CHAPTER 4: DEVELOPMENT AND MANAGEMENT

The previous chapters have addressed the description and analysis of natural features in the South March Highlands study area. The following will consider the management and development implications of those analyses. The objectives of the study include the identification of significant features and areas (see Figure 40) and the proposition of candidate Natural Environment Areas (NEAs), as well as discussion of considerations for planning the development of portions of the site.

1) Zoning

Much of the South March Highlands study area (including the entire area north of the railway track and most of the Hazeldean Escarpment (Figure 41) is presently zoned as Marginal Resource Restricted. This zoning recognizes the extreme constraints to development in these areas due to such problems as fresh water supply and waste water removal. It also requires that " ... development will not have an adverse impact on or off the site on such matters as deer, waterfowl, features of botanical significance, wetlands, forestry resources or scenic attributes" (Kanata Official Plan Section 4.4.1 [Haigis, MacNabb, DeLeuw Ltd. (1991)]).

Residential development is confined to widely distributed single-family residences on large lots (minimum 10 ha) or estate subdivisions with a maximum lot size of 0.8 ha, with the intention of permitting " ... non-intensive rural development appropriate to the continued existence and viability of the sensitive or significant environmental features" (Kanata Official Plan Section 4.4.1 [Haigis, MacNabb, DeLeuw Ltd. (1991)]).

Remaining lands in the study area are zoned Agricultural Resource where single family residences on lots as small as 2 ha can be built under some circumstances.

Altogether, zoning restrictions - reflecting the demanding environmental conditions in the South March Highlands Study Area - allow for a low level of residential development, relative to the urban portion of Kanata. Nonetheless, to ensure the long-term continuity of the significant natural values of the study area, as required by the Kanata Official Plan and the city's Environmental Code of Ethics, portions of the study area will need to be dedicated to natural environment protection and managed accordingly. With existing classification options, this is best achieved within Natural Environment Area (NEA) classification (presently designated only within the Urban Area of the City of Kanata).

Two candidate NEAs have been identified in this study (Figure 42). They encompass a complete selection of the study area's significant natural environment values. This NEA designation encloses what is considered a minimum areal requirement to ensure adequate representation of the range of significant natural values of the South March Highlands Study Area. Other less rigorous applications of these criteria would result in larger areas being delineated, enclosing larger examples of the various significant habitats and natural features of the study area (cf. the 750 ha candidate South March Highlands ANSI [Brunton 1992]).

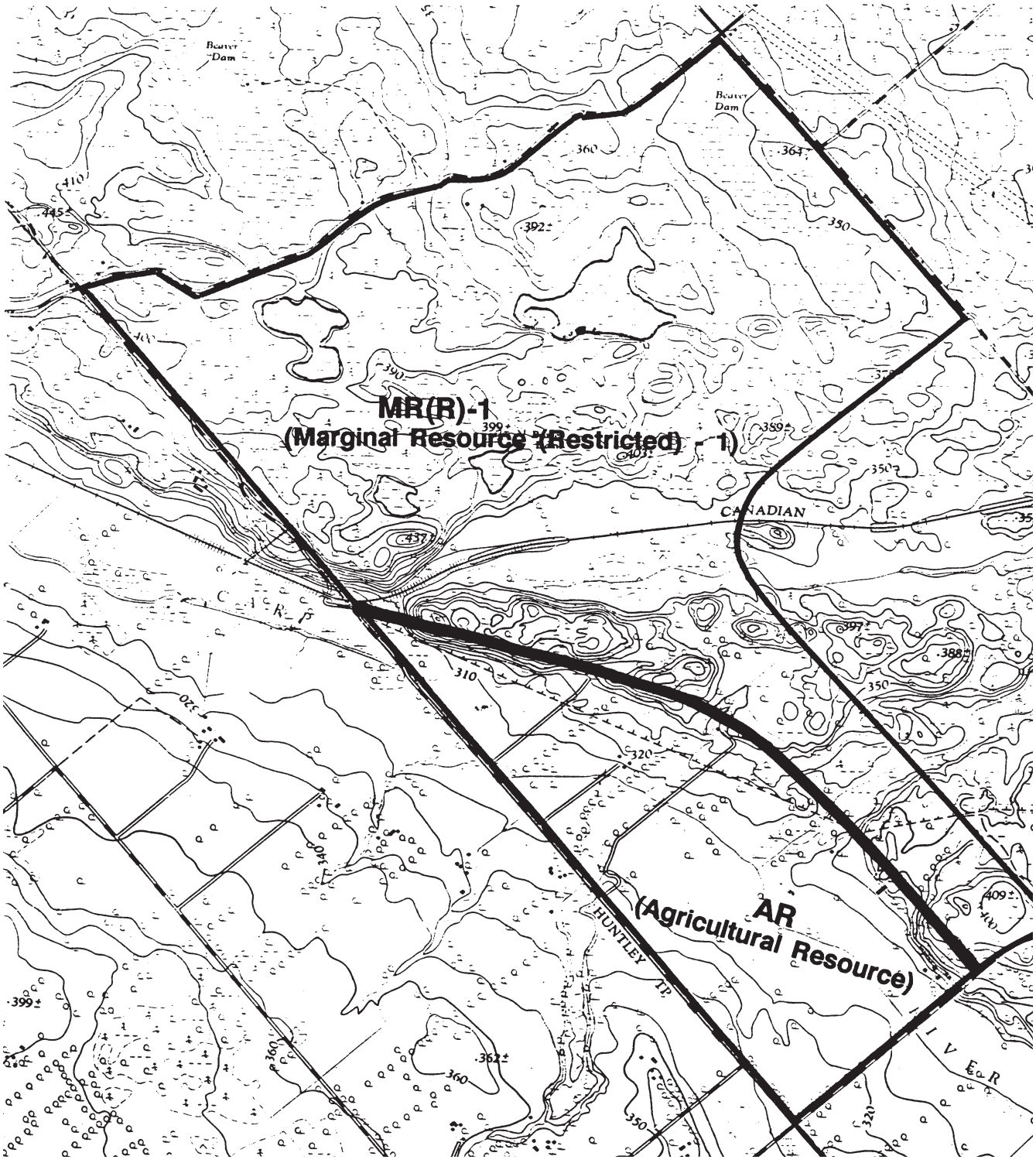

Figure 41: Existing Zoning in the South March Highlands Study Area

The candidate NEAs can be described as follows:

1. Upland Ponds NEA - incorporating the complex of Precambrian Shield-based pond and barrens; deer yard; significant floral and faunal associations and significant vegetation, plus connecting/protective ecological and aesthetic buffers [ca. 220 ha].

2. Hazeldean Escarpment NEA - incorporating the escarpment vegetation; floral and faunal values; aesthetic resources, including large pine forest; hardwood forests and protected swamp forest below the escarpment; connects directly to major candidate NEA in Kanata Lakes study area (Brunton 1992b) [ca. 65 ha.].

Virtually all of the South March Highlands Study Area north of the railway tracks, and a substantial portion of it south of the tracks, is contained within a Ontario Ministry of Natural Resources designated Class 1 (Provincially Significant) Wetland (cf. Kanata Official Plan Section 3.7.4 (Haigis, MacNabb, DeLeuw Ltd. (1991) and Amendment 13, 22 October 1991). Under the terms of the recently proclaimed (24 June 1992) Ontario Wetland Policy, all development is prohibited within the boundaries of any Provincially Significant wetland or wetland complex (Anonymous 1992). The South March Highlands wetland complexes are vaguely defined, however, and include substantial areas not considered to add significantly to the natural environment representation achieved within the candidate NEAs proposed in the present study. This new provincial policy, however, obviously has significant development implications for much of the rural area of the city of Kanata (see Official Plan, below).

The NEAs proposed herein (Figure 42) should be excluded from residential development, although such a restriction may be difficult to achieve if these areas remain in private ownership. It is also expected that the final definition of NEA boundaries will exclude those portions of existing small, private holding along the periphery of the NEAs (e.g. along the Old Carp and Huntmar Roads).

No existing zone presently applied to the Rural area of Kanata provides the required direction and management guidance for NEA areas, although the Conservation classification most closely satisfies these requirements and could form the starting point for an amended planning vehicle. Conservation classification precludes the construction of any structures, for example, except those required " *... to support or which are complementary to one of the primary uses*" (Kanata Official Plan Section 4.3.2. [Haigis, MacNabb, DeLeuw Ltd. (1991)]). This provides the foundation for a viable, sustainable development concept. The result of this zoning would be no net loss of significant natural environment functions or features in the South March Highlands Study Area, although the total size of the undeveloped area would be significantly reduced from its present size.

The direction and regulation of conservation lands within areas involving a variety of land uses is complex and would constitute a new initiative for Kanata - and the Regional Municipality of Ottawa-Carleton. Of great assistance in designing such a structure, however, would be the Ontario Ministry of Natural Resources management guidelines for nature reserves (OMNR 1978) which identify conforming and non-conforming activities, management principals and operational guidelines appropriate to such sites. These are included in this report for reference purposes (see Appendix 3).

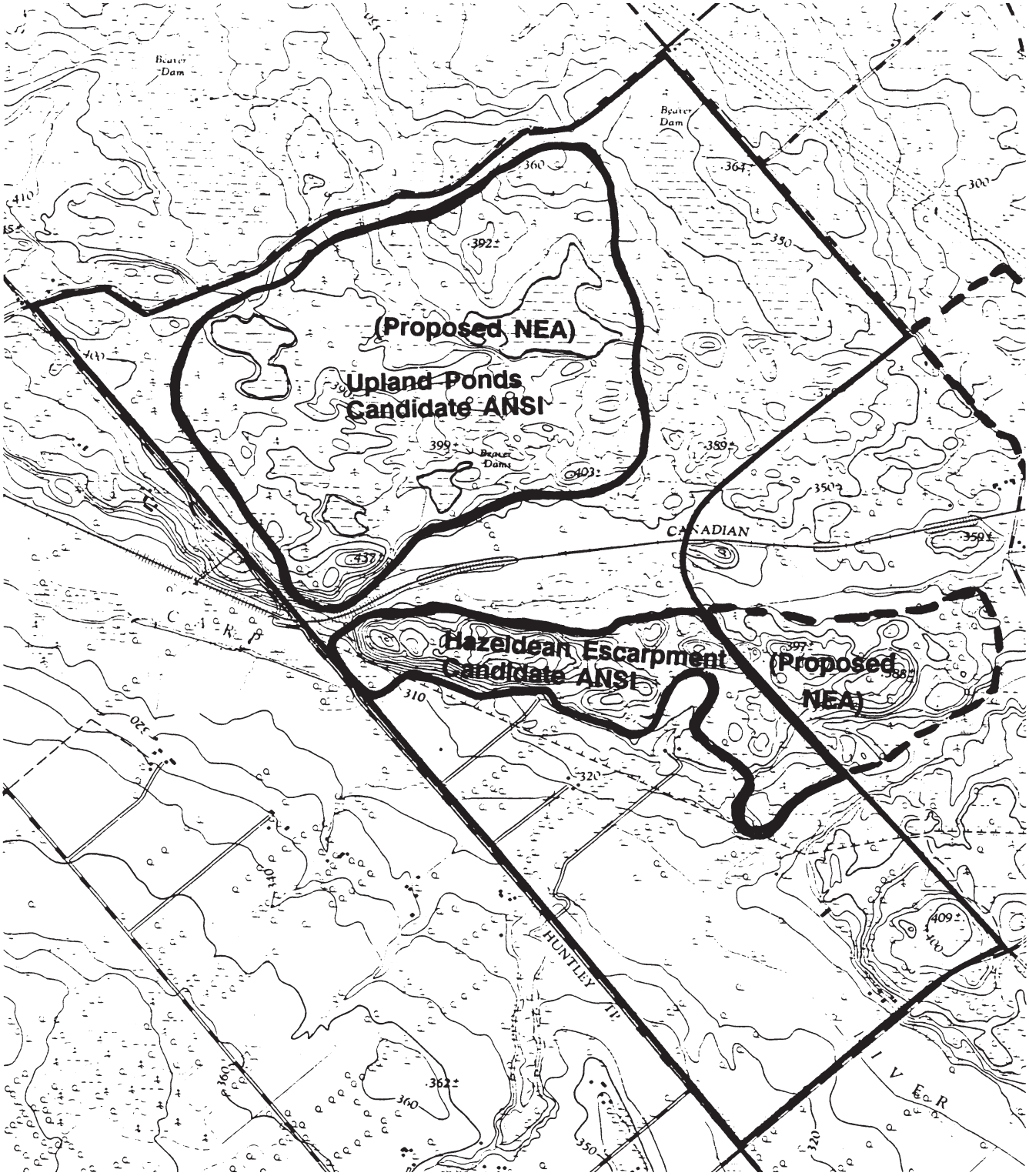

Figure 42: Candidate Natural Environment Area Zones

Formal designation of buffer areas between the environmental protection NEA zones and the residential lands around them is not accomplished here. It is anticipated that some 'edge effect' (physical impact, increase in introduced flora and fauna, increased faunal predation, etc. - cf. Harris (1984) will be the result. The already open nature of the vegetation however, implies a reduced level of such impact. Environmentally more sensitive development on immediately adjacent lands (determined on a case by case basis), can further mitigate such impacts by offering transitional conditions between developed and protected sites (see Site Development, below).

Two NEA areas are proposed in the adjacent Kanata Lakes Study Area to the east (Brunton 1992b). One of these abuts the Hazeldean Escarpment Candidate NEA (Figure 42). The large, single natural area which would result from the development these two environmental protection areas would significantly enhance the value of each component.

Other important but less representative and/or otherwise significant values (migratory waterfowl staging, wintering raptors, etc.) can be satisfactorily protected by the limitations placed on development by existing Marginal Resource Restricted zoning conditions - cf. (Kanata Official Plan Section 4.4. [Haigis, MacNabb, DeLeuw Ltd. (1991)]).

A provincially significant Area of Natural and Scientific Interest (ANSI) is proposed in the assessment of Site District 6-12 (Brunton 1992) for a substantial portion of the South March Highlands where a Regionally Significant ANSI has been designated for several years. This candidate ANSI is significantly larger than the two NEAs proposed herein (Figure 43). Separate Provincially and Regionally Significant ANSIs are also located north of the study area along the Carp Ridge.

The ANSI is defined by a wider interpretation of the significant landform-vegetation complexes of the Highlands than that utilized for these NEAs. They also identify a wider area and hence a greater level of ecological security for those natural values. Although designated ANSI areas do indicate sites which are considered of prime natural environment significance by the Ontario Ministry of Natural Resources, they, imply no conservation obligations on private lands.

2) Conservation Land Ownership

The Natural Environment Area zones would be most effectively managed, from a protection perspective, in public ownership, as is intended for the adjacent Kanata Lakes Study Area NEAs (cf. Brunton 1992b). This will provide the city with the greatest possible conservation management flexibility. This is not a necessity, however, as individual landowner co-operation (including participation in the development of a conservation management plan) and adjustment of development concepts may effect essentially the same result in most cases (see Residential Development Pattern, below).

Financial compensation to landowners may be appropriate where zoning changes result in a loss of development potential. In situations where conservation zoning changes will not reduce (or will increase) the net development potential of particular properties, however, financial compensation is not considered appropriate or necessary (cf. Ontario Municipal Board Decision of 8 October 1991 re: City of Ottawa zoning by-law Z-2k, OMB File Z 900116).

3) Official Plan

At present, Natural Environment Area zoning is applied to specific urban lands (Kanata Official Plan Section 6.4.3 [Haigis, MacNabb, DeLeuw Ltd. (1991)]). Rural area conservation lands would be variously considered under Conservation or Marginal Resource (Restricted) zoning.

To effectively manage NEA lands in Kanata a hierarchy of objectives needs to be recognized in the Official Plan that establishes the primacy of natural environment protection.

NEA lands in Kanata should be dedicated first and foremost to protecting significant and representative

Figure 43: Area Affected by Ontario Wetland Policy (1992) in Northern Portion of the South March Highlands Study Area

[Shaded Area = Approx. limit of Designated (1988) Class 1 Wetland complex; Dashed Line = Approx. limit of Candidate (1992) South March Highlands ANSI]

natural environment and earth science resources and features. Recognition of the role of people at such sites should clearly limit involvement to non-destructive passive recreation, environmental education and research.

If these areas are to maintain the natural values for which they were appreciated and designated in the first place, it must be understood that NEAs are not parks or recreational facilities. They are important natural ecosystems in which recreational activities must be cautiously and sensitively initiated - if at all. From a pragmatic perspective, however, some forms of appropriate heritage appreciation oriented activities in and about these sites are necessary in order to develop the appropriately proprietary sense of worth by the NEA's stakeholders - the citizens of Kanata. Appropriate management means a balancing of these two, with emphasis on protecting the ecological integrity of the site(s) remaining the driving principle.

An official plan amendment incorporating the objectives described above and offering consistent planning direction to NEA lands, be they in rural or urban portions of the city, is required.

A critical Official Plan consideration in regards to the South March Highlands and for large areas of Kanata is the new Ontario Wetlands Policy, issued 24 June 1992 (Anonymous 1992). Each municipality in Ontario, under the authority of Section 3 of the 1983 Planning Act, is obliged to " ... *have regard to* ... " this policy, which prohibits development in all wetland and wetland complexes in Kanata. The Official Plan presently allows for compatible development in wetland area, thus contradicting the new provincial directive (cf. Kanata Official Plan Sections 2.2.6 and 3.7.4. (Haigis, MacNabb, DeLeuw Ltd. (1991) and Amendment 13, 22 October 1991).

4) Municipal Authority

There is a need for a municipal management and planning vehicle which clearly directs the management of NEA areas and which are based on the objectives identified in the preceding discussion of Official Plan implications. This may require a by-law or comparable vehicle and will require a short-term and long-term planning and operational plan for NEA areas (see Recommendations).

Such a plan should be based on the understanding that the limited interpretive and recreational development permitted within an NEA to assist interpretation/environmental education should be focused at the edge of the site, and that the central core areas may have no development unless it is determined to be environmentally appropriate and ecologically sustainable (cf. OMNR 1978).

5) Site Development

a) Planning Control

The nature of the majority of the study area - thin soil, an abundance of exposed bedrock, disrupted drainage - indicates that development planning must be particularly sensitive to potential environmental constraints, particularly in regards to transportation and residential development concerns.

Management and development within NEA zones should be directed and controlled by approved conservation management plans which recognize the ecological integrity of the sites being of primary concern. Management and planning in municipal areas also must recognize social and cultural assets, such as ecologically conforming recreational uses like low impact hiking and ski trails. This layered approach to planning and management broadens the benefits of the area(s) to the community while protecting significant natural values.

Additional protection for the values contained within NEA zoning can be effectively achieved by sensitive site design on adjacent land. Placement of developments at the edge of the NEA boundary which are less ecologically impacting and provide appropriate vehicles for public environmental education (e.g. senior's residence, school yard, etc. *vs.* high density residential or manufacturing) are desirable. Appropriate development consideration, on a site by site basis, can significantly mitigate or even eliminate the physical impact of such residential development, particularly if aimed at achieving a goal of having no significant impact on the adjacent NEA area.

b) Transportation Corridors

The Canadian National Railway line crossing the central portion of the study area between the two proposed NEAs is scheduled for removal within two years or so. The installation of a recreational pathway, such as a pedestrian/bicycle pathway to connect to a future Morgan's Grant-South March Highlands bicycle path along the present alignment of Goulbourn Forced Road and to link in with existing cross-country ski trails, would be an environmentally desirable option. It would also provide access options for interpretive trails or facilities relating to either or both of the NEAs and potentially tie in with similar installations in the Kanata Lakes study are (Brunton 1992).

Failing a recreational utilization of the CNR corridor lands, mitigation of pollution into Shirleys Brook (road salt, sprays, etc.) and physical impacts on the water course and adjacent uplands (including noise, barriers to wildlife movements, etc.) will need to be factored into development plans. The narrow valley through which the railway passes at the western side of the study area will be of critical significance to migrating wildlife (especially large animals such as White-tailed Deer) when residential development of the adjacent areas is more advanced.

The natural environment features of the study area are particularly sensitive to potential physical stress resulting from roadway development with its concomitant drainage impact, edge effect on adjacent woodland, nutrification of verges and downstream areas, contamination of adjacent lands by salt and petroleum products, etc. Accordingly, the placement of a major arterial road across or adjacent to the upland portion of the site (*viz.*, above the Hazeldean Escarpment) would provide considerable concern for the long-term viability of a substantial portion of that area. Such concerns would not appear to be so great below the escarpment (e.g. across the Estate Residential lands), however, so long as the Hazard Lands were avoided.

Short, destination (dead-end) roads entering the study area from peripheral arterial (e.g. in the Richardson Side Road - Huntmar Road areas and/or westward from Kanata Lakes) would appear to offer less of a potential environmental threat to the candidate NEAs and to the overall natural environment quality of adjacent South March Highlands lands than through roads. They would preclude drive-through traffic (and its concomitant impacts), restricting travel largely to a smaller volume of residential destination traffic.

c) Residential Development Pattern

It is beyond the scope of this study to propose detailed development planning criteria. It is appropriate, however, to identify some general principals which could assist municipal and private planners to identify development options which imply a minimum of natural environment impact.

Residential density in the majority of the site, *viz.* individual minimum lot size of 10 ha, subdivision lot size to a minimum 0.8 ha (Kanata Official Plan Section 4.4.4 [Haigis, MacNabb, DeLeuw Ltd. (1991)]) is a recognition of the severe environmental limitations to development in the South March Highlands study

area and implies that dispersed development will lessen impact. It seems increasingly clear in rural areas of Ontario, however, that such dispersed estate housing supported by private water and sewage facilities and relatively extensive road networks, are potentially more economically and environmentally costly than the same number of units built in a smaller area, *viz.*, to a higher density (Silversides 1991).

From the perspective of protecting natural environment values, then, it is preferable that residential development in the South March Highlands Study Area (especially in those areas adjacent to NEAs) be placed adjacent to existing, already-disturbed roadway corridors and connected to the common municipal water and sewage treatment systems. This will undoubtedly result in less net impact on the natural landscape values of the South March Highlands. The end result could well be *a net increase in the number of residential units constructed* in a given portion of the study area while maintaining a high quality natural character to the overall landscape.

An amendment to the Kanata Official Plan will be required to allow for this change.

6) Recommendations

The recommendations of this natural environment inventory and analysis of the South March Highlands study area are as follows:

1) that the zoning changes proposed herein to accommodate Natural Environment Areas (see Zoning, above) be accepted by the City of Kanata, and include:
   - two publicly-managed NEA zones in which development is prohibited except for ecologically sustainable recreational/interpretative facilities to enhance public appreciation and enjoyment of these areas;

2) that mechanisms for achieving public ownership or management control of NEA lands be developed while also fairly compensating and/or accommodating existing landowners;

3) that ecological management plans for each Natural Environment Area zone be prepared for the approval of Council, these to include:
   - primary commitment to maintenance of the natural environment values of the NEA;
   - allowance for development only of ecologically compatible, dispersed recreation/ interpretation facilities;
   - no development of facilities, including surfaced trails, bridges, etc. without the prior acceptance of the NEA management plan by Council;
   - consideration of specialized resource management needs such as fire, research and "nuisance wildlife" management;

4) that NEA management plans be developed under the direction of a technical steering committee including ecological specialists from the Regional Municipality of Ottawa-Carleton, Ontario Ministry of Natural Resources, Mississippi Conservation Authority (as appropriate) and with representatives of the city and the appropriate community association(s).

5) that the Kanata Official Plan and/or bylaws be amended/developed to consolidate, clarify and expedite ecological sound planning and management direction for NEAs, as proposed in this study;

6) that an investigation of the Ontario Wetland Policy (1992) be initiated as soon as possible to clarify its implications for environmental protection and residential development in the city of Kanata;

7) that the transportation and residential development considerations discussed herein (see Site Development) be considered in development planning for the South March Highlands Study Area.

APPENDIX 1: Vascular Flora of South March Highlands Study Area

The following lists the 440 vascular plants taxa known from in the study area, based largely on 1991 field studies and archival research. Nomenclature typically follows Morton & Venns (1990) Ontario checklist while family order is that of Gillett & White's (1978) Ottawa checklist. Departures from the Ontario list occur occasionally, whereupon the name used in that authority is cited in synonymy (in brackets).

Voucher collections were obtained for a number of significant species and these are indicated by the notation of the D. F. Brunton collection number in brackets following the listings for each, with a brief discussion of status, habitat and site(s). The first set of these vouchers in deposited in the Royal Ontario Museum herbarium (TRT), Toronto, with replicates in the author's private herbarium (DFB) in many cases. In the absence of such a voucher, other collections or sight records may be credited. Collection numbers for common species are also noted, but are listed (in brackets) without discussion.

Significant Flora section are noted **in bold type**. Names followed by a double asterisk (**) are those of non-native taxa.

The acronyms used in the second column for significant species indicates its recorded status in the Regional Municipality of Ottawa-Carleton, as inferred from Gillett and White (1978), as up-dated by subsequent reviews (Darbyshire 1982; Brunton 1985). The acronyms are:

R = Rare in the Regional Municipality of Ottawa-Carleton

SP = Sparse in the Regional Municipality of Ottawa-Carleton

UN = Uncommon in the Regional Municipality of Ottawa-Carleton

The status, location and habitat of uncommon or rare Introduced (non-native) taxa are also listed but since these are of limited or no natural significance, they are **not** highlighted in bold type.

LYCOPODIACEAE

Huperzia lucidulum (Michx.)Trev.		
(= Lycopodium lucidulum Michx.)		(8256)
Lycopodium clavatum L.		
Lycopodium complanatum L. (s. st.)	**SP**	Rare in Cedar - Red Maple woods by beaver pond north of Shirleys Pond (10259).
Lycopodium dendroideum Michx.		
Lycopodium digitatum A. Br.		
Lycopodium hickeyi Wagner, Beitel & Moran		
(= L. obscurum L. var. isophyllum Hickey)		(8226)
Lycopodium obscurum L. (s. st.)	**SP**	Rare in maple-hemlock forest N of Heron Pond (10953)
Lycopodium tristachyum Pursh	**R**	Uncommon in Red Maple - Poplar scrub on sandstone flats by the old dump (8227).

EQUISETACEAE

Equisetum arvense L.
Equisetum fluviatile L.
Equisetum hyemale L.
Equisetum sylvaticum L.

SELAGINELLACEAE

Selaginella rupestris (L.)Spring	**R**	Observed on the western edge of the Hazeldean Escarpment S of the CNR in the early 1980s (B. Bracken).

OPHIOGLOSSACEAE

Botrychium dissectum Spreng.	**UN**	Uncommon in dry Red Maple - Sugar Maple forest near Heron Pond (8252; 8248; 8232)
Botrychium matricariifolium A. Br.		(10375)
Botrychium simplex E. Hitchc.	**UN**	Rare in White Cedar grove on E side of Heron Pond.
Botrychium virginianum (L.)Sw.		

OSMUNDACEAE

Osmunda cinnamomea L.
Osmunda regalis L.

ADIANTACEAE

Adiantum pedatum L.	**UN**	Uncommon in mesic loam in mature Sugar Maple forest N of Heron Pond (DAO)

POLYPODIACEAE

Polypodium virginianum L.

DENNSTAEDTIACEAE

Pteridium aquilinum (L.)Kuhn

THELYPTERIDACEAE

Thelypteris palustris (Salisb.)Schott

ASPLENIACEAE

Athyrium felix-femina (L.)Roth

Athyrium thelypteroides (Michx.)Desvr.	**UN**	Rare in wet Red Maple forest E of Heron Pond (8243).
Cystopteris bulbifera (L.)Bernh.		

Cystopteris fragilis (L.)Bernh.		
Dryopteris carthusiana (Vill.)Fuchs (= *D. spinulosa (Muell.)Watt*)		
Dryopteris cristata (L.)Gray	**UN**	Rare in wet Alder thicket swamp SE of Heron Pond (8245).
Dryopteris intermedia (Muhl.)Gray		(10957)
Dryopteris marginalis (L.)Gray		
Dryopteris x triploidea Wherry (= D. carthusiana x intermedia)		
Gymnocarpium dryopteris (L.)Newm.		
Onoclea sensibilis L.		
Polystichum acrostichoides (Michx.)Schott	**UN**	Common in mesic loam in mature Sugar Maple forest at N end of Heron Pond.
Woodsia ilvensis (L.)R. Br.	**R**	Rare on dry bedrock outcrops along the Hazeldean Escarpment (1971 spec in DAO).

TAXACEAE

Taxus canadensis Marsh.	**UN**	Uncommon in wet-mesic depressions and slopes in maple and maple-hemlock forest along the First Concession.

PINACEAE

Abies balsamea (L.)Mill.		
Larix laricina (Du Roi)K.Koch		
Picea glauca (Moench)Voss		
Pinus strobus L.		
Tsuga canadensis L.		

CUPRESSACEAE

Juniperus communis L.		
Thuja occidentalis L.		

TYPHACEAE

Typha latifolia L.		

SPARGANIACEAE

Sparganium chlorocarpum Rydb.	**SP**	Uncommon in marsh vegetation in Shirleys Brook by old dump (8223) and near Heron Pond.
Sparganium fluctuans (Morong)Robins.	**R**	Common in Heron Pond.

POTAMOGETONACEAE

Potamogeton illinoensis Morong	**SP**	Uncommon in Heron Pond.
Potamogeton pusillus L.	**UN**	Common in most larger ponds and in Shirleys Brook.
Potamogeton zosteriformis Fern.		

NAJADACEAE

Najas flexilis (willd.) R.& S.	**UN**	Uncommon in most larger ponds.

ALISMATACEAE

Alisma triviale Pursh
Sagittaria latifolia Willd.

POACEAE

Agrostis gigantea Roth		
Agrostis scabra Willd.	**UN**	Uncommon on sandstone flats at N shore of Heron Pond and rare on dry bedrock outcrops and exposed mud banks of dried beaver ponds throughout.
Agrostis stolonifera L.		
Alopecurus aequalis Sobol.	**UN**	Alder thicket swamp SE of Heron Pond (C. Frankton, 1970).
Brachyelytrum erectum (Schreb.)Beauv.		
Bromus ciliatus L.	**UN**	Uncommon along railway near Huntmar Road.
Bromus inermis Leyss.**		
Bromus japonicus Thunb. ex Murr.**	R	Rare along railway near Huntmar Road (1973 Frankton spec. in DAO).
Bromus tectorum L.**	SP	Rare along railway near Huntmar Road (1973 Frankton spec. in DAO); not noted in 1991.
Calamagrostis canadensis (Michx.)Nutt.		
Dactylis glomerata L.**		
Danthonia spicata (L.)Beauv.		
Echinochloa wiegandii (Fassett)McNeill & Dore		
Elymus hystrix L.	**UN**	Uncommon in dry-mesic Sugar Maple forest N and E of Heron Pond (8258).
Elymus repens (L.)Gould (= *Agropyron repens (L.)Beauv.*)**		
Festuca obtusa Biehler	**UN**	Rare in thin soil on outcrop in Sugar Maple - White Pine forest on W side of Heron Pond (8257).
Glyceria borealis (Nash)Batch.		

Glyceria canadensis (Michx.)Trin.	**UN**	Uncommon along shores of Heron Pond (8225) and adjacent swales (10462).
Glyceria striata (Lam.)Hitchc.		
Leersia oryzoides (L.)Sw.		
Lolium perenne L.**	UN	In earth fill at old dump.
Muhlenbergia mexicana (L.)Trin.		
Oryzopsis asperifolia Michx.		
Oryzopsis racemosa (Sm.)Ricker	**UN**	Locally common in dry-mesic, hardwood forests N of Heron and West Ponds (8241).
Panicum acuminatum SW. (= *Dichanthelium acuminatum (Sw.)Gould & Clarke*)		
Panicum capillare L.		
Panicum flexile (Gatt.)Scribn.	**SP**	Common on sandstone flats on N shore of Heron Pond (10955).
Phalaris arundinacea L.		
Phleum pratense L. **		
Poa compressa L.**		
Poa palustris L.		
Poa pratensis L.		
Schizachne purpurascens (Torr.)Sw.		
Setaria glauca (L.)Beauv.		
Setaria viridis (L.)Beauv.**		
Torreyochloa fernaldii (Hitchc.)Church	**R**	Uncommon in flooded Alder thicket swamps SE of Heron Pond (8251).
Zizania palustris L.	**UN**	Abundant in Carp River N of Richardson Side Road (10790).
	CYPERACEAE	
Carex albursina Sheld.	**UN**	Rare in Sugar Maple-White Pine forest along First Line Allowance
Carex arctata Boott		
Carex bebbii Olney		
Carex blanda Dew.		
Carex communis Bailey		
Carex comosa Boott		
Carex crinita Lam.		(10398)
Carex cristatella Britt.		
Carex deweyana Schw.		
Carex disperma Dew.		
Carex echinata Murr.	**R**	Uncommon along shores of Heron Pond (8233).
Carex gracillima Schw.		
Carex hystericina Willd.		
Carex intumescens Rudge		

Carex lacustris Willd.		
Carex lupulina Willd.		
Carex pallescens L.		(10357).
Carex peckii Howe		
Carex pedunculata Muhl.		
Carex pensylvanica Lam.		
Carex plantaginea Lam.	**UN**	Common in rich Sugar Maple forest N of Heron Pond.
Carex platyphylla Carey	**UN**	Rare in maple forest on bedrock outcrop S of Heron Pond.
Carex pseudo-cyperus L.		
Carex radiata (Wahl.)Sm.		
(= *C. rosea,* auct.)		
Carex rosea Schkuhr ex Willd.		
(= *C. convoluta Mack.*)		
Carex scoparia Willd.		(10958)
Carex sparganioides Willd.	**R**	Rare in rocky Sugar Maple forest near First Line Concession S of Shirleys Brook.
Carex sprengelii Dew.		(10256)
Carex tenera Dew.		
Carex tuckermanii Boott		
Carex vulpinoidea Michx.		
Dulichium arundinaceum (L.)Britt.	**UN**	Common around shores of Heron Pond (8234).
Eleocharis acicularis (L.)R.& S.		
Eleocharis obtusa (Willd.)Schultes		
Elocharis smallii Britt.		
(= *E. palustris, p. pt.*)		
Scirpus atrovirens Willd.		
Scirpus cyperinus (L.)Kunth		
Scirpus lacustris L.		
var. condensatus Peck		
(= S. validus Vahl.)		
Scirpus microcarpus Presl.		
(incl. *S. rubrotinctus Fern.*)		

ARACEAE

Arisaema triphyllum (L.)Schott		
Calla palustris L.		

LEMNACEAE

Lemna minor L.		
Spirodela polyrhiza (L.)Schleid.	**UN**	Rare in shallow water of beaver pond by Shirleys Brook E of Heron Pond (8224).

Wolffia borealis (Engelm.)Land.	**UN**	Locally abundant in shallow water in North Branch of Shirleys Brook by Second Line Road.
Wolffia columbiana Karst.	UN	Locally abundant in shallow water in North Branch of Shirleys Brook by Second Line Road.

JUNCACEAE

Juncus bufonius L.		
Juncus canadensis J. Gay	**SP**	Common along N shore of Heron Pond.
Juncus dudleyi Wieg.		
Juncus effusus L.		
Juncus filiformis L.		
Juncus tenuis Willd.		
Luzula acuminata Raf.	**SP**	Uncommon in rocky Sugar Maple forest along First Line at Richardson Side Road (10254), W edge of Hazeldean Escarpment and S of Heron Pond (10374).

LILIACEAE

Allium tricoccum Ait.		
Clintonia borealis (Ait.)Raf.		
Erythronium americanum Ker.		
Maianthemum canadense Desf.		
Maianthemum racemosum (L.)Link (= *Smilacina racemosa (L.)Desf.*)		(10268)
Polygonatum pubescens (Willd.)Pursh		
Trillium erectum L.		
Trillium grandiflorum (Michx.)Salisb.		

IRIDACEAE

Iris versicolor L.		
Sisyrinchium montanum Greene		

ORCHIDACEAE

Cypripedium acaule Ait.		
Cypripedium calceolus L.	**UN**	Rare in Sugar Maple N of Heron Pond.
Epipactis helleborine (L.)Crantz **		
Platanthera hyperborea (L.)Lindl.		
Platanthera lacera (Michx.)G. Don	**UN**	Dry hardwood forest E of Heron Pond (C. & E. Frankton, 1974).
Platanthera psycodes (L.)Lindl.		
Spiranthes lacera Raf.		

SALICACEAE		
Populus balsamifera L.		
Populus grandidentata Michx.		
Populus tremuloides Michx.		
Salix alba L.**	UN	Along Carp River near Huntmar Road.
Salix bebbiana Sarg.		
Salix discolor L.		
Salix lucida Muhl.		
Salix petiolaris Sm.		
JUGLANDACEAE		
Carya cordiformis (Wang)K. Koch		
Juglans cinerea L.		(10372)
BETULACEAE		
Alnus incana (L.)Moench ssp. incana (Duroi)Clausen (= *A. rugosa (Du Roi)Spreng.*)		
Betula alleghaniensis Britt.		
Betula papyrifera Marsh.		
Carpinus caroliniana Walt.	UN	Locally common in wet depressions in rich Sugar Maple forest.
Corylus cornuta Marsh.		
Ostrya virginiana (Mill.)K.Koch		
FAGACEAE		
Fagus grandifolia Ehrh.		
Quercus rubra L.		
Quercus macrocarpa Michx.		
ULMACEAE		
Ulmus americana L.		
URTICACEAE		
Boehmeria cylindrica (L.)Sw.	**UN**	Common in wet swales in mature hardwood forest throughout.
Laportea canadensis (L.)Wedd.		
Pilea pumila (L.)Gray		(10961)
Urtica dioica L. ssp. gracilis (Ait.)Selander		
ARISTOLOCHIACEAE		
Asarum canadense L.		

	POLYGONACEAE	
Polygonum achoreum Blake		
Polygonum aviculare L. ** (incl. *P. monspeliense Thieb.*)		(10970)
Polygonum cilinode Michx.		
Polygonum convolvulus L.	**UN**	Rare in S-facing slope in Sugar Maple forest above railway by Huntmar Road.
Polygonum hydropiper L.		
Polygonum lapathifolium L.		
Polygonum persicaria L. **		
Rumex acetosella L. **		
Rumex crispus L. **		
Rumex orbiculatus L.	**UN**	Uncommon in shallow thicket swamps in most ponds (8235).
Rumex verticillatus L.		
	CHENOPODIACEAE	
Chenopodium album L. **		
Chenopodium gigantospermum Aellen		(10947)
Chenopodium strictum Roth var. glaucophyllum (Aellen)Wahl		
Salsola pestifer Nels. **	UN	Common along railway track.
	AMARANTHACEAE	
Amaranthus retroflexus L. **		
	PORTULACEAE	
Claytonia caroliniana Michx.		
Portulaca oleracea L. **		
	CARYOPHYLLACEAE	
Arenaria serpyllifolia L. **	UN	Common on rock outcrops along Hazeldean Escarpment.
Cerastium fontanum Baumg. **		
Dianthus armeria L. **		
Saponaria officinalis L. **		
Silene vulgaris (Moench)Garcke (= *S. cucubalus Wieb.*) **		
Stellaria graminea L. **		

CERATOPHYLLACEAE

Ceratophyllum demersum L.

NYMPHAEACEAE

Brasenia schreberi Gmel.	**R**	Common in shallow water along shores of Heron Pond (8254).

Nuphar variegatum Engelm.

RANUNCULACEAE

Actaea pachypoda Ell.
Actaea rubra (Ait.)Willd.
Anemone cylindrica Gray.
Anemone virginiana L.
Aquilegia canadensis L.
Clematis virginiana L.
Coptis trifolia (L.)Salisb. (1979 Frankton spec in DAO)
Hepatica acutiloba DC.
Ranunculus abortivus L.
Ranunculus acris L. **
Ranunculus recurvatus Poir.
Thalictrum dioicum L.
Thalictrum pubescens Pursh

BERBERIDACEAE

Caulophyllum giganteum (Farw.)Loc.
var. giganteum Farw.
(= *C. thalictroides (L.)Michx*, p.pt.)

MENISPERMACEAE

Menispermum canadense L.	**UN**	Wet woods E of Heron Pond in early 1970s (C. Frankton).

PAPAVERACEAE

Sanguinaria canadensis L.

FUMARIACEAE

Corydalis sempervirens (L.)Pers.
Dicentra canadensis (Goldie)Walp.
Dicentra cucullaria (L.)Bernh.

BRASSICACEAE

Barbarea vulgaris R.Br. **
Berteroa incana (L.)DC. **

Capsella bursa-pastoris (L.)Medic **		
Dentaria diphylla Michx.		
Erysimum cheiranthoides L. **		
Lepidium densiflorum Schrad. **		
Rorippa palustris (L.)Bess.		
Thlaspi arvense L. **		(10364)

CRASSULACEAE

Penthorum sedoides L.	**UN**	Uncommon along wet marshy shore of West Pond (10959).
Sedum acre L. **		
Sedum hispanicum L. **	R	Uncommon on outcrop by Richardson Side Road by First Line.

SAXIFRAGACEAE

Mitella diphylla L.		
Saxifraga virginiensis Michx.		
Tiarella cordifolia L.		

GROSSULARIACAEAE

Ribes americanum Mill.		
Ribes cynosbati L.		
Ribes glandulosum Grauer		

ROSACEAE

Agrimonia gryposepala Wallr.		
Amelanchier arborea (Michx. f.)Fern. var. laevis (Wieg.)McKay		
Crataegus chrysocarpa Ashe var. chrysocarpa		(10365)
Crataegus punctata Jacq.	**UN**	Rare at edge of maple forest by Old Carp Road N of Heron Pond (10460).
Crataegus submollis Sarg.		
Fragaria vesca L.	**UN**	Rare in open hardwoods along slope above Huntmar Road by CNR tracks (10257) and W of Heron Pond (8250).
Fragaria virginiana Duchesne		
Geum aleppicum Jacq.		
Geum canadense Jacq.	**UN**	Common in hardwood forests throughout.
Malus pumila L. **		
Potentilla argentea L.		
Potentilla norvegica L.		(10423)
Potentilla recta L. **		

Prunus nigra Ait.
Prunus serotina Ehrh.
Prunus virginiana L.
Rubus allegheniensis Porter
Rubus pubescens Raf.
Rubus strigosus Michx. (10425)
Spiraea alba Du Roi (s. st.)
Spiraea tomentosa L.
Waldsteinia fragarioides (Michx.)Tratt.

FABACEAE

Amphicarpaea bracteata (L.)Fern.
Lotus corniculatus L. **
Medicago sativa L. **
Melilotus alba Desr. **
Trifolium repens L. **
Vicia cracca L. **

GERANIACEAE

Geranium robertianum L. (10786)

OXALIDACEAE

Oxalis acetosella L.
Oxalis fontana Bunge
(= *O. stricta, auct.; O. europea Jord.*)

EUPHORBIACEAE

Acalypha rhomboidea Raf.
Euphorbia cyparissias L.**
Euphorbia maculata L. SP Common along railway near Huntmar Road (10989).

ANACARDIACEAE

Rhus typhina L.
Toxicodendron rydbergii (Rydb.)Greene
(= *Rhus radicans L. var. rydbergii (Sm.)McNeill)*

AQUIFOLIACEAE

Ilex verticillata (L.)Gray
Nemopanthus mucronatus (L.)Loes.

CELASTRACEAE

Celastrus scandens L.

ACERACAE

Acer nigrum Michx. f.	**UN**	Uncommon on S-facing slope above railway by Huntmar Road (10263).
Acer pensylvanicum L.		
Acer rubrum L.		
Acer saccharinum L.		
Acer saccharum Marsh.		

BALSAMINACEAE

Impatiens capensis Meerb.

RHAMNACEAE

Rhamnus cathcartica L. **
Rhamnus frangula L. **

VITACEAE

Parthenocissus vitacea (Knerr)Hitchc.
Vitis riparia Michx.

TILIACEAE

Tilia americana L.

MALVACEAE

Malva neglecta Wallr. **	SP	Rare along Old Carp Road by Heron Pond.

CLUSIACAE

Hypericum majus (Gray)Britt.		(10949)
Hypericum perforatum L. **		
Triadenum fraseri (Spach)Gl.		

VIOLACEAE

Viola blanda Willd.		(10262)
Viola cucullata Ait.		
Viola conspersa Reich.		
Viola macloskeyi Lloyd ssp. pallens (Banks)Baker		(10260)
Viola pubescens Ait.		
Viola sororia Willd.		(10255)

THYMELAEACEAE

Dirca palustris L.

LYTHRACEAE

Lythrum salicaria L. **

	ONAGRACEAE	
Circaea alpina L.		
Circaea lutetiana L. ssp. canadensis (L.)Asch. & Magnus		
Epilobium angustifolium L.		
Epilobium ciliatum Raf. ssp. glandulosum (Lehm)Hoch & Raven		(10775)
Epilobium leptophyllum Raf.	**UN**	Rare in marshy thicket swamps E of Heron Pond.
Ludwigia palustris (L.)Ell.		
Oenothera parviflora L.		
	ARALIACEAE	
Aralia nudicaulis L.		
	APIACEAE	
Cicuta bulbifera L.		
Cryptotaenia canadensis (L.)DC.	**UN**	Rare in low maple-hemlock forest along Fist line Road allowance.
Daucus carota L. **		
Osmorhiza claytonia (Michx.)Clarke		
Sanicula marilandica L.		
Sium suave Walt.		(10781)
	CORNACEAE	
Cornus alternifolia L.f.		
Cornus canadensis L.		
Cornus stolonifera Michx.		
	PYROLACEAE	
Monotropa uniflora L.		
Pyrola elliptica Nutt.		
	ERICACEAE	
Gaultheria procumbens L.		
Gaylussacia baccata (Wang.)K.Koch		
Vaccinium angustifolium Ait.		
Vaccinium myrtilloides Michx.		
	PRIMULACEAE	
Lysimachia terrestris (L.)BSP.		
Lysimachia thyrsiflora L.		
Trientalis borealis Raf.		

OLEACEAE

Fraxinus americana L.
Fraxinus nigra Marsh.
Fraxinus pennsylvanica Marsh.
Syringa vulgaris L. **

APOCYNACEAE

Apocynum androsaemifolium L.

ASCLEPIADACEAE

Asclepias incarnata L.
Asclepias syriaca L.
Cynanchum rossicum (Klep.)Barb. **
(= C. medium R. Br.) SP One small patch by “the Haunted House” on Hazeldean Escarpment.

CONVOLVULACEAE

Convolvulus arvensis L. **

HYDROPHYLLACEAE

Hydrophyllum virginianum L.

BORAGINACEAE

Echium vulgare L. **
Lithospermum officinale L. **

VERBENACEAE

Verbena hastata L. (10951)
Verbena urticifolia L. **SP** Common along disturbed hardwoods and found on Second Line Road (8239).

LAMIACEAE

Glechoma hederacea L. **
Leonurus cardiaca L. **
Lycopus uniflorus Michx.
Mentha arvensis L.
Nepeta cataria L. **
Origanum vulgare L. **
Prunella vulgaris L. **
Satureja vulgaris (L.)Fritsch ** (8238)
Scutellaria galericulata L.
Scutellaria lateriflora L.

	SOLANACEAE	
Solanum dulcamara L. **		
Solanum ptycanthum Dunal (= *S. americanum, auct.*)	**UN**	Rare along marshy N shore of West Pond (10960).
	SCROPHULARIACEAE	
Chaenorrhinum minus (L.)Lange **	UN	Common along the railway track.
Linaria vulgaris Hill **		
Lindernia dubia (L.)Penn.		
Mimulus ringens L.		
Penstemon digitalis Nutt.		(10373)
Verbascum thapsus L. **		
Veronica longifolia L. **	R	Rare roadside weed along Old Carp Road (10963).
Veronica officinalis L. **		
Veronica scutellata L.	**UN**	Uncommon on wet thicket swamps east of the Hazeldean Escarpment (8232B).
	OROBANCHACEAE	
Epifagus virginiana (L.)Bart.		
	LENTIBULARIACEAE	
Utricularia vulgaris L.		
	PLANTAGINACEAE	
Plantago lanceolata L. **		
Plantago major L. **		
Plantago rugelii Ducne.		
	RUBIACEAE	
Galium aparine L.	**SP**	Uncommon on slopes of rock outcrops in rich Sugar Maple S of Heron Pond).
Galium circaezans Michx.	**SP**	Uncommon in rocky maple forest S (8242) and N (10956) of Heron Pond.
Galium mollugo L. **	UN	Rare in earth fill at the old dump site (8247).
Galium palustre L.		(10411).
Galium tinctorium L.	**SP**	Rare in marshy edge of north branch of Shirleys Brook by old dump site (10952).
Galium trifidum L.		
Galium triflorum Michx.		(10953)

CAPRIFOLIACEAE

Lonicera tartarica L. **		
Symphoricarpos albus (L.)Blake	**UN**	Rare in dry upland forest along Second Line Road (1972 Frankton spec in DAO).
Triosteum perfoliatum L.	**SP**	Rare on S facing slope above railway by Huntmar Road
Viburnum lentago L.		
Viburnum opulus L. var. americanus Ait. **(= *V. trilobum Marsh.*)**	**UN**	Uncommon in swamp thicket by Heron Pond.
Viburnum rafinesquianum Schultes		

CAMPANULACEAE

Campanula rotundifolia L.

LOBELIACEAE

Lobelia inflata L.

ASTERACEAE

Achillea millefolium L.		
Achillea ptarmica L. **	R	Rare along Second line Road S of old dump (8237).
Ambrosia artemisiifolia L.		
Anaphalis margaritacea (L.)Benth. & Hook.		
Antennaria howellii E. Greene		
ssp. canadensis (E.Greene)Bayer		
(= A. canadensis E. Greene)		(10258)
ssp. petaloides (Fern.)Bayer		
(= A. petaloides Fer.)		(10926)
Anthemis cotula L. **		
Arctium minus Bernh. **		
Artemisia biennis L. **		
Artemisia vulgaris L. **		
Aster ciliolatus Lindl.		
Aster cordifolius L.		
Aster lanceolatus Willd. ssp.lanceolatus		
Aster lateriflorus (L.)Britt.		
Aster macrophyllus L.		
Aster puniceus L.		

Bidens cernua L.		(10962)
Bidens frondosa L.		
Chrysanthemum leucanthemum L. **		
Cichorium intybus L. **		
Cirsium arvense (L.)Scop. **		
Cirsium vulgare (Savi)Tenore **		
Conyza canadensis (L.)Cronq. **		
Erigeron philadelphicus L.		
Erigeron strigosus Muhl.		
Eupatorium maculatum L.		
Eupatorium perfoliatum L.		
Eupatorium rugosum Houtt.		
Euthamia graminifolia (L.)Nutt.		
Gnaphalium uliginosum L.	**UN**	Uncommon in wet, marshy ground along N shore of West Pond.
Hieracium aurantiacum L. **		
Hieracium piloselloides Vill. ** (= *H. florentinum All.*)		
Inula helenium L. **		
Lactuca biennis (Moench)Fern.		
Matricaria matricarioides (Less.)Porter **		
Prenanthes altissima L.		
Rudbeckia hirta L.		
Senecio pauperculus Muhl.		
Solidago altissima L.		
Solidago caesia L.		(10988)
Solidago canadensis L.		
Solidago flexicaulis L.	**UN**	Uncommon in rocky maple woods W of First Line allowance by “Haunted House” ski trail.
Solidago gigantea Ait.		
Solidago juncea Ait.		
Solidago nemoralis Ait.		
Solidago rugosa Mill.		
Tanacetum vulgare L. **		
Taraxacum officinale Weber **		
Tragopogon pratensis L. **		

APPENDIX 2: Fauna in the South March Highlands Study Area

A comprehensive understanding of the natural environment values of an area by means of an assessment of its faunal data requires considerably more field time and human resources to be expended than is required with analyses of vegetation and flora. Accordingly, most faunal data are gathered as supplemental information to the vegetation and floral data and are less complete than the latter, although bird populations were examined in some detail (see below).

The faunal data gathered in the study area are confined to birds, mammals and, amphibians and reptiles.

1) Birds

Bird data were gathered and analyzed by Bruce Di Labio, with supplemental data provided by D. F. Brunton. Di Labio conducted field surveys of all sections and habitats of the study area between 17 June and 1 August 1991. He also examined a wide variety of published literature as well as unpublished data collections and his own extensive set of field data gathered during more than 20 years of field ornithology in the Ottawa area.

The following lists the bird species observed in the study area during field investigations in 1990, as well as through a review of regional bird literature in Trail & Landscape (1967 -1991), The Shrike (1976-1986), the Ontario Breeding Bird Atlas (Cadman et al. 1987), Dunrobin-Breckenridge Christmas Bird Census data (1981-1986) and Ottawa Field-Naturalists' Club spring and fall bird census' (1969-1991) and the Di Labio personal data base. They are listed in standard checklist order and following the nomenclature of Godfrey (1986).

Underlined species are confirmed to have bred in the study area, utilizing the criteria of Cadman et al. (1987) for determining definite breeding. The habitat or habitats utilized by that species are noted in the right hand column, signified by the code utilized in Figure 6 and in the habitat descriptions in the text. Species observed simply passing by and not utilizing any particular habitat are, accordingly, not given a habitat code.

Significant species are noted **in bold type**.

Pied-billed Grebe	n/a
American Bittern	n/a
Great Blue Heron	ow, 1
Green-backed Heron	1, 2
Canada Goose	ow, 1
Wood Duck	ow
American Black Duck	ow, 1
Mallard	ow, 1

Northern Pintail	ow
Green-winged Teal	ow
Blue-winged Teal	ow, 1
American Widgeon	ow
Common Merganser	ow
Hooded Merganser	ow
Turkey Vulture	R, S, M, D
Osprey	ow
Bald Eagle	n/a
Northern Harrier	1, M
Sharp-shinned Hawk	8, 9
Cooper's Hawk	8, 9
Northern Goshawk	6, 7, 8, 9
Red-shouldered Hawk	n/a
Red-tailed Hawk	S, M, 8
Broad-winged Hawk	7, 8
Rough-legged Hawk	M
American Kestrel	D, M, S
Gray Partridge	M
Ruffed Grouse	S, 2, 8, 9
Black-bellied Plover	M
Killdeer	D, M
Greater Yellowlegs	M
Lesser Yellowlegs	M
Solitary Sandpiper	1

Spotted Sandpiper	1
Upland Sandpiper	M
Common Snipe	1, 2, M
American Woodcock	2, S, 8
Ring-billed Gull	ow, M, D
Herring Gull	ow, M, D
Rock Dove	D
Mourning Dove	D, M, S
Black-billed Cuckoo	8
Great Horned Owl	M, S, 7, 8, 9
Snowy Owl	D, M
Boreal Owl	8, M
Barred Owl	7, 8
Great Gray Owl	M, S
Whip-poor-will	8
Chimney Swift	6, 7, 8
Ruby-throated Hummingbird	M, S, 8, 9, 10
Belted Kingfisher	ow, 2
Downy Woodpecker	6, 7, 8, 9
Hairy Woodpecker	7, 8, 9
Northern Flicker	5, 6, 7, 8, 9, 10, M
Pileated Woodpecker	5, 6, 7
Eastern Wood Pewee	5, 6, 7
Alder Flycatcher	2
Least Flycatcher	7, 8

Willow Flycatcher	2
Eastern Phoebe	D, M, S
Great Crested Flycatcher	5, 7, 8
Eastern Kingbird	D, M, S
Horned Lark	D, M
Purple Martin	M, D
Tree Swallow	ow, 1, M, 4, 8
Northern Rough-winged Swallow	ow, D, M
Bank Swallow	D, M
Cliff Swallow	D, M
Barn Swallow	D, M
Blue Jay	7, 8, 9
American Crow	D, M, 7, 8, 9
Common Raven	D, M, R
Black-capped Chickadee	2, 3, 4, 5, 6, 7, 8, 9, 10
Red-breasted Nuthatch	9, 10
White-breasted Nuthatch	5, 6, 7, 8
Brown Creeper	5, 7, 8, 9
House Wren	M, S, 8
Winter Wren	8, 9
Marsh Wren	1, 2
Golden-crowned Kinglet	8, 9
Ruby-crowned Kinglet	8, 9
Blue-gray Gnatcatcher	2, 4
Veery	8

Swainson's Thrush	7, 8, 9
Hermit Thrush	8, 9, 10
Wood Thrush	7, 8
American Robin	D, S, M, R, 1, 4, 8, 9
Gray Catbird	2, S
Brown Thrasher	S
Water Pipit	M
Bohemian Waxwing	2, 8
Cedar Waxwing	4, 7, 8, 9
Northern Shrike	M, S
European Starling	D, M, 4, 8, 9
Warbling Vireo	4
Red-eyed Vireo	5, 6, 7, 8
Tennessee Warbler	7, 8, 9
Nashville Warbler	7, 8, 9
Northern Parula Warbler	7, 8
Yellow Warbler	1, 2, S
Chestnut-sided Warbler	S, 8, 9
Magnolia Warbler	8, 9
Cape May Warbler	8, 9, 10
Black-throated Blue Warbler	7,8
Pine Warbler	10
Yellow-rumped Warbler	7, 8, 9, 10
Black-throated Green Warbler	7, 8, 9, 10
Bay-breasted Warbler	7, 8

Black & White Warbler	3, 8
American Redstart	S, 8
Ovenbird	7,8,9
Northern Waterthrush	4, 5
Mourning Warbler	S
Common Yellowthroat	1, 2
Canada Warbler	8,9, S
Scarlet Tanager	7, 8
Northern Cardinal	8
Rose-breasted Grosbeak	7, 8
Indigo Bunting	8
American Tree Sparrow	2, S, 8, 9
Chipping Sparrow	D, M, S
Field Sparrow	S
Savannah Sparrow	M
Song Sparrow	1, M, S
Swamp Sparrow	2
White-throated Sparrow	8, 9
White-crowned Sparrow	D, M, S
Dark-eyed Junco	S, 7, 8, 9, 10
Snow Bunting	M, D
Bobolink	M
Red-winged Blackbird	D, M, 1, 2
Eastern Meadowlark	D, M
Rusty Blackbird	2, 3, 8, 9

Common Grackle	D, M, 1, 2, 4, S
Brown-headed Cowbird	D, M, 2, 4, 7, 8, 9, 10, S
Northern Oriole	D, 8, 9
Pine Grosbeak	8, 9, S
Purple Finch	5, 6, 7, 8, 9
White-winged Crossbill	9, 10
Common Redpoll	D, M, S, 7, 8, 9
American Goldfinch	S,M,8
Evening Grosbeak	7, 8, 9
House Sparrow	D

2) Amphibians and Reptiles

The following lists the amphibian and reptile species observed in the study area during field investigations in 1991. The hot, dry summer of 1991 significantly reduced the number and diversity of amphibian sightings. Accordingly, species likely in the study area by virtue of their distribution and status in the Region (Cook 1981; Weller & Oldham 1988) but not noticed during this study are also listed (in brackets).

The species are listed in standard checklist order and following the nomenclature of Cook (1984).

The significant species (cf. T. Norris, Ontario Ministry of Natural Resources, Kemptville, in lit.) are indicated by **bold** type.

Amphibians	Reptiles
Blue-spotted Salamander	Midland Painted Turtle
(Red-backed Salamander)	**Blanding's Turtle**
American Toad	Eastern Garter Snake
Spring Peeper	(Northern Redbelly Snake)
Midland Chorus Frog	
Tetraploid Gray Treefrog	
Wood Frog	
Leopard Frog	
Green Frog	

3) Mammals

The following lists the mammals observed during the 1991 field studies and those documented in the study area by other sources. These observations were made incidentally to other investigations and are not considered a reliable indication of mammal diversity in the study area.

None of the mammals recorded from the study area appear to be Regionally significant from a natural environment perspective (cf. Rand 1945; Peterson 1966), although White-tailed Deer and Black Bear can be considered Locally Significant here.

Smoky Shrew
Little Brown Bat
Black Bear
Cottontail Rabbit
Eastern Gray Squirrel (Black phase)
Red Squirrel
Woodchuck
Eastern Chipmunk
Beaver
Deer Mouse
Meadow Vole
Meadow Jumping Mouse
Porcupine
Coyote
Red Fox
Raccoon
Mink
Striped Skunk
White-tailed Deer

APPENDIX 3: OMNR Planning and Management Criteria for Ecological Reserve Areas

The following is extracted from the *Ontario Provincial Parks Planning and Management Policies* (OMNR 1978). While designed for crown-owned provincial park lands, it offers an excellent guide for the development of planning and management requirements - including conservation managment plans - for Natural Environment Areas within municipal jurisdictions as well.

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NATURE RESERVES
PART III
MASTER PLANNING POLICIES

A Master Plan will be prepared for each Nature Reserve. Each Master Plan will establish detailed policy guidelines for the Reserve's long term protection, development, and management. Each Master Plan will be prepared in accordance with Master Planning and Public Participation Guidelines, issued by Provincial Parks Branch.

1. Zoning

Lands and waters within each Nature Reserve will be zoned so that they may be allocated to their most appropriate use relative to the Reserve. Nature Reserves always include Nature Reserves Zones, and may also include Access and Historical Zones. Figure 5 illustrates a hypothetical example of zoning in Nature Reserves.

Nature Reserve Zones include the significant earth and life science features of the Reserve, as well as a protective buffer, in which there is an absolute minimum of development.

Access Zones serve as staging areas where minimum facilities support use of Nature Reserve Zones. There normally will be only one such zone in any individual Reserve.

Historical Zones include any significant historical resources which require management distinct from that in adjacent zones.

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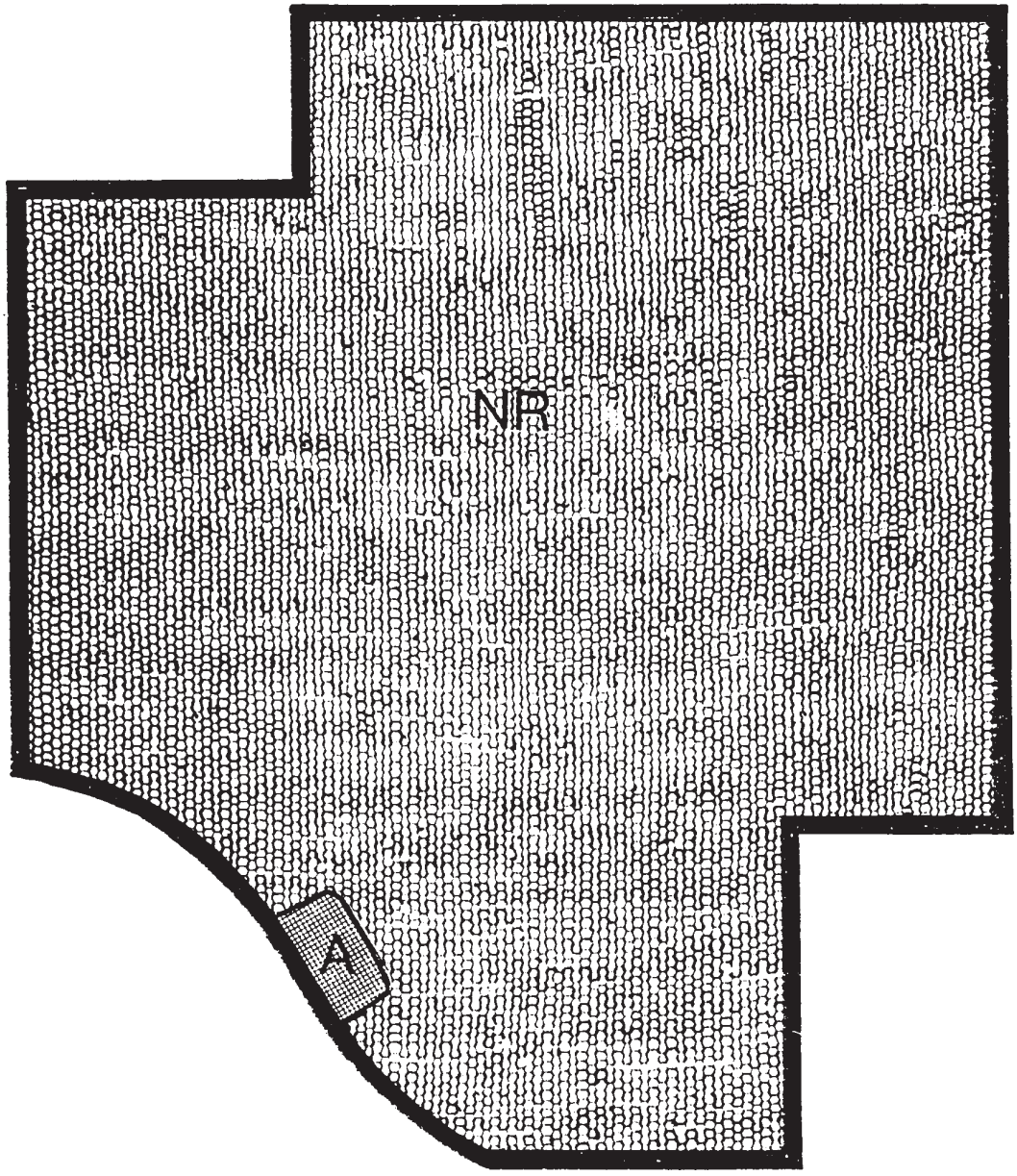
FIGURE 5

HYPOTHETICAL EXAMPLE OF ZONING IN NATURE RESERVES



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NATURE RESERVES
PART III
MASTER PLANNING POLICIES

2. Land and Water Uses

All alienated lands and waters within the boundaries of Nature Reserves will be acquired. All physical improvements on acquired lands will be removed, unless they are in a location and of such design as to be of value for park management or visitor services, or unless they are significant to the Reserve's history or complementary to its cultural landscape. Lands will not be leased for the private use of individuals or corporations.

In any Nature Reserve, non-conforming land and water, resource, or recreational uses may exist at the time of its designation. Such uses will be identified as non-conforming uses in the Master Plan for the Reserve. No further expansion of these uses will be permitted. Provided that they are not demonstrably incompatible with the Reserve and the zone within which they are situated, such uses will be permitted to continue until the lands are acquired, the uses disappear through normal processes, or equal opportunities for such uses are provided elsewhere.

The master planning and development and management policies set out in this document are without prejudice to, and may be superseded by, any settlements of claims made between the Ontario Government and Indian bands in Ontario.

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NATURE RESERVES
PART IV
DEVELOPMENT AND MANAGEMENT POLICIES

1. Development

The location, design, and materials of all facilities constructed within Nature Reserves will, to the maximum extent possible, reflect the environmental character of individual Reserves. All development will be carried out in accordance with approved site plans and development plans.

Nature Reserve Zones: Development will be limited to trails, necessary signs, minimal interpretive facilities, and temporary facilities for research and management.

Access Zones: Development will be limited to roads, visitor control structures, basic day-use facilities, group car campgrounds where appropriate, and orientation, interpretive, educational, research, and management facilities. Any group car campgrounds will be developed to a basic standard and normally will be for the use of educational and scientific groups only.

Historical Zones: Development will be limited to trails, necessary signs, minimal interpretive facilities, and temporary facilities for research and management.

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NATURE RESERVES
PART IV
DEVELOPMENT AND MANAGEMENT POLICIES

2. Environmental Management

a) Earth and Life Science Values

The earth and life science values of individual Nature Reserve Zones require scientifically based management policies in order that they best contribute to Parks System objectives. Management policies for individual Nature Reserve Zones will be defined through, and will be a key part of, the Master Plan for each Reserve. Monitoring programmes will be developed for systematic review of the impact and effectiveness of management policies and the revision of these policies as necessary.

Management objectives and policies for individual Nature Reserve Zones will fall into two distinct categories. The category practiced in an individual Reserve will depend upon the significant earth and life science values present.

Certain Nature Reserve Zones will protect natural features and conditions in an undisturbed state. Natural processes such as naturally occurring fires, insect and disease outbreaks, erosion, and so on, which alter existing features will dominate. Human alteration of any kind will be excluded, except where necessary to replicate natural processes such as fire, which have been forestalled by external intervention. These zones will not be appropriate for the protection of particular stages of successional vegetation, successional animal life, or geomorphological change, unless the perpetuation of those stages is assured by the action of recurrent natural disturbances. Thus a deciduous forest located in such a zone might well disappear through its natural replacement by a coniferous forest.

Other Nature Reserve Zones will protect natural features and conditions which require specific resource management for their perpetuation in a particular evolutionary stage where this is a desirable objective. Natural processes may be controlled in order to perpetuate natural features and conditions. Thus forest conditions which provide suitable habitat for a certain animal species might be artificially perpetuated in order to perpetuate that habitat.

Whichever category of management policies is practiced, management in Nature Reserve Zones will be directed solely to the achievement of protection, heritage appreciation, and scientific research objectives.

NATURE RESERVES
PART IV
DEVELOPMENT AND MANAGEMENT POLICIES

b) Lands and Waters

Commercial mineral exploration and extraction will not be permitted.

No new utility lines or rights-of-way may be developed, except those required for servicing the Park which may be developed in Access Zones only.

Reserve user solid waste and sewage will be disposed outside the Reserve.

Waters will not be controlled except for the perpetuation of natural features and conditions where desirable. Otherwise, no new water control structures may be built; and existing structures will be removed or allowed to deteriorate, unless they are essential for water control outside the Reserve, or their removal would result in an environmental impact more adverse than their retention.

c) Flora

Management of flora will be directed to the maintenance of an evolving natural succession unless alternative strategies are desirable.

Commercial forest operations will not be permitted. Where trees are removed for development or management purposes in Access Zones, they may be marketed if economic.

Agricultural practices will not be permitted except for the perpetuation of natural features and conditions where desirable.

Non-native plant species will not be deliberately introduced. Where they are already established and threaten Reserve values, a management programme for their eradication may be developed. Missing native species may be re-established if biologically feasible and acceptable, normally only where necessary to perpetuate the natural values for which the Reserve has been established. Fertilizers may not be used except in Access Zones.

The occurrence of natural fire is recognized as a process integral to an evolving natural succession in certain cases, or to the perpetuation of existing vegetative conditions in other cases. Natural fires in Nature Reserve and Historical Zones normally will be allowed to burn undisturbed unless they threaten human life, Access Zones, lands outside the Reserve, or the values for which the Nature Reserve or Historical Zones have been established. Prescribed burning may be carried out in Nature Reserve Zones to simulate

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NATURE RESERVES
PART IV
DEVELOPMENT AND MANAGEMENT POLICIES

natural fire when desirable. Fires in Access Zones, and fires resulting from human causes in other zones, will be suppressed. Fire suppression techniques used will have as minimal effect as possible on the Reserve's environment. Such means of suppression as bulldozing, and water bombing with chemical additives, will not be permitted except in critical situations.

The occurrence in a Nature Reserve of forest and vegetative insects and diseases native to the forest region in which the Nature Reserve is situated is recognized as an integral component of the Reserve's ecology. Native insects and diseases in Nature Reserve and Historical Zones normally will be allowed to develop undisturbed. Native insects and diseases threatening the values for which Nature Reserves or Historical Zones have been established, or values outside the Park, will be controlled where feasible. Insects and diseases not native to a Reserve's forest region will be controlled where feasible. Where control is desirable, it will be directed as narrowly as possible to the specific insect or disease so as to have minimal effects on other components of the Reserve's environment. Biological control will be used wherever feasible.

d) Fauna

Management of fauna will be directed to the maintenance of an evolving natural succession, unless alternative strategies are desirable.

Non-native species will not be deliberately introduced. Where they are already established, a management programme for their eradication may be developed if practical and desirable for the perpetuation of the values for which the Reserve has been established. Missing native species may be re-introduced, and existing populations replenished, if biologically feasible and acceptable and if desirable for the perpetuation of the values for which the Reserve has been established.

Animal populations may be controlled when essential to protect human health and safety, the health of the species outside the Reserve, or the values for which the Reserve has been established. Where control is desirable, techniques will be used having minimal effects on other components of the Reserve's environment. Any hunting or trapping required in control will be carried out under the strict supervision of, or directly by, the Ministry of Natural Resources.

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NATURE RESERVES
PART IV
DEVELOPMENT AND MANAGEMENT POLICIES

Sport fishing will not be permitted in Nature Reserves.

Commercial fishing, including commercial bait fishing, will not be permitted.

Sport hunting will not be permitted. Habitats will not be managed to facilitate wildlife viewing, except where such management will contribute to the perpetuation of natural features and conditions where desirable.

Commercial trapping will not be permitted.

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NATURE RESERVES
PART IV
DEVELOPMENT AND MANAGEMENT POLICIES

3. Recreation Management

A Management/Operating Plan will be prepared for each Nature Reserve, in accordance with Park Management/Operating Plan guidelines issued by Provincial Parks Branch. Each such Plan will establish detailed guidelines and procedures for the management and operation of Reserve activities and facilities.

Where such activities are compatible with and complementary to the values for which Nature Reserves have been established, low-intensity day-use activities will be encouraged which enhance appreciation of the values and natural landscapes of Nature Reserves. Recreational activities and facilities encouraged in each zone are set out in Figure 6.

Motorized land vehicles and watercraft of any kind will not be permitted, except for access purposes in Access Zones. The use of motorized transportation by the Ministry of Natural Resources will conform to these standards wherever possible.

Limits on the size of parties, and on the number of parties permitted to use designated areas at any one time, may be established in order to protect the values for which Nature Reserves have been established. Any activities may be restricted or prohibited in Nature Reserve and Historical Zones where necessary to protect those values.

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FIGURE 6

RECREATIONAL ACTIVITIES AND FACILITIES ENCOURAGED IN NATURE RESERVES

This figure shows activities and facilities encouraged in Nature Reserves, by zone. It should be noted that zones are subordinate to the Park class. Therefore activities encouraged or not permitted in an Access Zone, for example, in one class of park will not necessarily be the same as those in an Access Zone in another class.

The left hand column includes both activities and facilities. Facilities have been used where the accompanying activity is totally dependent on specially designed facilities (e.g., golfing requires a golf course, pool swimming requires a swimming pool). Activities have been used where facilities are not essential to the pursuit of the activity. Most of these activities may be pursued with or without facilities. Where both options are a realistic possibility, the activity is preceded by an asterisk, and two symbols are given. The first symbol refers to the activity without supporting facilities; the second, to the activity with facilities. For those activities not preceded by an asterisk, special facilities are not normally required (e.g., orienteering, historical appreciation) or are at a minimal level and are covered elsewhere (e.g., canoeing). In all cases, the development of any facilities will be at a level appropriate to the zone in question and subject to the general development policies for each zone. This list of activities and facilities is not, however, intended to be exhaustive.

Symbols

Y - Normally encouraged in this zone.
M - May be encouraged in this zone in certain parks of this class where appropriate.
Blank - Not compatible with this zone; if now exists, a non-conforming use which will be phased out.
a - If authentic to the Historical Zone.

Zones

Activities and Facilities	D	A	W	NR	H	NE
Arboretums						
Archery facilities (temporary)						
*Angling						
*Boating (ice)		M/		M/	M/	
* (powered)						

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Figure 6 cont'd

	D	A	W	NR	H	NE
Campgrounds (car)						
(boat-in or walk-in)						
(group, day)						
(group, overnight)		M				
(back-country campsites)						
Canoeing		M		M	M	
* Cycling		Y/				
Demonstration areas (demonstration farms, logging exhibits, etc.)						
Dog trials						
Golf courses						
* Hiking		Y/M		M/M	M/M	
Historical appreciation		M		M	M	
* Horseback trail riding						
* Hunting						
* Ice skating		Y/		M/	M/	
Kite flying		Y		M	M	
* Model aircraft flying						
* Model boat operation						
Nature appreciation		Y		M	M	
Orienteering		Y		M	M	
Outfitting services						
Painting		Y		M	M	
Parkways for pleasure driving						
Performing arts						
Photography		Y		M	M	
Picnic grounds		M				
Playing fields, open space						
Playgrounds						
Recreation programmes (organized)						
Religious programmes (organized)						
Resorts						
Restaurants and food services						
Roller skating rinks						
* Sailing		M/		M/	M/	
Shooting facilities (temporary)						
* Scuba and skin diving		M/		M/	M/	
* Skiing (cross country)		Y/		M/	M/	
* (downhill)						
* Sledding		Y/		M/	M/	
* Snowmobiling						
Snowshoeing		Y		M	M	
* Swimming		M/		M/	M/	
Swimming pools and lakes (artificial)						
Tennis courts						
* Trail biking						

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NATURE RESERVES
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DEVELOPMENT AND MANAGEMENT POLICIES

4. Visitor Services

a) Information

A basic low-key public information system will be developed for each Nature Reserve accessible to the public. Information on the Nature Reserve system will also be directed towards the general public (see Interpretation, below). The term "Nature Reserve" will be incorporated into the name of the Reserve for public identification purposes wherever possible. All brochures, maps, Reserve signs, etc., will indicate this designation; for example, Ouimet Canyon Provincial Nature Reserve.

b) Interpretation

In Nature Reserves accessible to the public, low-intensity programmes and facilities will provide visitors with opportunities to learn and experience the character and significance of individual Reserves. The level of interpretive programmes and facilities will be appropriate to the protection values of individual Reserves. Printed material, low-key self-use facilities, and informal personal contact will be the primary means of interpretation.

The Nature Reserve system as a whole also will be interpreted to the general public including both users and non-users. The earth and life science features of the Province included in the system, the benefits of the system, and the environmental constraints on the system's use by the public, will be interpreted through mass media and other print and audiovisual media.

c) Recreation Programmes

Recreation programmes will not take place in Nature Reserves.

d) Outdoor Education

Outdoor education use of Nature Reserves will be limited to groups with a specific interest in the earth and life science features of individual Reserves. Group activities must be compatible with protection needs in individual Reserves. The environmental constraints which dictate these restrictions, and the long term benefits of imposing them, should be communicated to interested educators in a positive fashion.

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NATURE RESERVES
PART IV
DEVELOPMENT AND MANAGEMENT POLICIES

5. Scientific Research

Scientific research by qualified individuals, which contributes to knowledge of natural and cultural history and to environmental management, will be encouraged in Nature Reserves.

All research programmes will require the approval of the Ministry of Natural Resources and must also meet all requirements under applicable provincial and federal legislation. The Ministry may approve the removal of faunal and floral specimens, soil and geological samples, and archaeological and historical artifacts by qualified researchers. All such materials removed remain the property of the Ministry. Approved research activities and facilities will be compatible with protection values and recreational uses in individual Reserves, and will be subject to development and management policies for Nature Reserves unless special permission is given. Sites altered by research activities will be rehabilitated as closely to their previous condition as possible.

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