

5.0 Management Recommendations

5.1 *Conservation of the Blanding's Turtle Population in South March Highlands*

The following recommendations are based on the above sections and have been developed from Dillon's experience with the previous Blanding's turtle and Wildlife Guide System research, the National Recovery Plan written for the Nova Scotia population, the experiences of the technical steering committee, expert advice from our peer reviewers and further research of management options undertaken by similar plans. Individuals involved with this needs assessment have been gaining Blanding's turtle conservation knowledge since they were confirmed to be residing in the South March Highlands in 2009. The planners, engineers, councilors and other employees that are responsible for management of the City's growth now consider Blanding's turtle, as well as other species-at-risk, in planning approvals, policy development, traffic management, and municipal boundary expansion. Likewise, awareness has been heightened within public, community organizations and the education system, which ultimately should be to the benefit of the species.

Realizing a 'Net Benefit to the Species' is a key guiding principle of the provisions of the Ontario Endangered Species Act as administered by the Ontario Ministry of Natural Resources (MNR). The test required by the MNR is that the activities or programs intended to offset the harmful impacts of disturbance, destruction of habitat or loss of individuals through mortality must have as a result, a net benefit to the recovery of the global Blanding's turtle population. Practically, the management strategies proposed herein focuses on the South March Highlands population, which is currently at risk, and threatened by urban development usurping their habitat. The particular threats to the population vary with respect to temporal impacts, but also relate to the species biology, habitat needs and the impact of anthropogenic processes.

Several key objectives are identified to help sustain the SMH Blanding's turtle population. Also listed are several examples of how the objectives can be met to support this population, however, the management tools should be generic enough to be applicable throughout the Ottawa Region and to other turtle populations elsewhere as needed. We have attempted to focus on immediate strategies that could be implemented to deal with current SMH issues, but some of the broader techniques are also applicable to the larger areas as the surrounding communities are developed in the future or are brought within the boundaries of the City of Ottawa. In addition to the specific objectives, we make detailed recommendations related to current development issues in the SMH.

5.2 *Specific Objectives for Conservation of SMH Blanding's Turtle*

Below we outline four aspects of SMH Blanding's turtle conservation (**Table 1**). The aspects focus around the species, their habitat, awareness, education and research. Within each aspect, specific objectives designed to achieve the conservation of the SMH Blanding's turtle are outlined, with generic actions, priority levels, time scale, stakeholders and targets identified. In addition to the objectives outlined in **Table 1**, specific examples of tasks that could be undertaken to meet the targets of the objectives are provided.

Table 1. Action, Priority, Time Scale, Organization Needed and Targets

Action	Priority Level	Time-Scale	Stakeholders / Organization	Targets to meet Objectives
Species Aspects				
Objective 1- Reduce direct and indirect causes of mortalities.				
1.1 Reduce the road mortality of Blanding's turtles to the greatest extent possible	High	Ongoing	Relevant government agencies, intergovernmental and non-governmental organizations (GINGO), universities, research institutions, scientists, researchers, local stakeholders and Ontario Road Ecology Group.	Road mortality in the SMH and surrounding area is minimized.
1.2 Reduce the amount of Blanding's turtles removed by illegal take	High	Ongoing	Ministry of Natural Resources, Peace Officers and Conservation Officers.	Illegal take of Blanding's turtle is minimized.
1.3 Reduce the amount of Blanding's turtle mortality associated with other anthropogenic sources to the greatest extent possible	Medium	Ongoing	GINGO, universities, research institutions, scientists, researchers, and other stakeholders	Mortality from other anthropogenic sources should be minimized
1.4 Reduce the amount of nest/hatchling mortality to the greatest extent practical	Medium	Ongoing	GINGO, universities, research institutions, scientists, researchers, and other stakeholders	Identify and protect as many Blanding's turtle nests as practical.
Objective 2- Continue to improve local knowledge of Blanding's turtles through research and monitoring				
2.1 Continue to determine the distribution and abundance of SMH Blanding's turtle	High	Immediate	GINGO, scientist and researchers	Understanding the number and whereabouts of the SMH Blanding's turtle population
2.2 Conduct new research and monitoring of the Blanding's turtle SMH Population	High	Ongoing	GINGO, universities and research institutions, scientists and researchers	Research and monitoring to assist with conservation and local knowledge is conducted
2.3 Collect and analyze data in order to determine root causes of mortality, especially as it relates to adult and	High	Ongoing	GINGO.	Data collected and published in the peer-reviewed literature and technical reports to support turtle

Action	Priority Level	Time-Scale	Stakeholders / Organization	Targets to meet Objectives
Species Aspects				
hatchling mortality				conservation.
Habitat Aspects				
Objective 3- Protect, conserve and manage Blanding's turtle habitat				
3.1 Identify core habitats of the SMH population (and neighbouring populations)	High	Immediate	GINGO, universities, research institutions, scientists and researchers	Complete map of core habitats in the SMH / Carp Ridge and surrounding North Kanata ridges / lowlands
3.2 Establish broad habitat protection measures	Medium	Ongoing	GINGO, universities, research institutions, scientists, researchers, and local stakeholders	Determination of 'best practices' associated with protection of Blanding's turtle habitat
3.3 Understand mechanisms causing habitat degradation; develop mitigation measures to reduce development effect	Medium	Ongoing	GINGO, universities, research institutions, scientists, researchers, and local stakeholders	Understanding of how anthropogenic and natural factors influence habitat degradation and 'best practices' for mitigating effects
3.4 Conserve areas of high Blanding's turtle density	High	Ongoing	GINGO, universities, research institutions, scientists, researchers, and local stakeholders	Areas of known Activity Centers are conserved
3.5 Rehabilitate degraded habitats where appropriate	Medium	Ongoing	GINGO, universities, research institutions, scientists, researchers, and local stakeholders	Degraded habitat rehabilitated to promote use by Blanding's turtle
3.6 Create new habitats close to identified core habitats; establish suitable compensation ratio of Loss to Replacement.	Low	Short Term	Land development community, builders organizations, professional services	Allow for offsetting compensation where unavoidable impacts may occur.
Research Aspects				
Objective 4- Improve understanding of Blanding's turtle and habitats through research				
4.1 Conduct new research that supports management interventions	Medium	Long Term	Relevant government agencies, universities, research institutions, students, scientists and researchers	Research conducted and published in peer-reviewed literature and technical reports
4.2 Fund bursaries, scholarships, post-graduate fellowships and primary research	Medium	Long Term	University graduate students, research scientists	Promote Ottawa institutions as centers of excellence in species at risk research

Action	Priority Level	Time-Scale	Stakeholders / Organization	Targets to meet Objectives
Species Aspects				
Awareness and Education				
Objective 5- Raise awareness of Blanding's turtle and conservation				
5.1 Establish education, awareness and information programs	High	Ongoing	GINGO, universities, research institutions, scientists, researchers	Implement programs and conservation needs are known by stakeholders
5.2 Work with local communities and groups to gain participation in conservation efforts	High	Ongoing	GINGO, universities, research institutions, local stakeholders and Ontario Road Ecology Group	Local communities are actively involved in Blanding's turtle conservation
Collaborative Aspects				
Objective 6- Enhance cooperation between local, provincial, federal, and international agencies and organizations				
6.1 Develop and implement mechanisms for effective exchange of information with respect to Blanding's turtle biology and habitat needs	Medium	Ongoing	GINGO, universities, research institutions, scientists, researchers, community organizations, Municipal environment committees and clubs	Ongoing dialogue and communication between Blanding's turtle stakeholders.
Legislative Aspects				
Objective 7- Promote lawful protection of Blanding's turtle				
7.1 Encourage environmental protection laws design to promote Blanding's turtle conservation	Medium	Ongoing	Non-governmental organizations, universities and research institutions, scientists and researchers, and local community	Laws passed design to protect Blanding's turtle and promote conservation
7.2 Support those in power to ensure the objectives of the conservation needs assessment are met.	High	Ongoing	Non-governmental organizations, universities and research institutions, scientists and researchers, and local community	Implementation of the objectives and recommendations of the conservation needs assessment

5.3 Management Actions

From the objectives and targets identified above, a number of specific actions could be implemented by the various stakeholders. Preferably, those of high priority would be addressed first, with the medium and lower priority actions addressed in time as needed. The first set of activities is intended to support the individual animals that constitute the population, versus habitat aspects which are addressed later.

5.3.1 Species Aspects

Objective 1- Reduce direct and indirect causes of Blanding's turtle mortality

1.1 Reduce the road mortality of Blanding's turtles to the greatest extent possible

Examples of specific actions that could be implemented:

- a) Extend the Wildlife Guide System along arterial roads. Fencing could be considered on the habitat side (rather than the urban side) of Terry Fox Drive towards Richardson Side Road, along Second Line Road towards Old Carp Road, and along Old Carp Road between Second Line Road and Huntmar Drive. Future improvements to the above roads or new arterial road improvements in Ottawa near Blanding's turtle habitat should consider the construction of wildlife culverts to facilitate dispersion between habitats and reduce the impacts of the road as barriers to movement corridors and the use of the granular shoulders as nesting sites.
- b) Reduce speed limits on selected roadways during sensitive periods when turtles are expected to be moving widely (nest searching). Install overhead signage and amber flashing lights to increase awareness.
- c) Implement a reduced Wildlife Guide System along Goulbourn Forced Road and other Collector roads adjacent to Blanding's turtle habitat including limited fencing and wildlife culverts.
- d) Increase "turtle" crossing signage and reduce speed limits along sensitive areas during prone periods of May-June and September. Ensure the signs are tamper proof and cannot be stolen.
- e) Re-visit the TFD Wildlife Guide System to identify usefulness for preventing the movement of hatchlings and juvenile Blanding's turtles.
- f) Re-examine the fencing fabric used, the height, configuration and general makeup of the fencing to see if it can be improved upon.
- g) Work with community groups to identify safe ways of moving turtles off roads and develop a public protocol for dealing with turtles crossing roads.
- h) Identify locations where alive, yet hurt, turtles can be taken for recovery (ie. Kawaratha Turtle Trauma Centre). An interested community group may wish to establish a similar centre in Kanata and could be the coordinating group for other efforts, such as a head start program.

1.2 Reduce the amount of Blanding's turtles removed by illegal take

Examples of specific actions that could be implemented:

- a) Increase public awareness of the crime and penalties of poaching species at risk. This could be done using signage or public announcements in the media.
- b) Monitor sensitive areas for illegal activities (e.g., set nets). Public action groups may be interested in forming watch parties during the prone periods. Trail cameras may be a useful tool to remotely monitor sites and identify intruders.
- c) Approach the MNR/Provincial Conservation Officers to conduct random inspections of vehicles leaving sensitive Blanding's turtle areas during prone periods. Establish a Turtle Tips hot line to local police.

- d) Lobby law-makers to increase the fines and penalties associated with poaching Blanding's turtle and other species at risk.

1.3 Reduce the amount of Blanding's mortality associated with other anthropogenic sources to the greatest extent possible

Examples of specific actions that could be implemented:

- a) Limit access to sensitive areas to reduce mortality and nest predation caused by pets. Nesting sites and areas with a high density of basking (or exposed) Blanding's turtles should be avoided by pets, as pets may cause harm (and/or harassment) to the turtles.
- b) Add signage to bike trails to inform riders of potential Blanding's turtle encounters and to enhance awareness of what to do if encountered.
- c) Monitor threats to Blanding's turtles. This may include monitoring fluctuations in water levels, predator abundance and movement, and seasonal temperature. As well, monitoring agricultural, forestry, and residential development disturbance could be completed. Once threats are identified to exist, contingency plans should be developed.

1.4 Reduce the amount of nest/hatchling mortality to the greatest extent practical

Examples of specific actions that could be implemented:

- a) Empower public groups to alert researchers/local governments to the whereabouts of Blanding's turtle nests. This could involve an annual public awareness campaign where the public is encouraged to send nesting locations to a maintained database. A volunteer nest monitoring program occurs in Nova Scotia and provides valuable data including nest success, clutch size, and nest site fidelity. This information is lacking for the SMH population.
- b) Initiate and manage a nest protection program to reduce predation by raccoons and fox. Grouped with solution 'a'; a nest protection program consists of locating nests and protecting them for four months by installing wire nest covers (e.g., http://turtle_tails.tripod.com/backyardturtles/byttour4.htm).
- c) Fund and manage a 'head-start' program whereby eggs would be collected, incubated, the hatchlings reared in captivity and released once large enough to be invulnerable to predation. See below for further details. Funding for such a program could be provided by activities having direct, long term impacts on Blanding's turtle.

Objective 2- Continue to improve local knowledge of Blanding's turtles through research and monitoring.

2.1 Continue to determine the distribution and abundance of SMH Blanding's turtle.

Examples of specific actions that could be implemented:

- a) Extend the mark: recapture population estimate field work beyond the current 2013 end point. By doing so, population-specific vital rates (such as adult and juvenile survivorship, reproductive success, transitioning rates, etc.) could be calculated; abundances and projections could be determined with a higher level of confidence. This work is labour intensive and must be done at specific times of the year, yet could be done by funding a volunteer group(s) or transitioning the current program to a research based institution (e.g., Carleton University, University of Ottawa, and Algonquin College) or organization (e.g., Wildlife Conservation Society- Canada, Ontario Nature). Regular sampling of the SMH population is essential for understanding the long-term demographics, survival rates, hatching success and age structure.
- b) Collect and identify road kill mortalities by their PIT tags, to adjust the population statistics and maintain an inventory of the population as it matures.
- c) Develop a turtle watch program whereby community users can contact a 'hotline' and report turtle sightings or poaching activities.
- d) Continue to identify habitats where juveniles are present and refine the methods for juvenile capture.
- e) Ensure that data collected is standardized and that marking and handling procedures are refined as technologies change.
- f) Further refine the population structure by understanding movement patterns. A long-term monitoring project using radio telemetry (or other similar devices) to continuously track individuals could be funded, however this activity should be done or supervised by trained professionals.

2.2 Conduct new research and monitoring into Blanding's turtle and the SMH and neighbouring populations

Examples of specific actions that could be implemented:

- a) Conduct a landscape-scale study to assess potential movement corridors of Blanding's turtles between the major habitats where a few Blanding's turtles have already been observed. This could involve habitat suitability GIS analysis across the region, and/or road mortality studies to determine 'hot-spots' of animal mortality. This information could be used to identify other Arterial Roads in need of Wildlife Guide Systems. This work could be undertaken by the scientific or research community and be published in peer-reviewed literature and/or technical reports
- b) Fund research to understand the biological basis for Blanding's turtle local movements and motivations. Genetic research into the larger Ottawa Population could be done to understand the genetic variability between the sub-populations. This should be undertaken by the local scientific community and be published in peer-reviewed literature to the benefit of the species. This may include genetic-based studies to understand the relationship between the local Blanding's turtle populations, and it may aid with understanding movement corridors between sub-populations. Understanding paternity in clutches is another possible project, as it would help to determine the degree of inbreeding that occurs in the SMH population.

- c) Maintain a current Blanding's turtle database for the SHM population. This should be held at a long-lived institution such as a university or college as the turtles often outlive the researchers studying them. Kejimikujik National Park in Nova Scotia offer a great example, as they include general observations, trapping data, radio tracking locations, imagery, nesting monitoring data, hatchling statistics, morphological measurements, and more in a database. Data from researchers, volunteers, public sightings, university-based research and museums are included in the database.

2.3 Collect and analyze data in order to determine root causes of mortality, especially as it relates to adult and hatchling mortality

Examples of specific actions that could be implemented:

- a) Fund research into Blanding's turtle mortality associated with other anthropogenic sources (e.g., bioaccumulation, invasive species, etc.). Understanding the causes of mortality will potentially allow researchers to develop mechanisms to reduce mortality caused by anthropogenic sources. This should be undertaken by the scientific community and be published in peer-reviewed literature.
- b) Investigate the impact of global climate change on local wetlands. Changes in water chemistry, levels and the surrounding environment could potentially degrade Blanding's turtle habitat and reduce the amount of critical habitat (i.e., overwintering areas). This should be undertaken by the scientific and research community and be published in peer-reviewed literature and/or technical reports.
- c) Fund research to understand Blanding's turtle nest predation and parasites. Understanding nest mortality will allow for long-term and sustainable solutions to be developed. This should be undertaken by the scientific and research community and be published in peer-reviewed literature and/or technical reports.

5.3.2 Habitat Aspects

Objective 3- Protect, conserve and manage Blanding's turtle habitat

3.1 Identify core habitats used in the SMH and by Neighbouring Populations

Examples of specific actions that could be implemented:

- a) Based on the Blanding's turtle habitat quality analysis completed for this study, develop a city-wide GIS application using readily available Remote sensing topographical, wetted perimeter and vegetation data to identify potential core habitats of Blanding's turtle.
- b) Ground truth a number of areas identified through remote sensing to confirm the presence or absence of Blanding's turtle in these potential habitats. See PhD Dissertation (In Progress) – Amy Mui, University of Toronto.
- c) Create a Population-wide Conservation Management/Protection Plan. This plan should consider all populations and habitats (i.e., core habitats, resident wetlands, activity centers, and not presently occupied wetlands) in the region for Blanding's turtle and suggest protection measures to ensure population

longevity. This plan would need to consider future land development, education and stewardship initiatives for private landowners.

3.2 Establish broad protection measures for Blanding's turtle core habitat

Examples of specific actions that could be implemented:

- a) Research techniques and develop guidelines for planners and practitioners to aid with rapidly defining and identifying core habitats and 'best practices' for protection.
- b) Identify known locations to property speculators so they may be acknowledged during the due diligence phases of their property enquiries, avoiding planning conflicts which may arise later during development applications.
- c) Exchange information with other groups focused on Blanding's turtle protection.
- d) Publicly promote Blanding's turtle protection measures to aid in community involvement.
- e) Reduce threats by protecting in perpetuity core habitats.

3.3 Understand mechanisms causing habitat degradation and develop mitigation measures to reduce risk effects

Examples of specific actions that could be implemented:

- a) Research should be conducted to assess habitat degradation caused by urbanization and its impact on Blanding's turtle.
- b) Experiment with different buffer widths, enhanced planting strategies, fencing alternatives and habitat creation in close proximity to residential areas to test the limits of the species tolerance towards interaction with human activities.
- c) Develop mitigation measures which bring ecological processes into the urban fabric (reconfigured creek valleys, stormwater management alternatives, Low Impact Development [LID] strategies, infiltration technologies), which are also designed to prevent urbanization from negatively impacting Blanding's turtle habitat.

3.4 Conserve areas of high Blanding's turtle density

Examples of specific actions that could be implemented:

- a) Review the proposed realignment of Gholbourn Forced Road to ensure it does not impact core habitats important to the conservation of Blanding's turtle.
- b) Purchase lands or undergo land swaps with Owners where known, high concentrations of Blanding's turtle or their core habitat exist on private land.

- c) Integrate park systems, trails, wildlife corridors and Natural Environment zoning to ensure habitat connectivity between core habitats.
- d) Work with land owners to plan Blanding's turtle solutions when encountered on their properties. This could serve as a "how to" guide for owners dealing with Blanding's turtles and other species-at-risk throughout the Province.
- e) Foster the idea that turtles and humans can "Share the Space". Turtles only move about for part of the year, living in wetlands most of the time. They only need to utilize these corridors for a short period and can share the space with some human recreational activities.

3.5 Rehabilitate degraded habitat where appropriate

Examples of specific actions that could be implemented:

- a) Tile drain fields were once wet, sometimes wetlands or sloughs. Reinstating the hydraulic conditions by removing or blocking the tile drainage will almost always revert the land to wetland conditions in time. Excavating basins adjacent to existing or degraded habitats and allowing natural encroachment to revegetate the area is a cost-effective method of rehabilitation. Tree roots, boulders and other naturally occurring objects are the only other ingredients necessary to reestablish the once-present wetlands.
- b) Identify degraded habitat and implement 'best practices' for restoration. This potentially could be done by means of a literature review combined with a field assessment of candidate areas. If technology gaps are present, a series of case studies could be used to determine protocols. Cost efficiency should be understood as well. Funding for rehabilitation could be raised from developers/constructors/governments that have degraded Blanding's turtle habitat or seek to offset the impacts of land development.
- c) Mitigation Banking is a concept where entities requiring impact offsets may purchase units of created or protected habitats created for this purpose, which are then permanently enshrined in the planning framework to ensure sustainable, long term protection of the habitat without the threat of further infrastructure or land development.

3.6 Create new wetlands close to core habitats; Establish suitable compensation ratio of Loss to Replacement

Examples of specific actions that could be implemented:

- a) Allow for compensation wetland or nest construction where avoidance of the impacts to existing turtle habitat is not practical or possible. Restoring the Carp River north from Richardson sideroad, reinstating the broad meandering channel originally there, may be an appropriate location for large scale compensation efforts.
- b) Establish a standardized ratio of loss to replacement (i.e., 3:1 to 10:1) on an area-basis (ha or m²) to ensure fair and equitable treatment of proponents, but with the aim of ensuring a net benefit accrues to the species, core habitats and related flora and fauna species.

- c) Focus efforts on nesting areas of at least ½ ha in size each, with multiple locations to reduce the density of nests and the likelihood of egg predation. Provide ongoing surveillance and maintenance to avoid aggressive or exotic invasion of vegetation (ie. Autumn Olive shrubs, *Phragmites australis*) that blocks nesting or shades the nests from solar radiation.
- d) Include a large component of roots, stumps, log piles, boulders, aquatic macrophytes and standing trees under permanently flooded conditions.

5.3.3 Research Aspects

Objective 4 – Improve understanding of Blanding's turtle and habitats through research

4.1 Conduct new research that supports management interventions

Examples of specific actions that could be implemented:

- a) Research biophysical characteristics of key Blanding's turtle habitats (e.g., overwintering sites, nesting sites).
- b) Refine habitat suitability models to further define Blanding's turtle habitat in the SMH.
- c) Conduct a large scale corridor study to assess the connections of the SMH Blanding's turtle population to other populations.
- d) Further understand habitat-use by Blanding's turtle.
- e) Identify all key habitats for Blanding's turtle in the SMH.

4.2 Fund bursaries, scholarships, post-graduate fellowships and primary research

Examples of specific actions that could be implemented:

- a) Partner with academic research councils to research programs (e.g., Natural Sciences and Engineering Research Council).
- b) Fund local research programs at Carleton University, University of Ottawa, and other local schools that are conducting Blanding's turtle and/or conservation biology research.
- c) Facilitate partnerships between stakeholders and academic institutions to fund monitoring and research.

5.3.4 Awareness and Education

Objective 5- Raise awareness of Blanding's turtle and conservation

5.1 Establish Education, awareness and information programs

Examples of specific actions that could be implemented:

- a) Introduce a school program designed to teach local children about Blanding's turtle and conservation. Parks Canada has a Teacher Resource Centre designed to aid teachers with educating students about

species-at-risk, however the individual species aids are lacking (http://www.pc.gc.ca/apprendre-learn/prof/sub/theme/spec_e.asp).

- b) Implement a youth-in-environment summer work program, engaging high school and college-age students on restoration of local streams, wetlands and promoting the importance of protecting natural areas within the City. Similar to SHaRP (Salmon Habitat Restoration Program) or SNAP (Surrey's Natural Areas Partnership) in Surrey BC.
<http://www.surrey.ca/city-services/1997.aspx>;
<http://www.surrey.ca/culture-recreation/2013.aspx>
- c) Partner with a charitable foundation or local major corporation (RIM, CAE) willing to promote and take action on Blanding's turtle conservation. The Rick Hanson Foundation founded the Fraser River Sturgeon Conservation Society to promote sturgeon populations at the grassroots level (<http://www.rickhansen.com/language/en-CA/Who-We-Are/About-Rick-Hansen/Ricks-Life-Passions/Fraser-River-Sturgeon-Conservation-Society.aspx>).

5.2 Work with local communities and groups to gain participation in conservation efforts

Examples of specific actions that could be implemented:

- a) Work with local community advocacy groups, the City Environmental Alliance Committee and Green Space Committee and the City's Parks and Recreation Department to produce awareness signage for local forests, wetlands and creek valleys.
- b) Promote and develop stewardship. Fostering an ethic of local stewardship will support success of Blanding's turtle conservation. This can be completed by enhancing landowner contact (often landowners are unaware that Blanding's turtle exist on their lands), and collaborating with private and corporate landowners, which will encourage habitat protection and reduce disruptive activities.
- c) Support local education efforts. The Kejimikujik Area Stewardship program for Blanding's turtle offers an appropriate template for how such a program would function (<http://www.speciesatrisk.ca/stewardship/BlandingsTurtle.html>)

5.3.5 Collaboration Aspects

Objective 6 - Enhance cooperation between local, provincial, federal, and international agencies and organizations

6.1 Develop and implement mechanisms for effective exchange of information with respect to Blanding's turtle biology and habitat needs

Examples of specific actions that could be implemented:

- a) Form a stakeholders group designed specifically to deal with Blanding's turtle conservation in the City of Ottawa (and particularly the SMH and surrounding area). Stakeholders may include the City of Ottawa, National Capital Commission, Ministry of Natural Resources, Parks Canada, Professors from University

of Ottawa and/or Carleton University, Representatives from local conservation-oriented groups, Nature Conservancy of Canada, Wildlife Society of Canada, Ontario Road Ecology Group, etc.

- b) Host a symposium on Blanding's turtle conservation and invite local, provincial, federal, and other agencies and organizations to attend. Presenters could be researchers, policy makers, managers, etc.

5.3.6 Legislative Aspects

Objective 7- Promote lawful protection of Blanding's turtle

7.1 Encourage environmental protection laws designed to promote Blanding's turtle conservation.

Examples of specific actions that could be implemented:

- a) Lobby all levels of government to strengthen environmental protection laws designed to promote Blanding's turtle conservation.
- b) Advocate for evidenced-based Blanding's turtle conservation policies and laws.
- c) Support local action with respect to Blanding's turtle conservation policies and laws.

7.2 Support those in power to ensure the objectives of the conservation needs assessment are met.

Examples of specific actions that could be implemented:

- a) Secure long-term funding for Blanding's turtle conservation in the SMH by associating with a likeminded foundation, conservation oriented society or major corporation with local connections to the community (i.e., RIM, CAE)
- b) Ensure that the conservation needs assessment is implemented and a working group is created.
- c) Formalize conservation agreements with relevant stakeholders.

5.4 Information to Support Specific Actions

5.4.1 Expansion and Improvement of Existing Wildlife Guide System

To improve the efficacy of the existing Wildlife Guide System we suggest the following:

- The culverts with larger rocks should be smoothed out and where feasible covered with a more 'turtle friendly' substrate such as coarse gravel, sand, and woody debris. Some of the culverts currently have turtle-friendly substrates and should be used as a template.
- Expand fencing beyond the current limits. We suggest extending the fence on the west side of Second Line Road to Klondike Road and on Terry Fox Drive to Richardson Side Road (or the limit of current development activities).
- Fencing should be tested to ensure that hatchlings cannot move through the current fence fabric. If they can, a finer gauge fence material should be installed along the bottom.

- Consider reducing speeds on Terry Fox Drive during the Blanding's turtle prone periods (i.e., nesting period (early June to early July) and hatching period (mid-September to early October)).

5.4.2 Offsite Habitat Creation / Protection Zones / Ecological Restoration

Offsite habitat creation may be considered a practical, cost effective method of offsetting habitat losses or population impacts elsewhere. Advances in ecological restoration over the past 20 years have resulted in fairly significant changes to the science of recreating habitats. With time, usually on the order of 10 years or more, many common habitat types can be created. Once a habitat is built, many wildlife species will opportunistically move in and establish territories within weeks or months. On the Terry Fox Drive project, three wetlands were constructed over an 8.0 ha area in 2010. By the spring of 2012, at least one male Midland Painted Turtle had used one of the wetlands (Personal Observation, Shawn Taylor, Dillon biologist).

5.4.3 Ensuring Connectivity- Linkage Planning

Connectivity between populations is important for maintaining genetic diversity and access to habitats. Development in the vicinity of the SMH has reduced access to other Blanding's turtle populations and habitats. By buying lands, creating protection area, or reducing barriers, connectivity can be restored and populations can disperse to ensure genetic diversity and access to quality habitat.

Existing Linkages Identification

The SMH population is located at the southern edge of the Carp Hills/SMH ridge, with the Kizell Wetland. There are approximately 57 km² of suitable wetlands and forest woodlots that are relatively contiguous and undeveloped north of the SMH in the Carp Hills. Currently, road and residential development is a barrier for movement between the two areas. To increase connectivity between the SMH and Carp Hills, residential development should be limited to the current type (i.e., estate lots) and a Wildlife Guide System should be created below Old Carp Road and March Road.

Other connections lie to the west along Huntmar Drive and along the Carp River. The majority of the adjoining area are clay-based floodplains, developed for agricultural uses and do not provide suitable habitat for Blanding's turtle. The Carp River has been deepened and straightened to provide improved drainage to support agricultural uses; however, the area regularly floods in the spring. Today, Blanding's turtle may occasionally use the Carp River as a corridor to the Cork Highlands, but it is open with little overhead cover and given the intervening road network and distance involved, this may be a risky movement for a Blanding's turtle. As the Carp River restoration project proceeds, constructing wetlands habitat suitable for Blanding's turtle along the way, as was done near Richardson's Sideroad, would be appropriate to try and re-establish the Carp River linkage and reduce the risk of movements between habitats. As the urban area expands and land-uses change, restoring the original, meandering form of the Carp River, with wide, forested buffers suitable to Blanding's turtle should be a goal.

Buying Land

Parcels of the land could be purchased by the City (or donated) as part of the conservation strategy to offset habitat losses elsewhere. Land that is existing habitat for turtles is most desirable, although land that is near water and can be converted into Blanding's turtle habitat is also acceptable. The parcel at the southwest corner of Second Line and Old Carp Road, owned by Metcalf Realty would be a good candidate, as Blanding's turtles were found using radio telemetry to be using a large wetland there. Other tracks of land located in the flood plain of the Carp River would allow for a large habitat restoration project to be undertaken.

Integrating Parklands

Land development proposals in Ottawa are required to dedicate 5% of the land holdings to the City for dedicated parklands. In most cases, these are developed for soccer fields, parks or baseball diamonds, often filling in the marginal lands unusable for homes. In close proximity to naturally wet areas, the parks sometimes become the only available nesting areas for turtles (2011 case of snapping turtles in Britannia Park, Ottawa¹). The First Line Road Allowance corridor, running north of Kizell Drain to Terry Fox Drive, has been zoned Natural Environment and planned for future recreational use, but other than having a width of 25-30 m and a planned walkway, the park area is unplanned. We recommend maintaining the First Line Road Allowance corridor as it is today ensuring a sustained linkage between the Kizell Wetland and the West Shirley's Brook watercourse.

Planned parkland parcels within existing Blanding's turtle habitat should be created keeping habitat intact without any land re-grading, no hard infrastructure and limited hazard tree removals. Narrow pathways could be built with hard (i.e., paved) surfaces, but lighting should be managed in away to not interfere with Blanding's turtle (i.e., lighting may disrupt nesting as it occurs later in the day and into the evening). There should be no playground equipment or turf grass in the parklands to encourage people to stay in the area. As much as possible, parkland areas with known Blanding's turtle habitat should be left natural and undeveloped. Fencing around the perimeter, to limit turtle and wildlife movements into developed areas would reduce threats.

5.4.4 Programs to Support Egg & Hatchling Survivability

Increasing the survivability of eggs and hatchlings is a secondary priority in maintaining the SMH population (relative to the protection of adults). It is known that natural predation of the eggs in Blanding's turtle nest is the largest cause of egg loss and hatchling mortality, and so if nests can be protected, or managed to reduce losses, then the overall population will benefit. Egg and hatchling programs can also provide important data for PVAs. It should be noted that egg protection and hatchling rearing is a time intensive action and can be expensive.

¹ <http://www2.canada.com/ottawacitizen/news/city/story.html?id=c919a060-0b4c-4d09-945d-0dc425c0ea4b>

Nest Protection

A long term stewardship program has been operating at Kejimikujik National Park in Nova Scotia to help sustain their population of about 300 adults, based largely on local volunteer participation through the Kejimikujik Stewardship Program². During nesting season of mid-May to mid-June, known nesting areas are monitored nightly to identify when females are nesting and if they have laid eggs. The known nesting sites may be protected with stout wire mesh coverings, staked or anchored to the ground, that prohibit wildlife from depredating the nests after being laid (**Plate 3**). Eggs incubate in sandy or gravel soils for 60-90 days, depending on the mean ambient temperature and exposure to sunlight. The nests would need protection throughout this period, and then in September and October, the nests are monitored daily for emerged hatchlings, which are trapped under the cages. Alternatively, the screens are removed just prior to hatching for free release, or the young hatchlings are taken into captivity for artificial rearing (Head Start as below).



Plate 3 Volunteers at Kejimikujik National Park placing a nest protection box. Photo: J. McKinnon, Parks Canada with permission.

Artificial Turtle Nests

Creating nesting areas for Blanding's turtle may induce females to lay eggs in preferential areas rather than in sites close to threats. Sunny openings in the SMH where the substrate is suitable for nesting could be increased in size to promote nesting. Artificial nesting beds may be created by simply layering a sand-gravel mixture covering large areas (> 1 acre; ½ ha), over a well-drained site with minimal vegetation cover;

² <http://www.speciesatrisk.ca/stewardship/BlandingsTurtle.html>

however, the specific biophysical factors of nesting sites are unknown (Pers Comm, Dr. Justin Congdon). Blanding’s turtles may find the sites randomly and hopefully use the sites for nesting.

Head Start Program

Head start programs aim to harvest Blanding’s turtle eggs and rear them to a predetermined age (often over periods greater than one year). A successful Blanding’s turtle head start program has been undertaken in Kejimikujik National Park in Nova Scotia. Eggs or newborn hatchlings are collected and reared in captivity to help sustain the local population. Eggs can either be collected by digging up recently laid nests or by collecting gravid females and encouraging egg deposition using oxytocin. Eggs are incubated underground naturally or in artificial incubation chambers (Plate 4) where the temperature can be controlled and varied as needed. When the eggs hatch (Plate 5), the hatchlings are kept in captivity and fed a formulated diet.



Plate 4. Eggs in incubation beginning to hatch.

Plate 5. Recently hatched Blanding’s turtles.

Photos with permission of Southwest Nova Biosphere Reserve.

Under controlled conditions hatchlings can feed on algae, plankton, crustaceans, insects, worms, small fish and other food resources while remaining protected from predators. The young are raised for about two years and released to the wild. A head start program in the SMH would require a dedicated staff biologist, a group of knowledgeable volunteers, and a small facility to undertake the work. Alternatively, eggs could be collected in the SMH, raised elsewhere in an existing facility and released back into the SMH. Any such facility or operation would require permitting and technical oversight by the Ontario Ministry of Natural Resources. Should a head start program be considered, best practices should be researched more thoroughly, and a cost-effective analysis be done to ensure that the program meets its goals. It is clear that a head start program would be expensive and be a long-term investment, so partnerships and funding sources should be identified early in the process.

