

PI Name/Short Description: Spiny Softshell Turtle (*Apalone spinifera*) and Northern Map Turtle (*Graptemys geographica*) – reproductive habitat surface area (Lake St. Louis to Trois-Rivières)

[E31]

Technical Workgroup: Environment TWG

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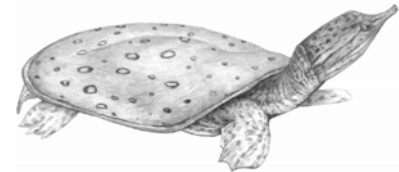
Modeled by: Jean Morin, Olivier Champoux and Sylvain Martin



Map Turtle

Mandi Eldridge

Performance Indicator Metric: This PI addresses nesting and egg development of the Map Turtle, a 25 cm or 9.84 inch (maximum) aquatic turtle and Spiny Softshell, a 50 cm or 19.69 inch (maximum) aquatic turtle. The PI gives an annual value of the available safe potential surface area of nesting and eggs development habitat (measured at the Sorel gage). The aggregated 100 year plan scenarios are expressed by the percent of time that the PI exceeds the first quartile value for plan 1958DD for the comparable water supply series (e.g. Historic, S1, S2 S3, etc). This metric will be used for plan evaluation by calculating a ratio of metrics between two plans.



Spiny Softshell Turtle

Judie Shore

Ecological Importance/Niche:

The Spiny Softshell is a 50 cm or 19.69 inch (maximum) aquatic turtle designated as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). This species is in the process of being added to schedule 1 of the Species At Risk Act as a Threatened Species. After listing, this species and its habitat will be protected under the Species At Risk Act, and a Recovery Strategy will be required within two years. Critical habitat protection will be required when the Recovery Strategy or Action Plan identifies this as a necessary step. The Spiny Softshell is designated as threatened by the Québec government under the Loi sur les espèces menacées ou vulnérables. Under this provincial act, individuals are protected. The indicator gives the available safe potential surface area of nesting and egg development habitat for different water discharge conditions.

Temporal validity: We measure the potential nesting habitat available for all of June and the two first quarter month (QM) of July while we measure the risk to drown eggs from the first QM of June until the last one of September.

Spatial validity: The PI is valid for the Lower St. Lawrence River between Lake St. Louis and Lake St. Pierre (except Laprairie Basin). The Lake St. Louis sub region is used to evaluate plans since Map Turtle has never been found anywhere else in the study area and Spiny Softshell observations are mainly coming from Lake St. Louis area.

Hydrology Link: This PI is influenced by hydraulic attributes responsible for nesting habitat availability and eggs/embryos survival. More specifically, the PI was developed using 2D modeling based on the combination of hydrodynamic model and shore substrate and vegetation database. Two hydraulic variables were considered: *mean water depth* and *water level increase*.

The Map Turtle and Spiny Softshell Turtle prefer to lay eggs in sand or gravel substrate, normally from 50 cm to 100 cm (19.69 inches to 39.37 inches) above the water level. Water levels fluctuations have three known linkages to this turtle reproduction:

- 1) Amplitude, duration and recurrence of flood are good indicators of the portion of banks / beaches available for nesting.
- 2) Amplitude, duration and recurrence of flood are good indicators of what the banks / beaches will be made up of (substratum and vegetation density).
- 3) Water level raises can drown eggs if submerged more than 48 hr.

Algorithm: The PI is made from the potential nesting and eggs development habitat model, from which the mortality model removes all portions where water levels fluctuations create “unsafe” conditions to the eggs/embryos development. The two models built to create the PI are presence / absence type models that are based on the parameters and values that were determined upon literature review and expert opinions. (more info in Giguère and al. (2005)).

Potential nesting habitat model (QM 21 to 26)

Habitat is considered as suitable if all the following features are present: water depth < 0; slope < 30°; one of the following shore polygon features.

- Beaches
- Top bank vegetation = beach or bare ground
- Bank vegetation = beach or bare ground
- Lower bank vegetation = beach or bare ground
- Top bank vegetation density < 5% + substratum = sand or gravel
- Bank vegetation density < 5% + substratum = sand or gravel
- Lower bank vegetation density < 5% + substratum = sand or gravel

Mortality model (QM 21 to 36)

From the resulting potential habitat, the mortality model removes all the nodes where the water level raises > 0 m during at least one of the considered QM.

Calibration Data: No data available

Validation Data: In the study area, Map Turtle has been found in one site during the reproduction period. This site does not fit the potential habitat highlighted by the modeling effort since the shore had not been fully characterised at this specific site. On the other hand, the Lake St. Louis has not been closely examined and other sites can be used by the Map Turtle. There is no known nesting site of Spiny Softshell in the study area. The Lake St. Louis potential habitat has been visited by Giguère and represents well these species needs in term of nesting habitat. Several traces of nesting activities have been seen (digging) without identification of the species (no individual have been seen).

Documentation and References are available in: Giguère, S, J. Morin, P. Laporte and Mingelbier, M. (2005) Évaluation des impacts des fluctuations hydrologiques sur les espèces en péril. Tronçon fluvial du Saint-Laurent (Cornwall – Pointe-du-Lac). Rapport final déposé à CMI (2002 - 2005). Environnement Canada, Région du Québec, Service canadien de la faune.

Risk and Uncertainty Assessment:

This PI is based on the following assumptions:

- Nesting habitat supply and egg/embryos survival are significant factors influencing the size and integrity of Map Turtle and Spiny Softshell Turtle populations.
- Predicted turtles response to hydrologic conditions based upon literature review is valid.
- Quarter month hydrologic data is representative of real hydrologic conditions.
- Predicted turtles response to hydrologic conditions based on statistical modeling is valid.
- Transformation from a 2D to 1D hydrologic model is correct.

Confidence rating: This PI has been built from a moderate amount of literature information that was available from outside of the region of interest. Little information was available for the study area. The potential habitat highlighted by the modelling effort has also been visited in the Lake St. Louis and are representative of the species reproduction needs. A “precaution” principle has also been used in order to obtain a “conservative” type PI. Thus we are confident that the PI allows for an accurate relative comparison among alternate water level and flow regimes within the Lower St. Lawrence.

Although hydrologic variables are strongly associated with habitat and Map Turtle / Spiny Softshell occurrence, there is also a significant amount of variation not explained by hydrology. In order to assess 100 year water level scenarios, the predictive models necessarily ignore, or hold constant other important population variables (e.g. productivity, age and sexes distribution) and environmental variables (e.g. predation, food availability, pollution, human disturbance) that can also impact reproductive success, and have an influence on regional Map Turtle / Spiny Softshell populations. For these reasons the PI values should only be considered as relative measures between plans.

Significance of the species: The Map Turtle is designated as Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The species is listed in the Schedule 1 of the *Species at risk Act*; the species, its residence (e.g. hibernacula) and its critical habitat are legally protected under this Act. Critical habitat protection will be applied when it is identified within the Recovery Strategy or Action Plan. The Map Turtle is also designated as Vulnerable by the Québec government under

the *Loi sur les espèces menaces ou vulnérables*. Under this provincial act, individuals are protected.

The Spiny Softshell Turtle is designated as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The species is listed in the Schedule 1 of the *Species at risk Act*; the species, its residence (e.g. hibernacula) and its critical habitat are legally protected under this Act. Critical habitat protection will be applied when it is identified within the Recovery Strategy or Action Plan. The Spiny Softshell is also designated as Threatened by the Québec government under the *Loi sur les espèces menaces ou vulnérables*. Under this provincial act, individuals are protected.

Sensitivity to water levels management: The scientific literature document the close association between Map Turtle and Spiny Softshell Turtle occurrence, during eggs laying period, and specific hydrological conditions. Map Turtle / Spiny Softshell Turtle PI is retained as a Key PI because it clearly shows an important vulnerability and sensitivity to alternations in water levels and flows, and is listed as a Species at risk. As such it should be used to evaluate potential environmental responses to alternative water regulation plans.