

**HABITAT MANAGEMENT GUIDELINES FOR ONTARIO'S FORESTS
NESTING ACCIPITERS, BUTEOS AND EAGLES**

ONTARIO MINISTRY OF NATURAL RESOURCES

**Prepared by Ross D. James
Associate Curator of Ornithology
Royal Ontario Museum**

MNR # 51607

ISBN 0-7794-2357-7 (Internet)

March 1984

Table of Contents

<i>Introduction</i>	4
<i>Factors Affecting Management Considerations</i>	5
General Comments	5
Deciduous Forests	5
Forest Sizes.....	5
Habitat Diversity	6
Riparian Areas	6
Edges and Openings.....	7
Nest Site Provision.....	7
Habitat Dispersion.....	7
Pesticides	7
Human Disturbance.....	7
Legislation.....	8
Minimum Standards.....	8
Wild Areas.....	8
<i>The Species and their Requirements</i>	9
Northern Goshawk, <i>Accipiter gentilis</i>	9
Cooper's Hawk, <i>Accipiter cooperii</i>	9
Sharp-shinned Hawk, <i>Accipiter striatus</i>	10
Red-shouldered Hawk, <i>Buteo lineatus</i>	10
Broad-winged Hawk, <i>Buteo platypterus</i>	11
Bald Eagle, <i>Haliaeetus leucocephalus</i>	12
<i>Management Guidelines</i>	12
General Guidelines for All Species.....	12
Design Principles for All Species.....	14
Guidelines for Northern Goshawk	14
Guidelines for Cooper's Hawk.....	15
Guidelines for Sharp-shinned Hawk.....	15
Guidelines for Red-shouldered Hawk.....	15
Guidelines for Broad-winged Hawk	16
Guidelines for Bald Eagle.....	16

<i>Acknowledgements</i>	16
<i>Appendix I: Inventory Data Sheet for Raptor Nests</i>	22
<i>Appendix II: Ontario Nest Records Scheme</i>	23

Introduction

With increasing urbanization in recent years, there has been a remarkable increase in the nonconsumptive use of wildlife, and a proportionate decrease in the number of hunters (Bury et al. 1980, Fillion et al. 1983). At the same time there is a growing realization that a natural community must be considered as a whole unit, and not managed solely for one segment of the animal or plant community (Evans 1978). Ecosystems are very complex things, the intricacies of which we undoubtedly do not yet fully understand. But it is certain that very often the health of one group depends upon the viability of another that may scarcely have been considered before. We should be trying to maintain a healthy system of all plants and animals for the maximum benefit of everyone. Any agency making decisions that affect Ontario's forests should be responsive to those needs and changes, and to the demand for nongame planning and research.

In almost all natural communities, nongame animals constitute the greatest portion of the vertebrate species and numbers of individuals; they are energetically critical elements of the functioning of natural ecosystems (Evans 1978, Bury et al. 1980). Raptors are wildlife species in need of protection and conservation as much as any other group of creatures. They are an integral part of a healthy functioning ecosystem. Since they occupy positions at the top of food chains and since they have specific requirements for nesting, they are useful as environmental barometers (Redig 1979). The precipitous decline of peregrine falcons in eastern North America subsequent to the widespread use of DDT for example, did a great deal to alert us to the hazards of continued use of persistent organochloride biocides. A healthy, diversified, regularly reproducing raptor population implies that management programs directed toward forest and wildlife populations are being conducted in accordance with the principles of maintaining a balanced ecosystem (Redig 1979).

Most breeding species have a wide geographic range, are mobile, and in no current danger of being reduced to less than self-sustaining populations. But some tolerate on a much narrower range of habitat variability or disturbance and require a more specialized management program (Evans and Connor 1979). Raptors are among the most easily disturbed by clearing or logging practices, and characteristically one of the first groups to disappear from disturbed areas (Noon et al. 1979). As they are relatively rare to start with, all forest dwelling raptors have undergone serious declines during the last century during a time when a large proportion of the native forests of Ontario have been subjected to clearing or disturbance. The more intensively our forests are managed in future, with an ever increasing demand for wood products, the greater the need to consider raptorial species that require extensive tracts of relatively mature forests (Jones 1979, Titus and Mosher 1981, Grier et al. 1982, Risley 1982, Morris and Lemon 1983, Reynolds 1983).

Timber management and wildlife management are seen as generally compatible, if the needs of wildlife are recognized and considered along with the requirements of timber management (Thomas 1979). No one can deny the value of wood products to the people of Ontario. It is not intended that these guidelines be considered strict laws that must be obeyed, but rather

procedures which can do a great deal to provide the necessary habitat for the continued existence of forest dwelling raptors. In many instances only some modification of existing practices may be necessary. But the habitat requirements of forest dwelling raptors must be considered if we are to retain viable populations of birds in the long term.

Although legislation may compel us to consider in great detail management for a species like the Bald Eagle, the other forest inhabiting raptors have generally not reached the critical stage yet in Ontario (Penak 1981, Risley 1981). Proper management now, however, for the most critical of species, means that in future we will not have to depend upon very costly programs of emergency recovery for single species. The key to raptor survival is habitat preservation (Redig 1979).

Factors Affecting Management Considerations

General Comments

Much of the information we have about the requirements of forest dwelling raptors comes from studies done outside Ontario. Nonetheless, the response of raptors to habitat manipulations is likely to be very similar throughout their range. We know a considerable amount about their needs and can reasonably predict what will occur in various situations.

There is an urgent need for additional information about Ontario's raptors. A suggested inventory data sheet and an Ontario Nest Record card are provided in Appendices I and II. Both should be completed for each nest located.

Deciduous Forests

The deciduous forests of Ontario, 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 and boreal forests on the Canadian Shield.

Forest Sizes

There appear to be 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 species, particularly raptors, are area sensitive. They 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, Robins 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 forests of deciduous trees in southern Ontario south and west of the Canadian Shield has undoubtedly contributed to the almost complete disappearance of the red-shouldered hawk from that area (Campbell 1975, Risley 1982). In small woodlots they are out-competed by the more dominant red-tailed hawk.

Habitat Diversity

The first rule of intelligent tinkering is to save **all** the pieces (Leopold 1949). The provision of diversity in forest ecosystems, that is the provision of some areas of all ages, from recently cut to mature, and of all tree species native to the area, is an objective that is considered to be essential to wildlife management (MacArthur and MacArthur 1961, MacArthur 1964, Willson 1974, Connor and Adkisson 1975, Siderts 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. 1979, Bury et al. 1980, Luman and Neitro 1980, Anderson and Robbins 1982, Takekawa 1982, Franzreb 1983). The provision of diverse habitats is a worthy goal for aesthetic and moral reasons, as well as being a workable management practice (Thomas et al. 1979).

Even-aged management, involving clearcutting of various ages, 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 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). However, although the provision of diversity is a basic concept of wildlife management, this does not preclude specific habitat management to meet the requirements of declining, threatened or endangered species (Siderts and Radtke 1977).

Riparian Areas

A major threat to some avian species is the loss of forests adjacent to lakes and rivers, particularly extensive swamplands (Samson 1979, Stauffer and Best 1980). All the forest dwelling raptors display a propensity for nesting close to rivers and lakes. The red-shouldered hawk is particularly adapted to hunting in lowland forests. Draining of swamps and removal of lowland forest may be critical to the survival of this species.

The riparian forests are important for the preservation of water quality through the control of erosion by wind and water and thus for the preservation of fish habitat, and for the preservation of rare plants; they provide travel lanes for wildlife and escape or thermal cover for terrestrial vertebrates; they provide dead trees for cavity nesters and a quality gene pool for forest tree

species (Allan and Bohart 1979). They are worth preserving for a whole host of species in addition to raptors.

Edges and Openings

Raptors often nest near or hunt in natural openings or along the edges of woods, and frequently use watercourses or laneways as flight paths. The maintenance of natural openings or the creation of additional ones is of benefit to most raptors.

Nest Site Provision

All the raptors considered here (except the bald eagle) will find suitable nest trees, if they can locate a suitable patch of forest in which to live. The bald eagle requires very large trees in which to place a nest and long term provision of these trees is a necessary part of eagle management.

Habitat Dispersion

Forest dwelling raptors are strongly territorial. Two patches of habitat each suitable for a single pair of one species must be a certain distance apart, or only one pair will occupy both patches.

Pesticides

Raptors are at the top of food chains of various types. Chemical pesticides found in their prey species are accumulated and concentrated in their bodies. We have been witness to the disastrous effects of this poisoning in Ontario as well as elsewhere in the world. The use of persistent biocides can only have a negative effect on breeding raptor populations. Let us not forget that we too are at the top of a food chain.

Human Disturbance

Raptors are very susceptible to human disturbance, particularly among the larger birds and especially early in the breeding season. Nests may be abandoned after a single disturbance and repeated disturbances later in the season may cause young to be neglected, leading to their death (Jones 1979, Craighead and Mindell 1981, Evans 1982, Grier et al. 1982).

Prime areas of former wilderness, once incorporated into a park, become increasingly subject to human disturbance. It is very important in park management to limit human activities in certain areas or at certain seasons if raptor populations are to be maintained in these areas (Craighead and Mindell 1981). Road building for any reason may also provide access to areas once isolated and have a negative impact on raptor populations.

Legislation

A regulation made under the *Endangered Species Act, R.S.O. 1980, c.138*, protects the bald eagle and its habitat. Two other raptors, the peregrine falcon (*Falco peregrinus*) and golden eagle (*Aquila chrysaetos*) are also protected by this legislation.

All other raptors are protected under the *Game and Fish Act, R.S.O. 1980, c.182*, but their habitats are not specifically protected.

Minimum Standards

Managers may be tempted to shorten rotation times for forest cutting in an attempt to provide maximum yields in the face of increasing demands. If they try to provide only the minimum standards necessary for the maintenance of the most critically threatened wildlife species, in the long run they may bring about 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 cases 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

Northern Goshawk, *Accipiter gentilis*

The goshawk breeds through Ontario, except in the extreme south where a sufficient amount of forest habitat is no longer available. They can be found only in extensive stands, but of deciduous, mixed or coniferous trees. They strongly favour **mature or old growth forests** where there is a variety of understory trees and shrubs to provide green foliage from near the ground to the canopy. The canopy closure need not be very high (averaging sixty [60] percent)



Nests are placed in the most dense patch of trees available, almost always near a stream or lake and the natural open area provided by the water body for use as a flight path.

Nests are well below the crown, preferably in large deciduous trees, averaging nine (9) to twelve (12) m (thirty [30] to forty [40] ft) in height, and are placed in main crotches or against the trunk on large branches.

The home range used for hunting by a single pair of goshawks encompasses ten (10) to twenty (20) sq. km (four [4] to eight [8] sq. mi) or more, but may include a variety of forest types. A smaller nesting territory of at least twelve (12) ha (thirty [30] ac) of mature or old growth forest is necessary. Nests are unlikely to be closer than one (1) km (0.6 mi). Therefore, the maximum density will be four (4) pairs per township (of 6 x 6 mi or 9.6 x 9.6 km). (Hagar 1960, Erskine 1977, Jones 1979, Thomas 1979, Luman and Neitro 1980, Reynolds et al. 1982, Peck and James 1983).

Cooper's Hawk, *Accipiter cooperii*

The Cooper's hawk breeds throughout southern Ontario, and only about as far north as the latitude of Lake Superior. They are not a boreal forest bird. In the extreme south where forests have been largely cut, they are very sparse or absent.

They occupy only large areas of deciduous or mixed forests. They prefer **even-aged second growth** forest, but **with older trees** (fifty [50] to ninety [90] years) where there are deep crowns and fewer trees per unit area. Canopy closure is moderately high (sixty [60] to seventy [70] percent) and generally little or no ground cover. In Ontario they have a preference for mature white pine stands.



Nests will be in a dense patch of trees, usually deciduous, in the main crotch or on large limbs at the trunk, well below the forest canopy. Nests heights average nine (9) to fourteen (14) m (thirty [30] to forty-five [45] ft) high, and as with other accipiters will be placed near water and the clearing provided by the lake or stream.

A nesting territory must be at least six (6) ha (fifteen [15] ac) in size, but the hunting territory will extend over three (3) to five (5) sq. km (one [1] to two [2] sq. mi). The hunting habitat required is not strictly even aged forest, and requirements are not as stringent as for goshawks or sharp-shinned hawks. Nests are unlikely to be closer than 1.6 km (one [1] mi), and the maximum density is about five (5) pairs per township (of 6 x 6 mi or 9.6 x 9.6 sq. km). (Stewart and Robbins 1958, Jones 1979, Thomas 1979, Penak 1981, Titus and Mosher 1981, Reynolds et al. 1982, Peck and James 1983, Reynolds 1983).

Sharp-shinned Hawk, *Accipiter striatus*

The sharp-shinned hawk may be found in summer across Ontario north to about Pickle Lake and Moosonee, but seldom ever south of the Canadian Shield in southern Ontario. They place their nests in very **dense** (eighty [80] percent or more canopy closure) **even-aged, young** (twenty [25] to fifty [50] years old) stands of **coniferous trees**, often in wet areas, but usually near lakes and rivers. However, they forage regularly in deciduous or mixed as well as coniferous woods, particularly near more open areas and so are typical of edge situations. So while they prefer relatively remote areas with extensive forests, they require openings or edges. They may forage in cut over areas.



Nests are placed near the crowns of dense conifers, and average six (6) to ten (10) m high (twenty (20) to thirty-five [35] feet). They defend an area of 100 to 200 m about the nest (four [4] ha), but fly as far as 1.2 km (0.75 mi) about the nest to forage. Nests would seldom be as close as one (1) km (0.6 mi). Maximum density then would be about twenty (20) pairs per township (of 6 x 6 mi; 9.6 x 9.6 km). (Hagan 1960, Godfrey 1966, Erskine 1977, Jones 1979, Taylor and Taylor 1979, Thomas 1979, Reynolds et al. 1982, Peck and James 1983, Reynolds 1983).

Red-shouldered Hawk, *Buteo lineatus*

This species is confined mainly to southern Ontario. A few may be found as far north as Lake Abitibi if extensive deciduous forests are found. South and west of the Canadian Shield they have become scarce as forests have been cleared or reduced to small woodlots.

They occupy mixed or deciduous forests, but prefer deciduous. On the Canadian Shield these woods may be quite dry, but elsewhere they particularly like wet bottomlands and swamps. Wherever they occur they are almost totally restricted to **mature, closed canopy forests** with a minimum of understory. They have a strong preference for maple or beech forest.



They are an **area sensitive** species requiring a minimum of ten (10) ha (twenty-five [25] ac) of continuous forest to meet territorial requirements, and would probably prefer closer to 100 ha (250 ac) of forest before taking up residence. In prime habitat nests are unlikely to be closer than .6 km (.35 mi) apart.

Nests are almost always near water, placed well below the canopy, but still high (twelve [12] - fifteen [15] m/forty [40] - fifty [50] ft) in very tall trees. The birds may hunt in marshes adjacent to or interspersed in a forest tract, but usually hunt within the forest. They commonly take prey on the ground in wet areas. (Stewart 1949, Stewart and Robbins 1958, Godfrey 1966, Campbell 1975, Galli et al. 1976, Robbins 1979, Samson 1980, Bednarz and Dinsmore 1981, Titus and Mosher 1981, Risley 1982, Armstrong and Euler 1983, Morris and Lemon 1983, Peck and James 1983).

Broad-winged Hawk, *Buteo platypterus*

The broad-winged hawk breeds throughout Ontario, rarely as far north as Pickle Lake and Moosonee. In the agricultural parts of the province they are scarce as extensive woods are few.

Broad-winged hawks nest in dense and extensive forests, usually of deciduous trees or mixed coniferous and deciduous, but rarely in coniferous forest. They will occupy younger and more open forests than red-shouldered hawks, often where there is considerable understory, but also in mature forest. Birch and aspen forests, rather than maple forests are preferred.



They frequently nest near lakes, rivers or forest edges. Nests are placed in the main crotches of deciduous trees, particularly birch trees, mainly seven and one half (7.5) to twelve (12) m high (twenty-five [25] - forty [40] ft).

Home range probably covers as much as two and one half (2.5) sq. km (one [1] sq. mi) but precise data are lacking. (Stewart and Robbins 1958, Matray 1974, Erskine 1977, Webb et al. 1977, Noon et al. 1979, Titus and Mosher 1981, Armstrong and Euler 1983, Peck and James 1983).

Bald Eagle, *Haliaeetus leucocephalus*

The bald eagle may be found throughout the province where large lakes are found. They are virtually absent from the whole of the Hudson Bay Lowland and have become very rare in southern Ontario.

They require a large continuous area of deciduous or mixed woods around the shores of large lakes or rivers. For nesting, shelter, roosting, feeding and normal behaviour, they require an area of about 255 ha (640 ac). Islands in lakes are preferred sites for nesting because they have often not been burned or logged and offer many large trees suitable for nests. They prefer rather open woods with about thirty (30) to fifty (50) percent canopy cover.



They require tall living trees for nests. They usually select the tallest available. Nests are placed below the tree top to provide some shade. These trees then must be sticking above the rest of the forest canopy and offer a clear approach from all directions. These trees should be within 200 m and preferably within fifty (50) m of a lakeshore. In southern Ontario they use almost any species of tree to nest in. White pines are preferred in northern Ontario and beyond the range of this species, trembling aspen is used almost exclusively.

They also require a number of tall dead, partially dead or living trees, usually within 400 m of a nest, for perching. (Evans 1982, Grier et al. 1982, Brownell and Oldham 1983, Peck and James 1983).

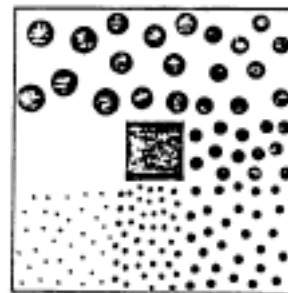
Management Guidelines

General Guidelines for All Species

1. 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 lowland areas with hardwoods. This is one place where the provision of maximum diversity is not necessarily advisable - see management guidelines for red-shouldered hawk (Samson 1979).

2. In mixed and coniferous forests clearcutting blocks is the preferred practice, but set rotation ages of forests long enough that trees have time to reach maturity (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 equals 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 $1/10$ th (Mealey et al. 1982).
3. Consider leaving five (5) to ten (10) percent off any management unit uncut (at least 255 ha but preferably as much as 1,000ha - 640 to 2500 ac) 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).
4. 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 (10) to twenty (20) ha (twenty-five [25] to fifty [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).

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











5. Avoid cutting riparian forests if possible. Plan to leave them as part of the nesting requirements of any raptor, as well as for the requirements of numerous other animals. The closer cutting is to a stream or lake, the greater the impact on wildlife. Leave forest on all steep banks. Limit cutting there 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. 1979).
6. Avoid monocultures of single species. Natural regeneration or planting with mixed species compositions is preferable (Capen 1979, Crawford and Titterington 1979, Temple et al. 1979, Evans 1982).

7. Avoid constructing roads along riparian corridors as this greatly increases disturbance in these critical areas (Thomas et al. 1979).
8. Try to provide optimal and not just minimal habitat requirements (Connor 1979).
9. Avoid the use of persistent pesticides on forests (Radke 1973, Takekawa et al. 1982).

Design Principles for All Species

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

	Better	Worse
– Manage for larger rather than smaller plots.		
– One large plot is better than several smaller ones that cover an equivalent area. Small ones may be useful for small unique habitats.		
– If fragments are necessary, the more closely they are grouped the better to facilitate dispersal.		
– If fragments are necessary try to provide corridors of at least 100 m width between them (eg., along watercourses).		

Guidelines for Northern Goshawk

If nest sites are known - leave at least eight (8) ha (3.2 ac) around the nests uncut and unthinned.

Where nest locations are not known plan to provide a maximum of four (4) sites per township (of thirty-six [36] mi sq) each of eight (8) ha. If possible provide an alternate site of the same size near each primary site. The distance between primary sites should be at least six (6) km (3.6 mi). Sites should be of mature or over mature trees. Sites should be remote and not subject to disturbance during the breeding season. Each site should have a river or lake present within it. Restrict activity in nesting areas during the period March through June. (Reynolds et al. 1982, Reynolds 1983).

Guidelines for Cooper's Hawk

If nest sites are known - avoid cutting or thinning trees in an area of at least six (6) ha (2.4 ac) around each.

Where nest locations are not known plan to provide a maximum of five (5) sites per township (thirty-six [36] sq. mi) each of at least six (6) ha. Provide an alternate site of the same size near each primary site, if possible. The distance between primary sites should be at least five (5) km. Each site should have a river or lake included. Tree ages should be forty (40) to eighty (80) years old. These sites when more mature will be suitable for Goshawk if large enough in area. A strip of 400 - 500 m wide along a lake or river would be suitable. Restrict activity in nesting areas from March through July. (Jones 1979, Penak 1981, Reynolds et al. 1982, Reynolds 1983).

Guidelines for Sharp-shinned Hawk

If nest sights are known avoid cutting or thinning in an area of at least four (4) ha (1.6 ac) about the nest.

Where nest locations are not known plan to provide as many as twenty (20) sites per township (of thirty-six [36] sq. mi), each of at least four (4) ha (ten [10] ac) in area, and not closer than four (4) km apart. If possible provide an alternate site of the same size near each of the primary sites. Age of the trees should be twenty (20) to fifty (50) years. Include a river or lake shore in each site. If sites are left large enough they may be subsequently taken over by Cooper's Hawks and Goshawks.

Restrict activity in nesting areas from April through July. (Reynolds et al. 1982, Reynolds 1983).

Guidelines for Red-shouldered Hawk

If nest sites are known, maintain essentially mature forest with little understory in an area of at least ten (10) ha (twenty-five [25] ac), preferably more. Selective cutting of single trees or very small patches is possible. Avoid disturbance in the area from mid March to the end of June. Management of woodlots for sugar maple production through the removal of smaller trees is beneficial.

Where nest sites are not known, preserve large tracts of maple dominated deciduous forests in sizes of ten (10) to 100 ha or more, in mid to late successional stages, particularly low wet woods in southern agricultural areas, but also drier regions on the Canadian Shield. Streams, lakes or marshes should be a part of any such area. Centres of such areas should not be much closer than half (.5) to one (1) km. Management should encourage the growth of large trees and closed canopy forest. Thinning of individual or very small patches is permitted. Restrict activity in

nesting areas from March through July. (Samson 1979, Bednarz and Dinsmore 1981, Risley 1982, Morris and Lemon 1983).

Guidelines for Broad-winged Hawk

If the general guidelines for all species are followed, this species will probably be provided for. They need extensive stands of relatively dense forest, but tolerate numerous openings. They require stands in riparian areas, particularly deciduous or mixed woods.

Guidelines for Bald Eagle

Refer to: Bald Eagle Habitat Management Guidelines
Wildlife Branch, Ontario Ministry of Natural Resources
1987

Acknowledgements

I would like to thank I. Bowman, Nongame Program Coordinator, for giving me the opportunity to prepare this report. The librarians at the Royal Ontario Museum were most helpful in providing and processing numerous works. The manuscript was typed by Mrs. Margaret Goldsmith.

Literature Cited

- Allan, D. H. and C. V. Bohart. 1979. *Soil conservation service programmes in nongame bird habitat management*. In De Graaf, R. M. and K. E. Evans. 1979. Management of north central and northeastern forests for nongame birds. USDA Forest Service, General Technical Report NC-51. pp. 260-262.
- Anderson, S. H. and C. S. Robbins. 1982. *Habitat-size and bird community management*. Trans. North American Wildlife and Natural Resources Conferences 46:511-520.
- Armstrong, E. and D. Euler. 1983. *Habitat usage of the two woodland **Buteo** species in central Ontario*. Canadian Field-Naturalist 97(1):200-207.
- Bednarz, J. C. and J. J. Dinsmore. 1981. *Status, habitat use and management of Red-shouldered Hawks in Iowa*. J. Wildlife Management 45:236-241.
- Brownell, V. R. and M. J. Oldham. 1983. *Status report on the Bald Eagle (*Haliaeetus leucocephalus*) in Canada*. Ontario Ministry of Natural Resources, Unpubl. Rept. 80 pp.
- Bury, R. B., H. W. Campbell and N. J. Scott. 1980. *Role and importance of nongame wildlife*. Trans. North American Wildlife and Natural Resources Conference 45:197-207.
- Campbell, C. A. 1975. *Ecology and reproduction of Red-shouldered Hawks in the Waterloo Region, southern Ontario*. Raptor Research 9:12-17.
- Capen, D. E. 1979. *Management of northeastern pine forests for nongame birds*. In De Graaf, R. M. and K. E. Evans. Management of north central and northeastern forests for nongame birds. USDA Forest Service, General Technical Report NC-51. pp. 90-109.
- Connor, R. M. 1979. *Minimum standards and forest wildlife management*. Wildlife Society Bulletin 7:293-296.
- Connor, R. M. and C. S. Adkisson. 1975. *Effects of clearcutting on the diversity of breeding birds*. J. Forestry 73:781-785.
- Craighead, F. C. and D. P. Mindell. 1981. *Nesting raptors in western Wyoming, 1947 and 1975*. J. Wildlife Management 45(4):865-872.
- Crawford, H. S. and R. W. Titterington. 1979. *Effects of silvicultural practices on bird communities in upland spruce-fir stands*. In De Graaf, R. M. and K. E. Evans. Management of north central and northeastern forests for nongame birds. USDA Forest Service, General Technical Report NC-51. pp. 110-119.

- Dawson, D. K. 1979. *Bird communities associated with succession and management of lowland coniferous forests*. In De Graaf, R. M. and K. E. Evans. Management of north central and northeastern forests for nongame birds. USDA, Forest Service, General Technical Report NC-51. pp. 120-131.
- Diamond, J. M. 1975. *The island dilemma: lessons of modern biogeographic studies for the design of natural reserves*. Biological Conservation 7:129-146.
- Erskine, A. J. 1977. *Birds in Boreal Canada*. Canadian Wildlife Service, Report Series 41.
- Evans, D. L. 1982. *Status reports on twelve raptors*. U. S. Fish and Wildlife Service, Special Scientific Report. Wildlife No. 238.
- Evans, K. A. 1978. *Forest management opportunities for songbirds*. Trans. North American Wildlife and Natural Resources Conference 43:69-77.
- Evans, K. E. and R. N. Connor. 1979. *Snag management*. In De Graaf, R. M. and K. E. Evans. Management of north central and northeastern forests for nongame birds. USDA, Forest Service, General Technical Report NC-51. pp. 214-225.
- Filion, F. L., S. W. James, J. L. Ducharme, W. Pepper, R. Reid, P. Boxall and D. Teillet. 1983. *The importance of Wildlife to Canadians*. Canadian Wildlife Service. 40 pp.
- Franzreb, K. E. 1983. *A comparison of foliage use and tree height selection by birds in unlogged and logged mixed-coniferous forest*. Biological conservation 27:259-275.
- Franzreb, K. E. and R. D. Ohmart. 1978. *The effects of timber harvesting on breeding birds in a mixed-coniferous forest*. Condor 80:431-441.
- Galli, A. E., C. F. Leck and R. T. T. Forman. 1976. *Avian distribution patterns in forest islands of different sizes in New Jersey*. Auk 93:356-364.
- Godfrey, W. E. 1966. *The birds of Canada*. National Museum of Canada. Bulletin 203.
- Grier, J. W., F. J. Bramlich, J. Mattsson, J. E. Mathisen, J. V. Kussman, J. B. Elder and N. F. Green. 1982. *Northern States bald eagle recovery plan*. Unpubl. Rept. to U.S. Fish and Wildlife Service. 100 pp.
- Hagar, D. C. 1960. *The interrelationship of logging, birds and timber regeneration in the Douglas-fir region of northwestern California*. Ecology 44:116-125.

- Jackson, J. A. 1979. *Insectivorous birds and North American forest ecosystems*. In Dickson, J. G., R. N. Connor, R. R. Fleet, J. A. Jackson and J. C. Kroll eds. *The Role of Insectivorous birds in Forest Ecosystems*. New York, Academic Press. pp.1-7.
- Jones, S. 1979. *Habitat management series for unique or endangered species*. Rept. No. 17. The accipiters - Goshawk, Cooper's Hawk, Sharp-shinned Hawk. U.S. Dept. Interior, Bureau of Land Management, Tech. Note. 51 pp.
- Leopold, A. S. 1949. *A Sand County Almanac, and Sketches Here and There*. New York, Oxford University Press.
- Luman, I. D. and W. A. Neitro. 1980. *Preservation of mature forest seral stages to provide wildlife habitat diversity*. Trans. North American Wildlife and Natural Resources Conference 45:271-277.
- MacArthur, R. H. 1964. *Environmental factors affecting bird species diversity*. American Naturalist 98:387-397.
- MacArthur, R. and J. MacArthur. 1961. *On bird species diversity*. Ecology 42:594-598.
- MacClintock, L., R. F. Whitcomb and B. L. Whitcomb. 1977. *Evidence for the value of corridors and minimization of isolation in preserving biotic diversity*. Amer. Birds 31:6-16.
- Mathisen, J. E., D. J. Sorenson, L. D. Frenzel and T. C. Dunstan. 1977. *Management strategy for Bald Eagles*. Trans. North American Wildlife and Natural Resources Conference 42:86-92.
- Matray, P. F. 1974. *Broad-winged Hawk nesting and ecology*. Auk 91:307-324.
- Mealey, S. P., J. F. Lipscomb and K. N. Johnson. 1982. *Solving the habitat dispersion problem in forest planning*. Trans. North American Wildlife and Natural Resources Conference 47:142-153.
- Morris, M. M.J. and R. D. Lemon. 1983. *Characteristics of vegetation and topography near Red-shouldered Hawk nests in southwestern Quebec*. J. Wildlife Manage. 47:138-145.
- Nilsson, S. G. 1979. *Effect of forest management on the breeding bird community in southern Sweden*. Biological Conservation 16:135-143.

- Noon, B. R., V. P. Bingman and J. P. Noon. 1979. *The effects of changes in habitat on northern hardwood forest bird communities*. In De Graaf, R. M. and K. E. Evans. Management of north central and northeastern forests for nongame birds. USDA, Forest Service, General Technical Report NC-51. pp. 33-48.
- Peck, G. K. and R. D. James. 1983. *Breeding birds of Ontario: nidiology and distribution*. Vol. 1: nonpasserines. Life Sci. Misc. Publ., Royal Ontario Museum.
- Penak, B. L. 1981. *The status of the Cooper's Hawk (Accipiter cooperii) in Ontario, with an overview of the status in Canada*. Ontario Ministry of Natural Resources, Unpubl. Rept.
- Radtke, R. 1973. *Eagle management on national forests*. In Madsen, C. R. ed. Notes on a Bald Eagle nest survey workshop. U. S. Dept. Interior, Fish and Wildlife Service, Twin Cities, Minnesota. pp. 37-42.
- Redig, P. T. 1979. *Raptor management and rehabilitation*. In De Graaf, R. M. and K. E. Evans. Management of north central and northeastern forests for nongame birds. USDA, Forest Service, General Technical Report NC-51. pp. 226-237.
- Reynolds, R. T. 1983. *Management of western coniferous forest habitat for nesting accipiter hawks*. USDA, Forest Service, Gen. Technical Rept. RM-102.
- Reynolds, R. T., C. E. Meslow and H. M. Wright. 1982. *Nesting habitat of coexisting Accipiter in Oregon*. J. Wildlife Management 46:124-138.
- Risley, C. J. 1982. *The status of the Red-shouldered Hawk in Ontario, with an overview of the status in Canada*. Ontario Ministry of Natural Resources, Unpubl. Rept.
- Robbins, C. S. 1978. *Determining habitat requirements for nongame species*. Trans. North American Wildlife and Natural Resources Conference 43:57-68.
- Robbins, C. S. 1979. *Effect of forest fragmentation on bird populations*. In De Graaf, R. M. and K. E. Evans. Management of north central and northeastern forests for nongame birds. USDA, Forest Service, Gen. Technical Report NC-51. pp. 198-212.
- Samson, F. B. 1979. *Lowland hardwood bird communities*. In De Graaf, R. M. and K. E. Evans. Management of north central and northeastern forests for nongame birds. USDA, Forest Service, General Technical Report NC-51. pp. 49-66.
- Samson, F. B. 1980. *Island biogeography and the conservation of nongame birds*. Trans. North American Wildlife and Natural Resources Conference 45:245-251.

- Siderts, K. and R. E. Radtke. 1977. *Enhancing forest wildlife habitat through diversity*. Trans. North American Wildlife and Natural Resources Conference 42:425-434.
- Stauffer, D. F. and L. B. Best. 1980. *Habitat selection of birds of riparian communities: evaluating effects of habitat alternatives*. J. Wildlife Management 44:1-15.
- Stewart, R. E. 1949. *Ecology of a nesting Red-shouldered Hawk population*. Wilson Bull. 61:26-35.
- Stewart, R. E. and C. S. Robbins. 1958. *Birds of Maryland and the District of Columbia*. U. S. Dept. Interior, Fish and Wildlife Service, N.A. Fanna No. 62.
- Takekawa, J. Y., E. O. Garton and L. A. Langelier. 1982. *Biological control of forest insect outbreaks: the use of avian predators*. Trans. North American Wildlife and Natural Resources Conference 47:393-409.
- Taylor, C. M. and W. E. Taylor. 1979. *Birds of upland openings*. **In** De Graaf, R. M. and K. E. Evans. Management of north central and northeastern forests for nongame birds. USDA, Forest Service, Gen. Technical Report NC-51. pp. 189-197.
- Temple, S. A., M. J. Mossman and B. Ambuel. 1979. *The ecology and management of avian communities in mixed hardwood-coniferous forests*. **In** De Graaf, R. M. and K. E. Evans. Management of north central and northeastern forests for nongame birds. USDA, Forest Service, General Technical Report NC-51. pp. 132-153.
- Titus, K. and J. A. Mosher. 1981. *Nest site habitat selected by woodland hawks in the central Appalachians*. Auk 98:270-281.
- Thomas, J. W. ed. 1979. *Wildlife habitats in managed forests: The Blue Mountains of Oregon and Washington*. USDA, Forest Service. Agricultural Handbook 553.
- Thomas, J. W., C. Maser and J. E. Rodiek. 1979. *Edges*. **In** Thomas, J. W. ed. Wildlife habitats in managed forests: The Blue Mountains of Oregon and Washington. USDA, Forest Service, Agricultural Handbook 553. pp.48-59.
- Webb, W. L., D. F. Behrend and B. Saisorn. 1977. *Effect of logging on song bird populations in a northern hardwood forest*. Wildlife Monograph 55.
- Whitcomb, R. F. 1977. *Island biogeography and "habitat islands" of eastern forest*. American Birds 31(1):3-5.
- Willson, M. F. 1974. *Avian community organization and habitat structure*. Ecology 55:1017-1029.

Appendix I: Inventory Data Sheet for Raptor Nests

The enclosed sheet has been adapted from several other sheets for specific raptor studies, to provide a general sheet for all raptors. This type of information should be gathered for all nests located. It will provide considerable data for future reference in planning management strategies in various regions.

Inventory Data Sheet for Raptor Nests

Species: _____ Nest No. _____
 Location: _____ Twp. _____ District: _____
 Year: _____ Prepared by: _____
 Latitude and Longitude: _____ Map reference: _____

NEST TREE **NEST**

Species: _____ Height: _____ Distance from nearest other nest _____
 DBH: _____ Size: _____ of this species: _____
 Height: _____ Visibility _____ Position in tree: _____
 Condition: _____ Ease of Accessibility: _____
 _____ Date constructed: _____

NEST HABITAT **AREA CHARACTERISTICS**

Forest type: _____ Surrounding forest size: _____
 Distance to open water: _____ Size of nearest lake: _____
 Distance to lake of 40 ha or larger: _____ Distance to nearest main road: _____
 _____ Distance to nearest access road: _____
 Are other nest trees available?: _____ Distance to nearest buildings, etc.: _____
 Approximate number: _____ Nearest logging activity: _____
 Are roost trees available? _____ Distance from other possible disturbances? _____
 Distance from nest tree: _____
 Land ownership: _____
 Feeding areas if known: _____
 Response to human intrusion: _____

Nest Observations						
Date	Time Spent Observing	Incubating	Brooding	#Eggs	#Young	Other observations presence of adults, building, success or failure, etc.

Management Recommendations

Appendix II: Ontario Nest Records Scheme

The Canadian Wildlife Service and the Royal Ontario Museum provide a central registry for all nesting birds in the province. ONRS cards should be completed for all raptor nests located. These cards will be kept in confidence if so requested. A sample card is included. They are available from the Department of Ornithology, Royal Ontario Museum, 100 Queen's Park, Toronto, Ontario M5S 2C6.

Information about habitat should include comments on size or extent of forest, presence of edges or openings, distance to nearest building or roadway, height of trees, presence or absence of subcanopy or shrub layers in the forest and moisture level at the ground.

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	Egg	Young	No. Nests	COWBIRD Egg Young		Comments			
							8. County, District, R.M.:			
							9. Township:			
							10. Locality: nearest town, landmark			
							11. Lat. Long. Ref.:			
							12. Latitude _____		13. Longitude _____	
							14. Grid Ref.:			
							Map No. _____			
45. Total Visits				46. Total						
16/17 Name and Address of Observer					15. Card Source					

2. Card No.	HABITAT		NEST DESCRIPTION		29. Nest Height _____ M (ft. x 3048 = M)	
18. Habitat Type:		20. Outer Material:		27. Incubation Stage:		
19. Habitat Desc.:		21. Nest Lining:		<input type="checkbox"/> Fresh		
27. Plant Species Supporting Nest:		22. Nest Form:		<input type="checkbox"/> Slight		
28. Nest Position:		Nest Size (CM) (H. x 2.54 = CM)		<input type="checkbox"/> Moderate		
46. Comments:		23. Outer height _____		<input type="checkbox"/> Heavy		
		24. Inner height _____		<input type="checkbox"/> Added		
		25. Outer diameter _____		36. Incubation period _____ days		
		26. Inner diameter _____		34. Clutch Size:		
		36. Incubation period _____ days		No. Eggs Hatched		
		34. Clutch Size:		38. % Hatch		
		No. Eggs Hatched		No. Young Fledged		
		38. % Hatch		39. % Fledge:		
		No. Young Fledged				
<input type="checkbox"/> Duplicates of nest unknown <input type="checkbox"/> because evidence for or against success is not conclusive <input type="checkbox"/> because observations were not continued		Return by December 31st to: ONTARIO NEST RECORDS SCHEME Department of Ornithology, ROYAL ONTARIO MUSEUM 100 Queen's Park, Toronto, Ontario M5S 2C6				