

# North Fort Myers Water Quality Improvement and Flood Protection Study

---

FSA Summer Conference  
June 20, 2019

**David Warthen**  
Project Manager



**Steve Peene, PhD**  
Water Resources Principal

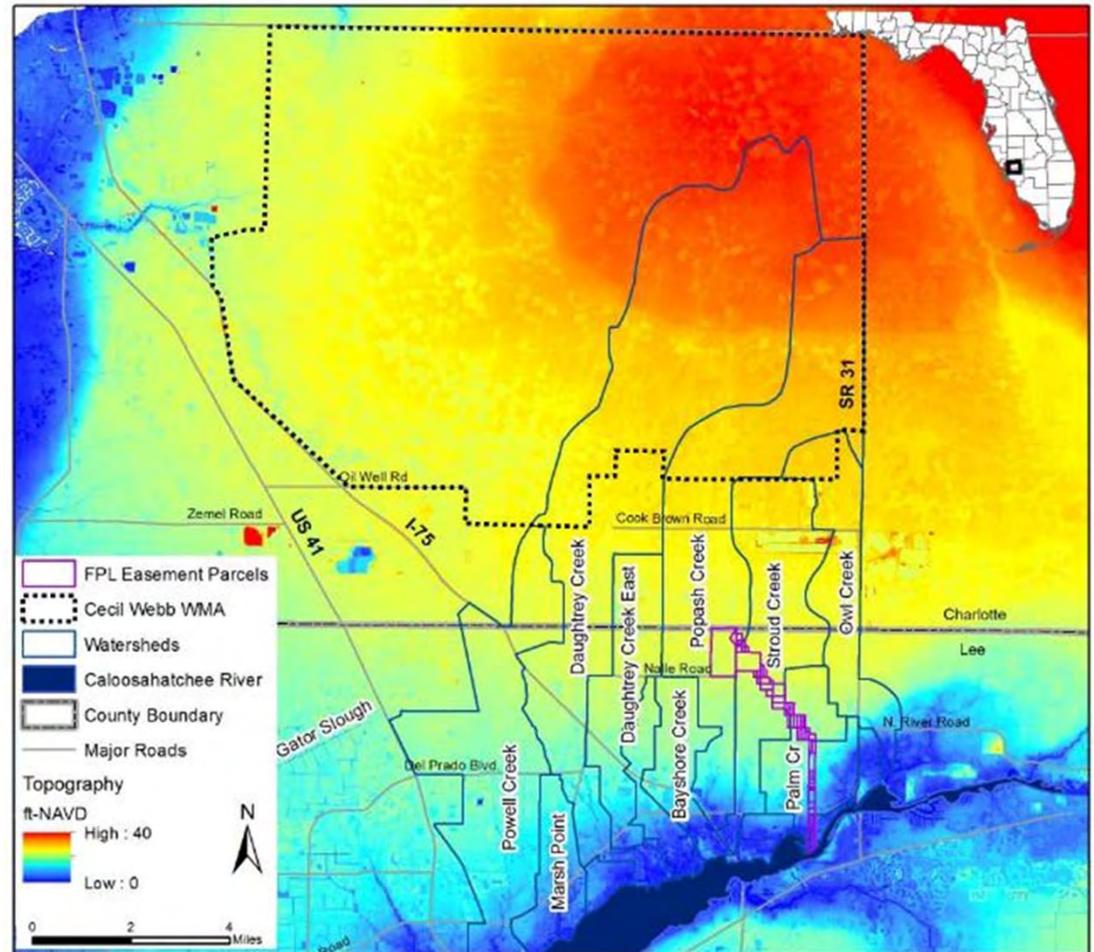


**Maria Loinaz, PhD, PE**  
Senior Engineer



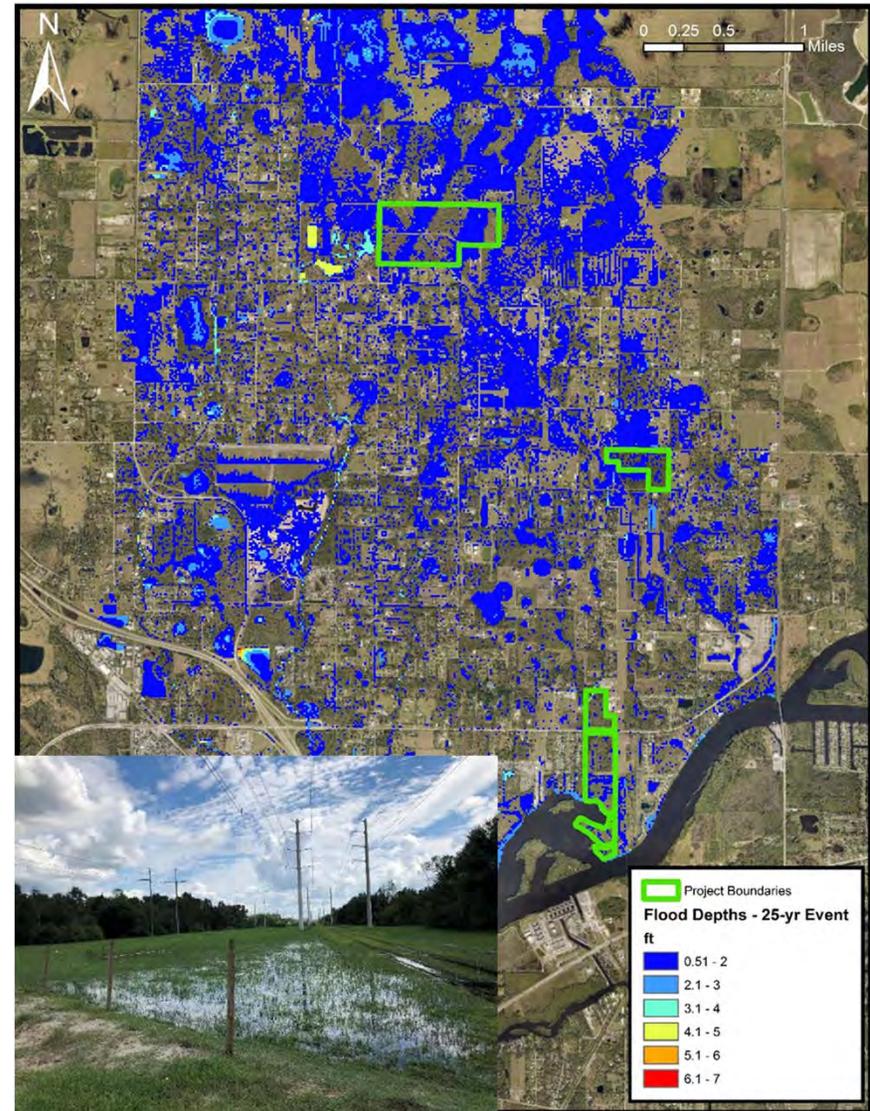
# Background – Water Quality

- Watersheds drain to the Caloosahatchee River
- TMDL requires a 23% TN reduction
- Lee County's allocation is 140,853 lb-N/yr as part of Basin Management Action Plan (BMAP)



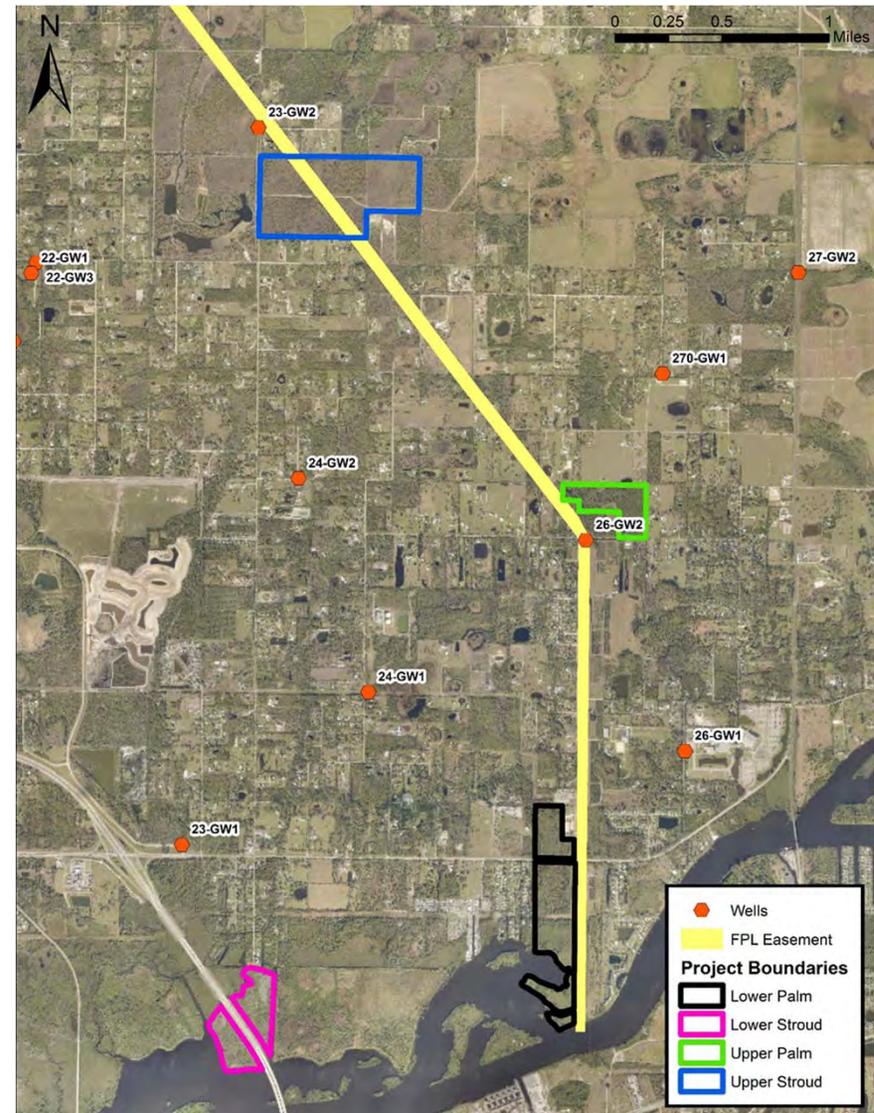
# Background – Flooding

- The NFM area has historically experienced flooding
- The FPL easement passes through 5 of the 10 watersheds within the NFM area
- A berm within the existing FPL easement has caused flooding in the area through interception of historical flow ways

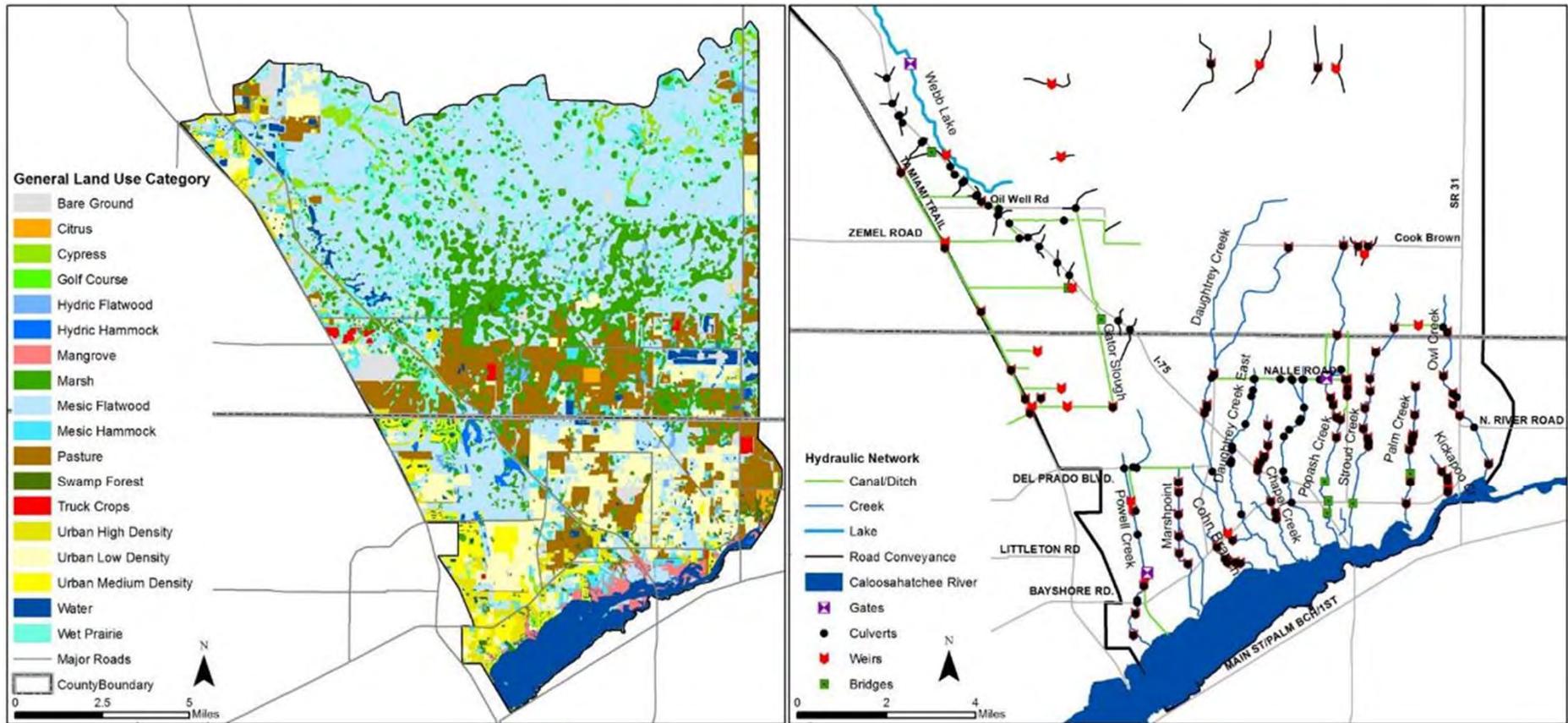


# Project Approach and Objectives

- Lee County initiated a study of the all NFM watersheds
- Refined the study based on recommendations in previously developed BMAP plan
- Grant focused on areas near FPL Easement
- Utilized Regional and Localized integrated groundwater/surface water models

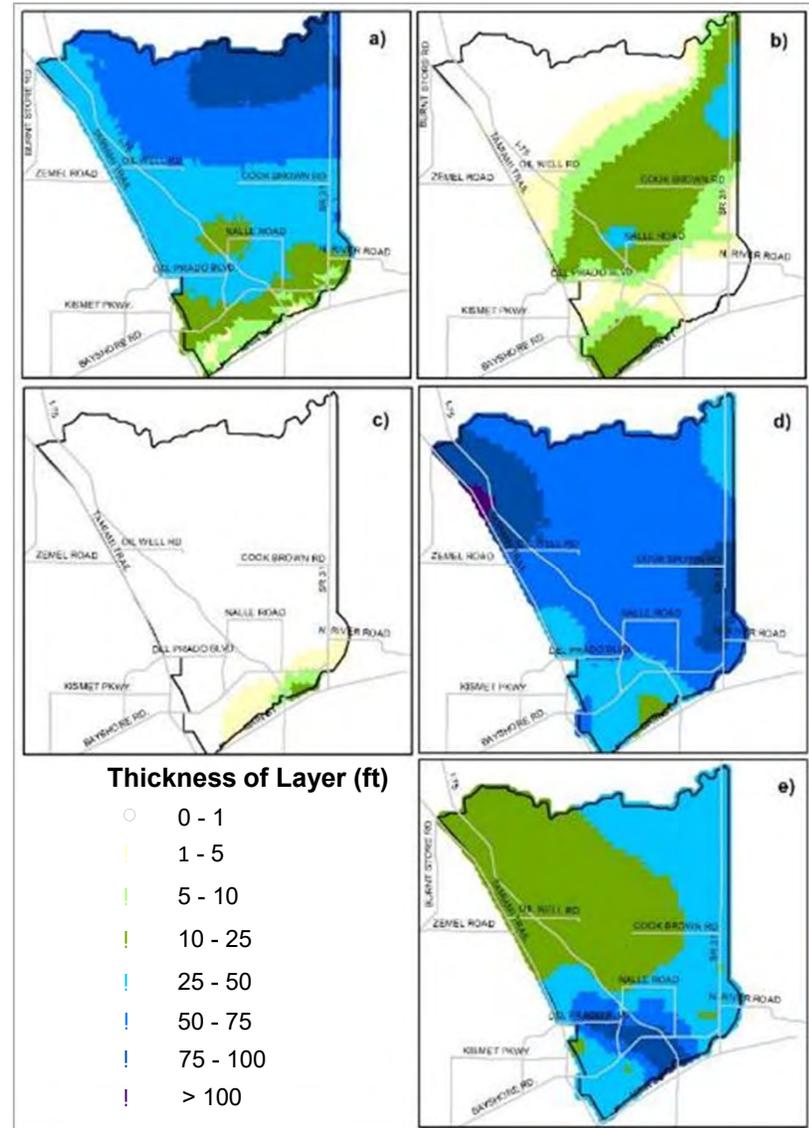


# Regional Model – Surface Water Model

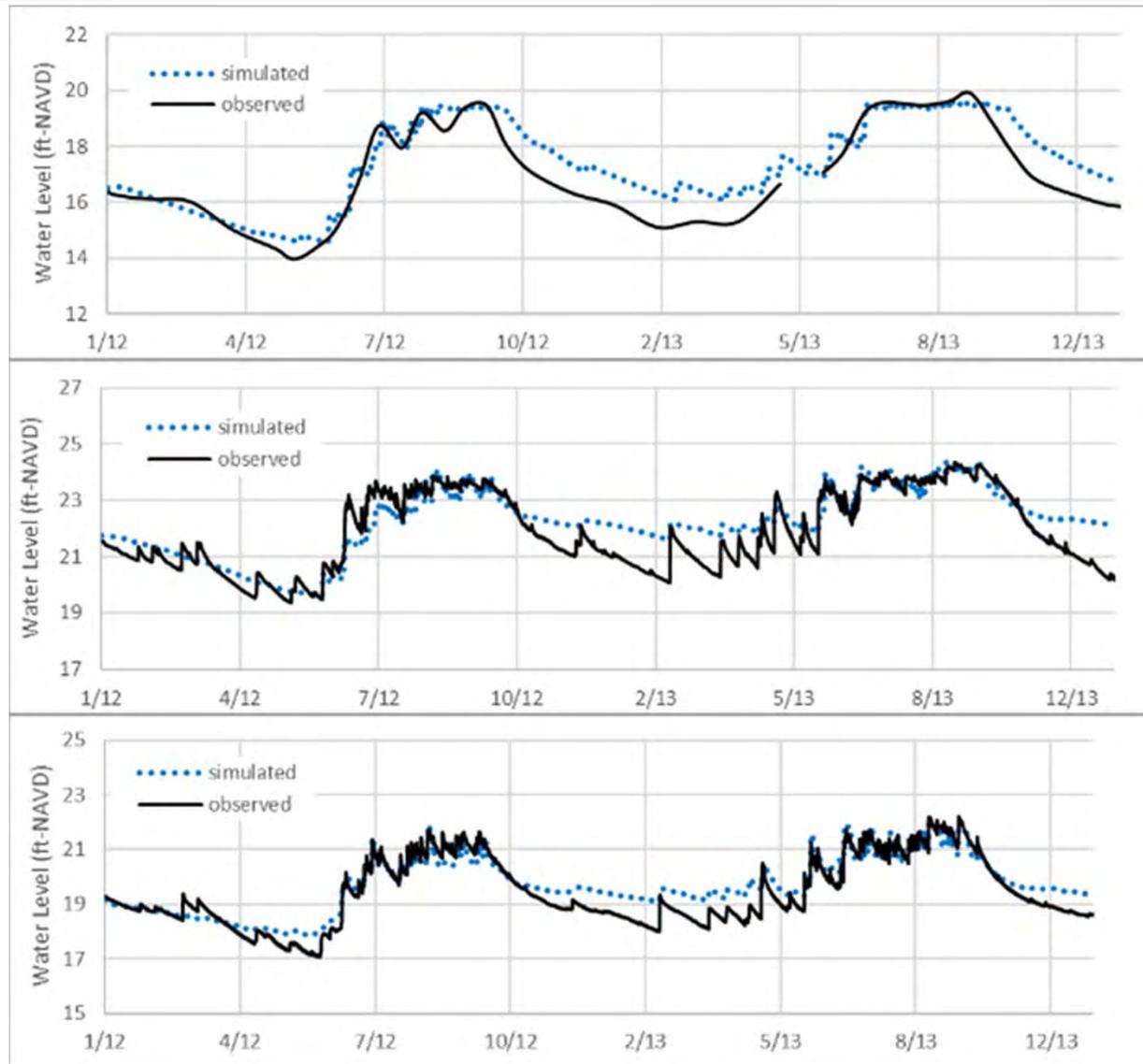


# Regional Model – Groundwater Model

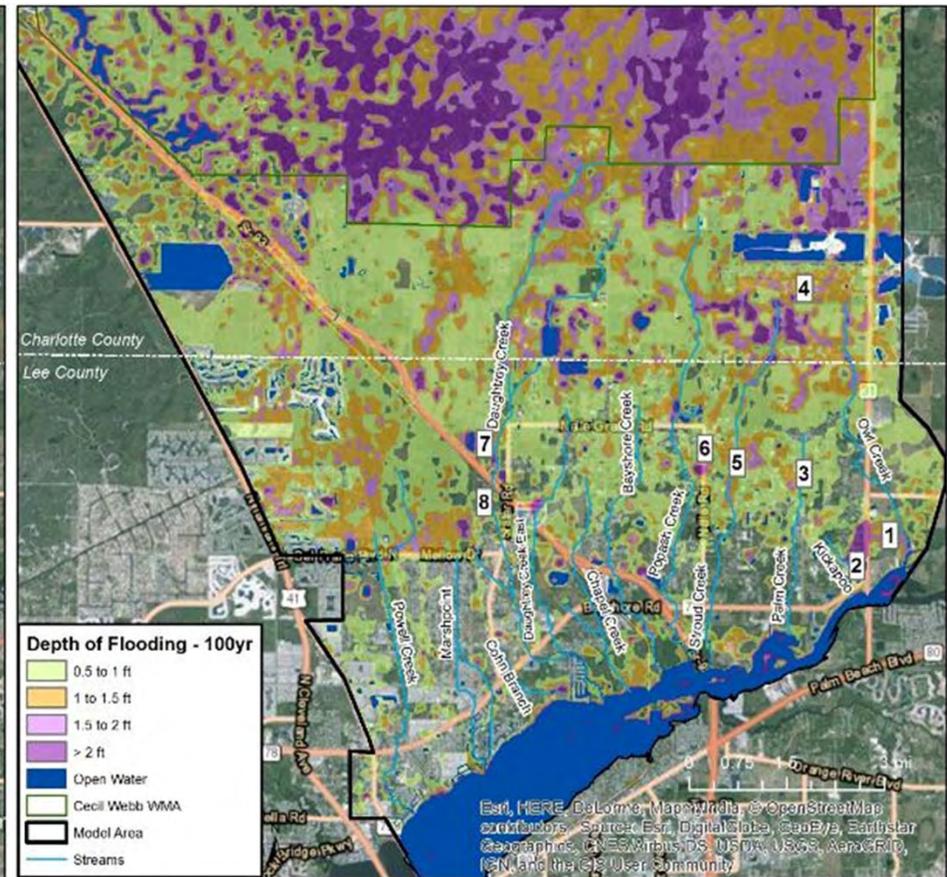
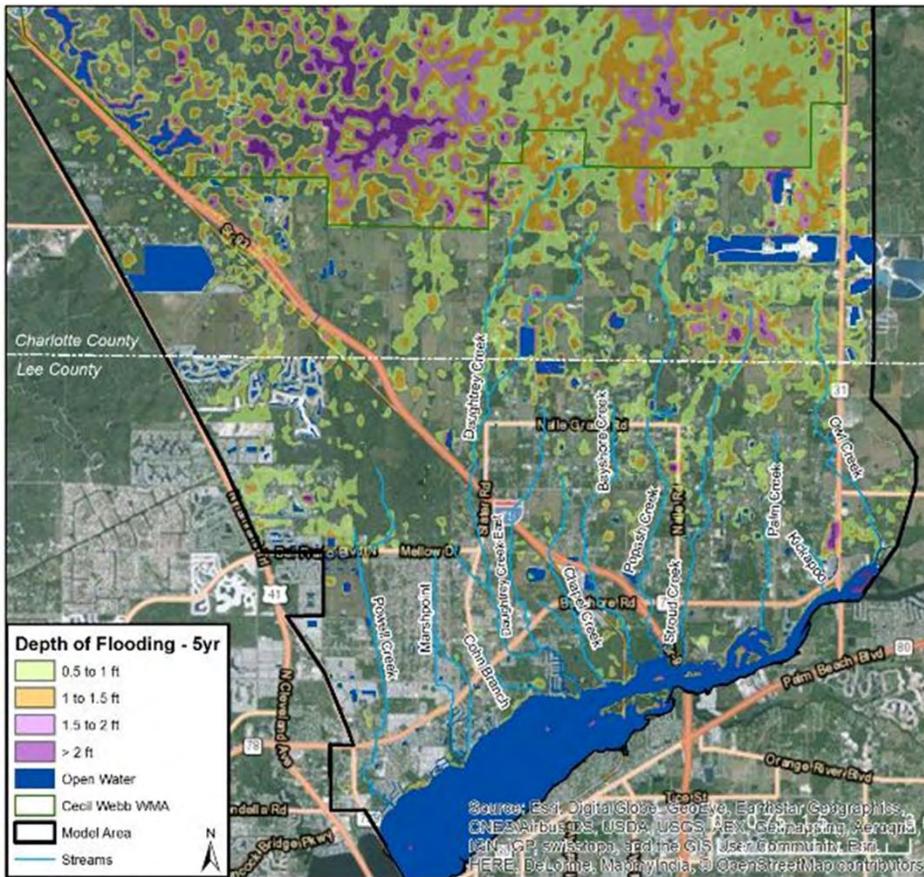
System	Hydrogeologic Unit	Lithostratigraphic Unit	Subject of this Study		
Surficial Aquifer System	WATER TABLE AQUIFER (WT)	Undifferentiated Holocene/Pleistocene		TAMiami Formation	
	TAMIAMI CONFINING UNIT (TC)	Pinecrest Sand Member			
	LOWER TAMIAMI AQUIFER (L1)	Bonita Springs Marl Member / Caloosahatchee Clay Member			
Intermediate Aquifer System	UPPER HAWTHORN CONFINING UNIT (H1)	Peace River Formation		Hawthorn Group	
	SANDSTONE AQUIFER (SA)				CLASTIC ZONE (S2)
					CARBONATE ZONE (S1)
	MID-HAWTHORN CONFINING UNIT (H2)				
	MID-HAWTHORN AQUIFER (HM)				
Floridan Aquifer System	LOWER HAWTHORN CONFINING UNIT (H3)	Arcadia Formation			
	UPPER FLORIDAN AQUIFER	Suwannee Limestone			
		Ocala Limestone			
	MIDDLE CONFINING UNIT	Avon Park Formation			
	LOWER FLORIDAN AQUIFER	Oldsmar Formation			
	Sub-Floridan Confining Unit	Cedar Keys Formation			



# Regional Model – Calibration



# Regional Model – Flood Projection



# Project Selection Process

The goal of the project selection process was to identify those projects that best fit a series of criteria relative to flood abatement potential, water quality treatment potential, ease of land acquisition, ease of construction, and permissibility.

North Fort Myers Water Quality Improvement Projects - Alternatives Matrix														
Alternatives	Criteria												Total Weighted Score	Rank
	Publicly Owned		Larger Property		Single Owner		Water Availability		Treat Higher TN Loads		No Entitlements			
	Weight = 4	Weighted Score	Weight = 2	Weighted Score	Weight = 2	Weighted Score	Weight = 4	Weighted Score	Weight = 4	Weighted Score	Weight = 5	Weighted Score		
Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	
1 Pritchett Williams Rd Property	1	4	2	4	5	10	5	20	5	20	5	25	83	5
2 Oak Creek SW FL Property	1	4	5	10	3	6	5	20	5	20	1	5	65	11
3 Rich Road Property	1	4	5	10	5	10	5	20	5	20	1	5	69	10
4 Pritchett Pkwy Property	1	4	5	10	5	10	5	20	4	16	1	5	65	11
5 Caloosahatchee Creeks - I-75	5	20	5	10	5	10	5	20	1	4	5	25	89	2
6 Caloosahatchee Creeks - Durance	5	20	5	10	5	10	5	20	1	4	5	25	89	2
7 Palm Creek	1	4	3	6	1	2	2	8	2	8	3	15	43	16
8 FPL Deal Rd	3	12	3	6	5	10	2	8	3	12	5	25	73	7
9 11241 Deal Rd	2	8	1	2	5	10	2	8	5	20	5	25	73	7
10 FPL Swale	1	4	2	4	1	2	5	20	2	8	5	25	63	14
11 10101 Sharon Dr	2	8	1	2	5	10	4	16	1	4	5	25	65	11
12 SR 31 Flow Way	1	4	4	8	1	2	2	8	4	16	3	15	53	15
13 Rock Mines	1	4	5	10	4	8	5	20	3	12	5	25	79	6
14 Owl Creek Restoration	1	4	5	10	1	2	5	20	5	20	3	15	71	9
15 Distributed Storage	1	4	5	10	5	10	4	16	5	20	5	25	85	4
16 Conveyance Weirs	3	12	2	4	5	10	5	20	5	20	5	25	91	1

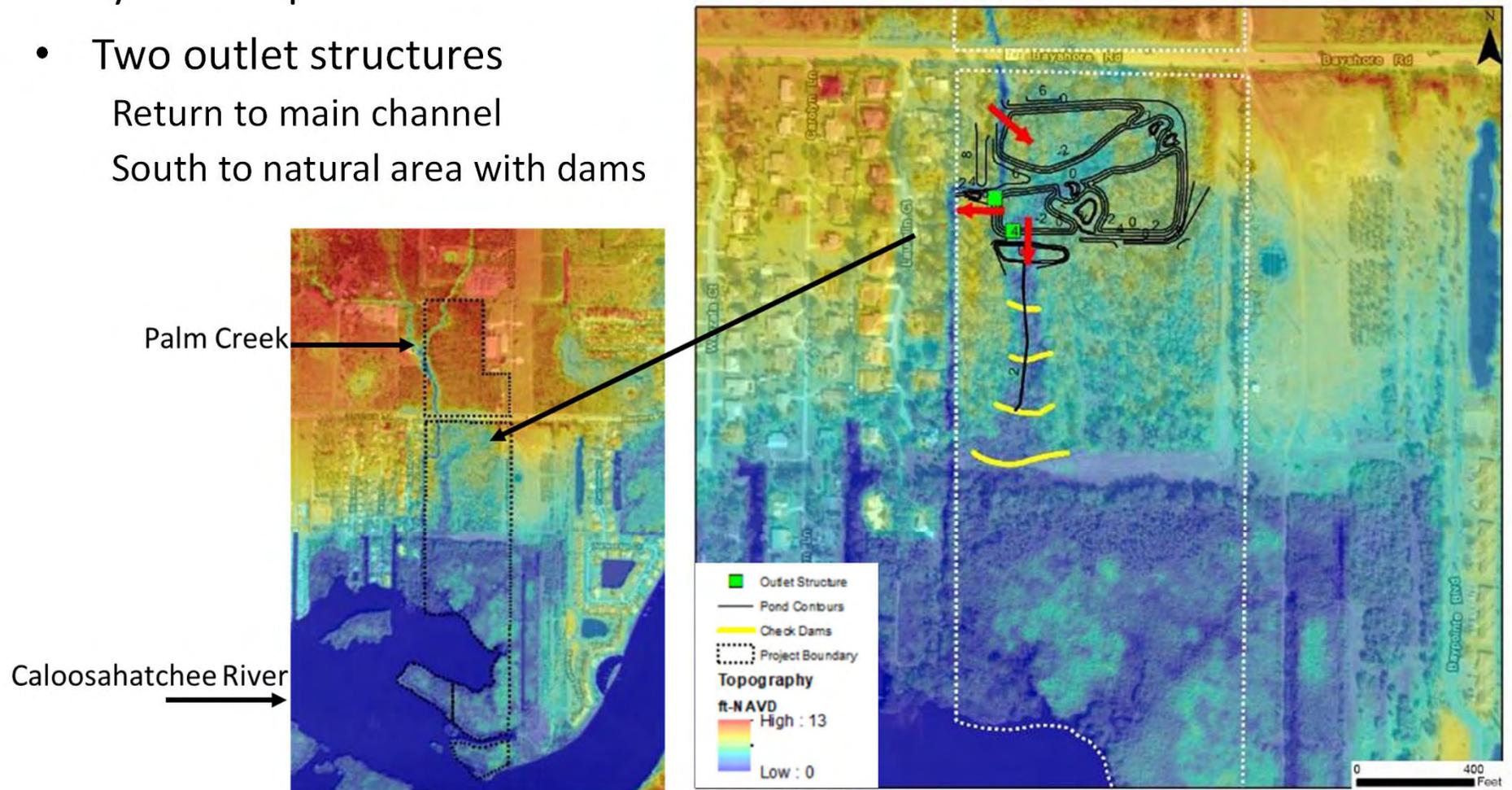
# Project Selection Process

- Four projects identified in two of the NFM watersheds
- Projects
  - Upper Palm
  - Lower Palm
  - Upper Stroud
  - Lower Stroud
- Based on projects selected and the follow up site visits, determined need for localized model

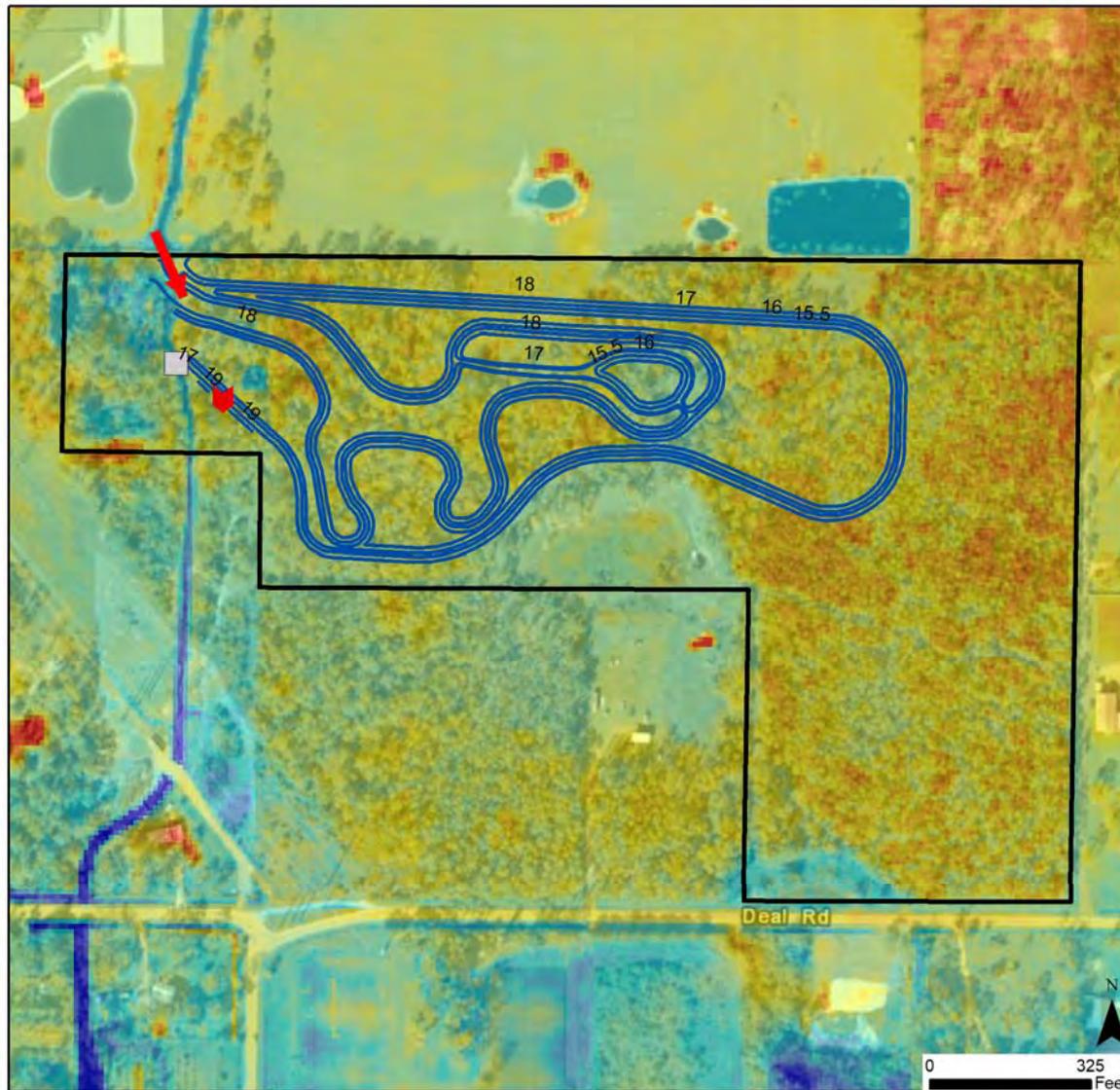


# Lower Palm Project – Concept Design

- Divert channel flow into a system of ponds
- Two outlet structures  
Return to main channel  
South to natural area with dams



# Upper Palm Project – Concept Design



-  Box Culverts (2-5'x2', 16 ft-NAVD)
  -  Emergency Spillway (500', 17.75 ft-NAVD)
  -  Project Boundary
  -  Pond Contours
- Topography**  
ft-NAVD
-  High : 21  
Low : 16

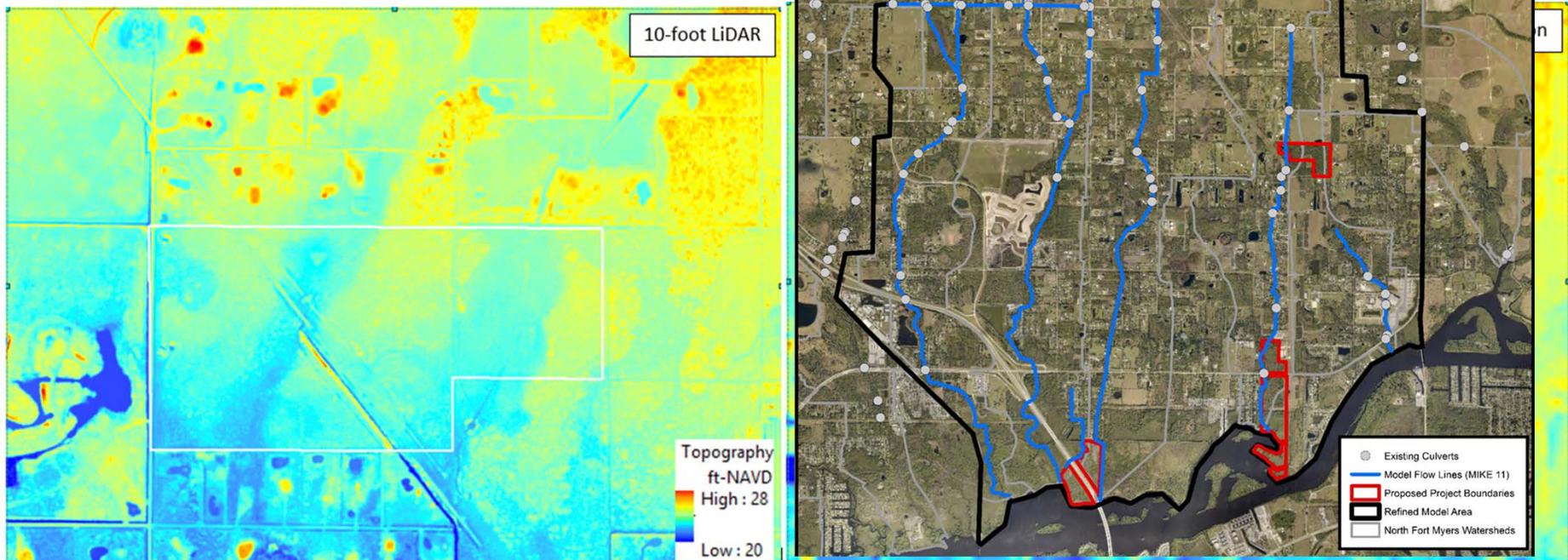
# FPL and Project Site Visits

- Identified hydraulic connections and unknown flow pathways
- Identified local flooding issues and environmental nature of properties

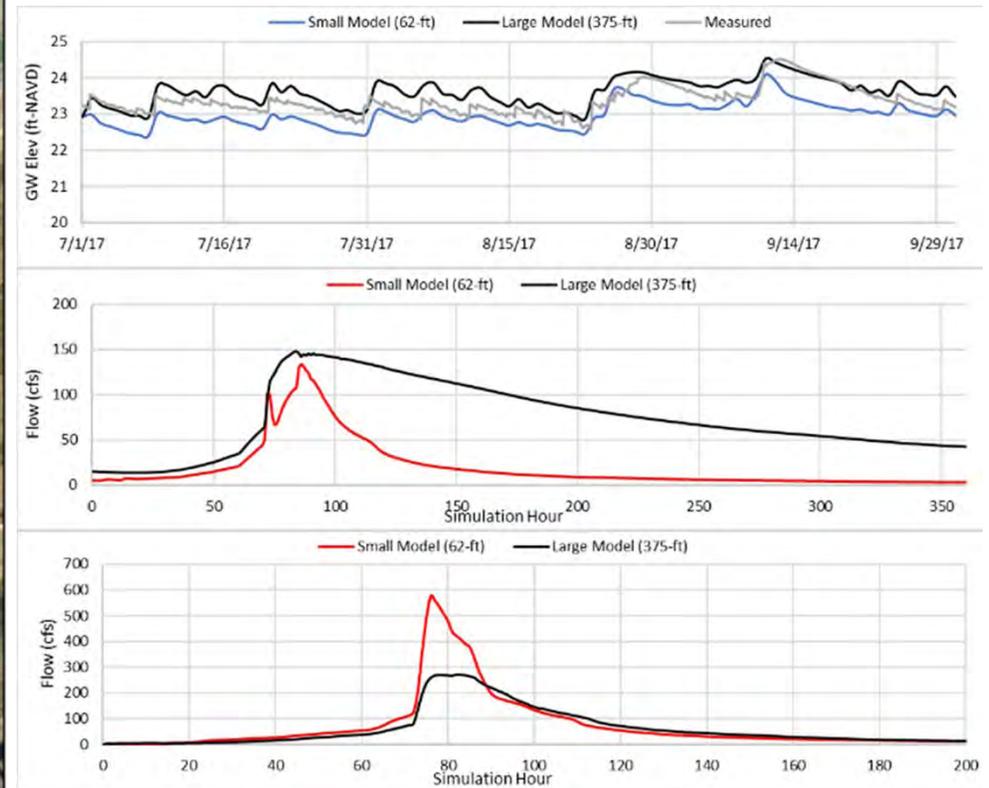
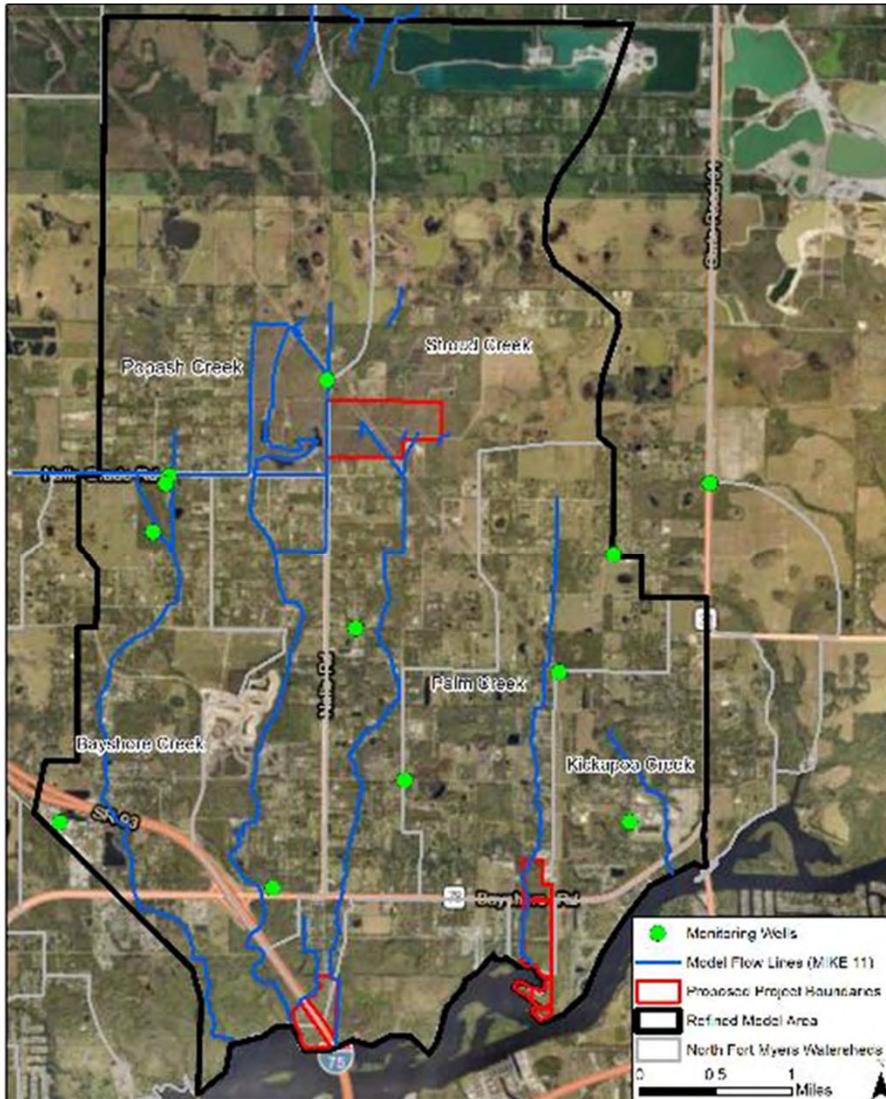


# Refined Model – Resolution and Area

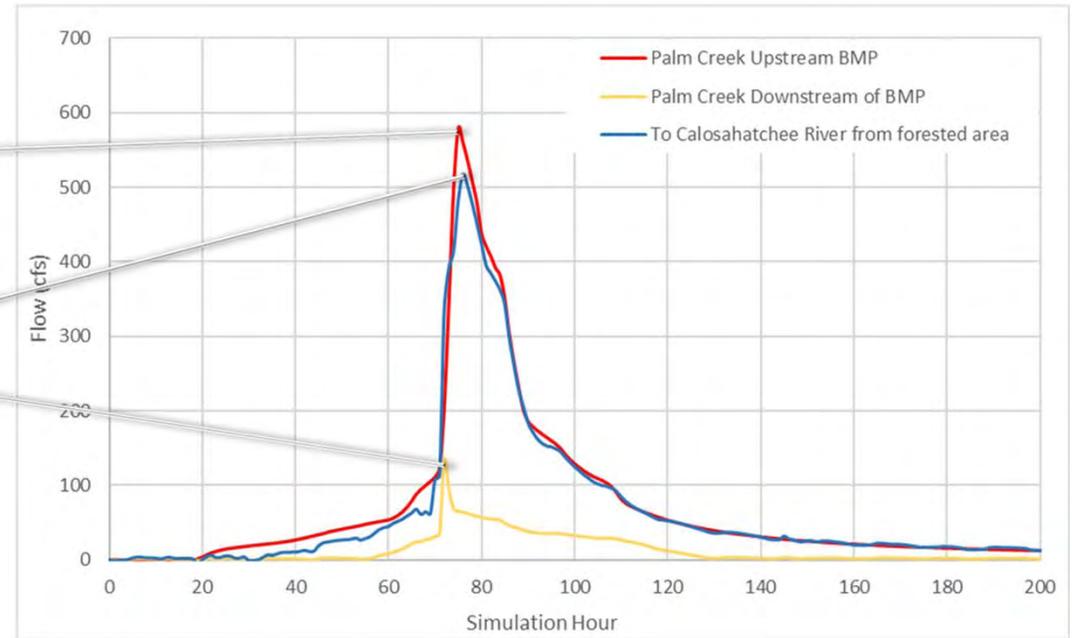
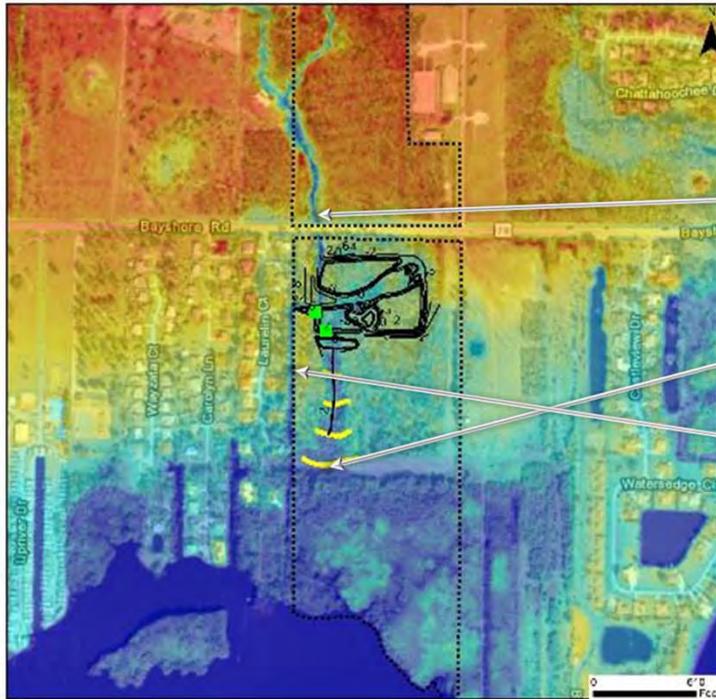
- Refined resolution (62.5 feet)
- Refined surface water network
- Boundary conditions from larger model
- Simulate 3 design storm events and Irma



# Refined Model – Simulations



# Lower Palm Project – 100 Year Event



**Total Flow Volume (ac-ft)**

Upstream BMP	Downstream BMP	Return from Forested Area
1,325	181	1,248

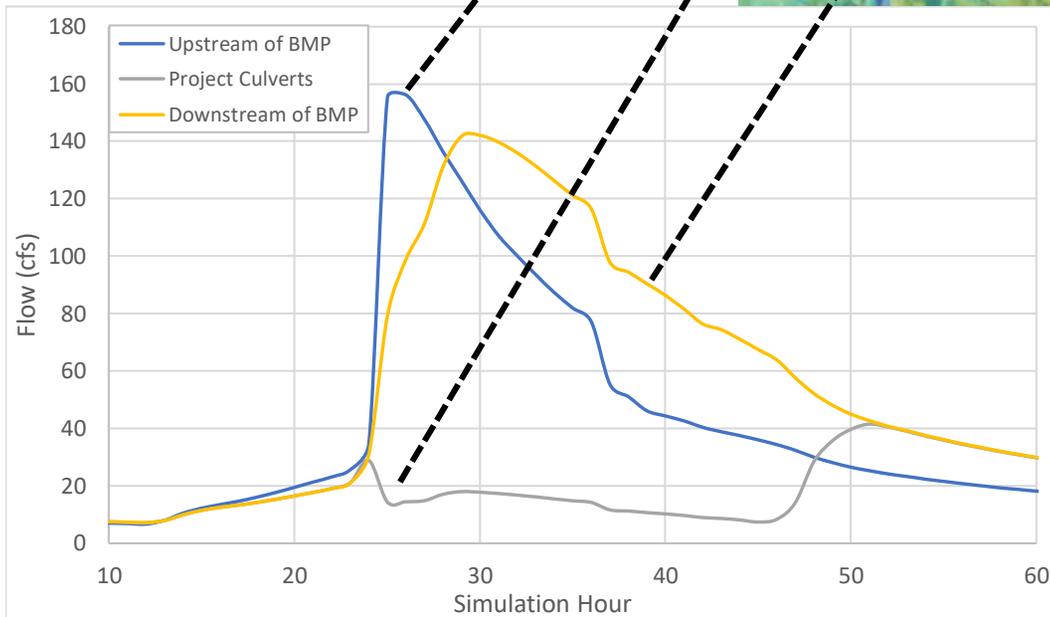
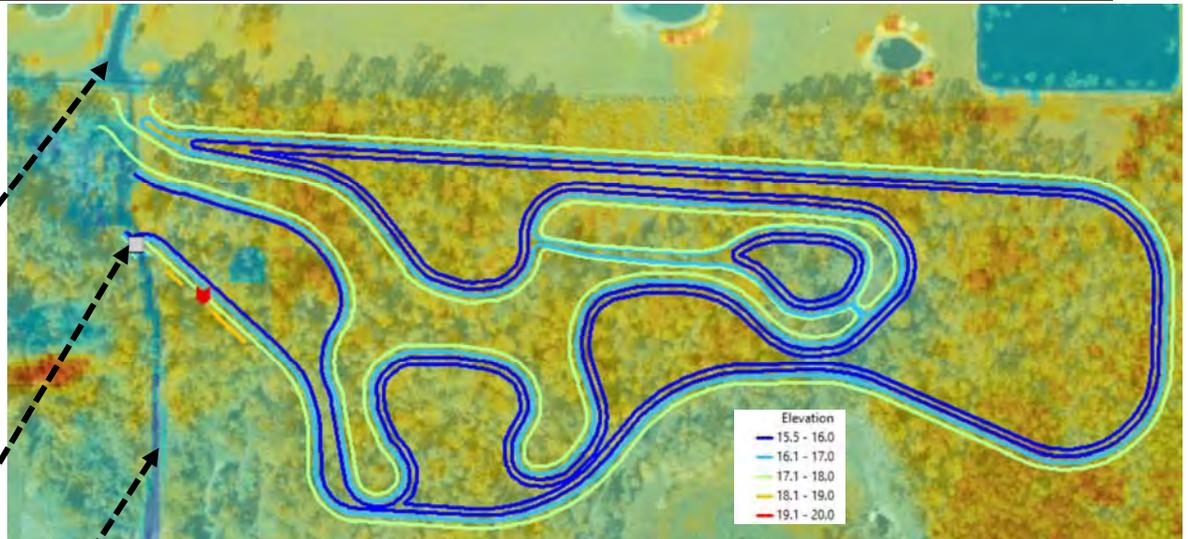
# Lower Palm Project – Load Reduction

- ECM method (Harper and Baker, 2007) – using a land use based estimated average concentration of 1.84 mg/L
- Wet detention system treatment efficiency for TN (assume 25%)

## Annual Load Estimates

Year	Upstream of BMP		Downstream of BMP		Direct Load Reduction	Return from BMP After Treatment		
	Runoff Volume (ac-ft)	Mass Load (lb.)	Runoff Volume (ac-ft)	Mass Load (lb.)		Runoff Volume (ac-ft)	Mass Load (lb.)	Treated Load Reduction (lb.)
2012	1,683	8,420	280	1,403	7,016	1,585	5,946	1,754
2013	3,663	18,328	610	3,055	15,274	3,449	12,944	3,818
2017	4,045	20,242	674	3,374	16,868	3,809	14,296	4,217

# Upper Palm Project – 5 Year Event



~85% of the upstream flow enters the pond during the storm.

# Upper Palm Project – Load Reduction

- ECM method (Harper and Baker, 2007) – using a land use based estimated average concentration of 1.57 mg/L
- Wet detention system treatment efficiency for TN (assume 25%)

## Annual Load Estimates

Year	Upstream of BMP		Downstream of BMP		Direct Load Reduction	Return from BMP After Treatment		
	Runoff Volume (ac-ft)	Mass Load (lb.)	Runoff Volume (ac-ft)	Mass Load (lb.)		Runoff Volume (ac-ft)	Mass Load (lb.)	Treated Load Reduction (lb.)
2012	1,272	5,432	192	821	4,610	1,080	3,458	1,153
2013	2,702	11,535	408	1,744	9,791	2,293	7,343	2,448
2017	2,658	11,348	402	1,716	9,632	2,256	7,224	2,408

Thank you!