Expert Report on the possible effects of the Windsor-Essex Parkway on Butler's Gartersnake (*Thamnophis butleri*) for the purposes of a potential permit issued under clause 17(2)(d) of the Endangered Species Act, 2007

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1. Executive Summary.

This report examines the LGL/URS report on the potential impact of the proposed Windsor-Essex Parkway (WEP) on the survival of Butler's Gartersnake (*Thamnophis butleri*), a species listed as Threatened in Canada (COSEWIC) and in Ontario (COSSARO). The WEP construction will destroy about 25% of the snakes' habitat in the study area, including an area that is used by at least 80% of the snakes. To compensate for this loss, the LGL report proposes to mitigate by moving some snakes to a larger area of restored or created habitat. The LGL report is judged to lack sufficient data to determine whether the mitigation will succeed. The report simply reports numbers of snakes captured under boards using limited sampling events, using an inexplicable distribution and number of boards, and moreover lacks any data on food, causes of mortality, hibernation and habitat needs. Many of the assertions in the report, particularly on movements, habitat needs and hibernation have no factual foundation. There appears to be no investigation of the literature on translocation of snakes and the problems with this management strategy.

Thus, the translocation of the snakes is judged to be an *ad hoc* venture with no serious planning or scientific basis. The construction and mitigation will inevitably kill many snakes and the population data from 2008 indicate that this mortality could lead to extirpation of the population because of the small number of breeding females. If the WEP proceeds and the impact on the snakes is as severe as judged in this report, then there could be a negative impact on the Butler's Gartersnake's survival and recovery in Ontario because the species appears to be declining and is confined to a dwindling number of small isolated locations.

Outline of Report Structure

This report is organized into two major sections corresponding to the two questions the writer was asked to address in the Terms of Reference provided by OMNR. (Note: numbering of sections refers to the report structure requested in the Terms of Reference). The first major section will address the question of how the proposed construction of the Windsor-Essex Parkway (WEP) portion of the DRIC project may potentially affect the population of Butler's Gartersnake *(Thamnophis butleri*) in the study area described in the LGL/URS report and how the proposed mitigation measures could alter these impacts. In discussing the proposed mitigation, the author will discuss limitations of the LGL/URS study and report and how these limitations might be addressed in the context of recent research on the success or failure of translocation strategies in other conservation actions people have undertaken on populations or species that have been threatened by

development. The second section of the report will address the question of potential impact of the proposed Parkway on the survival and recovery of Butler's Gartersnake in Ontario, and by extension in Canada as the species' Canadian range is confined to Ontario. This question is the more difficult and important of the two. At present, although we have a reasonably accurate knowledge of the distribution of Butler's Gartersnake, we have almost no data on abundance or trends in abundance, and even the basic biology, such as age-specific survival, hibernation requirements, parasites, predators, diurnal patterns of activity, mating system, reproductive output and so forth are poorly known, and what we do know mostly comes from studies in somewhat more temperate climates in the USA. No Recovery Plan exists for Butler's Gartersnake, and indeed, there is apparently not even a Recovery Team despite this species having been listed by both COSEWIC and COSSARO as Threatened since 2001. These omissions and vast knowledge gaps make pronouncements on the possible loss of one of the populations of the species somewhat speculative. The report begins with a brief review of what is known about the more important and relevant aspects of Butler's Gartersnake biology and distribution to set the context for the remainder of the report.

Brief Background on Butler's Gartersnake (*Thamnophis butleri*).

Butler's Gartersnake has the smallest global distribution of any Canadian reptile and its range in Canada is restricted to a scattering of small, locally isolated populations in Ontario, bordering on the Detroit River, Lake St Clair, the St Clair River and the extreme southern

shore of Lake Huron between Windsor and Sarnia. Two disjunct populations occur at Skunk's Misery in the southwest extreme of Middlesex, and Luther Marsh in Wellington County near Guelph. At least two other such isolated locations, remote from the main distribution, have been reported but seem unlikely to have the species (COSEWIC 2001). Although the patchy distribution of Butler's Gartersnake could result from populations being overlooked or from a pattern of introductions, there is no evidence that either of these hypotheses is true (M. Oldham pers. comm. 1999). It is now accepted that this odd and restricted range represents relic populations from a former distribution over much of south western Ontario when there was an extensive prairie habitat (Planck and Planck 1977; Harding 1997; COSEWIC 2001). It appears that Butler's evolved from the Plains Gartersnake (*Thamnophis radix*) along with the Short-headed Gartersnake (*Thamnophis brachystoma*). Butler's presumably moved into Ontario during the Hypsithermal Period (~9000-5000 ybp (Harding 1997). During the latter half of this period (Xerothermic Interval), it was warm and dry and south west Ontario was largely covered in tall-grass prairie and oak savanna and part of the 'prairie peninsula' (Schmidt 1938; Smith 1957; Schueler and Westell 1975). These habitats are largely gone and so is Butler's Gartersnake Gregory 1977).

Butler's Gartersnake is currently slated for an updated reassessment in 2010 by both COSEWIC and COSSARO. The COSEWIC assessment involves field surveys to update our knowledge of its presence. These surveys are ongoing in summer 2009, and have included searches of almost all of the approximately 36 locations reported to the NHIC (COSSARO

2001), plus others that may contain the species based on unconfirmed reports and/or apparently suitable habitat (D. Noble, J. Choquette pers. comm. July 2009).

There are three key features of this species relevant to this report's assessment of the possible effects of the proposed WEP on this snake. First, Butler's Gartersnake is considered to be a habitat specialist, having evolved in conjunction with tall-grass prairie habitat (Harding 1997; COSEWIC 2001). As such, the species is associated with high quality prairie remnants in Ontario and thus often associated with other at risk prairie species, particularly plants. That said, however, Butler's Gartersnake is frequently found in highly degraded habitats, such as old quarries, old fields, fields littered with junk and human detritus that serve as cover for the snakes, wastelands, and areas highly modified by people, surrounded by urban landscapes. Almost always, they are close to water. Second, Butler's Gartersnake has a highly specialized diet, consisting almost exclusively of earthworms, and, occasionally, leeches (Carpenter 1952, Casbourn et al. 1976; Planck and Planck 1977; Catling and Freedman 1980b). Behavioural studies demonstrate that Butler's is better able to track and capture earthworms and leeches than are sympatric gartersnakes (Burghardt 1969, 1970). As such, it is likely that much of its distribution, activity and population size depends on availability and activity of earthworms, a point made strongly in the foregoing literature. Third, Butler's Gartersnake is small (~50cm maximum size), inconspicuous, and rare, confined to debris-filled fields with heavy grass cover. Therefore, we know relatively little about it and there have only been two significant studies in Ontario (Planck and Planck, 1977; Catling and Freedman 1977, 1980a,b; Freedman and Catling 1978, 1979). Indeed, even the relationship between Butler's

Gartersnake and the Plains Gartersnake (*Thamnophis radix*) is not really clear, nor is whether or not the Ontario populations of *T. butleri* might be a complex of two species, Butler's Gartersnake and the even rarer Short-headed Gartersnake (*Thamnophis brachystoma*) (Ruthven 1904, 1908; Logier 1939a,b; Bleakney 1958; Logier and Toner 1961; Rossman et al. 1996; Harding 1997; Minton 2001). It is hoped that genetic samples being collected in the COSEWIC survey may help to resolve these uncertainties. All these factors should be considered in evaluating the potential impact of the proposed Parkway on the recovery and future survival of Butler's Gartersnake in Ontario.

SECTION 1

2. **What are the possible effects of the activities associated with the construction of the Windsor-Essex Parkway portion of the DRIC project on Butler's Gartersnake (*Thamnophis butleri*), taking into account the proposed mitigation? Construction activities may include but are not limited to site preparation, excavation, building road base, cut/fill areas, grading, ditching, drainage (culverts), excess overburden placement, office, equipment storage/maintenance areas, paving, landscaping, installation of utilities, demolition of houses, etc. and associated mitigation activities.**

It appears that the proposed Parkway will directly affect Butler's Gartersnake in the area between [redacted] (ECRP) where the WEP meets the ECRP. At this site, the LGL report indicates that Butler's

Gartersnakes use several small fields (1-3ha each total = 7.0 ha). Part or all of four of these fields were to have been directly affected in that the proposed road construction was going over them (Fields A, B, E, F). A proposed modification of the original plan would reduce this direct impact from 3.0 ha to 2.1 ha, essentially reducing the per cent of Butler's habitat removed from ~42% to ~25%, but still removing all of fields B and F and much of E. Field A would end up directly along the south edge of the proposed new construction. One point not addressed in the discussions of the fields removed under these two alternatives is that ~ 80% of the Butler's Gartersnakes captured were in Fields A and B.

There are four issues here. First, there are the potential impacts from project activities. Second, we must look at the study that LGL has conducted and at their conclusions about how the snakes use the area, how many snakes there are and their ecology. Third, we must consider the mitigation proposed by MTO and by the LGL team. Finally, we have to address possible shortcomings of the snake study, its uncertainties and knowledge gaps, and finally the limitations of the presentation of the study's results.

Project Activities: Description and Effects.

The project's activities were not described in detail in the material provided, but there are several obvious activities associated with construction and with the influx of people and the mitigation activities that will affect the snakes. First, without mitigation, the machines and complete habitat destruction in the areas directly affected (Fields F, B, parts of Fields A and E) will directly kill any snakes living there. Raising awareness among workers will not help mitigate these effects as these snakes are small and inconspicuous

and will likely go underground with disturbance from heavy machinery. Second, the construction activities will destroy any hibernation sites on these fields and the snakes in them or needing them. Third, increased traffic in the construction area will increase snake mortality. Fourth, capture and translocation of Butler's Gartersnakes as part of mitigation will undoubtedly increase stress on the snakes potentially leading to increased rates of mortality and reduced reproductive output. Fifth, the report does not mention any consideration of the timing of the onset of construction activities or the translocation of snakes. This timing would be significant and its impact needs to be considered fully. Sixth, based on the LGL capture data, as noted earlier, the habitat removed and maximally disturbed is by far the most important for Butler's Gartersnakes in the study area. Finally, the construction activities will inevitably reduce abundance of snakes and given the population data in the LGL report, even a small reduction could push the population to extinction. Although the LGL reports from 2008-09 suggest a "healthy" population, one must look at the number of breeding females as the most significant segment of the population. In 2008, of 106 captured snakes only 18 (~20%) were breeding age females and only 50-75% of these are likely to breed in a given year (Harding 1997). The population estimates suggest 150 snakes in the population. Therefore, if 20% are adult females and if 50-75% breed, then we have only 15-23 females who are potential breeders. Even a small amount of mortality from construction added to normal mortality could reduce reproduction to a point from which the population could not recover.

3. Possible Effects of Activities and Proposed Mitigation on Butler's Gartersnake.

The LGL Study

LGL looked at an area directly impacted by the WEP EFA bounded by [redacted]

Butler's Gartersnake habitat was assessed as seven "fields" with a total area of 7 ha. The area (study site) is highly disturbed by people. The study commenced in April 2008, and ran until the end of Oct 2008. It is continuing in a similar manner in 2009, and a one-page summary of 2009 results up to early July was provided to the author of this report. In 2008, they set out 131 boards (an accepted procedure to find cryptic snakes) to attract snakes looking for cover. Captured snakes were measured, marked for individual recognition and recaptures were used to estimate distances moved, growth rates and abundance. This approach is fairly standard if one wants only this basic information. The seven fields were identified as A-F. Boards were checked once per week in April, May, and perhaps September and October (this was not clear), and only once per month in June, July and August, on the supposition that the snakes were inactive in summer.

They caught 44 adult Butler's and 62 young of the year (YOY), of which 94% were captured in fields A, B, and C. This uneven distribution and the fact that all captures in the first half of April (two weekly samples) were in Field A were attributed to the hypothesis that snakes hibernated in fields A and perhaps B, but also may reflect that most sampling boards were in A and B (48 and 36 = 84 of 131) for unexplained reasons. The arrangement of boards was also systematic in Fields A and B but seemed haphazard in other fields: see Fig. 4).

The recapture data were subjected to four different methods to estimate population size. These estimates indicated a population of adults plus YOY of about 140-160 individuals with 95% confidence limits of 123-163 for the POPAN estimate that took into account the other 3 estimates (Table3 in LGL Report). These seem to be fairly reliable estimates given the relatively narrow confidence limits.

Problems with the LGL Snake Data

Although the report suggests the snakes moved out to all fields in July, only three snakes were found in fields E, F, D, and G combined in the single samples taken in June, July and August (see relevant Figures in the report). It appeared to this author that a great deal of interpretation and generalization was made that was not justified or evident from the limited data presented. For example, "By July, Butler's Gartersnakes were captured in every designated field. They were now being found at the outer boundaries of the study area, as far away as Field F along [redacted] and at the west end of Field E next to [redacted], as presented in Figure 10" (page 19 in LGL Report). This statement seems a bit sweeping because in fact those two snakes in F and E were the only captures made in those fields after the end of May and the captures were only ~100m from A the central field. Not much can be said from such skimpy data derived from single monthly checks under boards.

From these data, several claims were made in the LGL report on Impacts (Section 6.0 page 42). These claims are discussed here in the order in which they appear. It is this author's opinion that LGL's 'conclusions' are often not substantiated by data or even

contradict the data presented. First, they claim that fields B, D, and F are summer "feeding areas" for the snakes. However, from their two samples in July-August, this author could count only four Butler's Gartersnakes observed in those three fields and only one of these was not in B (Figs. 10, 11). Furthermore, there is no reference in either the main LGL report or in the Supplemental Documentation on Butler's Gartersnake, to observations of feeding or reference to the snakes' main prey, earthworms and leeches. Therefore, given the small number of samples taken, the small number of snakes observed and the lack of any observations or evidence of feeding, one can not support the claim that the snakes are moving out to other areas beyond fields A and B to feed or to do anything else. These data could better support the hypothesis that the snakes rarely leave their home field or that those that do are occasional migrants.

Second, I see no data supporting the next claim that "most of the Butler's Gartersnakes leave Field A and move into Field B for the summer". From Figs. 10,11, I see only three captures in Field B in July and August (note this second claim also seems to contradict the earlier assertion that the snakes go to Fields E and F). Their argument that these movements give B a "disproportionately larger number of snakes compared to other fields during summer" (page 42) makes no sense and has no quantitative support. The LGL report then points out that the loss of Fields B, E, and F would be a loss of about 42% of occupied habitat, and I would agree, if they adde the phrase "and at least 80% of the snakes". They go on to state that the remaining fields (and I would emphasize Field A which would be right next to the areas directly affected) could still be impacted by vibrations and other disturbances from construction. Then they say that the fields just south of the construction

could become "inundated with snake numbers" (page 43). This is illogical, because most snakes are in Field A anyway (according to their data) and they have already argued that the snakes move out to these other fields to feed. It is difficult to see these statements as anything more than speculation based on very weak evidence.

Mitigation: Impacts and Difficulties

The LGL report sensibly recognizes that the key problem for the Butler's Gartersnake will be that "a large proportion of its habitat is scheduled to be removed" and that this removal "could have a negative effect on the size, distribution and long-term viability of the population" (Section 6.3). To remedy this obvious problem, they describe mitigation measures and (adaptive) management options. It is here that I have more serious problems with the report, particularly with how they interpret the term 'adaptive management strategy'. Essentially, their plan is to create and restore habitat suitable for Butler's Gartersnake in the area south of Fields A, B, F and E and [redacted] They are quite vague about how to do this, but they begin by noting that the DRIC study team has made "every reasonable attempt to avoid ecologically sensitive habitats" and that the "original alignment for the WEP in this area would have had a much higher impact on the Butler's Gartersnake habitat" (than the current proposed alternative alignment; see Section 7.0). I think this assertion is questionable given their data showing that the great majority of the snakes exist where habitat is slated for total removal. In the original alignment, the DRIC team reduced direct removal of Butler's habitat from 3.0 ha (42%) to 2.1 ha (25%) of the total (Section 3.0 pages 3-4, Supplemental Documentation). These percentage

differences appear trivial comprising a mere 0.9 ha, but the realignment does mean that Field A, clearly the most important for the snakes given the limited data, would be spared direct removal. (See section 3.0 in Supplemental Documentation for BGS).

The goal then of the adaptive management strategy is to "ensure no net loss and the potential for an overall benefit through the maintenance of existing BGS habitat" (excluding the 2.1 ha removed, presumably), plus the improvement of existing natural areas through ecological enhancement; and the creation of new habitat by means of ecological restoration. Several other objectives are listed, but clearly the plan lacks specifics. The basic plan is simply to capture snakes and move them to the enhanced or restored habitats, and one is not told much more than this. Of course, there is no evidence whether or not this will succeed because no one has attempted to translocate this species, no one has quantified their critical habitat features, and there is no evidence that the proponents know how to create or "restore" good Butler's Gartersnake habitat. For example, because the habitat requirements of Butler's Gartersnake are not well understood, it is not clear why they are in Fields A and B but not E, F and D (Note though that in the 2009 mini-report, it states "a large percentage of the Butler's Gartersnakes are continually being caught in Field F...*probably due to the increased number of boards set up in this area.*) (Italics added by this author) Field E, also in the proposed highway footprint, has had an *enormous* jump in numbers in 2009 compared to 2008". These statements reinforce the inadequacies of the study in this author's view, and referred to above.

The report argues that research on "the specifics of ecology" should be continued, but there are no data to indicate research on ecology has started beyond the capture, measurement and sexing of snakes by turning over boards once per week or month.

In the Supplemental Documentation report (section 5), it states that vegetation management in the enhanced areas will be monitored to "confirm that it is suitable for BGS before translocation could occur". But I saw no data or any kind of information on what constitutes suitable vegetation or habitat or how confirmation would be achieved. Similarly, the Supplemental Documentation states on page 4 that all Butler's Gartersnakes encountered during construction will be relocated to suitable habitat outside the project footprint by an "expert". This sounds good, but when one asks who such an expert could be, or what constitutes suitable habitat or how snakes will respond to being picked up and dropped a few hundred meters away, then one realizes that answers to these questions are not anywhere in the Report. And answers to such questions will not be available without serious research on the ecology and behaviour of Butler's Gartersnake.

In section 5, they note that common reed will be removed and that habitat will be enhanced for three species of at risk plants (dense blazing star, colicroot and willowleaf aster). Up to 10.75 ha will be subject to this habitat enhancement. This may occur, but there is no reason to think that these plants will be good habitat for Butler's. There is no evidence presented in the LGL report, to suggest that anyone has thought beyond broad assurances that in the future they will fix everything to suit Butler's Gartersnakes.

In section 5.2, hibernacula are discussed. They have argued here that crayfish burrows and ant hills are important ("essential requirements for successful translocation of BGS")

presumably as hibernacula. Therefore, not only must they make the restored habitat suitable for Butler's Gartersnake, they must also make the areas suitable for digger crayfish (*Fallicambarus fodiens*) and ants (spp?). However, this author was unable to find clear evidence that either ants or crayfish are necessary for Butler's Gartersnake to hibernate or to be successful generally. Several areas inhabited by these snakes do not have crayfish present (Catling and Freedman 1980b; J. Choquette pers. comm. 2009; P. Catling pers. comm. 2009; S. Gillingwater pers. comm. 2009). There does not appear to be any reference to these dependences from the limited work on Butler's in Ontario, but the LGL report describes the crayfish burrows as likely key features for Butler's to hibernate in. These assertions may have derived from earlier studies by Carpenter (1952, 1953) in south east Michigan. In his 1953 paper, Carpenter gave descriptive accounts of ant (spp?) mounds, vole (*Microtus pennsylvanicus*) tunnels and crayfish (*Cambarus diogenes*) burrows being used by several species of snakes as hibernacula. He reported Butler's Gartersnakes (2) in ant mounds, and vole tunnels (1), but not in crayfish chimneys. This could simply be a sampling problem because other *Thamnophis* species used all three types, but it means there are few or no actual observations of the chimneys being used by Butler's Gartersnake. In the July 2009 update by LGL (and provided to this author by OMNR), it was stated that the "Numbers of chimney crayfish burrows and anthills in the study area were searched out (*sic*) and GPS coordinated (*sic*). These points will be generated on maps of the study area and compared with Butler's Gartersnake activity areas to determine any type of relationships." It is unclear what this could mean, but there was no indication that they looked into the burrows to validate the presence of snakes. It certainly would improve the

mitigation argument that crayfish and ants are "essential" elements of Butler's habitat if the LGL researchers could investigate the ant mounds and crayfish chimneys with exit traps. These traps are simple to operate and effective at sampling what is in the mounds/chimneys (Carpenter 1953). They could even dig up some in Fields B and F as these are going to be removed anyway. It does not seem that LGL did look for direct evidence that these structures were being used by the snakes. Lastly, the update stated that there were more chimney crayfish burrows "here" than anywhere else in the study area. It was not clear where 'here' was, but it appeared they meant in the area slated for restoration and relocation of snakes. If this is the case, then it becomes a concern that the snakes do not seem to hibernate there and that perhaps the crayfish chimneys are not essential after all.

One specialized trait that we know Butler's Gartersnake possesses is a diet consisting almost entirely of earthworms and leeches (Burghardt 1969, 1970; Planck and Planck 1977; Casbourn et al. 1976; Catling and Freedman 1980a). The LGL report makes no reference to earthworms or leeches or any direct reference to food or diet of Butler's Gartersnakes. Planck and Planck (1977) and Casbourn et al (1976) in the most extensive studies of BGS in Ontario to date, report that Butler's Gartersnake not only feeds almost exclusively on earthworms, but also that their distribution correlates "significantly" with the density of earthworms. Therefore, it is possible that the distribution reported in the LGL study could reflect earthworm and/or leech numbers and have no direct relationship to number of crayfish burrows or anthills. In any case, the report contains no data on numbers of either crayfish or their burrows or ants and their mounds, so any relationship

remains quite speculative. In fact, although there are many areas where both Butler's Gartersnakes and 'terrestrial' crayfish co-occur, given that both species prefer wet meadows and being close to water, there are many other areas where the snakes do not overlap with crayfish (P. Catling pers. comm. July 2009; J. Choquette pers. comm.. July 2009, J. Harding pers. comm. July 2009; F. Schueler pers. comm. July 2009). Ant mounds are rather shallow and may be more likely to freeze in winter in Windsor, than at Carpenter's site in Michigan. Or they may be different species of ants. Therefore, ant mounds may not be viable as hibernacula for the snakes at the Windsor site. Regardless, this speculation may all be irrelevant because there are no observations to tie the snakes in the current study with the presence of any identified hibernacula.

In the July 2009 update provided by OMNR, it stated that radio transmitters were placed into some Butler's Gartersnakes, but that all transmitters were "rejected" by the snakes and that this work was "put on hold" until the problems could be corrected. The problems weren't described.

In the 2009 update, there is reference to 160 new Butler's Gartersnakes being captured in 2009 and that in May and June nearly three times as many captures were made as in 2008. This is good news, but only 13 of the 106 captured in 2008 were recaptured in 2009. The high overall 2009 capture rate could stem from placement of more boards, as their report points out, or it could be related to the cool wet spring that enticed more earthworms under the boards for the snakes to eat. The very low recapture rate indicates that the snakes may have poor annual survival and short generation time. This is of concern because if the proposed construction and mitigation lead to increased mortality

the population could be reduced beyond recovery. This point is discussed further in section 4.

The LGL report proposes to mitigate the impact of construction of the WEP on Butler's Gartersnakes by three major steps. First, there would be a snake-proof fence erected between the construction zone and the remaining habitat. This makes sense. Second, an area of new Butler's Gartersnake habitat would be created or restored, a process involving introduction of some native vegetation, crayfish and ants and possibly altering the hydrology to encourage immigration of crayfish. This restored area would actually be large enough that there would be an overall increase in good habitat for the snakes and for other at risk plant species. Third, when encountered, snakes would be moved from the habitat being destroyed (before construction of course) and deposited by an expert in the area of restored and created habitat suitable to Butler's Gartersnakes. (Note earlier comment on the lack of consideration on the importance of seasonal timing of these activities).

Many studies have been published on this type of mitigation strategy, although none were on Butler's Gartersnake and none were cited in the report. There have also been some reviews of the success of these measures and examination of reasons for failure or lack of any conclusive outcome. Papers summarized in the present review have concentrated on translocation of reptiles. Often snakes are moved because they are a potential threat to bite people. These management techniques are usually divided into short versus long distance translocations. In either case, the relocated snakes are normally placed in existing good quality habitat and then their movements, survival and body mass are compared to control 'resident' snakes. In general, translocated reptiles move further, and survive more poorly

than resident controls (Plummer and Mills 2000), and these effects are more pronounced the further they are moved (Platenberg and Griffiths 1999; Sullivan et al. 2004). Snakes relocated over shorter distances (<1000m) tended to return to their original location in less than 3 weeks (Brown et al. 2009). It is important to recognize that the distances proposed for translocation of the Butler's Gartersnake are much less than 1000m and would likely result in the snakes trying to return to the area where they were caught even if they were released in high quality habitat.

In general, translocations of reptiles are meeting with higher success now than when this process was reviewed back in the early 1990's (Dodd and Seigel 1991), with an approximate doubling of the success rate from 19% to 41% (Germano and Bishop 2008). The most common reason for translocation failure is inadequate preparation by the people doing the work. Homing and migration out of release sites are the next most common problem. Another reason for failure was that many studies reported only short-term success and did not realize that the translocation failed later on. A population should be monitored and managed for a sufficient time to ensure it is self-sustaining (Fischer and Lindenmayer 2000; Germano and Bishop 2008). This can take many years or even decades. There are several reasons for translocation to fail even if the translocated snakes do not try to leave the release sites. Very young animals may be less prone to home, but are more prone to depredation (e.g., Haskell et al. 1996). Poor quality or unsuitable habitat was another major cause of failure. Finally, relocations are often carried out in an *ad hoc* manner without careful preparation based on the species' biology, ecology and behaviour (Fischer and Lindenmayer 2000). This failing could easily occur with the present mitigation

and management proposal given our knowledge gaps for Butler's Gartersnake. Furthermore, it is not clear from the LGL report how the translocated Butler's Gartersnakes will be managed to ensure or reduce homing, decreased survival, and long term sustainability.

4. **Will the activities associated with the construction of the Windsor-Essex Parkway, taking into account the proposed mitigation, jeopardize the survival or recovery of Butler's Gartersnake (*Thamnophis butleri*) in Ontario?**

This question is much more difficult to answer than whether the construction will jeopardize the study population itself. As stated above, the answer regarding the study population is very probably; yes it will jeopardize the study population. However, even if the population at the Windsor study site is lost or greatly reduced by the impacts of construction, it is not clear how much this loss would affect the overall Ontario population of Butler's Gartersnake. (NOTE: this author was provided with data from 2009 that indicated that at least one other population of Butler's Gartersnake was being affected by WEP). The species' current COSEWIC and COSSARO status is Threatened, but it likely could meet the criteria for Endangered, especially under COSEWIC's guidelines. Currently, a required Update Status Report for Butler's Gartersnake is being prepared for COSEWIC (D Noble, J Choquette pers. comm. 2009), and in this instance, the report authors have undertaken extensive searches of all reported Ontario Element Occurrences and some

other sites that have had reports of possible occurrences (Oldham and Sutherland 1986; Sandilands 1988a,b; Weller and Oldham 1988; Oldham and Weller 1989). In addition, they are collecting DNA from all captured snakes to obtain information on connectivity and population isolation and to try to clarify taxonomic uncertainties. These surveys already indicate that Butler's Gartersnake may have been extirpated from several sites including two important areas that formerly harboured large populations. If these suggested losses prove valid, then it is quite probable that the conservation status of Butler's Gartersnake should be elevated to Endangered.

Butler's Gartersnake has a patchy distribution throughout its range and there are four not mutually exclusive hypotheses to account for this. One is that the species was once widespread in the province, but has been reduced to remnant patches by loss of prairie habitat as the climate changed over the past few thousand years and, more recently, as human settlements and agriculture destroyed and further fragmented habitat and snakes. The proposed WEP is a further example of this process. A second hypothesis is that the species nearly complete reliance on earthworms for sustenance led to a patchy distribution based on a patchy occurrence of earthworm numbers (several sources). This hypothesis is unlikely because earthworms are virtually ubiquitous in southern Ontario (Reynolds, 1977). However, a combination of habitat features and earthworm availability may explain some local patterns of distribution (Casbourn et al. 1976; Planck and Planck 1977, Catling and Freedman 1980b). A third hypothesis contends that the snakes may have been introduced into some more remote parts of their distribution such as Skunk's Misery and Luther Marsh (M. Oldham, pers. comm.1999). There is no evidence to support this

contention. Fourth, there may be many undiscovered populations intervening among known ones. This may have seemed possible 30 years ago, but it is no longer likely given the increased search effort. Therefore, Butler's Gartersnake distribution in Ontario likely reflects a series of small relic populations surviving and declining in a shrinking set of habitat patches.

Butler's Gartersnake has very limited movements (Planck and Planck 1977, Catling and Freedman 1980a, LGL 2008) and therefore, it is susceptible to local extinctions from expanding urban development of all kinds because the snakes can not be rescued by immigrants. Paradoxically, this lack of mobility may also allow small populations to persist somewhat longer in small swatches of habitat in urban areas, as they do in Sarnia and Windsor, because they don't need large areas and rarely would leave grassy cover to be killed by vehicles, dogs or people. They would only require earthworms and good cover, which may explain how they can be found surrounded by development and in abandoned, derelict lots filled with "decaying ruins of an auto wrecking operation" (Planck and Planck 1977). But such areas are exceptionally vulnerable to urban development and continuing encroachment.

The current status of Butler's Gartersnake throughout Ontario is poorly known because the species occurs in a patchy distribution in small areas, and often the habitat is of little interest to most people. Add to that the small size of the snake, its secretive nature and its close resemblance to the larger and much more common and widespread Eastern Gartersnake (*Thamnophis sirtalis*) and Northern Ribbonsnake (*Thamnophis sauritus*) and it is clear why this snake's population size and trends are mysterious. Previous attempts to

estimate numbers of Butler's Gartersnakes in even a small area were usually based on mark-recapture with small numbers of captures and large confidence limits (Planck and Planck 1977; Freedman and Catling 1978; Catling and Freedman 1980b). Generally, authors have reported that the numbers were large, but these were always under 1000 and often , as in the LGL study, fewer than 200. For a small short-lived species, these numbers, especially as they usually included YOY, are not impressive. As many have pointed out, the chances of such small isolated populations being eliminated are great especially when one adds the stochastic effects of inbreeding on genetic variation. There is evidence that the overall Ontario population is declining, and certainly, it is not increasing. The recent (2009) surveys for COSEWIC suggest that some populations have declined or completely disappeared. One of these was considered by Planck and Planck (1977) to be the largest population in Ontario, so its loss is a large blow to the overall population. Several populations, comprising about half of the ~20 element occurrences have a rank of D indicating low numbers or marginal habitat (COSSARO 2001).

So, the question is does the proposed project jeopardize the species' survival and recovery. In the opinion of this author, the proposed mitigation of the study population is likely to fail in the longer term given lack of knowledge, the small population size, the unavoidable levels of disturbance, the potential for the mitigation to reduce survival and reproduction, and the superficial nature of the research conducted to date. As is noted in the Supplementary Documentation, Butler's Gartersnake exists in "habitat that is decreasing in area and becoming more fragmented and isolated" p. 4. The report goes on to say that "Provincial and federal legislation prevents the destruction of species at risk and

their habitat. As a result, construction Alternative three is not acceptable". This statement was made because there was Alternative four which compensated for the loss of 2.1 ha with a potential gain of up to 10.75 ha. However, as discussed earlier, there is no evidence that the 'replacement' habitat will be adequate for the snakes, especially given the inevitable mortality that construction and translocation will produce. So, this construction and 'mitigation' will increase the risk of loss of the population in which case any putative increase in habitat for the species becomes irrelevant.

If this population fails then will this failure jeopardize the species in Ontario. Given the small number of sites, the snakes small size, their isolation and their vulnerability, it is difficult to see how the loss of this population will not have a negative impact on the survival and recovery of the species overall. If it disappears then there is less reason to protect the remaining habitat even if some other species at risk occur there, plus it is a loss of another piece of the ecosystem. Each small population of Butler's is a part of the whole in terms of its genetics and its potential contribution in individuals and genetic material to a recovery if a recovery plan comes along. If one adds to this loss the apparent extirpation of perhaps 25% of locations in just the past 9 years since the species was designated threatened, then it is hard to dispute that the Butler's Gartersnake in Ontario is jeopardized in terms of both survival and recovery because of the proposed project and despite the recommended mitigation.

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Qualifications of the Author

The author has conducted research on the ecology, conservation, behaviour, evolution and population biology of reptiles in Ontario over the past 30+ years. During this time, he has published over 100 papers in scientific journals, authored over 200 reports for government, business and ENGO's and supervised 65 graduate students working in conservation and ecology. The author was Director of the Algonquin Wildlife Research Station (1984-2001), and is co-chair of the Amphibian and Reptile Subcommittee of COSEWIC (1996-2009) and a member of COSSARO (2008-2009). Currently, he is supervising the production of an Update Status Report on Butler's Gartersnake in Canada for COSEWIC. This project includes surveys of all known or suspected locations for the species to assist in determining its current conservation status. His extensive research experience with snakes and their conservation biology and his experience with the production of the 2001 and 2010 COSEWIC reports on Butler's Gartersnake plus overseeing the production of more than 20 other COSEWIC reports on conservation status of Canadian snakes represent the basis for his assessment of the proposed project on this species.

Statement of Independence

I affirm that I am free of any influence, interest or relationship with the proponents of the proposed Windsor-Essex Parkway. I have no interests, either financial or personal, in the proposal whatsoever.