

EVALUATING TURTLE ROAD MORTALITY MITIGATION: IDENTIFYING KNOWLEDGE GAPS AND PUBLIC ATTITUDES

Heather Reed, BSc. Environmental Science
Dalhousie University; Halifax, Nova Scotia
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Supervisor: Dr. Stephen Flemming, Parks Canada c/o Kejimikujik National Park and National Historic Site [Stephen.Flemming@pc.gc.ca]; Duncan Smith (functional guidance), Parks Canada c/o Kejimikujik National Park and National Historic Site [Duncan.Smith@pc.gc.ca].

ABSTRACT:

An evaluation was made of the strategy to mitigate road mortality of the *endangered* Blanding's turtle in Kejimikujik National Park and National Historic Site of Canada. The strategies physical mitigation measures (speed reductions, cautionary turtle signs, and speed bumps), and social outreach measures (educational photographs) were evaluated against conservation goals. Speed radar was used to record maximum vehicle speed. All motorists exceeded posted speed limits; however, signs alone, and signs and speed bumps together significantly reduced vehicle speeds. Motorists' observations of adult and hatchling turtle models were tested at two speeds, and two levels of education. Speed did not significantly decrease motorists' ability to observe adult or hatchling models. Education significantly increased motorists' ability to observe hatchling models, but not adult models. The strategy was partially successful in decreasing vehicle speed and educating motorists, but improvement is needed to meet minimum conservation goals. Increased use of signs and speed bumps are recommended to enhance physical mitigation. Social science research (a public opinion survey) is recommended to identify means to enhance social outreach by ascertaining the dominant attitudes and current level of understanding held by the public about turtles, turtle road mortality, and road mitigation. This evaluation and investigation taken together will enhance protection of turtles from road mortality, and work to foster sustainable behaviours in motorists.



“Behold the turtle.

He only makes progress when he sticks his neck out.”

James Bryant Conant, Harvard President

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1.0 INTRODUCTION:

1.1 OVERVIEW:

Kejimikujik National Park and National Historic Site of Canada (Kejimikujik) is located in southwestern Nova Scotia, and is part of the core of the Southwest Nova Biosphere Reserve. This unique location is home to the *Endangered* Blanding's turtle and its critical habitat. Unfortunately, turtle habitats throughout Kejimikujik and southwestern Nova Scotia are frequently bisected by anthropogenic type disturbances, of which roads are a prime example. Kejimikujik currently employs a mitigative strategy to manage vehicle movement through critical turtle habitat that incorporates both physical measures and social outreach and education (Smith, 2006).

Although the physical mitigation measures (speed reductions, cautionary turtle signs, and speed bumps) and social outreach (education, turtle images) used by the current strategy have been successful in slowing vehicles and increasing motorists' awareness of turtles on roads, its overall success in protecting turtles *from* road mortality has yet to be evaluated. Further investigation is required to facilitate an understanding of what outcomes can be reasonably expected from the strategy (both in the park and in the biosphere reserve), whether it meets conservation goals, and where it can be improved. This study attempts to enhance turtle protection by evaluating the physical components of the current strategy, and by investigating methods to identify gaps in public education, and the dominant public attitudes and perceptions of turtles and road mortality.

1.2 OBJECTIVES

This project had three specific objectives, each intended to address a piece of the current mitigative strategy identified as having a potential knowledge gap. These objectives were to: (1) Characterize motorist behaviour in response to various physical roadway mitigation; (2) Evaluate impacts of the strategies speed reduction and education

approaches on motorist ability to observe turtles on roads; and, (3) Identify methods and approaches to discern gaps in public knowledge, and public attitudes and perceptions of turtles and road mortality, that will be used to enhance public education. Collectively, these objectives will be used to enhance protection of turtles from road mortality, and will work towards fostering sustainable behaviours in the regions motorists.

2.0 LITERATURE REVIEW:

2.1 BACKGROUND

Southwest Nova Scotia is known for its rich cultural and natural history, including the greatest concentration of reptile and amphibian diversity in Atlantic Canada. Specifically, Kejimikujik - in southwest Nova Scotia - is home to three of the four species of freshwater turtle that occur in Nova Scotia: eastern painted turtle (*Chrysemys picta picta*), snapping turtle (*Chelydra serpentina*), and Blanding's turtle (*Emydoidea blandingii*). While eastern painted and snapping turtles are abundant within the province, the Nova Scotia population complex of Blanding's turtle has been listed as *Endangered* both federally by the *Species at Risk Act* (SARA) (SARA Public Registry, 2006) and provincially by the *Nova Scotia Endangered Species Act* (NSDNR, 2006). As Blanding's turtles within Kejimikujik are located on federal lands, their legal protection falls under the *Species at Risk Act* (SARA) (SARA, 2003).

SARA (2003) requires a Recovery Strategy (c. 37(1)) and Action Plan (c. 47) to be completed for each legally listed species. The Blanding's Turtle Recovery Plan (currently being updated) lists strategic objectives for the recovery of the species that include the maintenance and restoration of Blanding's turtle population size, population structure, and critical habitat, as well as the removal or reduction of threats to the

Blanding's turtle and its habitats. SARA also has a strong theme of stewardship (see appendix 1 for glossary), believing it is essential to the success of protecting and recovering species at risk (Government of Canada, 2003). For this reason, in addition to the Blanding's Turtle Recovery Plan a supplementary Communication Action Plan was developed; this document provides a framework for communication based recovery actions, prioritizes key recovery messages and audiences, and the specific actions required to meet recovery objectives (Lavers, 2003).

The Recovery Plan specifically lists "direct vehicular mortality, particularly during nesting movements" as a threat to the survival of the Blanding's turtle (Blanding's Turtle Recovery Team, 2003). In addition to accidental turtle road mortality that results from lack of motorist awareness or turtle migration movements across busy roadways (Gibbs & Shriver, 2002; Aresco, 2005; Dodd et al, 2003), there are also records in the literature of motorists making deliberate attempts to hit and kill turtles for sport (Ashley et al, 2007; Seburn & Seburn; BC Ministry of Water, Land and Air Protection, 2004). Section 32(1) of SARA states it is illegal to "damage or destroy the residence of" or "kill, harm, or harass" a species listed by the Act as *Endangered*, and by virtue of the *Interpretation Act* (1985), attempted or incomplete offences of this nature are also punishable under SARA. Therefore, the protection of Blanding's turtles from road mortality is a legal obligation requiring timely action, as turtles die each year on Kejimikujik's roads.

2.2 BLANDING'S TURTLE LIFE HISTORY

Blanding's turtles are a North American species found primarily around the Great Lakes region (both in Canada and the United States); its patchy Canadian distribution extends

east through southern Ontario, southern Quebec, and southwest Nova Scotia (Herman et al, 1995). They are classified as threatened or endangered throughout most of their range (Blanding's Turtle Recovery Team, 2003). Like turtle species in general, the Blanding's turtle is long lived and late maturing, with low reproductive and recruitment rates (Herman et al, 1995). Blanding's turtles also have naturally high rates of juvenile and egg mortality, which further limits population recruitment (Congdon et al, 1993); road mortality functions to further represses reproductive and recruitment rates in Blanding's turtles (Szerlag & McRobert, 2006; Steen et al, 2006; Congdon et al, 1993).

The disjunct Nova Scotia population complex of Blanding's turtles - comprised of three genetically distinct populations - is the most isolated, living at the northern and eastern extent of the species range (Herman et al, 1995). As a result, the usual turtle life history traits and constraints are more acute in this population (Congdon et al, 1993). Blanding's turtles in Nova Scotia are estimated to exceed 80 years of age, mature later than other Blanding's turtles (at age 20-25), and are dependent on specialized habitat and travel corridors (Blanding's Turtle Recovery Team, 2003). Together, these factors make the Nova Scotia population complex especially vulnerable to increases in adult and hatchling road mortality (Congdon et al, 1993; Gibbs & Shriver, 2002, Gibbs & Steen, 2005).

2.3 ROADS AND THE BLANDING'S TURTLE:

While all three of Kejimikujik's turtle species utilize specific seasonal habitats for summering, overwintering, and nesting (Smith, 2006), the Blanding's turtle also uses specific travel corridors to move between these sites (Blanding's Turtle Recovery Team, 2003). Although roads may bisect turtle travel corridors from time to time, more significant is the fact that roads can function as 'ecological traps' offering attractive

habitat to nesting females (Coffin, 2007; Aresco, 2005; BC Ministry of Water, Land and Air Protection, 2004). The regular occurrence of nesting activities on roadsides exposes female turtles, hatchlings, and eggs to a disproportionate risk of road mortality (Steen et al., 2006; Gibbs & Steen, 2005; Gibbs & Shriver, 2002), especially since nesting activities often occur during evening hours when turtles are less visible to motorists (Standing et al, 1999; Szerlag & McRobert, 2006). These factors result in an added risk of road mortality to females during the nesting season, and are hypothesized to explain the existence of a male-skew in sex ratios of aquatic turtles (Steen et al., 2006; Szerlag & McRobert, 2006; Aresco et al, 2005; Gibbs & Steen, 2005).

Blanding's turtle nesting season extends through June; at this time female turtles will actively seek suitable nesting substrate on cobble beaches, gravel pits, and on gravel road shoulders - primarily during the evening hours (Blanding's Turtle Recovery Team, 2003). This nesting substrate search can take several hours to several days, and female turtles will cross the roadway multiple times during the process, furthering their risk of road mortality (Blanding's Turtle Recovery Team, 2003; Smith, 2006). Road mortality also occurs during the emergence season, throughout September and October, when Blanding's turtle hatchlings emerge from nests near roads, and are subsequently drawn to nearby pavement for its thermoregulation potential (Ashley & Robinson, 1996; Forman et al, 2003).

While nesting and emergence are critical times of the year for turtle species in general, it is particularly true for the *Endangered* Blanding's turtle. Road mortality is considered to have one of the greatest impacts on endangered species populations (Jaarsma et al., 2006). A probability model by Gibbs & Shriver (2002) suggests that in

excess of 5% of terrestrial and large aquatic turtles are road killed annually. This is considerable as even a slight increase in annual adult mortality (2-3%) has the potential to push turtle species to extinction (Congdon et al, 1993; Gibbs & Steen, 2005; Aresco, 2005).

Blanding's turtle use and movement on and around roads is a matter of particular concern with respect to the continued survival of the species in southwest Nova Scotia. Although there are few documented records of eastern painted and snapping turtles being struck and killed on Kejimikujik roads, in the last 35 years there were three recorded incidents of female Blanding's turtles (of a total of 38 known nesting females) being struck and killed within the park (Smith, 2006). This represents an 8% loss of the total Kejimikujik breeding female population in less than one Blanding's generation. Hatchling mortality in Kejimikujik is much more common, and occurs almost every year; mortality rates range from zero to greater than 60% per nest (Smith, 2006). Smith (2006) also reports that for Blanding's turtles specifically in Kejimikujik, there are on average between one and four known hatchling road mortalities each year.

2.4 CURRENT MITIGATIVE STRATEGY:

The current mitigative strategy used by Kejimikujik to address turtle road mortality was designed to incorporate the objectives of both the Recovery Plan and the Communication Action Plan. The former requires protection from 'direct vehicular mortality' (Blanding's Turtle Recovery Team, 2003), and the latter prioritizes key messages including 'Blanding's turtles are special', 'Blanding's turtles are at risk', and 'with cooperation, we can help Blanding's turtles' (Lavers, 2003). The resulting strategy to manage vehicle

movement through areas of critical habitat has been in use since the 2006 nesting and emergence seasons.

These areas of critical habitat, known as ‘Turtle Zones’, are given a heightened profile through the use of physical measures to reduce motorist speed, and social outreach measures to heighten public education and awareness. Within Kejimikujik four Turtle Zones have been identified as requiring seasonal mitigation (Smith, 2006). The level of mitigation used at each location varies depending on the degree to which the area is used by turtles, and the amount of vehicle traffic expected through the location. The Turtle Zone of primary concern occurs on the busiest section of the Main Parkway and is approximately 1.0km in total length (appendix 2). This area includes the only road to the Jeremys Bay campground, and known nesting sites and travel corridors for the *Endangered* Blanding’s turtle, as well as the other two species.

This primary Turtle Zone is marked with yellow cautionary diamond signs containing a turtle image, with additional english and french language “CAUTION Endangered Species Nesting Area” signs attached below (appendix 3: figure 3A). Speed is reduced to 20km/h in this area (from a 60km/h maximum throughout Kejimikujik), in anticipation that motorists will have a better chance of observing and avoiding adult and hatchling turtles on the road (appendix 3: figure 3B). Signs are erected in early June when nesting activities are expected to begin, and again in early September when emergence is expected to begin; they are removed approximately 2 weeks after the last known nesting/emergence activity takes place (Smith, 2006). In addition to the signs, black and yellow speed bumps are used as a traffic calming measure to help oblige motorists to participate in the strategy (appendix 3: figure 3C). Speed bumps are placed

in the Turtle Zone, at intervals of approximately 95m, for the period of time beginning with the first observation of nesting/emergence activities and ending 10 days after the last observation of nesting/emergence activities (Smith, 2006). All physical mitigation is removed from the roadway outside of nesting and emergence seasons to ensure that motorists do not become de-sensitized to their presence (Smith, 2006).

In conjunction with these physical mitigative actions, there are several high profile public education actions engaged by the current strategy. These strategies are used throughout the year, but are highlighted during peak visitor season from June to September. Most notable of these was a full-page advertisement in the 2006 Kejimkujik Visitors Guide, a ‘turtle sign’ bookmark that explains the importance of public participation in the strategy (handed out during management seasons), as well as several turtle specific interpretive programs. The educational campaign includes symbolic adoption kits, as well as t-shirts, hats, bumper stickers, and mini-signs; all of which are marketed under the slogan “*Give Turtles A Break*” (available at the Friends of Keji gift shop).

2.5 EVALUATING MITIGATIVE STRATEGIES

While the majority of the current road mortality literature focuses on large mammals, turtles are known to be significantly affected by road kill (Coffin, 2007; Gibbs and Shriver, 2002; Szerlag & McRobert, 2006; Forman et al, 2003). There is a gap in the knowledge base surrounding the issue of turtles, road mortality, and effective mitigation (Aresco, 2005; Coffin, 2007; Blanding’s Turtle Recovery Team, 2003; Szerlag & McRobert, 2006; Seburn & Seburn, 2000; BC Ministry of Water, Land and Air Protection, 2004; Jackson & Marchland, 1998; Jackson, 2003). The majority of studies

investigating this issue have focused on identifying factors that contribute to increases in road mortality, such as road density/km², road width, traffic volume, adjacent habitat, vehicle speed, and animal crossing speed; this information is then primarily used to develop probability models (Jaarsma et al, 2006; Gibbs & Shriver, 2002; Szerlag & McRobert, 2006; Ashley & Robinson, 1996; Clevenger et al, 2003).

The traversibility model developed by Jaarisma et al. (2006) evaluated four theoretical ‘traffic calming’ measures. Although it was based on assumptions it found reduced speed limit to 60 km/h (from 80 km/h) and use of ‘a few speed bumps’ reduced mortality rates of medium and small sized mammals by ~33%, and “stricter traffic-clam[ing] (to 60 km/h)...with more measures to reduce speed and a narrower pavement” reduced mortality rates by ~50% (Jaarisma et al., 2006). As previously stated, the Gibbs and Shriver (2002) model suggests that in excess of 5% of terrestrial and large aquatic turtles are road killed annually. Aresco (2005) modified the 2002 Gibbs and Shriver model, and found that 98% of turtles are killed in one attempted crossing (as a function of traffic volume); of the turtles that were road killed, 95% were killed upon entering the first traffic lane, and the remaining 5% were killed in the second traffic lane. Finally, Szerlag and McRobert (2006) found a positive correlation between road kills and increasing traffic volume; and Ashley and Robinson (1996) found that turtle mortality was significantly associated with seasonal migrations and adjacent open water areas.

Few studies have evaluated the effectiveness of mitigation measures currently used to limit road mortality of turtles (Jaarisma et al., 2006; Aresco, 2005; BC Ministry of Water, Land and Air Protection, 2004; Dodd et al, 2003; Forman et al, 2003). Clevenger et al (2003) found that a raised road-bed (relative to level sections) reduced

vertebrate mortality by 93%. Jackson (2003) found that fences and under road tunnel designs can be successful for some species, but requires species specific testing. Preliminary results suggest that this type of mitigation is not successfully used by Blanding's turtles (Jackson, 2003), but may be appropriate for painted turtles (Jackson & Marchland, 1998).

Aresco (2005) and Dodd et al. (2003) found that drift fences that assist turtles to use road culverts, combined with continuous volunteer monitoring were successful at significantly reducing reptile and amphibian road mortality by 98% and 93.5% respectively. The use of drift fences and construction of artificial nesting habitats, used in conjunction with interpretive road signs and educational programs, was found to be successful in southeastern British Columbia (BC Ministry of Water, Land and Air Protection, 2004). Signs were reported to reduce turtle road mortality by 30% in Peterborough, Ontario (The Alma Matter Society, 2006). Similarly, culverts, barrier fences, and artificial nesting habitat were also found to be successful at reducing turtle mortality in New York state (USA); however, use of additional 'turtle crossing' signs was ruled out by the New York State Department of Transportation (Nelson et al, 2005).

To date focus has centered on *animal response* to mitigation measures (Steen et al, 2006; Ashley et al, 2007; BC Ministry of Water, Land and Air Protection, 2004; Jackson & Griffin, 2000; Jackson & Marchland, 1998; Jackson, 2003); there has been no investigation of *motorist response* to mitigation measures, or the general understanding and attitudes of motorists about turtle road mortality and mitigation (Forman et al, 2003). Perhaps the greatest knowledge gap exists in the use and effectiveness of speed reduction, interpretive road signs, and education in mitigating turtle road mortality; there has been

no quantitative or qualitative evaluation of any of these mitigative approaches with respect to turtles (Jackson & Griffin, 2000; Aresco, 2005; Ashley et al, 2007; Seburn & Seburn, 2000; Wright, 2007; Forman et al, 2003). Literature and conservation organizations that refer to the use of these tools often state without empirical evidence that they are unsuccessful (BC Ministry of Water, Land and Air Protection, 2004; Ashley et al, 2007; Wright, 2007; Forman et al, 2003), or simply mention their use in passing (BC Ministry of Water, Land and Air Protection, 2004; Seburn & Seburn, 2000; Turtle Haven, n.d.; Turtle S.H.E.L.L., 2007; Canadian Amphibian and Reptile Conservation Network, 2008; Forman et al, 2003). Only one study concerning reptiles and driver behaviour was located; it found that 1.7% of drivers intentionally hit turtles (Ashley et al, 2007).

2.6 RATIONAL FOR FURTHER INVESTIGATION:

Turtles are found throughout Nova Scotia, and roads continue to fragment their habitats. In this province alone there are over 93,000km of paved and forestry roads (S. Flemming, personal communication, April 08, 2008). Paved roads account for 31,000km of provincial roads (of which 23,000km are highway), there are an average of 29 people living adjacent to each kilometre of paved road, and over 650,000 people hold a valid road motor vehicle operators licence (Government of Nova Scotia, 2007). Road densities can only be expected to increase with increasing urbanization, little is known about how to mitigate the impacts of roads on small vertebrates, and little has been done in terms of actual mitigation (Jackson & Griffin, 2000; Forman et al, 2003). Accordingly, there is an urgent need to investigate and evaluate the effectiveness of mitigation measures currently used to limit road mortality of turtles (Forman et al, 2003). Moreover, the Recovery Plan explicitly calls for improved information upon which it can base recovery actions and

evaluate the current recovery strategy (Blanding's Turtle Recovery Team, 2003). As the issue of wildlife road mortality falls within the realm of modern "environmental problems", it thus becomes crucial to examine it both as the technical issue of evaluating and enhancing current strategies to reduce road mortality, *as well as* the need to identify the social forces at work behind the phenomenon.

National Parks are ideally suited to conduct investigations of this nature; their purpose is to protect nationally significant natural heritage (such as the *Endangered* Blanding's turtle) and foster public understanding in ways that ensure ecological integrity is maintained (Parks Canada Agency, 2002). Kejimikujik presents a unique opportunity to protect Blanding's turtles and educate motorists and visitors about the significant impacts of turtle road mortality and road mitigation. First, a mitigative strategy to reduce turtle road mortality has been in use within the park since 2006. Secondly, a Patterns of Visitors Use survey conducted in 2006 revealed the Kejimikujik audience to be an ideal group for an evaluation of this nature. Close to 70% of Kejimikujik visitors are from the province of Nova Scotia, with almost 40% having four or more visits in the past two years (Parks Canada Agency, 2006). This means that Kejimikujik visitors are likely to have been exposed to both the physical aspects of mitigation, and the social outreach and education required to make the strategy successful.

While there has been no direct measure of the success of the current strategy, several questions specific to 'turtle road signs' and species at risk were included in the survey. When asked, "What is the significance of turtle road signs?" 84% of respondents indicated "slow down", 72% indicated "watch for hatchlings", and 60% indicated "watch for female turtles" (Parks Canada Agency, 2006). Kejimikujik

interpretive programs were also measured for their ability to inform visitors about specific aspects of national significance. The survey results showed that 63% of respondents were able to identify the Blanding's turtle as "NOT a common turtle in Nova Scotia" (Parks Canada Agency, 2006). Additionally, when asked to identify three species at risk, "Blanding's turtle" was the species that "first came to mind", and was the most frequent answer given (Parks Canada Agency, 2006). These results indicate that the Kejimikujik audience is aware of the issue of turtles on roads, but it gives no indication of the strategies ability to reduce overall turtle road mortality. Furthermore, in order to ensure the long-term success of the current approach, focus must be shifted from measuring public *reaction* to the strategy, and moved to achieving public *action* towards the strategy.

Participation in conservation strategies such as this can be facilitated through effective public education, and fostering sustainable behaviours fits well with the Parks Canada commitment to protect species while educating people. To state that education is unsuccessful in achieving action towards conservation is pre-emptive; the questions 'why has education been unsuccessful', and 'how can education become successful' require answering. It is important to remember that vehicles do not kill turtles; it is the *people who drive vehicles* that kill turtles, whether it is accidental or intentional. In order to engage Kejimikujik visitors and other communities to participate in mitigative strategies, it is crucial to first seek to understand what they know and feel about the issue (Mackenzie-Mohr & Smith, 1999). The reasons why individuals do not or choose not to partake in conservation strategies can be numerous, and it is facile to make assumptions about why. In order to engage individuals it is essential to identify the barriers, both

perceived and real, to participation in strategies such as road mitigation (Mackenzie-Mohr & Smith, 1999). Identifying the dominant attitudes and perceptions held by the public, through a public opinion assessment, is a crucial first step to answering these questions.

3.0 METHODS

This research project includes four areas of investigation, each designed to fill an identified knowledge gap. Descriptive research methods were used to determine the success of specific components of the current strategy in achieving conservation goals. Exploratory research methods were used to determine how to assess the knowledge baseline of motorists and the general public, and how they feel about turtle road mortality and associated issues.

The specific questions addressed are as follows:

1. How do motorists respond to current roadway management?
 - 1.1. What effect do management signs have on motorist speed?
 - 1.2. What effect do management signs and speed bumps have on motorist speed?
2. How does the current strategy effect motorist ability to observe turtles on roads?
 - 2.1 What effect does speed have on the number of turtle models observed?
 - 2.2 What effect does education have on the number of turtle models observed?
3. How can dominant attitudes and perspectives held by the public on the issues of turtle road mortality and road mitigation be identified and assessed?
4. Does the current strategy meet conservation goals?

3.1 STUDY AREA

This study took place in Kejimikujik during the fall Turtle Zone management season, on a ~3km section of the two lane Jeremys Bay campground road (appendix 4). This year (2007) two Blanding's turtle nests were located on the gravel shoulder of this road (within the Turtle Zone management area). Observations of motorist response to

management took place inside the Turtle Zone, and motorist observations of turtle models took place outside of the Turtle Zone.

3.2 STUDY DESIGN AND DATA COLLECTION

3.2.1 MOTORIST RESPONSE TO MANAGEMENT

Unobtrusive observations of motorists' response to Turtle Zone management on the J-Line road were made from August 27 to November 09, 2007. Observations were made of motorists travelling through the Turtle Zone before, during, and after the fall management season; three different groups of motorists were observed (in the order listed here) and included motorists travelling under:

- i) No Management (control),
- ii) Partial Management (signs only) , and
- iii) Full Management (signs and speed bumps)

Observations of treatment groups ii) and i) were repeated (in the order listed here) to attempt to account for the differences in visitor demographics that exist before and after the fall Turtle Zone management season.

The maximum speed that motorists reached in the Turtle Zone was measured with the use of a speed radar gun. Observations were made from a hidden location under the J-Line Road bridge (appendix 4) - inside the Turtle Zone- by placing the radar at an inconspicuous spot on the bridge wall at the roads edge (figure 1). Speeds recorded from August 27 to September 02 were made using a Tribar Industries Type No. Muni Quip T3 speed radar gun, however this machine was subsequently damaged. From September 07 to September 11 speeds were recorded with an MPH Industries Inc. Model # (990801) BEE III Directional Radar System, on loan from the Nova Scotia Department of Transportation and Public Works. The remaining speed observations, from September 12

to November 09, were made with the use of a Kustom Signals Inc. PRO-1000DS radar system.



Figure 1. Unobtrusive speed observation location on the J-Line Road bridge and placement of the speed radar gun at the roads edge (between the concrete and wood post).

A non-probabilistic purposive sampling method as described by Palys (2003) was used to determine trial participant inclusion. Trial participants were recruited from the group of motorists' travelling on the J-Line Road from the direction of the Kejimikujik Visitors Reception Centre (VRC) and towards Jeremys Bay campground. This was done in order to reduce the possibility of individual cars being included more than once, as motorists were assumed to be travelling throughout the park, and not to and from the VRC. No observations were made of Parks Canada vehicles, or any other vehicle that could be identified as that of a researcher or regular park volunteer, as these individuals may have had prior knowledge of the sampling being undertaken.

Observations of motorist response to management were made once a day on 25 days, for approximately 1 hour per day, between 8:30-11:30 or 16:30-19:30, until November 01. Beginning November 02, in response to a dramatic decline in traffic volumes and visitor numbers, observations were made for approximately 2 hours per day between 11:30 and 13:30, the most common time of road use. Sampling days of the week

were drawn at random from a hat, and morning or evening sampling time was based on a random coin toss. Sampling was avoided during uncharacteristic peak travel times (e.g. evenings/mornings before and after long weekends) to avoid a possible bias in the data, and surveys were only conducted in fair weather to eliminate differences expected in driving behaviour due to poor weather.

An appropriate sample size of approximately 100 observations, per management treatment group, was determined through consultation with Dan Kehler, Parks Canada Atlantic Service Centre statistician (Personal communication, July 9, 2007). A total of 208 observations were made, and observation data included maximum vehicle speed (km/h), time of observation, vehicle type, and any interesting or unique behaviours exhibited while travelling in the Turtle Zone. Motorist participation was not voluntary, as sampling was comprised of unobtrusive observations made from an undisclosed location.

3.2.2 MOTORIST OBSERVATION OF TURTLE MODELS

A trial course testing motorists' ability to observe turtle models on the road was conducted from September 03 to September 08, 2007. These trials were completed along two contiguous 0.8 km sections of the J-Line road (total trial course length of 1.6km) (appendix 4). Number of motorist observations of turtle models was chosen as the unit of measure over the number of model 'hits' because there was no way to differentiate deliberate hits from accidental hits. Each section of the course contained identical numbers of turtle models, with a total of 5 adults and 10 hatchling models per section. Adult and hatchling turtle models were placed randomly throughout both the first and second sections of the observation course, and placement locations were repeated each day. Placement of turtle models was such that a buffer zone existed (between trial course

sections) to prevent motorists' from observing and being influenced by one another's driving behaviours (appendix 4).

Adult turtle models were carved, with an electric carving knife, from upholstery foam and painted to resemble adult Blanding's turtles (figure 2). Hatchling turtle models, made of hard plastic, were purchased and painted to resemble Blanding's hatchlings (figure 2).



Figure 2. Foam Blanding's adult turtle model (12.5cm height \times 32cm length \times 18cm width) placed on the road (left); plastic Blanding's hatchling model (1.5cm height \times 5cm length \times 3.5cm width) (top right) and real Blanding's hatchling (bottom right).

In order to test the effects of speed and education on motorist ability to observe turtle models, participants were designated to drive either a) 20km/h or b) 40km/h, with i) No education or ii) Education. Education consisted of exposure to photographs of adult and hatchling turtles on a road, as these were deemed to be the most likely form of education motorists would be exposed to (appendix 5). Motorists were not shown pictures of the cautionary turtle sign because the 2006 VIP survey identified that motorists understood the significance of this sign. Participants were then required to report the number of observations made of adults and hatchlings, while driving either:

- 20km/h with no education, and
 - 20km/h with education
- or,

- 40km/h with no education, and
- 40km/h with education

For analysis purposes, where the number of reported observations exceeded the total number of observations, the maximum number was used. Where a range of observations was reported (i.e. 6-7), the greater of the two numbers was used.

A non-probabilistic purposive sampling method as described by Palys (2003) was employed, and trial participants were recruited from the group of motorists' travelling on the J-Line Road towards Jeremys Bay Campground, and who had not already participated. Again, this was done to reduce the possibility of individual cars being included more than once. No Parks Canada employees, researchers, or known volunteers were included, as these individuals may have had prior knowledge of the model observation trials being undertaken. The appropriate ethics application to undertake this trial was submitted and approved as required (appendix 6).

Three researchers were necessary to undertake this trial, and were all certified as temporary workplace traffic control persons for safety purposes. Additionally, researchers wore reflective orange safety clothing and remained in radio contact for the duration of the trials. The first 0.8km section (0-0.8km) of the observation course was preceded by a "Caution – Men at Work" sign to reduce the speed of approaching motorists' without introducing observation bias. Researcher #1 held a stop/slow sign, and stopped vehicles to request their participation if:

- i) they were the 'only' vehicle on the road;
- ii) there was no visible traffic on the course ahead; or if
- iii) it was the last vehicle in a series/group, and no previous vehicles were still visible on the course ahead.

Researcher #1 then requested the motorists' participation in the study, informed them of guaranteed confidentiality, provided them with a coded data record sheet (appendix 7), and designated them to drive approximately 20km/h or approximately 40km/h to the next researcher. At the 0.8km point (mid course), researcher #2 asked motorists to report the number of adult and hatchling turtles observed, recorded this on the coded data sheet, exposed the motorists to education, and ask the motorists to drive the second section (0.8-1.6km) of the observation course at the same designated speed while being observant for turtle models. At the 1.6km point, researcher #3 asked the motorists to report the number of adult and hatchling turtles they had just observed, obtained the coded data sheet, and recorded the final number of observations. Researcher #3 was also responsible to record any additional comments or behaviours the participants made, and comments researcher #1 and #2 had communicated by radio.

Trial participants were approached on six consecutive days for a period of approximately 3 hours, between 8:30 and 11:30 or 16:30 and 19:30. Sampling days of the week were drawn at random from a hat, and morning or evening sampling time was based on a random coin toss. Again, sampling was avoided during uncharacteristic peak travel times (e.g. evenings/mornings before and after long weekends) to avoid a possible bias in the data, and surveys were only conducted in fair weather to eliminate differences expected in driving behaviour and observability of models due to poor weather.

An appropriate sample size of approximately 50 trial participants, per trial group, was determined through consultation with Dan Kehler, Parks Canada Atlantic Service Centre statistician (Personal communication, July 9, 2007). A total of 66 participants were recruited, and trial data included (on the coded data sheets) time of participation,

designated vehicle travelling speed (km/h), and the number of adult and hatchling turtle models observed. Motorist participation was voluntary and confidential, and participants were requested to initial a voluntary participation form confirming that no personal information or vehicle identifiers were recorded (appendix 7).

3.2.3 IDENTIFYING DOMINANT ATTITUDES AND PERSPECTIVES

Qualitative social science research methods were examined and evaluated for their ability to collect descriptive and inferential data from a statistically representative sample of three identified populations of interest. These populations include the national public living in Canadian provinces known to contain turtles; the regional public of southwest Nova Scotia including the Halifax Regional Municipality (HRM); and the local public (visitors) within Kejimikujik. Research methods were evaluated for their potential to identify the dominant attitudes and perspectives held by these populations on the issues of turtles, turtle road mortality, and road mortality mitigation. More specifically, the chosen methodology was required to address the following general topics of inquiry:

- the knowledge baseline, knowledge gaps, and general attitude of the public about turtles, turtle road mortality, and road mortality mitigation
- the public perception of risks to turtles and wildlife
- the importance individuals place on protection of turtles from road mortality
- the perceived importance organizations place on protection of turtles from road mortality
- where Kejimikujik social outreach and education has been successful or requires improvement
- attitudes about management strategies and mitigative measures
- barriers and opportunities to participation, and public willingness to alter behaviours

This assessment was made with the help and expertise of Dr. Peter Clark, a social anthropologist at Dalhousie University. A plan for the Parks Canada Agency to undertake

an evaluation of this nature is proposed, along with an estimated budget for project completion.

3.3 DATA ANALYSIS

All data was analyzed with the use of Statistical Package for Social Sciences (SPSS, 2006) version 15.0 for Windows, a statistical and data management package used by analysts and researchers. Additional guidance was taken from the text *SPSS for Introductory Statistics: Use and Interpretation* (Morgan et al, 2004). Motorist response to different treatments of Turtle Zone management was assessed by performing a one-way ANOVA on the three treatment groups at $p = 0.05$. Post hoc Games Howell tests, also at $p = 0.05$, were subsequently used to identify which groups were significantly different. Effect size, d , was also calculated to show the magnitude (strength) of significant differences between the groups (Morgan et al, 2004). The results were compared to show what kind of improvement in speed reduction was achieved with the use of signs, versus reductions achieved through the use of signs and speed bumps together.

The effect of the current strategy on motorist ability to observe turtles on roads was assessed by performing a series of t -tests at $p = 0.05$. Independent t -tests assessed the impact of speed on the number of observations, and paired t -tests assessed the impact of education on the number of observations. Effect size, d , was again calculated to show the magnitude of significant differences between the groups (Morgan et al, 2004). The results were compared to the actual number of turtles on the road to see if speed impacts observations, and how; if education impacts observations and how; as well as what, if any, correlation exists between the two variables. A final independent t -test was used to

make a theoretical comparison of an 'ideal' group of motorists to a more realistic 'observed' group of motorists travelling through the Turtle Zone.

To determine whether the current strategy meets conservation goals inside Kejimikujik boundaries (protection of adult and hatchling turtles from road mortality), results of the ANOVA and *t*-tests were compared against defined conservation goals. To meet these goals, motorists must:

1. understand that there are both adult and hatchling turtles found within the Turtle Zones;
2. observe no fewer than 90% of adult turtles, and 75% of hatchling turtles; and,
3. be travelling no more than 20km/h under full management

The results were also used to determine whether the current strategy *could* meet conservation goals outside park boundaries in the biosphere reserve (protection of adult turtles from road mortality), results of the ANOVA and *t*-tests were compared against alternate conservation goals. To meet these alternate goals, motorists must:

1. understand both adult and hatchling turtles are found on roads in designated areas;
2. observe no fewer than 90% of adult turtles; and,
3. be travelling at a speed that would allow them to make, and respond to, observations of adult turtles.

3.4 VALIDITY AND RELIABILITY

It is believed that the sampling procedures, sampling design, and data analysis methods chosen are reliable because a consistent methodology was used throughout observation and data collection. The proposed methods are easily reproducible, and thus also possess inter-rater reliability (Palys, 2003). Additionally, the sampling design, data collection, and data analysis methods chosen are also considered to be valid. This is because their specific approaches were designed to measure the operationalized variables identified as being of interest and importance to answering the research questions posed (management,

speed, education, and awareness), thus they also exhibit convergent validation (Palys, 2003).

It is also believed that this research possesses catalytic validity, as it is designed to “reflect the sort of social order [the researcher] wishes to promote” (Palys, 2003:77). Moreover, this research project will help to “[empower] people by enhancing their self understanding [of the identified problem of turtle road mortality], and show them the possibility...to transform it” (Palys, 2003:77).

3.5 LIMITATIONS AND DELIMITATIONS

The overall limitations of this project were time, funding, person hours, and the patterns of Kejimikujik visitor use during the fall season. Visitor use dropped sharply in the fall after the Thanksgiving long weekend, which necessarily decreased the number of vehicles available for observation. Also, changes in visitor demographics may have impacted the speed observation data. Some degree of volunteer bias is expected in the turtle model observation trial. Additionally, there could be discrepancy between actual vehicle speeds, and speeds measured by the three speed radar guns that were used.

The delimitations of this project are generally those imposed by the non-probabilistic purposive sampling methods. Although traffic flows two-ways on the J-Line road, sampling was designed to measure how effective the current strategy is in gaining motorist attention, decreasing vehicle speed, or enhancing the ability to observe turtles, and *not* to measure overall patterns of use, or changes in use, of the Turtle Zone as motorists move in and out of the specified area.

4.0 RESULTS

4.1 MOTORIST RESPONSE TO MANAGEMENT

A total of 208 vehicles were observed travelling through the Turtle Zone sample site during the three levels of management treatment (no management group (NM) = 53, partial management group (PM) = 44, and full management group (FM) = 111). Mean observed vehicle speed in all three treatment groups exceeded the legal speed limit (NM limit = 60km/h, PM and FM limit = 20km/h). Table 1.1 shows that mean NM speed was 67.21 km/h (SD 11.68), mean PM speed was 60.43 km/h (SD 14.40), and mean FM speed was 36.66 km/h (SD 7.40).

A statically significant difference was found among the three levels of management treatment on observed maximum vehicle speed, $F(2,205) = 187.04$, $p = 0.000$ (table 1.2). Post hoc Games-Howell tests (table 1.3) indicate that maximum observed vehicle speeds differed significantly between the NM and the PM groups ($p = 0.037$), and the effect size was typical ($d = 0.52$). There were also significant differences between the NM and FM groups ($p = 0.000$), with a much larger than typical effect size ($d = 3.39$); and the PM and FM groups ($p = 0.000$), also with a much larger than typical effect size ($d = 2.39$). Thus, significant speed reductions were achieved in the Turtle Zone using both a partial management ‘signs only’ approach, and a full management ‘signs and speed bumps’ approach.

Several additional motorist behaviours were noted throughout unobtrusive observation. When the turtle signs were initially erected, motorists were seen exiting their vehicle, or driving very slowly, to investigate the roadside turtle nests. Motorists also stopped either on the road or gravel shoulder to take pictures of the turtle signs. Under FM, when solitary vehicles were observed on the road, several motorists used or

attempted to use the gravel shoulder to drive around the speed bumps. Wooden posts of ~1m height, marked with reflective tape, were erected adjacent to the speed bumps to discourage this behaviour. However, a number of posts were removed or damaged; although these incidents were never observed, it was likely the result of purposeful collisions with larger vehicles. Finally, the majority of vehicles travelling under FM rolled over the speed bumps at speeds too slow to be detected, then proceeded to accelerate as much as possible until they had to brake for the next speed bump.

Table 1.1. *Comparison of means and standard deviations of maximum observed vehicle speed in the three Turtle Zone management groups.*

Management group	Observed vehicle speed		
	<i>n</i>	M	SD
No Management	53	67.21	11.68
Partial Management	44	60.43	14.40
Full Management	111	36.66	7.40
Total	208	49.47	17.33

Table 1.2. *One-way analysis of variance summary table comparing level of Turtle Zone management on maximum observed vehicle speed (km/h). The difference is significant at $p < 0.05$.*

Observed Vehicle Speed	<i>df</i>	SS	MS	F	<i>p</i>
Between Groups	2	40183.32	20091.66	187.04	0.000
Within Groups	205	22020.50	107.42		
Total	207	62203.83			

Table 1.3. *Post hoc Games-Howell summary table of multiple comparisons between management treatment groups. The mean difference is significant at $p < 0.05$.*

(I) Management Group	(J) Management Group	Mean Difference (I-J)	Std. Error	Sig.
No Management	Partial Management	6.78	2.70	0.037
	Full Management	30.55	1.75	0.000
Partial Management	Full Management	23.77	2.28	0.000

4.2 MOTORIST OBSERVATION OF TURTLE MODELS

A total of 66 motorists participated in the turtle model observation trials, 35 in the 20 km/h designated speed group and 31 in the 40km/h designated speed group. Table 2.1 and figure 2 through figure 5 show the frequency distribution of motorist observation of adult and hatchling turtles made in both the 20km/h group and the 40 km/h group at two levels of education.

Table 2.1 *Comparison of means and standard deviations of the number of adult and hatchling model observations made at 20km/h and 40km/h, at two levels of education.*

Treatment Group	Model Observations				
	<i>n</i>	Adult Models		Hatchling Models	
		M	SD	M	SD
20 km/h no Education	35	4.83	0.45	0.23	0.97
20 km/h with Education		4.77	0.49	6.14	3.31
40 km/h no Education	31	4.68	0.48	0.03	0.18
40 km/h with Education		4.61	0.67	5.42	3.30

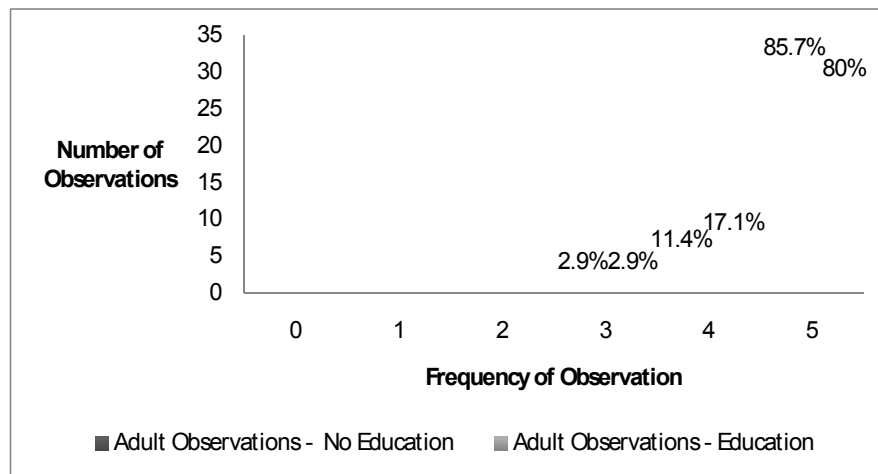


Figure 2. *Frequency (n = 35) of motorist observation of adult turtle models made at 20km/h at two levels of education treatment (no education and education). Percent values of each frequency are also presented.*

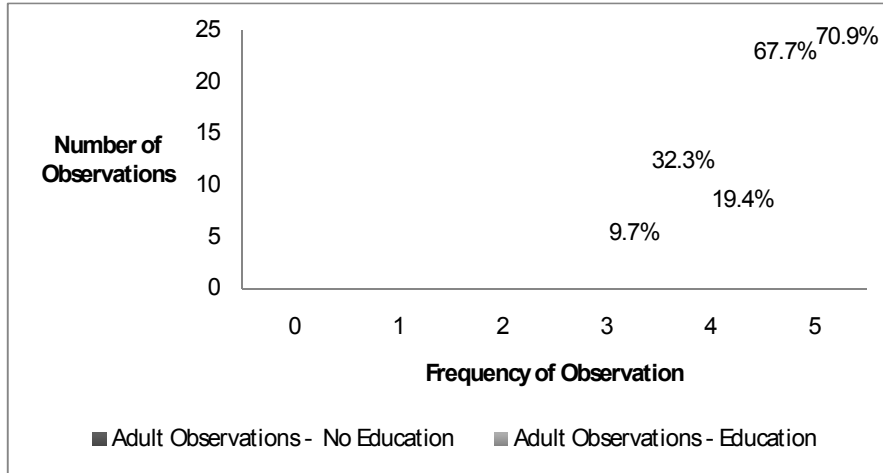


Figure 3. Frequency ($n = 35$) of motorist observation of adult turtle models made at 40km/h at two levels of education treatment (no education and education). Percent values of each frequency are also presented.

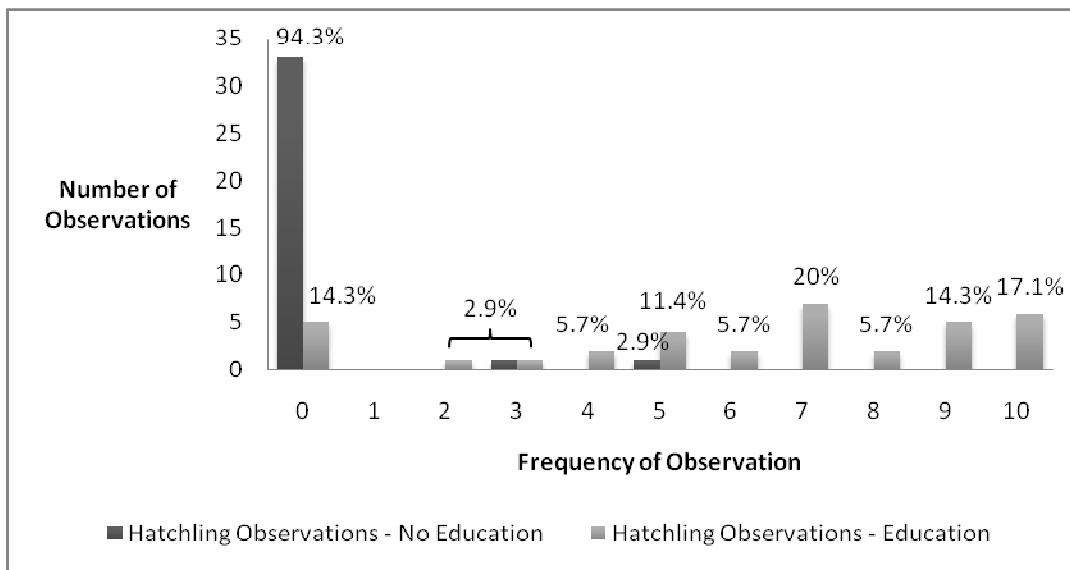


Figure 4. Frequency ($n = 31$) of motorist observation of hatchling turtle models made at 20km/h at two levels of education treatment (no education and education). Percent values of each frequency are also presented.

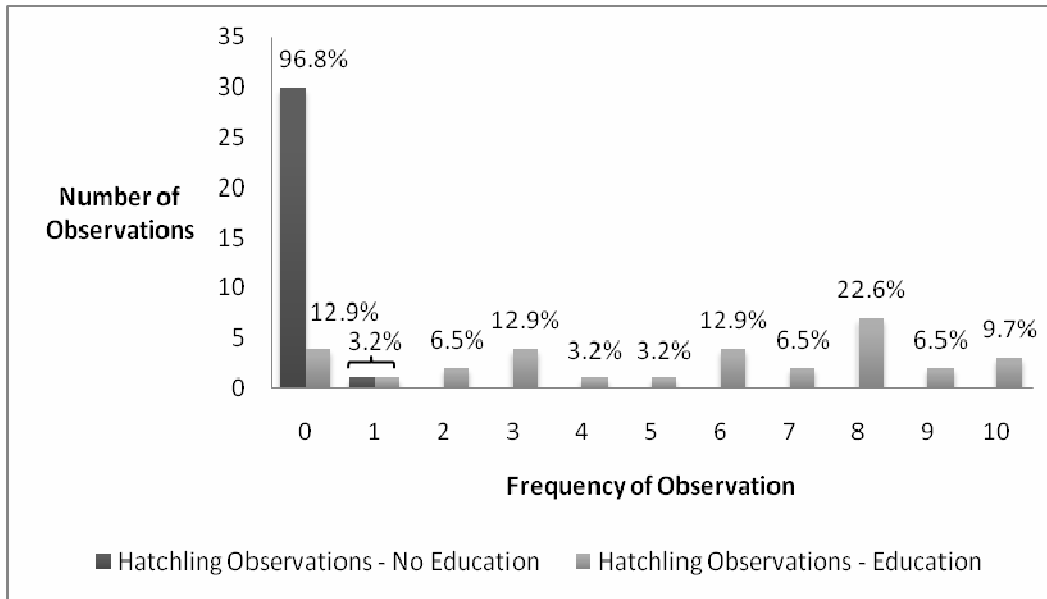


Figure 5. Frequency ($n = 31$) of motorist observation of hatchling turtle models made at 40km/h at two levels of education treatment (no education and education). Percent values of each frequency are also presented.

Several additional motorist behaviours were noted during the model turtle observation course. Observations on the initial trial day were delayed as a result of ‘helpful’ and concerned motorists removing the adult models from the road. Several individuals were seen exiting their vehicles to warn oncoming traffic of turtles being on the road. On several occasions, the occupants of multiple vehicles were observed discussing ‘what to do’. Interestingly, the models were treated as live turtles should be; when removed from the road way, models were moved in the direction that they were facing. Motorists removed two adult models, and one was anonymously returned several days later. On each of the six sampling days there were approximately 2 hatchling turtles found overturned in each section of the observation course, and two were lost. A portion may have moved as a result of wind created by motorists travelling at 60+ km/h (those who did not participate), however visible scratches in the paint surface made it evident that a number of hatchling models were ‘road-killed’.

4.2.1 IMPACT OF SPEED ON OBSERVATION

Vehicle speed did not have a significant impact on motorist ability to make observations of adult or hatchling turtle models on the road, at either level of education (table 2.2).

Table 2.2 *Independent t-test summary table comparing designated vehicle speeds on motorist ability to observe adult and hatchling models at two levels of education. The mean difference is significant at $p < 0.05$.*

Treatment Group	M	SD	<i>t</i>	<i>df</i>	<i>p</i>
Adult observations w/o Ed			1.32 ^a	62.16 ^a	0.192
20 km/h	4.83	0.45			
40 km/h	4.68	0.48			
Adult observations w/ Ed			1.17 ^a	36.61 ^a	0.249
20 km/h	4.77	0.49			
40 km/h	4.61	0.67			
Hatchling observations w/o Ed			1.09 ^a	54.55 ^a	0.281
20 km/h	0.23	0.97			
40 km/h	0.03	0.18			
Hatchling observations w/ Ed			0.89	64	0.378
20 km/h	6.14	3.31			
40 km/h	5.41	3.30			

^a The *t* and *df* were adjusted because variances were not equal.

4.2.2 IMPACT OF EDUCATION ON OBSERVATION

Education had a significant impact on motorist ability to make hatchling observations at both 20 km/h $t(34) = -9.923, p = 0.000$, and 40 km/h $t(30) = -8.998, p = 0.000$ (table 2.3). The effect size for both of these groups was also much larger than typical effect size ($d = -2.76$) and ($d = -3.10$). Education did not have a significant impact on adult observations at either 20 km/h or 40 km/h. It is interesting to note that with an increase in education there was a decrease the mean number of adult observations made at both speeds, shown in table 2.1. This may be due to an increasing number of tasks demanding the motorists' attention once they were aware that there may be hatchling turtles on the road.

Several participants in the model observation trial stated they were familiar with the cautionary turtle signs. When exposed to the educational photographs these

individuals commented that they “had always searched for turtles the same size as the turtle image depicted on the signs”, “had no idea that hatchlings were so small”, and/or “had no idea that hatchlings would go onto the road”..

Table 2.3 *Paired t-test summary table comparing level of education on motorist ability to observe adult and hatchling models at two designated speeds. The mean difference is significant at $p < 0.05$.*

Treatment Group	M	SD	<i>t</i>	<i>df</i>	<i>p</i>
Adult observations at 20 km/h			0.63	34	0.535
No Education	4.83	0.45			
With Education	4.77	0.49			
Hatchling observations at 20 km/h			-9.92	34	0.000
No Education	0.23	0.97			
With Education	6.14	3.31			
Adult observations at 40 km/h			0.42	30	0.677
No Education	4.68	0.48			
With Education	4.61	0.68			
Hatchling observations at 40 km/h			-9.00	30	0.000
No Education	0.03	0.18			
With Education	5.42	3.30			

A theoretical comparison of the strategies ‘ideal’ group of motorists versus the more realistic ‘observed’ group of motorists was made in order to assess how the current strategy impacts overall motorist response. For the purposes of this analysis, the ‘ideal’ group was represented by motorists travelling at 20 km/h who were exposed to education, while the ‘observed’ group was represented by motorists travelling at approximately 40 km/h who were not exposed to education about turtles. The rationale for the ‘observed’ group being realistic is based on i) mean motorist speed under full management was 36.66 km/h; and ii) the comments motorists made about what they understood the cautionary signs to represent. Table 3.1 shows hatchling observations in the ‘ideal’ group were significantly different from hatchling observations in the ‘observed’ group $t(64) = 10.91$, $p = 0.000$ with a much larger than typical effect size ($d = 2.53$), but adult

observations in the ‘ideal’ group were not significantly different from adult observations in the ‘observed’ group.

Table 3.1 *Independent t-test summary table comparing two theoretical motorist group treatments on motorist ability to observe adult and hatchling models. Ideal motorists travelled at 20 km/h with education, observed motorists travelled at 40 km/h without education. The mean difference is significant at $p < 0.05$.*

Treatment Group	M	SD	<i>t</i>	<i>df</i>	<i>p</i>
Adult observations			0.789	64.0	0.443
Ideal group	4.77	0.49			
Observed group	4.68	0.48			
Hatchling observations			10.91 ^a	32.23 ^a	0.000
Ideal group	6.14	3.31			
Observed group	0.03	0.18			

^a The *t* and *df* were adjusted because variances were not equal.

4.3 IDENTIFYING DOMINANT PUBLIC ATTITUDES AND PERCEPTIONS

In consultation with P. Clark, questionnaires were deemed the most appropriate method of identifying the dominant attitudes and perceptions held by the national, regional and local public on the issues of turtles, turtle road mortality, and road mortality mitigation (personal communication, December 14, 1997). Questionnaires are cost effective, allow for heterogeneous sampling over large areas, require minimal field training to administer as well as collect subsequent data, and they maximize participant anonymity and therefore avoid interview bias (Palys, 2003; Neuman, 2000). Some of the disadvantages inherent in questionnaires include traditionally low response rates, time lags between delivery and data collection, several reminder notices may be required to prompt questionnaire return, and non-response bias can be significant. Although questionnaires present a unique set of advantages and disadvantages, design and delivery methods can address many of the disadvantages making their use a valid and reliable choice.

It is anticipated that the results of this questionnaire will highlight some of the social forces at work behind the phenomenon of turtle road mortality, as well as guide the development of more effective outreach and education opportunities by identifying barriers to participation in mitigative strategies. This will be a unique opportunity to understand how social outreach methods employed by Kejimikujik have been effective at meeting the strategies objectives, as well as highlight specific areas for improvement. A comparison of information generated by the national, regional, and local surveys can guide the development of successful technical and social mitigation strategies within Kejimikujik and elsewhere in Canada. Additionally, an understanding of public perceptions and attitudes towards turtle road mortality mitigation can help to direct the implementation of more effective physical mitigative actions.

4.3.1 QUESTIONNAIRE DESIGN

Questionnaires specific to the three identified audiences were designed with guidance from Dr. Peter Clark (appendix 8). The rationale behind each question posed by the questionnaires is included in appendix 9. The national questionnaire targets the eight Canadian provinces in which turtles are found: Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia. The regional questionnaire targets southwest Nova Scotia: Annapolis, Digby, Yarmouth, Shelburne, and Queens Counties, plus the HRM. The local questionnaire targets Kejimikujik visitors only.

The format of posed questions included both closed (structured) and open-ended questions. Closed structured questions include single-response, categorical response, rating scales, and Likert-type attitude assessment questions (Palys, 2003). The questions

were designed to assess participant knowledge, attitude (feelings), and willingness to take or avoid certain actions. Careful attention was given to question format, question wording, context effects, and crafting of easy to follow instructions. Every reasonable attempt was made to ease response, avoid threatening questions, and make individuals feel that their participation is important and appreciated.

All three questionnaires will require professional translation into french language in order to ensure comfort and equality of participant response. Questionnaires should be conducted on behalf of, and returned to Parks Canada Agency National Office. This is recommended as a national office is an easily recognizable, credible, bilingual, and central agency of the federal government, which can increase response rates. To assure best results, the questionnaires should also:

- be limited to five pages of questions (Neuman, 2000);
- have a neat and easy to follow layout that is professionally printed (Palys, 2003; Neuman, 2000);
- include an attractive cover photo or diagram to entice participants (Palys, 2003);
- include a letter of introduction with a statement of intended purpose;
- confirm participant confidentiality (Palys, 2003; Neuman, 2000);
- clearly identify who is conducting the questionnaire, who it is being conducted for, and how the information will be used (Palys, 2003; Neuman, 2000);
- offer an incentive for completing the questionnaire (Palys, 2003; Neuman, 2000); and,
- end with a sincere thank you, and contact information (Palys, 2003; Neuman, 2000).

4.3.2 QUESTIONNAIRE DELIVERY

It is proposed that local questionnaire delivery be in person, by uniformed Kejimikujik park staff, to motorists travelling in the vicinity of Jeremys Bay campground. The proposed mode of national and regional questionnaire delivery is by mail, and the overall delivery process has been specifically developed to increase participation and

response rates. It is recommended that these participants be recruited in advance by telephone, by a professional survey agency. Participants name, address, and language preference must be recorded (to personalize delivery), and a verbal commitment to complete the questionnaire can be gained (Neuman, 2000). Verbal commitments and mail which is personally addressed are shown to dramatically increase response rates (McKenzie-Mohr & Smith, 2006). The questionnaire is then delivered by mail addressed to the participant, and should include a small thank you gift such as a sticker or magnet. Additionally, the gift acts as a reminder the participant made a commitment to complete and return the questionnaire, further increasing response rates (Neuman, 2000; Palys, 2003; McKenzie-Mohr & Smith, 2006).

The national and regional questionnaire packages should also include a postage paid envelope of a suitably large size to ease return. An additional incentive for completing and returning the questionnaire promptly should be included, such as an entry form to win a 2009 National Park visitor pass (for example). A post card should be mailed to each participant one to two weeks after the initial survey is delivered which thanks the participant and acts as a reminder to complete and return the questionnaire if they have not already done so (Neuman, 2000; Palys, 2003). Each questionnaire should be numbered before delivery and tracked upon return; this prevents reminder post cards from being mailed to individuals who have already returned their questionnaires (Neuman, 2000). Additionally, questionnaires should be date stamped upon return, which would allow a response rate bias curve to be constructed (Palys, 2003).

4.3.3 ESTIMATED SAMPLE SIZE

Appropriate survey sample sizes were approximated in consultation with D. Kehler (personal communication, March 03, 2008), and will ultimately depend upon the type of analysis and data coding methodology chosen by the administering agency. In each case a 95% confidence level and a $\pm 5\%$ margin of error were used in calculating sample sizes. A basic sample size for all three surveys is 384, and will allow each population to be described individually, and an analysis of proportions of responses within each population to be determined (Bartlett et al, 2001, Bonnell, 2000). However, a basic sample size does not allow comparisons to be made within or between the three populations. In order to conduct more complex analyses on the collected data, *reasonable estimated* sample sizes of 1200 (national), 500 (regional), and 384 (local) are suggested (P. Clark, personal communication, March 24, 2008).

In addition to sample size, response rates will also have to be approximated and considered so that the appropriate number of potential participants are contacted or approached to result in a response sample set required for a statistically robust analysis. Palys (2003) and Neuman (2000) report response rates for mail delivered questionnaires are usually between 50% and 60%. However, a regional survey conducted in Newfoundland about sustainable forest management had response rates of between 70% and 80% (with an overall response rate of 74.4%) (Bonnell, 2000). Studies on the effects of questionnaire delivery and a small, for example \$1.00, incentive show that the measures outlined here can result in a 17% increase in expected response rates (Teisl et al, 2005; French and Doehrman, 1980). Thus, assuming an approximate 70% response rate, a necessary basic sample size of 549 ($384/0.70$) would be required, and necessary

complex sample sizes of 2979 would be required; consisting of 1715 (1200/0.70) for the national, 715 (500/0.70) for the regional, and 549 (384/0.70) for the local questionnaire.

4.3.4 ESTIMATED BUDGET

Materials required to undertake this proposed questionnaire were sourced and priced from Grand&Toy[®] (online office supply store), unless otherwise stated. It is the opinion of P. Clark that SPSS is the best available software package for data management and analysis of this type of information (personal communication, December 14, 2007), so the cost of purchasing this program has also been included. Because of the effect of in-kind incentives on response rates they are also included in the estimated budget. Due to time, equipment, and staffing constraints it is also recommended that a professional telephone survey company be hired to make initial contact with potential participants and generate the required mailing list.

It is estimated that completion of this project will cost approximately \$19,569.00 to \$29,781.00 to collect and compile this data (table 4.1). Since the cost of undertaking a questionnaire of this magnitude may be prohibitive to a single agency, it is suggested that financial support be solicited from organizations that support conservation efforts, capacity building, and knowledge sharing. These organizations could include the Southwest Nova Biosphere Reserve, the Canadian Amphibian and Reptile Conservation Network, national and provincial parks tasked with the protection of turtles, academic institutions, as well as community and not-for profit groups dealing with local turtle road mortality.

Table 4.1. An estimated cost for materials required to undertake a basic and complex sample size, and to complete analysis of proposed questionnaires.

Item	Item Description	Estimated Cost	
		Basic	Complex
Wage or salary	2 people @ \$20.00/h (internal resources)	\$3,200.00	\$2,400.00
Survey Company	if internal resources unavailable ^a	\$8,875.00	\$18,185.00
Paper & printing	questionnaire ^b	\$460.00	\$840.00
	reminder postcard ^c	\$450.00	\$540.00
Envelopes	(delivery)	\$120.00	\$240.00
	(return)	\$52.00	\$105.00
Address labels	(delivery)	\$30.00	\$30.00
Postage	(delivery at \$1.15)	\$1,265.00	\$2795.00
	(return at \$0.96)	\$1054.00	\$ 2332.00
	(reminder postcard)	\$527.00	\$1164.00
Incentives	FoK gift certificate	\$0	\$0
	sticker/magnet	\$200.00	\$400.00
	return incentive	\$500.00	\$250.00
Translation	french language	\$500.00	\$500.00
SPSS program	commercial edition ^d		\$2336.00
Total		\$19,569.00	\$29,781.00

^a sourced from Dimark Research Inc.

^b sourced from Kinko's printers (Halifax, NS) at a bulk student discount of \$0.04/page

^c sourced from Big Monkey Media (Halifax, NS)

^d sourced from the SPSS online store

5.0 DISCUSSION

5.1 EVALUATING THE TURTLE ZONE

Overall, physical measures to reduce motorist speed in the Turtle Zone were successful in reducing vehicle speeds, but motorists still exceeded posted maximum speed limits. Signs alone, (partial management) and signs and speed bumps together (full management) achieved significant speed reductions from the observed mean pre-management speed. Speed did not have a significant impact on motorist ability to observe adult and hatchling turtles on roads. Education significantly impacted motorist ability to observe hatchling turtles, but it did not significantly impact motorist ability to observe adult turtles. The results of this evaluation suggest that the current Turtle Zone mitigative strategy is

partially successful in meeting the defined conservation criteria. Again these goals were to ensure motorists: (1) understand both adult and hatchling turtles are found on roads within the Turtle Zones; (2) observe no fewer than 90% of adult turtles and 75% of hatchling turtles; and, (3) travel at no more than 20km/h under full management.

Motorists did understand that adult turtles are known to be found on or near roads in Kejimikujik. However, without specific education about hatchling turtles, many motorists were completely unaware of hatchling turtle presence on or near roads. The results of the model observation trial identify motorist knowledge and expectation of hatchling turtles on roads as a serious knowledge gap (conservation goal #1).

Conservation goal #2 was partially satisfied; again motorists were able to meet the goal for adult turtle observations but not hatchling turtle observations. Between 90.3% and 100% of motorists were able to observe $\geq 80\%$ (4 of 5) adult turtle models (figure 2 and figure 3), with mean adult observations between 92.2% and 96.6% (table 5.1). Conversely, between 0% and 57.1% of motorists were able to observe $\geq 70\%$ (7 of 10) hatchling models (figure 4 and figure 5), with mean hatchling observations between 2.3% and 61.4% (table 5.1). These results further highlight a knowledge gap in the strategies ability to educate motorists about hatchling turtles.

Table 5.1 Mean percent and standard deviation of the number of adult and hatchling model observations made at 20km/h and 40km/h, at two levels of education.

Treatment Group	Model Observations				
		Adult Models		Hatchling Models	
	<i>n</i>	M	SD	M	SD
20 km/h no Education	35	96.6%	9.0%	2.3%	9.7%
20 km/h with Education		95.45%	9.8%	61.4%	33.1%
40 km/h no Education	31	93.6%	9.6%	3.0%	1.8%
40 km/h with Education		92.2%	13.4%	54.2%	33.0%

Finally, the strategy failed to reduce vehicle speeds to the maximum posted speed of 20km/h (conservation goal #3), both during partial management and full management. Although speed did not make a significant impact on motorist ability to observe turtle models, the recognition that the required hatchling observation rate of 75% was not met suggests that maximum speed should remain at 20km/h. The results of the speed observations results also suggest that an intensification of both physical mitigative measures and direct motorist education is required.

Overall, the results of this study suggest that the Turtle Zone mitigative strategy could be successfully modified and used outside Kejimikujik in the greater biosphere reserve. Since education was such a successful component of the strategy in Kejimikujik, priority should be given to developing an educational campaign for areas of southwest Nova Scotia in need of turtle road mortality mitigation. Again conservation goals outside the park were to ensure motorists: (1) understand both adult and hatchling turtles are found on roads in designated areas; (2) observe no fewer than 90% of adult turtles; and, (3) be travelling at a speed that would allow them to make, and respond to, observations of adult turtles. Particular components of this alternate strategy such as how the Turtle Zone is delineated, how signage is designed and placed, and what kind of education will be most effective and appropriate will require careful consideration.

5.2 ENHANCING THE TURTLE ZONE

This evaluation identified where enhancements are required in Kejimikujik's Turtle Zone strategy, and thus where priorities should be focused. Priorities include increasing motorist awareness of hatchling turtles and reducing vehicle speed to 20km/h. A

heightened awareness and expectation in motorists about hatchling turtles on roads could (in part) be achieved by:

- seasonally modifying cautionary turtle signs to be hatchling specific during the fall management season, possibly with the application of black hatchling-sized (silhouette shaped) magnets to the current signs; and,
- continuing adult and hatchling road mortality specific messaging in the visitors guide.

Enhancements to achieve a maximum vehicle speed of 20km/h include:

- increasing the number of speed bumps, they are effective, relatively inexpensive, and easy for bicycles to cross;
- decrease the distance between speed bump intervals to 80m (from the current 95m), to address speeding between the speed bumps;
- increase the number of 20km/h signs to prompt motorists to remain at a constant slow speed within the zone, particularly where vehicles turn off the Main Road and onto the J-Line Road. Additionally, speed limit signs in the park can be enhanced by placing pictures of charismatic species, like the Blanding's turtle, on the signs (appendix 10, figures 10A and 10B). This measure has been used by several western mountain parks including Jasper National Park and Banff National Park; and,
- install an LED radar speed sign that will display approaching vehicle speed with programmable variable messaging including "Your Speed", "Slow Down", and a static "Speed Limit" (appendix 10, figure 10C). These signs can run off solar power or a rechargeable battery, as well as measure and record traffic data (traffic volume, time of travel, and vehicle speed).

General enhancements include:

- better delineating the Turtle Zone, possibly by painting the outer edge of the road surface red (or another attention grabbing colour), so that motorists are aware that they are driving in an area that requires continued caution;

- install permanent metal posts adjacent to speed bumps to prevent motorists from driving around speed bumps - these can use the same anchoring system as the signs do so that posts can be seasonally installed and removed;
- complete the proposed national, regional, and local questionnaires and use the data to design more effective and relevant social outreach and educational campaigns; and,
- post a large informative sign on the main park road before the Turtle Zone showing turtle specific information and pictures (D. Smith, personal communication, February 20, 2008). It may be useful to also post counts of both adult and hatchling mortality on the sign (J. McIsaac, personal communication, October 25, 2007). An example of such a large sign is provided in Appendix 10, figure 10D.

6.0 RECOMMENDATIONS FOR FUTURE ACTIONS

6.1 KEJIMKUJIK

In addition to the direct physical Turtle Zone enhancement recommendations made above, continued monitoring of the strategy and additional focused research is recommended. Using the evaluation methods outlined here during the spring Turtle Zone management season will provide a more accurate description of the success of the Turtle Zone, as well as identify areas of the strategy that may require further enhancement. It would also be useful to repeat the turtle model observation trials at 60km/h and 80km/h, enabling the Turtle Zone strategy to be tailored to the unique road conditions and driving behaviours that exist outside the park on provincial roads (and elsewhere in Canada). Additionally, by repeating the model observation trials (at 20, 40, 60 and 80km/h) while using different sized turtle models, it would allow for effective object size and vehicle speed combinations to be identified (D. Smith, personal communication, February, 20, 2008). A simple and important measure would be to start a formal record of the species,

age-class, and number of all road-killed turtles in the park. Although these recommended actions may not be directly applicable to Blanding's turtles in Kejimikujik, the park presents a unique opportunity to undertake research of this nature, which ultimately is useful to turtle populations elsewhere in North America.

A goal of the Turtle Zone management strategy should be to achieve and maintain a high level of education within Kejimikujik staff. More specifically park staff should have an enhanced understanding of:

- why it is important to adhere to the strategy themselves - uniformed staff and staff driving park vehicles are setting an example of 'acceptable' driving behaviour within the park;
- Blanding's turtle hatchling mortality is just as important as Blanding's turtle adult mortality; and,
- all turtle species are at risk of road mortality.

This could be achieved by dedicating a 'staff turtle day' to educate staff and set up seasonal displays in the VRC (D. Smith, personal communication, February 20, 2008). Providing staff with an incentive, such as a turtle shirt, would also help to educate and motivate staff to participate fully in the strategy. Additionally, because t-shirts would act as advertising to visitors they would also help staff themselves to commit to the strategy, as individuals desire to be seen by others as consistent (Mackenzie-Mohr & Smith, 1999). Seasonal VRC turtle displays could include a message board where nesting/emergence activity is regularly posted, a display at the reception counter with life size adult and hatchling models, and hatchling-sized removable static window-clings and messaging for the main entrance windows.

To further enhance visitor awareness of hatchling turtles on roads, a few parks vehicles can be seasonally ‘covered’ with hatchling size magnets as a mobile display. It may also be useful to develop permanent turtle installations throughout key areas of the park. These might include painting yellow adult and hatchling-size silhouettes on kiosk walls or the pavement beneath the kiosk window so that staff can easily bring visitor attention to the issue of turtles on roads.

6.2 SOUTHWEST NOVA SCOTIA AND BEYOND

This research project has shown that education is an essential requirement for the protection of wild freshwater turtles from road mortality. The proposed questionnaire could be a significant tool in identifying education priorities and barriers to public participation in a turtle conservation strategy. According to UNESCO “[t]he goal of education is to make people wiser, more knowledgeable, better informed, ethical, responsible, critical and capable of continuing to learn...Education, in short, is humanity's best hope and most effective means in the quest to achieve sustainable development” (UNESCO, 2007). For this reason an education plan to protect turtles from road mortality in the Southwest Nova Biosphere Reserve (SNBR) should be drafted along with a social-marketing strategy for its effective implementation.

Social marketing is part of the greater sustainability movement; it is defined as “the systematic application of marketing along with other concepts and techniques to achieve specific behavioural goals for a social good” (Mackenzie-Mohr & Smith, 1999). Community-based social marketing is an integrative approach to promote sustainable behaviours and encourage communities to come together to reach a common goal; and much like traditional marketing, it relies on media advertising to encourage behaviour

changes. Once knowledge gaps and public perceptions of turtle road mortality in the SNBR have been identified, appropriate, novel, and attention grabbing media sources can be utilized to expose the public to educational messaging. These might include:

- inviting television news stations to film a dramatic or theatrical event;
- organize a series of interactive radio interviews that include trivia (education in disguise), question call-in, and/or a contest;
- invite the children's show w00t! to interview motorists, turtles, and researchers (a child hosted Eastlink television ® children's program);
- advertise the "Give Turtles A Break" slogan in public spaces such as transit buses and terminals;
- develop rear-view mirror hangers displaying the turtle sign and "Give Turtles A Break" slogan, additionally these can be signed by motorists as a way of showing their commitment to the strategy; and,
- host interesting interpretive events at public libraries and in urban park spaces.

The idea that education is fundamental to sustainable behaviours, such as the protection of freshwater turtles from road mortality, is perhaps best described by the following statement from UNESCO (2007):

“[f]undamental social changes, such as those required to move towards sustainability, come about either because people sense an ethical imperative to change or because leaders have the political will to lead in that direction... Human societies are skilful at estimating risks, dangers and limitations. They are much less experienced in calculating their own potentialities: their capacities to invent, innovate, discover, reorganize, create, correct and improve. Societies need to be convinced [through education] of the need for sustainable development, in order to show their capacity to devise solutions to the problems confronting them”.

In short, conservation efforts require education to sustain effective protection.

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APPENDIX 1: GLOSSARY

Adult turtle – A sexually mature turtle. Turtles are considered to be adults if a) there is evidence of reproduction or external sexual characteristics (gravid, hemi-penis) and/or b) there is no evidence of new growth (no white midline, growth annuli worn, typical adult size). It is believed that sexual maturity occurs between 17 and 24 years of age in most Nova Scotia Blanding's turtles (Blanding's Turtle Recovery Team, 2003)

Critical habitat - The habitat that is necessary for the survival or recovery of a SARA listed species and that is identified as the species' critical habitat in a recovery strategy or action plan (Government of Canada, 2003)

Endangered species – A wildlife species that facing imminent extirpation or extinction (Government of Canada, 2003)

Hatchling turtle – A young turtle from the time it hatches from the egg (prior to emergence from the nest) until the onset of overwintering the following year (approx 0 to 14 months of age) (Blanding's Turtle Recovery Team, 2003)

Stewardship – the wide range of voluntary actions that Canadians take to care for the environment, ranging from conserving wild species and their habitats directly, to improving the quality of habitat by mitigating human impact. (Environment Canada, 2006)

Summering habitat – areas used by adults and juvenile turtles (immature adults) during summer. Beaver activity is present at most summer habitats and may provide important drought refuges (Blanding's Turtle Recovery Team, 2003)

Nesting habitat – areas where female turtles excavate their nests. Includes specific nesting sites and surrounding areas that are used as refuges by females and hatchlings (Blanding's Turtle Recovery Team, 2003)

Overwintering habitat – Includes specific sites where turtles spend the winter as well as surrounding areas frequented immediately prior to and after wintering. Turtles often densely aggregate in these sites and individually typically return to these same sites year after year (Blanding's Turtle Recovery Team, 2003)

APPENDIX 2: KEJIMKUJIK ROAD SAMPLING LOCATIONS

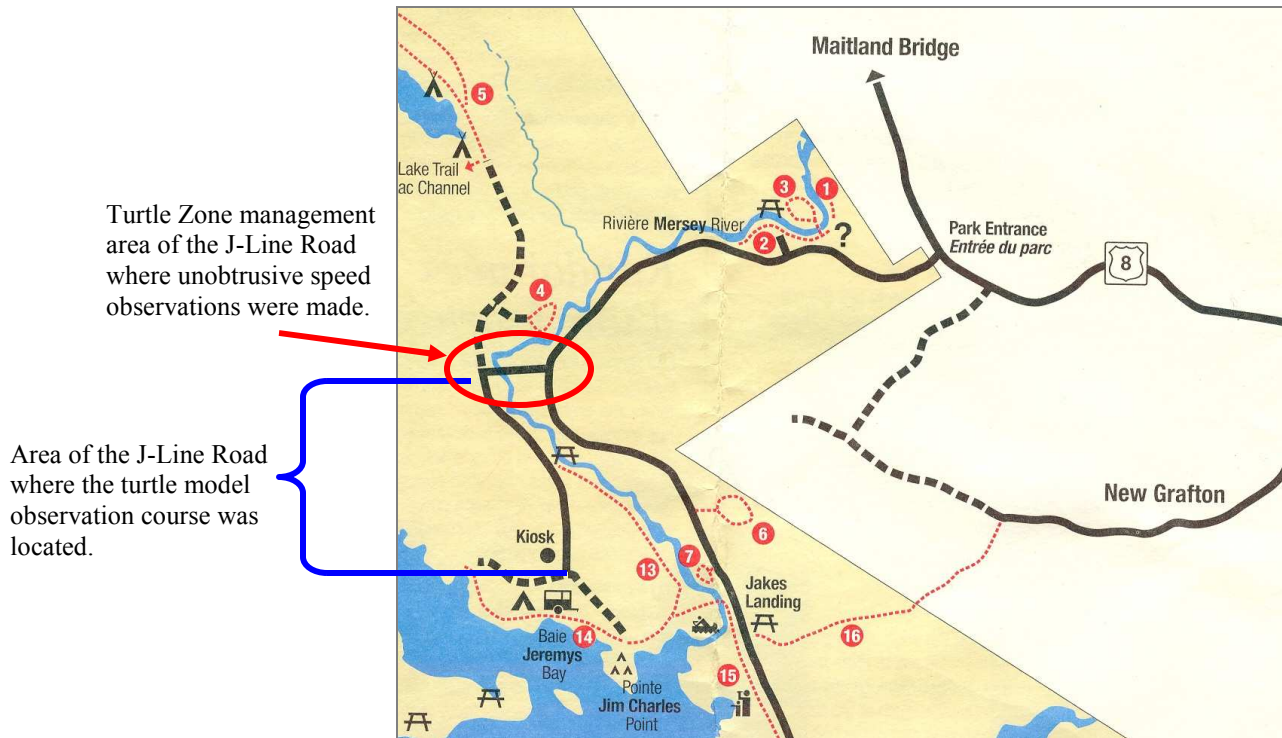


Figure 2A. Visitors map of Kejimikujik National Park and National Historic Site showing the main road from the park entrance to Jakes landing, the J-Line Road to Jeremys Bay campground is also shown. The area circled in red represents the location of the main Turtle Zone management area, as well as the location of unobtrusive observations of vehicle speed. The area outlined in blue represents the location of the turtle model observation course. Map by Parks Canada.

APPENDIX 3: TURTLE ZONE MANAGEMENT PHOTOS



Figure 3A: Cautionary “Attention Endangered Species Nesting Area” turtle sign. Photo by Heather Reed



Figure 3B: View of the approach to the J-Line Road Turtle Zone management area showing cautionary turtle sign, speed reduction sign (Maximum 20), and speed bump warning sign. Photo by Heather Reed



Figure 3C: View of a vehicle entering the J-Line Road Turtle Zone management area showing speed bumps (in front of vehicle) and an *Endangered* Blanding’s turtle nest and nest protection enclosure (to the left of the vehicle and red posts). Photo by Duncan Smith.

APPENDIX 4: STUDY LOCATION AND DESIGN

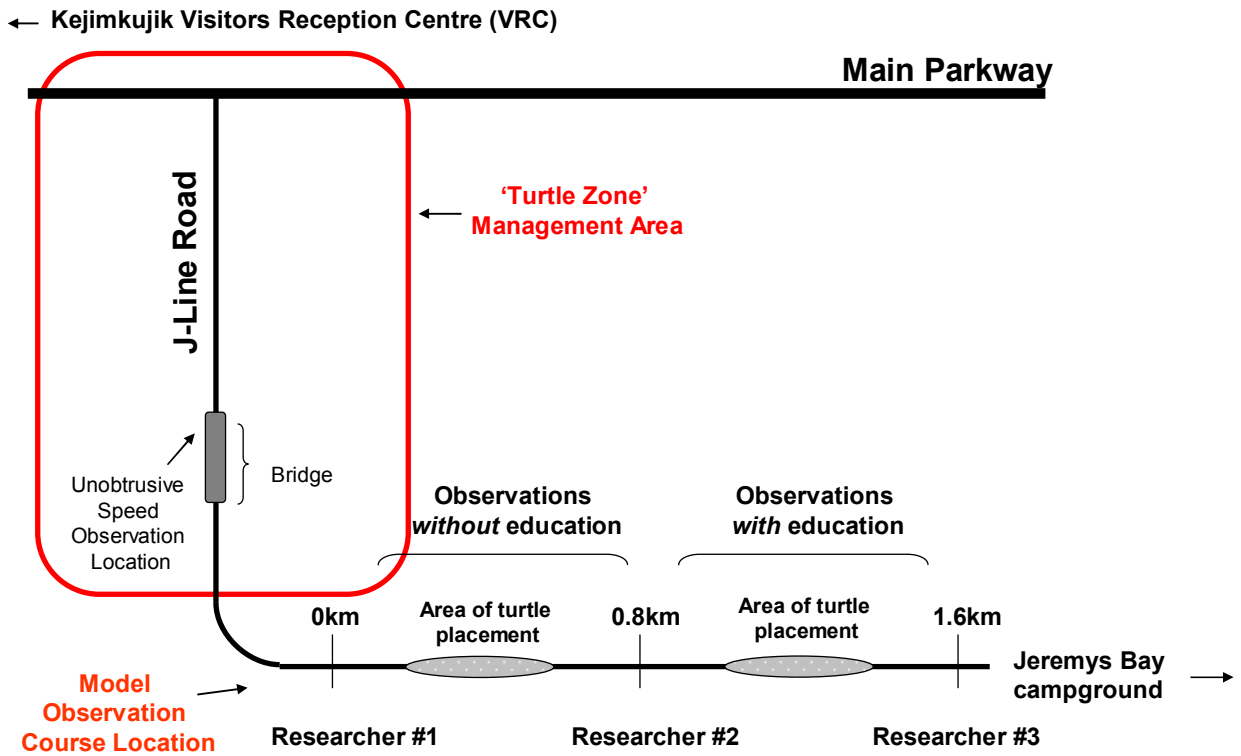


Figure 4A. Schematic representation of the location of unobtrusive speed observations on the J-Line Road. Also shown is the location and design of the turtle model observation trial course, revealing the location of turtle model placement and location of the researchers.

Appendix 5: Educational Turtle Model Observation Course Photos



↑ This is an adult Blanding's turtle on the road.

↓ This is a hatchling Blanding's turtle on the road.



* Photos are smaller than actual photos shown to participants.

ENVIRONMENTAL PROGRAMMES

FACULTY OF SCIENCE

DALHOUSIE UNIVERSITY

APPLICATION FOR ETHICS REVIEW OF RESEARCH INVOLVING HUMAN PARTICIPANTS

UNDERGRADUATE THESES AND IN NON-THESIS COURSE PROJECTS

GENERAL INFORMATION

1. **Title of Project:** *Enhancing Strategies to Reduce Turtle Mortality on Roads: Identifying Knowledge Gaps and Public Attitudes*

2. **Faculty Supervisor(s)** **Department** **Ext:** **e-mail:**
I don't have a faculty supervisor, my supervisor works at Kejimikujik National Park and National Historic Site.
- Dr. Stephen Flemming, Species at Risk Biologist and Ecosystem Scientist.
Species at Risk Recovery-Atlantic Service Centre, Parks Canada
Stephen.Flemming@pc.gc.ca 1(902) 682-2185
- Duncan Smith, MSc. (functional guidance) Species at Risk Stewardship Biologist,
Species at Risk Recovery-Atlantic Service Centre, Parks Canada
Duncan.Smith@pc.gc.ca 1(902) 682-7401

3. **Student Investigator(s)** **Department** **e-mail:** **Local Telephone Number:**
Heather Reed BSc. Environmental Science hreed@dal.ca 1(902) 448-5626

4. **Level of Project:**
Thesis Course Project [X] Undergraduate [] Graduate Specify course and number:
ENVS 4901

5. a. **Indicate the anticipated commencement date for this project:** **August 2007**
b. **Indicate the anticipated completion date for this project:** **February 2008**

SUMMARY OF PROPOSED RESEARCH

1. **Purpose and Rationale for Proposed Research**
Briefly describe the purpose (objectives) and rationale of the proposed project and include any hypothesis(es)/research questions to be investigated.

Kejimikujik National Park and National Historic Site (Kejimikujik) is home to the Endangered Blanding's turtle, and Blanding's turtle critical habitat. Unfortunately, these areas of critical turtle habitat are often bisected by anthropogenic disturbance such as roads. Kejimikujik currently employs a dual approach mitigative strategy to manage vehicle movement through critical turtle habitat, and it incorporates both technical measures (Turtle Zones) and social outreach and education. While the current strategy has been successful at both slowing motorists and increasing public awareness about turtles on roads, further investigation is essential. Required actions include exploration into the overall success of the strategy in achieving effective

protection for turtles from road mortality, as well as determination of how the strategy might be improved. With this in mind I propose to identify and investigate knowledge gaps and possible improvements to the current strategy, as well as identify public attitudes and perceptions of the issue of turtles and turtle road mortality. This research project will include three specific areas of investigation, each intended to address a piece of the current mitigative strategy identified as having potential knowledge gaps and/or room for improvement. These areas of investigation will include: 1. Determining if the current strategy achieves effective protection, by investigating how speed and education impact motorist observation of turtles on roads; 2. Identifying areas of the current strategy that require enhancement; and 3. Determining the current understanding and attitudes of Nova Scotians on the issues of turtles and turtle road mortality.

2. Methodology/Procedures

a. Which of the following procedures will be used? Provide a copy of all materials to be used in this study..

- Survey(s) or questionnaire(s) (mail-back)
- Survey(s) or questionnaire(s) (in person)
- Computer-administered task(s) or survey(s)]
- Interview(s) (in person)
- Interview(s) (by telephone)
- Focus group(s)
- Audio taping
- Videotaping
- Analysis of secondary data (no involvement with human participants)
- Unobtrusive observations
- Other, specify _____

b. Provide a brief, sequential description of the procedures to be used in this study. For studies involving multiple procedures or sessions, the use of a flow chart is recommended.

1. In August, before the fall Turtle Zone management season, I conducted a survey of the number of adult and hatchling turtle models participants were able to observe under varying levels of speed and turtle specific education.
2. From September through November I will conduct unobtrusive observations of motorist speeds through the Turtle Zone. This will involve obtaining motorist speed with the use of a speed radar gun from a hidden location.
3. In February I will write a questionnaire to determine public attitudes towards and perceptions of turtles and turtle road mortality, as well as a proposed methodology for Kejimkujik to implement the questionnaire in the future. I plan to pilot test the regional questionnaire (in southwest Nova Scotia) by conducting a small sample size pilot test (~50 participants) by telephone.

3. Participants Involved in the Study

a. Indicate who will be recruited as potential participants in this study.

- Dalhousie Participants: Undergraduate students
- Graduate students
- Faculty and/or staff
- Non-Dal Participants: Children
- Adolescents

- Adults
- Seniors
- Persons in Institutional Settings (e.g. Nursing Homes, Correctional Facilities)
- Other (specify) _____

b. Describe the potential participants in this study including group affiliation, gender, age range and any other special characteristics. If only one gender is to be recruited, provide a justification for this.

Participants will include adults who are driving on the Kejimkujik campground road. Both male and female drivers were included, but no attempt was made to differentiate groups by gender. Age of participants will include 16+ years of age (ie. legally eligible to hold a valid drivers license).

c. How many participants are expected to be involved in this study? _____

- 100 in the model observation survey
- 300 in the unobtrusive speed observation

4. Recruitment Process and Study Location

a. From what source(s) will the potential participants be recruited?

- Dalhousie University undergraduate and/or graduate classes
- Other Dalhousie sources (specify) _____
- Local School Boards
- Halifax Community
- Agencies
- Businesses, Industries, Professions
- Health care settings, nursing homes, correctional facilities, etc.
- Other, specify (e.g. mailing lists) Individuals driving on the Kejimkujik campground road.

b. Identify who will recruit potential participants and describe the recruitment process.

Provide a copy of any materials to be used for recruitment (e.g. posters(s), flyers, advertisement(s), letter(s), telephone and other verbal scripts).

- Duncan Smith was responsible for recruiting participants for the turtle model observation survey, as he is a Kejimkujik Park employee. Potential participants driving on the campground road were slowed through the use of official Department of Transportation traffic control person signs (slow/stop sign paddles, orange safety pylons, safety vest), and asked if they would like to participate in a research project being conducted in the Park. If they chose not to participate they were waved through, if they chose to participate they were asked to initial a form indicating they were voluntarily participating, that they understood no information identifying them or their vehicle was collected, and that they were guaranteed confidentiality. (Please see attached form)
- I am responsible for 'recruiting' participants in the unobtrusive speed observation, individuals were chosen if they drove onto the campground road from the direction of the Park entrance.

- I will be recruiting participants into the regional survey questionnaire pilot test by calling individuals at random out of several regional phonebooks. Individuals will be asked if they would like to participate.

5. Compensation of Participants

Will participants receive compensation (financial or otherwise) for participation? Yes [] No [X]

If Yes, provide details:

6. Feedback to Participants

Briefly describe the plans for provision of feedback and attach a copy of the feedback letter to be used. *Wherever possible, written feedback should be provided to study participants including a statement of appreciation, details about the purpose and predictions of the study, contact information for the researchers, and the ethics review and clearance statement.*

Note: When available, a copy of an executive summary of the study outcomes also should be provided to participants.

Participants were advised that this project would be completed by the spring of 2008, and that if they would like further information about the project and its conclusions they should contact Park staff, and/or Duncan Smith in the Species at Risk office. Since no information identifying specific individuals was or will be collected (in order to guarantee confidentiality) there is no way for me to contact participants at the conclusion of this project. However, since this project is occurring in a National Park, participants do know whom to contact if they would like further information.

POTENTIAL BENEFITS FROM THE STUDY

1. Identify and describe any known or anticipated direct benefits to the participants from their involvement in the project.

- Since Kejimikujik has a high rate of repeat visits by local people, it is anticipated that these individuals may benefit from feeling that their participation is helping the Park, and that they are able to "give back" to the Park.

2. *Identify and describe any known or anticipated benefits to society from this study.*

- The residents of southwest Nova Scotia live in a UNESCO Biosphere Reserve, of which Kejimikujik National Park and National Historic Site is a part. Local residents, Park visitors, and society in general stand to gain from the increased protection of an endangered species, and increased awareness of the risks that everyday activities (ie. Driving) poses to species at risk, and all wildlife on Canadian roads. I anticipate that inquiry into both the technical and social aspects of this problem, and its solutions, will allow me to offer effective solutions to the issues of wildlife road mortality and public safety from wildlife collisions.

POTENTIAL RISKS TO PARTICIPANTS FROM THE STUDY

1. For each procedure used in this study, provide a description of any known or anticipated risks/stressors to the participants. Consider physiological, psychological, emotional, social, economic, legal, etc. risks/stressors

No known or anticipated risks

Explain why no risks are anticipated:

No risks are anticipated because all participation was/is on a voluntary basis, and no personal information was/is being collected. Although motorists were required to change their driving behavior, it was only to slow down their vehicle speed to either 20km/h or 40 km/h (in a 60km/h zone). In addition, no questions regarding risky or illegal behavior will be asked in the regional questionnaire pilot test.

Minimal risk

Description of risks:

Greater than minimal risk

Description of risks:

2. Describe the procedures or safeguards in place to protect the physical and psychological health of the participants in light of the risks/stresses identified in Question 1.

No risks are anticipated because all participation was/is on a voluntary basis, and no personal information was/is being collected.

INFORMED CONSENT PROCESS

Refer to: <http://pre.ethics.gc.ca/english/policystatement/section2.cfm>

1. What process will be used to inform the potential participants about the study details and to obtain their consent for participation?

~~Information letter~~ Verbal information with written consent form; provide a copy

Information letter with verbal consent; provide a copy

Information/cover letter; provide a copy

2. If written consent cannot be obtained from the potential participants, provide a justification.

N/A

ANONYMITY OF PARTICIPANTS AND CONFIDENTIALITY OF DATA

1. Explain the procedures to be used to ensure anonymity of participants and confidentiality of data both during the research and in the release of the findings.

No personal information was collected; participants were made aware of this and signed a form agreeing to this.

2. Describe the procedures for securing written records, questionnaires, video/audio tapes and electronic data, etc.

All recorded data (on paper) is being stored in an unmarked file at my personal residence. It is assumed that this is not a problem since no personal information is connected to the

collected data. Speeds for the unobtrusive observation are recorded in a spreadsheet on my personal computer, and again there is no personal information connected to this data.

3. Indicate how long the data will be securely stored, the storage location, and the method to be used for final disposition of the data.

- Paper Records**
- Confidential shredding after _____ years
- Data will be retained indefinitely in a secure location
- Data will be retained until completion of specific course.

- Audio/Video Recordings

- Erasing of audio/video tapes after _____ years
- Data will be retained indefinitely in a secure location
- Data will be retained until completion of specific course.
- Electronic Data

- Erasing of electronic data after _____ years

- Data will be retained indefinitely in a secure location
- Data will be retained until completion of specific course.

Specify storage location: The data will be kept in files at my personal residence.

ATTACHMENTS

Please **check** below all appendices that are attached as part of your application package:

- Recruitment Materials:** A copy of any poster(s), flyer(s), advertisement(s), letter(s), telephone or other verbal script(s) used to recruit/gain access to participants.
- Information Letter and Consent Form(s).** Used in studies involving interaction with participants (e.g. interviews, testing, etc.)
- Information/Cover Letter(s).** Used in studies involving surveys or questionnaires.
- Parent Information Letter and Permission Form for studies involving minors.
- Materials:** A copy of all survey(s), questionnaire(s), interview questions, interview themes/sample questions for open-ended interviews, focus group questions, or any standardized tests used to collect data.

SIGNATURES OF RESEARCHERS	
Heather Reed	November 02, 2007
_____ Signature of Student Investigator(s)	_____ Date

FOR ENVIRONMENTAL PROGRAMMES USE ONLY:

Ethics proposal been checked for eligibility according to the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans

Signature

Date

Approval received November 20, 2007.

APPENDIX 7: VOLUNTEER RECRUITMENT AND DATA RECORD SHEET

Researcher #1 participant “recruitment script”:

“Hi, welcome to Kejimikujik, would you like to volunteer to participate in a research project, it will only take about 4 minutes of your time, and all you’ll have to do is drive 20 km/h (or 40km/h depending on the treatment group) for the next 0.8km until you see a researcher on the side of the road dressed just like me (in a bright orange vest). She’ll have 2 questions for you, there are no wrong answers, and she’ll send you on your way...Participation is completely voluntary, and we don’t collect any information about you or your vehicle so your confidentiality is guaranteed. Please initial ‘here’ and take this slip to her. Thank you very much”!

Data record sheet:

I _____ (initials only) acknowledge that I am voluntarily participating in this trial, my name and vehicle identifiers are not being recorded, and that I have been guaranteed confidentiality. Thanks for your participation!			
Date:		Time:	
Designated Speed:	km/h	-----	Initials
*O-1:	*A	*H	
*O-2:	*A	*H	

*A= Adult turtles, H=Hatchling turtles; O-1=Observations in section 1, O-2= Observations in section 2

Researcher #2 script:

“Hi, did you happen to see any wildlife on the road? About how many adults and how many hatchlings did you see?”

- This information was recorded on the above sheet. The participants were then shown a picture of what adult and hatchling turtles looked like on the road (Appendix 5).

“This is what an adult and hatchling turtles look like on the road. Adults are easier to spot because of their size, but hatchling turtles are only the size of a toonie coin! Turtles can be on the road at anytime, and we’re expecting to see our hatchlings begin to emerge from nests in the Park in the next 10-14 days so keep your eyes open while your in the Turtle Zones! Please continue driving at your designated speed (20km/h or 40 km/h) for another 0.8km until you see another researcher dressed like me (in a bright orange vest) at the side of the road. She’ll have 2 more questions for you, and then you’re all done. Please take this slip to her. Thank you very much for participating”!

Researcher #3 script:

“Hi, did you happen to see any wildlife on the road? About how many adults and how many hatchlings did you see?”

- This information was recorded on the above sheet.

“You’re all done, thanks a lot for your time. If you’re interested in getting information about this research project, please contact Duncan Smith (provided email or phone number if requested) or any Parks staff and they will be able to help you. Thanks again for your time”.

APPENDIX 9: QUESTION RATIONAL

Questionnaire			Question Rational
National	Regional	Local	
1	1	1	Easy introductory question, can compare perception of how common wildlife is to perception of how common turtles are
-	2	2	Test knowledge and awareness of the capacity of regional protected areas
2	3	3	Measure importance placed on protection of turtles with respect to other flora & fauna
3	4	4	Measure support for protection of turtles with respect to other flora & fauna
4	5	5	Introduce road mortality; measure attitudes towards taking further action to protect wildlife from road mortality (compare with #17/18/21)
5	6	6	Determine attitude of concern for road mortality as a threat to wildlife
6	7	7	Test knowledge about the prevalence of turtles (compare to #1)
7	8	8	Test knowledge of how rare turtles are in the wild
8, 9	9	9	Test knowledge of where turtles can be found
-	-	10	Test knowledge of adult turtle size, success of park outreach (important with respect to comments received during model observations)
-	-	11	Test knowledge of hatchling turtle size, success of park outreach (important with respect to comments received during model observations)
10	10	12	Test knowledge of impacts to turtles, and determine perception of level of risk impacts pose
-	11	13	Test knowledge of turtle species
11	12	14	Determine attitudes and perceptions surrounding turtles
12	13	15	Test knowledge of turtle behaviour
13	14	16	Test knowledge of turtle behaviour
14	15	17, 18	Determine attitudes and reported driving behaviours with respect to turtles
15	16	19	Test knowledge of turtle behaviour
16	17	20	Test knowledge of turtle behaviour, identify a possible key point of future education
17	18	21	Measure attitudes towards taking further action to protect turtles from road mortality (compare with # 4/5/5)
18	19	22	Measure willingness to participate in mitigative strategies when no physical measures are involved
19	20	23	Determine attitudes towards mitigative strategies
20	21	24	Measure perception of others willingness to participate in mitigative strategies
21	22	25	Measure willingness to participate in mitigative strategies
22	23	26	Determine attitude towards the use of physical mitigation
23	24	27	Determine perception of commitment towards SAR research and recovery, identify a possible key point of future education
-	-	28	Measure attitudes towards taking further action to protect wildlife from road mortality (Compare to # 4/5/5 and #17/18/21)
-	-	29	Determine exposure to mitigative strategy within Kejimkujik
-	-	30	Determine exposure to mitigative strategy within Kejimkujik
-	-	31	Determine exposure to mitigative strategy within Kejimkujik
-	-	32	Determine exposure to mitigative strategy within Kejimkujik

National	Regional	Local	Question Rational
-	-	33	Determine exposure to mitigative strategy within Kejimkujik
24	25	34	Determine interpretation of road sign
Questionnaire			Question Rational
National	Regional	Local	
-	-	35	Measure willingness to participate in mitigative strategies and attitude towards the use of physical mitigation in Kejimkujik (compare to #22/23/26)
25	26	36	Determine perception of the effectiveness of education
26	27	37	Determine perception of effective education, can be used to prioritize investment of education and outreach
-	-	38	Measure attitudes towards 'local' mitigation (willingness to participate), compare to attitudes/willingness outside park
-	-	39	Determine exposure to volunteer programs, identify if volunteers are different than the rest of the population
-	-	40	Test knowledge/perception of 'SAR'
27	28	41	Demographic: gender
28	29	42	Demographic: age
29	30	43	Demographic: driver or non-driver
30	31	44	Demographic: geographic location

APPENDIX 10: ADDITIONAL MANAGEMENT SIGNS



Figure 10A. View of an example of a Traffic Logix radar speed sign displaying the “Your Speed” variable sign. Photo by Traffic Logix.



Figure 10B . View of an in-situ radar speed sign displaying the “Slow Down” variable sign. Photo by Traffic Logix.



Figure 10C. An example of a speed reduction sign used in Canada’s mountain National Parks. The signs display species affected by road mortality and is accompanied by a “Drive as if their life depends on it” tag line found in the mountain parks visitor guide. Photo by Parks Canada.



Figure 10D. An example of a ‘Bear at Risk’ sign used in Canada’s mountain National Parks. The signs are used to remind motorists to be observant while driving and is accompanied by information in the mountain parks visitor guide. Photo by Parks Canada.

REGIONAL QUESTIONNAIRE – Six counties in southwest Nova Scotia and HRM

General knowledge and attitude questions:

*These first few questions are about wildlife and protected areas in Nova Scotia. Please choose the answer that you feel **best** represents your opinion.*

1. In your opinion, how common is the presence of wildlife in Nova Scotia?
 - a. Very common
 - b. Common
 - c. Uncommon
 - d. Very uncommon
 - e. Not sure

2. In your opinion, what is the largest protected nature area in Southwest Nova Scotia?
 - a. Tobeatic Wilderness Reserve
 - b. Kejimikujik National Park and National Historic Site
 - c. Southwest Nova Biosphere Reserve
 - d. Other _____
 - e. Not sure

3. The following is a list of wildlife found in southwest Nova Scotia. *In your opinion, how important it is to protect each plant or animal?* Please rate each one on a scale of 1 to 7, where (1) is *not very important* to protect, and (7) is *very important* to protect. Circle your answers.

	<i>Not very important</i>			<i>Very important</i>			
Large mammals such as the moose	1	2	3	4	5	6	7
Small mammals such as the squirrel	1	2	3	4	5	6	7
Birds such as the owl	1	2	3	4	5	6	7
Reptiles such as the turtle	1	2	3	4	5	6	7
Insects such as the butterfly	1	2	3	4	5	6	7
Plants such as wild flowers	1	2	3	4	5	6	7

4. The following list again contains wildlife found in southwest Nova Scotia. *In your opinion, do Nova Scotians support the protection of each plant or animal?* Please rate each one on a scale of 1 to 7, where (1) is *not very supportive*, and (7) is *very supportive*. Please circle your answers.

	<i>Not very supportive</i>			<i>Very supportive</i>			
Large mammals such as the moose	1	2	3	4	5	6	7
Small mammals such as the squirrel	1	2	3	4	5	6	7
Birds such as the owl	1	2	3	4	5	6	7
Reptiles such as the turtle	1	2	3	4	5	6	7
Insects such as the butterfly	1	2	3	4	5	6	7
Plants such as wild flowers	1	2	3	4	5	6	7

5. How strongly do you agree with the statement “*enough is being done to protect wildlife from being killed on Nova Scotia’s roadways*”?
 - a. Strongly agree
 - b. Agree
 - c. No opinion
 - d. Disagree
 - e. Strongly disagree

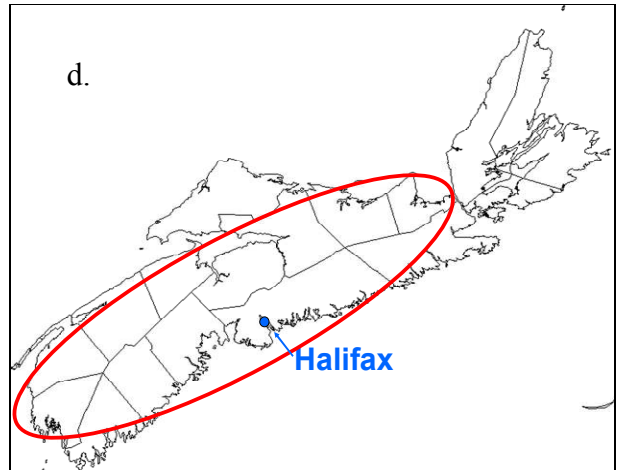
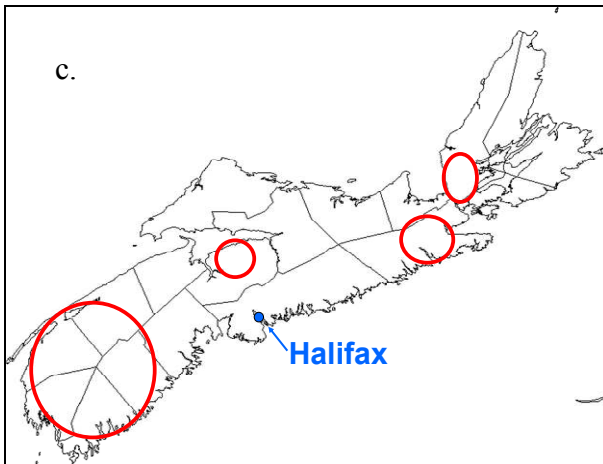
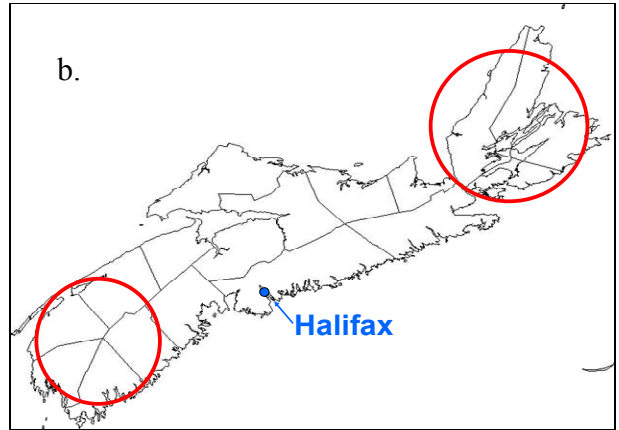
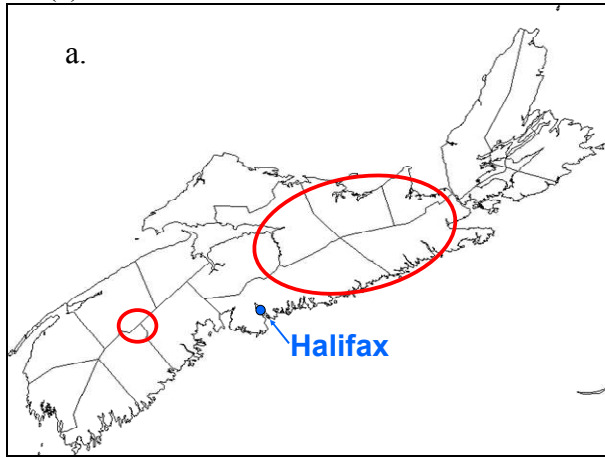
6. How strongly do you agree with the statement “*Nova Scotians are concerned about the loss of wildlife from vehicle collisions*”?
- Strongly agree
 - Agree
 - No opinion
 - Disagree
 - Strongly disagree

Turtle specific questions:

*The next few questions are about wild freshwater turtles in Nova Scotia. Please choose the answer that you feel **best** represents your opinion.*

7. In your opinion, how common are wild freshwater turtles in Nova Scotia?
- Very common
 - Common
 - Uncommon
 - Very uncommon
 - Not sure
8. In your opinion, what condition are wild freshwater turtle populations in (in Nova Scotia)?
- Populations are increasing
 - Populations are stable
 - Populations are decreasing
 - Not sure

9. There are four (4) maps of Nova Scotia provided below. Regions of each map are highlighted with red circles. Please choose the map that you feel highlights the area or areas of Nova Scotia that are **most** likely to contain wild freshwater turtles. If you are not sure, please choose option (e) below.



e. Not sure

10. The following is a list of impacts that pose risks to the survival of turtles in Nova Scotia. Please rank these risks in the order that you feel represents the (1) greatest risk to (6) least risk to the survival of turtles in Nova Scotia.

- Industry (forestry, mining, etc.) _____
- Predators' _____
- Roads and vehicles _____
- Climate change _____
- Poaching _____
- Cottage/housing development _____

11. Please rate how common the following species of turtle are in Nova Scotia:

	Very common	Common	Not very common	Not sure
Painted turtle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mirabilis turtle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wood turtle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Blanding's turtle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Snapping turtle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. The following is a list of statements that describe feelings about turtles. How strongly do these statements reflect your feelings about turtles?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
a. I am fond of turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. I am interested in turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Turtles are disgusting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. I am curious about turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. I am afraid of turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Turtles are harmless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. I dislike turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. I am indifferent towards turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Turtles are special	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Turtles are dangerous	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Turtle and road specific questions:

*Freshwater turtles are sometimes observed on or near roads. The next few questions are about turtles and roads. Please choose the answer that you feel **best** represents your opinion.*

13. In your opinion, for what reason would you most expect to see a freshwater turtle on or near a road?

- a. Habitat disturbance
- b. Nest digging
- c. Food searching
- d. Predator escape
- e. Not sure

14. In your opinion, what time of year would you most expect to see a freshwater turtle on or near a road?

- a. Spring and summer
- b. Spring, summer and fall
- c. Spring and fall
- d. Summer and fall
- e. All year long
- f. Not sure

15. If you were driving and you saw a turtle on the road, what would you most likely do?

- a. Ignore it
- b. Drive around it
- c. Drive slower
- d. Stop and try to move it
- e. Other _____

16. In your opinion, what gender of freshwater turtle is most likely to be on a road?
- Adult Male
 - Adult Female
 - Hatchling (with no identifiable gender)
 - All of the above
 - Not sure
17. How strongly do you agree with the statement “*each female turtle is important to the overall survival of turtles in Nova Scotia*”?
- Strongly agree
 - Agree
 - No opinion
 - Disagree
 - Strongly disagree
18. How strongly do you agree with the statement “*enough is being done to protect freshwater turtles from being killed on Nova Scotia’s roadways*”?
- Strongly agree
 - Agree
 - No opinion
 - Disagree
 - Strongly disagree

Road mortality mitigation specific questions:

Freshwater turtles are sometimes hit and killed by vehicles. The next few questions ask about your attitudes towards turtle road mortality. Please choose the answer that you feel best represents your view.

19. How strongly do you agree with the statement “*if signs warned drivers that there may be turtles on the road ahead they would slow down*”?
- Strongly agree
 - Agree
 - No opinion
 - Disagree
 - Strongly disagree
20. How strongly do you agree with the statement “*to protect freshwater turtles, vehicle speed should be seasonally reduced in areas where freshwater turtles are known to cross roads*”?
- Strongly agree
 - Agree
 - No opinion
 - Disagree
 - Strongly disagree

21. In your opinion, if the speed limit was 80km/h, how willing do you think drivers in Nova Scotia would be to slow down to ___ km/h to protect turtles? *Please choose one answer for each section (a), (b), and (c) by checking the appropriate boxes with an “X”.*

	Very willing	Willing	Not willing or unwilling	Unwilling	Very unwilling
a. Slow to 65 km/h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Slow to 55 km/h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Slow to 45 km/h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22. In your opinion, if the speed limit was 80km/h, how willing do you think you would be to slow down to ___ km/h to protect turtles? *Please choose one answer for each section (a), (b), and (c) by checking the appropriate boxes with an “X”.*


	Very willing	Willing	Not willing or unwilling	Unwilling	Very unwilling
a. Slow to 65 km/h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Slow to 55 km/h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Slow to 45 km/h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. In your opinion, if temporary speed reductions protected freshwater turtles, how appropriate would it be to use speed bumps in designated areas to reduce speeds?

- a. Very appropriate
- b. Appropriate
- c. No opinion
- d. Inappropriate
- e. Very Inappropriate

24. In your opinion, how willing do you think the following groups are to support endangered species research and recovery, even though it requires significant cost and effort? *Please choose one answer for each section (a) through (f) by checking the appropriate boxes with an “X”.*

	Very willing	Willing	Not willing or unwilling	Unwilling	Very unwilling
a. Federal government	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Provincial government	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Municipal governments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Non-profit organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Canadians	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Nova Scotians	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Yourself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

25. What is this sign telling you? 

- a. There are turtles on the road ahead
- b. Stop if you see a turtle on the road ahead
- c. There is a wildlife viewing opportunity ahead
- d. Pull off the road if you see a turtle
- e. Drive with caution there may be turtles on the road



26. In your opinion, would more education help people understand how to reduce turtle mortality on roads?

- a. Yes
- b. No
- c. Not sure

27. In your opinion, what is the most effective to help educate people how to reduce turtle mortality on roads? *Please rank the 3 most effective options in the order that you feel represents the (1) least effective, to (3) most effective method.*

- Pamphlet
- TV advertisements
- Radio announcements
- Newspaper article/ announcement
- Interpretive programming (local survey only)
- Large road signs
- Booth at community events
- Other _____

Demographic questions:

These last few questions help us to learn how representative participants in this study are of the population in Nova Scotia.

28. Are you:

- a. Female
- b. Male

29. Are you:

- a. 16 – 25
- b. 26 – 35
- c. 36 – 45
- d. 46 – 55
- e. 56 – 65
- f. over 65

30. Do you have a valid drivers licence, or have you held a valid drivers licence in the past?

- a. Yes
- b. No

31. In which province or territory is your primary residence located in? *Please choose only one by checking the appropriate box with an “X”.*

- | | | |
|--|---|--|
| <input type="checkbox"/> Newfoundland and Labrador | <input type="checkbox"/> Ontario | <input type="checkbox"/> Yukon |
| <input type="checkbox"/> Nova Scotia | <input type="checkbox"/> Manitoba | <input type="checkbox"/> Northwest Territories |
| <input type="checkbox"/> Prince Edward Island | <input type="checkbox"/> Saskatchewan | <input type="checkbox"/> Nunavut |
| <input type="checkbox"/> New Brunswick | <input type="checkbox"/> Alberta | <input type="checkbox"/> USA |
| <input type="checkbox"/> Quebec | <input type="checkbox"/> British Columbia | <input type="checkbox"/> Other _____ |

Would you be interested in obtaining more information about Nova Scotia's species at risk and a free field guide to Nova Scotia's Species at Risk? If yes, please include your email address here. This will ONLY be used to contact you with the specific information you have requested.

Email: _____

Do you have any other questions or comments? We encourage you to share your views and any praise or criticisms you may have about wildlife and wildlife protection in Nova Scotia.

Thank you very much for your participation. If you would like more information about this study, or if you would like to see the results of this study, please feel free to contact...

NATIONAL QUESTIONNAIRE – 8 Canadian provinces (NS, NB, QU, ON, MB, SK, AB, BC)

General knowledge and attitude questions:

*These first few questions are about wildlife and protected areas in Canada. Please choose the answer that you feel **best** represents your opinion.*

1. In your opinion, how common is the presence of wildlife in Canada?
 - a. Very common
 - b. Common
 - c. Uncommon
 - d. Very uncommon
 - e. Not sure

2. The following is a list of wildlife found in Canada. In your opinion, *how important it is to protect each plant or animal?* Please rate each one on a scale of 1 to 7, where (1) is *not very important* to protect, and (7) is *very important to protect*. Please circle your answers.

	<i>Not very important</i>							<i>Very important</i>							
Large mammals such as the moose	1	2	3	4	5	6	7		1	2	3	4	5	6	7
Small mammals such as the squirrel	1	2	3	4	5	6	7		1	2	3	4	5	6	7
Birds such as the owl	1	2	3	4	5	6	7		1	2	3	4	5	6	7
Reptiles such as the turtle	1	2	3	4	5	6	7		1	2	3	4	5	6	7
Insects such as the butterfly	1	2	3	4	5	6	7		1	2	3	4	5	6	7
Plants such as wild flowers	1	2	3	4	5	6	7		1	2	3	4	5	6	7

3. The following list again contains wildlife found in Canada. *In your opinion, do Nova Scotians support the protection of each plant or animal?* Please rate each one on a scale of 1 to 7, where (1) is *not very supportive*, and (7) is *very supportive*. Please circle your answers.

	<i>Not very supportive</i>							<i>Very supportive</i>							
Large mammals such as the moose	1	2	3	4	5	6	7		1	2	3	4	5	6	7
Small mammals such as the squirrel	1	2	3	4	5	6	7		1	2	3	4	5	6	7
Birds such as the owl	1	2	3	4	5	6	7		1	2	3	4	5	6	7
Reptiles such as the turtle	1	2	3	4	5	6	7		1	2	3	4	5	6	7
Insects such as the butterfly	1	2	3	4	5	6	7		1	2	3	4	5	6	7
Plants such as wild flowers	1	2	3	4	5	6	7		1	2	3	4	5	6	7

4. How strongly do you agree with the statement “*enough is being done to protect wildlife from being killed on Canada’s roadways*”?
 - a. Strongly agree
 - b. Agree
 - c. No opinion
 - d. Disagree
 - e. Strongly disagree

5. How strongly do you agree with the statement “*Canadians are concerned about the loss of wildlife from vehicle collisions*”?
- Strongly agree
 - Agree
 - No opinion
 - Disagree
 - Strongly disagree

Turtle specific questions:

*The next few questions are about wild freshwater turtles in Canada. Please choose the answer that you feel **best** represents your opinion.*

6. In your opinion, how common are wild freshwater turtles in Canada?
- Very common
 - Common
 - Uncommon
 - Very uncommon
 - Not sure
7. In your opinion, what condition are wild freshwater turtle populations in (in Canada)?
- Populations are increasing
 - Populations are stable
 - Populations are decreasing
 - Not sure
8. Where in Canada would you *most* expect to find wild freshwater turtles? *Please check the appropriate boxes with an “X”.*
- Atlantic provinces (NS, NB)
 - Eastern provinces (ON, QU)
 - Central provinces (MB, SK)
 - Western provinces (AB, BC)
 - All of the above
 - None of the above
 - Not sure
9. Where in Canada would you *least* expect to find wild freshwater turtles? *Please check the appropriate boxes with an “X”.*
- Atlantic provinces (NS, NB)
 - Eastern provinces (ON, QU)
 - Central provinces (MB, SK)
 - Western provinces (AB, BC)
 - All of the above
 - None of the above
 - Not sure

10. The following is a list of impacts that pose risks to the survival of turtles in Canada. *Please rank these risks in the order that you feel represents the (1) greatest risk to (6) least risk to the survival of turtles in Canada.*

- Industry (forestry, mining, etc.) _____
- Predators' _____
- Climate change _____
- Roads and vehicles _____
- Poaching _____
- Cottage/housing development _____

11. The following is a list of statements that describe feelings about turtles. *How strongly do these statements reflect your feelings about turtles? Please check the appropriate boxes with an "X".*

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
a. I am fond of turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. I am interested in turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Turtles are disgusting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. I am curious about turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. I am afraid of turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Turtles are harmless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. I dislike turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. I am indifferent towards turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Turtles are special	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Turtles are dangerous	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Turtle and road specific questions:

*Freshwater turtles are sometimes observed on or near roads. The next few questions are about turtles and roads. Please choose the answer that you feel **best** represents your opinion.*

12. In your opinion, for what reason would you most expect to see a freshwater turtle on or near a road?

- a. Habitat disturbance
- b. Nest digging
- c. Food searching
- d. Predator escape
- e. Not sure

13. In your opinion, what time of year would you most expect to see a freshwater turtle on or near a road?

- a. Spring and summer
- b. Spring, summer and fall
- c. Spring and fall
- d. Summer and fall
- e. All year long
- f. Not sure

14. If you were driving and you saw a turtle on the road, what would you most likely do?
- Ignore it
 - Drive around it
 - Drive slower
 - Stop and try to move it
 - Other _____
15. In your opinion, what gender of freshwater turtle is most likely to be on a road?
- Adult Male
 - Adult Female
 - Hatchling (no identifiable gender)
 - All of the above
 - Not sure
16. How strongly do you agree with the statement “*each female turtle is important to the overall survival of turtles in Canada*”?
- Strongly agree
 - Agree
 - No opinion
 - Disagree
 - Strongly disagree
17. How strongly do you agree with the statement “*enough is being done to protect wild freshwater turtles from being killed on Canada’s roadways*”?
- Strongly agree
 - Agree
 - No opinion
 - Disagree
 - Strongly disagree

Road mortality mitigation specific questions:

Freshwater turtles are sometimes hit and killed by vehicles. The next few questions ask about your attitudes towards turtle road mortality. Please choose the answer that you feel best represents your view.

18. How strongly do you agree with the statement “*if signs warned drivers that there may be turtles on the road ahead they would slow down*”?
- Strongly agree
 - Agree
 - No opinion
 - Disagree
 - Strongly disagree

19. How strongly do you agree with the statement “to protect freshwater turtles, vehicle speed should be seasonally reduced in areas where freshwater turtles are known to cross roads”?

- a. Strongly agree
- b. Agree
- c. No opinion
- d. Disagree
- e. Strongly disagree

20. In your opinion, if the speed limit was 80km/h, how willing do you think Canadian drivers would be to slow down to ___km/h to protect turtles? Please choose one answer for each section (a), (b), and (c) by checking the appropriate boxes with an “X”.

	Very willing	Willing	Not willing or unwilling	Unwilling	Very unwilling
a. Slow to 65 km/h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Slow to 55 km/h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Slow to 45 km/h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. In your opinion, if the speed limit was 80km/h, how willing do you think you would be to slow down to ___km/h to protect turtles? Please choose one answer for each section (a), (b), and (c) by checking the appropriate boxes with an “X”.


	Very willing	Willing	Not willing or unwilling	Unwilling	Very unwilling
a. Slow to 65 km/h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Slow to 55 km/h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Slow to 45 km/h	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22. In your opinion, if temporary speed reductions protected freshwater turtles, how appropriate would it be to use of speed bumps in designated areas to reduce speeds?

- a. Very appropriate
- b. Appropriate
- c. No opinion
- d. Inappropriate
- e. Very Inappropriate

23. In your opinion, how willing do you think the following groups are to support endangered species research and recovery, even though it requires significant cost and effort? Please choose one answer for each section (a) through (f) by checking the appropriate boxes with an “X”.

	Very willing	Willing	Not willing or unwilling	Unwilling	Very unwilling
a. Federal government	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Provincial government	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Municipal governments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Non-profit organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Canadians	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Nova Scotians	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Yourself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

24. What is this sign telling you? 
- a. There are turtles on the road ahead
 - b. Stop if you see a turtle on the road ahead
 - c. There is a wildlife viewing opportunity ahead
 - d. Pull off the road if you see a turtle
 - e. Drive with caution there may be turtles on the road



25. In your opinion, would more education help people understand how to reduce turtle mortality on roads?
- a. Yes
 - b. No
 - c. Not sure
26. In your opinion, what is most effective way to help educate people how to reduce turtle mortality on roads? *Please rank the 3 most effective options in the order that you feel represents the (1) least effective, to (3) most effective method.*
- Pamphlet
 - TV advertisements
 - Radio announcements
 - Newspaper article/ announcement
 - Interpretive programming (local survey only)
 - Large road signs
 - Booth at community events
 - Other _____

Demographic questions:

These last few questions help us to learn how representative participants in this study are of the Canadian population.

27. Are you:
- a. Female
 - b. Male
28. Are you:
- a. 16 – 25
 - b. 26 – 35
 - c. 36 – 45
 - d. 46 – 55
 - e. 56 – 65
 - f. over 65
29. Do you have a valid drivers licence, or have you held a valid drivers licence in the past?
- a. Yes
 - b. No

30. In which province or territory is your primary residence located in? *Please choose only one by checking the appropriate box with an "X".*

- | | | |
|--|---|--|
| <input type="checkbox"/> Newfoundland and Labrador | <input type="checkbox"/> Ontario | <input type="checkbox"/> Yukon |
| <input type="checkbox"/> Nova Scotia | <input type="checkbox"/> Manitoba | <input type="checkbox"/> Northwest Territories |
| <input type="checkbox"/> Prince Edward Island | <input type="checkbox"/> Saskatchewan | <input type="checkbox"/> Nunavut |
| <input type="checkbox"/> New Brunswick | <input type="checkbox"/> Alberta | <input type="checkbox"/> USA |
| <input type="checkbox"/> Quebec | <input type="checkbox"/> British Columbia | <input type="checkbox"/> Other _____ |

Do you have any other questions or comments? We encourage you to share your views (both positive and negative) about wildlife and wildlife protection in Canada.

Thank you very much for your participation. If you would like more information about this study, or if you would like to see the results of this study, please feel free to contact...

APPENDIX 8 : LOCAL, REGIONAL, AND NATIONAL QUESTIONNAIRES

LOCAL QUESTIONNAIRE – Kejimkujik NPNHS visitors only

Recruitment statement:

“Hello, we are conducting a survey about wildlife and wildlife protection in Kejimkujik National Park and National Historic Site. We would really like to know what you think, and your participation would be greatly appreciated! I want you to know your participation is voluntary, your responses will be kept strictly confidential, and the answers you provide here will be grouped with those of others. Also, no information identifying you as an individual will be recorded. The survey should take you about 10 minutes to complete, and if you choose to participate we would like to give you a \$5 Friends of Keji gift shop certificate in appreciation of your time. These surveys can be returned to the campground kiosk, or the main desk at the visitors reception centre. Would you like to participate”?

Obtaining consent:

Thank you very much for agreeing to complete this survey about wildlife and wildlife protection in Kejimkujik National Park and National Historic Site. Your responses will be kept strictly confidential and the answers you provide here will be grouped with those of others. No information identifying you as an individual will be kept.

I _____ (initials only) acknowledge that I am voluntarily completing this questionnaire, my name and vehicle identifiers are not being recorded, and that I have been guaranteed confidentiality.

Thanks for your participation, it is greatly appreciated! Upon completing this survey you will receive a \$5 Friends of Keji gift shop certificate in appreciation of your time.

General knowledge and attitude questions:

*These first few questions are about wildlife and protected areas in Nova Scotia. Please choose the answer that you feel **best** represents your opinion.*

1. In your opinion, how common is the presence of wildlife in Nova Scotia?
 - a. Very common
 - b. Common
 - c. Uncommon
 - d. Very uncommon
 - e. Not sure

2. In your opinion, what is the largest protected nature area in Southwest Nova Scotia?
 - a. Tobeatic Wilderness Reserve
 - b. Kejimkujik National Park and National Historic Site
 - c. Southwest Nova Biosphere Reserve
 - d. Other _____
 - e. Not sure

3. The following is a list of wildlife found in southwest Nova Scotia. *In your opinion, how important it is to protect each plant or animal?* Please rate each one on a scale of 1 to 7, where (1) is *not very important* to protect, and (7) is *very important* to protect. Circle your answers.

	<i>Not very important</i>						<i>Very important</i>
Large mammals such as the moose	1	2	3	4	5	6	7
Small mammals such as the squirrel	1	2	3	4	5	6	7
Birds such as the owl	1	2	3	4	5	6	7
Reptiles such as the turtle	1	2	3	4	5	6	7
Insects such as the butterfly	1	2	3	4	5	6	7
Plants such as wild flowers	1	2	3	4	5	6	7

4. The following list again contains wildlife found in southwest Nova Scotia. *In your opinion, do Nova Scotians support the protection of each plant or animal?* Please rate each one on a scale of 1 to 7, where (1) is *not very supportive*, and (7) is *very supportive*. Circle your answers.

	<i>Not very supportive</i>						<i>Very supportive</i>
Large mammals such as the moose	1	2	3	4	5	6	7
Small mammals such as the squirrel	1	2	3	4	5	6	7
Birds such as the owl	1	2	3	4	5	6	7
Reptiles such as the turtle	1	2	3	4	5	6	7
Insects such as the butterfly	1	2	3	4	5	6	7
Plants such as wild flowers	1	2	3	4	5	6	7

5. How strongly do you agree with the statement “*enough is being done to protect wildlife from being killed on Nova Scotia’s roadways*”?
- a. Strongly agree
 - b. Agree
 - c. No opinion
 - d. Disagree
 - e. Strongly disagree
6. How strongly do you agree with the statement “*Nova Scotians are concerned about the loss of wildlife from vehicle collisions*”?
- a. Strongly agree
 - b. Agree
 - c. No opinion
 - d. Disagree
 - e. Strongly disagree

Turtle specific questions:

*The next few questions are about wild freshwater turtles in Nova Scotia. Please choose the answer that you feel **best** represents your opinion.*

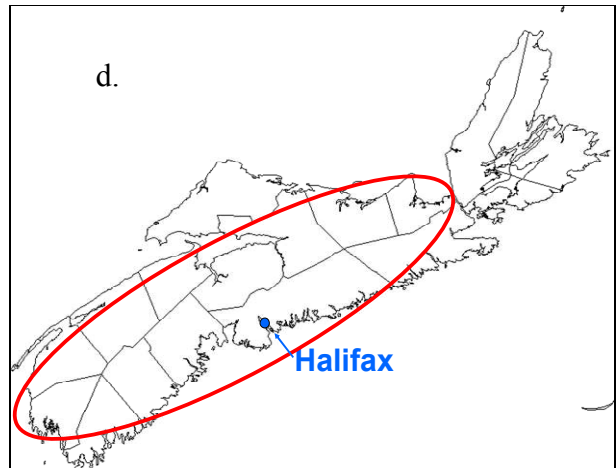
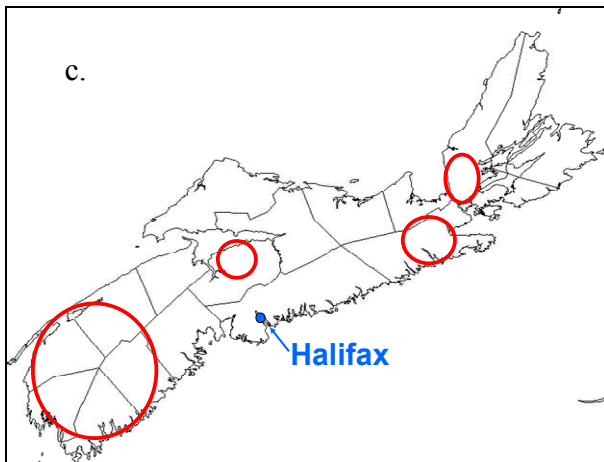
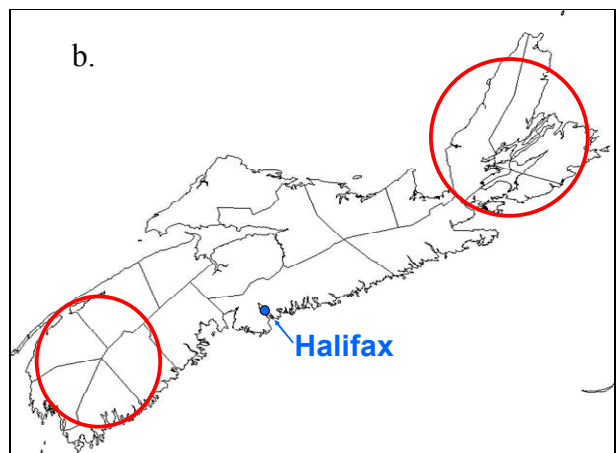
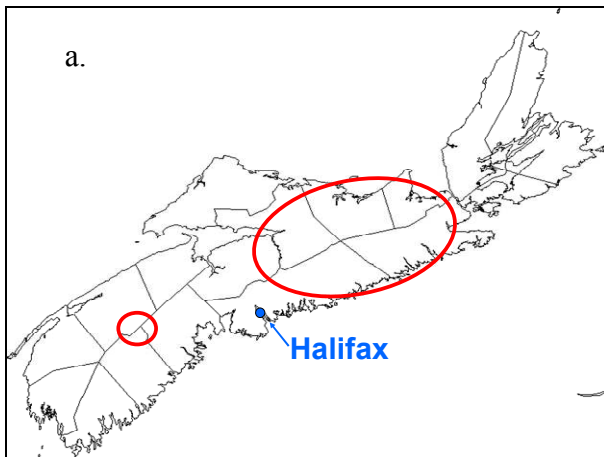
7. In your opinion, how common are wild freshwater turtles in Nova Scotia?
- a. Very common
 - b. Common
 - c. Uncommon
 - d. Very uncommon

e. Not sure

8. In your opinion, what condition are wild freshwater turtle populations in (in Nova Scotia)?

- a. Populations are increasing
- b. Populations are stable
- c. Populations are decreasing
- d. Not sure

9. There are four (4) maps of Nova Scotia provided below. Regions of each map are highlighted with red circles. Please choose the map that you feel highlights the area or areas of Nova Scotia that are **most** likely to contain wild freshwater turtles. If you are not sure, please choose option (e) below.



e. Not sure

10. In your opinion, what is the average size of an adult turtle?

- a. 15.0cm (6.0 inch)
- b. 25.0cm (10.0 inches)
- c. 35.0cm (14.0 inches)
- d. 40.0cm (16.0 inches)
- e. Not sure

11. In your opinion, what is the average size of a hatchling turtle?

- a. 2.5cm (1.0 inch)
- b. 5.0cm (2.0 inches)
- c. 10.0cm (4.0 inches)
- d. 15.0cm (6.0 inches)
- e. Not sure

12. The following is a list of impacts that pose risks to the survival of turtles in Nova Scotia. Please rank these risks in the order that you feel represents the (1) *least risk* to (6) *greatest risk* to the survival of turtles in Nova Scotia.

- Industry (forestry, mining, etc.) _____
- Predators' _____
- Roads and vehicles _____
- Climate change _____
- Poaching _____
- Cottage/housing development _____

13. Please rate how common you believe the following species of turtle are in Nova Scotia. *Please check the appropriate boxes with an "X"*.

	Very common	Common	Not very common	Not sure
Painted turtle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mirabilis turtle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wood turtle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Blanding's turtle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Snapping turtle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. The following is a list of statements that describe feelings about turtles. *How strongly do these statements reflect your feelings about turtles? Please check the appropriate boxes with an "X"*.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
a. I am fond of turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. I am interested in turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Turtles are disgusting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. I am curious about turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. I am afraid of turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Turtles are harmless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. I dislike turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. I am indifferent towards turtles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Turtles are special	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Turtles are dangerous	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Turtle and road specific questions:

*Freshwater turtles are sometimes observed on or near roads. The next few questions are about turtles and roads. Please choose the answer that you feel **best** represents your opinion.*

15. In your opinion, for what reason would you most expect to see a freshwater turtle on or near a road?
- Habitat disturbance
 - Nest digging
 - Food searching
 - Predator escape
 - Not sure
16. In your opinion, what time of year would you most expect to see a freshwater turtle on or near a road?
- Spring and summer
 - Spring, summer and fall
 - Spring and fall
 - Summer and fall
 - All year long
 - Not sure
17. If you were driving outside the park and you saw a turtle on the road, what would you most likely do?
- Ignore it
 - Drive around it
 - Drive slower
 - Stop and try to move it
 - Other _____
18. If you were driving inside the park and you saw a turtle on the road, what would you most likely do?
- Ignore it
 - Drive around it
 - Drive slower
 - Stop and try to move it
 - Other _____
19. In your opinion, what gender of freshwater turtle is most likely to be on a road?
- Adult Male
 - Adult Female
 - Hatchling (no identifiable gender)
 - All of the above
 - Not sure

20. How strongly do you agree with the statement “each female turtle is important to the overall survival of turtles in Nova Scotia”?
- Strongly agree
 - Agree
 - No opinion
 - Disagree
 - Strongly disagree
21. How strongly do you agree with the statement “enough is being done to protect wild freshwater turtles from being killed on Nova Scotia’s roadways”?
- Strongly agree
 - Agree
 - No opinion
 - Disagree
 - Strongly disagree

Road mortality mitigation specific questions:

*Freshwater turtles are sometimes hit and killed by vehicles. The next few questions ask about your attitudes towards turtle road mortality and mitigation. Please choose the answer that you feel **best** represents your view.*

22. How strongly do you agree with the statement “if signs warned drivers that there may be turtles on the road ahead they would slow down”?
- Strongly agree
 - Agree
 - No opinion
 - Disagree
 - Strongly disagree
23. How strongly do you agree with the statement “to protect freshwater turtles, vehicle speed should be seasonally reduced in areas where freshwater turtles are known to cross roads”?
- Strongly agree
 - Agree
 - No opinion
 - Disagree
 - Strongly disagree
24. In your opinion, if the speed limit was 80km/h, how willing do you think drivers in Nova Scotia would be to slow down to ___ km/h to protect turtles? *Please choose one answer for each section (a), (b), and (c) by checking the appropriate box with an “X”.*
- | | Very willing | Willing | Not willing
or unwilling | Unwilling | Very unwilling |
|--------------------|--------------------------|--------------------------|-----------------------------|--------------------------|--------------------------|
| a. Slow to 65 km/h | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Slow to 55 km/h | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Slow to 45 km/h | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

25. In your opinion, if the speed limit was 80km/h, how willing do you think you would be to slow down to ___ km/h to protect turtles? *Please choose one answer for each section (a), (b), and (c) by checking the appropriate box with an “X”.*
- | | Very willing | Willing | Not willing | Unwilling | Very unwilling |
|--------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| a. Slow to 65 km/h | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Slow to 55 km/h | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Slow to 45 km/h | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

- | | | | | | |
|--------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | | | or unwilling | | |
| a. Slow to 65 km/h | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Slow to 55 km/h | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Slow to 45 km/h | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

26. In your opinion, if temporary speed reductions protected freshwater turtles, how appropriate would it be to use speed bumps in designated areas to reduce speeds?

- a. Very appropriate
- b. Appropriate
- c. No opinion
- d. Inappropriate
- e. Very Inappropriate

27. In your opinion, how willing do you think the following groups are to support endangered species research and recovery, even though it requires significant cost and effort? *Please choose one answer for each section (a) through (g) by checking the appropriate boxes with an "X".*

- | | Very willing | Willing | Not willing
or unwilling | Unwilling | Very unwilling |
|-----------------------------|--------------------------|--------------------------|-----------------------------|--------------------------|--------------------------|
| a. Federal government | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Provincial government | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Municipal governments | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Non-profit organizations | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Canadians | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f. Nova Scotians | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| g. Yourself | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

28. How strongly do you agree with the statement “*enough is being done to protect wild freshwater turtles from being killed on Kejimikujik’s roadways*”?

- a. Strongly agree
- b. Agree
- c. No opinion
- d. Disagree
- e. Strongly disagree

Keji specific questions:

The next few questions ask about Kejimikujik and activities that go on in the park.

29. In the last two years, about how often have you been to Kejimikujik National Park and National Historic Site?

- a. 0 (zero). *Please continue on to question number 34.*
- b. 1-2,
- c. 3-4
- d. 5 or more

30. What time(s) of year did you visit Kejimikujik? *Please choose all that you feel apply by checking the appropriate boxes with an "X".*

- Spring

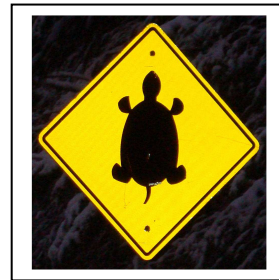
- Summer
- Fall
- Winter

31. Did you attend any interpretive programs while you were at Kejimkujik?
- a. Yes
 - b. No

32. While visiting Kejimkujik, did you travel through a “Turtle Zone”?
- a. Yes
 - b. No. *Please continue on to question number 34.*
 - c. Not sure. *Please continue on to question number 34.*

33. In your opinion, what is the purpose of the Turtle Zone? *Please choose all that you feel apply by checking the appropriate boxes with an “X”.*
- Adult turtle protection
 - Hatchling turtle protection
 - Endangered turtle protection
 - Traffic control
 - Wildlife viewing
 - Turtle nesting area

34. What is this sign telling you? →
- a. There are turtles on the road ahead
 - b. Stop if you see a turtle on the road ahead
 - c. There is a wildlife viewing opportunity ahead
 - d. Pull off the road if you see a turtle
 - e. Drive with caution there may be turtles on the road
 - f. Not sure



35. In your opinion, how appropriate are the use of speed bumps in Kejimkujik to enforce speed reductions, in order to protect the endangered Blanding’s turtle?
- a. Very appropriate
 - b. Appropriate
 - c. No opinion
 - d. Inappropriate
 - e. Very Inappropriate

36. In your opinion, would more education help people understand how to reduce turtle mortality on roads?
- a. Yes
 - b. No
 - c. Not sure

37. In your opinion, what is the most effective way to help educate people how to reduce turtle mortality on roads? *Please rank the 3 most effective options in the order that you feel represents the (1) least effective, to (3) most effective method.*

- Pamphlet
- TV advertisements
- Radio announcements
- Newspaper article/ announcement
- Interpretive programming (local survey only)
- Large road signs
- Booth at community events
- Other _____

38. In your own words, please describe how you would feel about seasonal traffic management (with wildlife warning signs, speed reductions, and speed bumps), on the only road to the Jeremys Bay campground area.

39. Can you name a volunteer program operating in Kejimikujik?

40. Please describe, in your own words, what the term “*species at risk*” means to you.

Demographic questions:

These last few questions help us to learn how representative participants in this study are of Kejimikujik park visitors.

41. Are you:
- a. Female
 - b. Male

42. Are you:
- a. 16 – 25
 - b. 26 – 35
 - c. 36 – 45
 - d. 46 – 55
 - e. 56 – 65
 - f. over 65

43. Do you have a valid drivers licence, or have you held a valid drivers licence in the past?
- a. Yes
 - b. No

44. In which province or territory is your primary residence located in? *Please choose only one by checking the appropriate box with an “X”.*
- | | | |
|--|-----------------------------------|--|
| <input type="checkbox"/> Newfoundland and Labrador | <input type="checkbox"/> Ontario | <input type="checkbox"/> Yukon |
| <input type="checkbox"/> Nova Scotia | <input type="checkbox"/> Manitoba | <input type="checkbox"/> Northwest Territories |

- | | | |
|---|---|--------------------------------------|
| <input type="checkbox"/> Prince Edward Island | <input type="checkbox"/> Saskatchewan | <input type="checkbox"/> Nunavut |
| <input type="checkbox"/> New Brunswick | <input type="checkbox"/> Alberta | <input type="checkbox"/> USA |
| <input type="checkbox"/> Quebec | <input type="checkbox"/> British Columbia | <input type="checkbox"/> Other _____ |

Would you be interested in obtaining more information about Nova Scotia's species at risk and a free field guide to Nova Scotia's Species at Risk? If yes, please include your email address here. This will ONLY be used to contact you with the specific information you have requested.

Email: _____

Do you have any other questions or comments? We encourage you to share your views (both positive and negative) about wildlife and wildlife protection in Nova Scotia and in Kejimikujik National Park and National Historic Site.

Thank you very much for your participation. If you would like more information about this study, or if you would like to see the results of this study, please feel free to contact...