

**ECOLOGY OF THE BARRED OWL  
IN THE  
PRINCE ALBERT  
MODEL FOREST**

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## SECTION 1

### **Ecology of the Barred Owl in the Prince Albert Model Forest**

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#### **Abstract**

Barred Owls (*Strix varia*) are suspected to be strongly associated with mature/old (80+ year old) mixedwood forest in the boreal forests of Saskatchewan. However, very little is known about their ecology in such habitats. The existence of such old forests is often at odds with the objectives of commercial forestry management. For example, current rotation ages for aspen and white spruce are 70 and 90 years respectively. Using a GIS, we analyzed forest habitat surrounding 25 Barred Owl locations identified through nocturnal surveys that revealed a strong quantitative association with mature/old mixedwood forests when compared to available habitat. In addition, fourteen radio-marked Barred Owls exhibited a strong preference for mature/old mixedwood forest with 67% of 380 owl locations falling within that habitat type. Owl home ranges were smallest during the breeding season (mean = 148 ha), and largest during the non-breeding season (mean = 1234 ha). Annual home ranges averaged 956 ha. A strong negative relationship was revealed between home range size and the percent of the home range that was mature/old mixedwood ( $r = -.826$ ), suggesting that a threshold minimum area of mature/old mixedwood forest is required by each Barred Owl pair. Barred Owls also consistently nested in old forest, with 9 out of 10 nests occurring within mixedwood. Seven of these nests occurred in very large snags. Mammals (especially red squirrels) and various birds comprised the main items in the diet. Surveys revealed that red squirrels were found to be more abundant in mature mixedwood forest than in mature aspen forest, and that voles and mice were more abundant in mature aspen forest than in mature mixedwood forest.

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## SECTION 2

### Research Parameters/Introduction

Recent studies have shown that mature/old (80+ year old) mixedwood forests are the most species-rich habitat within the boreal forest (Stelfox 1995). It is therefore important that a representative quantity of such forest be maintained in the boreal forest of Saskatchewan in order to sustain total native forest biodiversity. To ensure this, we have proposed that the Barred Owl (*Strix varia*) may serve as an indicator of this forest type to aid in forest management. However, before utilizing the Barred Owl, we must first validate its status as a species reliant on mature/old forests and quantify its specific forest habitat requirements.

We began investigating the spatial habitat requirements of the Barred Owl in the Prince Albert Model Forest in the Spring of 1993. Our main objectives were to quantify the forest types used by the Barred Owl and in what proportions they were used, to determine the area requirements of this species, and to identify probable limiting factors of the habitat, such as nest sites and food.

## SECTION 3

### Methods

#### **Home Range**

We located, captured and placed radio-transmitters (AVM Electronics, Livermore, CA) on Barred Owls during the spring, summer and fall of 1993 and 1994. The location of each radio-marked owl was determined through triangulation with a vehicle, roof-mounted or a hand-held yagi antenna combined with a radio receiver (Lotek Engineering, Newmarket, ONT). Three or four strong, directional bearings were used to triangulate each owl position. The bearings were plotted on forest inventory (1:25,000) or topographical (1:50,000) maps. The error polygon surrounding each triangulation was calculated. Owl locations with error polygons greater than 10 ha were not used for home range estimation.

Barred Owl home range values were calculated using the 95% Minimum Convex Polygon estimator with the aid of the program Home Range (Ackerman *et al.*, 1990). Breeding (April 1 - Sept 30), non-breeding (Oct. 1 - March 31) and annual home ranges were calculated.

#### **Habitat Selection**

#### **Call Survey**

Barred Owl locations were estimated through nocturnal call-surveys from April 28, 1993 to May 28, 1993. Call-surveys were restricted to vehicle accessible roads, which were surveyed at random, beginning no earlier than one half hour after sunset and concluding no later than one half hour prior to sunrise (Shepherd, 1992). Survey stops were spaced at 1 km so to minimize the possibility of missing owls. Thirteen survey routes, covering a total of 250 km, were each surveyed once. The territorial calls of a male and female Barred Owl, provided by the Royal Saskatchewan Museum, were broadcast using a 12-watt, battery-powered tape recorder with 4 directional speakers (MTC Electronics). The tape recorder was positioned approximately 1.5m above the ground. We remained at each survey stop for 8 minutes consisting of an initial 1 minute listening period prior to broadcast, followed by a 2 minute broadcast, and concluding with a 5 minute post-broadcast listening period. McGarigal and Fraser (1985) and Mosher *et al.* (1990) found that between 70% and 80% of Barred Owls detected during the post-broadcast listening period, responded within 5 minutes of the end of the broadcast period. Surveys were not conducted during periods of precipitation or when winds exceeded 15 km/hr as reported by Environment Canada, or scored 3 or greater on the Beaufort Scale.

The direction of an owl (to the nearest degree), single or pair, loudness of response (barely perceptible, faint, moderate, or loud), time for owl to respond, and if the owl(s) was (were) seen, were recorded for each of the periods for all survey stops. Owl locations were determined by triangulation of an owl that was heard from at least two consecutive survey stops, or by direct observation of the owl, in which case the

survey location was used as the owl location.

Habitat within 700 ha circular buffers (1.5 km radius) centred on 25 owl locations (seven of which represented a pair of owls and 18 a single owl), 275 survey locations along roads, and 100 random points in the forest, was determined. The circular buffers do not represent an owl's home range, but rather provide an area with which the owl is likely associated. We classified habitat into 12 classes (see Appendix for full description). The percent of each habitat class that contributed to the owl, random, and survey buffers was then calculated using ARC/INFO geographic information system (GIS, Gido Langen, Prince Albert Model Forest). A statistical comparison between habitat associated with random points and survey points, and between survey points and owl locations was made using Mann-Whitney U-tests.

#### Radio-telemetry

Barred Owls fitted with radio-transmitters were tracked as for home range determination. However, only owl locations with associated error polygons less than or equal to 4 hectares were retained for habitat analysis. The habitat each Barred Owl location fell within was determined via GIS (Michael Fitzsimmons, Prince Albert National Park). Habitat types associated with Barred Owl use were compared to the proportion of habitat types available in the landscape. If no habitat selection was occurring, Barred Owl habitat use would be expected to approximate the proportion of habitat types available in the landscape.

Habitat composition of 95% Minimum Convex Polygon home ranges for the breeding season was determined through GIS (Michael Fitzsimmons, Prince Albert National Park). The relationship between home range size and the percent of the home range that was mature mixedwood forest was plotted. Data from Prince Albert National Park alone were included in this analysis since difficulties with importing digital provincial forest inventory data were encountered. Furthermore, data for the non-breeding season were not included as the analysis is still in progress and expected to be completed by the spring of 1996.

#### Nest Site Selection

Structural vegetation characteristics surrounding Barred Owl nests were measured to determine microhabitat attributes important to the Barred Owl. Centred on the nest tree, we measured tree density, shrub density, canopy closure, ground cover, and volume of downed woody material within a .04 ha buffer (11.3m radius) (James and Shugart, 1970). We also measured several attributes of the nest tree: height of the nest tree, whether or not it was alive, height of the nest cavity, diameter at breast height (dbh) of the nest tree, nest tree species, type of nest structure, and the type of forest stand the nest tree was in.

#### Prey Selection

In order to determine which species of prey Barred Owls were utilizing, pellets (regurgitated, non-digestible hair and bone of consumed animals) were collected from

the area surrounding Barred Owl nest sites and roost sites. Once identified, the species and relative proportions of prey species in the diet of the Barred Owl was compared to the relative abundance of prey within the habitat selected and avoided by the Barred Owl. Relative abundance of red squirrels (*Tamiasciurus hudsonicus*), and small mammals (cricetid rodents) were monitored during the spring, summer and fall of 1995.

Chatter surveys were conducted during June and July, 1995 to determine relative abundance of red squirrels in mature mixedwood forest and mature aspen forest. Four mature mixedwood and four mature aspen sites were surveyed (Fig. 1). Surveys were conducted from points 100m from the edge of the forest stand and points within the same forest stand were spaced by a minimum of 300m. Each forest stand surveyed had two to three survey points within it, and were surveyed twice during June and twice during July. Surveys consisted of a 10 minute listening period when all red squirrels detected were plotted on a map. Surveys were conducted between 0600h and 0800h. Small mammal relative abundance was monitored in two mature mixedwood and two mature aspen forest stands (Fig. 1) during May and October, 1995. One hundred Museum Special snap-traps (Woodstream Corp., Lititz, PA), were set per plot with one trap per station, stations 10 m apart, in two parallel rows 100 m apart, ie. two 500 m rows of 50 snap-traps each. Traps were baited with peanut butter and rolled oats and checked each morning for the three mornings following set up. This yielded a total of 300 trap nights.

## SECTION 4

### Results

#### **Home Range**

Radio-transmitters were placed on 14 adult Barred Owls (10 - ♀ and 4 - ♂) during the 1993 and 1994 breeding seasons. We tracked 4 owls for 2 - 7 months, 9 owls for 8 - 11 months and 1 owl for 18 months. On average, each radio-marked Barred Owl was located every fifth day, yielding between 20 and 100 locations per owl. Approximately 1400 hours were spent radio-tracking Barred Owls to determine their home range and habitat use.

The 95% MCP home ranges of individual owls averaged 148 ha for the breeding season, 1234 ha for the non-breeding season, and 956 ha for annual home ranges (Table 1).

#### **Habitat Selection**

#### **Call Survey**

Habitat around survey locations differed ( $P < 0.05$ ) from the habitat around random locations for 9 of 12 habitat types (Table 2). Since the area surveyed along roads was found not to be representative of the total habitat within the study area, habitat around owl locations along roads was compared to habitat around survey locations along roads and not the more conventionally-used random locations throughout the forest.

Habitat around owl locations differed ( $P < 0.05$ ) from habitat around survey locations for 7 of the 12 habitat types (Table 3). Significantly greater amounts of Immature Deciduous, Mature Deciduous, Immature Mixedwood, Mature Mixedwood, Immature Conifer, Mature Conifer and Water were found around owl locations compared to survey locations (Table 3).

#### **Radio-telemetry**

A total of 380 Barred Owl radio-telemetry locations were analyzed for owl habitat use. Owl habitat use, pooled for owl locations of 11 radio-marked Barred Owls within PANP revealed a strong preference for older mixedwood forest (Fig. 2). Barred Owls used mature/old mixedwood forest nearly 3 times greater than expected if the forest landscape had been used at random. Immature mixedwood was also used by Barred Owls greater than expected from random (Fig. 2). All other habitat classes were used less than expected, except immature deciduous which was used in proportion to its availability. Clearly, Barred Owls are selecting for mature/old and some immature mixedwood habitat.

Barred Owl breeding home range size was found to be negatively correlated with the percentage of mature/old mixedwood forest within the home range ( $r = -.826$ , Fig. 3). Simply stated, home ranges composed of high percentages of mature/old

mixedwood forest were smallest in size as compared to home ranges composed of low percentages of mature/old mixedwood forest (Fig. 3). The mean proportion of home ranges that was mature/old mixedwood forest was 61 percent. Given that the mean breeding season home range is 148 ha (Table 3), Barred Owls would require 90 ha of mature/old mixedwood per pair during the breeding season. Extrapolating this to the non-breeding season, (mean HR size = 1234) Barred Owls would require about 752 ha of mature/old mixedwood forest per pair. The smaller annual home range average (956 ha) would result in a value of 583 ha of mature/old mixedwood forest per Barred Owl pair on an annual basis. Since final analysis is still in progress, conclusive values for the non-breeding and annual home ranges will not be available until the spring of 1996.

#### Nest Site Selection

During 1994/95, 10 Barred Owl nests were located. Barred Owl nests were found exclusively within old forest stands, and 9 were within mixedwood forest (Table 4). Nest tree species included white spruce (4), trembling aspen (3), balsam poplar (2), and white birch (1). Nests were predominantly in the form of a cavity. The mean height of nest trees was 18.04m and the mean height of the nest structure was 13.00m. Nest trees were very large, averaging 49.1cm dbh. Remaining structural attributes of microhabitat surrounding nest sites is currently undergoing analysis and is expected to be complete in the spring of 1996.

#### Prey Selection

Seventy Barred Owl pellets and/or prey remains were collected. Preliminary analysis has revealed a varied diet, including birds, cricetid rodents, shrews, and both red and northern flying squirrels.

Red squirrel relative abundance was found to be 1.65 squirrels per station within mature mixedwood forest compared to 0.05 squirrels per station in mature aspen forest (Table 5). Mature mixedwood contained more small mammals than mature aspen in the spring, but fewer during the fall (Table 6). Both mixedwood and aspen had much higher numbers of small mammals in the fall than the spring. During the spring, the mixedwood had higher numbers of red-backed voles and lower numbers of deer mice than the aspen. However, during the fall the aspen had higher numbers of both red-backed voles and deer mice (Table 6).

#### Discussion

Barred Owls exhibit a strong preference for mature/old (80+ year old) forest, primarily mature mixedwood forest. This was clearly evident with both survey location habitat analysis and the more precise radio-telemetry method. The majority of the radio-telemetry owl locations reflect foraging and roosting habitat use, suggesting that the mature/old mixedwood forest is critical to both aspects of Barred Owl ecology. The strong dependence upon mature/old mixedwood forest is reinforced by the significant negative relationship between home range size and the percent of mature/old mixedwood within the home range, suggesting that a minimum threshold area of such

habitat is necessary for Barred Owl occupancy. This preliminary correlation incorporates only breeding season home range habitat composition. As non-breeding season home ranges are considerably larger, the correlation with % mature mixedwood may not be as high. The large non-breeding home ranges will encompass areas not utilized by Barred Owls and therefore add further variance to the relationship. However, it is predicted that the relationship seen for the breeding season will hold true for the non-breeding season. We estimate that one pair of Barred Owls requires at least 583 ha of mature/old mixedwood forest to fulfil their annual requirements.

Barred Owls consistently nested in old forests, and nearly always in mixedwood. It is likely that the mature/old mixedwood forest is the only forest type that supports enough large trees (50+ cm dbh) to provide a suitable nest structure (Dunstan and Sample, 1972; Elody, 1983). This need for large trees for nest structures ultimately limits the Barred Owl to older forests. However, the strong association with mature/old mixedwood forest for foraging and roosting demonstrates that Barred Owls require mature mixedwood forest for other activities too.

Medium-sized mammalian prey were considerably more abundant in the mature mixedwood forest. Conversely, voles and mice were nearly twice as abundant in mature aspen. Considering the availability of ground-dwelling small mammals to the Barred Owl, aspen forests, commonly with a thick understorey of shrubs, may be difficult for them to hunt in. The shrub layer might conceal such ground-dwelling prey, making them unavailable to the owl, irrespective of their abundance. Conversely, the clear understorey and flyways of mature mixedwood forest likely increase the availability of ground-dwelling prey.

Barred Owls are clearly a species of mature/old forests, primarily mature mixedwood forests. Their need for a minimum area of mature mixedwood forest supports the notion that Barred Owls can serve as an indicator of mature/old mixedwood forest in the boreal forest of Saskatchewan.

Table 1. Barred Owl 95% Minimum Convex Polygon breeding, non-breeding, and annual home ranges within Prince Albert Model Forest, 1993-1995.

| Owl              | Breeding  | Non-Breeding | Annual    |
|------------------|-----------|--------------|-----------|
| Beaverlgen ♂     | 91        | 1403         | 1766      |
| Candle Lake ♀    | 50        | 610          | 600       |
| Heart Lakes ♀    | 129       | 970          | 873       |
| Hillcrest ♂      | 66        | 1181         | 1184      |
| Birch Bay ♂      | -         | 728          | -         |
| Birch Bay ♀      | 101       | -            | -         |
| Paignton Beach ♀ | 105       | 573          | 584       |
| Narrows ♀        | 55        | 885          | -         |
| Shady Lake ♂     | 363       | 2010         | 808       |
| Spruce River ♀   | 341       | 1270         | 1267      |
| Summit ♀         | 38        | 588          | 562       |
| Waskesiu River ♀ | -         | 2678         | -         |
| Whelan Bay ♀     | 144       | 1917         | -         |
| Whiteswan ♀      | 294       | -            | -         |
| Mean (SD)        | 148 (116) | 1234 (666)   | 956 (423) |

Table 2. Mean (SD) percentage of habitat found within 700 hectare circular buffers centred on random locations ( $n = 100$ ) and survey locations ( $n = 275$ ), in the Prince Albert Model Forest 1993.

| Habitat Type        | Random      | Survey    | P-value |
|---------------------|-------------|-----------|---------|
| Young Deciduous     | 2.5 (7.3)   | 1.2 (2.8) | 0.9449  |
| Immature Deciduous  | 5.3 (13.6)  | 1.9 (6.2) | 0.0477* |
| Mature Deciduous    | 4.8 (11.5)  | 2.4 (6.0) | 0.5914  |
| Young Mixedwood     | 4.1 (8.2)   | 2.1 (4.0) | 0.0634* |
| Immature Mixedwood  | 3.2 (6.2)   | 1.1 (2.5) | 0.0013* |
| Mature Mixedwood    | 13.4 (16.3) | 6.8 (8.7) | 0.0045* |
| Young Coniferous    | 5.6 (12.8)  | 2.1 (4.5) | 0.0258* |
| Immature Coniferous | 11.8 (14.6) | 2.2 (4.4) | 0.0000* |
| Mature Coniferous   | 7.4 (10.0)  | 3.4 (5.1) | 0.0005* |
| Treed Muskeg        | 16.8 (17.7) | 4.0 (6.1) | 0.0000* |
| Open Areas          | 10.4 (11.3) | 3.9 (4.8) | 0.0000* |
| Water               | 7.2 (14.6)  | 4.3 (7.2) | 0.0233* |

\* Significant difference between random and survey habitat

Table 3. Mean (SD) percentage of habitat found within 700 hectare circular buffers centred on Barred Owl locations ( $n = 25$ ) and survey locations ( $n = 275$ ), in the Prince Albert Model Forest 1993.

| Habitat Type        | Owl         | Survey    | P-value |
|---------------------|-------------|-----------|---------|
| Young Deciduous     | 1.1 (2.2)   | 1.2 (2.8) | 0.5351  |
| Immature Deciduous  | 7.6 (17)    | 1.9 (6.2) | 0.0183* |
| Mature Deciduous    | 5.3 (9.9)   | 2.4 (6.0) | 0.0087* |
| Young Mixedwood     | 0.9 (2.6)   | 2.1 (4.0) | 0.1940  |
| Immature Mixedwood  | 5.7 (10.6)  | 1.1 (2.5) | 0.0211* |
| Mature Mixedwood    | 29.2 (23.6) | 6.8 (8.7) | 0.0000* |
| Young Coniferous    | 0.8 (3.4)   | 2.1 (4.5) | 0.1115  |
| Immature Coniferous | 7.2 (11.4)  | 2.2 (4.4) | 0.0056* |
| Mature Coniferous   | 9.5 (11.8)  | 3.4 (5.1) | 0.0148* |
| Treed Muskeg        | 6.8 (10.9)  | 4.0 (6.1) | 0.3536  |
| Open Areas          | 6.8 (7.8)   | 3.9 (4.8) | 0.0858  |
| Water               | 12.0 (15.2) | 4.3 (7.2) | 0.0031* |

\* Significant difference between owl and survey habitat

Table 4. Characteristics of Barred Owl nest sites within Prince Albert Model Forest 1994, 1995.

| Species/Status       | Nest Type          | Tree Height (m) | Cavity Height (m) | Tree Dbh (cm) | Stand Age | Stand Type |
|----------------------|--------------------|-----------------|-------------------|---------------|-----------|------------|
| White Spruce/Dead    | Cavity Broken Top  | 14.70           | 12.20             | 74.5          | Mature    | Mixedwood  |
| White Spruce/Live    | Cavity Broken Top  | 16.65           | 14.25             | 59.0          | Mature    | Mixedwood  |
| White Spruce/Live    | Platform*          | 21.50           | 15.50             | 34.7          | Mature    | Mixedwood  |
| White Spruce/Live    | Platform           | 29.50           | 22.25             | 42.6          | Mature    | Mixedwood  |
| Trembling Aspen/Live | Platform           | 23.50           | 18.00             | 31.9          | Mature    | Mixedwood  |
| Trembling Aspen/Dead | Cavity Broken Limb | 19.25           | 14.00             | 48.1          | Mature    | Mixedwood  |
| Trembling Aspen/Dead | Cavity Broken Top  | 9.25            | 9.00              | 37.8          | Mature    | Mixedwood  |
| Balsam Poplar/Dead   | Cavity Broken Top  | 7.75            | 6.95              | 41.6          | Mature    | Mixedwood  |
| Balsam Poplar/Live   | Cavity Broken Limb | 24.50           | 10.95             | 69.2          | Mature    | Mixedwood  |
| White Birch/Live     | Cavity Broken Top  | 13.75           | 6.85              | 51.5          | Mature    | Deciduous  |
|                      | Mean (SD)          | 18.04 (6.9)     | 13.00 (4.9)       | 49.1 (14.5)   |           |            |

\* Platform nests include: stick nests, squirrel nests and dwarf mistletoe clumps

Table 5.

Relative red squirrel abundance in mature mixedwood and mature aspen forest within and adjacent Prince Albert Model Forest 1995.

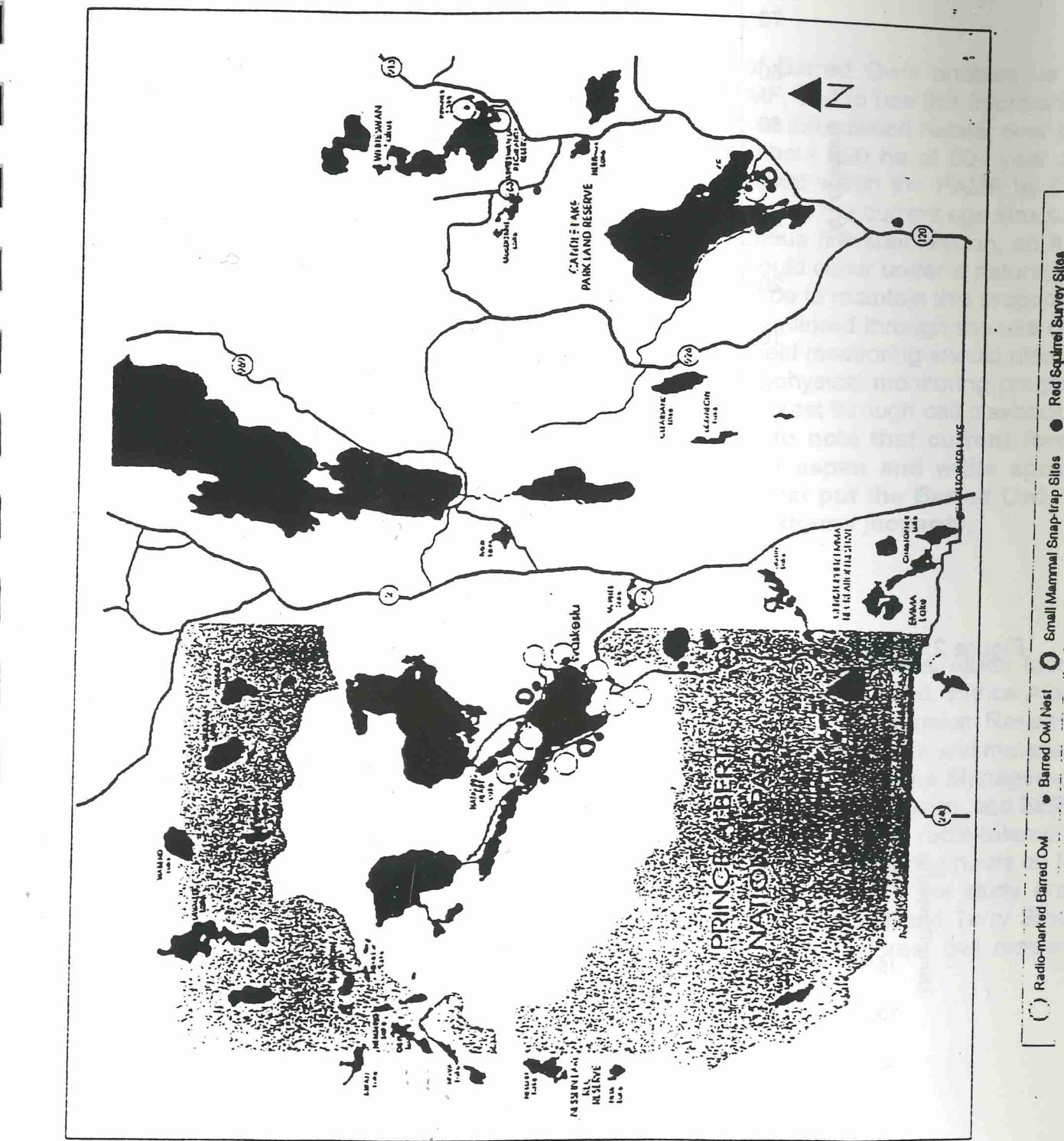
|           | Mixedwood   | Aspen       |
|-----------|-------------|-------------|
| Mean (SD) | 1.65 (1.27) | 0.05 (0.22) |

Table 6.

Small mammal abundance (# captured per trap night) in mature mixedwood and mature aspen forest within and adjacent Prince Albert Model Forest 1995.

| Species         | Mixedwood |      | Aspen  |      |
|-----------------|-----------|------|--------|------|
|                 | Spring    | Fall | Spring | Fall |
| Red-backed Vole | .027      | .160 | .002   | .197 |
| Deer Mouse      | .007      | .010 | .022   | .123 |
| Shrew spp.      | -         | .003 | -      | -    |
| Other           | -         | -    | -      | .010 |
| Total           | .034      | .173 | .024   | .330 |

Figure 1. Study area displaying location of radio-marked Barred Owls, nest sites, small mammal snap-trap sites and red squirrel survey sites.



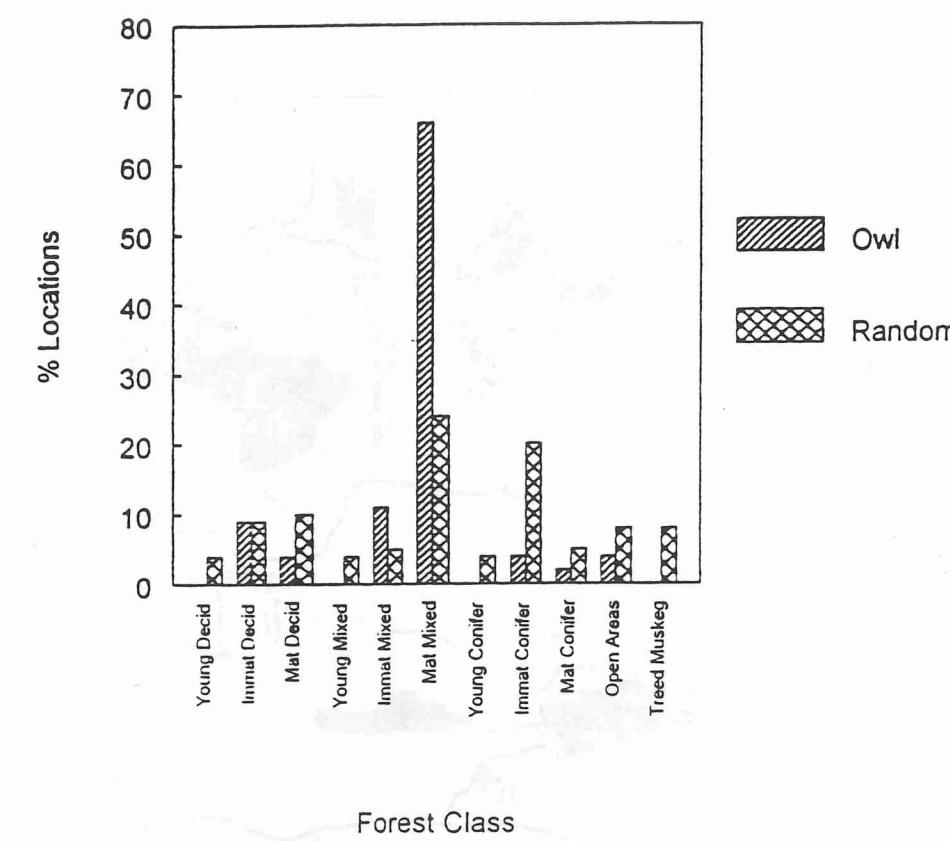


Figure 2. Habitat use by 11 radio-marked barred Owls and habitat use expected at random.

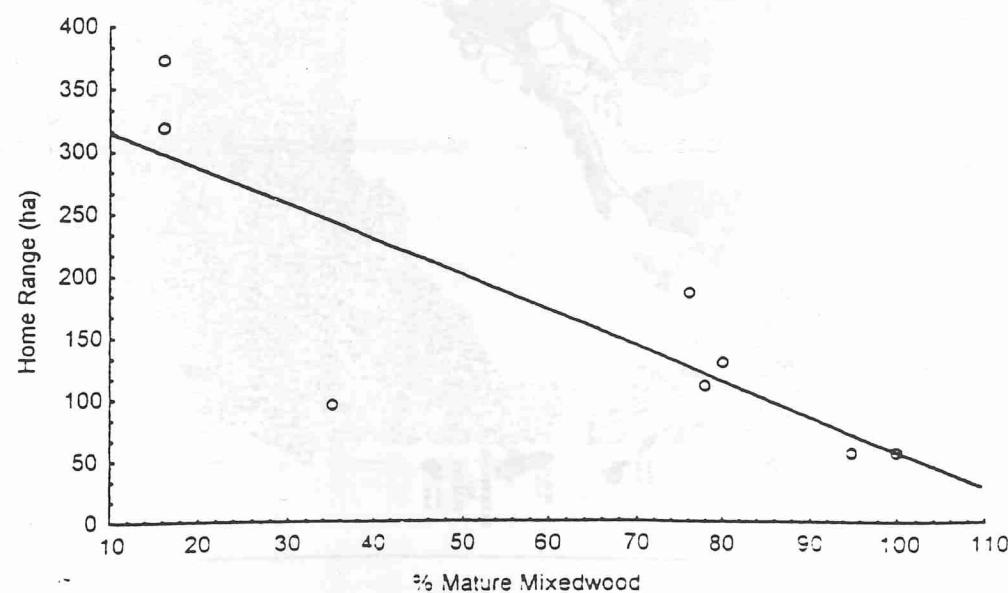


Figure 3. Relationship between Barred Owl breeding home range size (95% Minimum Convex Polygon) and the percent home range composition of mature mixedwood forest ( $r = -.826$ ).

## SECTION 5

### Recommendations

Knowing the spatial and habitat requirements of Barred Owls enables us to estimate their current breeding population within the PAMF, and to use this information to predict and manage a continuous supply of sufficient old mixedwood habitat over the long-term. One pair of Barred Owls requires a total of about 600 ha of 80+ year old mixedwood forest. Dividing the total amount of such habitat within the PAMF by 600 would therefore yield a crude estimate of total population size. The current age structure of the forest has been derived through decades of rigorous fire suppression, so it is possible that there are more Barred Owls present than would occur under a natural fire regime. The long-term forestry management goal should be to maintain this proportion of older forest indefinitely. This could be modelled and monitored through the use of a spatially-dynamic GIS forest inventory model. However, field monitoring should also be conducted. One way of doing this as part of a larger biophysical monitoring program would be to monitor the population of Barred Owls in the forest through call playback in much the same way as outlined above. **It is important to note that current forest management practices of 70 and 90 year rotation for aspen and white spruce respectively and the 'unmixing' of the mixedwood forest put the Barred Owl, its associated ecosystem, and thousands of species in extreme jeopardy.**

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## SECTION 6

### Publications

James, P.C. 1993. Oldgrowth and owls: What have we learned? Pages 70-79 in D.H. Kuhnke, editor. Birds in the boreal forest. Proceedings of a workshop held March 10-12 in Prince Albert, Saskatchewan. Forestry Canada, Edmonton, Alberta.

James, P.C., and K.M. Mazur. 1995. A method for designing boreal forest representative areas. In prep.

Mazur, K. et al. 1995. Habitat selection by Barred Owls in boreal forest: a GIS approach. In prep.

### Presentations

- Integrated Resource Management 1993, Saskatoon
- Vickers Elementary School 1993, Prince Albert
- Prairie Universities Biological Seminars 1994, Calgary
- Prince Albert National Park 1993, 1994
- University of Regina Graduate Seminars 1995, Regina
- Waskesiu Learning Institute 1995, University of Saskatchewan/ Prince Albert National Park

## SECTION 7

### Contributors

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## APPENDICES

Table A1. Habitat age classification.

| Habitat Type | Age (yrs) |
|--------------|-----------|
| Young        | < 50      |
| Immature     | 50 - 79   |
| Mature/Old   | 80 +      |

Table A2. Habitat cover classification.

| Habitat Type | Cover Vegetation   |
|--------------|--|
| Deciduous    | Trembling Aspen +/or Balsam Poplar +/or White Birch  |
| Mixedwood    | Combination of deciduous and coniferous species:<br>Trembling Aspen, Balsam Poplar, White Birch, White Spruce, Black Spruce, Jack Pine, Balsam Fir |
| Coniferous   | White Spruce +/or Black Spruce+/-or Jack Pine +/or Tamarack +/or Balsam Fir  |
| Treed Muskeg | Black Spruce +/or Tamarack, excessive moisture and retarded tree growth  |
| Open         | Cut Over, Burn Over, Flooded Land, Sand, Clearing, Open Muskeg, Herbs, Shrubs  |
| Water        | Lakes, Rivers, Creeks  |