

**HABITAT USE AND ABUNDANCE TRENDS OF
WINTERING RAPTORS IN THE FRASER DELTA
2005 – 2006**

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Picture from: The Illinois Raptor Center

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RENEWABLE RESOURCES
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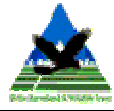
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May 2006



Summary

The Fraser Delta is a critical habitat for raptors which migrate to the area to take advantage of the abundant food and temperate climate. In addition, raptors stay in the Fraser Delta year-round. Delta Farmland and Wildlife trust has implemented programs to enhance wildlife habitats, especially for wintering raptors, while promoting sustainable farming strategies. This report documented the abundance trends and use of different habitat types by wintering raptors in the farmland of Delta, B.C. Car surveys were conducted from November 2005 to March 2006 along six transects throughout Delta. Plots were placed every 500 m along each transect. The survey area was divided into eight field types: berry crop, corn stubble, crop residue, tall grass, short grass, bare field, winter cover crop and other. Species, age, sex, field type, behaviour, time, and weather conditions were recorded for each raptor spotted.

Species spotted during surveys were northern harrier, (*Circus cyaneus*), red-tailed hawk, (*Buteo jamaicensis*), bald eagle, (*Haliaeetus leucocephalus*), rough-legged hawk, (*Buteo lagopus*), sharp-shinned hawk, (*Accipiter striatus*), peregrine falcon, (*Falco peregrinus*), American kestrel, (*Falco sparverius*), Cooper's hawk (*Accipiter cooperii*), Short-eared owl (*Asio flammeus*), merlin (*Falco columbarius*), snowy owl, (*Nyctea scandiaca*), and gyrfalcon (*Falco rusticolus*). Bald eagles were the most commonly seen raptors in the study area; however they showed little habitat preference in terms of field types. Their population increased dramatically at the end of December as they migrated to the Fraser Delta for winter. Northern harriers were the second most commonly seen raptor in Delta and appeared to favour tall grass field types.

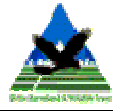
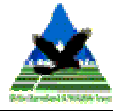


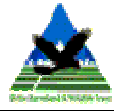
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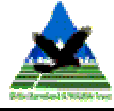
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1.0 Introduction

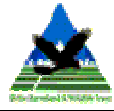
1.1 Background

The Fraser River delta is very important for both agriculture and wildlife. Its long growing season and soils makes it one of the most productive agricultural areas in Canada. The Fraser delta is also recognized as one of Canada's important bird areas (Delta Farmland and Wildlife Trust, 2005). The delta is an open, flat landscape located on the Pacific flyway (Delta Farmland and Wildlife Trust, 2005). Each year the Fraser delta attracts at least 1.5 million migrating birds (Merkins, pers. comm.). These birds will either stop to rest and feed or remain in Delta for winter. Many species of bird also live in the Fraser delta year round (Delta Farmland and Wildlife Trust, 2005). The clear, flat areas that make up the Fraser Delta are ideal for raptors as it allows for clear visibility of prey. Cover from grass, particularly long grass, makes excellent habitat for prey species such as the Townsend's vole (*Microtus townsendii*), house mouse (*Mus musculus*), and deer mouse (*Peromyscus maniculatus*).

Population growth in nearby centres throughout Delta has been causing urban encroachment. Over 2 million people live within 60 km of Delta (Merkins, pers. comm.). Pressure is continually increasing to develop the valuable agricultural land of Delta for urban and industrial development. These decreasing agricultural lands are important habitat for many wildlife species including raptors (Delta Farmland and Wildlife Trust, 2005).

1.2 Delta Farmland and Wildlife Trust

Delta Farmland and Wildlife Trust (DF&WT) is an organization dedicated to protecting agricultural lands and the wildlife habitat in it. It was started in 1993 by local conservationists and farmers who were concerned about the decreasing space for valuable agricultural lands and wildlife due to urban and industrial development. DF&WT are currently working with local farmers to preserve wildlife habitat within these agricultural



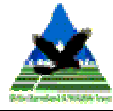
lands. Some current projects include encouraging farmers to plant winter cover crops, forming five-year grassland set-asides and planting hedgerows. These projects will improve habitat for wildlife, while improving agricultural value of the land and promoting sustainable agriculture (Delta Farmland and Wildlife Trust, 2005).

The grassland set-aside program is a stewardship program set up by the DF&WT to improve wildlife habitat. Farmers are given financial compensation to set aside areas of their land for four years as grass is allowed to grow. Small mammals, particularly the Townsend's vole utilize grasslands set-asides. Northern harriers (*Circus cyaneus*) and red-tailed hawks (*Buteo jamaicensis*) have shown a preference for tall grass habitats and frequently hunt in grassland set-asides (Bland et al., 2001; Crook et al. 2004). Savannah sparrows (*Passerculus sandwichensis*), common yellowthroats (*Geothlypis trichas*), and barn swallows (*Hirundo rustica*) have all been known to breed in grassland set-asides. Besides wildlife values, grassland set-asides benefit farmers by stabilizing surface soil, adding nutrients to soil and absorbing water (Merkins, pers. comm.).

Winter Cover Crops is a DF&WT stewardship project aimed at improving wildlife habitat during the non-growing season. The primary wildlife focus is to provide forage for thousands of migrating waterfowl such as snow geese (*Chen caerulescens*) and Canada geese (*Branta canadensis*) that stop or winter in the Fraser delta. Winter cover crops are beneficial for farmer as well because they decrease erosion, add nutrients to soil and act as a diversionary food to distract waterfowl from commercially important crops (Merkins, pers. comm.).

1.3 Project Objectives

Managing habitat for raptors is important because they play an important ecological role by controlling small mammal and songbird populations. Many of their prey species such as voles, deer mice, and house mice feed on vegetation and/or seeds and could be



detrimental to farmland. The prey species may also be detrimental to ecosystem health if numbers were allowed to get too high. The primary objectives of this study were to document and assess:

- different farmland habitat of different raptor species in winter.
- relative abundance of each raptor species spotted in the Fraser Delta
- raptor abundance over winter.

This study will help to monitor the effectiveness of the DF&WT's Cover Crop and set-aside programs. This study will also help to identify habitat types that need to be enhanced to increase raptor use.

This project is a continuing study to assess winter habitat used by raptors. This study was conducted by Markus Merkins in 1999-2000, and by BCIT Fish, Wildlife & Recreation students in 2000-2001 (Bland et al., 2001), and in 2003-2004 (Crook et al. 2004). In previous year's surveys, the most frequently and consistently recorded birds have been the bald eagle and northern harrier (Bland et al., 2001). Northern harrier, red-tailed hawks, and merlin showed a preference for long grass. Rough-legged hawks showed a preference for short grass and cover crop (Merkins, pers. comm).

2.0 Study Area

2.1 Site Description

Our study area was in the Fraser River delta in BC (Figure 1). The city of Delta is one of the southern most cities in the lower mainland. The population of Delta is 97,210 people, which are separated into three areas, Ladner, North Delta, and Tsawwassen (Corporation of Delta, 2005). Delta consists primarily of farmland, urban and protected areas, and is surrounded by the Fraser estuary to the west and, Boundary Bay to the south-east. The area is in the dry maritime subzone of the Coastal Western Hemlock (CWHdm)

Biogeoclimatic zone. The mean annual precipitation is 1827 mm and the mean annual temperature is 9.8 degrees Celsius (Meidinger and Pojar, 1991). Climate along the west coast is highly influenced by the ocean, causing high precipitation, and mild summers and winters.



Figure 1. Delta, BC, is in the southern lower mainland, surrounded by the Fraser estuary to the west and Boundary Bay to the south-east (adapted from Mapquest, 2005).

2.2 Field Types

Our study area was divided into eight field types, each with different habitat characteristics: crop residue, corn stubble, bare field, short grass, tall grass, cover crop, berry crop, and other.

Crop residue field type contained rotting remains of vegetables harvested in 2005. Most of these fields consisted of the remains of cabbage, beans pumpkins, carrots, rutabaga, and turnip (Figure 2). Many birds, particularly migrating waterfowl, will feed on the rotting vegetation in these fields (pers. obs.).



Figure 2. Harvested cabbage field, an example of winter crop residues field type in Delta, B.C. (photo by: C. Fairbrother 2005).

Corn stubble field type consisted of cornfields that had been harvested in 2005. They were not placed in the same category as crop residue because northern harriers would often hunt in corn stubble, but not in other crop residue (Merkins, pers. comm.). Some corn stubble fields contained only rows of short stalks, which provided little cover for small mammals (Figure 3). Other corn stubble fields contained taller stalks with foliage still on the stalks, which provided more cover for small mammals than fields of short corn stalks.



Figure 3. An example of a corn stubble field type in Delta, B.C. (photo by: C. Fairbrother).

Bare field types were composed of areas of exposed soil that had been harvested of all vegetation and showed no sign of being planted with a winter cover crop. These fields contained little or no cover or food for wildlife (Figure 3).



Figure 4. An example of bare field type in Delta, B.C. (photo by: C. Fairbrother 2005).

Short grass field types were classified as areas with a consistent short grass cover. They included pastures, harvested hayfields (Figure 4), turf farms, and golf courses, and some first year set-asides. They provided more cover value than bare fields, crop residue, and corn stubble.

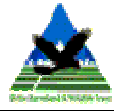


Figure 5. Harvested hayfield, an example of a short grass field type in Delta, B.C. (photo by: C. Fairbrother 2005).

Tall grass field types were classified as areas of grass growing taller than 20 cm. Tall grass consisted of most DF&WT set-asides, and old, unmaintained fields. These fields have excellent cover and food value to small mammals, particularly the Townsend's vole. Second- to fourth-year set asides had the highest vole and shrew populations (Merkins pers. comm.).



Figure 6. Grassland set-aside, an example of tall grass in Delta B.C. (photo by: C. Fairbrother, 2006)



Winter Cover Crops are another DF&WT project. Farmers were encouraged by DF&WT to plant winter cover crops to reduce winter soil erosion, replenish nutrients in the soil, and improve wildlife habitat for birds and small mammals (Figure 5). Common winter cover crop species included wheat, oat, rye, clover, fall rye and timothy.



Figure 7. An example of winter cover crop in Delta, B.C. Grass is planted before corn is harvested and grows through winter (photo by: C. Fairbrother 2005).

Berry crop field type consisted of cranberry and blueberry fields. Cranberry plants grow low to the ground and provide constant, unbroken cover (Figure 8). Blueberry plants are grown in rows, are shrub like, and provide inconsistent cover for small mammals.



Figure 8. Cranberry field, an example of berry crop in Delta, B.C. (photo by: C. Fairbrother 2006).

Other habitat types consisted of man-made structures such as roads, houses, barn, greenhouses, train tracks and dykes (Figure 6).



Figure 9. A road and buildings, examples of other field types in Delta, B.C. (photo by: C. Fairbrother 2005).

3.0 Methods

Surveys began 23 November 2005 and finished in early March 2006. Methods for this survey were adapted from the inventory protocols developed by B.C. (RISC, 2001). We surveyed six transects throughout the study area (Figure 10). Plots were set up 500 m apart along each transect. We spent five minutes at each plot watching for raptors. For each raptor, species, sex, age, behaviour, field type, weather conditions, and time spotted was recorded. Positions of each raptor were identified on maps provided by DF&WT. Surveys were completed every 10-14 days, starting at 08:00 and ending between 13:00 and 14:30. Transects were surveyed in a different order every survey day, to decrease time bias.

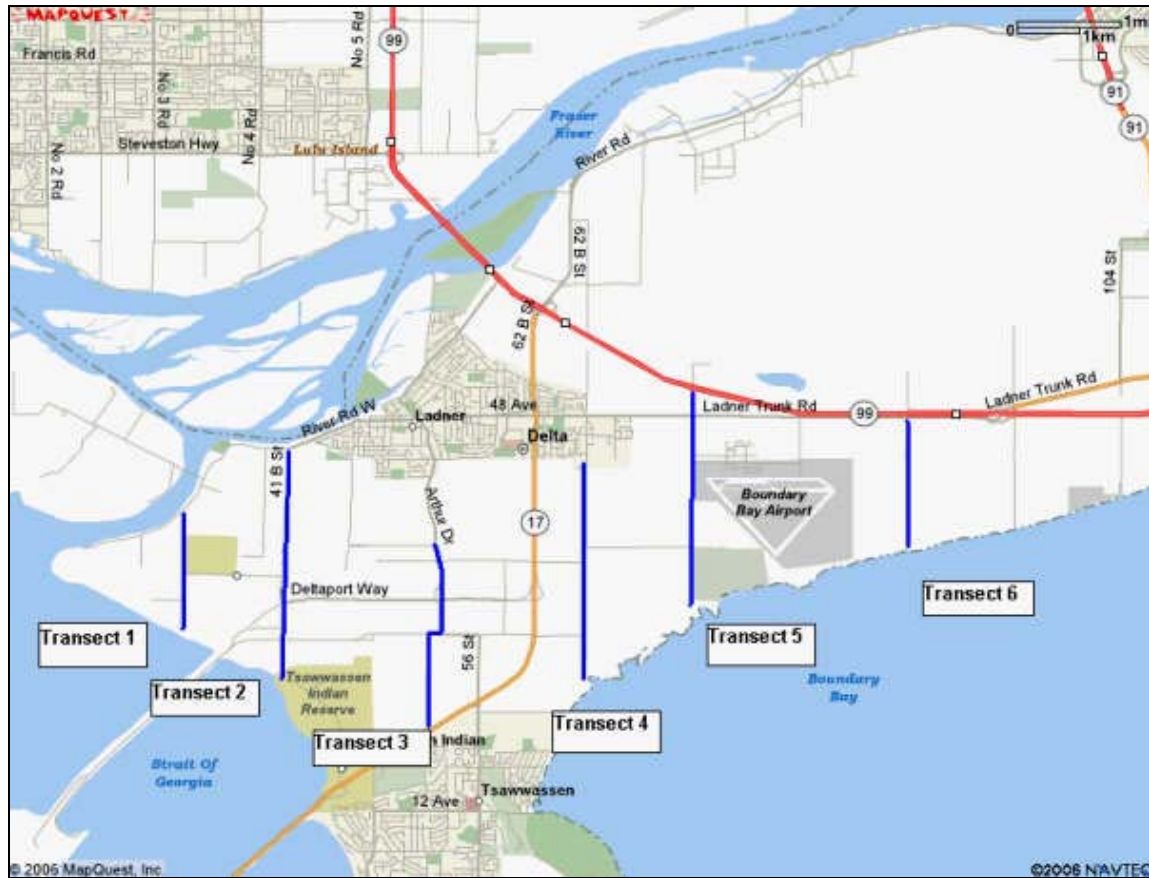
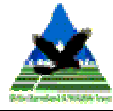


Figure 10. Six study transect locations in the Fraser delta (adapted from Mapquest 2006).

Because northern harriers often nest and perch in tall grass, their detectability varies between field types. To eliminate this bias, we did not count any perching harriers. Also, when calculating habitat use, we only included harriers that were flying low to the ground (under 15 m).



4.0 Results

4.1 Abundance Trends

Raptors spotted in the study area during surveys included bald eagles, northern harriers, red-tailed hawks, rough-legged hawks, Cooper's hawks, sharp-shinned hawks, merlins, American kestrels, peregrine falcons, and snowy owls. Bald eagles, northern harriers, and red-tailed hawks were the most common, with bald eagles being by far the most common (Table 1).

Table 1. Total numbers of raptors observed during surveys in Delta, 2005-2006.

Species	Total
bald eagle	551
norther harrier	204
red-tailed hawk	83
rough-legged hawk	10
peregrine falcon	6
American kestrel	4
Merlin	2
sharp-shinned hawk	2
Cooper's hawk	2
snowy owl	3
short-eared owl	1
gyrfalcon	1
Total	869

Bald eagle detections increased throughout the beginning of the winter, peaking in early February (Figure 11). After the peak, bald eagles started to decline but their population did not return to what it was at the beginning of the surveys in November. Minor fluctuations in northern harrier detections occurred between January 3 and February 19 but like the bald eagles, they also peaked in early February (Figure 11). After February 19, Northern harrier detections decreased rapidly. The red-tailed hawk population seems to vary from survey to survey, with a slight decline near the end.

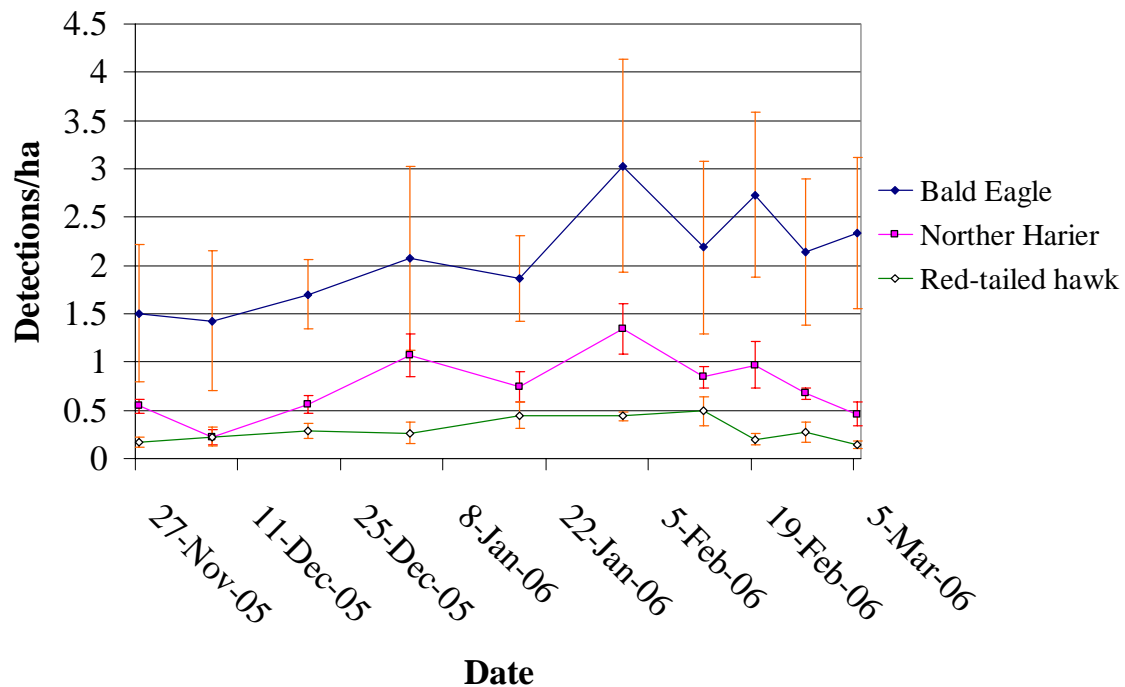
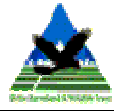


Figure 11. Detections per hectare of bald eagle, northern harrier, and red-tailed hawk with 90% confidence intervals over ten surveys in Delta, B.C.

4.2 Habitat Use

Bald eagles showed a preference to other field types and bare field and showed avoidance of cover crop field types (Figure 11). Most bald eagles detected were perched on tall trees or telephone poles. Those perched on the ground were usually on bare field or short grass (pers. obs.).

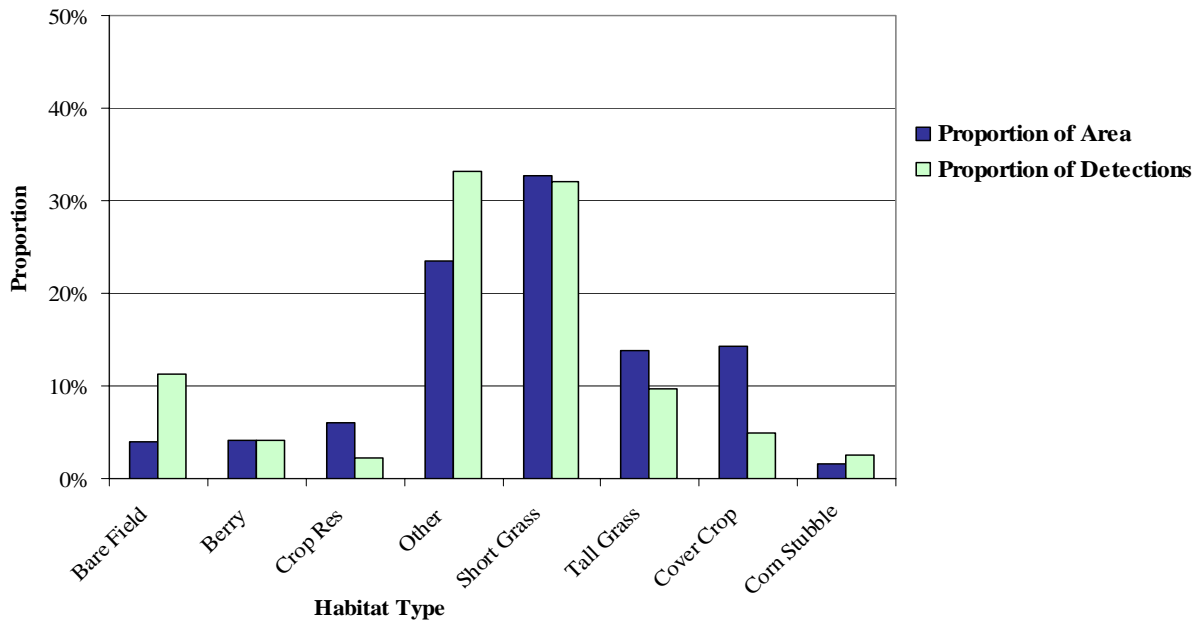
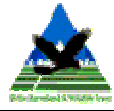


Figure 12. Proportion each field types in the study area compared to proportion of bald eagles found in each field type. Habitat preference is shown by the proportion of detections being significantly greater than the proportion of area.

Northern harriers showed a prominent preference to tall grass field types and avoidance to short grass and other field types (Figure 12).

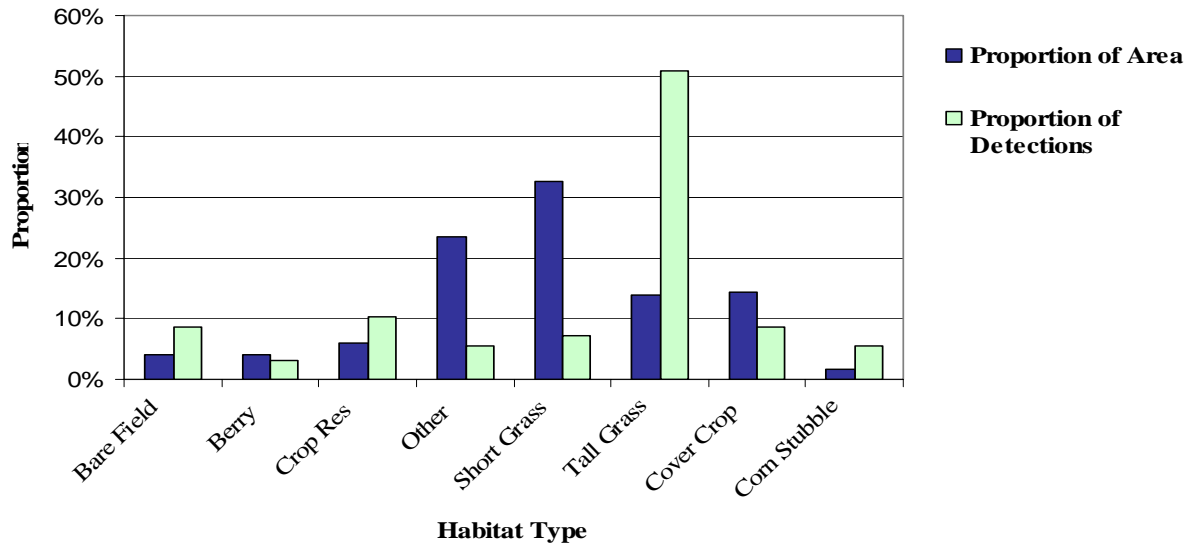
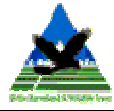


Figure 13. Proportion each field types in the study area compared to proportion of northern harriers found in each field type. Habitat preference is shown by the proportion of detections being significantly greater than the proportion of area.

Red-tailed hawks showed a preference to tall grass habitats, and some avoidance of other habitats (Figure 13).

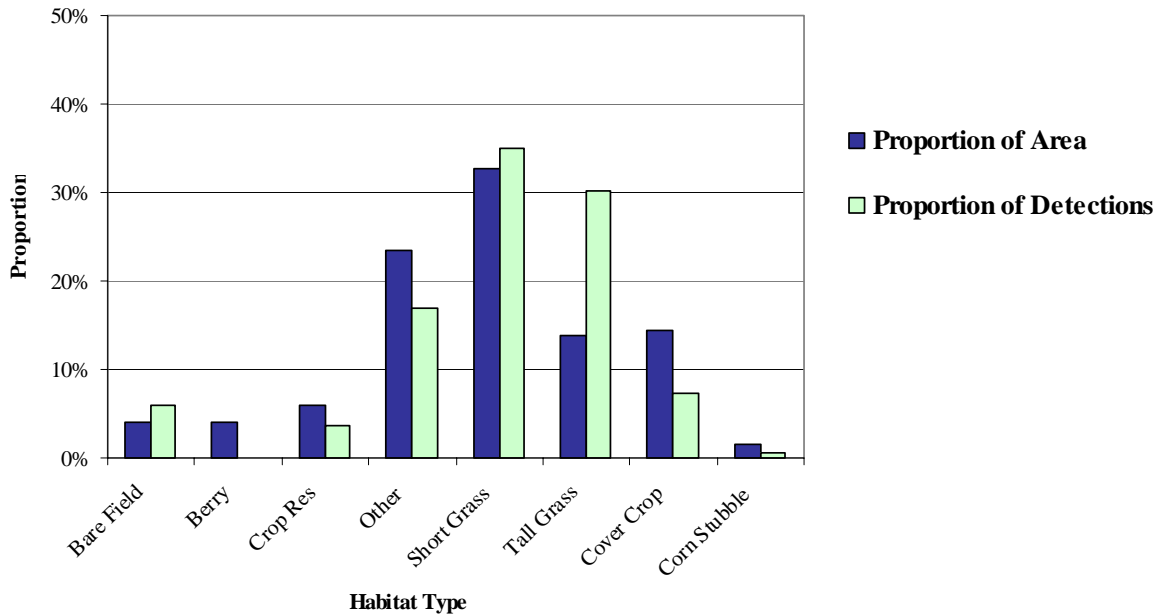
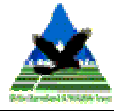


Figure 14. Proportion each field types in the study area compared to proportion of red-tailed hawk. Habitat preference is shown by the proportion of detections being significantly greater than the proportion of area

5.0 Discussion

5.1 Abundance Trends

Bald eagles winter along the coast of B.C., because of mild climate and abundant food (Figure 15) (Herkert *et al.* 1999). Their seasonal migration depends greatly on food supply such as fish and waterfowl (Dunwiddie and Kuntz, 2001). Previous studies in both the Fraser Delta and the Skagit Valley have shown that bald eagle populations start to increase near the end of November (Bland *et al.* 2001; Crook *et al.* 2004). The increase in population is possibly due to increase in migrating waterfowl. Similarly, the decrease could have been caused by the dispersing of the migrating waterfowl.

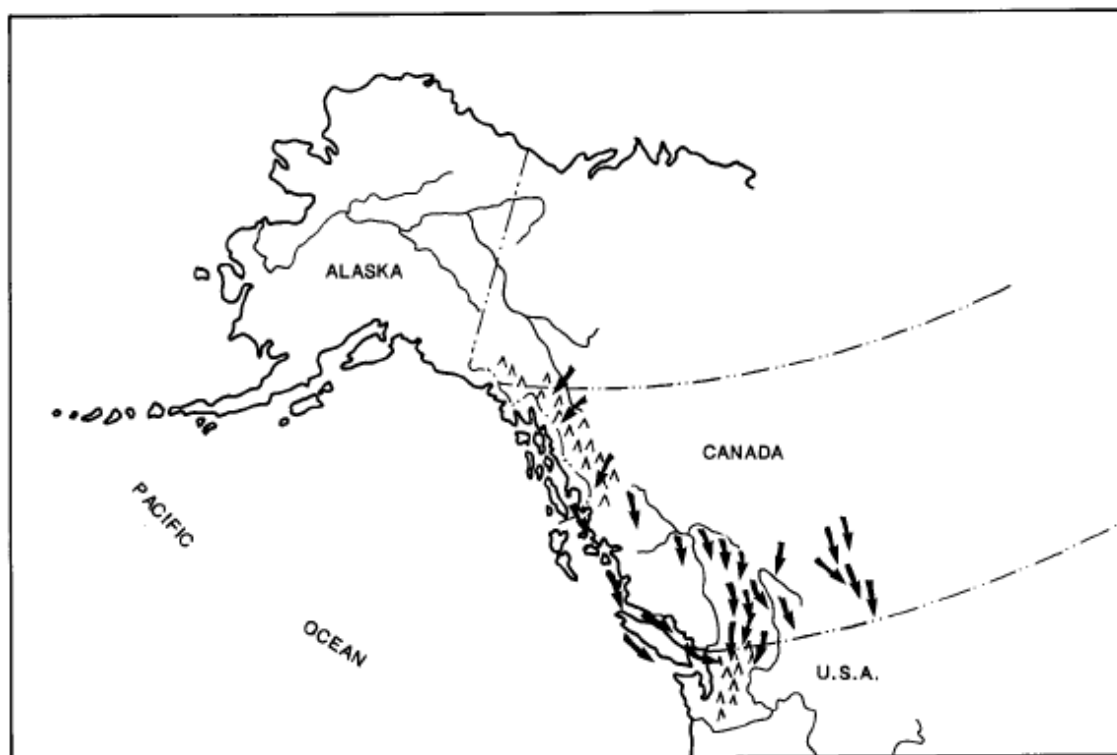
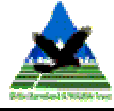


Figure 14. Hypothetical movement of the bald eagles in B.C. during October, November and December. Picture taken from Blood and Anweiler (1994)

Confidence intervals for the bald eagle large because eagles were not spread evenly through the transects. A large proportion of the eagles were found on one transect. In the earlier surveys, they were mostly found near the water on transect one. Throughout the winter, they began to disperse along the transect. This could have been because the transect was a flyway between the ocean and a garbage dump (Merkins pers. comm.)

Northern harriers also migrate to the Fraser delta for winter and disperse to their breeding grounds in spring (Crook et al.). This would have accounted for their detections increasing until late February as they arrived in the Fraser delta, and then decreasing after that as they left for their breeding grounds. Northern harrier behaviour seemed weather dependant as they were rarely seen hunting or flying during heavy rain or wind (pers. obs.). Minor fluctuation between surveys on January 3 through February 19 could have been due to poor weather during some of the survey days.

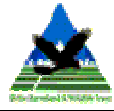


5.2 Habitat Preferences

Northern harriers nest on the ground in grassland or marshes and are usually found flying low over grasslands, or perching on the ground or low perches near grassland (Sibley 2004). In Illinois, northern harriers have been found to prefer nesting in grasslands that have been undisturbed for more than 12 months (Herkert et al. 1999.). Previous studies in the Fraser delta by Crooke et al. (2004) and Blande et al. (2001) have also shown that northern harriers prefer tall grass habitat. Tall grass provides more ground cover than other habitat types in the Fraser delta.

Tall grass provides good habitat for small mammals, which could explain the preference to tall grass for both northern harriers and red-tailed hawks. The Townsend's vole, which makes up 80-90% of the food for raptors in the Fraser Delta, will quickly colonize a grassland set-aside that is two years or older (Merkins pers. comm.). Two other common prey species, deer mice and shrews, are more abundant in two-year-old set-asides than in one-year-old set-asides (Merkin pers. comm.). Also, grassland set-asides that are only on a two year rotation have been shown to support lower densities than a two year old grassland set-aside on a four year rotation. One-year-old set-asides tend to have much shorter grass than the older set-asides, suggesting that small mammals are drawn to the tall grass habitats (Merkins pers. comm.).

Bald eagles are thought to be habitat ambivalent (Merkins pers. comm.). However, our data showed preference to other habitats and bare field. Most bald eagles detected throughout the study were perched on telephone poles or tall trees. Most trees in the study area were in residents' yards, while most telephone poles were on the edge of roads or dykes. Roads, dykes, and yards were all classified as other habitat type. The preference shown to other habitat type was likely due to the availability of high perches, rather than other habitat factors such as food or cover. Most bald eagles seen in bare fields were perched on the ground. A possibility for this is that the detectability of ground perched bald eagles is greater than ground perched bald eagles in other habitat



types. Another possibility is that bare field lacks cover, so eagles can effectively watch the area around them.

5.3 Limitations

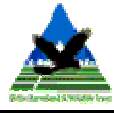
This study did not decipher between old field habitat and grassland set-asides, nor did it identify what stage of the cycle grassland set-asides were in. All set-asides were lumped together as tall grass habitat. As a result, we could only show the importance of grassland set-asides to wintering raptors in Delta rather than showing the effectiveness of grassland set-asides.

We did our surveys primarily in the day, when short-eared owls show little activity and are usually roosting in tall grass (Sibley 2004). As a result, our representation of short-eared owl populations in the study area was very likely much lower than what was actually there.

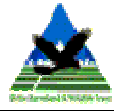
Weather also may have created some bias in our study. Heavy rain and fog decreased our visibility, making it hard to detect raptors near the outer boundaries of the study area. Raptors, particularly northern harriers, seemed to remain covered and out of sight during strong winds or rain. This could have created fluctuations in detections between surveys, that which could have been misinterpreted as an abundance trend.

6.0 Recommendations

We recommend that the study be continued by future BCIT students and DF&WT technicians to record changing raptor abundance trends and habitat use. The Grassland set-aside demonstrated important habitat therefore should be continued. For future studies, more research could be done to study the uses of different aged grassland set-asides and old field habitats. This would help determine the importance of each age of grassland set-asides and old fields. In addition to raptors found in the study area, raptors found near or adjacent to the study site should be noted. This will help determine

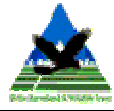


other important habitat areas and presence detected of raptors. Our final recommendation is there should be at least two teams spotting and recording data on different transects. This will speed up the survey and cover more of the study area. By conducting the studies faster, the related time bias will be reduced.

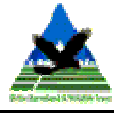


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Appendices



Appendix II – Raw Data