# Long-term Eastern Georgian Bay Reptile Monitoring Program

**Interim Report**
Contribution Agreement No. 2020-001

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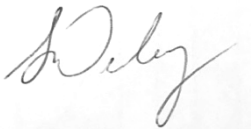
X 

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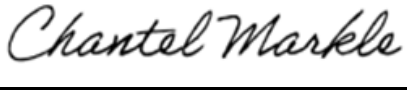
X 

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# Executive summary

The Henvey Inlet Wind Energy Centre (HIWEC) and the 2018 Parry Sound forest fire (PAR033) have had major impacts on the habitat, ecological communities, and wildlife within the Henvey Inlet First Nation (HIFN) Reserve #2. As a result, the Eastern Georgian Bay Initiative (EGBI) recommended a long-term monitoring study to assess the impacts of the PAR033 and the HIWEC on reptilian species at risk (SAR). The program was approved, the second field season commenced on May 18, 2020.

The second field season of this monitoring program was a success! The project is on-schedule, and all deliverables are complete to date. In addition to building upon the reptile mark-recapture study initiated in 2019, several concurrent applied conservation studies were successfully initiated by the project team this field season including:

1) Assessing how the ecohydrological function (e.g., water temperature, peat temperature, water level dynamics, etc.) at representative reptile hibernation sites varies among the four treatments and the created hibernation habitat
2) Assessing the use of created hibernation habitats by target reptile species

The following deliverables have already been accomplished:

- 55 individuals of the target species were captured during mark-recapture surveys conducted across all four treatment areas
- Approximately 474 hours of mark-recapture surveys were conducted
- Established 23 long-term vegetation monitoring plots to compare changes in habitat to changes in reptile populations over time
- Multiple critical overwintering wetlands as well as two nesting locations have been identified
- To assess overwintering conditions and monitor changes in suitability, the McMaster Ecohydrology Lab is currently monitoring a suite of ecohydrological variables at one or two wetlands per treatment area (6 total)

Two members from the HIFN community; Jason Ashawasegai, and Mike Ashawasegai were hired to conduct a large proportion of the mark-recapture, and vegetation surveys. The ongoing involvement and support from the HIFN community is essential to the continued success of future years of this project.

Now that the first field season is complete, the following activities are underway:

- Data management
- Habitat mapping (overwintering, nesting, gestation, etc.)
- Calculate population size estimates for each target species in each treatment
- Preliminary assessment of impacts on target species
- Share results with GMI (Ganawenim Meshkiki) and HIFN community
- Generate a regional reptile monitoring program by continuing to leverage partner support at other sites across eastern Georgian Bay
- Prepare for long-term continuation of monitoring

There are several deviations from the project goals or final deliverables including:

- Due to COVID-19, events proposed to occur within the HIFN community (community update session, knowledge sharing meeting, and reptile blitz) will be delayed until it is safe to meet in person.
- Due to logistical challenges, the number of turtles equipped with transmitters is less than originally proposed. The number of turtles tracked is still sufficient to provide valuable results.

It was anticipated that creating a long-term population study of this scale would yield new partnerships and unanticipated benefits over time. These benefits have begun to come to fruition in only the second year of the project.

- Blazing Star Environmental (BSE) formed a new partnership with a Master of Science Candidate from McMaster University working in Dr. Patricia Chow-Fraser's lab. The student will assess the effect of fire and construction on the natural hibernation wetlands used by Blanding's turtles using biological data, habitat mapping, and water quality indices.
- Supporting funds were raised that will benefit the project including internship funding which allowed additional team members in 2020, and a three-year grant which will allow additional mark-recapture surveys to be conducted, more intensive artificial habitat monitoring, and threats monitoring (emerging wildlife disease and invasive species).

Despite the challenges brought on by the COVID-19 global pandemic, we believe this year has been very successful so far. We are excited to share the status of our project activities within this report!

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# 1 Introduction

The Henvey Inlet Wind Energy Centre (HIWEC) was recently constructed and is now fully operational. In the summer of 2018, a wildfire named Parry Sound 33 (PAR033) altered, and in some areas removed, a significant amount of important habitat (forests, rock barrens, wetlands, etc.) in the same area as the HIWEC within the Henvey Inlet First Nation (HIFN) Reserve #2. These habitats support various ecological communities and wildlife, including reptiles. As a result, a long-term monitoring study was recommended by Eastern Georgian Bay Initiative (EGBI) to observe the succession of ecological communities and reoccupation by reptilian species at risk (SAR). It is assumed that there will be some positive ecological effects following the fire, however, there is a lack of data to support this. This monitoring study will ultimately assess the long-term response and recovery of target reptile species to the combined impacts of the construction and operation of the HIWEC, the wildfire, as well as climate change.

Impact monitoring of this duration has never been conducted in Canada and is critical to understanding how populations of long-lived species, like snakes and turtles, respond to disturbance, and will provide data to inform mitigation strategies to recover populations.

Target species include massasauga (*Sistrurus catenatus*) and Blanding's turtle (*Emydoidea blandingii*). Secondary target species include eastern foxsnake (*Pantherophis gloydi*), eastern hog-nosed snake (*Heterodon platirhinos*), and eastern musk turtle (*Sternotherus odoratus*). These species are secondary because they do not occur in high enough densities on the site to establish accurate population estimates.

In 2020, the second year of the long-term monitoring program was completed. The survey team was made up of staff members from Blazing Star Environmental (BSE), Laurentian University, and McMaster University. Two team members are HIFN #2 community members: Jason Ashawasegai, and Mike Ashawasegai. Preliminary results of this successful second year are outlined in this interim report.

## 1.1 Project goals

The purpose of our project is to understand how abundance, habitat use, and body condition of SAR reptiles respond to the impacts of construction and operation of the HIWEC, various stages of landscape succession post-fire, climate change, and to the mitigation and habitat improvement measures implemented as a condition of the *Species at Risk Act* permit. This project

builds upon the successful long-term reptile monitoring program initiated in 2019. A secondary objective of this project is to leverage partner support to include additional reptile populations throughout the eastern Georgian Bay area to generate a regional monitoring program. Our goal is to build local capacity and establish long-term monitoring at a suite of control and impact sites. This will improve our understanding of the impacts of land cover change on target reptile species throughout the eastern Georgian Bay Region.

## 1.2 Alignment with EGBI Objectives

This conservation project aligns closely with EGBI's objectives in the following ways:

- Knowledge of how SAR respond to and recover from impacts including construction and operation of HIWEC, and the wildfire of 2018 will be acquired. This knowledge will improve management of the target SAR and their habitat across their range.
- This improved management will lead to increased biodiversity in the greater eastern Georgian Bay Region.
- This project contributes to the survival and recovery of the following EGBI's targeted species:
    - Massasauga rattlesnake (*Sistrurus catenatus*)
    - Blanding's turtle (*Emydoidea blandingii*)
    - Eastern foxsnake (*Pantherophis gloydi*)
    - Eastern hog-nosed snake (*Heterodon platirhinos*)
    - Eastern musk turtle (*Sternotherus odoratus*)

## 1.3 Study area

Four treatment areas of varying levels of impact were chosen to estimate and monitor the population size of the target species over time (Figure 1):

1. Control: the area north of the Key River and east of the fire's footprint will be studied as an unimpacted control site (green).
2. Wind: the area south of Henvey Inlet and was affected by construction, but not the fire (blue).
3. Burn: the area immediately north of the Key River and was affected by the fire, but not construction (orange).
4. Wind+Burn: the area north of Henvey Inlet and south of the Key River impacted by the fire and construction (yellow).

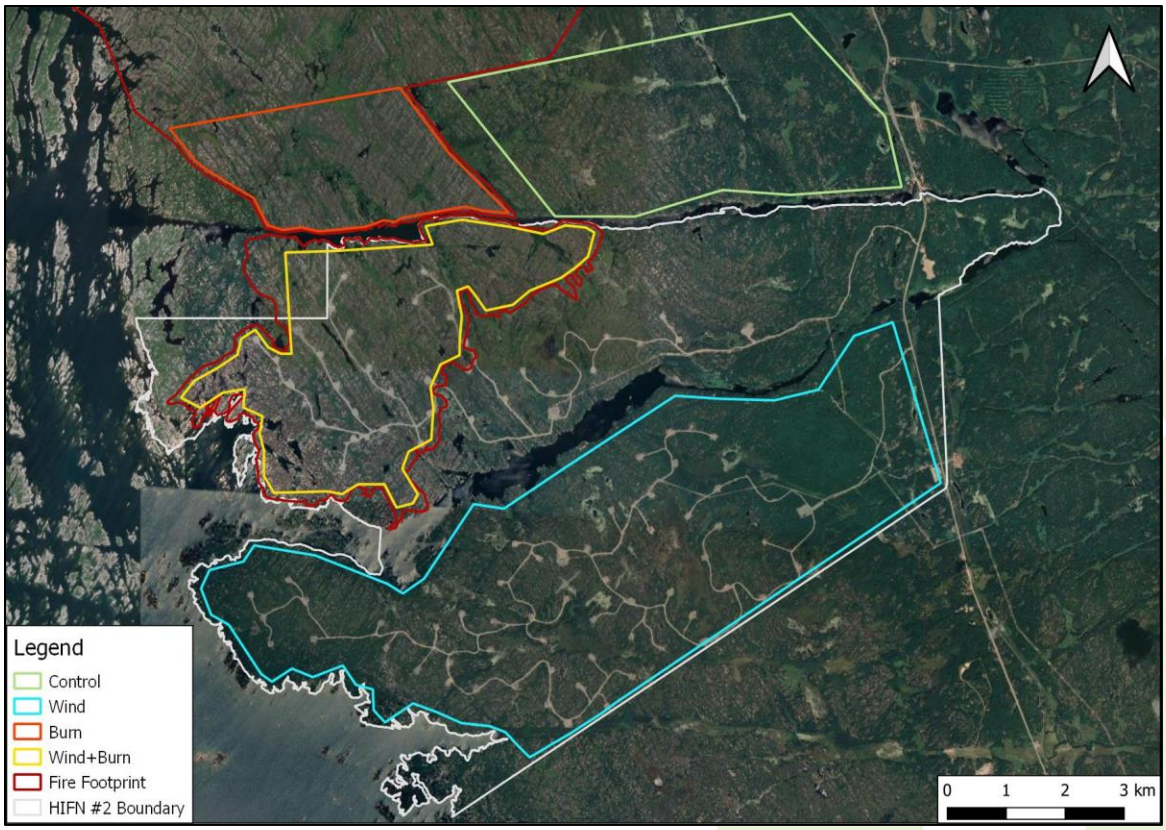


Figure 1. Long-term mark-recapture study treatment areas identified on and surrounding HIFN #2 include Control (green), Wind (blue), Burn (orange), and Wind+Burn (yellow). Red indicates the boundary of the 2018 wildfire. White indicates the boundary of HIFN #2.

# 2 Completed project activities

The 2020 field season was a success! Mark-recapture complex sites with suitable habitat for all target species were selected. These sites were thoroughly surveyed, leading to the capture of 123 individuals of our target species; and will be monitored for changes in vegetation composition and species use over time.

In addition to building upon the reptile mark-recapture study initiated in 2019, several concurrent applied conservation studies were successfully initiated by the project team:

1) Assessing how the ecohydrological function (e.g., water temperature, peat temperature, water level dynamics, etc.) at representative reptile hibernation sites varies among the four treatments and the created hibernation habitat

2) Assessing the use of created hibernation habitats by target reptile species

The field season would not have operated as effectively without meaningful collaboration from HIFN community members. Two members from the HIFN community; Jason Ashawasegai and Mike Ashawasegai were hired to collect and enter data for this study. The continued involvement and support from the HIFN community is essential to the success of this collaborative monitoring study.

## 2.1 Reptile mark-recapture surveys

**Conduct mark-recapture surveys across all four treatment areas (including 3 created overwintering sites and 3 created nesting sites).**

For all mark-recapture surveys, field crews entered target habitats (overwintering, foraging, gestation, basking) at the appropriate time of active season, searched for target species and captured any observed individuals (Figure 2-4). Timing of surveys are outlined in this section.

Figure 2. Environmental monitor Mike Ashawasegai and Conservation Biologist Monique Aarts measuring the length of an adult massasauga.

Figure 3. Species at Risk Ecologist, Kaitlyn Hall, prepares to PIT tag a sub-adult massasauga while Terrestrial and Wetland Ecologist, Siobhan Galway, carefully holds it steady.

Due to permit delays related to COVID-19, surveys began later than ideal and the turtle emergence period was missed in all treatment areas. Mark-recapture surveys began on May 18, 2020. In-field training was provided to all team members by senior staff, including John Urquhart, Senior Herpetologist. Surveys in the Control and Burn treatment areas did not begin until June 3, 2020. This was due to a COVID-19 delay in obtaining permits from the Ministry of Natural Resources and Forestry (Wildlife Scientific Collectors Authorization #1092305) to conduct surveys within provincially regulated lands north of the Key River, including French River Provincial Park. During the first few weeks of the active season, surveys were prioritized in treatment areas within HIWEC because this survey window was missed in these areas in 2019 due to permit delays.

Initial surveys focused on suitable overwintering habitat for Blanding's turtles because turtles emerge from overwintering habitat earlier in the spring than snakes do. As the season progressed and turtles migrated to foraging habitat, turtle surveys were conducted in suitable turtle foraging habitat.

For the entire spring (May 18-June 30), surveys were focused on locating additional turtle habitat. Spring is the ideal survey window for capturing turtles. For this reason, massasaugas that were encountered during the spring were recorded, but not captured, to allow sufficient time to survey for turtles. Any data that could be collected from a massasauga without capturing it was recorded.

When turtle activity began to decrease in late June, survey effort was shifted to suitable massasauga gestation and foraging habitat. Turtles observed incidentally during this time were still recorded, and if possible, captured.

Beginning in late August, snakes and turtles return to their overwintering habitat. Consequently, survey effort shifted again at this time to suitable overwintering habitat for massasaugas and Blanding's turtles. Massasauga overwintering surveys were primarily conducted surrounding the artificial reptile overwintering habitat created on the south side of the HIWEC (Figure 12). This habitat was created to replace overwintering habitat that was impacted during the construction of the HIWEC. Surveys were not conducted directly within the artificial habitat features because the newly created habitat is sensitive as it is in the early stages of succession. Instead, overwintering surveys were conducted in suitable habitat surrounding artificial sites. Overwintering habitat surveys continued until mid-October.

Habitat scouting for all target species occurred throughout the field season to establish complexes of suitable habitat for massasaugas and Blanding's turtles in each treatment area. Results of habitat scouting from 2019 and 2020 were combined to establish 6 complexes during the 2020 field season: one in the Control, two in the Wind, one in the Burn, and two in the Wind+Burn (Figure 5). Each complex contains confirmed overwintering and foraging habitat for all target species (see Figure 6 for an example of one of these complexes). Additional mark-recapture complexes will be added in 2021 as additional habitat is confirmed.

A total of 474 person-hours of mark-recapture survey effort were conducted in the second field season of this mark-recapture study (Table 1). This total survey effort is lower than the first field season (697 person-hours) because there was a delayed start in the spring due to COVID-related permit delays, and more time was spent conducting vegetation surveys in 2020 than 2019. The highest survey effort was conducted in the treatment areas within HIWEC (Table 1); Wind (186 person-hours), Wind+Burn (120 person-hours), Control (111 person-hours), and Burn (57 person-hours). Attempts were made to balance the survey effort across each of the four treatment areas. A lower amount of survey effort was conducted in the Burn (57 person-hours) than other treatment areas for several reasons: 1) delayed access in spring due to permits, 2) other treatment areas without confirmed turtle habitat were prioritized in the spring. Within the Wind treatment area, 71 of the 186 person-hours of survey effort was conducted in the artificial habitat area (Figure 7).

Table 1. Survey effort in each of the treatment areas from May 18 – October 9, 2020 and May 7 – Oct 11, 2019. Survey effort is expressed in person-hours. The 2020 survey effort is lower than the first field season (697 person-hours) because a delayed start due to COVID-related permit delays, and time was spent conducting vegetation surveys were conducted in 2020 than 2019.

| Treatment area | Survey effort (person-hours) 2019 | Survey effort (person-hours) 2020 |
|---|---|---|
| Control | 251 | 111 |
| Wind | 100 | 115 |
| Burn | 222 | 57 |
| Wind+Burn | 87 | 120 |
| Artificial Habitat | 0 | 71 |
| Refuge - North | 8 | 0 |
| Refuge - South | 29 | 0 |
| **Total** | **697** | **474** |

Each captured individual was given a unique identifier (PIT tag for snakes, notch in marginal scutes for turtles). Captured massasaugas also had a rattle segment painted with blue non-toxic nail polish to indicate that they have been previously captured within the 2020 field season. Red non-toxic nail polish was carried in the field in case a massasauga from 2019 was captured and needed its rattle touched up. In addition, every individual had a variety of characteristics measured (e.g., size, sex, mass, injuries, behaviour, etc.). These characteristics will be assessed to determine how health of the populations change over time. Finally, weather and habitat characteristics were recorded (e.g., vegetation, precipitation, temperature, etc.).

During the second year of the mark-recapture study a total of 94 animals were observed, representing all primary target species, and one secondary target species. Some of these animals (n=7) were observed outside of the treatment areas while driving towards the Wind+Burn treatment on HIWEC. More massasaugas (n=57) were observed than Blanding's turtles (n=37). Of the 94 animals that were observed, 55 were captured. More massasaugas (n=28) were captured than Blanding's turtles (n=27) in 2020. For the first time on this project, an eastern foxsnake (secondary target species) was captured. This individual was captured in the Wind treatment area (Figure 11).

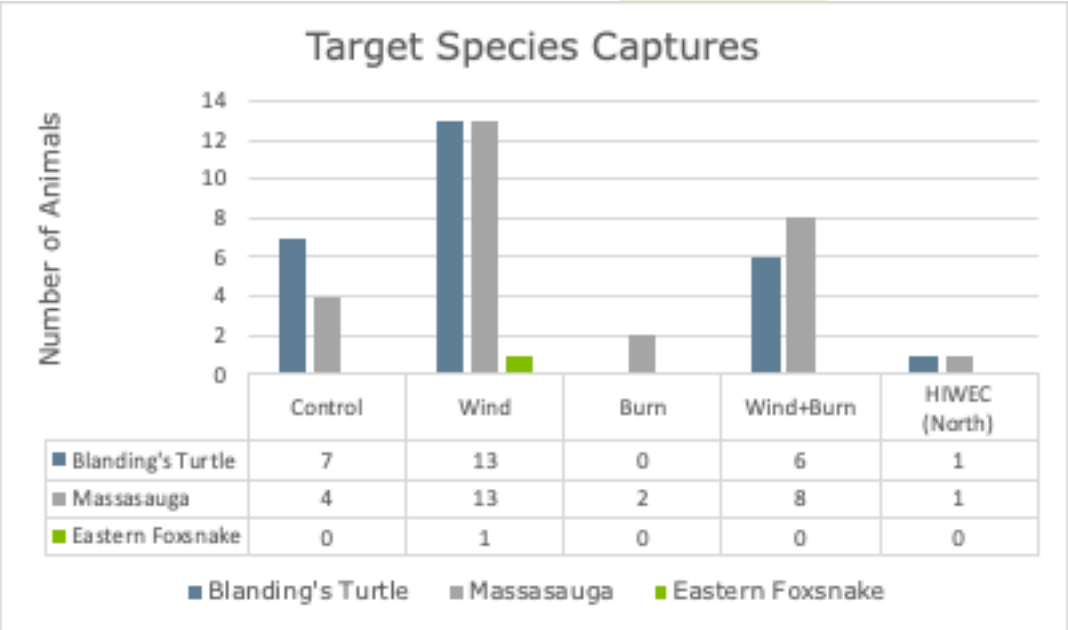


Figure 4. Total target species captured per treatment area in 2020. HIWEC (North) refers to the area within HIWEC that is north of the inlet, and outside of the Wind+Burn treatment area.

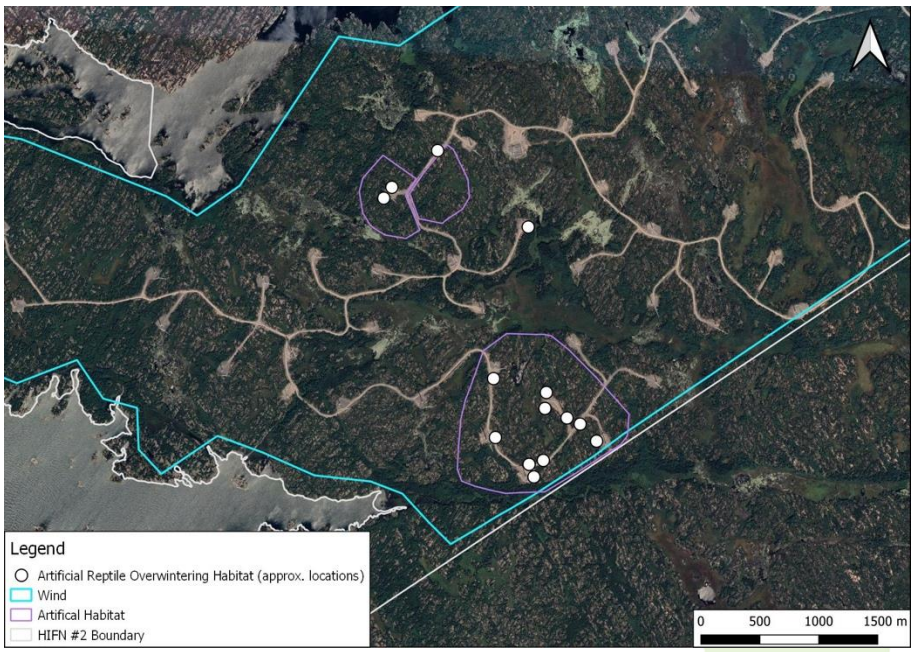


Figure 5. Locations of the artificial habitat areas that were surveyed in 2020 (purple) and the approximate locations of the artificial reptile overwintering habitat (white circles).

The mark-recapture data collected in 2019 and 2020 will be used to calculate approximate population sizes of each species in each treatment. This data will allow us to refine the initial population estimates calculated in the 2019 Final Report. The refined population estimates will be available in the next Interim Report.

These population estimates will be used to determine changes in population size attributed to both the fire and the construction. These estimates will have broad confidence intervals after only two years but will improve as the study progresses over time. Estimates will be sufficiently accurate to conduct a trend analysis (change in population size over time) once two seasons have been completed that contain at least a 10% recapture rate (i.e., 10% of individuals were captured and marked in a previous season). We have not yet had a recapture rate of 10%, so accurate trends will not be available for at least another two years.

## 2.2 Vegetation monitoring

**Establishing long-term vegetation monitoring plots to compare changes in habitat to changes in reptile populations over time.**

Vegetation surveys were conducted in each of the four treatment areas from July 6 – September 25 with the purpose of measuring vegetation species abundance and composition after the impacts. The changes observed in vegetation species and composition over time will be compared to changes in reptile population size and use over time. Vegetation is expected to change significantly over time, especially in the areas impacted by the wildfire.

Sites were selected within habitat used by the target species, wetlands, and rock outcrops. Some sites from 2019 were resurveyed in 2020. The exact 1 m x 1 m quadrats were revisited so that vegetation species abundance and composition can be compared directly over time. Additional rock sites were selected based on confirmed massasauga gestation habitat and new wetland sites were selected based on confirmed turtle overwintering habitat. The wetland vegetation sites were selected in overwintering habitat since this type of habitat is the most sensitive and important habitat required for survival of all target species. All sites selected in 2020 will be resurveyed in following project years.

Vegetation surveys were performed in accordance with the survey protocol developed by McMaster University's Ecohydrology Group. In each pre-defined site, ten 1 m x 1 m quadrats were haphazardly placed throughout the site to accurately represent the diversity of vegetation. Surveyors recorded the percentage cover of all species of lichen and moss, vascular plants (e.g., shrubs, trees, herbs), litterfall, and bare rock or soil. For vascular plants, canopy height and the number of individuals were also recorded. Lastly, microforms such as hummocks, hollows, and lawns were recorded. Photos of each quadrat were taken to compare changes in vegetation over years. Some of the vegetation surveys were completed by the Ecohydrology group. This data will be included in future data analysis.

A total of 11 wetland sites and 12 rock barren sites were surveyed by BSE (Figure 14) in 2020. Within each site, ten quadrats were surveyed accounting for a total of 110 wetland vegetation surveys and 120 rock barren vegetation surveys (Table 2). Additional vegetation surveys were conducted by McMaster University students. The vegetation survey results from BSE and McMaster University will be combined to provide a more in-depth picture of changes in vegetation species abundance and composition across the landscape over time.

Table 2. Number of vegetation sites surveyed by BSE in each treatment area. Each site had 10 vegetation quadrats surveyed.

| Treatment | Rock sites | Wetland sites |
|---|---|---|
| **Control** | 3 (30 quadrats) | 3 (20 quadrats) |
| **Wind** | 3 (30 quadrats) | 3 (30 quadrats) |
| **Burn** | 3 (30 quadrats) | 2 (20 quadrats) |
| **Wind+Burn** | 3 (30 quadrats) | 3 (30 quadrats) |

## 2.3 Ecohydrological monitoring

**Ecohydrological monitoring of 1 selected wetland per treatment area.**

Overwintering habitats vary among turtle species but include a variety of wetland types (e.g., Edge et al. 2009; Markle and Chow-Fraser 2017). Similarly, overwintering habitat for snakes vary based on region and species, but massasaugas use peatlands in the eastern Georgian Bay region (e.g., Rouse and Willson 2002; Smolarz et al. 2018). While macrohabitat use varies among reptile species, the overwintering microenvironment must meet certain physical, chemical, and thermal conditions to maximize winter survival. To assess overwintering conditions and monitor changes in suitability, the McMaster Ecohydrology Lab is currently monitoring a suite of ecohydrological variables at one or two wetlands per treatment area (Control, Wind, Burn, Wind+Burn; Figure 15, Table 3). This ecohydrological monitoring will occur continuously throughout the reptile overwintering and active season.

Table 3. Ecohydrological monitoring sites within each treatment area.

| Treatment | Monitoring station | Notes |
|---|---|---|
| Control | KEY 401 | Turtle habitat profiles, snake profiles to be added in 2021 |
| Burn | KEY 501 | Turtle habitat profiles, snake profiles to be added in 2021 |
| Wind | HIS 059 | Snake habitat profiles |
| Wind+Burn | HIN 009 | Turtle habitat profiles |
| | HIN 013A | Turtle habitat profiles; water level only |

Each of the habitat profile monitoring stations include:

1) A water level well with levellogger to record water level position every 30 minutes
2) Time lapse camera to record daily ice and/or snow cover

3) Micrometeorology station to record air temperature and relative humidity every 30 minutes
4) 3-5 temperature profiles (with various depths) to record water or peat temperature every 30 minutes

The following sections provide a summary of each site and the monitoring that has taken place to date.

## Control - KEY-401

The location of Site KEY-401 was informed by 2019-2020 reptile observations (Figure 16). Monitoring of Site KEY-401 began on November 3rd, 2020. In addition to water level, ice cover, and micrometeorology, sediment and water column temperatures are being measured for four profiles at fixed depths (-50, -7, +7, +50 cm) relative to the sediment-water interface. For example, -7 cm represents 7 cm into the sediment and +7 cm represents 7 cm above the sediment-water interface in the water column. A depth of 7 cm was chosen to approximate the location of a turtle's shell if they were sitting on the bottom on the sediment or buried just below the sediment surface. The 50 cm depth was chosen since turtles tend to overwinter in Canadian Shield wetlands where sediment and water depth is approximately 50 cm. In situations where sediment depth was slightly less than 50 cm, the lower temperature measurement was adjusted to match sediment depth. Due to COVID-19 and subsequent field limitations imposed by McMaster University, field work was limited to one day of equipment setup. In 2021, we have plans to revisit the site to add temperature profiles in the peat to also capture overwintering locations representative of massasauga overwintering habitat.

Figure 6. Newly installed micrometeorology station monitoring a confirmed overwintering wetland in the control treatment area.

## Burn - KEY-501

The location of Site KEY-501 was informed by 2019-2020 reptile observations (Figure 17). Monitoring began on November 4th, 2020. In addition to water level, ice cover, and micrometeorology, sediment and water column temperatures are being measured for four profiles at fixed depths (-50, -7, +7, +50 cm) relative to the sediment-water interface. Due to COVID-19 and subsequent field limitations imposed by McMaster University, field work was limited to one day of equipment setup. In 2021, we have plans to revisit the site to add temperature profiles in the peat to also capture overwintering locations representative of massasauga overwintering habitat.

Figure 7. Newly installed micrometeorology station monitoring a confirmed overwintering wetland in the Burn treatment area.

## Wind - HIS-059

Site HIS-059 was installed as part of a separate research project managed by the McMaster Ecohydrology Lab (Figure 18). Monitoring began in December 2017. The data collected here are now also being used to support this collaborative project. In addition to water level, snow depth, and micrometeorology, peat column temperatures are being measured for five hummock profiles at fixed depths (5, 15, 25, 50 cm) relative to the surface of the hummock. For example, the 5 cm fixed depth represents 5 cm from the surface of the hummock into the peat. This wetland was confirmed overwintering habitat for the massasauga before construction of HIWEC. No snake surveys have been conducted at this site post-construction.

Figure 8. Previously installed micrometeorology station monitoring a confirmed massasauga overwintering habitat in the construction-only treatment area.

## Wind - HIN-009

Site HIN-009 was installed as part of a separate research project managed by the McMaster Ecohydrology Lab (Figure 19). Monitoring began in December 2017. The data collected here are now also being used to support this collaborative reptile monitoring project. In addition to water level, ice cover, and micrometeorology, water column temperatures are being measured for four profiles at fixed depths (-50, -7, +7, +50 cm) relative to the sediment-water interface.  This wetland was confirmed overwintering habitat for turtles (Blanding's turtle, painted turtle, snapping turtle) before construction of the HIWEC. No turtle surveys have been conducted at this site post-construction.

Figure 9. Previously installed micrometeorology station monitoring a confirmed turtle overwintering habitat in the construction-only treatment area.

## Wind+Burn - HIN-110

This site was installed as part of a separate research project managed by the McMaster Ecohydrology Lab (Figure 20). Monitoring began in December 2017. This wetland was directly affected by PAR033 (Figure 21) and $17,500 of monitoring equipment was destroyed, so some data gaps exist as a result. Most of the equipment was later replaced by McMaster with separate funds. The data collected here are now also being used to support this collaborative project. In addition to water level, peat column temperatures are being measured for hummock profiles at fixed depths (5, 15, 25, 50 cm) relative to the surface of the hummock. Due to COVID-19, field work permissions were limited but we have plans for a site visit in December 2020 to check on the status of the temperature profiles. This wetland was confirmed overwintering habitat for the massasauga before the fire. No snake surveys have been conducted at this site post-fire.

Figure 10. Confirmed massasauga overwintering habitat in the Burn and Wind treatment area. The site photo was taken before the fire.

Figure 11. Confirmed massasauga overwintering habitat (HIN-110) after PAR033.

### Wind+Burn - HIN-013-A

Water levels at a second site (Mac ID HIN-013) within the Wind+Burn treatment area that was confirmed overwintering habitat for turtles (Blanding's turtle, midland painted turtle) pre-fire (Figure 22) is being monitored. This site falls on the edge of the fire footprint. Monitoring began in December 2017.

Figure 12. Confirmed turtle overwintering habitat in the Wind+Burn treatment area. The site photo was taken before the fire.

# 3 Ongoing project activities

With the 2020 field season complete; the project team is busy analyzing data and compiling results. Once results of this project year are finalized, we will begin sharing results and planning for future monitoring! Our next interim report will include the completion of the following actions.

## 3.1 Data management

- Finalize mark-recapture survey and vegetation survey data entry.
- Compile vegetation data collected by BSE with vegetation data collected by McMaster University.
- Identify the remaining unidentified plant samples collected.

## 3.2 Habitat mapping

- Map all established vegetation monitoring sites and reptile survey sites.
- Map important habitat use (e.g., overwintering, nesting, gestation, etc.).

## 3.3 Calculate population size estimates for each target species in each treatment

- Calculate approximate population sizes for each species in each treatment before, immediately after impact, and ongoing trends over time using information collected prior to 2019, and the mark-recapture data.
- Estimate the changes in population size attributed to both the fire and the construction over time. These estimates will have broad confidence intervals after only two years but will improve as the study progresses over time. Estimates will be sufficiently accurate to conduct a trend analysis (change in population size over time) once two seasons have been completed that contain at least a 10% recapture rate (i.e., 10% of individuals were captured and marked in a previous season). We have not yet had a recapture rate of 10% so accurate trends will not be available for at least another two years.

## 3.4 Preliminary impact assessment

- Identify preliminary initial effects of the impacts (HIWEC construction and operation; wildfire) on target species populations. We expect to have a preliminary summary of these impacts contained within our next interim report.

## 3.5 Annual HIFN community update session and reptile bio blitz

- Due to COVID-19, these community engagement events have been delayed. It was decided that virtual events would be ineffective alternatives due to social distancing concerns and internet access issues for 2020. Options are being investigated for 2021. As soon as it is safe to do so, these community engagement events will be held.

## 3.6 Generate a regional reptile monitoring program

- Continue to leverage partner support at other sites throughout eastern Georgian Bay to generate a regional reptile monitoring program. Over winter 2021, BSE will meet with SAR biologists at Magnetawan First

Nation and Shawanaga First Nation to form a working group to further align monitoring efforts and improve collaborations. Both organizations have expressed interest in participating in this initiative as control sites. They are already using standard provincial survey methods for the target species and their data will be comparable to that collected at HIFN. Additionally, BSE will approach additional project partners to establish control sites. These potential partners have some monitoring underway including Killbear Provincial Park, Georgian Bay Biosphere Reserve, Laurentian University, and Georgian Bay Islands National Park.

### 3.7 Prepare for long-term continuation of monitoring

- Complete year-end permit reports and renew all permits so that approvals are in place for 2021.
- Continue to fine-tune and improve study design based on 2020 field season.
- Recruit a graduate student to assess how reptile and amphibian community ecology varies among the four treatments.
- Improve data collection sheets, and training materials for future years of monitoring.

## 4 Deviations from project proposal and goals

### 4.1 Postpone HIFN community events due to COVID-19

Due to the COVID-19 pandemic, we are unable to safely hold the following events within the community. As soon as it is safe to do so, we will begin planning these important events. It was decided that virtual events would be ineffective alternatives due to internet access issues for 2020, but options are being investigated for 2021.

- Bi-annual meeting with HIFN community elders and members to share traditional ecological knowledge with project team.
- Community update session.
- Annual Reptile Bio Blitz event to engage community members in project.

### 4.2 Artificial nesting sites not surveyed

This project's work plan within the contract mentions monitoring use of artificial nesting habitat by turtles. It is our understanding that this turtle nesting habitat was not created. Therefore, this deliverable could not be

completed. We are awaiting data from Pattern Energy which will confirm when these features will be created and will begin monitoring them at that time. The purpose of the data request submitted on August 18, 2020 is to confirm location of all artificial habitat and what monitoring of these artificial features is currently taking place. This data will help us design an effective artificial monitoring study design moving forward.

# 5 Additional project benefits

It was anticipated that creating a long-term population study of this scale would yield new partnerships and unanticipated benefits over time. These benefits have begun to come to fruition in only the second year of the project.

## 5.1 Developed a new partnership with McMaster University

BSE formed a new partnership with a Master of Science Candidate from McMaster University working in Dr. Patricia Chow-Fraser's lab. The student initiated a Blanding's turtle radio telemetry study in 2020 within HIWEC. This partnership will likely lead to some collaboration of field work and sharing Blanding's turtle data that will benefit both projects. BSE will meet with Dr. Chow-Fraser this winter to further discuss and formalize the collaboration.

# 6 Final Financial Report for 2020

The project to date has completed its deliverables on schedule and has expended the funds as contracted and on schedule. Minor deviations among budget categories to respond to COVID-19 were made. In particular having a slightly smaller team and diverting some salary dollars to increased equipment and travel costs required to operate safely during the global pandemic.

The following additional funds were raised:

- Internship funding (Clean Leadership, Career Launcher, Canada Summer Jobs) was awarded to hire four team members allowed us to conduct additional surveys. Over $22,000 was raised to match GMI's contribution.
- Funding from the provincial Species at Risk Stewardship Program will allow additional reptile mark-recapture surveys to be conducted, leading to a more refined population estimate sooner. In addition, these funds will allow our team to conduct project activities above and

beyond the activities outlined in this contract. These activities include: an in-depth assessment of the effectiveness of all artificial reptile habitat on HIWEC, invasive species, and emerging wildlife disease monitoring. Understanding these additional threats will help the community and HIWEC protect the target species over time. Over $176,000 was raised, over three years, to match GMI's contribution.

- Because of our passion for this project, and its magnitude, BSE staff and our partners have contributed substantially more in-kind time than proposed. Our budget included $31,500 worth of in-kind time to be contributed by April 15, 2021. As of Jan. 20, 2021 we have contributed over $75,000 in in-kind time to the project!

In summary, the project is operating on budget and has raised over $200,000 in supporting cash and has exceeded our in-kind time contributions by more than $43,000 in less than one year of this 4-year project. We are on track to greatly exceed our matching cash and in-kind commitments for this project while remaining within the approved GMI contributions. The successful fundraising will also lead to exceeding the promised deliverables.

# 7 Conclusion

The second field season of this monitoring program was a success! Despite a global pandemic, the project is on-schedule and all deliverables are complete to date. In addition to building upon the reptile mark-recapture study initiated in 2019, several concurrent applied conservation studies that will greatly strengthen the results of this study were successfully initiated by the project team this field season. The ongoing involvement and support from the HIFN community is essential to the continued success of future years of this project.

## Literature cited


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