

Clean Annapolis River Project

**Wood Turtle Research, Conservation, and Stewardship
in the Annapolis River Watershed 2015-2016**

Final Project Report to Nova Scotia Habitat Conservation Fund

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Male and female turtle observed together

(1) Project goal and objectives

The goal of this project is to ensure the long-term persistence of wildlife that utilize riparian habitat in the Annapolis watershed, using wood turtles as a focal species to engage community members in conservation and stewardship efforts.

Specific objectives include:

- Conduct habitat, population and ecological research on the Annapolis River watershed population of wood turtles
- Recruit, train and involve volunteers in wood turtle surveying, monitoring and stewardship activities in order to build organizational capacity and develop a skilled and engaged volunteer base
- Involve community based organizations and student groups in field based activities in order to establish a community driven wood turtle monitoring and nest conservation program
- Engage the community through outreach and education activities to promote understanding of the ecological needs and importance of the wood turtle and their habitat
- Engage new landowners and stakeholders in the development and adoption of stewardship actions
- Work with known landowners to implement Stewardship Agreements initiated in the previous project cycle;

- Continue to identify and assess specific threats to wood turtle habitat in the Annapolis River watershed and work with landowners and stakeholders to develop strategies to address threats;
- Continue to contribute to a provincial wood turtle recovery strategy
- Contribute new data to the central wood turtle database maintained by the Mersey Tobeatic Research Institute (MTRI)

(2) Outline of the work completed

2.1 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. Protocols for data collection and handling of turtles were based on those developed by the Blanding's Turtle Recovery Team (2007). 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).

2.2 Radio Telemetry

Radio transmitters were attached to the carapace of individual turtles using methods developed by the Blanding's Turtle Recovery Team (2007). 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. 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.



CARP Project Leader, Jamie, during a visual survey

2.3 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. Confirmed nests were monitored daily,

beginning 60 days after oviposition. Emerged hatchlings were notched and released on site once data collection was complete. Nest 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.

2.4 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.

2.5 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.

2.6 Public Outreach and Education

A variety of educational and outreach materials were developed for the project, 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.

(3) Results

3.1 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. A total of 229 hours were spent on visual surveys, 142 hours of which were completed by volunteers

Turtles were observed during 10 of these surveys, accounting for 8 individuals, 3 of which were first captures. Two of the female turtles identified through visual surveys were equipped with radio-transmitters.

3.2 Radio-telemetry

Three turtles were equipped with radio-transmitters prior to overwintering between November 2014 and April 2015. Radio-telemetry surveys 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. 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. Telemetry sessions concluded in November, after the two turtles equipped with radio-transmitters (456, 458) had moved into over-wintering sites.

3.3 Nesting and Emergence 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. Five individuals were observed making nest attempts, four of which were observed ovipositing, and nests were subsequently protected. 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.



Newly emerged hatchlings



Grade 10 students assisting with emergence survey

3.4 Stewardship Plans

Five stewardship plans were developed for private properties in areas of known or suspected wood turtle habitat and Stewardship Agreements signed by landowners.

3.5 Outreach Activities

Eleven community outreach events were conducted across the watershed. This included volunteer training events, guest presentations for youth organizations and community-based organizations, activities and displays at public events, and seminars for private landowners focused on habitat stewardship.

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. Electronic materials included: a project webpage; social media posts on Facebook, Twitter and Instagram; an interview on CBC Radio Morning program; you-tube video; powerpoint presentations.

Print materials included: “Wood Turtle Stewardship in Your Backyard” information brochure; posters for all events and volunteer opportunities; “Have you seen a wood turtle” posters; “Have you seen a wood turtle” ID cards; press releases in local newspapers and community publications (Valley harvester, Annapolis Spectator, Bridgetown Reader, Kings County Register and Advertiser, Nova News Now); and articles in CARP’s Waterstrider newsletter

(4) Assessment of achievements and lessons learned, measured against the project goals and objectives

What you will do (activities)?	What should result (outcomes)?	How will you evaluate each activity?	Evaluation/Assessment
<p>Data collection- wood turtle land and water visual surveys</p> <ul style="list-style-type: none"> -Systematic and repeatable land and water based visual surveys conducted on rivers and tributaries within the Annapolis River watershed from April to September -Turtle notching will be conducted based on the protocol developed by DNR -Standardized wood turtle data cards will be used to ensure consistent data collection (Appendix C) -Group tracking field sessions organized for community members 	<ul style="list-style-type: none"> -Identification of new (un-notched) turtles -Re-capture of previously marked turtles -Collection of mark-recapture data -Collection of data from all turtles will provide information required to analyze habitat use, population range and population demographics -Collection of data from previously marked turtles will allow for analysis of home range size and preferred habitat -Collection of wood turtle behavioural data - Contributions made to provincial wood recovery strategy through sharing of data -Data contributed to central wood turtle database, maintained by the Mersey Tobeatic Research Institute 	<ul style="list-style-type: none"> -Contribution of 2015 data collected from all turtles (new and recaptures) in addition to that collected in the 2012-2014 seasons, allowing for improved knowledge of the species over a more extensive area -Monitoring of community participation in tracking activities 	<ul style="list-style-type: none"> √4 un-notched individuals identified √14 previously notched turtles identified (re-captured) √17 visual surveys conducted and data collected √96 turtle observations (all survey methods) √30 radio-telemetry sessions conducted and data collected √All data added to internal database and submitted to provincial database √All GPS data mapped and analyzed √All behavioural and habitat data analyzed √142 hours volunteer effort on visual surveys √Group tracking sessions organized for community volunteers and school groups

	(MTRI) -Active opportunities for community members to participate in stewardship activities and citizen science		
Data collection- radio telemetry -Radio transmitters will be used to track turtles throughout the field season and during overwintering -Standardized wood turtle data cards will be used to ensure consistent data collection -Transmitters will be attached using methods established by the NS DNR, Acadia University and the Wood Turtle Recovery Team -Training provided to community volunteers to increase local capacity for monitoring using radio-telemetry -Group tracking field sessions	-Identification of nesting sites to allow for nest protection and monitoring Effective monitoring of wood turtle movement and distribution, including over-wintering sites -Active opportunities for community members to participate in stewardship activities and citizen science -Increased knowledge of habitat use -Data available for identifying areas of critical habitat and for targeting stakeholders through stewardship activities -Contributions made to provincial wood recovery strategy through sharing of data -Data contributed to central wood turtle database, maintained by the	- Contribution of 2015 data collected from all turtles (new and recaptures) in addition to that collected in the 2012-2014 seasons, including knowledge of habitat use, mating, nesting areas and travel corridors -Monitoring of community participating in tracking activities	✓Telemetry training sessions conducted with community volunteers and school groups ✓92 hours volunteer effort on radio-telemetry ✓All data added to internal database and submitted to provincial database ✓All GPS data mapped and analyzed ✓All behavioural and habitat data analyzed ✓5 turtles tracked during the field season

organized for community members	Mersey Tobeatic Research Institute (MTRI)		
Data collection- nesting and emergence surveys -Nesting surveys conducted as per methods established by the Blanding's Turtle Recovery Team (2007) -Data will be recorded using established NS Turtle Nesting and Observation Card (Appendix C) -Community volunteers trained in nest and emergence survey methods	-Identification of new females (un-notched or previously marked) in target areas -Hatchlings notched for future identification to allow for future mark-recapture data collection -Contributions made to provincial wood turtle recovery strategy through sharing of data -Data contributed to central wood turtle database, maintained by MTRI -Active opportunities for community members to participate in stewardship activities and citizen science -Network of community volunteers with the capacity to independently conduct nesting and emergence surveys	-minimum of 2 sites monitored and assessed through nest and emergence surveys -Identification of critical nesting habitat -Nest protection and successful release of emerged hatchlings -Collection of emergence data (measurements, weights, notching). -Monitoring of community participating in tracking activities	√2 volunteer training sessions conducted, plus additional in-field training √ 228.8 hours of volunteer effort on nesting surveys √63.43 hours of volunteer effort on nest monitoring and emergence surveys √identification and monitoring of 5 areas of nesting habitat √4 nests protected √21 hatchlings from 3 nests successfully emerged and released on site √emergence data collected, analyzed and entered into internal database and provincial database
Conservation- nest site protection -Screen enclosures placed over	-Increased success of hatchling emergence due to decreased predation -Community engagement in building	-Hatchlings measured and weighed -Hatchlings notched to allow for mark-recapture data	√Nest enclosure building completed as youth program √21 hatchlings from 3 nests successfully

<p>nests to prevent predation</p> <p>-Nest enclosure building workshops organized and open for public participation</p>	<p>nest enclosures</p>	<p>collection</p> <p>-Improved recruitment of wood turtles in subsequent years</p>	<p>emerged and released on site</p> <p>✓emergence data collected, analyzed and entered into internal database and provincial database</p>
<p>Outreach & education</p> <p>-Train volunteers in data collection activities</p>	<p>-Capacity developed throughout the local community in field data collection methods</p> <p>- Community members actively engaged in conservation and stewardship practices</p>	<p>-Project leader will track number of volunteers recruited and trained during 2015 season, and keep records of volunteer hours committed</p> <p>- A minimum of 10 volunteers trained, resulting in increased organizational capacity</p>	<p>✓20 volunteers trained on various field methodologies</p> <p>✓40+ students trained on field methodologies</p> <p>✓426.23 volunteer hours logged on field surveys</p>
<p>Outreach & education</p> <p>-Public presentations and activities held throughout the community</p>	<p>-Community members educated about wood turtles, wood turtle habitat, and conservation/stewardship practices</p> <p>-Increased community support for project and participation in project initiatives</p> <p>-Key stakeholders educated about wood turtles, wood turtle habitat, and conservation/stewardship</p>	<p>-Minimum 5 community presentations</p> <p>-Presentation and outreach event attendance will be tracked</p>	<p>✓15 community outreach events conducted, including presentations, activities and field days</p>

	<p>practices</p> <ul style="list-style-type: none"> -Reduced threats to wood turtles and their habitat from private landowners and other stakeholders 		
<p>Outreach and education</p> <ul style="list-style-type: none"> -Electronic and social media campaign 	<ul style="list-style-type: none"> -Community members educated about wood turtles, wood turtle habitat, and conservation/stewardship practices -Increased community support for project and participation in project initiatives 	<ul style="list-style-type: none"> -Regular updates to social media pages throughout project lifecycle -Dedicated project webpage updated with current project information 	<ul style="list-style-type: none"> √Regular social media posts to CARP Facebook, Twitter and Instagram √Project webpage updated and hosted on CARP website
<p>Stewardship- Landowner Stewardship Agreements:</p> <ul style="list-style-type: none"> - identify priority land parcels using GIS - work with landowners to develop stewardship plans for their properties; seek commitment to specific actions defined in the plan through signature of a stewardship agreement with landowners 	<ul style="list-style-type: none"> - list of high priority landowners to engage in stewardship activities developed -landowners engaged in development of site specific stewardship plans -stewardship plans signed and implemented by landowners -reduction of practices that threaten wood turtles and their habitat 	<ul style="list-style-type: none"> -Minimum 6 landowners engaged, and 3 landowners committed to stewardship plans -Follow up meetings will be scheduled with landowners to asses success in implementation 	<ul style="list-style-type: none"> √9 Landowners engaged about prospective stewardship plan development √5 new Stewardship Plans completed and Stewardship Agreements signed √2 follow-up meetings with landowners with existing Stewardship Plans

(5) Recommendations for follow-up steps to the project.

In order to support national efforts 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 and future efforts should continue to build on this work.

It is recommended that as in 2016-2017, priority for radio-tracking is given to sexually mature females, in order to increase the chances of observing nesting activity, allowing for subsequent protection of nests. It is recommended that as the project continues, once nesting territories have been identified through radio-telemetry, that transmitters are removed, so that they are available to be equipped to newly identified females. During June 2015 one turtle was observed to be gravid, but not observed nesting; continued radio-tracking in 2016 may lead to the identification of her nesting habitat.

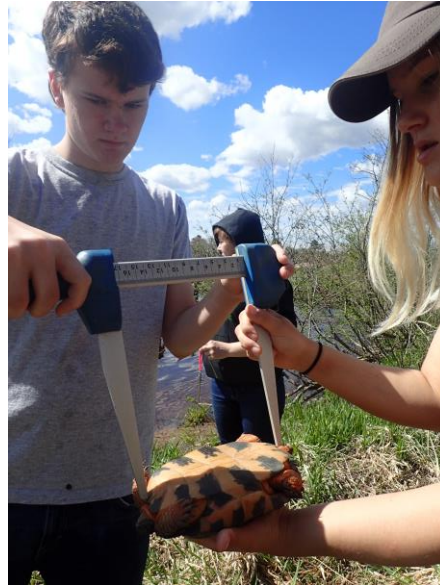
Radio tracking of individuals can also be used to refine knowledge about habitat needs in order to inform our understanding of spatio-temporal use, as recommended in the federal Recovery Strategy. The use of tracking units with the ability to log GPS data should be explored.

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. Future effort should include the identification of new nesting areas; continued visual surveys will likely lead to the identification of 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. Social media and public outreach events can be used to engage individuals who may have information about historical nesting sites.

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 long-term relationships with key stakeholder groups, such as agricultural landowners/managers, is required to facilitate future recruitment of landowners. Support should also be provided for landowners who have signed Stewardship Agreements in past years of the project.

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. Continued volunteer training is also a good option for reducing the amount of field time required by project staff.

The wood turtle is a charismatic species that garners the interest of many individuals. As a result, CARP's Wood Turtle Monitoring and Stewardship project generates a high level of community interest, provides rewarding experiences for volunteers, and provides an excellent educational opportunity for local students. The continuation of this project is an important means to engage members of the public in wildlife stewardship and foster an appreciation for wood turtles as well as other wildlife and their habitat in the Annapolis River watershed.



Grade 10 student learning to take measurements during a field day



Group surveys with residents of Lawrencetown