

An Evaluation of the Wood Turtle Habitat and Probable Locations and Timing of their Activity in the Marysville Flats Restoration Project Management Zones

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Background

The Marysville Flats are an 11.2-hectare (27.6 acre) property located along the Nashwaak River in Fredericton, New Brunswick (PID# 75457440) (Figure 1). The property is owned by the City of Fredericton and falls within a Provincially Significant Wetland (PSW) designation (Figure 1). The property is bordered on the east by the Gibson Trail, and includes an island that became separated due to erosion. Both pieces were cleared for agriculture in the past, primarily to graze cattle. (Figure 1).

Before land clearing, the flats would have been composed of a Silver Maple dominated floodplain-forest community. Floodplain forests, such as those along the Nashwaak River are, for a variety of reasons, critically important ecosystems. Thus, the Nashwaak Watershed Association Inc. (NWA) has developed a management plan to restore this area to a silver maple dominated floodplain-forest community (Noseworthy 2015). We have delineated four management zones in the restoration plan (Figure 2), which correspond to the management zones listed in this document.

However, the proposed restoration includes areas that have been proposed as candidate critical habitat for Wood Turtle, a provincially and nationally threatened species. The NWA has prepared this document, in collaboration with the New Brunswick Department of Energy and Resource Development (NBDERD) to address related concerns. In a first step, the potential overlap of proposed restoration work with Wood Turtle activity (spatial and temporal) is described. This is followed by the identification of measures to minimize risk to the turtles and their habitat. The approach will be adjusted to reflect the lessons learned during implementation.

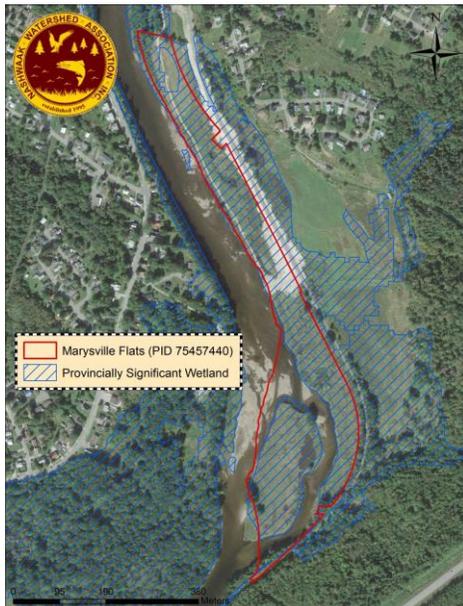


Figure 1: Location of restoration project

Threats and timelines

The immediate concerns for the Wood Turtle and the focus of the document are related to the restoration project planned for the Marysville Flats. However, there are current and potential future activities that may have an impact on the turtle population or its habitat and that are also identified in this document.

Immediate concerns – Marysville Flats restoration

Marysville Flats Management Goal: Restore Floodplain Forest community

Objective 1: Prevent Riverbank Erosion and Sedimentation

Objective 2: Restore Floodplain Forest Species Composition / Structure

Objective 3: Identify the important Wood Turtle habitat and minimize the threats to this species

The forest restoration plan for the Marysville Flats is based on four management zones (Figure 2). The general approaches to minimizing threats are presented in Table 1, followed by a description of the activities, related threats, and proposed mitigation for each zone. In addition, the small island downstream of the targeted area has been identified as particularly suitable habitat, and is not included in the current plans.

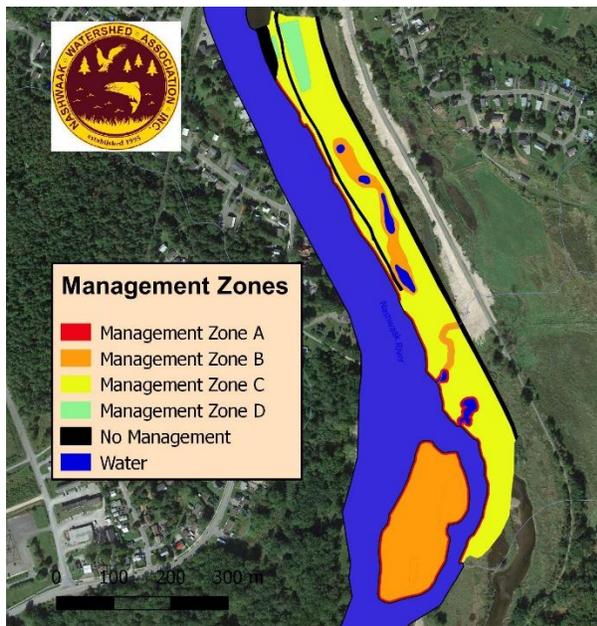


Figure 2: Management zones in the Marysville Flats

General or preparatory approaches for mitigating threats to Wood Turtle

A significant step in reducing threats to Wood Turtle can be accomplished through staff training and through attention to the common activities of mowing or trimming. Dr. Connie Browne, an ecologist with a background in turtle ecology has been a consultant on the preparation of this document and will assist in staff training and habitat assessments.

Table 1. General Mitigation

Activity	Proposed timing	Mitigation / Description
String trimming and/or mowing	Late spring to late autumn	<p>Intense visual inspection throughout active season.</p> <p>Training provided for staff in charge of trimming and mowing (how to spot turtles, tracks, what do to if a turtle is found, etc.)</p> <p>In consultation with NBDERD, we will consider a mowing pattern that involves starting in the middle of the old field and moving towards the perimeter</p> <p>Mowing will be done frequently enough to keep the grasses short enough to allow turtles to be easily spotted. Mowing of tall grasses will be done in the early spring or fall when turtles are closer to the river.</p>
Staff awareness training	Spring	<p>Site visit and inspection by Wood Turtle expert to assess potential nesting areas, hibernation spots, and general use of the area by Wood Turtles.</p> <p>Followed by training of permanent staff and interns on how to spot turtles and tracks and what to do if a turtle is found, including who to contact.</p>

Mitigation Required by Management Zone:

Management Zone A: Willow Planting

Proposed Management from the NWA I Restoration Plan:

Zone A includes a 4-metre swath of land running the length of the shoreline along the Marysville Flats, which totals 0.76 hectares (1.88 acres) in size. This area will receive willow planting. In high, eroded areas, sloughing banks may need to be sloped to a shallower grade for plantings to be successful.

In 2017, NWA I will be restoring a section of eroding river bank. Results from the 2016 geomorphic assessment of the Nashwaak River identified the Marysville Flats section of the river as being unstable and in transition. In the fall of 2016 Ben Whalen of the Kennebecasis Watershed Restoration Committee visited this and other properties to help us determine the best location for a restoration project. The location of the proposed riverbank restoration project was identified as a priority from the geomorphic assessment. The Nashwaak River's floodplains were historically converted to pasture lands and only fragments of the wetlands and floodplain forests remain. The NWA I has begun the work to restore retired hay fields to floodplain forests with the goal of re-establishing habitat for many wildlife species. We will partner with the City of Fredericton; a landowner on the lower Nashwaak River, to restore a wetland in the Marysville Flats (PID# 75457440, City of Fredericton Parks and Trees) using bioengineering techniques and materials such as willow staking and geo-textile fabric.

The restoration project will serve as a demonstration site for upstream landowners to visualize the benefits (landowner benefits and habitat/biodiversity benefits) of protecting and restoring riparian habitat.

For this phase of the project, the NWA I will:

- a) Work with a local engineering company to survey the eroded bank we have identified and design a restoration plan;
- b) Apply for a Wetland and Watercourse Alteration permit;
- c) Hire a local contractor to help with the project (resloping of the bank, hauling and placing rock, and site clean-up);
- d) The restoration plan is to slope the bank back at a 3:1 angle, install two rock keys on either side (perpendicular to the river) and a rock toe. We will then cover the site with geo-textile fabric and stake it densely with native species of willow. We will plant native species of trees behind the restoration site;
 - a. Volunteers and NWA I staff will carry out all work except for the excavation and the placement of rock;
 - b. We will monitor the site closely (weekly) and re-plant or re-stake as necessary;
 - c. We expect that the work will take 2-5 days to complete;
 - d. We are committed to monitoring the site for at least 3 years until vegetation stabilizes the bank; and
 - e. There will be no heavy machinery in the watercourse.

- e) Once the site is restored and the willows have begun rooting, we will hold landowner meetings and field trips to view and discuss the site.



Figure 3: Location of proposed riverbank restoration

Wood Turtle Use and Timing:

Wood turtles typically overwinter within 2 m of the shoreline and may use woody debris, vegetation, roots, bank undercuts, or muskrat/beaver burrows for shelter or simply rest on the stream bottom (Greaves and Litzgus 2007, 2008; Scott Gillingwater pers. comm.; Mark Pulsifer pers. comm). Cold, inactive turtles would be highly vulnerable to machinery because of their reduced awareness and mobility. Therefore, high impact activities that could alter overwintering sites (e.g., collapsing bank edges or muskrat tunnels, machinery entering the water, etc.), should be avoided during the overwintering period. Most individuals likely overwinter from November to ice out, but some may remain at or near their overwintering sites from September to May (Jones and Wiley 2015; Browne 2017).

Wood turtles will use river/stream edges throughout the active season (April to October) and are highly concentrated along river/stream edges and the beginning (April-May) and end of the active season (September-October). On colder days (e.g., $<9^{\circ}\text{C}$) they will likely be in the water, but on warmer days they will bask along the stream/river banks.

Wood turtles could also be using Management Zone A for nesting if appropriate conditions are present, such as open sand/gravel bars or banks. Nesting usually occurs in June, but can occur from mid-May to mid-July (Jones and Wiley 2015). Hatchlings will emerge from August to October (Jones and Wiley 2015).

Visual surveys can be used to find turtles to remove them from impact areas, but detection rates tend to be very low. Jones and Wiley (2015) estimated detection rates to be 0.03 (one turtle observed for every 33 turtles present in the area). Despite the low detection rates, surveys conducted immediately prior to commencing work are likely still a worthwhile mitigation process because turtles basking along a river bank that are disturbed by a human will often sneak away to the river once they think you aren't looking (C. Browne pers. obs.).

Table 2. Mitigation for Zone A

Activity	Proposed timing	Mitigation
Bank shaping and restoration work: <ul style="list-style-type: none"> • site access by heavy machinery via dirt road, • placement of rock toe, • resloping of bank, • placement of geotextile fabric, • site clean up (removal of all extra materials and machinery), and • tree planting/ willow staking 	Ideally in August but timing will depend on WAWA permitting.	Regular monitoring for basking turtles on warm sunny days. Inspection for nesting areas, prevention of nesting with fabric if applicable. Monitoring and intense visual inspections before work begins (including inspection for tunnels or undercut areas that may serve as hibernation or resting areas). Active exclusion if turtles found. Machinery will be on the riverbank only, not in the river.
Willow staking	Spring (as soon as water level recedes)	Little risk of harm to turtles, particularly if completed prior to the nesting season.

Management Zone B: Sensitive Area

Proposed Management from the NWAJ Restoration Plan:

The NWAJ is not planning any management or restoration activities in Zone B. This zone buffers the backwater wetlands, a watercourse that cuts through the flat, and the island in the Nashwaak River. Patches of natural vegetation occur throughout zone B, and the soil is saturated for most of the year. The vegetation will be left to regrow naturally.

Wood Turtle Use and Timing:

Wood turtles overwinter in the water and have been documented to use oxbow and marsh sites, but they usually choose rivers or streams (White 2013). Although it's possible that they could use the waterbodies in Management Zone B for overwintering, but it's more likely that they would use the river rather than these sites.

Management Zone B is likely used during the active season. A habitat selection study conducted in New Brunswick indicated that wood turtles selected areas near water (the river or smaller water bodies, including isolated oxbows, beaver ponds, and vernal pools) with low canopy cover (Roy-McDougall 2010); thus, this zone may be selected for during the active season. The active season for wood turtles is from April to October, but because they usually remain close to their overwintering sites early and late in the year, use of Management Zone B probably occurs from May to September. This zone may be especially attractive to wood turtles during the spring pre-nesting season (May to early June) because the waterbodies would provide protection from cold weather and predators, when vegetation cover is limited elsewhere. Additionally, these small ponds may provide superior foraging and thermoregulation opportunities for turtles during the spring. The small pools would warm up faster than the river on warm spring days and they might provide food sources (e.g., amphibian larvae, aquatic invertebrates) early in the year before vegetation and berries become options. Spring movements from river overwintering sites to pools and wetlands adjacent to the river have been observed elsewhere in Canada (Hughes 2016; Browne 2017).

Management Zone C: Old Field

Proposed Management from the NWA Restoration Plan:

This zone is composed of old-field and cleared land that is not considered sensitive. Restoration activities including site preparation by bush hogging in the fall, tree planting, and mowing of grasses around seedlings for a minimum of three years. Planting of Silver Maple trees should be completed in late spring once flooding has subsided and the soil has begun to dry and planting density will be 2x2 metre spacing. It has been recommended that field vegetation be bush-hogged prior to planting trees in late autumn when soils are dry and vegetation has begun to die back. Tree planting will likely be completed in late spring. Planted areas will be maintained by mowing field vegetation as often as possible for three or more years after planting.

Wood Turtle Use and Timing:

Wood turtles shift their habitat use during the active season, they primarily use riparian areas in the spring and fall and terrestrial habitat in the summer (Roy-McDougall 2010; Jones and Wiley 2015). Wood turtles use alder swales, grassy openings, forests, agricultural land, open pasture, fields, wet meadows, and wetlands (Jones and Wiley 2015). Wood turtles select habitat edges (e.g., fields bordering forests). Habitat edges allow turtles to move between open areas to warm up in and more densely vegetated areas for food and shelter. Wood turtles must maintain warm body temperatures to digest their food, so warm basking sites within close proximity of feeding areas are required. A good proportion of the wood turtle population could be using the upland forests and old fields in July and August, with some turtles moving to these areas in June and staying until September. Wood turtles in New Brunswick have been recorded to use habitat up to 810 m from water, but most observations are within 200 m of a waterway (Roy-McDougall 2010).

Management Zone C begins 4 m away from the river, adjacent to Management Zone A, so turtles could be using this zone throughout the active season (April to October), but are probably limited to the areas close to the river early and late in the season. From June to September, they could be anywhere in Management Zone C, but are most likely to be in areas close to the river or close to forest habitat.

Wood turtles will nest in anthropogenically modified habitat, thus any open, well-drained, exposed areas of sand and/or gravel in Management Zone C could be used for nesting. Aerial photographs show some open areas adjacent to the maintenance road and recent construction work to install a sewer line has created open areas adjacent to Gibson trail and down to the river through Zones C and A at one section. Nesting usually occurs in June, but can occur from mid-May to mid-July (Jones and Wiley 2015). Hatchlings will emerge from August to October (Jones and Wiley 2015).

The use of machinery and mowing equipment is a serious threat to wood turtles (Erb and Jones 2011). In a trial using surrogates for Wood Turtle, Erb and Jones (2011) found that rotary mowers (bush hog) set at 15 cm could cause approximately 28% mortality from the blades plus 46% from the tractor tires (74% mortality for turtles in the fields). As proposed, the timing of mowing and use of machinery could overlap with when turtles are possibly using this area.

Table 3. Mitigation for Zone c.

Activity	Proposed timing	Mitigation
Bush-hog mowing for site prep	Late autumn	Intense visual inspection throughout active season. Bush hog mowing will be done as late as possible in the year to reduce the risk to Wood Turtles. Mowing will be avoided on warm autumn days
Planting	Spring and fall	Visual inspection for potential nesting and basking sites to avoid. If an area is deemed a good nesting area by the Wood Turtle expert then the site will be left untouched.
String trimming and/or mowing	Late spring to late autumn	Intense visual inspection throughout active season. Mowing will be done frequently enough to keep the grasses short enough to allow turtles to be easily spotted. Mowing of tall grasses will be done in the early spring or fall when turtles are closer to the river.

Management Zone D: NWAJ Planted

Proposed Management from the NWAJ Restoration Plan:

This zone was previously planted by NWAJ with a variety of tree species, some of which are not able to survive annual flooding. Dead and undesirable trees will be replaced using floodplain tree species. To prepare the site, field vegetation will likely be mowed and the stems of undesirable trees will be cut flush with the ground. Planting will occur in late spring. Planted areas will be maintained by mowing field vegetation as often as possible for three or more years after planting.

Wood Turtle Use and Timing:

The timing of wood turtle use of Management Zone D is probably very similar to Management Zone C and, therefore, mitigation measures would be the same (see Mitigation Table in Zone C). In Management Zone D, the area adjacent to the shoreline thicket (between the river and maintenance road) is probably the most attractive area to wood turtles within this zone. Wood turtles select for habitat edges, sites closer to the river, and commonly use alder and shrub thickets (Compton et al. 2002; Arvisais et al. 2004; Roy-McDougall 2010). This area of Zone D is approximately 20 m from the river and could be used anytime during the active season (April to October).

As proposed, the timing of mowing and use of machinery could overlap with when turtles are possibly using this area and is a threat to wood turtles (Erb and Jones 2011). The mitigation for mowing described in Table 1 will be applied to this zone.

Best Wood Turtle Habitat within the Marysville Flats Management Area:

The area around the island is likely quite attractive to wood turtles because it contains several features that wood turtles are associated with: a small pool adjacent to the river that might be used in the spring, sand/gravel bars along the river edge that could potentially be used for nesting, a forest field edge on the mainland that could be used for foraging and thermoregulation, and branching in the river channel that might provide ideal sites for overwintering. Therefore, the NWAJ will not carry out any management or restoration activities on the island and leave the vegetation to regrow naturally.

Current or potential threats in the lower Nashwaak River: a long-term perspective for partners

The lower Nashwaak has been identified as candidate critical habitat in the proposed national recovery strategy for the Wood Turtle (Env. Canada 2016). Managing the area in a way that minimized threats to the species and its habitat involves consideration of the varied interests and partners on the river. A general list of threats to the Wood Turtle is presented in the proposed recovery strategy: road networks, agricultural practices, illegal collection as pets and for consumption, residential and commercial development, subsidized predation, forestry practices, water management (including bank stabilization), off-road vehicles, sand and gravel pits, pollution and sediment input. The Department of Energy and Resource Development is engaged in identifying the best approaches to measuring threats on a watershed scale and in identifying and testing potential mitigation and avoidance solutions.

As in the case of the Marysville Flats project, arriving at a plan for minimizing threats would involve:

- the identification of the current or proposed activities
- an assessment of the overlap with Wood Turtle activity and habitat
- an assessment of the potential impact on the species
- consideration of the mitigation options

The following is a preliminary list of the current anthropogenic activities that are likely to result in threats to Wood Turtles on the lower Nashwaak. While some mitigation methods have been proposed, their efficacy may not have been confirmed.

Table 4. Major threats to Wood Turtle in the lower Nashwaak.

Activity/factor	Threat or impact
Trails- access to the area	Collection
Angling and other recreational activities	Collection
Mowing	Adult mortality
Residential or commercial development	Habitat loss Change in river dynamics
Road network	Adult mortality
Subsidized Predator	Adult mortality, nest destruction

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