# HABITAT MANAGEMENT GUIDELINES FOR CAVITY-NESTING BIRDS IN ONTARIO

## ONTARIO MINISTRY OF NATURAL RESOURCES

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## Introduction

The majority of cavity-nesting birds are insectivorous and represent a major portion of the entire insect eating forest fauna (Kendeigh 1947, Thomas et al. 1976, Scott et al. 1977). As such they are important in the control of insect pests in forests (Scott et al. 1977, Otvos 1979, Thomas et al. 1979a, Takekawa 1982). Most cavity-nesting birds in Ontario are year round residents and thus are even more important in insect control as they exert a strong influence during the winter period when arthropods are largely inactive (Thomas et al. 1979a).

They are, in addition, an integral part of natural communities and have an intrinsic value in the continued well being of those ecosystems (Evans 1978, Evans and Connor 1979, Bury et al. 1980). There is growing public concern that we should be attempting to manage forests with the needs of all species in mind, not just one segment of a plant or animal community (Evans 1978). The more intensive the forest management, the greater the need to manage for wildlife species (Thomas et al. 1979a). This is particularly true for cavity nesters that are among the most seriously affected by logging practices (Connor et al. 1975, McClelland et al. 1979, Noon et al, 1979, Connor 1980).

The presence of dead or dying trees suitable for cavity excavation is the single most important factor limiting the numbers of cavity-nesting birds (Haartman 1957, Thomas et al. 1976, Thomas et al. 1979a, Dickson et al. 1983). Some cavity nesters also require relatively mature forests and relatively large trees in which to excavate cavities in order to survive (Connor et al. 1975, Hall and Thomas 1979, McClelland et al. 1979, Connor 1980). Intensive management, however, tends to eliminate older stands, where dead and decaying trees may be found naturally, to eliminate dead or dying trees to reduce the size of trees available, and in some instances to remove dead trees as fire or safety hazards or to burn them for firewood (Thomas et al. 1979a).

If cavity-nesting birds are to remain a viable part of managed forests, some consideration must be given to providing their requirements (Thomas et al. 1976, Scott et al. 1977, Thomas et al. 1979a). The considerations and guidelines provided here are intended to give some reasonable and practical measures that can enhance forest habitats for cavity-nesting birds, but are not intended as invariable practices that must be followed. In general, the requirements of cavity nesters and forestry practices are compatible with the needs of the birds considered in this report (Hagar 1960, Webb et al. 1977, Franzreb and Ohmart 1978, Thomas 1979).

Although some secondary cavity nesters prefer to use natural cavities, most use old woodpecker holes. We should not forget the needs of these secondary cavity nesters, but if we provide for woodpeckers, the primary excavators, most of the other species will also be taken care of.

## Factors Affecting Management Considerations

### Pesticides

Insect populations have an innate capacity for tremendous growth within a short period of time. The application of chemical pesticides does not result in complete destruction of insect pests, and hence must be repeatedly applied at considerable expense in order to contain outbreaks (Kendeigh 1949, Takekawa et al. 1982). Moreover, the continued use of pesticides in the long term results in the evolution of genetically resistant strains of insects, making the continued use of poisons even less effective. At the same time the natural predators of insects suffer considerable mortality and become much less effective in controlling the pests (Rudd 1964, Miller and Varty 1975, Varty 1975, Comins 1979). The use of pesticides within forests then, may prolong insect outbreaks and shorten the period between insect eruptions (Blais 1974, Holling et al. 1979, Takekawa et al. 1982.)

Perhaps it is useful to note that most chemical insecticide manufacturers are based in the United States, and thus management with insecticides has been strongly encouraged in North America. In Europe management of forests for songbirds predators has been used for centuries to increase avian predation on forest insects (Takekawa et al. 1982).

### The Role of Birds in Insect Control

As long ago as the 1300's, European countries passed laws to provide specific habitat requirements for insectivorous birds in an effort to control destructive insects. Habitat manipulations have been shown to affect populations of birds by a five to twenty (5-20) fold increase in density (Otvos 1979, Takekawa et al. 1982). Documented cases have shown that where birds were artificially increased, outbreaks of forest insects were prevented, even on forests immediately adjacent to those with outbreaks (Takekawa et al. 1982). However, those manipulations are practiced in relatively small forest areas and rely in part on the provision of nest boxes for cavity-nesting birds. Although the provision of boxes or even artificial nest substrates for woodpeckers (Peterson and Grubb 1983) is possible in southern deciduous woodlots, it is not practical on the scale of the mixed or boreal forests of Ontario. However, there is no doubt that habitat improvement for insectivorous birds would greatly assist in the control of forests insect pests.

With few exceptions, the conclusion of hundreds of studies is that birds act as important components of natural biological control at endemic insect levels, and that in some circumstances may act as a major cause of a suppression of a major outbreak (Thomas et al. 1979a, Takekawa et al. 1982). Most studies agree that the role of birds is in the prevention rather than the suppression of insect epidemics. During an outbreak, the reproductive potential of insects is so great that it literally overwhelms the birds' ability to act as an effective control (Kendeigh 1949, Otvos 1979, Thomas et al. 1979a, Takekawa et al. 1982).

The diet of insectivorous birds may be more than eighty percent (80%) destructive forest insects (Takekawa et al. 1982). They have been proven to reduce significantly the numbers of insects in forests (by as much as eighty or ninety percent [80 or 90%]). (Holmes et al. 1979, Takekawa et al. 1982). One study indicated that for a comparable reduction of insects by chemical means would have cost $3770 per square mile in an outbreak year, and this did not include the long term effects of birds in reducing insects prior to the outbreak (Takekawa et al. 1982). On the scale of mixed and boreal forests of Ontario it may be far more economical in the long run to manipulate habitat for insectivorous birds than to attempt chemical control of insect pests.

Birds are able to survive in areas without high concentrations of one particular insect pest. They may, therefore, be able to prevent outbreaks more readily than other natural enemies such as parasites or pathogens that tend to be host specific. Birds are mobile and concentrate where insects are abundant, contributing to the suppression of outbreaks (Otvos 1979). Birds are selective in their consumption of insects in that they are known to eat non-parasitized insects and thus not compete with other natural controls (Buckner and Turnock 1965, Coppel and Sloan 1971, Sloan and Simmons 1973, Schlichter 1978). They may aid in the spread of viruses that attack forest insects (Entwhistle et al. 1977a, 1977b). Woodpeckers in the process of feeding, flake bark or puncture bark. This alters the microhabitat of the prey and can affect the survival of those insects that are not directly eaten, and the holes may allow the entry of insect parasites (Jackson 1979, Otvos 1979).

Cavity nesters, in particular, are year round residents and can act through the winter on dormant insect populations. But in order for birds to buffer insect epidemics, they must be maintained at sufficient population levels by the provision of habitat requirements (Evans and Connor 1979).

**Snags**

Snags are completely or partially dead trees that are still standing. There is a direct relationship between the numbers of snags in an area and the numbers of cavity-nesting birds present. Without snags there may be a complete absence of cavity nesters (Thomas et al. 1976, Scott et al. 1977, Thomas et al. 1979a, Dickson et al. 1983).

Each species of cavity-nesting bird has its own requirements in terms of the diameter of snag required and the height above ground needed. In general, the diameter is more critical. Larger birds must have a large sized tree, but can choose various heights as long as snags are not very short. Smaller birds can use larger trees as well, but smaller sized snags are also important as they are much preferred by the smaller birds. Heights may be particularly important only to the larger cavity nesters (Thomas et al. 1976, Scott et al. 1977, Thomas et al. 1979a).

Hard snags are those with solid exteriors, but soft interiors. Over a period of time they undergo further decay to become soft snags. Only hard snags can be created through management or natural processes, but only a percentage remain standing long enough to become soft. Soft snags are a critical component as nesting sites for some primary excavators, as well as important feeding sites for woodpeckers. They have no commercial value, have a short life expectancy, are

dangerous to remove, unless numerous do not represent a fire hazard, yet are relatively rare, and should all be preserved unless they represent a safety hazard (Thomas et al. 1976, Thomas et al. 1979a). In general, if the requirements of woodpeckers for hard snags are met, and if soft snags are retained, the requirements of secondary cavity users, both birds and mammals, will probably be met (Thomas et al. 1976).

Trees that have heart rot but are still alive are particularly valuable to woodpeckers, but are of limited commercial value. They can be identified by the presence of fungal conks on the trunk, the decayed stubs of broken branches, wounds or scars on the tree trunks, dead areas on living trees or the presence of woodpecker holes already in them (Thomas et al. 1979a). Such trees would become useful snags if left or girdled.

Snags do not survive indefinitely. In general, larger ones last longer but life depends upon the climate and the species of tree involved. But continued provision of suitable snags is an important consideration (Dickson et al. 1983). A shortage of suitable snags may also lead to the use of utility poles for cavities causing hundreds of dollars damage each year (Otvos 1979). In a naturally regenerating forest there is likely to be an adequate number of snags as the forest becomes older. But in clearcut areas or very young forests there is a need to provide for the requirements of cavity-nesting birds. Also, in thinning or selective cutting operations, efforts should be taken to preserve trees with heart rot, or those that are dead or dying (Thomas et al. 1976, Evans et al. 1979, Thomas et al. 1979a).

It is unlikely that the required number of snags can be provided on all forest tracts at all times for all cavity nesters, but if some provision is made throughout the management area, there is bound to be an increase in the numbers of cavity nesters.

**Logs and Slash**

Logs on the forest floor are a valuable component of a woodland (Maser et al. 1979). By numerous birds they are used as lookout posts, as drumming sites, as perches, as nesting sites or nesting cover, as dusting sites, as thermal shelter in winter and by woodpeckers as food sources. They also contribute to nutrient recycling as does logging slash. Slash also provides cover and perches for many small vertebrates as well as food for woodpeckers.

If snag management is practiced, they will probably provide adequate numbers of logs without additional provisions. But the removal of logs and slash or intensive site preparation is not beneficial to cavity-nesting birds (Capen 1979, Dawson 1979).

**Habitat Diversity**

The provision of diversity in forest ecosystems, that is the provision of adequate areas of all ages from recently cut to mature forest, and of all tree species native to the area, is an objective that is considered to be essential to wildlife management (MacArthur 1964, Willson 1974, Connor and Adkisson 1975, Siderits and Radtke 1977, Webb et al. 1977, Evans 1978, Franzreb and Ohmart

1978, Crawford and Titterington 1979, Jackson 1979, Nilsson 1979, Temple et al. 1979, Thomas 1979, Thomas et al. 1979c, Bury et al. 1979, Luman and Neitro 1980, Anderson and Robbins 1982, Takekawa 1982, Franzreb 1983).

Increasing tree species and age diversity contributes to greater avian diversity and hence better insect control. Emphasis on management for diversity will help ensure the continued existence of all living components of the ecosystem. The provision of diverse habitats is a worthy goal for aesthetic and moral reasons as well as being a worthwhile management practice (Thomas et al. 1979c).

Even-aged management, involving clearcutting of various patches is not necessarily incompatible with wildlife needs. Stands of various ages provide horizontal diversity, edge requirements and different aged stands for different species (Thomas 1979). But the rotation times must be sufficiently long to provide areas mature enough to meet the requirements of some species.

The number of species in pure coniferous forests tends to be low to start with (Capen 1979), but the mixed forests of central Ontario support some of the highest densities of birds in North America (Temple et al. 1979). Forest management that seeks to select for a single species of tree is known to be detrimental to wildlife populations (Nilsson 1979). In addition to failing to supply the diversified habitat necessary for a varied bird population, single-aged monocultures also fail to support an adequate diversity of arthropods to maintain a stable food supply for birds. Birds will tend to avoid such areas and this may actually contribute to insect outbreaks. Single-species forests also make it much easier for species specific arthropods to multiply (Jackson 1979).

However, although the provision of habitat diversity is basic to good wildlife management, specific rare or declining species may require special management to meet their needs (Siderits and Radtke 1977, Stauffer and Best 1980).

**Forest Sizes**

There are apparently no birds restricted to small forest tracts, although there are many that occur only in large patches (Luman and Neitro 1980). Many local forests thought of as preserves have failed to preserve the species characteristic of extensive communities of the same region (MacClintock et al. 1977). Some birds have become adapted over thousands of years to living in forests of a certain size. If an isolated forest tract is below this minimum size, the species can no longer successfully breed (Diamond 1975, Whitcomb 1977, Robbins 1978, Connor 1979, Robbins 1979, Samson 1980). Geneticists consider population sizes smaller than 1000 to be vulnerable. Hundreds of hectares may be required throughout the range of a species to assure the long term survival of area sensitive bird species (Whitcomb 1977).

The disappearance of extensive forest tracts of deciduous trees in southern Ontario, south and west of the Canadian Shield has undoubtedly contributed to the almost complete disappearance of several species of insectivorous birds in this region. We should not be concerned with providing woodlots large enough to accommodate only a single pair of birds, but large enough tracts to

provide for an entire population. Larger forest patches are essential to maintain a complete regional avifauna (Galli et al. 1976).

**Edges and Openings**

The edges of woodlots, or borders between different aged stands or about forest openings are an integral part of any forest environment. They represent unique places which produce animals not found in any other vegetative association. Yet intensive forest management tends to select against them (Taylor and Taylor 1979). Edges are unusually rich in wildlife because species from both adjacent habitats will be found there, and with the increased diversity of vegetation of edges, there will be additional species that are found only in edges.

Natural edges resulting from changes in soil, drainage and topography are relatively stable, long lasting communities of considerable importance to wildlife and worth preserving (Thomas et al. 1979c). The amount and arrangement of edge are important tools for enhancing wildlife habitat. A mosaic or irregular edge provides more habitat than an abrupt edge.

**Riparian Areas**

A major threat to some avian species is the loss of forests adjacent to lakes and rivers (Samson 1979, Stauffer and Best 1980). These areas offer water, greater vegetative production (ie., larger tree sizes of critical value to some species) because of water and deeper soil conditions, greater vegetative diversity with rapidly changing conditions there and in contrast to adjacent areas. They provide edges and openings essential to some species. In coniferous forests they provide a disproportionately high number of habitat zones because of deciduous vegetation that may be there but not elsewhere, and distinct height layers of vegetation not found in the forest (Thomas et al. 1979b).

Riparian forests are important for the preservation of water quality through control of erosion by wind and water, and thus for the preservation of fish habitat, for the preservation of rare plants, to provide travel lanes for wildlife escape and thermal cover for numerous terrestrial vertebrates, and they provide a quality gene pool for forest trees (Allan and Bohart 1979). They are worth preserving for a whole host of species, and the bird species diversity making use of them increases with the width of these habitats (Stauffer and Best 1980).

**Deciduous Forests**

The deciduous forests of Ontario (of maple, beech and other hardwoods), particularly south of the Canadian Shield, are now very limited in extent in comparison to presettlement days. They are in much greater need of preservation and proper management than the more extensive mixed forests (coniferous with birches and poplars) and coniferous boreal forests on the Canadian Shield.

**Information Needs**

There is a need for much more information about the nesting requirements of most cavity-nesting birds in Ontario. Much of the information we have comes from other areas or is incomplete. For all nests located, a nest record card should be filled out (see Appendix II).

**Management for a Critical Species**

In relation to habitat, the pileated woodpecker has the narrowest ecological requirements of all cavity-nesting birds. Yet it provides the largest cavities that may be of critical importance for a number of secondary cavity users. Thus, this species can be a key indicator of the retention of a complete community of hole-nesting birds.

Pileated woodpeckers cannot be accommodated by leaving snags in areas otherwise clearcut. Careful management is needed to provide the necessary forest requirements. If managers can succeed in perpetuating pileated woodpeckers, they can be reasonably confident that provision of suitable habitat for other hole-nesting birds will require comparatively simple measures (McClelland et al. 1979).

**Roosting and Feeding Requirements**

If providing suitable habitat for cavity nesters is a management objective, consideration must be given to providing more than just snags for nest sites. The manager must also provide the appropriate habitat around those snags, and must provide adequate snags and habitat for feeding and roosting during the entire year. The primary excavators are resident species and must be provided for on a year round basis if they are to be found at all (Brawn et al. 1982).

**Provision of Nest Boxes**

The provision of artificial nest cavities in boreal forest areas is not practical. But in southern deciduous woods, mainly off the Canadian Shield, the provision of boxes would be very beneficial. Since nesting sites may be a limiting factor, insect control could be greatly enhanced by the provision of nest boxes. Through the cooperation of landowners this could be a very practical consideration.

Primary cavity excavators generally do not use nest boxes, but all secondary cavity users would benefit by the provision of nest boxes. Sizes of these boxes are presented in Appendix I.

**Legislation**

Most cavity-nesting birds are protected under the provisions of the *Migratory Birds Convention Act* of 1917. This Act prohibits killing of birds, collecting their eggs, keeping birds captive or selling and trading birds or their eggs. Several cavity-nesting raptors not included in the *Migratory Birds Convention Act* are afforded protection by the *Game and Fish Act of Ontario,*

*RSO 1980, C182*. Their habitats are not specifically protected, but without continued provision of suitable breeding areas, laws protecting the birds themselves cannot preserve the species.

**Minimum Standards**

Managers may be tempted to shorten rotation times for forest cutting in an attempt to provide only the minimum standards necessary for the maintenance of the most critically threatened wildlife species. In the long run, this may bring about a biological disaster. The provision of only minimum habitat requirements may lead to suboptimal conditions that can lead to low nesting success, and eventual extinction of a population. Continued selection toward minimum standards could shift the genetics of the population, reducing the buffering effects of natural genetics that provide for natural environmental changes (Connor 1979).

But by providing optimum requirements, or at least a range of habitats, some of which exceed the known requirements, we can achieve the goals of multiple use without any gradual negative effect on species we wish to preserve.

**Wild Areas**

A growing number of people believe that every manager of forests should protect significant and representative areas from all habitat manipulation (Robbins 1979, Temple et al. 1979, Bury et al. 1980, Luman and Neitro 1980).

These areas serve as reservoirs of species that need mature vegetation for survival. They serve as biological indicators against which to measure the effects of various management practices. They provide a quality gene pool for forest tree species. In some instances they may be essential to the survival of some very rare species. If for no other reasons than moral and ethical, we should consider some areas inviolate.

## The Species and their Requirements

### Pileated Woodpecker, *Dryocopus pileatus*

The pileated woodpecker breeds throughout Ontario about as far north as Pickle Lake and Moosonee, but is less common in boreal forests than farther south.

They occupy both mixed and deciduous forests, but seldom pure coniferous forest. They show a propensity for white cedar and hemlock. They occupy both lowland and upland forests, but occur only in relatively mature and old growth woods with large trees. They may feed in a recently logged area if large numbers of snags and logs are left adjacent to mature forest where they prefer to live. They are an area sensitive species, requiring seventy (70) to 200 ha (175 to 500 ac) of forest per pair.

Nests are always in dead snags, typically within fifty (50) m of a stream or lake. There, snags average forty to sixty (40-60) cm (sixteen to twenty-four [16-24] in) DBH and between eight and twelve )8-12) m (twenty-five to thirty-five [25-35] ft) high. They prefer trees in which the centres decay before the exteriors - that is aspens over conifers.

(Bent 1939, Stewart and Robbins 1958, Beals 1960, Godfrey 1966, Connor and Adkisson 1975, Thomas et al. 1976, Connor and Adkisson 1977, Erskine 1977, Scott et al. 1977, Evans 1978, Evans and Connor 1979, Hall and Thomas 1979, McClelland 1979, McClelland et al. 1979, Niemi 1979, Temple et al. 1979, Thomas 1979, Connor 1980, Green and Niemi 1980, Luman and Neitro 1980, Anderson and Robbins 1982, Brawn et al. 1982, Peck and James 1983).

**Red-headed Woodpecker, *Melanerpes erythrocephalus***

The red-headed woodpecker nests across southern Ontario, although seldom on the Canadian Shield. They occur in the Rainy River to Thunder Bay region and along the north shore of Lake Huron where deciduous forests prevail.

They require mature deciduous and sometimes mixed woods, but prefer dry park like areas where there is little understory.

They will forage in fence rows and small woodlots near larger woods and require about four (4) ha (ten [10] ac) for a territory. They forage preferentially on living trees, but also on the ground, at forest edges and along fence rows. They "flycatch" for insects, and hence like openings and edges. Nests are in trunks of dead deciduous trees having at lease a diameter of forty to sixty (40-60) cm (sixteen to twenty-four [16-24] in) and a height of seven and a half to twelve (7.5-12) m (twenty-four to forty [24-40] ft).

(Bent 1939, Connor and Adkisson 1977, Scott et al. 1977, Evans and Connor 1979, Connor 1980, Peck and James 1983).

**Red-bellied Woodpecker, *Melanerpes carolinus***

The red-bellied woodpecker occurs only in a limited area in the extreme southwestern part of the province.

They also prefer mature deciduous forests, but dense and more continuous and with numerous dead trees on which they forage preferentially. They may be found in wet bottomland or mesic uplands, but require at least four (4) ha (ten [10] ac) of continuous forest.

Their nests are placed in the trunks of dead trees averaging thirty-five to fifty-five (35-55) cm (fourteen to twenty-two [14-22] in) DBH and nine to twelve (9-12) m (thirty to forty [30-40] ft) high.

(Bent 1939, Bond 1957, Stewart and Robbins 1958, Godfrey 1966, Scott et al. 1977, Evans 1978, Evans and Connor 1979, Robbins 1979, Samson 1980, Stauffer and Best 1980, Anderson and Robbins 1982, Brawn et al. 1982, Peck and James 1983).

**Yellow-bellied Sapsucker, *Sphyrapicus varius***

The yellow-bellied sapsucker breeds across Ontario north to Big Trout Lake and Moosonee, but is rare in the extreme south where much of the forest has been removed.

They are found in deciduous or mixed forests, particularly where birch and aspen occur, also where hemlock is available. They may be found in dense or very open forest, but require tall living trees for foraging.

Nests are also in tall trees, usually alive, but with heart rot. They select deciduous trees of twenty-five to thirty-five (25-35) cm (ten to thirteen [10-13] in) DBH and from six to twelve (6-12) m (eighteen to thirty-five [18-35] ft) high for most nests. Territories include from two to five (2-5) ha (five to twelve and a half [5-12.5] ac).

(Beals 1960, Erskine 1977, Scott et al. 1977, Evans and Connor 1977, Temple et al. 1979, Thomas 1979, Welsh and Filman 1980, McLaren and McLaren 1981, Brawn et al. 1982, Franzreb 1983, Peck and James 1983).

**Hairy Woodpecker, *Picoides villosus***

The hairy woodpecker breeds throughout the province, but becomes scarce in the far northern areas.

They prefer deciduous forests or mixed, but rarely pure coniferous stands. They prefer relatively mature trees, but accept a wide range of tree sizes and canopy closures. They must have some tree growth, but will nest in very open areas if a large number of tall trees and snags remain.

They nest in the main trunks of both live and dead trees, preferably alive with heart rot. Size of trees is usually at least twenty-five to thirty-five (25-35) cm (ten to twelve and a half [10-12.5] in) DBH and six to twelve (6-12) m (twenty to forty [20 – 40] ft) high. Territories cover four to eight (4-8) ha (ten to twenty [10-20] ac) of forested land, usually dry forest.

(Bond 1957, Stewart and Robbins 1958, Beals 1960, Godfrey 1966, Anderson and Shugart 1974, Connor and Adkisson 1975, Connor et al. 1975, Thomas et al. 1976, Connor and Adkisson 1977, Erskine 1977, Scott et al. 1977, Evans and Connor 1979, Robbins 1979, Thomas 1979, Connor 1980, Stauffer and Bent 1980, Welsh and Filman 1980, Peck and James 1983). (Bond 1957, Stewart and Robbins 1958, Beals 1960, Godfrey 1966, Anderson and Shugart 1974, Connor and Adkisson 1975, Connor et al. 1975, Thomas et al. 1976, Connor and Adkisson 1977, Erskine 1977, Scott et al. 1977, Evans and Connor 1979, Robbins 1979, Thomas 1979, Connor 1980, Stauffer and Bent 1980, Welsh and Filman 1980, Peck and James 1983).

**Downy Woodpecker, *Picoides pubescens***

The downy woodpecker breeds throughout Ontario as far north as Favourable Lake and Fort Albany.

They occur in deciduous or mixed woodlands, mainly in deciduous components, and although they require some tree growth may be found in very sparse woods and from very young to mature forests. They seem to prefer small woodlots or edges with shrubs and saplings. Dry areas are preferred.

Nests are almost invariably in dead snags, most often of fifteen to twenty-five (15-25) cm (six to ten [6-10] in) DBH and three to nine (3-9) m (ten to thirty [10-30] ft) high.

Territories cover two to four (2-4) ha (five to ten [5-10] ac) of woodlands.

(Bond 1957, Godfrey 1966, Anderson and Shugart 1974, Connor et al. 1975, Erskine 1975, Scott et al. 1977, Evans and Connor 1979, Niemi 1979, Thomas 1979, Green and Niemi 1980, Stauffer and Best 1980, Welsh and Filman 1980, Peck and James 1983).

**Black-backed Woodpecker, *Picoides arcticus***

The black-backed woodpecker occurs throughout forested parts of northern Ontario and as far south as Muskoka and Haliburton Districts.

They are found only in mature or old growth coniferous forests with large trees, but the forest need not be dense. They like burns, swamps and riparian areas that may be very open.

Nests are mainly in dead conifers, preferably twenty to thirty (20-30) cm (eight to twelve [8-12] in.) high. DBH and two and a half to four and a half (2.5-4.5) m (eight to twelve [8-12] ft.) high. They forage mainly on dead trees and territories cover thirty to forty (30-40) ha (seventy-five to one hundred [75-100] ac).

(Bent 1939, Godfrey 1966, Shortt 1974, Thomas et al. 1976, Erskine 1977, Scott et al. 1977, Dawson 1979, Evans and Connor 1979, McClelland 1979, Thomas 1979, Welsh and Filman 1980, James et al. 1982a, Peck and James 1983).

**Three-toed Woodpecker, *Picoides tridaclylus***

The three-toed woodpecker breeds primarily from northern Lake Superior northward, but a few isolated reports occur on the Canadian Shield as far south as Kingston.

They require coniferous tree growth that is relatively mature to old growth. They often nest in riparian areas, foraging mainly on live trees. They appear to need twenty to forty (20-40) ha (fifty to one hundred [50-100] ac) of forest or more. Nests are usually in dead snags of twenty to thirty (20-30) cm (eight to twelve [8-12] in) DBH and two to ten (2-10) m (six to thirty-five [6-35] ft) high.

(Bent 1939, Shortt 1974, Erskine 1977, Scott et al. 1977, Thomas et al. 1976, Evans and Connor 1979, McClelland 1979, Thomas 1979, Welsh and Filman 1980, James et al. 1982a, Peck and James 1983).

**Northern Flicker, *Colaptes auratus***

The northern flicker breeds throughout Ontario, in deciduous and mixed woods, but less often coniferous stands. They need large trees either dead or alive, but prefer very open woods edges, riparian areas, groves and logged areas with snags remaining. Territory size is about ten to twenty (10-20) ha (twenty-five to fifty [25-50] ac) in forested areas, but much less in open country, and the birds occur most places regardless of the forest size.

Nests are in dead deciduous trees mainly of about thirty to forty (30-40) cm (twelve to fourteen [12-14] in) DBH and from three to nine (3-9) m (ten to thirty [10-30] ft) high or higher.

(Stewart and Aldrich 1952, Beals 1960, Hagar 1960, Godfrey 1966, Connor et al. 1975, Galli et al. 1976, Thomas 1976, Connor and Adkisson 1977, Erskine 1977, McClelland et al. 1977, Evans and Connor 1979, Temple et al. 1979, Thomas 1979, Connor 1980, Peck and James 1983).

**Black-capped Chickadee, *Parus atricapillus***

The black-capped chickadee breeds across Ontario about as far north as Sandy Lake and Fort Albany. They frequent mixed and deciduous woods, but seldom pure coniferous forest, that may be very open to relatively dense, always with undergrowth of deciduous shrubs. Some tree growth appears to be important, whether short or tall and the area may be wet or dry. The nest is usually excavated by the bird, but may be a natural cavity or woodpecker hole in a dead deciduous stub, usually ten to eighteen (10-18) cm (four to seven [4-7] in) DBH and one to four (1-4) m (three to twelve [3-12] ft) high. Territories encompass an area of only one to two (1-2) ha (two and a half to five [2.5-5] ac) of woodland.

(Bond 1957, Godfrey 1966, Galli et al. 1976, Erskine 1977, Niemi 1979, Thomas 1979, Best 1980, Welsh and Filman 1980, Brawn et al. 1982, Peck and James 1983).

**Boreal Chickadee, *Parus hudsonius***

The boreal chickadee breeds across northern Ontario, south to about Algonquin Provincial Park.

They prefer coniferous forest, but also mixed woods, always with an understory of coniferous or deciduous shrubs and small trees. The territory size is probably about the same as that of the black-capped chickadee, usually in a dry area.

The nest cavity is ordinarily excavated by the birds in a dead deciduous stub, likely of ten to fifteen (10-15) cm (four to seven [4-7] in) DBH and one to four (1-4) m (three to twelve [3-12] ft) high.

(Godfrey 1966, Erskine 1977, Welsh and Filman 1980, McLaren and McLaren 1981, Jones et al. 1982a, James et al. 1982b, Peck and James 1983).

**Tufted Titmouse, *Parus inornatus***

The tufted titmouse is found only in the extreme south of the province, in deciduous and mixed woods. They require trees and a high degree of canopy cover, but the trees may be quite young to very mature. Shrub and sapling growth, often near water seems to be important. They appear to be area sensitive, requiring at least four (4) ha (ten [10] ac), but the evidence is not conclusive.

Nests are usually placed in natural cavities, rarely woodpecker holes, in living or dead deciduous trees, from nine to fourteen (9-14) m (thirty to forty [30-40] ft) high.

(Stewart and Robbins 1958, Godfrey 1966, Anderson and Shugart 1974, Connor and Adkisson 1975, Galli et al. 1976, Scott et al. 1977, Noon et al. 1979, Robbins 1979, Stauffer and Best 1980, Crawford et al. 1981, Brawn et al. 1982, Peck and James unpubl.).

**Red-breasted Nuthatch, *Sitta canadensis***

The red-breasted nuthatch breeds across Ontario as far north as Pickle Lake and Moosonee, but is very scarce south of the Canadian Shield.

They prefer mixed or coniferous woods mainly, and are most abundant in mature woods and relatively dense forests of at least 1 ha (2.5 ac) in size.

Nests are excavated usually, in a dead deciduous stub of 12 - 20 cm (5 - 8 in), between 3 and 9 m (10 - 30 ft) high.

(Stewart and Aldrich 1952, Stewart and Robbins 1958, Martin 1960, Godfrey 1966, Erskine 1977, Scott et al. 1977, Capen 1979, McClelland et al. 1979, Temple et al. 1979, Monthey 1983, Peck and James unpubl.).

**White-breasted Nuthatch, *Sitta carolinensis***

The white-breasted nuthatch breeds mainly in southern Ontario, but also in the Rainy River, Thunder Bay and the north shore of Lake Huron regions.

They prefer mature beech maple forests, but also mixed woods, either dry or moist. The trees may be relatively young as long as the canopy close is high and undergrowth is sparse.

Nests are usually in natural cavities in the main trunk of living and deciduous trees of twenty-five to thirty-five (25-35) cm (ten to fourteen [10-14] in) or larger DBH and from two to nine (2-9) m (six to thirty [6-30] ft) high. They need at least two (2) ha (five [5] ac) or more of continuous forest.

(Bond 1957, Godfrey 1966, Galli et al. 1976, Erskine 1977, Scott et al. 1977, Temple 1979, Stauffer and Best 1980, Crawford et al. 1981, Anderson and Robbins 1982, Peck and James unpubl.).

**American Kestrel, *Falco sparverius***

The American Kestrel breeds throughout Ontario, but is scarce in the boreal forest. They prefer open country with standing tall trees and snags including clearcuts, burns, and forest edges.

Nests are in old woodpecker holes or natural cavities in trees that are at least thirty (30) cm (twelve [12] in) DBH averaging five to twelve (5-12) m (sixteen to forty [16-40] ft) high.

(Godfrey 1966, Erskine 1977, Scott et al. 1977, Thomas 1979, Peck and James 1983).

**Barn Owl, *Tyto alba***

The barn owl breeds only in the extreme south near Lake Erie. They prefer open agricultural land in the vicinity of woodlots or buildings.
Nests in natural cavities require snags of at least fifty (50) cm (twenty [20] in) DBH and five (5) m (fifteen [15] ft) high.

(Stewart and Robbins 1958, Scott et al. 1977, Thomas 1979, Peck and James 1983).

**Eastern Screech-*Owl, Otus asio***

The eastern screech-owl is confined largely to southern Ontario as a breeding bird. They prefer open to more dense deciduous woods with mature trees. Nests are placed in deciduous trees, dead or alive, of at least thirty (30) cm (twelve [12] in) DBH and five (5) m (fifteen [15] ft) high or higher. Small woodlots are acceptable if scattered trees at least are available over several hectares.

(Godfrey 1966, Van Camp and Henry 1975, Noon et al. 1979, Thomas 1979, Peck and James 1983).

**Northern Hawk-Owl, *Surnia ulula***

The northern hawk-owl breeds throughout all of northern Ontario north of Wawa and Cochrane, rarely farther south. They characteristically prefer open coniferous or mixed woods, edges, and burns. Nests are placed in natural or old woodpecker cavities in snags whose DBH would probably normally exceed nineteen (19) cm (eight [8] in) and a height of two (2) m (six [6] ft).

(Godfrey 1966, Erskine 1977, Scott et al. 1979, James et al. 1982a, Peck and James 1983).

**Barred Owl, *Strix varia***

The barred owl breeds across Ontario, probably as far north as the Albany River and southern James Bay but northern limits are poorly documented. South of the Canadian Shield they are very rare or absent. They prefer mixed and deciduous forests of mature trees, with good crown closure and little understory, often near lakes and river. Swamps and river bottomlands are desired, but they require 100 to 250 ha (250 - 625 ac) per pair.

Nests are in snags of at least 50 cm (20 in) DBH and of 9 m (30 ft) in height.

(Stewart and Robbins 1958, Godfrey 1966, Erskine 1977, Noon et al. 1979, Scott et al. 1977, Thomas 1979, Peck and James 1983).

**Boreal Owl, *Aegolius funereus***

The boreal owl apparently breeds across the province in the boreal forest region, but the precise extent of its range is undetermined.

They apparently prefer mixed to pure coniferous forests (perhaps because of the presence of suitable cavities in aspens), and prefer to hunt in open areas at edges, beaver ponds and natural openings. They prefer mature forest. Nests are placed from eleven to seventeen (11-17) m (thirty-five to sixty [35-60] ft) high in dead or living trees at least thirty to thirty-five (30-35) cm (twelve to fourteen [12-14] in) DBH. Hunting territories may be as large or larger than five 5 sq. km (ca two [2] sq. mi).

(Godfrey 1966, Erskine 1977, Scott et al. 1977, Bondrup-Nielsen 1978, Green and Niemi 1980, Peck and James 1983).

**Saw-whet Owl, *Aegolius acadicus***

The saw-whet owl breeds across Ontario at least as far north as Lake Nipigon and Lake Abitibi, possibly further. They breed in coniferous, mixed and deciduous woods, of both second growth and mature trees in either wet or dry areas. Nests are placed in cavities, usually old woodpecker holes, from three to six (3-6) m (twelve to twenty [12-20] ft) high, in dead or living trees of at least thirty (30) cm (twelve [12] in) DBH.

(Godfrey 1966, Scott et al. 1977, Thomas 1979, Peck and James 1983).

**Great Crested Flycatcher, *Myiarchus crinitus***

The great crested flycatcher breeds primarily in southern Ontario where they occupy both deciduous and mixed woods.

They prefer neither very dense nor very open woods, and although more mature woods are favoured, they can be found in relatively short tree growth if a sufficient number of snags are available. Territories may not be more than one (1) ha (two and a half [2.5] ac) in size, but the birds seem to prefer rather extensive woodlands.

(Bond 1957, Stewart and Robbins 1958, Godfrey 1966, Connor and Adkisson 1975, Galli et al. 1976, Scott et al. 1977, Robbins 1979, Temple et al. 1979, Stauffer and Best 1980, Crawford et al. 1981).

**Tree Swallow, *Tachycineta bicolor***

The tree swallow breeds throughout the province, preferring open spaces often over water, but also recent clearcuts, beaver ponds, bogs, etc., where snags are available with cavities.

Nests are placed mainly in dead wood of at least twenty-five (25) cm (ten [10] in) DBH, at most any height.

(Godfrey 1966, Scott et al. 1977, McClelland et al. 1979, Noon et al. 1979, Thomas 1979, James et al. 1982a).

**Brown Creeper, *Certhia americana***

The brown creeper breeds throughout the forested portions of Ontario, but is rare in the far north and south of the Canadian Shield.

They occupy mixed, deciduous and coniferous forests, mainly older second growth and mature forest, often in riparian areas. Most nests are under the loose bark of snags, but sometimes also in tree cavities. Snags are usually between fifteen and forty (15-40) cm (six to sixteen [6-16] in) DBH and from two to six (2-6) m (six to twenty [6-20] ft) in height.

(Scott et al. 1977, McClelland et al. 1979, Thomas 1979, Green and Niemi 1980, Peck and James unpubl.).

**House Wren, *Troglodytes aedon***

The house wren breeds north to Kenora and Cochrane, but is scarce on the Canadian Shield. They prefer the edges of woods, rivers, swamps, clearcuts, openings, etc., where there are numerous shrubs and thickets.

They primarily occupy deciduous wood edges where there are snags of at least twenty-five (25) cm (ten [10] in) DBH and two (2) m (six [6] ft) high. Territories may occupy only point four (0.4) ha (1 ac).

(Stewart and Robbins 1958, Godfrey 1966, Scott et al. 1977, McClelland 1979, Thomas 1979).

**Eastern Bluebird, *Sialia sialis***

The eastern bluebird breeds as far north as Sioux Lookout and Moosonee, but is rare on the Canadian Shield. They require very open situations with little ground cover, ie., along the edges of forests in farmland or recent clearcuts.

They require snags with natural cavities or old woodpecker holes. Snags should be at least twenty (20) cm (eight [8] in) DBH and two to three (2-3) m (six and a half to ten [6.5-10] ft) high. Territories are four to eight (4-8) ha (ten to twenty [10-20 ac).

(Godfrey 1966, Scott et al. 1977, Pinkowski 1979, Taylor 1979, Crawford et al. 1981).

**Prothonotary Warbler, *Protonotaria citrea***

The prothonotary warbler breeds only in the extreme southern part of Ontario. They require wooded swamps with standing or flowing water and more than twenty-five percent (25%) canopy cover, and with numerous stumps and snags. They are an area sensitive species, preferring 100 ha (250 ac) or more of such woodland.

Nests are in natural or woodpecker cavities in dead wood of ten to forty-six (10-46) cm (four to eighteen [4-18] in) DBH, preferably only one to two (1-2) m (three to six [3-6] ft) above water or the ground.

(Scott et al. 1977, Robbins 1979, McCracken 1981, Peck and James unpubl.).

## Management Guidelines

### General Guidelines for all Species

(1) Leave all trees standing that are dead or dying or that have heart rot, regardless of the type of management practice (Connor and Adkisson 1975, Thomas et al. 1976, Scott et al. 1977, Evans 1978, Allan and Bohart 1979, Evans and Connor 1979, Taylor and Taylor 1979, Thomas et al. 1979a, Crawford et al. 1981, Brawn et al. 1982).

(2) In even-aged management strategies leave all dead or dying trees of any size for future snag replacement, and it may be necessary to have a certain number of healthy trees to grow to very large size to provide future snags. (Back 1979, McClelland et al. 1979, Thomas et al. 1979a). Programs that leave some live trees standing have the effect of increasing the number and diversity of birds over the entire area being managed (Connor and Adkisson 1975, Franzreb 1983).

(3) Leave all unwanted trees - broken tops, twisted, many branches, scarred or unwanted species - as future snags (Crawford and Titterington 1979, Thomas et al. 1979a).

(4) Snags must be well distributed, but not necessarily evenly spaced, because of the territorial requirements of birds in summer (Thomas et al. 1979a).

(5) If undesirable trees are to be killed, girdle them rather than cutting and removing them. This provides snags at very little cost (Evans 1978, Temple et al. 1979).

(6) Leave all logs and logging slash on the forest floor (Connor and Adkisson 1975, Back 1979, Capen 1979, Dawson 1979, Maser et al. 1979).

(7) Discourage salvage logging or cutting of dead trees for firewood (Crawford and Titterington 1979, Thomas et al 1979a).

(8) Provide at least nine (9) large snags per hectare (three [3] per acre) in riparian areas and at least six (6) large snags per hectare elsewhere. Twice that number for smaller snags should be provided as well. These provide the basic requirements for nesting birds, but numerous additional snags may be required for winter feeding. See guidelines (1) and (2) for the provision of snags (Scott et al. 1977, Dickson et al. 1983).

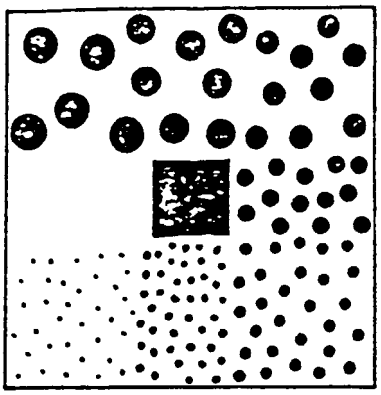
(9) In more southern hardwood stands, avoid clearcutting. Selective cutting of small patches or thinning of single trees is the optimum practice (Crawford and Titterington 1979, Takekawa et al. 1982). Encourage the reforestation of blocks of hardwoods, particularly in lowland areas. There is a need for more extensive forest sizes in agricultural areas south of the Canadian Shield. This is one type of woodlot where the provision of maximum diversity is not necessarily advisable (Samson 1979).

(10) In mixed and coniferous forests, clearcutting blocks is the preferred practice but set rotation ages long enough that trees have time to reach maturity (to provide optimum tree sizes for a key species - the pileated woodpecker) (Evans 1978, Connor 1979, Dawson 1979, Evans and Connor 1979, Temple et al. 1979). The fraction of a management area to be cut in any decade equals 1/R where R is the desired stand rotation age in decades (ie., if the time for a forest to mature is 100 years, the fraction of the management area to be cut in any decade is 1/10th (Mealey et al. 1982).

(11) Consider leaving five to ten percent (5-10%) of any management area uncut (at least 255 ha but preferably as much as 1000 ha - 640 - 2500 acres) to provide for area sensitive and secretive species. These areas may include riparian zones but should include some upland as well. Various unique features may be preserved here (Evans 1978, Evans and Connor 1979, Robbins 1979, Temple et al. 1979, Luman and Neitro 1980).

(12) If possible, maintain a large undisturbed tract as the nucleus of any managed area in regions where extensive forests still exist (ie., on the Canadian Shield). Then avoid unnecessary fragmentation. Plan for large blocks, not necessarily all the same size, but probably ten to twenty (10-20) ha (twenty-five to fifty [25-50] ac) minimum. Use a fairly uniform plan of rotation on the large blocks so that species displaced in mature stands have a minimum of distance to move to similar forest (Robbins 1979). The manager should maintain a diversity of habitats so that the minimum area of each successional stage is always available for the breeding birds in that region.

An ideal model might be as seen here with the centre uncut and the size of spots representing different ages of trees.



The edges of different stands need not be straight. Uneven edges provide increased edge effect.

(13) Avoid cutting riparian forests. Plan to leave them as part of the nesting requirements for cavity nesters, as well as for the requirements of numerous other animals. The closer the cutting is to a stream or lake, the greater the impact on wildlife. Leave forest on all steep banks. Limit cutting to selective removal if it is to be done. Try to maintain a minimum of fifty (50) m uncut on either side of a river or lake (Allan and Bohart 1979, Evans and Connor 1979, Thomas et al. 1979b).

(14) Avoid huge monocultures of single species. Natural regeneration or planting along with natural regeneration to provide for mixed species composition (diversity) is preferable (Capen 1979, Crawford and Titterington 1979, Temple et al. 1979, Evans 1982).

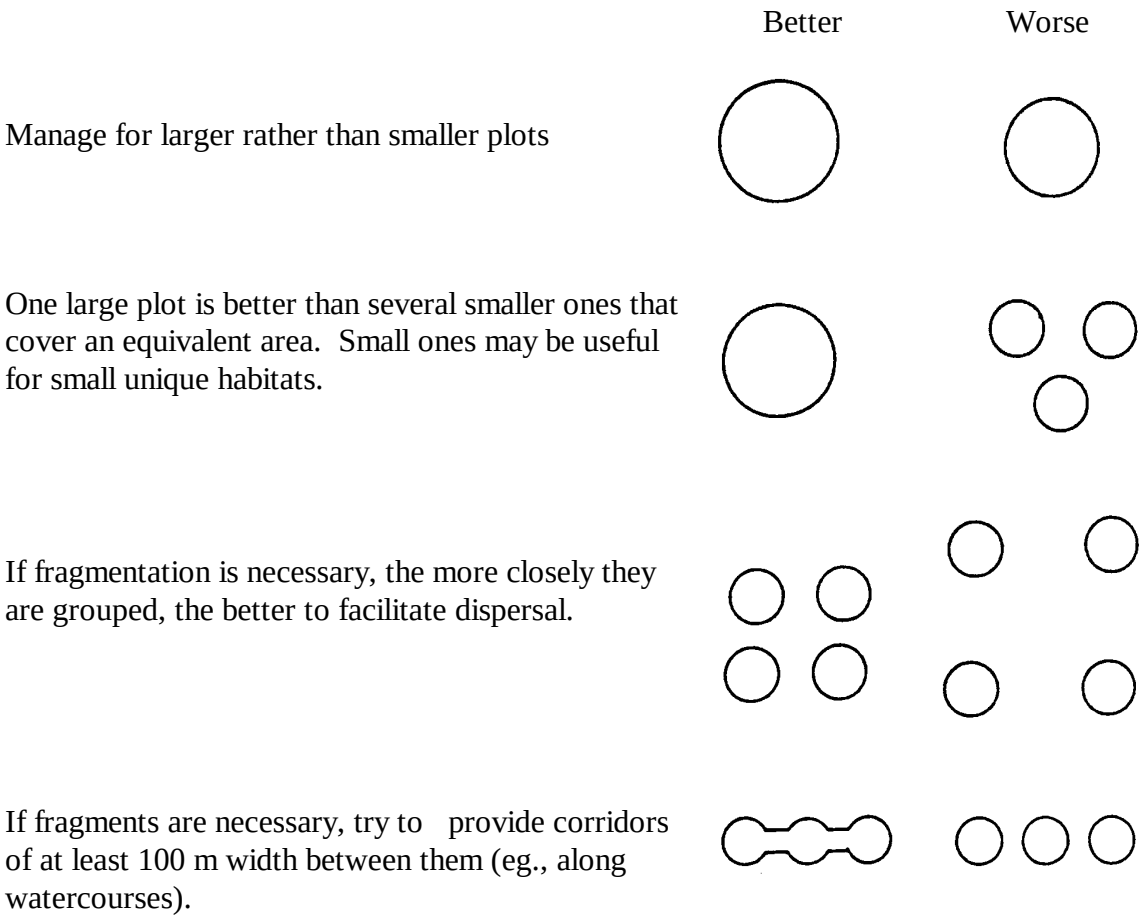
(15) Avoid constructing roads along riparian corridors, as this greatly increases disturbance in these critical areas (Thomas et al. 1979b).

(16) Try to provide optimal and not just minimal habitat requirements (Connor 1979).

(17) Avoid the use of pesticides on forests (Radtke 1973, Takekawa et al. 1982).

**Design Principles for All Species**

These principles will minimize local extinction rates (Diamond 1975).




**Guidelines for Pileated Woodpecker**

Within each management area, leave five to ten percent (5-10%) of the forest with a significantly old-growth component. This may be in blocks of at least twenty to forty (20-40) ha (fifty to one hundred [50-100] ac), or riparian corridors of at least 100 m (300 ft) in width (McClelland et al. 1979). Follow general guidelines (1) to (8), particularly for snags and logs and riparian areas.

**Guidelines for Other Woodpeckers**

If the general guidelines and design principles are followed, with particular attention to the needs of the pileated woodpecker, the other woodpeckers will generally be taken care of.

**Guidelines for Other Cavity-Nesting Birds**

If the general guidelines and design principles are followed for woodpeckers, the other cavity-nesting birds will be accommodated. But also consider nest boxes, particularly for barn-owl, screech-owl, eastern bluebird and prothonotary warbler as outlined in Appendix I.

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## Appendix I: Dimensions of boxes for forest-dwelling cavity-nesting birds.

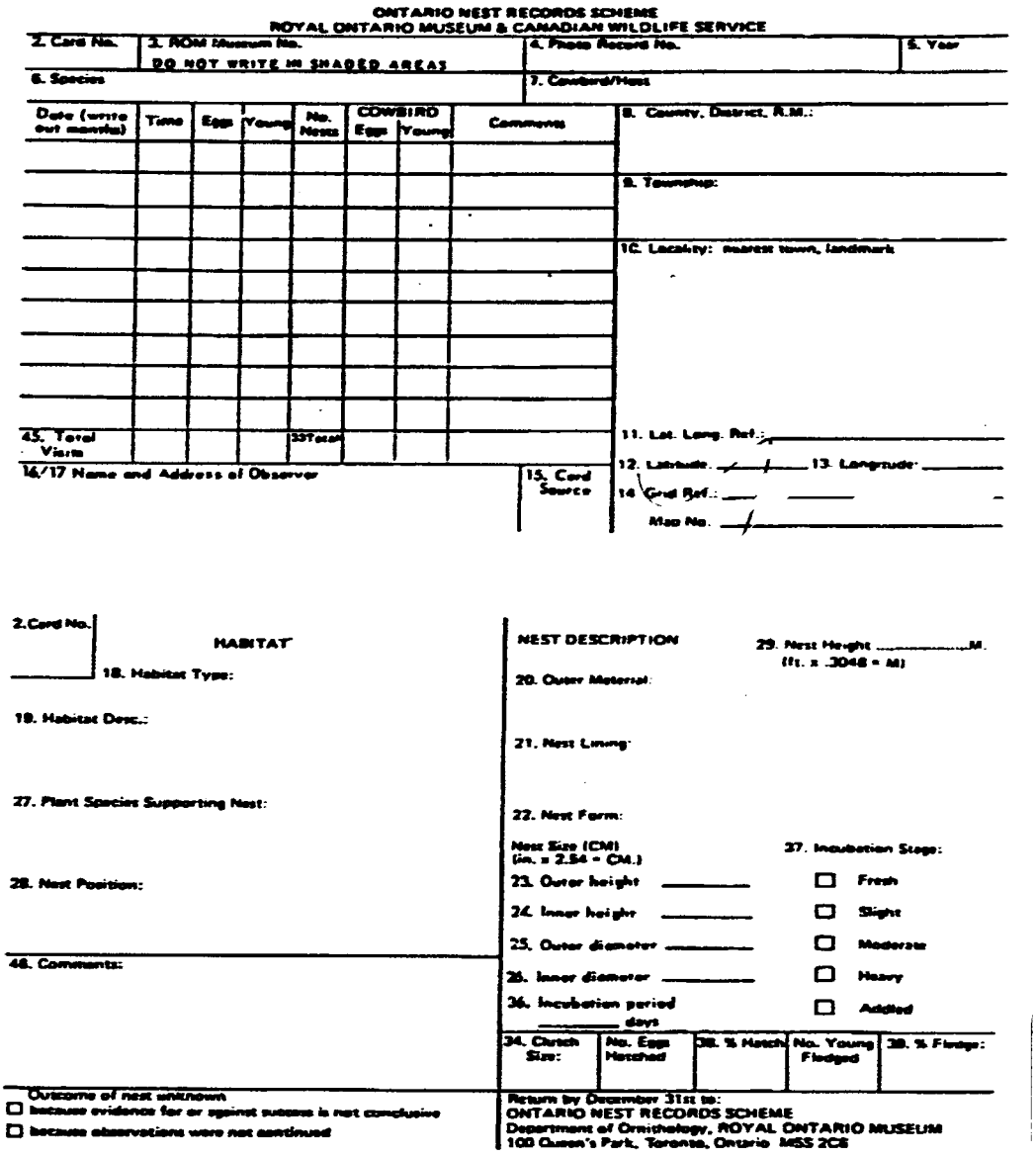
| Species | Floor Area (cm) | Height of Walls (cm) | Hole Diameter (cm) | Entrance Above Floor (cm) | Min. Height Above Ground (m) |
|---|---|---|---|---|---|
| American Kestrel* | 20x20 | 30-40 | 8x10 | 24-30 | 5-12 |
| Barn Owl -outdoor* | 25x25 | 40-45 | 12x15 | 30-40 | 5-12 |
| -for buildings | 45x75 | 45 | 15 | 15-20 | 5-12 |
| Screech Owl* | 20x20 | 45-50 | 8 | 45 | 3-9 |
| Barred Owl* - not known to use nest boxes, but try barn owl sized box or larger. | | | | | |
| Saw-whet Owl* | 15x15 | 45 | 6.5 | 40 | 4-6 |
| Great Crested Flycatcher* | 12x12 | 30 | 5 | 25 | 3-10 |
| Tree swallow | 12x12 | 15 | 4 | 10-12 | 2-5 |
| Black-capped Chickadee | 10x10 | 20-25 | 3 | 15-20 | 2-5 |
| White-breasted Nuthatch | 10x10 | 20-25 | 3.5 | 15-20 | 3-8 |
| Tufted Titmouse | 10x10 | 20-25 | 3 | 15-20 | 2-10 |
| House Wren | 10x10 | 15-20 | 2.5 | 12-15 | 3-8 |
| Eastern Bluebird | 12x12 | 20-25 | 4 | 15-20 | 1-3 |
| Prothonotary Warbler | 9x9 | 20 | 4 | 11 | 1-2 |

*Wire mesh should be fastened to the inside front of the box below the entrance, to assist young birds in clambering out.

## Appendix II. Ontario Nest Record Cards

A sample copy of a card is included on this page. They are obtainable from the Department of Ornithology, Royal Ontario Museum, 100 Queen's Park, Toronto M5S 2C6. The completion of these cards for all nests located would provide considerable information on specific habitat requirements for bird species.

Habitat information should include the tree species and shrub species present, the ages and sizes of trees in general, the nearness to water, the canopy closure, and other comments as apparent. For cavity nesters also include the DBH of the nest tree.



ONTARIO NEST RECORDS SCHEME
ROYAL ONTARIO MUSEUM & CANADIAN WILDLIFE SERVICE

2. Card No. | 3. ROM Museum No. DO NOT WRITE IN SHADED AREAS | 4. Photo Record No. | 5. Year

6. Species | 7. Cowbird/Host

| Date (write out months) | Time | Eggs | Young | No. Nests | COWBIRD Eggs | COWBIRD Young | Comments |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 45. Total Visits | | | | 33Total | | | |

8. County, District, R.M.:

9. Township:

10. Locality: nearest town, landmark

11. Lot. Long. Ref.:

12. Latitude: 13. Longitude:

14. Grid Ref.:

Map No.

16/17 Name and Address of Observer

15. Card Source

2. Card No.

HABITAT

18. Habitat Type:

19. Habitat Desc.:

27. Plant Species Supporting Nest:

28. Nest Position:

48. Comments:

Outcome of nest unknown
☐ because evidence for or against success is not conclusive
☐ because observations were not continued

NEST DESCRIPTION

29. Nest Height ____M. (Ft. x .3048 = M)

20. Outer Material:

21. Nest Lining:

22. Nest Form:

Nest Size (CM) (in. x 2.54 = CM.)

23. Outer height ____

24. Inner height ____

25. Outer diameter ____

26. Inner diameter ____

36. Incubation period ____ days

37. Incubation Stage:
☐ Fresh
☐ Slight
☐ Moderate
☐ Heavy
☐ Addled

| 34. Clutch Size: | No. Eggs Hatched | 38. % Hatch | No. Young Fledged | 39. % Fledge: |
|---|---|---|---|---|
| | | | | |

Return by December 31st to:
ONTARIO NEST RECORDS SCHEME
Department of Ornithology, ROYAL ONTARIO MUSEUM
100 Queen's Park, Toronto, Ontario M5S 2C6