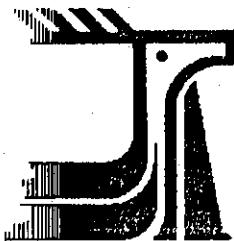


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COMMITTEE ON THE  
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OTTAWA (ONT.) K1A 0H3  
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STATUS REPORT ON THE ROUGH-LEGGED HAWK  
*BUTEO LAGOPUS*

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88

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Vol. 9

IN CANADA

BY

ROBERT J. PARSONS



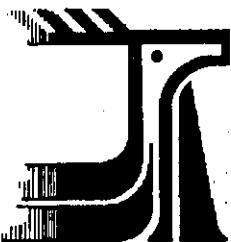
STATUS ASSIGNED IN 1995  
NOT AT RISK

REASON: WIDESPREAD; NO EVIDENCE OF DECLINE; NO OBVIOUS THREATS.

OCCURRENCE: YUKON TERRITORY, NORTHWEST TERRITORIES,  
MANITOBA, QUEBEC, ONTARIO, NEWFOUNDLAND AND  
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**STATUS REPORT ON THE ROUGH-LEGGED HAWK  
*BUTEO LAGOPUS***

**IN CANADA**

**BY**

**ROBERT J. PARSONS  
68 THATCHER DRIVE  
WINNIPEG, MANITOBA  
R3T 2L3**

**STATUS ASSIGNED IN 1995  
NOT AT RISK**

**TABLE OF CONTENTS**

LIST OF FIGURES . . . . .	3
LIST OF TABLES . . . . .	3
LIST OF APPENDICES . . . . .	3
EXECUTIVE SUMMARY . . . . .	4
A ABSTRACT . . . . .	6
B DISTRIBUTION . . . . .	6
C PROTECTION . . . . .	10
D POPULATION SIZE AND TRENDS . . . . .	10
E HABITAT . . . . .	15
F GENERAL BIOLOGY . . . . .	15
F.1 REPRODUCTION . . . . .	15
F.2 SPECIES MOVEMENTS . . . . .	17
F.3 BEHAVIOUR/ADAPTABILITY . . . . .	18
G LIMITING FACTORS . . . . .	19
G.1 DIRECT HUMAN INTERFERENCE . . . . .	19
G.2 ENVIRONMENTAL CONTAMINANTS . . . . .	19
G.3 HABITAT ALTERATION . . . . .	20
H SPECIAL SIGNIFICANCE OF THE SPECIES . . . . .	21
I EVALUATION AND PROPOSED STATUS . . . . .	22
J LITERATURE CITED . . . . .	23
L ACKNOWLEDGEMENTS . . . . .	26
M APPENDICES . . . . .	27

### LIST OF FIGURES

Figure 1. Eurasian distribution of the Rough-legged Hawk ( <i>Buteo lagopus</i> ) The breeding range is indicated by the dark area; winters south to dash line (from Palmer 1988). . . . .	7
Figure 2. Breeding distribution (dark area) of the Rough-legged Hawk in Canada (from Godfrey 1986). . . . .	9
Figure 3. Breeding and winter ranges of Rough-legged Hawk showing relative winter state and provincial indices (average number seen per Christmas Bird Count, 1986) (from Johnsgard 1990). . . . .	14

### LIST OF TABLES

Table 1. Status of Rough-legged Hawk Populations in Canada (assessment from Fyfe 1976). . . . .	12
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### LIST OF APPENDICES

APPENDIX A. Rough-legged Hawk breeding density and average reproductive success on Herschel Island, Yukon in 1984 - 1986. (Data from Dave Mossop) . . . . .	27
APPENDIX B. Rough-legged Hawk (RLH) and small mammal data for Coppermine and Hope Bay/Walker Bay. # RLH indicates number of occupied nests seen in study area. Small mammal index (SMI) is total captures per 100 trap nights. (Data provided by Christopher C. Shank) . . . . .	28

## EXECUTIVE SUMMARY

### **ROUGH-LEGGED HAWK** *Buteo lagopus*

#### **Description**

The Rough-legged Hawk is a fairly large member of the genus *Buteo*. The plumage is very variable with dark and light morphs (also referred to as "phases" in some publications). The bird is longer winged than most *Buteos* and has fully feathered tarsi. These separate it from most species, other than the Ferruginous Hawk (*Buteo regalis*). The typical light morph has upperparts that are grey-brown, with the head being paler than the rest of the body. A band of white is present near the base of the tail when viewed from above. The wing linings are white with a large black carpal (or "wrist") patch. The rest of the under parts are light grey-brown and there is a thick dark band (appearing black in field conditions) across the lower breast. The dark morph appears almost black all over, but usually retaining the white at the base of the tail. There are many birds which are intermediate between the plumage extremes described. The field marks are fairly well illustrated in most of the more recent field guides to bird identification.

#### **Distribution**

Breeds in a band across the southern and mid tundra in Canada (also in Eurasia) and winters primarily in the U.S. midwestern states.

#### **Population size and trends**

No intensive surveys of population have been done, but Christmas Bird Counts indicate a North American population of approximately 50,000 or perhaps more. Population numbers seem to be steady.

#### **Habitat**

The Rough-legged Hawk breeds primarily in open tundra and winters primarily west of the Mississippi River on the plains of the U.S. The breeding habitat is relatively unaltered by human activity; the wintering habitat has been extensively modified by agriculture, to which the Rough-legged Hawk appears to have adapted very well.

#### **General Biology**

Probably begins breeding at two or three years of age. Usually lays four or five eggs. Hatching percentages are high as is fledging success. The result is that typically half of the eggs result in fledged young. These numbers can vary considerably in response to rodent populations: when the rodent numbers are high, more young survive; when they are low, fewer young survive to fledging. One brood per year is the norm, with renesting occurring if a nest fails early on. The survival rate of young after fledging is poorly known, but appears to be adequate to keep populations at

least at replacement levels. The Rough-legged Hawk is near the top of its food chain and helps keep rodent populations at manageable levels.

#### **Limiting factors**

Primarily dependent on rodent population levels, there are relatively few limiting factors from human activities at present times. However, shooting deaths were a problem in the 19th century and early 20th century.

#### **Protection**

The Rough-legged Hawk is protected in Canada by provincial/territorial legislation in each jurisdiction. These laws were designed to prevent shooting, pursuing and other direct harassment. In the United States it is protected by federal law. The existing legislation, combined with recent education of the public on the value of importance of raptors, in both Canada and the U.S., seems adequate for this species.

#### **Conclusions**

The Rough-legged Hawk appears to be doing well under existing wildlife management schemes and further protection seems unnecessary. The bird may serve as an indicator species of its habitat.

## A ABSTRACT

The Rough-legged Hawk breeds in Canada across the tundra. Numbers fluctuate in relation to prey levels, but are stable overall. The population is healthy, and the limiting factors of human activity do not threaten this species, unlike many raptors. Considering its population and its stable habitat availability, the Rough-legged Hawk should not be considered for inclusion in any of the COSEWIC categories of species at risk in Canada.

## B DISTRIBUTION

### B.1. World (Figure 1)

The Rough-legged Hawk is a holarctic breeding species. Its breeding range is roughly delineated on its southern boundary by the tree line. In Eurasia it breeds mainly north of 60° latitude along the Arctic Ocean coast through northern Norway, Sweden, Denmark and Russia with an extension south along the Pacific coast to the Kamchatkan Peninsula and the Sea of Okhotsk (Brown & Amadon 1968).

It winters south from the breeding range, reaching its greatest abundance in southern Europe and the Steppes of central Asia (Harrison 1982).



Figure 1. Eurasian distribution of the Rough-legged Hawk (*Buteo lagopus*). The breeding range is indicated by the dark area; winters south to dash line (from Palmer 1988).

In North America the rough-leg nests on the western and northern two thirds of Alaska, northern Yukon, northern Northwest Territories north to Prince Patrick, Bylot and Baffin islands, south to the approximate northern extent of the tree-line across most of Canada (Johnsgard 1990).

The winter range is from southern Canada south to California, Arizona, New Mexico, northern Mexico (extreme northern portions of Chihuahua and Coahuila), Texas (south to southern limit of the Edwards Plateau), Missouri, Indiana, Kentucky, Maryland and Virginia (Johnsgard 1990; Palmer 1988).

#### B.2. Canada (Figure 2)

Breeds from northern Yukon, across the Arctic Archipelago, northern and eastern Mackenzie, Keewatin, northern Manitoba, extreme northern Ontario, northern and eastern two-fifths of Quebec, Labrador and interior of island of Newfoundland (Godfrey 1986).

Winters along southern edge of Canada, mainly in very low numbers. More common in extreme southeastern B.C. (Campbell, et al. 1990) and southern Ontario (Johnsgard 1990).



Figure 2. Breeding distribution (dark area) of the Rough-legged Hawk in Canada (from Godfrey 1986).

### C PROTECTION

In the United States, the Rough-legged Hawk is protected under the Migratory Bird Treaty Act (16 U.S.C. 703-711) which prohibits hunting, trapping or overt harassment for all species that it covers (Olendorff et al. 1980). Canada, however, did not include raptors in its similar Migratory Birds Convention Act of 1916. As a result, raptor protection falls under provincial/territorial jurisdiction. All provinces have similar statutes, with slight variations in their wording, which prohibit "chasing, pursuing, following after, shooting at, stalking...molesting, taking or destroying of raptors except by any landowner who finds any animal destroying his property or believing, on reasonable grounds, that such an animal is about to damage or destroy his property" (various wildlife officials across Canada, pers. comm.). Violations usually are punishable by fines. This protection is probably adequate, especially considering that the Rough-legged Hawk is not present in densely populated parts of Canada for very long periods of the year.

### D POPULATION SIZE AND TRENDS

There have been few or no attempts to census the population of the Rough-legged Hawk on most of its breeding ground. Small scale studies by wildlife officials exist for Yukon and Northwest Territories. These are mainly studies of nesting birds. Wildlife officials in Newfoundland (including Labrador) have a few observations of nests.

In Yukon, the best known and largest population is on Herschel Island (D. Mossop, pers. comm.) where a maximum of 28 nesting territories have been identified. From 1984 through 1986 breeding densities on Herschel Island averaged approximately one nest per 4.5 km<sup>2</sup>. More detailed results of these can be found in Appendix A. Sixty-nine Rough-legged Hawk nesting sites have been identified elsewhere on the north slope. Not all territories have been occupied each year and there have been years of little nesting activity. This seems to be in response to natural fluctuation of the prey base and Mossop (pers. comm.) feels there is no long-term change in numbers either on Herschel Island or elsewhere in Yukon.

In Northwest Territories there have been studies of nests in the Coppermine and Hope Bay/Walker Bay areas from 1982 through 1993 (C. Shank, pers. comm.). Numbers of nests at Coppermine have ranged from 13 to 79. Numbers at Hope Bay have ranged from 0 to 32. There is some correlation in numbers, from year-to-year in the two areas, with fluctuations in prey levels. Detailed results are included as Appendix B.

In Labrador, 34 Rough-legged Hawk nests have been found between 1985 and 1991 (K. Knox, pers. comm.). The maximum recorded per year in that time period was 14 in 1989. There is little definite population information, but the species is not considered rare on the mainland. In some years there were no nests recorded. In most of the years without nesting, rodent populations were also low. On the island of Newfoundland, the species is considered a rare breeder (Knox, pers. comm.; Peters and

Burleigh 1951) and few nest records exist. In 1993, a year with high vole populations, 6 nests were documented as fledging young. The preceding year no nests were found and rodent populations were low. Although there is little idea of the actual rough-leg population, numbers appear to be stable over the long term and officials find no cause for concern (Knox, pers. comm.).

In Manitoba, the Rough-legged Hawk has long been known to nest in the Churchill area (Taverner and Sutton 1934) where it was considered a common breeder in the early 1930's. It has apparently declined since that time. Jehl and Smith (1970) considered it a very uncommon summer resident, varying greatly from one year to the next, and speculate that nesting probably did not occur in the immediate area of town east of the Churchill River. However on visits to Churchill in 1988 and 1994, I observed a total of three active nests, the one in 1988 being placed on the grain terminal. R. Koes (pers. comm.) informs me that groups with the Manitoba Naturalists Society which he has led, have observed Rough-legged Hawks nesting there most years. There is little information available for areas away from Churchill. Wildlife officials in Manitoba do not see any cause for concern (B. Koonz, pers. comm.).

In Ontario, although most authorities (eg. Godfrey 1986; Palmer 1988; Johnsgard 1990) include the entire Hudson Bay coast as part of the breeding range (through extrapolation), the Rough-legged Hawk is known to nest only at Cape Henrietta Maria with perhaps no more than one nesting pair in the entire province in any year and entirely absent in some years (R. James, pers. comm.). Cadman et al. (1987) show some areas of unconfirmed breeding along the extreme western Ontario coast of Hudson Bay. As the species is at the extreme edge of its range, this low population does not indicate that the bird is in any danger and officials in that province see no cause for concern.

In areas such as the east coast of Hudson Bay, the Labrador-Ungava region and the Great Whale River in northern Quebec, a number of authors have classed the Rough-leg as common, with numbers fluctuating in tandem with rodent populations (Lewis 1930; Manning 1946; Savile 1950), with Manning and Macpherson (1952) finding it to be the most common raptor in the area on the east side of James Bay. These data are primarily early to mid 20th century at a time when populations would have still been depressed by shooting along the various eastern U.S. mountain ranges as discussed below. There appear to be no recent data that would suggest any population decline.

Table 1  
Status of Rough-legged Hawk Populations in Canada

Area	Population trends	Relative abundance
Maritimes		Migrant
Ontario and S. Quebec		Migrant
Prairie Provinces		Mainly Migrant
British Columbia		Migrant
NWT and Yukon	Fluctuating	Medium to high
Canada	Stable	Medium to high

Assessment from Fyfe (1976).

More attempts to census Rough-legged Hawks have been made in migration and in winter, than on the breeding grounds. Hawk counts made at strategic lookout points have become popular in recent years. Unfortunately, there is considerable bias in such counts as individual hawks or local populations are not necessarily restricted to using the same route over their lifetimes and weather can influence numbers of migrating hawks over a given lookout site (Heintzelman 1975). Most of these sites are in eastern North America and consistently report the Rough-legged Hawk as among the rarer species (Palmer 1988).

Reports on wintering raptors have been used as indices of population. One such example is the Christmas Bird Count reports from *Audubon Field Notes* and *American Birds*. These were analyzed by Johnsgard for the winter of 1986 (Figure 3). His data suggest about 49,600 birds wintered south of Canada, and he reached the startling conclusion that it was "one of the most abundant raptors native to North America" and was especially abundant west of the Mississippi River, with the highest concentrations in the midwest states of Montana and Idaho (Johnsgard 1990). This is in apparent conflict with the migration data of hawk-watch sites above, but since the vast majority of Rough-legged Hawks winter west of the Mississippi River this may not be the contradiction it otherwise appears to be. Surveys such as the Christmas Bird Count, while not without weaknesses such as observer effort, are probably our most effective censusing tool for this species.

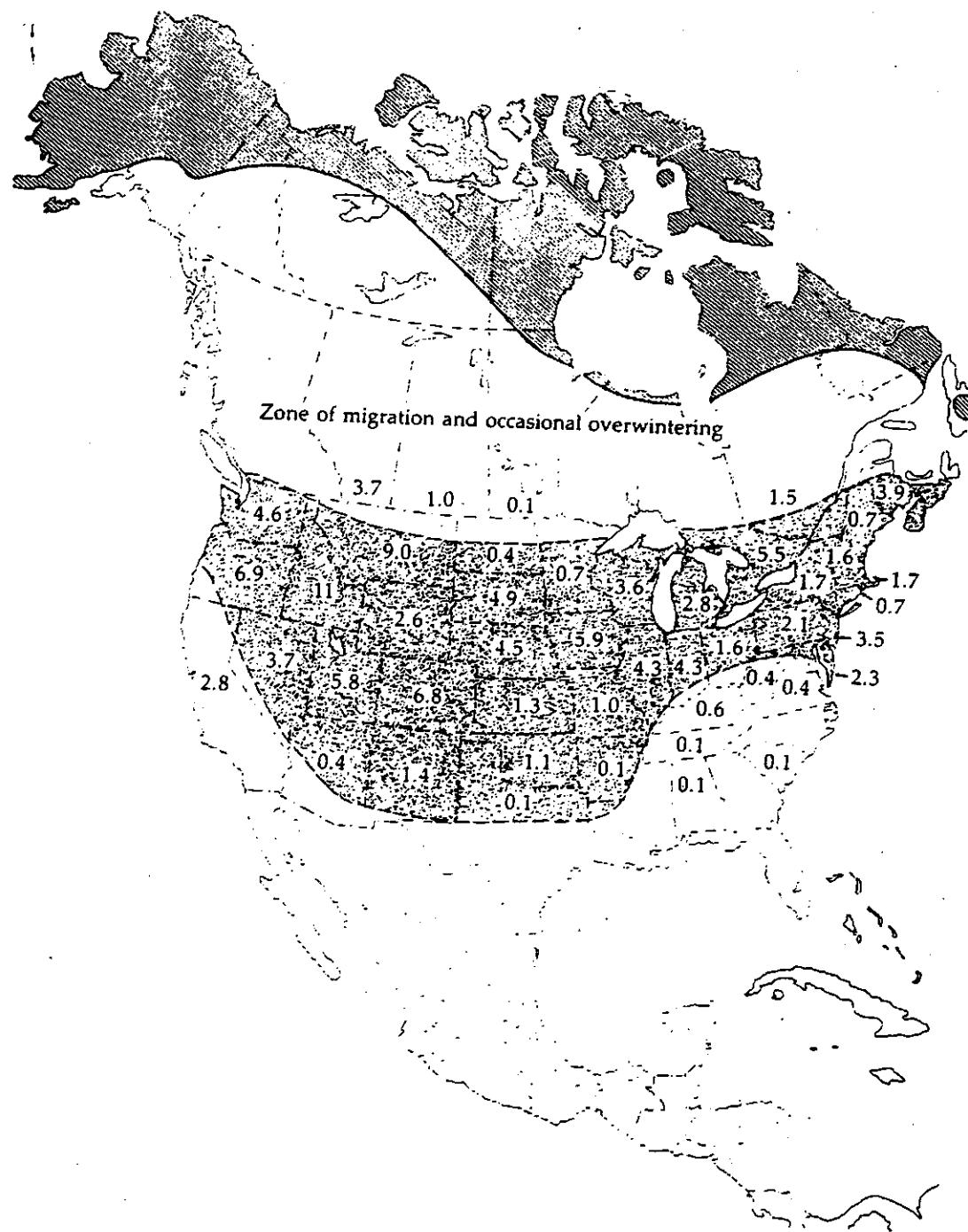


Figure 3. Breeding and winter ranges of Rough-legged Hawk showing relative winter state and provincial indices (average number seen per Christmas Bird Count, 1986) (from Johnsgard 1990).

### E HABITAT

As a breeding species the Rough-legged Hawk is confined almost exclusively to tundra and immediately adjacent taiga habitats. It usually is found in areas of cliffs and rock escarpments, which it favours for placement of nests (Palmer 1988). In this regard it comes into conflict with three other species of predatory birds, the Peregrine Falcon (*Falco peregrinus*), Gyrfalcon (*Falco rusticolus*) and the Common Raven (*Corvus corax*). Although the other three species compete for nesting sites with the rough-leg, they tolerate, and are tolerated by, rough-legs in their territories. Hunting strategies and prey species are sufficiently different that partitioning of an area can occur and rough-leg territories frequently overlap with the other species.

Winter habitat is primarily open area with few or no trees (Palmer 1988). The species forages readily over both relatively unaltered grassland and cultivated agricultural land. Bock and Leptien (1976) found that the Rough-legged Hawk tends to avoid hunting areas favoured by its congener the Red-tailed Hawk (*Buteo jamaicensis*) and, to a lesser extent, the Ferruginous Hawk (*Buteo regalis*) although in times of food abundance this separation is less apparent.

Both breeding and winter habitat for the Rough-legged hawk are in good supply with little fragmentation or restriction. The breeding areas are well away from most human activity and the bird has demonstrated a good ability to adapt to agricultural land. The majority of the birds winter far enough north that they are usually not foraging over land which is actively farmed at the time they are in an area.

Although relatively little land frequented by the rough-leg is formally protected under refuges, wildlife management areas or parks, it seems at least adequate for the species to maintain itself.

### F GENERAL BIOLOGY

Authorities differ on the number of subspecies of Rough-legged Hawk. The nominate *B. l. lagopus* occupies Europe and the Western Palaearctic; *B. l. kamtchensis* is found in Siberia and possibly the Aleutian Islands and *B. l. sancti-johannis* occupies the rest of North America (Snyder 1957). Some authorities split the Siberian race into two and restrict *kamtchensis* to extreme eastern Siberia (essentially Kamchatka and the Sea of Okhotsk) and treat the rest being as *B. l. menzbieri* (Brown and Amadon 1968). Most recent authorities treat the rough-leg as having a maximum of three subspecies worldwide (Palmer 1988; Johnsgard 1990) with Palmer (1988) in particular pointing out that there is a dearth of specimens from the Siberian race and that all three subspecies are poorly differentiated from one another. Brown and Amadon (1968) state that the North American race is the smallest overall and the most polymorphic with the only known dark morph. All Canadian birds are *B. l. sancti-johannis* (Godfrey 1986).

#### F.1 REPRODUCTION

The age at which the Rough-legged Hawk breeds for the first time is not definitely known (Palmer 1988), although Cramp and Simmons (1980) state

"probably at two or three years". Yearlings may account for some of the summer sightings of birds across southern Canada, well to the south of the breeding range.

The age and sex ratios of rough-legs are unknown, in part because of a lack of surveying attempts, but primarily because of the difficulty in sexing and ageing birds in the field.

The nest is a bulky structure of sticks where available, bones and other transportable debris will augment or substitute if sticks are not available. The lining is made up of small twigs, grasses and sedges and, as the season progresses, moulted feathers and lemming fur (Palmer 1988). These last may be primarily remains of prey, rather than a conscious attempt at lining the nest. As noted under habitat, cliffs are preferred, but a wide variety of sites are accepted including trees, man-made structures such as towers (used at Churchill and Cape Henrietta Maria for example). Rarely, the species will nest on the ground.

Nests are frequently reused from one year to the next, and nests in favoured sites may be used for many years, perhaps exceeding the lifetime of the original occupants (Palmer 1988). New material is added to existing nests, further increasing the bulk. Kuyt (1980), however, found that Rough-legged Hawks in the Thelon River of Northwest Territories rarely used the same nest for more than two years in succession. In some cases this may have been the result of Peregrine Falcons or Gyrfalcons usurping the nests as he recorded some nests being used by all three species over the years of observation.

An adequate supply of lemmings for food is a prerequisite for successful nesting. Nesting may not be undertaken on years of low lemming populations, or there may be a poor fledging percentage under such situations. Because this is a phenomenon that the Rough-legged Hawk has existed with throughout its existence, it is not a threat to the overall survival of the species.

Initiation of egg-laying varies from early May to mid June in southern portions of the range, such as Newfoundland; to late May to mid July in arctic Canada and Alaska (Palmer 1988), perhaps averaging a little closer to Newfoundland data in forested parts of Yukon and Alaska. Clutch size is variable, ranging from 2 to 7 eggs (Aleksiuk 1964; Sealy 1966; Parmelee et al. 1967; Palmer 1988; Johnsgard 1990). Two or three are the norm in years of low lemming populations, while five to seven are more typical of good lemming years (Johnsgard 1990). Mossop (pers. comm.) found an average of about four eggs per nest in those years when nests were occupied. Shank (pers. comm.) found an average of slightly over 2.5 eggs per nest over a 12 year period in Northwest Territories.

Estimates of incubation times vary. Twenty-eight days has been considered the norm (Burns 1915 in Bent 1937); however Bird and Lague (1976) working with captive birds reported 37 days. Captivity may have altered "normal" results. Parmelee et al. (1967) estimated a 31 day incubation period for birds on Victoria Island in the Northwest Territories. Hatching success is high, typically at 80% or better (Sealy 1966; Shank pers. comm.; Mossop pers. comm.). In common with most arctic nesting birds, and with raptors in general, one brood per year is raised

(Palmer 1988). However, a second clutch may be initiated if the first is lost early; there are some known late nesting records which may be explained by this (Palmer 1988). The nestling period is variable with some leaving the nest at 34 days, but most remaining for 40 days or slightly longer (Parmelee et al. 1967).

The survival rate of young birds is poorly known. On average, about half the eggs laid result in young which survive to flight age (Palmer 1988; Mossop pers. comm.). Very little is known of the survival of fledged young, although if they are like most raptors there is probably a high mortality of young birds. In 48 selected band recoveries of dead rough-legs, the average lifespan was 20.7 months with the oldest individual reaching 18 years, 1 month (Keran 1981). Reproduction appears adequate to replace individuals lost through mortality.

## F.2 SPECIES MOVEMENTS

The Rough-legged Hawk was classed by Kerlinger (1989) as a long distance migrant. Most breed north of 60° latitude. Most winter south of 45°, a distance of 2500 km in a straight north to south line. Additionally, there is a westerly movement in fall migration, especially of eastern birds. Palmer (1988) cites records of birds banded east of 80° turning up in Manitoba and Kansas, both near the 100th meridian. While these pale compared to a migrant like the Swainson's Hawk (*Buteo swainsoni*) or the Peregrine Falcon, it is still a longer flight than many raptors make. Rare among Buteos, the rough-leg readily crosses substantial bodies of water. There are reports of birds coming in from the water on the west side of James Bay in the fall (Palmer 1988). This willingness to cross water undoubtedly facilitates the southwest fall movement.

Migration is fairly protracted. The first spring migrants often appear in late February in the southern part of the prairie provinces and migration lasts well into May with the peak numbers being seen in late March and early April (Salt and Salt 1978; Knapton 1979; Taylor 1983). In southern Ontario and Quebec, migration is somewhat earlier, mostly over by late April (Godfrey 1986). In Nova Scotia, the rough-leg shows a similar pattern to Ontario of being gone by late April and very early May (Tufts 1986). This is applicable to the provinces of New Brunswick and Prince Edward Island as well (Godfrey 1986). In British Columbia the species is mostly gone from the south by mid April with stragglers into May (Campbell et al. 1990). In most of Canada (away from the prairie provinces) the beginning of migration cannot be accurately determined because of the presence of overwintering birds. Fall migrants begin to appear in southern Canada in September, numbers peak in late October and November, and most migrants have probably departed after the second week of December (Salt and Salt 1978; Knapton 1979; Taylor 1983; Godfrey 1986; Tufts 1986; Campbell et al. 1990), although there are again problems of differentiating between migrants and overwintering birds. In Newfoundland the rough-leg is considered a rare permanent resident (Peters and Burleigh 1951), although there is no information as to whether the nesting and wintering birds are the same population.

Because the Rough-legged Hawk will cross water, it is not funnelled into migrant hawkwatch locations (several of which, such as Hawk Cliff on Lake Erie, usually rely on such funnelling agents) and there are far fewer concentrations of them than most other relatively abundant raptors. Migration is thus spread out over a broad front. This also helps to explain the apparent rarity of rough-legs at migration sites and further points out the weaknesses of relying on migration data for population estimates.

### F.3 BEHAVIOUR/ADAPTABILITY

Many authors have commented on the lack of wariness of the Rough-legged Hawk (Bent 1937; Palmer 1988), often to the detriment of the bird. While a lack of wariness is a problem in situations where direct persecution is a possibility, it is to the species' advantage in situations where it is not a threat. An unwary species is less inclined to be upset from day to day activities and copes successfully with human activity. It has been known to nest on man-made structures as noted above. There are occasional problems, however. The lack of wariness has resulted in birds, which have been hunting along highways, being killed or injured when struck by automobiles (Palmer 1988).

As noted, the Rough-legged Hawk relies heavily on small rodents for its sustenance. On the breeding ground lemmings (*Dicrostonyx*, *Lemmus*) often constitute 80% or more of prey when sufficiently available, supplemented with voles (*Microtus*, *Clethrionomys*) where available (Palmer 1988). Most older literature states that birds are not taken by the rough-leg, but more recent authors have found otherwise. White and Cade (1971) found that 13.5 percent of prey items taken were birds. Springer (1975) found that birds made up 21 percent of the prey items. Almost all of these fell into two categories: fledgling passerines or ptarmigans. The one unifying characteristic is that neither of these are strong fliers. The Rough-legged Hawk appears to be poorly equipped to catch any but the slowest birds. On the wintering ground rodents make up the vast majority of the Rough-legged Hawk's food. The primary prey items are *Peromyscus* mice and *Microtus* voles (Schnell 1967). Birds are occasionally taken, being almost exclusively slow-flying gallinaceous birds such as the Gray Partridge (*Perdix perdix*) and Ring-necked Pheasant (*Phasianus colchicus*) (Schnell 1967). Rough-legged Hawks are thus not a threat to birds on the wintering grounds. Surprisingly often, insects feature prominently in the diets of raptors, even ones as large as the Swainson's Hawk. The rough-leg is an exception to this with authors in general agreement that it does not eat insects (Palmer 1988).

## G LIMITING FACTORS

Fyfe (1976) identifies three factors which negatively impact raptor populations. These are direct human interference, environmental contamination and habitat alteration.

### G.1 DIRECT HUMAN INTERFERENCE

The remote location of the breeding range of the Rough-legged Hawk means that inadvertent human disturbance is minimal. Exploration for, and extraction of, oil and other minerals may be a threat in limited areas. Most human contact in the breeding range is by northern native peoples who have coexisted with the Rough-legged Hawk for a long period of time without any seeming detriment to it or other northern raptors. Many observers of the Rough-legged Hawk have commented on its seeming unwariness (Bent 1937; Palmer 1988; Johnsgard 1990). Abandonment of nests resulting from deliberate or inadvertent human disturbance, documented in many raptors, is thus less likely to occur with this species (Johnsgard 1990).

In migration shooting was formerly a problem. Bent (1937) details various such anecdotes of slaughter in the late 19th and early 20th century. The slaughter of raptors along the mountain ranges of the eastern U.S. until the establishment of Hawk Mountain and similar refuges is well described by Harwood (1973), among others. Certainly, many species must have been decimated. With education and protection, this has been halted in the eastern states.

Bent (1937) also details deaths from shooting on the wintering grounds in the same time period of the late 19th and early 20th centuries. It seems undoubtable that there are isolated instances of this to the present day, but this, too, is more an event of history than current news. Deaths from shooting today are not likely a threat to the species.

### G.2 ENVIRONMENTAL CONTAMINANTS

Pesticide contamination with resulting problems such as eggshell thinning has not been the problem for the Rough-legged Hawk that it has for many other species of raptors. Although eggshell thinning has been documented in the rough-leg (Cade et al. 1971), there does not seem to be any evidence that it impacts on hatching. This is perhaps explained by the fact that rough-legs seem to ingest far lower levels of bio-toxins than many other raptors. Lincer et al. (1970) found toxin levels in rough-legs to be much lower than in Peregrine Falcons in the same area of Alaska.

Fyfe (1976) summarizes the pesticide contamination risks to raptors. At greatest risk are those species (or races) that are highly migratory (thus wintering in areas of greater contamination) and feed on contaminated avian prey which are in turn often migratory. An example is the Peregrine Falcon feeding on shorebirds.) The next highest residues are found in species which feed on contaminated prey, but do not occur in areas of heavy contaminants. At a lower risk are those which winter in relatively uncontaminated areas and feed primarily on mammals. (Small mammals can be

expected to have lower levels of contamination than small birds because they eat mostly plant material, while birds eat more insect material, thus concentrating the pesticides more.) At least risk are those that are essentially resident in far northern areas and feed primarily on resident prey. (An example of this last category would be Gyrfalcon feeding on ptarmigan.) The Rough-legged Hawk is in the third category. It winters almost exclusively north of areas where persistent pesticides are still used, it takes few migrant birds as prey (and the ones it takes are primarily fledglings which would not have built up high pesticide levels) and it does not feed on insects. The Rough-legged Hawk is clearly one of the less threatened raptors from environmental contamination.

### **G.3 HABITAT ALTERATION**

As discussed under the habitat section, there has been virtually no alteration of the breeding habitat by human activity. By contrast, wintering habitat has been altered significantly by agriculture. This does not appear to pose a threat to the species as it winters in large numbers throughout the agricultural region of the U.S. midwest. Few raptors are as little affected by this limiting factor as the Rough-legged Hawk.

## H SPECIAL SIGNIFICANCE OF THE SPECIES

The Rough-legged Hawk, as a bird of prey near the top of its food chain, can be considered an indicator species of its habitat. Declines in this species would indicate grave problems in its habitat. Endangered species such as the Peregrine Falcon also rely on this habitat. As Peregrines use rough-leg nests, the presence of the Rough-legged Hawk can be seen to be an agent of habitat enhancement for the falcons.

## I EVALUATION AND PROPOSED STATUS

Although there is evidence that the Rough-legged Hawk population, at least in eastern North America, may have declined in the late part of the last century and the beginning of the 20th century, the species is, to all appearances, not in any peril now. The evidence suggests that the rough-leg has regained that ground.

To maintain current Rough-legged Hawk numbers, the species must be protected from shooting (through enforcement of existing legislation and through education).

Given that the number of North American Rough-legged Hawks is in at least the tens of thousands of individuals, that no loss of habitat is taking place, and that there is no evidence of a population decline, the proposal is that the species not be included in any of the COSEWIC categories for species in danger; the Rough-legged Hawk is not rare, threatened, endangered, extirpated or extinct.

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## M APPENDICES

Appendix A. Rough-legged Hawk breeding density and average reproductive success on Herschel Island, Yukon in 1984 - 1986. (Data from Dave Mossop)

Year	Density of Breeding Pairs	Average Number of Eggs Per Nest	Average of Young Surviving 10-14 Days
1984	1 pair/5.56 km <sup>2</sup> n=19	--	--
1985	1 pair/4.56 km <sup>2</sup> n=22	3.9 ± 0.3 n=16	2.7 ± 1.1 n=15
1986	1 pair/4.12 km <sup>2</sup> n=24	4.1 ± 0.5 n=21	2.0 ± 1.7 n=12

Appendix B. Rough-legged Hawk (RLH) and small mammal data for Coppermine and Hope Bay/Walker Bay. # RLH indicates number of occupied nests seen in study area. Small mammal index (SMI) is total captures per 100 trap nights. (Data provided by Christopher C. Shank)

Year	# RLH Nests	Mean RLH Copper- mine	# RHL Nests	Mean RLH Clutch Size Hope Bay	SMI Walker Bay	SMI Hope Bay
1982	--	--	17	--	--	--
1983	78	4.1	11	3.5	--	--
1984	79	3.3	32	3.0	--	7.8
1985	13	1.9	11	2.6	--	1.8
1986	15	2.3	6	2.0	--	0.0
1987	17	2.5	23	3.6	--	5.5
1988	15	2.5	0	--	--	0.8
1989	39	3.6	17	3.9	--	1.0
1990	75	4.3	27	--	6.8	9.9
1991	18	1.7	8	3.0	2.0	--
1992	55	3.7	17	3.3	3.6	--
1993	57	3.8	13	4.0	1.6	--