

TURTLE NEST PREDATION STUDY
POINT PELEE NATIONAL PARK

JULY 1991

Prepared by:
Daniel Kraus

RESOURCE CONSERVATION
POINT PELEE NATIONAL PARK

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SUMMARY

This study examined turtle nest predation along the east beach at Point Pelee National Park. All turtle nesting activity was recorded in two sample plots. Intact and predated nests were counted. Predator exclosures were tested.

Nest predation was 80% in one sample plot and 100% in a second plot. 84 predated and 3 intact nests were recorded along the east beach. 61% of all nests were from Snapping Turtles. Raccoons are the primary predator.

The current rate of nest predation appears to be high and may be threatening to the long term viability of turtle populations.

It is recommended that this study be continued in 1991. Five sample plots should be censused and the status monitoring of turtles should continue. A population estimate of raccoons should be attempted through nocturnal roadside surveys.

Preliminary management strategies recommend the installation of raccoon-proof waste receptacles and eliminating the release of raccoons in order to restore natural population dynamics. Methods of enhancing turtle populations are also discussed.

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1.0 INTRODUCTION

1.1 TURTLE SPECIES AT POINT PELEE

Point Pelee National Park has one of the greatest concentrations of turtle species in Canada. A total of seven native turtles have been recorded; a diversity matched only at Long Point and Rondeau Provincial Park. Three of these species; the Musk Turtle, Spotted Turtle and Eastern Spiny Softshell are rare in Canada, Ontario and at Point Pelee. The Eastern Box Turtle is also rare at the Park; however, this species is probably introduced to Ontario (Cook). The Red-eared Slider, the common pet store turtle, is occasionally recorded and is definitively introduced. The remaining four species; Snapping Turtle, Blanding's Turtle, Map Turtle and Eastern Painted Turtle are the most common turtles. The abundance of turtles at the Park can be attributed to the extensive and diverse wetlands and undeveloped beaches (see Map I).

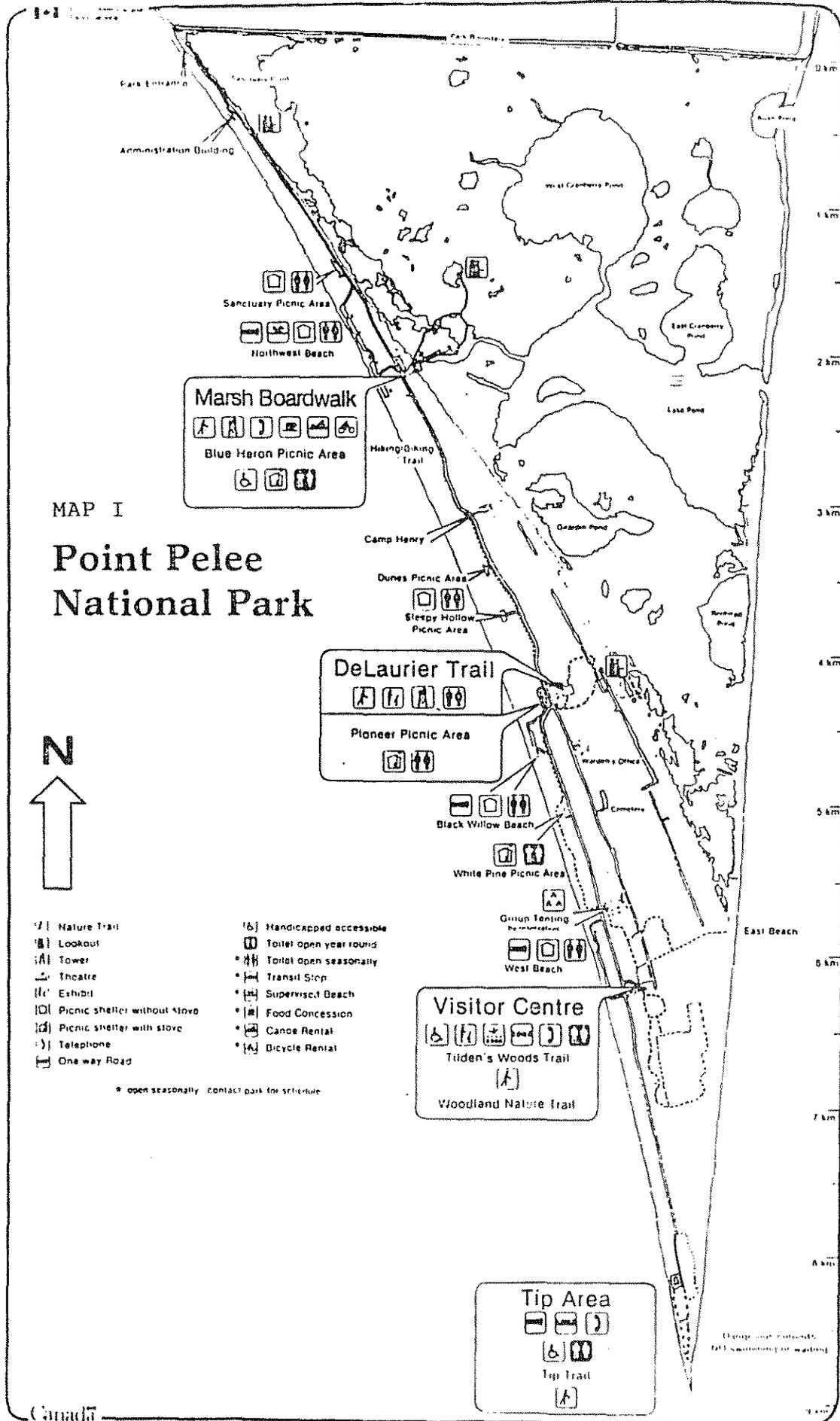
1.2 PAST STUDIES ON NEST PREDATION

Despite several detailed herptile surveys at Point Pelee (Logier, Cook, Rivard), no observations of massive nest predation were made until the 1980's. In 1983 Dowhan began to survey known nesting areas in order to observe predation. These accounts were included in annual herptile summaries and are listed below:

- 1983: "dozens of depredated and intact snapping turtle nests were discovered along the east barrier ridge, last week of June"
- 1984: "depredated (snapping turtle) nests were abundant"
- 1985: "on 8 June the turtle nesting site east of the Cemetery was checked, there appears to have been 10-15 snapping turtles nests in an area of about 25 square metres, most, if not all had been depredated; tracks in the area indicated that coyotes and raccoons had visited the site".
- 1988: "28 depredated and 6 intact nests were observed along the East Barrier Ridge on the 21st of June".
- 1990: 45 nest predations observed along the east beach (Michano)

1.3 OBJECTIVES OF THE REPORT

This report presents the methodology, results, discussion, conclusions and recommendations of a four week study on turtle nest predation at Point Pelee National Park. A preliminary assessment of the predation rate and preliminary management recommendations are presented in the Appendices. The purpose of this report is to highlight a potential limiting factor of turtle populations at Point Pelee.



2.0 METHODOLOGY

This study was designed to focus on turtle nest predation along the east beach at Point Pelee. This area is known to have a high density of nesting activity, and has been the site of previous observations on nest predation (Dowhan, 1983-88).

Four sampling methods were utilized in this study. Sample plots and intact nests were monitored to determine predation rates. A gross count of predated nests was done to provide data on key nesting areas and times. Predator exclosures were tested for their utility as a conservation device and were used as controls for unprotected areas.

2.1 SAMPLE PLOTS

In order to sample turtle activity and nesting success, intact nests, predated nests and test holes were recorded every 2-3 days in two sample plots for the month of June.

Plot 1 measured 10 x 10 m, and was located 50 m north of the old East Beach road exit. Plot 2 encompassed 75 m sq., and was located at the central sand beach on Redhead Pond (see Map II).

2.2 INTACT NEST CENSUS

Intact nests encountered during June were marked and monitored to provide information on predation rates. Nests were located by examining sites that had been freshly dug, and identified with a small numbered flag.

2.3 PREDATED NEST CENSUS

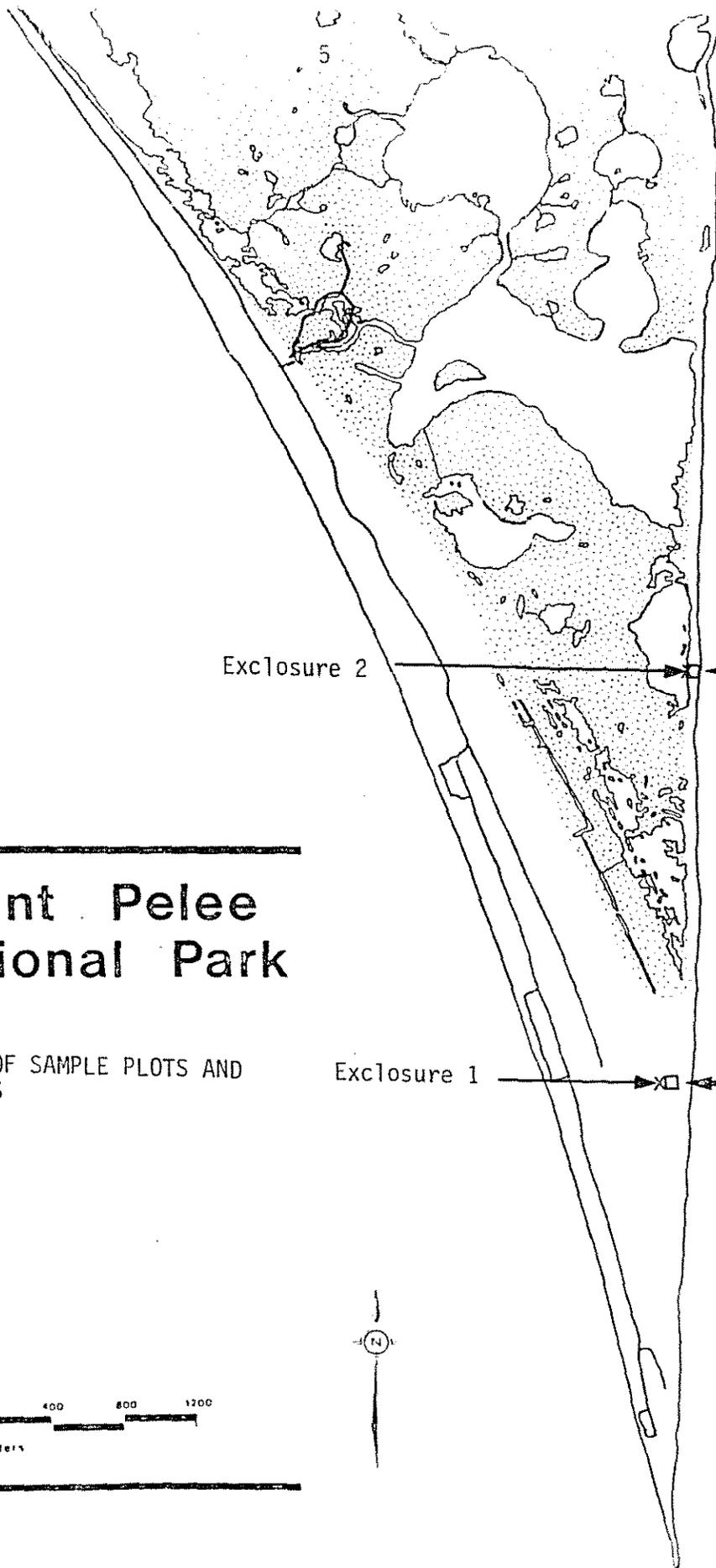
Censusing of predated nests was intended to provide a gross figure of predation, locate high density nesting sites, and indicate the peak nesting season.

Predated nests were found by searching for empty turtle egg shells. Each predated nest was identified as either Snapping Turtle (SNTU) or other species (OTHER) by inspection of shell fragments. Snapping Turtles are the only species that lay spherical eggs (except for the extremely rare Spiny Softshell), and the average clutch size (30) is much greater than other species (3-13).

2.4 PREDATOR EXCLOSURES

Two predator exclosures were constructed, each measuring 1.5 x 2.0 m; the sides were covered with 10 x 15 cm mesh and the top covered with chicken wire (see Figure I). This design was intended to exclude predators but allow access by small and medium sized turtles.

Both exclosures were placed in areas where nesting activity had occurred on May 31 and remained in place for duration of the study. Exclosure 1 was placed near the exit of old East Beach road. Exclosure 2 was placed near Redhead Pond (see Map II), and covered an intact nest.



Exclosure 2

Sample Plot 1

MAP II

Point Pelee National Park

LOCATION OF SAMPLE PLOTS AND EXCLOSURES

Exclosure 1

Sample Plot 2

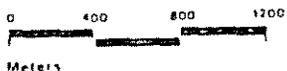
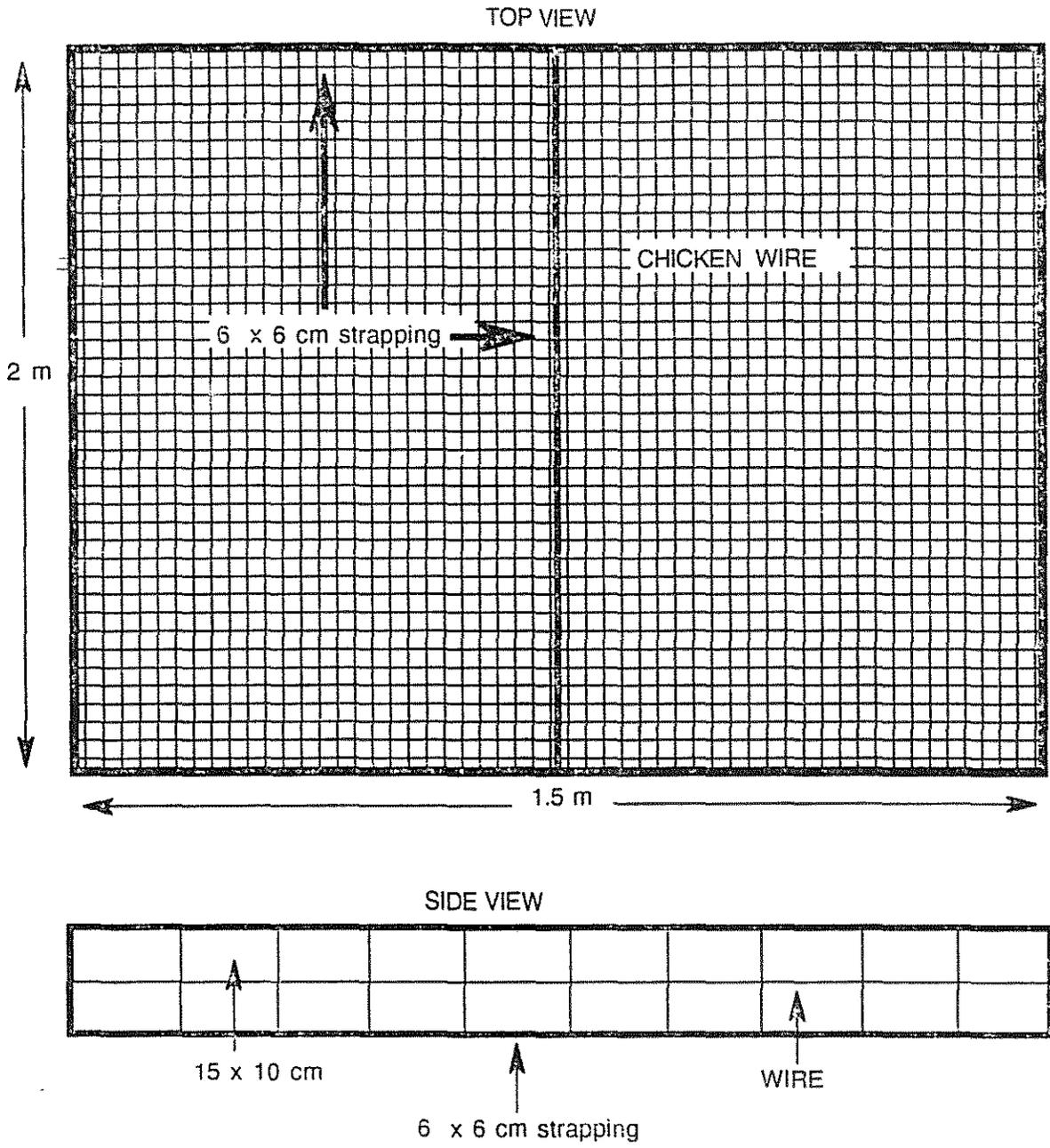


Figure i
Turtle Nest Depredator Exclosure



3.0 RESULTS AND DISCUSSION

3.1 SAMPLE PLOTS

Plot 1 had three predated nests. Plot 2 had eight predated nests and two intact nests (one covered by Exclosure 2). Test holes were recorded at both sites (see Table I).

Predation in Plot 1 was 100%, and 80% in Plot 2. Predation at Plot 2 may have been greater if one nest had not been protected by an exclosure.

3.2 INTACT NEST CENSUS

Three intact nests were found during this study. One was protected by Exclosure 2, and another was located 2 metres west of this site in Plot 2. Both were identified as species other than a Snapping Turtle. A Snapping Turtle nest was found on the beach, due east of Plot 2. No marked nests were predated.

DATE	LOCATION	SPECIES
03 June	1900 m north of Shuster's exit	SNTU
03 June	Sample Plot 2 (exclosure)	OTHER
06 June	Sample Plot 2	OTHER

This method did not provide any conclusive information on predation rates. Too few nests were located to provide an adequate sample size. One of the greatest barriers to finding intact nests may simply be the high rate of predation. Lack of predation on marked nests may be linked to the sampling method. The act of digging a nest up to identify the species may dissipate the scent of the eggs, or mask the site with human scent.

TABLE I

Turtle Activity in Sample Plots

SAMPLE PLOT 1 (near old East Beach road exit)

DATE	ACTIVITY
31 May	monitoring plot established
03 June	2 predated nests (SNTU) 1 test hole
07 June	1 test hole
17 June	1 predated nest (OTHER)

Predation = 100%

SAMPLE PLOT 2 (west shore of Redhead Pond)

DATE	ACTIVITY
03 June	monitoring plot established
03 June	1 intact nest (OTHER) - covered by Exclosure #2
03 June	4 predated nests (SNTU)
06 June	1 intact nest (OTHER)
06 June	3 test holes
07 June	2 predated nests (OTHER)
10 June	1 predated nest (OTHER)
10 June	2 test holes
25 June	1 predated nest (OTHER)

Predation = 80%

3.3 PREDATED NEST CENSUS

A total of 10 field surveys were made along east beach during this study, in addition to several opportunistic counts at other sites. 90 predated nests were found, 84 of which occurred on the east beach, primarily adjacent to marsh ponds (see Maps III and IV and Table II). The majority of tracks near predated nests were from raccoons. Coyote or dog tracks were also recorded along the beach, and one observation of canid predation was made.

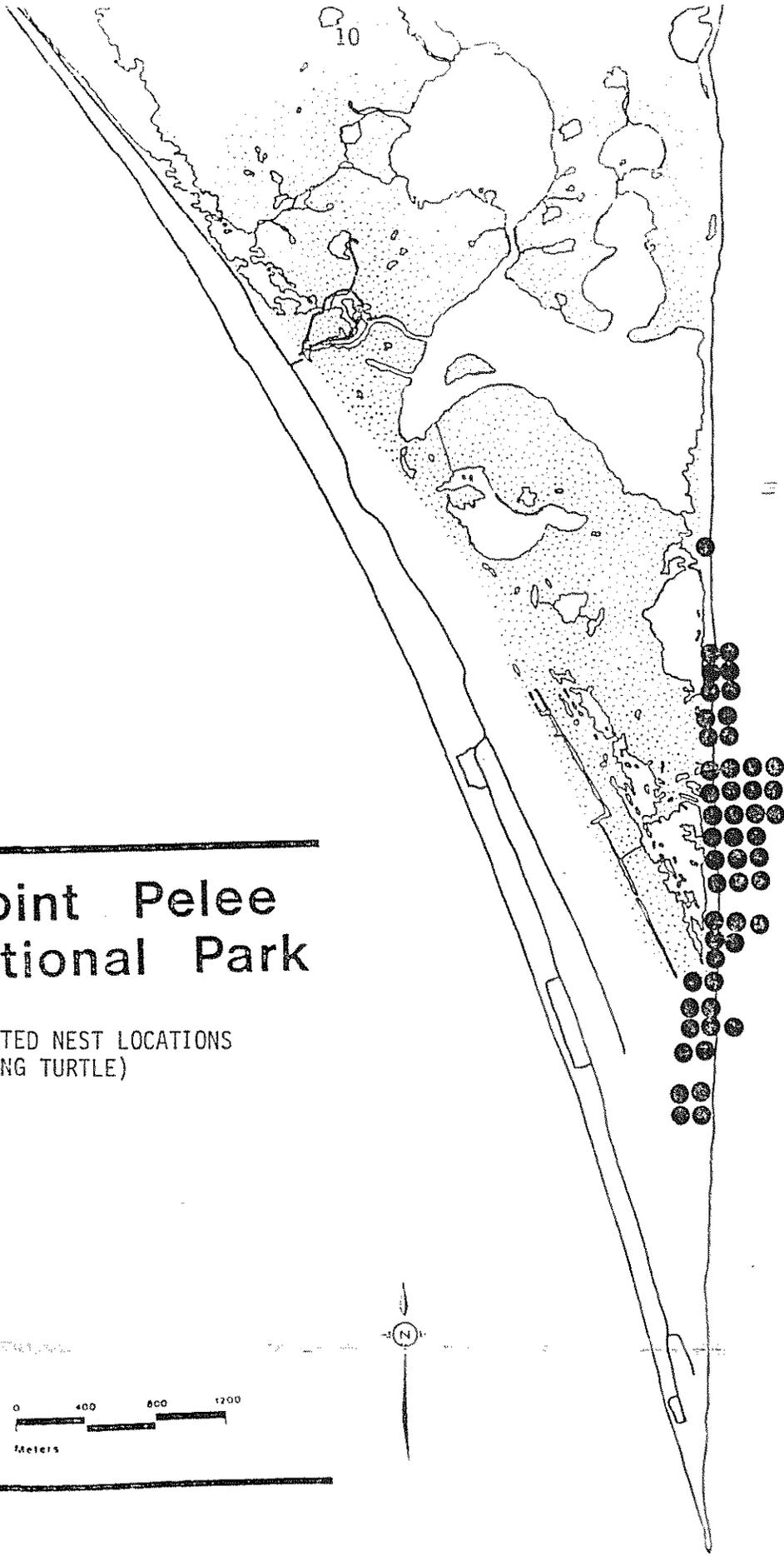
61% of turtles using the east beach for nesting were Snapping Turtles. This may indicate a site preference of this species rather than a relative abundance. Utilizing an average clutch size of 30 eggs for Snapping Turtles and 8 for other species (Cook), this study documented the predation of 1650 Snapping Turtle eggs and 280 others.

3.4 PREDATOR ENCLOSURES

No nesting activity was recorded in either predator enclosure. The nest that had been previously located at the site of Enclosure 2 was however protected. From tracks it is evident that smaller turtles did enter the enclosures and that larger turtles changed direction when the enclosures were encountered. At Enclosure 2, there were several unsuccessful attempts by a predator to dig under the enclosure.

This method failed for several reasons, but primarily because of scale. Relative to the available nesting area, the enclosures covered a minute area. The probability of a turtle entering an enclosure (or any 3 square m area) and nesting is very small.

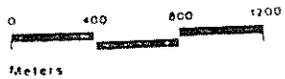
Based on the protection of a single nest, and the foiled attempts of predators, the enclosures were successful at protecting established nests. The same function could however be served by a much smaller, portable and cheaper design. Protecting intact Blanding's Turtle nests with a small chicken wire cage has been proven to be effective in Kejimikujik National Park (Drysdale pers. comm.).

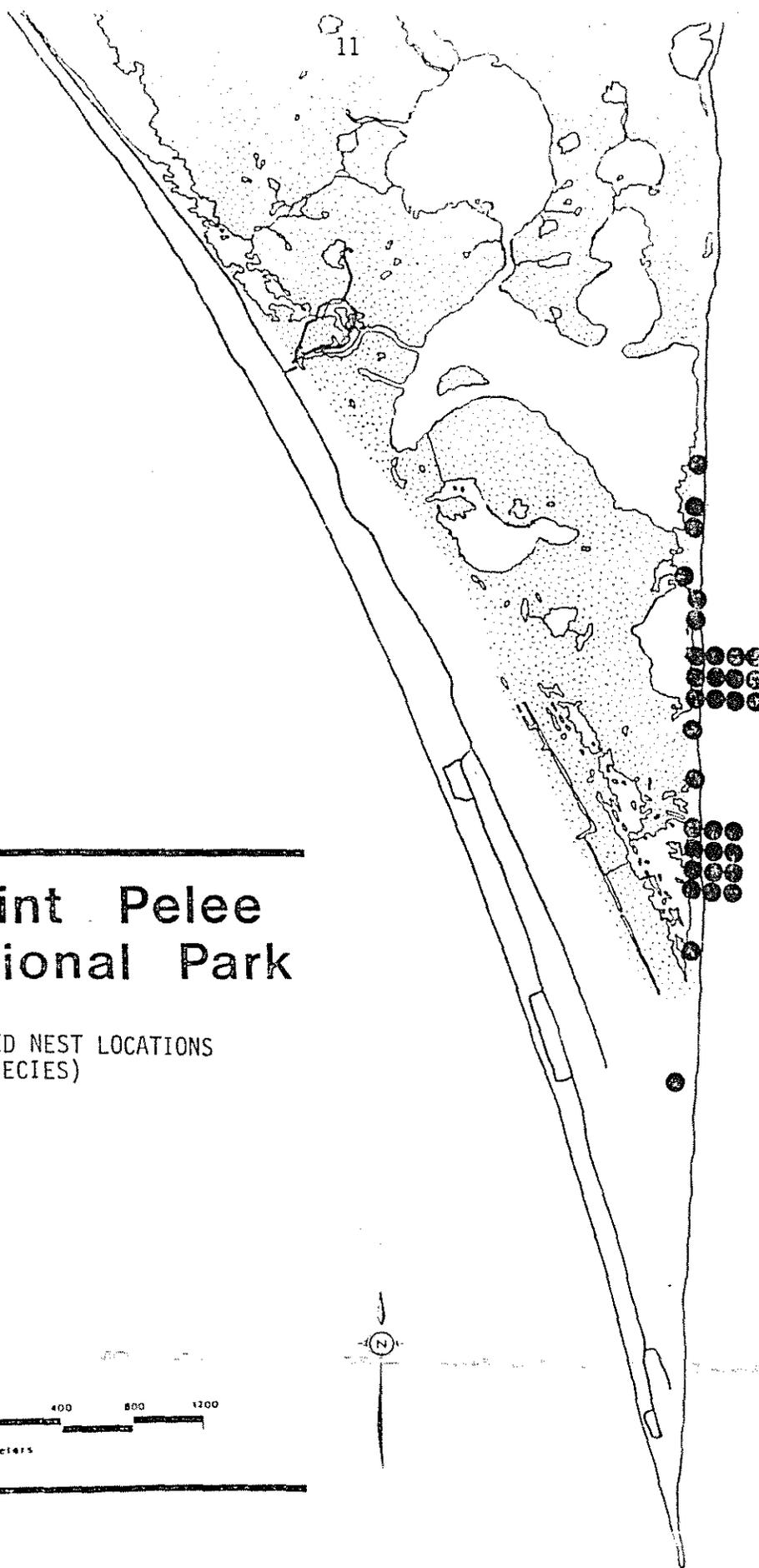


MAP III

Point Pelee National Park

DEPREDATED NEST LOCATIONS
(SNAPPING TURTLE)





MAP IV

Point Pelee National Park

DEPREDATED NEST LOCATIONS
(OTHER SPECIES)

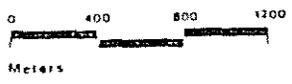


TABLE II
Nest Predations

DATE	LOCATION	OBSERVATIONS
31 May	Shuster's Trail bridge	SNTU
31 May	10 m east of bridge	SNTU
31 May	near old east beach road exit	SNTU
31 May	near old east beach road exit	SNTU
31 May	entrance to Northwest Beach	SNTU
03 June	Sample Plot 1	SNTU
03 June	Sample Plot 1	SNTU
03 June	near old east beach road exit	SNTU
03 June	near old east beach road exit	SNTU
03 June	near old east beach road exit	OTHER
03 June	100 m north of Shuster's exit	SNTU
03 June	150 m north of Shuster's exit	SNTU
03 June	160 m north of Shuster's exit	SNTU
03 June	300 m north of Shuster's exit	SNTU
03 June	300 m north of Shuster's exit	SNTU
03 June	600 m north of Shuster's exit	SNTU
03 June	750 m north of Shuster's exit	SNTU
03 June	1000 m north of Shuster's exit	SNTU
03 June	1000 m north of Shuster's exit	SNTU
03 June	1100 m north of Shuster's exit	OTHER
03 June	1100 m north of Shuster's exit	OTHER
03 June	1100 m north of Shuster's exit	SNTU
03 June	Sample Plot 2	SNTU
03 June	Sample Plot 2	SNTU
03 June	Sample Plot 2	SNTU
03 June	Sample Plot 2	SNTU
04 June	50 m north of Shuster's exit	SNTU
04 June	550 m north of Shuster's exit	OTHER
04 June	900 m north of Shuster's exit	SNTU
04 June	900 m north of Shuster's exit	SNTU
04 June	1000 m north of Shuster's exit	SNTU
04 June	1020 m north of Shuster's exit	SNTU
04 June	1020 m north of Shuster's exit	SNTU
04 June	1050 m north of Shuster's exit	SNTU
04 June	1075 m north of Shuster's exit	SNTU
04 June	1075 m north of Shuster's exit	SNTU
04 June	1075 m north of Shuster's exit	OTHER
04 June	1200 m north of Shuster's exit	OTHER
04 June	1550 m north of Shuster's exit	SNTU
05 June	1100 m north of Shuster's exit	OTHER
05 June	2600 m north of Shuster's exit	OTHER
05 June	2700 m north of Shuster's exit	OTHER
05 June	2900 m north of Shuster's exit	SNTU
05 June	north shore of Redhead Pond	OTHER

DATE	LOCATION	OBSERVATIONS
07 June	250 m north of Shuster's exit	SNTU
07 June	950 m north of Shuster's exit	SNTU
07 June	1250 m north of Shuster's exit	OTHER
07 June	1500 m north of Shuster's exit	OTHER
07 June	Sample Plot 2	OTHER
07 June	Sample Plot 2	OTHER
10 June	200 m north of Shuster's exit	SNTU
10 June	420 m north of Shuster's exit	SNTU
10 June	620 m north of Shuster's exit	SNTU
10 June	900 m north of Shuster's exit	SNTU
10 June	1150 m north of Shuster's exit	OTHER
10 June	1200 m north of Shuster's exit	SNTU
10 June	1220 m north of Shuster's exit	OTHER
10 June	1220 m north of Shuster's exit	SNTU
10 June	1220 m north of Shuster's exit	SNTU
10 June	1600 m north of Shuster's exit	SNTU
10 June	Sample Plot 2	OTHER
12 June	south end of canal	SNTU
12 June	south end of canal	SNTU
12 June	south end of canal	SNTU
12 June	south end of canal	SNTU
12 June	west beach near Sanctuary	OTHER
17 June	Sample Plot 1	OTHER
17 June	450 m north of Shuster's exit	SNTU
17 June	450 m north of Shuster's exit	SNTU
17 June	1150 m north of Shuster's exit	OTHER
17 June	1450 m north of Shuster's exit	OTHER
17 June	1600 m north of Shuster's exit	OTHER
17 June	2350 m north of Shuster's exit	OTHER
17 June	2400 m north of Shuster's exit	OTHER
17 June	2600 m north of Shuster's exit	SNTU
17 June	2600 m north of Shuster's exit	OTHER
17 June	2600 m north of Shuster's exit	OTHER
17 June	2600 m north of Shuster's exit	OTHER
19 June	550 m north of Shuster's exit	SNTU
19 June	1000 m north of Shuster's exit	OTHER
19 June	1100 m north of Shuster's exit	OTHER
19 June	1300 m north of Shuster's exit	SNTU
19 June	2000 m north of Shuster's exit	OTHER
19 June	2800 m north of Shuster's exit	OTHER
25 June	Sample Plot 2	OTHER
09 July	20 m south of Sample Plot 2	OTHER (old)
09 July	20 m south of Sample Plot 2	OTHER (old)
09 July	20 m south of Sample Plot 2	SNTU (old)
09 July	20 m south of Sample Plot 2	SNTU (old)
09 July	50 m south of Sample Plot 2	OTHER (old)

TOTAL PREDATED NESTS

90 (55 SNTU, 35 OTHER)

84 along east beach

4.0 CONCLUSIONS

4.1 NESTING ACTIVITY

The results of this study support previously collected data on turtle nesting at Point Pelee. Nesting occurs in June, peaking in the 2nd and 3rd weeks. The peak this year may be early in comparison to past years because of the hot spring. Areas of high nesting density are; the east shore of the southern marsh ponds and the east shore of Redhead Pond. While not intensively studied during this project, the east shore of Lake Pond and sandy areas near the canals probably support high densities of nests. Nests of Snapping Turtles are the most frequently observed.

4.2 PREDATION RATES

This study indicates that turtle nest predation along the east beach at Point Pelee National Park is possibly as high as 80%. While this rate may not be applicable to all nesting habitats, it is probably representative of overall predation. The primary predators are raccoons.

The apparently high predation rate of turtle nests along the east beach at Point Pelee National Park is cause for concern. While nest predation is a natural phenomena, current rates appear excessive and may be detrimental to the long term viability of turtle populations. Further study is required, and management action may be required to mitigate this issue through the reduction of raccoon numbers and/or enhancement of turtle populations.

*This may be completely normal.
- turtle populations are relatively long
- pop. of Pelee seem to be healthy
as evidence of all the nests
- some trees produce millions of seeds
but only need a few over a period of decades
to survive - as a percentage survival this
would be very low.
I suspect in the absence of the evidence
turtle pop. at Pelee are OK*

5.0 RECOMMENDATIONS

This study must be continued in 1992 in order to verify predation rates and trends. In addition, other pertinent factors must be examined, including the status of turtle and the raccoon populations. The following action is recommended:

Intensified field studies of turtle nest predation.

- repeated monitoring of the two sample plots utilized in 1991
- primary monitoring of three additional sample plots
- census of predated nests
- identification of egg shells from predated nests

Time required: 2 person weeks

This study will aid in the refinement of predation rates. The identification of eggs shells will require the assistance of museum or university herptile experts. This data will provide very significant information on critical nesting areas for each species.

Continued status monitoring of turtles.

- continuation of bask censuses
- further field trials of turtle trapping

The status of each turtle species must be determined through intensive monitoring. Emphasis should continue to be on Spotted, Common Musk and Eastern Spiny Softshell Turtles.

Time required: 3 person weeks

Population estimate of raccoons.

- estimate the number of raccoons at Point Pelee through nocturnal roadside surveys (possibly marking animals with paint pellets); this should be conducted in May or June
- determine if the raccoon density at the Park is unnaturally high in comparison to other areas

This research will illuminate the root of the issue. The need for restoring raccoon populations to a natural equilibrium will be revealed. The magnitude of this limiting factor on turtles and other predated species will be better understood, and can serve as a benchmark to evaluate the impact of eliminating artificial food sources.

Time required: 1 person week

There may not be an issue here - except in fiction.

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APPENDIX I

Trends in Raccoon Numbers at Point Pelee

The rate of turtle nest predation is probably related to the density of raccoons inhabiting the Park. This section provides a brief outline of historical accounts relating to raccoon populations at Point Pelee and discussed some of the anthropogenic factors that may relate to their numbers.

Numbers of raccoons have apparently been increasing since the time of Park establishment. In 1918 raccoons were considered to be very rare or extirpated from Point Pelee (Taverner, in Stranak). By 1939 raccoons were considered to be uncommon (Halliday), and common in 1969 (Menefy). This increase may be attributable to an elimination of natural and human predation and an increasing supply of garbage.

Raccoons are currently common at Point Pelee. The population may be maintained at unnaturally high numbers by food wastes taken from garbage cans and handouts. The population of raccoons at Point Pelee may also be supplemented by the release of "rescued" animals into the Park.

The average density of wild raccoons in Canada ranges from 5 to 24 individuals/sq. km (Battin). While the number of raccoons at the Park is not known, casual observations indicate a high density. This density is the greatest in late spring and early summer as the young emerge and begin to forage. The period of greatest raccoon density thus coincides with turtle nesting.

The significance of released raccoons may be minimal in terms of popⁿ numbers. - a short period of adjustment may occur as they probably have a no home range - etc that they protect - kill or drive each other away

- The release question is more related to disease spread and gene pool - which is likely negative on the native popⁿ.

APPENDIX II

Turtle Mortality

The impact of nest predation on turtles must not be perceived in isolation of other mortality factors. It would be erroneous to conclude that predation of 80% of the nests results in a hatchling survival rate of 20%. This section discusses some of the other sources of mortality faced by turtles, and related these factors to nest predation; including some preliminary discussion on turtle populations at Point Pelee.

Environmental factors during incubation, such as drought, flooding and storm action add to the initial mortality rate of nest predation. Erosion of the east beach over the last twenty years has decreased the area of suitable nesting habitat. During emergence, the hatchlings are exposed to a multitude of predators including raccoons and shore birds. Many never find water and dehydrate or are killed on the roads. Hatchlings that do reach water must survive a spectrum of aquatic predators and environmental factors (including hibernation) for several years until maturity. Thus, apparent nest predation of 80% would result in a recruitment rate of considerably less than 20%.

Low recruitment rates is more critical to some species than others. Painted and Snapping Turtles are very abundant at Point Pelee, and are probably able to survive sustained predation. Less common species may decline or eventually become extirpated if unnaturally high predation rates are sustained. *and a high rate of low recruitment over long term.*

The impact of predation is the most serious on those species that are already rare. Spotted Turtles have drastically declined at the Park since the 1960's; primarily because of collecting and habitat loss (Roy pers. comm.). The low reproductive rate of this species (2-4 eggs) coupled with a high rate of nest predation could reduce recruitment to such a low level that the long term survival of the species in the Park is threatened.

*probably
strongly related to this.*

APPENDIX III

Preliminary Management Recommendations

This last Appendix examines some of the management options that could be employed to decrease the impact of turtle nest predation at Point Pelee if this phenomena is determined to be a significant threat. A preliminary management strategy is given at the end of this section.

MANAGEMENT OPTIONS

No Action

Management at Point Pelee could simply accept the high predation rate as a natural phenomena, an unmanageable problem, or low a priority issue, and take no action.

This approach would probably result in declining turtle populations and accelerate the imminent extirpation of the Spotted Turtle. While this is the cheapest option in the short term, the future costs of restoring original turtle populations would be very high. The Canadian Parks Service has the moral and legal obligation to maintain and restore populations of native species. Thus, this option has no ecological, economic or ethical support.

Continued Research

The results of this study could be expanded upon by continuing the study of turtle nest predation along east beach. Research into raccoon densities could also be initiated.

This option would result in a more complete definition of the problem. The predation rate could be refined, and trends determined. While this option in itself would not provide solutions, it is an important component for choosing and assessing the effectiveness of other options.

Non-lethal Controls of Predators

Raccoon populations can be controlled by eliminating artificial food sources and released animals. All garbage cans could be replaced with raccoon-proof containers. This would also be a positive public safety and maintenance step. Stricter enforcement and education on feeding wildlife and releasing animals would also be beneficial. The cooperation of Erie Wildlife Rescue may be obtained by meeting and explaining the ecological impacts of releasing raccoons. Re-location of Point Pelee raccoons to other sites is not considered an option.

Raccoon-proof waste receptacles have recently been installed at the Marsh Boardwalk. This may decrease raccoon populations in the long term; however, the elimination of this food source may increase the intern use of natural food, possibly resulting in additional pressure on the turtle population. This option may need to be complimented with methods of turtle conservation.

Raccoon Cull

As the root of this problem may be unnaturally high numbers of raccoons, the ultimate solution may be to reduce the population. A cull would protect natural food sources from a surge in exploitation if raccoon-proof garbage containers are installed throughout the Park.

This option would be extremely effective. However, it is not considered feasible because of the time scale and costs required for further research, public education and approval.

Pre-Nesting Exclosures

High density nesting areas could be fenced off in a means that would allow for open access by turtles, but restrict predators. The only pre-nesting exclosure that would be functional is a fence that encompasses an area of high nesting activity and adjacent open water (see Figure II).

This option would be feasible at only a few sites in the Park; along Redhead Pond and the canals. While the initial work required to implement this option is high, it is essentially maintenance-free and key nesting areas would be protected.

Post-Nesting Exclosures

All intact nests that are found could be protected by a small wire cage which does not interfere with eggs or hatchlings, but prevents the nest from being predated (see Figure II).

The success of this option would be determined by the number of intact nests which are located. As intact turtle nests are difficult to locate, this option would not be an effective means of enhancing turtle populations, but could be utilized on an opportunistic basis.

Artificial Rearing

Turtle populations could be supplemented through the release of artificially incubated hatchlings. Eggs from intact nests could be collected and incubated, or gravid females captured and placed in nesting pens (see Figure III). Hatchlings could then be released once they emerge, or held for the winter. This would enhance turtle survival rates through a very critical period.

I don't think there is evidence to support any of these. We artificially support one component of the ecosystem because we feel it is better? This type of meddling may in fact be

This option would definitely increase turtle populations, and may be necessary for the survival of some species (Spotted Turtle). Interference of the natural order is justified in this case because it is a corrective measure. The resources required to implement this option depend upon the intensity of the project. While placing gravid females in a nesting pen, allowing the eggs to incubate outside and releasing the young after hatching would not require intensive inputs; artificial incubation and over-wintering of hatchlings would require a commitment of several person weeks.

PRELIMINARY MANAGEMENT STRATEGY

A combination of management options should be employed to decrease turtle nest predation. The issue must be solved at two levels; elimination of the problem, and mitigation of the impacts.

Raccoons at Point Pelee must be restored to natural population levels. Human influences must be eliminated if this goal is to be achieved. All garbage cans should be replaced with raccoon-proof receptacles and the release of animals discouraged. By decreasing artificial supplements to the raccoon population at Point Pelee, numbers should decline and reach a naturally controlled equilibrium.

Management of raccoon numbers must be accompanied by strategies that restore turtle populations. As the raccoon population declines, turtle populations should be enhanced. Large pre-nesting exclosures should be constructed at the Redhead Pond sites and at the canal behind Warden Services. The site within the canal exclosure should be cleared of ground vegetation to encourage nesting. The exclosures should be in place by early May, and can remain for several years.

Went → The primary method of population enhancement should be the artificial rearing of eggs. *apparently it's already been done.* A nesting pen should be constructed in the Park nursery. Any gravid female which is captured should then be placed in the pen until the eggs are laid. Intact nests should be intensively searched for along east beach, possibly including in the exclosures. Eggs should be removed and artificially incubated. Eggs from the nesting pen could also be removed and incubated indoors. Snapping Turtle and Painted Turtle hatchlings should be released in the fall. Holding the less common species for the winter should be considered. All Spotted Turtles that are captured should be retained as breeding stock. Interpretation has been successful in hatching the eggs of most turtles. Several articles on turtle egg incubation are available.

Research on this issue should also be continued. Several more monitoring plots should be established in order to refine the quantification of the predation rate. An estimation of raccoon numbers (and thus density) in the Park should also be completed.

FIGURE II

Pre- and Post-Nesting Exclosure Designs

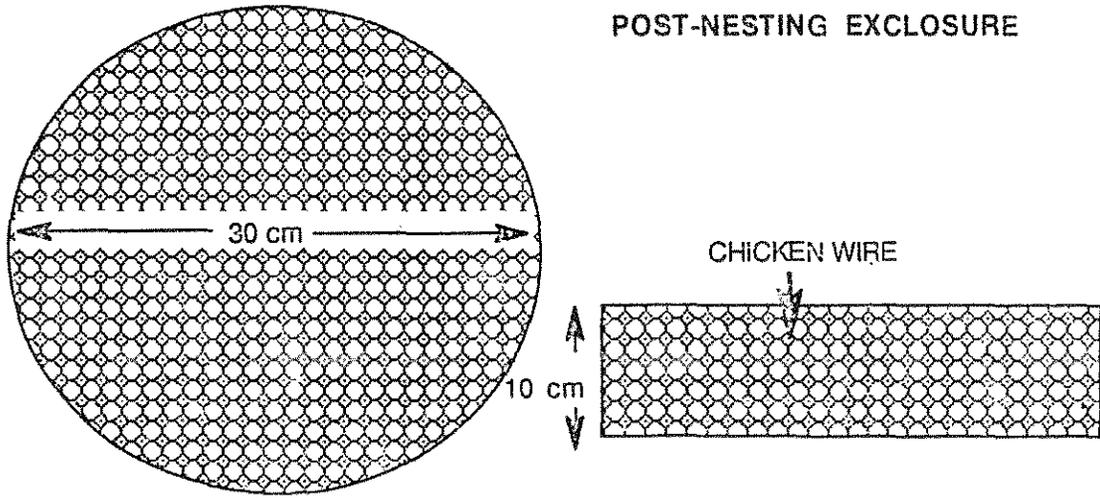
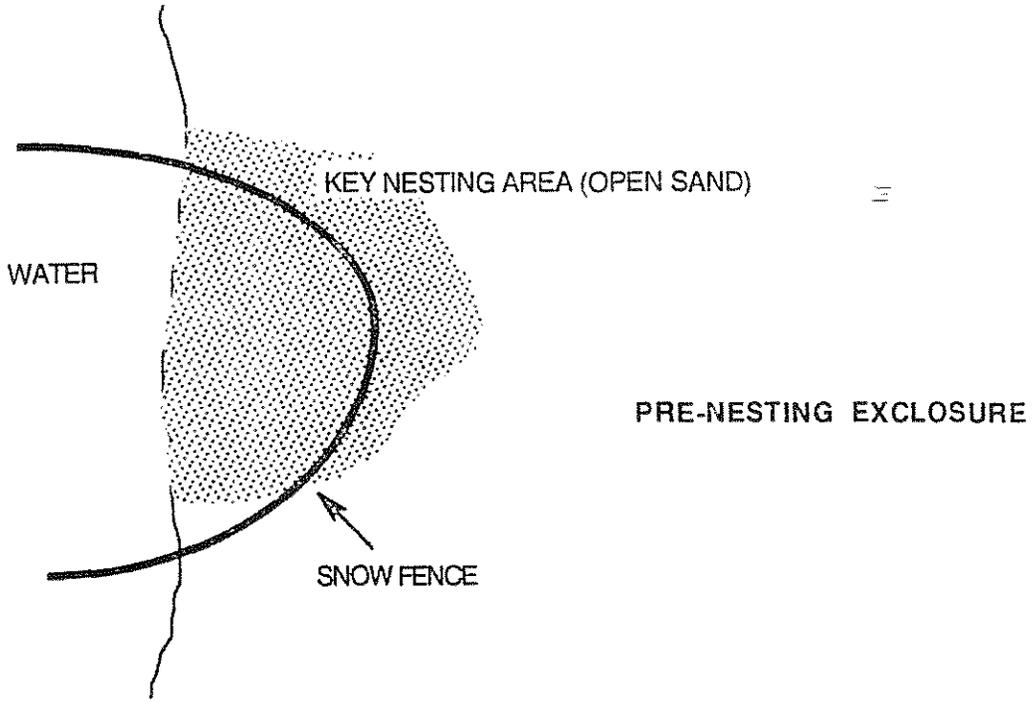
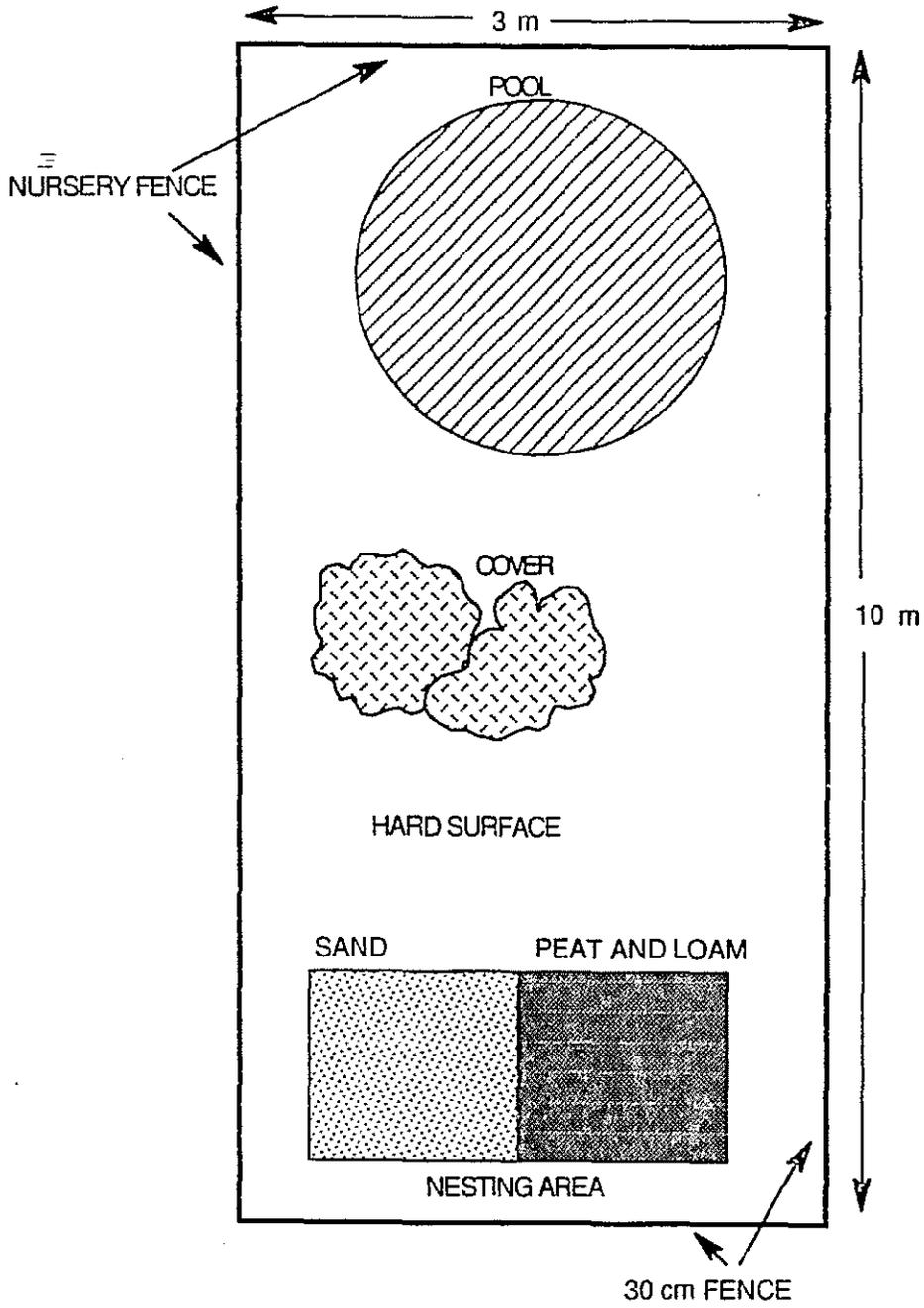


FIGURE III
Nesting Pen Design



POINT BEEF NATIONAL PARK

POINT PELEE NATIONAL PARK