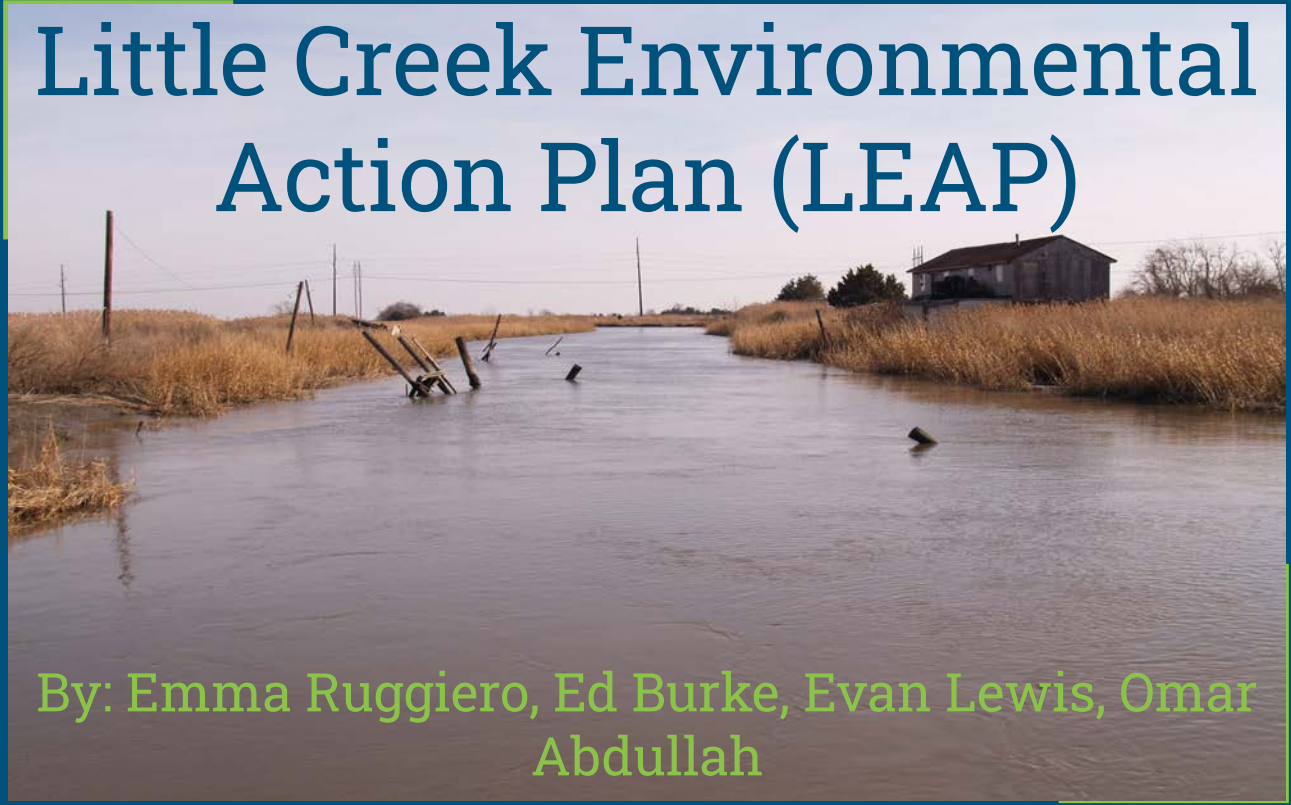
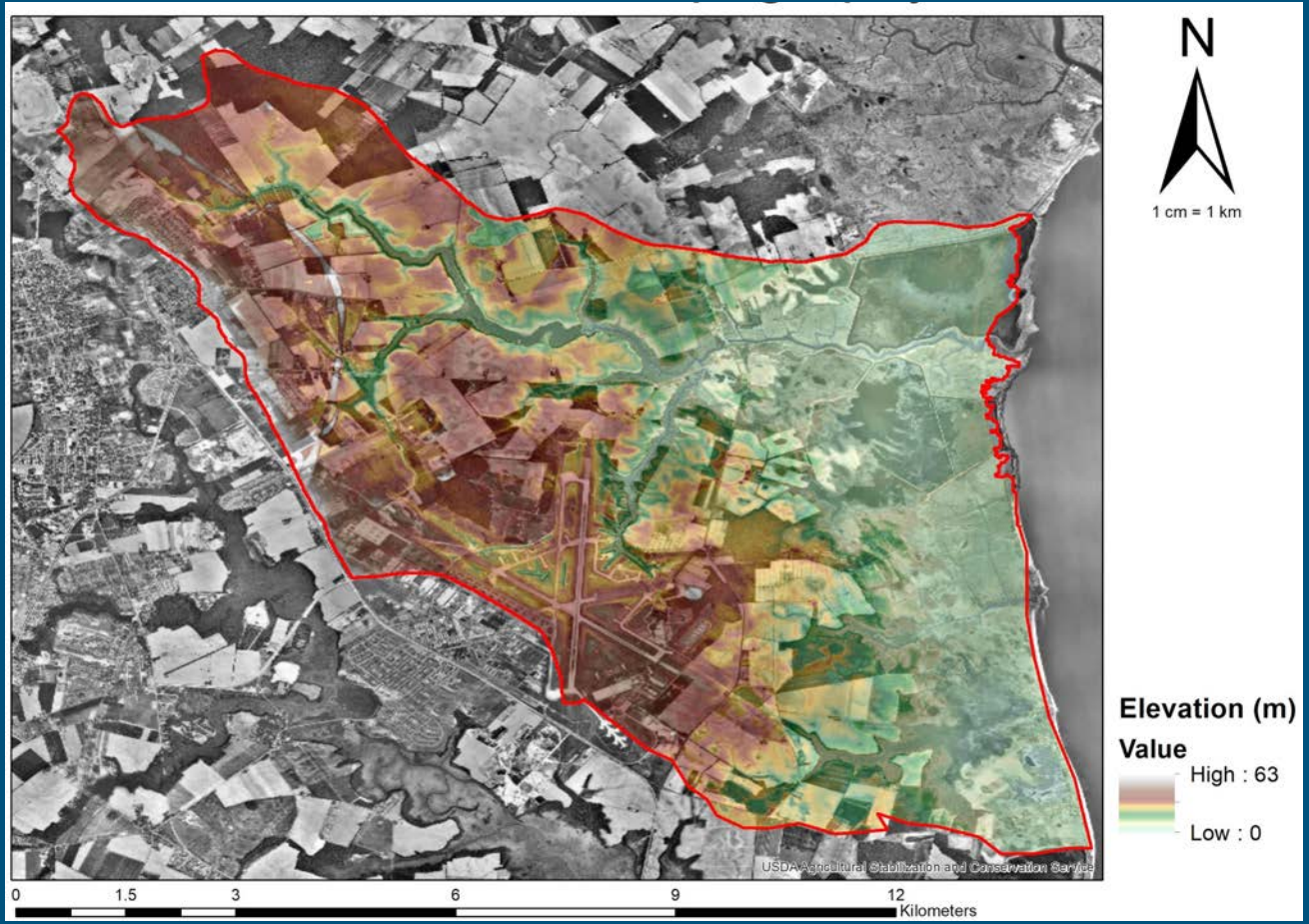
Little Creek Environmental Action Plan (LEAP)

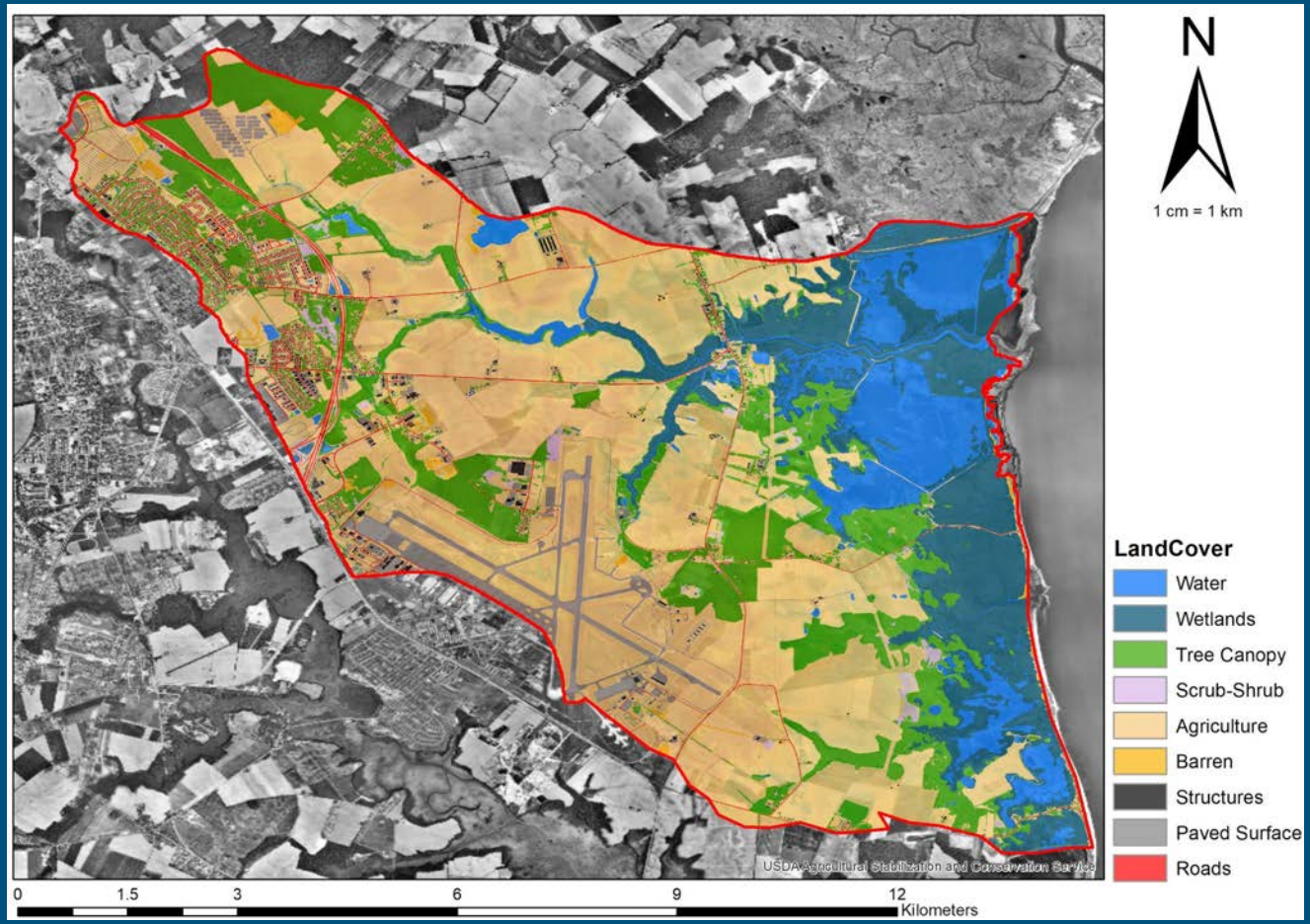


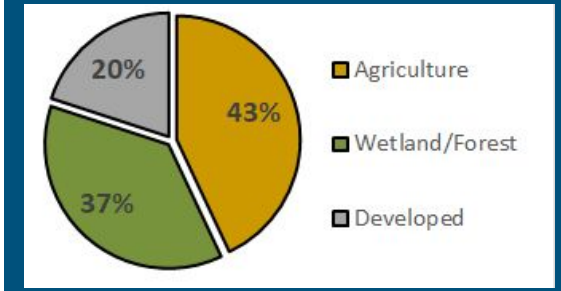
By: Emma Ruggiero, Ed Burke, Evan Lewis, Omar Abdullah

Little Creek Watershed Topography



Little Creek Watershed Land Use





Land Use Designations in the Little Creek Watershed. Data was gathered from The USDA Agricultural Stabilization and Conservation Service, Chesapeake Conservancy and Shippensburg University.

Background - Town of Little Creek

- 8,000 permanent residents within the 23 sq. mile drainage area which feeds directly into the delaware Bay
- Wetlands in the region are being threatened by forest harvesting, invasive plant species, excavation, filling ditching, and the development of agriculture
- TMDLs established for the Little Creek Watershed suggest meeting 40% reductions in phosphorus and nitrogen, as well as 75% reductions in bacterial loadings

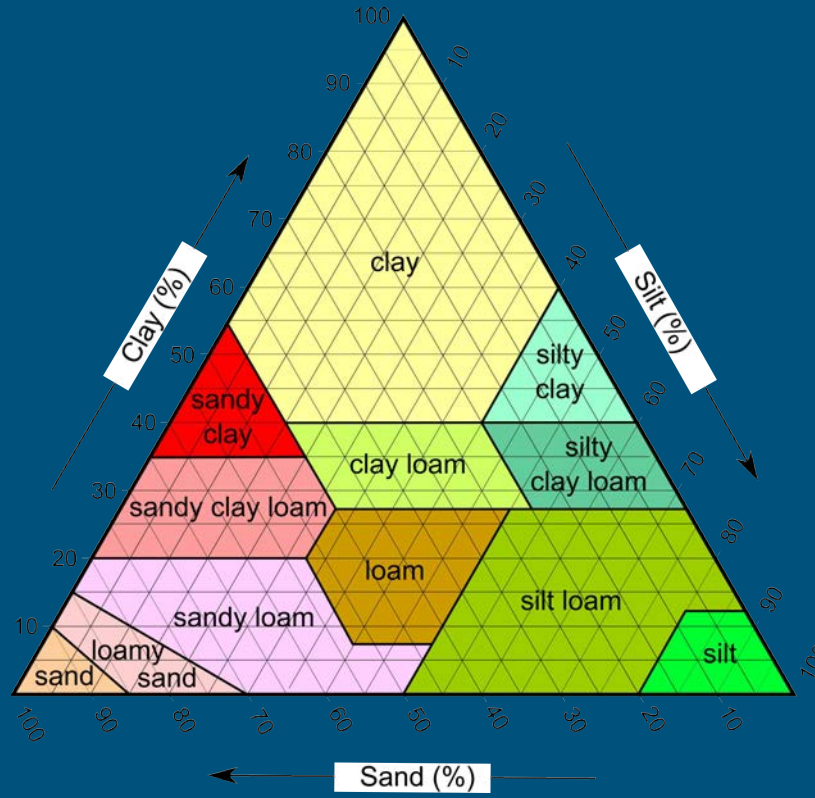
Background - Town of Little Creek

- The little creek mainstem is used for:
  - Primary and Secondary recreation
  - Fishing
  - Industrial water supply
  - Agricultural water supply
  - The little creek also serves as valuable aquatic wildlife habitat

- There are two contaminant sites currently under investigation by the EPA:
  - Dover Air Force Base
  - Wildcat Landfill
  - Substances of concern include volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls, and metals.

History

- The Town of Little Creek was established as a commercial shipping hub for the city of Dover and was very productive in the 1800's with a thriving oyster and canning industry.
- The entire little creek watershed is underlain by structureless/finely laminated organic rich silty clays.
- The rich soils in the region developed via a process of sea level rise, coastal inundation and the burying of productive shrublands and marshes resulting in an abundance of silty loams in the region



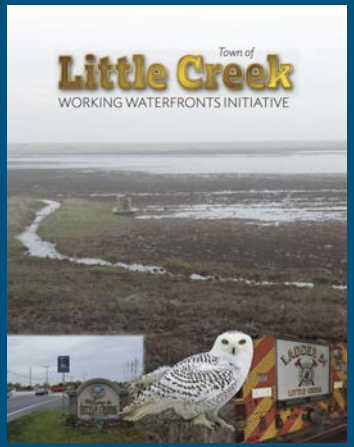
Little Creek Oyster Fleet, 1924

Mission Statement

"LEAP's mission will be to improve wildlife habitat and water quality in the Little Creek watershed to meet water quality standards (WQS) for primary contact recreational/fishable levels by the year 2025."

Policies and Mandates in Place

- The Delaware River Basin Commission oversees all watersheds within the Delaware River Basin, which includes the Little Creek watershed
  - Little Creek watershed follows the DRBC Compact and Water Code for policies
- Town of Little Creek Working Waterfronts Initiative
  - Collected survey responses to preserve the working waterfront in Little Creek, DE and protect the watershed surrounding the creek
- State of Delaware Surface Water Quality Standards
  - Enforced by Federal Clean Water Act and DNREC



Freshwater and Marine Water Water Quality Standards for Little Creek Specified by DNREC

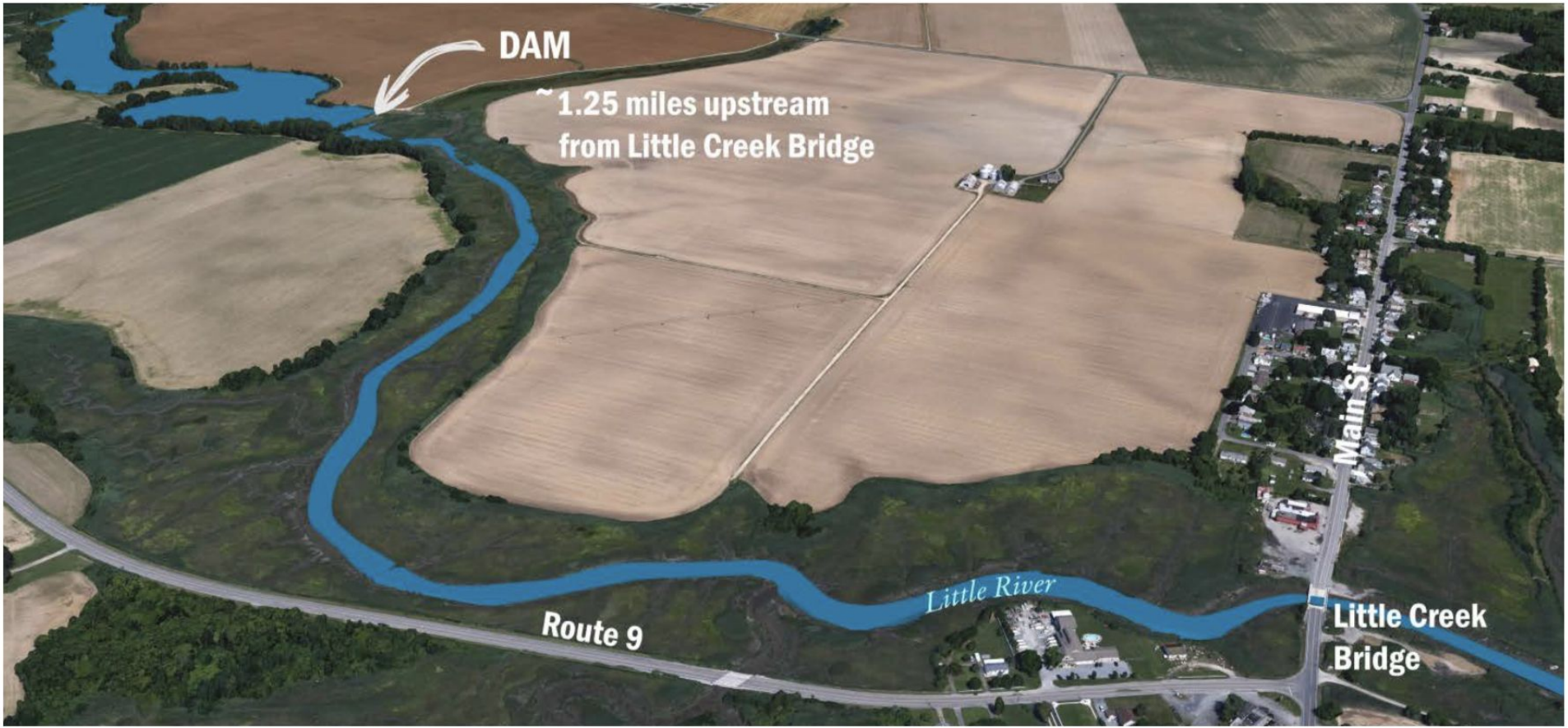
Nutrient	**WQS - Freshwater**	**WQS - Marine Waters**
Dissolved Oxygen (DO)	Daily average of not less than 5.5 mg/L (minimum of 4 mg/L)	Daily average of not less than 5 mg/L (minimum of 4 mg/L)
Enterococcus - Single Sample Value (cannot be exceeded)	185 colonies/100mL (col/100mL)	104 col/100mL
Enterococcus - Monthly Geometric Mean	100 col/100mL	35 col/100mL
Total Nitrogen (TN)	3.0 mg/L	3.0 mg/L
Total Phosphorus (TP)	0.2 mg/L	0.2 mg/L

Governance Structure to Implement

- No true governing body solely responsible for the Little Creek watershed
  - DRBC, Working Waterfronts Initiative, and DNREC TMDLs coordinate efforts with the Little Creek watershed
  - Leipsic River watershed (just North of Little Creek) sometimes overtakes the Little Creek watershed
- Proposal for new governing structure for the Little Creek watershed
  - Ensure safe water quality standards for drinkable, swimmable, or fishable conditions
  - Members from Little Creek, DE and eastern Dover, DE
  - One member → assigned by National Wildlife Refuge to protect Little Creek Wildlife Area
  - One member → liaison that reports to and from DRBC

Problem 1: Wetland Sedimentation & Habitat Degradation

- High-value saline wetland is being degraded by increased sedimentation
- Agricultural land uses and an upstream dam causing accelerated rates of erosion and deposition
- Reduced flow rates prevent flushing out of the tidal wetland
- Disturbance allowed for invasive *Phragmites australis* to colonize - threatens biodiversity



Via LC 2016 Comprehensive Plan

Goal 1: Improve Habitat Quality and Decrease Erosion and Sedimentation

- Restore natural flow to the Little River
  - Dredging loose material from behind the dam
  - Removing the dam
  - Grading streambanks and restoring wetland
- Implement long-term management for invasive *Phragmites australis*

Problem 2: Nutrient Loading & Abundant Bacterial Runoff

- The Little River and the Pipe Elm Branch have been impaired by low dissolved oxygen (DO) levels and nutrient and bacterial pollution from nonpoint sources
    - Upstream agricultural runoff, impervious cover (Dover Downs and the Delaware Air Force Base) and some agricultural feedlots
- DO level is lower than state minimum water quality standard (WQS) of 4 mg/l

Goal 2: Improve Water Quality & Reduce Enterococcus Bacteria

- 40% reduction in P and N and 75% reduction in enterococcus bacteria required to meet proposed TMDL criteria for a “primary contact recreational” river
- Implementation of BMPs on stream-adjacent agricultural property and alongside impervious surfaces
    - Riparian buffers
    - Wetland restoration (living shorelines)
    - Bioswales and rain gardens
- Public outreach to reduce nonpoint N and P inputs from agriculture and residential lawn application

Problem 3: Public Safety, Economic Welfare, & Impacts of Sea Level Rise

- Average elevation is 5-15’ above sea level; sea level rise poses risk to public safety by flooding roads and damaging infrastructure
- Failing stormwater infrastructure
- Saltwater intrusion into drinking water wells
- Cost of repairs and FEMA insurance rates are a financial burden
- Impaired access to Little River as an amenity reduces economic benefits associated with nature-based tourism along a Delaware Bayshore Byway ‘discovery zone’

Figure 8: Flood Events in the Commercial District

Flooding in the commercial district during a March 2010 nor'easter. This level of inundation, currently only seen during storm events, may become the future water level during high tides as a result of sea level rise.

Figure 9: Future Potential High Tide

Future potential high tide in year 2100 due to sea level rise in the commercial district. 0.5m low rise scenario (top left) and 1.5m high rise scenario in the commercial district (top right). 1.5m scenario at Main Street and Port Mahon Road intersection.

Goal 3: Reduce Flood Risk and Increase Economic Viability

- Mitigate flooding and improve groundwater recharge
  - Improvements to and long-term maintenance of stormwater infrastructure
  - Implement stormwater BMPs
  - Implement a source water protection ordinance to require impervious surface mitigation plans for all new developments in the watershed
- Reduce impacts to infrastructure and associated costs
- Promote nature-based tourism to benefit the small coastal town economy

Conclusions & Recommended Strategies

- Goal 1
  - Dredging, removal, and repurposing of accumulated sediment
  - Upstream dam removal
  - Control of invasive species
- Goal 2
  - BMP implementation along stream-adjacent agricultural property
  - Stormwater BMP implementation adjacent to impervious surfaces watershed-wide
- Goal 3
  - Update and maintain stormwater infrastructure
  - Implement a long-term plan for stormwater infrastructure maintenance
  - Implementing a source water protection ordinance