



# Assessment of Methoprene in Marine Waters After Catch Basin Treatment with Altosid® XR Briquets

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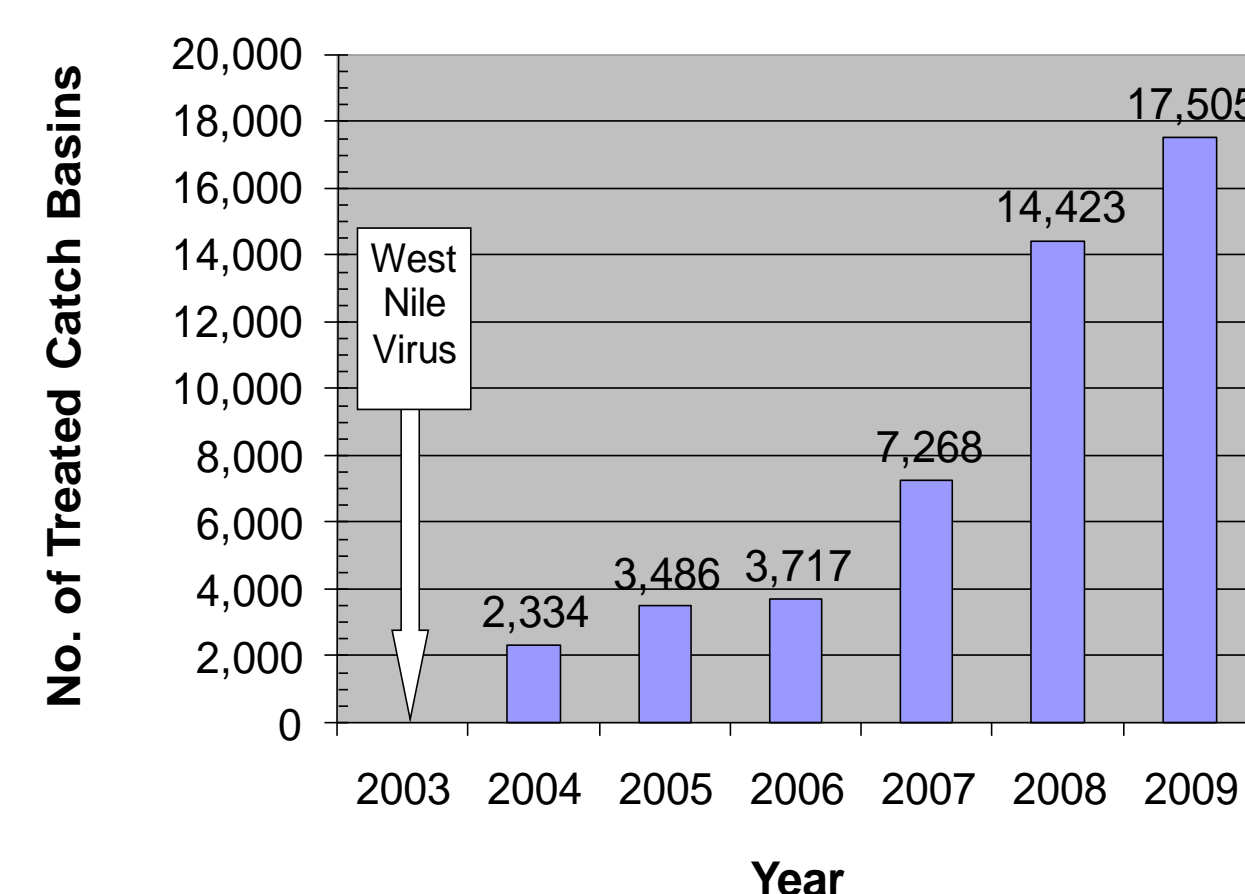
## Introduction

In 2003, the South Carolina Department of Health and Environmental Control discovered West Nile virus in Beaufort Co., SC, a coastal county with more water acreage than land and home to ~142,000 residents. Afterward, Beaufort Co. Mosquito Control (BCMC) observed immature and adult *Culex quinquefasciatus* within selected stormwater catch basins. In 2004, BCMC initiated a comprehensive GPS survey to map all catch basins in which ~19,000 occur mostly in the residential areas.



Location of historic downtown Beaufort within Beaufort Co. and SC.

During the same year, BCMC repeatedly applied Altosid® pellets (with 4.25% methoprene providing up to 30 days control) to catch basins in “high-risk” areas of the County. In 2006, BCMC replaced the pellets with more cost effective Altosid® XR briquets (with 2.1% methoprene for up to 150 days control). BCMC continued progressively to use this insect growth regulator for widespread coverage of the underground stormwater system.

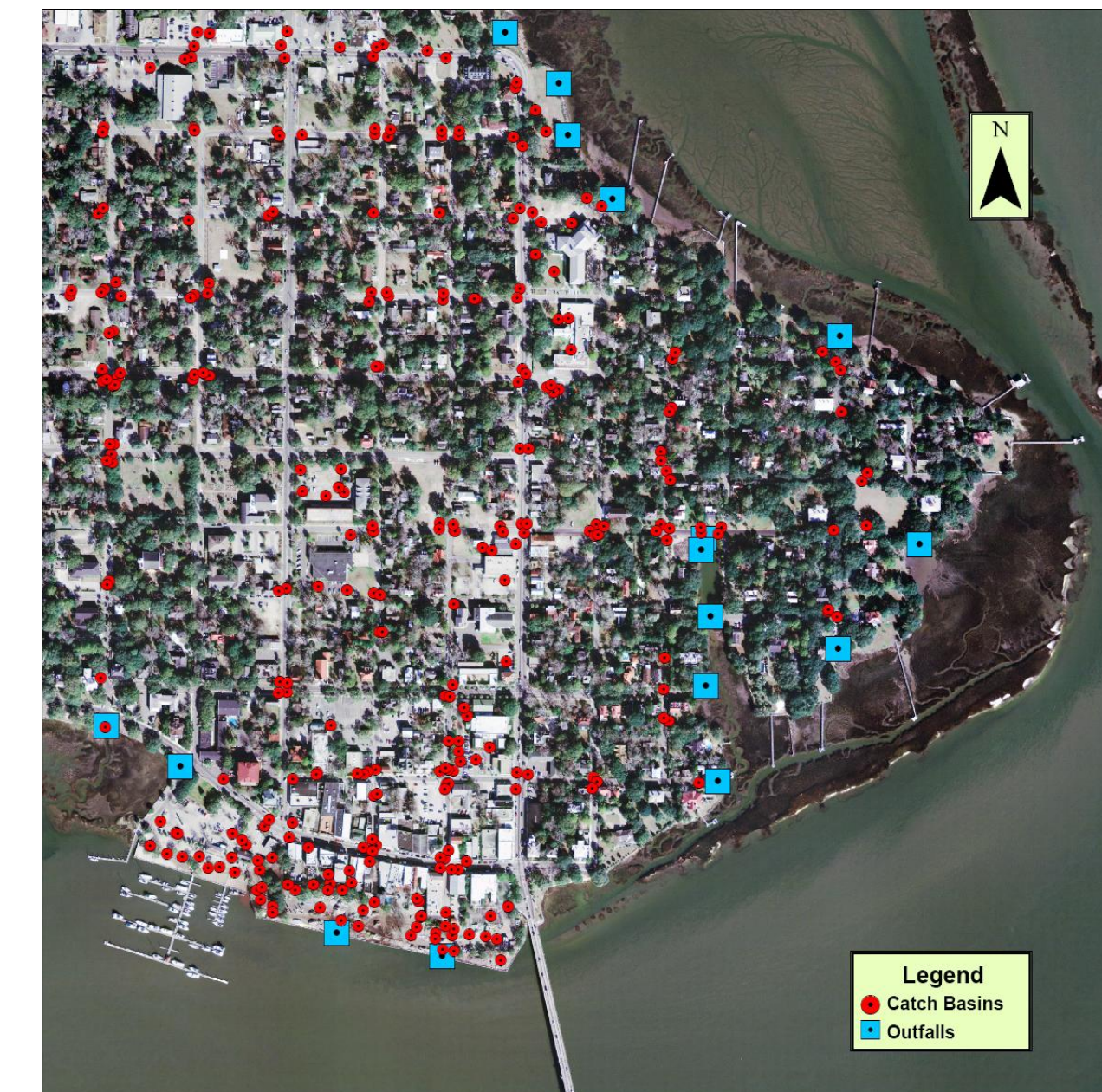


In 2007, the print media reported BCMC's ambitious plan to treat all accessible catch basins. In reaction, environmental activists expressed concern that the methoprene used as a public health insecticide would harm the shrimp, crabs, and other ecological receptors that resided in the receiving marine waters near the stormwater outfall structures. In response to this concern, BCMC initiated a study to determine if potential methoprene concentrations in the receiving waters were sufficient to disrupt the development of non-target species.



## Study Area

We selected an area with an exceptionally high density of catch basins that flowed directly to tidally influenced receiving waters by well-defined pathways. This ~200-acre area consisted of downtown Beaufort with the business district, a marina, a waterfront park, the historic Old Point neighborhood, and a tidal pond that flowed into a tidal creek and then the Beaufort River. We believed the study area represented a worst-case scenario for potential toxic concentrations of methoprene in receiving waters throughout the County.



## Methodology

The Skidaway Institute of Oceanography in Savannah, GA conducted methoprene analysis using gas chromatography-electron impact mass spectrometry with selected ion monitoring (detection limit at ~10 ng/L). Based on the known locations of the stormwater outfalls, we collected water samples mainly by tandem kayak at 13 sites on April 9, 2008 before catch basin treatment with Altosid® XR briquets to confirm the absence of methoprene. Once confirmed, we applied single briquets to 230 catch basins on April 23 in which ~50% were wet. Then, we collected 1-liter water samples at the 13 sites on June 3, June 17, July 11, August 14, and (for the last time) on September 12, nearly 5 months after catch basin treatment. Post-treatment collections occurred within 24 hours of a rain event of at least ½ inch. On one occasion, rainfall in excess of 2 inches immediately preceded sample collection. Total rainfall for the period between catch basin treatment and the last sampling date was ~17 inches.

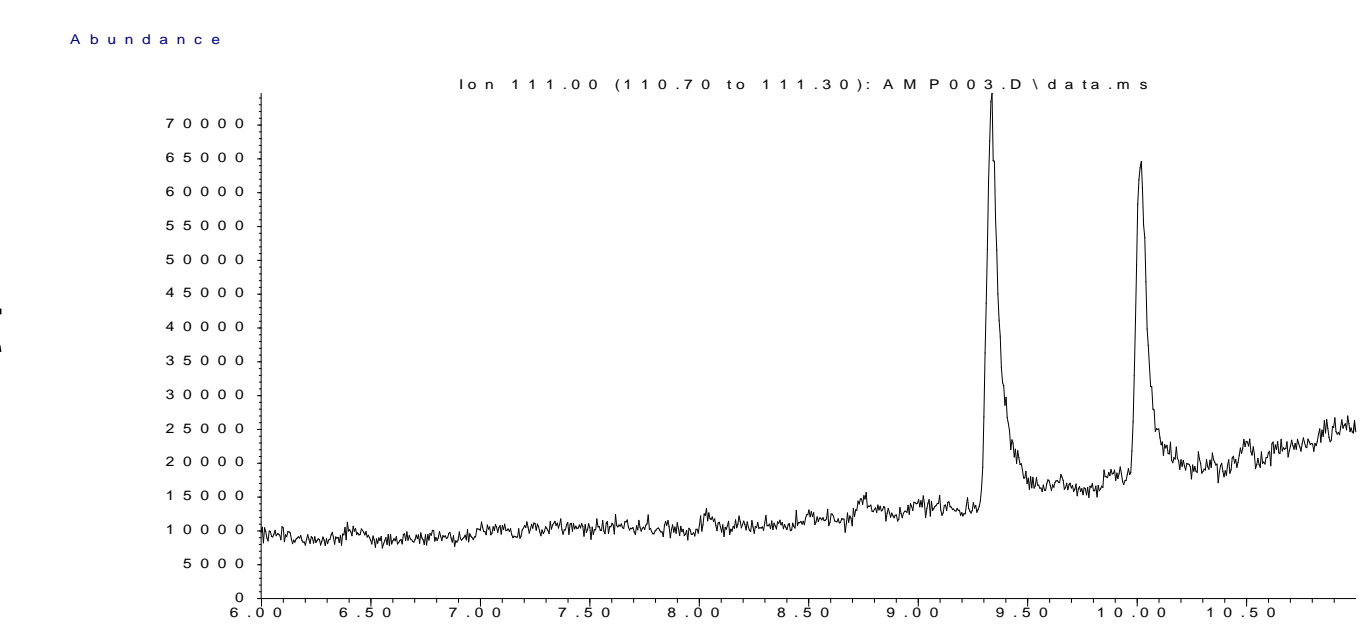


## Results

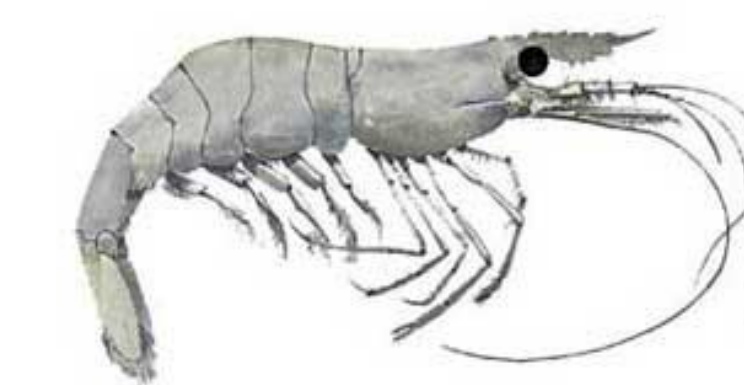
Methoprene was found in only 4 of the 65 (6.2%) post-treatment water samples. The map shows the collection sites including the methoprene-positive locations in proximity of the stormwater outfalls. The table summarizes the collection date, concentration, and location of each methoprene-positive water sample. Methoprene was detected infrequently and the maximum concentration was only 285 ng/L or, restated, 285 parts per trillion (ppt). Thus, what toxicological implications, if any, exist for non-target marine species to this level of exposure? An inclusive review of the scientific literature indicated shrimp were among the most sensitive organisms to methoprene. However, the lowest level of adverse effects reported to date appears to be 2,000 ppt, based on sublethal effects for shrimp growth and reproduction. Most minimal effect levels reported in the literature are considerably higher than 2,000 ppt.



Post-Treatment Methoprene		
Date	Concentration (ng/L)	Site
June 3	39	1
July 11	44	8
August 14	257	6
	285	3



Chromatogram showing kinoprene peak (left; internal standard) and methoprene peak (right; 285 ng/L from sampling location No. 3).



## Conclusions

Even with conditions believed to represent a worst-case scenario, catch basin treatment using Altosid® XR briquets did not result in methoprene concentrations sufficient to adversely impact non-target species. Further, accumulation over time to toxic concentrations is unlikely because methoprene degrades rapidly in the environment. Overall, the public health benefits of catch basin treatment seemingly outweigh any risk to non-target marine organisms.

## Acknowledgements

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