

DIAMONDBACK TERRAPIN BYCATCH REDUCTION STRATEGIES FOR COMMERCIAL AND RECREATIONAL BLUE CRAB FISHERIES



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Example of terrapin nesting beach, Guinea Marshes, York River, VA

Introduction

Diamondback terrapin *Malaclemys terrapin* is considered a keystone species for its influence on community structure of tidal marshes. Terrapins exhibit strong habitat & nest site fidelity, & have relatively small home ranges (< 2 km), so sub-populations tend to be spatially discrete. Terrapins rely on open water, wetlands, & adjacent uplands at various stages of their life-cycle, so the quality & connectivity of these habitat patches is critical to population persistence. Terrapin is listed in Virginia as a species of "Very High Conservation Need" based on threats due to nest predation & drowning of adults in crab pots.

Purpose

Our overall goal was to characterize essential terrapin habitats toward development of bycatch reduction strategies for managing commercial & recreational blue crab fisheries.

Approach

- 1) Geospatially define suitable terrapin habitat based on natural features in a pilot study area
- 2) Integrate spatial datasets to develop a "Vulnerability Index" of terrapin habitats & define potential resource conflict areas where crab pots correspond to essential terrapin habitat
- 3) Conduct terrapin and crab pot counts in habitats with varying suitability to test predictions

TERRAPIN HABITAT SUITABILITY

Explanatory variables used to characterize suitable habitat

Variable	Rationale	Metrics	Source
Bathymetry	Primary critical habitats occur in shallow waters	Waters ≤ 2m depth	NOAA - National Ocean Service
Tidal Marsh	Essential habitat: meso-polyhaline distribution	Presence of extensive or embayed marshes	Shoreline Inventory (CCRM-VIMS)
Nesting Beach	Nesting success influenced by nest site suitability	Presence of subaerial unconsolidated sands	Shoreline Inventory (CCRM-VIMS)
Riparian land-use	Access to high marsh, land-water connectivity diminished	Forested land use within 10m of the shore	Southeast Gap Analysis Land Cover Dataset
SAV	Supplementary feeding habitats	Presence/area of seagrasses	10-yr composite of annual VIMS SAV survey

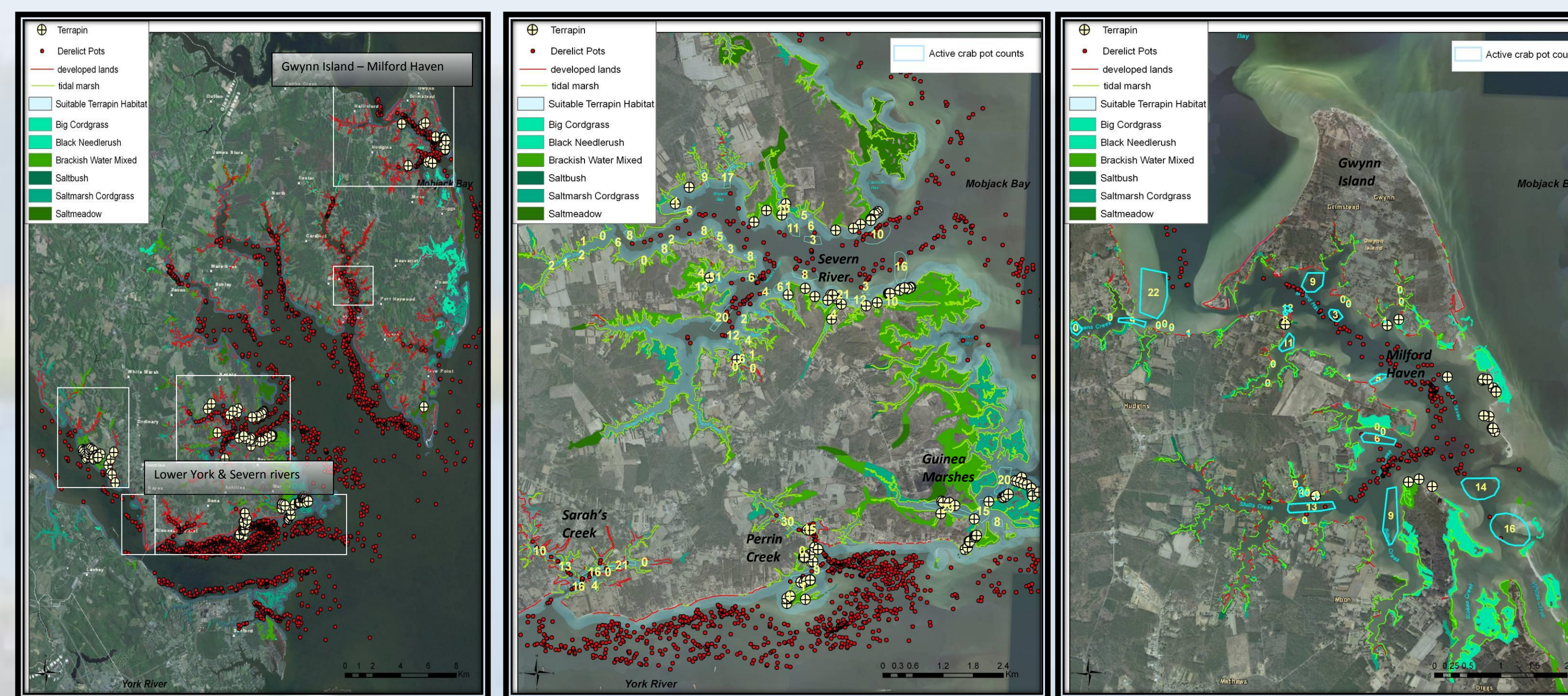
STRESSORS: CRAB POTS

•Terrapin population declines, reduced growth, & changes in sex ratios have been directly attributed to bycatch mortality in commercial crab pots e.g., Dorcas et al. 2007; Wolak et al. 2010

The Marine Debris Location and Removal Program (under the direction of VIMS & VMRC) employed commercial fishers to locate and remove lost or derelict blue crab pots from Virginia waters in 2008–2012 http://ccrm.vims.edu/marine_debris_removal/index.html. To date, approximately 30,000 derelict crab pots have been located, removed and bycatch information recorded.

•With these data, we applied a moving window analysis in GIS to categorize relative crabbing pressure in relation to suitable terrapin habitat

➤Of the suitable terrapin habitat (70km²) in the pilot study area, 21% (15 km²) was considered vulnerable to crabbing pressures (10% highly & 11% moderately vulnerable)



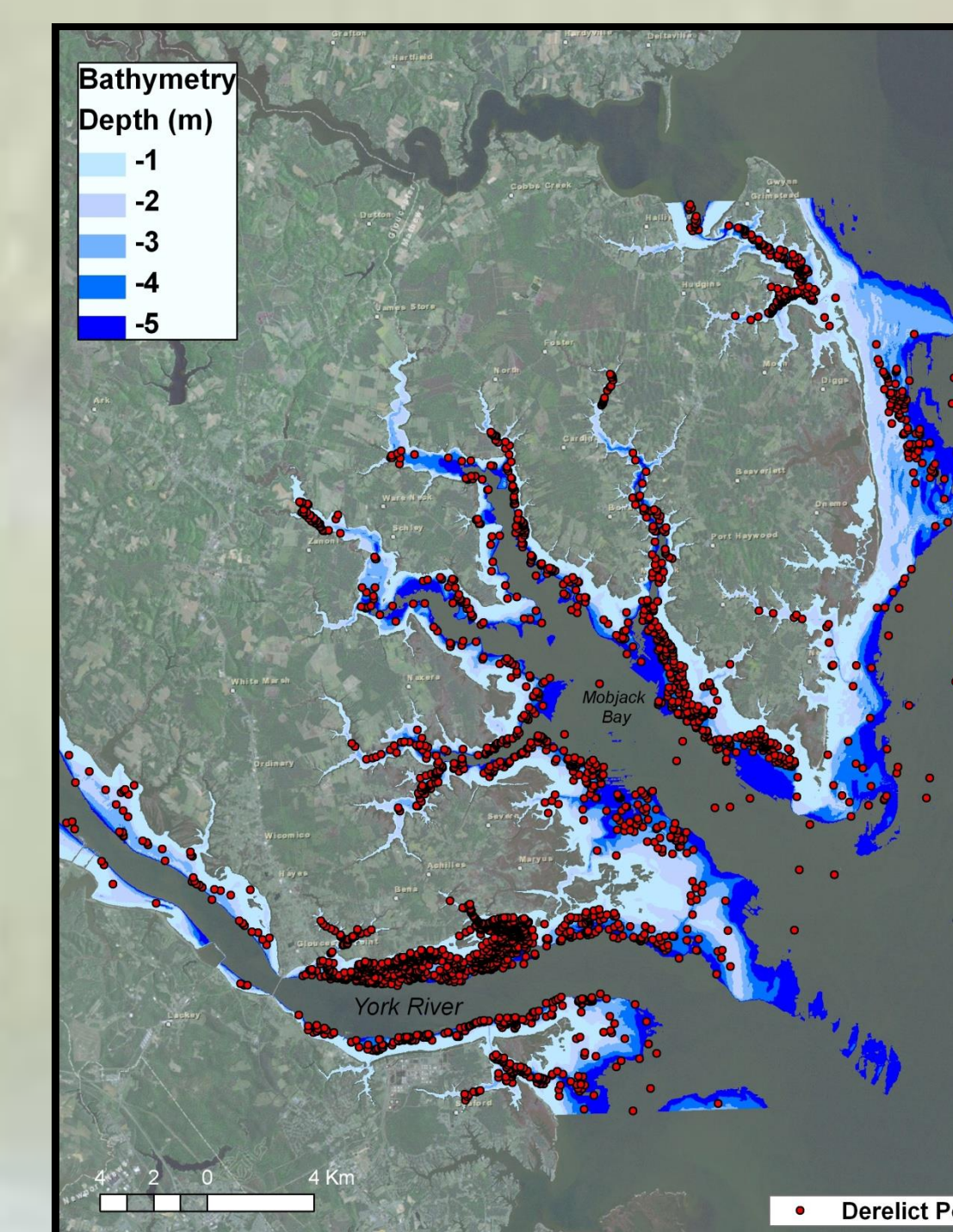
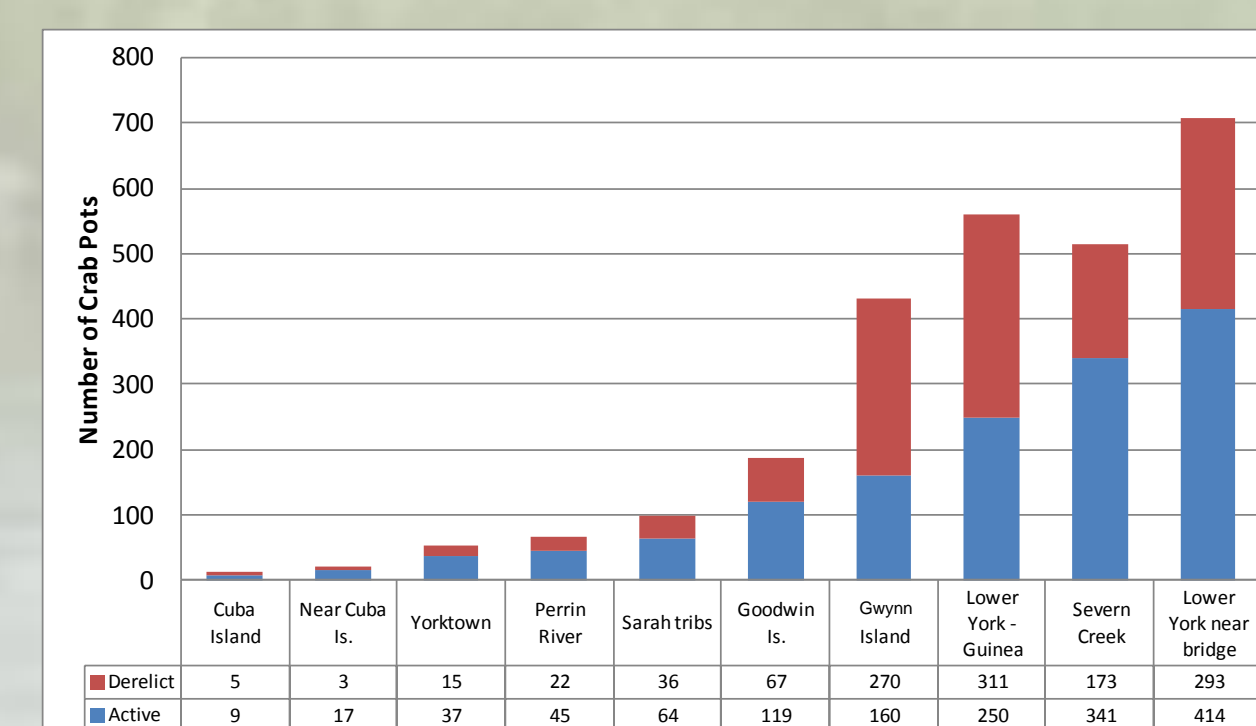
Results of terrapin occurrence, habitat suitability and crab pot distribution allow for the targeting of candidate zones for the application of blue crab fishery management actions to reduce bycatch. *Terrapin & crab pot field survey locations are enclosed with boxes.

The lower York and Severn rivers contain extensive suitable terrapin habitat, however terrapin were absent in select creeks (e.g., Sarah's Creek). Likely reasons are the lack of extensive marshes & the presence of anthropogenic stressors including residential development & crabbing pressures. Areas of concern for bycatch mortality include Perrin Creek, Cuba Island, Guinea marshes, & Severn River.

The south side of Gwynn Island, Milford Haven and Stutts creek contain highly suitable terrapin habitat & high fishing pressure on the basis of distribution and abundance of derelict & active crab pots.

The scope of the derelict crab pot issue

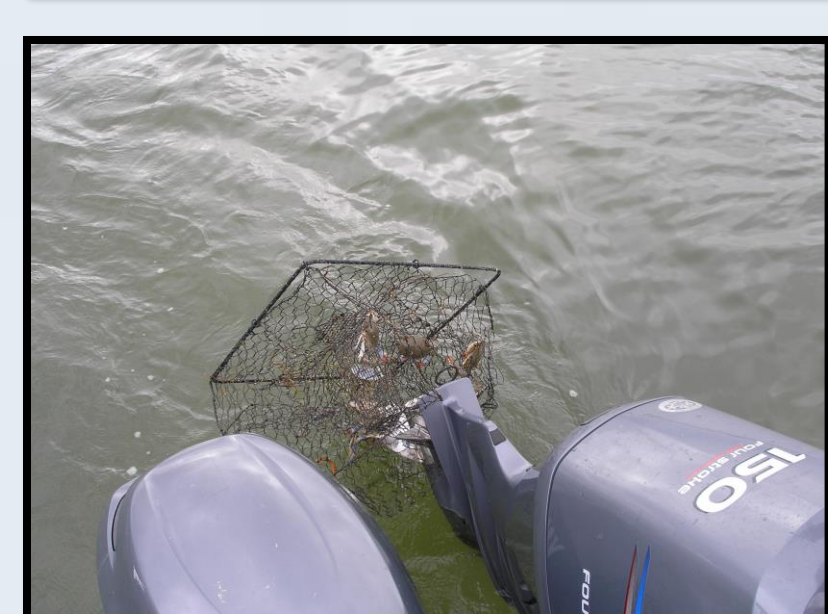
- Within the pilot study area 2872 derelict pots were removed during 2 winters
 - Of these, 22% were within shallow waters (≤ 2 m) where terrapins typically reside
- The amount of derelict pots generally corresponds to the number of active pots in a given area



Management Approaches

In resource conflict areas, there are several management options that can be used in combination

- 1) Require use of Bycatch Reduction Devices (BRDs) on commercial & recreational crab pots
- 2) Avoid particular habitats (e.g. small tidal creeks) or establish fishing exclusion zones
- 3) Educate – design public education programs to
 - promote the voluntary use of BRDs, and
 - communicate to recreational boaters the ramifications of severing buoy lines of active crab pots
- 4) Promote proper use of gear — e.g., retrieving pots regularly to minimize terrapin mortality



http://ccrm.vims.edu/research/mapping_surveying/terrapin/index.html

Summary

~15% of the study area was considered to be potential resource conflict areas for terrapin and crabbing. The integration of spatial information on terrapin habitat and crabbing pressure in a single framework will allow managers to identify areas where terrapins are most likely to encounter threats and target conservation efforts in those areas.