

Wood Turtle Monitoring and Stewardship in the Annapolis River Watershed

2015-2016 Final Report
Public Version

Prepared By:
Katie McLean
May 26, 2016



Clean Annapolis River Project

314 St. George Street, P.O. Box 395,
Annapolis Royal, NS, B0S 1A0
1-888-547-4344; 902 532 7533

carp@annapolisriver.ca, www.annapolisriver.ca

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This project was made possible thanks to the financial support from the
Nova Scotia Habitat Conservation Fund (contributions from hunters and trappers)



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Acknowledgements

Clean Annapolis River Project 's (CARP) 2015-2016 Wood Turtle Monitoring and Stewardship project was made possible thanks to financial support from the Nova Scotia Habitat Conservation Fund. CARP would also like to thank Dr. Steve Mockford (Acadia University), Jeffie McNeil (Mersey Tobeatic Research Institute), Mark Elderkin (Nova Scotia Department of Natural Resources) and Mark Pulsifer (Nova Scotia Department of Natural Resources), for their ongoing support for and collaboration on this project.

Field activities would not have been possible without the extensive contributions of volunteers who supported radio-telemetry, visual surveys, nesting surveys and emergence surveys:

Earl Acker	Jean McCamon	Brenda Forbes
Christina Spencer	Jamie McCamon	Steve Forbes
Alan Ng	Karen McClafferty	Mike Parker
Jamie Ring	Alyssa Matthew	The 2015 Middleton 02
Steve Murphy	Rick Baltzer	class
Ryan Murphy	Alan Hatt	Keegan Dexter
Marissa Murphy	Ariel Vallis	

CARP would also like to thank the various community groups that supported outreach activities, including the Paradise Active Healthy Living Society, the Annapolis Valley regional Libraries, the Annapolis Royal Friends of the Library, and the Middleton Options to Opportunities Program.

Executive Summary

The Wood Turtle Monitoring and Stewardship Project was initiated by the Clean Annapolis River Project (CARP) in collaboration with Acadia University, the Mersey Tobeatic Research Institute (MTRI), and the Nova Scotia Department of Natural Resources (NS DNR) in June of 2012. It has since completed four successful field seasons.

The goal of the project is to ensure the long-term persistence of the wood turtle and their habitat in the Annapolis River watershed. The project includes has components, including monitoring and data collection, public outreach and education, and promotion of stewardship actions.

During the 2015 field season a total of 18 individual turtles were observed through visual surveys, nesting surveys, radio-telemetry, or incidental to radio-telemetry, four of which were first captures.

Visual surveys took place in the Aylesford (South River), Kingston (Annapolis River) and Meadowvale (Fales River) areas. Eight individuals, three of which were first captures, were observed as a result of visual surveys.

Four turtles were radio-tracked during the 2015 field season. Two of the turtles tracked were females that had been identified through visual surveys; transmitters remained on these turtles throughout the overwintering period. Six additional turtles were observed incidental to radio-tracking.

Five turtles were observed making nest attempts, and four nesting events were observed. These nests were subsequently protected and monitored. Three of the four nests resulted in successfully emerged, live hatchlings. In total 21 hatchlings were notched and released at their respective nesting sites.

Additional activities included the development of five new stewardship plans with private landowners in Aylesford, Meadowvale and Paradise, and a variety of public education and outreach activities.

1.0 Introduction

Wood turtle description and ecology

The wood turtle (*Glyptemys insculpta*) is a medium-sized, semi-aquatic turtle, ranging in size from 16 to 25 cm in length as adults (COSEWIC 2007; MacGregor & Elderkin, 2003). The carapace is gray-brown in colour with a sculptured woody appearance, caused by pyramidal circular rings or growth lines. The plastron is yellow with a pattern of black or dark coloured blotches and has no hinge. The skin on the head and upper body of the wood turtle is often dark brown, while the skin on the throat, tail and undersides of the legs is often yellow, orange or red in colour. They are a long-lived species, reaching sexual maturity between the ages of 11 to 22 (with 16 years being the average). In the wild, wood turtles have an average lifespan of 30 years, compared to 50 years in captivity.

The wood turtle can be found distributed throughout northeastern North America (MacGregor & Elderkin, 2003). In Canada, the wood turtle can be found in Nova Scotia, New Brunswick, Quebec and Ontario. In the United States (US), the wood turtle can be found in Virginia, New York, Wisconsin, Minnesota and Iowa (MacGregor & Elderkin, 2003; Ernst & Lovich, 2009). In Nova Scotia, wood turtles have been reported in 31 watersheds throughout the province, although little is known about their abundance in many of these areas (MacGregor & Elderkin, 2003). The estimated population in Nova Scotia is between 2000 to 7000 individuals (Environment Canada, 2015). The largest known population of wood turtles in Nova Scotia can be found within the St. Mary's River watershed.

The wood turtle is the most terrestrial of the four freshwater turtle species in Nova Scotia, but still requires water for many of its seasonal activities (COSEWIC 2007; MacGregor & Elderkin, 2003) such as thermoregulation (Dubois et al., 2009), mating (Ernst & Lovich, 2009) and hibernation (Greaves & Litzgus, 2007). In Nova Scotia, the wood turtle requires a stream or river that is clear, meandering and moderately flowing (COSEWIC 2007; MacGregor & Elderkin, 2003). A sandy or sand-gravel area is required for nesting although wood turtles will also make use of artificial nesting sites such as gravel pits, road shoulders and residential sites. Riparian areas and forested habitat are preferred wood turtle habitat; however they are also found in habitats such as flood plains, meadows, hay and agricultural fields, oxbows and beaver ponds.

Wood turtles in Nova Scotia face a variety of natural and anthropogenic threats. Anthropogenic threats include accidental mortality as a result of vehicles or agricultural equipment, habitat loss and degradation, such as residential and commercial development, forestry practices, water management, and changes in ecological dynamics or natural processes, such as subsidized predation (Environment Canada, 2015). Illegal collection as pets or for consumption has also been identified as a potential threat. In the Annapolis River watershed, which includes extensive road networks and a relatively large amount of land in agricultural production, accidental mortality as a result of collisions with vehicles or farming

equipment are significant threats to wood turtles (Environment Canada, 2015; MacGregor & Elderkin, 2003).

Species at risk status

In Canada, the wood turtle is currently listed as *threatened* under the Federal Species at Risk Act (SARA). The wood turtle was first added to the SARA Registry in 1996 as a species of special concern, and re-examined and listed as threatened in Schedule 1 of SARA in 2010. Environment Canada (2015) has determined the recovery of the wood turtle in Canada to be both technically and biologically feasible. In 2015 a draft Recovery Strategy for the Wood Turtle (*Glyptemys insculpta*) in Canada was released, and open to public comment until April 1, 2016. Once a final Recovery Strategy has been approved, Wood Turtle Action plans will be posted to the Species at Risk Public Registry. These Action Plans are due for submission by 2020 and will guide conservation actions.

In Nova Scotia, the wood turtle was first listed under the Nova Scotia Endangered species act as *vulnerable* in 2000. After re-examination this designation was changed to threatened in 2013. These designations are largely imparted because of the wood turtle's sensitivity to human activities and land use practices.

Between 2005 and 2008 NS DNR completed wood turtle surveys within the Annapolis River watershed and 75 wood turtles were recorded. CARP initiated surveys in 2012 to re-assess the population and has developed a monitoring and stewardship program that is ongoing. There are a number of remaining data gaps regarding the local population of wood turtles, including the full extent of their range, and population size and structure.

2.0 Project Goals and Objectives

The overall goal of the Wood Turtle Monitoring and Stewardship project is to ensure the long-term persistence of the wood turtle and its habitat in the Annapolis River watershed. More broadly, the project aims to engage community members in environmental conservation and stewardship activities, using the wood turtle as a focal species.

Objectives during the 2015-2016 project season included:

- Monitoring the movement patterns and distribution of wood turtles in the watershed through the use of radio telemetry (e.g. travel routes among habitat types, distance traveled, etc.).
- Assessing habitat use by sub-populations in the Annapolis river watershed (e.g. nesting, overwintering, copulating, year round use, etc.).
- Implementing an outreach program to engage communities within the watershed to create awareness and promote education about the ecological needs and importance of the wood turtle.
- Recruiting, training and re-training volunteers in wood turtle surveying, monitoring and stewardship activities such as nest protection, in order to build organizational capacity and develop a skilled and engaged volunteer base.
- Engaging landowners and stakeholders in the development and adoption of stewardship activities (e.g. raising mower blades, maintaining riparian buffers on residential and/or agricultural lands, etc.) tailored to land uses around confirmed wood turtle habitat in the watershed.
- Contributing to a provincial wood turtle recovery strategy through participation in wood turtle recovery team meetings in NS, and sharing CARP's work and data with academic, government and community partners.
- Contributing new data to the central wood turtle database maintained by the Mersey Tobeatic Research Institute (MTRI).

3.0 Methodology

3.1 Visual Surveys

Systematic visual surveys of terrestrial and aquatic habitat were conducted in areas of known and suspected wood turtle habitat within the Annapolis River watershed between May and September 2015. Field teams recorded location and effort using Nova Scotia Turtle Daily Effort Cards (Appendix 1). Data for any individual turtles observed during surveys was recorded using Nova Scotia Turtle Observation cards (Appendix 2). Protocols for data collection and handling of turtles were based on those developed by the Blanding's Turtle Recovery Team (2007).

Data collection for each observed turtle included: notch code, GPS coordinates of location and a location description (position, habitat at capture, perch, etc.), weather conditions, turtle behaviour, and measurements. All survey data was recorded in an internal database and contributed to the central Species at Risk Turtle Database, maintained by Mersey Tobeatic Research Institute (MTRI).

Notch codes were used to mark each individual turtle, and were assigned to CARP by MTRI staff. Notch codes 451 to 500 were assigned to CARP staff. Left and right marginal scutes are assigned specific values, which when summed, provide an individual turtle ID number. A ½" triangular file was used to file notches on previously un-notched turtles.

3.2 Radio Telemetry

Radio transmitters were attached to the carapace of individual turtles using methods developed by the Blanding's Turtle Recovery Team (2007). Transmitters were glued to the rear marginal scutes of the carapace using epoxy. New turtles identified as candidates for radio telemetry were transported to the CARP office in a 40L plastic bin. After the transmitter was attached, turtles were held for a maximum 24 hours to provide time for the epoxy to set. Turtles were then transported back to and released at location where they were collected.

Three turtles were equipped with radio transmitters prior to the 2015 field season. Two additional transmitters were available for use and were equipped to new individuals during the 2015 field season. Transmitter units have approximately an 18 month lifespan, after which they must be removed in order to avoid having units expire while they are attached to turtles and subsequently lost. Units can then be refurbished for future re-use.

Radio telemetry was conducted semi-weekly at a minimum between May and October, with more frequent sessions focused on reproductive females during the nesting season. Telemetry sessions were conducted through November 2015 to identify overwintering sites and concluded once turtles were consistently identified in overwintering sites. Individual turtle observations were recorded on Nova Scotia Turtle Observation Cards (Appendix 2) and survey efforts recorded on Nova Scotia Turtle Daily Effort Cards (Appendix 1). Telemetry data

was recorded in an internal database and contributed to the central Species at Risk Turtle Database.

3.3 Nest and emergence surveys

Nest surveys were conducted based on methods established by the Blanding's Turtle Recovery Team (2007). Surveys were conducted at sites with previously documented nesting activity, or in areas with known females of reproductive age and suitable nesting habitat. Nesting surveys were conducted throughout June, and effort was recorded using Nova Scotia Turtle Daily Effort Cards.

Data about individual turtles observed nesting or attempting to nest was recorded on Nova Scotia Turtle Observation Cards. Morphometric data was collected only after females had completed nesting activity. Protective nest covers were placed on all nests where oviposition was observed, in order to prevent nest predation.

Confirmed nests were monitored daily, beginning 60 days after oviposition. Nest monitoring effort was recorded on Turtle Emergence Effort Cards. In the case of hatchling emergence, data was collected for the nest site on Turtle Emergence Cards, and individual hatchling data was documented on Turtle Hatchling Observation Cards (Appendix 3). Emerged hatchlings were notched and released on site once data collection was complete.

Nests covers were replaced after the first observation of hatchling emergence, and nests monitored for an additional week. After one week, nests were excavated in order to identify eggs or hatchlings that failed to emerge. In the case that emergence was not observed, nests were excavated after 120 days. All data was recorded in an internal database and contributed to the central Species at Risk Database.

3.4 Water Quality

Water quality samples were collected opportunistically throughout the season using a YSI Professional Plus multiparameter sonde unit (Model: Pro 10102030). Parameters measured included: water temperature, dissolved oxygen, specific conductivity, conductivity, pH, total dissolved solids and salinity.

3.5 Stewardship Plans

Stewardship plans were developed collaboratively between CARP and private land owners and managers. Potential properties were selected based on known sightings of wood turtles, presence of wood turtle habitat(s), and landowner interest in active participation in the project.

A property assessment form was developed to guide data collection for each property. Information collected included habitat types present on the property, a description of key habitat features, and specific threats to wood turtles on or near the property. Geospatial information was collected using a handheld computer and ArcPad GIS software. Data collected included boundaries of habitat types and locations of important habitat features. This data was used to produce property specific habitat maps using ArcGIS. Stewardship actions were recommended based on the outcomes of property assessments, taking landowner/manager property goals and objectives for their property into consideration. Recommendations were linked to specific habitat type of features identified on the property maps.

3.6 Public Outreach and Education

A variety of educational and outreach materials were developed for the project. Materials were developed in order to achieve a broad range of objectives, including raising awareness about wood turtles and threats to their population in the Annapolis River watershed, increasing awareness about the Wood Turtle Monitoring and Stewardship Project, engaging landowners in stewardship actions, and engaging members of the public in volunteer actions.

Outreach events targeted public engagement in project activities, including radio-telemetry and visual surveys. Educational events focused on promoting stewardship actions among landowners/managers and raising public knowledge about species at risk, including the wood turtle.

4.0 Results

Specific locations of individual turtles, survey areas, stewardship properties, etc. have been removed from this version of the report.

4.1 Visual Surveys

Visual survey efforts were concentrated in May and June, when conditions were most favourable for observing turtles, with vegetation at its least dense. Seventeen visual surveys were completed (Table 1). A total of 229 hours was spent on visual surveys, 142 hours of which were completed by volunteers (Table 2).

Turtles were observed during 10 of these surveys, accounting for 8 individuals, 3 of which were first captures (#453, 456, 458) (Table 7). Two of the female turtles identified through visual surveys were equipped with radio-transmitters (#456, 458).

Table 1. Visual survey locations, 2015

Date	Area	Turtles observed?
2015-05-01	Annapolis	Yes
2015-05-07	Annapolis	Yes
2015-05-13	South River	Yes
2015-05-14	Fales	No
2015-05-15	Annapolis	No
2015-05-16	Fales	No
2015-05-21	Fales	Yes
2015-05-22	Fales	No
2015-05-26	Annapolis	Yes
2015-05-27	Annapolis	No
2015-05-28	South River	Yes
2015-06-04	South River	Yes
2015-06-10	South River	Yes
2015-06-19	South River	Yes
2015-06-23	Annapolis	No
2015-06-23	Annapolis	No
2015-07-02	South River	Yes

Table 2. Visual survey effort, 2015

Area	Section	Total effort (hours)	Volunteer effort (hours)
Annapolis	Kingston	23	11
	CFB Greenwood	28	18
	Eden	10	5
	Lawrencetown	12.5	3.5
Fales	Meadowvale	26	13
	Fales	45	28
South River	Aylesford	84.5	63.5
TOTAL		229	142

4.2 Radio Telemetry

Three turtles (#608, 500, 542) were equipped with radio-transmitters prior to overwintering between November 2014 and April 2015. Radio-telemetry for these three individuals commenced in May, and all three individuals were located. The radio unit on turtle #500 was removed immediately for refurbishing, as the battery had reached its expiry date. The transmitters on turtles #608 and #542 were removed on July 27, 2015, and on August 9, 2015, respectively, as they reached their battery expiration dates. These units are available to be refurbished for future use.

Thirty telemetry field days were conducted throughout the 2015 season (Table 3). Effort was increased during the nesting season (late May-June), to increase chances of observing nesting activity. A total of 246.25 hours of effort were spent conducting radio-telemetry, 92 of which were completed by volunteers (Table 4).

Two refurbished units were available to be equipped on new individuals during the 2015 field season, with reproductive females made a priority, to help increase chances of observing nesting activity. These transmitters were attached to two adult female turtles identified during visual surveys, one found in the Fales River at Meadowvale (#456), and one found in the South River at Whitman Road, Aylesford (#458). Seven incidental observations were made during radio-tracking, accounting for six individual turtles.

Telemetry sessions concluded in November, after the two turtles equipped with radio-transmitters (456, 458) had moved into over-wintering sites.

Individual turtle observations resulting from both radio-telemetry and visual surveys are presented in section 4.3.

Table 3. Radio-telemetry sessions, 2015

Date	Area	Turtle	Turtle	Behaviour	Perch
------	------	--------	--------	-----------	-------

		Number	Name		
4-May-15	South River	n/a			
6-May-15	South River	n/a			
	Annapolis	452	Red Rocket	Atmospheric basking	Grass/sedge
	South River	605	Jeanie	Atmospheric basking	Grass/sedge
8-May-15	South River	608	Hannley	Aquatic stationary	Log/sticks
10-May-15	South River	522	The Hulk	Aggression/courtship	Grass/sedge
13-May-15	Annapolis	452	Red Rocket	Terrestrial stationary	Other: oak leaves
	South River	608	Hannley	Terrestrial active	Log/sticks
20-May-15	South River	205	Hank	Aggression/courtship	Grass/sedge
		608	Hannley	Terrestrial active	Corn field
	Annapolis	452	Red Rocket	Terrestrial active	Grass/sedge
25-May-15	Fales	456	Jenny	Terrestrial stationary	Buried in substrate
	Annapolis	500	Annie*	Terrestrial stationary	Log/sticks
26-May-15	South River	520	May	Terrestrial stationary	Grass/sedge
	Annapolis	565	Moe	Terrestrial stationary	Grass/sedge
		452	Red Rocket	Terrestrial stationary	Grass/sedge
28-May-15	Fales	456	Jenny	Aquatic active	Rock
2-Jun-15	Annapolis	452	Red Rocket	Aquatic stationary	
	South River	608	Hannley	Aquatic stationary	
		458	Miss Chris	Aquatic stationary	
	Fales	456	Jenny	Aquatic stationary	
4-Jun-15	South River	608	Hannley		
		458	Miss Chris	Terrestrial active	Grass/sedge
5-Jun-15	Fales	456	Jenny	Agression/courtship	Grass/sedge
8-Jun-15	Fales	456	Jenny	Terrestrial stationary	Grass/sedge
	South River	608	Hannley	Terrestrial stationary	Grass/sedge
		458	Miss Chris	Terrestrial stationary	Grass/sedge
	Annapolis	452	Red Rocket	Nest search/attempt	
10-Jun-15	Fales	456	Jenny		
	South River	458	Miss Chris	Terrestrial active	Grass/sedge
11-Jun-15	Annapolis	452	Red Rocket	Terrestrial active	Grass/sedge
12-Jun-15	Fales	456	Jenny		
	Annapolis	452	Red Rocket		
	South River	608	Hannley	Atmospheric basking	Grass/sedge
		458	Miss Chris	Terrestrial active	Grass/sedge
16-Jun-15	Fales	456	Jenny	Terrestrial stationary	Grass/sedge
	Annapolis	452	Red Rocket	Aquatic stationary	Buried in substrate
	South River	602	Hannley		

18-Jun-15	Fales	456	Jenny	Aquatic active	Bottom
	South River	608	Hannley	Aquatic stationary	Grass/sedge
		458	Miss Chris	Terrestrial stationary	Grass/sedge
	Annapolis	452	Red Rocket	Terrestrial active	Grass/sedge
23-Jun-15	Fales	456	Jenny	Terrestrial stationary	Log/sticks
	Annapolis	n/a			
	South River	458	Miss Chris	Terrestrial active	Grass/sedge
		608	Hannley	Terrestrial active	Grass/sedge
24-Jun-15	South River	458	Miss Chris	Terrestrial active	Grass/sedge
	Fales	456	Jenny	Terrestrial stationary	Log/sticks
25-Jun-15	South River	458	Miss Chris	Terrestrial active	Grass/sedge
	Fales	456	Jenny	Terrestrial stationary	Log/sticks
30-Jun-15	Fales	456	Jenny	Aquatic stationary	
	Annapolis	n/a			
	South River	205	Hank	Terrestrial active	Grass/sedge
		458	Miss Chris	Terrestrial active	Grass/sedge
		608	Hannley	Terrestrial active	Grass/sedge
15-Jul-15	Fales	456	Jenny	Atmospheric basking	Grass/sedge
	Annapolis	452	Red Rocket	<i>general location only</i>	
	South River	458	Miss Chris	<i>general location only</i>	
		608	Hannley	<i>general location only</i>	
27-Jul-15	Fales	456	Jenny	Foraging/eating	Grass/sedge
	Annapolis				
	South River	608	Hannley*	Terrestrial active	Grass/sedge
		458	Miss Chris	Terrestrial active	Grass/sedge
9-Aug-15	Annapolis	452	Red Rocket*	Terrestrial stationary	Grass/sedge
27-Aug-15	Fales	456	Jenny	Terrestrial stationary	Log/sticks
	South River	458	Miss Chris		Cropland
29-Sep-15	South River	458	Miss Chris	Aquatic stationary	Log/sticks
10-Oct-15	Fales	456	Jenny	Aquatic stationary	Rock
	South River	458	Miss Chris	Aquatic stationary	Bottom
26-Oct-15	Fales	456	Jenny	Aquatic stationary	Buried in substrate
	South River	458	Miss Chris	Aquatic stationary	same location as last sighting
20-Nov-15	Fales	456	Jenny	Aquatic stationary	Bottom
	South River	458	Miss Chris	Aquatic stationary	Bottom

Table 4. Radio telemetry effort, 2015

Radio-telemetry effort			
Area	Section	Total effort (hours)	Volunteer effort (hours)

Annapolis	Kingston	53	10.5
	Lawrencetown	9	4.5
South River	Aylesford	96.75	40.25
Fales	Meadowvale	85.5	36.75
	Rocknotch	4	0
TOTAL		246.25	92

Table 5. Radio transmitter unit data

Serial Number	Date shipped to CARP	Date Attached to turtle	Frequency	Turtle #	Turtle name	Anticipated expiry	Date removed	Date shipped for refurbishing
183540	23-Oct-14	Oct/Nov 2014	172.992	452	Red Rocket	May-16	09-Aug-15	<i>in office</i>
	14-May-13	09-Jul-13	172.992	471	Oli	Jan-15	14-Oct-14	* sent for refurbishing
183539	14-May-13	05-May-15	172.932	458	Ms Chris	Nov-14	24-Jul-15	<i>in office</i>
		03-Jun-13	172.932	500	Annie	Nov-14	25-May-15	
	14-May-13	27-May-13	172.932	548	Jules	Nov-14	03-Jun-13	
74247	23-Oct-14	21-May-15	172.401 (.402)	456	Jenny	Nov-16	<i>still attached</i>	
		12-Apr-13	172.402	608	Hannley	Oct-14	06-Oct-14	* sent for refurbishing
74252	21-Jan-14	ca. 16 September 2014	172.520	608	Hannley	Jun-15	27 July, 2015	<i>in office</i>
		May-14	172.520	455	Jimmy		16-Sep-14	
		29-Apr-13	172.522	566	Little Miss	Jan-14	06-Sep-13	* sent for refurbishing
		10-Jul-12	172.522	523	Earl	Jan-14	29-Apr-13	
74257	16-Jul-15	24-Jul-15	172.664	458	Ms Chris	Jan-17	<i>still attached</i>	
		30-Apr-13	172.665	452	Red Rocket		28-Oct-14	* sent for refurbishing
		26-Apr-13	172.665	451	Boomer		30-Apr-13	

4.3 Turtle observations

During the 2015 field season a total of 18 individual turtles were observed through visual surveys, nesting surveys, radio-telemetry, or incidental to radio-telemetry (Table 6). Four of

these individuals were first captures. This is similar to the number of observations made in past field seasons, with 17 individuals and 18 individuals observed in 2014 and 2013 respectively (Table 8).

Table 6. Survey methods and resulting observations

Sighting method	Individuals observed*	Observations	First captures
Visual survey	8	10	3
Radio-telemetry	5	63	0
Incidental to radio-telemetry	6	7	0
Nesting survey	5	15	1
Sniffer dog	1	1	0

*Individual turtles were potentially observed using multiple-methods

Table 7. Individual turtles observed, 2015

Turtle #	Name	Notch Code	Sex	Age Class	Area	Date of first capture/recapture	# observations 2015	Sighting method(s)	Reproductive female?
205	Hank	L3, R10,11	M	A	South River	recapture	4	V, I	
452*	Red Rocket*	L11-R2,8,9	F	A	Annapolis	recapture	14	R, V	√
453	Brucie	L11-R2,8,9,11	M	J	Fales	21-May-15	1	V	
454	Nick Jr.	R2,8,9,10	M	A	Annapolis	recapture	1	V	
456*	Jenny*	L11-R2,8,9,10	F	A	Fales	21-May-15	21	V, R	√
457	Lucky Lady	L10-R2,8,9	F	A	Annapolis	recapture	5	N	√
458*	Miss Chris*	L10, R2,8,9,11	F	A	South River	28-May-15	18	V, R	
459	Nina	L10,11-R2,8,9	F	A	South River	14-Jun-15	3	N	√
475	Luna	L8-R2,10,11	F	A	Annapolis	recapture	3	N	√
500*	Annie*	L0-R2,3	F	A	Annapolis	recapture	1	R	
520	May	L9, R2,3	F	A	South River	recapture	2	V, I	
522	The Hulk	L9,11-R2,3	M	A	South River	recapture	1	I	
553	Chip	L11-R2,3,8,9,11	F	A	South River	recapture	4	V, N	√
565	Moe	L9-R2,3,8,10,11	M	A	South River	recapture	1	I	
566	Little Miss	L9,11-R2,3,8,10	F	A	South River	recapture	1	D	
572	Myrtle	L9,11- R2,3,8,10	F	J	South River	recapture	1	I	
605	Jeanie	L3-R2,10,11	F	J	South River	recapture	1	I	
608*	Hannley*	L3,10-R2,11	M	A	South River	recapture	13	R	

Table 8. Summary of annual observations 2012-present

Year	Area	Individuals observed	First Captures	Males	Females	Undetermined Sex	Nesting females	Adults	Juveniles
2015	Total	18	4	6	12	0	6	15	3
2015	South River	11	2	4	7	0	2	9	2
2015	Annapolis	1	0	0	1	0	1	1	0
2015	Annapolis	4	0	1	3	0	2	4	0
2015	Fales	2	2	1	1	0	1	1	1
2014	Total	17	9	8	7	2	3	14	3
2014	South River	6	1	3	2	1	0	5	1
2014	Annapolis	6	5	3	3	0	2	6	0
2014	Annapolis	4	2	1	2	1	1	3	1
2014	Black River	1	1	1	0	0	0	1	0
2013	Total	18	9	7	9	3	3	17	1
2013	South River	10	1	5	5	0	2	10	0
2013	Annapolis	5	5	2	3	0	0	5	0
2013	Annapolis	1	0	0	1	1	1	1	0
2013	Black River	2	0	0	0	2	0	1	1
2012	South River	1	0	1	0	0	0	1	0

Based on data from wood turtle observation cards for all survey methods employed during the 2015 season, individuals were most frequently observed in riparian habitats (n=36), accounting for 38% of observations (Figure 1), followed by aquatic habitats and nesting substrate. "Other" habitats where turtles were observed included a private yard waste dump, which is within the known home range for turtle #456. The grass/lawn category was added because of the frequency with which it was recorded in the "other" habitat category. The number of observations for individuals in nesting substrate is biased as a result of the effort to observe turtles during nesting events.

It should be noted that certain habitat types are not amenable to observations, and are likely under-represented in the data collected. For example, it is often not possible to visually locate

turtles in aquatic habitats, and agricultural fields are often not surveyed to avoid causing crop damage.

The most frequently observed behaviours based on all observations were terrestrial stationary (n=21) and terrestrial active (n=17), cumulatively accounting for 40% of observations (Figure 2). Again, it should be noted that the number of observed nesting attempts is disproportionately high, as survey efforts targeted turtles that were likely to nest.

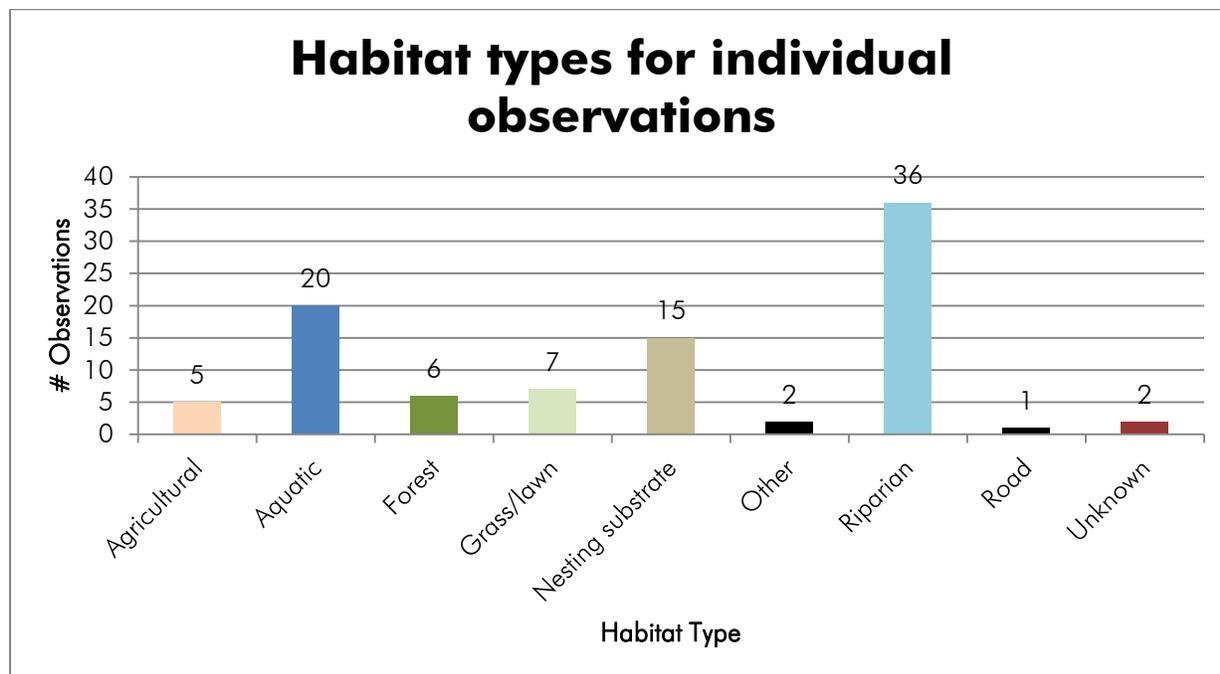


Figure 1. Habitat use during individual observations, 2015

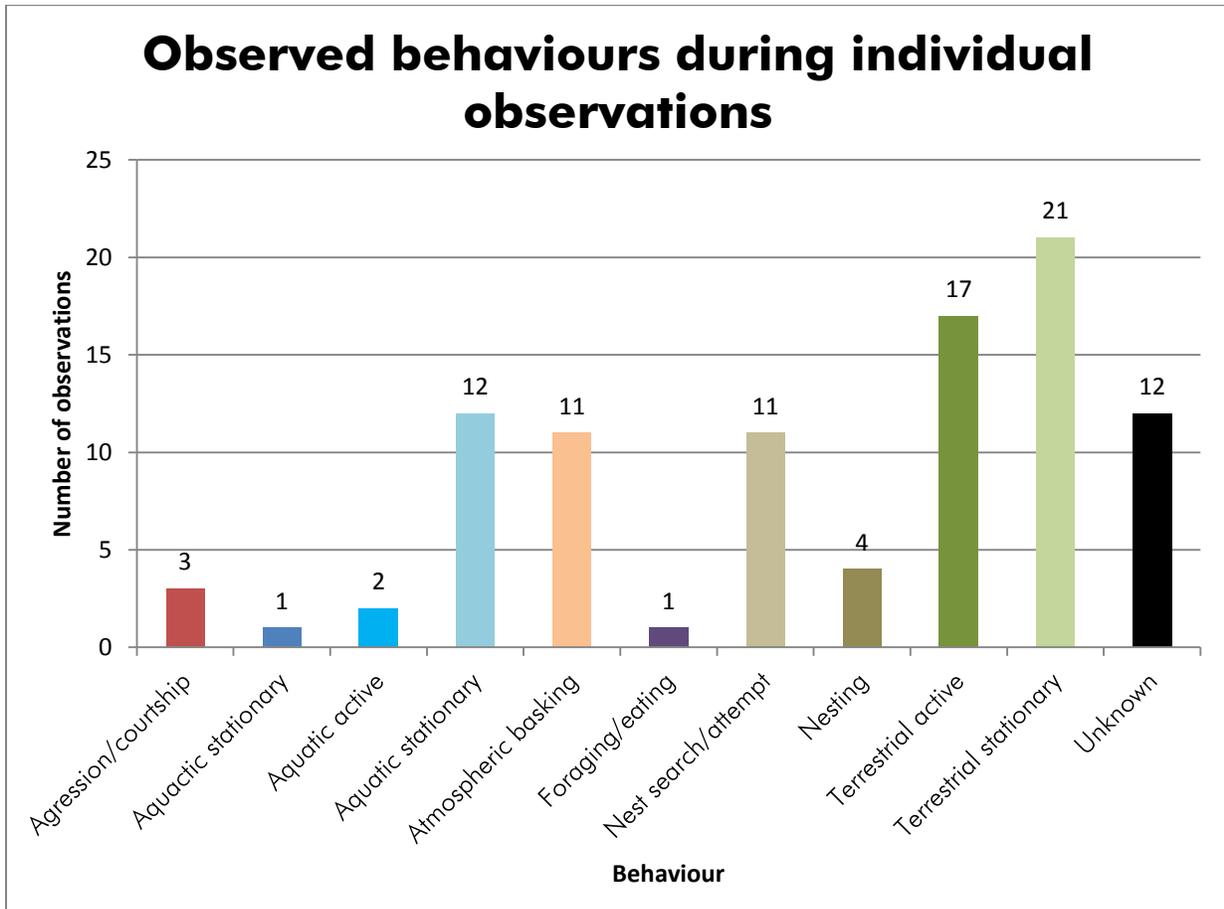


Figure 2. Observed behaviours for all individuals, 2015

Observations for position at observation were grouped into three categories based on air temperature during observation. When temperature was under 10°C turtles are most likely to be found in aquatic habitats (Figure 3). 70% of turtles were observed on land when temperatures were between 10 to 20 °C and 94% when temperatures were between 20 to 30 °C. The data also suggests that as temperatures increase, turtles will more frequently be observed covered or partially covered, likely a response to aid in thermoregulation.

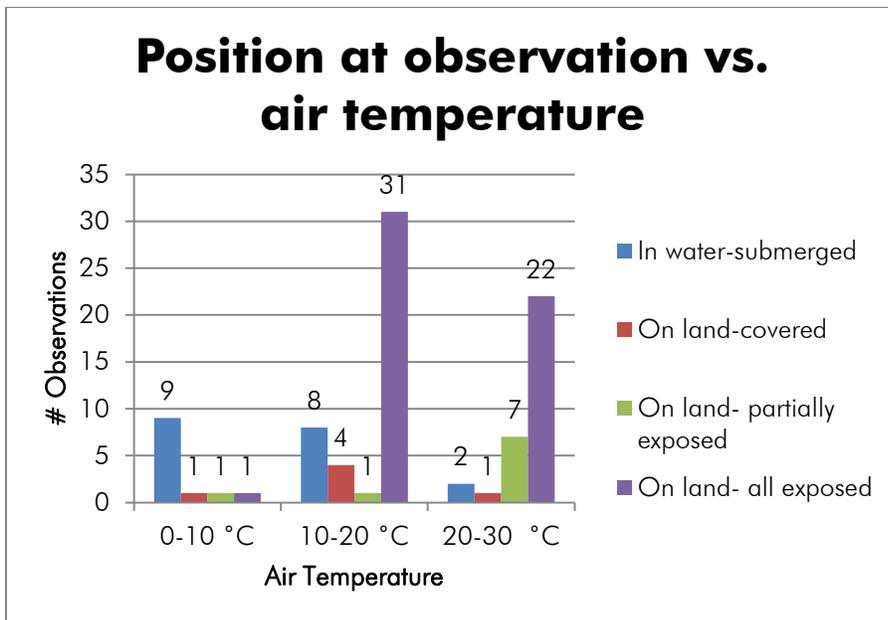


Figure 3. Position at observation vs. air temperature, 2015

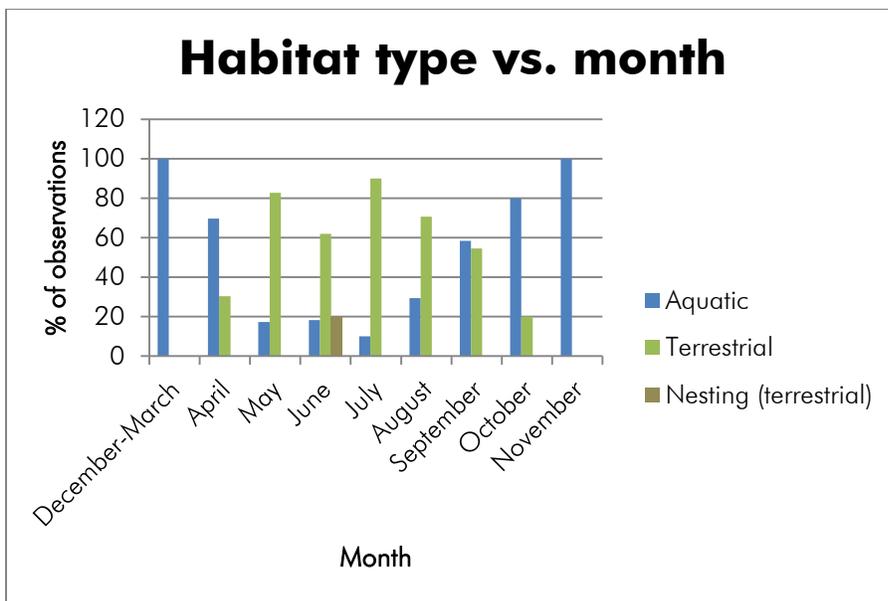


Figure 4. Habitat type vs. month, 2013-2015 observation data

Data from individual observations during the 2013, 2014 and 2015 field seasons were combined (n=282) in order to analyze habitat use. Observations were classified into three categories based on habitat type: aquatic, terrestrial and nesting (Figure 4). There is a trend of increasing proportion of observations in terrestrial habitats between April through July, followed by a gradual decrease until October. Between November and March all observations were for aquatic habitats, which coincides with the known over-wintering season. This data was also grouped into observed behaviour by month (Figure 5).

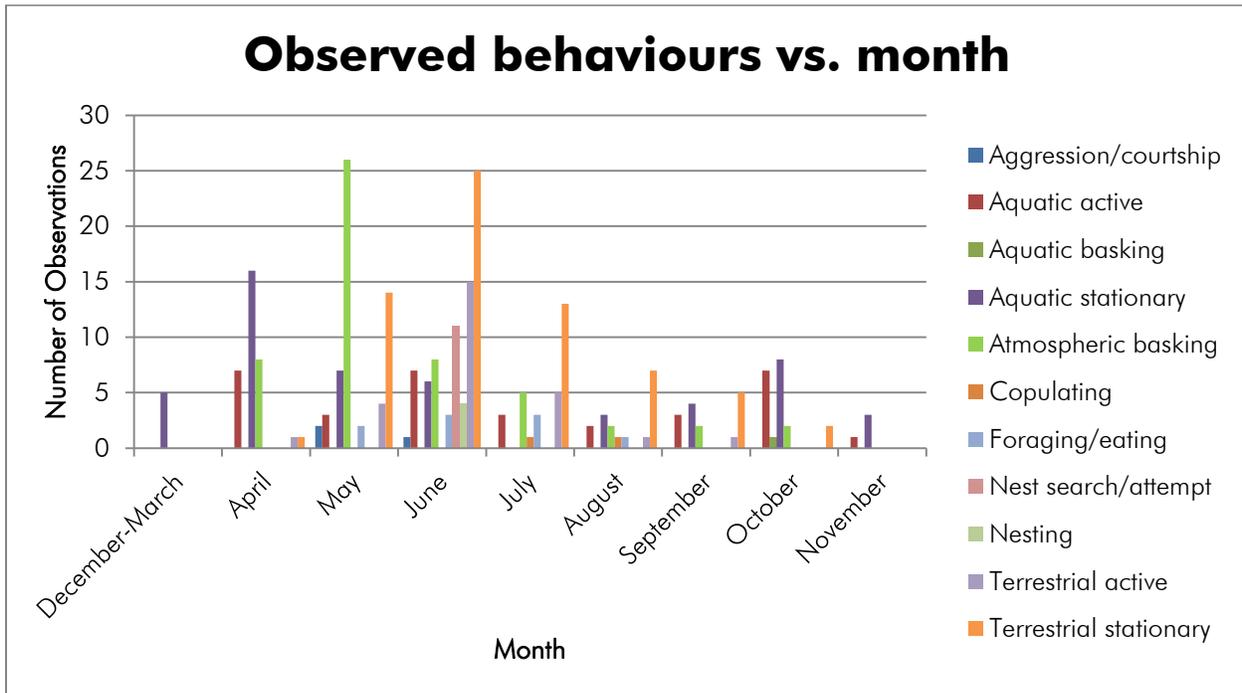


Figure 5. Observed behaviours vs month, based on 2013-2015 data

4.4 Nesting Surveys

Nesting surveys were conducted in areas where past nesting activity has been observed and in areas where females of reproductive age were being radio-tracked. These areas included a transitional zone between a river bank and an agricultural field in Aylesford, an inactive commercial cranberry bog, and a private gravel driveway. Each of these areas provided sand/gravel substrate for turtles to nest in.

Five individuals were observed making nest attempts, four of which were observed ovipositing, and nests were subsequently protected (Table 9). One additional turtle (#456) was confirmed as gravid through palpation and monitored through the nesting season, but nesting activity was never observed. In total 228.8 hours of nesting surveys were conducted, with 178 hours of these completed by volunteers.

Emergence surveys commenced after 60 days of incubation. A total of 70.23 hours of emergence surveys were completed, 63.43 hours of which were completed by volunteers. Hatchling incubation time ranged from 78 to 98 days. Fifty percent of eggs successfully developed, emerged and were live-released at their nest site. Two nests resulted in 100% successful egg development and hatchling emergence. In total 21 hatchlings were notched and released at their respective nesting sites. A summary of hatchling morphometrics is provided in Table 10.

Table 9. Monitored nests, 2015

Mother's #	Mother's Name	Date Laid	Location description	Date emerged/excavated	Incubation time	Clutch Size	Fate of eggs/hatchlings
452	Red Rocket	2015-06-09	Gravel driveway, private property	09-Sep-15	92 days	7	7 live hatchlings emerged released at nest site
459	Nina	2015-06-16	Riparian zone, adjacent to agricultural land	16-Oct-15	92 days	9	1 dead hatchling that emerged prior to death
							3 undeveloped eggs
							4 eggs with dead embryos
475	Luna	2015-06-19	Road, cranberry bog	25-Sep-15	98 days	12	1 live hatchling emerged released at nest site
							10 undeveloped eggs
							1 egg with dead embryo
457	Lucky Lady	2015-06-24	Road, cranberry bog	10-Sep-15	78 days	13	13 live hatchlings emerged and released at nest site

Turtles #475 and #457 were observed nesting during both the 2014 and 2015 field seasons. In 2014 turtle #457 had a clutch size of 12, with 7 successfully emerged hatchlings, compared to a clutch size of 13 and 13 successfully emerged hatchlings in 2015.

In 2014 turtle #475 had a clutch size of 10 with 0 successfully emerged hatchlings, compared to a clutch of 12 with 1 successfully emerged hatchling in 2015. In 2014 eight eggs with live embryos were identified through excavation. Results from both years suggest that nests may need longer than the 90 day recommended window prior to nest excavation, in order to avoid causing mortality. If a head-starter program is ever considered, where eggs recovered after nesting and incubated in captivity, nests laid by turtle #457 would be good candidates.

Table 10. Hatchling morphometrics

	Carapace length (cm)	Carapace width (cm)	Plastron length (cm)	Plastron width (cm)	Weight (g)
Average	3.2	2.9	2.7	1.9	6.8
Minimum	2.8	2.2	2.4	1.6	4
Maximum	3.4	3.3	3	2.1	8.1

4.5 Water Quality

A summary of water quality data from the three surveyed river systems is presented in Table 11. Water temperature trends are presented in Figure 6 through 8.

Table 11. Summary of water quality sampling results, 2015

River/ Area	n	DO(%)	DO (mg/L)	SPC (μ S/cm)	C- (μ S/cm)	TDS (mg/L)	SAL (ppt)	PH
Annapolis	25	91.30	11.13	56.40	32.41	32.13	0.05	7.03
Fales River	8	98.54	10.12	50.04	34.8	32.5	0.11	6.45
South River	22	98.54	10.36	45.08	30.66	29.31	0.11	6.7

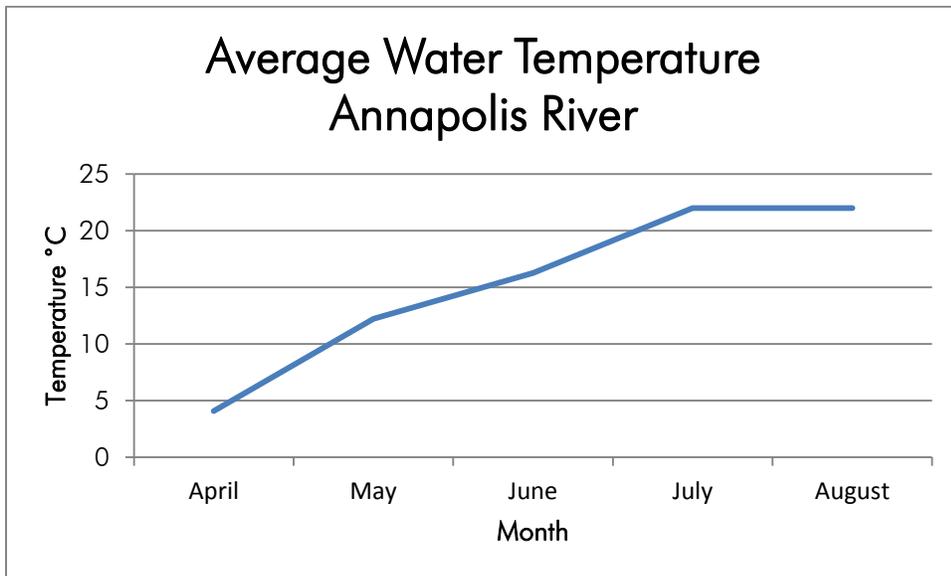


Figure 6. Average water temperature, Annapolis River

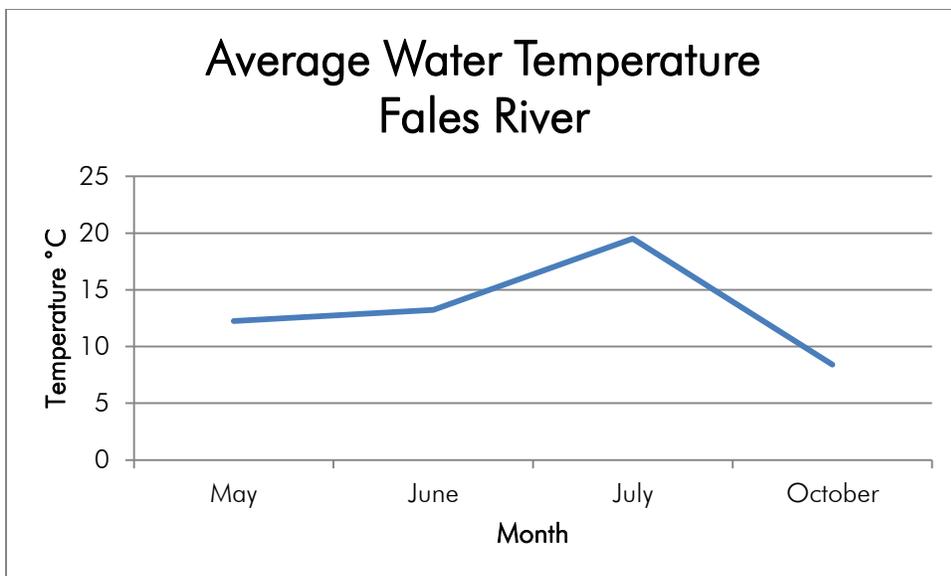


Figure 7. Average Water Temperature, Fales River

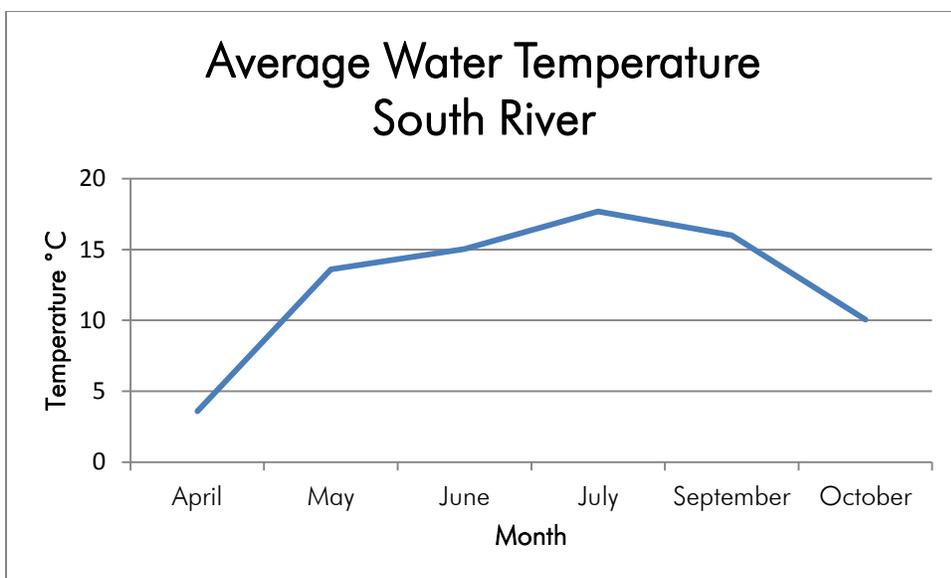


Figure 8. Average Water Temperature, South River

4.6 Stewardship Plans

Five stewardship plans were developed in areas of known or suspected wood turtle habitat. The general location and habitat features for each property is briefly described below:

Aylesford The property in Aylesford is a private residential property in an area where CARP has concentrated wood turtle survey efforts during 2014 and 2015. Thirteen individual turtles have been observed in this survey section, including nesting females. The landowners have

reported extensive historical observations of turtles, including nesting females. The area is also known to provide overwintering habitat for several individuals. The property is adjacent to the Annapolis River, and provides a variety of habitat types, including a riparian area, nesting substrate, and forested area.

Meadowvale Stewardship plans were developed for two properties in the Meadowvale area. Both properties are adjacent to the Fales River. Turtle #456 was observed on both properties through radio-tracking during the 2015 field season.

The first property is a private residence, with a large area being used as a yard-waste dump. The use of the area as a dump provides a unique set of threats and subsequent stewardship recommendations, but also adds to habitat complexity because of the increased number of coarse woody debris/brush piles, which create refugia for turtles. The site includes extensive gravel and sandy substrate, which provides potential nesting habitat. Other key habitat types include riparian and forested areas.

The second property is a private residence located approximately three kilometers down the road from the first Meadowvale property. The landowner was specifically targeted because the property is adjacent to the area where turtle #456 is overwintering. Most of the property is maintained as grass lawn, with a small wooded riparian buffer along the Fales River.

Paradise Several property owners in the Paradise area were identified as a result of their participation in an outreach event (*Breakfast With Wood Turtles*). These landowners expressed interest in supporting stewardship plan development for their properties. Two plans were completed during 2015-2016, with additional potential sites that could be explored in future years. Both properties are adjacent to the Annapolis River and provide a variety of key habitat types for wood turtles.

The first property is a private residence on a double lot. The landowner indicated that they had observed a wood turtle on their property in the past. The property includes a wooded riparian zone and adjacent forested area. A large amount of the property is maintained as lawn, with patches of garden, treed areas and brush piles scattered throughout.

The second property is located approximately 900m down the road from the first Paradise property described. It is also a private residence, and while no confirmed wood turtle observations have been made on the property, its location in close proximity to confirmed wood turtle habitat makes it a likely candidate area for supporting wood turtles. The property includes a vegetated riparian zone and wetland areas, and a forested area. The west border of the property is adjacent to the confluence of Leonard Brook and the Annapolis River.

4.7 Outreach

Outreach events included a variety of indoor and field-based educational programs, summarized in Table 12.

Table 12. Outreach events and presentations, 2015-2016

Event name	Location	Audience	General Description
Wood Turtle Volunteer Training Session May 5, 2015	Middleton Library	Prospective community volunteers	Open training session for prospective community volunteers
Family Fun Day July 7, 2015	Raven Haven Family Beachside Park	Family fun day participants- residents of Annapolis County and surrounding areas	Hands on youth activities; educational display
Guest presentation "Education to Action" July 28, 2015 August 18, 2015 August 20, 2015	Heart of the Valley, Middleton Mountain Lea Lodge, Bridgetown Tideview Terrace, Digby	Facility residents	Educational presentation about species at risk, wood turtle monitoring and stewardship overview
Wood Turtle Day August 10, 2015	Oaklawn Farm Zoo	General public, primarily families	Free program offered to visitors at Oaklawn Farm Zoo, located at the wood turtle habitat. Hands on activities (radio-telemetry), interpretation, educational resources, kids activities
Wood Turtle Stewardship in Your Backyard August 25, 2015 September 22	Kingston Library Bridgetown Library	General public; community members and landowners in Kingston, Greenwood and Bridgetown areas	Educational presentation focused on wood turtle stewardship opportunities for local residents and landowners/managers
Kids River Walk Saturday August 28	Paradise	Organized in partnership with Paradise Active Healthy Living Society (PAHLS), program open to youth ages 5-12	Youth educational programming, including turtle ID and species at risks
Breakfast with Wood Turtles November 7, 2015	Paradise Community Hall	Hosted by PAHLS, event open to the public; residents and landowners in Paradise	Educational presentation focused on wood turtle stewardship opportunities for local residents and landowners/managers; Variety of activities and displays; radio-

			telemetry demonstrations
Afternoon with Friends, guest presentation		Hosted by Annapolis royal Friends of the Library, open to the public	Educational presentation about species at risk, wood turtle monitoring and stewardship overview
November 14, 2015	St. Luke's Church, Annapolis Royal		

CARP also worked with a variety of other community and school groups to provide educational programming, including:

- Annapolis Young Outdoors Women, radio-telemetry training
- Annapolis West Education Center Envirothon Team, in class presentation and nest emergence field session
- Université Sainte-Anne, field biology course, radio-telemetry training and field session
- Middleton O2 class, radio-telemetry training and field session and visual survey

A variety of outreach materials were developed and distributed, including:

Electronic materials

- Project webpage
- Social media posts on Facebook, Twitter and Instagram
- Interview on CBC Radio Morning program
- You-tube video
- Powerpoint presentations

Print materials

- "Wood Turtle Stewardship in Your Backyard" information brochure
- Posters for all events and volunteer opportunities
- "Have you seen a wood turtle" posters (Appendix 4)
- "Have you seen a wood turtle" ID cards (Appendix 5)
- Press releases in local newspapers and community publications (Valley harvester, Annapolis Spectator, Bridgetown Reader, Kings County Registrar and Advertiser, Nova News Now)
- Articles in CARP's Waterstrider newsletter

5.0 Discussion and Recommendations

5.1 Visual surveys

Any future visual survey effort should be planned for May, when vegetation is at its least dense. It was noted by staff and project volunteers that as early as the first week of June vegetation severely impeded ability to make visual observations.

Future visual survey efforts could be focused on expanding the known range of wood turtles in the Annapolis watershed, by focusing on areas with little or no past survey effort. This would align with the approach recommended in the in the *Recovery Strategy for the Wood Turtle (Glyptemys insculpta) in Canada*. It would also be beneficial to document specific threats to individual turtles and their habitat in these areas.

Several sections of the South River has been surveyed extensively throughout the 2014 and 2015 field seasons. It may be more beneficial to focus visual surveys on the previously unsurveyed areas of the South River adjacent to this section.

One section in Kingston, on the Annapolis River, has been visually surveyed relatively extensively between 2013 and 2015. It is recommended that future survey effort focus on the areas adjacent to this section.

It is likely that additional survey effort in the Meadowvale section of the Fales River would uncover additional turtles that have not been previously observed, making it a good candidate site for future visual surveys. In 2014 a series of habitat suitability maps were produced for CARP, and could be used to guide the selection of new survey areas.

5.2 Radio-telemetry

Radio-tracking on a semi-weekly basis was sufficient for gathering general data about habitat use, without losing the approximate location of individuals. In 2015, priority for radio-tracking was given to sexually mature females, in order to increase the chances of observing nesting activity. It is recommended that as the project continues, once nesting territories have been identified that transmitters are removed, so that they are available to be equipped to newly identified females. Turtle #456 was observed to be gravid, but not observed nesting. Continued radio-tracking in 2016 may lead to the identification of her nesting habitat.

Continued volunteer training is a good option for reducing the amount of field time required by project staff. All training should reinforce the importance of concise, consistent data collection, to mitigate issues with data entry and analysis.

Radio tracking of individuals can also be used to refine knowledge about habitat needs in order to inform the understanding of spatio-temporal use, as recommended in the federal Recovery Strategy.

5.3 Nest and emergence surveys

Nest monitoring and emergence surveys are a relatively simple way to increase recruitment to the local population of wood turtles. Several areas known to support nesting activity have been identified, and should be the focus for nesting surveys in future years.

Continued visual surveys will also likely identify additional areas with high-quality nesting habitat. Ongoing engagement with land-users and members of the public to identify nesting areas should also be pursued.

5.4 Stewardship plans

Stewardship plans are an excellent tool for guiding stewardship actions and promoting the implementation of best management practices on private lands. Soliciting new landowners to participate in plan development can be challenging; continued effort to develop relationships with key stakeholder groups, such as agricultural landowners/managers, is required to facilitate future recruitment of landowners.

The availability of the Trimble unit with ArcMap software expedited the process of property mapping and allowed for the development of stewardship property maps with specific habitat types and features clearly identified.

5.5 Public outreach and education

While CARP's outreach programs have been well attended and the project has received coverage from a variety of local media sources, there is an ongoing need to raise awareness about wood turtles and the threats placing them at risk. Many members of the public are unaware that the Annapolis River watershed supports a population of wood turtles, let alone that they are a species at risk. It is recommended that active outreach programs such as events, guest presentations, and field days, are continued in future years of the project. Expanding the number of volunteer opportunities is another approach that can be used to raise local awareness and encourage participation in stewardship actions.

5.6 Project alignment with the Recovery Strategy for the Wood Turtle (*Glyptemys insculpta*) in Canada

In order to support national effort to recover the wood turtle it is essential that CARP's wood turtle project support Canada's Recovery Strategy and subsequently developed Action Plans.

CARP’s wood turtle project currently addresses each of the six broad recovery strategies identified. Table 13 provides an outline of the area where CARP’s current project aligns with the national *Recovery Strategy*.

Table 13. Recovery Strategy for Wood Turtles in Canada, Adapted from Canada’s Recovery Strategy (Environment Canada, 2015)

Broad Strategy for Recovery*	Priority*	General Description of Research and Management Approaches*	CARP Project Alignment
Reduction of adult mortality, injury and illegal collection	Urgent	<ul style="list-style-type: none"> - Protect Wood Turtle individuals through legislation and regulation tools. - Continue to develop and implement reduction and mitigation techniques (e.g., best management practices) to address threats to individuals. - Develop a federal/provincial strategy to address illegal collection as pets and for consumption. 	<ul style="list-style-type: none"> -development and installation of public signage (e.g. interpretive panels, turtle crossing signs) -development of and implementation support for stewardship plans -collaboration with key stakeholder groups to promote uptake of BMP’s
Conservation, management and restoration of habitat	Urgent	<ul style="list-style-type: none"> - Conserve or manage Wood Turtle habitat through legislation, regulation, administrative and stewardship tools. - Continue to develop and implement reduction and mitigation techniques (e.g., best management practices) to address threats to habitat where required and at a relevant scale. - Promote an integrated habitat management approach at the watershed scale. - Determine habitat restoration needs in streams where Wood Turtle habitat is declining. 	<ul style="list-style-type: none"> -development of and implementation support for stewardship plans - engagement of private landowners and managers in stewardship actions -identification of restoration opportunities on public and private lands, and implementation of restoration activities (e.g. riparian zone restoration)
Communication and outreach	Necessary	<ul style="list-style-type: none"> - Develop and implement communication strategies appropriate to reduce adult mortality, reduce threats and conserve habitat. - Encourage the transfer and archiving of information 	<ul style="list-style-type: none"> - development and implementation of a multi-faceted public outreach and education program, including events/presentations, print/electronic educational materials, etc. -contribution to provincial database and data sharing with partner

		<p>and tools, including Traditional Ecological Knowledge (TEK).</p> <ul style="list-style-type: none"> - Improve and maintain cooperation between stakeholders. - Promote research initiatives on the species. 	<p>organizations</p> <ul style="list-style-type: none"> -collaboration with relevant stakeholder groups -creation of opportunities for public engagement in stewardship activities
Improvement of recruitment where needed	Necessary	<ul style="list-style-type: none"> - Document recruitment needs in streams where the Wood Turtle is declining or where viability is deemed to be compromised. - Improve recruitment (where needed) in streams where the Wood Turtle is declining or where viability is deemed to be compromised. 	<ul style="list-style-type: none"> - nest activity monitoring and documentation across the Annapolis River watershed -nest protection and monitoring to increase recruitment
Surveying and monitoring	Necessary	<ul style="list-style-type: none"> - Develop and implement provincial monitoring plans. - Develop and promote the appropriate use of standardized protocols (e.g., data collection, handling, marking) and databases. - Improve the knowledge on local populations (e.g., abundance, suitable habitat size, threats, key habitats). 	<ul style="list-style-type: none"> -monitoring and data collection across the Annapolis River watershed (visual survey, radio-telemetry) -sharing of data through provincial database and with provincial species recovery team -identification of previously unrecorded areas of habitat and areas of critical habitat
Research	Necessary	<ul style="list-style-type: none"> - Verify the extent of local populations and most appropriate recovery scale. - Determine minimal habitat and population requirements to ensure local population viability (e.g., suitable habitat size, number of mature individuals). - Determine the full range of adverse effects (e.g., indirect effects, knowledge gaps) from identified threats as well as potential threats (including at the watershed scale). - Refine knowledge of habitat needs (e.g., females foraging habitat, brackish water) in order to develop a better understanding of spatial and temporal use. 	<ul style="list-style-type: none"> - identification and documentation of range of wood turtle sub-population(s) in the Annapolis River watershed -identification of specific threats to wood turtles and their habitat -documentation of habitat use and behaviour in the Annapolis River watershed (visual surveys and radio-telemetry)

*as identified in the Recovery Strategy for the Wood Turtle (*Glyptemys insculpta*) in Canada
Bolded items indicate areas of project alignment

6.0 References

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7.0 Appendices

Appendix 1. Nova Scotia Turtle Daily Effort Card

NOVA SCOTIA TURTLE DAILY EFFORT CARD

Population : _____
 Area: _____
 Date: _____
 Project: _____
 Target spp: Blanding's Painted
 Snapper Wood

Observers	Vol. Effort*	Observers	Vol. Effort*

*Total volunteer effort includes on site time, preparation time and travel time

Effort and activities				Weather at start of survey				Trapping details		# Observations				# Nests						
Section Name/ Nest Site	Activity **	# Observers	On site time			Precip. **	% Cloud Cover	Wind Speed	Air Temp	Water Temp	Trap ID	Session	Blanding's	Snappers	Painted	Wood	Blanding's	Snappers	Painted	Wood
			Time Start (24 hr)	Time end (24 hr)	Time															

Comments: _____

Appendix 2. Nova Scotia Turtle Observation Card

NOVA SCOTIA TURTLE OBSERVATION CARD

Entered? # _____

Species Blanding's Snapping Wood Painted

Notches _____ Turtle Number (w,s) _____

Name _____ Sex M F J Gravid Yes No

Date _____ (dd-mm-yy) Time _____ (24 hr)

Cap. type First Capture
 Recapture
 Escaped/ Not Identified
 Predated nest only: Suspected cause _____
 Intact nest only (no turtle observed) Nest ID _____

Status Alive Dead: Suspected cause _____

Handling type Handled & released on site Not handled
 Handled & brought into lab

Sighting method Visual survey
 Nesting survey
 Radio tracking Freq _____
 Incidental to radio tracking
 Trapping Session _____ # _____
 Incidental to trapping Distance to trap (m) _____
 Incidental to other research (e.g. ribbonsnake sampling)
 General observation / other (put details in comments)

Sighting type (if tracking) Turtle seen: first seen _____ min after pinpointing
 Pinpointed but not seen: Searched for 10 min
 General location only (put details in comments)

Observer who wrote card _____

Additional observers _____

Please refer to maps for population / area / section designation

Project _____ Population _____
 Area _____ Section _____

Location description (where the site is relative to fixed landmarks)

UTM (please use NAD 83 datum or specify in comments)
 East: _____ North: _____ Zone _____

UTM Source GPS unit (60+ second fix) Accuracy _____ m
 1:50 000 Topo 1:10 000 Topo Air photo grid

Precipitation None Drizzle / mist Moderate -heavy rain
 Light rain Snow flurries Moderate -heavy snow
 Other: _____

Wind speed Calm Light Moderate Strong

Estimate percent cloud cover _____ %

Air temp _____ °C Water temp _____ °C

<p>Behaviour (check only 1) <input type="checkbox"/> Aggression /Courtship</p> <p><input type="checkbox"/> Atmospheric Basking <input type="checkbox"/> Aquatic Basking <input type="checkbox"/> Foraging/Eating</p> <p><input type="checkbox"/> Aquatic Active <input type="checkbox"/> Aquatic Stationary <input type="checkbox"/> Copulating</p> <p><input type="checkbox"/> Terrestrial Active <input type="checkbox"/> Terrestrial Stationary <input type="checkbox"/> Nest Search/Attempt</p> <p><input type="checkbox"/> Nesting: Nest ID _____ Clutch size _____</p> <p>Position</p> <p><i>In water:</i> <input type="checkbox"/> Submerged <input type="checkbox"/> Carapace Exposed <input type="checkbox"/> Head Exp.</p> <p><i>On land:</i> <input type="checkbox"/> All Exposed <input type="checkbox"/> Partially Covered <input type="checkbox"/> Covered</p> <p>Dist. from: <i>nearest water</i> _____m <i>or nearest land</i> _____m</p> <p>Habitat at capture <input type="checkbox"/> Terrestrial <input type="checkbox"/> Flooded <input type="checkbox"/> Normally aquatic</p> <p>Perch (if applicable) <input type="checkbox"/> Sphagnum <input type="checkbox"/> Grass/ Sedge <input type="checkbox"/> Emergent Veg.</p> <p><input type="checkbox"/> Mud <input type="checkbox"/> Rock <input type="checkbox"/> Log/ Sticks <input type="checkbox"/> Lodge/ Dam</p> <p><input type="checkbox"/> Buried in substrate <input type="checkbox"/> Bottom <input type="checkbox"/> Other: _____</p> <p>General habitat description (dominant vegetation / features)</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Comments</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>Measurements <i>(Blanding's -do all measurements; other species- do those denoted)</i></p> <p>CL _____ cm (s, w) PRE _____ cm (s)</p> <p>CW _____ cm (s, w) POST _____ cm (s)</p> <p>CW_{Bridge} _____ cm (w) LPS _____ cm</p> <p>PL _____ cm (s, w) HT _____ cm (w)</p> <p>PW _____ cm (s, w) CON _____ cm</p> <p>PW_{Femoral} _____ cm WT _____ g (s)</p> <p>Upper Lip (Blanding's) <input type="checkbox"/> Striped <input type="checkbox"/> Solid</p> <p>Annuli <input type="checkbox"/> New growth <input type="checkbox"/> Visible, no new growth <input type="checkbox"/> Worn Smooth</p> <p>Annuli count: <i>from plastron</i> _____ <i>from carapace</i> _____</p> <p>Algae present on limbs (blue green)? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Algae present on shell (green, fuzzy)? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Detailed description of all identifying features (e.g. scars)</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Procedures (check all that apply)</p> <p><input type="checkbox"/> Photo _____ Numbers _____</p> <p><input type="checkbox"/> Scan _____ Photographer _____</p> <p><input type="checkbox"/> Blood sample Vial # _____</p> <p><input type="checkbox"/> Skin sample Vial# _____</p> <p><input type="checkbox"/> Transmitter: attached Frequency _____</p> <p><input type="checkbox"/> Transmitter removed</p> <p><input type="checkbox"/> GPS Logger attached</p> <p><input type="checkbox"/> GPS Logger removed</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin-top: 10px;"> <p><i>Card modified: 16-May-10</i></p> </div>
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Appendix 4. "Have you seen a wood turtle" poster

 <p>Have you seen a Wood Turtle? You can help protect this threatened species!</p>	 <p>Avez-vous vu une tortue des bois ? Vous pouvez aider à protéger cette espèce vulnérable!</p>
<p>HOW TO HELP</p> <p>Do not collect or disturb the turtle</p> <p>Report all sightings</p> <p>Become a wood turtle volunteer</p> <p>Leave a buffer of natural vegetation around water courses</p> <p>Raise the blade of your mower when haying</p>  <p>Hatchlings are only the size of a toonie!</p>  <p>WHAT THEY LOOK LIKE</p> <ul style="list-style-type: none"> • 16-21 cm shell length • Top shell grey-brown with a carved wood-like appearance • Orange-red colour on neck and legs • Bottom shell yellow with black patches <p>WHERE THEY LIVE</p> <ul style="list-style-type: none"> • In and around slow moving streams and rivers • On land in fields, river banks, alder stands and roadsides 	<p>COMMENT AIDER?</p> <p>Ne collectez pas ou ne dérangez pas la tortue</p> <p>Signalez toutes les observations</p> <p>Devenez un volontaire pour les tortues des bois</p> <p>Laissez une zone tampon naturelle autour des cours d'eau</p> <p>Soulevez la lame de la tondeuse lorsque vous tondez votre gazon</p>  <p>Les nouveau-nés ont la taille d'un deux dollars!</p>  <p>À QUOI RESSEMBLENT-ELLES?</p> <ul style="list-style-type: none"> • Longueur de la carapace : 16-21 cm • Dessus de la carapace brun-gris avec une apparence de bois sculpté • Cou et pattes de couleur orange-rouge • Plastron jaune avec taches noires <p>OÙ VIVENT-ELLES?</p> <ul style="list-style-type: none"> • Dans et autour des rivières et des ruisseaux à lent débit • Dans les champs, sur les berges, dans les aulnaies et sur le bord des routes
<p>To report a sighting or learn how to get involved call toll free: 1-866-727-3447 or email: sightings@speciesatrisk.ca</p>   <p><small>This project was undertaken with financial support from the Nova Scotia Department of Natural Resources and from the Government of Canada provided through the Department of Environment. Photos by Wendy Holman and Jeffie McNeil</small></p>	<p>Pour signaler la présence d'une tortue, pour en apprendre plus ou pour savoir comment vous impliquer, composez sans frais: 1-866-727-3447 Ou par courrier électronique: sightings@speciesatrisk.ca</p>   <p><small>Ce projet a été réalisé avec l'appui financier du Ministère des ressources naturelles de la Nouvelle-Écosse et du Gouvernement du Canada par l'entremise du Ministère de l'environnement. Photos par Wendy Holman et Jeffie McNeil.</small></p>

Appendix 5. Wood turtle ID cards

Have you seen a wood turtle?



How to help!

- Do not collect or disturb the turtle
- Take a picture
- Write down the location
- Take GPS coordinates (if possible)
- Report all sightings

Report a sighting:

Toll free: 1-866-727-3447
E-mail: sightings@speciesatrisk.ca
Online: <http://www.speciesatrisk.ca/sightings/>

Avez-vous vu une tortue des bois?



Vous pouvez aider !

- Il ne faut jamais emporter ou dérangez la tortue
- Prenez une photo
- Notez l'endroit (p. ex. route, rivière)
- Notez les coordonnées GPS (si possible)
- Faites rapport de toutes vos observations

Communiquez l'observation :

Appel sans frais : 1-866-727-3447
Courriel : sightings@speciesatrisk.ca
En ligne : <http://www.speciesatrisk.ca/sightings/>