

# LEE COUNTY FLOOD ASSESSMENTS

## INVEST 92L & HURRICANE IRMA

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Board of County Commissioners  
Work Session 03/06/2018

# INVEST 92L & HURRICANE IRMA: RAIN EVENTS

- What Happened
- What we Found
  - Assessment Observations
- What we are Doing
  - Remediation Efforts
- What We are Proposing
  - Long-Term Planning Effort

# FLOOD RESPONSE PLAN

**1** PHASE

Immediate Storm Debris Removal from Obstructed Waterways:  
Orange River, EMDD, County Canals, Bedman Creek,  
Hickey Creek, Estero River

**2** PHASE

**Flood Assessments – Identify Impediments to Storm Flow for Near Term or Short Term Remedial Efforts**

**3** PHASE

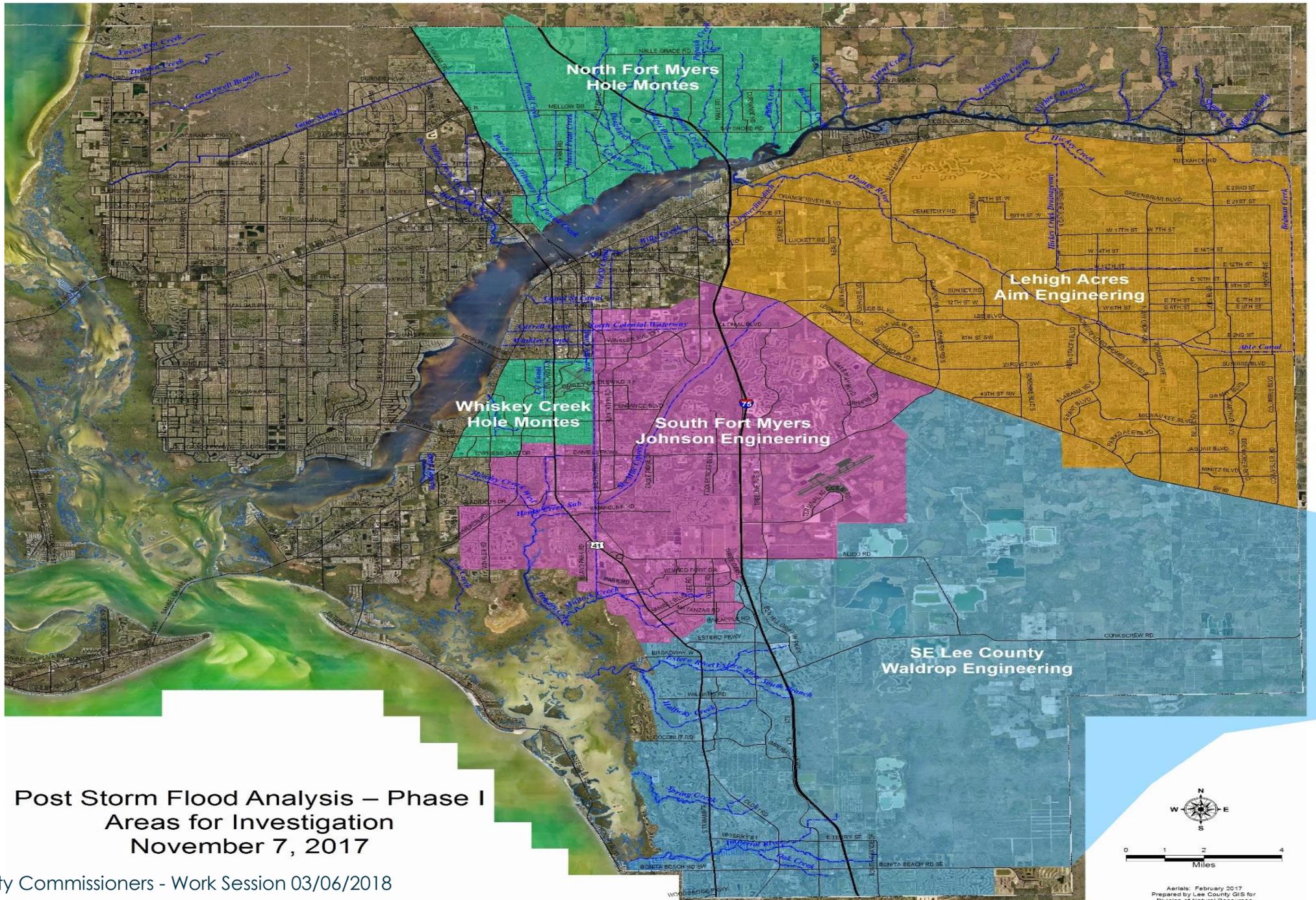
Long Term Plan – Stormwater Master Plans Updates to Address Long Term Remedial Projects



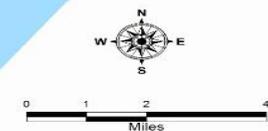
# PHASE 2: Scope of Work

- **Preliminary Assessment to Identify Short-term Relief Activities:**
  - Review Current Water Management Plans
  - Field Inspections & Collect Information About Flooding
  - Interact With Public & Review Observation Form Submittals & RFAs
  - Prioritization Based on Watersheds that Suffered Significant Home & Structural Flooding
  - Identify Conceptual Engineered Solutions for Long-term Mitigation Study





Post Storm Flood Analysis – Phase I  
 Areas for Investigation  
 November 7, 2017



# FINDINGS

- Rainfall/ Runoff
- Impediments to Flow
- Permitting Observations
- Long Term Planning

# RAINFALL & RUNOFF

“A massive amount of rainfall of 13.06 to 17.45 inches from Hurricane Irma (possibly a 1000-year storm event) fell on eastern Lee County.”- *Aim Engineering, Inc*

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“While the rainfall totals alone were significant and were expected to cause flooding, the very short time period between events, exacerbated conditions, as the Estero River North Branch and Imperial River were unable to recover from the Invest 92L rainfall before Hurricane Irma.” – *Waldrop Engineering*

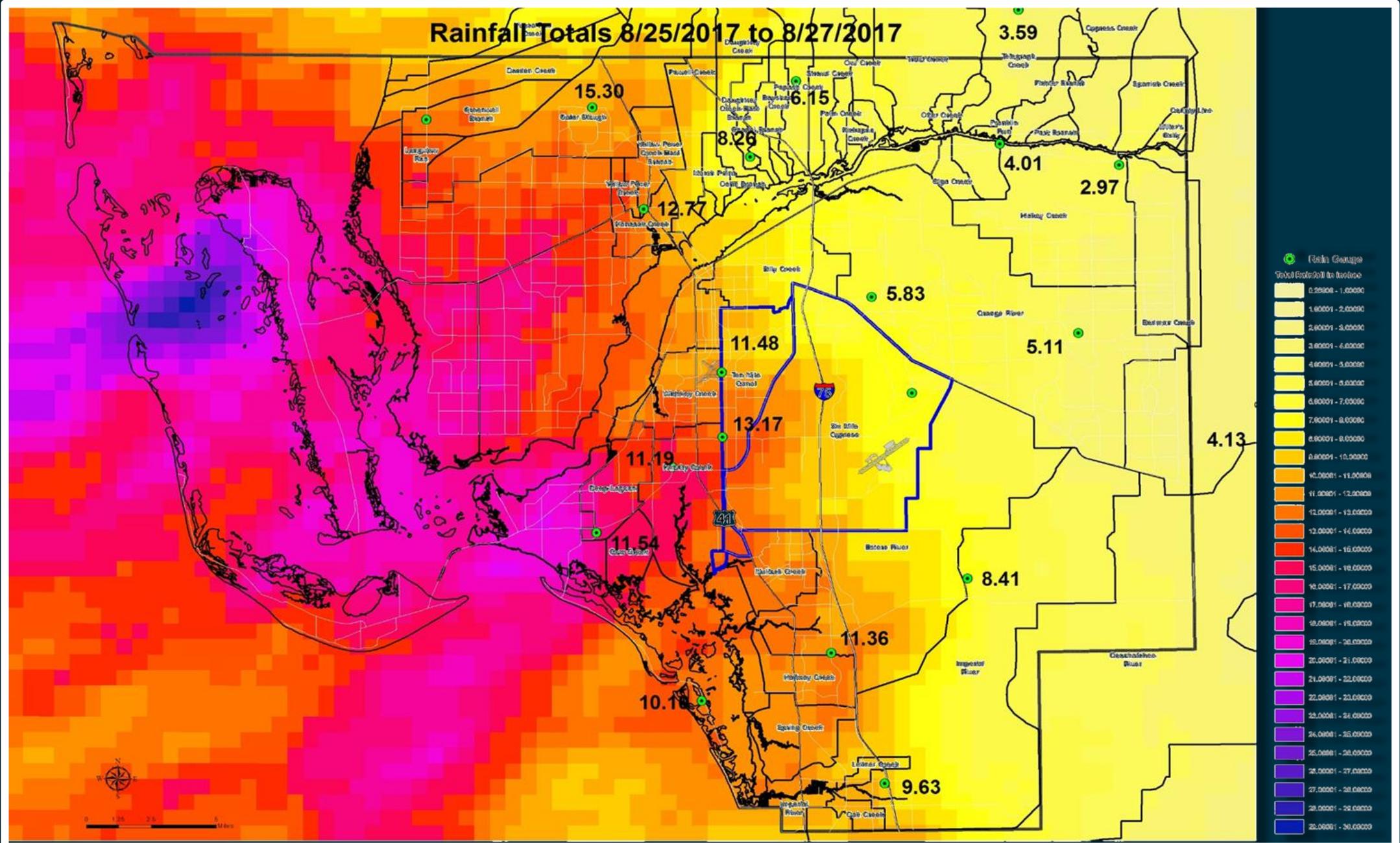


# RAINFALL & RUNOFF

- Invest 92L (August 22-25, 2017) & Hurricane Irma were major rainfall events singularly and cumulatively.
  - Storm frequency depended on location within County
- Impacts to multiple jurisdictions – municipalities, agencies, private property
- Drainage system was overwhelmed by generated runoff resulting in extensive flooding, exceeded most design standards & natural carrying capacity of creeks, streams, rivers
- Water levels did not fully recover from Invest 92L before Hurricane Irma arrived
- Storm surge in the Caloosahatchee restricted discharge capabilities of tributaries (Orange River, Bedman, Hickey Creek)

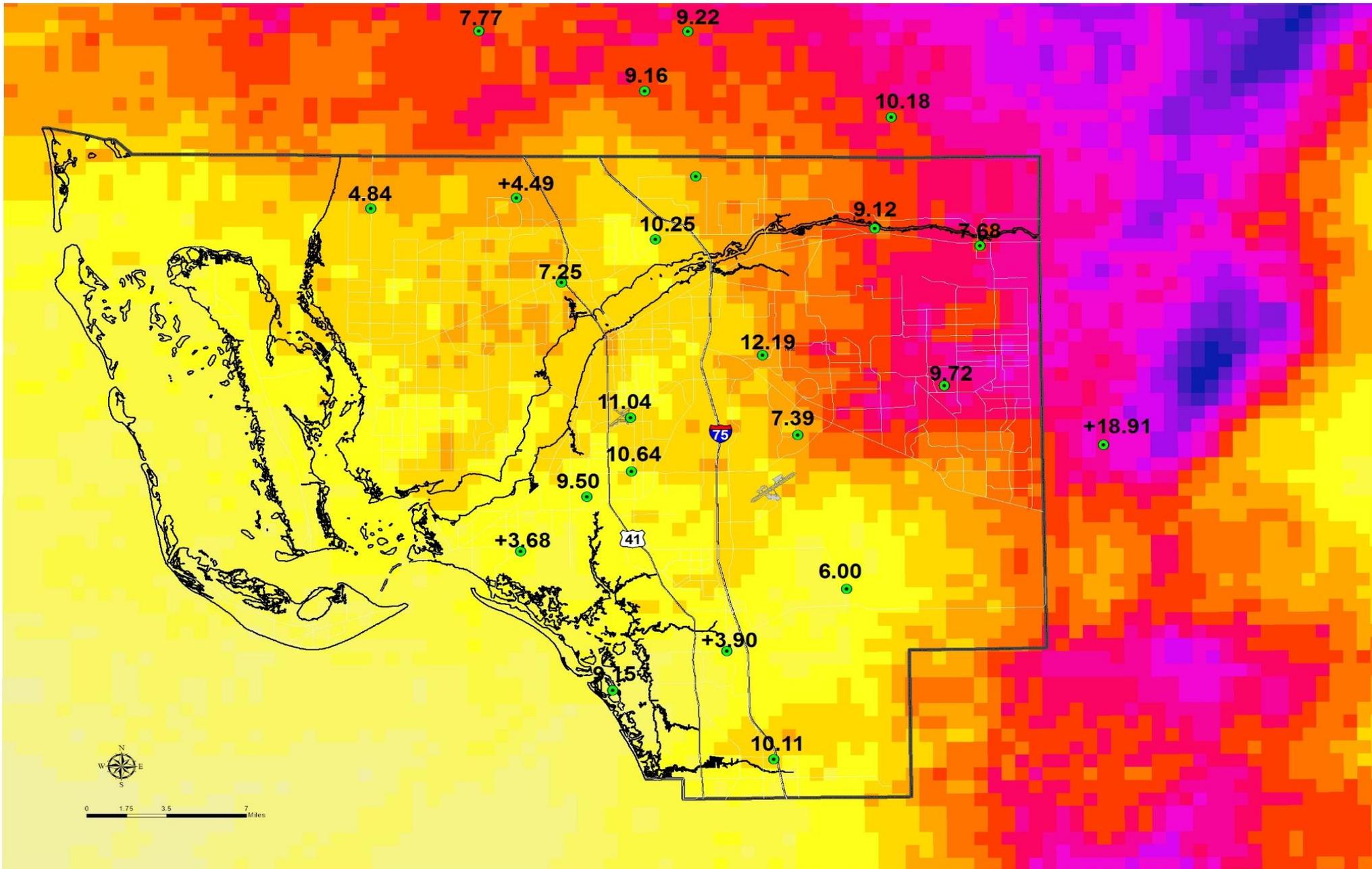


# Rainfall Totals 8/25/2017 to 8/27/2017



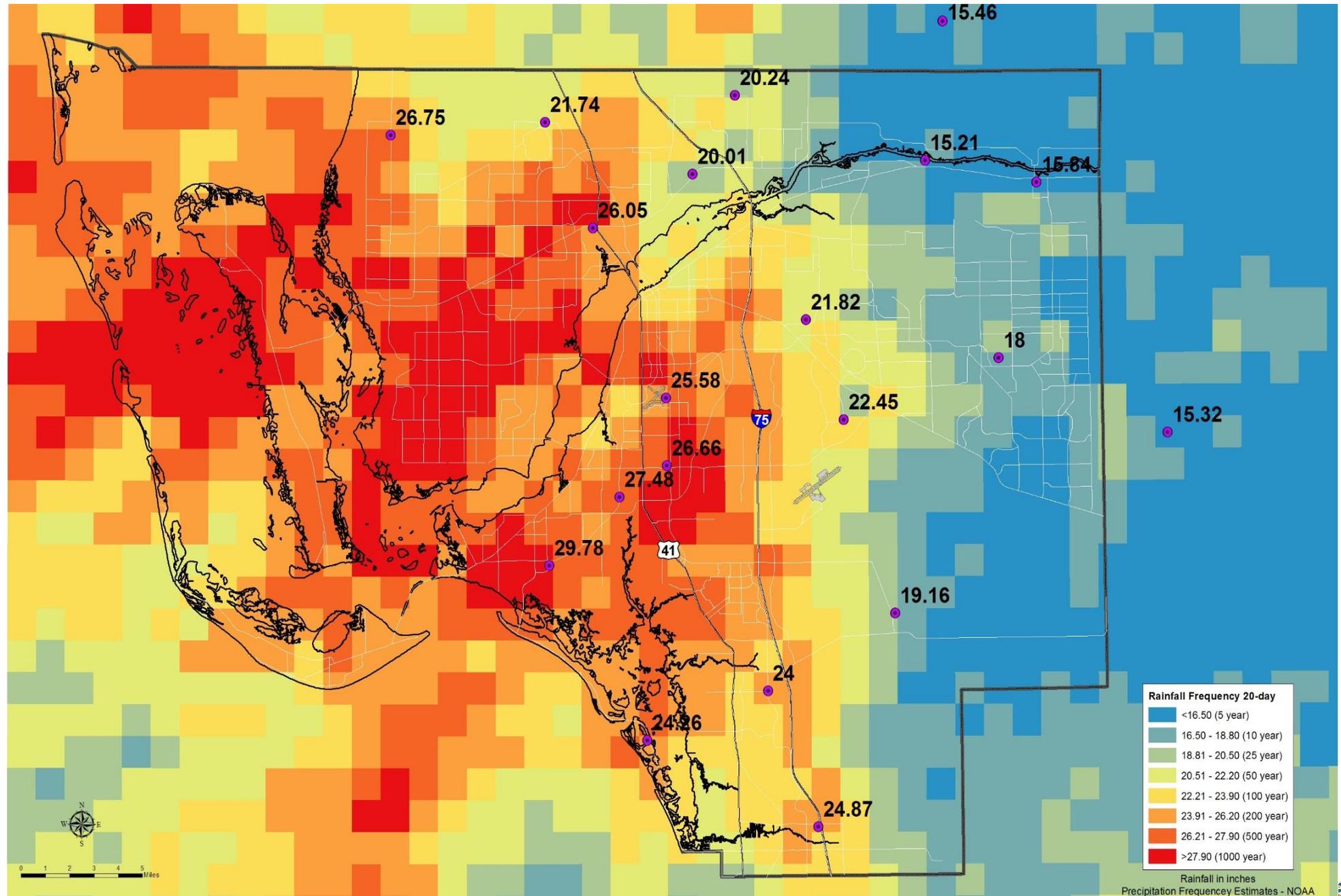
# Hurricane Irma

Rainfall Total  
9/9/17-9/11/17



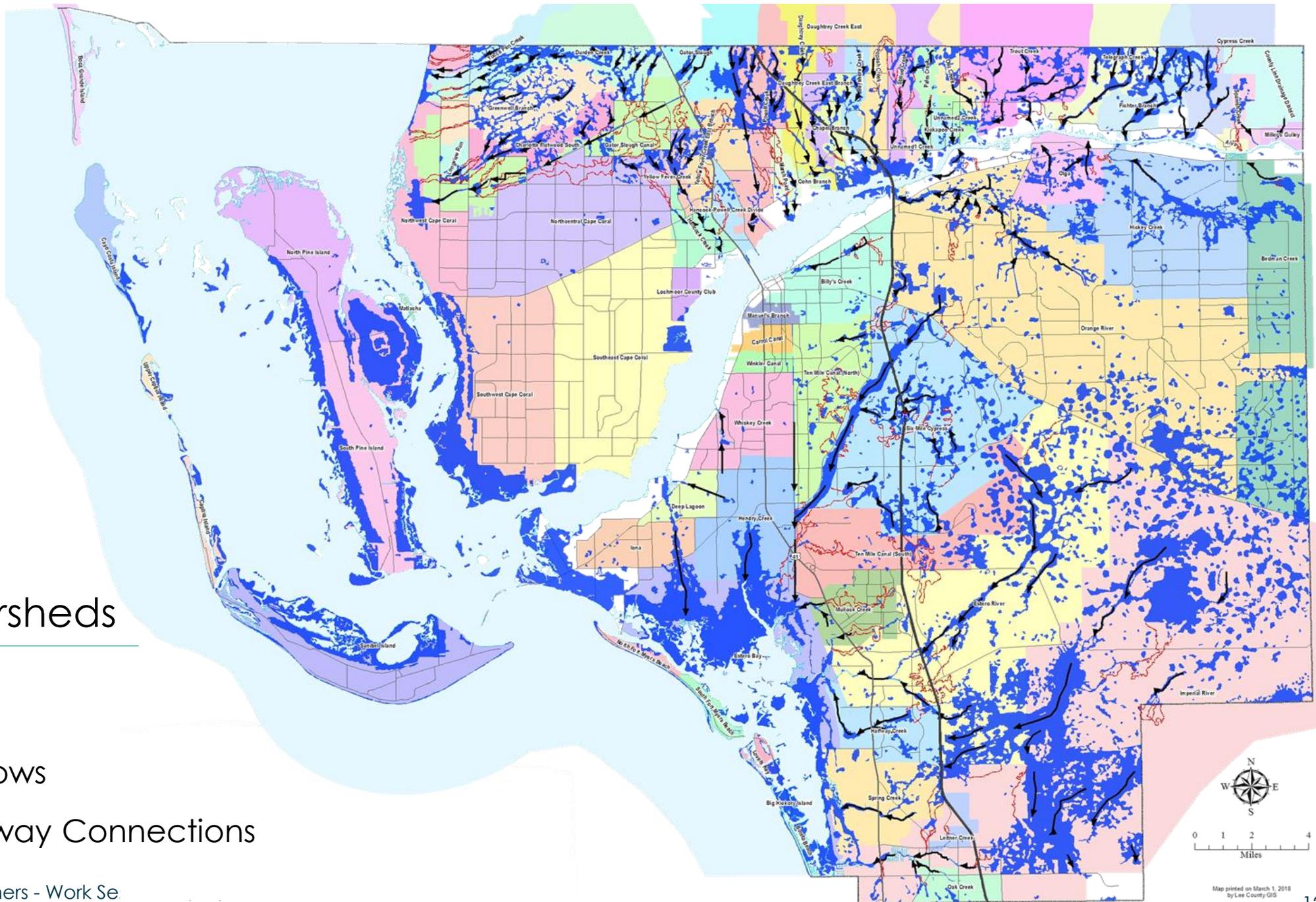
# 20-Day Rainfall

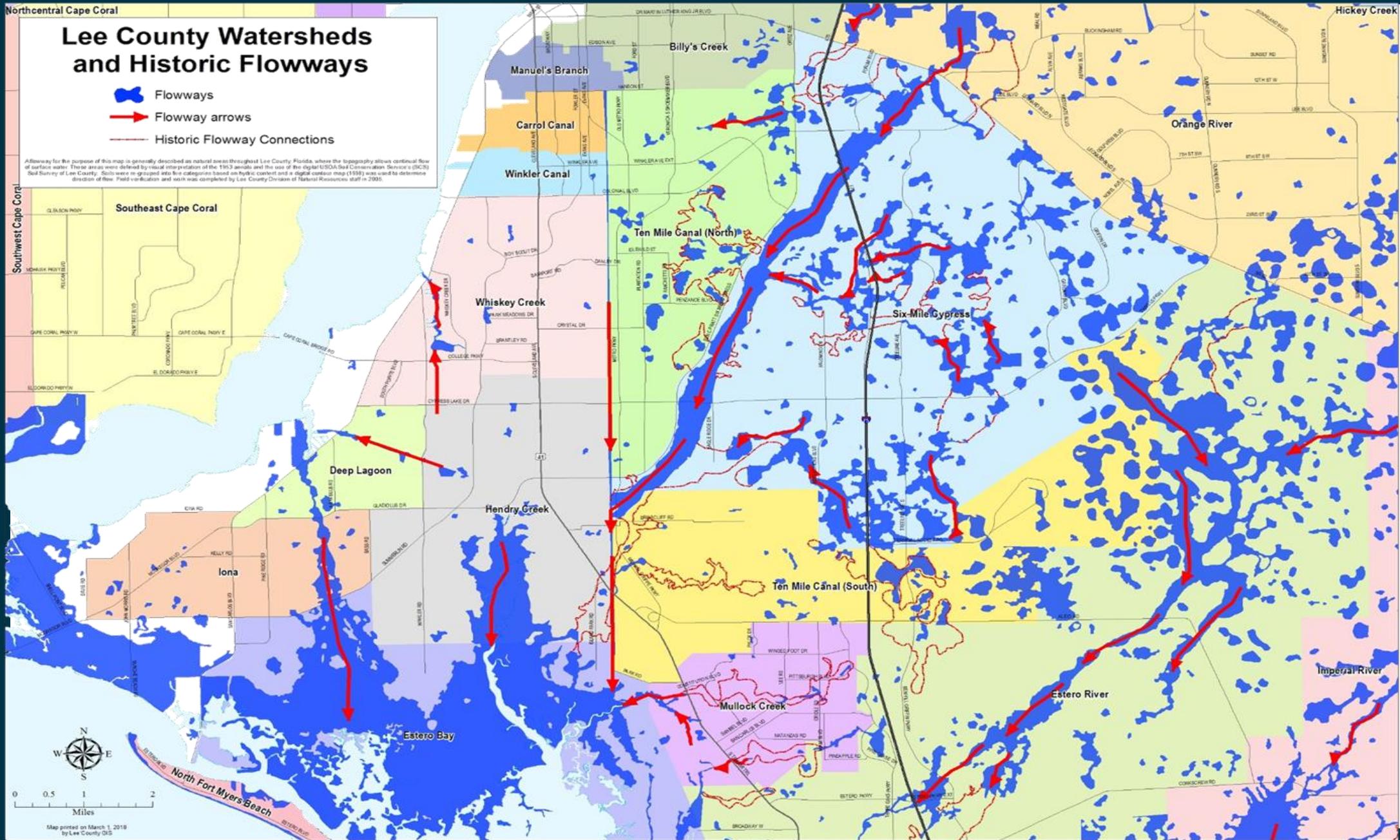
Totals & Frequency  
8/23/17 – 9/11/17



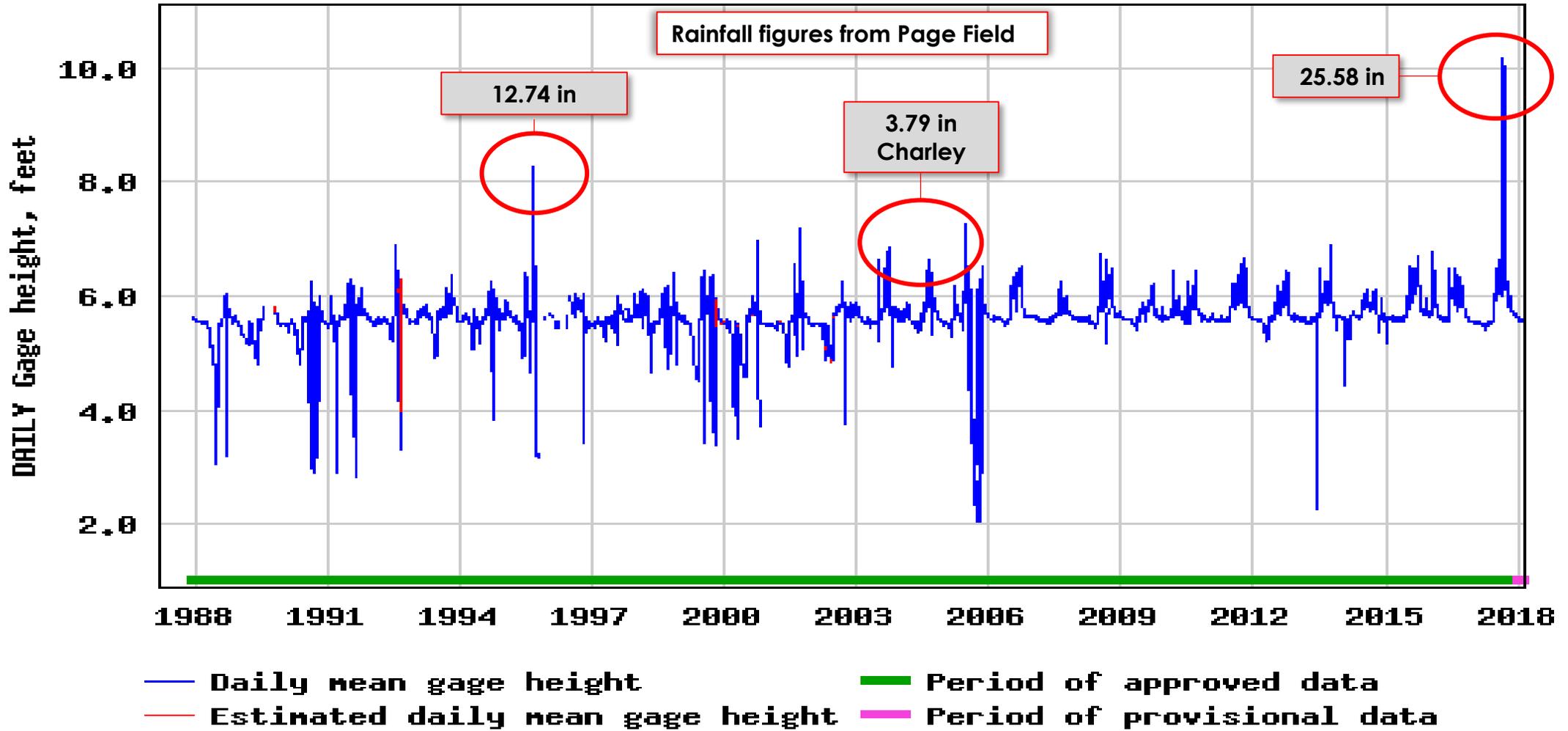
# Lee County Waterways & Historic Watersheds

- Flowways
- Flowway Arrows
- Historic Flowway Connections



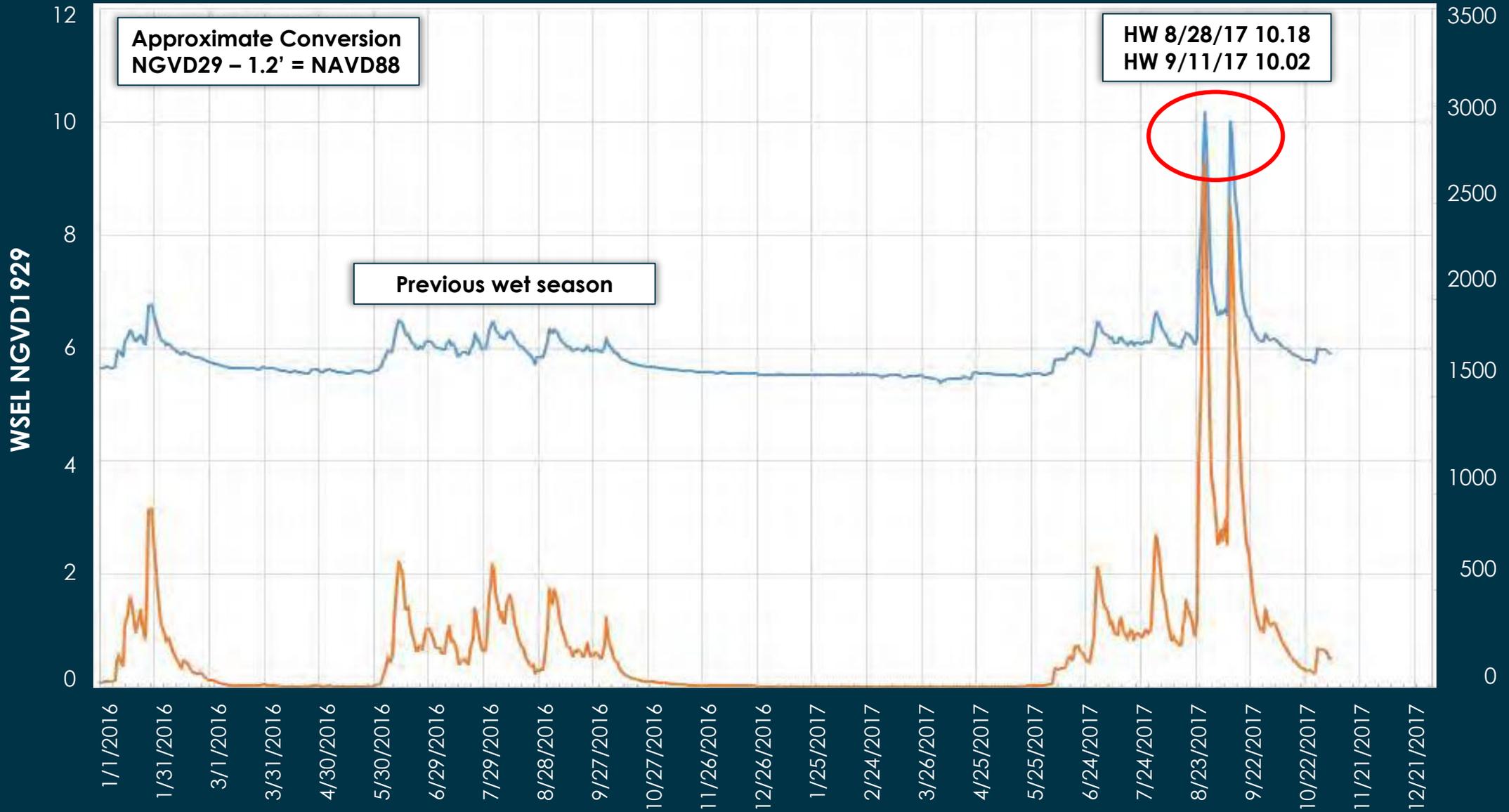


# USGS 02291673 TENMILE CANAL AT CONTROL NEAR ESTERO, FL

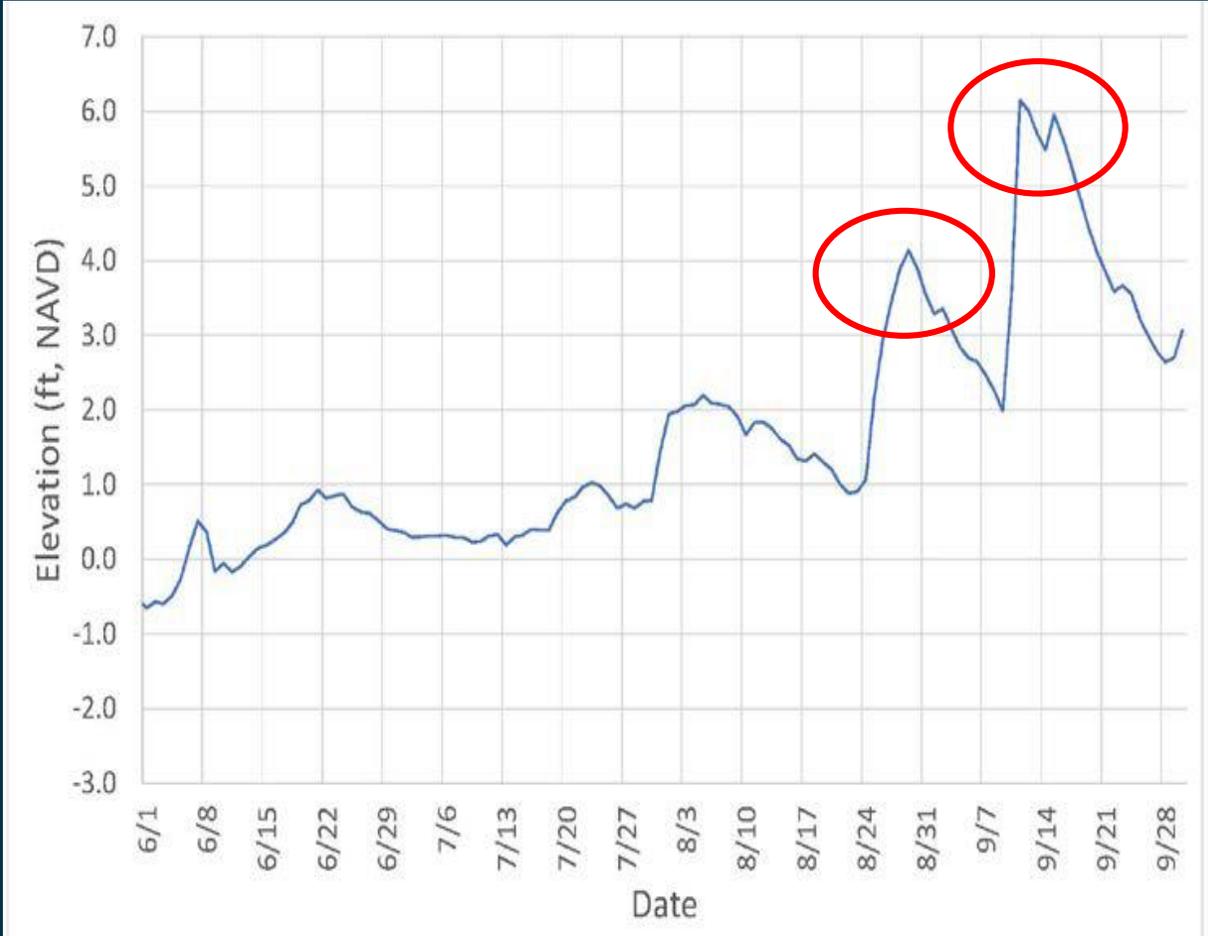


# WSEL TENMILE CANAL AT OLD US 41 WEIR

Source: USGS  
Station 02291673



# Imperial River at Felts Avenue 2017 Water Elevations



# Imperial River at Bonita Grande 2017 Water Elevations



# IMPEDIMENTS TO FLOW

- Inventory Created Based on Field Observations
  - Vegetation – excessive growth
  - Debris-blocking catch basins, culverts, ditches, canals- existing & storm generated
  - Fences across waterways
  - Erosion and siltation
  - Structural failures- culverts, private bridges, control structures
- Effected the depth and duration of flooding
- Multi-jurisdictional, lack of system continuity and inconsistent O&M
- Removing blockages can bring back built capacity at best, flooding still expected for similar sized storm events







**IMPEDIMENTS TO FLOW**





# IMPEDIMENTS TO FLOW

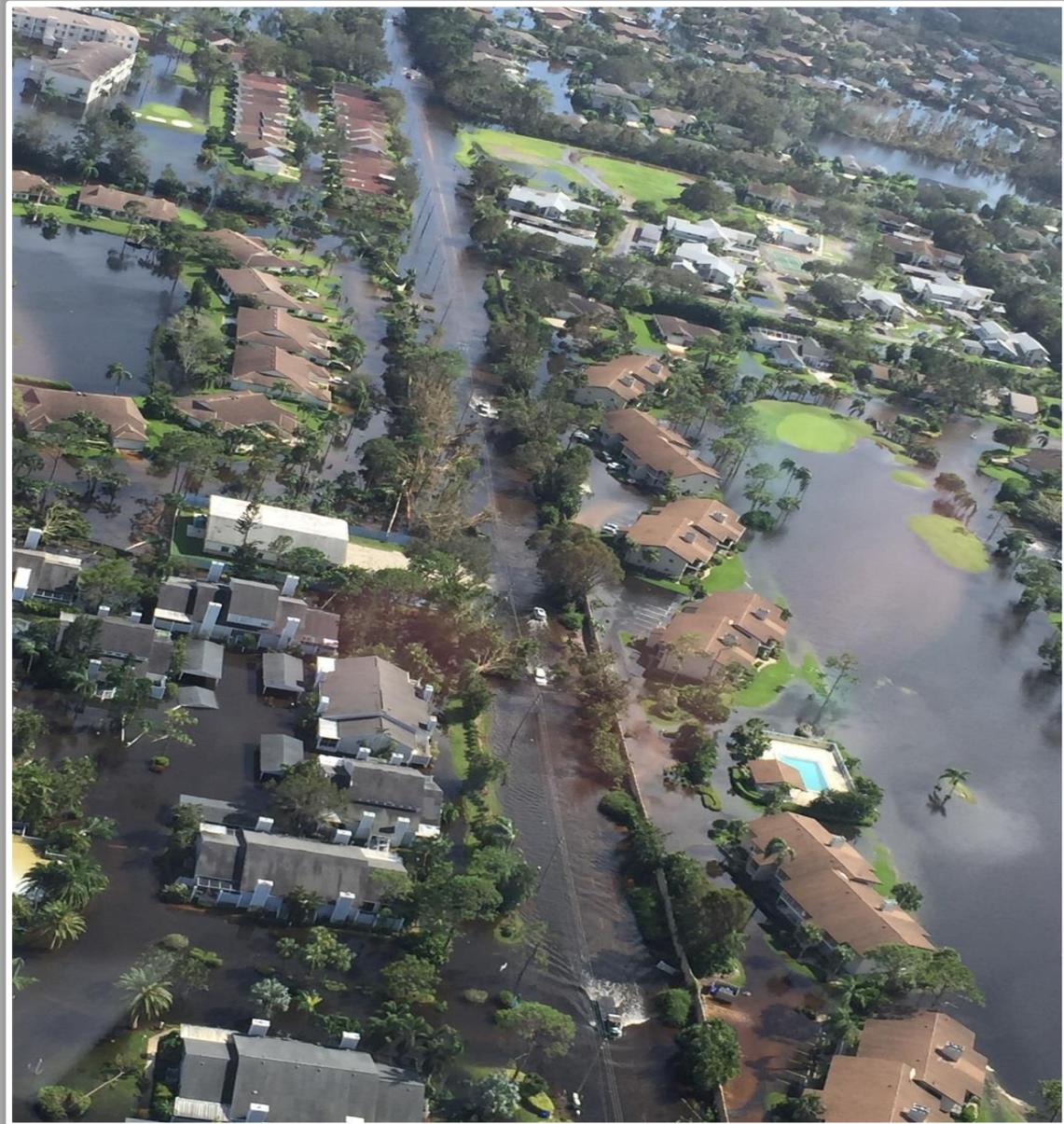




# PERMITTING OBSERVATIONS

- Homes Built To Current FEMA 100 Year Elevation Were Not Flooded (Post '92)
- Rainfall Event Exceeded Design Capacity Of System
- Permit Criteria Addresses Differing Elements Of The Community: Road Elevations, Stormwater System, House Pads, Dialogue With SFWMD Recommended
- Development Patterns Impact Flooding - Master Planning
- Lack Of Continuity Throughout Watershed, Multiple Entity/Jurisdictions, Lack Of Downstream Impact Review
- Older Development Has Encroached Into Floodways & Reduced Historic Conveyance Capacity
- Need for Communities to Maintain Stormwater System in Accordance With SFWMD Permit









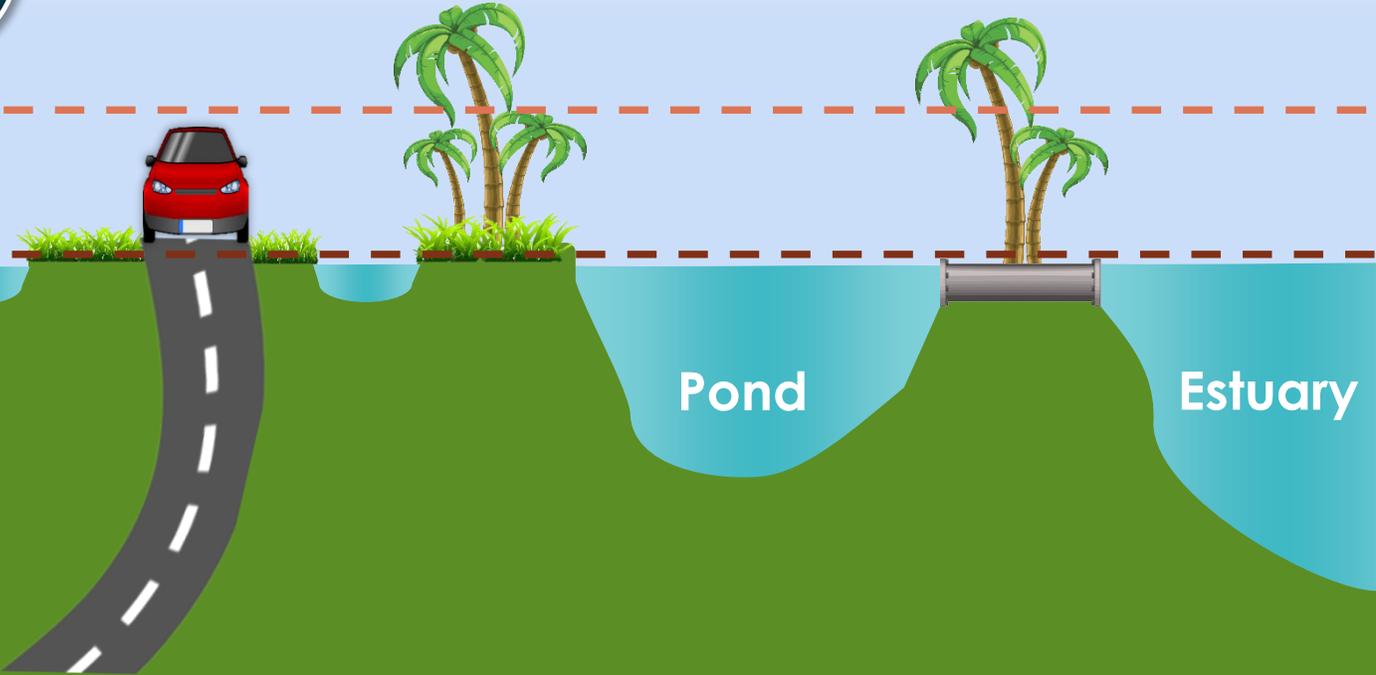
# DESIGN LEVELS: FLOOD PROTECTION



100  
Year

25  
Year

5  
Year



Pond

Estuary

# LONG-TERM PLAN

- Consideration to potential capital projects identified in phase 2 reports, require further investigation
- Obtain professional consultant services to provide an overall assessment of different geographic regions of the county regarding surface water management. The goal of this project is to establish plans to reduce flooding on a larger regional scale.
- Update current plans where possible
- Additional survey data as necessary- validation/ calibration
- Hydrology/ Hydraulic Modeling for a series of storm events
- Project alternatives analysis- cost/ benefit
- Public participation
- Prioritization, budgeting, cost share, grants, design, permitting, construction, O&M
- May be eligible for Army Corps of Engineers assistance



# IMPLEMENTATION

- Work prioritized & identified by responsible entity / agency:
  - County, Cities, FDOT, LAMSID, CDD, HOA, SFWMD
- Continue dialogue & coordination efforts
- LDOT has begun implementation within County ROW



# DISCUSSION QUESTIONS

Completed Reports Available  
<http://www.leegov.com/irma>

