

**Impacts of a Proposed Landfill on the  
Vulnerable Wood Turtle, *Glyptemys insculpta*,  
In Pontiac County, Québec**

by

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## Executive Summary

*LDC Gestion et Services Environnementaux* has proposed to construct a sanitary landfill adjacent to the Picanoc River, approximately 8 km from Danford Lake, Québec. The North American Wood Turtle (*Glyptemys* [= *Clemmys*] *insculpta*) has been previously documented to inhabit the Picanoc and Kazabazua Rivers. In 2005, the Wood Turtle was listed as a vulnerable species and is now afforded special protection by the Government of Québec. Thus, special considerations must be given to the impacts that such a large-scale anthropogenic disturbance might have on Wood Turtles in Gatineau and Pontiac Counties, Québec. The proposed landfill will result in: (1) unsustainable levels of road mortality of Wood Turtles as a result of an increase in commercial vehicles in Kazabazua and Danford Lake; (2) increased predation of all life stages (e.g. eggs, adults) as a result of higher numbers of raccoons (*Procyon lotor*). Lastly, the spatio-temporal sampling regime used by Fondex Outaouais biologists would not have revealed the presence of Wood Turtles in the vicinity of the proposed landfill site.

## **Introduction**

The goal of this report is to present information about the biology and conservation of Wood Turtles as it relates to the proposal by *LDC Gestion et Services Environnementaux* (LDC) to construct a sanitary landfill adjacent to the Picanoc River in Pontiac County, Québec. This document is divided into several sections. The Wood Turtle section provides a brief overview of the biology of the species. The Distribution section establishes that Wood Turtles are known to inhabit both the Kazabazua and Picanoc Rivers. The section entitled Conservation Status outlines a number of provincial laws that protect the Wood Turtle and its habitats in Québec. Lastly, a section entitled Threats gives an overview of the impacts that a sanitary landfill will have upon Wood Turtle populations.

## **Wood Turtles**

The North American Wood Turtle (*Glyptemys insculpta*) is a disturbance-dependent species that requires openings in the forest canopy for thermoregulation, egg incubation, and some foraging (Kaufmann 1992; Compton et al. 2002; Arvisais et al. 2004; Saumure 2004; Saumure et al. 2007). Today, such a propensity to occupy disturbed terrestrial habitats exposes Wood Turtles to significant risk (Saumure and Bider 1998; Galois and Bonin 1999; Saumure et al. 2007). The species is semi-aquatic, with populations centered upon small meandering rivers and streams characterized by sand or gravel substrates, relatively clear waters, and slow to moderate currents. Wood Turtles require the aquatic component of their habitat for hydration, mating, and hibernation. Being semi-aquatic, they are also known to frequent various types of forests, meadows, bogs, swamps, fields, and pastures (Harding and Bloomer 1979; Ernst et al. 1994).

Historically, openings in the forest canopy were created by forest fires, beaver (*Castor canadensis*), and wind falls. The arrival of European colonists, however, resulted in the extirpation of beavers from large parts of their North American range due to the burgeoning demand for their pelts. Moreover, most jurisdictions have put in place forest-fire suppression programs within the last century, while expanding logging operations. Consequently, most Wood Turtle populations are now dependent upon agriculture and logging operations to create suitable foraging and nesting habitats (e.g., logging roads, gravel pits).

## Distribution

Wood Turtles are known to inhabit several rivers in Québec. The Kazabazua and Picanoc Rivers are among several inhabited by Wood Turtles in Pontiac County, Québec (Saumure 1985, 1992; Daigle 1996; Saumure and Bider 1996, 1998; Galois and Bonin 1999; *Équipe de rétablissement de cinq espèces de tortues au Québec* 2005; Appendix I). The first specimens were reported from the Kazabazua River near Danford Lake in August 1946. In June of 1953, an adult male specimen was collected from the same area and deposited in the National Museum of Canada's herpetology collection. The first sighting of Wood Turtles in the Picanoc River occurred much later, reported to the National Museum of Canada in May 1987 (Appendix I). Thus, the presence of Wood Turtles in these two rivers has been documented officially for at least 20 years.

The spatio-temporal sampling regime used by Fondex Outaouais biologists would not have revealed the presence of Wood Turtles in the vicinity of the proposed landfill site. In Québec, the optimal time for sampling riparian habitats for Wood Turtles is May (Daigle 1996, 1997; Saumure and Bider 1998; Arvisais et al. 2002; Saumure et al. 2007). Inventories in June are only likely to reveal populations of Wood Turtles if nesting sites are monitored (Walde et al. 2007). Moreover, Wood Turtles in Québec engage in annual migrations to nesting sites, some of which are in excess of 2 km from home ranges (Arvisais et al. 2002; Saumure 2004; Walde et al. 2007). Thus, even if Wood Turtles from the Picanoc River population inhabited the landfill site, they could have been migrating from the area to distant nesting sites during the short sampling period described in the Environmental Assessment produced for LDC.

Experts with knowledge of the biology of the vulnerable Wood Turtle are required to conduct inventories for this rare and elusive species. For instance, despite considerable success at locating Wood Turtles in agricultural habitats in southern Quebec, Daigle (1996) found few specimens when sampling the speckled alder (*Alnus rugosa*) swales on the Kazabazua River. Once Wood Turtles have left a river's edge following emergence from hibernation, they are almost impossible to find amidst the secondary vegetation growing on the forest floor, i.e. they are the proverbial needle in a haystack.

## Conservation Status

Today, the fact that Wood Turtles occupy disturbed terrestrial habitats exposes them to significant risk. Wood Turtle populations are declining throughout their range as a direct result of such human activities as habitat destruction, vehicular traffic, and collecting for the pet trade. For millennia, turtles have relied on the protection afforded them by an armoured shell; an adaptation quickly becoming obsolete in a world of motorized vehicles. Consequently, Wood Turtles now rely on a number of laws to protect them.

In Québec, the Wood Turtle is protected as a non-harvestable reptile under law L.R.Q., c. C-61.1. Thus it is illegal to capture, hunt, and/or keep in captivity all turtle species native to Québec, regardless of their origin. Article 26 also specifies that one cannot disturb, destroy, or damage the eggs or nest of an animal. The Wood Turtle's aquatic habitat is also indirectly protected under law L.R. 1985, ch. F-14, a law that specifically protects fish habitat. Moreover, Québec law L.R.Q., c. Q-2 includes a decree concerning the protection of river banks and adjacent floodplains, the Wood Turtle's primary habitat.

To protect the Wood Turtle further in Québec, the *Ministère de l'Environnement et de la Faune* initially listed the Wood Turtle as a species "likely to be designated threatened or vulnerable" as defined in L.R.Q., c. E-12.01. In March 2005, the Wood Turtle was officially listed as a vulnerable species and is now afforded special protection by the Government of Québec.

## Threats

As proposed, the sanitary landfill site will expose Wood Turtles to unsustainable levels of anthropogenic mortality not considered in the environmental impact study conducted by Fondex Outaouais for LDC (LDC 2006). Sources of anthropogenic mortality include, but are not limited to: (1) road mortality in the villages of Danford Lake and Kazabazua; and (2) mortality as a result of an increase in Raccoons (*Procyon lotor*) population sizes in the area.

**Road mortality.**—The proposed location of the landfill site will result in a substantial increase of large commercial vehicles along the proposed transport corridor. Despite the fact that no Wood Turtles were encountered during ill-conceived Fondex surveys, previously documented populations exist in the Kazabazua River along the proposed highway corridor between Gatineau and the landfill site (Saumure 1985, 1992; Daigle 1996; Saumure and Bider

1996, 1998; Galois and Bonin 1999). Fondex did not consider the impact of its proposed activities on populations of the vulnerable Wood Turtle along the proposed transport corridor. As with noise pollution considerations, DLC must be held accountable for the impact of its proposed activities on all stakeholders, which includes species protected by the Government of Québec. Data indicate that Wood Turtles are already being killed by motorized vehicles along highways # 105 and # 301, particularly at crossings over the Kazabazua River in the villages of Danford Lake and Kazabazua (Galois and Bonin 1999; Desroches and Picard 2005; pers. obs.). Unless proper mitigation measures are adopted, the substantial increase in large commercial vehicles along the proposed transport corridor will exacerbate the road mortality problem.

The impact of road mortalities on freshwater turtles is well documented. One of the first reported instances of turtle mortality caused by motorized vehicles was reported in 1936 from Orange County, New York (Netting 1936). Since then, there have been several studies on road mortality in Canada (e.g., Brooks et al. 1992; Ashley and Robinson 1996; Haxton 2000; Desroches and Picard 2005). Most of the mortality is a result of migrations related to reproduction (i.e., female turtles leaving aquatic habitats in search of nesting sites). Brooks et al. (1992) documented the mortalities of seven adult female Wood Turtles on a road that served as a nesting site. So prevalent is wildlife mortality along roadways, that a new field of study called “road ecology” was created (Forman et al. 2003). Recently, however, the focus of such studies has shifted from purely observational studies that merely document the number and species composition of dead wildlife to those that seek correlations, model movements, and generate predictions (Gibbs and Shriver 2002; Baldwin et al. 2004; Steen and Gibbs 2004; Aresco 2005; Gibbs and Steen 2005; Steen et al. 2006). Significantly more adult female freshwater turtles are being killed along roadways than adult males, presumably as a result of annual nesting migrations (Steen and Gibbs 2004, Desroches and Picard 2005; Gibbs and Steen 2005; Steen et al. 2006). Long-term studies show that turtle populations are most sensitive to decreases in adult survivorship (Brooks et al. 1991; Congdon et al. 1993, 1994; Heppell 1998). Moreover, chronic reductions in adult survivorship require increases in the already high juvenile survivorship in order to maintain stable populations (Congdon et al., 1993; 1994). However, turtles appear to lack such a density-dependent response (Brooks et al., 1991).

Wood Turtle populations are already considered vulnerable by the Government of Québec. Exogenous sources (i.e., of recent human-induced origin) of adult mortality will quickly lead to

the extirpation of the Kazabazua River Wood Turtle populations, as has been documented for another Wood Turtle population in southern Québec (Daigle 1997; Saumure and Bider 1998; Daigle and Jutras 2005; Saumure et al. 2007).

**Raccoon predation.**—A landfill of the magnitude of the one proposed will provide abundant human refuse; thus, a stable food supply for Raccoons (e.g., Totton et al. 2002). Raccoons are opportunistic omnivorous that learn to quickly exploit concentrated sources of food (Zevuloff 2002). Thus, Raccoons populations and densities in the Danford Lake area will increase tremendously. Raccoons have long been known to be the primary predator of all life stages of Wood Turtles (Harding and Bloomer 1979; Harding 1985; Farrell and Graham 1991; Harding 1991). In small populations of long-lived organisms, the mortality of even a few individuals can be detrimental to the survival of the population as a whole. Such is the case with long-lived organisms like turtles, particularly if populations are small to begin with (Brooks et al. 1991; Congdon et al. 1993, 1994; Compton 1999). The mutilation rate of Wood Turtles in the Danford Lake / Kazabazua River population is 71% (Saumure and Bider 1998). The narrow snout of Raccoons permits them to defeat the classic chelonian refuge strategy of withdrawing into their shell. Harding (1985) found that limb loss resulted in significantly higher mortality rates in Wood Turtles. The Kazabazua River Wood Turtle population would be quickly extirpated by a local increase in the Raccoon population.

Predation on adult and juvenile Wood Turtles by Raccoons has been reported from several other populations. In Michigan, 9.7% of the turtles in the population were missing at least one limb (Harding 1985). Greater than 2% of turtles captured were missing at least two limbs. In New Jersey, 16.8% of the population had injuries (Farrell and Graham 1991). Specifically, 8.5% of turtles had missing limbs and 3.8% had damaged shells. In addition, one adult and two juveniles were found dead with their heads chewed off. Brooks et al. (1992) found that 60.4% of turtles captured from one Ontario population had missing limbs, tails, or damaged carapaces. Eleven turtles were also found dead, of which two were killed by predators. The aforementioned high percentages of Wood Turtles bearing scars as a result of encounters with predators suggest that this species is particularly inept at avoiding such altercations. Moreover, Wood Turtle nesting surveys have found that from 88% to close to 100% of nests may be destroyed annually by predators (Harding and Bloomer 1979; Brooks et al. 1992).

## **Summary**

Wood Turtle populations are already imperiled in Québec. As proposed, the landfill project would significantly increase rates of anthropogenic mortality as a result of (1) road mortality due to a substantial increase in commercial vehicles; and (2) predation by a subsidized predator, the Raccoon. Although the promoters attempted to assess the impact of the landfill site proper, they failed to consider the indirect effects to a Vulnerable Species now afforded special protection by the Government of Québec.



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## Appendix I

### Observation Card

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**Species:** *Clemmys insculpta*

**Identified by:** G.M. Saumure

**Locality:** Picanoc River, Canton de Normandie

**County:** Pontiac

**Province:** Qué

**Country:** C

**Date:** 18 May 1987

**Time start:** 12:00

**Time finish:** 15:00

**Collector(s):** R.A. Saumure Sr., G.M. Saumure

**Weather:** Sunny + moderate winds; had rained

**Habitat:** Area closed to sandy bank on Picanoc river, Pontiac Co., Québec

**Capture data:** Not captured

**Remarks:** Large *Clemmys insculpta* chasing a smaller specimen, right up to shore.

Larger specimen was approx. 9 inches as seen underwater, smaller specimen was approx. 6". Both specimens were scared by observers before capture attempt was initialized.

Have pictures of the habitat taken at a latter date.

Lat. 46°06'10"N

Long. 76 °31'21"W

Grid: 18 TUF 810 063

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**N.B.:** Original observation card has been on file at the Canadian Museum of Nature in Aylmer, Québec since 1987 (20 years).

## About the Author

Raymond A. Saumure began his career as a Research Associate for the National Museum of Canada's Herpetology Department while attending high school. He received his Bachelor of Science in Biology from the University of Guelph, located in Guelph, Ontario, Canada. His Masters of Science and Doctor of Philosophy (2004) were bestowed by McGill University in Montréal, Québec, Canada for his research on the impacts of agriculture on the North American Wood Turtle, *Glyptemys insculpta*. He designed and maintains the popular website WoodTurtle.com. He is a member of four IUCN Species Survival Commissions: the Re-introduction, Conservation Breeding, Tortoise and Freshwater Turtle, and Crocodylian Specialist Groups. He has numerous scientific publications, most of which are on the population ecology, parasitology, and conservation of freshwater turtles. In addition to his academic credentials, he has 11 years of experience working for innovative zoological institutions in the United States and Canada. His fields of expertise include: project management, research, education, museum sciences, development of living collections, and wildlife conservation. His extensive animal husbandry experience was obtained while working as an Animal Care Technician at the *Biodôme de Montréal*, as Senior Conservation Biologist for Shark Reef at Mandalay Bay, and currently as the Living Collections & Research Biologist for the Las Vegas Springs Preserve. His atypical career was featured recently by the American Association for the Advancement of Science (AAAS) in an article entitled: "Taking a Gamble: A Wildlife Biologist's Journey to Vegas". He serves on the Governing Board, Steering Committee, and as an Associate Editor of the journal *Herpetological Conservation and Biology*.

