

Spotted turtles (*Clemmys guttata*) Regional Conservation Needs Assessment Final Report (lower Delmarva)

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Introduction

From 2018-2021, we (Eric Liebgold and Tami Ransom) performed population monitoring and DNA collection for spotted turtles (*Clemmys guttata*) at 8 sites (4 MD, 4 DE). Sites were selected in consultation with Scott Smith (MD DNR) and Nathan Nazdrowicz (DE DNREC) and site/plot selection utilized local knowledge and surveys. Originally, the RCN was expected to run from 2019-2020, but starting in 2018 was permitted and. Due to Covid limitations, only one Demographic Assessment (DA) and one Trap-based Rapid Assessment (TRA) was done in 2020, and we requested and received an extension to the RCN through June 2021.

Methods

Eight sites were surveyed using DAs from March-June (Table 1; 12 survey nights over the course of the season) according to Spotted Turtle Working Group protocols with 1-4 plots of five traps each, depending on area and water availability within the 800m-2km area. We conducted additional DA and/or TRA at some sites in subsequent years (Table 1) because weather in 2018 & 2019 did not seem optimal for spotted turtle surveys and we wanted perform supplemental trapping to ensure optimal trapping success and enhance population estimates at those sites. At two sites (Blackwater and Prime Hook National Wildlife Refuges) we surveyed additional (sub)sites (outside the 2 km “site” area, but within 8 km, thus too close to be counted as an additional site) near the first plots. As the additions typically occurred late in a season when we received new information regarding additional spotted turtle sightings, we used a Trap-based Rapid Assessment of 4 nights. Likewise, even though we were limited by water availability and required distance between traps at most sites, we were able to utilize high density trapping at Trap Pond State Park when we did not have captures after the first round. We additionally trained and facilitated refuge personnel to conduct Demographic Assessments at 4 subsites at Blackwater Wildlife Refuge in 2021 (revisiting the DA and TRA subsites from 2019 and adding two more subsites). In sum, we sampled 1955 trap nights across 27 plots at 8 sites.

We used Promar minnow traps exclusively at most sites, with one site (Deal Island Wildlife Area), one sub-site (Kuenhle Tract at Blackwater Wildlife Area) and plots at two sites (Assateague National Seashore and Assawoman Wildlife Area) requiring D-Hoop traps for some plots due to water depth and potential raccoon interference (Table 1). We baited traps with cans of sardines in oil that were changed every 24 h.

Additional supplies and equipment purchased using the WMI funds included traps, stakes, waders, thermometers, bleach and a GPS and calipers. In addition, graduate students were funded to work on the project in two semesters. Funds were all matched (35% match) from Salisbury University funds and in-kind funds such as vehicular mileage and volunteer hours. We came in slightly under budget, with \$644.70 remaining.

Results

A total of 386 individual spotted turtles were successfully captured (plus 184 recaptures within seasons and 19 recaptures among years; Table 2) and data was submitted each year in a timely fashion. Tissue for DNA analyses was collected at all sites except one. After our 2018 surveys and the signing of our contract, the requested minimum number of tissue samples was modified and increased from 7 to 20, but we endeavored to meet that goal at all sites even with additional sampling even though we had already completed our intended sampling at some sites. With the exception of one site (Trap Pond State Park) with no spotted turtles captured, one site with only 5 individuals captured (Prime Hook National Wildlife Refuge), and one site that we were unable to return to post-2018 due to distance (Cedar Swamp Wildlife Area with 7 blood/tail tissue samples and 5 nail samples sent in), we collected and sent in at least 20 tissue samples for the remaining five sites (Table 3). Some of this coverage was due to targeted surveys (not following the protocols) in 2021 solely for the collection of DNA. Four of these sites with 20 samples were especially notable as per the DNA protocols, which listed them as genetically important because they were on peninsulas ($n = 3$) or on an island ($n = 1$) (Table 3).

Conclusions

We exceeded the stated planned goals in 2018 for monitoring populations of spotted turtles over three years and collecting tissue samples for DNA at two sites in DE and two sites in MD following the Spotted Turtle Assessment Protocols. We covered eight sites (four in each state), with varying surveys of each site based on geographical, water-level and protocol-related constraints on survey areas, for a total of 1955 trap nights across 27 plots (Table 1).

Across four years of surveying for Spotted Turtles on the Delmarva Peninsula for the Regional Conservation Needs Assessment, we encountered and overcame many difficulties, from suboptimal turtle trapping weather conditions to Covid-19 restrictions on field work. We also encountered some protocol-related difficulties. First, from prior sampling at some of our sites and sampling for DNA after the DA's, we have found that clustering traps in areas of high activity, as near as 2 m apart, yields higher capture rates than spacing 30 m or even 15 m apart as per the protocols. We would have had more effective trapping at some sites where we basically needed to place traps in poor quality habitat (for spotted turtles) in some plots rather than clustering traps in high activity pools. We do understand that for count surveys, consistency among sites is desirable, but mark-recapture estimates are robust to variation in effort (Nichols, JD 1192. Capture-recapture models, *Bioscience* 42:94-102). Likewise, we reported info for two sites with sub-site trapping efforts (plots > 2km apart) that were too close to be considered separate sites (< 8 km apart). For these two we had prior knowledge or reported sightings and wanted to include all relevant populations and subpopulations. However, during the initial site evaluations, we likely ignored exploring other subsite-level ponds that had spotted turtles but outside the distance criteria for plot demarcation.

Still, at the end, after procuring all necessary permits and site permissions, surveying sites, and purchasing and cleaning equipment (coming in slightly under budget), adhering to the protocols, as well as asking for and receiving a Covid-related end date extension, we captured spotted turtles 589 times, including 386 individual spotted turtles at eight sites (four in Delaware and four in Maryland; Table 2) and also collected 122 tissue samples for DNA from seven sites, with optimal numbers of at least 20 DNA samples from five sites (Table 3). Additionally, we provided training to two graduate students and 22 undergraduate students as well as personnel at Blackwater National Wildlife Refuge, who plan on continuing demographic surveys for this species.

Table 1. Summary of types of spotted turtle (*Clemmys guttata*) surveys and traps, and trap nights by sites during RCN surveys from 2018-2021.

State	Site	Code	TRA or DA or DNA	Year(s)	# plots	Trap type	# trap nights
DE	Assawoman Wildlife Area	AS	DA/TRA/DNA	2018/2020/2021	4	Promar/D-Hoop	410
DE	Cedar Swamp Wildlife Area	CS	DA + VRA	2018	2	Promar	100
DE	Prime Hook National Wildlife Refuge	PH	TRA/DA	2020/2021	3/3	Promar	200
DE	Prime Hook National Wildlife Refuge	PH2	TRA	2021	1	Promar	20
DE	Trap Pond State Park	TP	DA (plots 1/2 only)	2021	2 of 4	Promar	200
DE	Trap Pond State Park	TP	TRA (plots 3/4)	2021	2 of 4	Promar	40
MD	Assateague National Seashore	AT	DA/DA/DNA	2018/2019/2021	2	Promar/D-Hoop	260
MD	Blackwater National Wildlife Refuge	BL-KT	DA x 2	2019/2021	1	Promar	140
MD	Blackwater National Wildlife Refuge	BL-KU	TRA/DA	2019/2021	2	Promar	240
MD	Blackwater National Wildlife Refuge	BL-LW	TRA/DA	2020/2021	2/1	Promar	80
MD	Blackwater National Wildlife Refuge	BL-GB	DA	2021	1	Promar	100
MD	Deal Island Wildlife Area	DI	DA/TRA/TRA/DNA	2018/2019 2020/2021	1/2	D-Hoop	125
MD	Talbot (Private Property)	TA	DA	2020	4	Promar	240

Table 2. Summary of captures of spotted turtle (*Clemmys guttata*) during RCN surveys from 2018-2021. The numbers in the # individual CLGU and # of recaptures columns correspond to the trap years at each site in Table 1. TRA/ DA are standard protocols, while DNA is trapping for tissue from 1-3 nights or not following trap distance (> 15 m) protocols.

			TOTAL	27	1955		
State	Site	Code	# individual CLGU each year	# recaptures each year	# recaps b/t years	Total individual CLGU	Total captures
DE	Assawoman Wildlife Area	AS	50/4/11	9/0/0	4	61	74
DE	Cedar Swamp Wildlife Area	CS	24	4	-	24	28
DE	Prime Hook National Wildlife Refuge	PH	2/4	0/0	1	5	6
DE	Trap Pond State Park	TP	0	0	-	0	0
MD	Assateague National Seashore	AT	9/15/7	2/3/0	6	25	36
MD	Blackwater National Wildlife Refuge	BL	16/17	4/15	5	28	52
MD	Deal Island Wildlife Area	DI	3/10/6/4	2/0/0/0	3	20	25
MD	Talbot (Private Property)	TA	223	145	-	223	368
			TOTAL	184	19	386	589

Table 3. Summary of spotted turtle (*Clemmys guttata*) tissue samples collected for DNA by site across entire project and submitted by June 2021.

State	Site	Code	Type of site	# blood/tail tips
DE	Assawoman Wildlife Area	AS	peninsular	21
DE	Cedar Swamp Wildlife Area	CS	mainland	7 + 5 nails
DE	Prime Hook Wildlife Refuge	PH	mainland	5
DE	Trap Pond State Park	TP	mainland	0
MD	Assateague Nat'l Seashore	AT	island	20
MD	Blackwater Wildlife Refuge	BL	mainland	22
MD	Deal Island Wildlife Area	DI	peninsular	20
MD	Talbot (Private Property)	TA	peninsular	22