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Laboratory
Peterborough

Professional Engineers Ontario

APGO

June 7, 2017

Municipality of Trent Lakes
760 Peterborough County Road 36
Trent Lakes, ON KOM 1AO

Attn: Amanda Warren, Planning Technician

Re: Ministry of Natural Resources and Forestry Letter Regarding Species At Risk for Tecasy Ranch Official Plan and Zoning By-law Amendments
Cambium Reference No.: 5154-001

Dear Amanda,

An Environmental Impact Study (EIS) was prepared by Cambium Inc. (Cambium) dated August 31, 2016 for a proposed development at Tecasy Ranch, located at 38 Bolton's Road, Part of Lots 10 & 11, Concession 3, Harvey. Following their review of the EIS, the Ontario Ministry of Natural Resources and Forestry (MNRF) provided comments and recommendations for further studies into the presence of snakes and Blanding's turtle habitat in a letter dated February 17, 2017. Several snake and turtle species are listed as endangered or threatened on the Species at Risk in Ontario list. As such, these species and their habitats receive protection under the Endangered Species Act, (ESA; 2007). Based on our review of the MNRF letter, there were five (5) recommendations provided by the MNRF:

1. Clarification is required with regards to the number of proposed structures and events to occur at the property in order to ensure consistency between the Planning Report and the EIS.
2. Additional surveys for snakes within 100 metres (m) of the proposed development are recommended, particularly with regards to the buildings proposed for demolition. Additional surveys for Blanding's turtle nests within 100 m of the proposed development are recommended. Surveys requirements are to be confirmed through consultation with an MNRF biologist.
3. Wood turtle and its habitat were not adequately addressed in the EIS.
4. A five (5) m buffer around the barn swallow nesting structure is recommended. Other structures should be demolished prior to May 1.
5. A recommendation to report sightings of turtles and snakes should be included in the EIS.

Cambium consulted with Colin Higgins, Management Biologist with the MNRF, in order to confirm the scope of the additional surveys recommended in the letter. The details provided herein address the recommendations noted above and the additional surveys conducted in response to these recommendations.

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PROPOSED DEVELOPMENT

Cambium has reviewed the EIS with regards to the proposed structures, the number of events, and the development area. While there are small differences between the proposed development noted in the EIS and Planning Report, it is Cambium's opinion that these are minor in nature and that both reports highlight that the proposed development includes a small number of events per year and the same principal structures at the Site. A difference in two (2) sleeping cabins would not result in a significant difference in the degree of impact to adjacent natural heritage features. The development area shown on Figure 3 of the EIS is slightly smaller than the area of the proposed structures as shown on the Site Plan; however, Figure 3 was used as a guide to scope the field work and was not intended to show the exact locations of proposed structures. Provided the recommendations of the EIS, and the additional recommendations detailed herein, are adhered to, the findings of the EIS are appropriate for the proposed development. The Site Plan provided by EcoVue and attached to this letter incorporates the EIS recommendations; therefore, an updated EIS Figure is not considered to be necessary.

SNAKE AND TURTLE SURVEYS

Cambium consulted with Colin Higgins, Management Biologist with the MNRF, in order to confirm the scope of the additional surveys:

- Snake surveys should be conducted following the Survey Protocol for Ontario's Species at Risk Snakes (Ontario Ministry of Natural Resources and Forestry, 2016). Surveys should focus on the designated area of development, including any areas of existing development and a hedge row containing a possible stone fencerow. A minimum of three to four surveys should be conducted between late April and early May.
- Blanding's turtle surveys should focus on basking turtles and potential nesting habitat. Suitable nesting habitat should be investigated for signs of nesting (i.e. signs of digging, shells, tracks, etc.). Surveys should focus on areas along the edge of the wetland and creek located north and west of the designated area of development. County Road 36 should be visually assessed for nesting turtles and nesting sites. A minimum of three to four nesting surveys should be conducted following the survey protocol for Blanding's turtles in Ontario (Ontario Ministry of Natural Resources and Forestry, 2015).

Following further discussions with Colin Higgins, it was agreed that if the designated area of development is found to be unsuitable for Blanding's turtle nesting habitat (i.e. compacted soils, high clay/poor draining soils, etc.), no further surveys would need to occur.

Following confirmation of the survey scope, Cambium staff visited Tecasy Ranch on April 27, 2017, to survey for snakes and potential Blanding's turtle nesting habitat. The following provides details of the methodologies employed to complete these surveys, the results, and the recommendations with respect to the proposed development.

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SNAKES

Snake surveys focussed on the entire open field area in the vicinity of the proposed development and on the areas of existing development (farmhouse, outbuildings, and fencerow). Snake surveys were conducted on April 27, 2017, from 10:45 am to 11:45 am following the Survey Protocol for Ontario's Species at Risk Snakes (Ontario Ministry of Natural Resources and Forestry, 2016). The weather was sunny, with a slight breeze (6-11 km/hr), with 2% cloud cover. Air and basking temperature remained constant during the survey at 21°C and 28°C, respectively. The hedgerow was thoroughly investigated for the presence of snakes and potential snake habitat (i.e. stone piles). Transects approximately five (5) metres apart were walked in the open field areas, located to the east and west of the hedgerow. Due to their stone foundations, the farmhouse and drive shed were thoroughly investigated for potential snake habitat, visual encounters with basking or foraging snakes, and indicators of snake presence (i.e. shed skins).

Snake surveys did not reveal any high quality snake habitat and no visual encounters with snakes occurred.

The hedgerow consisted of a page-wire fence, mature trees, and shrubs, and does not provide any high potential snake habitat. There were no stones or rock piles within the hedgerow that would provide for hibernacula habitat. The hedgerow would provide limited foraging habitat for snakes, particularly along the edges where it meets the adjacent field.

The field where the new buildings are proposed is a cultivated field, planted in hay and harvested annually. This field would provide foraging habitat once the grasses grew longer; however, the current plan is to maintain these field as cut grass. The field is not considered high quality snake habitat.

The two (2) buildings with stone foundations on the property had no snakes observed and no signs of hibernacula were found. It should be noted that neither of the aforementioned buildings will be demolished or altered as part of the proposed development. The farmhouse is undergoing some internal renovations, but nothing that would impact the stone foundation. There are three (3) other structures on the property, all of which are free-standing sheds without foundations. One is a horse shelter and two are being used as woodsheds. None of these will be demolished as part of the proposed development. No building demolitions are planned as part of the development; this was incorrectly identified on the site plan.

As no high quality snake habitat was observed within the development area and no buildings are to be removed as part of the development, no impacts to snakes or snake habitat are anticipated from the proposed development. These results of the April 27, 2017 snake surveys were discussed with the MNRF and it was agreed that no further snake surveys were required.

As a precautionary measure, it is recommended that exclusionary silt fence be installed around the perimeter of any proposed area prior to construction following the Best Practices Technical

Note: Reptile and Amphibian Exclusion Fencing (Ontario Ministry of Natural Resources and Forestry, 2013). Any snakes encountered within the construction area should be photo documented and allowed to move out of the way, or carefully moved out of the construction area. Documented sightings and pictures should be submitted to the OMNRF Peterborough District.

BLANDING'S TURTLES

Female Blanding's turtles preferentially choose nesting locations in open areas, such as fields, with nests usually laid in loose sand and organic soils (COSEWIC, 2005). The General Habitat Description under the ESA states that Blanding's turtle nests are created in open habitats with low vegetation, including areas such as meadows, gravel roads, road shoulders, gardens, and yards (Ontario Ministry of Natural Resources and Forestry, 2013). In light of this, surveys for potential Blanding's turtle nesting habitat focused on the field adjacent to the locally significant wetland (Deer Bay Creek) located west of the area of development. This area consisted of a large field, inhabited mostly by weedy agricultural species, which are intermittently mowed. It was noted that along the western edge of the field, close to the wetland, a number of sedges and wetland species have started to encroach into the field.

The survey was conducted using soil profile analysis and visual surveys for evidence of nesting activity (i.e. disturbed soils, tracks, egg shells, etc.). Soil cores were sampled to a depth of 1 metre using a hand auger. Soils were classified as loamy-sand and displayed mottling at a depth of 10 cm and gley at depths of 30-70 cm. The water table was observed at a depth of 50 cm. Based on these observations, the Ecological Land Classification for Southern Ontario (Lee, et al., 1998) defines these soils as very moist and imperfectly drained. This indicates that soils within this field are too wet to provide suitable nesting habitat for Blanding's turtles. No visual signs of turtle nesting were observed throughout the surveyed area; however, the survey was conducted before the typical nesting season (late May to end of June) and is not conclusive for this reason.

The roadway leading to the site, Bolton's Road, was also identified as potential nesting habitat for turtles. Cambium reviewed the traffic report completed in September 2016 for County Road 36 and Bolton's Road prepared by C.C. Tatham & Associated Ltd. The traffic review found that the estimated increase in traffic associated with the proposed development will be readily accommodated by both County Road 36 and Bolton's Road. Further, the intersection at County Road 36 and Bolton's Road will continue to provide excellent operations. As a result, the proposed development will not require modifications to the current roadways leading to the site; therefore, no disturbance to any potential Blanding's turtle nesting habitat along the roadways will be required. The potential nesting habitat along Bolton's Road will not be altered by the proposed development. It should be noted that Bolton's road is a municipal road and is maintained by the municipality.

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Given these observations, no impact to potential Blanding's turtle nesting habitat is anticipated from the proposed development.

WOOD TURTLE

The EIS noted the presence of wood turtle (*Glyptemys insculpta*) in the general area of the Site; however the habitat suitability table (Table 1, page 10-11) states that there was "no suitable habitat within 200 m." Cambium conducted an additional review of the potential for wood turtle habitat to be present on the Site, based on the habitat requirements noted in the Recovery Strategy for this species (Ontario Ministry of Natural Resources, 2010). The Recovery Strategy notes that wood turtle in northern Ontario can be predicted based on three (3) habitat criteria: "(1) at least some sand or gravel bars; (2) deep pools, undercut muddy banks, log jams or beaver dams; and (3) open/herbaceous, short shrub, tall shrub and wooded habitat types present in the riparian zone" (page 4). Based on the descriptions provided in the EIS and observations made during the additional site visit on April 27, 2017, the main channel (larger of the tributaries) that runs adjacent to (west side) the proposed development does provide suitable habitat for this species. Wood turtle nesting preferences are similar to those of Blanding's turtle in terms of substrate (sand and grave) and habitat types (road sides, fields, gravel pits); however, wood turtles typically nest close to the water. The Recovery Strategy notes that nest sites are generally within 10 m of the water but can be up to 150 m away. No alteration to the watercourse, wetland, or forested habitat is proposed on the Site. Given the improperly drained soils noted during the Blanding's turtle nesting habitat survey and the 30 m development setback recommended for the proposed development, impacts to nesting habitat features for this species are not expected to occur.

BARN SWALLOW NESTING HABITAT

During our site visit on April 27, 2017, Cambium confirmed that barn swallows continue to use the horse structure as nesting habitat and several birds were observed flying in and out of the structure throughout the visit. No other structures were being used as nesting habitat. One (1) structure (old chicken coop) was demolished before the Site visit occurred; as such, this occurred prior to the nesting season for barn swallow as recommended by the EIS. No other structures are proposed to be demolished on the Site; the Site Plan has been updated to indicate that all remaining structures will be maintained. The Site Plan has also been updated to reflect the five (5) m buffer on the horse shelter, as recommended by the MNRF.

SUMMARY AND RECOMMENDATIONS

Cambium has provided additional information and conducted additional surveys at the Site in order to fully address the comments provided by the MNRF. An updated Site Plan has been prepared by EcoVue that incorporates the recommendations noted herein. With regards to the

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snake and turtles nesting surveys, Cambium has confirmed with the MNRF that no further surveys are required. Based on the information contained herein, Cambium has prepared the following recommendations, in addition to those already noted in the EIS dated August 31, 2016, that should be implemented for the proposed development

1. Exclusion fencing, installed according to the guidance provided by the MNRF and attached to this letter, should be installed around the construction area prior to commencing the work. Light duty silt fence would be recommended for this purpose as it would exclude the snake and turtle species likely to occur in the area. The exclusion fence should fully enclose the area, with a section that can be opened to provide machinery access during construction. In addition, all stockpiles of materials (sand, gravel, mulch, etc.) should be stored within this enclosure or should be surrounded by a silt fence barrier.
2. On site workers must be vigilant and check work areas for the presence of snakes and turtles. If snakes or turtles are encountered, work must be temporarily suspended until the animal is out of harm's way. Workers should report any observations (including photographs and coordinates) to the Peterborough District Office immediately at (705) 755-2001.
3. The owners are encouraged to provide event participants with information on species at risk in the area in order to promote protection and encourage reporting of these species. The Toronto Zoo's Adopt-a-Pond program provides excellent resources for the identification and reporting of amphibians and reptiles (see Frog Watch and Turtle Tally programs).
4. A five (5) m buffer around the horse shelter should be implemented where site alteration or human activity is limited during the nesting season for barn swallow (May 1 – August 31).

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June 7, 2017

Cambium trusts that the information contained herein address the requirements of the MNRF review letter. Should you have any additional questions or concerns, please feel free to contact the undersigned at 705-742-7900 ext. 235.

Best regards,

Cambium Inc.

Andrea Hicks, M.Sc.
Project Manager/Senior Biologist

ALH/tj

Encl. *EcoVue – Site Plan: Zoning Ketch/Concept dated June 5, 2017*
Reptile and Amphibian Exclusion Fencing – Technical Note
Copies: *Kent Randall, EcoVue Consulting Services Inc.*
Don Middleton, Tecasy Ranch

P:\5100 to 5199\5154-001 Don Middleton - EIS and SAR - Tecasy Ranch\Correspondence\Letters\2017-06-07 LTR Re MNRF SAR Comment Tecasy Ranch.docx

REFERENCES

COSEWIC. (2005). *COSEWIC assessment and update status report on the Blanding's turlte Emydoidea blandingii in Canada.* Ottawa: Committee on the Status of Endangered Wildlife in Canada.

Lee, H., Bakowsky, W., Riley, J., Bowles, J., Puddister, M., Uhlig, U., et al. (1998). *Ecological Land Classification for Southern Ontario: First Approximation and Its Application.* North Bay, Ontario: Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch.

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N

Proposed Cabins (12)
±3.66x2.74m (9x12ft)
±10m²

Fire Protection
Water Storage Pond
15.24x15.24m
(50x50ft)

28m

45.7m (150ft)

Proposed Mess Hall
±12x30m
±372m²

±149m

Proposed Septic
20x30m

±11m

Existing Horse Shelter to remain
±5x11m, ±56m²

Buffer for Barn Swallow as requested by MNRF

Proposed Comfort Station
±6x12m, ±74m²

±5m

Proposed Parking
40 spaces

Wood Shed to remain
±5x3m, ±15m²

Relocate
Wood Sheds
±61m²

Chicken Coop to be removed

New Drilled Well

Driveshed to remain
±6.6x4.6m, ±30m²

Existing House
to remain
±10x10m, ±106m²

Addition to remain
±8x8m, ±67m²

Existing Dug Well
Enclosure

Existing Septic

±5m

±21m

±166m (side yard)
±623m (rear yard)
±631m (rear yard)
±582m (rear yard)
±653m (rear yard)
±1112m (side yard)
±598m (rear yard)
±250m (side yard)
±1124m (side yard)
±1120m (side yard)
±1060m (side yard)
±1090m (side yard)
±687m (rear yard)
±700m (rear yard)
±967m (front yard)
±1091m (side yard)
±1103m (side yard)
±183m (side yard)
±193m (side yard)
±242m (side yard)
±244m (side yard)
±136m (front yard)
±118m (front yard)
±105m (front yard)
±59m (front yard)
±278m (side yard)
±230m (frontage)
±210m

LOT 11
CON 3

(RURAL)

36

County Road 36 (30m public travelled)

LOT 11
CON 2

(AGRICULTURAL)

Jack Hills Road
(20m public
travelled)

Boltons Road (20m public travelled)

LOT 10
CON 3

LOT 10
CON 2

FR 10 (20m public)

Subject Properties

36

Lower
Buckhorn
Lake

Subject Properties (155ha)
Lot Fabric
Watercourse
Wetland
Wetland 30m Setback
Tree Line

ECOVUE consulting services inc.
www.ecovueconsulting.com

PROJECT NO: 16-1600
DATE: June 5 2017
HORIZ. SCALE: 1:1,300

Zoning Sketch Detail

Tecasy Ranch - OPA and ZBA

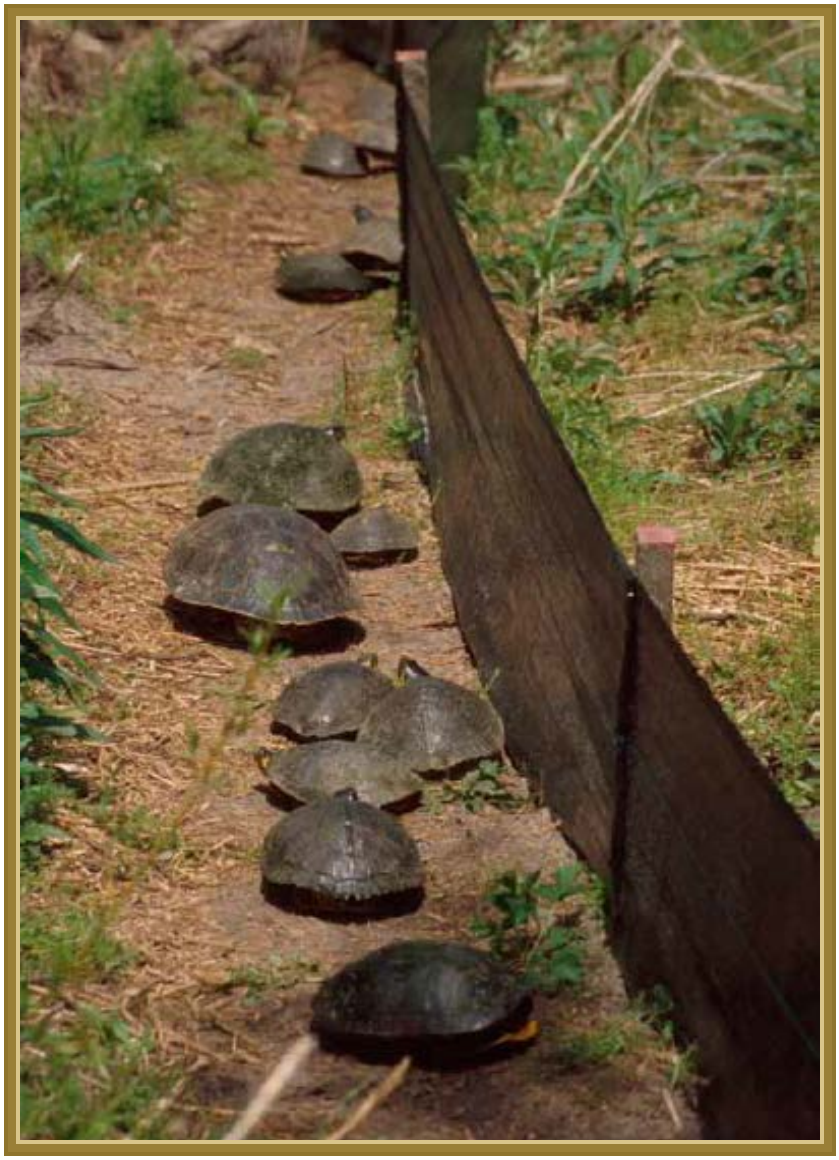
Part of Lots 10 & 11, Concession 3 (Harvey)
Municipality of Trent Lakes - 38 Bolton's Road

SPECIES AT RISK BRANCH
BEST PRACTICES TECHNICAL NOTE

REPTILE AND AMPHIBIAN EXCLUSION FENCING

Version 1.1

July 2013



Ministry of Natural Resources

Ontario

July 2013

Ontario Ministry of Natural Resources
Species at Risk Branch

Recommended Citation:
OMNR. 2013. Reptile and Amphibian Exclusion Fencing: Best Practices, Version 1.0. Species at Risk Branch Technical Note. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. 11 pp.

Cover illustration: Photograph by Matthew J. Aresco, Conservation Director, Nokuse Plantation

Before an activity can be initiated, permissions, approvals or authorizations may be required from MNR (e.g. Endangered Species Act authorization, Wildlife Scientific Collector's Authorization) or other agencies, levels of government (e.g. a conservation authority, municipality, federal or provincial government), or landowners. It is your responsibility to ensure that all necessary permissions, approvals and authorizations are acquired prior to proceeding with your activity.

This document presents information as of the point in time of publication and is meant to be updated through time as improved information becomes available.

Cette publication hautement spécialisée, Reptile and Amphibian Exclusion Fencing Best Practices n'est disponible qu'en anglais en vertu du Règlement 671/92 qui en exempte l'application de la Loi sur les services en français. Pour obtenir de l'aide en français, veuillez communiquer avec le ministère des Richesses naturelles au Pamela Wesley,705-755-5217.

Document History

Revision Number	Revision Date	Summary of Changes	Originated	Reviewed	Authorized
1.1	**June, 2013**	**Pre-publishing edits**	**June, 2013**	**June, 2013**	**June, 2013**

REPTILE AND AMPHIBIAN EXCLUSION FENCING - BEST PRACTICES -

The purpose of this guidance document is to provide an overview of proven design and installation techniques for reptile and amphibian exclusion fencing. Though this document points to site and species-specific design requirements, it is important to recognize that every situation is different. This guidance is not meant to replace site-specific advice obtained from local MNR staff or experienced exclusion fencing contractors. Moreover, exclusion fences are only effective when well planned, properly constructed, and maintained.

Exclusion fencing seeks to eliminate access to specific areas where activities that could harm animals are occurring (e.g. active aggregate operations, construction sites, and roads). The selection and installation of exclusion fencing can present some challenges, particularly if multiple species are being excluded. For example, some reptiles and amphibians are able to dig under fencing while others can climb over. Some may also take advantage of burrows dug by other animals. To maintain effectiveness, the bottom of the fence should be buried or secured firmly to the ground and minimum height recommendations (Table 1) are considered.

Exclusion fence design should consider the target species as well as those that might be unintentionally impacted. Fencing material should not pose a risk of entanglement or permit individuals to pass underneath or between openings. Landscape features such as topography and substrate need to be considered as they may constrain fencing design.

Including plans for fencing in advance of a project can increase efficiency and fence effectiveness. For example, long-term road projects that will include a permanent sound barrier could design the sound barrier such that it also meets the specifications of the required exclusion fence.

EFFECTIVE FENCE CHARACTERISTICS

The fence burial and height recommendations listed in Table 1 below have been compiled from scientific literature, established management practices, and practitioner best advice. These are general recommendations and at times other specifications may be more appropriate. For instance, in areas where the substrate does not permit fence burial, weighing down the fence with heavy items (e.g. sand bags) or backfilling may be acceptable. Where needed, speak with your local MNR staff or experienced exclusion fencing contractor to develop site-specific plans.

If multiple species are being excluded from the same area, and the species-specific fencing specifications differ, the uppermost minimum height and greatest depth recommendation should be used (Table 1). If you are excluding both Blanding's Turtle and Gray Ratsnake, for example, the exclusion fence should be a minimum of 2 m tall (see Gray Ratsnake section below for additional details).

Exclusion fences should be installed prior to emergence from hibernation. A survey of the enclosed/secluded area should be conducted immediately following fence installation to ensure that no individuals have been trapped on the wrong side of the fence.

Table 1. Recommended burial depth and height requirements of exclusion fencing for reptiles and amphibians. Recommended height is the height of the fence after it has been installed including the buried components and any installed overhangs or extended lips.

SPECIES	RECOMMENDED DEPTH OF FENCE BURIED (cm) *	RECOMMENDED HEIGHT OF FENCE (cm) **
Turtles – general	10 – 20	60
Eastern Musk Turtle, Wood Turtle	10 – 20	50
Massasauga, Eastern Hog-nosed Snake, Butler's Gartersnake, Queensnake	10 – 20	60
Gray Ratsnake & Eastern Foxsnake	10 – 20	200
Fowler's Toad	10 – 20	50
Snakes - general	10 – 20	100
Common Five-lined Skink	10 – 20	unknown
Salamanders	10 – 20	30

*** does not include the 10 cm horizontal lip that should extend outward an additional 10 – 20 cm (see Figure 2)**
**** the height of fencing has been provided as an approximate. Fencing materials may in fact not be available in proportions that would allow for these precise measurements. It is most effective, if the height and burial depth recommendations are met.**

DURATION OF ACTIVITIES & DEGREE OF ANTICIPATED DISTURBANCE

The type of disturbance, the proximity to disturbance, and the planned fence longevity are factors that influence which type of exclusion fence is most effective. For short-term activities (i.e. 1 to 6 months) such as minor road repairs, a light-duty geotextile fence is appropriate. Longer term or permanent fencing projects, however, require more durable materials such as – heavy-duty geotextile, wood, concrete, woven-wire, sheet metal, vinyl panels, or galvanized mesh.

GEOTEXTILE FENCES

Geotextile fences (e.g. silt fences) come in many types and qualities. They can be very effective for the temporary exclusion of reptiles and amphibians. For the purposes of this document, temporary use ranges from a few months up to 2-3 years. Winter weather is generally damaging to geotextile materials and the cost of maintenance over the long-term should be considered during the planning phase. Depending upon the quality, geotextile can be resistant to UV degradation and the bio-chemical soil environment.

Light-duty Geotextile Fencing:

Light-duty geotextile fencing is made of nylon material and is typically purchased with wooden stakes pre-attached at 2 m to 3 m intervals (Plate 1). It can also come without pre-attached stakes. Light-duty geotextiles are largely intended for projects with shorter durations of only a few months in duration and up to one season.

Geotextile fencing with nylon mesh lining should be avoided due to the risk of entanglement by snakes.

To use light-duty geotextile fencing:

- Fencing fabric is effective if attached to wooden, heavy plastic or metal stakes using heavy-duty wire staples or tie-wire (Figure 2).
- Secure the fence on posts that are placed at 2 m to 3 m apart. If using the greater recommended distance between posts, additional maintenance may be required to maintain effectiveness.
- Securely drive the stakes into the ground to a recommended depth of 30 cm. The fencing fabric should be buried to the recommended specifications in Table 1 and back-filled with soil.
- For snakes, supporting posts should be staked on the activity side (e.g. on the side facing the aggregate stock pile or the road - Figure 2).
- Light-duty geotextile fences are not effective where rocks or other hard surfaces prevent proper anchoring of fence posts and burial of the fence fabric.
- Light-duty geotextile fences are not effective where a large amount of concentrated run-off is likely or to cross streams, ditches or waterways without specific modifications.
- Contact your local MNR staff or experienced exclusion fencing contractor for advice and recommendations.
- See general best practices section below for additional details.

Generally, light-duty geotextile fences are not effective if they exceed 1 metre in height unless purposely manufactured for greater height (e.g. stakes placed at closer intervals or cross braces). If greater height is required consider using heavy duty geotextile, hardware cloth or other fencing materials.

Plate 1. Light-duty geotextile fencing with pre-attached wooden stakes used to exclude turtles from a road as seen on a regular maintenance check (photo credit: Brad Steinberg).

Heavy-duty Geotextile Fencing:

Heavy-duty geotextile fencing is typically constructed of a thick felt-like fabric. It may also be called ‘double row’ or ‘trenched’ fencing. For support, this fencing uses a woven wire fence (e.g. chain link) or some other structure (Plate 2). It is recommended that a minimum density of 270R or equivalent woven geotextile fabric is used.

Heavy-duty geotextile material can be effective for up to 2 or 3 years with proper maintenance. This type of fencing can be damaged by small mammals chewing through or torn by heavy debris (e.g. tree branches). Therefore, it may be best suited to turtles, which are less likely to take advantage of holes or tears in the fabric. If

used to exclude snakes or other animals, more maintenance may be required.

Heavy-duty geotextile fencing:

- The wire fence should be installed on the activity side to prevent animals from leveraging and climbing into the exclusion area while allowing the animal to escape if they find themselves on the wrong side (Figure 2).
- Geotextile fences across streams, ditches or waterways should have case-specific modifications.
- Contact your local MNR staff or experienced exclusion fencing contractor for advice.
- See light-duty geotextile section above and general best practices below for additional details.

Plate 2. Example of a heavy-duty geotextile fencing used to exclude snake species (photo credit: Jeremy Rouse).

HARDWARE CLOTH FENCES

Hardware cloth (also known as galvanized mesh or Birdscreen) is durable, cost effective and useful for excluding reptiles and amphibians. The fence should be made of heavy galvanized hardware cloth with a ¼ inch mesh. For fences intended to exclude small snakes, a ⅛ inch mesh may be more effective. In contrast, fencing intended to exclude turtle species can have a larger mesh size (e.g. ½ inch). Larger mesh may have a longer lifespan as it is constructed from a thicker material compared to smaller mesh sizes.

To use hardware cloth fencing:

- Secure the fence on posts placed a recommended 2.5 m apart with the stakes on the activity side (Figure 2).
- Pull the mesh taught and staple or secure with screws and a metal stripping to prevent the mesh from being ripped when pressure is applied.
- Installing a top rail or folding the mesh over a taut smooth wire reduces tearing (Plates 3 and 4).
- An outward facing lip installed on the species side ensures that snakes and amphibians are unable to climb or jump over the fence (Figure 2; Plate 4)
- Tears can be mended with 18-gauge galvanized wire.
- See general best practices section below for additional details.

Plate 3. Example of a galvanized mesh fencing used for the long-term exclusion of snakes and turtles from the adjacent highway (photo credit: Megan Bonenfant).

Plate 4. Long-term to permanent exclusion fencing using galvanized mesh with over-hanging lip to prevent animals from climbing or jumping over (photo credit: Megan Bonenfant).

WOOD LATH SNOW FENCING

In certain circumstances, wood lath snow fencing can be effective at excluding turtles. This fencing is typically constructed from soft wood slats that have been woven together with 13-gauge wire and is then attached to steel fence posts which have been driven into the ground.

Wood lath fencing is cost effective and can easily be laid down during the winter to prevent damage. The durability of the material, however, is not meant for very long-term use (e.g. more than 3 years), unless regular maintenance occurs.

To use wood lath snow fencing:

- The fencing should be attached to heavy plastic or metal stakes using heavy-duty wire staples or tie-wire.
- The stakes are recommended to be placed at 2 to 3 m intervals and securely driven into the ground 30 cm or more.
- Wood lath snow fencing across streams, ditches or waterways should have case-specific modifications.
- Wood lath snow fencing lends itself well to being combined with other types of material to ensure complete exclusion.
- See general best practices section below for additional details.

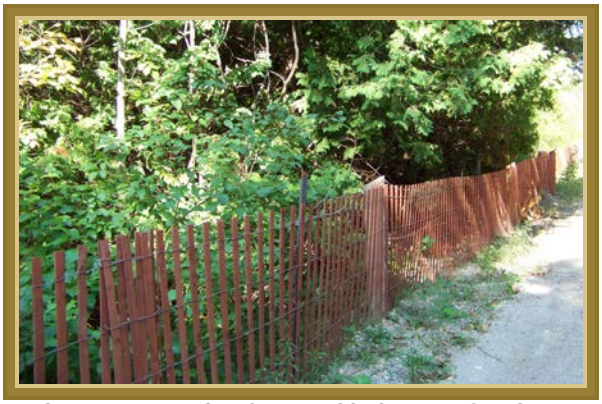


Plate 5. Example of a wood lath snow fencing used to exclude turtles (photo credit: Karine Beriault).

EXCLUSION FENCING FOR GRAY RATSNAKE AND EASTERN FOXSNAKE

Gray Ratsnake and Eastern Foxsnake are the largest snakes in Ontario - reaching nearly 2 m in length. They are also excellent climbers. For this reason, fencing intended to exclude either of these species has additional recommended design specifications.

- The fence should be at least 2 m high.
- The material on the species side (Figure 2) should be smooth to prevent the snakes from climbing into the excluded area.
- Stakes should be on the activity side of the fence (Figure 2).
- Due to the increase in fence height, it is valuable to decrease the distance between posts or install diagonal braces.
- See general best practices section below for additional details.

CONCRETE, SHEET METAL & VINYL WALLS

Concrete, metal or vinyl walls can stand alone or be combined with woven wire or chain link fences. They are durable, require minimal maintenance and are effective in excluding target species from high risk areas and guiding them to crossing structures or other desired locations (Plates 6 and 7). This fence type is comprised of a continuous vertical face of concrete, metal or vinyl sheeting with no gaps. Concrete walls can be installed as either pre-cast sections or pour directly in place.

Plate 6. Stand-alone continuous concrete wall used to exclude salamander species installed as pre-cast forms (photo credit: Steven Roorda).

Plate 7. Pre-formed vinyl sheeting fence intended to exclude salamanders for a construction site (photo credit: Herpetosure Ltd.)

The wall height depends upon the target species, but they are usually between 45 and 60 cm tall and buried 25 cm. Concrete, metal or vinyl exclusion fencing is most appropriate for salamanders, skinks, small snakes, and small turtles. For large turtle species, a chain link fence can be installed directly on top of the concrete wall for complete exclusion.

HABITAT CONNECTIVITY

Habitat connectivity is the connectedness between patches of suitable habitat or the degree to which the landscape facilitates animal movement. Exclusion fencing installed along roads or other large projects can effectively reduce or eliminate habitat connectivity for animals. In these scenarios, exclusion fencing should be considered with eco-passages in order to maintain connectivity. Fencing in isolation should be viewed as a temporary method to reduce mortality until species movement can be restored. Where eco-passages are not feasible they should be identified for consideration with any future road work or development to improve connectivity.

During the installation of fencing with an eco-passage, it is important that the fencing sits flush with the passage to ensure that

there are no gaps where animals can squeeze through.

Plate 7. A wood turtle travelling through a dry eco-passage. Ecopassages such as this help to ensure the long-term connectivity of seasonal habitat for this and other reptile and amphibian species (photo credit: Amy Mui).

GENERAL BEST PRACTICES:

- To deter digging, bury the fence 10 cm down with an additional 10 cm horizontal lip (Figure 2).
- Backfill and compact soil along the entire length on both sides of the fence (Figure 2).
- Once the fence is installed, a survey should be done to ensure that no individuals have been trapped inside (speak with MNR for survey advice).
- Exclusion fencing intended to exclude snakes should have the stakes installed on the activity side (opposite the normal requirement for sediment control fencing) to prevent snakes from using the stakes to maneuver over the fencing.
- For snakes and toads, the fence should have an overhanging lip on the species side (Figure 2).
- Fences should be inspected after spring thaw and at regular intervals throughout the active season, especially following heavy rain events. This is particularly important for geotextile fences. Any damage that affects the integrity of the fence (e.g. tears, loose edges, collapses, etc.) should be fixed promptly.
- Tall or woody vegetation on the species side of the fence should be managed if there is a risk that it may enable the animals to climb over. This is most important during spring and fall. Proceed cautiously to not harm animals protected plant species during vegetation removal.
- When installing an eco-passage, fencing or exclusion walls should be used as a guiding system to direct animals to passage openings.
- Natural screens such as trees or shrubs can help to reduce road access and can be combined with fencing to provide protection of individuals from predation.
- Install fences with a turn-around at the ends furthest from the wetland habitat and at any access areas to assist in redirecting animals away from any fence openings (Figure 1).
- Curving the ends of the fencing inward (i.e. away from the road or construction site) may help to reduce access to these locations. The ends may also be tied off to natural features on the landscape such as trees or rock cuts.

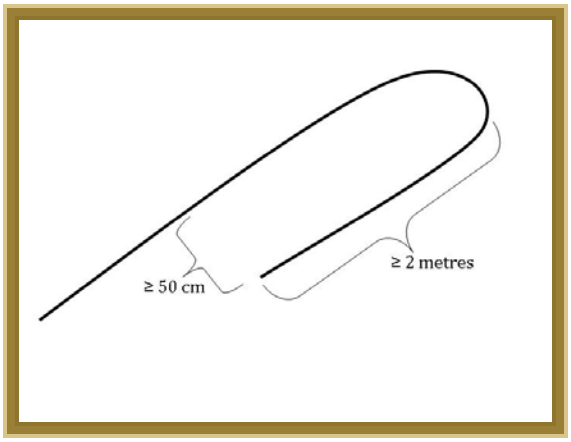


Figure 1. Diagram of the ends of the fence designed to curve inward in order to direct animals away from the area of exclusion.

WATER MOVEMENT & DRAINAGE

- In areas where surface water run-off may erode a soil-based backfill, consider using rocks or sand bags. Ensure these materials cannot be used by animals to climb over the fence.
- Where possible, minimize the number of water crossings: when necessary, it should occur where flow is minimal.
- Fence posts in waterways or areas prone to seasonal flooding should be driven rather than dug – unless following established best practices.
- Fencing should be placed above the high water mark anticipated for high water events such as spring freshet or periods of heavy or continuous rainfall.

TOPOGRAPHY:

- Fence posts should be closer together in undulating topography.
- Fences installed on slopes have a different effective height depending upon whether the animal will be approaching from the up or down slope. The fence height can be adjusted accordingly.

Improvements or questions regarding exclusion fencing can be brought to the local MNR Species at Risk Biologist or other MNR staff.

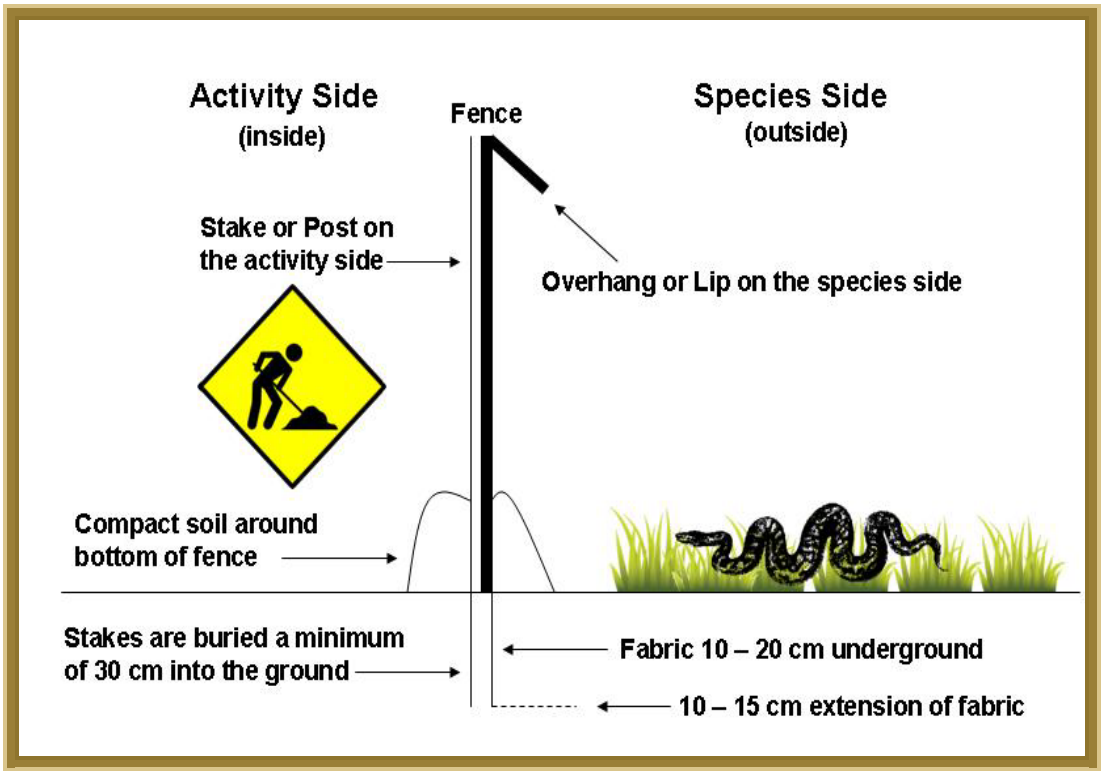


Figure 1. A side view of a basic exclusion fence including an overhang or flexible lip to deter animals from climbing or jumping over the fence. Placement of the stake on the Activity Side or on the inside of excluded area is also illustrated. This is particularly important for snake species which may use the stakes to maneuver over the fence.

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For additional information:

Visit the species at risk website at
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