

Your Stormwater Master Plan can be **SO MUCH MORE!**

Florida Stormwater Association Annual Conference
June 25, 2021

Presented by:
Whitney Marsh, Tracy Dayton, David Jones, Khansith
Boupha, Stephanie Dunham, Tony Janicki, & Julia Serynek

DUNEDIN
Home of Honeymoon Island

JonesEdmunds

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Engineers ■ Architects ■ Planners

Janicki Environmental, Inc.



Collective
WATER RESOURCES

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What's So Special?

- Multiple components under “one roof”
- What would be individual studies, the components are now able to share data seamlessly
- This provided:
 - Updated technology
 - High performing consistency



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The Components

1. Watershed Model in ICPR4
 - 8 structural BMPs, 2 city-wide BMPs
2. Environmental Assessment
 - Water quality trends, pollutant-loading data
3. CRS
 - Recommendations for improving CRS ranking
4. Vulnerability Assessment
 - Sea level rise related to storm surge, king tides, and rainfall events
5. Downtown Regional Stormwater Treatment

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Our Team



JonesEdmunds

Main Consultant

- ICPR4 Model
- CRS



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- Environmental Assessment



Collective
WATER RESOURCES

- Vulnerability Assessment

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- Downtown Redevelopment Plan

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NOAA Atlas 14

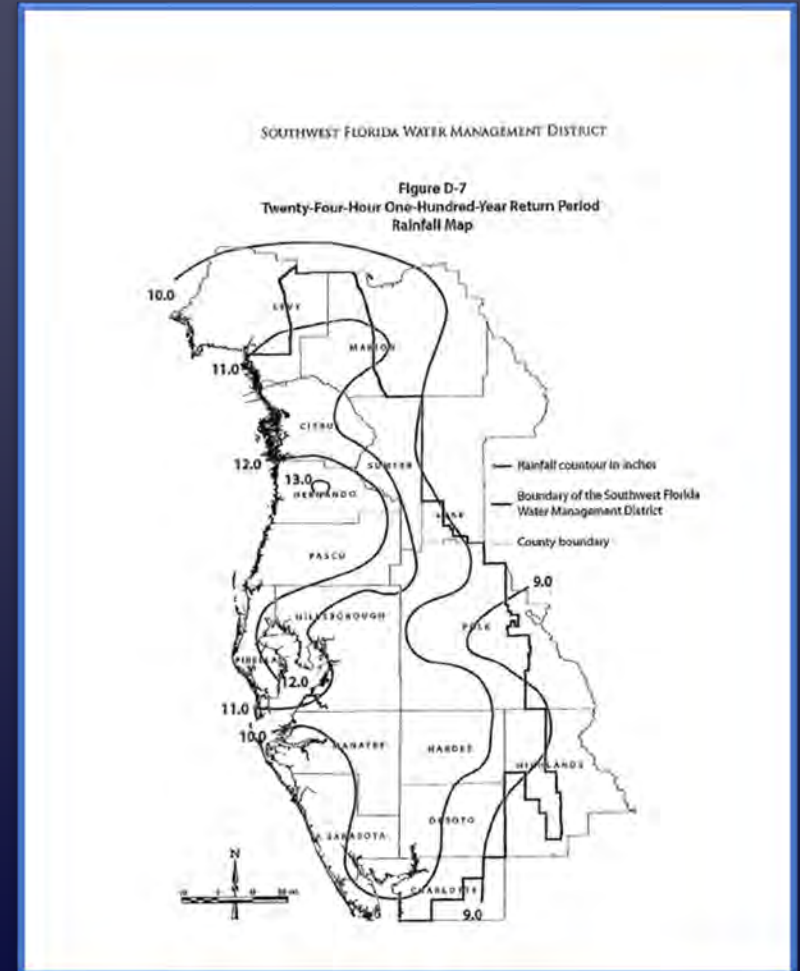
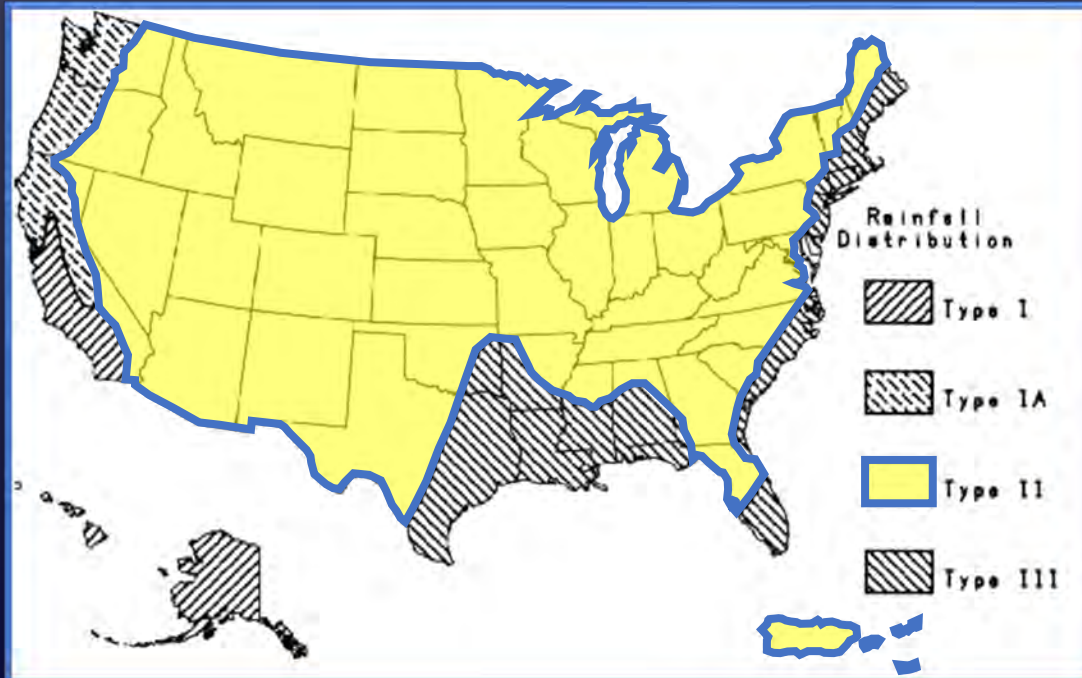


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Legacy Rainfall Distributions

- Distribution
- Depth

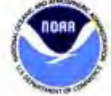


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NOAA Atlas 14



NOAA Atlas 14



Precipitation-Frequency Atlas
of the United States

Volume 9 Version 2.0: Southeastern States
(Alabama, Arkansas, Florida, Georgia,
Louisiana, Mississippi)

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy,
Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta,
Geoffrey Bonnin

U.S. Department
of Commerce

National Oceanic
and Atmospheric
Administration

National Weather
Service

Silver Spring,
Maryland, 2013

NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: FL

Data description
Data type: [Precipitation depth] Units: [English] Time series type: [Partial duration]

Select location
1) Manually:
a) By location (decimal degrees, use "*" for S and W): Latitude: [] Longitude: [] Submit
b) By station (list of FL stations): [Select station]
c) By address: [Search] [Q]

2) Use map (if ESRI interactive map is not loading, try adding the host: <https://js.arcgis.com/> to the firewall, or contact us at fdcr.questions@noaa.gov).

Map [v]
 Terrain

a) Select location
Move crosshair or double click
b) Click on station icon
 Show stations on map

Location information:
Name: Sorrento, Florida, USA*
Latitude: 28.9035°
Longitude: -81.5908°
Elevation: 118.66 ft **

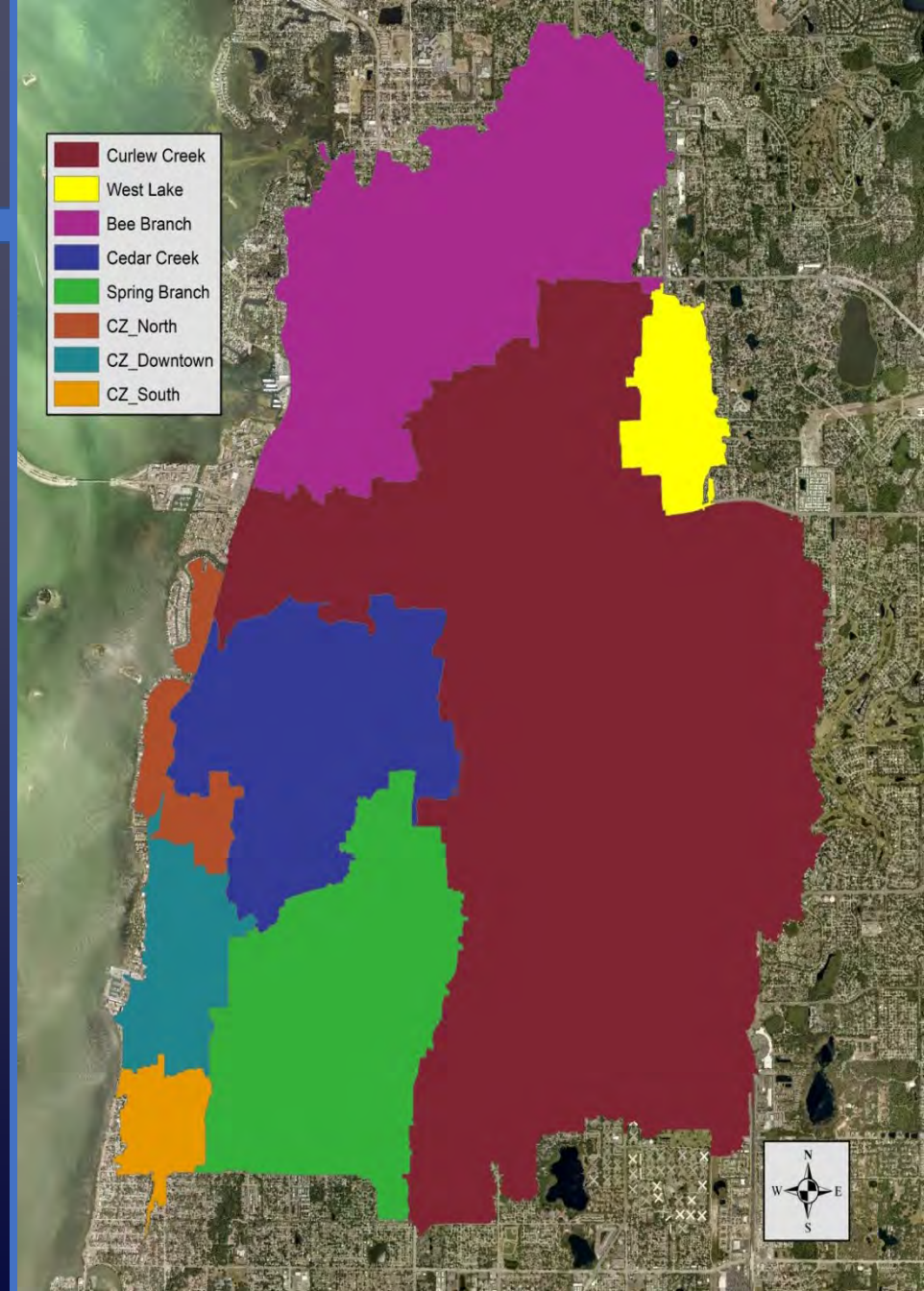
* Source: ESRI Maps
** Source: USGS

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES
WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 9, Version 2

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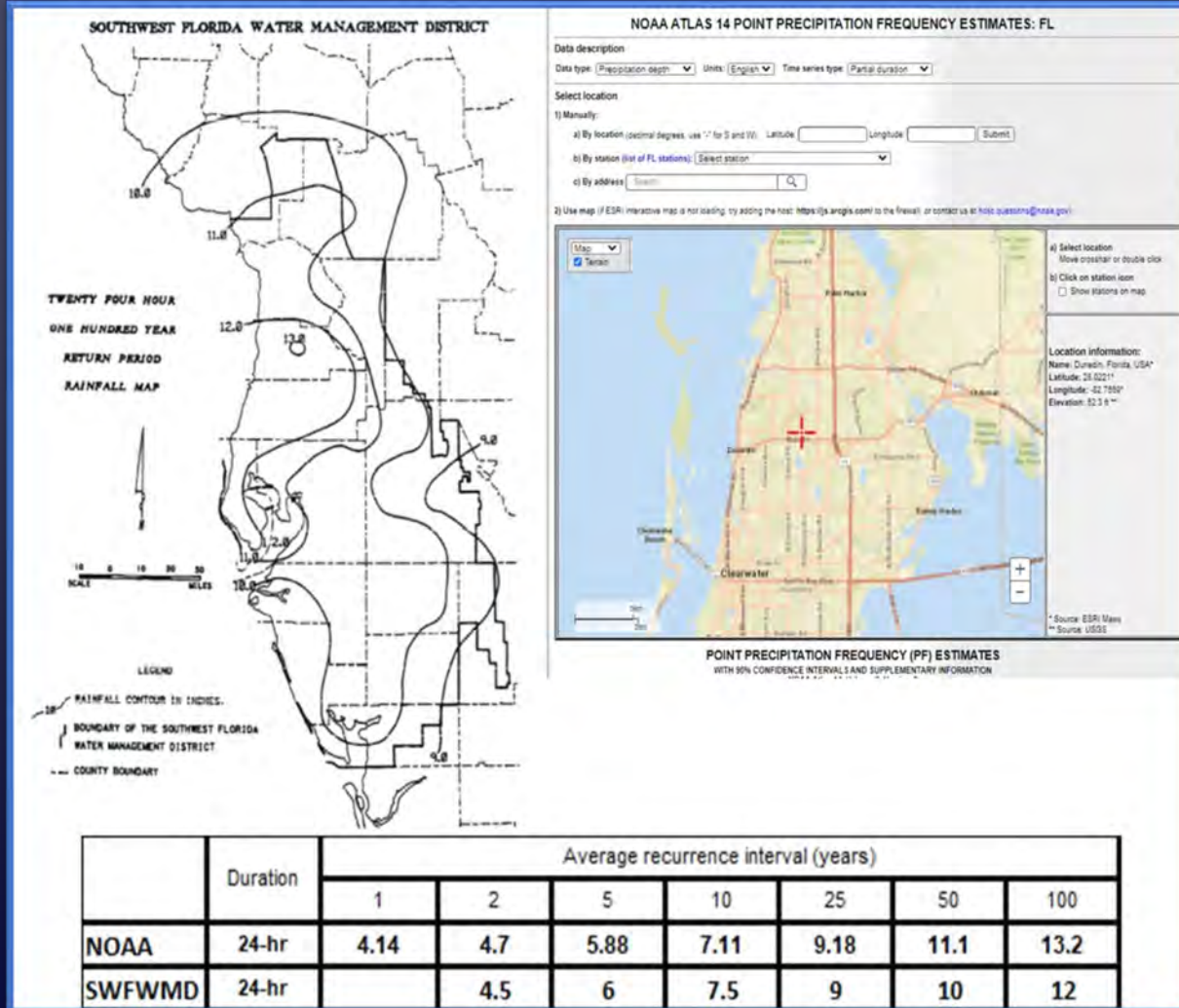
City Of Dunedin Model

- Pinellas County
- City of Dunedin
- City of Clearwater



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Rainfall Depths



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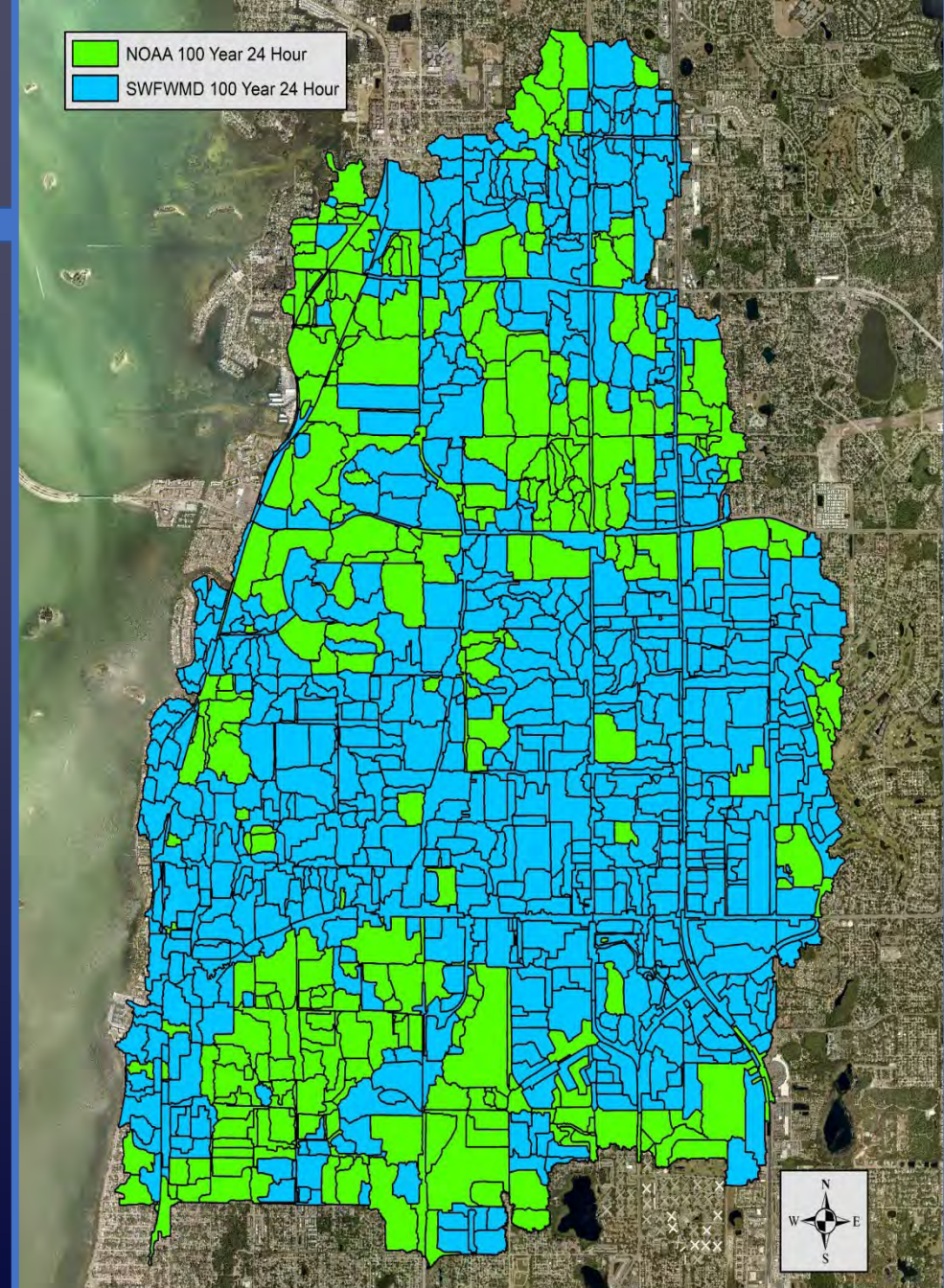
100 Year 24 Hour Results

SCS Type II Florida Modified

- 769 Basins
- 65% by area
- On Average 0.34 foot higher than NOAA

NOAA 14

- 322 Basins
- 35% of Study Area
- On Average 0.12 foot higher than SCS



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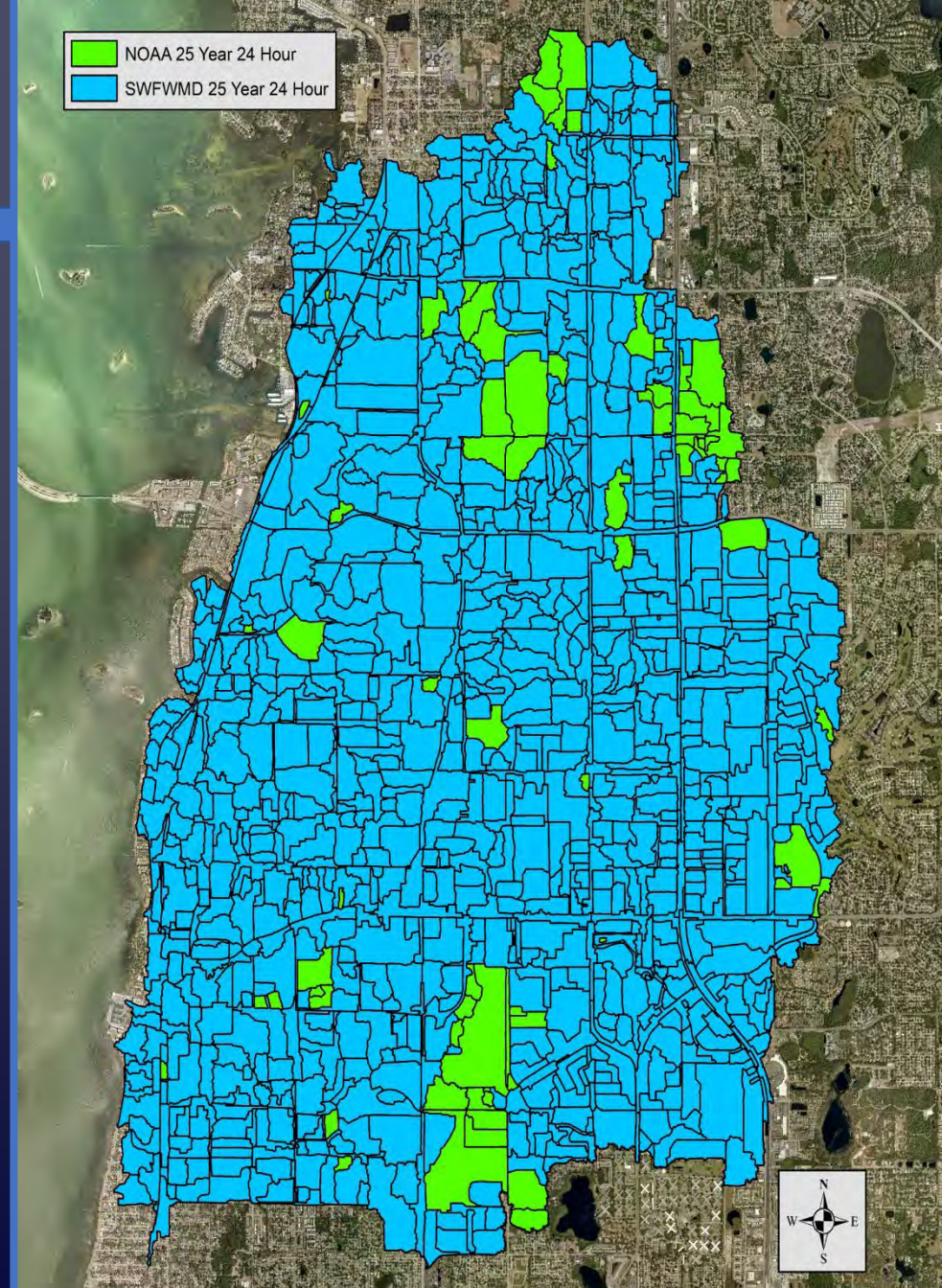
25 Year 24 Hour Results

SCS Type II Florida Modified

- 1020 Basins
- 92% by area
- On Average 0.29 foot higher than NOAA

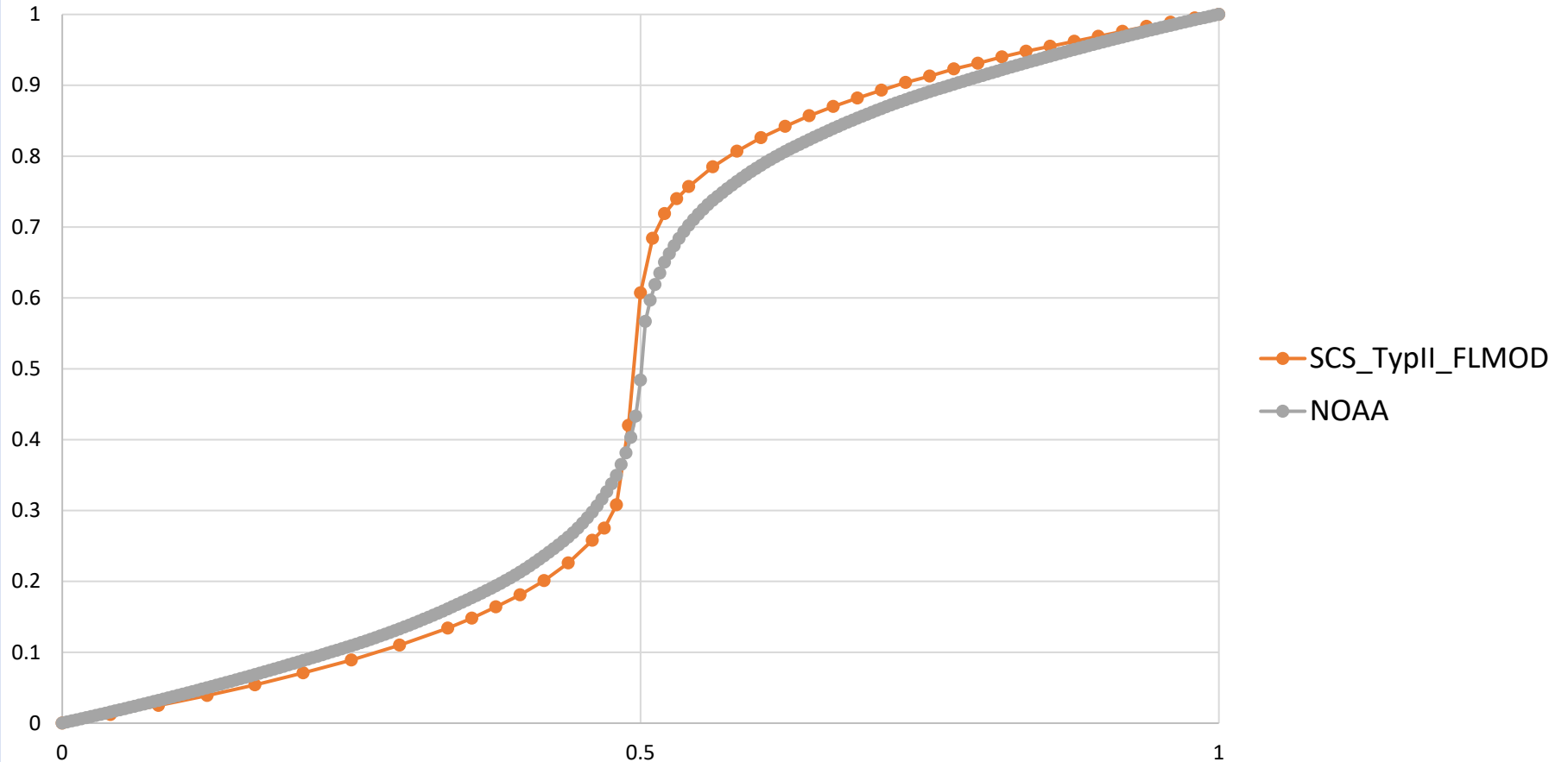
NOAA 14

- 322 Basins
- 8% of Study Area
- On Average 0.03 foot higher than SCS



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24-HR Distributions



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Water Quality



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Water Quality

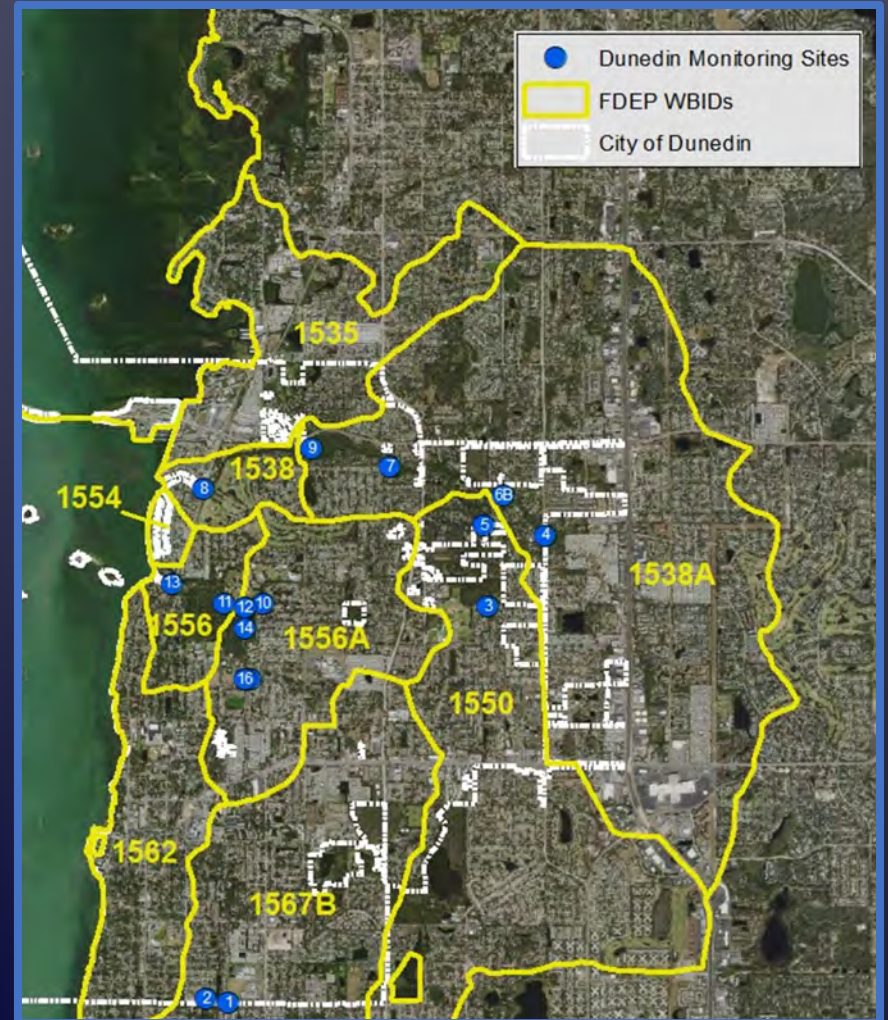
- Ambient water quality – status & trends
- Pollutant Loading



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Water Quality Sampling Sites

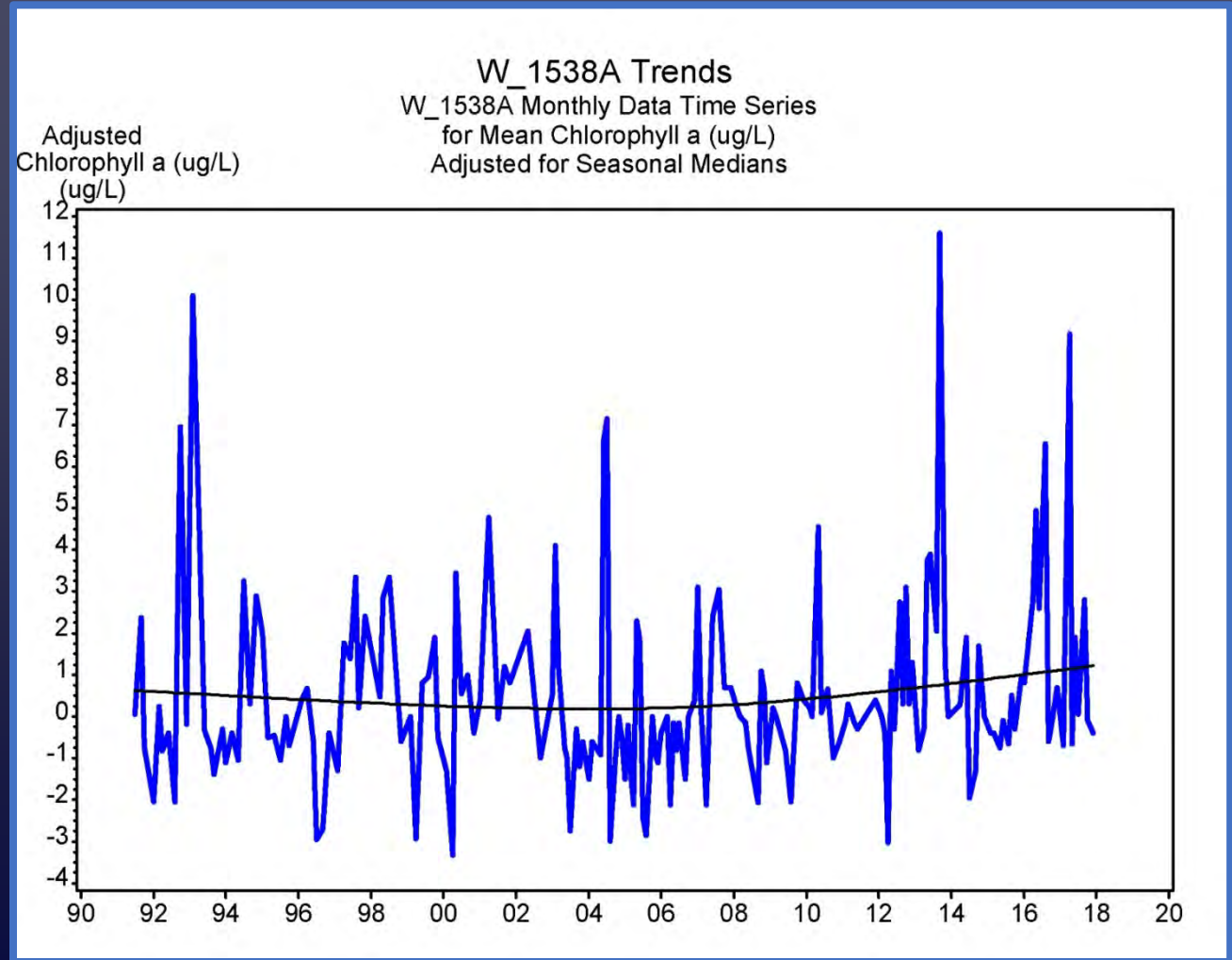
	Curlew Creek Freshwater Segment	
1538A		Stream
1550	Jerry Branch	Stream
1567B	Spring Branch	Stream
1538	Curlew Creek Tidal	Estuary
1556	Cedar Creek (Tidal)	Estuary
1556A	Cedar Creek	Stream



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Trend Analysis

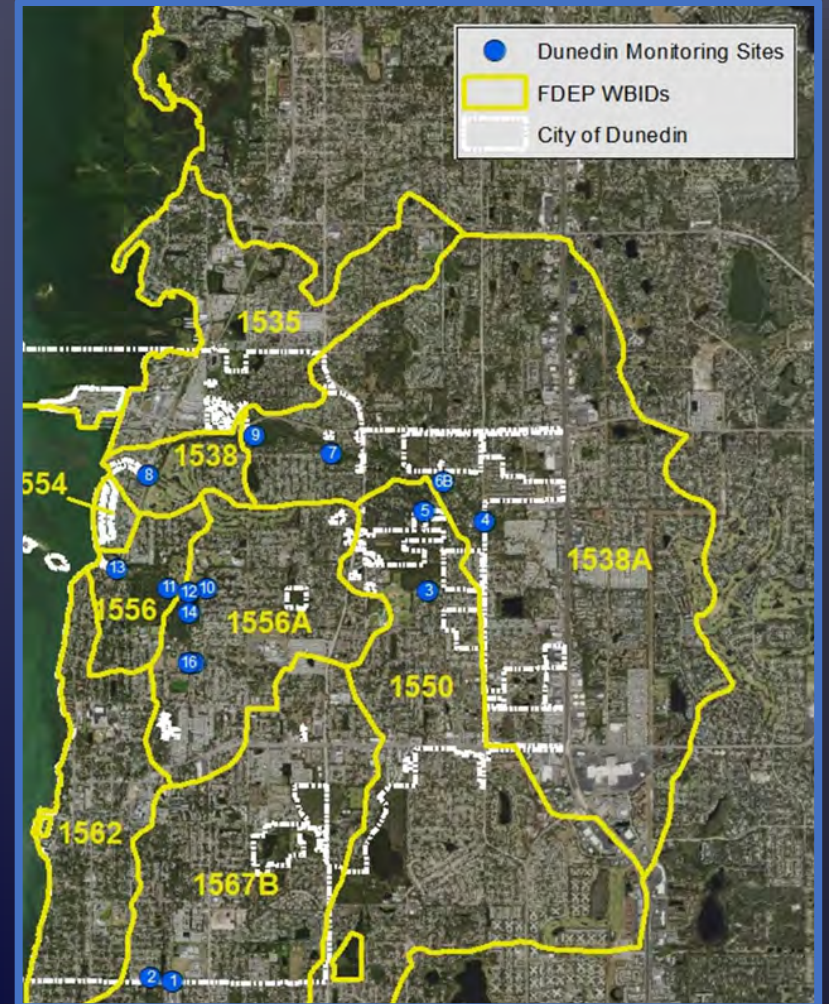
- Seasonal Kendall Tau



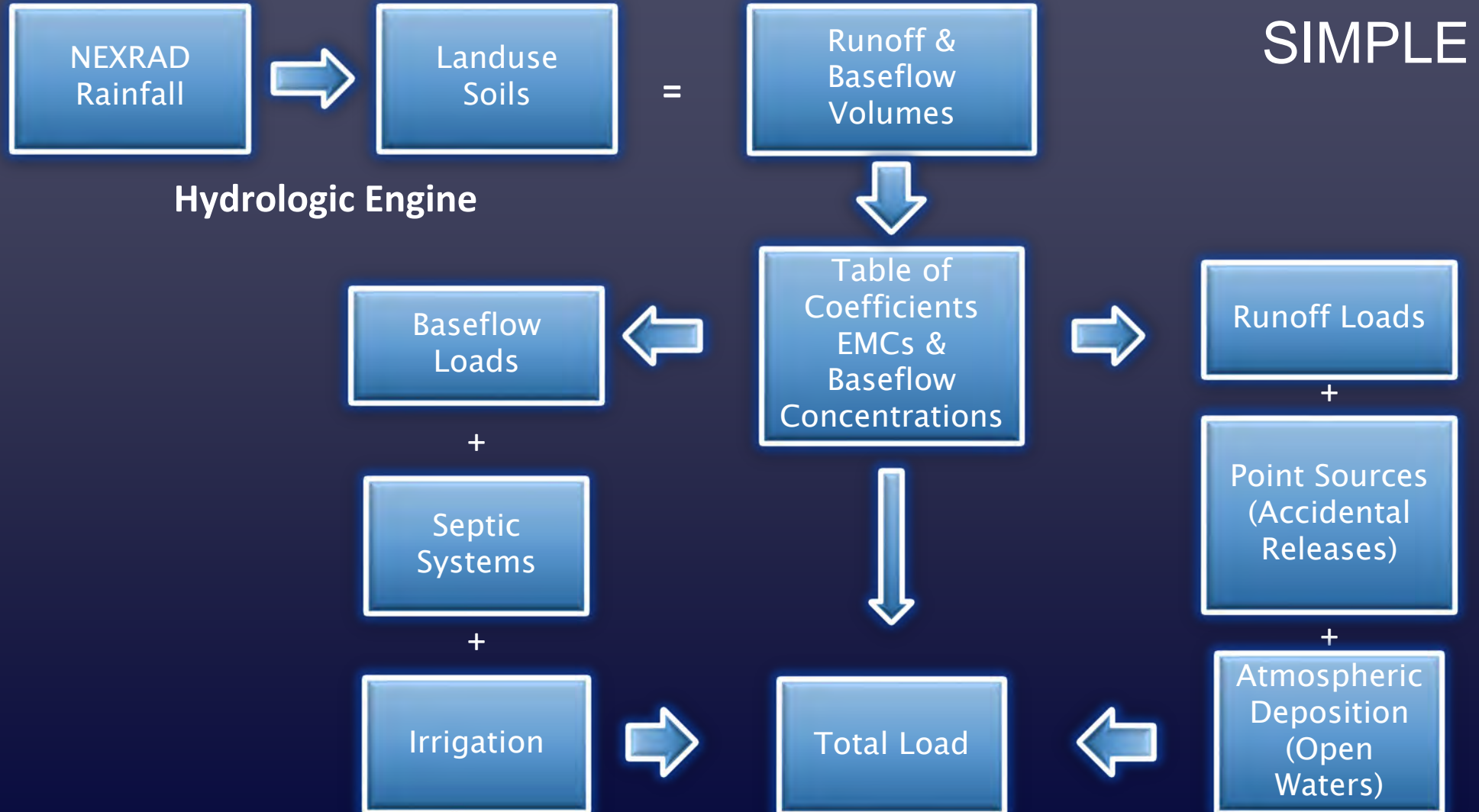
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Water Quality Trends

Water Body	TN	TP	Chlorophyll
Curlew Creek Freshwater	↓	↓	↔
Curlew Creek Tidal	↓	↓	↔
Spring Branch	↓	↓	↔
Cedar Creek Freshwater	↓	↑	
Cedar Creek Tidal	↓	↑	↓



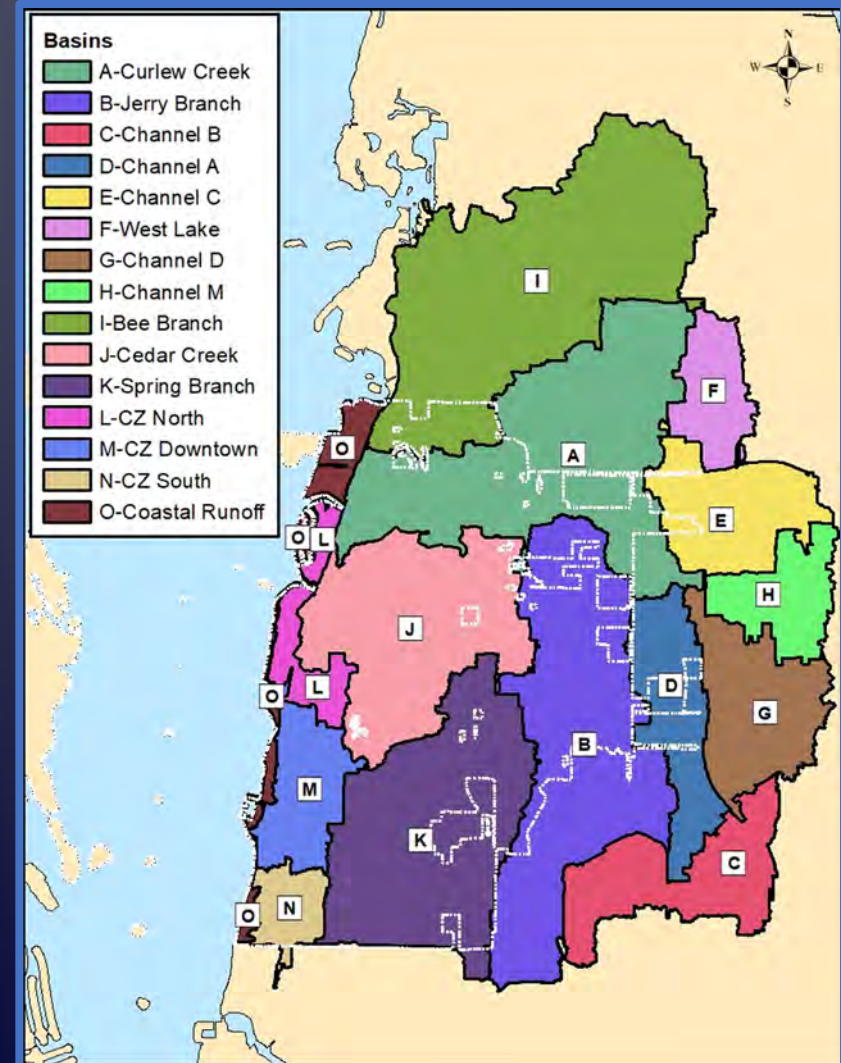
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Pollutant Loading

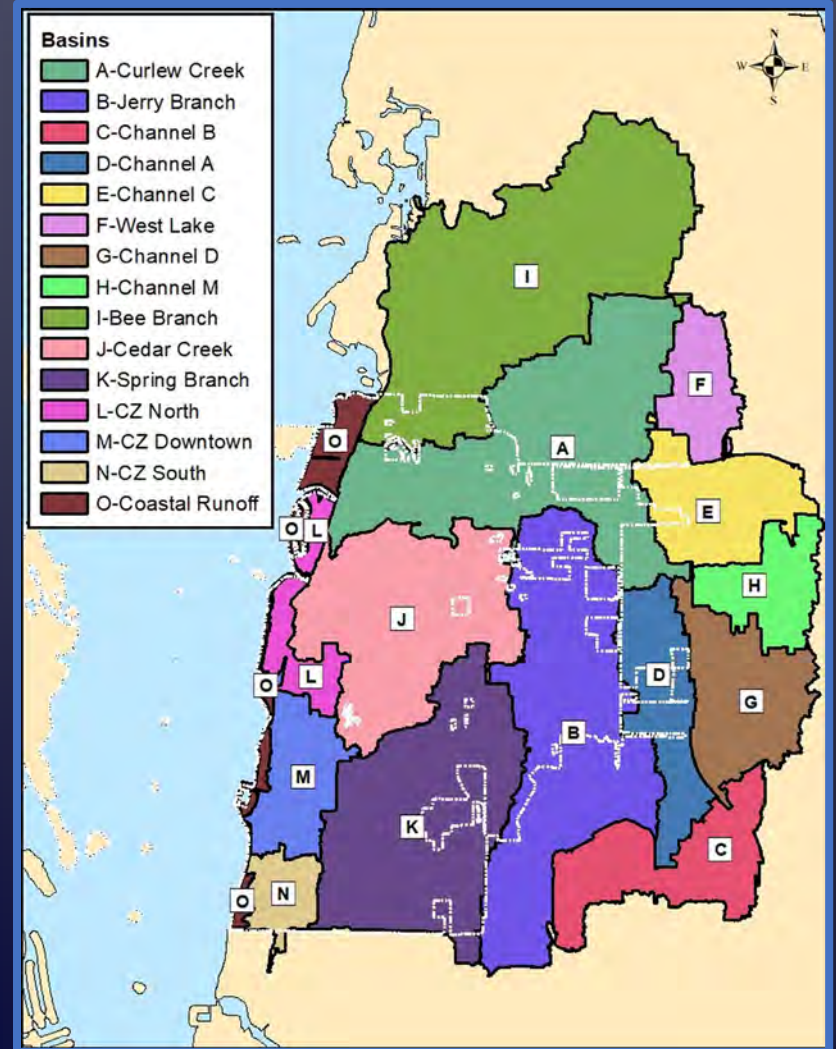
- Impacts of pollutant loading can be attributed to sources generated both within and outside of the city proper



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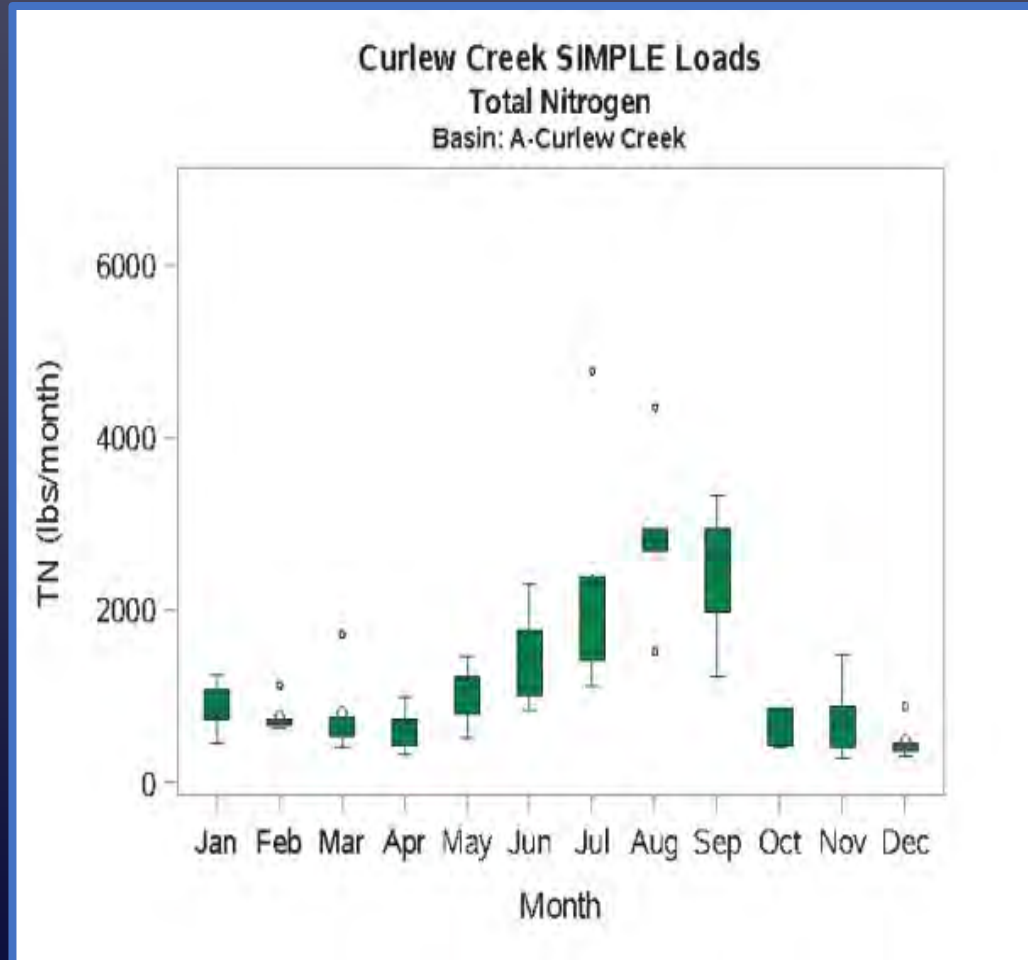
Loading Sources

- Direct Runoff
- Baseflow
- Point Sources
- Septics
- Atmospheric Deposition (Open Waters)



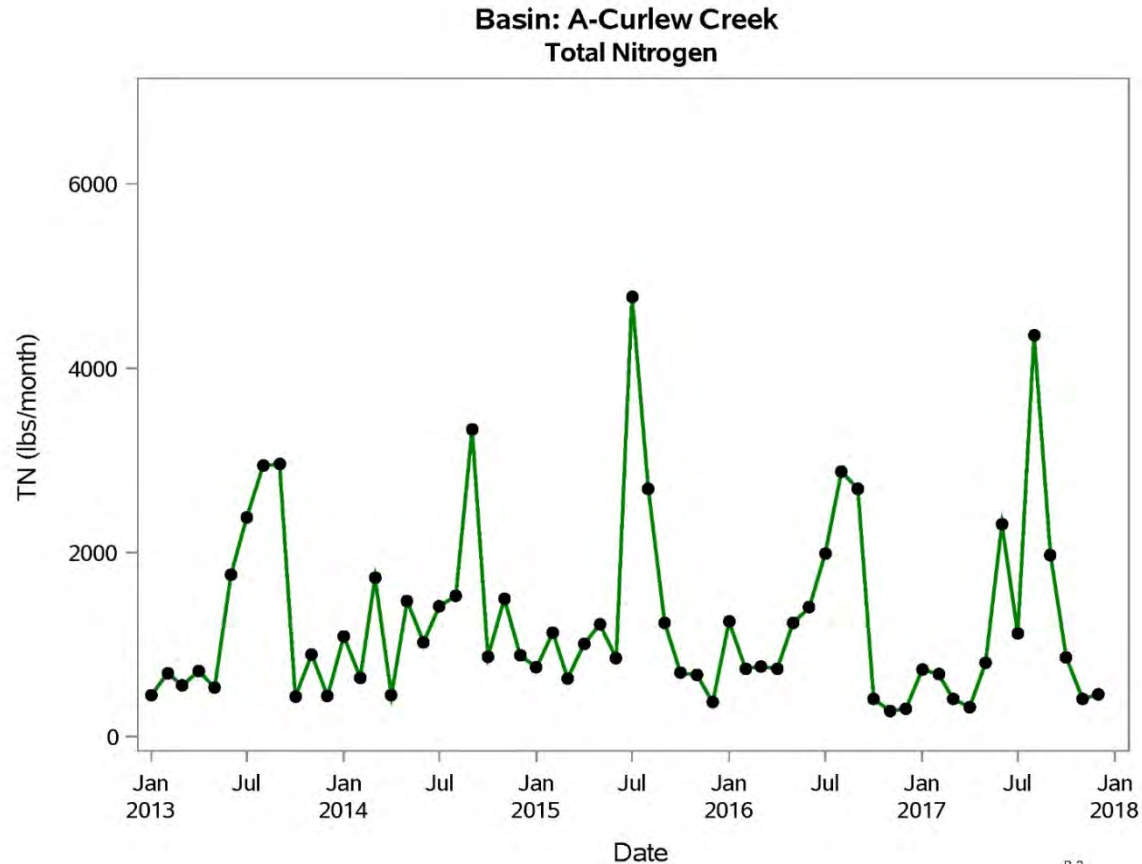
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Seasonal Variations



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Interannual Variation



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Direct runoff and baseflow are the dominant loading sources in all basins

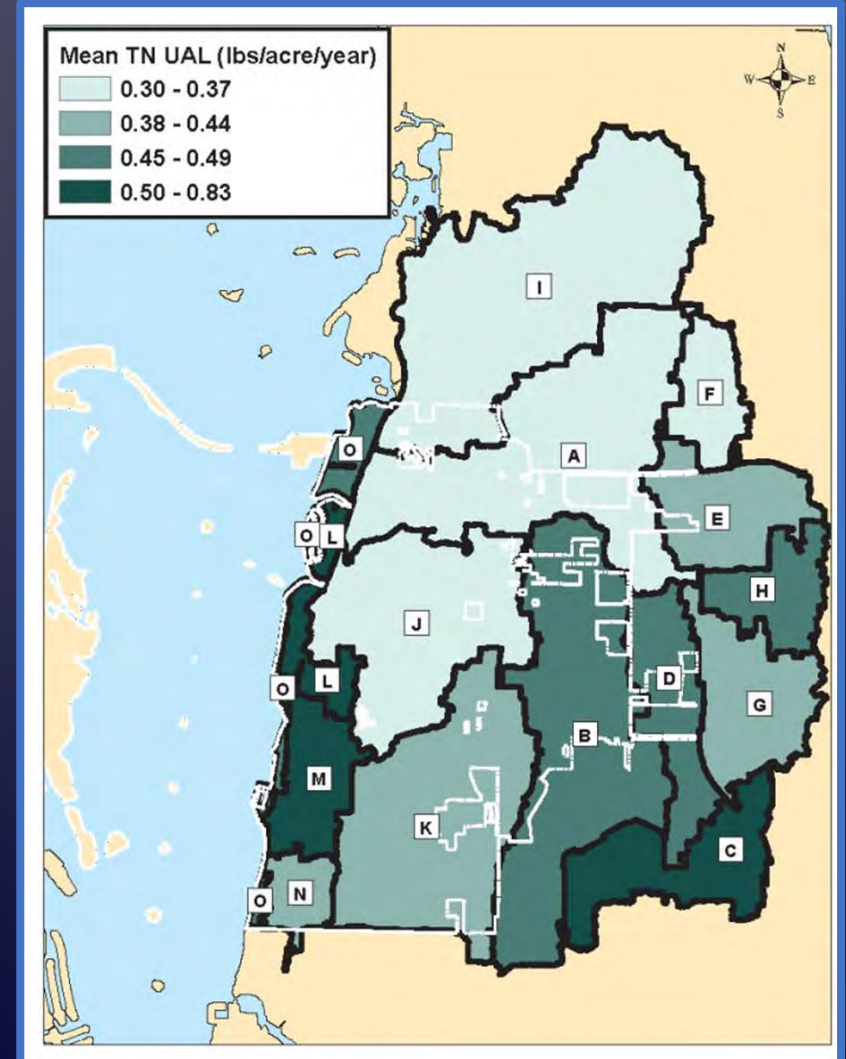
Loads by Source for Sample Basins

Basin	Parameter	Baseflow	Direct Runoff	Point Source	Septic
Curlew Creek	TN	4,224	7,578	2,876	482
	TP	1,267	1,214	712	26
Cedar Creek	TN	2,912	8,029	0	95
	TP	874	1,526	0	4

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Pollutant Loading – Direct Runoff

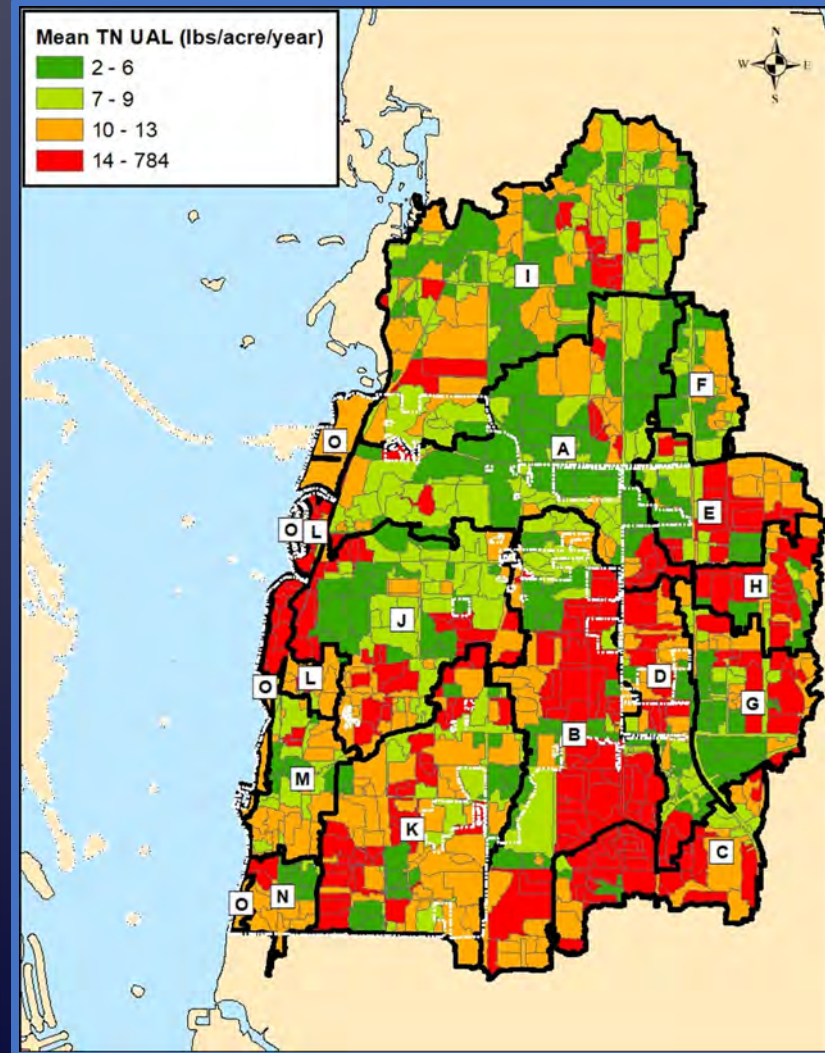
- Unit Area Loads are used to identify “Hot Spots”



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Pollutant Loading

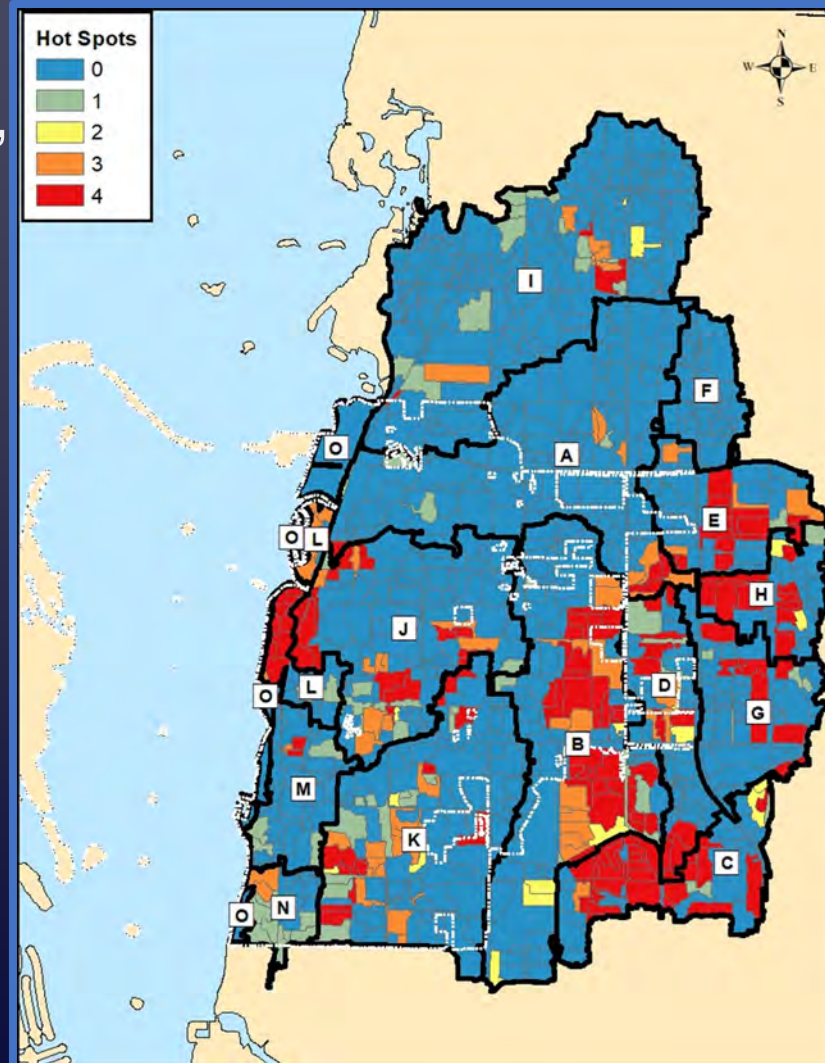
- TN Loading “Hot Spots”



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Pollutant Loading

- Composite “Hot Spots”
 - TN
 - TP
 - BOD
 - TSS



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Downtown Redevelopment Area

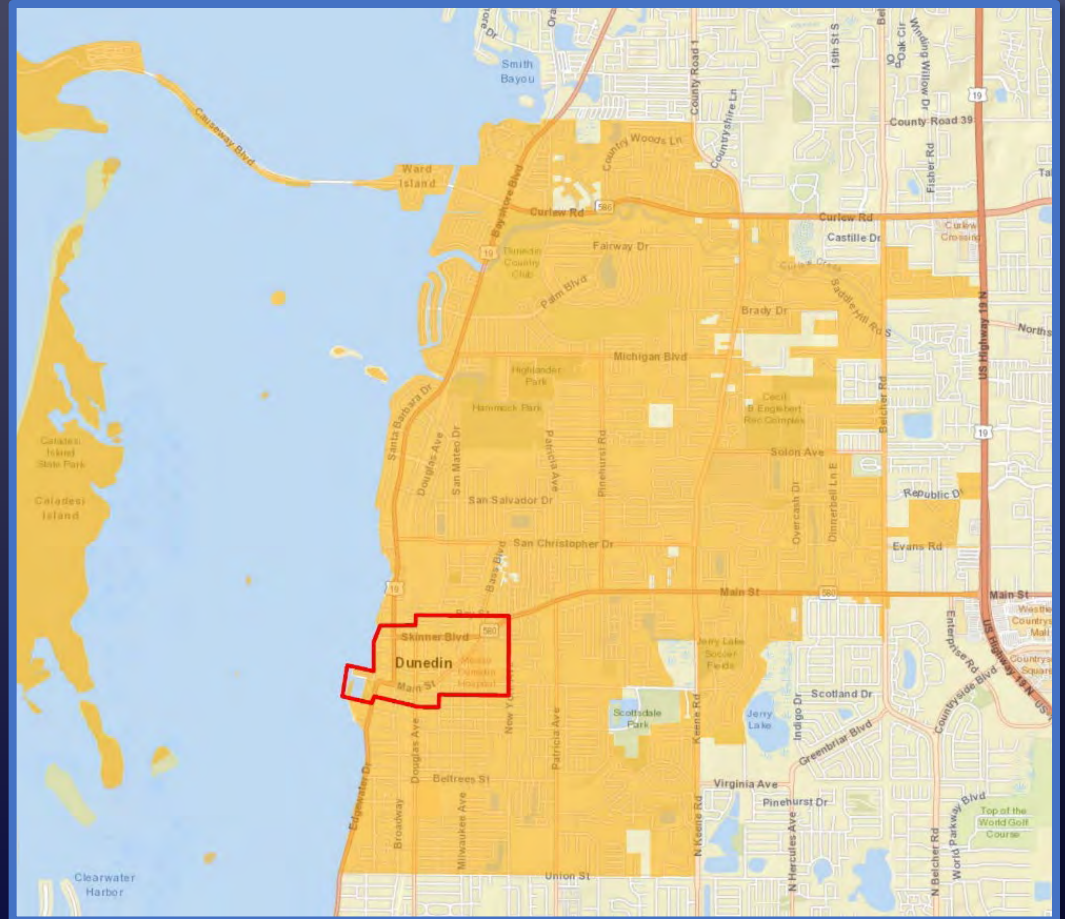


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Downtown Regional Stormwater Goals

Fulfill water quality treatment needs for redevelopment in the City of Dunedin's Downtown Redevelopment Area (DRA) with regional best management practice (BMP) alternatives



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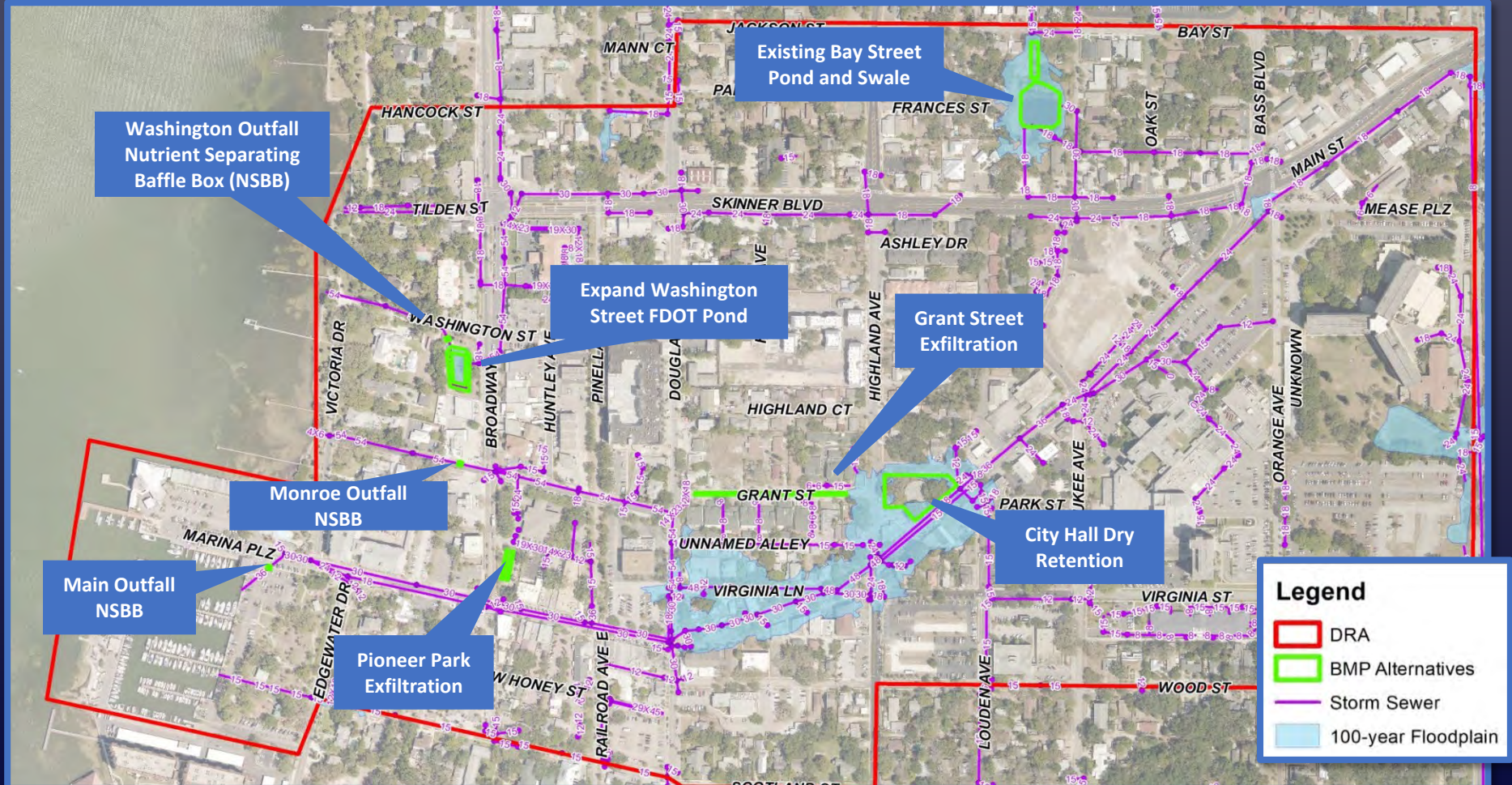


Downtown Regional Permitting Approach

- Conceptual Approval Permit from SWFWMD
 - Urban infill or redevelopment qualifies for a Conceptual Approval Permit
 - Subsequent construction can be authorized under General Permits
 - Treatment is fulfilled via net improvement nutrient loading analysis
- What would be included in permit?
 - 372 parcels (82 acres) identified for redevelopment
 - 85% impervious assumed in the future condition
 - Excludes large permitted facilities, planned/recent construction, waterfront residential, utilities, trails

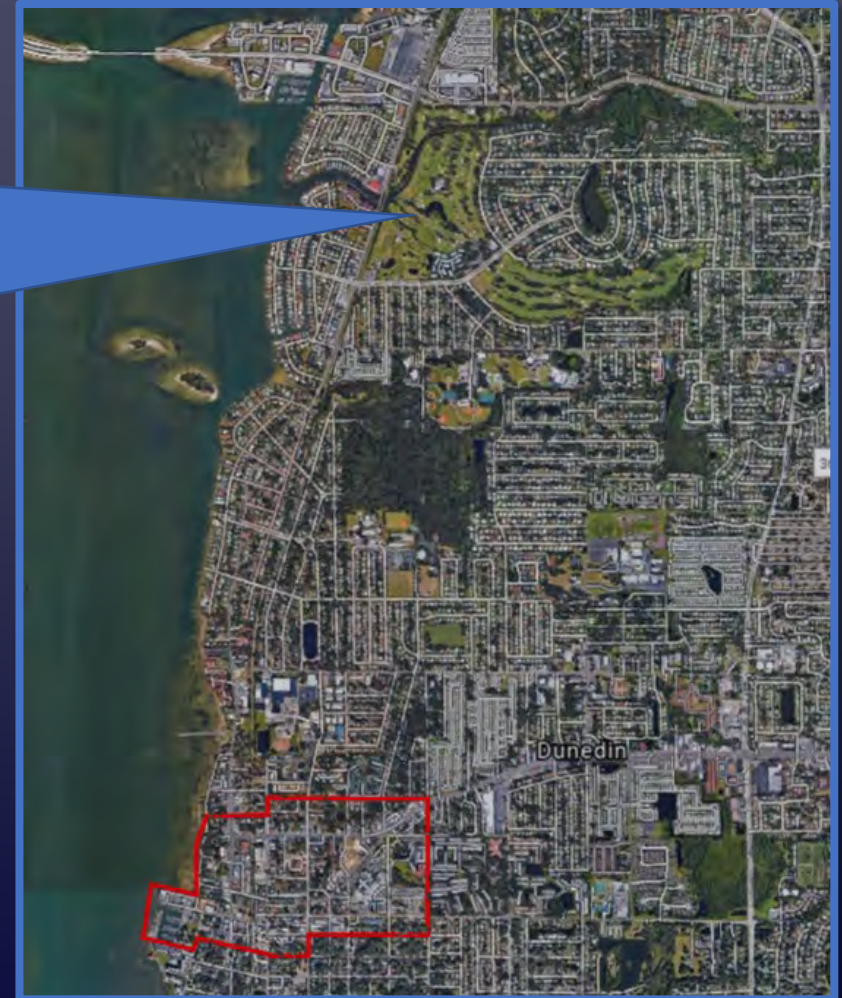
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BMP Alternatives within DRA



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BMP Alternatives - Offsite



- Recently transferred to City
- Proposed compensatory wet detention
- BMP piggybacks on Capital Improvement project

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BMP TRAINS “Pre” Model

- BMP Trains used to model existing nutrient loading in runoff
- Existing discharge load:
 - Total Nitrogen = **494 kg/yr**
 - Total Phosphorus = **66 kg/yr**
- Proposed conditions cannot exceed this amount!

General Site Information for Project File: Dunedin_Pre

Name for Your Project: DUNEDIN-PRE

Select Meteorological Zone for Project: Florida Zone 4

BMP Trains Reports

Copy Back

Spec **Summary Report**

Nitrogen

Surface Water Discharge

Total N post load	604.44 kg/yr	
Percent N load reduction	18 %	
Provided N discharge load	494.05 kg/yr	1089.39 lb/yr
Provided N load removed	110.38 kg/yr	243.39 lb/yr

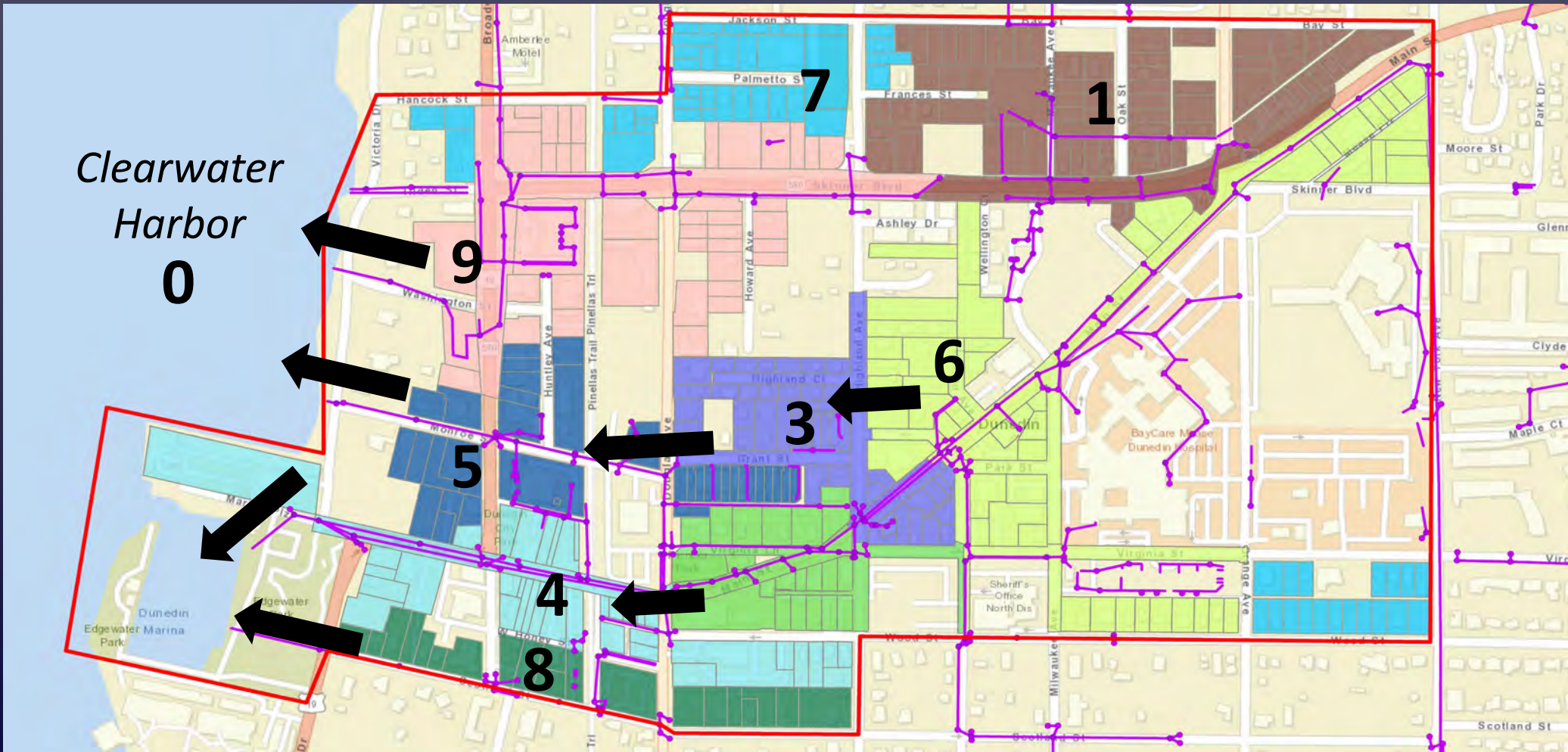
Phosphorus

Surface Water Discharge

Total P post load	86.888 kg/yr	
Percent P load reduction	24 %	
Provided P discharge load	65.683 kg/yr	144.83 lb/yr
Provided P load removed	21.205 kg/yr	46.756 lb/yr

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BMP TRAINS “Post” Model Network



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BMP TRAINS “Post” Model

The image displays two overlapping screenshots from the BMP TRAINS software. The background screenshot shows the 'Select Catchment Configuration' window with a table of catchments. The foreground screenshot shows the 'BMP Trains Reports' window with a 'Load Diagram for Exfiltration (As Used In Routing)'. A blue callout box highlights a specific data point in the diagram.

	From	To	Area	BMP Used
1	0	16.70	Multiple BMP	
2	4	7.10	Exfiltration	
3	0	8.50	Exfiltration	
4	0	11.60	User Defined BMP	
5	0	8.00	None	
6	3	20.10	Retention	
7	0	9.90	None	
8	0	5.50	None	
9	0	18.30	Multiple BMP	

Load Diagram for Exfiltration (As Used In Routing)

Upstream Nodes: None

Load: N: 60.66 kg/yr, P: 8.72 kg/yr, Q: 20.50 ac-ft

Treatment: N: 93.8 %, P: 93.8 %

Mass Discharged: N: 3.77 kg/yr, P: 0.54 kg/yr, Q: 1.27 ac-ft

Mass Removed: N: 56.89 kg/yr, P: 8.18 kg/yr

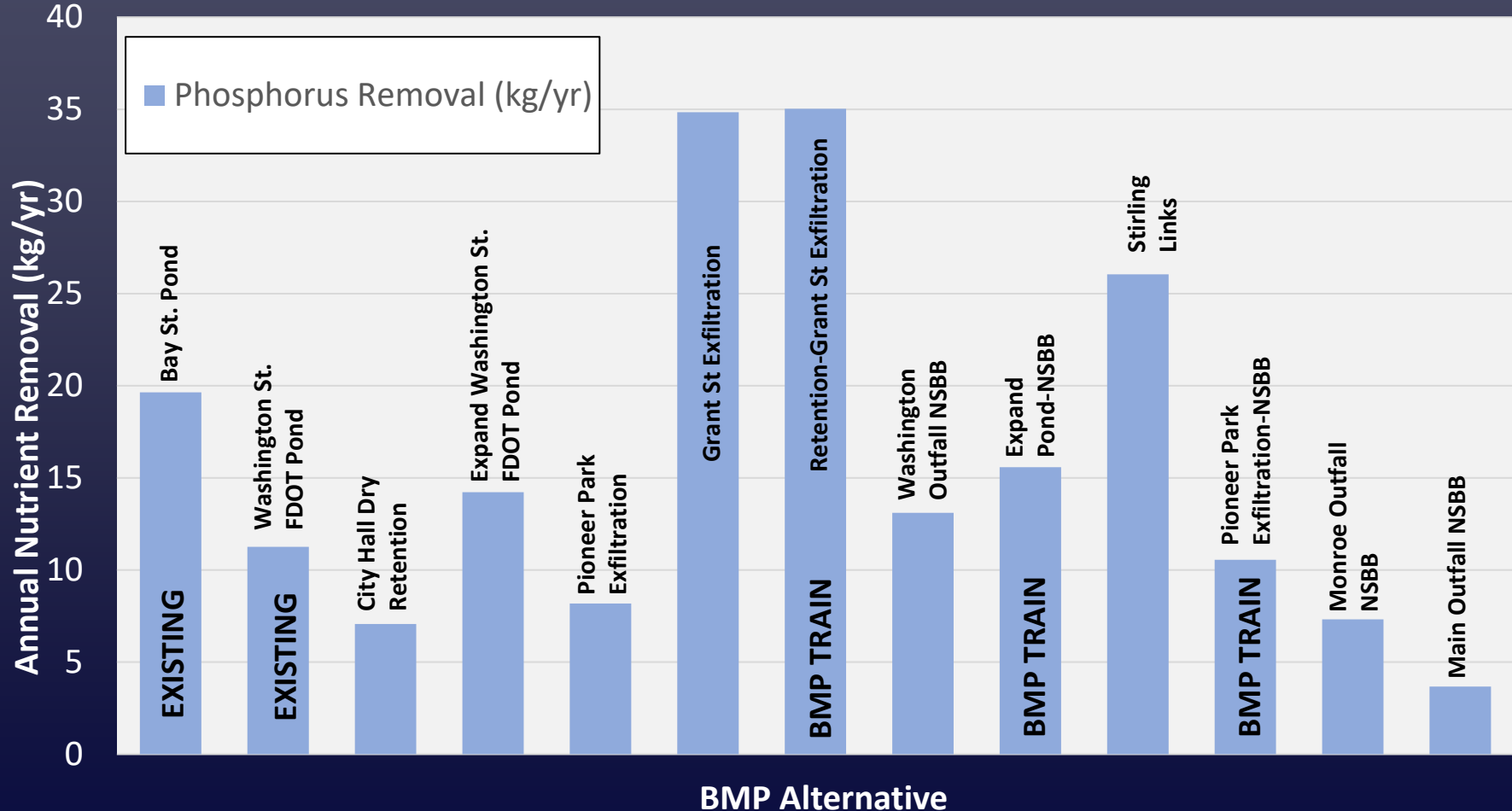
Required Removal Rates: N: 421 kg/yr, P: 67 kg/yr

Pioneer Park Exfiltration BMP provides about 13% of goal

Watershed Characteristics: Catchment Area (acres) 7.10

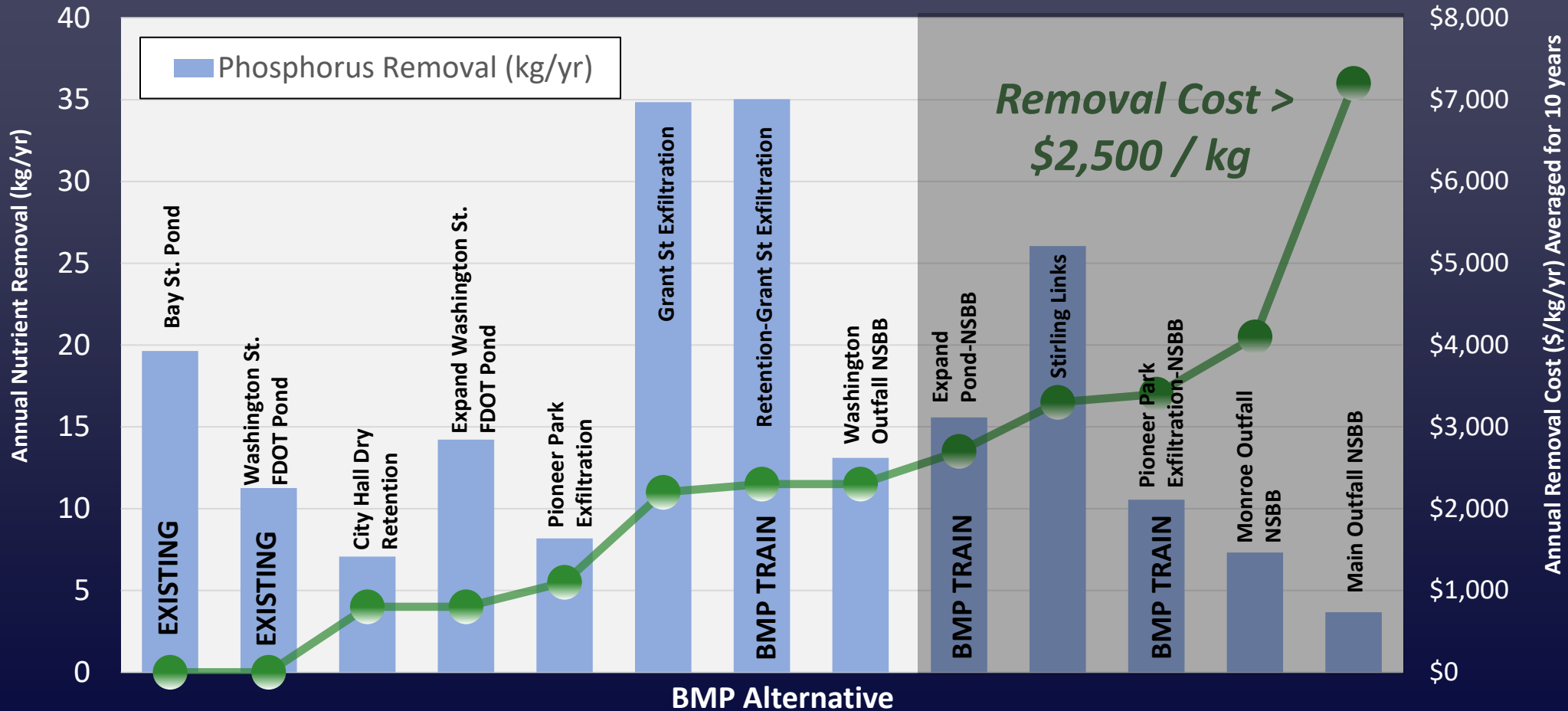
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Phosphorus Removal by BMP



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Phosphorus Removal and Weighted Cost



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Recommended BMP Configurations

BMP Description	Option 1	Option 2	Option 3
Existing Bay Street Pond	✓	✓	✓
City Hall Dry Retention			✓
Grant Street Exfiltration	✓	✓	
Pioneer Park Exfiltration	✓		✓
Existing Washington St. FDOT Pond	✓		
Expand Washington St. FDOT Pond		✓	✓
Stirling Links (Compensatory)			✓
Preliminary Construction Cost	\$213,200	\$282,500	\$810,200
Total Nitrogen Removed (kg/yr)	464 <input checked="" type="checkbox"/>	439 <input checked="" type="checkbox"/>	429 <input checked="" type="checkbox"/>
Total Phosphorus Removed (kg/yr)	74	69	75

Required Removal Rates:

421 kg/yr TN

67 kg/yr TP

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Sea Level Rise & Resiliency



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SLR & Resiliency

SLR Scenarios

- Relative Rise vs. Time



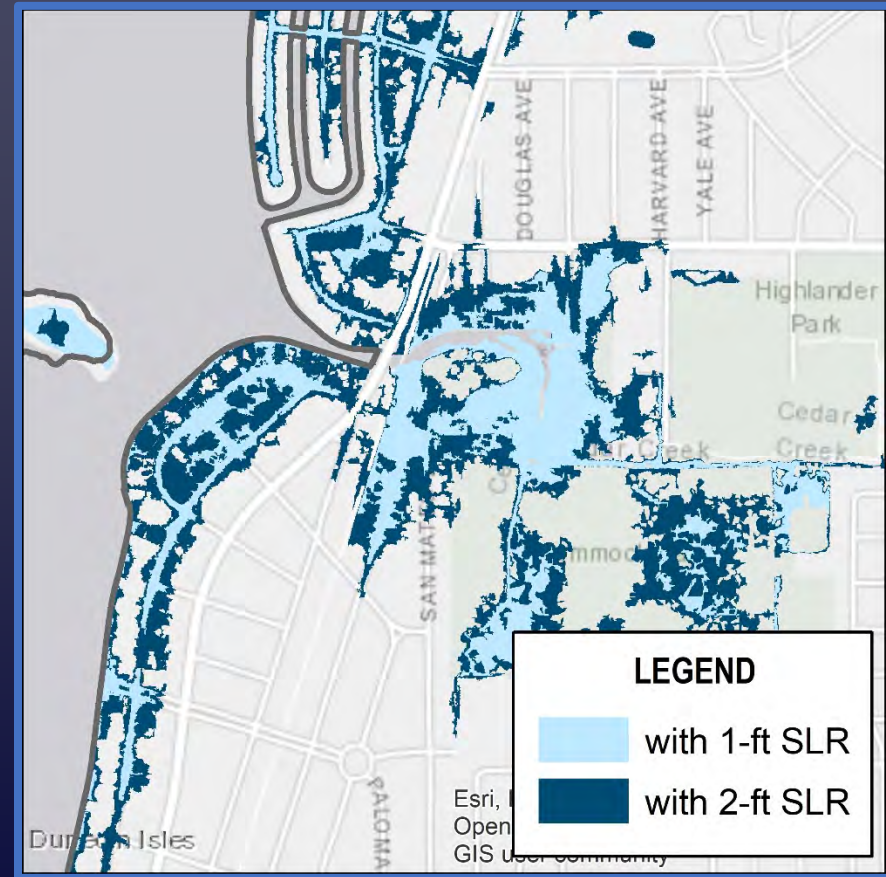
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SLR & Resiliency

Hazard Analysis

- Extreme Tides
- Storm Surge
- Stormwater

Sea Level Rise
is a Threat
Multiplier

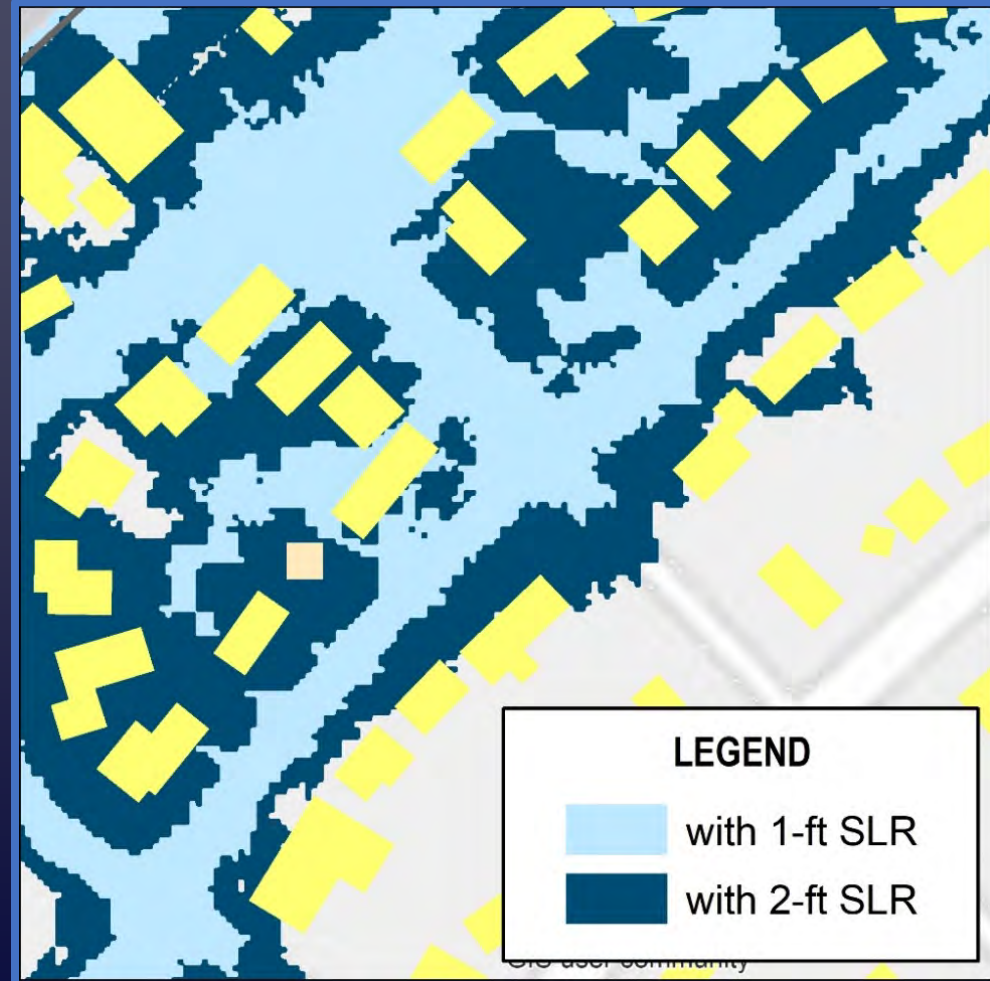


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SLR & Resiliency

Exposure Analysis

- Structures
- Property
- Roadway
 - Local
 - Major
 - Evacuation



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SLR & Resiliency

Vulnerability Analysis

- Potential Impact
- Adaptive Capacity

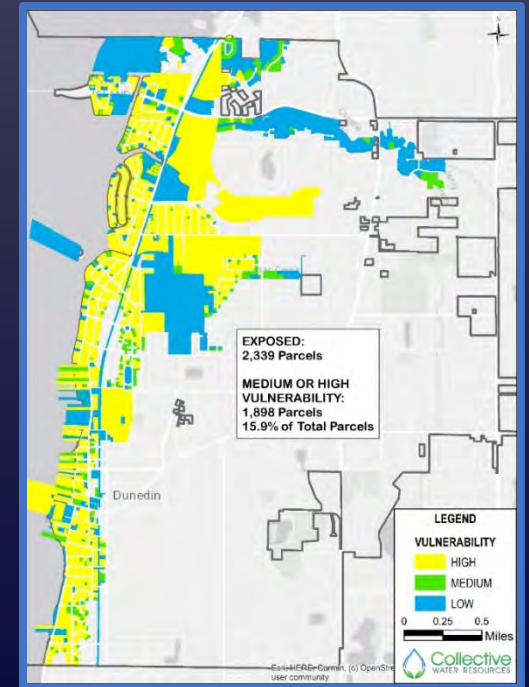
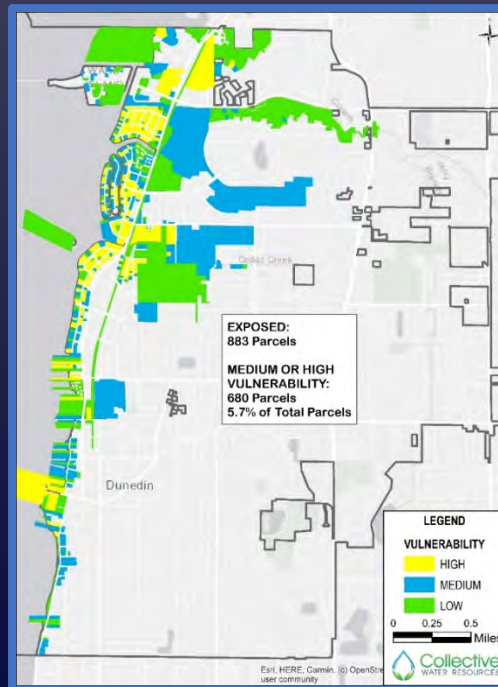
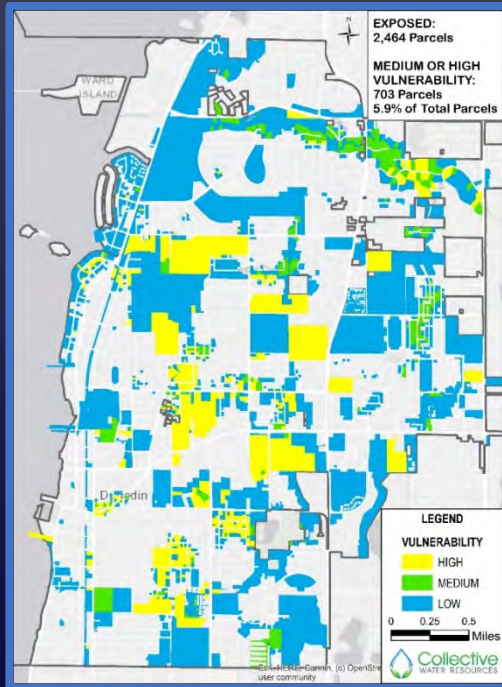
		Adaptive Capacity		
		High	Medium	Low
Potential Impact	Low	Low	Low	Medium
	Medium	Low	Medium	High
	High	Medium	High	High

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SLR & Resiliency Resiliency Analysis

- Parcels

Type of Flooding	SLR Scenario	Parcels with High or Medium Vulnerability	Percent of Total Parcels
Stormwater Flooding	1-foot	701	5.9%
	2-feet	703	5.9%
Extreme Tide	1-foot	373	3.1%
	2-feet	680	5.7%
Storm Surge	1-foot	1,686	14.1%
	2-feet	1,898	15.9%

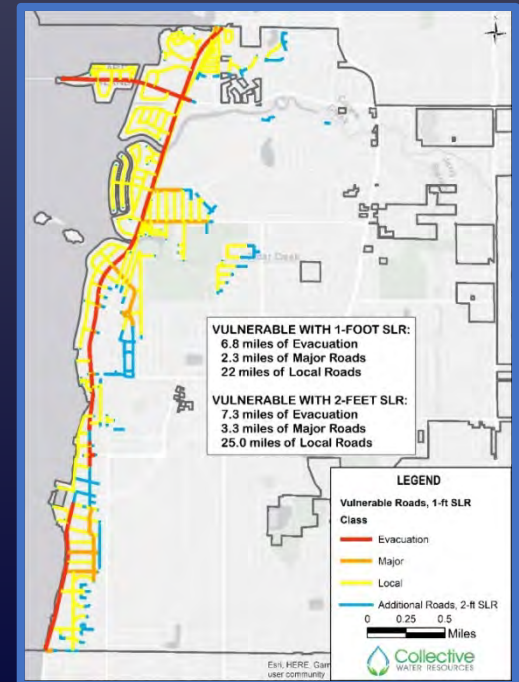
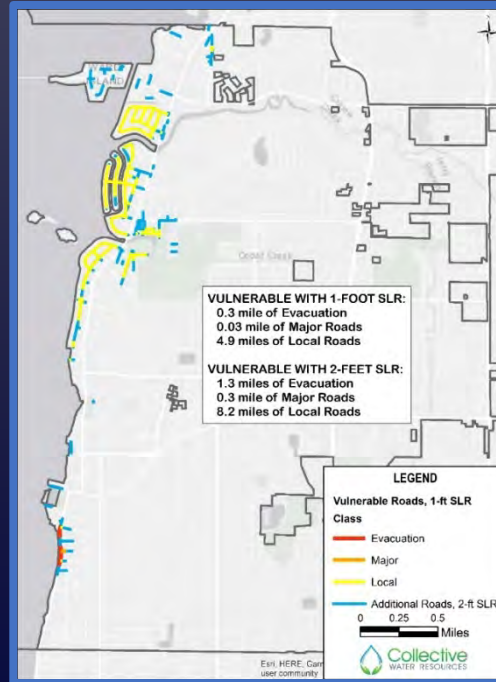
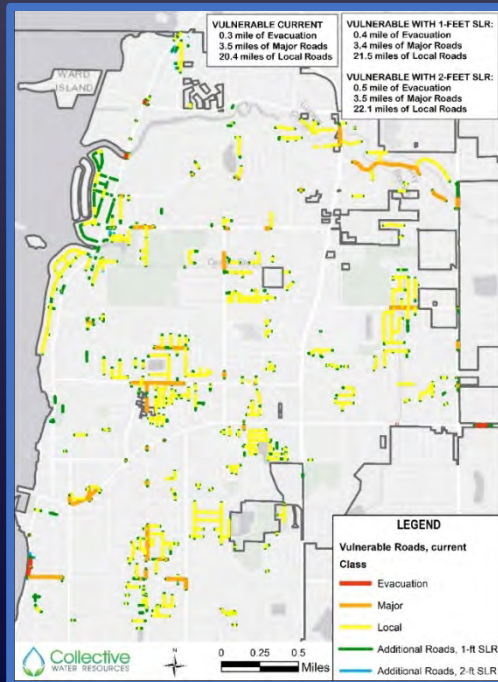


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SLR & Resiliency Resiliency Analysis

- Roadways

Type of Flooding	SLR Scenario	Road Miles with High or Medium Vulnerability	Percent of Total Parcels
Stormwater Flooding	1-foot	3.8	8.7%
	2-feet	4.0	9.2%
Extreme Tide	1-foot	0.3	0.7%
	2-feet	1.6	3.7%
Storm Surge	1-foot	9.1	20.8%
	2-feet	10.6	24.3%



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SLR & Resiliency

Moving Forward

- Structural Actions
 - Backflow preventors
 - Seawall elevation requirements
- Non-Structural Measures
 - Building requirements (e.g., finished floor elevations)
 - Promote low impact development
 - Increase O&M and customer service budgets
 - Coordination with FDOT and Pinellas County

NOAA High SLR Projections

Recommended for Sensitive and Critical Infrastructure

NOAA Intermediate High

Recommended for Assets with Adaptive Capacity

IPCC Medium

Recommended for Assets with Short Life Cycles

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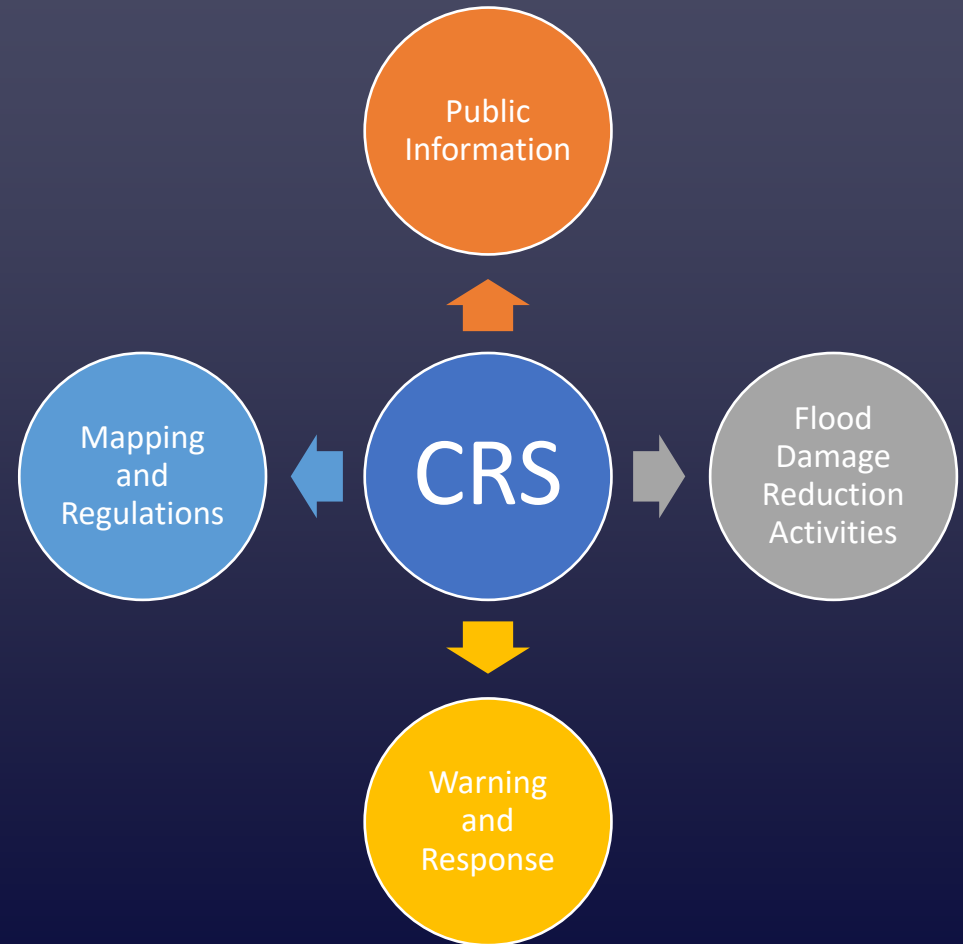
Community Rating System



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- The Community Rating System is a voluntary program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the National Flood Insurance Program (NFIP).
- Program goals include:
 - Reduce and avoid flood damage to insurable property
 - Strengthen and support the insurance aspects of the National Flood Insurance Program
 - Encourage comprehensive floodplain management



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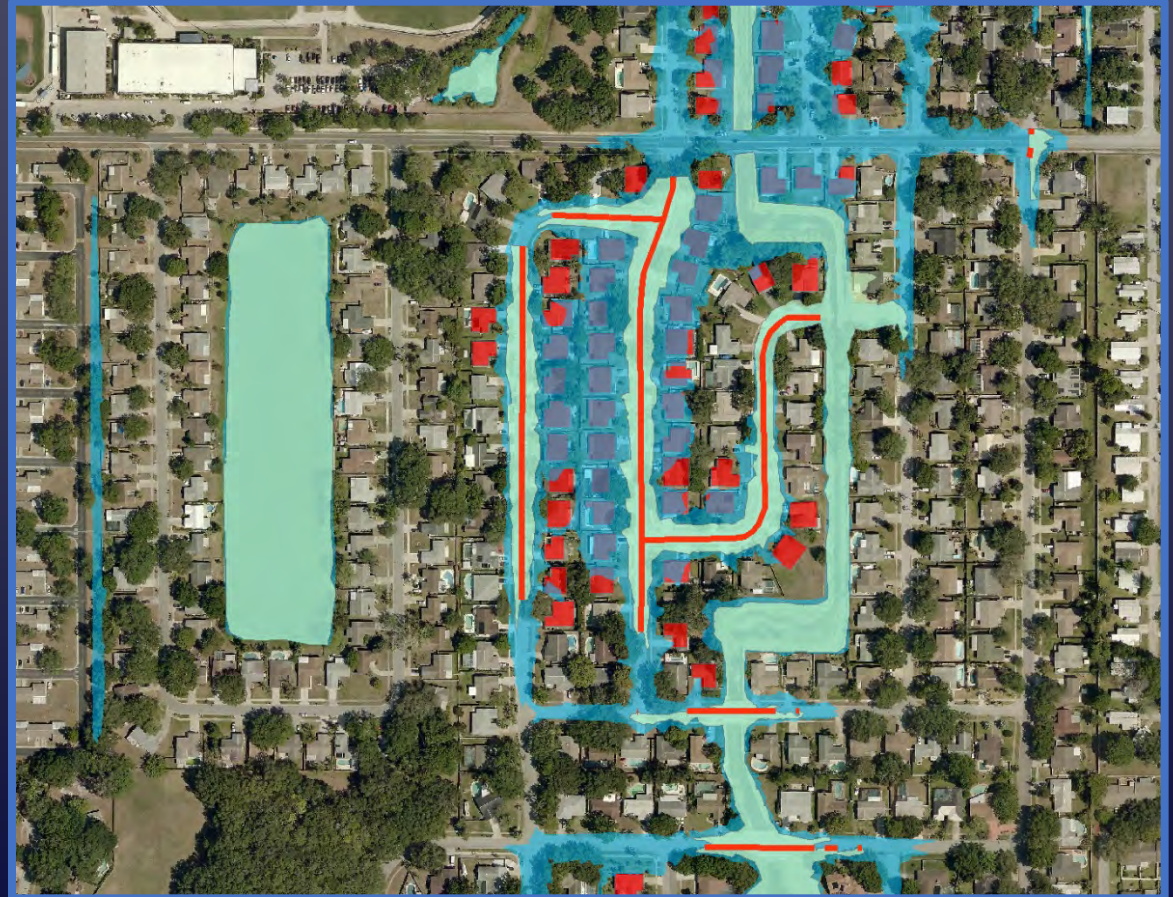
- CRS
 - Flooding Risks
 - Flooding Depth
 - Uses
 - Outreach
 - Planning decisions
 - Emergency Management



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- CRS

- Criteria
- Structural
- Roadway



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- Dunedin doing great job implementing comprehensive floodplain management program
- Currently Class 5 – saving residents up to 25% on flood insurance
- Recommendations
 - Improve flood inquiries tracking and information collected
 - Floodplain ordinance improvements



A small, translucent orange frog is perched on a vibrant green leaf. The frog is holding a thin green stem in its mouth. Above the frog's head is a white, cloud-like thought bubble with a black outline. The background is a blurred green, suggesting a natural, outdoor setting. The overall scene is bright and clear, with some water droplets visible on the leaf.

Questions?