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Natural Environment Area boundary in South March Highlands Special Study Area

FINAL REPORT

June 2004

Delineation of Natural Environment Area in the South March Highlands Special Study Area, Kanata, City of Ottawa

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June 2004

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1) INTRODUCTION

Lands in the South March Highlands north of Richardson Side Road, west of the First Line Road allowance and east of the proposed Terry Fox Drive extension are designated Special Study Area (SSA) on Schedule B of the City of Ottawa Official Plan (Ottawa OP) (Figure 1). Policy 3.11 of the Ottawa OP (Ottawa 2003a) outlines the intent of this designation, which is generally to permit a refinement of designation boundaries within it. The policy states the following:

“In particular, The City will undertake a study within 12 months of City Council’s adoption of this Plan - in consultation with landowners, community groups, individuals and other stakeholders with an interest to evaluate:

- a) **the appropriate boundaries of the Natural Environment Area [NEA] found within the Special Study Area based on an assessment of natural values and its role as part of a large greenspace in the area;***
- b) mechanisms to ensure public ownership of the Natural Environment Area lands;*
- c) **The relationship of all lands surrounding the Special Study Area, including the adjacent Natural Environment Area lands in the rural area to the west and north, to determine the potential greenspace linkages, trail connections and opportunities for lands acquisition;***
- d) the most appropriate land-use designations within the Special Study Area;*
- e) the location of the urban boundary.’“*

The present study addresses *a*) and a portion of *c*) (in **bold**, above). The objectives of this study include:

- confirmation of evaluation criteria employed in Brunton (2000) for NEA boundary delineation;

- delineation of the southern boundary of the South March Highlands NEA boundary within and adjacent to the SSA, including justification of any modifications of NEA boundary delineated in Brunton (2000);
- assessment of the ecological importance and function of the SSA NEA within the larger context of the South March Highlands.

The present study does not involve original background field work. This was deemed unnecessary, given the existing detailed in-house knowledge of the site and its surroundings. There is also a substantial body of recent, additional natural environment documentation for this area, as noted in Section 2.2. Nonetheless, the boundary recommendation of this study was reviewed and confirmed in the field in June 2004 (Appendix 3).

2) METHODS AND CRITERIA

In order to understand the ecological significance and contributions of the SSA it is necessary to evaluate it within the context of its larger natural unit, the South March Highlands. This is a science-based investigation which intentionally does not factor in social issues such as recreational desires or aesthetic interests. The intention here is to provide a clearly defined, ecologically defensible boundary which can be accepted by any interested parties as a technically reliable, objective delineation.

Determinations in this study are consistent with the directions and standards of the Ontario Provincial Policy Statement (Ontario 1997) and its Natural Heritage Reference Manual (Ontario 1999), as well as the Natural Environment Areas directions and discussion of the Ottawa OP (Ottawa-Carleton 1999; Ottawa 2003a). Criteria employed in the definition and delineation of NEA boundaries reflect the significant weight given to ecological function values by the province and the municipality in these policy documents.

2.1 Natural Environment Area definition

“Natural Environment Area designation applies to land having a high environmental value as assessed through federal, provincial, and municipal studies. This designation identifies sensitive areas where development could unduly stress ecological functions and where careful management, restoration and enhancement are required. [This] ... includes areas identified by the Province as significant wetlands and related complexes on the Canadian Shield, such as the Carp Hills and South March Highland These lands are designated to ensure that the natural features and functions inherent in each area are protected and preserved.” (Ottawa 2003a)

The criteria employed for the identification of lands satisfying the Natural Environment Area (NEA) definition are consistent with those employed in the identification of High Value regionally significant natural areas in the City of Ottawa (former Region of Ottawa-Carleton) Natural Environment System Strategy (Ottawa-Carleton 1997). They include:

- *ecological integrity* (level of ‘naturalness’, including representation of natural habitat diversity of the larger natural area);
- *habitat continuity* (uninterrupted (or lighted interrupted) interior forest area (woodland core not affected by disrupting ‘edge effect’) within which natural ecological functions persist; ecologically appropriate size and shape of the area);
- *ecological corridor function* (size and importance of linkage between natural habitat areas);
- *natural biodiversity* (diversity of native species and habitats represented within the natural habitat);
- *special features* (number and population size of Provincial VTE (Vulnerable, threatened, Endangered) native species (Oldham 1999) or Regionally (City of Ottawa) significant native species (Brunton 1998); Provincially or Regionally significant vegetation types (Bakowski 1996; Geomatics International 1995, respectively).

Sites found to most completely satisfy a number of these criteria (highest diversity, largest interior forest area, effective ecological linkage, etc.) were rated as High Value natural areas within the City of Ottawa (former Region of Ottawa-Carleton). The South March Highlands rated High (Brunton 1997) and is designated Natural Environment Area (NEA) in the City's Official Plan (Ottawa 2003a). Consistent with those guiding municipal and provincial policies then, the proposed SSA NEA boundary represents a qualification by practical protection and sustainability considerations of landscapes otherwise satisfying NEA designation. These qualifying factors include:

- vulnerability of NEA lands to physical impact by external activities (adjacent land use, recreational and transportation activity, landform character, etc.);
- isolation or fragmentation of NEA component habitats (physical separation from other potential NEA land);
- restrictive impact of other municipal or provincial directions (municipal zoning, Provincial Policy Statement, etc.);
- degree of representation of compromised significant habitats (peripheral locations, degraded condition) within the NEA.

2.2 Work Plan

A comprehensive review of the documentation of natural environment features, functions and related planning considerations of the SAA and its surroundings was undertaken. These include the Ontario Provincial Policy Statement (PPS) (Ontario 1997; 1999) and the City of Ottawa Official Plan (OP) (Ottawa-Carleton 1999; Ottawa 2003a). A chronological review of natural environment inventory and significance assessment documentation was also undertaken as follows, commencing with the initial natural environment assessments for the area:

- *Natural Environment Inventory of the Kanata Lakes Study Area, Kanata, Ontario* (Brunton 1992);

- *South March Highlands Study Area: Natural Environment Assessment* (Brunton 1992);
- *Natural Environment Systems Strategy for the Regional Municipality of Ottawa-Carleton: Stage 1, Regional information base and ecological profile.* (Geomatics International Inc. 1995);
- *Candidate Life Science Areas of Natural and Scientific Interest in Site District 6E-12: A Review and Assessment of Significant Natural Areas* (Draft) (Brunton 1995);
- *Candidate Natural area evaluation* (Ottawa-Carleton 1997);
- *Summary Natural Area reports for Natural Areas west of the Rideau River (500 series)* (Brunton 1997);
- *Provincial Policy Statement* (Revised February 1, 1979) (Ontario 1997);
- *Natural Heritage Reference Manual* (revised) (Ontario 1999);
- *Official Plan, Regional Municipality of Ottawa-Carleton* (Ottawa-Carleton 1999);
- *Shirley's Brook/Watts Creek Subwatershed Study* (Dillon Consulting 1999);
- *Natural environment implications of the Terry Fox Drive alignment in the South March Highlands, Kanata, City of Ottawa* (Brunton 2000)
- *Terry Fox Drive Environmental Study Report* (Dillon Consulting 2000)
- *Kanata Lakes Natural Environment Area Implementation Plan* (Draft) (CH2MHILL. 2001);
- *Kanata Lakes North Serviceability Study* (Cummings Cockburn Ltd. 2002);
- *Richardson Lands, Kanata - Initial identification of NEA lands* (Muncaster 2002c);
- *Lots 8 and 9, Conc. I, Kanata - comments on natural environment features* (Muncaster 2002b);
- *Kanata Lakes NEA boundary definition, Shirleys Brook and tree-cutting mitigation* (Muncaster 2002a);
- *Environmental Impact Statement: Kanata Lakes North, Kanata Ward, City of Ottawa* (Muncaster 2003);
- *City of Ottawa Official Plan* (Ottawa 2003a);
- *Carp River Watershed/ Subwatershed Report* (Draft) (Robinson Consultants 2003).

Brunton (2000) provides considerable background information on the SSA and is appended to this report for reference purposes (Appendix 1).

Established and verified ecological data were extracted from the above and employed in the determination of ecological significant sites and landscapes (1) within the SSA, and (2) within the Extended Study Area. The Extended Study Area (Figure 1) includes the landscape between the SSA and adjacent natural lands to the north, east and west (i.e. the remainder of the South March Highlands and westward to the Carp River). The ecological data derived from the assessment of existing documentation are summarized and compiled below in order to identify the overall area within and adjacent to the SSA containing ecologically significant landscapes definable under terms of the PPS (Ontario 1997).

As noted above in 2.1) Natural Environment Area definition, the proposed NEA boundary within the SSA directly reflects this objective analysis of the ecological feature and function data which have been documented within and adjacent to the SSA. It is qualified, however, by considerations of the ecological implications of land use designations and zoning, the land management history of particular sites, and recent land management actions. Areas with a recent history of intensive logging activity, otherwise significant unforested habitats demonstrating several agricultural grazing impact, and sites with ecologically disruptive adjacent land use practices, have poorer long-term ecological prospects. To achieve ecological significance comparable to other SSA landscapes in such areas, if even possible, would require substantial mitigation efforts.

This NEA boundary also reflects how the ecologically significant area within the SSA connects with and relates to comparable ecologically significant lands in adjacent portions of the South March Highlands. The boundary designation also considers the ecological connectivity requirements between the SSA NEA and the natural lands in the Extended Study Area to the east and north, and towards the Carp River. The Provincial Policy Statement (Ontario 1997) requirement for ecological protection zones adjacent to Significant Natural Heritage Area

Woodlands are then addressed in order to allow for physical protection of the NEA from proposed development.

The NEA boundary within the SSA was reviewed and confirmed through an on-site examination on 4 June 2004, with the boundary revisited and discussed with a group of landowner representatives, City planners and review agency specialists on 9 June 2004. This allowed for some additional natural environment features and function documentation (e.g. degraded quality of open habitat immediately north of the Compensation Lands, additional significant species observations). The on-site examination confirmed the location of the proposed boundary line within the SSA at a finer scale and accommodated the landscape changes which had occurred since the 2000 field season thereafter.

3) OVERVIEW OF THE SPECIAL STUDY AREA (ADAPTED FROM BRUNTON 2000)

The Special Study Area is situated at the southern end of the Precambrian Shield bedrock outcrop known as the Carp Hills which extends from Kanata northwestward to the Ottawa River in the Galetta area. This wetland-rich landform is unique in the City of Ottawa, constituting a 'island' of rugged, heavily-glaciated, rocky, Gatineau Hills-like habitat on the otherwise ±level, sedimentary lowlands. The end result is a landscape with severely limited agricultural potential and substantial challenges to residential/ commercial development. It has remained largely undeveloped, constituting one of the largest areas of continuous natural landscape in the City. The more or less original natural state coupled with a uniquely complex geology has resulted in the southern portion of the Carp Hills (the South March Highlands) supporting a diverse and significant natural biodiversity including Provincially and Regionally significant features and habitats (Brunton 1992a; 1992b; 1997).

The South March Highlands incorporates a number of watercourses and their watershed areas. The SSA incorporates catchment areas for the Carp River, Shirley's Brook and Watts Creek. Most of the drainage in the SSA is westward down the Hazeldean Escarpment slope and

into the Carp River. The northeastern corner of the area drains eastward, however, flowing into the south branch of Shirleys Brook. So too does the Watts Creek headwaters which commence immediately west of the First Line Road ROW in the southern half of the area and flows easterly through Kanata ('Kizell Drain'), eventually discharging into the Ottawa River (Dillon Consulting 2002). Numerous small and/ or intermittent drainage channels occur in the many depressions and ravines occurring in this rugged landscape, all other eventually reaching the Carp River system.

The SSA (Figure 1) is part of the South March Highlands natural area which, in various configurations, has been identified as a candidate Provincially Significant Area of Natural and Scientific Interest (ANSI) (Brunton 1995), a High Value Natural Environment System Strategy (NESS) natural area (Ottawa-Carleton 1997; Brunton 1997) and Natural Environment Area-A and Natural Environment Area B (Ottawa-Carleton 1999). The significance of this area is reflected in the purchase of over 225 ha of natural landscape north of the railway for long-term ecological protection purposes by the former Region in 2000 (Figure 9). This 'Regional Conservation Land' area was enlarged by the City of Ottawa through the purchase of an additional 20 ha of adjacent natural landscape in 2002.

The SSA supports a rich diversity of native plant and animal species typical of superior examples of their respective habitats within the South March Highlands (Brunton 1992a). Some of these species are found within the Highlands only in or immediately adjacent to the SSA (see section 4.1, Significant native species, below). The mature upland deciduous forest habitat in the northern half of the study area contributes the greatest number of these representative and locally unique species (Brunton 1992b).

The SSA contains an extensive complex of common and rare habitats demonstrating a high degree of ecological integrity. Over 80% of this area supports Regionally rare vegetation types (Geomatics International 1995). A number of the nesting bird species present here and in the adjacent forested landscape to the east breed successfully only in extensive woodlands

(Brunton 1992b; Muncaster 2002c). Habitat fragmentation is rare here, with the First Line Road ROW providing the only physical interruption crossing the length of the SSA.

A high level of natural biodiversity is identified as an important contributor to the identification of a Provincially Significant natural area (Ontario 1997). The contribution of the SSA to the ecological integrity of the larger South March Highlands natural area is an important element of the latter area's overall significance and conservation value.

4) ECOLOGICAL SIGNIFICANCE IN AND ABOUT SPECIAL STUDY AREA

The following summarizes the data presented in the existing documentation concerning the ecological features and values of the SSA.

4.1 Significant vegetation

As noted above, a remarkably high proportion of the natural habitat of the SSA and its surrounding lands constitutes Regionally Significant vegetation (*viz.*, community/ landform types covering less than 0.1% of the City of Ottawa - Ottawa-Carleton 1997). Over 80% of the SSA is so rated, as is over 50% of the land between here and the Goulbourn Forced Road and better than 90% of the uplands area westward along the Hazeldean Escarpment towards Huntmar Road Geomatics International 1995; Brunton 1997). Much of this significance comes from the Regionally unusual granitic and marble bedrock underlying most of the South March Highlands (and the Carp Hills). Among other unusual habitats resulting from this situation are the natural bedrock barrens and meadows found commonly along the driest portion of the Hazeldean Escarpment in the SSA.

Figure 2 illustrates the distribution of Regionally Significant vegetation in and about the SSA. Beyond its intrinsic value as an unusual natural asset, Regionally Significant vegetation

provides habitat for a wide variety of Regionally uncommon plant and animal species (see also Figure 3).

Significant vegetation addresses the Natural Biodiversity, Ecological Integrity and Special Features criteria for NEA identification and delineation.

4.2 Significant native species

A substantial diversity of significant vascular plant species occurs in and/ or immediately adjacent to the SSA. While none constitute Provincially Rare species (Oldham 1999), a number are Regionally Rare, being known from fewer than 10 contemporary populations in the City of Ottawa (Brunton 1998). These significant species include:

- Rusty Woodsia (*Woodsia ilvensis*) - [largely in KNL lands east of First Line Road ROW; also Richardson Forest, Hazeldean Escarpment outcrops]
- Southern Blue Grass (*Poa saltuensis*) - throughout hardwoods in SSA
- Wood-rush (*Luzula acuminata*) - throughout hardwoods in SSA
- Long-leaved Chickweed (*Stellaria longifolia*) – deciduous swamp forest at north end
- Spiny Coon-tail (*Ceratophyllum echinatum*) [extirpated in 2003 by destruction of wetland habitat in Richcraft Property east of First Line Road ROW]

Other native vascular plant species found in the SSA are considered to be Regionally Significant, but at a lesser level of importance. These include taxa formerly considered Regionally Rare but for which additional field studies have determined more than ten City of Ottawa populations. Their occurrence in fewer than 20 known populations, however, indicates that such Regionally Uncommon taxa (frequently indicative of unusual and/ or pristine natural habitats) remain significant within the City of Ottawa as local indicators of ecological value.

The Regionally Significant (Uncommon) native vascular plant species known within the SSA are as follows:

- Short-husk Grass (*Brachyelytrum erectum*)
- Bear Sedge (*Carex albursina*)
- Head Sedge (*Carex cephaloidea*)
- Hairy Sedge (*Carex hirtifolia*) – largest known population in City of Ottawa in Lot 8 hardwood forest habitat
- Bur-reed Sedge (*Carex sparganioides*)
- Cleavers (*Galium aparine*)
- White-licorice (*Galium circaezans*)
- Bicknell’s Geranium (*Geranium bicknellii*)
- Virginia Stickseed (*Hackelia virginiana*)
- Mountain-rice Grass (*Oryzopsis racemosa*)
- White Vervain (*Verbena urticifolia*)
- Purslane Speedwell (*Veronica peregrina* ssp. *xalopensis*)

The number of known City of Ottawa populations for each of these Regionally Significant (Rare and Uncommon) species are noted with the appropriate entries in Appendix 2.

Figure 3 illustrates areas within and about the SSA where significant vascular plant species are concentrated. These designations include locations for the Regionally Rare species noted above as well as Regionally uncommon species (Brunton 1992a; Brunton 1992b). These are defined as being known from fewer than 20 City of Ottawa populations and/ or which are very locally distributed in Ottawa (Brunton, in prep.).

The habitat in these areas also tends to concentrate populations of breeding bird species requiring uncommonly pristine forest habitats (Brunton 2000). In the SSA these include Regionally uncommon nesting species such as Pileated Woodpecker, Scarlet Tanager, Black-throated Green Warbler, Ovenbird and Winter Wren (Brunton 1992a; Brunton 1992b; Muncaster 2002a).

Significant native species addresses the Natural Biodiversity and Special Features criteria for NEA identification and delineation.

4.3 Ecological connectivity

Brunton (1992a; 1992b; 1995; 1997; 2000), Ottawa-Carleton (1997), Ontario (1999) and Dillon Consulting (2003) make it clear that the ecological connectivity of natural habitats in general and of the natural lands in the SAA area in particular, is critical to the maintenance of high quality, self-sustainable natural values here. Linkages between natural habitats contributes significantly to the establishment and maintenance of natural biodiversity as well as permitting for ecological recruitment and renewal within habitats.

Based on original faunal investigations, Dillon Consulting (2003) identifies areas of important linkage value along the proposed Terry Fox Road ROW. Illustration of these are accompanied in Figure 4 by the identification of other floristic and faunal linkages. These were indicated by the continuous extent of particular habitats across watersheds and topographic features (e.g. extensive upland forest and wetlands), and/ or by the identification of geographically key locations between major natural habitat areas. The relatively greater importance of particular linkage areas is subjectively indicated by more prominent graphic symbols in Figure 4.

Based on the extent and location of their natural features and values the four most significant areas for ecological connectivity in the SSA (Figure 4) are:

- 1) 'The Saddle' across the high, narrow ridge of mature deciduous forest connecting the southwestern South March Highlands with natural habitats along the Hazeldean Escarpment;
- 2) the area of mature upland and swamp forest habitats straddling the watershed divide between the headwaters of Watts Creek and the Carp River;
- 3) the forested and sloping, scrubby western edge of the Hazeldean Escarpment;

- 4) The upland forest habitat (the 'Richardson Forest') straddling the First Line Road ROW between SSA Lot 6 and the upland/ lowland complex south of Watts Creek.

Other distinctive but ecologically less critical linkages are also noted on Figure 4, most of these being identified from the faunal data in Dillon Consulting (2003).

Ecological connectivity addresses the Ecological Corridor Function and Habitat Continuity criteria for NEA identification and delineation.

4.4 Ecological integrity

The degree of 'naturalness' of particular landscapes is determined through the consideration of a number of over-lapping ecological factors. It is usually difficult, however, to quantitatively measure the ecological condition of a particular site. The Coefficient of Conservation (CC) rating, however, is useful in this regard. It represents a determination on a scale of 0 (lowest) to 10 (highest) of the degree to which particular native vascular plant species require undisturbed, pristine habitat conditions. Accordingly, a calculation of the average CC rating of the native vascular flora provides a useful absolute and relative measure of the ecological integrity of particular areas (Oldham et al., 1995), particularly in regards to distinguishing the relative ecological integrity of areas similar habitats.

Coefficient of Conservation ratings of 7 to 10 represent at given to species which are particularly representative of intact natural habitats. An unusually number of species found in the mature deciduous and mixed forests of the central and northern portion of the SSA and others on the open, native outcrop barrens (over 35) have such high CC ratings (Appendix 2). These include Wild Leek (*Allium tricoccum*), Rusty Woodsia (*Woodsia ilvensis*), Ground-pine (*Lycopodium complanatum* (s. str.)), Horse-gentian (*Triosteum aurantiacum*), White Bedstraw (*Galium circaezans*), Speedwell (*Veronica peregrina* ssp. *xalapensis*), Spiny Coon-tail (*Ceratophyllum echinatum*), Rose Twisted-stalk (*Streptopus lanceolatus*) and Wood Lily (*Lilium philadelphicum*) (Brunton 1992a; 1992b; 2000).

The average CC rating of the 268 species of native vascular plants known from the SSA is 4.47 (Appendix 2). This is an exceptionally high level for an urban area within the City of Ottawa, likely placing amongst the top 10 ratings of the ±185 candidate natural sites being examined in the on-going Urban Natural Areas study (pers. obs.).

The exceptional level of native biodiversity representation within the South March Highlands as a whole is largely attributable to the relatively pristine condition of major habitats best represented within the SSA (Brunton (1992a; 1992b). The mature hardwood forest and bedrock outcrop barrens are particularly notable in this regard.

Invasive plant species - non-native plants which aggressively invade native habitats and degrade or replace native vegetation - pose a serious threat to the ecological integrity of natural habitats in southern Canada (White et al., 1993), particularly so in and around urban areas. The relatively large areas of intact natural habitat within the SSA in particular and the South March Highlands in general, however, has maintained the number and severity of invasive plant impacts here at a level well below that typically encountered in the City of Ottawa (Brunton 2000; *per obs.*).

4.5 Habitat continuity

The extent of interior forest - the area of woodland unaffected by negative external 'edge effects' - offers a valuable indication of site ecological integrity as well as identifying potential concentration areas for disturbance-intolerant flora and fauna (Ottawa-Carleton 1997). It is defined in the on-going City of Ottawa Urban Natural Areas study as constituting the area of continuous woodland occurring 100 m or more in from the edge of natural forest habitat. Figure 5 indicates the approximate position of the large areas of interior forest in and about the SSA.

The size and shape of natural habitat areas are also important contributing factors for the sustainability of a natural area, with smaller, more irregular areas being more exposed and thus

vulnerable to ‘edge effect’ (Harris 1984; Riley & Mohr 1994). The existence of a large block of native habitat centred on the First Line Road ROW (Figures 5 and 7) and presently connected to even larger natural areas to the west (Hazeldean Escarpment), north (the Regional Conservation Lands and interior South March Highlands) and east (Watts Creek system), is important for the sustainability of natural values in the SSA.

4.6 Situation and other ecological assets

The highland situation of much of the SSA reduces the vulnerability of many natural habitat areas within it to upstream negative impacts such as catastrophic pollution events and the cumulative impact of smaller pollution events and habitat disturbance. Conversely, this enhances the importance of the headwater areas within the SSA as these provide ecological resources and protection for the down-stream areas along Shirleys Brook, Watts Creek and the Carp River (Figure 5). In establishing a policy of no-net-loss of subwatershed aquatic habitat, the City of Ottawa Infrastructure Master Plan (Ottawa 2003b) acknowledges increased municipal and provincial responsibilities for enhanced levels of source water planning and protection for both short-term and long-term conservation purposes.

One area abutting the SSA constitute an element of the Provincially Significant South March Highlands Wetland Complex (CH2MHILL 2001). This Provincially Significant Wetland (PSW) element constitutes the eastern end of the thicket swamp by the railway at north end of the First Line Road ROW (Figure 5). Development (such as residential housing) is prohibited within Provincially Significant Wetlands in the City of Ottawa (Ottawa 2003a).

The mature maple swamp forest draining into the Carp River through Lot 7 constituting much of the 14.4 ha ‘Compensation Lands’ area established as part of the mitigation for illegal forest clearing in parts of the KNL lands, is a Locally Significant, Class 4 Evaluated Wetland. This Kizell Drain Wetland was evaluated as scoring 585 of a the required minimum of 600 points required to be considered a Provincially Significant Wetland (Ontario 1994; S. Murphy, pers. comm.). A review of this classification may or may not determine that PSW scores are

achieved in this wetland, although it clearly is very closely to achieving that status. Protection of Locally Significant Wetlands is stated as a goal in the City of Ottawa's Official Plan.

This attribute addresses the Ecological Integrity, Natural Biodiversity and Habitat Continuity criteria for NEA identification and delineation.

4.7 Synthesis of ecological values

The Natural Environment Area designation within the SSA identifies ecologically sustainable and manageable landscapes contained within topographically measurable habitat limits. Sections 4.1 through 4.6 have addressed the significance of the various natural environment assets which combine to identify those areas which satisfy the Ottawa OP criteria (Ottawa 2003a) for NEA lands. They also, however, satisfy criteria for identifying Provincially Significant areas ("*ecologically important in terms of features, functions, representation or amount and contributing to the quality and diversity of an identifiable geographic or natural heritage-system*") (Ontario 1999).

To have ecological assets within a particular area which satisfy the criteria for one of these Provincially Significant natural heritage values is notable. To have ecological resources within a particular area which satisfying the criteria for three of these Provincially Significant natural heritage values is exceptional, however, and attests the remarkable nature of the SSA in particular and the South March Highlands in general. The particular natural heritage systems satisfied are described below.

Provincially Significant Wetland (PSW): "*identified as provincially significant by the Ministry of Natural Resources using evaluation procedures established by the province*; this applies to elements of the South March Highlands Wetland complex found at the north end of the SSA.

Significant Woodlands: “... *treed areas that provide environmental and economic benefits such as erosion prevention, water retention, provision of habitat, recreation and the sustainable harvest of woodland products ...and vary in their level of significance* ” (Ontario 1997). Provincially Significant Woodlands are identified through consideration of woodland size, ecological function, fragmentation characteristics and rarity (including old age) (Ontario 1999). These values are well represented within the SSA, as identified in both the Site District 6E-12 assessment (Brunton 1995) and the Natural Environment System Strategy study (Brunton 1997), as well as this review (above).

Significant Wildlife Habitat: “*Specific wildlife habitats of concern may include areas where species concentrate at a vulnerable point in their annual life cycle; and areas which are important to migratory or non-migratory species*” (Ontario 1997). This is determined through the identification of significant values including 1) seasonal concentration of animals, 2) rare vegetation communities or specialized habitats for wildlife, 3) habitats for species of conservation concern and 4) wildlife movement corridors (Ontario 1999). Again, these values are well represented within the SSA, as identified in both the Site District 6E-12 assessment (Brunton 1995) and the Natural Environment System Strategy study (Brunton 1997), as well as this review (above).

Figure 6 illustrates a simple additive accounting of areas in and about the SSA containing the Provincially Significant ecological values identified above. This does not, however, factor in significant landscape changes presently underway, habitat degradation of peripheral areas, adjacent conflicting land uses and land use projections, habitat fragmentation, etc. These latter considerations (see 4.8, below) are also important in establishing the limits of a sustainable, ecologically manageable Natural Environment Area. This designation of provincial significance does not simply repeat the candidate ANSI boundary suggestion (Brunton 1995) but represents an independent delineation of areas which support features and functions of sufficient kind and quality to satisfy the standards established by the Ontario Provincial Policy Statement (Ontario 1997).

4.8 Constraints to NEA delineation

Although fundamentally science-based, NEA boundaries are not determined in isolation of existing and future natural environment conditions and human activities, both on and off site. Review of the objective ecological information with consideration of existing and anticipated external land use qualifies our understanding of the long-term natural sustainability of particular areas. This provides direction for the delineation of NEA boundaries. Discussion of the most important of these considerations follows.

4.8.1 Ecological constraints

Fragmentation and isolation: The SSA in particular and the South March Highlands in general have increasingly become ‘islands’ of natural habitat at the edge of the expanding residential and commercial core of the City of Ottawa urban landscape. Such development and related activities pose a significant threat to the long-term sustainability and ecological integrity of the natural values described above.

Intensive agricultural activity (cropping and pasturing) long ago transformed the deeper soil areas closer to the Carp River from their former natural condition. A large agricultural area east of the SSA at the railway line is similarly no longer in natural condition (Figure 7) and presents a physical barrier to most ecological processes along the edge of adjacent natural habitats.

Physical impact: Forest clearing in the spring of 2002 significantly impacted several hectares of woodland immediately east of the First Line Road ROW (Muncaster 2002a). This canopy disturbance negatively impacts ecological functions (most notable, ecological connectivity and habitat integrity) in the surrounding woodlands. Numerous unofficial trails have been developed throughout the South March Highlands and surrounding landscape by hikers, cross-country skiers and most notably in recent years by mountain bicycle riders. Soil erosion and tree root damage on steep slopes, in wet depressions and in shallow soil areas is locally significant in many areas along these trails (*pers. obs.*).

Extent of interior forest: The First Line Road ROW transects continuous natural habitat area. Despite a recent (post 1999 ice-storm ?) clearing and leveling of the surface, however, the ROW constitutes a relatively minor negative impact on adjacent natural habitat. Forest habitat has been maintained up to and out over the edge of the ROW for much of its length along both sides, though it is severely disturbed adjacent to the new residential development north of Richardson Side Road (Richcraft Homes property). Native shrubbery and ground vegetation has developed in many places within the ROW and contributes to habitat continuity.

Although too disturbed and degraded in and of themselves to constitute viable natural habitat, portions of this narrow corridor, if managed in association with adjacent natural forest, demonstrate considerable potential for ecological rehabilitation. Accordingly, the concession ROW does not constitute a significant, permanent limitation to the extent of interior forest. At present, however, the open condition of the ROW facilitate the spread of invasive, non-native vegetation along the eastern side of the SSA.

4.8.2 Adjacent land use

The land uses on adjacent properties have a substantial influence on the ecological integrity, function and significance of natural areas (see Sections 4.1 through 4.6 for a discussion of the relative importance of such factors within the SSA). Residential development presently underway as well as future changes resulting from residential and transportation development commitments on other adjacent properties (Figure 1), have important implications for the ecological significance and sustainability of the natural landscape within the SSA. The major adjacent land use issues affecting the SSA are discussed below.

Richcraft Homes Property: Extensive forest clearing has been conducted for residential development on the urban lands immediately north of the Richardson Side Road, east of the First Line Road (photo below). These lands are in the process of being converted from a natural condition. This action reduces the overall ecological diversity and significance of the South

March Highlands and directly affects ecological connectivity values and the extent of interior forest in the Richardson Forest portion of the SSA.

Developer representatives, City planning staff and review agency specialists along First Line ROW by cleared forest on Richcraft Homes property (9 June 2004)



KNL lands: Residential development is committed in the majority of the KNL lands between the First Line Road ROW and Goulbourn Forced Road. This has major implications for the ecological significance of both the SSA in particular and the South March Highlands in general. That includes a major reduction in the ecological corridor function presently active between the Regional Conservation Lands north of the Terry Fox Road ROW and the Trillium Woods Urban Natural Feature (UNF) within and immediately east of the Extended Study Area, along either side of Goulbourn Forced Road (Figure 9). It will also increase the edge effect impact of the Terry Fox Road ROW on the adjacent Regional Conservation Lands habitat. The KNL

residential development area is transected by Kizell Pond Urban Natural Feature along Watts Creek.

The KNL development plan dramatically reduces the existing area of ecological connectivity between the SSA and other significant natural areas of the South March Highlands (Brunton 1992a; 1992b; 2000). The remaining UNF west of Goulbourn Forced Road constitutes about 100 ac (40 ha) of upland and wetland habitat (S. Murphy, pers. comm.). The Richardson Forest in Lot 6 will be particularly negatively effected, being completely isolated from comparable natural habitats to the north and east. As well, virtually all of the interior forest values of the Richardson Forest will be eliminated.

The loss of continuous forest habitat within the KNL lands north of Watts Creek in the West Block will have similar though less intense impacts on the northern portion of the SSA. The negative impact is lessened in that area by the existence of continuous natural habitat along the top and face of the Hazeldean Escarpment to the west of the SSA (Figures 2, 3, 4 and 5). Development of portions of the West Block on the KNL property will result in the loss of native biodiversity, a reduction in biological restoration and recruitment potential and the initiation of microclimatic changes. It will inevitably reduce the self-sustainability and overall ecological significance of the adjacent portion of the SSA. Without detailed on-site examination of the lands involved, however, it is difficult to quantify the loss of particular natural features.

4.8.3 Terry Fox Road extension impact

Dillon Consulting (2003) has established that construction of the proposed Terry Fox Road extension across the SSA will have a significant, negative ecological impact "*Terry Fox Drive will form a barrier and break between the northern and southern portions of the presently continuous South March Highlands [natural] area*". Recognizing the importance of maintaining ecological connectivity across this barrier, Dillon Consulting. (2003) proposes a system of modified culverts and a major sub-roadway ecological passageway along the preferred roadway ROW to partially mitigate these loses.

As part of the recent discussions on the design of this road, an alternative route crossing the SSA and located slightly west of the preferred route (Dillon Consulting 2003) was suggested by a landowner. Dillon Consulting (2003) considered that the Balys & Associates alternative route would have “*a higher impact on the environment (volume of rock knolls to be removed, and wetland impacted)*”. In a later assessment of the natural environment implications of the Balys & Associates proposed route, it was suggested (Muncaster 2002b) that the degree of ecological disturbance along this alternative route for the crossing of the Hazeldean Escarpment and the SAA might be no greater or even somewhat reduced to that of the preferred Terry Fox Road ROW. That opinion, however, does not address the question of maintaining ecological connectivity across the roadway ROW other than to suggest that roadway development along either alternative will inevitably have some impact.

Regardless of the route selected, it is clear that the extension of the Terry Fox Road arterial across the South March Highlands will constitute a major ecological challenge to the Provincially Significant values in and about the SSA and throughout a large segment of the South March Highlands. Major mitigation measures, as described above, will be required to at least reduce the losses of significant ecological value here.

5) NEA BOUNDARY AND PROTECTION REQUIREMENTS

The proposed NEA boundary encloses a representative, self-sustainable natural landscape which satisfies Natural Environment Area criteria of the Ottawa OP (Ottawa 2003a) as well as Provincially Significant Woodland, Provincially Significant Wetland and Provincially Significant Wildlife Habitat delineation standards called for in the Ontario Provincial Policy Statement (Ontario 1997; 1999). As described above, the NEA considers not only the present ecological assets and capabilities of the landscape in question but addresses long-term sustainability in light of the on-going development of adjacent lands.

5.1 Proposed NEA boundary

The SSA NEA boundary proposed as a result of this investigation is illustrated in Figure 8. As noted previously, the natural features and functions of adjacent landscapes are important to long-term ecological sustainability of this area. Accordingly, NEA identification criteria are applied to the Extended Study Area as well and the resulting boundary is also depicted on Figure 8. Definition of all portions of the NEA boundary within the Extended Study Area have not been defined with the same degree of rigour, however, as has been applied within and immediately adjacent to the SSA. The location of the proposed NEA boundary within the SSA was reviewed and confirmed by D. F. Brunton and S. Murphy during the field inspection of 4 June 2004. A summary of decision points and observations is provided in Appendix 3. The proposed NEA boundary in the larger Extended Study Area has not been field checked beyond the SSA.

The present critical analysis of NEA boundary requirements is largely consistent with and supportive of the conclusions drawn by the earlier NEA boundary analyses for the lands west of the First Line ROW (Brunton 1992a; Brunton 1992b; 2000). For the lands east of the First Line Road ROW, the present analysis is largely consistent with the NEA boundary conclusions of Brunton (1992a), Brunton (1992b), CH2MHILL (2001) and Ottawa-Carleton (1999). It does not match well, however, with the significantly smaller NEA boundary proposed by Muncaster (2002a; 2003) (see also 4.8.2, above).

The NEA boundary proposed in this study (Figure 8) involves substantial reductions in the area of provincial ecological significance depicted in Figure 6. The reductions are intended to exclude only natural landscape areas for which development approvals have been granted and/ or habitats which, subsequent to adjacent development being completed, will no longer sustain the significant ecological features and values they presently possess. The proposed NEA, however, still retains all of the ecological functions identified as significant within the SSA, as well as a large majority of the significant ecological features. The major areas to be excluded and the implications of their removal are as follows:

- Richardson Forest (Lot 6)

- moderately significant upland forest vegetation isolated from the remainder of South March Highlands significant landscape by long-standing agricultural development to the north and by on-going residential development to the east for which the City of Ottawa has committed development approvals;
- linkage area with the proposed SSA NEA near the First Line Road ROW negatively impacted by the 2002 forest clearing and to be completely severed by proposed residential development of Urban lands south of Watts Creek;
- ecological function of the forest area also increasingly impacted by expanding residential development south of Richardson Side Road (Heritage Hills);
- preservation of locally or Regionally significant features (e.g. White Pine forest area) can be addressed at the site plan level of subdivision design.

- Drainage route to Carp River from Lot 7 Evaluated Wetland

- degraded upland scrub habitat which is regenerating from extensive, long-term agricultural activity and which supports few natural values;
- wetland protection requirements can be accommodated by typical fisheries habitat protection measures in subwatershed planning (including 30 m no-development buffer), subdivision site planning and/ or through landowner stewardship initiatives (water course enhancements, etc.) (see 5.3, below).

- Rock outcrop habitat in Lot 7 to south of Evaluated Wetland

- habitat severely degraded by long-term agricultural activity (grazing) with few natural or representative vegetation elements remaining.

- KNL Lands south of Terry Fox Road to Kizell Pond UNF boundary

- area is entirely committed to urban scale residential development.

Although reduced in size and ecological significance by the constraints identified above in Section 4.8 (see also Figure 9), the proposed SSA Natural Environment Area remains a highly significant natural asset. Key sustainable ecological values include:

- Biodiversity:
 - retains a rich assembly of native biodiversity with no known SSA native species excluded from the proposed NEA.

- Special features:
 - full representation of the significant vegetation types and of all known SAA significant species (Regionally Significant fauna, uncommon flora) retained;
 - Provincially and Locally Significant Wetland components.

- Ecological connectivity:
 - linkages with the remainder of the West Block to the east and with the Regional Conservation Lands to the north retained; the latter linkage has the additional ecological benefit of including PSW habitat.

- Ecological integrity:
 - retains extensive area of natural, unfragmented forest habitat with little or no significant non-native elements.

This combination of ecological assets indicates that the proposed NEA area would remain large enough and with sufficient ecological function to be self-sustainable despite the negative impacts of surrounding development. This capacity is enhanced by the upland nature of most of the site, making it potentially less vulnerable than down-slope areas. Protection of these significant values will require designation of a buffer zone between proposed development areas and retained NEA lands (see 5.2, below).

5.2 NEA protection requirements

Ecological buffer areas are required to provide a protective transition zone between ecologically sensitive and Provincially significant habitats and negative external influences (Ontario 1997). The size of such protection zones are left to the determination of particular planning authorities through the application of good planning principles. The Ontario Wetland policy identifies an Adjacent Area extending 120 m beyond Provincially Significant Wetlands (or PSW complex elements) within which the needs of a sufficiently wide protective natural vegetation buffer should be considered (Ontario 1994). In the case of the appropriate protection zone surrounding the Provincially Significant NEA area within the South March Highlands SSA, that direction is provided by the City of Ottawa OP (Ottawa 2003a).

An Environmental Impact Statement (EIS) is required for new development within a 30 metre distance of the boundary of an NEA or Urban Natural Feature to “*manage the ... transition zone between urban development and natural features ...*” (Ottawa 2003a). The EIS would determine the mitigation measures, including consideration of a no-development buffer, required to provide the appropriate level of protection for the NEA’s significant values. This NEA protection zone performs the same function identified for ‘Adjacent Lands’ in the OPPS (Ontario 1997).

The Natural Heritage Reference Manual (Ontario 1999) recommends a 50 m ‘Adjacent Lands’ zone abutting Significant Woodland and Significant Wildlife habitat “*... for considering whether development may have an impact on significant wildlife [and woodland] habitat*”. Particularly in light of the uncommonly sensitive nature of the South March Highlands landscape, therefore, establishment a comparable no-net-impact zone of 50 m in width is both appropriate and ecologically justifiable along the NEA boundary in the SSA. This is particularly so in light of South March Highlands soils being generally more vulnerable to disturbance and less capable of supporting disturbance-tolerant natural vegetation than landscapes on the clay and loam based lowlands which dominate eastern Ontario (Chapman and Putnam 1984).

The Provincial Policy Statement and the Ottawa OP (Ontario 1997; Ottawa 2003a) would not be contradicted by a particular development proposal on abutting lands, then, if it is first demonstrated by an competent EIS study that no net negative impact would result for the significant features and functions for which the NEA or Urban Natural Feature was identified.

5.3 Linkage to Carp River

Linkage is provided between the SSA Natural Environment Area and the Carp River in Lot 7 along a degraded drainage channel through areas of transformed agricultural land, upland thicket and scrubby forest over partially buried granitic bedrock outcrop. This narrow and relatively lightly vegetated corridor provides limited potential for upland habitat representation though it may offer significant aquatic functional values (fisheries habitat, water quality protection, etc.) in the Carp River. Accordingly, maintenance of the drainage channel within its natural course and application of the standard City of Ottawa 30 m no-development water course and fish habitat buffer should satisfy both the policy and the intent of stream set-back directions provided in the Ottawa OP (Ottawa 2003a).

6. CONCLUSIONS AND RECOMMENDATIONS

Despite existing and proposed negative impacts from development on neighbouring properties, the proposed SSA Natural Environment Area constitutes a self-sustainable, provincially significant natural landscape. It can continue indefinitely to provide an important contribution to the ecological wealth of the larger South March Highlands and indeed, to the City of Ottawa. The major considerations in achieving this ecologically important result are noted below.

6.1 Ecological representation provided by the NEA

The proposed NEA boundary reflects the objective analysis of the known ecological features, values and processes of the SSA. In recognition of the implications of present and future land uses on the long-term sustainability of natural landscape values in the NEA, the recommended protection area is substantially smaller in extent than the landscape presently definable as being Provincially Significant (Ontario 1997; 1999). The proposed NEA boundary, however, still contains the majority of SSA natural values and largely supports similar protection area conclusions of Brunton (1992a), Brunton (1992b), CH2MHILL (2001) and Ottawa-Carleton (1999).

6.2 Protection Zone requirements for the NEA

Adjacent Lands are identified by the OPPS (Ontario 1997) as providing a transitional zone between significant natural landscapes (Provincially Significant Wetlands, Woodlands, Wildlife Habitat) and development. The Ontario Natural Heritage Manual recommends a 50 m wide Adjacent Lands zone around landscapes like those of the SMH NEA (Provincially Significant Woodlands and Wildlife Habitat), while a comparable 30 m wide zone is identified as requiring an EIS within the City of Ottawa (Ottawa 2003a). Given the additional level of ecological sensitivity of this granitic-based landscape, however, the establishment of a 50 m Adjacent Area

zone surrounding the SMH NEA lands is both ecologically appropriate and defensible, and is recommended here.

6.3 Protection of other SSA natural features and values

Some locally or regionally significant natural features (e.g. the White Pine grove in the Richardson Forest) are not at a sufficient scale of ecological importance to be included within the NEA proposed here. Protection and preservation of such areas should be accommodated, however, at the site plan level of subdivision design.

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Appendix 1:

*Natural environment implications of the Terry
Fox Drive alignment in the South March
Highlands, Kanata, Region of Ottawa-Carleton*

(Brunton 2000)

**Natural environment implications of the Terry Fox Drive alignment
in the South March Highlands, City of Kanata, Region of Ottawa-
Carleton, Ontario**

Daniel F. Brunton
September 2000

prepared for:
Planning and Development Services Branch,
Region of Ottawa-Carleton

INTRODUCTION

A review and assessment of the natural environment implications of the proposed Terry Fox Drive alignment between Richardson Side Road and Morgan's Grant subdivision in Kanata, Region of Ottawa-Carleton, has been undertaken in light of the recommendations of Region of Ottawa-Carleton Planning and Development Approvals Department (Tunnacliffe *in lit.*, 17 April 2000). This area is presently designated as Natural Environment Area (B) in the Regional Official Plan (Region of Ottawa-Carleton 1999) and, within Natural Environment System Strategy (NESS) Natural Area 539, contains a wide variety of Regionally uncommon to rare natural environment features and values (Brunton 1997). Selection of route 4-1 as the preferred route raises issues regarding environmental boundaries between the route 4-1 and the existing urban boundary (First Line Road allowance).

The primary focus of this assessment, therefore, concerns the ecological implications for the ±115 ha area of NEA land *between* the option 4-1 and 4-2 alignments which would be affected by the selection of alignment option 4-1 (hereafter, the 4-1/ 4-2 study area) (Figure 1). The present investigation considers the following questions:

- 1) would the assessment of significance and recommended Natural Environment Areas be likely to change significantly given the Terry Fox Drive Extension Alignment 4-1 ?
- 2) what factors or ecological functions within the significant areas, if any, are likely to take on added importance given the Terry Fox Drive extension ?

To answer these questions, existing documentation was reviewed, particularly the 1992 natural environment inventories of the South March Highlands and Kanata Lakes areas (Brunton 1992a; 1992b), and new field investigations were undertaken.

Figure 1: The 4-1/ 4-2 study area (hatched area) (route 4-1 (approx.) = dotted line)



WORK PLAN

Subsequent to access approvals arranged by Region of Ottawa-Carleton personnel, field investigations were undertaken throughout the 4-1/ 4-2 study area, with all affected boundaries being examined directly, all major habitats visited, and potential natural corridors to other NEA areas investigated. The area south of Richardson Side Road between the edge of the Hazeldean Escarpment and First Line Road (i.e. by the communications tower) which had not previously been evaluated, was also inventoried. Notes were recorded and voucher specimens made of known or potentially significant native plant species. Faunal studies, particularly breeding bird and herptiles (amphibians and reptiles) were also conducted in the 4-1/ 4-2 study area in the spring/ early summer to fill out the biological information base on the area.

Field examinations were conducted in spring, early summer and late summer (18 April, 29 May, 27 June, 4 July and 16 August 2000) in order to develop a fuller appreciation of seasonal variation within the study area landscape. Several of these field investigations were undertaken in the company of David Miller, Regional Planner, Planning and Development Approvals Branch, Region of Ottawa-Carleton. Elements of the investigation included:

1. *the range of significant natural features and assets existing in the 4-1/ 4-2 study area, including:*
 - . an on-site proofing of existing documentation of representation vegetation, habitats and species;
 - . the identification/ confirmation of study area habitats and features supporting local/ regional ecological functions;

2. *the boundaries of the area(s) required to enclose and protect sustainable representation of the natural assets of the 4-1/ 4-2 study area, focusing on 1992 proposed NEA boundaries, including:*
 - . the size and location of significant features and populations (individual species, breeding/ hibernation/ and/or feeding sites, etc.);
 - . size and extent of core representative natural area (including representative and Regionally exceptional vegetation);
 - . size and extent of natural corridors and connections to ecologically contributing satellite areas;
 - . on-site wetland resources and functional watercourse connections with adjacent drainage systems;

3. *identification of linkage opportunities:*
 - . existing/ potential linkages between the proposed 4-1/ 4-2 study area protected area(s) and neighbouring significant natural landscapes in the South March Highlands (Trillium Woods, Natural Environment Area (B)).

4. *identification of assumptions and conditions concerning site restoration and impact mitigation along the Terry Fox Drive corridor:*
 - . approaches in associated lands during and after construction.

From these inventory efforts and the review of existing documentation, ecological clarifications (as noted below) were documented to assist in the resolution of outstanding planning issues.

STUDY AREA CONTEXT

The natural environment resources of the 4-1/ 4-2 study area are summarized in Tunnacliffe *in lit.* (17 April 2000) and discussed in greater detail within the natural environment inventories of the Highlands (Brunton 1992a; 1992b). The study area is situated at the southern end of the Precambrian Shield bedrock outcrop known as the Carp Ridge, which extends from Kanata northwestward to the Ottawa River in the Galetta area. This wetland-rich landform is unique in the Region of Ottawa-Carleton, constituting a 'island' of rugged, heavily-glaciated, rocky, Gatineau Hills-like habitat on the otherwise ±level, sedimentary lowlands. The end result is a landscape with severely limited agricultural potential and substantial challenges to residential/ commercial development. It has remained largely undeveloped, constituting one of the largest areas of continuous natural landscape in the City. The more or less original natural state coupled with a uniquely complex geology has resulted in the southern portion of the Carp Ridge (the South March Highlands) supporting a diverse and significant natural biodiversity including Provincially and Regionally significant features and habitats (Brunton 1992a; 1992b; 1997).

Straddling the western rural/ urban boundary, the 4-1/ 4-2 study area constitutes a small portion of a larger NEA (B) landscape surrounded by Business Park (south and east), Agricultural Resource (west), General Urban (east) and NEA (A) (northeast) lands (Region of Ottawa-Carleton 1999).

Virtually all of the drainage in the 4-1/ 4-2 study area is westward down the Hazeldean Escarpment slope and into the Carp River. Only the northeastern corner of the 4-1/ 4-2 study area drains eastward, flowing into the South Branch of Shirleys Brook. Numerous small and/ or intermittent drainage channels occur in the many depressions and ravines occurring in this rugged landscape. The Watts Creek watershed commence immediately east of the First Line Road ROW in the southern half of the area and there may be some cross-over in either direction. Aquatic systems except in the severely disturbed drains immediately south of the railway corridor at the northern end of the study area seem to be in good condition. There was little evidence of over-nutrication or serious non-native plant infestations in these wetlands.

ECOLOGICAL RESOURCES

As noted in Tunnacliffe *in lit.* (17 April 2000), most of the highland portion of the 4-1/ 4-2 study area is forested, although a substantial area of agricultural land (pasture) occurs in the southern portion. On-site investigations confirm that the habitats and the extend of agricultural incursion remain substantially as previously documented, although the area of deciduous swamp forest half way along and west of the First Line Road is more extensive than was described previously. Figure 2 (below)

provides an up-dated version of a portion of the vegetation mapping included as Figure 9 in Brunton (1992b) and Figure 8 (Brunton 1992a). The only conspicuous change along this eastern edge of the 4-1/4-2 study area is the up-grading of power lines and poles (post- ice storm ?), with an accompanying clearing of the ROW. Water levels substantially lower than 1992 levels were noted in the small Shield wetlands in the area. This is believed to be indicative of the low-water conditions apparent in such wetlands across the Region of Ottawa-Carleton in the late 1990s.

Vegetation

As noted above, field investigations during the present study confirmed the distribution and composition of the 4-1/4-2 study area to be as described in the earlier South March Highlands natural environment inventory (Brunton 1992b). In terms of the vegetation classification now employed in southern Ontario by the Ontario Ministry of Natural Resources (Lee et al. 1998), seven major habitats can be described here. They, with their appropriate vegetation codes noted (in brackets), are as follows:

Habitat 1: *Sugar Maple Deciduous Forest (FOD6)* - ca. 45% of study area (Vegetation Types 7 and 8 of Brunton 1992b);

- Sugar Maple dominated upland forest, particularly mature in the northern half of the study area; small patches of Hardwood-Hemlock Mixed Forest (FOM3) occur throughout (probably reduced by selective logging) with inliers of swamp forest and bedrock outcrop (see below);

- most extensive vegetation type in the study area with diverse spring floristic development; relatively undisturbed understory with few non-native plant species; good representation of breeding bird species typical of extensive, ±mature deciduous forest (see Appendix 1);

Habitat 1: *Sugar Maple Deciduous Forest (FOD6)* - ca. 45% of study area (Vegetation Types 7 and 8 of Brunton 1992b);

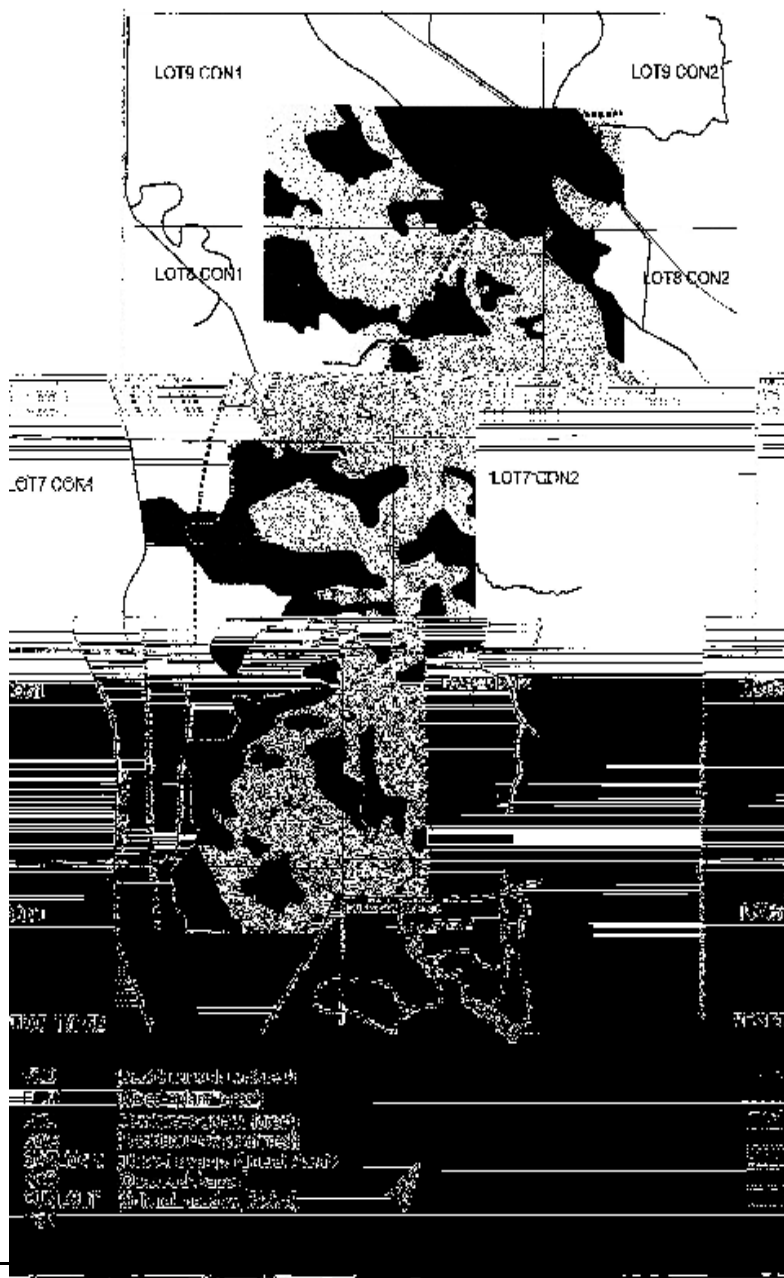
- Sugar Maple dominated upland forest, particularly mature in the northern half of the study area; small patches of Hardwood-Hemlock Mixed Forest (FOM3) occur throughout (probably reduced by selective logging) with inliers of swamp forest and bedrock outcrop (see below);

- most extensive vegetation type in the study area with diverse spring floristic development; relatively undisturbed understory with few non-native plant species; good representation of breeding bird species typical of extensive, ±mature deciduous forest (see Appendix 1);

Habitat 2: *Hardwood-Hemlock (FOM3) and Poplar-White Pine Mixed Forest (FOM5)* - ca. 15% of study area (Vegetation Type 9 of Brunton 1992b);

- young deciduous (Red Maple, Sugar Maple, Trembling Aspen, White Ash) upland forest species in complex mixture with Eastern Hemlock, White Pine and White Cedar; pure coniferous forest, swamp forest and rock inliers occur (see below); predominantly in southern half of the study area and also south of Richardson Side Road; relatively undisturbed understory with few non-native plant species; typical representation of upland mixed and coniferous forest breeding birds noted (see Appendix 1);

Figure 2: vegetation types



Habitat 3: *Pine Coniferous Forest (FOC1)* - ca. 5% of study area (Vegetation Type 10 of Brunton 1992b);

- young to mature White Pine dominated forest, commonly grading into FOM5 mixed forest on drier, rockier sites and FOM3 forest in mesic situations; concentrated in the southern half of the study area (including mature grove known as 'Cathedral Grove'); typical representation of upland mixed and coniferous forest breeding bird noted (see Appendix 1);

Habitat 4: *Deciduous Swamp Forest (SWD)* - ca. 10% of study area (Vegetation Types 4 and 5 of Brunton 1992b);

- young to mature Red Maple (SWD6) or Black Ash, Green Ash (SWD5) dominated wetlands with White Elm, Yellow Birch, Balsam Fir, over organic deposits (SWD6) in bedrock depressions and drainage channels across the study area; both standing water and ephemeral wetland areas present; supports representative and uncommon breeding bird and herptile species (Appendix 1);

Habitat 5: *Thicket Swamp (SWT2)* - <5% of study area (Vegetation Type 2 of Brunton 1992b);

- small section of large willow-Red-osier Dogwood (SWT2-2, SWT2-5) thicket over mineral soil at northeastern corner of study area; small areas of Mineral Meadow Marsh (MAM) east of the First line ROW; low floristic and faunal diversity noted (Appendix 1);

Habitat 6: *Open Rock Barren (RBO)* - ca. 20% of study area (Vegetation Type 'R' of Brunton 1992b);

- dry, hot, open areas of gneissic bedrock with sparse associated vegetation along escarpment edge and within forested uplands, with woodland and scrub 'islands' in areas of thin soil; supports Regionally significant native vegetation but low faunal diversity (Appendix 1);

Habitat 7: *Meadow & scrub (CUM, CUT)* - ca. 10% of study area (Vegetation Types 'S' and 'M' of Brunton 1992b);

- small areas of regenerating farmland along lower portions of escarpment, with largest example in southern portion of the study area; high faunal diversity, with representative breeding birds of fields and woodland edges (Appendix 1) but severely limited natural floristic diversity.

Flora

As noted above, the vascular flora of the various 4-1/ 4-2 study area habitats was found to be a continuation of the flora recorded in comparable habitats across the South March Highlands (Brunton 1992a; 1992b). The extent of unfragmented habitat and relative isolation of the site has encouraged unusually large populations of some mature deciduous forest plant species such as Wild Leek (*Allium tricoccum*). One additionally Regionally significant species was found in the study area during the

present investigation, that being a large population of Short-headed Sedge (*Carex brevior*) (see Significant features, below).

Fauna

The breeding bird, mammal and herptile (amphibian and reptile) observations made during the present field investigations are noted in Appendix 1. Species considered significant in the Region of Ottawa-Carleton (cf. the preliminary lists of Brownell & Larson 1997) are also listed below.

Birds: the diversity of breeding bird species includes a number which are typical of extensively forested areas and thus are otherwise rare in the fragmented habitat which constitute much of the forested portions of the Region of Ottawa-Carleton. These include Scarlet Tanager, Yellow-bellied Sapsucker, Pileated Woodpecker and Wood Thrush. Several Regionally significant species were also noted:

Red-shouldered Hawk	Black-throated Blue Warbler
Winter Wren	Black-throated Green Warbler
Golden-winged Warbler	Pine Warbler

All of these except the Golden-winged Warbler are typical of more mature, extensive upland or swamp forest areas (Winter Wren in the latter); they were found sparingly in such habitat at the northern end of the 4-1/ 4-2 study area. A singing male Golden-winged Warbler was heard and observed along the margin of the extensive Thicket Swamp habitat at the north end of the study area on 29 May 2000. This predominantly southern species has rarely been recorded breeding within the Region of Ottawa-Carleton, previous breeding-season reports also being from the Carp Ridge area.

Amphibians & reptiles: few herptiles were observed in the 4-1/ 4-2 study area, perhaps at least in part due to the drought which apparently has negatively affected wetland species during the last three or four years in the Region of Ottawa-Carleton. No salamander species were observed although potential breeding pools were searched in mature hardwood forest habitat. Only in July were frogs noted with frequency, these being the common Green Frog and Wood Frog.

Blanding's Turtles, considered Regionally Significant in the Region of Ottawa-Carleton in the preliminary list of Brownell & Blaney (1997), were observed basking on a log in a small pond along the First Line Road allowance in the Carp River watershed by the height-of-land with the Watts Creek watershed. This ± 40 m long pond exhibited an unusual diversity of turtles, with Painted, Snapping and Blanding's Turtles all being observed there on different occasions.

Mammals: Relatively few mammal species were observed during the natural environment assessment of the 4-1/ 4-2 study area. None are considered to be Regionally Significant (cf. preliminary list of Brownell & Larson 1997). White-tailed Deer are common here, as they have been throughout the western portion of the Region of Ottawa-Carleton since the early to mid 1990s (Broadfoot and Voigt 2000).

ECOLOGICAL FUNCTIONS

The contribution of the 4-1/ 4-2 study area to the ecological integrity of the larger NEA area within which it is contained is an important elements of its overall significance and conservation value. The following include the ecological attributes reviewed in assessing candidate NESS areas in this area of the Region of Ottawa-Carleton 1997; Brunton 1997).

Representation and condition: being virtually continuous natural woodland, particularly one with a diversity of upland and wetland habitats with little non-native intrusion, the study area contains an extensive complex of common and rare habitats demonstrating a high degree of ecological integrity. Over 80% of the study area supports Regionally rare vegetation types (Geomatics International 1993) and represents a continuation of similar vegetation types in the NEA (B) area to the north and the NEA (A) area to the east. As noted above, a number of the nesting bird species noted within the 4-1/ 4-2 study area are successful breeders only in extensive woodlands. Fragmentation is rare here, with the First Line Road ROW providing the only physical interruption crossing the length of the site. Agricultural development intrudes from the west in some sections.

Natural biodiversity: the 4-1/ 4-2 study area is known to support a rich diversity of native plant and animal species typical of superior examples of the habitats represented here (Brunton 1992b; 1997). None of the habitats and only a few particular species, however, are unique to this area of the South March Highlands (see Special features, below)

Hydrological values: The First Line Road ROW virtually forms the height of land between the Watts Creek and Carp River watersheds, with drainage westward to the river being through a myriad of ephemeral ponds, deciduous swamps and tiny drains. The northern half of the 4-1/ 4-2 study area with deeper soils and more extensive water-filled depressions contributes most of the water retention and regulatory function of the area.

Special features: a substantial number of Regionally significant plant and animal species are documented from the habitats noted in the 4-1/ 4-2 study area, the mature upland deciduous forest habitat in the northern half of the study area contributing the greatest number of these (Brunton 1992b).

Few of these are unique to the 4-1/ 4-2 study area in the South March Highlands. The largest Region of Ottawa-Carleton population of the Regionally Rare Short-headed Sedge (*Carex brevior*) found during the present inventory on the bedrock outcrops south of the Richardson Side Road, however, is one such locally unique feature. Another was an apparently territorial and possibly breeding Regionally Rare Golden-winged Warbler noted at the edge of the large thicket swamp at the north end of the study area. Amongst the otherwise typical herptile species, a Regionally uncommon Blandings Turtle was noted in a small woodland pond along the First Line Road adjacent to the Watts Creek watershed. This species has also been observed both east and north of the study area in the South March Highlands (Brunton 1992a; 1992b).

Linkages: The western half of the study area forms a direct and continuous link with identical significant habitat to the north. The southern half of the study area, however, protrudes into developed or slated-for-development lands and will be impacted on the west, south and east by agricultural and urban development.

NATURAL ENVIRONMENT SIGNIFICANCE WITHIN THE SOUTH MARCH HIGHLANDS

The extensive escarpment and upland forest landscape in the northern half of the 4-1/ 4-2 study area identified as areas 3 and 4 in Tunnacliffe *in lit.* (17 April 2000) has been documented as being of Regional and Provincial ecological significance (Brunton 1992b). That assessment was supported by observations made during the present investigation. As noted above, few of the natural environment assets of the 4-1/ 4-2 study area are unique to the area. The rich natural biodiversity of the area, and of adjacent natural lands to the east and north, is directly related to the relatively high state of ecological integrity in this area. That, in turn, is directly related to the contribution each portion of the Highlands makes to each other - particularly to adjacent lands.

Identification and designation of areas of significant vegetation as being of conservation or preservation priority is of only of academic interest if conditions are not in place to ensure that such areas/ features/ values are naturally sustainable over the long term. The self-sustainability of an area is dependent on characteristics such as natural diversity, hydrological condition and ecological integrity. A major consideration regarding the sustainability of significant natural environment values within the 4-1/ 4-2 study area, then, is the potential impact of development options on the linkage of this area with other significant natural landscapes to the north and east. The effective ecological communication between such areas is necessary for the movement of plant and animal species between them.

The 4-1/ 4-2 study area provides considerable ecological significance within the NEA (B) of which it is a part (Brunton 1997), and the South March Highlands as a whole (Brunton 1992). Virtually all of

these floristic, faunal, habitat and ecological function values are replicated elsewhere in South March Highlands NEA lands. While reduction of the size of the NEA in the 4-1/ 4-2 study area would reduce the quantity of protected ecological assets, its ecological diversity would remain essentially unchanged.

Boundaries of representative area:

As noted above, few natural environment assets in the study area are unique. While a substantial block of this area would have to be maintained intact if significant species, populations and functions are to prevail, not all of the 4-1/ 4-2 study area is essential in that regard. Protection of the more extensive escarpment edge and mature Sugar Maple dominated upland of the northern half will contain the majority of significant values and contributions of the study area. This reduced area would align along its southern border with the NEA (A) land to the east (Figure 3). With the development of the General Urban lands to the east of the First Line Road allowance the ecological integrity of the southern half of the 4-1/ 4-2 study area will be impacted - possibly severely - by fragmentation and edge effect. As noted above, however, the vegetation types and biodiversity assets of the southern half contribute less to the conservation value of the larger NEA area than those of the northern portion. The ecological assets of the southern half also largely represented in the southeastern section of the NEA (B) area immediately west of the Second Line Road.

MITIGATION OF LOSS OF NEA SIGNIFICANCE

Although ecological diversity will not be appreciably lessened by an NEA size reduction, mitigation will be required if compensation for the resulting reduction in overall ecological value is to be effective. The preferred route for mitigating the loss of such land would be the addition of comparable quality natural lands elsewhere to the NEA. With additional natural lands unavailable to the south or west, such compensation appears to be possible only to the east towards the 'Trillium Woods' NEA(A) area along Goulbourn Forced Road. Since adjacent development will eventually isolate this important site, the addition of protected land here would also secure an important ecological linkage between the two NEAs.

Mitigation of a reduction in NEA area within the 4-1/ 4-2 study area could include:

- 1) up-grading the retained portion from NEA(B) to NEA(A) in keeping with the adjacent zoning to the east and to better reflect its ecological significance;

- 2) replacing lost NEA features and securing future ecological linkage functions between the 'Trillium Woods' NEA(A) and remaining NEA lands to the west through the addition of NEA lands between them (i.e. north of the Trillium Woods east of the Second Line Road ROW and/or west of the Trillium Woods south of the new Terry Fox Drive ROW);
- 3) closing Goulbourn Forced Road to vehicle traffic through the Trillium Woods NEA(A) and encouraging natural revegetation of the roadbed;
- 4) relocating the transmission line from the First Line Road ROW to the Terry Fox Drive ROW and permitting natural revegetation along the First Line Road ROW;
- 5) providing protection for Regionally significant floristic values found in Bedrock Barrens habitat south and west of the communications tower south of Richardson Side Road.

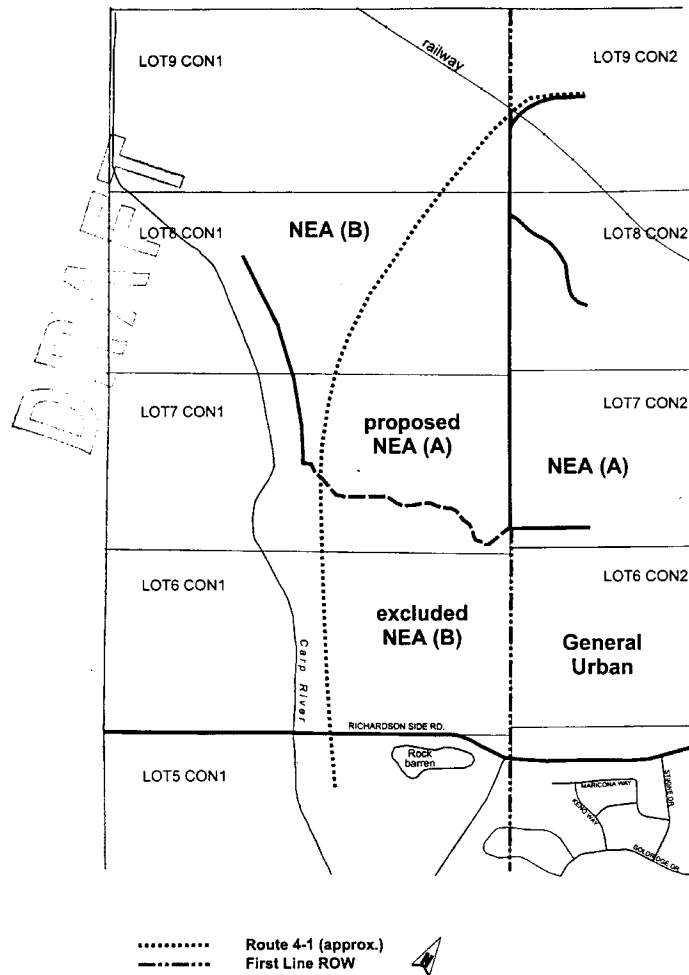
TERRY FOX DRIVE MITIGATION CONSIDERATIONS

Construction of Terry Fox Drive along route 4-1 will involve a crossing of the Hazeldean Escarpment. This will require substantial construction activity involving such activities as rock blasting and earthfill. While the upland nature of much of this proposed roadway corridor reduces the threat to drainage systems, the finished roadway would constitute:

- 1) a significant impediment to wildlife movement along the Hazeldean Escarpment, raising public safety as well as wildlife mortality issues, and
- 2) increased fragmentation of the habitat.

Wildlife corridor impacts can be reduced by bridging rather than filling some steep/ deep sections of the roadway at the escarpment crossing, permitting at least small mammals and herptiles to cross in safety beneath the roadway. The fragmentation issue can be mitigated by maintaining the narrowest possible roadway ROW (excluding paved shoulders or a wide central median, for example) and by encouraging natural revegetation of roadway margins. Pre-construction salvage of on-site, native trees and shrubs for later transplantation along the corridor can also reduce the advance of non-native weeds which may degrade native biodiversity in adjacent forested areas.

Figure 3: proposed NEA reconfiguration



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Appendix 1 (Brunton 2000): Fauna observed in the 4-1/ 4-2 study area

1) BREEDING BIRDS

The following lists the breeding status of bird species observed between 18 April and 4 July 2000 in the 4-1/ 4-2 study area. Breeding status was determined by the use of Ontario Breeding Bird Atlas criteria (Cadman et al., 1987) as follows:

Possible breeding:

- species observed in its breeding season in suitable nesting habitat.
- single male(s) present or call heard in suitable nesting habitat in breeding season.

Probable breeding:

- pair observed in suitable nesting habitat in breeding season.
- territorial behaviour observed on at least two days, a week or more apart, at the same site.
- courtship display, including copulation or courtship feeding.
- visiting probable nest site.
- agitated behaviour of an adult.
- nest building or excavation of a nest hole.

Confirmed breeding:

- distraction display or injury feigning.
- used nest or egg shells found.
- recently fledged or downy young found.
- adults carrying faecal sacs or food for young.
- adults leaving or entering apparently occupied nests.
- nest with young or eggs found.

The listing order and nomenclature follows standard Ontario checklist format (Ontario Field Ornithologists 1997). Significant breeding species in the former Region of Ottawa-Carleton are determined from the preliminary list in Brownell & Larson (1997). The names of these species are noted in **bold** and CAPITALS. If such species were noted in the study area but not as breeding species (e.g. flying over and not utilizing any study area habitat), however, their name is not bolded and no further discussion of their status occurs.

Status codes employed for bird species observed during the 4-1/ 4-2 study area are as follows:

- M migrant
- * possible breeding species
- probable breeding species
- confirmed breeding species
- X flying over

Species	Young/ submature upland forest	Mature upland forest	Upland scrub & meadow	Swamp forest	Thicket swamp	No habitat use (flying over)
Great Blue Heron						X
TURKEY VULTURE						X
CANADA GOOSE						X
Wood Duck				*		
American Black Duck						X
Mallard						X
RED-SHOULDERED HAWK		*				
Red-tailed Hawk	●		*			
American Kestrel			*			
Ruffed Grouse			○			
Killdeer						
American Woodcock				*		
Ring-billed Gull						X
Rock Dove						X
Mourning Dove			○			
Black-billed Cuckoo	*					
Ruby-throated Hummingbird	*					
Belted Kingfisher						X
Yellow-bellied Sapsucker	○	○				

Species	Young/ submature upland forest	Mature upland forest	Upland scrub & meadow	Swamp forest	Thicket swamp	No habitat use (flying over)
Downy Woodpecker	●			○		
Hairy Woodpecker		*				
Northern Flicker	○		○			
Pileated Woodpecker		●				
Eastern Wood Pewee	○	○				
Alder Flycatcher					○	
Least Flycatcher		○ ○		○		
Eastern Phoebe			*			
Great Crested Flycatcher	○			*		
Eastern Kingbird				*		
Tree Swallow			○	○		
Barn Swallow			*			
Blue Jay	○	*		*		
American Crow	○	*				
COMMON RAVEN						X
Black-capped Chickadee	○	○	○	●		
White-breasted Nuthatch	*	○				
House Wren			○			
WINTER WREN				○		
Veery	○					
Wood Thrush		○				
American Robin	●	●	○	○		
Gray Catbird	○		○			
Brown Thrasher			○			
Cedar Waxwing	○		○			
European Starling	○		○			
Red-eyed Vireo	○	○				

Species	Young/ submature upland forest	Mature upland forest	Upland scrub & meadow	Swamp forest	Thicket swamp	No habitat use (flying over)
GOLDEN-WINGED WARBLER					○	
Nashville Warbler	●					
Yellow Warbler			○		○	
Chestnut-sided Warbler	○		*			
Magnolia Warbler	M					
BLACK-THROATED BLUE WARBLER		*				
BLACK-THROATED GREEN WARBLER		○				
PINE WARBLER		○				
Blackpoll Warbler	M	M	M			
Black & White Warbler		*	*			
American Redstart	○		○			
Ovenbird	○	○				
Northern Waterthrush				○		
Mourning Warbler	*					
Common Yellowthroat			○		○	
Scarlet Tanager		○				
Rose-breasted Grosbeak	○	○				
Chipping Sparrow			○			
Song Sparrow	○		○		○	
Swamp Sparrow					○	
White-throated Sparrow	●					
Bobolink			*			
Red-winged Blackbird	*		○		●	
Common Grackle			*	○		
Brown-headed Cowbird	●	○	○			

Special Study Area NEA boundary

Baltimore Oriole						
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Purple Finch 1 Tf 0.0007 Tc 0.0008 Tw 001 .72 -.94 Tm () Tj ETEM C/P 8 </MCID 6 >> BDCBT/TTudye O725 Tc 12 0 refw 001 .72 -.9

3) **MAMMALS**

The relatively few mammals species noted during vegetation, floristic and breeding bird studies are listed below.

Snowshoe Hare	droppings noted regularly throughout woodlands.
Meadow Vole	tunnels observed in open meadows.
Eastern Chipmunk	common in woodlands.
Woodchuck	burrows encountered in open areas and along woodland edges.
Beaver	active dams maintained along several drainage channels.
Red Squirrel	uncommon in woodlands, particularly in association with coniferous forest.
White-tailed Deer	common throughout; evidence of winter concentrations along bare rock areas near coniferous cover is conspicuous immediately north of Richardson Side Road; tracks, trails, pellet groups and browse are evident throughout.
Striped Skunk	tracks noted along wetland edges.
Porcupine	animals or evidence of feeding noted rarely.
Raccoon	tracks noted along wetland edges; recently born young observed south of Richardson Side Road.
Red Fox	tracks observed near Richardson Side Road.
Coyote	droppings noted south of Richardson Side Road; reported to be common in and about the study area (<i>fide</i> L. Richardson).

Appendix 2:
**Native vascular plants of the
Special Study Area**

Special Study Area vascular flora

Data for the following list of native vascular plants were primarily derived from existing documentation (Brunton 1992a; Brunton 1992b) as well as from field observations on 4 June 2004 and 9 June 2004 and from miscellaneous 1992 - 2003 collections documented in the herbarium of D. F. Brunton.

The species are listed alphabetically by genus. Regional status (abundance or rarity in the City of Ottawa) is taken from the draft annotated list of the vascular flora of Ottawa (Brunton, *in lit.*). The Co-efficient of Conservation rating for each species is taken from Oldham et al. (1995).

Species	Sites/ status in Ottawa	Co-efficient of Conservation
<i>Abies balsamea</i> (L.) Mill.	Common	5
<i>Acer rubrum</i> L.	Common	4
<i>Acer saccharinum</i> L.	Common	5
<i>Acer saccharum</i> Marsh.	Common	4
<i>Achillea millefolium</i> L.	Common	0
<i>Actaea pachypoda</i> Ell.	Common	5
<i>Actaea rubra</i> (Ait.) Willd.	Common	5
<i>Adiantum pedatum</i> L.	Uncommon	7
<i>Ageratina altissima</i> (L.) King & Robins. (<i>Eupatorium rugosum</i> Houtt.)	Common	5
<i>Agrimonia gryposepala</i> Wallr.	Common	2
<i>Agrostis scabra</i> Willd.	Uncommon	6
<i>Agrostis stolonifera</i> L. (<i>A. alba</i> L.; <i>A. palustris</i> Huds.)	Common	0
<i>Alisma triviale</i> Pursh	Common	3
<i>Allium tricoccum</i> Ait.	Uncommon	7
<i>Alnus incana</i> (L.) Moench ssp. <i>rugosa</i> (Duroi) Clausen (<i>A. rugosa</i> (Du Roi) Spreng.)	Common	6
<i>Ambrosia artemisiifolia</i> L.	Common	0
<i>Amelanchier arborea</i> (Michx. f.) Fern. ssp. <i>laevis</i> (Wieg.) McKay (<i>A. laevis</i> Wieg.)	Common	5
<i>Amphicarpaea bracteata</i> (L.) Fern.	Common	4
<i>Anaphalis margaritacea</i> (L.) Benth. & Hook.	Common	3

Special Study Area NEA boundary

Species	Sites/ status in Ottawa	Co-efficient of Conservation
<i>Anemone acutiloba</i> (DC) Lawson (<i>Hepatica acutiloba</i> DC)	Common	6
<i>Anemone canadensis</i> L.	Common	3
<i>Anemone virginiana</i> L. (s.l.) (incl. <i>A. riparia</i> auct., non Fern.; <i>A. virginica</i> L. var. <i>cylindroidea</i> Boivin)	Common	4
<i>Antennaria howellii</i> E. Greene ssp. <i>canadensis</i> (E. Greene) Bayer (<i>A. canadensis</i> E. Greene)	Uncommon	2
<i>Apocynum androsaemifolium</i> L.	Common	3
<i>Aquilegia canadensis</i> L.	Common	5
<i>Aralia nudicaulis</i> L.	Common	4
<i>Arisaema triphyllum</i> (L.) Schott	Common	5
<i>Asarum canadense</i> L.	Common	6
<i>Asclepias incarnata</i> L.	Common	6
<i>Asclepias syriaca</i> L.	Common	0
<i>Aster cordifolius</i> L. (<i>Symphyotrichum cordifolium</i> (L.) Nesom.)	Common	5
<i>Aster lanceolatus</i> Willd. (s.str.) (<i>A. simplex</i> Willd.; <i>Symphyotrichum lanceolatum</i> (Willd.) Nesom.)	Common	3
<i>Aster macrophyllus</i> L. (<i>Eurybia macrophylla</i> (L.) Cass.)	Common	5
<i>Aster novae-angliae</i> L. (<i>Virgulus novae-angliae</i> (L.) Rev. & Keen)	Common	2
<i>Athyrium filix-femina</i> (L.) Roth var. <i>angustum</i> (Willd.) Lawson	Common	4
<i>Betula alleghaniensis</i> Britt.	Common	6
<i>Betula papyrifera</i> Marsh.	Common	2
<i>Bidens cernuus</i> L.	Common	2
<i>Bidens frondosus</i> L.	Common	3
<i>Boehmeria cylindrica</i> (L.) Sw.	Uncommon	4
<i>Botrychium virginianum</i> (L.) Sw.	Common	5
<i>Brachyelytrum erectum</i> (Schreb. ex Sprengel) Beauv. var. <i>glabratum</i> (Vasey ex. Millsp.) Koyama & Kowano	Uncommon [16]	7
<i>Caltha palustris</i> L.	Common	8
<i>Campanula rotundifolia</i> L.	Common	7
<i>Cardamine diphylla</i> (Michx.) Wood (<i>Dentaria diphylla</i> Michx.)	Uncommon	7

Special Study Area NEA boundary

Species	Sites/ status in Ottawa	Co-efficient of Conservation
<i>Carex albursina</i> Sheld.	Uncommon [15]	7
<i>Carex arctata</i> Boott	Common	5
<i>Carex bebbii</i> (Bailey) Fern.	Common	3
<i>Carex blanda</i> Dew.	Common	3
<i>Carex bromoides</i> Willd.	Common	7
<i>Carex cephaloidea</i> (Dew.) Dew.	Uncommon [13]	6
<i>Carex communis</i> Bailey	Common	6
<i>Carex crinita</i> Lam.	Common	6
<i>Carex deweyana</i> Schw.	Common	6
<i>Carex gracillima</i> Schw.	Common	4
<i>Carex granularis</i> Willd.	Common	3
<i>Carex hirtifolia</i> Mack.	Uncommon [15]	5
<i>Carex intumescens</i> Rudge	Common	6
<i>Carex peckii</i> Howe	Common	6
<i>Carex pedunculata</i> Willd.	Common	5
<i>Carex plantaginea</i> Lam.	Uncommon	7
<i>Carex radiata</i> (Wahl.) Small (<i>C. rosea</i> , auct., non Willd.)	Common	4
<i>Carex rosea</i> Schkuhr ex Willd. (<i>C. convoluta</i> Mack.)	Common	5
<i>Carex scoparia</i> Willd.	RS (7*): Carp Ridge*; South March Highlands; Whelan Park; Mer Bleue CA, South Gloucester; Mud Pond; Town Centre Woods*.	5
<i>Carex sparganioides</i> Willd.	Uncommon [11]	5
<i>Carex spengelii</i> Dew. ex Sprengel	Common	6
<i>Carex tenera</i> Dew.	Common	4
<i>Carex tuckermanii</i> Boott ex Dew.	Common	7
<i>Carex vulpinoidea</i> Michx.	Common	3
<i>Carpinus caroliniana</i> Walt.	Common (local)	6
<i>Carya cordiformis</i> (Wang) K. Koch	Common (local)	6
<i>Caulophyllum giganteum</i> (Farw.) Loc. & Black. (<i>C. thalictroides</i> var. <i>giganteum</i> Farw.)	Common	6

Special Study Area NEA boundary

Species	Sites/ status in Ottawa	Co-efficient of Conservation
<i>Celastrus scandens</i> L.	Common	3
<i>Chelone glabra</i> L.	Uncommon	7
<i>Chenopodium simplex</i> (Torr.) Raf. (= <i>C. gigantospermum</i> Aellen; <i>C. hybridum</i> auct., non L.)	Common	0
<i>Cicuta bulbifera</i> L.	Common	5
<i>Circaea lutetiana</i> L. ssp. <i>canadensis</i> (L.) Asch. & Magnus	Common	3
<i>Claytonia caroliniana</i> Michx.	Common	7
<i>Clematis virginiana</i> L.	Common	5
<i>Clintonia borealis</i> (Ait.) Raf.	Common	7
<i>Conyza canadensis</i> (L.) Cronq.	Common	0
<i>Cornus alternifolia</i> L.f.	Common	6
<i>Cornus sericea</i> L. (<i>C. stolonifera</i> Michx.)	Common	2
<i>Corydalis sempervirens</i> (L.) Pers.	Common	7
<i>Corylus cornuta</i> Marsh.	Common	5
<i>Crataegus chrysocarpa</i> Ashe (<i>s.str.</i>) (incl. <i>C. aboriginum</i> Sarg)	Common	4
<i>Cystopteris bulbifera</i> (L.) Bernh.	Common	5
<i>Cystopteris tenuis</i> (Michx.) Desv. (<i>C. fragilis</i> (L.) Bernh. var. <i>mackayii</i> Lawson)	Common	6
<i>Danthonia spicata</i> (L.) Beauv. ex R. & S.	Common	5
<i>Dicentra canadensis</i> (Goldie) Walp.	Common	7
<i>Dicentra cucullaria</i> (L.) Bernh.	Common	6
<i>Diphasiastrum digitatum</i> (A. Br.) Holub (<i>Lycopodium digitatum</i> A. Br.; <i>L. flabelliforme</i> (Fern.) Blanch.)	Common	5
<i>Dirca palustris</i> L.	Common (local)	7
<i>Dryopteris carthusiana</i> (Vill.) Fuchs (<i>D. spinulosa</i> (Muell.) Watt)	Common	5
<i>Dryopteris cristata</i> (L.) A. Gray	Uncommon	7
<i>Dryopteris intermedia</i> (Muhl.) A. Gray	Common	5
<i>Dryopteris marginalis</i> (L.) A. Gray	Common	5
<i>Echinochloa wiegandii</i> (Fassett) McNeill & Dore (<i>E. pungens</i> (Poir.) Fass. var. <i>wiegandii</i> Fass.)	Common	4
<i>Eleocharis acicularis</i> (L.) R. & S.	Common	5

Special Study Area NEA boundary

Species	Sites/ status in Ottawa	Co-efficient of Conservation
<i>Eleocharis obtusa</i> (Willd.) Schultes	Common	5
<i>Eleocharis palustris</i> (L.) R.& S. (incl. <i>E. smallii</i> Britt.)	Common	6
<i>Elodea canadensis</i> Michx.	Common	4
<i>Elymus hystrix</i> L. (<i>Hystrix patula</i> Moench)	Uncommon	5
<i>Epifagus virginiana</i> (L.) Bart.	Common	6
<i>Epilobium angustifolium</i> L.	Common	3
<i>Epilobium ciliatum</i> Raf. (s.str.) (<i>E. adenocaulon</i> Haussk.; <i>E. glandulosum</i> , auct.)	Common	3
<i>Equisetum arvense</i> L.	Common	0
<i>Equisetum hyemale</i> L.	Common	2
<i>Equisetum sylvaticum</i> L.	Common	7
<i>Erechtites hieracifolia</i> (L.) Raf.	Uncommon	2
<i>Erigeron annuus</i> (L.) Pers.	Common	0
<i>Erigeron philadelphicus</i> L.	Common	1
<i>Erigeron strigosus</i> Muhl.	Common	0
<i>Erythronium americanum</i> Ker.	Common	5
<i>Eupatorium maculatum</i> L.	Common	3
<i>Eupatorium perfoliatum</i> L.	Common	2
<i>Euthamia graminifolia</i> (L.) Nutt. (<i>Solidago graminifolia</i> (L.) Salisb.)	Common	2
<i>Fagus grandifolia</i> Ehrh.	Common	6
<i>Fallopia cilinodis</i> (Michx.) Holub (<i>Polygonum cilinode</i> Michx.)	Common	2
<i>Fragaria virginiana</i> Duchesne	Common	2
<i>Fraxinus americana</i> L.	Common	4
<i>Fraxinus nigra</i> Marsh.	Common	7
<i>Fraxinus pennsylvanica</i> Marsh.	Common	3
<i>Galium aparine</i> L.	Uncommon [11]	4
<i>Galium circaezans</i> Michx. (incl. <i>G. lanceolatum</i> Torr.)	Uncommon [17]	7
<i>Galium palustre</i> L.	Common	5
<i>Galium triflorum</i> Michx.	Common	4

Special Study Area NEA boundary

Species	Sites/ status in Ottawa	Co-efficient of Conservation
<i>Gaultheria procumbens</i> L.	Common	6
<i>Geranium bicknellii</i> Britt.	Uncommon [12]	5
<i>Geum aleppicum</i> Jacq.	Common	2
<i>Geum canadense</i> Jacq.	Common	3
<i>Glyceria striata</i> (Lam.) A. Hitchc.	Common	3
<i>Gymnocarpium dryopteris</i> (L.) Newm.	Common	7
<i>Hackelia virginiana</i> (L.) Johnst.	Uncommon [20]	5
<i>Huperzia lucidula</i> (Michx.) Trev. (<i>Lycopodium lucidulum</i> Michx.)	Common	7
<i>Hydrophyllum virginianum</i> L.	Common	6
<i>Ilex verticillata</i> (L.) A. Gray	Common	5
<i>Impatiens capensis</i> Meerb.	Common	4
<i>Iris versicolor</i> L.	Common	5
<i>Juglans cinerea</i> L.	Common	6
<i>Juncus bufonius</i> L.	Common	1
<i>Juncus effusus</i> L. (s.str.)	Common	4
<i>Juncus tenuis</i> Willd.	Common	0
<i>Juniperus communis</i> L.	Common	4
<i>Laportea canadensis</i> (L.) Wedd.	Common	6
<i>Leersia oryzoides</i> (L.) Sw.	Common	3
<i>Lemna minor</i> L.	Common	2
<i>Lobelia inflata</i> L.	Common	3
<i>Lonicera canadensis</i> Bart. ex Marsh.	Common	6
<i>Lonicera dioica</i> L.	Uncommon	5
<i>Luzula acuminata</i> Raf.	RS (5+) : South March Highlands (3+ populations); Loggers Way Woods; Carp Hills; French Hill Creek.	6
<i>Lycopodium clavatum</i> L.	Common	6
<i>Lycopodium dendroideum</i> Michx.	Common	7
<i>Lycopus americanus</i> Muhl.	Common	4

Special Study Area NEA boundary

Species	Sites/ status in Ottawa	Co-efficient of Conservation
<i>Lycopus uniflorus</i> Michx.	Common	5
<i>Lysimachia terrestris</i> (L.) BSP.	Common	6
<i>Maianthemum canadense</i> Desf. (<i>s.str.</i>)	Common	5
<i>Maianthemum racemosum</i> (L.) Link (<i>Smilacina racemosa</i> (L.) Desf.)	Common	4
<i>Matteuccia struthiopteris</i> (L.) Todaro	Common	5
<i>Medeola virginiana</i> L.	Common (local)	7
<i>Mimulus ringens</i> L.	Common	6
<i>Mitella diphylla</i> L.	Common	5
<i>Moehringia lateriflora</i> (L.) Fenzl (<i>Arenaria lateriflora</i> L.)	RS (10+) : Shirleys Bay (Watts Creek); Crystal Bay (Beatty Point); Britannia CA; Champlain Bridge ESA; 3 km NE of Sarsfield; Stony Swamp CA; Greens Creek CA (several); Long Swamp; Carlsbad Springs SW; South Gloucester.	7
<i>Monotropa uniflora</i> L.	Common	6
<i>Muhlenbergia mexicana</i> (L.) Trin.	Common	1
<i>Oenothera biennis</i> L.	Common ? [taxonomic problem]	0
<i>Onoclea sensibilis</i> L.	Common	4
<i>Oryzopsis asperifolia</i> Michx.	Common	6
<i>Oryzopsis racemosa</i> (Sm.) Ricker ex Hitchc.	Uncommon [17]	7
<i>Osmorhiza claytonii</i> (Michx.) Clarke	Common	5
<i>Osmunda cinnamomea</i> L.	Common	7
<i>Osmunda regalis</i> L.	Common	7
<i>Ostrya virginiana</i> (Mill.) K. Koch	Common	4
<i>Oxalis stricta</i> L. (<i>O. europea</i> Jord.; <i>O. fontana</i> Bunge)	Common	0
<i>Panicum acuminatum</i> Sw. Ell. var. <i>fasciculatum</i> (Torr.) Lelong (<i>P. lanuginosum</i> Ell. var. <i>fasciculatum</i> Fern.)	Common	2
<i>Panicum capillare</i> L.	Common	0
<i>Panicum linearifolium</i> Scribn.	Common (local)	8
<i>Panicum philadelphicum</i> Bernh. ex Trin.	Uncommon (locally abundant)	8
<i>Parthenocissus vitacea</i> (Knerr) Hitchc.	Common	3

Special Study Area NEA boundary

Species	Sites/ status in Ottawa	Co-efficient of Conservation
<i>Persicaria hydropiper</i> (L.) Opiz (<i>Polygonum hydropiper</i> L.)	Common	4
<i>Persicaria pensylvanica</i> (L.) J. K. Small (<i>Polygonum pensylvanicum</i> L.)	Common	3
<i>Phegopteris connectilis</i> (Michx.) Watt	Common (local)	8
<i>Phryma leptostachya</i> L.	Uncommon	6
<i>Picea glauca</i> (Moench) Voss	Common	6
<i>Pinus strobus</i> L.	Common	4
<i>Plantago rugelii</i> Ducne.	Common	1
<i>Poa saltuensis</i> Fern. & Wieg.	RS (6): South March Highlands; Buchans Bay W; Stony Swamp CA; Carlsbad Springs SW; South Gloucester; DND Woods.	7
<i>Polygonatum pubescens</i> (Willd.) Pursh	Common	5
<i>Polypodium virginianum</i> L.	Common	6
<i>Polystichum acrostichoides</i> (Michx.) Schott	Uncommon	5
<i>Populus balsamifera</i> L.	Common	4
<i>Populus grandidentata</i> Michx.	Common	5
<i>Populus tremuloides</i> Michx.	Common	2
<i>Prenanthes altissima</i> L.	Common	5
<i>Prunus serotina</i> Ehrh.	Common	3
<i>Prunus virginiana</i> L.	Common	2
<i>Pteridium aquilinum</i> (L.) Kuhn var. <i>latiusculum</i> (Desv.) Underw.	Common	2
<i>Pyrola elliptica</i> Nutt.	Common	5
<i>Quercus macrocarpa</i> Michx.	Common	5
<i>Quercus rubra</i> L.	Common	6
<i>Ranunculus abortivus</i> L.	Common	2
<i>Ranunculus recurvatus</i> Poir.	Uncommon	4
<i>Rhus hirta</i> (L.) Sudworth (<i>R. typhina</i> L.)	Common	1
<i>Ribes cynosbati</i> L.	Common	4
<i>Ribes glandulosum</i> Grauer	Common	6
<i>Rorippa palustris</i> (L.) Bess. ssp. <i>fernaldiana</i> (Butt. & Abbe) Jonsell	Common	3

Special Study Area NEA boundary

Species	Sites/ status in Ottawa	Co-efficient of Conservation
<i>Rubus allegheniensis</i> Porter	Common	2
<i>Rubus odoratus</i> L.	Common	3
<i>Rubus pubescens</i> Raf.	Common	4
<i>Rubus strigosus</i> Michx. (<i>R. idaeus</i> L. var. <i>strigosus</i> (Michx.) Max.)	Common	0
<i>Rudbeckia hirta</i> L.	Common	0
<i>Sagittaria latifolia</i> Willd.	Common	4
<i>Salix bebbiana</i> Sarg.	Common	4
<i>Salix lucida</i> Muhl.	Common	5
<i>Salix petiolaris</i> Sm.	Common	3
<i>Sambucus racemosa</i> L. ssp. <i>pubens</i> (Michx.) House (<i>S. pubens</i> Michx.)	Common	5
<i>Sanguinaria canadensis</i> L.	Common	5
<i>Sanicula marilandica</i> L.	Common	5
<i>Saxifraga virginiensis</i> Michx.	Common	6
<i>Schizachne purpurascens</i> (Torr.) Swallen	Common	6
<i>Scirpus atrovirens</i> Willd.	Common	3
<i>Scirpus cyperinus</i> (L.) Kunth (<i>S. atrocinctus</i> Fern.)	Common	4
<i>Scirpus microcarpus</i> Presl. (<i>S. rubrotinctus</i> Fern.)	Uncommon	4
<i>Scutellaria galericulata</i> L.	Common	6
<i>Scutellaria lateriflora</i> L.	Common	5
<i>Senecio pauperculus</i> Muhl.	Common	7
<i>Sisyrinchium montanum</i> Greene	Common	4
<i>Sium suave</i> Walt.	Common	4
<i>Solanum ptycanthum</i> Dunal (<i>S. americanum</i> , auct.)	Common	3
<i>Solidago altissima</i> L. (<i>S. canadensis</i> L. var. <i>scabra</i> (Muhl.) T. & G.)	Common	1
<i>Solidago caesia</i> L.	Uncommon	5
<i>Solidago canadensis</i> L.	Common	1
<i>Solidago flexicaulis</i> L.	Uncommon	6
<i>Solidago hispida</i> Muhl. (<i>S. bicolor</i> L. var. <i>concolor</i> T. & G.)	Uncommon	7

Special Study Area NEA boundary

Species	Sites/ status in Ottawa	Co-efficient of Conservation
<i>Solidago juncea</i> Ait.	Common	3
<i>Solidago nemoralis</i> Ait.	Common	2
<i>Solidago rugosa</i> Mill.	Common	4
<i>Sparganium emersum</i> Rehm. (<i>S. chlorocarpum</i> Rydb.)	Common	5
<i>Spiraea alba</i> Du Roi (<i>s.str.</i>)	Common	3
<i>Stellaria longifolia</i> Muhl.	RS (4): Mer Bleue CA; Albion Wetland; South Gloucester, South March Highlands.	2



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Special Study Area NEA boundary

Species	Sites/ status in Ottawa	Co-efficient of Conservation
<i>Viola canadensis</i> L.	Common (local)	6
<i>Viola macloskeyi</i> Lloyd ssp. <i>pallens</i> (Banks) Baker	Common	6
<i>Viola pubescens</i> Ait. (incl. <i>V. eriocarpa</i> Schwein.)	Common	5
<i>Viola sororia</i> Willd. (<i>s.str.</i>) (= <i>V. septentrionalis</i> , auct.)	Common	4
<i>Waldsteinia fragarioides</i> (Michx.) Tratt.	Common	5
<i>Woodsia ilvensis</i> (L.) R. Br.	RS (2+): Stony Swamp CA (2 populations); South March Highlands (3+ populations).	8
CC Aggregate:		1197

Total Species	Regionally Significant (incl. Uncommon)	High CC (>6)	Average Co. of Cons.	EI rating
268	18	39	4.46	High

Appendix 3:
NEA boundary definition field notes
(4 June 2004)

NEA boundary definition field notes (4 June 2004)

(field survey: D. Brunton, S. Murphy)

- commencing immediately west of First Line ROW at southeast edge of ‘Compensation Lands’ (CL) at northeast corner of Richardson’s pasture;
- boundary at corner of First Line ROW at southeast edge of CL = MK 77 [45° 19.362' N 75° 56.366' W ^[NAD 84]];
following fence-line southwestward along edge of forest [upslope of CL marking tape] to ensure continuous natural habitat captured;

Richardson pasture at south side of Compensation Lands (4 June 2004)



- no-net-loss of significant features/ functions buffer extends outwards from edge of continuous forest; *not* a geotechnical buffer (e.g. unstable slopes) but an ecological buffer (transition zone);
 - development or activities within buffer acceptable if not compromising significant features/ functions of NEA;
 - 50 m buffer appropriate for boundary section adjacent PSW, reflecting extra level of ecological sensitivity of South March Highlands landscapes;
 - 50 m ‘adjacent lands’ area recommended by OPPS for adjacent lands by PS woodlands and wildlife habitat; 50 m no-net-impact adjacent lands zone minimum required to satisfy ecological and policy conservation requirements.
- exceptionally large Butternut (*Juglans cinerea*) with 86 cm dbh at edge of outcrop in pasture at 45° 19.291' N 75° 56.402' W ^[NAD 84];

Exceptionally large Butternut tree at north end of Richardson's pasture (4 June 2004)



- NEA border at Richardson cattle coral: MK 78 [45° 19.332' N 75° 56.422' W ^[NAD 84]]; follows edge of woods by PSW cliff; marked border dips towards wetland edge (excluding severely disturbed, discontinuous habitat damaged by intensive grazing; non-native veg predominates)

- to large White Pines [45° 19.275' N 75° 56.524' W ^[NAD 84]]; habitat to south transformed from natural condition by severe grazing;

- to informal farm debris dump [45° 19.265' N 75° 56.549' W ^[NAD 84]]; lines dips through old cart track under scattered White Cedar and over earth-fill to end of edge by north track across front of PSW (across outlet);

- by track at ca. Mid-point across PSW (under Silver Maple) [45° 19.239' N 75° 56.687' W ^[NAD 84]]; track through wetland and forms western edge of continuous Silver Maple swamp forest; superior example of Silver Maple swamp forest, though with an abundance of Canary-grass (*Phalaris arundinacea*) below canopy - still predominantly natural;

west edge of Compensation Lands swamp forest (4 June 2004)



- northwest corner of CL [45° 19.327' N 75° 56.787' W ^[NAD 84]]; at entrance to Northern Field (immediately north of PSW and CL);
 - line crosses disturbed wetland at corner but follows (northeastward along forest edge, following natural (south) side of old track and excluding planted White Pine; closely follows CL flagging here;
 - back southeast of North Field [45° 19.419' N 75° 56.699' W ^[NAD 84]] at edge of outcrop and continuous natural forest to east;
- North Field overwhelmingly non-native, dominated by dense Kentucky Bluegrass (*Poa pratensis*) with Cinquefoil (*Potentilla argentea*), Curled Dock (*Rumex crispus*) in thin soil over granitic bedrock (outcropping); heavily pastured and almost totally transformed from a natural condition;
- NEA boundary runs northward across back (east end) of North Field outcrop along edge of continuous natural forest to Lot 8 southern fenceline;
 - Mk 82 [lat & long omitted here] - northeast corner of North Field at Lot 8 southern fenceline;
 - follows Lot 8 southern fenceline southwestward omitted severely disturbed scrub and young (planted White Pine) in grazed outcrop area;

Westward across transformed outcrop (pasture) north of Compensation Lands



- MK 84 [45° 19.403' N 75° 56.843' W ^[NAD 84]] - northwest corner of North Field and intersection with electric fence field to north;

- NEA border follows north along fenceline above electric fence west of 'Haunted House' site; natural habitat around degraded outcrop by Haunted House site forms narrow band adjacent to electric fence in southern half of remaining NEA border segment to Terry Fox Road ROW;

- NEA boundary to continue along fence to Terry Fox Road ROW *including* degraded Haunted House outcrop (outcrop maintains substantial native vegetation component which can be foundation of restoration; removal would reduce extent of high priority Interior Forest commencing immediately east of Haunted House outcrop.