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Raptor Population Dynamics

Birds as Bio-Indicators in Western Newfoundland Forests

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**BIRDS AS BIO-INDICATORS IN
WESTERN NEWFOUNDLAND FORESTS**

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OVERVIEW

Birds have proven extremely useful as indicators of habitat change and perturbation. Birds are upper trophic level consumers and as such reflect conditions in lower aspects of food webs. Birds are wide ranging, relatively highly visible, and easily studied. There are numerous precedents for using birds as indicators in a diversity of forest ecosystems.

In the present research program run through the Biopsychology Program of Memorial University of Newfoundland, a number of projects are directed at birds as components of Western Newfoundland forest ecosystems. These studies are focused on 1) birds of prey, 2) woodpeckers, and 3) avian communities in riparian habitats and the effects of uncut buffers of different widths on these communities.

Overall, our preliminary assessments are leading to an understanding that balsam fir forests in Western Newfoundland are relatively homogeneous compared to other boreal forest ecosystems. Consequently, species diversity and population levels are low. Considerable research effort has been put into the documentation of the distributions of rare species in different habitats. Population extrapolations and habitat relationships are being developed for birds of prey and woodpeckers. Implications of these research projects will be made available for management considerations.

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**Diversity, Distribution, and Habitat Relationships of
Birds of Prey in the Western Newfoundland
Model Forest**

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A study of the distribution and habitat requirements of birds of prey within the Western Newfoundland Model Forest is an important component in understanding wildlife and forestry interactions in Newfoundland. Ecological study and preservation of top level carnivores offer direct and incisive means with which to understand and maintain biodiversity in terrestrial ecosystems (e.g. Soule and Wilcox, 1980; Frankel and Soule, 1981). Raptors are vulnerable to both natural and human-induced perturbation (e.g. Poole, 1989) and thus are valuable indicator species within boreal forest ecosystems.

The main objectives of the project were to collect data on the diversity, abundance, distribution, and habitat requirements of raptors in the Western Newfoundland Model Forest (WNMF). Specifically, three main habitat type were surveyed to determine the relative densities of raptors in each. These habitat types were old-growth balsam fir forests (80+ yrs.), second growth forests (40-60 yrs.), and clearcuts (1-10 yrs.). Information on raptors and other wildlife species in Western Newfoundland will hopefully be integrated and used by resource managers in decision making processes.

The primary study area was concentrated around the area of Little Grand Lake, however research was also conducted at sites near Pasadena, Cook's Pond, George's Lake, Gallants, and Stephenville Crossing. Methods to investigate population dynamics of birds of prey involved conducting surveys along forest access roads that passed through various habitat types. Conspecific vocalization playbacks of selected raptor species were broadcast at 800m intervals along established survey routes. When sites of high raptor activity were located (i.e. prey remains or multiple sightings) efforts were made to locate nests and plucking areas. Several techniques were employed including vocalization playbacks, concealed observations, and ground searches. Habitat data were collected at sites of high raptor activity, such as around nests, roosts, and plucking posts. Data regarding stand structure, snags, coarse woody debris (CWD), vegetation, soil type, and a general description of the area were collected within an 11.3 m (0.04 ha.) fixed plot.

The method of using playback vocalizations was not entirely successful, however raptors were detected by using this method and by coincidental encounters. Ten species of raptors were sighted in the study area, these included: the Sharp-shinned Hawk (*Accipiter striatus*), Northern Goshawk (*Accipiter gentilis*), Rough-legged Hawk (*Buteo lagopus*), Red-tailed Hawk (*Buteo jamaicensis*), Osprey (*Pandion haliaetus*), Merlin (*Falco columbarius*), American Kestrel (*Falco sparverius*), Boreal Owl (*Aegolius funereus*), Great Horned Owl (*Bubo virginianus*) and Northern Hawk-Owl (*Surnia ulula*). Results from raptor - habitat associations suggest some general trends in raptor utilization of available habitats (see table 1). Survey results indicate that old growth forests appear to contain a greater diversity of raptor species in comparison to second growth forest, pre-commercially thinned areas, and clearcuts. Results from habitat mensuration will provide further insight as to the specific micro and macrohabitat requirements of birds of prey

within the Model Forest.

Research conducted in 1993 and 1994 suggests that the densities of most raptor species in the WNMF are typically low. Historically, human development has led to a general decline in raptors on a widespread scale. For raptors in general, three main factors have been identified as causing declines (or limiting numbers), namely, restriction and degradation of habitat, persecution by man and contamination by toxic chemicals (Newton, 1979). A major manipulator of the environment that is extensively contributing to habitat destruction and fragmentation is forest harvesting. Timber management activities have generally resulted in the shifting of mature or old-growth forested areas to lower successional stages (M^cCarthy *et. al.*, 1989), therefore species such as Boreal Owls, Sharp-shinned Hawks, and Northern Goshawks which rely on older forests for part or all of their life history will be adversely affected. An approach to mitigate the impact of forestry practices on raptors may be to create buffer zones around nest sites and roosting areas. This may be effective for larger raptors with obvious nests, however research has indicated that nest sites of woodland raptors are extremely difficult to locate. The optimal management strategy from a conservation perspective may be to promote preservation of large tracts of land from extensive harvesting operations. This would vastly improve the chances of sustaining viable populations of raptors on a long term basis. Further research is required to fully quantify raptor habitat and to assess the impact that human development land-use may have on populations of birds of prey.

Table 1. Habitat Associations of Raptors in the WNMF, 1993-1994.

HABITAT TYPE	ASSOCIATED SPECIES
CLEARCUT (0-10 yr) (also includes clearcuts treated with herbicides)	Rough-legged Hawk Northern Hawk-Owl Merlin American Kestrel
THINNED (10-20 yr)	Rough-legged Hawk Red-tailed Hawk Merlin
SECOND GROWTH (30-60 yr)	Sharp-shinned Hawk Great Horned Owl Merlin
OLD GROWTH FOREST (81+ yr)	Sharp-shinned Hawk Northern Goshawk Boreal Owl Merlin Osprey

Woodpecker Assemblages In Natural And Managed Balsam Fir Forests Of Western Newfoundland

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Background

Habitat loss is the greatest threat to biodiversity. Quantitative indicators of ecosystem conditions have to be generated in order to make comparisons within and between different ecosystems. More knowledge has to be gained about the trade-offs between forest management practices with ecological integrity and wildlife conservation. Black-backed woodpeckers are potentially good indicators of the effects of forest harvesting because they are almost 10 times more abundant in natural than in similar-aged managed balsam fir forests in western Newfoundland. Forest harvesting may be affecting the distribution or availability of woodpecker food and/or nest sites. Competition for resources may be greater in homogenous managed stands than in the more diverse uncut stands.

Objectives

- To compare the diversity and abundance of woodpeckers in different-aged western Newfoundland balsam fir forests.
- To examine interspecific behavioural differences of woodpeckers that may occur between natural and managed forest ecosystems.
- To compare the foraging behaviours of woodpeckers within and between managed and previously uncut (natural) balsam fir forests.
- To quantify woodpecker spatial and temporal use of habitat in western Newfoundland balsam fir forests.
- To quantify nesting site characteristics of woodpeckers in western Newfoundland balsam fir forests.

Methods

- From 1991 to 1994, 10 natural growth sites in the Little Grand Lake area and 20 managed balsam fir forests throughout the Western Newfoundland Model Forest were surveyed for woodpecker distribution and abundance using the IPA technique of Blondel et al (1981).
- An 800 m x 20 m transect was used at each site to determine the presence of woodpecker nests. Tree diameter, height and condition, nest height, aspect and condition were recorded.

- Tree girdling was used to create a 'food rich' environment in managed stands. Woodpecker abundance beyond the 1994 season will be used as a measure of the association between food abundance and habitat use.
- The foraging behaviour and success of woodpeckers found on the study sites can be used as a measure of food abundance. An indirect method was to measure the biomass of adult woodboring insects in the different balsam fir ecosystems by erecting Lindgren funnel traps. An 800 m x 10 m transect was used on each site to measure the current presence of wood-boring insect infested trees (a potential food source for woodpeckers).

Results

The three-toed species (Black-backed and Three-toed) are a rarity in both types of forests. However, when they are found, they are most often in natural growth stands. Wood-boring insect infested trees are more abundant in the natural growth stands, but the density of these potential food sources is quite low, even compared to the managed stands (perhaps a 10 % difference). This may partly explain the low abundance of resident bird species which could rely on this year-round supply of food. This will eventually be compared to abundance of woodpeckers in mainland boreal forests. A distribution of insect infested trees, or trees prone to insect infestation, throughout a stand may play an important role in three-toed woodpecker habitat and the continued presence of this species in balsam fir forests of western Newfoundland.

A Study to Assess the Habitat Value of Uncut Buffer Zones for Woodland Birds in Western Newfoundland

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In the spring of 1994, this 2 year study was initiated as a part of the Copper Lake buffer zone study. The objectives of the project are 1) assessing avian utilization of riparian areas in balsam fir forests of western Newfoundland, 2) to evaluate the effects forest harvesting has on woodland bird communities, and 3) to assess the conservation value of different sized uncut riparian buffer zones to birds.

Research during the 1994 field season was partitioned into two phases. During the first phase (June 1 - July 9), research involved setting up study plots and censusing the birds inhabiting them. The second phase of fieldwork (July 10 - August 16) focused on collecting habitat data on all of the study plots.

A total of 12 study plots were established. To investigate riparian effects, 11 of the plots were located along either ponds or rivers. The remaining plot follows an edge created by a woods road, and will help to distinguish between edge and riparian effects on the other plots. On each plot, 5 transects run parallel to the edge at distances of 0, 20, 50, 100, and 150 m. Surveys along transects will be used to identify differences between avian communities in riparian and non-riparian portions of plots. Overall, the study plots span a total of just over 3 km of edge habitat to a width of 150 m, or an area of about 45 hectares. About half of this area is from plots which are currently uncut, the remainder having been harvested to between 0 and 100 m of the waters edge since 1986. Some of the uncut plots were scheduled for harvesting during the winter of 1994/95.

Bird surveys were carried out between 0500 and 0900 h when weather was favourable, as this is when birds are most conspicuous. During surveys birds were usually identified by songs, as well as by visual observations when possible. Once a bird was identified its position, sex, behaviour and movements were recorded. Transects on each plot were surveyed twice.

Habitat information collected included tree basal area, tree species composition, stand age, and canopy height. Sites were then classified with respect to Damman site type. Finally habitat maps of all plots were made using airphotos, forest inventory maps, and ground verification. Locations of plots were determined using a global positioning

system, which was referenced with the base station at the Fisher Institute in Corner Brook.

A total of 36 species of birds were observed on the plots during surveys. As one would expect, the species composition of bird communities in clearcuts differed markedly from those in woodlands. Also, several of the species seen were obviously directly associated with the riparian habitat (e.g. Spotted Sandpiper). Differences among avian communities are being related to habitat parameters (buffer width, pond vs. river etc.). During autumn and winter maps of study plots will be digitized and GIS software used for spatial comparison of survey and habitat data, followed by statistical analysis. This analysis will be used to provide directions for upcoming field work.

Table 1: Study sites established at Copper Lake during the summer of 1994.

Plot	Treatment	Boundary	Transect Length
T1-1 A	Uncut (to be cut to 0 m)	Fluvial	150 m
T1-1 B	Uncut (to be cut to 0 m)	Fluvial	150 m
T1 A	Uncut (to be cut to 0 m)	Fluvial	350 m
0-1	Cut to 0 m in 1987	Lacustrine	350 m
20-1	Cut to 20 m (89-91)	Fluvial	200 m
20-2	Cut to approximately 30 m (1989-91)	Lacustrine	150 m
T1-2 B	Uncut (to be cut to 20 m)	Fluvial	150 m
T1-2 C	Uncut (to be cut to 20 m)	Fluvial and Lacustrine	200 m
100-1	Cut to approximately 50 m (1990-92)	Lacustrine	400 m
100-2	Cut to approximately 50 m (1987)	Fluvial	400 m
T1-3 B	Uncut control	Fluvial	150 m
C-2	Uncut control	Woods road	400 m

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