

3.0 Threats to Blanding's Turtle

An understanding of threats and risks is important for assessing the long-term viability of the SMH Blanding's turtle population. Threats can be natural or anthropogenic and individual animals may differ in their level of risk depending upon behavior, movement, sex and age. Cumulative effects are important. Exposure to a greater number of threats in a confined area is clearly detrimental to a population, but equally so, a single threat over a wide area may be equally as detrimental. Some threats, however, create a greater magnitude of risk than others. Priority should be placed on management strategies that reduce the risks with the highest impact on a population, although the cumulative effects of lesser risks should not be ignored.

In order of magnitude of risk to Blanding's turtle, below we outline some of the most significant risks to the SMH population:

3.1 Road Mortality

Vehicle strikes represent the highest threat to Blanding's turtle, as they are often killed while crossing roads. During the course of the City of Ottawa studies in 2010-2012, three Blanding's turtles, two Common Snapping turtles and four Midland Painted turtles are known to have been killed on the roads in and around the South March Highlands. Huntmar Drive, Goulbourn Forced Road and Old Carp Road have each existed for several decades and we speculate that many Blanding's turtle mortalities have occurred on them over the years, especially where the roads bisect wetlands and water bodies. Mortalities are expected to be highest in May and June when gravid females are nest-searching, then again in September as the eggs hatch and the young move towards nearby wetlands. The on-going study on the effectiveness of the Terry Fox Drive Wildlife Guide System suggests that culverts work to reduce the potential for road mortality in turtles and other SMH animals, but they may be a learned behaviour and the frequency of their use will improve over time. Other solutions, like turtle crossing signs and seasonally-adjusted reduced speed limits, may decrease the risk of road mortality to Blanding's turtle.

3.2 Habitat Loss Due to Urban Expansion

Key Blanding's turtle habitat has the potential to be lost when urbanization occurs in areas with known populations of Blanding's turtles. Blanding's turtles naturally make their resident habitat in areas where there are permanent wetlands and prefer swampy/marshy environments with lots of woody structure. Blanding's turtles are known to use forested upland habitats and connecting water bodies as travel corridors. Urban land development requires the clearing of agricultural and forested lands, fragments the habitat connectivity, creates movement barriers, fills or alters creeks, drainage ditches or wetlands, and covers over nesting areas with pavement, lawns and buildings. Development may lower groundwater tables and change groundwater movement patterns, causing vernal pools to dry up and become encroached with herbaceous vegetation, shrubs and trees. Natural soil structure may be altered by site grading, leaving compacted subsoil overlain by a skim of

topsoil, devoid of earthworms, fungi and other beneficial microorganisms. Consequently, urbanization is almost always incompatible with the protection of Blanding's turtle habitat.

3.3 Predation

Predation is a threat in any naturally occurring population. Adult Blanding's turtles can be predated or harmed if their extremities are not enclosed in the shell, but this is rare and usually only happens when turtles are laying eggs (Pers Comm, Dr. Justin Congdon). Several authors have reported that Blanding's turtle eggs are most vulnerable to predation while in their nest and shortly after hatchling emergence (Congdon *et al.*, 2008). Nest predation over a 34 year study in Michigan was highly variable, and averaged 43.8% (ranged 7-78%) (Congdon *et al.*, 1993). Nests were regularly predated by raccoons and foxes, with predation occurring within three days of nest construction (Congdon *et al.*, 1983, 2000). Skunks and mink are also known predators of nests. Caging programs, aimed at reducing predation by protecting known nests, have been effective at reducing predation in and around Kejimikujik National Park in Nova Scotia for over 20 years and have become an important management tool for protecting the Blanding's turtle population there (Standing *et al.*, 2000).

3.4 Poaching

Poaching presents a very significant risk to Blanding's turtle populations, because large numbers of turtles can be easily collected and transported for the exotic pet or medicinal drug trade. Although poachers are unlikely to find and remove young turtles, it may only require the poaching of a few reproductive adults from a population to cause a precipitous drop in the population size. One poacher in Ontario was found in possession of up to 35 Blanding's turtles in the trunk of a car (Canadian Gazette, 2009). For this reason the specific locations of habitats and individuals are kept as confidential information by the City. Educating the public and monitoring of sensitive areas may reduce the risk and potential for turtles to be removed by poachers.

3.5 Diseases and Parasites

Parasites have the potential to reduce immune response and cause mortality. Blanding's turtle are parasitized by protozoans, trematodes, nematodes, acanthocephalans, leeches, and mosquitos (Ernst and Barbour, 1972). Due to a paucity of research, levels of infestation have not been quantified. One of the more researched Blanding's turtle parasites are leeches, specifically the Smooth turtle leech (*Placobdella parasitica*) and the Ornate turtle leech (*P. ornate*) (Samure, 1990, Davy *et al.*, 2009). A concern is that both leeches can transmit blood parasites (Siddal and Dresser, 1992). With respect to diseases, shell diseases have been identified as a potential factor in the global decline of turtles. Shell diseases include lesions and abnormal shell growth (Gibbon *et al.*, 2000) but no reports of shell disease in Blanding's turtles were found during our literature review.

3.6 Invasive Species

Invasive species are animals and plants which are non-native species that can move into areas naturally but most often come to an area because of human introduction (either purposefully or by

mistake). Many invasive species never take hold in new environments because conditions are too harsh for them to carry out their life processes, however for species that do successfully invade new ecosystems, they often out-compete native species and fill similar functional niches. Below we outline several invasive species that have the potential to inhabit the SMH and what their impacts on the local Blanding's turtle population may be.

Red-eared slider (*Trachemys scripta elegans*) is a turtle native to the southern U.S. and sold as pets. So far, the turtle has been reported to be able to overwinter in the Ottawa Region, however biologists do not believe it can reproduce here due to cooler temperatures. The red-eared slider competes with native turtles for food, basking sites and occupies similar nesting areas.

The rusty crayfish (*Orconectes rusticus*) is native to the central United States and has been spread by anglers into non-native waters through emptying of bait buckets and livewells. Rusty crayfish were first observed in the Ottawa Region in 1986 and has spread to several water bodies, including the Rideau River. Rusty crayfish out compete native crayfish for resources and have drastically reduced native crayfish populations in many areas of Ontario. SMH Blanding's turtles may be impacted by Rusty crayfish as the diversity of food available to Blanding's turtle may be lower than in the past.

Zebra mussels (*Dreissena polymorpha*) occur in large open water lakes and some of the larger rivers of Ontario, such as the Rideau and Ottawa Rivers. Zebra mussels are very efficient filter feeders and will drastically alter the turbidity and water clarity of a water body which has cascading effects on native species. We would not expect zebra mussel to invade the waters of the SMH in any significant way due to the overall lack of suitable, hard substrates for attachment and growth.

Semi-aquatic invasive plant species such as Purple Loosestrife (*Lythrum salicaria*), and Common Reed Grass (*Phragmites australis*) have been spreading north-east throughout Ontario for several years, invading wetlands, riverbanks and wet ditches. Both of these species can out-compete the native cattail (*Typha latifolia*) as well as the smaller, less robust emergent macrophytes, softstem bulrush (*Scirpus validus*), rushes (*Juncus sp.*) and the spike rushes (*Eleocharis sp.*) common in freshwater marshes. Competition may affect the cover diversity and food sources of the prey organisms. *Phragmites*, which grows to 5 m tall, is known to totally dominate an area, choking out other species and making it nearly impassable. Once *Phragmites* enters a system, it can grow so quickly, with so much biomass, that the open water areas important for turtle basking and feeding may become closed, overly shaded and inaccessible. Within dense stands of *Phragmites*, there are no resources for other flora and fauna, there are no frogs or crickets, and the colonized area essentially becomes a barren environment.

Eurasian milfoil (*Myriophyllum spicatum*) a submerged aquatic plant transported primarily through anthropogenic means (fouled boat motors), does not seem to have invaded the wetlands of the SMH waterways, and may not be expected to do so unless directly transplanted. It has become common in lakes, ponds and relatively large, open water-bodies with clear water and a muddy bottom. If it does start to occur in the SMH, it will provide an alternative food source for turtles and their prey. However, in waterbodies with high nutrient levels (e.g. urban runoff), the biomass may accumulate to

a density where swimming through the areas may become difficult for turtles. In the fall and winter when the large biomass decomposes, dissolved oxygen levels in the water column may become depressed, potentially leading to winterkill of hibernating Blanding's turtles.

The SMH study area was inspected for invasive species in June 2012 during the radio tracking studies (unpublished data, Dillon Consulting Limited). Of the six species noted above, only Purple Loosestrife (*Lythrium salicaria*) was found in two locations. One of the earliest species known to affect wetlands in Eastern North America, this species has become a common plant along the Carp River riparian zones. Fortunately, the introduction of biological control agents in Ontario appears to have successfully controlled populations of Purple Loosestrife. Consequently, the densities around the SMH remain quite low and do not appear to be significantly affecting the population of other native plants and animals.

3.7 Plastic Floatables

Roadways and urban areas generate significant volumes of floatable or windblown plastic and styrene products. Bottle caps, cigarette lighters, cigarette butts, water bottles and plastic bags commonly are found floating in waterways around urban areas. Turtles may mistakenly consume smaller items in the belief they are food items. These items are indigestible and can get lodged in the gut, cannot be passed, and may reduce an animal's ability to absorb nutrients from the food. In extreme cases, the accumulation of many plastic items can permanently occlude the intestines, resulting in death. Non-photodegradable plastic shopping bags can be persistent in the environment and can entangle or trap animals below the water where they may drown.

3.8 Climate Change

As with most predictive biology, the effect of a changing climate on Blanding's turtle is currently not well known. No studies have been done to look at the impact of long-term climatic variation and Blanding's turtle ecology, therefore we only speculate here. Historical climate records and climate modeling for Ottawa suggest that the main effects of climate change in this area are warmer, more variable winters, drier and earlier spring thaw, and drier summers with more frequent severe summer storms. Warmth earlier in the spring may result in an earlier onset to breeding and nesting. Irregular weather during the winter can result in premature warming of water and potentially cause early emergence. Drier summers may reduce the availability of suitable wetland habitats, requiring longer or more frequent overland movements by turtles and thereby increasing physiological stress and exposure to other hazards.

3.9 Inbreeding

When the rate of recruitment to a population is low and adult mortality potentially high, there is a potential for inbreeding, either sibling with sibling or parent with offspring. There is evidence that young hatchlings find a different water body to grow and develop in separate from the parents (Butler and Graham, 1995; Standing *et al.*, 1997). In large conservation areas like Kejimikujik National Park or Algonquin Provincial Park, the availability of suitable habitats is quite diverse and

maintaining separation is relatively easy. However, it may be that the SMH is too small and maintaining separation between related individuals is difficult. For instance, a population genetic study done in 2001 suggests that a habitat-limited population of Blanding's turtles near Chicago, IL is experiencing loss of genetic diversity, potentially from inbreeding (Rubin *et al.*, 2001). Loss of genetic diversity is a problem because it may limit how the population can respond to future environmental change. Dispersal of eggs by gravid females is an important variable modeled in Section 4.0 which reflects the need to minimize inbreeding.

3.10 Bioaccumulation

Few comparative studies of bioaccumulation of pollutants have been conducted on Blanding's turtles, however there has been extensive work done on the Common Snapping turtle as a sentinel indicator of pollutants in estuaries and freshwater ecosystems. Snapping turtles share many of the same habitats as Blanding's turtles, have a similar lifespan, and like Blanding's turtles, they sit high on their food chains. In theory, both Blanding's turtles and snapping turtles may be susceptible to negative effects on individual health or reproduction due to bioaccumulation of toxins. It is important to note that within the Testudines Order of Reptiles, the various turtle species have evolved along separate pathways and therefore will reflect different risk profiles with respect to their vulnerability to bioaccumulation of pollutants; so interspecies comparisons should be interpreted with caution.

Common snapping turtles stay in one general area from year to year, often for their whole life span, so are likely to remain exposed to the same chemicals year after year. As in most carnivorous or omnivorous species, persistent contaminants accumulate in the fatty adipose tissues, liver, skeletal muscles and may be passed through to their young in the lipid content of eggs. Studies from New York State, Southern Ontario, the St. Lawrence River and Algonquin Park have found evidence of bioaccumulation of polyaromatic hydrocarbons, organochlorines and metals in snapping turtles (Herbert *et al.*, 1993; Bishop *et al.* 1995, 1996). However, the evidence of negative impacts on health or reproduction appears mixed and inconclusive.

Historically, the South March Highlands has been relatively undeveloped, save from the railway routed through the wetlands, a single electricity line, farming in the drier areas and further back in time, lumber extraction from the hillsides. Although contaminant levels have not been sampled in this area, we hypothesize that it is quite possible that the creosote, polyaromatic hydrocarbons (PAH's) and persistent organochlorine contaminants (OCS) in the preservatives for the railway ties and hydro poles may have resulted in some low levels of OCS for the existing Blanding's turtle population prior to the development of Terry Fox Drive and the proposed residential developments.

The above is a brief summary of a complex field of study. A more complete discussion of bioaccumulation in turtles is included **Appendix D**.

