



**BARRED OWL HABITAT USE AND
DISTRIBUTION IN THE
FOOTHILLS MODEL FOREST**

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Abstract

The objective of this two-year study is to determine the key habitat features important to the Barred Owl (*Strix varia*) in the Foothills Model Forest. The Barred Owl was chosen because of its possible dependence on older forests. Broadcast surveys were conducted from March through May, 1995. Six species of owls were recorded: Barred Owls (*Strix varia*), Boreal Owls (*Aegolius funereus*), Great Gray Owls (*Strix nebulosa*), Great Horned Owls (*Bubo virginianus*), Northern Saw-whet Owls (*Aegolius acadicus*) and Northern Pygmy Owls (*Glaucidium gnoma*). Live capture efforts using mist nets resulted in one female Barred Owl being radiotagged. Twenty-nine territorial Barred Owls were recorded in the first field season. Barred Owls were found to be associated with older mixed wood stands containing trembling aspen and white spruce. Results to date are presented.

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Introduction

The introduction of large forestry companies into Alberta has prompted many new research opportunities in the boreal forest. A two-year project was initiated in west-central Alberta to study the ecology of Barred Owls (*Strix varia*). The Barred Owl is of interest because of its possible dependence on mature/old forests. The Barred Owl has the potential to serve as an indicator of these forests (James 1993). According to Allen (1987), the large size classes and decadent nature of forests near water provide ideal cover and nesting cavities. Older forests (in Alberta) are characterized by large diameter trees, a multilayered canopy, a high canopy closure, and dead standing and downed woody material.

The Barred Owl is easily recognized by the horizontal streaking on the upper chest and neck and vertical streaking below. They are the only species of owl in Alberta that has dark brown eyes (Robbins *et al.* 1983). There is little information existing on the Barred Owl in western Canada. James *et al.* (1995) found good numbers of Barred Owls in the Prince Albert Model Forest, Saskatchewan. Semenchuk (1992) reported only eight breeding records of Barred Owls in Alberta. Barred Owls are found to be concentrated in the boreal forest region north of Edmonton, in the foothills/montane forests west of Calgary, and in Jasper National Park (Beck, pers. comm.). There have been recent sightings in the Wabasca region and nesting in the La Crete area in northern Alberta (Takats 1995). There is little information on the habitat use of the Barred Owl in Alberta.

Farr (1992) noted that forests managed primarily for fibre production undergo regional changes in vegetation patterns, particularly in the age class distribution of forest stands. The purpose and rationale of this study was to determine what key habitat features the Barred Owls in the Foothills Model Forest require so that forest managers may develop a management strategy to ensure the survival of this species. The Foothills Model Forest's mission is "to develop and recommend an approach to sustainability and integrated resource management through research and technology by means of collaborative partnerships."

Habitat suitability index models (HSI) provide habitat information useful for impact assessment and habitat management. The models synthesize information of habitat use into a framework appropriate for field application and are scaled to produce an index value between 0 (unsuitable habitat) and 1 (suitable habitat) (Allen 1987, Van Horn and Weins 1991).

Objectives

The objectives of this study were five-fold:

1. To determine the distribution and abundance of the Barred Owl in the Foothills Model Forest.
2. To determine the habitat associated with the Barred Owls presence and to provide this information to forest managers to be used in better forest management for wildlife.
3. To determine the prey available to, and the prey selected by, the Barred Owl.
4. To use the habitat components that are most important to the Barred Owl to validate the Foothills Model Forest Draft Habitat Suitability Index Model for the Barred Owl (Olsen *et al.* 1995).
5. To determine the distribution and abundance of other owls in the Foothills Model Forest.

Methods

Study Area

The Foothills Model Forest (FMF) is located in west-central Alberta, Canada (Figure 1) and includes boreal, montane, and sub-alpine forests. The dominant tree species are lodgepole pine (*Pinus contorta*), trembling aspen (*Populus tremuloides*), and white spruce (*Picea glauca*), with pockets of black spruce (*Picea mariana*), balsam poplar (*Populus balsamifera*), Douglas fir (*Pseudotsuga menziesii*), and subalpine fir (*Abies lasiocarpa*).

Distribution

Owls vocalize to communicate with their mates, to delineate their territory, and to signal its occupancy (Nicholls and Fuller 1987). Ten call playback transects were randomly laid along roads within 80 km of the town of Hinton (Figure 2). Transects had to be accessible in winter conditions and had to have limited use (safety and detectability of owls). This ensured that a diversity of habitats were surveyed. Transects were 16 km in length to facilitate 10 equally spaced calling stations. Counts were not conducted in inclement weather (wind >15 km/hr, temperature <-25°C, or precipitation) because it has been found that these weather conditions directly affect winter raptor counts (Fuller and Mosher 1987). Two test transects were conducted during inclement weather to determine whether this was true in this region.

At each point a two minute listening period was followed by a series of Barred Owl calls (Sony tape player). Playback recordings effectively elicit Barred Owl vocalizations (McGarigal and Fraser 1985). Test transects were run to test which species of owl calls would work best. Responses from all species of owls were noted. The distance from and direction to the owl, the interval of response, and the type of response were all recorded. Each transect was visited four times between March and May, 1995. Broadcast surveys were conducted during the breeding season because response rate during the non-breeding season is significantly lower (Bosakowski 1987). The transects were visited randomly in three time slots, 20:00 to 23:59, 0:00 to 3:59, and 4:00 to 7:59.

Other locations of owls were recorded from sightings by other researchers in the region, and by conducting call surveys in other areas. All species of raptors on or near Barred Owl territories were recorded throughout the season as these species are potential competitors. A Christmas Bird Count was conducted in Switzer Provincial Park on January 31, 1995. Owl broadcast surveys were conducted between 4:00 and 8:00 and between 21:30 and 23:30, and bird surveys were conducted during the day.

Telemetry

Barred Owls are secretive and it is difficult to determine their nesting and foraging sites. As well, it is difficult to produce continuous data on movements of owls (Nicholls and Warner 1972). For this reason, radio telemetry was used to help track their movements. Live capture efforts began in late May (trapping equipment did not arrive until then). Mist nets were suspended between poles and set in an L-shape on the territory of a Barred Owl (Nicholls and Fuller 1987, Bloom 1987). A mechanized Barred Owl decoy accompanied by taped calls was used to attract the Barred Owls to the mist nets. In July, drop-lid traps were employed, as owls no longer respond well to taped calls (Kenward *et al.* 1983). Drop-lid trapping hours were shared with a northern

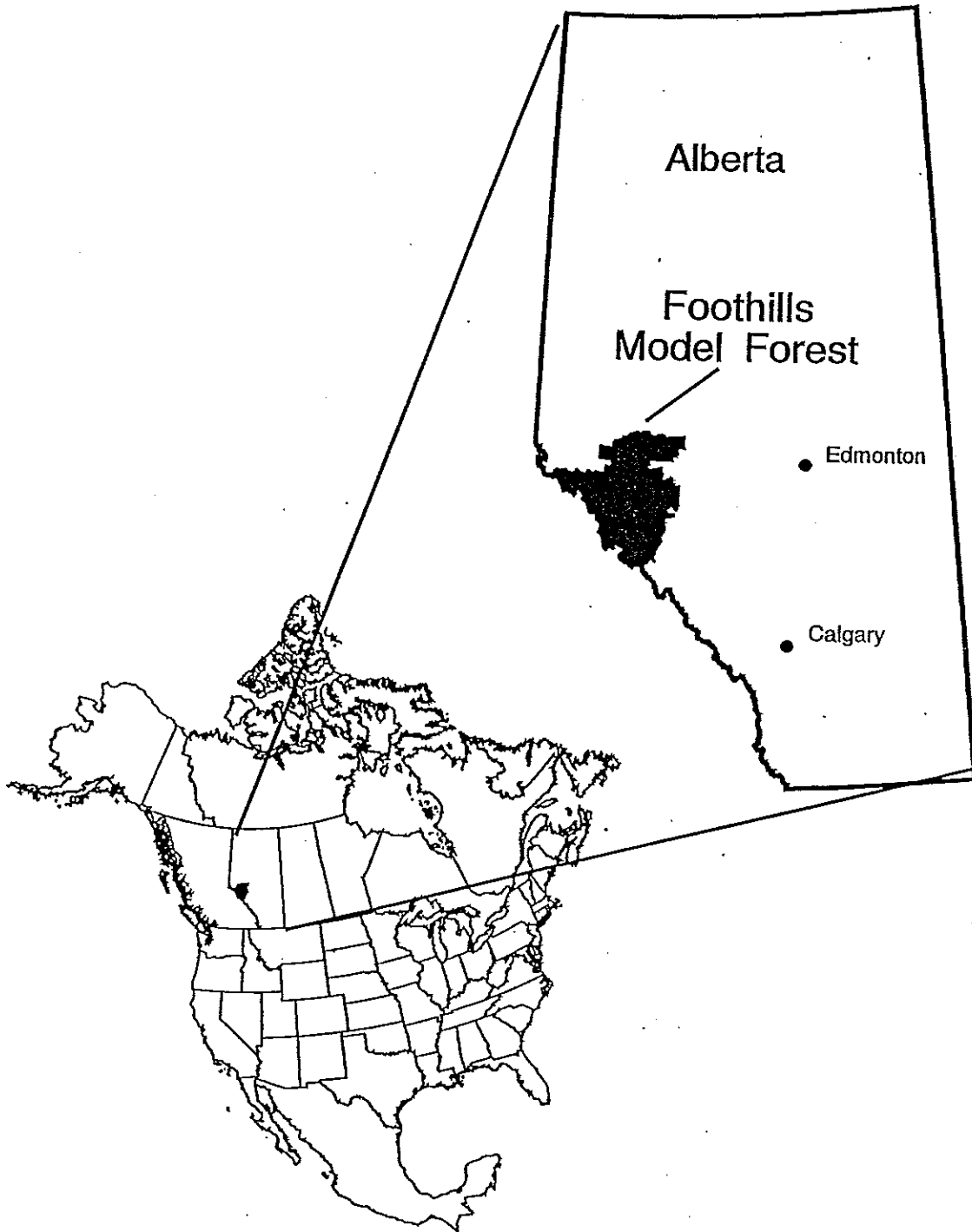


Figure 1: Map showing the location of the Foothills Model Forest.

goshawk study. Traps were checked twice during the day and once at night. Backpack transmitters with eighteen month batteries were used to allow for winter habitat monitoring.

Habitat Use

Barred Owl nesting, roosting and foraging habitats were determined by three methods. The first method was to investigate the habitat of owls that had responded on the transect surveys. The second method was triangulation and walking in on radiotagged owls. Radio telemetry was difficult in the foothill terrain of the FMF but all steps were taken to ensure accurate readings (Guetterman *et al.* 1991). Readings were discarded if the angle between readings was less than 20 degrees and if the area of the triangle was larger than 5 ha. The third method was audio triangulation and walking in on owls that were calling spontaneously. Locations were classified, when possible, as nesting, roosting, or foraging. If nesting was suspected, then the area where a pair was found was investigated and all possible nest trees were tapped to flush the female. Nests are very difficult to locate, as they leave little sign of their presence (Court, pers. comm.).

Vegetation surveys were conducted at known owl nest, roost, and forage sites. These surveys were modeled on Timony (1993) and Bibby and Burgess (1992) nested plot methods. Each vegetation survey had a center plot and four plots set in cardinal directions 30 m away. The nest/roost/forage tree was considered the center of the survey. Each plot of the vegetation surveys recorded information on trees in a 0.04 ha area, shrubs in a 0.004 ha area, and herbs in four one 1 m² areas (averaged).

Prey Determination

Another variable that is important to consider the prey of the Barred Owl (O'Neil *et al.* 1988). Nest observations, pellets, and prey remains will be important in determining what prey the raptors are consuming (Holroyd, pers. comm.). Searches were made for pellets and prey remains. Walking in to watch owls forage was also used. All potential prey species in owl territories were recorded over the field season.

Results

Distribution

Test transects showed that Barred Owl vocalizations elicited the best response. In addition, precipitation and wind were found to have a significant effect on the calling of owls. A total of six species were recorded on the transect surveys: Barred Owls (*Strix varia*), Boreal Owls (*Aegolius funereus*), Great Gray Owls (*Strix nebulosa*), Great Horned Owls (*Bubo virginianus*), Northern Saw-whet Owls (*Aegolius acadicus*) and Northern Pygmy Owls (*Glaucidium gnoma*) (Table 1). Sixteen territorial Barred Owls were recorded during the broadcasts.

Densities were calculated for the Barred Owl, the Boreal Owl and the Great Horned Owl. The total area surveyed was 10 transects X 16 km (length) X 2 km (width) = 320 km². The boreal owl was found in high densities (0.17 owls/km²). In many cases, the Boreal Owl was calling spontaneously before Barred Owl calls were played. Great Horned Owls and Barred Owls both had densities of 0.05 owls/km². Densities were not calculated for the other owl species because Great Gray Owls respond poorly to Barred Owl calls, Northern Saw-whet Owls did not begin responding until May, and Northern Pygmy Owls are daytime callers.

Table 1: Numbers of territorial owls recorded on the transect surveys (density=owls/km²)

Transect	Barred Owl	Boreal Owl	Great Gray Owl	Great Horned Owl	Northern Saw-whet Owl	Northern Pygmy Owl
1	3	5	0	2	2	0
2	2	12	0	1	0	0
3	2	3	0	3	1	1
4	0	9	0	1	2	0
5	1	2	1	2	3	0
6	2	3	0	1	3	0
7	1	9	1	2	0	0
8	3	3	0	2	1	0
9	1	3	0	2	2	1
10	1	6	0	1	6	0
Total	16	55	2	17	20	2
*Density	0.05	0.17	-	0.05	-	-

There were areas where no (or very few owls) called during the transect surveys: Switzer Campground, points 6 to 9 on TriCreeks transect; Pedley transect; and Blackcat points 1 to 4.

There were many locations of owls apart from the transect surveys. Thirteen more territorial Barred Owls were discovered. Of the total 29 territorial Barred Owls, four were paired (Figure 2). Others could have been paired, but time did not allow for investigation into this. Three Great Gray nests, three Great Horned Owl nests and three Northern Saw-whet nests were recorded (Table 3). Table 3 shows the total numbers of all owls recorded during the field season. The Boreal Owl was the most abundant owl recorded. Sixty-one territorial Boreal Owls were found.

Table 2: Sightings of owls apart from transect surveys.

Species	Sightings	Nests	Young	Fledged
Barred Owl	13	0	-	-
Boreal Owl	6	0	-	-
Great Gray Owl	10	3	2/2/1	2/2/0
Great Horned Owl	13	3	2/2/1	2/2/1
Northern Saw-whet Owl	21	3	????	????
Northern Pygmy Owl	5	0	-	-

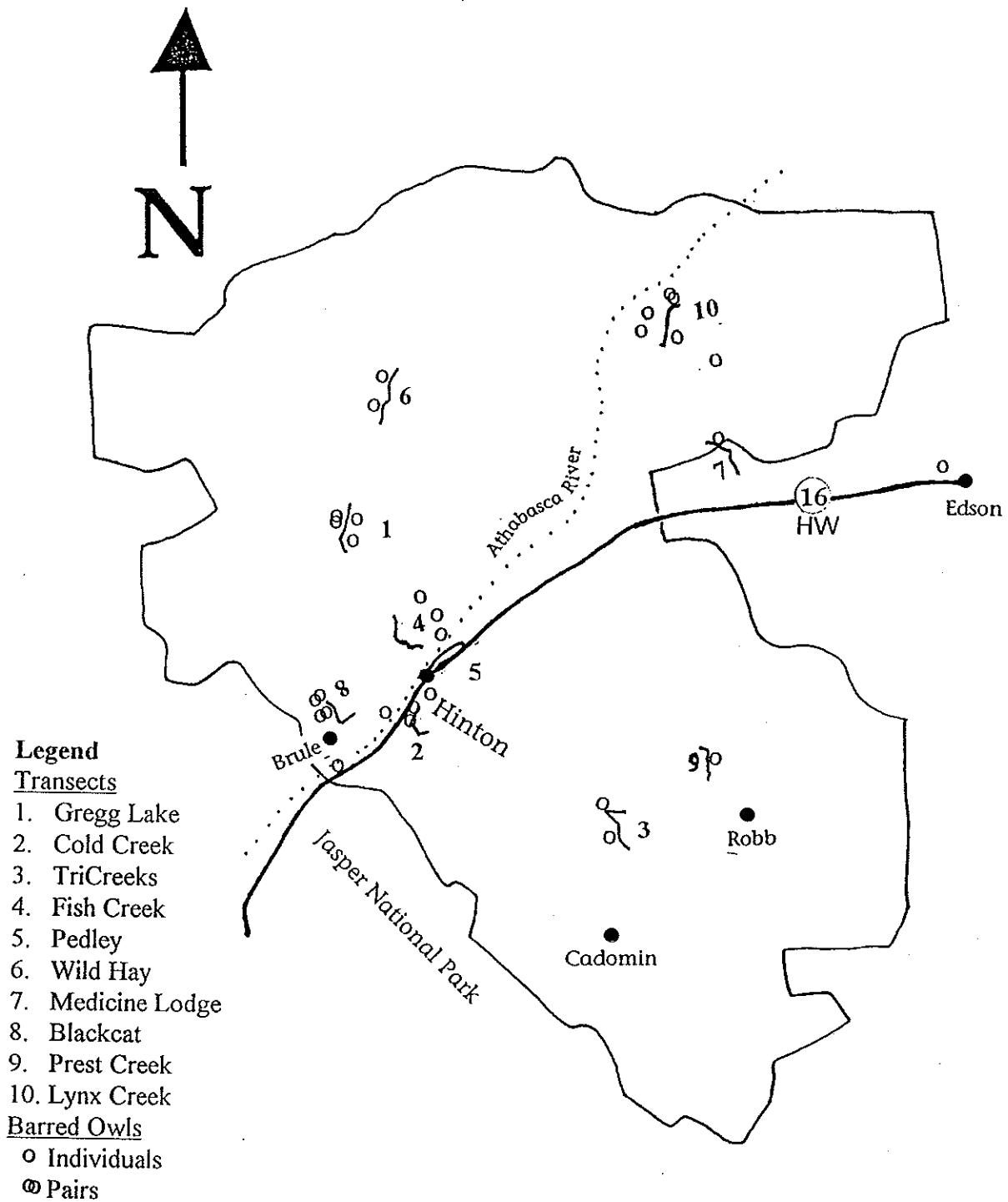


Figure 2: Map showing locations of transects and territorial Barred Owls in the FMF.

Table 3: Total numbers of owls recorded during the field season.

Species	Transects	Sightings	Totals
Barred Owl	16	13	29
Boreal Owl	55	6	61
Great Gray Owl	2	10	12
Great Horned Owl	17	13	30
Northern Saw-whet Owl	20	21	41
Northern Pygmy Owl	2	5	7

Other species of raptors recorded on or near Barred Owl territories include Northern Goshawk (*Accipiter gentilis*), Cooper's Hawk (*Accipiter cooperii*), Sharp-shinned Hawk (*Accipiter striatus*), Northern Harrier (*Circus cyaneus*), Red-tailed Hawk (*Buteo jamaicensis*), Bald Eagle (*Haliaeetus leucocephalus*), Osprey (*Pandion haliaetus*), American Kestrel (*Falco sparverius*), and Merlin (*Falco columbarius*) (Table 4).

Table 4: Other raptors recorded on or near Barred Owl territories.

Species	Sightings	Nests	Young	Fledged
Northern Goshawk	6	1	3	0
Cooper's Hawk	1	0	-	-
Sharp-shinned Hawk	3	0	-	-
Northern Harrier	2	0	-	-
Red-tailed Hawk	6	1	2	?
Bald Eagle	9	0	-	-
Osprey	1	0	-	-
American Kestrel	8	0	-	-
Merlin	2	0	-	-

The Christmas Bird Count in Switzer Provincial Park provided some new owl records. A new Barred Owl was recorded behind Jarvis Lake on evening of January 31. Other owls recorded during the survey were eight Northern Saw-whet Owls, one Boreal Owl and one Great Gray Owl. These will not be mapped with the spring/summer surveys because there is a potential that the owls moved during the non-breeding season.

The bird survey during the day recorded only one raptor, a northern goshawk. A Great Gray Owl was observed on January 13 near in Switzer. This owl was never recorded before.

Telemetry

Eighteen attempts at mist netting (75 hours, 8 locations) resulted in one female Barred Owl being radiotagged. The Solomon Creek Barred Owl was banded and radiotagged on June 27. The owl is still wearing the transmitter.

Thirteen drop-lid traps were placed in four different locations and were open for 6329 hours. Four raptor species and a Gray Jay (*Perisoreus canadensis*) were caught. There were no captures of Barred Owls (Table 5). Many traps were triggered but contained no birds.

Table 5: Location and date of species caught in drop-lid traps.

Species	Location	Date
Northern Goshawk	Wild Hay Ridge	June 29
Cooper's Hawk	Wild Hay Ridge	July 19
Cooper's Hawk	Blackcat Ranch	August 3
Gray Jay	Blackcat Ranch	August 4
Sharp-shinned Hawk	Blackcat Ranch	August 14
Red-tailed Hawk	Blackcat Ranch	August 16
Northern Goshawk	Blackcat Ranch	August 18

Forty-six triangulations (June to January) have been made on the female Barred Owl (Figure 3). The summer home range size has been estimated at 200 ha. The winter home range has yet to be determined but appears to be slightly larger.

Habitat Use

The radiotagged female was walked in on fourteen times. The owl was found to be roosting eleven times and foraging three times. Four roosting sites of other Barred Owls were found. The Barred Owls chose balsam poplar, trembling aspen, and white spruce as roost trees. The Solomon Creek female was never observed using the same roost tree twice. The average DBH of chosen roost trees (be all owls) was 39.6 cm. The stands where the Barred Owls were found had high canopy closure (C and D density), had tall trees, and had white spruce as a component. On one occasion a female barred owl was followed near transect one. The habitat is primarily lodgepole pine and aspen with pockets of white spruce. The owl would fly from one pocket of white spruce to the next, selecting for the denser foliage of these pockets to escape.

Trees over 35 cm DBH are characteristic of old forests in Alberta (Beck, pers. comm.). The number of trees with a diameter greater than 35 cm was very high in the roost areas (Figure 4). Not all vegetation surveys have been conducted. The Lynx Creek bird was found in a buffer strip. Although this habitat was very rich, the strip was quite narrow. The Lynx Creek female was flushed from a cavity in a balsam poplar tree measuring 76.9 cm DBH. The cavity was created by a broken off branch rotting into the tree. When the tree was climbed no evidence of nesting was found.

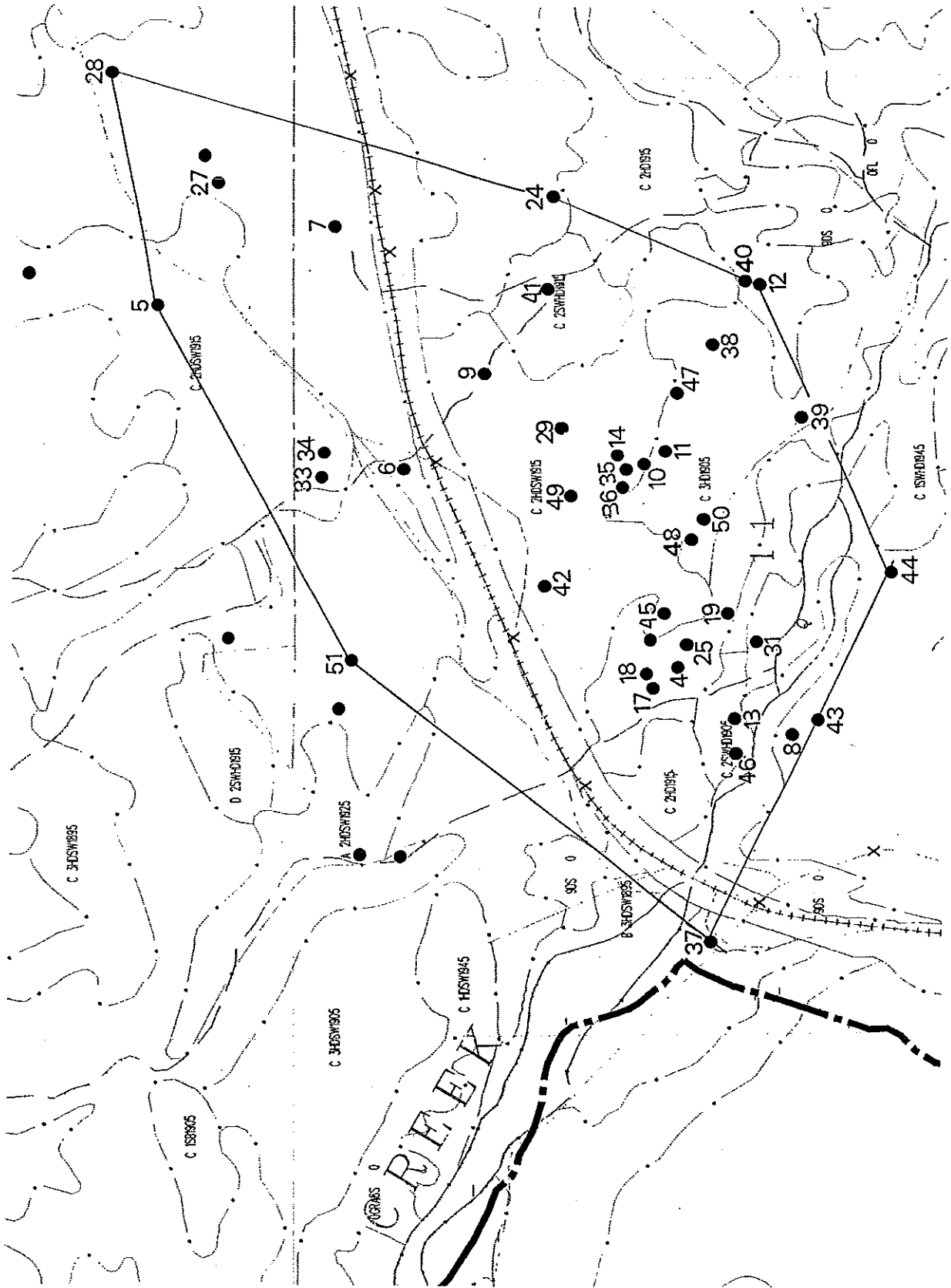


Figure 3: Map showing the radio-telemetry locations on the Solomon Creek female Barred Owl.

Table 6: Roost tree characteristics for various Barred Owl locations.

Owl Location	Tree Species	DBH (cm)	Stand Characterization
Solomon Creek female	Pb	33.4	D8SwPbAw
Solomon Creek female	Aw	39.0	D8AwSw
Solomon Creek female	Aw	28.0	C7AwSwPb
Solomon Creek female	Aw	35.1	D8AwSwPb
Solomon Creek female	Pb	65.9	D9PbAwSw
Solomon Creek female	Sw	41.0	D8AwSwPb
Solomon Creek female	Sw	22.5	C7SwAw
Solomon Creek male	Aw	34.8	C8AwSw
Blackcat female	Pb	49.8	C9PbAwSw
Wild Hay female	Pb	17.0	C8SwAwPbPl
Lynx Creek female	Pb	69.3	C9SwPbAw

Canopy Closure (density): C=50-84 % D=85% or higher

Tree Height: 7=21.1-24 m 8=24.1-27 m 9=27.1-30 m

Tree Species: Aw=trembling aspen Pb=balsam poplar Sw=white spruce Pl=lodgepole pine

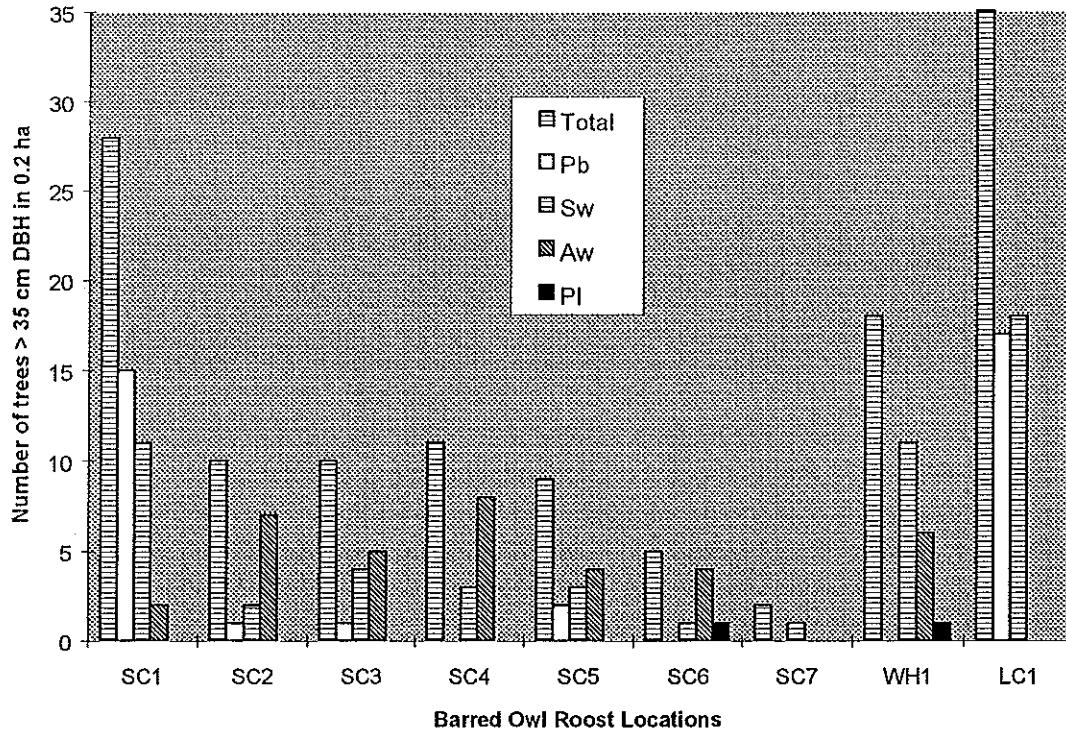


Figure 4: Graph showing the number of trees greater than 35 cm DBH in roost areas. (SC=Solomon Creek, WH=WildHay, LC=Lynx Creek)

The three Great Gray owl nests were found in large diameter trembling aspen trees in mixed wood stands (aspen and white spruce). The stick nests were positioned in the primary fork of the tree about three quarters up the tree. The Great Horned Owl nests were also found in aspen trees positioned in the primary fork. The habitat was deciduous dominated mixedwood or pure deciduous. The Northern Saw-whet Owl nests were all found in cavities of aspen trees. One was in an aspen forest (C density), and two were in an open area with scattered large aspen trees (previously horse logged).

The Boreal Owls were found to be associated with black spruce, white spruce, and trembling aspen. Pockets of wet black spruce bogs surrounded by clearcuts were havens for the owls. No nests were found.

Prey Determination

No pellets or prey remains were found in any of the Barred Owl territories. There were no nests found and therefore no prey transfers were observed.

The radiotagged owl did not have success in the first two foraging attempts observed. The owl appeared to be hunting for small mammals on the ground, since no birds flew up. The third foraging episode was successful. The owl was observed attempting to catch a red squirrel (*Tamiasciurus hudsonicus*). There were four attempts before a successful capture was observed.

There are 13 species of small mammals available in the area (Watson, pers. comm.; Gibbard, pers. comm.). There is an abundance of birds available to the Barred Owls.

Discussion

The six species recorded during the first year have been previously observed the Hinton area. The Northern Hawk-Owl was the only owl that was expected but was not recorded. The records of other raptor species were also expected. The number of boreal owls recorded seemed very high. The precise distribution of this species in Canada is not known and extremely little is known about the abundance (Hayward and Verner 1994, Kirk 1995). Few data are available on habitat associations of Boreal Owls (Kirk 1995). Semenchuk (1992) described the habitat of Boreal Owls as coniferous and mixed wood forests, and stated that they avoid large stands of pine. This is reflected in the findings.

The number of Barred Owls recorded was also surprising. The Barred Owl has been considered uncommon and rare in Alberta in the past (Semenchuk 1992). This may be because there was little work done on owls in the past. All twenty-nine of the territorial barred owls were found in mixedwood forests with white spruce, trembling aspen, and balsam poplar. Lodgepole pine was present but was not chosen. Barred Owls are selecting for older, denser stands of forest as seen in many other studies (James *et al.* 1995, Nicholls and Warner 1972, Bosakowski *et al.* 1987).

The core areas that had no owls recorded had some common features. These areas were either predominantly lodgepole pine or had much human disturbance (logging, acreages). The areas also had few trees that would support a stick nest or cavity nest and provide sufficient cover.

The number of Northern Saw-whet Owls recorded on the Switzer Bird Count shows that this species did not respond well to call surveys. The bird count recorded five owls on the Wild Hay transect, whereas the transect surveys recorded only two owls. The last transect survey was conducted on Lynx Creek road in May. This transect recorded six Northern Saw-whet Owls. Transect surveys need to run longer into May.

Prey determination was unsuccessful. The Barred Owls were not observed using the same roost trees. Walking in to observe the owls foraging is a good method to observe behavior and observe foraging attempts.

Conclusions

Based on the first field season a number of conclusions can be reached:

1. The Barred Owl is found throughout the Foothills Model Forest in reasonable numbers.
2. There are six species of owls in the area, with the boreal owl being the most abundant.
3. There are nine other raptor species near or on the Barred Owl territories.
4. The four pairs of Barred Owls studied did not nest.
5. The Barred Owl selects dense stands with many large trees for roosting. Mixedwood stands are chosen with white spruce as a necessary component.
6. There is a variety of small mammals and birds for the Barred Owl to use as prey. The Barred Owl eats red squirrels (*Tamiasciurus hudsonicus*).
7. The Blackcat Ranch area is a very important wildlife site. Two pairs of Barred Owls were found, along with a pair of Northern Goshawks and Pileated Woodpeckers.
8. The study area had a lot of rainfall throughout the season which could have contributed to many of the findings.

Future Work

Tracks in the snow are a useful indication of the relative abundance of prey (Craighead and Craighead 1969). Winter work will include track surveys to determine the relative abundance of prey in a range of habitats. Fifty-eight different habitats have been chosen with variable species composition, density, and height. Radio telemetry is continuing on the collared owl. Trapping for Barred Owls will begin in February using mist nets and Bal Chatri traps. The combination of these two methods is thought to be the most successful method for capturing Barred Owls (Fuller and Christenson 1976). Drop-lid traps will be used again later in the season. They will be modified slightly to ensure they are not triggered unless a bird is in the trap.

Transects will be run again starting in March. Some of the transects had clearcut logging over the summer of 1995. The results from the pre-harvest survey will be compared to the post-harvest survey. New transects will be added to the study, to incorporate Jasper National Park (joined the FMF in September, 1995). These transects will have Great Gray Owl and Boreal Owl calls added on. Day surveys looking for Great Gray Owls and Northern Hawk Owls and listening for Northern Pygmy Owls will be conducted (time permitting). An ecological database exists for Jasper National Park (Holroyd and VanTighem 1983). The information collected will enhance this database. Bird point counts will be run in June and small mammal live trapping in August (if track surveys do not work).

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