



COASTAL RESOURCES DIVISION  
ONE CONSERVATION WAY • BRUNSWICK, GA 31520 • 912.264.7218  
COASTALGADNR.ORG

MARK WILLIAMS  
COMMISSIONER

DOUG HAYMANS  
DIRECTOR

MAY 11 2018

Michelle Kaylor  
Jekyll Island Authority  
Georgia Sea Turtle Center  
214 Stable Rd  
Jekyll Island, GA 31527

**Re: Letter of Permission (LOP), Temporary Placement of TerraPen Excluder Cage, Jekyll Island Causeway, Glynn County, Georgia**

Dear Ms. Kaylor:

This Letter of Permission (LOP) is in response to your request, dated April 27, 2018, for the placement of one (1) TerraPen excluder cage in coastal marshlands. The proposed project is to hand-place an 8ft. x 16ft. TerraPen at the edge of an intertidal zone of a creek bordering the Jekyll Island Causeway. According to your request, the project location is a natural habitat for terrapins (*Malaclemys terrapin*) and will jut out perpendicularly from the bank into the creek. The pen will be anchored using cinder blocks and nylon ropes at each corner. *M. terrapin* juveniles will be placed inside the TerraPen™ and monitored over the duration of the experiment. Wrack will be added to the pens to provide the juvenile terrapins places to hide. The pen will be checked daily and accessed by foot. The installation of the TerraPen structure will begin no sooner than 15 days from the date of this letter and will be completed no later than six (6) months from the date of this letter.

The Department authorizes the temporary placement of the TerraPen within CMPA Jurisdiction, as depicted in the attached description and drawings, and has no objection to the action, provided Best Management Practices (BMP's) are used. No unauthorized equipment, materials, or debris may be placed, disposed of, or stored in jurisdictional areas. Any incidental damage to dunes or dune vegetation will require restoration to be coordinated through this office. This LOP is valid for the above referenced project. Any change in the use, location, dimensions, or configuration of the approved project, without prior notification and approval from this office, could result in the revocation of this permission and in the required removal of the related structures.

This authorization does not relieve you from obtaining any other required federal, state, or local permits. If you have any further questions or concerns in regards to this or any other projects, please feel free to contact Sheldon Leiker at (912) 264-7218.

Sincerely,

Jill Andrews  
Chief, Coastal Management Section

Enclosures: Project Description/Drawings  
File: LOP20180077



COASTAL RESOURCES DIVISION

Research Application Form

Application Title: Acclimating head-started Diamondback terrapins in TerraPen

Principal Investigator: Michelle Kaylor, Terry Norton

Student Researcher: \_\_\_\_\_

Academic Sponsor: \_\_\_\_\_

Mailing Address: 214 Stabe Rd Jekyll Island GA 31527

E-mail Address: Mkaylor@jekyllisland.ga Phone Number: 912-635-4070

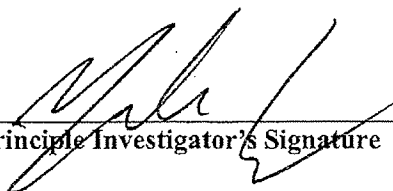
Project Location: 31.058308, 81.447654 Downing Musgrave Causeway

GPS Coordinates: 31.058308, 81.447654

Expected Start Date: May 1, 2018 Expected End Date: Oct 1, 2018

Upon completion of research, Applicants are subject to the following Post Research Requirements:

- Provide DNR a copy of all data collected, with the understanding that DNR will not publish the data without the consent of the researcher, upon request
- Provide DNR a digital copy of any research poster produced by the student, upon request
- Provide DNR a written report of the results, upon request
- Provide DNR a copy of any published materials
- DNR CRD should be properly acknowledged in any publications
- Removal of all project related materials at the end of the project

  
\_\_\_\_\_  
Principle Investigator's Signature

4/27/18  
\_\_\_\_\_  
Date

\_\_\_\_\_  
Student Researcher's Signature

\_\_\_\_\_  
Date

**Acclimating Head-Started Diamondback Terrapins (*Malaclemys terrapin*) Before Release  
in an Outdoor Enclosure**

**Terry M. Norton, DVM, Dipl. ACZM  
Michelle Kaylor**

**Jekyll Island State Park Authority, Georgia Sea Turtle Center**

**Request for a Georgia Department of Natural Resources Coastal Marshlands Protection  
Act Letter of Authorization**

**The Issue:** Globally, turtle species are experiencing population declines due to various anthropogenic effects ranging from over-collection, pollution, habitat degradation, and habitat loss (Rhodin et al. 2011). As such, highly inventive and novel extinction countermeasures need to be developed, refined, and implemented on ecologically-significant scales (populations and species). Effective conservation measures will rely on the integration of wildlife natural history, health, conservation biology, effect mitigation, and environmental education.

**The Species:** Diamondback Terrapins (*Malaclemys terrapin*) are the only estuarine turtle species in North America and occur along the eastern seaboard. This species is experiencing localized declines throughout its range as a result of various anthropogenic factors, such as habitat loss and pollution, crab pots, and road mortality (e.g., Hoyle and Gibbons 2000, Green et al. 2010, Crawford 2011). Population expansion and development in coastal areas necessitates road and infrastructure development which results in conflicts with their terrestrial nesting behaviors. Specifically, approximately 400 reproductive females enter the Jekyll Island Causeway in Georgia each nesting season as they are attracted to the elevated and open road shoulder to nest, resulting in an ecological trap and compromising long-term population viability (Crawford 2011).

**Objectives:** The Georgia Sea Turtle Center (GSTC) on Jekyll Island has instituted an integrated conservation approach (wildlife health, biology, and education) for mitigating these road effects that includes road patrolling and removing terrapins from the Causeway during peak nesting; rehabilitating injured terrapins at the GSTC hospital; constructing artificial nesting habitat on road shoulders; installing flashing signage to alert drivers; and outreach and education of island visitors, staff, and residents. Additionally, the GSTC veterinary and husbandry staff removes eggs from dead and injured females for incubation and head-starting at the hospital over the winter. The scientific basis for head-starting hatchling terrapins is that their increased size at release will help them survive their most vulnerable life stage as has been documented in freshwater turtle species (Haskell et al. 1996). To date, 838 hatchlings have been successfully reared indoors and subsequently released by GSTC staff. Here, we propose to continue the utilization of the outdoor marsh pens [TerraPens™] as a soft release method for head-started young *M. terrapin*. This project can guide future priorities in population augmentation efforts for *M. terrapin* on Jekyll Island while more broadly serving as a model for mitigating loss of reproductive females for this species and other turtle species worldwide that are viable candidates for head-starting programs.

**Methodology:** The purpose of this project is primarily to acclimate head-started *M. terrapin* to the wild after being raised in captivity for roughly a year at the GSTC. Eggs will continue to incubate *in situ* on the shoulders of the Causeway and in artificial nest boxes and to be removed from injured and dead *M. terrapin* hit on the Causeway for *ex situ* incubation at the hospital. The resulting hatchlings will then be raised in two stages exposed to different environmental conditions: first, in indoor Waterland® tubs at the GSTC hospital; and second, in an outdoor TerraPen™ (predator-excluded floating pen deployed in the marsh). Subjects will be handled minimally, except for enclosure cleanings, health examinations, and growth monitoring. The hospital rearing stage experiences manipulated conditions including heated water, UV lighting, basking lights, and supplemented food. Once in the marsh-deployed TerraPen™, *M. terrapin* will experience natural environmental ambient conditions and foraging options with the goal of acclimating them via a soft release to marsh conditions. Terrapins will remain in the TerraPen™ for a period of two weeks, during which one to two GSTC staff will check on the animals and the structure daily. There will be minimal interaction with the animals while in the outdoor enclosure, unless deemed necessary.

Terrapins will be pit-tagged, measured, and assessed by veterinarian before placement in the TerraPen™. During the hospital rearing stage individuals are fed Reptomin®, Zoo Med®, and dried krill primarily whereas during the TerraPen™ stage individuals will be fed a medley diet of chopped bait fish and have access to natural food sources in the marsh flora and fauna that colonize the TerraPen™.

*TerraPen™ Methodology:* The TerraPen™ was constructed using 4" and 1" diameter PVC pipe that is filled using Great Stuff brand expansion foam. The primary base is a 16' x 8' rectangular frame made of 4" diameter PVC pipe which serves as a floating attachment site for ½" hole size black nylon aquaculture netting which will form the walls and floors of the TerraPen™ creating an approximately 16' x 8' x 2' (LWD) pen size when fully inundated and outstretched. Additionally the TerraPen™ has predator exclusion netting of the same black nylon material covering the top of the pen in an arch of 1" diameter PVC pipe-making them <3' tall from the surface of the water and surrounding ground. It can be deployed by hand at the edge of an intertidal zone of a creek bordering the Jekyll Island Causeway whereby the TerraPen™ will jut out perpendicular to the bank into the creek. This location is ~10' from the high ground of what appears to be a dredge spoil from either the construction of the Jekyll Island Visitor Center or the Jekyll Island Causeway. Estimated coordinates for location are as follows: 31.058308, -81.447654. Since the TerraPen™ will be deployed by hand it requires no heavy machinery to install. It is imperative that the TerraPen™ be deployed at the edge of the tidal marsh creek and high marsh interface because this area is the habitat used by free-ranging wild juvenile *M. terrapin*. They select this habitat due to its high prey availability, protection from predators, and lower salinity levels relative to open water in the marsh. The lightweight design will allow for secure anchoring into place using cinder blocks placed at each corner and attachment using nylon rope. This design secures the enclosure during tidal fluctuations but still allows the pen to move vertically in a similar fashion as a floating boat dock. The TerraPen™ will be checked by foot traffic only. Daily husbandry and monitoring at the site will be accomplished using boots and waders as needed depending on the tidal stage. Tidal wrack will also be added to the inside of the TerraPen™ by hand as necessary to provide the terrapins with adequate hiding materials. Additional accumulation of marsh mud and debris will occur as a natural function of tidal fluctuations.

**Timeline:** We request a current Coastal Marshlands Protection Act (CMPA) Letter of Authorization to once again deploy the TerraPen™ at the same site for six months (starting as soon as possible) just as we have since 2014. Provided granting of a CMPA Letter of Authorization, head-started *M. terrapin* will be reared and monitored in the TerraPen™ for two weeks until their release. The two weeks in the pen should allow the terrapins to acclimate to the tidal fluctuations, micro-habitat availability within the marsh, and provide them with a greater chance of survival.

**Pilot Study Results:** The 2014 pilot phase was permitted under a previous Letter of Authorization due to being deployed for less than 6 months. We placed nine head-started individuals into the TerraPen after deploying temperature loggers for 10 days to confirm suitability of the site (average: 20°C; range: 12-26°C). Subsequently, we experienced 100% survival of the pilot phase head-starts during the two months they were monitored prior to release. Both basking and feeding behaviors were regularly observed and significant weight gains were observed in the TerraPen™. No biting or tail-nipping injuries were observed. Additionally, the TerraPen™ is secure in its placement within the marsh and adjusts floatation with the tide as expected. Use of *M. terrapin* remains covered under our DNR Scientific Collection Permit (#). ***Specifically, with this LOA, we are requesting permission to deploy the TerraPen™ at this site for six months this year just as we have done previously with this past years' head-starts.***

**Deliverables:** This plan is a complement to the current research quantifying demographical and population effects. This project will further contribute tools for the mitigation of ecological impacts and the management of a declining keystone marsh species that has been negatively impacted through human actions. Results will be shared through presentations and publications for the scientific and wildlife management community. Additionally, public education opportunities on the plight of *M. terrapin* will be taken advantage of through the GSTC's existing terrapin dioramas and educational displays. Should the TerraPens™ prove effective, their use could be easily implemented throughout the range of *M. terrapin* as well as with many other imperiled aquatic turtle species found throughout the world.

**Citations:**

Crawford, A.B. 2011. Mortality and Management: Assessing Diamondback Terrapins (*Malaclemys terrapin*) on the Jekyll Island Causeway. Thesis. University of Georgia, Athens, Georgia. USA.

Green, A.D., K.A. Buhlmann, C. Hagen, C. Romanek, and J.W. Gibbons. 2010. Mercury contamination in turtles and implications for human health. *Journal of Environmental Health* 72:14-22.

Haskell, A., et al. 1996. Size-related survival of head-started redbelly turtles (*Pseudemys rubriventris*) in Massachusetts. *Journal of Herpetology* 30: 524-527.

Hoyle, M.E. and J.W. Gibbons. 2000. Use of a marked population of diamondback terrapins (*Malaclemys terrapin*) to determine impacts of recreational crab pots. *Chelonian Conservation*



and Biology 3:735-737.

Rhodin, a.G.J., et al. 2011. Turtles in Trouble: The World's 25+ Most Endangered Tortoises and Freshwater Turtles. Lunenburg, MA: IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, Turtle Conservation Fund, Turtle Survival Alliance, Turtle Conservancy, Chelonian Research Foundation, Conservation International, Wildlife Conservation Society, and San Diego Zoo Global, 54 pp.

**Figures:**

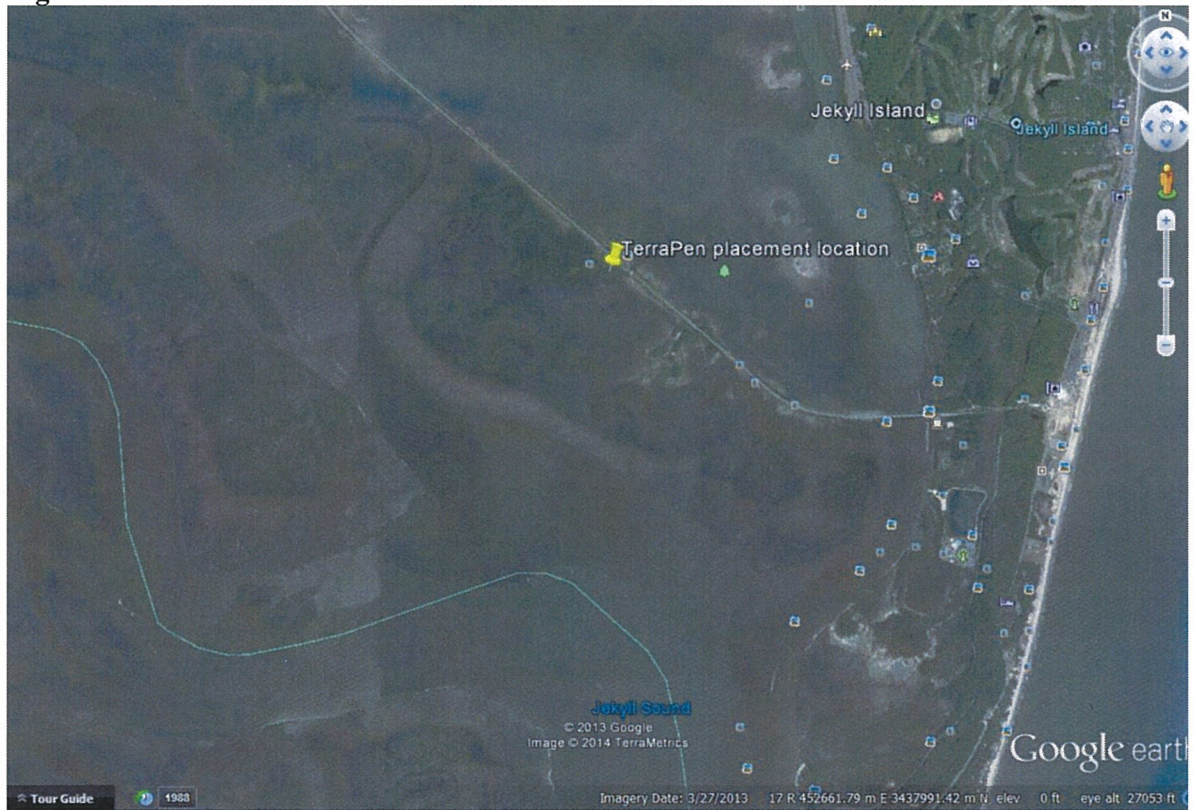


Fig. 1) The yellow DropPin denotes the TerraPen™ site just south of the Jekyll Island Causeway near the Visitor Center.



Fig. 2) Pictured is a south-facing view of the TerraPen™ site at high tide where TerraPen™ is deployed under our past CMPA Letter of Authorization. The photo was taken from a game trail on high ground on what appears to be an old construction spoil.





Fig. 3) Pictured are 2013 head-started *M. terrapin* being added to the TerraPen™ for the pilot phase.