APPENDIX B

LETTERS OF PEER REVIEW

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15 January 2013

I was asked by Dillon Consulting Limited to review a previous draft of the "South March Highlands Blanding's Turtle Conservation Needs Assessment" (BTCNA) and provide a letter with comments on the biology and ecology of Blanding's Turtles in relation to the report. I was not asked to comment on the Population Viability Analyses, but I did make some observations on the management scenarios developed from those models. My assessment of the situation at South March Highlands (SMH) was made without the benefit of a site visit.

My expertise was gained primarily from 33 continuous years (1975-2007) of research on three species of turtles (Blanding's Turtles, Painted Turtles and Snapping Turtles) on the University of Michigan's E. S. George Reserve. Areas of study on Blanding's Turtles include: 1) evolution of life-histories, 2) the importance of indeterminate growth to life histories, 3) aging and the expression of actuarial senescence, 4) reproductive and nesting ecology, 5) spatial biology and core area protection, 6) genetic connectivity among population sub-units, and 7) male reproductive success. I have published 13 papers on Blanding's Turtles (including two conservation assessments) and have one on spatial genetics in review, one on male reproductive success in full draft, and one on reproductive frequency in preparation.

I found the recent draft of the BTCNA to be comprehensive in covering the situation at South Marsh Highlands to date and the proposed management scenarios for Blanding's Turtles cover all important issues. The work on the design, construction and monitoring of the 'eco-passages' in the Terry Fox Drive extension was commendable and further monitoring should provide data useful in future designs. The basic data on the population status and spatial biology of the South Marsh Highland area collected over the past few years provides baseline support for the issues and management recommendations discussed in the report.

My comments on the BTCNA are in two major sections, first is a general statement about Blanding's Turtles at South Marsh Highlands and how their life histories and biology relate to overall conservation concerns. Second are general and specific comments organized around the management objectives listed beginning on page 48 of the BTCNA.

General statement of the problems for Blanding's Turtles in the South March Highlands and in many other areas where they are of conservation concern.

Core areas and conservation. - - The concept of core area (the area required for organisms to successfully complete their life cycle) is important for landscape level conservation planning that is needed at the SMH area. The concept is of particular importance for the conservation of semi-aquatic organisms such as Blanding's Turtles that have core areas that include permanent and ephemeral wetlands and surrounding terrestrial areas. Maintaining the physical and ecological integrity of the core areas of Blanding's Turtles requires an appreciation of the importance of ephemeral wetlands and terrestrial areas, and knowledge of their life-histories, spatial biology, and the behaviors that help define the underlying functions and temporal aspects of habitat use.

To successfully maintain Blanding's Turtle populations, four habitats have to be included in a protected area: 1) resident wetlands, 2) ephemeral wetlands, 3) riparian corridors, and 4) an adequate number of terrestrial nesting areas of reasonable size. Blanding's Turtles have been documented to have long-term fidelity (> 40 years) to a single resident wetland and both sexes of adults make relatively long-distance terrestrial movements to visit (e.g., find mates, and exploit seasonal resources) ephemeral wetlands. In addition, females make long-distance movements to nest in well drained soils in open areas that receive sunlight for much of the day (in Michigan, embryos in completely shaded nests always failed to fully develop). In Michigan, females used from 1- 6 nesting areas in different years, some separated by up to 1 km. Loss of nesting areas (such as KNL Phase 8 lands) and previously visited ephemeral wetlands will certainly cause individuals to move to new areas and that will increase risks associated with movements, particularly movements in new areas. Risks associated with the extensive terrestrial movements of Blanding's Turtles are at odds with the high adult survivorships required to maintain stable populations, particularly in areas that overlap with human development and the associated increased roads and traffic that will occur in the SMH area.

The size of protection zones should be determined from documentation of biologically based core areas of semi-aquatic species. A 33 year study of Blanding's Turtle ecology and spatial biology on the E. S. George Reserve in southeastern Michigan documented that a 2.0 km protection zone around the residence wetlands was required to protect all resident females that nested on the 525 ha protected area, and that approximately 50% of resident females nested outside of the protected area in at least one year of the study (Congdon et al. 2011a). Based on those results, the 400 ha protected area at SMH will probably not be sufficient to encompass all movements and nesting areas used by Blanding's Turtle females. Establishment of inadequate protected areas will allow the integrity of actual core areas to degrade while giving the appearance of protecting wetland communities (see Congdon et al. 2011a and citations therein).

Long-term fidelity to residence wetlands suggests that there are substantial costs associated with changing residence (e.g., increased risks of injury or death and reduced efficiencies in finding and harvesting seasonal resources). In small and isolated populations like the one found at SMH, fidelity to residence wetland contributes to spatial variation in allele frequencies that can contribute to the probability of loss of genetic diversity. Because Blandings Turtles have long reproductive lifetimes, fidelity to residence wetlands increases the probability of within generation inbreeding (between siblings) and intergenerational inbreeding (between parents and offspring) that will also contribute to loss of genetic diversity within the population. In addition, fidelity to a single residence wetland substantially reduces the probability of genetic exchange resulting from immigration or emigration of adults, the most often documented mechanism promoting genetic connectivity between sub-units of metapopulations and between populations. At SMH fidelity to residence will also result in increased risks for adults remaining in wetlands impacted by development.

Blanding's Turtle life-history and conservation. - - Compared to shorter-lived organisms, the suite of co-evolved life-history traits of Blanding's Turtles pose additional problems for conservation efforts. The life-history trait values of Blanding's Turtles include: 1) high adult survivorship, 2) potentially long reproductive lifespans, 3) low nest (embryo) survivorship, 4) high average juvenile survivorship, 5) delayed attainment of sexual maturity (14-21 years), 6) and low annual fecundity. Reproductive output of females (clutch size and clutch frequency) and parental investment (i.e., egg and offspring size) primarily increase with age rather than body size and that contributes to older females being valuable for population persistence.

An important conservation issue for Blanding's Turtle is that delayed maturity requires high average juvenile survivorship (from yearling to age at maturity) to result in adequate recruitment of juveniles into the adult population (i.e., replace the adults that die). In most cases the smaller body sizes of juveniles (compared to adults) increases risk of being killed by predators and therefore it very difficult to increase the survivorship of juveniles, particularly if core habitats are degraded or lack all components.

Comments specific to the Management Objectives of the BTCNA.

The BTCNA management objectives address the major issues related to the conservation of Blanding's Turtles at SMH.

Objectives for reducing direct and indirect causes of mortality of Blanding's Turtles. - -

1. A lot of thought went into the "Wildlife Culvert Crossings" and associated fencing and a lot can be learned from efforts to determine culvert characteristics (e.g., lighting and substrates) that will promote use by Blanding's Turtles and other organisms. Because fencing material and its configuration may pose a trap hazard for different sized animals, the areas around culvert opening should be monitored and periodically searched for dead animals.
2. As development within the radius of Terry Fox Drive is completed, I think that site fidelity to residence wetlands will result in continued exposure to increased risks rather than result in adults moving to less impacted wetlands.
3) Poaching for the pet trade will remain a serious and a particularly deleterious problem for Blanding's Turtle populations since experienced poachers can remove a substantial number of adults from the population in a relatively short time. Poaching is particularly detrimental to small populations because removal any number of adults may represent a large proportion of reproductive females and removal is a population equivalent of death. The proposed use of publicity to make poachers aware of risks and penalties for poaching activities will probably reduce risks of loss of turtles.
4) Using metal cages should not be part of protocols to protect nests because metal cages apparently affect magnetic fields around the embryos and hatchlings in nests (Irwin et al. 2004). At present it is not known whether hatchling freshwater turtles use a sun or magnetic compass to maintain headings while dispersing from nests when target habitats are not available (Pappas et al. 2009; Congdon et al. 2011b; Iverson et al. 2011).

Transplantation of adult turtles, nest protection, and head starting. - - On page 28 of the BTCNA three potential management strategies are suggested based on the Population Viability Analyses.

"First, if two adult female turtles every 5 years are removed from the SMH-C sub-population and transplanted in the KW subpopulation, the action prevents decline in the KW sub-population, but causes the SMH-C subpopulation to decline (an undesirable outcome)."

> An underlying assumption is that transplanted adults will remain in a new residence wetland. I have reservations that adult turtles would remain in a new area; however, I know of no data pro or con on translocation of adult Blanding's Turtles.

"Second, the next management strategy modeled was to protect nests found in the area. The outcome of the nest protection scenario suggests a positive outcome, as both the SMH sub-populations grow and the KW sub-population remains unchanged, compared to the Baseline model."

Protecting nests is not difficult (but see above comment about using metal cages) but locating nests requires a substantial effort.

"Third, if a head start program is implemented (eggs hatched and young reared for 2 years in captivity prior to release) both SMH sub-populations increase in size while the KW sub-population also shows positive growth."

Head starting turtles is difficult and expensive, particularly if such an endeavor must continue over many years. Harvesting eggs requires nests to be located, gravid females to be captured and induced to lay eggs with hormones, or gravid females have to be held in enclosures until they lay eggs. I am not sure females will voluntarily lay eggs in captivity (in Michigan, 12 female Painted Turtles were moved to outdoor ponds with adjacent nesting areas after the nesting season, none laid eggs the following year). After eggs are obtained, incubation temperatures and moisture content of egg incubation substrates have to be closely monitored because they influence the sexes and quality of hatchlings. After that, hatchlings reared for 2 years.

Conclusions. - - I fully agree with the summary paragraph on p. 67.

"In addition, the recommendations made to curtail further habitat loss, degradation and other threats to the SMH Blanding's turtle should be explored prior to any further urban development outside of the Terry Fox Drive planning area. The conservation and protection of this species at risk requires collaboration, sustainable funding, innovation and enforcement by government, landowners, researchers, non-governmental organizations and the public."

However, I think that some curtailment to development inside the Terry Fox Drive planning area may also be required to reduce the severity of influence on resident turtles there.

The single and most important issue for South March Highlands (SMH) Blanding's Turtles is the amount of protected land and a commitment to managing all four habitats listed above. The paragraph on page 3 of the BTCNA describing the situation at SMH is not encouraging.

"Overall, the South March Highlands has experienced multiple, cumulative effects of urbanization, including direct loss of habitat, fragmentation, and alteration of drainage patterns. These impacts are projected to continue in the future, resulting in the permanent loss, isolation or degradation of approximately half of the natural landscape. The remaining 400 ha of Conservation Forest will be largely bound by urban development, arterial and collector roads, and estate lot developments. At present, a semi-natural landscape connection exists between the Conservation Forest and the floodplain of the Carp River. However, that connection would be lost if development were to occur in the newly approved urban expansion study area".

Based on the situation at SMH and the results from my three decades of study, I am skeptical that a stable Blanding's Turtle population can be maintained on the remaining 400 ha of the SMH Conservation Forest. Successful conservation programs for Blanding's Turtle and other semi-aquatic organisms require broad-scale protection of wetlands of all sizes and protection of substantial areas of terrestrial habitats. I recognize that further work is necessary to identify critical Blanding's Turtle habitats in the SMH area. Surveys identifying critical nesting areas and their qualities will be important to maintain adequate recruitment into the SMH population. Identifying patterns of use of riparian corridors for movement within and adjacent to protected areas are desperately needed to understand how well existing protected lands are adequate to protect the existing Blanding' Turtle population.

Acquiring key terrestrial areas suitable for nesting, overland access routes to those nesting areas, and additional riparian corridors connecting SMH to other populations or sub-populations will substantially reduce the need for long-term and expensive conservation interventions (e.g., wetland construction, nesting area construction, nest protection, head starting). As stated the BTCNA abstract.

> "Blanding's Turtle conservation and management in the SMH must remain a priority of the City of Ottawa and other stakeholders to help preserve this threatened, unique species. Should the objectives, targets and recommendations of the BTCNA not be implemented, the Blanding's Turtle in the SMH will continue to face threats to their core habitats, survivability and population abundance".

Over time, the cost of acquiring critical additional land areas would be discounted by reductions in intensive conservation management costs. Because interest in maintaining long-term commitments to intensive conservation efforts often wane, acquiring critical habitats for protection will, in my opinion, have the highest probability of long-term success in promoting the persistence of the SMH Blanding' turtle population.

Sincerely,

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References

Irwin, W.P., A.J. Homer, K.J. Lohmann. 2004. Magnetic field distortions produced by protective cages around sea turtle nests: unintended consequences for orientation and navigation. Biological Conservation 118:117-120.

Iverson, J.B., R.L. Prosser, and E.N. Dalton. 2009. Orientation in juveniles of a semiaquatic turtle *Kinosternon flavescens.* Herpetologica 65:237–245.

Pappas, M.J., J.D. Congdon, B.J. Brecke, and J.D. Capps. 2009. Orientation and dispersal of hatchling Blanding's turtles (*Emydoidea blandingii*) from experimental nests. Canadian Journal of Zoology 87:755–766.

Congdon, J.D., O.M. Kinney, and R.D. Nagle. 2011a. Spatial Ecology and Core Area Protection of Blanding's Turtle (*Emydoidea blandingii*). Canadian Journal Zoology, 89:1098-1106

Congdon, J.D., M.J. Pappas, B.J. Brecke, and J.D. Capps. 2011b. Conservation implications of initial orientation of naïve hatchling Snapping Turtles (*Chelydra serpentina*) and Painted turtles (*Chrysemys picta belli*) dispersing from experimental nests. Chelonian Conservation and Biology 10:42–53.

11 January 2013

Review of the *South March Highlands Blanding's Turtle Conservation Needs Assessment* by Dillon Consulting

Preface

Blanding's turtles (*Emydoidea Blandingii*) are semi-aquatic turtles that are found in the eastern half of North America at a latitudinal range corresponding roughly to that of the Great Lakes. In Canada, they are found primarily in Ontario and Québec, but a disjunct population also occurs in Nova Scotia. The designatable unit of the St. Lawrence/Great Lakes that occurs in Ontario and Québec is considered Threatened by the Committee on the Status of Endangered Wildlife in Canada as per the last species assessment conducted in May 2005. As such, this designatable unit is listed on Schedule 1 of the Canadian Species at Risk Act.

Blanding's turtles occur within the Ottawa city limits. Ongoing development in the city puts several populations in jeopardy. One such population occurs in the South March Highlands. In an effort to preserve this population of Blanding's turtles, the City of Ottawa has asked Dillon Consulting to prepare an assessment of its conservation needs. In the present document, I offer my review of this assessment entitled «*South March Highlands Blanding's Turtle Conservation Needs Assessment*». In March 2012, I have also provided a review of the document entitled «*Professional Services Proposal: Blanding's Turtle Conservation Management Plan*» by Dillon Consulting that served as the planning document for the current assessment.

Brief Qualifications

I have been conducting research on reptiles since 1995. My research areas are Evolutionary Ecology and Conservation Biology. Since 2000, I have published over 75 articles in peer-reviewed journals on the ecology of reptiles. Specifically in the context of this review, my graduate students and I have conducted two radio-telemetry studies of Blanding's turtles: one is St. Lawrence National Park, and one in Gatineau Park and adjacent lands. Thus far, these two studies have led to the following publications:

- Millar C. 2010. The spatial ecology of Blanding's turtles (*Emydoidea blandingii*): from local movement patterns, home ranges and microhabitat selection to Ontario-wide habitat suitability modeling. MSc Thesis, Department of Biology, University of Ottawa.

✤ Millar CS & Blouin-Demers G. 2011. Spatial ecology and seasonal activity of Blanding's turtles (*Emydoidea blandingii*) in Ontario, Canada. Journal of Herpetology 45: 370-378.
✤ Millar CS & Blouin-Demers G. 2012. Habitat suitability modelling for species at risk is sensitive to algorithm and scale: a case study of Blanding's turtle, *Emydoidea blandingii*, in Ontario, Canada. Journal for Nature Conservation 20: 18-29.
✤ Millar CS, Graham JP & Blouin-Demers G. 2012. The effects of sex and season on patterns of thermoregulation in Blanding's turtles (*Emydoidea blandingii*) in Ontario, Canada. Chelonian Conservation and Biology 11: 24-32.
✤ Fortin G, Blouin-Demers G & Dubois Y. 2012. Landscape composition weakly affects home range size in Blanding's turtles (*Emydoidea blandingii*). Écoscience 19: 191-197.
✤ Fortin G. 2012. Can landscape composition predict movement patterns and site occupancy by Blanding's turtles? A multiple scale study in Québec, Canada. MSc Thesis, Department of Biology, University of Ottawa.

Finally, I am a Full Professor in the Department of Biology at the University of Ottawa, and an elected member of the Amphibians, Reptiles & Turtles sub-committee of the Committee on the Status of Endangered Wildlife in Canada.

General Comments

In general, I found the assessment thorough and comprehensive. It was mostly easy to read, although several sentences were awkwardly written. I do have several suggestions for improvement, however. I detail these suggestions below.

I think population isolation needs to be addressed in more depth in the report. A strong case can be made that the long-term likelihood of survival of the South March Highlands Blanding's turlte population is near zero if it is completely isolated. This point is somewhat made on Page 11 and on Page 58, but a stronger case can and should be made early in the report. With an effective population size (i.e., reproductive individuals) probably around 100, the South March Highlands populations falls very short of being self-sustainable. The minimum effective population size that is necessary to avoid extinction has been estimated to range from about 500 to 5000 individuals.

✤ Lande R. 1995. Mutation and conservation. Conservation Biology 9: 782-791.
✤ Franklin IR & Frankham R. 1998. How large must populations be to retain evolutionary potential? Animal Conservation 1: 69-73.

Another point that I think should be addressed more thoroughly and early in the report is what we should consider to be the proper baseline. We have no information on what this population of Blanding's turtles was like before the City of Ottawa was created. What are the impacts that have occurred prior to the development of the area? Surely, the original population has been reduced as a result of habitat loss and habitat fragmentation. Data gathering only started a few years ago, a very long time after development started affecting this population. This issue is alluded to on the top of Page 11, but this is a very important point that deserves further discussion. In conservation, there is a realization that the baseline is shifting with each passing generation. If this trend continues, there is a real danger that we may consider the baseline to be much degraded ecosystems.

- Pauly D. 1995. Anecdotes and the shifting baseline syndrome of fisheries. Trends in Ecology and Evolution 10: 430.
- Papworth SK, Rist J, Coad L & Milner-Gulland EJ. 2009. Evidence for shifting baseline syndrome in conservation. Conservation Letters 2: 93-100.

Specific Comments

Page iii: The statement «The field research reported herein, however, is the first in-depth study conducted on an individual population in this region» is inaccurate if you consider Gatineau Park to be part of the Ottawa-Gatineau region. We have conducted an extensive radio-telemetry study as well as a population survey from 2008 to 2011 in the western section of Gatineau Park and adjacent lands. Two documents have already been published from this work.

- Fortin G, Blouin-Demers G & Dubois Y. 2012. Landscape composition weakly affects home range size in Blanding's turtles (*Emydoidea blandingii*). Écoscience 19: 191-197.
- Fortin G. 2012. Can landscape composition predict movement patterns and site occupancy by Blanding's turtles? A multiple scale study in Québec, Canada. MSc Thesis, Department of Biology, University of Ottawa.

Page iv: I agree that Objective 1 should be the top priority, and that part of Objective 2 (population monitoring) should be the next priority. Objectives 2 and 4 are partly redundant. I think Objective 2 should be about continued population monitoring, while Objective 4 should be about filling knowledge gaps both in terms of life history and habitat needs. I would keep Objective 3 about habitat protection. Objectives 5 and 6 are fine. Objective 7 should be clarified. The Species at Risk Act already affords legal protection of the species. In terms of critical habitat, this applies to federal lands only. The 'safety net' that is built into the Act, however, could theoretically be invoked to afford protection to the South March Highlands population of Blanding's turtles. In addition, as is explained on Page 3, the Endangered Species Act of Ontario also affords protection to the species and its habitats.

Page 3: The statement «... Old Carp Road. The latter road bisects the northern half of the South March Highlands, but because it is narrow and heavily forested on both sides it may not be a significant barrier to movement of Blanding's turtle» is unsubstantiated. The barrier effect of roads can occur in two ways: 1) animals avoid crossing the roads, or 2) animals attempt to cross the roads, but get hit by vehicles and die. In both cases, the effective dispersal is much reduced. In the second case, not only is effective dispersal reduced, but mortality augmented. Thus, the negative population effects of small forested roads that animals attempt to cross can sometimes be worse than those of large roads that animals do not attempt to cross. In the absence of strong data on both the propensity to cross various types of roads and on the risk of mortality while crossing these roads, it is premature to speculate that a small forested road is not a significant barrier.

Page 8: The Canadian range of the Blanding's turtle extends into Québec. This is actually mentioned at the bottom of Page 10. The range extent should be made clear here, as the connectivity of the South March Highlands population is most likely to be achieved through connections with the populations living on both sides of the Ottawa River to the north of the South March Highlands. In addition, while the studies by Congdon and colleagues do provide very valuable information on patterns of habitat selection and life history characteristics, additional studies have been conducted locally by our research group (see references above) and that of Jacqueline Litzgus at Laurentian University:

- Edge CB, Steinberg BD, Brooks RJ & Litzgus JD. 2010. Habitat selection by Blanding's Turtles (*Emydoidea blandingii*) in a relatively pristine landscape. Écoscience 17: 90-99.
- Paterson JE, Steinberg BD & Litzgus JD. 2012. Revealing a cryptic life-history stage: differences in habitat selection and survivorship between hatchlings of two turtle species at risk (*Glyptemys insculpta* and *Emydoidea blandingii*). Wildlife Research 39: 408-418.
- Edge CB, Steinberg BD, Brooks RJ & Litzgus JD. 2009. Temperature and site selection by Blanding's Turtles (*Emydoidea blandingii*) during hibernation near the species' northern range limit. Canadian Journal of Zoology 87: 825-834.

This body of work even includes the elusive juvenile life stages. The patterns of habitat selection documented in these local studies are likely to be more applicable to the South March Highlands population than those found by Congdon and colleagues in Michigan. I am very surprised that more references are not made to this body of work in this section.

Page 15: One cannot really expect to document evidence of effective dispersal (animals moving between distinct populations and successfully reproducing in their new population) via a radio-telemetry study. The rule of thumb in population genetics is that 1 to 10 effective migrants per generation is sufficient to maintain gene flow.

- Mills LS & Allendorf FW. 1996. The one-migrant-per-generation rule in conservation and management. Conservation Biology 10: 1509-1518.

✤ Wang J. 2004. Application of the one-migrant-per-generation rule to conservation and management. Conservation Biology 18: 332-343.

Given that the generation time for Blanding's turtles is probably 15 to 20 years, it would still be unlikely to detect an effective migrant in a two-year mark-recapture and radio-telemetry study even if radio-transmitters were attached to all adults. Genetic tools are probably more appropriate than telemetry data to assess the current and past levels of genetic connectivity with neighbouring populations.

Page 20: Inbreeding would be reduced by maintaining connectivity with neighbouring populations. Again, I think this is a very important point.

Page 21: I am surprised that reference is made only to organic toxins in the first paragraph of the section on bioaccumulation. I would think mercury, which is inorganic, may be a prime candidate for bioaccumulation in turtles.

Page 22: I am surprised that habitat loss is not mentioned as a factor of endangerment in the first paragraph.

Page 22: In section 4.1 on Population Viability Analysis, I think it must be made crystal clear that making absolute predictions about extinction risk is a very shaky enterprise. As I indicated in my review of the initial proposal, PVA can be effectively used to compare various conservation scenarios, for instance:

✤ Row JR, Blouin-Demers G & Weatherhead PJ. 2007. Demographic effects of road mortality in black ratsnakes (*Elaphe obsoleta*). Biological Conservation 137: 117-124.
✤ Bulté G, Carrière MA & Blouin-Demers G. 2010. Impact of recreational power boating on two populations of northern map turtles (*Graptemys geographica*). Aquatic Conservation 20: 31-38.

Its use to make absolute predictions is, however, rightly critiqued. PVA is very sensitive to variation in input parameters. In addition, PVA requires input parameters that are unknown for most species, for instance age-specific survivorship from birth to adulthood. This is why many authors recommend that PVA be used to evaluate relative rather than absolute extinction risk.

✤ Ellner SP, Fieberg J, Ludwig D & Wilcox C. 2002. Precision of population viability analysis. Conservation Biology 16: 258-261.

I could not agree more with these authors: using PVA to make absolute predictions about the risk of extinction is a shot in the dark. My experience with PVA is that slight variation of some key input parameters (e.g., juvenile survival) within the range of our estimated values has a dramatic influence on the probability of persistence. Some allusion is made to this limitation is sections 4.1.1 and 4.1.5, but I think this information should figure prominently in section 4.1.

Page 23: The reality is that we have no idea whether the number of males present affects the population growth rate. Even if males are polygynous, they could be sperm limited. Although sperm are less costly to produce than eggs, they are not free. In the absence of a sufficient number of males, it is possible that some females are not inseminated. This is an entirely untested assumption. This comment also applies to Page 77.

Page 26: Translocation (a better word than transplantation) of adult reptiles has been shown to be a very poor conservation strategy. Adult reptiles frequently do not survive translocation events. I am thus unsure adult translocation should be envisioned.

- Reinert HK & Rupert RR. 1999. Impacts of translocation on behavior and survival of timber rattlesnakes, *Crotalus horridus*. Journal of Herpetology 33: 45-61.
- Sullivan BK, Kwiatkowski MA & Schuett GW. 2004. Translocation of urban Gila monsters: a problematic conservation tool. Biological Conservation 117: 235-242.

Page 36: It would be useful to describe briefly how habitat suitability is derived in the body of the report. As it turns out, I do not think this index can really be called habitat suitability (please see my last comment below). Also, it would also be useful to preface this section with a short explanatory paragraph on why this habitat suitability index was derived.

Page 39: The role of COSEWIC is to assign species to risk categories. The identification of critical habitat is actually the responsibility of recovery teams or government agencies.

Page 41: There is real danger in inferring the importance of movement corridors with, relative to the whole population, fairly scant telemetry data. As indicated above, not very much movement is necessary to maintain population connectivity. Thus, existing corridors that appear under utilized may in fact be important in maintaining long-term population connectivity.

Page 46: Please refer to my comments on the objectives presented for Page iv above. These comment apply equally here. In addition, I am unsure of the distinction between 2.1 and 2.2. They seem largely overlapping. I am unsure 4.2 is really relevant in the context of this assessment. What laws does 7.1 refer to? There are already a provincial law and a federal law that can both be used to protect Blanding's turtles and their habitat. The tools are in place, they need to be used.

Page 58: Given the limited dispersal ability of Blanding's turtles, and their propensity to use the same areas year after year, re-creating habitats in areas where there are no Blanding's turtles, or in areas inaccessible to Blanding's turtles, seems unlikely to yield conservation benefits for this species.

Page 63: An ecological trap is actually an area where a given species is attracted, but where the population growth rate is negative. The population is only sustained because of immigration. The negative growth rate can, but is not necessarily due, to genetic isolation. The negative growth rate is actually often attributed to poor local reproduction.

Page 77: I am surprised that a greater dispersing ability is inferred for adults than for juveniles. Adults tend to be very faithful to their home ranges year after year. I would expect that most dispersal occurs at the juvenile stage, not at the adult stage.

Page 88: Again, I am surprised that only organic pollutants are considered in the first sentence. Given the life habits of turtles, I suspect they accumulate several metals, notably mercury.

Pages 91-93: This habitat suitability index is a bit misleading. It considers several variables, but the suitability values are then defined by the researcher based on experience. Therefore, the suitability values are largely arbitrary. In addition, the contributing variables are weighed differently, with no rationale given for the selection of the various weights. Therefore, although in the body of the report the index looks more formal than a simple assignment by the researcher, it really boils down to the researchers's best guess based on relatively scant telemetry and capture data. This aspect deserves acknowledgement in the body of the report. In addition, habitat suitability is probably an inappropriate name for this index. I would call it a 'subjective habitat quality index'. Habitat suitability models are a class of models that employ a series of predictor variables (often habitat variables) to predict correctly the presences and absences of a species. For example, see:

- Millar CS & Blouin-Demers G. 2012. Habitat suitability modelling for species at risk is sensitive to algorithm and scale: a case study of Blanding's turtle, *Emydoidea blandingii*, in Ontario, Canada. Journal for Nature Conservation 20: 18-29.

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Dr. Blouin-Demers' Comment	Location in Text	Response/Action
1)General comments	Forward	RESPONSE. Dr. Stow has addressed these comments in his forward of the Conservation Needs Assessment.
2) Inaccuracy with respect to the statement that the study is the first in the region.	End of first paragraph of Executive Summary	REVISED. The field research reported herein represents one of the first in-depth studies conducted on an individual population in the urbanized area of the Ottawa and Gatineau region.
3) Comment about objectives	Page iv	NOTED.
4) Comment about Old Carp Road and threat to Blanding's turtles	Page 3	NOTED. We acknowledge the statement is speculative and have written it as such.
5) Range extent	Page 8	REVISED. Blanding's turtles range from central Nebraska and Minnesota to southern Ontario/southwestern Quebec and northern New York.
6) Studies by Litzgus	Page 8	NOTED.
7) Comment on effective dispersal	Page 15	NOTED.
8) Inbreeding	Page 20	NOTED.
9) Bioaccumulation in turtles	Page 21, first paragraph	REVISED. Removed "organic" from the sentence
10) Comment about the omission of habitat loss as a threat	Page 22, first paragraph	REVISED. Added habitat loss to the last sentence.
11) Comment about the interpretation of PVA data in general	Page 22	NOTED.
12) Male presence and sperm limitation	Page 23	NOTED.
13) Comment on Translocation	Page 26	NOTED.
14) Comments on Habitat suitability	Page 36 and Appendix E	REVISED. Now reads: A subjective Blanding's Turtle Habitat Quality Index (HQI_{BT}) was created to reduce biases in the one used in previous Dillon reports. The new approach uses a Geographic Information System (GIS) to model Habitat Quality based on weighted environmental variables based on researcher experiences.

		REVISED. Replaced Habitat Suitability with Habitat Quality throughout.
15) Comment on COSEWIC and Critical Habitat	Page 39	NO CHANGE NEEDED
16)Comments on Conservation Objectives	Page 46	NOTED.
17) Creating habitat in new areas	Page 58	NOTED.
18) Ecological Trap Definition	Page 62	REVISED.
19) Dispersal Ability	Page 77 (Appendix C)	NOTED. Dispersal in the model relates to distance travelled over the year. We acknowledge that there is little evidence to support whether adults or juveniles disperse further.
20) Organic Pollutants	Page 88	See response to comment 9)
21) Habitat suitability	Appendix E	See response to comment 14)