

**COSEWIC**  
**Assessment and Update Status Report**

on the

**Ferruginous Hawk**  
*Buteo regalis*

in Canada



**THREATENED**  
**2008**

**COSEWIC**  
Committee on the Status  
of Endangered Wildlife  
in Canada



**COSEPAC**  
Comité sur la situation  
des espèces en péril  
au Canada

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## COSEWIC Assessment Summary

### Assessment Summary – April 2008

**Common name**

Ferruginous Hawk

**Scientific name**

*Buteo regalis*

**Status**

Threatened

**Reason for designation**

This large hawk is found primarily on natural grasslands in southern Alberta, Saskatchewan and Manitoba and is a specialist predator on Richardson's ground squirrels. It suffered a 64% decline in population from 1992 to 2005; since Alberta comprises the majority of the Canadian range, this implies a decline of at least 30% across the Prairies over that time period. The loss, degradation and fragmentation of its native grassland habitat are the most serious threats to the population.

**Occurrence**

Alberta, Saskatchewan, Manitoba

**Status history**

Designated Threatened in April 1980. Status re-examined and designated Special Concern in April 1995. Status re-examined and designated Threatened in April 2008. Last assessment based on an update status report.



**COSEWIC**  
**Executive Summary**

**Ferruginous Hawk**  
*Buteo regalis*

**Species information**

The Ferruginous Hawk (*Buteo regalis*; French: Buse rouilleuse) is a large, open country, diurnal raptor that occurs in western North America. In many respects, the Ferruginous Hawk is similar to the Golden Eagle. The Ferruginous Hawk has broad, long wings with rounded tips and a fan-shaped tail. Two colour phases occur; a more common pale phase in which hawks have brown upper parts (with extensive orange-cinnamon and white markings on the shoulders and back), white underparts with brown streaks and a white to greyish tail. The less common dark-phased birds have dark brown plumage (some feathers are edged with cinnamon) and a white, pinkish or grey tail.

**Distribution**

The Ferruginous Hawk is found in the grasslands, shrublands and deserts of the western United States and western Canada. In Canada it breeds in southern Alberta, southern Saskatchewan and southern Manitoba; a few pairs have nested in southern British Columbia, at least historically.

Canada holds about 10% of the world's breeding distribution of the Ferruginous Hawk and that range is contracting; it now occupies only 48% of its historical range in Canada.

**Habitat**

East of the Rocky Mountains, the Ferruginous Hawk is strongly dependent on native grasslands, which have been subject to degradation, conversion and fragmentation by urbanization, farming and industrial development. West of the Rockies, grasslands and shrub-steppe arid areas are heavily used by Ferruginous Hawks. On the other hand, aspen parkland, montane forests and areas of intensive agriculture are avoided. The distribution of the Ferruginous Hawk retracted at the northern edge of the range in Canada during the early 1900s because of agriculture and invasion of trembling aspen into the remaining mesic native prairie grassland due to fire suppression. Ferruginous Hawks are very sensitive to habitat loss and are considered a native grassland specialist.

## **Biology**

The Ferruginous Hawk is wary of humans, as well as being secretive, often roosting on the ground. Thus, it is much less conspicuous than other sympatric hawks such as Swainson's Hawk, making it more difficult to monitor its populations. The Ferruginous Hawk uses a wide variety of structures for nesting, including cliffs, trees, utility structures, farm buildings, abandoned farm machinery, haystacks and artificial platforms. Apparently monogamous (though sometimes three birds are seen together), the Ferruginous Hawk is territorial and breeds for the first time at two years of age. Clutch size ranges from 2-8 eggs. The Ferruginous Hawk is a "sit-and-wait" predator and up to 5-10 hawks have been observed at prairie dog towns. East of the Rockies, the Ferruginous Hawk depends on a keystone prey species, the Richardson's ground squirrel, whereas west of the Rockies, it preys on jackrabbits, prairie dogs and pocket gophers.

## **Population sizes and trends**

Ferruginous Hawks now occupy about half of their historical range in Canada. In Alberta, the population was estimated at  $618 \pm 162$  pairs in 2005, substantially lower than earlier estimates. Whether this is due to an actual decline in numbers in Alberta or improvements in survey techniques is unknown but it is now thought that the population has been at a low since 2000. In Saskatchewan, the population had previously been roughly estimated at between 300-500 pairs based on known nest localities, site occupancy and extrapolation from small study areas. A 2006 survey found 278 nests in Saskatchewan in a search that covered all historical nesting sites and about 12% of the species' range there. In Manitoba, the latest population estimate (2005) is 42 pairs. The entire Canadian population is probably about 1200 pairs, about half of what was estimated in 1998.

Evidence for recent declines in Ferruginous Hawk populations comes from hawkwatch counts while Breeding Bird Survey data suggest a stable or increasing population, although the latter have many deficiencies for monitoring trends in raptor populations. The latest analysis of migration counts from western North America (1977-2001) demonstrated significant declines at four of the six hawkwatch sites analyzed. At two of these sites passage rates increased until the early to mid-1990s, then decreased; long-term declines have occurred at the other two sites.

Like many other raptor species, population parameters (e.g., reproductive success) of Ferruginous Hawks fluctuate according to prey abundance and availability. Natural fluctuations in the populations of ground squirrels are mirrored in the breeding parameters of Ferruginous Hawks. Although populations may appear healthy in ranching areas of Alberta, habitat for the species is saturated and there is quite strong evidence that the species is declining.

### **Limiting factors and threats**

Limiting factors in order of importance are likely increased human disturbance (particularly at nest sites), decreased prey abundance (Richardson's ground squirrel), loss and/or declines in habitat quality of native prairie grassland, interspecific competition (from other *Buteo* hawk species), and oil and gas exploration.

### **Special significance of the species**

The Ferruginous Hawk is a native prairie grassland specialist and is one of the least adaptable of several other species of prairie hawks.

### **Existing protection or other status designations**

The Ferruginous Hawk was listed as Threatened by COSEWIC in 1980, but was downlisted to Special Concern in 1995 by COSEWIC and is on Schedule 3 of the federal Species at Risk Act (SARA 2002). It is listed as Endangered under the Alberta Wildlife Act and as Threatened under the Manitoba Endangered Species Act. The species is not listed in Saskatchewan.



### COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

### COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

### COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

### DEFINITIONS (2008)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

\* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

\*\* Formerly described as "Not In Any Category", or "No Designation Required."

\*\*\* Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.



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**Update  
COSEWIC Status Report**

on the

**Ferruginous Hawk**  
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## SPECIES INFORMATION

### Name and classification

Scientific name: *Buteo regalis* (Gray 1844)

English name: Ferruginous Hawk

French name: Buse rouilleuse

Classification: Class: Aves, Order Falconiformes, Family Accipitridae.

According to chromosome analysis *Buteo regalis* is most closely related to the Gray Hawk (*B. nitidus*), Red-tailed Hawk (*B. jamaicensis*), Rough-legged Hawk (*B. lagopus*), White-tailed Hawk (*B. albicaudatus*), Roadside Hawk (*B. magnirostris*) and Harris' Hawk (*Parabuteo unicinctus*) (Schmutz *et al.* 1993). Despite their geographical separation, the Upland Buzzard (*B. hemilasius*), which occurs in central Asia, may be the most closely related species to the Ferruginous Hawk (Bechard and Schmutz 1995). Although there are two subpopulations of the Ferruginous Hawk, one on the east side and one on the west side of the Rocky Mountains, no subspecies have been recognized (Bechard and Schmutz 1995).

### Morphological description

The Ferruginous Hawk has broad, long wings with rounded tips and a fan-shaped tail, as well as a robust chest, large head and wide gape (Bechard and Schmutz 1995). It ranges from 56-69 cm in length and from 977-2074 g in mass. Although sexes are similar in plumage, females tend to have more pigmentation on their belly and legs. Females are also larger in mass and in maximum grasp between the toes. Two colour phases occur. In the more common pale morph, hawks have brown upper parts (with extensive orange-cinnamon and white markings on the shoulders and back), white underparts with brown streaks and a white to greyish tail. They have a characteristic "V" on their undersides formed by the dark reddish legs when flying. Other distinctive features include the white "window" in the fully extended primaries during flight, the head, which appears much whiter than other hawks from above and rufous shoulders/back.

The less common dark-phased birds have dark brown plumage (some feathers are edged with cinnamon) and a white or grey tail. Considerable variation occurs within each colour morph; adult morphs have variable proportions of dusky brown and ferruginous feathers on the underside and pale morphs have variable amounts of mostly ferruginous and some light neutral grey feathers in a band across the underside of the wings and belly.

## DISTRIBUTION

The Ferruginous Hawk breeds mostly in western North America from southern Canada (between the Rocky Mountains and Great Plains) southwards to northern Arizona and New Mexico (Figure 1). In Canada it occurs in southeastern Alberta (Figure 2; Semenchuk 1992, Downey 2006), southern Saskatchewan (Smith 1996), and extreme southwestern Manitoba (Manitoba Naturalists Society 2003). In British Columbia, the only confirmed breeding record was in 1968; it has been suspected that Ferruginous Hawks have bred since then in central southern interior B.C. because of the occasional presence of summering birds there (Campbell *et al.* 1990).

In the United States, the species breeds southwards from Canada through central and western parts of North and South Dakota (sparingly across northeastern South Dakota to Roberts and Deuel Counties), western Nebraska, westernmost Kansas (from Cove county, west), Thompson and Ely, Cimarron and Texas counties (Oklahoma), the northwest corner of the Texas Panhandle, and northern New Mexico and Arizona west to the Great Basin (eastern Nevada but breeding sparingly in the west), the Columbia River Basin regions of eastern Oregon and southeastern Washington (Bechard and Schmutz 1995).

In winter it is found from California, southern Nevada, Arizona, Colorado and western Kansas south to central Mexico.

Canada holds about 10% of the world's breeding distribution of the Ferruginous Hawk; estimates range from 8.4% (NatureServe data, P. Blancher pers. comm. 2007) to 12% (Schmutz and Schmutz 1980). Schmutz and Schmutz (1980) estimate that it now occupies only 48% of its historical range in Canada. The Canadian range now covers about 200,000 km<sup>2</sup>, of which about 20,000 km<sup>2</sup> is actually used by Ferruginous Hawks (assuming 2000 pairs, each using a territory of about 10 km<sup>2</sup>).

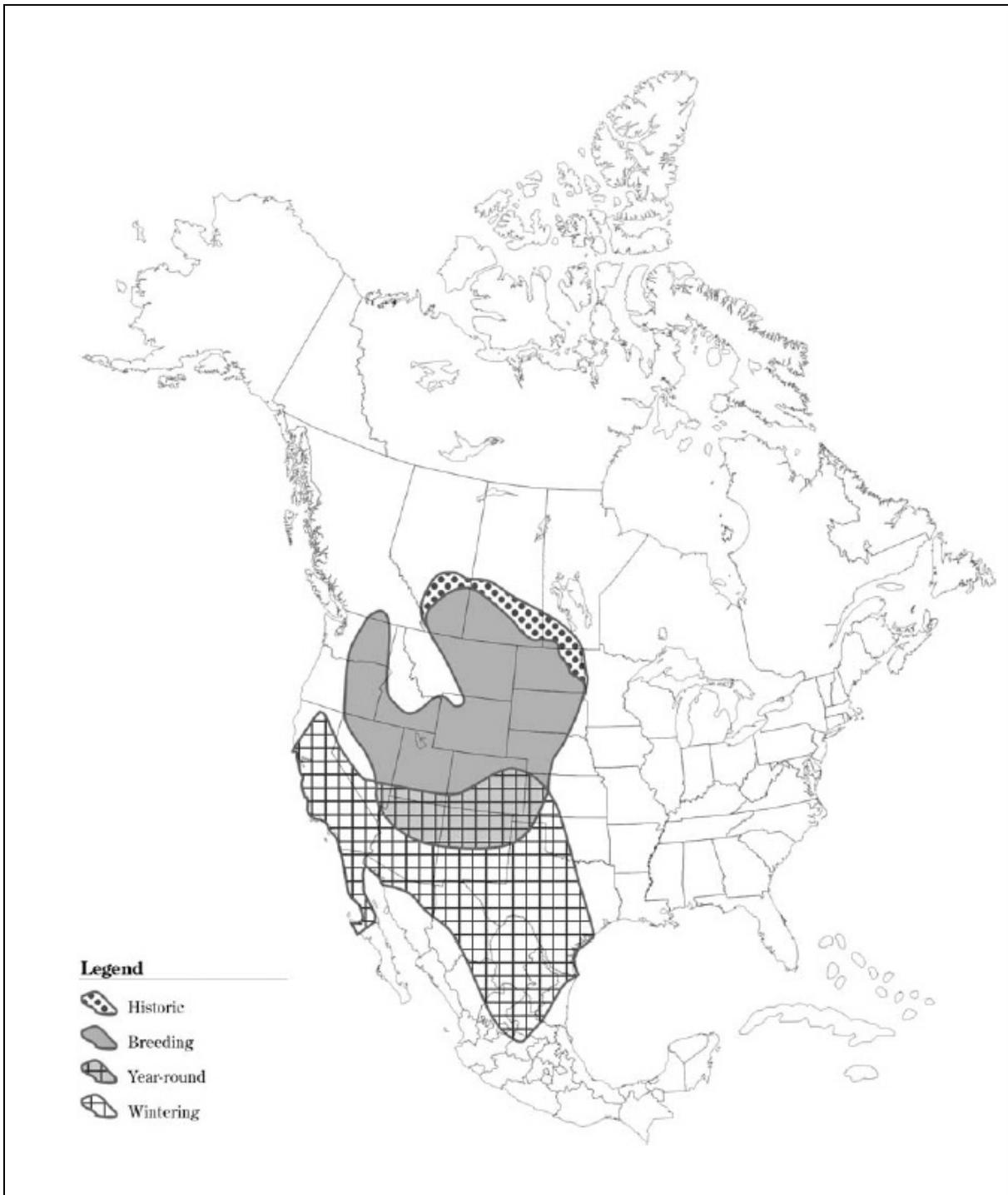


Figure 1. The distribution of the Ferruginous Hawk (from Downey 2006).

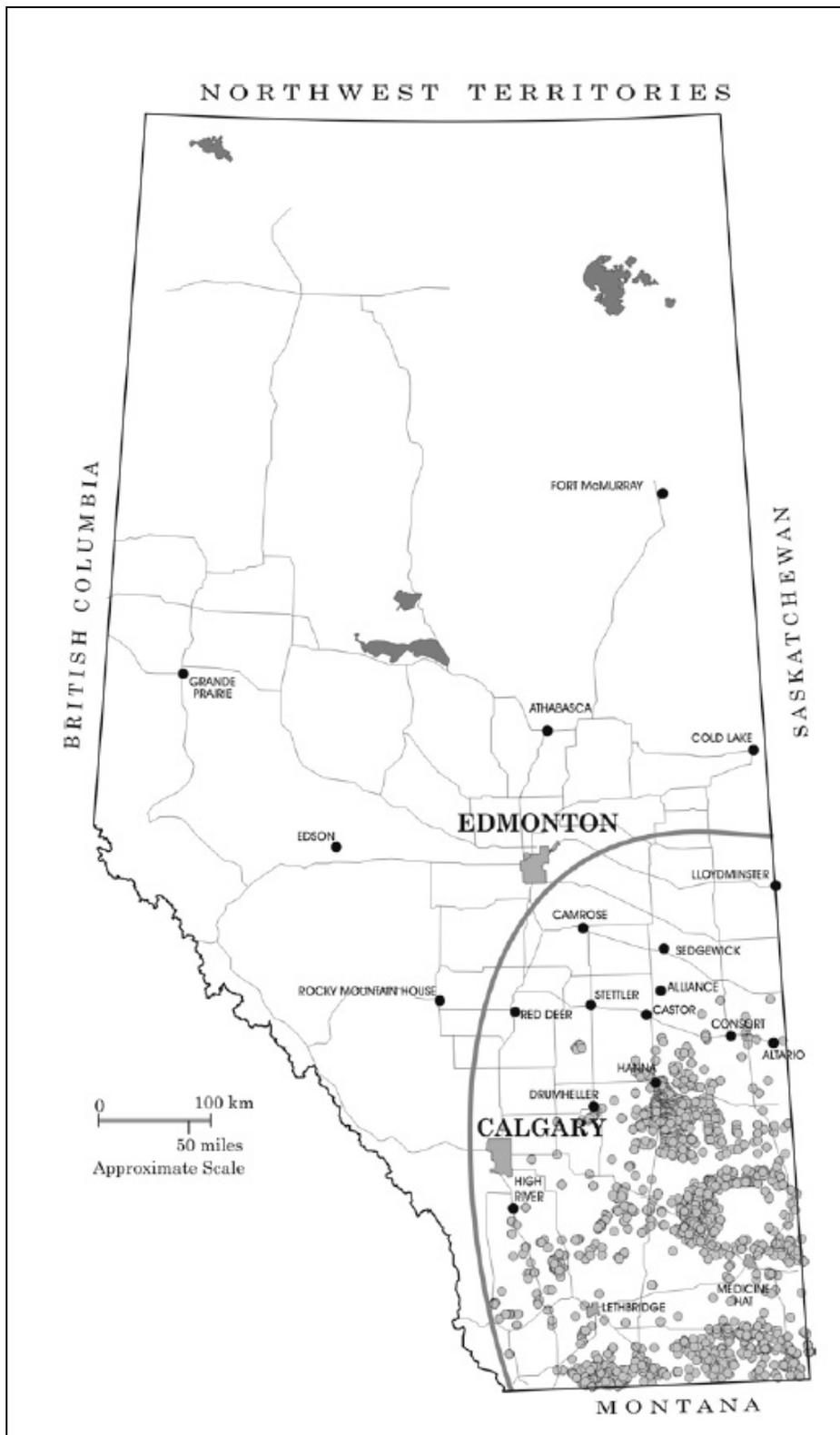


Figure 2. Ferruginous Hawk sightings in Alberta from 1958 to 2005; grey line indicates edge of historical range (from Downey 2006).

# HABITAT

## Habitat requirements

To the east of the Rocky Mountains, the Ferruginous Hawk is strongly dependent on native grasslands, whereas west of the Rockies, grasslands, shrub-steppes and other arid areas are heavily used (Bechard and Schmutz 1995). Aspen (*Populus tremuloides*) parkland, montane forests and areas of intensive agriculture are avoided. Based on the fact that the Richardson's ground squirrel (*Spermophilus richardsonii*), which are the most important prey item of the Ferruginous Hawk, prefers areas with >30% cultivation and a grass sward height <30 cm (Downey *et al.* 2006), it is likely that such habitat is also preferred by Ferruginous Hawks; this has been confirmed by a positive correlation between hawk nesting densities and densities of ground squirrels (Downey *et al.* 2005). Although Ferruginous Hawk territories may contain cultivated areas, nesting sites are generally located in pasture or native grassland (Figure 3; Schmutz 1993, Bechard and Schmutz 1995). Over much of the species' range, grasslands have been subject to destruction, degradation and fragmentation by urbanization, farming and industrial development (Bechard and Schmutz 1995). Ferruginous Hawks are very sensitive to habitat loss and are considered a native grassland specialist.

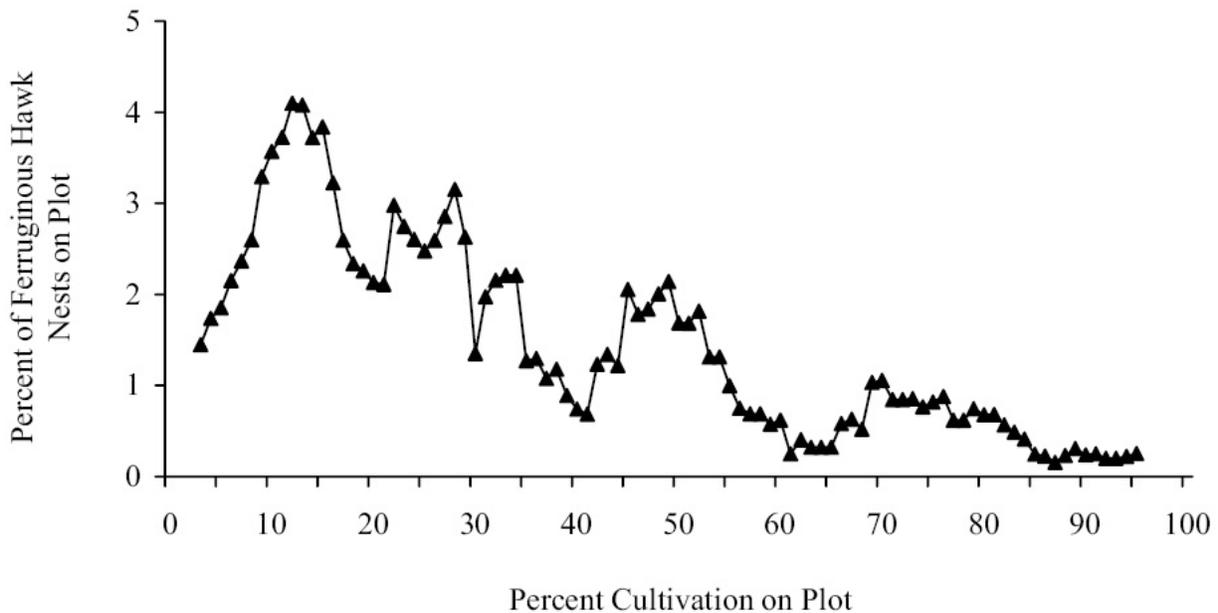


Figure 3. Frequency distribution of Ferruginous Hawk nests in relation to cultivation density on Alberta study plots (from Schmutz 1993).

## **Habitat trends**

The distribution of the Ferruginous Hawk retracted at the edge of its range in Canada during the early 1900s because of agriculture and fire suppression allowing the invasion of trembling aspen into the remaining native prairie grassland (Houston and Bechard 1984, Schmutz *et al.* 1992). However, trembling aspen invasion is not an issue in the drier parts of the Ferruginous Hawk range. A negative relationship between the proportion of land under cultivation and site occupancy by Ferruginous Hawks has been demonstrated many times in several different geographical areas (e.g., Gilmer and Stewart 1983, Woffinden and Murphy 1989, Schmutz 1993, 1994). One reason postulated for this relationship is the fact that Ferruginous Hawks are very sensitive to disturbance during the nesting season. However, there is some evidence that the type of disturbance is important; disturbance from mining causes nest desertion and productivity is low near oil and gas wells (Olendorff 1993, Stepnisky *et al.* 2004). Railroads do not disturb nesting pairs, but primary and secondary roads do as evidenced by the fact that Ferruginous Hawks nest further away from them than do Swainson's Hawks (Bechard and Schmutz 1995). The sensitivity of Ferruginous Hawks may cause pairs to avoid areas subject to disturbance or they may abandon nests leading to nest failure or they may relocate nesting territories elsewhere.

While Ferruginous Hawks are sensitive to disturbance, the fact that no significant change occurred in the proportion of cultivated land between 1982-2005 in the Alberta study population suggests that factors other than habitat loss to agriculture have caused declines in Ferruginous Hawk numbers (Downey 2005). These factors may include habitat loss to oil and gas, residential or other developments.

## **Habitat protection/ownership**

Most suitable land for Ferruginous Hawks is on privately owned/operated rangeland where native range prevails (Schmutz 1999, Houston 2004). Almost 500 km<sup>2</sup> of suitable habitat is protected in Grasslands National Park.

# **BIOLOGY**

## **Life cycle and reproduction**

Ferruginous Hawks are thought to breed for the first time at 2 years of age (Bechard and Schmutz 1995). The proportion of adults that breed is determined by prey availability, particularly in populations dependent on jackrabbits (west of the Rockies) and ground squirrels (east of the Rockies). It is also believed that breeding pairs may exhibit a nomadic tendency in relation to prey availability; this could explain "the dynamic nature of breeding populations" (Bechard and Schmutz 1995).

Clutch size is variable but clutches of 2-4 eggs are common (range 1-8; see Bechard and Schmutz 1995 for more details). In a recent study, Houston and Zazelenchuk (2006) found that, based on a survey of 1,433 nests, mean brood size ranged from <2.6 young per nest in very poor years to >3.2 young per nest in very good years. Little is known about lifetime reproductive success, but one banded male in Alberta contributed to the fledging of 20 young or more over a period of seven years (Bechard and Schmutz 1995).

In Alberta and Saskatchewan, annual adult survival rate was estimated to be 0.708 (SE = 0.024) while first year survival for nestlings was 0.545 (SE = 0.147) (Schmutz *et al.* 2008).

### **Predation**

Adult Ferruginous Hawks are probably not preyed upon by any species other than Great Horned Owls (*Bubo virginianus*) and humans; relatively few documented cases of nest predation exist. The vulnerability of hawk nests to predation varies depending on nest location. For example, Bechard and Schmutz (1995) considered coyotes (*Canis latrans*), American badgers (*Taxidea taxus*) and foxes (*Vulpes* spp.) as serious threats to ground nesting pairs and their young. Both crows (*Corvus* sp.) and Common Ravens (*Corvus corax*) prey on eggs and nestlings, whereas Great Horned Owls are the main predator of nestlings; Golden Eagles (*Aquila chrysaetos*) also prey on young (Bechard and Schmutz 1995).

### **Physiology**

No information.

### **Dispersal/migration**

Unlike the relatively sedentary or short-distance southern breeding populations, northern populations of Ferruginous Hawks (from Washington, Montana, North Dakota, Alberta and Saskatchewan) are migratory (Bechard and Schmutz 1995). Hawks from the north and central Great Plains generally stay to the east of the continental divide, follow grasslands during their migration, and prey on ground squirrels and prairie dogs. Their overwintering destinations are Oklahoma, Texas and northern Mexico (Bechard and Schmutz 1995, Houston and Zazelenchuk 2006). A Tri-National investigation of migration and winter ranges of the Ferruginous Hawk is currently underway (Watson and Banasch 2005); preliminary results demonstrate that Canadian hawks winter as far south as Oklahoma.

## **Interspecific interactions**

Ferruginous Hawks are generally harassed by other *Buteos* more often than they perpetrate harassment; in turn they harass Golden Eagles and Great Horned Owls because both of these species prey on young Ferruginous Hawks. On the overwintering grounds in Texas, both Golden and Bald Eagles (*Haliaeetus leucocephalus*) dominate in disputes over captured prey caught by Ferruginous Hawks. Swainson's Hawks are also dominant over Ferruginous Hawks in breeding areas (Bechard and Schmutz 1995).

The Ferruginous Hawk nests in habitats used extensively by Swainson's Hawks and, less frequently, by Red-tailed Hawks (*Buteo jamaicensis*). Joint defence of overlapping territories between Ferruginous Hawks and other *Buteos* can be either beneficial (increasing nesting success) or detrimental (reduced reproductive success) if interspecific agonistic interactions occur (agonistic interactions also occur against tethered intruders) (references in Bechard and Schmutz 1995). This is of interest because competition from other *Buteos* has been offered as one explanation as to why Ferruginous Hawks have declined in some areas (Schmutz 1984).

## **Adaptability**

Ferruginous Hawks appear to show poor adaptability, since they are a native grassland specialist; unlike the Swainson's Hawk they do not adapt well to agriculture.

## **POPULATION SIZES AND TRENDS**

### **Search effort**

Survey effort has varied considerably for Ferruginous Hawk surveys (Table 1), which affects the precision of population estimates. In 2006, about 15,400 km<sup>2</sup> of suitable habitat was searched for nests in Saskatchewan, including most of the known historical breeding sites; this represents about 12% of the species' range in Saskatchewan (U. Banasch, pers. comm. 2006). Because the previous four surveys in Alberta had relatively low precision, three new procedures were implemented for the 2005 survey of Ferruginous Hawks in Alberta (Downey 2005). First, the survey quadrats were stratified into two strata (< 50% and ≥ 50% native prairie); second, the number of quadrats was increased, and third, the study area was decreased to what it was previously in the 1987-1992 surveys (Taylor 2003, Saunders 2005).

## Abundance

In Canada, the densities of breeding Ferruginous Hawks are highest in Alberta (Table 1). However, breeding densities vary greatly depending on prey availability. For example, there was a five-fold difference in densities between surveys done in 1976-77 and 1984-88 and those done in 1987. Note that these surveys are not strictly comparable as they are based on different survey areas and searching intensities. Ferruginous Hawks occur at lower densities in Saskatchewan (Table 1) but over a larger area.

**Table 1. Breeding densities of Ferruginous Hawks from different studies. Searching intensity: a = "complete"; b = "complete with random sampling"; c = "maximizing".**

Location	Years	Study area (km <sup>2</sup> )	Nests/100 km <sup>2</sup>	Source
Alberta	1976-77 and 1984-88	480 <sup>a</sup>	11.6	Schmutz <i>et al.</i> 1980
Alberta	1987	74,686 <sup>b</sup>	2.3	Schmutz 1987
Saskatchewan	1978-1988	1,600 <sup>c</sup>	1.9	Harris 1989
Saskatchewan	1986-1988	2,862 <sup>a</sup>	1.5	Banasch 1989
Saskatchewan	2006	15,400 <sup>a</sup>	1.8	Banasch pers. comm. 2006
Manitoba	1988	1,843 <sup>c</sup>	1.1	De Smet and Conrad 1991

In Manitoba, the number of nesting pairs averaged 43.2 between 1987-2004 (range 11 in 1987 to 56 in 1991); the latest count was 42 in 2005 (K. De Smet, pers. comm.). In Saskatchewan, 900 breeding localities for Ferruginous Hawks have been documented; this includes records compiled during completion of the atlas (Smith 1996), and the addition of more recent records (A. R. Smith, pers. comm.). Assuming that there are probably many sites that are unknown, A. R. Smith (pers. comm.) estimates that there are at least 1000 sites in the province. In the Maple Creek study area there is a 50% occupancy rate (A. Smith pers. comm.), which suggests that there could be 500 pairs of Ferruginous Hawks in Saskatchewan. A second rough "guesstimate" for Saskatchewan is of 300-400 pairs (D. Zazelenchuk, pers. comm.).

The Saskatchewan survey undertaken in 2006 covered approximately 12% of the Ferruginous Hawk's range in that province. Searches were made throughout the range, but were not done randomly; all known historical sites were visited, augmented by other areas of suitable habitat (U. Banasch, pers. comm.). This survey found 278 nests but because of the non random way the survey was undertaken it is difficult to extrapolate this figure into an estimate of the overall Saskatchewan population. Considering the fact that all historical sites were checked and 278 nests were found, it seems likely that the Saskatchewan population is less than 500 pairs.

The latest estimate for the Alberta population is 618±162 pairs, or 1236 adult individuals (Downey 2006).

These provincial estimates (Alberta—618; Saskatchewan—500; Manitoba—42) suggest that the entire Canadian population could be less than 1200 pairs, half that estimated in 1998 (Kirk and Hyslop 1998).

### Fluctuations and trends

The Canadian range of Ferruginous Hawks has decreased by about half since the 1920s (Schmutz and Schmutz 1980).

Four sources provide data on trends in Canadian Ferruginous Hawk populations: 1) Long-term data on nesting productivity in Saskatchewan and Manitoba and population estimates in Alberta; 2) Breeding Bird Survey (BBS) results; 3) Migration counts from hawkwatches and 4) Christmas Bird Counts from the United States.

- 1) Surveys in Alberta in 1987 and 1992 suggested that the provincial Ferruginous Hawk population was 1,700 pairs (Schmutz 1987, 1993); however, by 2000 only about 731 pairs were found (Stepnisky *et al.* 2001, 2004). The latest estimate (2005) is of  $618 \pm 162$  pairs; this is considered a more precise estimate compared to the 2000 count, and is substantially reduced from the 1992 estimate (Downey 2005). As the survey was based on 93% of the Grassland Region, it is possible that some birds may have been missed in outlying areas but it is believed that this would add only 50 pairs (R. Quinlan in pers. comm. to Downey 2005). However, it is certain that the population in Alberta has been at a low since 2000, and has been declining since the early 1990s (Downey 2005). The population decline by about 64% between 1992 and 2005. Alberta population estimates are graphed in Figure 4.

Ferruginous Hawks show considerable fluctuations in breeding success in response to changes in the abundance of ground squirrels. In Alberta, Downey *et al.* (2003) found a positive correlation between Ferruginous Hawk numbers and densities of ground squirrels. Although historical data on ground squirrels in Alberta is limited, based on sales of poison used by farmers for ground squirrels (Schmutz and Hungle 1989) it is believed that ground squirrel numbers were high during the late 1980s and early 1990s. Nesting densities around Hanna, AB rose slightly from  $10.3 \pm 0.5SE$  per  $100 \text{ km}^2$  in 1975-77 to  $13.5 \pm 0.2$  in 1986-90, then declined sharply to  $4.4 \pm 0.6$  in 2001-06 (Fig. 4; Schmutz *et al.* 2008).

In Saskatchewan, Houston and Zazalenchuk (2006) recently examined productivity of 1,433 Ferruginous Hawk nests between 1969-2004 in relation to ground squirrel numbers. Between 1967-1987 (Period 1) when ground squirrel numbers were high, productivity averaged 3.0 young per nest. Nests with four and five young averaged 32% and 4% respectively of all nests examined. When ground squirrel numbers plummeted between 1988-1996 (period 2), average productivity of Ferruginous Hawks fell to 2.7 young per nest. By contrast with period 1, nests containing four and five young made up only 18% and 1%, respectively, of all nests examined. During 1997-2002 (period 3),

despite the fact that when ground squirrel numbers increased slowly and irregularly (reaching an estimated half of their initial numbers in 2003), productivity of Ferruginous Hawks averaged only 2.7 young per nest. Ferruginous Hawk productivity only started to increase in 2003-2005 when productivity again averaged 3.0 young per nest (Houston and Zazalenchuk 2006).

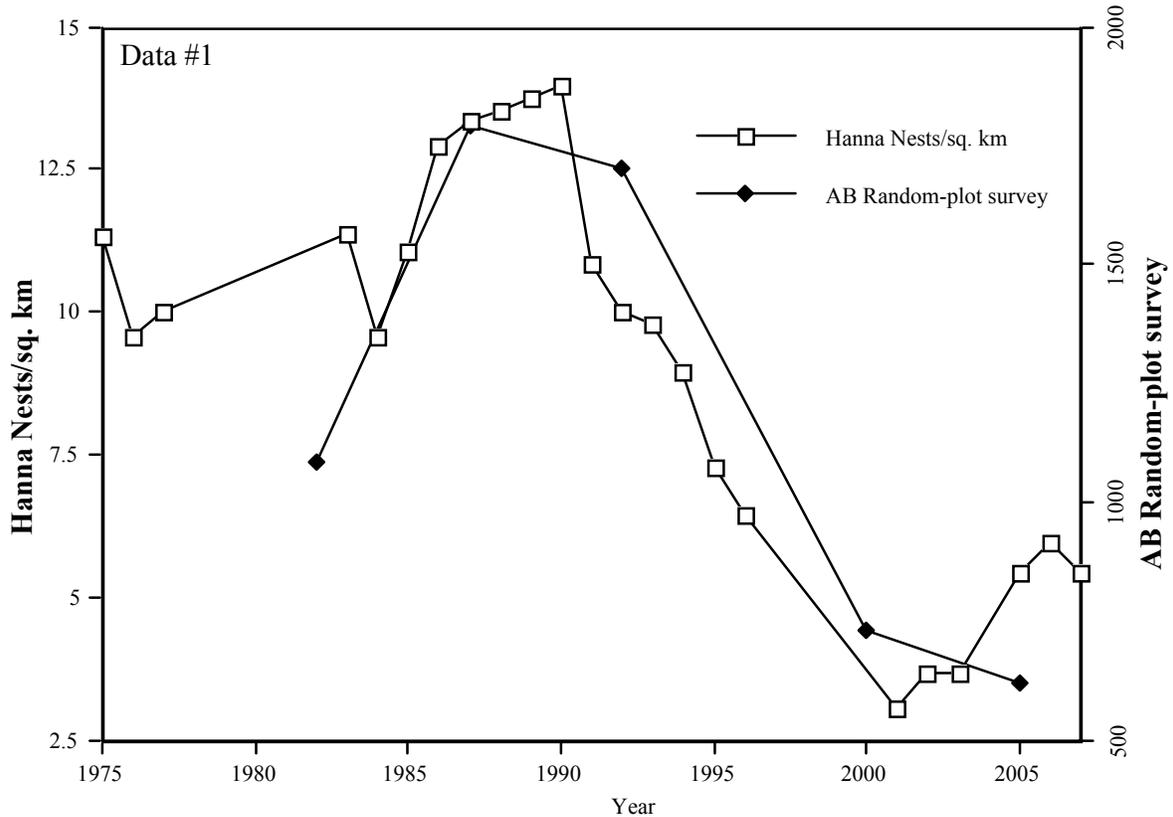


Figure 4. Estimated number of pairs of Ferruginous Hawks in Alberta and the density of breeding Ferruginous Hawks near Hanna, AB (data from J. Schmutz, pers. comm.).

**Table 2. Estimated number of Ferruginous Hawk pairs in Alberta (1982-2005); data from Schmutz (1993), except 2000 data from Stepnisky *et al.* (2002).**

Year	Number of Quadrats	Study Area (km <sup>2</sup> )	Estimated Number of Pairs	95% Confidence Limits	95% Confidence Intervals
1982	80	74,686	1082	40.5	653-1511
1987	83	77,947	1791	28.5	1307-2275
1992	85	77,947	1702	30.6	1181-2223
2000	86	77,947	731	50.1	364-1097
2005	147	77,157	618	26.2	456-780

- 2) BBS results, although based on a relatively small sample size, suggest a stable or increasing population trend for the Ferruginous Hawk in Canada (Table 3, Figure 5), but these indices are based on low sample sizes.

**Table 3. Breeding Bird Survey (BBS) annual trends for the Ferruginous Hawk for Canada, Alberta and Saskatchewan (Downes and Collins 2007). \*:  $0.05 < p < 0.10$ .**

Region	1968-2006	1968-1985	1986-2006	1996-2006
Canada	8.7 (51)	8.7 (15)	0.1 (44)	8.0 (33)
Alberta	7.4 (31)	---	2.5 (28)	10.1 (24)
Saskatchewan	1.1 (16)			

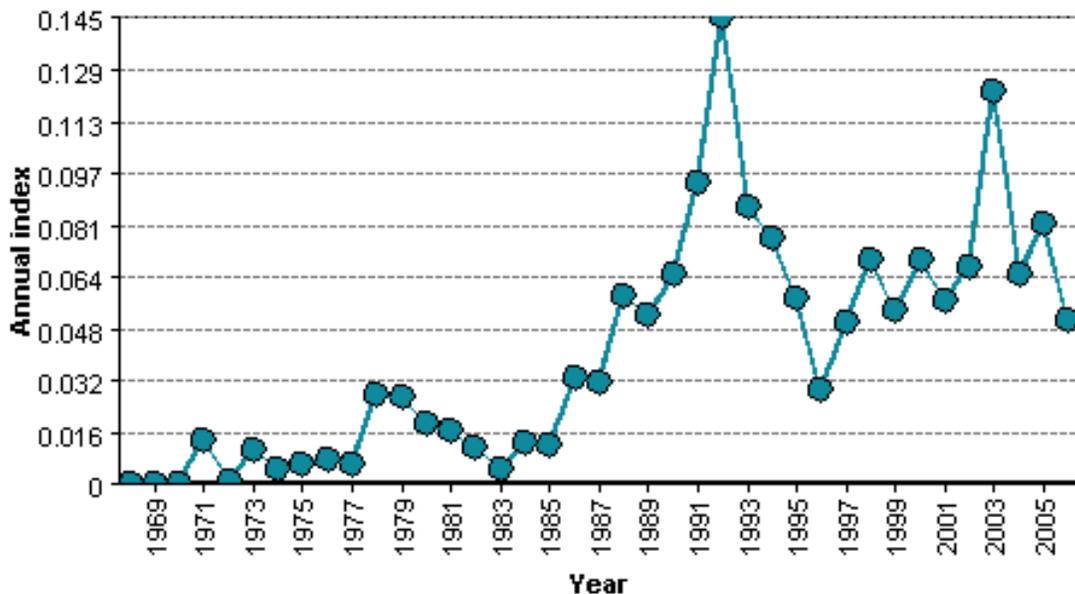


Figure 5. Annual population indices for the Ferruginous Hawk in Canada (Downes and Collins 2007).

- 3) According to the latest analyses from six hawkwatch sites in western North America, long-term declines have occurred in Ferruginous Hawk populations (Hoffman and Smith 2003). At two of these sites (Goshute Mountains, Nevada and Wellsville Mountains, Utah) passage rates increased until the early to mid-1990s, then decreased; long-term declines have occurred at the other two sites (Manzano Mountains, New Mexico and Lipan Point, Arizona). Passage rates were also below average for the other two migration sites since 1998 (Hoffman and Smith 2003).

- 4) Continental trends for the Ferruginous Hawk derived from the Christmas Bird Count data (1977-2001) indicate a significant quadratic trend (convex hill pattern, i.e. a bell-shaped distribution;  $P < 0.01$ ; National Audubon Society 2005). A more recent analysis of the same data produced a significant increasing annual population trend of  $2.1 \pm 0.7\%$  throughout the species' range over the last 40 years.

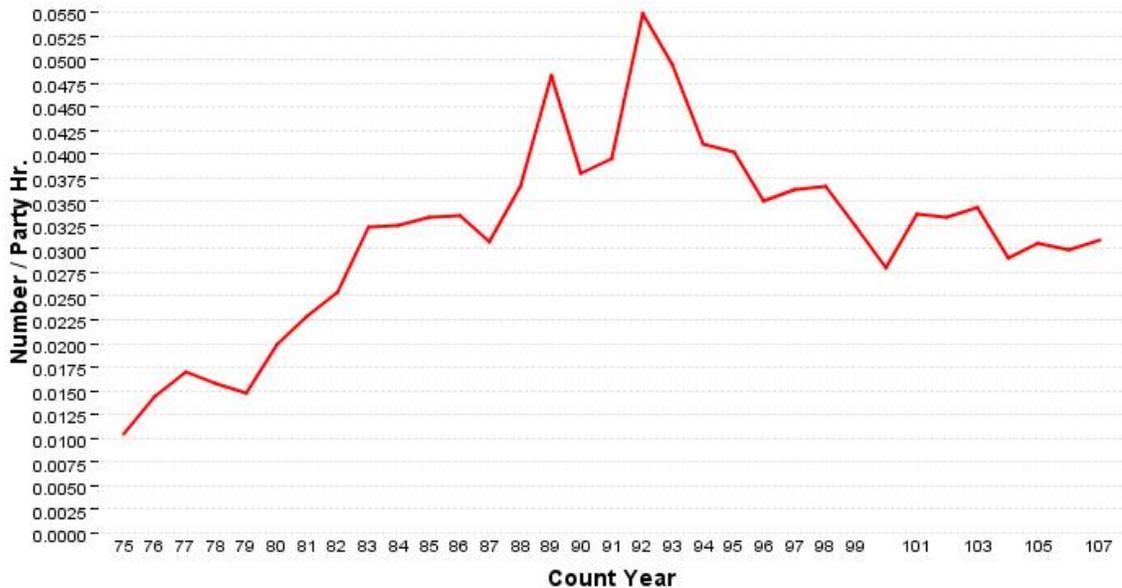


Figure 6. Christmas Bird Count totals for Ferruginous Hawk adjusted for effort, from the 75th count (1974-75) to the 107th count (2005-06). Data are from throughout the western United States.

In summary, BBS data and Alberta surveys both indicate an increase in population during the 1980s, followed by a decline in the 1990s. The present population seems to be lower in Alberta now than it was in the early 1990s, but the national population trend is rather unclear because there has not been a series of comparable population surveys in Saskatchewan. Demographic studies in Saskatchewan, however, show a decline in nesting density, and numbers in Manitoba have declined as well.

### Rescue effect

It is possible that, given the nomadic propensity of the Ferruginous Hawk, hawks could occupy vacated areas if native grassland habitat and an adequate prey base were available. However, little is known about the site fidelity of migratory populations or the extent of nomadism; there are few data on return rates of banded individuals (Bechard and Schmutz 1995).

## LIMITING FACTORS AND THREATS

Numerous factors are thought to limit populations of the Ferruginous Hawk. First, the range of the species has been reduced by 50% in Canada (Schmutz *et al.* 1992). Because hawks that die or vacate territories are replaced quickly by new individuals, Schmutz (1995) deduced that available habitat was saturated. Maintaining prairie grassland was identified as a priority in the recovery plan (Schmutz *et al.* 1994). Second, as for all raptors, there is a strong relationship between Ferruginous Hawk populations and their prey base (Newton 1979). In Canadian populations, the main prey is ground squirrels, and hawk reproduction is strongly tied to ground squirrel population fluctuations (Downey *et al.* 2004, Houston and Zazelenchuk 2006). It is possible that although historically populations of Ferruginous Hawks fluctuated with changes in ground squirrel populations, 1) the limited remaining grassland habitat preferred by ground squirrels provides a much-reduced prey base for hawks and 2) the magnitude and spatial scale of fluctuations in ground squirrel populations may be greater due to anthropogenic factors, though there is no firm evidence for this (B. Downey, pers. comm.). The hawk population that remains may be particularly vulnerable to disturbance at nests by humans. Other factors recently identified as possibly contributing to declines in Ferruginous Hawk populations are climate change, and oil and gas pipelines (Stepnisky *et al.* 2004; Downey 2005).

## SPECIAL SIGNIFICANCE OF THE SPECIES

The Ferruginous Hawk is unique in that it is a native grassland specialist strongly dependent in Canada on a keystone prey species, Richardson's Ground Squirrel.

## EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

In Canada, *B. regalis* is listed as being of 'Special Concern' by COSEWIC (last assessment in 1995). The species is currently listed under Schedule 3 of the Canadian Species at Risk Act (Statutes of Canada 2002). The Ferruginous Hawk is listed as Endangered under the Alberta Wildlife Act and as Threatened under the Manitoba Endangered Species Act. The species is not listed in Saskatchewan.

According to NatureServe, the global status of *B. regalis* is G4 (apparently secure). However, out of 17 states and three provinces where Ferruginous Hawks occur they are considered by NatureServe to be secure in only two states and one province (Figure 7). This species is listed as critically imperilled in one Canadian province (British Columbia, S1B – extremely rare throughout its range in the province with typically 5 or fewer occurrences or very few remaining individuals) and one state. It is imperilled in one province (Manitoba S2B – rare throughout its range in the province [6 to 20 occurrences or few remaining individuals] and may be vulnerable to extirpation due to rarity or other factors] and eight states; and vulnerable in one province (Alberta; S3B - ) and five states. It is listed as secure in only one province (Saskatchewan S4B) and two states. It was not assessed in one state.

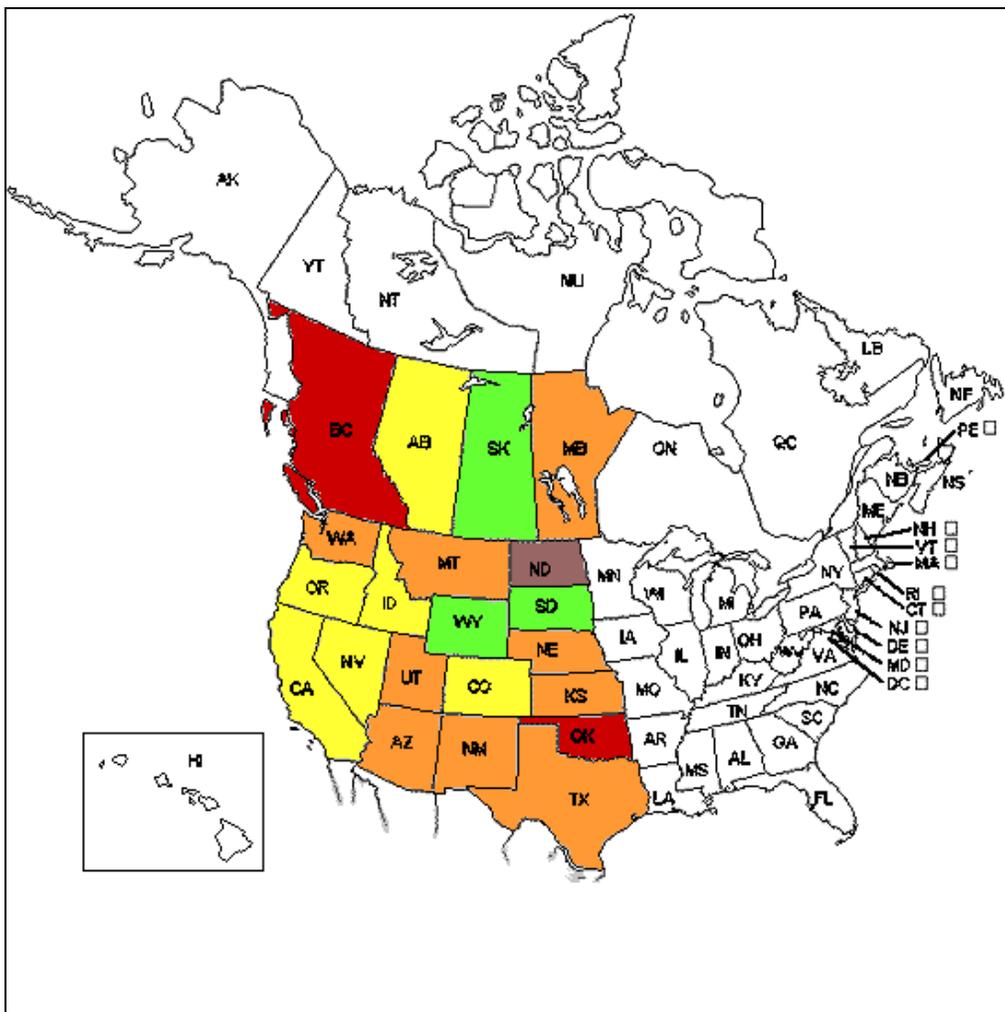


Figure 7. NatureServe ranks by province/state for the Ferruginous Hawk. Red = critically imperilled (S1); Orange = imperilled (S2); Yellow = vulnerable (S3); Green = apparently secure (S4); Purple = not ranked/under review.

## TECHNICAL SUMMARY

### ***Buteo regalis***

Ferruginous Hawk

Buse rouilleuse

Range of Occurrence in Canada: Alberta, Saskatchewan, Manitoba

#### **Extent and Area Information**

<ul style="list-style-type: none"> <li>• <i>Extent of occurrence (EO)(km<sup>2</sup>)</i> (NatureServe digital range map data)</li> </ul>	206,000 km <sup>2</sup>
<ul style="list-style-type: none"> <li>• <i>Specify trend in EO</i></li> </ul>	Decline, at least historically
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in EO?</i></li> </ul>	No
<ul style="list-style-type: none"> <li>• <i>Area of occupancy (AO) (km<sup>2</sup>)</i> assuming pairs use territories of 10 km<sup>2</sup> each</li> </ul>	Ca. 9600-12,000 km <sup>2</sup>
<ul style="list-style-type: none"> <li>• <i>Specify trend in AO</i></li> </ul>	Decline, at least in Alberta
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in AO?</i></li> </ul>	No
<ul style="list-style-type: none"> <li>• <i>Number of known or inferred current locations</i></li> </ul>	Not applicable
<ul style="list-style-type: none"> <li>• <i>Specify trend in #</i></li> </ul>	Not applicable
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in number of locations?</i></li> </ul>	No
<ul style="list-style-type: none"> <li>• <i>Specify trend in area, extent or quality of habitat</i></li> </ul>	Declining, at least historically

#### **Population Information**

<ul style="list-style-type: none"> <li>• <i>Generation time (average age of parents in the population) (adult annual mortality 30%, first breed at 2 years of age)</i></li> </ul>	Ca. 5 years
<ul style="list-style-type: none"> <li>• <i>Number of mature individuals</i></li> <li>• Alberta 618 pairs; Saskatchewan 300-500 pairs; Manitoba 44 pairs.</li> </ul>	Ca. 1200 pairs
<ul style="list-style-type: none"> <li>• <i>Total population trend:</i></li> </ul>	Declining in AB and MB, trend in SK unknown but likely declining
<ul style="list-style-type: none"> <li>• <i>% decline over the last/next 10 years or 3 generations.</i></li> </ul>	64% over last 13 years in AB (less than 3 generations); similar trend in Manitoba; no suitable data available from SK
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in number of mature individuals?</i></li> </ul>	No
<ul style="list-style-type: none"> <li>• <i>Is the total population severely fragmented?</i></li> </ul>	No
<ul style="list-style-type: none"> <li>• <i>Specify trend in number of populations</i></li> </ul>	Not applicable
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in number of populations?</i></li> </ul>	Not applicable
<ul style="list-style-type: none"> <li>• List populations with number of mature individuals in each</li> </ul>	

#### **Threats (actual or imminent threats to populations or habitats):**

Native grassland loss, degradation and fragmentation  
 Declining prey populations  
 Disturbance from oil and gas exploration

**Rescue Effect (immigration from an outside source)**

<ul style="list-style-type: none"> <li>• <i>Status of outside population(s)?</i> USA: Occurs in 17 states apparently declining in 13 of them</li> </ul>	
<ul style="list-style-type: none"> <li>• <i>Is immigration known or possible?</i></li> </ul>	Possible
<ul style="list-style-type: none"> <li>• <i>Would immigrants be adapted to survive in Canada?</i></li> </ul>	Yes
<ul style="list-style-type: none"> <li>• <i>Is there sufficient habitat for immigrants in Canada?</i></li> </ul>	No
<ul style="list-style-type: none"> <li>• <i>Is rescue from outside populations likely?</i></li> </ul>	Unlikely

**Quantitative Analysis**

Not done
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**Current Status**

COSEWIC: Special Concern (1995), Threatened (2008)
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**Status and Reasons for Designation**

<b>Status:</b> Threatened	<b>Alpha-numeric code:</b> A2b
<b>Reasons for Designation:</b> This large hawk is found primarily on natural grasslands in southern Alberta, Saskatchewan and Manitoba and is a specialist predator on Richardson's ground squirrels. It suffered a 64% decline in population from 1992 to 2005; since Alberta comprises the majority of the Canadian range, this implies a decline of at least 30% across the Prairies over that time period. The loss, degradation and fragmentation of its native grassland habitat are the most serious threats to the population.	

**Applicability of Criteria**

<b>Criterion A</b> (Declining Total Population): Meets Threatened A2b because of a known 64% decline over 3 generations in Alberta can be inferred to translate into at least a 30% decline throughout the Canadian range in the absence of trend data from Saskatchewan.
<b>Criterion B</b> (Small Distribution, and Decline or Fluctuation): Not applicable. Distribution too large.
<b>Criterion C</b> (Small Total Population Size and Decline): Not applicable. Population seems stable overall.
<b>Criterion D</b> (Very Small Population or Restricted Distribution): Not applicable. Population and distribution too large.
<b>Criterion E</b> (Quantitative Analysis): Not done.

## ACKNOWLEDGEMENTS AND AUTHORITIES CONSULTED

The authors wish to thank Environment Canada for funding the preparation of this report. Numerous persons provided information on population trends in Ferruginous Hawks; Ursula Banasch, Ken De Smet, Brandy Downey, Stuart Houston, Sue McAdam, Joe Schmutz, Al Smith, and Dan Zazelenchuk. Brad Downey and Gail Michener provided information and various publications on Richardson's ground squirrel.

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## **BIOGRAPHICAL SUMMARIES OF REPORT WRITERS**

Born in England, Dr. David Anthony Kirk immigrated to Canada in 1989 and for 16 years has worked as a self-employed research ecologist and Executive Director of Aquila Applied Ecologists. Most contractual agreements have been with the federal government of Canada (Environment Canada and Parks Canada), but David has also worked with conservation organizations such as World Wildlife Fund, NatureServe, and the Yellowstone to Yukon Conservation Initiative (with Jennie Pearce). He is particularly interested in integrating resource use with conservation of biodiversity both through ecologically sustainable land use practices and protected area networks. Specifically, this has involved research on 1) the effects of farming and forestry on biodiversity and 2) conservation planning and monitoring biodiversity at multiple scales. David has recently worked on environmental outlooks and scenarios and their implications for biodiversity and human well-being. Outside Canada, his research ranges from studying the effects of introduced hares on vegetation and avifauna of islands in the Seychelles and conservation of maquis vegetation in North Africa, to resource partitioning among sympatric vultures in South America. He has completed 12 previous COSEWIC status reports (6 full reports and 6 updates) and written over 30 peer-reviewed scientific papers and reports, on subjects as diverse as different approaches to the selection of indicators with reference to Canadian National Parks, to the effects of genetically modified organisms on biodiversity in Canada, and statistically robust approaches to inventory and monitoring of species at risk.

Dr Jennie L. Pearce was born in Australia and immigrated to Canada in 1999. In both countries her research has focused on spatial modelling of the distribution and abundance of wildlife; her Ph.D was on the endangered Helmeted Honeyeater *Lichenostomus melanops cassidix*. She is particularly interested in testing the accuracy of spatial models and how these can be used for solving landscape management concerns, such as conservation of endangered species, managing forests in an ecologically sustainable framework and allocating resource extraction industries over landscapes. She is also interested in the use of bioindicators for sustainable forestry, particularly for large and small mammals (including wolverine *Gulo gulo* and shrews), amphibians, carabid beetle and spider communities. She has published more than 25 scientific papers in this area, as well as participated in numerous workshops and conference proceedings.

### **COLLECTIONS EXAMINED**

No collections were examined during preparation of this status report.