The Anchorage Canal Drainage Area Stormwater Retrofit Project

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Presentation to CIB Board of Directors
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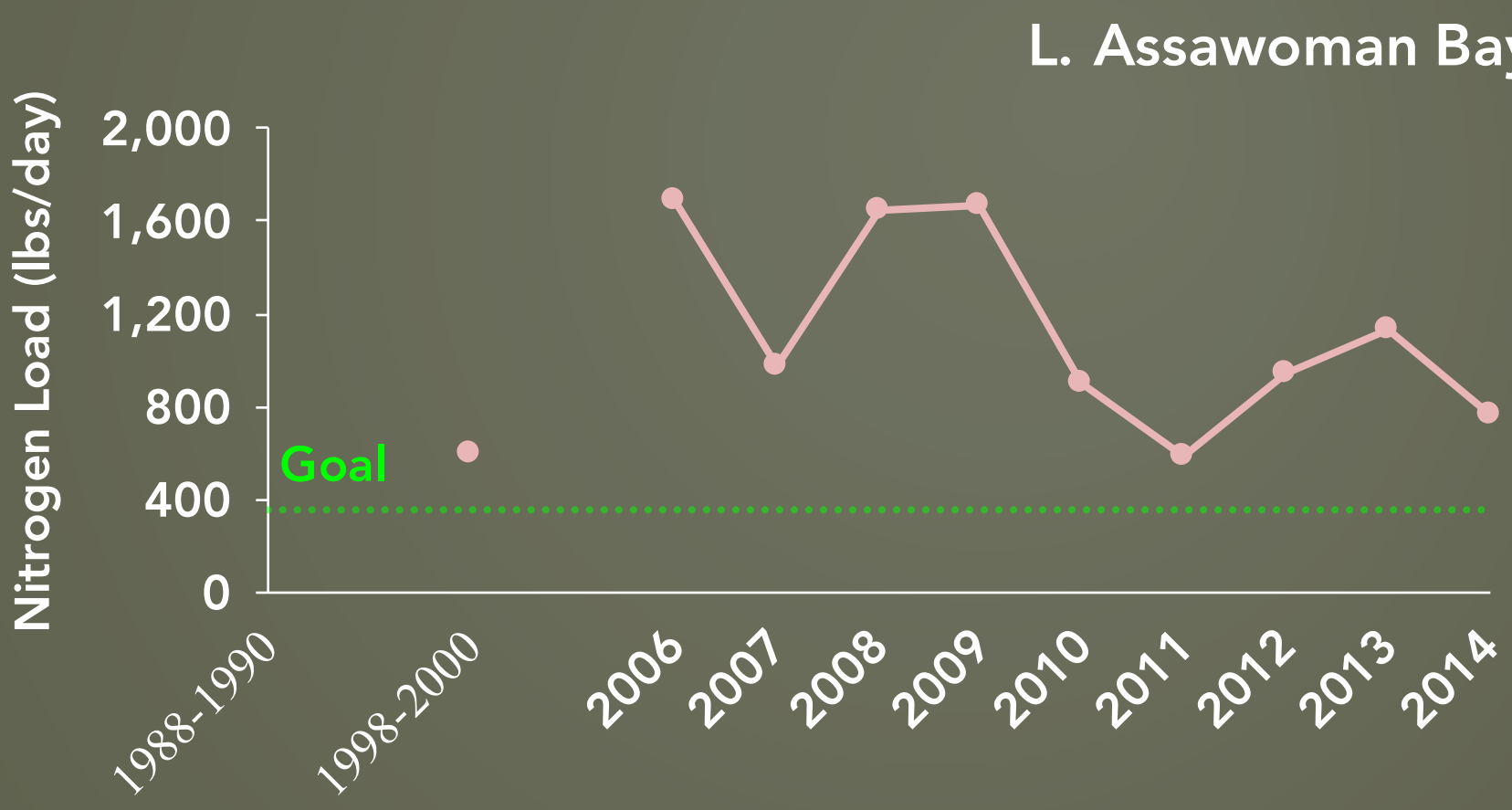
Non-point Source Nitrogen Loads are the major nutrient source to the Bays.



The 2008 Inland Bays Pollution Control Strategy includes a Stormwater Retrofit Goal

Create stormwater management facilities for 4,500 acres of urban and residential lands developed pre-1990 Stormwater Law.

Center for Watershed Protection

What Are Stormwater Retrofits?

Stormwater retrofits are stormwater management practices in locations where stormwater controls did not previously exist or were ineffective

Anchorage Canal is a part of the Town of South Bethany canal system on Little Assawoman Bay.

- Highly impervious drainage area (~50%), largest of all residential canals
- Receives runoff from storm drains under Rte. 1
- High pollutant loads
  - *592 lbs N/yr*
  - *33 lbs P/yr*
  - *First flush Coliforms 90,000-800,000 units*
- Highly eutrophic
- No MS4


Anchorage Canal
Surface Drainage Area &
Communities
Bethany Beach
Sea Colony
Middlesex Beach
South
Bethany
Highway 1
(DelDOT
Storm drain system outlet
Anchorage Canal


DEMARTE
SALES
ICE
ICE

Sediment Control Forebay

- Installed in 2004
- 16.5 yd^3 of sediment enter annually
- Initially 28% efficient at sediment capture

Scarborough & Mensinger 2005 DNREC Coastal Programs Evaluation

Pollution Control Assessment and Retrofit Strategy Development

GOALS

- Reduce nutrient loads by 40% per TMDL
- Collaborative Demonstration
- Multiple benefits
- Cost Effective
- Coastal Aesthetic
- Consider climate change


Native Maritime
Shrubland

Stormwater retrofit assessment utilized CWP's Stormwater Retrofit Process

- Retrofit Scoping-Identify Objectives
- Desktop Analysis
- Retrofit Reconnaissance Investigation (RRI)
- Compile Retrofit Inventory
- Evaluation and Ranking
- Final Design and Construction

Desktop Analysis

- Rapidly search for and identify potential retrofit sites across the subwatershed
- Save time in the field

Retrofit Reconnaissance Inventory

- Purpose
  - Verify feasibility of candidate retrofit sites
  - Collect information
- Key tasks
  - Evaluate potential retrofit sites, collect pertinent site information, and produce a basic concept design sketch

Methodology developed by CWP

Assessment prioritized 25 retrofits by cost effectiveness & feasibility

- 25 prioritized projects @ 30% design.
- Bioretention and infiltration focused.
- One keystone project.
- Dense development made finding space challenging.
- Maintenance schedule included.

FUNDING: USACE Planning Assistance to the States Grant matched by the Center, Town of South Bethany, an DelDOT = $105,375 total.

Project 1: Wet Swale and Infiltration Pits

- Treated 30 - 40 ac. of high rise condo facility
- Installed 19 parking lot curb cuts and infiltration pits
- Converted existing ditch to planted wet swale with roadside filter strips

Project 1: Wet Swale with Check Dams

- Converted existing ~1 mi. long ditch to wet swale with check dams and planted.
- Regraded along PA Ave. shoulder to provide filter strip.
- $190,913 total cost (cash + in-kind services)

Project 1: Wet Swale with Check Dams

Wet Swale Performance

2015

- Exemplary vegetation maintenance by Sea Colony Condo Assoc.
- High plant diversity and habitat value
  - Fish
  - Turtles
  - Herons
  - Muskrats
- No structural issues
- Natural appreciation and education values


Note: closely mown road edge for aesthetics

Projects 2 & 3 Highway Bioretention Areas

- 33 highway bioretention areas treated ~20 ac. of highway and residential runoff.
- Utilized medians and ROWs.
- Conducted in two phases.


Grade-all excavation was careful not to damage catch basins.

On some medians we exposed a former wetland surface (inter-dunal swale) higher in organic matter.

Right of Way Bioretention Areas

Six areas received bio-char amendment from 5 – 15%.

Highway Bioretention Performance

- Variable vegetation establishment and related sediment transport within areas
- Areas of bare, slightly eroding ground common
- Many established wetland conditions
- Typically drain within 48 hrs


Typical vegetation coverage after five yrs.

Project Efficiency Examples

Wetswale & Pits

Source	Amount
DNREC Grant	$95,866
CIB	$31,235
Seacolony	$21,000
TOTAL CASH	$148,101
LEVERAGED IN-KIND	$42,812
TOTAL	*$190,913*
Lbs TP reduced	3.44
Lbs TN reduced	23.7
$/lb/TP over 30 yrs.	$1,850
$/lb/TN over 30 yrs.	$268

Excludes maintenance costs
$/lb calculated separately for TP and TN.

Median Bioretention

Source	Amount
DNREC Grant	$44,297
CIB	$21,000
South Bethany	$18185
Middlesex Beach	$700
DE Forest Service	$30,000
TOTAL CASH	$84,182
LEVERAGED IN-KIND	$19,589
TOTAL	*$103,771*
Lbs TP reduced	3.28
Lbs TN reduced	27.35
$/lb/TP over 30 yrs.	$1054
$/lb/TN over 30 yrs.	$126

Project 4: Sandpiper Pines Bioretention and Infiltration Areas

- Concept design for 12 facilities around residential catch basins.
- Individual drainages mapped
- 6 in-situ bioretention /infiltration trenches and 2 infiltration trenches selected for implementation
- 10 total acres treated
  - 15 lbs nitrogen removed
  - 2 lbs phosphorus removed
  - 452 lbs sediment removed

Sandpiper Pines Pre-existing Conditions


Infiltration
trench/bioretention area
completed: 2016.


Catch basin
Infiltration trench/bioretention area completed: 2016.

Project Funding & Efficiency

- Excludes maintenance
- Costs for nutrients calculated separately
- Extensive planning and design + low efficiency of practice infiltration = low cost effectiveness

Sandpiper Pines

Source	Amount
EPA Planning Assistance	$35,000
DNREC Implementation Grant	$136,900
South Bethany Match	$7,530
TOTAL CASH	$179,430
LEVERAGED IN-KIND	$10,441
TOTAL	$189,871
Lbs TP reduced	2
Lbs TN reduced	15
$/lb/TP over 30 yrs.	$3,165
$/lb/TN over 30 yrs.	$421

Wetland – Wetpond Demo
Project *Location Aerial*


‘Slip-ramp’highly used during summer by pedestrian and bi-cyclists that conflict with sometimes speeding autos.


Highway Wetland/Wetpond Site
Sea Colony
High Rise Complex
Proposed Facility Area

Continuing Projects: Highway Wetland/Wetpond

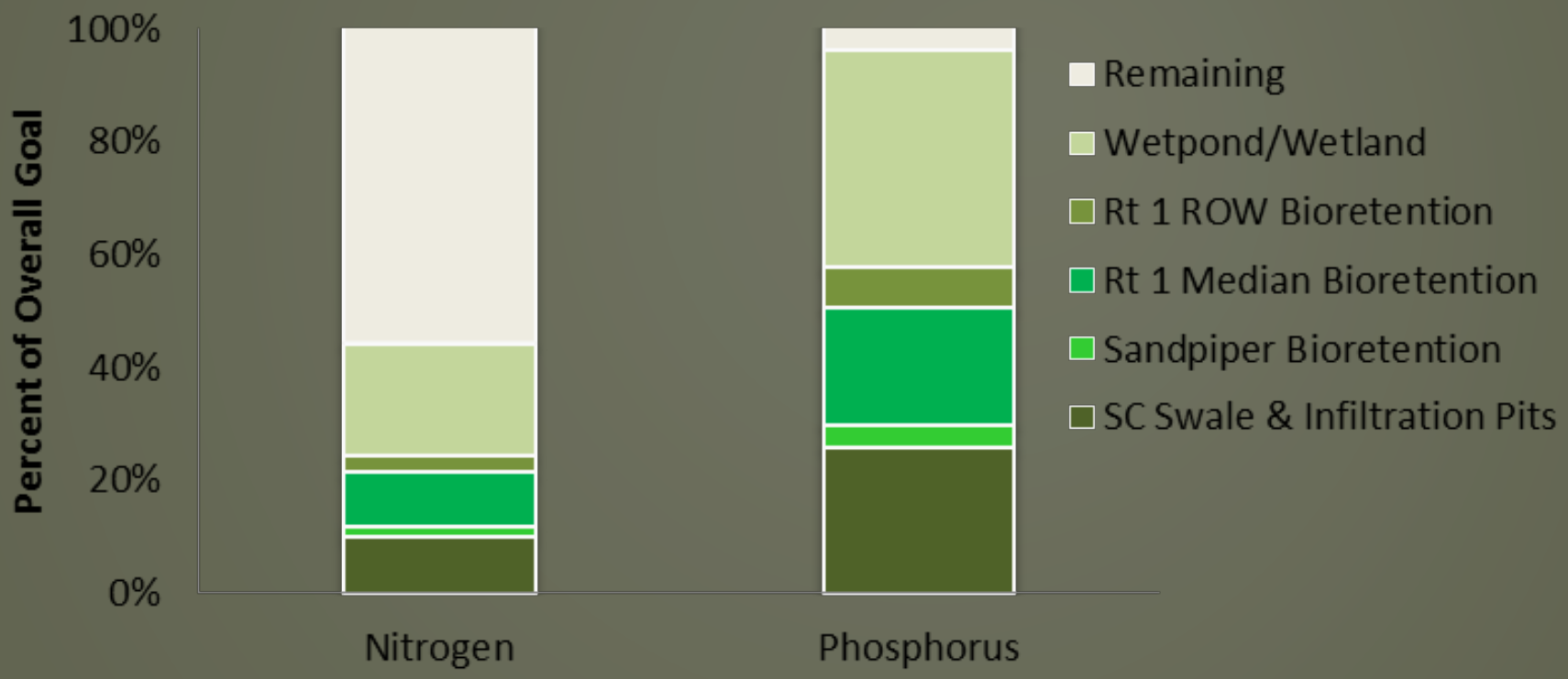
Highway Wetland Wetpond Concept

- Treat 6.4 acres of high rise complex runoff.
- Part of existing treatment train
- Estimated removal of 25.6 lbs. of nitrogen and 4.6 lbs. of phosphorus
- Estimated cost of $500,000 funded 80% by DelDOT and 20% by SeaColony and CIB

Additional Accomplishments

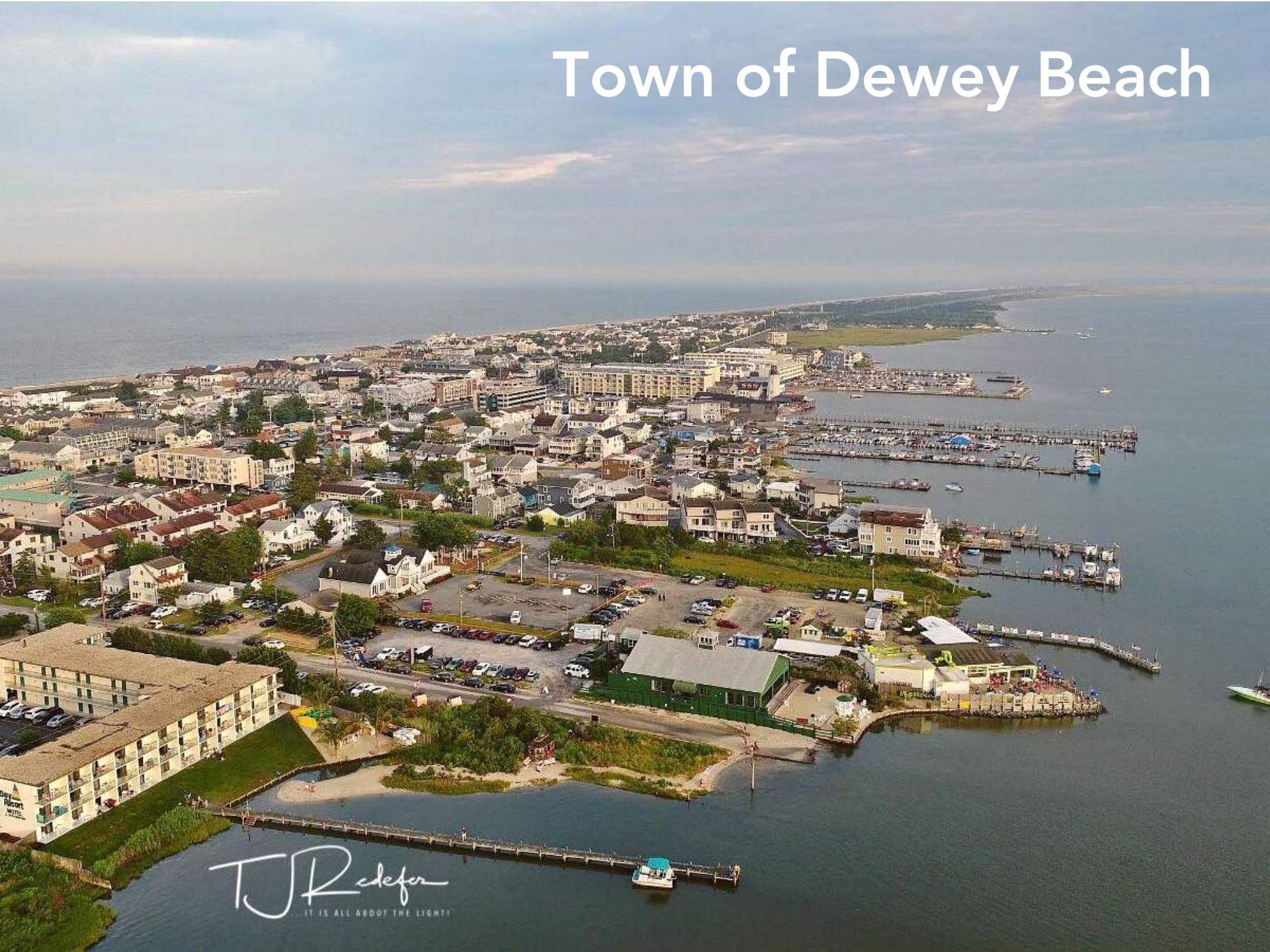
- Micro-rain gardens around additional highway ROW catch basins
- Town of South Bethany ordinances
  - Ban on new outdoor showers draining to canals
  - Impervious surface ordinance
- Floating Filters Demonstration & Research Project in Canals
  - 100 floating cages with 2 bushels ea. of adult oysters
  - 10 floating treatment wetlands

Progress Towards Pollution Reduction Goals for the Anchorage Canal Drainage Area Stormwater Retrofit Demonstation Project



Project goal is a 40% reduction in Total Nitrogen and Total Phosphorus loads to the Canal and Bay

Town of Dewey Beach



- Phase II Stormwater Master Plan completed August 2017.
- Identifies/prioritizes retrofit opportunities.


PC2
BR2
Dagsworthy St
BR1
PA4
Dagsworthy St
PA4
State Hwy 1
PC3
PA6
PP1
PP1
McKinley St
BR3
PA6
McKinley
PA5
PP1
McKinley St
Read
PC3
PA8
BR5
Read St
PA8
PA7
BR4
PA7
BR6
PC3
PA10
BR8
Rodney Ave
PA9
BR7
PA11
Rodney
Rodney Ave
BR10
PA9
PC4
State Hwy 1
BR11
PA13
Dickinson St
PA13

Read Ave. Living Shoreline Project

Little Store Stormwater Retrofit

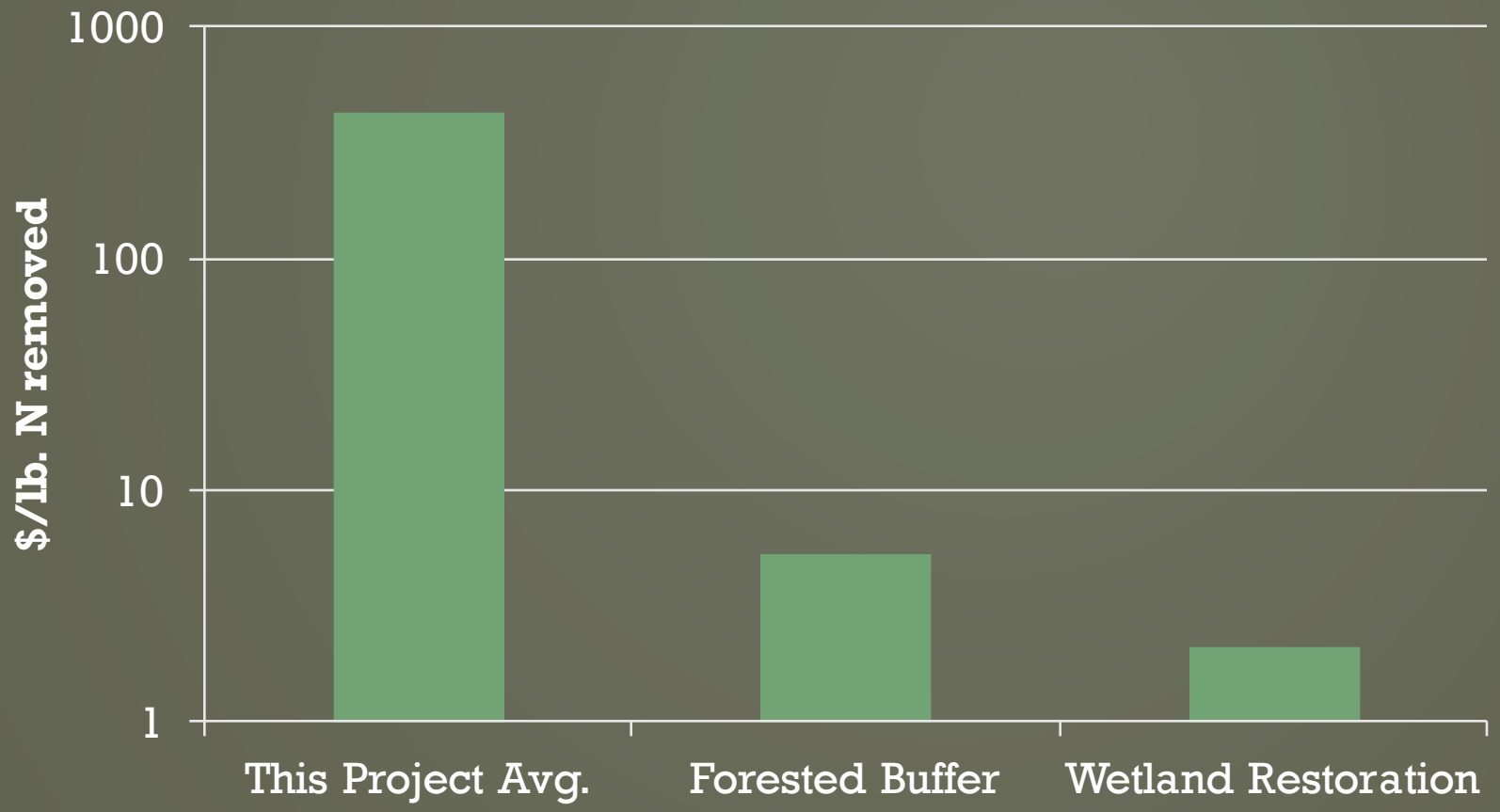
Retrofit Retrospectives – Part 1

- Multiple benefits – hallmark of stormwater retrofits; non-water quality likely key.
- Like any mid-large scale effort, persistence and continuity of leadership pays off.
- Delaware's Clean Water Revolving Fund (SRF) has been an essential funder: be and advocate for clean water funding!

Retrofit Retrospectives – Part 2

- Plantings in coastal highway environments are expensive for install and maintenance, add little water quality benefit, and have mixed success for purpose.
- Expect nutrient reductions (and cost effectiveness) to decrease from concept to actual construction.

Cost Comparison for Urban versus Rural water quality restoration practices.



Weiland et al. 2009. Costs & Cost Efficiencies for some Nutrient Reduction Practices in MD.


Capturing Stormwater
...for Cleaner Canals