jurisdictions in Canada peaked during the 1980s when record high pelt prices coincided with the low of the cycle, trapper effort was high and overharvest was suspected in many areas (Todd 1985). Many jurisdictions enacted more restrictive legislation to curb the harvest through the late 1980s and into the low of the mid-1990s. Some jurisdictions (e.g., Québec and Manitoba) only lifted season closures in 1998 after lynx populations were into the increase phase of the cycle and the "health" of the population was perceived to be recovering. The experience of concern and reaction to perceived overharvest may result in more careful monitoring and management of lynx populations in the foreseeable future. However, given the intensity and accuracy of

TABLE 2. Legislative status, regulations, monitoring and population trend of Canada lynx by management jurisdiction in Canada based on information and opinions provided by agency biologists in fall 1999, and updated in 2003 from government websites. All jurisdictions regulated the harvest using seasons and reported monitoring harvest levels from trapper returns. Most provinces vary season length during the lynx cycle.

Province/territory	Legislative status	Maximum season	Harvest regulation and monitoring	Population monitoring	Population trend (over past two decades)
Newfoundland	Furbearer	Labrador: 15 October – 31 March Newfoundland Island: 20 October – 1 February	Compulsory inspection (Newfoundland Island)	Carcass collections, hare cycle monitoring	Stable
Nova Scotia	Furbearer	Closed	Closure	Aerial track transects, tracking at bait sites	Stable, possibly decreasing
New Brunswick	Furbearer	Closed	Closure; inspection of incidental captures	Regional study	Unknown
Québec	Furbearer	Mostly 25 October – 1 February	Quota; closure (1995–98)	Questionnaire, hare cycle monitoring	Stable
Ontario	Furbearer	25 October – 28 February	Quota; compulsory registration	Questionnaire	Unknown
Manitoba	Furbearer	1 December – 28 February	Closure (1995–98), compulsory inspection	Pelt measurement	Stable
Saskatchewan	Furbearer	1 November – 28 February	–	–	Stable
Alberta	Furbearer	1 December – 15 February	Quota, compulsory registration	–	Unknown, possibly still depressed in some stable areas
British Columbia	Furbearer, big game	15 November – 15 February	BG quota of 1, compulsory inspection in south	Pelt measurement	Stable
Yukon	Furbearer	1 November – 10 March	Compulsory inspection	–	Stable
Northwest Territories	Furbearer	1 November – 15 March	–	Pelt measurement, carcass collection, hare cycle monitoring	Unknown, likely stable
Nunavut	Furbearer	1 November – 15 March	–	–	Unknown

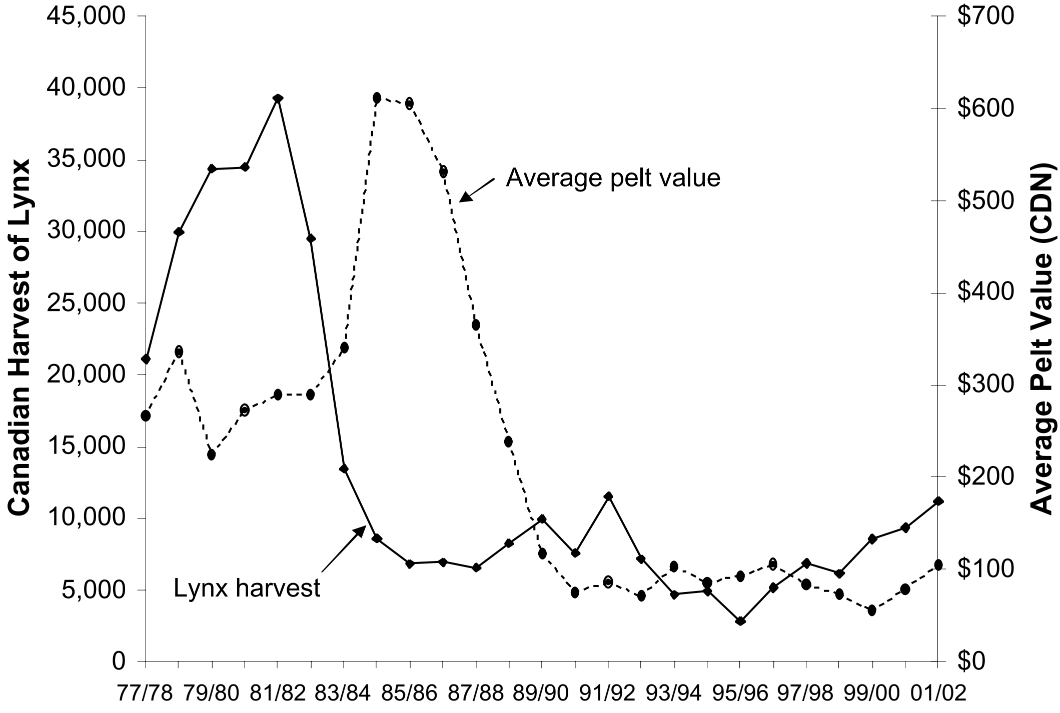

FIGURE 3. Canada Lynx harvest in Canada and average pelt value from 1977 to 2002. Data from Statistics Canada, updated to August 2003.

the current monitoring and research programs on lynx in Canada, most jurisdictions would be unable to identify anything but a dramatic decline in lynx numbers or distribution beyond the normal cyclic fluctuations.

The public generally perceives lynx as an elusive denizen of the Canadian forests. Long important to the trapping industry, the recent attention to biological diversity and conservation biology has meant that the lynx has been recognized as an important component of the ecosystem. The cyclic fluctuations in numbers and its close ties to the cyclic abundance of Snowshoe Hares have fascinated many over the years, including scientists keen on determining the driving mechanisms behind the hare and lynx cycles.

While direct assessment of lynx populations is exceedingly difficult, there is no evidence to suggest that lynx numbers across most of Canada are declining. Harvest effort and numbers have declined dramatically over the past decade, and there is little to suggest a reversal in trend. There is no evidence that illegal harvest is a serious concern. High reproductive potential and the propensity to disperse long distances suggest that lynx numbers in affected areas can be repopulated given time and removal of the factors that cause the initial decrease. Lynx habitat should be maintained given continuing availability of early to mid-seral stage forests with adequate structure for denning and cover.

Acknowledgments

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TABLE 3. Provincial and territorial harvest records for Canada Lynx, 1983–2002. Source: Statistics Canada (August 2003).

	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02
Nfld	425	469	297	114	76	53	46	34	108	115	78	61	49	58	89	91	121	191	633
PEI																			
NS	5	6	8									2					11		
NB																			
Que	1735	1799	1261	1011	880	847	839	699	978	1176	924	965	139	85	635	1105	1482	1884	3588
Ont	1677	495	675	508	512	573	526	665	932	929	812	991	527	734	830	655	635	1004	1343
Man	596	419	29	400	383	406	446	372	530	356	244	195	78	95	127	246	275	454	575
Sask	932	560	610	674	157	0	385	581	1129	639	613	558	365	724	746	812	1229	1661	1763
Alta	3054	1279	813	854	617	720	1807	1278	2215	1391	773	786	591	1365	2460	1438	1456	2028	1667
BC	2760	1668	1206	1050	1113	1243	1230	600	2017	1172	750	641	382	717	533	500	602	701	864
Yukon	961	925	805	668	799	1235	1875	1256	1403	529	100	187	152	310	442	592	459	603	214
NWT	1300	1005	1149	1674	2037	3188	2823	2094	2230	873	419	521	536	1083	1011	709	2303	835	579
CANADA	13445	8625	6853	6953	6574	8265	9977	7579	11542	7180	4713	4907	2819	5171	6873	6148	8573	9361	11226
Ave. value	$340.92	$611.38	$605.23	$531.37	$365.44	$238.04	$117.44	$75.51	$86.57	$71.22	$103.51	$86.01	$93.05	$106.04	$84.95	$72.70	$55.10	$78.68	$104.33

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