

RECOVERY PLAN FOR THE *BLANDING'S TURTLE* (*EMYDOIDEA BLANDINGII*) IN NOVA SCOTIA



**A recovery plan adopted by the Nova Scotia Department of Lands and
Forestry**

2020 - 2025

FINAL

Recommended citation:

Nova Scotia Department of Lands and Forestry. 2020. Recovery Plan for the Blanding's turtle (*Emydoidea blandingii*) in Nova Scotia [Final]. *Nova Scotia Endangered Species Act Recovery Plan Series*.

Cover illustration: Nesting Blanding's turtle with identification notches. Photo credit: Jeffie McNeil

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Adoption of a Recovery Plan per Section 15(9) of the Endangered Species Act

Species:

Blanding's turtle (*Emydoidea blandingii*)

Reference:

Parks Canada Agency. 2012. Recovery Strategy for the Blanding's turtle (*Emydoidea blandingii*), Nova Scotia population, in Canada. *Species at Risk Act* Recovery Strategy Series. Parks Canada, Ottawa.

Environment and Climate Change Canada and Parks Canada Agency. 2019. Action Plan for the Blanding's Turtle (*Emydoidea blandingii*), Nova Scotia Population, in Canada. *Species at Risk Act* Action Plan Series. Environment and Climate Change Canada and Parks Canada Agency, Ottawa.

Whereas a Species at Risk Act Recovery Strategy has been prepared for this species by Environment Canada, and that plan has been reviewed by members of the applicable Nova Scotia Recovery Team and determined to fulfil the requirements of Section 15(4) of the Endangered Species Act as they pertain to Nova Scotia, the above-named recovery plan and action plan shall be adopted in lieu of a Nova Scotia Recovery Plan subject to the following:

Date of Adoption: 20 May 2020

Expiry/renewal Date: 20 May 2025

Conditions:

1. Adoption of this recovery plan will be reviewed 5 years from the Date of Adoption.
2. Only elements of this plan that are relevant to Nova Scotia and are in accordance with the Endangered Species Act (Nova Scotia) shall be used. This includes the following sections of the reports:

Parks Canada Agency (PCA; 2012): 3.1 Species Description, 3.2 Population and Distribution, 3.4 Needs of the Blanding's turtle, 3.5 Knowledge Gaps, 4.0 Threats, 5.0 Population and Distribution Objectives, 6.0 Broad Strategies or

General Approaches to Meet Objectives, 7.0 Critical Habitat (see condition),
10.0 References

Environment and Climate Change Canada and Parks Canada Agency (ECCC
and PCA; 2019): 1. Recovery Actions, 2. Evaluation of Socio-economic Costs
and Benefits, 3. Measuring Progress, 4. References

3. The Nova Scotia Amphibians and Reptiles Recovery Team explicitly endorsed the adoption of critical habitat as described in this Recovery strategy and Action plan in lieu of core habitat and that core habitat be described as laid out in Section 7.0 PCA (2012) and Section 1.0 ECCC and PCA (2019).
4. Should any additional requirements be identified, the Nova Scotia Department of Lands and Forestry may prepare an addendum to this plan under the Endangered Species Act.

Approved:



Donna Hurlburt, Manager of Biodiversity

Date:

20 May 2020

Appendix A:

Parks Canada Agency. 2012. Recovery Strategy for the Blanding's turtle (*Emydoidea blandingii*), Nova Scotia population, in Canada. *Species at Risk Act* Recovery Strategy Series. Parks Canada, Ottawa.

Recovery Strategy for the Blanding's turtle (*Emydoidea blandingii*), Nova Scotia Population, in Canada

Blanding's turtle



2012

Recommended citation:

Parks Canada. 2012. Recovery Strategy for the Blanding's turtle (*Emydoidea blandingii*), Nova Scotia population, in Canada [Draft]. *Species at Risk Act* Recovery Strategy Series. Parks Canada, Ottawa. xx + xx pp.

For copies of the recovery strategy, or for additional information on species at risk, including COSEWIC Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the Species at Risk Public Registry (www.sararegistry.gc.ca).

Cover illustration: Adult Blanding's turtle basking © Jeffie McNeil

Également disponible en français sous le titre
« **Stratégie de rétablissement de la population néo-écossaise de tortues
mouchetées (*Emydoidea blandingii*) au Canada** »

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ISBN 978-1-100-18469-2

Catalogue no. En3-4/101-2011E-PDF

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PREFACE

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996) agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies for listed Extirpated, Endangered, and Threatened species and are required to report on progress within five years.

The Minister of the Environment and the Minister responsible for the Parks Canada Agency are the competent ministers for the recovery of the Blanding's turtle, Nova Scotia population, and has prepared this strategy, as per section 37 of SARA. It has been prepared in cooperation with the Blanding's Turtle Recovery Team, Province of Nova Scotia and numerous additional individuals and agencies, academics, environmental non-government organizations, industry stakeholders, Aboriginal groups, and volunteers.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment Canada and the Parks Canada Agency, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Blanding's turtle, Nova Scotia population, and Canadian society as a whole.

This recovery strategy will be followed by one or more action plans that will provide information on recovery measures to be taken by Environment Canada and the Parks Canada Agency and other jurisdictions and/or organizations involved in the conservation of the species. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

ACKNOWLEDGMENTS

This strategy was prepared by Jennifer McNeil, in collaboration with the Blanding's turtle recovery team.

The recovery team has contributed to the science and communications for the recovery of the Blanding's turtle, in addition to the advice provided for this recovery strategy. We would like to acknowledge the contributions of the many volunteers, landowners, students, field assistants and interns who have helped with Blanding's turtle recovery over the years. Their field work and participation in recovery team meetings is much appreciated.


RECOMMENDATION AND APPROVAL STATEMENT

The Parks Canada Agency led the development of this federal recovery strategy, working together with the other competent minister(s) for this species under the Species at Risk Act. The Chief Executive Officer, upon recommendation of the relevant Park Superintendent(s) and Field Unit Superintendent(s), hereby approves this document indicating that Species at Risk Act requirements related to recovery strategy development (sections 37-42) have been fulfilled in accordance with the Act.


Recommended by:


Harry Delong
Superintendent, Kejimikujik National Park and National Historic Site

Recommended by:


Linda Frank
Field Unit Superintendent, Mainland Nova Scotia Field Unit

Approved by:


Alan Latourelle
Chief Executive Officer, Parks Canada Agency

All competent ministers have approved posting of this recovery strategy on the Species at Risk Public Registry.

EXECUTIVE SUMMARY

Blanding's turtles (*Emydoidea blandingii*) are typically found in shallow wetlands with abundant vegetation. During their life, they use a variety of habitats and may travel considerable distances from water, particularly for nesting. They take about 20 years to mature and can live for over 80 years. The Nova Scotia population is isolated from the species' main range and their distribution in the province appears to be limited to the southwest interior. To date, three main populations have been identified as well as two smaller concentrations. These main populations exhibit significant differences in behaviour, morphology, habitat use and fecundity. Viability analysis suggests that at least two of the populations may be at significant risk of extinction. The isolation, restricted distribution, small population size and projected decline have resulted in the listing of the Nova Scotia population as Endangered under both the federal *Species At Risk Act* (S.C. 2002, c.29) and the *Nova Scotia Endangered Species Act* (S.N.S. 1998, c.11).

Known and potential threats identified in this recovery strategy include increased adult mortality from road kill and collection and other activities habitat loss from activities such as development, agricultural, forestry and recreational practices; increased predator populations associated with human development, and the effect of climate change. Blanding's turtles in Nova Scotia are limited in their ability to respond to threats and habitat changes by their long generation time (approx. 40 years), physiology and geographic isolation. Their slow maturation and longevity makes them especially vulnerable to increases in adult mortality. Their long generation time can also delay their ability to respond quickly to threats and can result in significant time lags in recovery. These limitations can constrain researchers' abilities to detect changes in the population until long after an event has occurred.

At the present time, recovery is considered feasible. The long term objectives are to achieve a self-sustaining population of Blanding's turtles in Nova Scotia by maintaining and/or increasing the three existing populations and two known concentrations over the current range, with a less than 5% risk of extinction in each recognized population when projected over 10 generations (400 years), and to maintain sufficient gene flow to prevent any single population from becoming genetically isolated. Intermediate objectives have also been identified; these objectives are described in Section 5 and a list of broad strategies and approaches to achieving recovery are outlined in Section 6. Research and recovery actions have been underway for many years, and the strategic approaches taken in this strategy build on these actions. While research has increased knowledge of much of the turtles' life history and habitat requirements, significant knowledge gaps remain and are identified in Section 3.5.

Critical habitat is identified for the Blanding's turtle in Nova Scotia at all five known sites. For each site, high use areas were identified by mapping turtle locations and applying the guidelines outlined in Section 7. Following this, critical habitat was identified by delineating a polygon that connects all of the high use areas. The identified critical habitat is necessary for the recovery of the species, but may not be sufficient to achieve the population and distribution objectives due to insufficient knowledge of the turtle's distribution.

One or more actions plans will be completed by December 2014.

RECOVERY FEASIBILITY SUMMARY

At this time, recovery of Blanding's turtles in Nova Scotia is considered to be feasible according to the criteria identified in the Policy on the Feasibility of Recovery (Government of Canada 2005), as outlined in Table 3.

Table 3. Feasibility of recovery criteria.

Criteria	Meets criteria?
1. Individuals of the wildlife species that are capable of reproduction are available now or in the foreseeable future to sustain the population or improve its abundance	✓
2. Sufficient habitat is available to support the species or could be made available through habitat management or restoration	✓
3. The primary threats to the species or its habitat (including threats outside of Canada) can be avoided or mitigated.	✓
4. Recovery techniques exist to achieve the population and distribution objectives or can be expected to be developed within a reasonable time frame	✓

The population contains individuals capable of reproduction, and it is believed that sufficient habitat is available to support the population. While some threats, such as vehicular mortality, are difficult to avoid, Population Viability Analysis suggests that a combination of management actions aimed at increasing recruitment and reducing threats could effectively recover these populations (Bourque et al 2006).

TABLE OF CONTENTS

Recovery Strategy for the Blanding's turtle (<i>Emydoidea blandingii</i>), Nova Scotia Population, in Canada	i
PREFACE	iii
ACKNOWLEDGMENTS	iii
RECOMMENDATION AND APPROVAL STATEMENT	iv
EXECUTIVE SUMMARY	v
RECOVERY FEASIBILITY SUMMARY	vii
1. COSEWIC Species Assessment Information	1
2. Species Status Information	1
3. Species Information	2
3.1 Species Description	2
3.2 Population and Distribution	3
3.2.1 Nova Scotia population: range and structure	3
3.2.2 Population size and trends	4
3.2.3 Significance of the NS population	4
3.3 Mi'kmaq involvement in recovery	4
3.3.1 Aboriginal Traditional Knowledge	5
3.3.2 Commitment to include the Mi'kmaq and consider traditional knowledge	5
3.4 Needs of the Blanding's turtle	6
3.4.1 Habitat and biological needs	6
3.4.2 Limiting factors	7
3.5 Knowledge gaps	8
4. Threats	8
4.1 Threat Assessment	8
4.2 Description of Threats	10
5. Population and Distribution Objectives	12
6. Broad Strategies and General Approaches to Meet Objectives	13
6.1 Actions Already Completed or Currently Underway	13
6.2 Strategic Direction for Recovery	14
6.3 Narrative to Support the Recovery Planning Table	19
7. Critical Habitat	20
7.1 Identification of the Species' Critical Habitat	20
7.1.1 Rationale for critical habitat identification	20
7.1.2 Information and methods used to identify critical habitat	21
7.1.3 Geographic location and biophysical attributes of Critical habitats	23
7.2 Schedule of Studies to Identify Critical Habitat	26
7.3 Activities Likely to Result in the Destruction of Critical Habitat	26
8. Measuring Progress	27
9. Statement on Action Plans	28
10. References	29
APPENDIX A: Effects on the Environment and Other Species	34

1. COSEWIC SPECIES ASSESSMENT INFORMATION

Date of Assessment: May 2005

Common Name (population): Blanding's turtle (Nova Scotia population)

Scientific Name: *Emydoidea blandingii*

COSEWIC Status: Endangered

Reason for Designation: The three small subpopulations of this species found in central southwest Nova Scotia total fewer than 250 mature individuals. These three subpopulations are genetically distinct from each other and from other Blanding's turtles in Quebec, Ontario and the United States. Although the largest subpopulation occurs in a protected area, its numbers are still declining. The other subpopulations are also susceptible to increasing habitat degradation, mortality of adults and depredation on eggs and hatchlings.

Canadian Occurrence: Nova Scotia

COSEWIC Status History: Designated Threatened in April 1993. Status re-examined and designated Endangered in May 2005. Last assessment based on an update status report.

2. SPECIES STATUS INFORMATION

Globally, the current range of the species extends from extreme southern Quebec and Ontario, west to central Nebraska, and south to Illinois and Indiana (Cochran and Lyons 1986, Ernst 1973, Olson 1987). Isolated local populations occur throughout the range and the Nova Scotia population is one of the most isolated (Herman *et al.* 1995). In Canada, populations are restricted to southern Ontario, the southwestern corner of Quebec, and the interior of southwestern Nova Scotia. Approximately 20 percent of the global distribution exists in Canada and less than five percent of this exists within Nova Scotia.

Blanding's turtle has a Global Rank (G-Rank) of G4, and a National Rank (N-Rank) of N4 (Natureserv 2010). The Nova Scotia population, which is the focus of this recovery strategy, has a Sub-National Rank (S-Rank) of S1. This population is listed as Endangered under both Canada's *Species at Risk Act* (2005) and the *Nova Scotia Endangered Species Act* (2000).

3. SPECIES INFORMATION

3.1 Species Description



Figure 1 a) Adult female in the water b) Adult female basking with head up c) Newly hatched Blanding's turtle

Blanding's turtles are medium sized freshwater turtles with a semi-hinged shell. They are very long lived (80+ years) and, in Nova Scotia, slow to mature (approx. 20 years) (Congdon *et al.* 1993, Herman *et al.* 1999, McNeil 2002). One of their most distinctive features is the bright yellow chin and throat (Figure 1b). Their high-domed top shell (carapace) is grey to black with yellow flecks (Caverhill and Crowley, 2008). The flecks are typically brighter in younger turtles and most visible when the shell is wet (Figure 1a). The lower shell (plastron) is orange-yellow with irregular black patches. In juveniles, annual growth lines are visible on the lower shell (Figure 2). After turtles mature, the rings begin to wear off and the plastron eventually becomes smooth.

In Nova Scotia, adult shell length ranges from 18 to 25 cm (Nova Scotia Blanding's turtle database 2010). Adult males are typically larger than females and can be distinguished by their concave plastron, thick tail base and solid grey upper lip. Newly emerged turtles, called hatchlings, are approximately 4cm long (the size of a toonie), and have uniform grey shells (Figure 1c).



Figure 2. Bottom shell (plastron) of a juvenile Blanding's turtle, showing annual growth rings

3.2 Population and Distribution

3.2.1 Nova Scotia population: range and structure

In Nova Scotia, Blanding's turtles appear to be restricted to the southwestern interior of the province, although recent findings have expanded the extent of the range within that area (Caverhill 2006; McNeil 2002) (Figure 3). Studies of turtle movements and distribution, in concert with genetic assessment, have revealed that the Nova Scotia population complex is spatially structured, containing several distinct populations (Caverhill 2003, McNeil 2002, Mockford *et al.* 1999, Mockford *et al.* 2005, Toews 2004). To date, three genetically distinguishable populations have been documented, each separated by at least 15 km (Figure 3). These populations exhibit significant biological differences in behaviour, morphology, habitat use and fecundity (Caverhill 2006, McNeil 2002, Mockford *et al.* 2005). Even within populations, genetic structuring among concentration sites may be evident (Toews 2004)

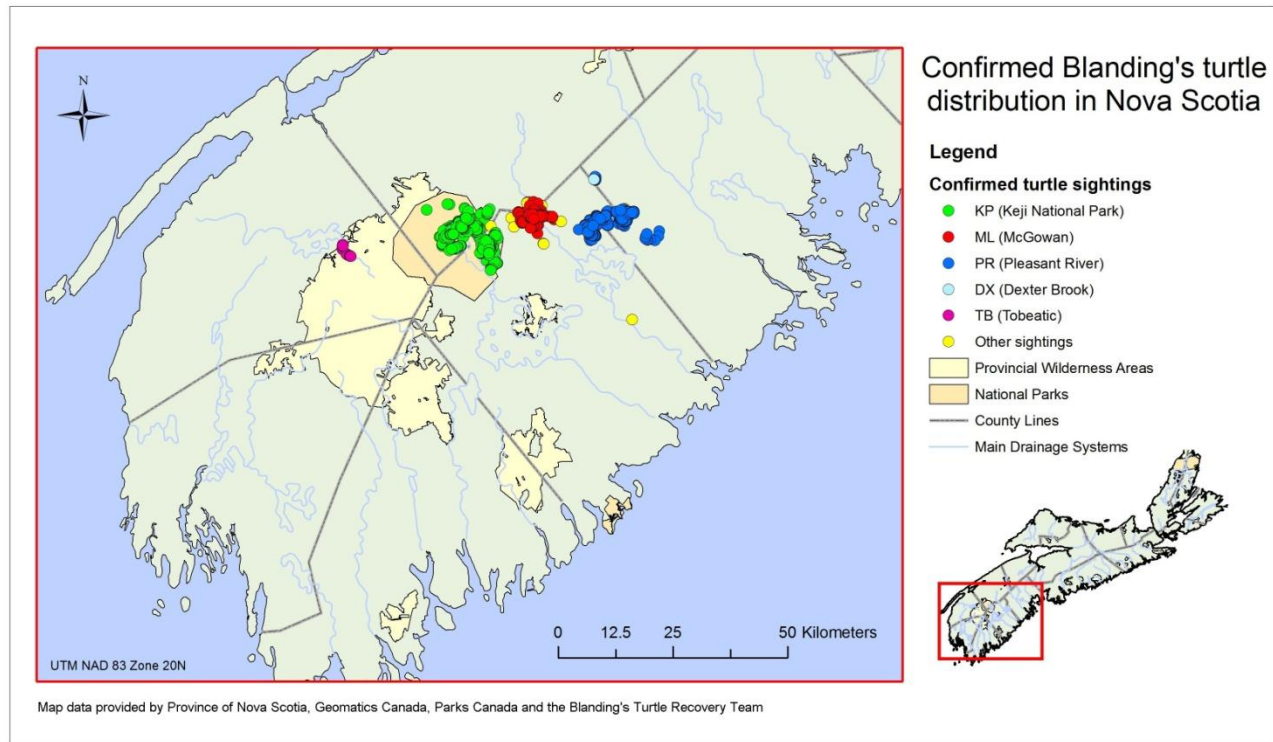


Figure 3. Confirmed distribution of Blanding's turtles in Nova Scotia, with sightings coloured by population / concentration. Yellow dots represent confirmed sightings that have not yet been assigned to specific populations.

The Kejimikujik population occurs on the Mersey River watershed, almost entirely within the boundaries of Kejimikujik National Park and National Historic Site (Kejimikujik). The McGowan Lake and Pleasant River populations occur in working landscapes on the Medway watershed. Two smaller concentrations have also been identified within the population complex, one in the Tobeatic Wilderness Area on the Sissaboo watershed (4 turtles) and one in Dexter Brook on the Medway watershed (3 turtles). Additionally, several isolated sightings and unconfirmed reports along the Mersey, Medway and adjacent watersheds suggest that undiscovered populations may exist.

3.2.2 Population size and trends

Based on our current knowledge of the species' range, it is believed that the entire Nova Scotia Blanding's turtle population complex contains approximately 350 adults. Estimated current population size for each of the known populations is presented in Table 1. Initial population modeling of two of the three populations suggests that both may be declining (Bourque *et al.* 2006). Although little is known of the history of Blanding's turtle in Nova Scotia, based on estimates of genetic diversity, it is possible that populations were once larger and more widespread than at present (Herman *et al.* 2003). Estimates of gene flow suggest that over the last few generations the McGowan Lake population has gone from a source population to a sink population, while the reverse has occurred at Pleasant River (Howes *et al.* 2009).

Table 1. Estimated size for populations of Blanding's turtles in Nova Scotia

Population/ Concentration	Years of data	Population estimate/ total adults marked	Watershed	Primary Ownership
Kejimikujik	1969-2010	Population estimates: 63 -132 ¹ 146 adults marked	Mersey	Federal
McGowan Lake	1996-2010	Population estimate: 79 (60-116) ² 63 adults marked	Medway	Provincial / Private
Pleasant River	1997-2010	82 adults marked	Medway	Private / Provincial
Whitesand Stream	2007-2010	3 adults marked	Sissiboo	Provincial
Dexter Brook	2004-2005	3 adults marked	Medway	Private

¹ Kejimikujik population estimate based on two separate estimates: 1. Mean annual Jolly-Seber estimate using data from 1987- 2002 (Bourque *et al.* 2006). 2) Schnabel binomial estimate based on data census intervals 1969-1988 (Herman *et al.* 1995). Actual numbers of adults includes all adults marked from 1969-2010 and does not take into account individuals that may have died during this time period.

² McGowan population estimate calculated using data from 1996-2002 using the Schnabel method.

3.2.3 Significance of the NS population

Studies have shown that the degree of genetic variation in the NS population is similar to, or even higher than, that of populations in the species' main range (Mockford *et al.* 1999, Ruben *et al.* 2001). The NS population has also significantly diverged genetically from populations in the main range (Mockford *et al.* 1999, Mockford 2007, Ruben *et al.* 2001) and has been proposed as an important evolutionary unit of the species (Mockford 2007).

3.3 Mi'kmaq involvement in recovery

As a preamble to this section, there are two important considerations. First, this recovery strategy, as a requirement of SARA, adheres to the directives set out in that legislation. Second, Section 3.3 provides insight on Aboriginal perspectives on the recovery of the Blanding's Turtle as contributed by Mi'kmaq members of the recovery team, and through consultation with the Native Council.

Blanding's turtle habitat falls within Kespukwitk, one of the seven traditional districts of

Mi'kma'ki. For this reason, it is important that the involvement of the Mi'kmaq living on and sharing the land is actively sought and encouraged. It is this continuum of Mi'kmaq throughout Kespukwitk, who through their sages, talks, and walks, will begin to reveal aspects of the Blanding's turtle. Mi'kmaq can make important contributions to the recovery of turtles through traditional teachings, revealing the importance of traditional practices, and sharing an Aboriginal eco-centric world view. Mi'kmaq customary use of biodiversity embodies the Mi'kmaq principle of *netukulimk*; a way of harvesting resources without jeopardizing the integrity, diversity, or productivity of our natural environment (Native Council of Nova Scotia 1994). A more inclusive approach to ecosystem based management may be particularly useful for Blanding's turtle recovery and also to other rare and at risk species that are tied to similar habitats in the watersheds of southern Nova Scotia. This recovery strategy cannot hope to illustrate the total knowledge of the Mi'kmaq. Recovery planning can be revised over time as involvement with the Mi'kmaq grows.

3.3.1 Aboriginal Traditional Knowledge

In order to integrate Aboriginal Traditional Knowledge (ATK) with other types of knowledge, it is important for recovery planners to understand how the Mi'kmaq world view may differ from other Aboriginal and scientific world views. Mi'kmaq traditional knowledge is not necessarily written, peer-reviewed, or published. ATK is a living knowledge, captured in oral language and culture, and which is highly specific to place and time – it is the *ki* of *Mi'kma'ki*. In sharing ATK, Mi'kmaq will often end by saying *tan teli kji'jitu* (as I know it to be), recognizing that the knowledge is living. In other words, the knowledge shaped from the land, e.g. about the Blanding's turtle, carried forward, and shared will differ between those experiencing that place at different times. It may change because of another action or because of another's perspective.

There are several legends and stories of *Mikjikj*, the Mi'kmaq name for turtles. These range from creation stories to legends of how the turtle got its shell. Some describe how the turtle was used by the Mi'kmaq and other stories of how and why specific turtles were named (Speck, 1923). The vast array of stories and legends signify a deep spiritual connection between the Mi'kmaq and turtles, suggesting there is much we can learn from their collective knowledge.

It is not known if Mi'kmaq people hold specific knowledge of Blanding's turtles but they likely hold knowledge of the turtle's habitat and that information has not yet been accessed. For example, ATK may be able to inform changes that have occurred in turtles' range and provide insight as to whether changes in distribution may be related to changes in habitat. In addition, the Mi'kmaq world view of planning for 7 generations into the future would be beneficial for understanding and advancing the necessity for planning for long periods that are biologically relevant to the long lived Blanding's turtle (e.g. 10 generations for Blanding's turtle is 400 years).

3.3.2 Commitment to include the Mi'kmaq and consider traditional knowledge

This Recovery Strategy recognizes and incorporates Mi'kmaq knowledge in the recovery of Blanding's turtles and their habitats.

- First, by recognizing the significance that the Mi'kmaq People have shared a long history with the Blanding's turtle in Kespukwitk.

- Second, by inviting Mi'kmaq individuals and communities to sit with others, as peers, to discuss, draft, and implement recovery strategies and action plans.
- Third, by recognizing and acknowledging that it is important to gather and understand the collective knowledge of the Mi'kmaq about Blanding's turtles and their habitats.
- Fourth, by recognizing the need to include Mi'kmaw worldviews to ensure the value of netukulimk for the long term sustainability of Kespukwitk.
- Finally, by recognizing the valuable contribution of the Mi'kmaq and their traditional knowledge as an important step towards reconciling Aboriginal and scientific world views.

3.4 Needs of the Blanding's turtle

3.4.1 Habitat and biological needs

Blanding's turtles use a variety of habitats during their life cycle, and because of their longevity, individuals may have to shift these areas in response to changes in habitat over their lifetime. Limiting features of habitat are not currently known at this time. The following summary of known habitats used is presented to inform the identification of critical habitat.

Summer habitats: Blanding's turtles in Nova Scotia are found in a variety of habitats including fens, shallow lake coves, vernal ponds, and slow flowing brooks and rivers. They tend to use these habitats from April to late September. Within these habitats, Blanding's turtles tend to frequent shallow water (<2 m deep) containing abundant vegetation, often with deep, organic sediments (Ernst and Barbour 1972, Gilhen 1984, Graham and Doyle 1979, McMaster and Herman 2000, Power 1989, Ross 1989, Ross and Anderson 1990). Sites where turtles are present tend to have sweetgale (*Myrica gale*) or sedge (*Carex spp.*) overhanging the banks, few rocks (Bourque 2006), a mid range of water colour with peaty soils (Bourque 2006, Power 1989) and living sphagnum mats (McMaster and Herman 2000). Extensive beaver activity is also apparent at most known Blanding's turtle sites in NS. Juveniles typically occur in the same overall habitats as adults, although they may use different microhabitats within the larger wetland (McMaster and Herman 2000, McNeil 2002). Summer habitat for hatchlings and very young juveniles may vary. While some have been encountered in traditional turtle summer habitats, others have been radio tracked to wet areas in the woods or in small pools prior to moving to the larger wetlands (unpublished data).

Winter habitats: Blanding's turtle adults and juveniles often densely aggregate at their aquatic overwintering sites, and return to the same sites year after year (Caverhill 2006, McNeil 2002, Power 1989). They typically arrive at these sites in September and October and leave shortly after the ice melts in March and April. The characteristics and location of overwintering sites vary, including wooded pools or channels, railway trenches, and specific sections of streams or wetlands (McNeil 2002, Newton and Herman 2009, Power 1989). Sites typically have a deep organic bottom and undercut banks (Newton and Herman 2009). Temperature profile, dissolved oxygen level, water flow, water depth and vegetation composition vary considerably among sites (Newton and Herman 2009). Mating activity is often observed at overwintering sites, particularly during the fall (McNeil 2002) and basking activity occurs in nearby areas particularly in spring. Recent tracking studies of hatchlings show that their overwintering habitat is different from

adults, as they spend the winter in a variety of habitats such as vegetated water or buried in moist substrates on land (Camaclang 2007).

Nesting habitats: Blanding's turtles nest in a variety of habitats, both natural and human-influenced, including lakeshore cobble beaches, slate outcrops, gravel roadsides, borrow pits, vegetable gardens, mine tailings, and recreational tracks (Caverhill 2006, McNeil 2002, Power 1989, Standing *et al.* 2000). Sites must be exposed to adequate solar heat gain to allow for incubation of the eggs, and are often facing southwest (Power 1989, Standing 1997). Nest sites may be close to water or considerable distances inland. Females may nest densely in one area or singly. Many, but not all, females show high fidelity to specific nesting areas (Standing *et al.* 2000). However, they have also demonstrated the ability to shift sites when necessary. Nesting typically occurs in evenings in June-early July and females may spend several days at or near the site prior to nesting. Females lay only one nest per year, and may not nest every year. Hatchling emergence from the nest typically occurs from late August to mid October. During emergence, hatchlings may remain in the vicinity of the nest for several days before dispersing (Camaclang 2007, McNeil *et al.* 2000, Smith 2004, Standing *et al.* 1997). In rare cases, hatchlings have been observed to overwinter in the nest cavity (Nova Scotia Blanding's turtle database 2010).

Travel routes: Blanding's turtles are capable of travelling considerable distances both overland and along waterways. They move regularly among seasonal habitats and may make occasional long distance migrations (Kydd 2010, Power 1989). Turtles travelling to and from nesting sites have been shown to use the same travel route in multiple years (Kydd 2010). Newly emerged hatchlings often make extensive treks on land as they leave their nest site and seek an appropriate overwintering location (Camaclang 2007, McNeil *et al.* 2000, Smith 2004, Standing *et al.* 1997).

3.4.2 Limiting factors

Blanding's turtles in Nova Scotia are limited in their ability to respond to threats and habitat changes by their long generation time, physiology and small population size and geographic isolation from the species' main range.

As a long lived species with substantially delayed maturation (20 years), Blanding's turtles are especially vulnerable to increases in adult mortality. Even slight increases in adult mortality can drive populations to local extinction (Congdon *et al.* 1993, Heppel 1998). Because of their longevity and slow maturation, the species has a very long generation time (approx. 40 years), which can delay their ability to respond quickly to threats and result in significant time lags in recovery. These time lags also limit our ability to detect changes in the population until long after an event has occurred.

Restricted heat units and low productivity conditions significantly constrain Blanding's turtles in Nova Scotia. Sufficient heat units are required for successful incubation of eggs and emergence of hatchlings (Gutze and Packard 1987). In colder years, poor hatchling success, high rates of developmental abnormalities and lethargy in hatchlings are often apparent (Standing *et al.* 2000). Low productivity habitats may limit population density and in conjunction with short growing seasons, inhibit individual growth rates. As a result, maturation appears to be substantially delayed; in fact, Blanding's turtles in Nova Scotia have the highest age of maturity reported for the species (McNeil 2002).

As a small, isolated population complex, Nova Scotia Blanding's turtles are vulnerable to stochastic (chance) events (COSEWIC 2005). Local disturbances such as unusually high predation, extreme weather, or disease, which would have little effect on a large population, could be devastating. The species' tendency to densely aggregate at seasonal locations, such as nesting and overwintering sites exacerbates this risk.

3.5 Knowledge gaps

Despite the long term research, knowledge gaps remain. As a result of their longevity and late maturation, accurately assessing the status of the Blanding's turtle population is a long term process. All of the research and recovery efforts listed below in section 6.1 aid in our ability to understand the population but the majority of this work has taken place in less than half of a turtle generation, which is estimated to be approximately 40 years (Herman *et al.* 2003).

Some important remaining questions include:

- What is the overall distribution in the province? Is this distribution currently shrinking, expanding and/or stable? How has it changed historically?
- Are the Kejimikujik and McGowan populations currently declining as indicated by the PVA? If so, why? What is the state of the Pleasant River population?
- What are the natural long term variations in survivorship and fecundity rates and how do they compare with elsewhere in the species range?
- How much habitat is necessary to sustain the population over the long term (allowing for shifts in habitat use)?
- What is the effective population size? Is the proportion of males successfully reproducing unusually low compared to elsewhere in the geographic range? If so, why is it low and does it reflect a recent change and/ or is it an indicator of a yet-to-be identified threat?
- What are the long term effects of ¹headstarting on fitness?
- If laboratory incubation and headstarting is to continue to be an important component of recovery, what is the most appropriate incubation temperature to produce healthy males and females?
- What will be the long term effect of climate change?
- What is the long term effect of cumulative habitat loss / alteration and disturbance?

4. THREATS

4.1 Threat Assessment

Existing and suspected threats have been identified in Table 2.

¹Headstarting is the process by which hatchling turtles are raised in captivity for a period of up to 2 years.

Table 2. Threat Assessment Table

Threat	Level of Concern¹	Extent	Occurrence	Frequency	Severity²	Causal Certainty³
Habitat loss or degradation						
Cottage and residential development	High	Widespread	Current / historic	One-time / recurrent	Moderate	High
Forestry practices (e.g. clearcutting, harvesting in riparian zone)	Medium	Widespread	Current / historic	Recurrent	High	Low
Road development	High	Widespread	Current / historic	Recurrent	High	High
Agricultural practices (e.g. Cranberry growing, tilling, crop production)	Low	Localized	Unknown	Rare	Moderate	Medium
Recreational use of nesting areas (e.g. beaches, OHV trails)	Medium	Localized	Current / historic	Seasonal	Moderate	Medium
Peat mining	Low	Localized	Unknown	Rare	Moderate	Medium
Accidental Mortality						
Mortality from on and off road vehicles and machinery	High	Widespread	Current / historic	Seasonal – rare	High	High
Motorboat use	Medium	Localized	Unknown	Seasonal – rare	High	Medium
Collection for museum specimens ⁴	Low	Localized (KP)	Historic	One-time	High	High
Collection for food ⁴	Low	Widespread	Unknown	Rare	High	High
Compaction or destruction of nests	Low	Localized	Unknown	Seasonal – rare	Low	Low
Changes in Ecological Dynamics or Natural Processes						
Hydroelectric dam operation	Medium	Localized	Current / historic	Continuous	Moderate	Medium
Human alteration of beaver dams	Medium	Localized	Current / historic	One-time / recurrent	Moderate	Medium
Introduction/ establishment of exotic predatory fish (small mouth bass and chain pickerel)	Medium	Widespread	Anticipated	Continuous	Unknown	Low
Changes in predator populations resulting from human activities	Medium	Localized	Current/ historic	Recurrent	Moderate	Low

Climate and natural disasters						
Climate change	Medium	Widespread	Anticipated	Continuous	Unknown	Low
Stochastic events that increase adult mortality ⁵	Medium	Localized	Unknown	Unknown	High	High
Disturbance or persecution						
Collection for pets and / or relocation	Medium	Localized	Current/ historic	Unknown	High	Medium
Pollution						
Pesticide and herbicide use	Low	Localized	Unknown	One-time / recurrent	Unknown	Low
Contaminants from mine tailings	Low	Localized	Historic	Recurrent	Unknown	Low

¹ Level of Concern: signifies that managing the threat is of (high, medium or low) concern for the recovery of the species, consistent with the population and distribution objectives. (This criterion considers the assessment of all the information in the table).

² Severity: reflects the population-level effect (High: very large population-level effect, Moderate, Low, Unknown).

³ Causal certainty: reflects the degree of evidence that is known for the threat (High: available evidence strongly links the threat to stresses on population viability; Medium: there is a correlation between the threat and population viability e.g. expert opinion; Low: the threat is assumed or plausible).

⁴ Threats known to have occurred previously and/or do occur in other parts of the species range. These currently have a low level of concern, but there is a high causal certainty that they would significantly impact the population

⁵ High causal certainty that this will significantly impact the population, however, currently a medium level of concern as it is not regularly occurring.

4.2 Description of Threats

The following highlights major threats outlined in Table 2, emphasizing key points and providing additional information on the threats. Evidence suggests significant population-level impacts exists for threats with a “high” for both ‘level of concern’ and ‘causal certainty’; other threats are identified as being potentially significant if they were to occur. While threats are listed separately, an important concern is the long-term cumulative effect of a variety of threats on the Blanding's turtle population. As human development increases, the overall impact of activities on the habitat becomes more serious at both the small and large scale. At the landscape scale, incremental losses and multiple threats often complicate recovery efforts and confound understanding of population trends (Jensen *et al.* 1993).

Mortality, habitat loss and changes to ecological processes associated with human activities

Increased adult mortality is a potential yet very serious threat to the Blanding's turtle, as it is known to cause major declines in turtle populations (Congdon *et al.* 1983). Blanding's turtles' longevity and late maturation make their populations particularly vulnerable to even small increases in adult mortality (Congdon *et al.* 1983, Congdon *et al.* 1993). By reducing lifetime reproductive output, even these small changes can drive populations to local extinction (Heppel 1998, Congdon *et al.* 1993). Although younger life stages have higher natural mortality rates, sustained increases in mortality in these stages will also cause a population to decline (Bourque

et al 2006); the decline may be difficult to detect in the short term due to the species long generation time and the more cryptic nature of juveniles.

Human activities can affect survivorship of all life stages both directly and indirectly. In the Nova Scotia population, collection for museum specimens (historic) and vehicle collisions (on and off road) have contributed directly to mortality (Penny 2004). When first described in the early 1950's, it is known that more than a dozen turtles, most believed to be female, were removed as samples; additionally, there have been 4 known instances where vehicle mortality has occurred in adults, again all females, and several instances of vehicle mortality in hatchlings and juveniles. Indirectly, habitat destruction and fragmentation from cottage development and forestry and agricultural practices disrupt population structure by reducing the amount of habitat and impeding movements within and between populations (Hartwig 2004). This can force turtles to travel through higher risk areas; additionally, in some cases, human activities actually create habitat which attracts turtles, particularly for nesting (Congdon *et al.* 2008). Both of these put turtles at increased risk for encounters with people, machinery and pets. Additionally, nesting areas near human development may have unusually high populations of opportunistic predators such as raccoons, which could substantially increase predation on eggs and hatchlings; if sustained, this would decrease lifetime reproductive output (Hartwig 2004). In Ontario, an increase in the predation of nests by sarcophagid fly larvae has been identified as a potentially significant threat, although the cause of increase is unknown (COSWEIC 2005). In Nova Scotia only a small number of eggs have been found to contain maggots that may be from the sarcophagid fly (NS Blanding's turtle database 2010), although this may pose a future threat (Bolton *et al.*, 2008).

Blanding's turtles require seasonally predictable water levels at all seasonal habitats. Hydropower generation in this region tends to accentuate variability and unpredictability in water level (Herman *et al.* 2003). Lake draw-downs in mid and late summer reduce or eliminate drought refuges and create large uninhabitable expanses; in the winter, they can potentially increase mortality by exposing overwintering turtles. Retention of water during wet summers can flood shoreline nests (NS Blanding's turtle database 2010). In contrast, impoundments controlled by beavers reduce variability and increase predictability in water level. Removal or control of beaver activity by cottage owners, farmers, foresters and highway maintenance crews potentially threatens all life stages of the turtle.

Human activities can also affect availability of food such as aquatic invertebrates and amphibians. Invasive predatory fish species, such as smallmouth bass and chain pickerel, reduce populations of amphibians and small fish (Jackson 2002, Vander Zanden *et al.* 2004), and may also pose a direct predatory threat to hatchlings. While not yet documented at Blanding's turtle sites, the ranges of both of these species has been expanding in southwestern Nova Scotia through human introductions. Likewise, pollution and pesticides may directly affect the turtles themselves, as well as system productivity and the availability of food. This reduced productivity could affect growth of the turtles at a local scale, which may explain differences in sizes seen among populations in Nova Scotia.

Climate change and natural disasters

In the longer term, Blanding's turtles in Nova Scotia face an uncertain climatic future and it is not known if the overall effects of climate change will be positive or negative. Because of their limited physiological tolerance and long generation time (approximately 40 years), they are limited in ability to respond genetically to climatic change (Herman and Scott 1992). Substantial changes in climate may occur within the lifetime of an individual turtle; adaptive responses to such changes would have to be behavioral rather than genetic (Herman and Scott 1992). Changes to overall temperatures and seasonal water flow could affect habitat at any life stage. Additionally, climate change could alter nest temperatures which could result in skewed sex ratios or decreased fitness in the population over time. The sex of hatchlings is determined by the temperature at which they were incubated in the nest, with lower incubation temperatures producing males and higher temperatures producing females (Gutze and Packard 1987). Sub-optimal temperatures or moisture levels during incubation can result in nest failure, increased incidents of deformities, or decreased overall fitness in hatchlings (Packard 1999, Standing et al 2000).

Natural disasters that increase adult mortality can be a serious threat to this small isolated population, for reasons described above.

5. POPULATION AND DISTRIBUTION OBJECTIVES

The long term objectives are to achieve a self-sustaining population of Blanding's turtles in Nova Scotia, over the current range, (as measured by 95% probability of persistence in each recognized population when projected over 10 generations (400 years)), and to maintain sufficient gene flow to prevent any single population from becoming genetically isolated.

The long term objectives include the three currently recognized populations. The status of the two small concentrations is currently unknown, with less than 5 turtles identified at each. Further study is needed to determine if they are currently, or were historically, viable populations. In the interim, the following short term objectives will be measured in terms of their contribution to the long term objective:

- Maintain or increase adult survivorship sufficient to sustain the three recognized populations.
- Maintain or enhance recruitment into the three recognized populations
- Maintain extent of occurrence in the province
- Maintain area of occupancy in the province
- Reduce threats facing all life stages

Current range (area of occupancy) was chosen as the benchmark as there is no information available on historic range of the species in Nova Scotia. Because our current knowledge of distribution is incomplete, loss of range is difficult to assess and requires surveys to locate

additional populations. Protecting Blanding's turtle habitat does not necessarily mean that no human activities can occur, but that necessary ecosystem processes be maintained so that survivorship, fecundity and gene flow are not negatively affected.

6. BROAD STRATEGIES AND GENERAL APPROACHES TO MEET OBJECTIVES

6.1 Actions Already Completed or Currently Underway

Blanding's turtles have been described as a flagship species for conservation in Nova Scotia (Lefebvre 2009) and research and recovery actions have been underway for many years. The strategic approaches identified in this strategy are informed by both past and current research and build on the successes and knowledge gained from early recovery actions.

The Kejimikujik population was first described in Nova Scotia in 1953 and turtles have marked in this population since 1969 (Drysdale 1983, Thexton and Mallet 1977-1979, Weller 1971-1972). With help from members of the public, the populations at McGowan Lake and Pleasant River were described in 1996 and 1997 respectively (McNeil 2002, Caverhill 2003).

An extensive research, recovery and monitoring program has been underway since the mid 1990's which has increased knowledge of habitat use, threats, and age-specific survivorship necessary to inform recovery. In addition to ongoing monitoring, many research projects have been conducted to examine nesting ecology, hatchling movement, juvenile abundance and survivorship, travel routes, habitat characteristics, population genetics, and predation threats¹. The cornerstone of the recovery approach has been based on a well established volunteer-based nest protection program which has taken place annually in Kejimikujik since 1992 (Standing *et al.* 2000) and was expanded to the other two populations in the early 2000's (Caverhill 2003, McNeil 2002). In addition to protecting nests from predation, this program provides valuable data on survivorship, fecundity, site fidelity and recruitment.

Initial efforts to bolster recruitment through headstarting in the early 1990s showed that headstarts could survive and behave like wild juveniles (Morrison 1996). Recent headstarting efforts began in 2002 to specifically address recovery at Grafton Lake, in Kejimikujik (Newbould 2003, Penny 2004). In the early 2000's, a Population Viability Analysis (PVA) was conducted on the Kejimikujik and McGowan Lake populations suggest that both are at a significant risk of decline; it predicted that a variety of recovery actions aimed at younger life stages could effectively reduce the extinction risk in both populations. Following the development of the

¹ Research project referencing: Nesting ecology (Standing 1997), hatchling movement (Standing 1997, McNeil *et al.* 2000, Smith 2004, Camaclang 2007, unpublished data), juvenile abundance and survivorship (McMaster and Herman 2000, Morrison and McNeil 2003, Arsenault in progress), travel routes (Kydd 2010), habitat characteristics (Bourque 2006), population genetics (Mockford *et al.* 2005, Howes *et al.* 2009), and predation threats (Oickle 1997, Shallow 1998, Standing *et al.* 2000b)

PVA, the headstarting program was expanded to include the entire Kejimikujik population and McGowan Lake populations. In 2009, the current phase of this recovery experiment began, including the laboratory incubation of eggs at a variety of temperatures to determine the most appropriate to produce healthy hatchlings of both sexes (Arsenault in progress).

Efforts have also been underway to protect Blanding's turtle habitat. The known Kejimikujik population occurs mostly within the boundaries of the park, and much of this habitat has been declared as Zone 1, the highest level of protection (Kejimikujik National Park 1995). At McGowan Lake, 102ha of Blanding's turtle habitat were formally protected by Abitibi-Bowater under the company's Unique Areas Program; the Province of Nova Scotia has since acquired this land. Additionally, the province has protected over 500 ha through their Integrated Resource Management system and recently purchased an additional 12 ha of important overwintering habitat from a private landowner at McGowan Lake. Through the Nova Scotia Nature Trust, four parcels of Blanding's turtle habitat have been protected in Pleasant River.

Research and recovery actions are guided by the Blanding's Turtle Recovery Team, which each year reviews the ongoing activities and provides recommendations. The recovery program involves a variety of partners including Parks Canada, Nova Scotia Department of Natural Resources, Acadia University, Dalhousie University, Oaklawn Farm Zoo, Nova Scotia Nature Trust, Mersey Tobeatic Research Institute, Friends of Keji Cooperating Association, Abitibi-Bowater, Nova Scotia Power as well as numerous volunteers, students, and local landowners. The well established outreach program provides the opportunity for the public to be directly involved in meaningful research and recovery actions that support the strategic approaches identified in this strategy.

6.2 Strategic Direction for Recovery

To achieve the long-term and intermediate population and distribution objectives, the following broad strategies have been identified:

1. Continue to support, inform, recommend and, where possible, build on the significant public participation and partner involvement in meaningful recovery actions; engaging landowners, volunteers, Mi'kmaw communities, students, local industry, NGO's and government agencies.
2. Invite, encourage, and include Mi'kmaw involvement in the recovery process to explore opportunities for different approaches and knowledge.
3. Determine the extent of the range in Nova Scotia and identify population status, structure, habitat use and threats in known and any new concentrations.
4. Ensure conservation of currently known critical habitats and new habitats as they are identified.
5. Undertake recovery actions to increase recruitment or decrease mortality (e.g., enhance juvenile survivorship through headstarting or nest protection) in areas that have been identified and evaluate the effectiveness of these actions.

6. Examine male fecundity in the population complex to determine if there is a conservation concern and continue studies to assess and maintain the genetic variation that will sustain a viable population.
7. Conduct strategic monitoring of the population complex and continue refining and reassessing population modeling.

Recommended research and management approaches to implement these strategies are identified in Table 3.

Table 3. Recovery Planning Table

Threats Addressed	Priority	Broad strategy to recovery	General Description of Research and Management Approaches
All	Necessary	Continue to support, inform, recommend and, where possible, build on the significant public participation and partner involvement in meaningful recovery actions.	<ul style="list-style-type: none"> • Continue to invite and involve volunteers directly in meaningful recovery actions and priority research and monitoring activities and provide feedback. • Continue work with Mi'kmaw communities supporting Blanding's turtle recovery. • Facilitate landowner stewardship by building relationships and providing guidance to achieve habitat conservation and restoration and evaluate effectiveness of approaches to stewardship. • Collaborate with other recovery teams and partners to coordinate and deliver ecosystem based recovery activities and minimize overlap in landowner contact. • Work closely with local forestry, hydro electricity and tourism industries to protect and restore habitat and to foster public involvement in recovery
All	Necessary	Invite, encourage, and include Mi'kmaw involvement in the recovery process to explore opportunities for different approaches and knowledge	<ul style="list-style-type: none"> • Seek out and integrate Mi'kmaw knowledge and worldviews into decision making and long term planning. • Explore opportunities to establish regular communications between Mi'kmaw organizations and communities and species at risk jurisdictions, academics and volunteers • Explore opportunities for ceremony to be a regular part of recovery action.

Threats Addressed	Priority	Broad strategy to recovery	General Description of Research and Management Approaches
All	Urgent	Determine the extent of the range in Nova Scotia and identify population status, structure, habitat use and threats in known and any new concentrations found.	<ul style="list-style-type: none"> • Continue to solicit sighting reports from members of the public. • Continue targeted trapping and visual surveys in new areas, based on reported sightings, single confirmed sightings, aerial photographs and threats. • Assess the size and extent of known and new concentrations. • Continue to provide training for volunteers and support volunteer-led efforts that contribute to research and monitoring goals.
Habitat destruction, fragmentation and loss; human induced mortality	Urgent	Ensure conservation of currently known critical habitats and new habitats as they are identified.	<ul style="list-style-type: none"> • Employ a variety of approaches to conserve habitat: legal, policy and stewardship. • Coordinate recovery actions on high priority ecosystems that may contain multiple species at risk, with other recovery teams and partners. • Explore with landowners, NGO's, industry and the academic community ways to effectively use stewardship to identify and maintain critical habitat. • Facilitate recovery planning by providing updated information to partners through the Blanding's turtle database and species at risk resource website. • Monitor critical habitats to identify threats and take actions to remove or reduce any threats which arise.
Vehicular mortality; increased predation due to human influences; historic mortality; small population effects	Urgent	Undertake recovery actions to increase recruitment or decrease mortality in areas that have been identified and evaluate the effectiveness of these actions	<ul style="list-style-type: none"> • Continue the annual nest protection program in all known populations and conduct an initial evaluation of the program by 2015. • Assess short-term effectiveness of the incubation and headstarting program. Following the assessment, discuss optional and/or required next steps with the recovery team. • Take additional steps to reduce vehicular and boat mortality through signs, speed bumps, and public education. • Conduct research and take actions where there is imminent risk of mortality by moving vulnerable adults, hatchlings and nests. • Reduce the risk of poaching and collection for pets through public education. • Take other recovery actions that are identified as necessary by recovery experts and document all decisions, goals and evaluations of success.

Threats Addressed	Priority	Broad strategy to recovery	General Description of Research and Management Approaches
Low fecundity, Small population effects	Urgent	Examine male fecundity in the population complex to determine if there is a conservation concern and continue studies to assess and maintain genetic variation that will sustain a viable population	<ul style="list-style-type: none"> • Determine the effective population size by conducting an assessment of paternity within the population complex to identify the number of males successfully reproducing and the proportion of clutches with multiple sires. • Undertake studies to determine if there is a conservation concern such as male fertility, as required. • Assess genetic relationships of known and any new concentrations (when sample sizes allow) with the three known populations through DNA collection.
All	Necessary	Conduct strategic monitoring of the population complex and continue to reassess and update population models	<ul style="list-style-type: none"> • Develop a strategic monitoring plan and conduct standardized monitoring at a level necessary to refine assessment of survivorship, abundance and fecundity and identify new threats. • Construct initial population models for Pleasant River and refine the models for Kejimikujik and McGowan to reflect the most current demographic data, literature on models, and recovery actions underway. • Collect data necessary to assess the effectiveness of recovery actions. • Monitor the effect of human activities and habitat change on long term viability.

6.3 Narrative to Support the Recovery Planning Table

The overarching philosophy to recovery planning for Blanding's turtles is respect, for both the turtles and the many partners involved in recovery. Blanding's turtle recovery has always relied upon the integration of science, stewardship and recovery (Caverhill 2006, Herman *et al.* 1998) and on the cooperation of many partners including government, academic institutions, NGO's, aboriginal organizations, industry, volunteers and landowners. In fact, Blanding's turtles have been described as a flagship species for conservation in southwest Nova Scotia because they are well liked by the public and their recovery program presents opportunities for direct public involvement (Lefebvre 2009). This recovery strategy recognizes the importance of volunteer stewardship that directly supports the science, monitoring and recovery actions identified in Table 3. Much of the knowledge gained and recovery actions undertaken to date could not have happened without the involvement and inspiration of volunteers. Developing a strategic plan will ensure these volunteer contributions have maximum impact on recovery while minimizing disturbance to individual turtles. Engaging landowners and local communities through a variety of methods is the key to generating a local sense of ownership in recovery. Encouraging Mi'kmaq involvement in recovery may identify different types of knowledge and planning which may aid in Blanding's turtle recovery; the Mi'kmaq worldview of long-term planning (7 generations into the future) may be biologically relevant to the long lived Blanding's turtle.

Because of the long generation time of Blanding's turtles (~40 years), long term data is required to truly assess the status of the population and to assess the effectiveness of recovery actions. For example, although nest protection and headstarting efforts have been underway since the mid 1990s, this represents less than one half of one generation and several more years remain before the turtles from the earliest efforts will begin recruiting into the adult population. While intermediate assessments of success can be done in the meantime by looking at juvenile survivorship and growth, the long term data is important to truly evaluate the effect of recovery actions. If Blanding's turtles in Nova Scotia are conservation dependent, long term human intervention may be required to recover the population (NatureServ 2010).

Research activities described in Table 3 include determining the extent of the range, locating habitats, assessing male fecundity and monitoring known populations and concentrations, as well as habitats. Knowledge gained from these activities is essential to assessing population trends, identifying additional critical habitat, and recognizing threats. Identifying new areas of critical habitat is an additive process, which begins with expanding the knowledge of the species range in the province. Monitoring allows us to identify new threats and to collect important baseline data for population modeling. Appropriate monitoring frequencies will vary according to age class, location, and research question being asked. The development of a comprehensive monitoring strategy, which clearly outlines the rationale for each monitoring component, will provide appropriate frequencies to ensure all areas receive sufficient effort and avoid unnecessary sampling.

Population models, including Population Viability Analysis as well as other methods, can be useful tools to help predict the trends of a population, such as that of Blanding's turtles, for which the historical population size is unknown and for which the long generation time prevents a more direct assessment of population trends. However, those same factors which necessitate

the use of the models preclude their validation; as a result these models should be used with caution and regularly updated to ensure they reflect the most current information.

Genetic assessment has shaped the direction of the recovery program. Analysis has revealed that the Nova Scotia population is an ecologically significant unit; identifying three distinct populations (Mockford *et al.* 1999, 2005 and 2007). Continued genetic assessment will reveal whether known and any new concentrations of turtles should be treated as distinct populations, examine gene flow, and identify potential population bottlenecks. Initial analysis of male fecundity suggests that the number of males breeding is significantly lower than other populations of Blanding's turtles (Beckett 2006, Patterson 2007). Confirmed low fecundity could mean the effective population size is considerably smaller than previously thought, affecting both population projections and potential for recovery.

7. CRITICAL HABITAT

7.1 Identification of the Species' Critical Habitat

7.1.1 Rationale for critical habitat identification

Critical habitat is defined in the *Species at Risk Act* (S.C. 2002, c.29) as "...the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species" (s. 2(1)).

In this recovery strategy, critical habitat is identified for the Blanding's turtle in Nova Scotia to the extent possible, using the best available information. In the province, many of the species' habitats have been determined including nesting sites, overwintering sites and summering sites used for most life stages. For many sites, multiple years of data are available, illustrating both repeated use of sites over time by the species and individual site fidelity.

Critical habitat is identified at all five known sites containing two or more identified individuals (three major populations and two smaller concentrations). Sites containing unconfirmed sightings are not included at this time. Sites containing only one identified turtle were excluded because it is possible that the turtles were moved there by the public. The two small concentrations were included in critical habitat identification at this time based on the precautionary principle; this will be reviewed as more information becomes known about these sites.

The critical habitat identified in this Recovery Strategy is necessary for the recovery of the species, but may not be sufficient to achieve the intermediate or long-term population and distribution objectives for the species due to insufficient understanding of the highly variable habitat attributes and the lack of knowledge of the species' distribution in Nova Scotia. The amount of critical habitat required to support a self-sustaining population of Blanding's turtles in Nova Scotia over the long term is currently unknown. There may be additional viable populations yet to be discovered, which are important to the long term persistence of the

population complex. Additionally, critical habitats around the periphery of the known populations may not yet be identified. Critical habitat identified here does not take into account corridors that enable movement between populations which, though infrequent, is necessary to maintain gene flow.

7.1.2 Information and methods used to identify critical habitat

Critical habitat is identified at each of the five sites using a two step process:

- 1) High use areas were identified by mapping turtle locations by categories based on seasonal activity and life-stage and then applying the delineation guidelines identified below.
- 2) The geographic limits of each of the five sites were identified by drawing a polygon that connects all of the high use areas.

Identifying high use areas

Turtle sighting locations were mapped according to seasonal activity (nesting, spring basking, summer, winter, fall travel) and life stages (male, female, juvenile). Following this, high use polygons were delineated using the following guidelines:

- When turtle location(s) were contained within wetlands, the entire wetland was included, as well as the terrestrial and aquatic area that extends 100m around the wetland, even if the turtle locations occurred only in part of the wetland.
- When turtle location(s) were contained within rivers or streams, the extent of the water channel encompassing the turtle locations and 200m upstream and downstream of the outermost extent was included, as well as the terrestrial and aquatic area that extends 100m on either side of the river or stream.
- When turtle locations(s) were contained within lakeshores, the extent of shoreline encompassing the turtle locations and 200m on either side of the outermost extent was included. The lakeshore waterside area within 100m and the terrestrial area within 50m were also included.
- When turtle location(s) were based on inland nesting areas, the entire nesting area was included, along with the surrounding terrestrial and aquatic habitat extending 100m around the site. If the nesting locations occurred along a roadway or rail bed, then the nesting area was defined as the zone encompassing the locations, plus 200m along the roadway on either side of the outermost sightings, excluding the paved surfaces.
- When the turtle location was based on an isolated sighting, a 100m radius around the sighting was included.

The terrestrial areas around identified wetlands are intended to capture additional habitats used by turtles, and include important components of the species' required habitats. This includes vernal pools, treed wetlands, small channels, seasonally flooded areas around the periphery of wetlands, and other areas that may not be identified using traditional wetland polygons. These areas also include terrestrial habitats that may be used by the turtles for travel, basking or refugia. These habitats may be particularly important to hatchling and young juveniles (unpublished data). While knowledge of turtle use of these habitats is somewhat limited in Nova Scotia, use of adjacent terrestrial habitats has been documented elsewhere in the species range. In Maine, for example, Blanding's turtles were found to frequent forested vernal pools in spring (Beaudry *et al.* 2009). These areas are not buffer zones; they are fundamentally part of the critical habitat used by Blanding's turtles and their prey. The identified areas are conservative compared to others identified in the literature, where terrestrial areas of 135m to 1000m are recommended for Blanding's turtles (Bell and Stevens 2006, Hartwig 2004, Semlitch and Bodie 2003).

The lakeshore aquatic areas are identified to account for changes in seasonal water levels. Areas around nesting sites take into account female movements during nesting season and post-emergence movements of hatchlings, which can spend considerable time on land (Camaclang 2007, McNeil *et al.* 2000, Smith 2003, Standing *et al.* 2000).

Identifying extent of critical habitat in each site

Critical habitat at each site was identified by linking the outer boundaries of the high use areas together to form a polygon. With the exception of the Kejimikujik population, in places where the line would have bisected a lake, the entire lake was included. This rule was not applied to Kejimikujik Lake, due to the large size of the lake. It is believed that turtles in this population travel primarily along the shoreline rather than across open water (Kydd 2010). For Kejimikujik Lake, lakeside polygons were joined using a 100m waterside area that followed the shoreline. In the Kejimikujik population, three high use areas at the periphery of the population were identified as separate polygons because their relationship to the main population is unknown (Figure 4).

This approach allows for travel among high use areas, unidentified habitats within the population or habitats that are currently unused but may become used in future (e.g. new wetland habitat following creation of a beaver dam; new nesting areas created through disturbance).

7.1.3 Geographic location and biophysical attributes of Critical habitats

Using the above criteria, five sites were identified as critical habitat in Nova Scotia as outlined in Table 4 and illustrated in Figure 4.

Table 4. Five critical habitat sites identified in Nova Scotia. Main populations have more than 50 individuals identified and small concentrations have less than five individuals identified.

Location	Type	Watershed	Map square*
Kejimikujik	Main population	Mersey	I-11
McGowan	Main population	Medway	M-10
Pleasant River	Main population	Medway	R-10
Whitesand Stream	Small concentration	Sissiboo	B-12
Dexter Brook	Small concentration	Medway	Q-08

* Map square refers to the accompanying map. A low resolution version of this map is presented in Figure 4.

Biophysical attributes

Critical habitat includes all areas within the identified polygons. This encompasses seasonal habitats required for all life stages and the aquatic and terrestrial travel routes between these habitats. Biophysical attributes of habitats used varies considerably with site, season and age-class, and not all are currently identified. Typical biophysical attributes are listed below, although it should be noted that specific attributes for certain life stages (e.g., hatchings) are still unclear. Hence, section 7.2 identifies activities to help better define these attributes and determine the geographic locations of any additional critical habitat.

Biophysical attributes of aquatic habitats used during the active season typically include, but are not limited to, the following (Bourque 2006, Caverhill 2003, Gilhen 1984, McMaster and Herman 2000, Power 1989):

- Wetlands including fens, bogs, ponds, vernal pools, lake coves, streams
- Slow moving water
- Abundant aquatic vegetation
- Overhanging vegetation (e.g. sedges or sweetgale)
- Mid-range water color (100-250 TCU)
- Muddy, organic substrate, not dominated by rocks

Biophysical of overwintering habitats typically include, but are not limited to, the following (Caverhill 2006, McNeil 2002, Newton and Herman 2009, Power 1989):

- Wooded pools or channels, railway trenches, and specific sections of streams or wetlands
- Deep organic substrate
- Undercut banks

Biophysical attributes of nesting habitats include, but are not limited to, the following (Caverhill 2006, McNeil 2002, Power 1989, Standing 1997):

- Natural or human-modified sites such as lakeshore beaches, woodland outcrops, gravel pits and roadsides
- Areas exposed to sunlight
- Areas with exposed substrate such as gravel, soil or sand, in which a turtle can dig a nest

Biophysical attributes of travel routes, include but are not limited to, the following (Camaclang 2007, Kydd 2010, Lefebvre 2010, McNeil 2002, Power 1989):

- A variety of terrestrial habitats including woodland, trails, meadows
- A variety of aquatic habitats including along streams, along lake shores or across lakes, through wetlands, vernal pools

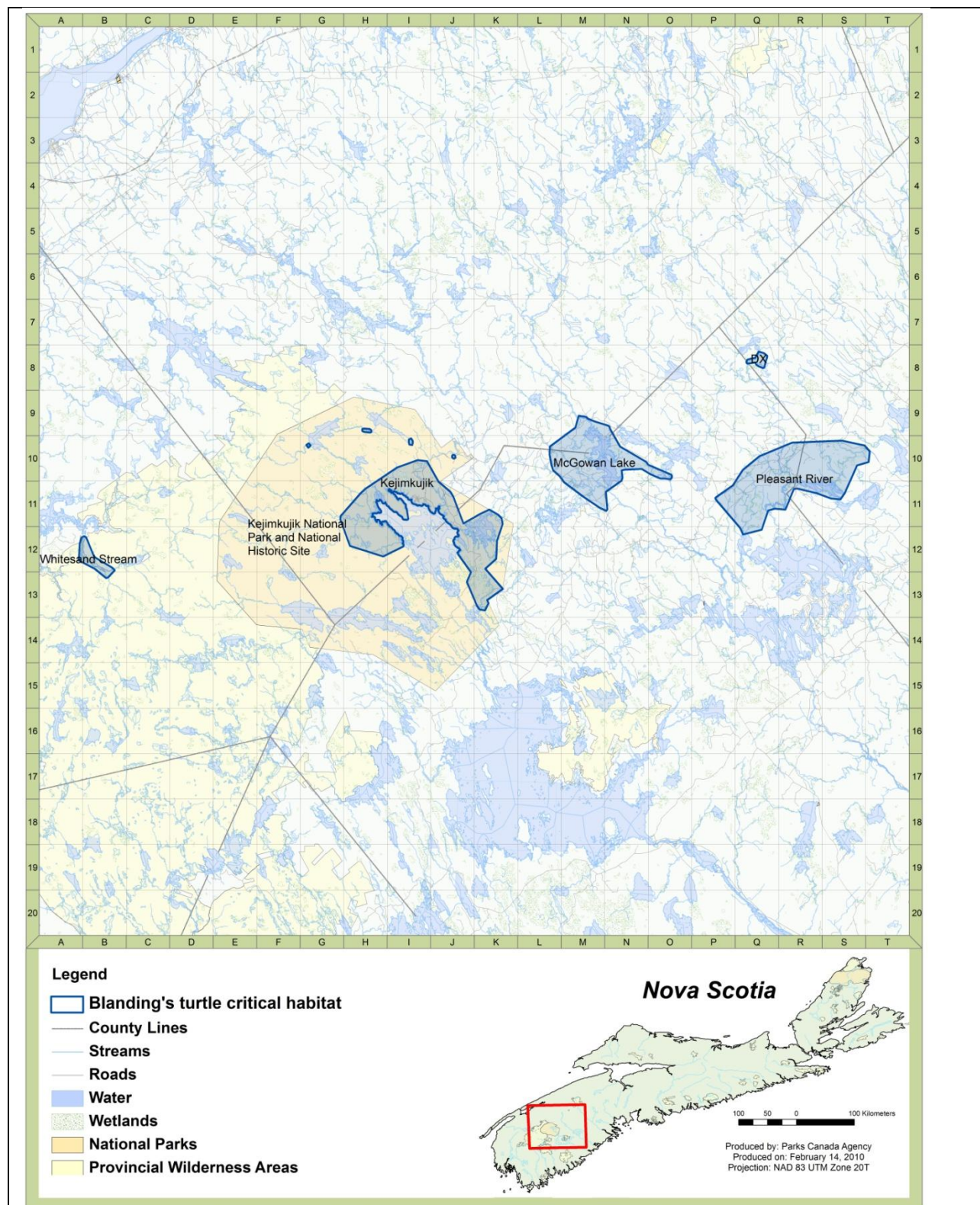


Figure 4. Location and extent of critical habitat parcels for Blanding's turtle (Nova Scotia population) in southwestern Nova Scotia. A full resolution version of this map is available on the [Species at Risk Public Registry](#).

7.2 Schedule of Studies to Identify Critical Habitat

The critical habitat identified in this recovery strategy is necessary for the survival or recovery of the species, but may be insufficient to achieve the population and distribution objectives for the species due to insufficient understanding of the species' distribution, habitat use and the habitat's biophysical attributes in Nova Scotia.

Table 5. Schedule of Studies to identify critical habitat for Blanding's turtle, Nova Scotia population

Description of Activity	Rationale	Timeline
Investigate confirmed sightings of single individuals and unconfirmed sightings to see if populations exist	Confirm if these were single individuals or actual populations	As sightings are identified
Continue trapping potential areas in southwest Nova Scotia to locate additional populations and identify potential corridors between populations	Expand knowledge of the range in Nova Scotia. New areas of critical habitat identified, including population corridors.	2016
Conduct surveys and radio tracking studies in new areas identified, with a focus on identifying population corridors.	Refine knowledge of habitats used in new areas identified, including corridors between populations	2016
Continue radio tracking studies of hatchlings and young juveniles to better understand their seasonal movements	Increase knowledge of terrestrial habitats (biophysical attributes) used by young age classes	2015
Conduct surveys and radio tracking to better understand use of vernal pools and other terrestrial habitats used (or other wetland habitats not recognized as wetlands, seasonally flooded areas)	Refine knowledge of biophysical attributes and critical habitats allowing for refined buffer delineation	2016

7.3 Activities Likely to Result in the Destruction of Critical Habitat

Destruction of critical habitat would result if part of the critical habitat were degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from a single or multiple activities at one point in time or from the cumulative effects of one or more activities over time.

Table 6. Examples of activities likely to result in the destruction of the critical habitat for the Blanding's turtle.

Examples of Activities	Example of Impact on Biophysical Attributes
Road, causeway and trail development	<ul style="list-style-type: none"> - fragments habitat - alters natural hydrologic regime, reduces natural vegetation, increase sediment, modifies water levels - increases risk of mortality by creating habitats that attract turtles
Off-highway vehicle use	<ul style="list-style-type: none"> - crushes or damages vegetation or compacts habitat - compacts nests and nesting substrate

Cottage, recreational, residential and industrial development	<ul style="list-style-type: none"> - fragments, degrades or eliminates habitat - alters natural hydrologic regime, reduces natural vegetation, increases sediment, modifies water levels - increases risk of mortality by creating habitats that attract turtles
Shoreline alterations, lawn development and maintenance	<ul style="list-style-type: none"> - degrades habitat constructs breakwaters that alter natural shorelines and natural processes
Draining and infilling of wetlands or vegetation removal	<ul style="list-style-type: none"> - eliminates habitat - changes natural processes
Hydroelectric dam operations	<ul style="list-style-type: none"> - alters water levels and natural hydrologic regime, creating unstable water levels that flood nests or drain overwintering sites and impact vegetation in wetlands and on shorelines
Crop and animal production	<ul style="list-style-type: none"> - decreases water quality through run off with pesticides and excessive animal waste - alters hydrologic regime through landscape modification, reducing natural vegetation, increasing sediment, and modifying water levels
Forest harvesting near waterways	<ul style="list-style-type: none"> - decreases water quality through erosion and sedimentation - alters hydrologic regime through changing processes and water levels - destroys overwintering sites through direct vehicle impacts
Excessive harvesting of beavers or removal of beaver dams	<ul style="list-style-type: none"> - alters water levels and natural hydrologic regime, creating unstable water levels that flood nests or drain overwintering sites and impact vegetation in wetlands and on shorelines - drains drought refuge sites
Peat Mining	<ul style="list-style-type: none"> - eliminates habitat - decreases water quality, through sedimentation and vegetation removal

8. MEASURING PROGRESS

The performance indicators presented below provide a way to define and measure progress toward achieving i) the Population and Distribution Objectives (Section 5) and ii) Strategic Direction for Recovery (Section 6.2).

Because of the turtle's longevity and slow maturation, achieving the population and distribution objectives is a long-term goal.

i) Population and Distribution Objectives Measures

- Adult survivorship maintained in all known populations.
- Management strategies implemented to mitigate identified site specific threats
- Survivorship estimates updated at least every 5 yrs to refine PVA to ensure that the goal of less than 5% extinction risk is being met

ii) Strategic Direction for Recovery Measures

- Juvenile survivorship maintained or enhanced in all known populations
- Extent of current distribution maintained or increased at all known populations
- Number of nests protected maintained or enhanced in all three populations
- Number of sites under formal habitat protection increased
- Number of landowners employing best practices to protect habitat increased
- Improved awareness of traditional knowledge of turtles and their habitat through number of stories shared
- Male fecundity in the population complex assessed
- Strategic monitoring plan developed by 2014 to enable reassessments of population models

9. STATEMENT ON ACTION PLANS

One or more action plans will be completed by December 2014.

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APPENDIX A: EFFECTS ON THE ENVIRONMENT AND OTHER SPECIES

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below in this statement.

Overall, it is anticipated that the approaches outlined in this recovery strategy will have a beneficial impact on non-target species (other species at risk and those not at risk), ecological processes, and the environment. Management is likely to include protection of wetland habitat. This has the potential to benefit many wetland species, including some that are at risk. In Nova Scotia, the distribution and habitats of Blanding's turtles overlap considerably with that of the Threatened eastern ribbonsnake. There are also a number of Atlantic Coastal Plain Flora species at risk that occur in similar wetlands. There are examples, such as the water pennywort, where the habitats of Atlantic Coastal Plain Flora species overlap with those of Blanding's turtles. Where other species at risk coexist with Blanding's turtles, recovery and conservation initiatives outlined in this strategy will be coordinated with other recovery teams. It will ensure that actions are mutually beneficial and not detrimental to other species at risk.

Stewardship actions, educational programs and awareness initiatives with landowners, Aboriginal organizations, and the general public; all levels of government; industry; and other audiences; will lead to increased understanding, appreciation of, and concrete action towards the conservation of wetlands and the recovery of species at risk in general. The Blanding's turtle, eastern ribbonsnake and Atlantic Coastal Plain Flora recovery teams regularly collaborate on a number of outreach projects. A best practices guide for landowners with species at risk on their property has been developed to help encourage stewardship of all wetland species at risk on private lands and inform landowners of ways to minimize their impacts on these species.

Appendix B:

Environment and Climate Change Canada and Parks Canada Agency. 2019. Action Plan for the Blanding's Turtle (*Emydoidea blandingii*), Nova Scotia Population, in Canada. *Species at Risk Act* Action Plan Series. Environment and Climate Change Canada and Parks Canada Agency, Ottawa.

Action Plan for Blanding's Turtle (*Emydoidea blandingii*), Nova Scotia Population, in Canada

Blanding's Turtle



2019



Government
of Canada

Gouvernement
du Canada

Canada

Recommended citation:

Environment and Climate Change Canada and Parks Canada Agency. 2019. Action Plan for the Blanding's Turtle (*Emydoidea blandingii*), Nova Scotia Population, in Canada [Proposed]. *Species at Risk Act* Action Plan Series. Environment and Climate Change Canada and Parks Canada Agency, Ottawa. v + 24 pp.

For copies of the action plan, or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, recovery strategies, and other related recovery documents, please visit the [Species at Risk \(SAR\) Public Registry](https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html)¹.

Cover illustration: Blanding's Turtle (Jeffie McNeil)

Également disponible en français sous le titre
« Plan d'action pour la tortue mouchetée (*Emydoidea blandingii*), population de la Nouvelle-Écosse, au Canada [Proposition] »

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ISBN

Catalogue no.

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¹ <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html>

Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#)² agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of action plans for species listed as Extirpated, Endangered, and Threatened for which recovery has been deemed feasible. They are also required to report on progress within five years after the publication of the final document on the SAR Public Registry.

Under SARA, one or more action plan(s) provides the detailed recovery planning that supports the strategic direction set out in the recovery strategy for the species. The plan outlines what needs to be done to achieve the population and distribution objectives identified in the recovery strategy, including the measures to be taken to address the threats and monitor the recovery of the species, as well as the proposed measures to protect critical habitat that has been identified for the species. The action plan also includes an evaluation of the socio-economic costs of the action plan and the benefits to be derived from its implementation. The action plan is considered one in a series of documents that are linked and should be taken into consideration together. Those being the COSEWIC status report, the recovery strategy, and one or more action plans.

The Minister of Environment and Climate Change and Minister responsible for the Parks Canada Agency is the competent minister under SARA for the Blanding's Turtle, Nova Scotia population, and has prepared this action plan to implement the recovery strategy, as per section 47 of SARA. To the extent possible, it has been prepared in cooperation with the Nova Scotia Department of Natural Resources, the Blanding's Turtle Recovery Team, Indigenous groups, and environmental non-government organizations, as per section 48(1) of SARA.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions and actions set out in this action plan and will not be achieved by Environment and Climate Change Canada, the Parks Canada Agency, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this action plan for the benefit of the Blanding's Turtle and Canadian society as a whole.

Implementation of this action plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

The recovery strategy sets the strategic direction to arrest or reverse the decline of the species, including identification of critical habitat to the extent possible. It provides all Canadians with information to help take action on species conservation. When critical

² www.canada.ca/en/environment-climate-change/services/species-risk-act-accord-funding/accord-protection-background.html

habitat is identified, either in a recovery strategy or an action plan, SARA requires that critical habitat then be protected.

In the case of critical habitat identified for terrestrial species including migratory birds SARA requires that critical habitat identified in a federally protected area³ be described in the *Canada Gazette* within 90 days after the recovery strategy or action plan that identified the critical habitat is included in the public registry. A prohibition against destruction of critical habitat under ss. 58(1) will apply 90 days after the description of the critical habitat is published in the *Canada Gazette*.

For critical habitat located on other federal lands, the competent minister must either make a statement on existing legal protection or make an order so that the prohibition against destruction of critical habitat applies.

If the critical habitat for a migratory bird is not within a federal protected area and is not on federal land, within the exclusive economic zone or on the continental shelf of Canada, the prohibition against destruction can only apply to those portions of the critical habitat that are habitat to which the *Migratory Birds Convention Act, 1994* applies as per SARA ss. 58(5.1) and ss. 58(5.2).

For any part of critical habitat located on non-federal lands, if the competent minister forms the opinion that any portion of critical habitat is not protected by provisions in or measures under SARA or other Acts of Parliament, or the laws of the province or territory, SARA requires that the Minister recommend that the Governor in Council make an order to prohibit destruction of critical habitat. The discretion to protect critical habitat on non-federal lands that is not otherwise protected rests with the Governor in Council.

³ These federally protected areas are: a national park of Canada named and described in Schedule 1 to the *Canada National Parks Act*, The Rouge National Park established by the *Rouge National Urban Park Act*, a marine protected area under the *Oceans Act*, a migratory bird sanctuary under the *Migratory Birds Convention Act, 1994* or a national wildlife area under the *Canada Wildlife Act* see ss. 58(2) of SARA.

Acknowledgments

This document was prepared by Megan Crowley (Parks Canada Agency) and Jeffie McNeil (Mersey Tobeatic Research Institute) in collaboration with the Blanding's Turtle Recovery Team and its partners, with extensive input from Julie McKnight (Environment and Climate Change Canada). Advice and guidance were provided by staff at Parks Canada, Environment and Climate Change Canada and the Nova Scotia Department of Natural Resources.

The recovery team has contributed to the science and communications for the recovery of the species, in addition to the advice provided for this action plan. The recovery team acknowledges the contributions of the many volunteers, landowners, students, field assistants and interns who have helped with recovery actions over the years. Their field work and participation in recovery team meetings, as well as help with the preparation with this document, is much appreciated.

Executive Summary

This action plan complements the recovery strategy for the Blanding's Turtle, *Emydoidea blandingii* (Nova Scotia population) (Parks Canada Agency 2012). It addresses each of the seven broad strategies identified in the Blanding's Turtle recovery strategy and builds on existing recovery programs with a focus on fostering stewardship and partnerships with a variety of stakeholders.

Critical habitat for the Nova Scotia population of Blanding's Turtles was identified to the extent possible in the recovery strategy (Parks Canada Agency 2012), and this action plan identifies new critical habitat for the Blanding's Turtle (Nova Scotia population) to take into account new population information. Proposed measures to protect critical habitat are presented in section 1.4.

This action plan was developed in collaboration with, and is closely tied to, the action plan for Eastern Ribbonsnake, *Thamnophis sauritus* (Atlantic population). Both of these species are wetland reptiles with isolated populations occurring in southwest Nova Scotia. Due to their similar distributions and wetland habitat requirements, there are many common stakeholders for both species and they face some similar threats. This action plan is also closely tied to the Multi-Species Action Plan for Kejimikujik National Park and National Historic Site of Canada, which includes measures for Blanding's Turtle within park boundaries (Parks Canada Agency 2016).

The recovery measures included in this plan build on the recommended approaches outlined in the recovery strategy for the Blanding's Turtle (Nova Scotia population). An implementation schedule is included and prioritizes each recovery measure and delineates timelines.

Proposed recovery measures in this action plan will have limited socio-economic impact and constraints to human land use. Indirect costs are expected to be minimal and the benefits relate to the value of biodiversity to Canadians, positive impacts on cultural values, and conservation of other species.

Table of Contents

Preface.....	i
Acknowledgments	iii
Executive Summary	iv
1. Recovery Actions	1
1.1. Context and Scope of the Action Plan.....	1
1.2. Measures to be Taken and Implementation Schedule	2
1.3. Critical Habitat.....	12
1.4. Proposed Measures to Protect Critical Habitat.....	18
2. Evaluation of Socio-Economic Costs and of Benefits.....	18
2.1. Policy Baseline.....	19
2.2. Socio-economic Costs of Implementing this Action Plan	19
2.3. Benefits of Implementing this Action Plan	20
2.4. Distributional Impacts.....	21
3. Measuring Progress	21
4. References.....	22
Appendix A: Effects on the Environment and Other Species.....	24

1. Recovery Actions

1.1. Context and Scope of the Action Plan

Blanding's Turtles are medium sized freshwater turtles with a semi-hinged shell. They are very long lived (80+ years) and slow to mature (approx. 20 years in Nova Scotia) (Congdon et al. 1993, Herman et al. 2003, McNeil 2002). One of their most distinctive features is the bright yellow chin and throat. Their high-domed top shell (carapace) is grey to black with yellow flecks (Caverhill and Crowley 2008). The flecks are typically brighter in younger turtles and most visible when the shell is wet. The lower shell (plastron) is orange-yellow with irregular black patches.

The Nova Scotia population of Blanding's Turtle was listed as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 1993 and uplisted to Endangered on re-assessment in 2005 due to its small size and the projected decline of one of its populations (COSEWIC 2005). Its status remained Endangered on re-assessment by COSEWIC in 2016. It is listed as Endangered under the Nova Scotia Endangered Species Act (2000) and federal *Species at Risk Act* (2006). The majority of threats occur in three broad categories, 'habitat loss or degradation', 'accidental mortality' and 'changes in ecological dynamics or natural processes'. Specifically, the high priority threats are mortality from on and off road vehicles and machinery, cottage and residential development, road development, and increased predation pressure resulting from human activities.

In Nova Scotia, the Blanding's Turtle (Nova Scotia population, hereafter referred to as Blanding's Turtle), is concentrated in the southwest interior of the province. This includes Kejimikujik National Park and National Historic Site of Canada (KNPNHS) as well as the surrounding areas, particularly along the Mersey and Medway river watersheds. Within this range, Blanding's Turtles occur in at least three distinct populations, as well as several smaller concentrations, as described in the Recovery Strategy (Parks Canada Agency 2012). Since the publication of the recovery strategy, two new sites have been discovered, both on the Medway watershed: one likely represents a new distinct population and the other appears to be an extension of a previously known population.

The short-term population and distribution objectives established by the recovery strategy are to maintain or increase adult survivorship sufficient to sustain the three recognized populations; maintain or enhance recruitment into the three recognized populations; maintain extent of occurrence in the province; maintain area of occupancy in the province; and reduce threats facing all life stages. The long term objectives are to achieve a self-sustaining population of Blanding's Turtles in Nova Scotia, over the current range (as measured by 95% probability of persistence in each recognized population when projected over 10 generations (400 years)), and to maintain sufficient gene flow to prevent any single population from becoming genetically isolated.

The recovery strategy for the Blanding's Turtle (Nova Scotia population) was posted on the Species at Risk Registry in 2012 (Parks Canada Agency 2012). All broad strategies and general approaches to meet objectives detailed in the recovery strategy for the Blanding's Turtle are addressed in this document. This action plan will be implemented only within Nova Scotia, which is the only province in Canada where the Blanding's Turtle (Nova Scotia population) occurs. Critical habitat is partially identified in the recovery strategy for Blanding's Turtle and new critical habitat is identified in this document (Section 1.3).

The recovery strategy provides more details on the strategic direction and approaches for recovery of listed relevant species, critical habitat information, and background information on the species and its threats. A multi-species action plan was developed specifically for Kejimikujik National Park and National Historic Site of Canada and includes recovery measures for all species at risk that occur within the park (Parks Canada Agency 2016), including the Blanding's Turtle. The KNPNS multi-species action plan is consistent with the recovery measures outlined in this action plan.

1.2. Measures to be Taken and Implementation Schedule

The recovery measures outlined below are arranged according to the broad strategies identified in the recovery strategy for Blanding's Turtle (Nova Scotia population). This implementation schedule (Table 1) is for all recovery measures and includes the level of priority (high, medium or low) assigned to each recovery measure, the threats or concerns addressed, and the timeline. Measures that will be conducted within Kejimikujik National Park and National Historic site are outlined in the park's multi-species action plan (2016).

In Table 1, "Priority" reflects the degree to which the measure contributes directly to the recovery of the species or is an essential precursor to a measure that contributes to the recovery of the species. High priority measures are considered those most likely to have an immediate and/or direct influence on attaining the recovery objective for the species. Medium priority measures may have a less immediate or less direct influence on reaching the recovery population and distribution objectives, but are still important for recovery of the population. Low priority recovery measures will likely have an indirect or gradual influence on reaching the recovery objectives, but are considered important contributions to the knowledge base and/or public involvement and acceptance of species.

Table 1. Implementation schedule for recovery measures for the Blanding's Turtle.

#	Recovery Measures	Priority ^a	Threats or objectives addressed	Timeline
Broad Strategy 1: Continue to support, inform, recommend and, where possible, build on the significant public participation and partner involvement in meaningful recovery actions.				
1.1	Approach: Continue to invite and involve volunteers directly in meaningful recovery actions and priority research and monitoring activities and provide feedback.			
1.1.1	Invite and involve volunteers in recovery efforts, and provide support, training, feedback, and recognition.	M	Public perception, lack of information	Ongoing
1.1.2	Provide equipment, support, and training to environmental, non-governmental and community organizations that engage volunteers.	M	Public perception, lack of information	Ongoing
1.1.3	Engage and mentor youth in recovery.	M	Public perception, lack of information	Ongoing
1.2	Approach: Continue to work with Mi'kmaw communities supporting Blanding's Turtle recovery.			
1.2.1	Detailed in Broad Strategy 2.	-	-	-
1.3	Approach: Facilitate stewardship by building relationships and providing guidance to achieve habitat conservation and restoration and evaluate effectiveness of approaches to stewardship.			
1.3.1	Contact landowners and distribute educational materials and exchange knowledge, as necessary, to encourage people to engage in conservation and stewardship activities. Update public websites and other information sources as required.	H	Habitat loss or degradation, accidental mortality, disturbance	Ongoing
1.3.2	Create opportunities for affected landowners and community members to express their opinions and seek creative solutions (e.g., sandbar and rail bed nesting sites).	H	Habitat loss or degradation, accidental mortality, disturbance	As required
1.3.3	Collaborate with social scientists to develop and conduct surveys to evaluate the success of educational initiatives in affecting knowledge and behaviour.	L	Habitat loss or degradation, accidental mortality, disturbance	2021
1.4	Approach: Collaborate with other recovery teams and partners to coordinate and deliver ecosystem-based recovery activities and minimize overlap in landowner contact.			
1.4.1	Liaise with recovery teams and partners to coordinate activities and deliver consistent messaging at the ecosystem level.	M	Foster partnerships	Ongoing

#	Recovery Measures	Priority ^a	Threats or objectives addressed	Timeline
1.5	Approach: Work closely with local forestry, hydroelectricity and tourism industries to protect and restore habitat and to foster involvement in recovery.			
1.5.1	Continue to work with Nova Scotia Power to reduce risk of turtle nest flooding.	H	Changes in ecological dynamics or natural processes	Ongoing
1.5.2	Work with stakeholders to foster the conservation of this species (habitat, education, involvement).	H	Habitat loss or degradation	Ongoing
1.5.3	Work with stakeholders (NS DNR, forestry companies, private landowners) in the newly discovered population in the Lower Medway to develop a management plan for this area	H	Habitat loss or degradation, accidental mortality, changes in ecological dynamics or natural processes	2019
Broad Strategy 2: Invite, encourage, and include Mi'kmaw involvement in the recovery process to explore opportunities for different approaches and knowledge.				
2.1	Approach: Seek out and integrate Mi'kmaw knowledge and worldviews into decision making and long term planning.			
2.1.1	Hold co-organized and hosted recovery team meetings in local Mi'kmaw communities to integrate Mi'kmaw philosophy, knowledge and worldviews (e.g. sharing circles, ceremony).	M	Foster partnerships	At least once every 2 years
2.1.2	Support outreach and recovery actions on Mi'kmaw lands and communities (e.g. community meetings, events, monitoring, research, conservation planning, and ceremonies).	H	Habitat loss or degradation, accidental mortality, disturbance	Ongoing
2.1.3	Support Mi'kmaw-led projects to learn cultural stories, names, and teachings about Blanding's Turtle, their habitat and our relationship to their habitat and communicate appropriate information back to communities and recovery team.	M	Foster partnerships	As required

#	Recovery Measures	Priority ^a	Threats or objectives addressed	Timeline
2.2	Approach: Explore opportunities to establish regular communications between Mi'kmaw organizations and communities and species at risk jurisdictions, academics and volunteers. Explore opportunities for ceremony to be a regular part of recovery action.			
2.2.1	Integrate Mi'kmaw philosophy and practices as a regular part of recovery team meetings.	M	Foster partnerships	When possible
2.2.2	Engage interested local Mi'kmaw community members (including youth) in recovery.	M	Foster partnerships	Ongoing
2.2.3	Regularly communicate with Mi'kmaw organizations, Mi'kmaw communities, species at risk jurisdictions, academics and volunteers.	M	Foster partnerships	Ongoing
Broad Strategy 3: Determine the extent of the range in Nova Scotia and identify population status, structure, habitat use and threats in known and any new concentrations found.				
3.1	Approach: Continue to solicit sighting reports from members of the public.			
3.1.1	Maintain toll free reporting hotline and online species at risk reporting form and develop mobile reporting app.	H	Lack of information, maintain extent of occurrence	Ongoing (app developed 2017)
3.1.2	Solicit sighting reports through outreach (talks, booths at community events, websites), citizen science, and the distribution of outreach materials.	H	Lack of information, maintain extent of occurrence	Ongoing
3.2	Approach: Continue targeted trapping and visual surveys in new areas, based on reported sightings, single confirmed sightings, aerial photographs and threats.			
3.2.1	Conduct targeted surveys to search for new populations, following established protocols and guidelines.	H	Lack of information, maintain extent of occurrence	Ongoing (report every 5 years)
3.3	Approach: Assess the size and extent of known and new concentrations.			
3.3.1	Conduct surveys and tracking in the Lower Medway and any other newly discovered concentrations to identify habitat use and distribution	H	Habitat loss or degradation	Lower Medway 2019; other as required
3.3.2	Conduct tracking studies of hatchlings and young juveniles to better understand their seasonal movements.	M	Habitat loss or degradation	Ongoing
3.3.3	Conduct studies to better understand use of vernal pools, seasonally flooded areas, terrestrial habitats and seasonal connections between sites.	H	Habitat loss or degradation	Ongoing
3.3.4	Determine connectivity between new populations/concentrations and known populations.	M	Habitat loss or degradation	As required

#	Recovery Measures	Priority ^a	Threats or objectives addressed	Timeline
3.3.5	Locate new nesting sites (through tracking, visual surveys, etc.) and evaluate the need for nest protection efforts.	H	Habitat loss or degradation; accidental mortality, changes in ecological dynamics or natural processes	Ongoing
3.4	Approach: Continue to provide training for volunteers and support volunteer-led efforts that contribute to research and monitoring goals.			
3.4.1	Detailed in Approach 1.1	-	-	-
Broad Strategy 4: Ensure conservation of currently known habitats and new habitats as they are identified.				
4.1	Approach: Employ a variety of approaches to conserve habitat: legal, policy and stewardship.			
4.1.1	Support land trusts that contribute towards Blanding's Turtle recovery through formal protection of habitat.	H	Habitat loss or degradation, accidental mortality, changes in ecological dynamics or processes	Ongoing
4.1.2	Engage forest certification systems to implement private standards and codes governing private sector practice that are beneficial for the species.	M	Habitat loss or degradation, accidental mortality, changes in ecological dynamics or processes	As required
4.1.3	Provide recommendations on land planning for existing, new and proposed protected areas.	H	Habitat loss or degradation, accidental mortality, changes in ecological dynamics or processes	As required
4.1.4	Work with the province to develop Special Management Practices (SMPs).	M	Habitat loss or degradation, accidental mortality, changes in ecological dynamics or processes	As required

#	Recovery Measures	Priority ^a	Threats or objectives addressed	Timeline
4.2	Approach: Coordinate recovery actions on high priority ecosystems that may contain multiple species at risk, with other recovery teams and partners.			
4.2.1	Detailed in 1.4	-	-	-
4.3	Approach: Explore with landowners, NGO's, industry and the academic community ways to effectively use stewardship to identify and maintain habitat.			
4.3.1	Work with stakeholders to minimize impacts on the species and its habitat, and to develop site specific management plans as required.	H	Habitat loss or degradation, accidental mortality	Ongoing; management plans as required
4.4	Approach: Facilitate recovery planning by providing updated information to partners through the Blanding's Turtle database and species at risk resource website.			
4.4.1	Annually update the central online databases that are part of the species at risk resource website and provide to the Atlantic Canada Conservation Data Centre. Ensure up-to-date information and maps are available to partners.	M	Lack of information, habitat loss or degradation, accidental mortality	Ongoing – annual
4.5	Approach: Monitor habitats to identify threats and take actions to remove or reduce any threats which arise.			
4.5.1	Detailed in 7.3.3	-	-	-
Broad Strategy 5: Undertake recovery actions to increase recruitment or decrease mortality in areas that have been identified and evaluate the effectiveness of these actions				
5.1	Approach: Continue the annual nest protection program in all known populations and conduct an initial evaluation of the program.			
5.1.1	Protect turtle nests from predation by covering with a protective cage and, where possible, protect nesting females from accidental mortality.	H	Accidental mortality, changes in ecological dynamics or processes, maintain or enhance recruitment, maintain or increase adult survivorship	Annual
5.1.2	Evaluate nest protection program using trapping, tracking and visual survey data to determine survivorship from protected nests.	M	Maintain or enhance recruitment	Ongoing – report every 5 years

#	Recovery Measures	Priority ^a	Threats or objectives addressed	Timeline
5.2	Approach: Assess short-term effectiveness of the incubation and headstarting program. Following the assessment, discuss optional and/or required next steps with the recovery team.			
5.2.1	Conduct systematic tracking, trapping and visual surveys to identify previously released headstarts to assess survivorship. Use this data to assess the effectiveness of the turtle headstarting program.	M	Maintain or enhance recruitment	Ongoing
5.3	Approach: Take additional steps to reduce vehicular and boat mortality through signs, speed bumps, and public education.			
5.3.1	Mitigate threats to Blanding's Turtles from vehicle mortality (e.g., through speed reduction, wildlife passage corridors, gates, signage, education)	H	Accidental mortality	Ongoing
5.3.2	Work with NS Department of Transportation and other authorities to sign priority sites on provincial roads and ATV trails.	H	Accidental mortality	2019 at known sites; other sites as required
5.3.3	Reduce the threat of motor boat collisions through signage, education and regulation.	L	Accidental mortality	Where applicable
5.4	Approach: Conduct research and take actions where there is imminent risk of mortality by moving vulnerable adults, hatchlings and nests. Take other recovery actions that are identified as necessary by recovery experts and document all decisions, goals and evaluations of success.			
5.4.1	Move nests and turtles that are in imminent danger (e.g., from flooding or vehicular impacts). Undertake additional recovery actions as required.	H	Accidental mortality	Ongoing
5.5	Approach: Reduce the risk of poaching and collection for pets through public education.			
5.5.1	Ensure outreach includes messaging on the importance of keeping wild turtles in their natural habitat.	H	Disturbance or persecution, accidental mortality	Ongoing
5.5.2	Inform enforcement agencies when poaching is suspected.	H	Disturbance or persecution, accidental mortality	As required

#	Recovery Measures	Priority ^a	Threats or objectives addressed	Timeline
5.6	Approach: Take other recovery actions that are identified as necessary by recovery experts and document all decisions, goals and evaluations of success.			
5.6.1	Develop a food and garbage awareness program, where applicable, to reduce impacts of hyperabundant predator populations (raccoons, red squirrels) on wildlife, including turtle nest predation.	H	Changes in ecological dynamics or processes	2020
5.6.2	Monitor for alien invasive fish (Smallmouth Bass, Chain Pickerel) and develop a response plan, as required.	M	Changes in ecological dynamics or processes	2023
5.6.3	Explore mechanisms for preventing the introduction and spread of invasive fish.	M	Changes in ecological dynamics or processes	2020
Broad Strategy 6: Examine male fecundity in the population complex to determine if there is a conservation concern and continue studies to assess and maintain genetic variation that will sustain a viable population.				
6.1	Approach: Determine the effective population size by conducting an assessment of paternity within the population complex to identify the number of males successfully reproducing and the proportion of clutches with multiple sires. Undertake studies to determine if there is a conservation concern such as male fertility, as required.			
6.1.1	Determine the effective population size by conducting an assessment of paternity within the population complex to identify the number of males successfully reproducing and the proportion of clutches with multiple sires. Undertake studies to determine if there is a conservation concern such as male fertility, as required.	M	Maintain or enhance recruitment, small population effects	2020
6.2	Approach: Assess genetic relationships of known and any new concentrations (when sample sizes allow) with the three known populations through DNA collection.			
6.2.1	Facilitate genetic analysis by collecting scute clipping and blood samples during ongoing monitoring and research.	L	Small population effects	Ongoing
6.2.2	Assess the genetic relationships of newly discovered groups of turtles with the previously known populations.	M	Connectivity, small population effects	2020 Lower Medway; others as required

#	Recovery Measures	Priority ^a	Threats or objectives addressed	Timeline
Broad Strategy 7: Conduct strategic monitoring of the population complex and continue to reassess and update population models.				
7.1	Approach: Develop a strategic monitoring plan and conduct standardized monitoring at a level necessary to refine assessment of survivorship, abundance and fecundity and identify new threats. Collect data necessary to assess the effectiveness of recovery actions.			
7.1.1	Develop and implement a long-term monitoring strategy with clearly identified goals and methods.	M	Monitor populations, habitats, and threats	2019, revise as necessary
7.1.2	Identify priority sites and the roles of partners involved, and conduct monitoring as laid out in the monitoring strategy.	M	Monitor populations, habitats, and threats	Ongoing
7.1.3	Investigate other factors affecting nest success (e.g., humidity and temperature).	L	Monitor populations, habitats, and threats	As required
7.2	Approach: Construct initial population models for two of the four known populations and refine the models for the other two to reflect the most current demographic data, literature on models, and recovery actions underway.			
7.2.1	Review population viability analysis (PVA) assumptions and calculations to determine confidence in model outputs.	M	All	Every five years
7.2.2	Review and update population existing models as required.	M	All	Every five years
7.2.3	Assess turtle data in other populations to determine if a population viability analysis (PVA) is possible and either construct initial PVA or collect additional data.	M	All	2019
7.3	Approach: Monitor the effect of human activities and habitat change on long term viability.			
7.3.1	Continue to photo document nesting site habitat over time to ensure that existing and emerging threats to nesting habitat are being identified and adequately mitigated.	M	Habitat loss or degradation, changes in ecological dynamics or processes, climate change	Ongoing
7.3.2	Develop and implement monitoring protocol for nesting habitats that are prone to change.	M	Habitat loss or degradation, changes in ecological dynamics or processes, climate change	2019

#	Recovery Measures	Priority ^a	Threats or objectives addressed	Timeline
7.3.3	Document and monitor development in and around habitats to identify new threats and allow for long term evaluation the effects of development on the species.	M	Habitat loss or degradation, changes in ecological dynamics or processes, climate change	2020
7.3.4	Track turtles to monitor response to changing environments.	M	Habitat loss or degradation, changes in ecological dynamics or processes	Where applicable

^a "Priority" reflects the degree to which the measure contributes directly to the recovery of the species or is an essential precursor to a measure that contributes to the recovery of the species. High priority measures are considered those most likely to have an immediate and/or direct influence on attaining the population and distribution objectives for the species. Medium priority measures may have a less immediate or less direct influence on reaching the population and distribution objectives, but are still important for the recovery of the population. Low priority recovery measures will likely have an indirect or gradual influence on reaching the population and distribution objectives, but are considered important contributions to the knowledge base and/or public involvement and acceptance of the species.

1.3. Critical Habitat

Critical habitat is defined in the *Species at Risk Act* (2002) section 2(1) as “the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species’ critical habitat in the recovery strategy or in an action plan for the species.”

Critical habitat for the Blanding’s Turtle in Canada was partially identified in the federal recovery strategy (Parks Canada Agency 2012). It was recognized that the information available at the time was insufficient to fully identify critical habitat because it was not known if critical habitat identified was sufficient to support a self-sustaining population of Blanding’s turtles in Nova Scotia over the long term. A schedule of studies was included to obtain the information required. Additional critical habitat at two sites is identified in this action plan, based on recent survey work, using the approach described in section 7.1 of the recovery strategy (Parks Canada Agency 2012). Nevertheless, critical habitat remains partially identified. The completion of the schedule studies identified in the recovery strategy will allow for the full identification of critical habitat.

1.3.1. Identification of the species' critical habitat

Critical habitat characteristics and description

Critical habitat for Blanding’s Turtle is presented in Figures 1-5. These maps distinguish between the critical habitat identified in the recovery strategy (2012) and the critical habitat being identified in this action plan. The biophysical attributes of critical habitat are described in section 7.1.3 of the recovery strategy (Parks Canada Agency 2012).

In this action plan, critical habitat is identified in the two new areas discovered since the publication of the recovery strategy. Both areas are found on non-federal lands in the Medway watershed: one forms an extension to the critical habitat polygon at a previously identified population, while the other is a new critical habitat polygon representing a newly discovered population. As this latter area was just discovered in 2016, it is expected that critical habitat for this population is incomplete and will need to be revised as further information becomes available.

Critical habitat for Blanding’s Turtle, Nova Scotia population, occurs within the identified polygons (Figures 1-5) where the critical habitat criteria and methodology described in section 7.1 of the recovery strategy are met.

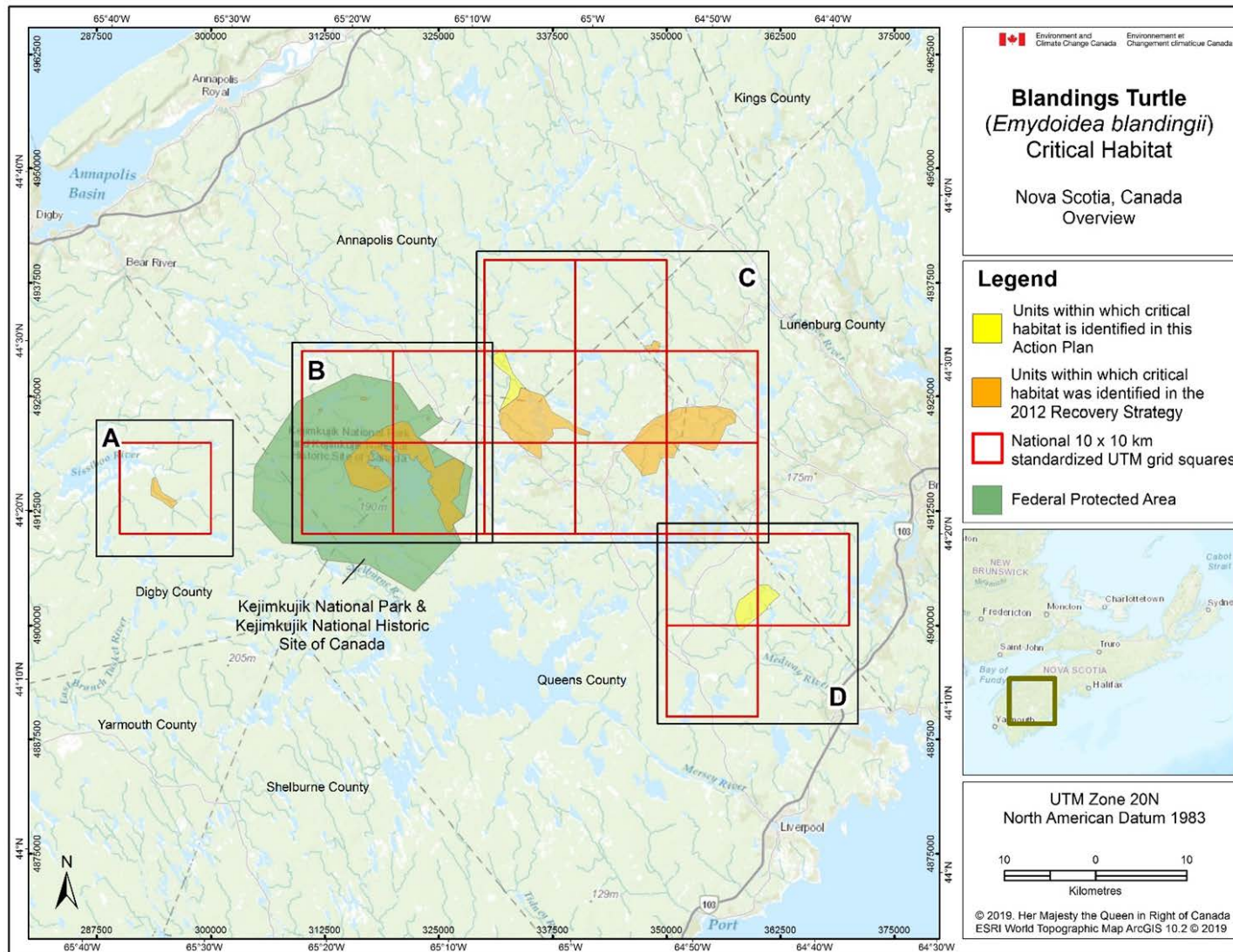


Figure 1. Overview of critical habitat for *Blanding's Turtle* (Nova Scotia population). Critical habitat is represented by the yellow and orange shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met.

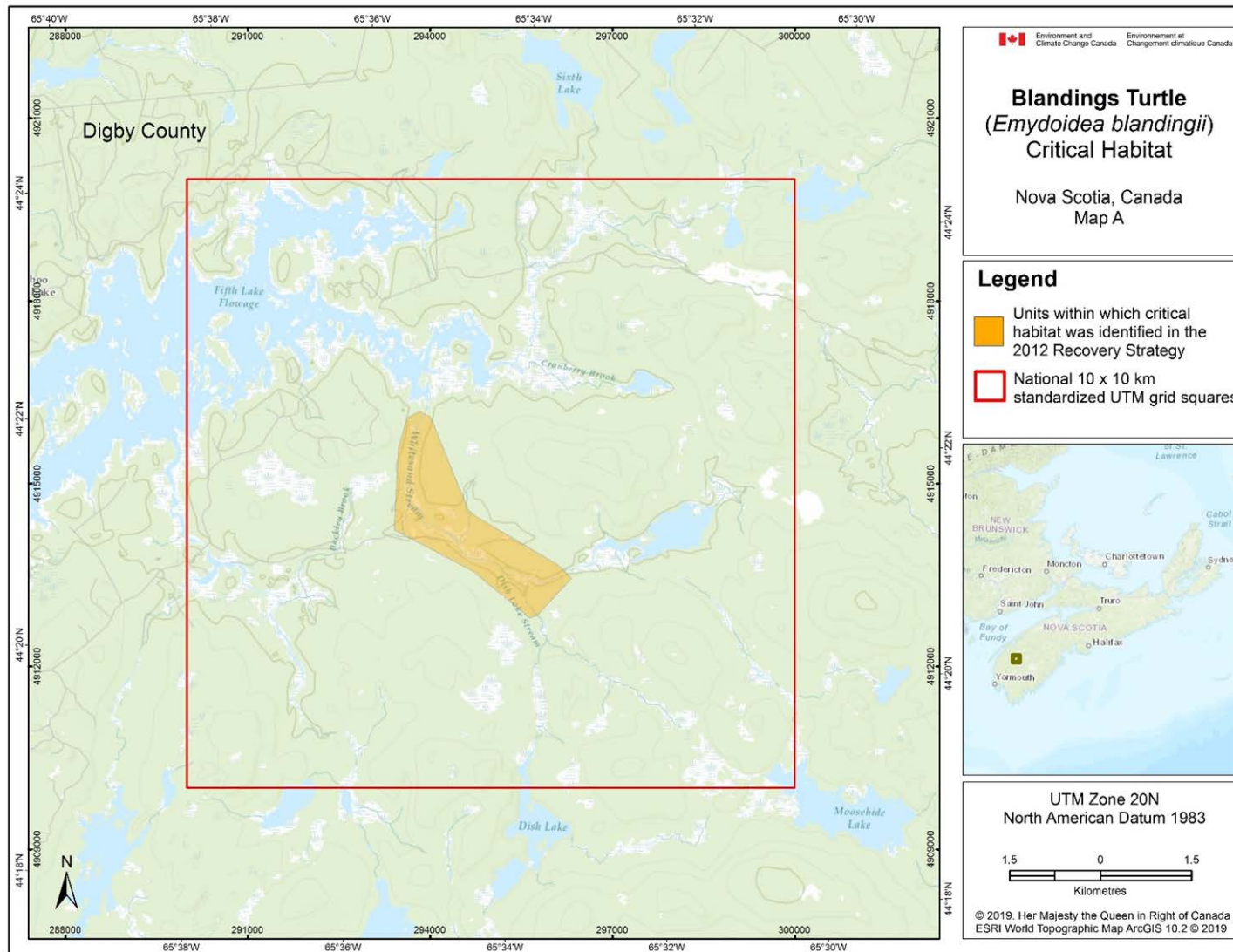


Figure 2. Critical habitat for *Blanding's Turtle* (Nova Scotia population) identified in block A of Figure 1. Critical habitat is represented by the orange shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met.

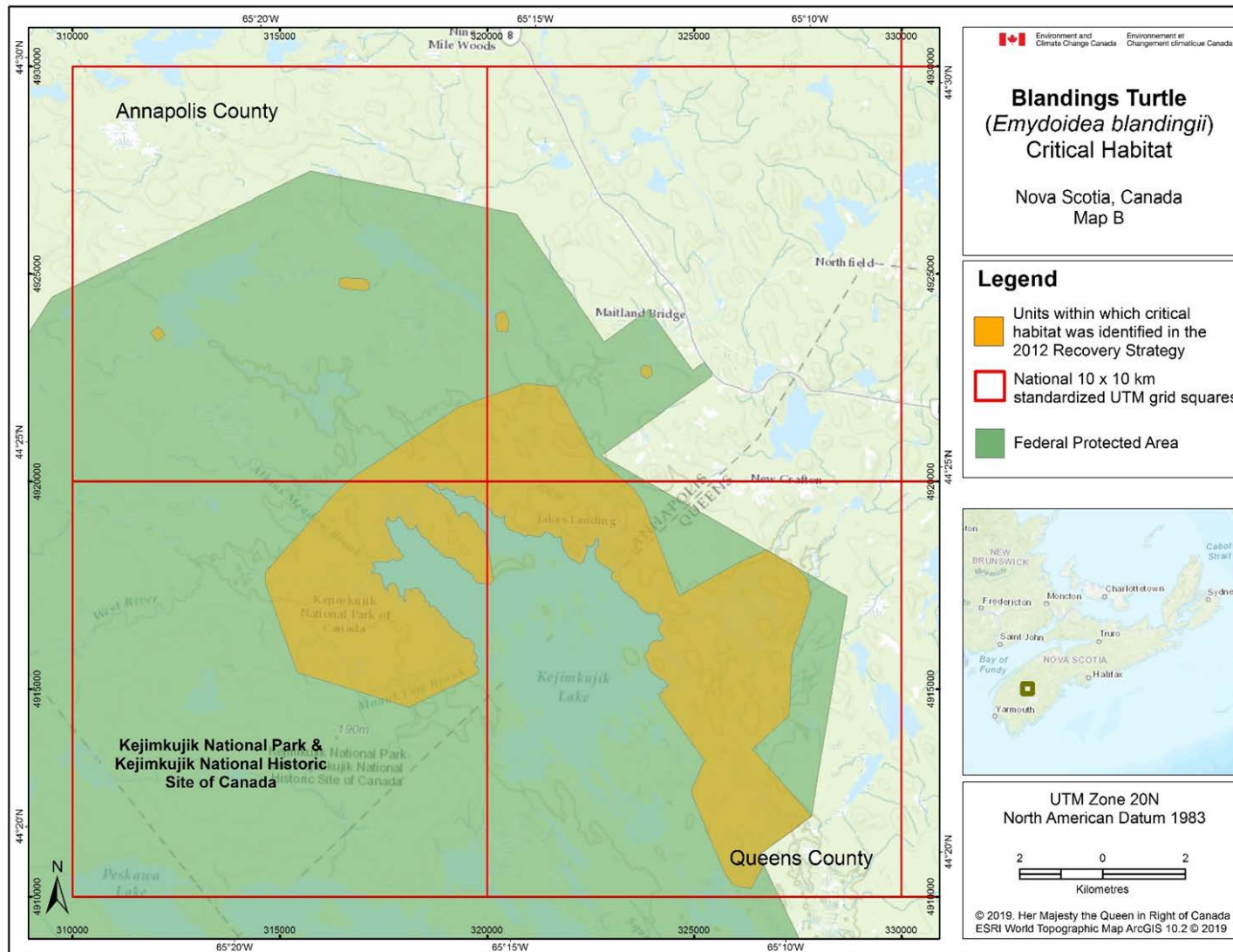


Figure 3. Critical habitat for *Blanding's Turtle* (Nova Scotia population) identified in block B of Figure 1. Critical habitat is represented by the orange shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met.

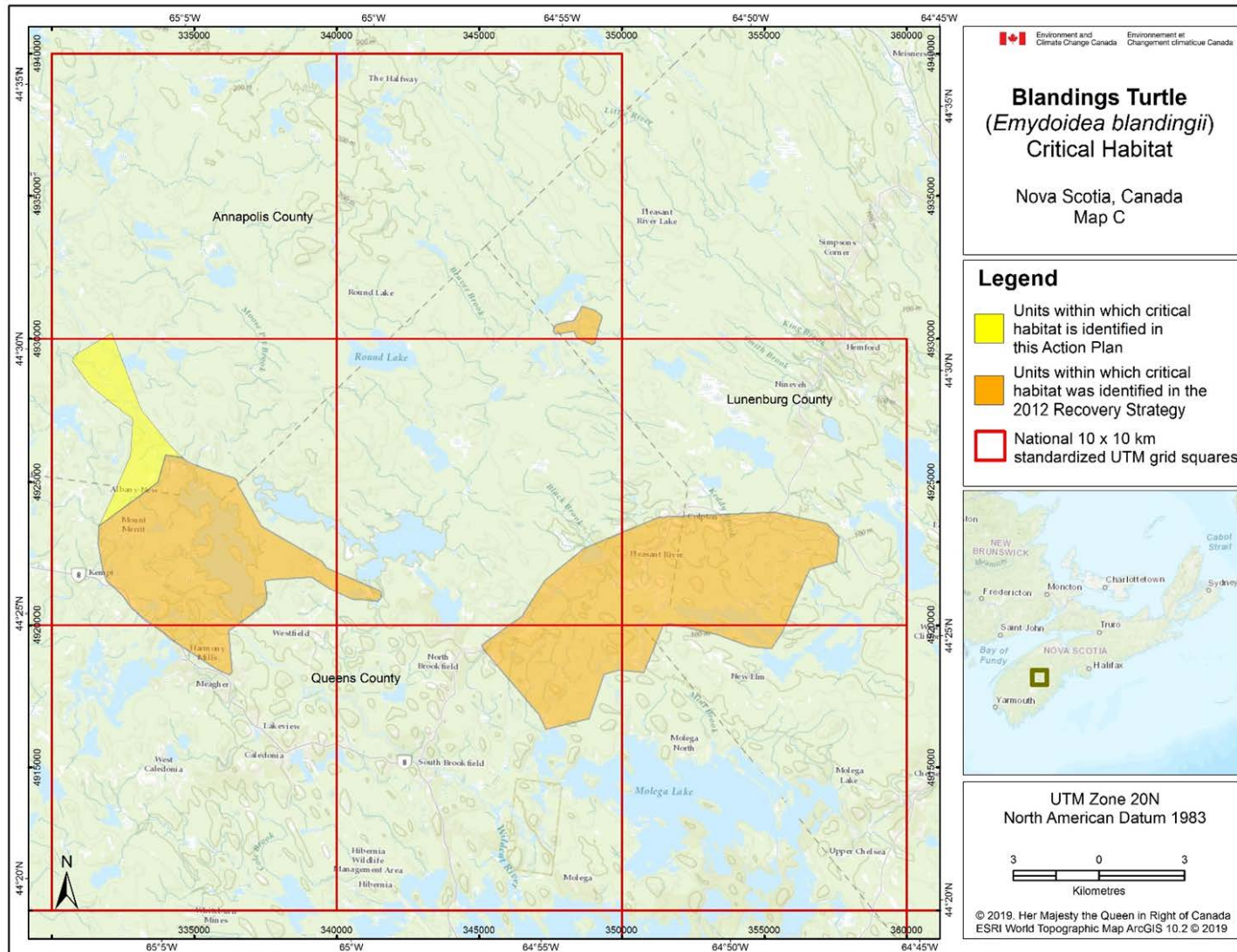


Figure 4. Critical habitat for *Blanding's Turtle* (Nova Scotia population) identified in block C of Figure 1. Critical habitat is represented by the yellow and orange shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met.

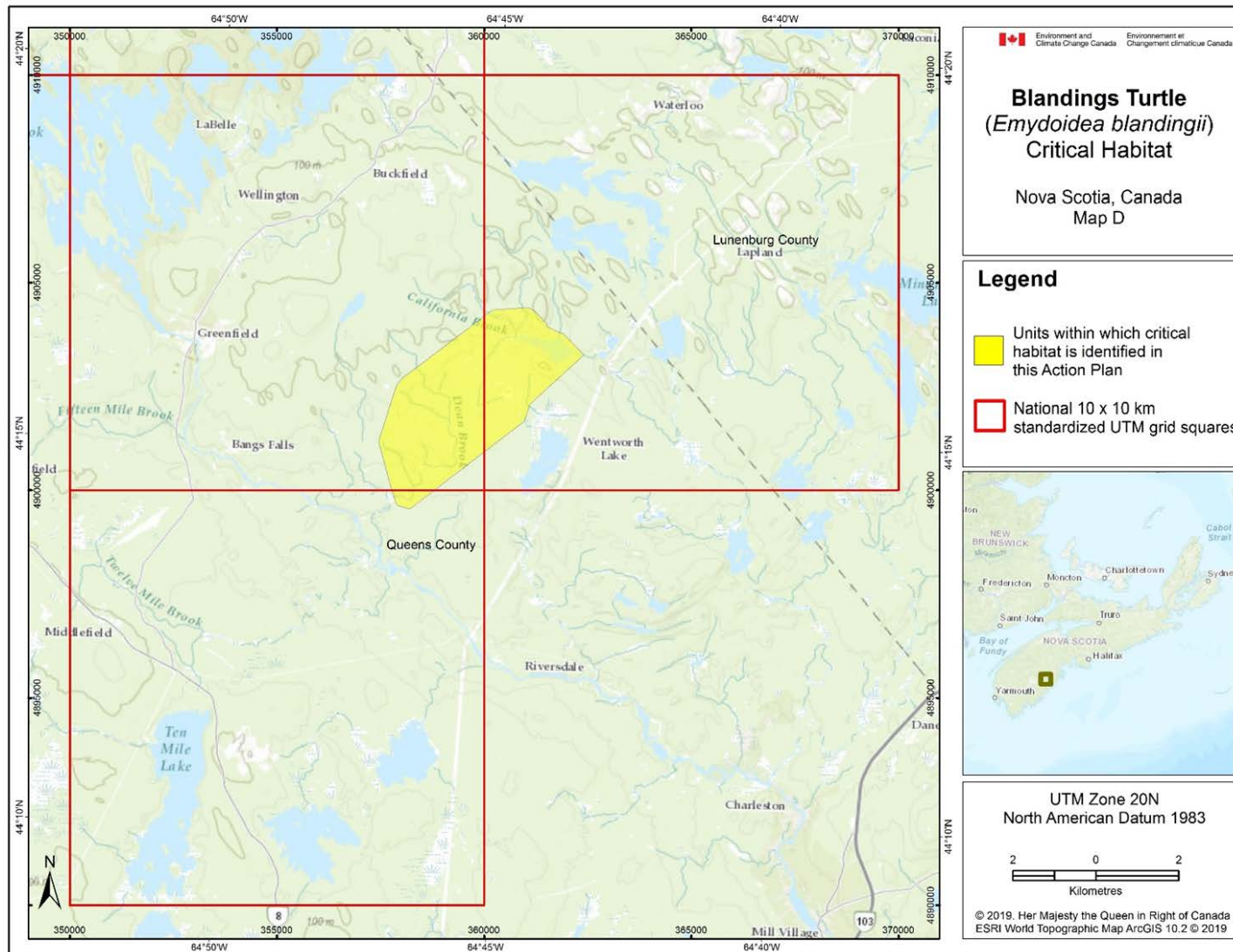


Figure 5. Critical habitat for *Blanding's Turtle* (Nova Scotia population) identified in block D of Figure 1. Critical habitat is represented by the yellow shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met.

1.3.2. Examples of activities likely to result in destruction of critical habitat

Examples of activities likely to result in the destruction of critical habitat are described in the recovery strategy (Parks Canada 2012).

1.4. Proposed Measures to Protect Critical Habitat

The information below outlines the measures proposed to be taken to protect critical habitat for Blanding's Turtle, Nova Scotia population.

1.4.1 Measures proposed to protect critical habitat on federal lands

Critical habitat for Blanding's Turtle occurs in KNPNHS of Canada, a federal protected area. KNPNHS was described on Schedule 1 of the *Canada National Parks Act* on February 19, 2001. As required under SARA, a description of the portion of previously identified critical habitat for Blanding's Turtle found in this area was published in the Canada Gazette by Parks Canada on April 9, 2014. This critical habitat was protected under s.58(1) of SARA. No new critical habitat identified in this action plan occurs on federal lands.

1.4.2 Proposed protection measures on non-federal lands

With regard to the portions of critical habitat on non-federal lands, Environment and Climate Change Canada will assess the protection currently in place. This involves first working with the Government of Nova Scotia to determine which Nova Scotia laws and legal instruments are in place to prevent destruction of critical habitat. If there are gaps in the protection of critical habitat, provisions or measures in place under SARA or other federal legislation will be reviewed to determine whether they prevent destruction of critical habitat. The laws and legal agreements in place that protect critical habitat will be monitored for efficacy at least every five years. Conservation measures, including stewardship initiatives, that contribute to preventing critical habitat destruction will also be considered and monitored.

If it is determined that any portions of critical habitat are not protected, and steps are being taken to protect those portions, those steps will be communicated via the Species at Risk Public Registry through the reports referred to in section 63 of SARA.

2. Evaluation of Socio-Economic Costs and of Benefits

The *Species At Risk Act* requires that an action plan include an evaluation of the socio-economic costs of the action plan and the benefits to be derived from its implementation (SARA 49(1)(e), 2002). This evaluation addresses only the incremental socio-economic costs of implementing this action plan from a national perspective as well as the social and environmental benefits that would occur if the action plan were

implemented in its entirety, recognizing that not all aspects of its implementation are under the jurisdiction of the federal government. It does not address cumulative costs of species recovery in general nor does it attempt a cost-benefit analysis. Its intent is to inform the public and to guide decision making on implementation of the action plan by partners.

The protection and recovery of species at risk can result in both benefits and costs. The Act recognizes that “*wildlife, in all its forms, has value in and of itself and is valued by Canadians for aesthetic, cultural, spiritual, recreational, educational, historical, economic, medical, ecological and scientific reasons*” (SARA 2002). Self-sustaining and healthy ecosystems with their various elements in place, including species at risk, contribute positively to the livelihoods and the quality of life of all Canadians. A review of the literature confirms that Canadians value the preservation and conservation of species in and of themselves. Actions taken to preserve a species, such as habitat protection and restoration, are also valued. In addition, the more an action contributes to the recovery of a species, the higher the value the public places on such actions (Loomis and White, 1996; Fisheries and Oceans Canada, 2008). Furthermore, the conservation of species at risk is an important component of the Government of Canada’s commitment to conserving biological diversity under the *International Convention on Biological Diversity*. The Government of Canada has also made a commitment to protect and recover species at risk through the [Accord for the Protection of Species at Risk](#). The specific costs and benefits associated with this action plan are described below.

2.1. Policy Baseline

The province of Nova Scotia has access to many legislative, regulatory, and management tools for the conservation and stewardship of the Blanding’s Turtle (Nova Scotia population). This includes the *Endangered Species Act*, *Parks Act*, *Crown Lands Act*, *Wildlife Act*, *Environment Act*, *Forests Act*, *Special Places Protection Act*, *Conservation Easements Act*, Nova Scotia Wetland Conservation Policy, *Wilderness Areas Protection Act*, and Special Management Practices. Additionally, many recovery measures can be carried out by federal or provincial species at risk funding programs, in-kind contributions by recovery biologists, or research by universities.

2.2. Socio-economic Costs of Implementing this Action Plan

The implementation of the recovery measures identified in Table 1 may generate direct costs as well as societal costs. These costs are reported in this section only if they result in incremental expenditures or constraints in land uses (including foregoing or modifying current and future activities), compared to measures already in place (see ongoing measures in Table 1).

For the Blanding’s Turtle, the direct and reasonably expected societal costs are expected to be low (i.e., between \$0 and \$5 million) over the short term (2018-2027). These anticipated costs include salary, volunteer time, travel, materials, equipment, and

other related costs. Indirect costs are those resulting from implementing the action plan, which may have an impact on various stakeholders. Impacts to stakeholders include foregoing or modifying current and future activities.

Costs would only be incurred locally as the species occupies a limited geographic area in Nova Scotia. Costs at the regional or provincial scale are expected to be minimal.

2.3. Benefits of Implementing this Action Plan

Biodiversity is essential for healthy ecosystems, human health, prosperity, security and wellbeing. Canadians derive many benefits from biodiversity including recreational, aesthetic, educational, cultural benefits as well as ecological goods and services essential to human survival. Care for the environment is consistently ranked as one of Canada's top priorities in public opinion polls (Canada's Fourth National Report to the United Nations Convention on Biological Diversity, 2010). An opinion poll found that three quarters of Canadian respondents feel that preserving natural areas and the variety of native plant and animal life in Canada is important to them (Ipsos Reid Opinion Poll, 2011).

The total value of endangered species consists of non-consumptive use values (such as recreation, spiritual/cultural, research and education), indirect use values (value of the ecological role of a species in an ecosystem) and non-use values (i.e., preserving the benefits of nature for future generations)⁴. Achieving the objectives of this action plan will have a positive impact on society.

In the recovery strategy, lakeshore and wetland habitats are identified as critical habitat. Wetland ecosystems provide a number of goods and services that can be categorized as provisional goods, regulating services, habitat/support, cultural services, and supporting services (Millennium Ecosystem Assessment, 2003; TEEB, 2010). Important ecological services may be neglected in policy analysis because there are few suitable empirical studies from which benefits may be transferred.

Wetlands provide a wide range of socio-economic benefits including flood control, filtering contaminants, carbon sequestration, coastal protection, regulating drinking water supply, supporting plant life, and supporting recreational activities. According to a Genuine Progress Index (GPI) Atlantic study on the province's water resource values, Nova Scotia's wetlands provide an estimated \$7.9 billion worth of benefits in ecosystem services to Nova Scotians annually and wetland loss to development in Nova Scotia equates to an estimated \$2 billion annually in lost ecological services like water purification, recharging drinking waters and enhancing fishery productivity (Nova Scotia Wetland Conservation Policy, 2011).

⁴ Non-use values include bequest value (satisfaction of knowing that future generations will have access to nature's benefits), altruist value (satisfaction of knowing that other people have access to nature's benefits) and existence value (satisfaction of knowing that a species or ecosystem exists).

The actions outlined in this plan cover the entire range of the Nova Scotia population of Blanding's Turtles and are expected to contribute significantly to the recovery of this species. Other species at risk that will benefit from the protection of Blanding's Turtles include the Eastern Ribbonsnake and Atlantic Coastal Plain Flora suite. The measures outlined in the recovery action plan offer a cost effective way of maximizing conservation. It is expected that the recovery approaches outlined in the action plan will benefit the larger ecological community, including other species at risk.

2.4. Distributional Impacts

Although the Blanding's Turtle occurs on provincial, federal, and private properties, private landowners are not expected to bear the brunt of the costs for the species' recovery. Non-governmental organizations are active in Nova Scotia where the species occur and measures within this action plan include building on current stewardship and landowner initiatives.

3. Measuring Progress

The performance indicators presented in the associated recovery strategy provide a way to define and measure progress toward achieving the population and distribution objectives.

Reporting on implementation of the action plan (under s. 55 of SARA) will be done by assessing progress towards implementing the broad strategies.

Reporting on the ecological and socio-economic impacts of the action plan (under s. 55 of SARA) will be done by assessing the results of monitoring the recovery of the species and its long term viability, and by assessing the implementation of the action plan.

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Appendix A: Effects on the Environment and Other Species

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the [*Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*](#)⁵. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the [*Federal Sustainable Development Strategy*](#)'s⁶ (FSDS) goals and targets.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that implementation of action plans may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the action plan itself, but are also summarized below in this statement.

Overall, it is anticipated that the approaches outlined in this Action Plan will have a beneficial impact on non-target species (other species at risk and those not at risk), ecological processes, and the environment. Management is likely to include protection of wetland habitat. This has the potential to benefit many wetland species, including some that are at risk. In Nova Scotia, the distribution and habitat of Blanding's Turtles occasionally overlaps with that of other species at risk, including Eastern Ribbonsnake, species of Atlantic Coastal Plain Flora and wetland bird species. Where other species at risk coexist with Blanding's Turtles, recovery and conservation initiatives outlined in this strategy will be coordinated with other recovery teams; this is particularly the case with Eastern Ribbonsnake, where the recovery programs for the two species are closely integrated. It will ensure that actions are mutually beneficial and not detrimental to other species at risk.

Stewardship actions, educational programs and awareness initiatives with landowners, Indigenous organizations, and the general public; all levels of government; industry; and other audiences; will lead to increased understanding, appreciation of, and concrete action towards the conservation of wetlands and the recovery of species at risk in general. The Blanding's Turtle, Eastern Ribbonsnake and Atlantic Coastal Plain Flora recovery teams regularly collaborate on a number of outreach projects. A Landowner Stewardship Guide (titled "Healthy Lakes and Wetlands: A Landowner Stewardship Guide for Species at Risk in Nova Scotia") was developed to help encourage stewardship of all wetland species at risk on private lands and inform landowners of ways to minimize their impacts on these species (Crowley 2014).

⁵ www.canada.ca/en/environmental-assessment-agency/programs/strategic-environmental-assessment/cabinet-directive-environmental-assessment-policy-plan-program-proposals.html

⁶ www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1