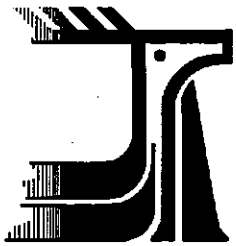

COMMITTEE ON THE
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WILDLIFE IN CANADA

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COMITÉ SUR LE STATUT
DES ESPÈCES MENACÉES
DE DISPARITION AU
CANADA

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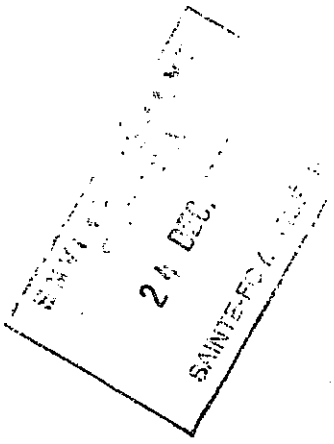
UPDATED STATUS REPORT ON THE GREAT GRAY OWL *STRIX NEBULOSA* IN CANADA



BY

DAVID A. KIRK

AND

JAMES R. DUNCAN

STATUS ASSIGNED IN 1996
NOT AT RISK

REASON: DELISTED UTILIZING BETTER INFORMATION; APPEARS TO BE A WIDESPREAD SPECIES WITH A POPULATION ESTIMATE OF 25,000 PAIRS WITH NO SIGNS OF POPULATION DECLINE OR HABITAT LOSS.

OCCURRENCE: ALBERTA, BRITISH COLUMBIA, MANITOBA, NORTHWEST TERRITORIES, ONTARIO, QUEBEC, SASKATCHEWAN, YUKON TERRITORY

COSEWIC - A committee of representatives from federal, provincial and private agencies which assigns national status to species at risk in Canada.

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JUNE 1994

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SPECIES:	"Species" means an indigenous species, subspecies, variety or geographically defined population of wild fauna and flora.
VULNERABLE: (V)	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
THREATENED: (T)	A species likely to become endangered if limiting factors are not reversed.
ENDANGERED: (E)	A species facing imminent extirpation or extinction.
EXTIRPATED: (XT)	A species no longer existing in the wild in Canada, but occurring elsewhere.
EXTINCT: (X)	A species that no longer exists.
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UPDATED STATUS REPORT ON THE GREAT GRAY OWL *STRIX NEBULOSA* IN CANADA

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Introduction: The purpose of this report is to provide an update on the status of the Great Gray Owl *Strix nebulosa* since the original COSEWIC report was produced and Vulnerable status assigned in 1979 (Nero 1979). At that time it was known that:

- the Great Gray Owl is a sparse resident breeder throughout much of the boreal forest in Canada,
- it nests "practically anywhere in widespread habitat" within the boreal forest and elsewhere in coniferous forest,
- the owl's reproductive success varies with the availability of its small mammal prey,
- threats include shooting, accidental trapping and collisions with vehicles, and loss of forest habitat,
- a conservative estimate of the North American population was 5000-50,000 owls,
- the population was apparently stable but information for many areas was lacking.

A Population size and trends

The Great Gray Owl occurs at low densities throughout the boreal forest (taiga) region in Canada and is generally considered rare (Nero 1980, Bull and Duncan 1993). Despite its large size it is easily overlooked and is probably more common than is believed. Its populations fluctuate in response to changes in microtine vole populations, accounting for short-term changes (Duncan 1987, Duncan 1992, Duncan and Hayward 1994). In northeastern North America, periodic invasions to the southern part of its range are spectacular and often involve large numbers of birds. Non-dispersing individuals that remain on the breeding range during prey crashes generally perish. Of 101 radio-tagged Great Gray Owls followed between 1984-1990, 37 (6 males, 5 females and 26 young) that did not disperse were found dead on their summer home range prior to the next breeding season (Duncan 1992). Of the remaining known non-dispersing owls, one remained resident on its previous breeding home range and seven remained resident on their previous breeding home range and re-nested. Because these were radio-tagged birds, this forms a relatively unbiased sample of recoveries.

These population fluctuations, and the nomadic nature of the species, make it difficult to document its population status and trends. Furthermore, the methodology used to estimate abundance of owls differs among studies, as does the phase of the prey cycle in northern populations and nest site availability (Duncan 1994a, Duncan and Hayward 1994).

Nero (1979) estimated a continent-wide population of 5,000-50,000 owls, most of which breed in Canada. The latest reported overall estimate is of the Canadian population is 10,000-25,000 pairs (reported in Kirk et al. 1995, Kirk and Hyslop in press). Most published studies of this species are from the United States (e.g., Oregon and Idaho) and, while these are valuable for forest management in the regions concerned, they are not representative of the vast part of the species' breeding range which is in northern Canada (Duncan 1994a,Duncan and Hayward 1994). Consequently, there are few data on populations trends and habitat.

Three of the seven U.S.D.A. Forest Service Regions in which the Great Gray Owl occurs list the species as "sensitive" (J. Verner, pers. comm. to Duncan and Hayward 1994). In addition, Great Gray Owls are given special management status in the states of Idaho and

Montana where they are a 'Species of Concern', and California, where they are considered endangered.

Breeding Bird Survey (BBS)

The latest results from the Breeding Bird Survey (1966-1994) suggested that populations of Great Gray Owls are stable in Canada (proportional annual change -0.11, n = 17), but trends cannot be estimated confidently because of the unsuitability of this daytime roadside survey for the species. There were too few routes and individuals to perform statistical analyses on the more recent 10-year period (1985-94) reported in Kirk and Hyslop (in press). No trends at the ecozone level were based on sufficient numbers of routes to estimate population trends statistically (14 routes and 40 individuals are used in the Canadian Wildlife Service, BBS protocol; Downes and Collins 1996). Most BBS routes are well to the south of the Great Gray Owl's main breeding range.

Christmas Bird Counts (CBC)

According to an analysis of trends from CBC data between 1959-1988, Great Gray Owl populations also showed no long-term change on a continent-wide level (% change/year = 0.5, number of circles = 59, relative abundance (birds/100 party hours) = 0.14; Sauer et al. 1996)). Invasion years occurred in the winters of 1991 and 1992 (when 234 owls were recorded in Ontario, 55 in Michigan, 196 in Minnesota, about 60 in Québec, and < 5 in New England; Bull and Duncan 1993) and most recently, in 1995, when low rodent numbers and early snowfall forced owl species many to move southwards (e.g, Aubry and Bannon 1996, Ridout 1996).

Breeding bird atlases

The species was not recorded on the Maritimes atlas (1986-1990; Erskine 1992). During Québec's breeding bird atlas (1984-1989), confirmed evidence of breeding was found in only two squares (0.08%), probable evidence of breeding was found in only one square (0.04%), and possible evidence in three squares (0.12%; Morneau 1995, J. Gauthier pers. comm.). However, coverage during the Québec atlas extended only to 50° N, so excluded the main possible breeding distribution of this species in the province. Although Godfrey (1986) was uncertain whether the species bred in Québec at all, it is possible that more nest there than previously realized.

In Ontario (1981-1985), confirmed evidence of breeding was found in only four 100 x 100 km blocks (13%), while breeding was probable in only eight blocks (25%) and possible in 20 (63%) (total blocks with breeding was 32 or 23% of total; Prevett 1987). However, in southern Ontario possible breeding evidence was found in one square (0.1%) out of 1,824 squares (Prevett 1987), suggesting a wider range than previously documented.

The Great Gray Owl was officially designated the bird emblem for Manitoba in 1987. R.W. Nero, in an account prepared for a book on Manitoba birds, estimated a provincial population of 1500-3000 owls (G. Holland pers. comm.).

In Saskatchewan, the Great Gray Owl is an uncommon permanent resident of the southern boreal region (Harris 1984, Smith 1996). Evidence of breeding was found in a total of 41 quadrants (6% of province); breeding was confirmed in six quadrants (0.8%), it was probable in three (0.4%) and possible in 32 (4.4%). The remaining records were of winter visitors (n = 65, 9%), fall transients (n = 2) and summer visitors (n = 2; Smith 1996). Note that the Saskatchewan atlas is based on historical records and not a short intensive atlassing period; it is thus not comparable with atlases in other provinces.

In Alberta, the Great Gray Owl is an uncommon inhabitant in the north and west (Semenchuk 1992). During the Alberta atlas years (1987-1991), breeding was confirmed in 32 squares, it was probable in 19 squares and possible in 42 squares (n = 2,206 squares surveyed; Semenchuk 1992).

Campbell et al. (1990) described the Great Gray Owl as an uncommon resident in the northern interior, and a rare resident in the southern interior. It is a very rare and irregular visitor to the south mainland coast. Only six nests have been found in British Columbia and there are a total of 29 breeding records (Campbell et al. 1990). In addition, there are 531 nonbreeding records (Campbell et al. 1990).

Nature Conservancy rankings

The Nature Conservancy considers the Great Gray Owl to be a G5 or demonstrably secure globally and essentially ineradicable under present conditions. The rankings for Québec are S1 (critically imperiled in province because of extreme rarity, < 5 occurrences; M. Huot pers. comm.); S3 for Ontario (Rare or uncommon, 21-100 occurrences; but this is being updated to S4, i.e. widespread, abundant and apparently secure, with many occurrences but of long-term concern, D. Sutherland pers. comm.); S3/S4B for both Manitoba and Saskatchewan (JRD), and S4 for BC (S.G. Cannings, pers. comm.). In neighbouring northern states, the Great Gray Owl is considered an SU in Minnesota, where it breeds, but its status is uncertain. In Wisconsin it is an S1B (critically imperilled in state because of extreme rarity or because of some factor [s] making it especially vulnerable to extirpation from the state) or SZN.

Recent research

Recent research indicates that densities of Great Gray Owls vary in different regions. This is not surprising, given the variation in forest types and prey bases. For example, the highest densities were in Manitoba and Minnesota, where Duncan (1992) found 1.88 pairs/km^2. Highest densities in Oregon were 0.74 pairs/km^2 and 1.72 pairs/km^2 in different areas (Bull and Henjum 1990), while in California they were 0.66 pairs/km^2 (Winter 1986). In all of these studies the densities reached lows of zero during prey crashes.

In the north, densities vary greatly depending on vole populations. During peak vole

populations, Duncan (1992) found 19 pairs in 4.5 km^2 (4.2 paris/km^2) in Manitoba and northern Minnesota. When vole populations crashed, no owls bred and birds dispersed from 100-600 km to the NNE (Duncan 1992).

The Manitoba Nocturnal Owl survey began in 1991 under the auspices of the Manitoba Department of Natural Resources (Duncan and Duncan 1994) and is likely to provide some of the best future data on owl densities in Manitoba. Preliminary results show that Great Gray Owl densities fell from 0.0704 owls/km in 1991 to 0.0392 owls/km in 1992 and 0.0263 owls/km in 1993. A similar pattern was revealed outside the study area in southeastern Manitoba (0.0177 owls/km in 1991 and 0.0081 owls/km in 1992). These changes are likely normal population fluctuations in relation to changing meadow vole *Microtus pennsylvanicus* populations (Duncan and Duncan 1994).

Synopsis

In the mid-western United States, Great Gray Owls have been recorded in seven states, but there are breeding records for only three (Michigan, Wisconsin and Minnesota; Byre and Spreyer 1991). However, because searches for breeding owls have only been made in the last 20 years, it is difficult to assess trends in population size in these states. Great Gray Owls are also uncommon local residents in the western United States, although there are no data on population trends (Forsman and Bull 1989).

It is highly probable that Great Gray Owls are more common than is suggested in Canada and they might breed well to the south of their supposed range (e.g., Algonquin Park, Bruce Penninsula; Shepherd 1992, Austen et al. 1994). Despite their large size, they can be very difficult to find, especially in the breeding season (Nero 1979).

B Habitat

A wide range of forest types is used by the species throughout its range (Servos 1986, Bull et al. 1988, Bouchart 1991). In Canada, the main habitat for Great Gray Owls is extensive boreal forest interspersed with *Sphagnum* bogs, muskegs, and other open spaces (Nero 1980, Godfrey 1986, Campbell et al. 1990, Semenchuk 1992). The most important habitat features for the species are the availability of nest sites and suitable foraging habitat (Lundberg 1979, Collins 1980, Nero 1980, Mikkola 1983, Duncan 1992, Duncan 1994a, Duncan and Hayward 1994). Because the requirements for these activities are quite different, Great Grays need a wide spectrum of habitat types. Duncan (1994a) stated that the species required forests of all successional ages that were well dispersed at both a local and regional scale.

Suitable foraging habitat includes relatively open areas, including bogs, fens, selective and clear cut logged areas, natural meadows and open forests (Nero 1980, Mikkola 1983, Winter 1986). Bryan (1985) and Bull and Henjum (1990) both reported that Great Grays prefer open forests for foraging in California and Oregon. Although Bull and Henjum (1990) observed males foraging in stands with 11-59% canopy closure in northeast Oregon, these stands resembled meadows because their dense ground cover was dominated by grasses (mean 88%). In Manitoba, Duncan (unpubl. data) has commonly observed Great Gray Owls hunting

in open tamarack (*Larix laricina*) stands with a dense *Sphagnum*, sedge and grass understory. That these habitats are preferred is demonstrated by the finding that they were used proportionally more than their availability (Servos 1986).

In terms of nesting, Duncan (1994a) has noted that the site itself is probably not as important as nesting habitat and surrounding foraging habitat. In Manitoba, preferred nesting habitats are tamarack bogs and aspen (*Populus tremuloides*) stands associated with wet areas (Nero 1980, Servos 1986, Lang et al. 1991, Duncan 1992). In Saskatchewan, Smith (1996) described habitat as muskegs, upland coniferous, mixed-wood and deciduous forests. In Alberta, most breeding records (as a % of the area surveyed) were from the foothills, followed by the boreal forest, the Rocky Mountain and Parkland ecoregion (G. Semenchuk pers. comm.). Finally, in British Columbia, Great Gray Owls breed in "coniferous, deciduous or mixed woodlands, usually in the vicinity of water, including marshes, lakes, muskegs, wet meadows, and pastures" (Campbell et al. 1990). The most common forest types were Douglas-fir (*Pseudotsuga menziesii*) with trembling aspen, Douglas-fir and lodgepole pine (*Pinus contorta*), lodgepole pine and Engelmann spruce (*Picea engelmannii*) and pure stands of Engelmann and black spruce (*Picea mariana*) (Campbell et al. 1990). In the Okanagan Valley, Great Gray Owls range from subalpine to low elevation forests.

In winter, a broader range of habitats is used for foraging. In Manitoba, hardwoods are used more often in the winter (Duncan and Hayward 1994). Bouchart (1991) found that tamarack, black spruce, and aspen forests were used in winter. To the south of their breeding range, during invasions, a large range of habitats are used including open fields, scattered large trees, shrubbery and fencerows (Nero 1979, Brunton and Pittaway 1971). In Alaska, the ecotone between grassland meadows on the one hand and tall willow, balsam poplar (*Populus balsamifera*) and white spruce is preferred habitat in winter (Osborne 1987).

Trends in habitat

Forest management guidelines have concentrated on nesting habitat, with the short-term objective of protecting currently or recently occupied nests. Specific forest-level management recommendations for nine U.S. National Forests and two provinces typically provide only general direction to protect nest sites or to protect raptor nests in general. Few report on general management recommendations to manage foraging and nesting habitat or prey populations. However, ecologists and forest managers increasingly recognize the importance of landscape level habitat management and so a goal should be to plan future timber harvests to meet these requirements.

Although the main habitat of Great Gray Owls in Canada is to the north of most human population centres, there are potential effects of human activities on their populations. The most important of these is the effect of timber harvest in the boreal region. Timber harvest has both positive and negative effects on Great Gray Owl populations. Clear-cuts, provided they are not too large and far from forest edges, increase suitable foraging habitat. To function as foraging habitat, clear-cuts must also contain snags, left trees or other perch sites. Duncan (1994a) believed that the portion of the cut more than 30 m from an edge or perch was of little value to Great Gray Owls, unless snags or other perches were available in

a large cutover area. This is true at least for the first few years after cutting. Later, dense vegetation may render such areas unsuitable for foraging. Thus, clear cuts are not comparable in their longevity with muskegs and meadows as foraging habitat (Duncan and Hayward 1994). They are also not comparable to fire in several respects. First, depending on the intensity of the burn, fires are more patchy in their effects than cutovers, and also leave large numbers of snags. In logged areas, snags must be removed to comply with Health and Safety Acts of different provinces. Second, fires produce scalloped edges, whereas clear-cut edges are usually straight. At Red Lake, Ontario, at the edge of a hot fire many trees were snapped off because of high wind velocities in front of advancing fire; later their rotted-out tops provided nest sites for Great Gray Owls (D. Gilmore, OMNR pers. comm.). Finally, the time elapsed between disturbance and the development of dense young forest unsuitable for foraging owls may be about 20 years for both a cutover and a burned areas; however, regeneration in the wetter areas preferred by Great Gray Owls may take 70 years, and thus, be available to owls over a longer period of time (JRD).

At the landscape scale, forestry has several potential detrimental effects on Great Gray Owls. One is the effect of fire suppression, which has altered forest structure and composition over a large area. Prior to settlement by Europeans, boreal forest fires were frequent (i.e. every 100 years or less) and encompassed large areas (Telfer 1993). This created open patches and a mosaic of forest stands varying in successional age and structure. As a result of fire suppression forest canopy cover is probably greater than it was in presettlement times (e.g., Duncan 1994a, B. J. Naylor pers. comm.). Increased canopy cover reduces understory cover and associated prey populations (Duncan 1994a). In addition, fire suppression has removed some foraging habitats for owls, such as grassy meadows that have been invaded by conifers.

In terms of nesting habitat, timber harvest removes the old or mature stands preferred for nesting (Duncan and Hayward 1994). Duncan (1994a) believed that even modest removal of old forest might have a long-term impact on available nesting habitat for Great Gray Owls. The argument is often made that given the historical periodicity of fires in the boreal forest at 100 years or less, there would be few old or mature forests anyway (see Telfer 1993). However, the effects of fires are patchy, and old or mature forest sites may escape fire for several hundred years because of their topographic situation. Removal of these older stands will result in a decline in the average age of the forest because of increases in the area cut each year and decreasing rotations for commercial timber harvest. Although stand area need not be large for nesting, it is important to note that replacing a nest stand removed by timber harvest would take > 70 years (Duncan 1994a).

A further effect of timber harvest may be increased populations of predators. Both Northern Goshawks (*Accipiter gentilis*) and Great Horned Owls (*Bubo virginianus*) prey on juvenile Great Gray Owls (Duncan 1987). Mortality is highest during the first year; 91% of 32 radio-tagged fledgling Great Gray Owls died during their first year and 18 of these (57%) were killed by Great Horned Owls or goshawks (Duncan 1992). Forest cutting increases available habitat, especially for Great Horned Owls (Johnson 1993) and Red-tailed Hawks (*Buteo jamaicensis*) (Moore and Henny 1983), or may make young Great Gray Owls more vulnerable to predation. The provision of artificial platforms in Oregon increased populations of goshawks and Great Horned Owls to the detriment of Great Grays (Bull and Henjum 1990). Cutting may benefit Great Gray Owls by increasing habitat for crows and some hawks

(e.g., Red-tailed Hawks) and thus increase availability of nest sites. However, Red-tailed Hawks may prey on Great Gray Owls (Duncan and Hayward 1994).

Lastly, the suitability of Great Gray Owl foraging areas may be reduced by grazing by livestock in parts of its range (e.g. alpine meadows in California - Winters 1986). While this seems an unlikely factor in most of Canada, in parts of northern Alberta, or around Riding Mountain National Park in Manitoba, cattle grazing may affect habitat for Great Gray Owls.

Habitat suitability models have been developed for the Great Gray Owl in Manitoba (Duncan 1994b) and California (Beck 1986).

C Evaluation and proposed status

Nest sites are unlikely to be limiting for Great Gray Owls; provided forest management plans consider maintenance of a range of forest types varying in successional stage this should ensure viability of populations. Particularly important is the juxtaposition of forests providing nesting opportunities (old or mature forests) with open country for foraging. Both fire and specific silvicultural practices can provide these habitats. Because of its nomadic breeding habits leading to dispersal over huge areas, the Great Gray Owl requires this combination of habitat types over a very large region. Therefore, extensive logging of boreal mixedwood forest (e.g. 220,000 km^2 have been slated for logging by the Alberta government - Schmiegelow and Hannon 1993) without implementation of some of the forest management guideline recommendations for this species (Duncan 1994a) may affect populations detrimentally. The species is of concern in Alberta because of fragmentation from logging in the boreal mixedwood zone. Although considered vulnerable (Nero 1979), more information may reveal that this species should not be in any COSEWIC category. Because of its small population, unusual breeding behaviour and nomadic movements it likely should be considered a species to watch. There is no information on how much mature forest is needed to maintain viable populations of Great Gray Owls, although minimum population viability analysis could be performed by modelling. This species should provide a model of how forest management can be integrated with wildlife conservation.

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