

Town of Wasaga Beach Natural Heritage System

Eastern Hog-nosed Snake Discussion Paper



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Nottawasaga Valley Conservation Authority

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Executive Summary

Background

In spring 2004, the Town of Wasaga Beach entered into an agreement with the Nottawasaga Valley Conservation Authority (NVCA) to undertake a Natural Heritage System Update and Review (NVCA, 2004). This review includes a broad, landscape scale natural heritage modeling exercise covering the entire Town as well as four more detailed study components: Eastern Hog-nosed Snake Discussion Paper, Shoreline Study, Dune Outlier Study and South Bank Study.

The purpose of this review is to provide the Town with the information and tools necessary to strike an appropriate balance between land and resource use and the protection of the Town's significant natural features and their functions.

Introduction

The eastern hog-nosed snake (*Heterodon platirhinos*) is a federally and provincially designated threatened species that is present within the Town of Wasaga Beach. This species and its habitat are protected through federal legislation and provincial legislation as well as provincial policy. Two of the chief threats to the eastern hog-nosed snake in Ontario are habitat loss and human persecution.

The purpose of the Eastern Hog-nosed Snake Discussion Paper is to evaluate the habitat needs of the eastern hog-nosed snake within the Town of Wasaga Beach. Identification and protection of habitat is critical to its long-term viability. Section 13.4.9.2 of the Town of Wasaga Beach Official Plan (Section 2.4) provides policies directed toward protection of threatened and endangered species such as eastern hog-nosed snake. Although a Species Recovery strategy is currently being developed under the Species At Risk Act (SARA), there is an urgent need to develop interim significant habitat mapping to protect this threatened species in the absence of an approved recovery strategy.

The *Eastern Hognose Snake Research Program*, initiated in 2001 by Wasaga Beach Provincial Park (WBPP) and The Friends of Nancy Island and Wasaga Beach Park has provided invaluable data that is used throughout the paper to document eastern hog-nosed snake ecology and local distribution and movement data. NVCA staff have worked closely with researchers to ensure that leading edge provincial science was used to develop the recommendations provided at the conclusion of the discussion paper. Comprehensive comments on the draft discussion paper received from MNR and Trent University researchers, as well as peer review comments from Dillon Consulting, have been incorporated into the final paper.

Legislation and Policy

The eastern hog-nosed snake is designated as a threatened species and is listed on the federal *Species At Risk Act* (SARA) registry (Schedule 1, Part 3). A species is designated as threatened if it is deemed likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction. As a threatened species, preparation of a Recovery Strategy (RS) for the eastern hog-nosed snake is required within four years from the SARA's proclamation (June 2, 2003).

Identification of a species' critical habitat, based on the best available information, is a key component of the RS. Critical habitat is defined as "the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species critical habitat in the recovery strategy or in an action plan for the species" (*Law website*). SARA prohibits the destruction of any part of the critical habitat of a listed endangered or a listed threatened species.

Provincial and municipal natural heritage planning policy documents (such as County/Municipal Official Plans) must conform with and support federal SARA legislation.

Eastern Hog-nosed Snake – Ecology and Behaviour

Endemic to North America, the eastern hog-nosed snake is found east of the Rocky Mountains and is most abundant in the United States. Within Canada, it is restricted to particularly dry, sandy sites in southern and central Ontario (Scheuler, 2001).

The eastern hog-nosed snake is characterized by its relatively thick body and its upturned, keeled snout which is used to root through leaf litter and soil for prey. Its upturned snout is also used for excavating nesting and hibernation sites. Locally, large adults tend to be a solid olive colour while darker patterns are characteristic of younger/smaller snakes. Their cryptic colouration provides excellent camouflage and their presence is easily overlooked - even at close range.

The eastern hog-nosed snake is most readily recognized by its unique defense mechanisms – acting like a cobra then playing dead - which come into play when it feels threatened. Despite its unique behaviours when threatened, the eastern hog-nosed snake is non-venomous and is harmless to humans.

Within the Town of Wasaga Beach, eastern hog-nosed snakes mate in either the spring or the fall, but mating may not occur every year (Cunnington, 2004b). Copulation occurs adjacent to woody cover (i.e. overhanging branches) which likely shields the snakes from predators during the copulation process which can last three days (Cunnington, 2004b).

Most nesting activity occurs in early July. Female snakes probe exposed sandy areas, typically with southwest aspects for maximum warmth, searching for ideal nesting sites. Burrows are partially covered following egg deposition and the young emerge from their nests in early fall.

Within WBPP, eastern hog-nosed snakes hibernate in mixed intolerant upland forests (i.e. pine-oak forests), digging discrete burrows in the ground below the frost line which are often obscured by leaf fall. They emerge from hibernation in mid-April.

As they grow, snakes periodically shed the outer part of their skin. Typically, a period of inactivity occurs before the shedding process and usually lasts from one to two weeks. Eastern hog-nosed snakes are extremely vulnerable to predation during this period. Low shrub meadows within open forests provide prime shedding habitat and cover for eastern hog-nosed snakes.

Eastern Hog-nosed Snake - Habitat Requirements

Eastern hog-nosed snake populations are typically associated with a variety of open vegetation cover types (woodland, forest edge and sand barrens) underlain by sandy, well-drained surface soils. These sites must be in relatively close proximity to wetlands since American toads (*Bufo americanus*), which require wetlands for breeding, comprise more than half of its food source with other wetland-breeding amphibians contributing to 20-30% of its diet.

Site records and radio telemetry research indicates that eastern hog-nosed snake are utilizing most habitat types found in WBPP and contiguous natural areas including the parabolic dune system, transverse dunes and the series of ridges and troughs associated with the ancient Lake Nipissing shoreline. Interconnected complexes of primary habitat types are essential to provide the necessary habitat elements required to sustain all portions of the eastern hog-nosed snake life cycle.

Distribution within the Town of Wasaga Beach

Wasaga Beach Provincial Park (south of River Road) and contiguous natural heritage features provide core habitat for eastern hog-nosed snake within the Town of Wasaga Beach. Site records and telemetry research indicates that these snakes utilize contiguous forests and wetlands extending south and east of the park boundary.

Eastern hog-nosed snakes are able swimmers and have been tracked crossing the Nottawasaga River to adjacent habitats at the east end of Knox Road and along the south bank of the Nottawasaga River. Mounting evidence indicates that a connected sub-population of eastern hog-nosed snake is present in the core forests and wetlands south of Jack's Lake (Cunnington, 2004). Strong gene flow between this sub-population and the WBPP population increases the genetic fitness of both populations.

Although site records and research are lacking for the Nipissing shoreline features northeast of WBPP, the complex of ridge and trough topography and associated contiguous forest/wetland cover that parallels the Georgian Bay shoreline from the Town of Wasaga Beach north to Balmy Beach has potential to support eastern hog-nosed snake (Cunnington, 2004a). In the absence of documented research, it is reasonable to apply the precautionary principle and assume that these habitat types located northeast of the park and parallel to the Georgian Bay shoreline potentially support eastern hog-nosed snake habitat.

Critical/Significant Habitat

Although a RS for eastern hog-nosed snake is underway, it has yet to be completed and approved. Given the intense development pressures within the Town of Wasaga Beach, it is important to identify and protect the significant habitat of the eastern hog-nosed snake within the municipality as an interim measure until critical habitat is defined through the species RS.

For relatively wide-ranging and mobile wildlife species such as eastern hog-nosed snake, identification of the significant portions of the habitat is a complex task. Core areas associated with their home range must incorporate the full range of interconnected habitat types required to fulfill life cycle processes if viable populations are to persist on the landscape.

Areas of identified significant eastern hog-nosed snake habitat (see attached Figure) are associated with large core areas that support a variety of upland and wetland habitat types that, in turn, support habitats required for all parts of the snake's life cycle. The NVCA natural heritage model consistently scores these areas as having a high value on the landscape. These high value natural heritage features are worthy of retention because they support landscape-level terrestrial, aquatic and hydrogeologic functions. The presence of eastern hog-nosed snake in these areas further emphasizes their importance on the landscape.

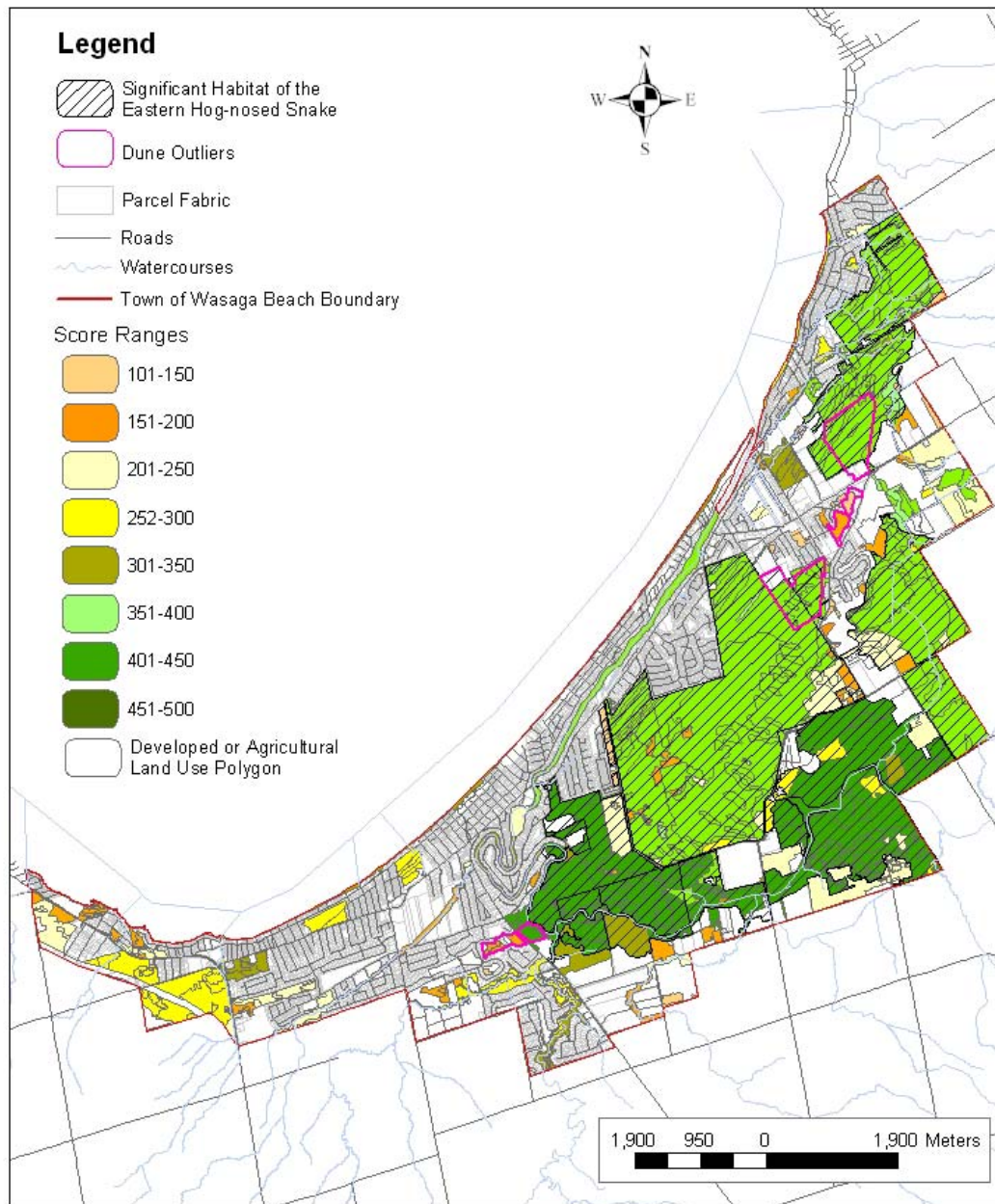


Figure 2: Significant Habitat & Natural Heritage Modeling Scores

Universal Transverse Mercator
North American Datum 1983
Zone 17 North

Smaller habitat areas that have been isolated by roads and development have been excluded. Even though small numbers of eastern hog-nosed snake may persist in these areas, these isolated habitats are unlikely to support viable populations over the long-term due to random local extinction events/poor genetic fitness combined with lack of immigration opportunities into these areas from other viable habitats.

Recommendations

The two greatest threats to the eastern hog-nosed snake are habitat loss and human persecution. With educational programs firmly in place, the most significant threat to the eastern hog-nosed snake population in the Town of Wasaga Beach is the rapid pace of development within areas of suitable snake habitat (Gurr, 2004).

An eastern hog-nosed snake Recovery Strategy has been initiated under the auspices of SARA; however, its completion date and ultimate approval are months away. In the interim, the recommendations of this discussion paper can be used to meet municipal responsibilities to protect this threatened species under SARA and the Provincial Policy Statement. The Town of Wasaga Beach, the Nottawasaga Valley Conservation Authority and the Ministry of Natural Resources will need to work cooperatively to ensure that adequate protection of significant habitat is provided to protect viable populations of eastern hog-nosed snake over the long term. Specific recommendations include:

- Adoption of significant habitat mapping, as presented in this report, as a Schedule within the Town of Wasaga Beach Official Plan;
- Temporary inclusion of previously undesignated significant habitat areas within Category 2 Environmental Lands within the Official Plan to provide protection of these areas from incompatible land uses;
- Inclusion of all areas designated as “critical habitat” by the Species Recovery Team as Category 1 Environmental Lands within the Official Plan once the Recovery Strategy (and associated critical habitat mapping) is approved;
- Consideration of private property acquisition within Dune Outlier 3 to maintain habitat linkage to Wasaga Beach Provincial Park;
- Discouragement of road construction through significant habitat. Where roads have been previously approved or where crossings cannot be avoided, the Town and County should use best available science to determine road layouts which minimize habitat destruction and loss of connectivity;
- The Town should continue to support public awareness and education efforts to help protect the eastern hog-nosed snake; and,
- The Town should consider partnering with the Species Recovery Team to apply for funding for stewardship activities based on the outcome of the eastern hog-nosed snake Recovery Strategy.

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The NVCA thanks:

The Town of Wasaga Beach for its dedication to reviewing and updating its natural heritage mapping and policies.

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The Ministry of Natural Resources and key individuals including Angela McConnell and Gary Allen for their expertise, availability and overall participation and interest in this study.

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Glenn Cunnington, Richard Doucette (MNR), Burke Korol (MNR) and Tom Young (Dillon Consulting) for their peer review of the draft report which contributed to the strength of the final document.

1.0 Introduction

The eastern hog-nosed snake (*Heterodon platirhinos*) is a federally and provincially designated threatened species that is present within the Town of Wasaga Beach. This species and its habitat are protected through federal legislation and provincial legislation as well as provincial policy. In recent years, Species at Risk (SAR) biologists with the Ministry of Natural Resources (MNR) including staff at Wasaga Beach Provincial Park (WBPP) in partnership with a Trent University graduate program have undertaken extensive research to better understand the ecology of the eastern hog-nosed snake. Two of the chief threats to the eastern hog-nosed snake in Ontario are habitat loss and human persecution.

The Town of Wasaga Beach has been designated as a Settlement Area in Schedule 5.1 of the Simcoe County Official Plan. This designation encourages urban forms of development within the Town which can potentially induce land use planning conflicts between the Town's development mandate and its responsibilities with regard to SAR protection. Limited control of urban development may result in loss of eastern hog-nosed snake habitat and the eventual extirpation of this threatened species within the Town.

The purpose of this Eastern Hog-nosed Snake Discussion Paper is to evaluate the habitat needs of the eastern hog-nosed snake within the Town of Wasaga Beach. Identification and protection of habitat is critical to its long-term viability. Section 13.4.9.2 of the Town of Wasaga Beach Official Plan (Section 2.4) provides policies directed toward protection of threatened and endangered species such as eastern hog-nosed snake. Although a Species Recovery strategy is currently being developed under the Species At Risk Act (SARA), there is an urgent need to develop interim significant habitat mapping to protect this threatened species in the absence of an approved recovery strategy.

1.1 Study Development

In spring 2004, the Town of Wasaga Beach entered an agreement with, and provided funding for, the Nottawasaga Valley Conservation Authority to undertake a Natural Heritage System Update and Review (NVCA, 2004). This review includes a broad, landscape scale natural heritage modeling exercise covering the entire Town. The NVCA has recently undertaken similar natural heritage modeling exercises for the Town of New Tecumseth and Essa Township (Featherstone et al., 2004).

Following discussions with Town staff, three additional study components were added to the project Terms of Reference to encompass pressing Town natural heritage priorities:

- Eastern Hog-nosed Snake Discussion Paper
- Dune Outlier Study
- South Bank Study

Although the four study components are described separately within the project Terms of Reference, there is significant synergy between them. Section 4.1 summarizes the natural heritage model, dune outlier and south bank studies and describes the synergies between these studies and the Eastern Hog-nosed Snake Discussion Paper.

1.2 Discussion Paper Framework

The *Eastern Hognose Snake Research Program*, initiated in 2001 by WBPP and The Friends of Nancy Island and Wasaga Beach Park has provided invaluable data that is used throughout the paper to document eastern hog-nosed snake ecology and local distribution and movement data. This recent/ongoing research conducted by MNR staff/Trent University graduate students is a critical component of this paper and NVCA staff have worked with researchers to ensure that leading edge provincial science was used to develop the recommendations provided at the conclusion of the discussion paper. Unless otherwise noted, all research referred to in this paper is associated with this program. Two meetings were held with MNR/University staff/researchers (Appendix 1) to discuss eastern hog-nosed snake and associated research and recovery planning to assist with the development of this paper. Comprehensive comments on the draft discussion paper received from MNR and Trent University researchers, as well as peer review comments from Dillon Consulting, have been incorporated into the final paper.

The discussion paper begins with an exploration of SAR legislation and policy at various government levels. This is followed by a detailed review of eastern hog-nosed snake ecology with specific reference to research undertaken within the Town of Wasaga Beach. Ecology, legislation and policy are then combined to discuss the important concepts of “significant portions of the habitat” and “critical habitat” of eastern hog-nosed snake. Following a description of ongoing research and education initiatives, the discussion paper concludes with a series of recommendations focused on habitat protection needs for eastern hog-nosed snake within the Town of Wasaga Beach.

2.0 Legislation and Policy

2.1 Federal Designation and Legislation

The eastern hog-nosed snake was designated as a threatened species in November 2001 by the *Committee on the Status of Endangered Wildlife in Canada* (COSEWIC). A species is designated as threatened if it is deemed likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction.

Since 1977, COSEWIC has offered advice to the federal government regarding the status of plant and animal species that may be at risk by assessing their status according to a broad range of scientific data. As an independent scientific committee, COSEWIC cannot make laws or regulations to protect these species; however, the Government of Canada takes COSEWIC status into consideration when generating the legal list of SAR. The species present on this list are protected under the federal *Species At Risk Act* (SARA) which was proclaimed in June 2003.

The purposes of SARA are to prevent species at risk from becoming extirpated or extinct, to provide for the recovery of endangered or threatened species, and to encourage the management of other species to prevent them from becoming at risk (*SARA website*). SARA is applied Canada-wide to include all federally designated SAR. It provides legal protection to designated species at risk found on lands under federal jurisdiction and encourages activities such as stewardship measures to protect habitat. Prohibitions under SARA apply throughout Canada for aquatic species and birds listed in the *Migratory Birds Convention Act*, (1994). Other SAR in Canada are primarily protected by provincial or territorial laws; however, if these species are not effectively protected, SARA has provisions that act as a safety net authorizing the federal government to protect them (*SARA website*).

The eastern hog-nosed snake is present on the SARA registry (Schedule 1, Part 3). As a threatened species, preparation of a Recovery Strategy (RS) for the eastern hog-nosed snake is required within four years from the act's proclamation (June 2, 2003).

Identification of a species' critical habitat, based on the best available information, is a key component of the RS. Critical habitat is defined as "the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species critical habitat in the recovery strategy or in an action plan for the species" (*Law website*).

Once completed, the draft RS is released for agency review to the MNR, Parks Canada, Environment Canada. This review process can take a year or more to complete. When the agencies have completed their review, the Recovery Team (RT) incorporates their comments/recommendations into the draft RS. After this process is complete, the RS is released for another agency review. After revisions have been made from this second review process, the draft paper is released in draft final form.

The draft RS is posted on the Public Registry for 60 days for public written comments. Once approved, the strategy is implemented through the Recovery Action Plan (RAP). The RAP must identify the following:

- Identification of species' critical habitat and examples of activities that are likely to result in its destruction
- A statement of the measures that are proposed to be taken to protect the species' critical habitat
- Identification of any portions of the species' critical habitat that have not been protected
- A statement of measures that are to be taken to implement the RS
- Methods to be used to monitor species recovery and long-term viability
- An evaluation of the socio-economic costs of the RAP and the benefits to be derived from its implementation

Similar to the RS, the draft RAP is posted on the Public Registry. Once approved, the RAP is reviewed and updated every five years.

SARA prohibits the destruction of any part of the critical habitat of a listed endangered or a listed threatened species. Under SARA, the federal government may provide fair and reasonable compensation to any person for losses suffered as a result of any extraordinary impact of the application of critical habitat provisions of the Act.

The draft eastern hog-nosed snake RS is currently underway and its anticipated completion date is Fall 2005 (Cunnington, 2005). At this time, the Recovery Team is identifying elements that will constitute and/or define critical habitat for the eastern hog-nosed snake (Cunnington, 2004). Critical habitat mapping will be prepared for the Town of Wasaga Beach population which has been the subject of the most intensive research to date in Ontario.

Only a few final federal RSs actually exist. This is due in part to the constantly emerging science on species and their critical habitats. However, in many cases, recovery strategies have been implemented to some degree prior to their final release (Doucette, pers.comm.). This discussion paper and its recommendations regarding eastern hog-nosed snake habitat and its protection can be used by the planning department at the Town of Wasaga Beach as an interim planning control measure to protect eastern hog-nosed snake habitat prior to recovery team definition of critical habitat.

2.2 Provincial Designation, Legislation and Policy

Ontario SAR status designations are determined based on recommendations by the MNR's *Committee on the Status of Species At Risk in Ontario* (COSSARO). COSSARO ensures that approaches taken to evaluate and recover species at risk are scientifically based. Recent efforts have been undertaken by the Province to ensure that status designations are the product of complementary review and assessment processes implemented at national and provincial levels (*Ontario Parks* website). The designations assigned to species on the provincial list are now, in most cases, in agreement with those assigned by COSEWIC. However, MNR has assigned higher designations to species whose Ontario status is of greater concern than their status elsewhere in Canada. The eastern hog-nosed snake was designated as a threatened species by COSSARO in 2004 to conform with the federal designation. The MNR defines threatened species as "any native species that, on the basis of the best available scientific evidence, is at risk of becoming endangered throughout all or a significant portion of its Ontario range if the limiting factors are not reversed".

The eastern-hognosed snake is also listed and protected under the provincial *Fish and Wildlife Conservation Act* and Provincial Parks Policy PM 11.03.02 (Protection of Species at Risk in Provincial Parks).

The Provincial Policy Statement (PPS; MMAH, 2005), as described within the provincial *Planning Act*, seeks to protect natural heritage features and areas for the long term. Section 2.2 states “that the diversity and connectivity of natural features in an area, and the long-term *ecological function of natural heritage systems*, should be maintained, restored or improved where possible, recognizing linkages between and among *natural heritage features and areas, surface water features and ground water features*.” Planning authorities are required to “be consistent with” the PPS when making land use planning decisions.

Section 2.1.3 of the PPS states that “*development and site alteration shall not be permitted in significant habitat of endangered species and threatened species*.” The term “*significant*” when applied to the habitat of endangered and threatened species, is defined as:

the habitat as approved by the Ontario Ministry of Natural Resources, that is necessary for the maintenance, survival and/or the recovery of naturally occurring or reintroduced populations of endangered or threatened species, and where those areas as of occurrence are occupied or habitually occupied by the species during all or any part(s) of its life cycle.

2.3 County of Simcoe Official Plan

Section 3.3 of Simcoe County’s Official Plan contains development policies. It describes general subdivision and development policies which are applied to all land use designations. Section 3.3.4 specifically states,

Development and site alteration is not permitted in Class 1, 2, or 3 Wetlands, the habitats of threatened or endangered species, or hazardous lands. Development and site alteration may be permitted within 120 m of these features where such development is otherwise permitted by this Plan and local municipal plans and where an EIS can demonstrate that there will be no negative impact on the natural features or on the ecological functions, including water resources, for which the area is identified.

By stating that, “Development and site alteration is not permitted...*in the habitats of threatened or endangered species*...” renders this Official Plan policy more restrictive than Policy 2.1 of the PPS which reads, “development and site alteration will not be permitted in *significant portions of the habitat* of endangered and threatened species”.

2.4 Town of Wasaga Beach Official Plan

Section 13.1.1 of the Town Official Plan (OP) states that the objective of natural heritage policies is “to conserve, maintain and enhance the quality and integrity of the Natural Heritage System features and ecological processes of the Town of Wasaga Beach including air, water, land, and living resources for the benefit of future generations”. A following objective described in Section 13.1.2 is “to protect significant wetlands, ravines and watercourses, and the habitat of endangered and threatened species situated within the Town of Wasaga Beach.”

Lands designated as Natural Heritage System – Category 1 (NHS – Category 1) Lands on Schedule “A” of the OP include “habitat areas of endangered and threatened species”. Section 13.4.9.2 of the OP describes policies pertaining to the “Significant Habitat of Endangered and Threatened Species” which are summarized as follows:

- Natural areas within the town not yet identified or recognized may be inhabited by endangered or threatened species for all or part of their life cycle. It is the policy of the OP to regulate and possibly restrict development in areas of significant habitat of endangered or threatened species.
- Where a development proposal may have the potential to cause negative impacts to significant habitat of endangered and threatened species and where a recovery/management plan has been prepared, the Town may implement, as conditions of approval, the relevant habitat protection sections in the area to which the development proposal applies
- Where a development proposal may have the potential to cause negative impacts to significant habitat of endangered and threatened species and where a recovery/management plan has not been prepared, the Town should follow the protocol for the identification of the significant portions of the habitat of Endangered and threatened species and may require the applicant to identify and confirm through the completion of an E.I.A., the location, size, amount, configuration and quality of the habitat requiring protection.
- As conditions change or new information becomes known in regard to the location of habitat of endangered species, land or waters demonstrated to possess significant habitat of endangered and threatened species may be designated NHS – Category 1 Lands on Schedule “A” of this OP. Areas of Significant Habitat of Endangered and Threatened Species may be placed in the appropriate Zoning category in accordance with these policies.

OP policies are intended to preserve and protect the natural state of NHS – Category 1 Lands. Development is not permitted within these lands. Development proposals for lands situated adjacent to NHS – Category 1 Lands may be permitted by the Town subject to the completion of an Environmental Impact Assessment (EIA) to the satisfaction of the Town and applicable commenting agencies.

3.0 Ecology and Behavior

3.1 General Distribution

Endemic to North America, the eastern hog-nosed snake is found east of the Rocky Mountains and is most abundant in the United States. Within Canada, it is restricted to particularly dry, sandy sites in southern and central Ontario (Scheuler, 2001). It has been extirpated in several regions such as Point Pelee, Pelee Island and the Greater Toronto Area and has experienced population declines in Hastings, Durham, Haliburton and the former Haldimand-Norfolk counties (Scheuler, 2001). Recent records indicate the presence of population concentrations in the former Haldimand-Norfolk County, the Pinery-Grand Bend area and the Muskoka district (Scheuler, 2001). The eastern hog-nosed snake is native to Wasaga Beach and is found along the coast of Georgian Bay. The status of the Wasaga Beach population is unclear since there is little documented research on Ontario's northern populations (Cunnington, 2004). Ongoing MNR research in Wasaga Beach, as presented in part in this discussion paper, is intended to address significant gaps in our knowledge and understanding of this species and its ecology.

3.2 Physical Characteristics

The eastern hog-nosed snake is characterized by its relatively thick body and its upturned, keeled snout which is used to root through leaf litter and soil for prey. Its upturned snout is also used for excavating nesting and hibernation sites. Colouration in the eastern hog-nosed snake is variable and can range from yellow, orange, olive, brown or gray with blotches of another colour such as dark brown or dark grey. Its belly can be yellow, light gray or pinkish with possible green or grey mottling. Melanistic (black) individuals are also possible. Locally, large adults tend to be a solid olive colour while darker patterns are characteristic of younger/smaller snakes. Bellies are typically yellow to cream with neonates (young) exhibiting black or grey mottling. Their cryptic colouration provides excellent camouflage and their presence is easily overlooked - even at close range.

3.3 Defense Mechanisms

The eastern hog-nosed snake is most readily recognized by its unique defense mechanisms which come into play when it feels threatened. If threatened the snake will puff up with air and hiss loudly as it flattens its neck and body in a cobra-like fashion. There is a possibility that the snake may strike (almost always with its mouth closed) at this point. If this defense technique is unsuccessful, it will then convulse, secrete a foul-smelling odour, possibly defecate or regurgitate, occasionally bleed from the mouth and then it will lay with its belly up, tongue hanging out and lie still as though dead. It will lay completely motionless for several minutes before investigating whether the threat has passed and then will move away if it is safe to do so. This defense response is highly temperature dependent and is more likely to occur with decreasing temperatures (Cunnington, 2004a.). Under warm summer conditions, the eastern hog-nosed snake is more likely to move away from the perceived threat. Despite its unique behaviours when threatened, the eastern hog-nosed snake is non-venomous and is harmless to humans.

3.4 Reproduction

Within the Town of Wasaga Beach, eastern hog-nosed snakes mate in either the spring or the fall, but mating may not occur every year (Cunnington, 2004b). Copulation occurs adjacent to woody cover (i.e. overhanging branches) which likely shields the snakes from predators during the copulation process which can last three days (Cunnington, 2004b). Precopulatory behavior was documented on multiple occasions during the 2003 and 2004 field seasons (Cunnington, 2004).

Recent research indicates that most nesting activity occurs in early July. Female snakes probe exposed sandy areas, typically with southwest aspects for maximum warmth, searching for ideal nesting sites. This specific habitat type is limited, comprising only 1.3% of available habitat area in WBPP (Cunnington, pers.comm.).

Once found, the female excavates a burrow up to 30 cm deep and deposits a number of eggs; typically 19-23 over much of its range (Scheuler, 2001) but possibly less in the northern (Ontario) portion of its range. 2004 clutch size data indicates that snakes in the Wasaga Beach area lie within previously reported clutch ranges. Burrows are partially covered following egg deposition.

In 2004, neonates (young) emerged from their nests in September and October. Observed hatching success rate of 33% (limited data) is typical of other populations found further south (Cunnington, 2004b).

3.5 Hibernation

Recent research within the Town of Wasaga Beach indicates that eastern hog-nosed snakes hibernate in mixed intolerant upland forests (i.e. pine-oak forests), digging discrete burrows in the ground below the frost line which are often obscured by leaf fall. It is interesting to note that many of the tracked snakes spent little time in this habitat during their active season (Cunnington, 2004b). The snakes do not necessarily use the same site each year and 2004 telemetry data revealed 14 different hibernation sites. Unlike many other snakes, eastern hog-nosed snakes hibernate individually (Scheuler, 2001). They emerge from hibernation in mid-April and the cooler April weather makes them vulnerable to predation upon emergence (Cunnington, 2004c). Over the 2004/2005 winter, temperature data will be collected by the research team to measure thermal variance at the time of emergence.

3.6 Shedding

The shedding process in snakes is controlled hormonally and is related to growth. As they grow, snakes periodically remove the outer part of their skin. Younger snakes shed more frequently than older ones because of their more rapid rate of growth. Shedding frequency depends upon many factors including temperature, amount/frequency of feedings and activity level (*Vet* website). Typically, a period of inactivity occurs before the shedding process and usually lasts from one to two weeks. During this time the snake's eyes become a bluish-white, its vision is impaired, the outer skin is dull and the new underlying skin is susceptible to damage. It is extremely vulnerable to predation.

Low shrub meadows with ground cover such as bracken fern (*Pteridium aquilinum*) and low sweet blueberry (*Vaccinium angustifolium*) embedded within open forests provide prime

shedding habitat for eastern hog-nosed snakes within Wasaga Beach. Low shrubs/bracken fern provide important cover for snakes during this period of extreme vulnerability. Deadfalls and burrows along forest edges may also provide cover. Some snakes will even move underground during this period (R. Doucette, pers.comm.).

3.7 Recruitment and Mortality

Based on 2004 research, the adult eastern hog-nosed snake population is characterized by a sex ratio of 1:0.9 (male to female); however, this difference is not significant and likely fluctuates somewhat from year to year. Though data is limited, adult females appear to have a higher mortality rate than males. Since telemetry research focuses on adult snakes, there remains a significant gap in knowledge pertaining to recruitment of young snakes into the adult population. Additional research is required to assess mortality patterns of eastern hog-nosed snake within a range of age groups to assess overall population size and dynamics (Cunnington, pers.comm.).

3.8 Habitat Requirements

Eastern hog-nosed snake populations are typically associated with a variety of open vegetation cover types (woodland, forest edge and sand barrens) underlain by sandy, well-drained surface soils. These sites must be in relatively close proximity to wetlands since American toads (*Bufo americanus*), which require wetlands for breeding, comprise greater than 50% of its food source with other amphibians contributing to 20-30% of its diet. The remainder of the snake's diet consists of insects, mammals, birds, reptiles, worms and snails (Scheuler, 2001).

Site records and radio telemetry research indicates that eastern hog-nosed snake are utilizing most habitat types found in WBPP and contiguous natural areas including the parabolic dune system, transverse dunes and the series of ridges and troughs associated with the ancient Lake Nipissing shoreline. Preliminary suitability index modeling indicates that sand barren, deciduous forest, mixed forest, conifer forest and wetland habitats within these areas provide important habitat. Conifer plantations are of moderate habitat value; however, since they are typically embedded in core habitat areas, this moderate value suggests that eastern hognose snakes tend to circumvent plantations while moving between preferred habitat units. Meadow/thicket areas provide lower habitat values while urban areas are of lowest value (Cunnington, unpublished research). Interconnected complexes of primary habitat types provide the necessary habitat elements required to sustain all portions of the eastern hog-nosed snake life cycle.

Interconnections between habitats is essential since eastern hog-nosed snakes often move significant distances between hibernating, nesting, copulation, shedding and foraging sites through the year. The eastern hog-nosed snake is an able swimmer and MNR research has documented snakes crossing the Nottawasaga River to access various habitats along the south bank of the Nottawasaga River and in the floodplain forest east of Knox Road. Current velocities during periods of normal flow do not appear to restrict snake crossings of the river.

Eastern hog-nosed snakes tend to move great distances during their active season and can travel distances up to 100 m per day. Males tend to move the most while gravid (egg-laden) females move the least. Radio telemetry information obtained by the research program over the past three years indicates that the average range of male, female and gravid (egg-laden) female eastern hog-nosed snakes to be 225, 141 and 80 ha, respectively.

Roads may restrict the movement and dispersal of eastern hog-nosed snakes (Cunnington, 2004a). By restricting snake passage, roads may isolate individual population clusters thereby potentially reducing genetic fitness of individual populations – in isolated populations, genetic variation is reduced, making members of those populations less adaptable to environmental changes (Smith, 1986). Where roads isolate individual populations from their full suite of required habitat types, they can potentially result in the extirpation of individual populations.

Telemetry research indicates that eastern hog-nosed snakes are generally reluctant to cross roads; however, occasional individuals have been observed crossing local roads in the Wasaga Beach area (R. Doucette, pers.comm.), sometimes with fatal results. Recent research associated with Parry Sound extension of Highway 69 has concluded that traffic noise and vibrations inhibit snake passage (Rouse, 2004). Culverts constructed to allow for animal passage across the Highway 69 extension have not been used by eastern hog-nosed snakes (Rouse, 2004). It is possible that eastern hog-nosed snakes are sensitive to various factors such as road traffic levels, road surface treatments and seasonal road surface temperatures that may variably inhibit snake passage. Additional research on eastern hog-nosed snake movement across roads and potential effects on population genetics would assist in our understanding of potential impacts of roads on eastern hog-nosed snake populations.

3.9 Distribution within the Town of Wasaga Beach

Wasaga Beach Provincial Park (south of River Road) and contiguous natural heritage features provide core habitat for eastern hog-nosed snake within the Town of Wasaga Beach. Site records and telemetry research indicates that these snakes are utilizing contiguous forests and wetlands extending south and east of the park boundary. Eastern hog-nosed snakes are able swimmers and have been tracked crossing the Nottawasaga River to adjacent habitats at the east end of Knox Road and along the south bank of the Nottawasaga River.

Telemetry tracking indicates that mating may be occurring in habitats located south of the Nottawasaga River including lands in the vicinity of Jack's Lake suggesting that there may be a connected population of eastern hog-nosed snake in the forests and wetlands in this area (Cunnington, 2004). Evidence of habitat populations and connections continues to mount south of Jack's Lake. A large adult female was observed in April 2005 near 12th Concession and 13th Sideroad. This early spring sighting indicates that hibernacula area available in this area (possibly on the Nipissing beach ridge). A large male snake has also been documented just to the south of this area. The presence of this population outside of WBPP and observed movements between WBPP and the area south of Jack's Lake is indicative of strong gene flow between these areas that increased the genetic fitness of both populations.

Although site records and research are lacking for the Nipissing shoreline features northeast of WBPP, the complex of ridge and trough topography and associated contiguous forest/wetland cover that parallels the Georgian Bay shoreline from the Town of Wasaga Beach north to Balmy Beach has potential to support eastern hog-nosed snake (Cunnington, 2004a). Corridor width is variable but is generally 600 m to 1000 m. Significant concentrations of eastern hog-nosed snake sightings are associated with this habitat within WBPP. Numerous residential sightings have been documented in areas adjacent to the park where development has encroached into this habitat complex. In the absence of documented research, it is reasonable to apply the precautionary principle and assume that these habitat types located northeast of the park and parallel to the Georgian Bay shoreline potentially support eastern hog-nosed snake habitat. A

post-1983 record of eastern hog-nosed snake in the vicinity of Georgina Beach (*NHIC* website) lends credence to this principle. The WBPP research team will be investigating habitat potential in the northeast portion of the Town in 2005 (Cunnington, pers.comm.).

Fragmented portions of the parabolic dune system and Nipissing shoreline features within the Town of Wasaga Beach may still support small numbers of eastern hog-nosed snakes; however, they are no longer of sufficient size, diversity or connectedness to support viable populations over the long term.

4.0 Identification of Significant/Critical Habitat

Critical habitat for endangered and threatened species, as defined under SARA, must be identified through a RS. Conversely, at a provincial level, *significant portions of the habitat* (now referred to as *significant habitat*) of endangered and threatened species may be identified by a planning authority through consultation with MNR staff and non-governmental experts to determine the location, size, amount, configuration and quality of habitat to be protected (MNR, 1999). *Critical habitat* and *significant habitat* are similar concepts yet are have different definitions. *Critical habitat* can be interpreted as being less inclusive than *significant habitat*. The Eastern Hog-Nosed Snake Recovery Team is taking a broader interpretation of *critical habitat* that is analogous to *significant habitat* (Cunnington, pers. comm.). Regardless, the SARA does not preclude stronger SAR protection policies at the provincial/municipal level.

Although a RS for eastern hog-nosed snake is underway, it has yet to be completed and approved. Given the intense development pressures within the Town of Wasaga Beach, it is important to identify and protect the significant habitat of the eastern hog-nosed snake within the municipality as an interim measure until critical habitat is defined through the species RS.

The protection of endangered and threatened species and their habitats is necessary to slow or prevent the extirpation of species from the province and Canada and, in some cases, to help prevent their extinction on a global basis (MNR, 1999). The protection of threatened and endangered species requires that significant portions of their habitat be protected. The “significant habitat” provision within the PPS refers to the habitat that is necessary for the survival of populations of endangered and threatened species (MNR, 1999).

The amount of habitat required for the survival of an endangered or threatened species is normally determined on a case-by-case basis generally through the application of information in species-specific status reports or recovery plans supplemented with expert biological advice to apply this information at a site level (MNR, 1999).

For relatively wide-ranging and mobile wildlife species such as eastern hog-nosed snake, identification of the significant portions of the habitat is a complex task. For eastern hog-nosed snake, this includes protection of: foraging areas, productive habitat for key forage species (American toad), hibernacula, breeding sites, shedding sites, nesting sites and all interconnections that link these various habitat types. Telemetry research indicates that these snakes have large home ranges (Section 2.8). Core areas associated with their home range must incorporate all habitat types required to fulfill life cycle processes if viable populations are to persist on the landscape.

The minimum viable population is the minimum number of individuals necessary to maintain a long-term, genetically diverse population. Additional research is required to conclude whether the WBPP population is at or near the minimum threshold necessary to maintain current populations. Until this research data is available, it is reasonable to apply the “precautionary principle” (United Nations, 1992) and strive to protect large core areas that contain all required habitat types to ensure that populations do not fall below minimum viable size.

Identification of significant portions of the habitat of eastern hog-nosed snake within the Town of Wasaga Beach (Figure 1) incorporates the best available science pertaining to eastern hog-nosed

snake ecology with particular reference to recent research. Significant portions of habitat are associated with large core areas that support the various habitats required to fulfill all life cycle processes of the snake. Smaller habitat areas that have been isolated by roads and development have been excluded. Even though small numbers of eastern hog-nosed snake may persist in these areas, these isolated habitats are unlikely to support viable populations over the long-term due to random local extinction events/poor genetic fitness combined with lack of immigration opportunities into these areas from other viable habitats.

One area located at the northeast tip of Wasaga Beach Provincial Park has been draft approved for development. This forested natural area has been documented as eastern hog-nosed snake habitat. However, without the benefit of recent research, land use decisions were unknowingly made to the detriment of the eastern hog-nosed snake. This habitat block is part of the core habitat area for the eastern hog-nosed snake; however, due to its planning status, it has been removed from the significant habitat mapping.

4.1 Linkage With Other Natural Heritage Study Components

Including this discussion paper, The Town of Wasaga Beach Natural Heritage Update and Review (NVCA, 2004) consists of four component studies, three of which are interconnected with the Eastern Hog-nosed Snake Discussion Paper and identification of significant habitat. These component studies and their interconnections are discussed below.

4.1.1 Natural Heritage Model

The *Natural Heritage System – Background Review and Landscape Model* (Featherstone et al., 2005) modeling the significance of all identified natural heritage features within the Town of Wasaga Beach. This landscape-level model incorporates terrestrial, aquatic and hydrogeologic parameters to derive a total score for each feature. Land uses within, and adjacent to, the Town were identified and delineated using a modified form of the Ecological Land Classification system (Lee et al., 1999). Natural heritage features (forests, wetlands and successional fields) were identified to Community Series. Modifications to the system were implemented to describe agricultural and urban land uses on the landscape. Natural heritage features identified through this process were then scored using a GIS-based model developed by the NVCA (MGP Information Systems Ltd., 2003). Larger natural heritage features, often associated with watercourses and groundwater recharge/discharge zones, typically have higher scores and are of greater significance from a landscape ecology perspective. Modeled parameters and parameter weighting are listed in Table 1.

Table 1: Modeled Parameters and Parameter Weighting

Parameter	Weighting	Score Based On
Unit Size	30%	Area (ha)
Unit Shape	5%	Area:perimeter ratio
Matrix Influence	15%	Influence of land use within 2 km radius
Community Diversity	5%	Number of contiguous vegetation communities
Slope	5%	Presence of slopes >10% and 15%
Surface Water	20%	Stream type, stream health, riparian buffer
Groundwater	20%	Groundwater recharge and discharge

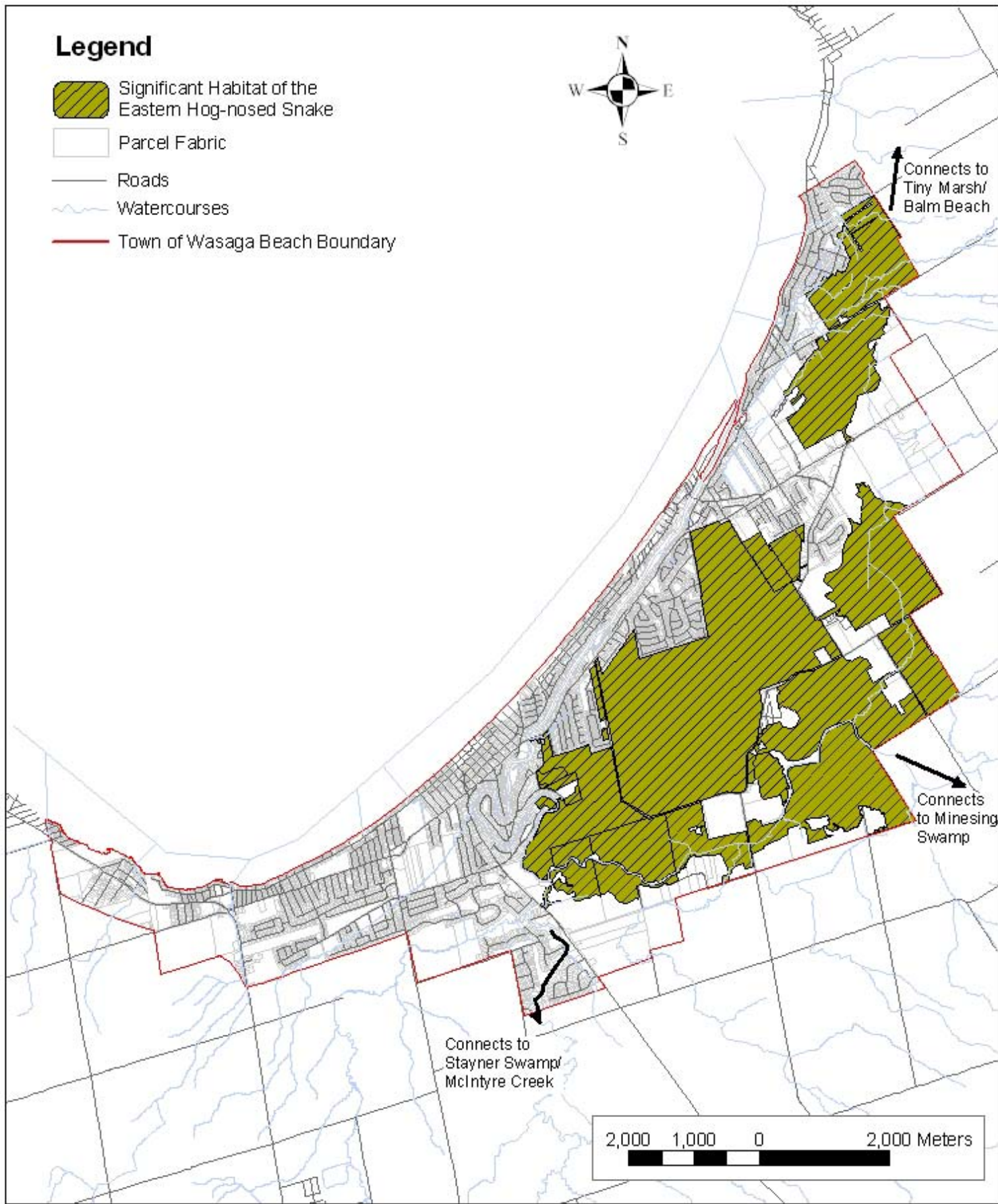


Figure 1: Significant Habitat of the Eastern Hog-nosed Snake

Universal Transverse Mercator
 North American Datum 1983
 Zone 17 North

Areas of identified significant eastern hog-nosed snake habitat are associated with large core areas that support a variety of upland and wetland habitat types that, in turn, support habitats required for all parts of the snake's life cycle. The natural heritage model consistently scores these areas as having a high value on the landscape (Figure 2). These high value natural heritage features are worthy of retention because they support landscape-level terrestrial, aquatic and hydrogeologic functions. The presence of eastern hog-nosed snake in these areas further emphasizes their importance on the landscape.

4.1.2 Dune Outlier Study

The *Dune Outlier Study* (Featherstone et al., 2005) provides an assessment of six parabolic dune outliers that are located outside of WBPP. Each outlier is assessed based on several criteria to determine potential constraints to development.

The parabolic dune outliers (Figure 2) provide variable habitat conditions for eastern hog-nosed snake. These dune outliers are located to the southwest and northeast of WBPP and form the tag ends of the parabolic dune system, most of which is contained within the park. These outliers are characterized by deciduous and mixed forest cover over steep sand dune topography typical of the parabolic dune system.

Mixed forest habitat associated with Dune Outlier 3 is contiguous with WBPP. Site records and telemetry data indicate that this contiguous "outlier" supports eastern hog-nosed snake habitat and, functionally, is part of the large core habitat present in the park. Dune Outlier 3 also supports relatively rare pine-oak woodland communities that are similar in composition to those found in WBPP. Forest interior habitat functions are provided by this outlier. Natural heritage modeling indicates that Dune Outlier 3 has a high natural heritage value on the landscape.

Dune Outlier 4 is linked to WBPP via the Nottawasaga River. Similar to Dune Outlier 3, Dune Outlier 4 supports relatively rare pine-oak woodland communities and forest interior habitat. However, near vertical banks more than 15 m in height on the east side of the river provide poor connectivity between the park and the forested outlier. A tenuous linkage from the Knox Road floodplain, where eastern hog-nosed snake has been observed, to Dune Outlier 4 is present. However, the presence of cottage properties which line the river between the floodplain and the outlier, and proposed future development between Knox Road and the outlier significantly constrain the present and future function of this linkage.

Although the presence of eastern hog-nosed snake has not been confirmed, Dune Outlier 6 and contiguous natural heritage features appears to support a full range of habitats required to complete the eastern hog-nosed snake life cycle. Connectivity and aerial extent of this habitat may constrain habitat opportunities in this area. The WBPP research team will be investigating habitat potential in the northeast portion of the Town in 2005 (Cunnington, pers.comm.).

Dune outliers 1 and 2 are encircled by roads and urban development and are poorly linked to documented habitats to the southwest and potential habitat areas to the northeast. Dune Outlier 5 is similarly impacted by roads and development with poor links to intact habitats to the east. These dune outliers do not support rare vegetation communities or significant forest interior functions and, from a natural heritage perspective, are of relatively low value as indicated through natural heritage modeling.

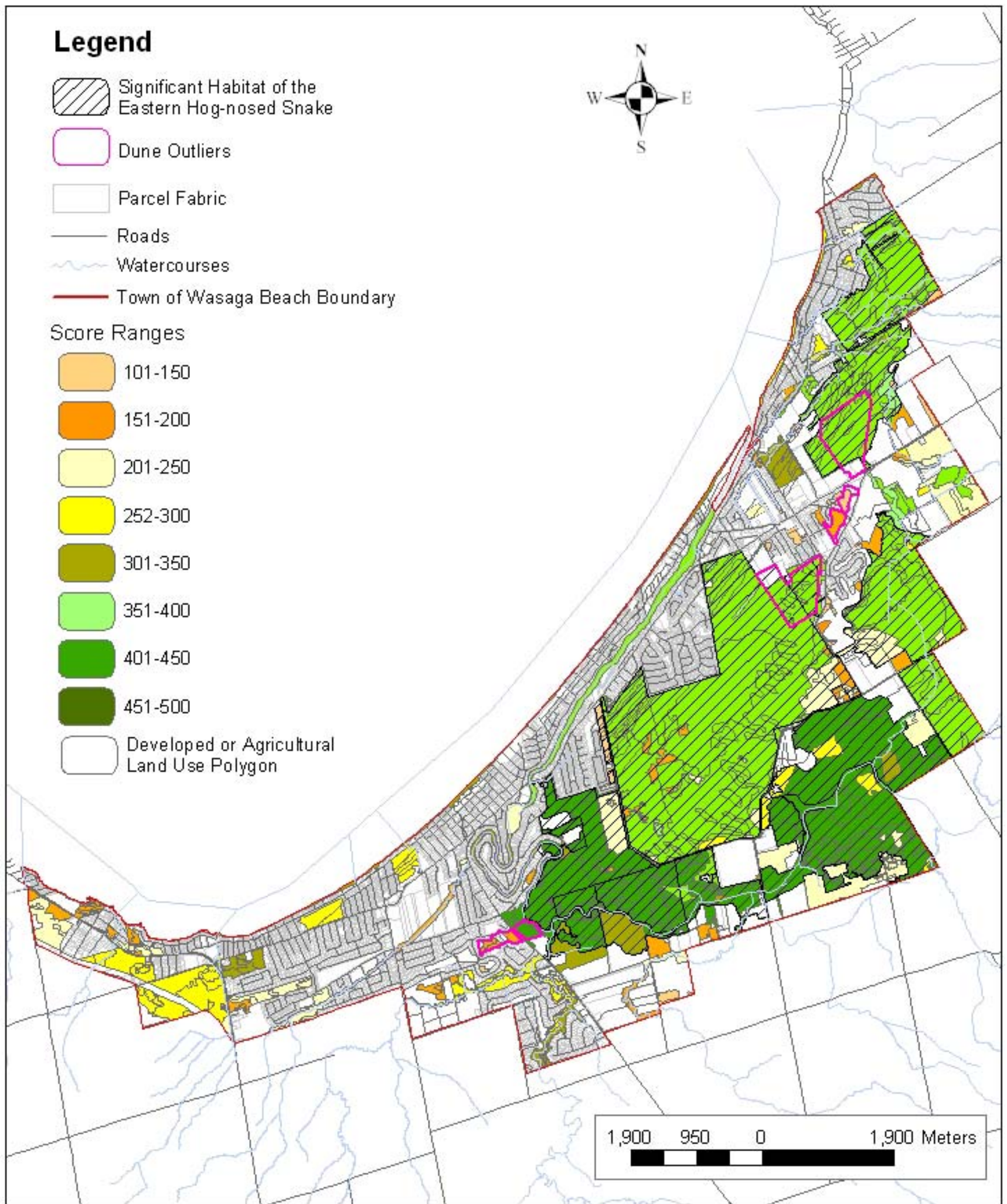


Figure 2: Significant Habitat & Natural Heritage Modeling Scores

Universal Transverse Mercator
North American Datum 1983
Zone 17 North

4.1.3 South Bank Study

This study, focused on lands south of the Nottawasaga River and centred on Jack's Lake, includes relatively detailed Ecological Land Classification inventories (to Vegetation Community Type) which have been used to refine the significance of natural heritage features within this portion of the Town of Wasaga Beach (Featherstone and Anderson, 2005).

The South Bank study area consists of interconnected natural heritage features including deciduous and mixed swamp communities, mixed forest, successional fields and tallgrass prairie remnants. Large forest blocks support forest interior habitat and have been assessed as high value natural heritage features through natural heritage modeling. These natural heritage areas also form an important corridor linking WBPP with Minesing Swamp to the south and portions of the Jack's Lake wetland complex to the southeast. The presence of eastern hog-nosed snake within this core area further emphasizes its importance on the landscape.

5.0 Recovery/Protection Initiatives

The *Eastern Hognose Snake Research Program* (EHSRP) was initiated in 2001 by WBPP and The Friends of Nancy Island and Wasaga Beach Park to:

- increase knowledge pertaining to the ecology and life history of the snake;
- conduct outreach and education; and, in conjunction with the Greater Georgian Bay Reptile Awareness Program (GGBRAP); and,
- develop community stewardship initiatives and assist with a province-wide genetic and diversity studies (MNR 2003).

Since its inception, the EHSRP has led to the capture, process and release of 123 eastern hog-nosed snakes including neonates from five clutches. Twenty-four of the released neonates were incubated and raised in the laboratory following the capture of gravid female. These captures have provided insight in to the sex ratio, sexual dimorphism and morphology of the snake. To date, 15 snakes have been outfitted with radio transmitters and tracked by study team biologists. This telemetry study has provided invaluable data pertaining to hibernation, foraging, mating, shedding and nesting activities as well as movement rates and home ranges. At the completion of the five year EHSRP, a comprehensive document will be developed. The goal of this document is to present detailed data analyses and assist in the development of future eastern hog-nosed snake research.

Public education in Wasaga Beach regarding the eastern hog-nosed snake has been a key component of protection efforts. In 1999, an educational pamphlet was distributed to 1800 households in Wasaga Beach and made available at the park office. As a result, sighting reports increased from six in 1999 to seventeen in 2000. In 2002, a five-minute educational video was created which provided information regarding the eastern hog-nosed snake and associated research efforts (WBPP website, Town website). This video was presented as part of park natural heritage presentations and made available on a newly created website.

The *Greater Georgian Bay Reptile Awareness Program* (GGBRAP), with financial assistance from the MNR, has been working to educate adults and children alike on the protection of the eastern hog-nosed snake and other reptiles at risk in the Greater Georgian Bay area. Reptile awareness workshops are offered throughout the region and provide information on the identification and ecology of reptiles at risk as well as monitoring programs designed to assess their status. The GGBRAP, in cooperation the Georgian Bay Islands National Park, has designed school units to bring reptile awareness to children in the Ontario Grade 4 curricula program. In Spring 2003, the GGRAP snake awareness program was presented to over 1700 Grade 6 students at four different elementary schools.

In addition to the loss of habitat through development pressures, and in spite of efforts to increase public awareness, humans who come into contact with the snake and witness their defensive behavior sometimes kill the snake. Emphasis on maintaining or improving public awareness and education efforts should continue to help protect the hog-nosed population.

In Ontario, the federal Habitat Stewardship Program (HSP) for Species at Risk provides funding to support partnerships aimed at assisting stewardship activities. These activities are directed at species at risk, their habitats and priority ecosystems and include habitat restoration and

improvement, communication and outreach and land acquisition (SARA 2004). By partnering with the Species Recovery Team the Town of Wasaga Beach may be able to apply for funding for stewardship activities based on the outcome of the recovery plan.

6.0 Conclusion and Recommendations

The two greatest threats to the eastern hog-nosed snake are habitat loss and human persecution. With educational programs firmly in place, the most significant threat to the eastern hog-nosed snake population in the Town of Wasaga Beach is the rapid pace of development within areas of suitable snake habitat (Gurr, 2004). Eastern hog-nosed snakes require an array of interconnected habitats to complete their full suite of life cycle processes. As such, they require large tracts of undisturbed land. Habitat fragmentation through development reduces the size of these tracts and degrades/destroys the habitat interconnections upon which the snake is dependent to maintain viable populations.

By partnering with the Nottawasaga Valley Conservation Authority to update and review its natural heritage strategy, the Town of Wasaga Beach has demonstrated a commitment to striking a balance between development and natural heritage protection. The protection of significant portions of the habitat of eastern hog-nosed snake is a distinct challenge within this rapidly urbanizing municipality.

An eastern hog-nosed snake Recovery Strategy has been initiated under the auspices of SARA; however, its completion date and ultimate approval are months away. In the interim, the recommendations of this discussion paper can be used to meet municipal responsibilities to protect this threatened species under SARA and the PPS. The Town of Wasaga Beach, the Nottawasaga Valley Conservation Authority and the Ministry of Natural Resources will need to work cooperatively to ensure that adequate protection of significant habitat is provided to protect viable populations of eastern hog-nosed snake over the long term. Specific recommendations include:

- Adoption of significant habitat mapping, as presented in this report, as a Schedule within the Town of Wasaga Beach Official Plan;
- Temporary inclusion of previously undesignated significant habitat areas within Category 2 Environmental Lands within the Official Plan to provide protection of these areas from incompatible land uses;
- Inclusion of all areas designated as “critical habitat” by the Species Recovery Team as Category 1 Environmental Lands within the Official Plan once the Recovery Strategy (and associated critical habitat mapping) is approved;
- Considering acquisition of the private property within Dune Outlier 3 to maintain habitat linkage to Wasaga Beach Provincial Park;
- Discouragement of road construction through significant habitat. Where roads have been previously approved or where crossings cannot be avoided, the Town and County should use best available science to determine road layouts which minimize habitat destruction and loss of connectivity;
- The Town should continue to support public awareness and education efforts to help protect the eastern hog-nosed snake; and,
- The Town should consider partnering with the Species Recovery Team to apply for funding for stewardship activities based on the outcome of the eastern hog-nosed snake Recovery Strategy.

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APPENDIX A

Agency Meetings

Meeting 1

Date: August 3, 2004

Location: Wasaga Beach Park Office

Attendees:

Name	Title	Agency
Sylvia Anderson	Ecologist	NVCA
Glenn Cunnington	Eastern Hog-nosed Snake Biologist	Trent University
Dave Featherstone	Manager, Watershed Monitoring	NVCA
Jessica Jackson	Natural Heritage Educator	Ontario Parks
Keith Johnson	Park Naturalist	Ontario Parks
Angela McConnell	Species At Risk Intern	MNR
Lisa Moran	Natural Heritage Technician	NVCA

Meeting 2

Date: October 31, 2004

Location: Wasaga Beach Park Office

Attendees: Dave Featherstone, Glenn Cunnington, Jessica Jackson