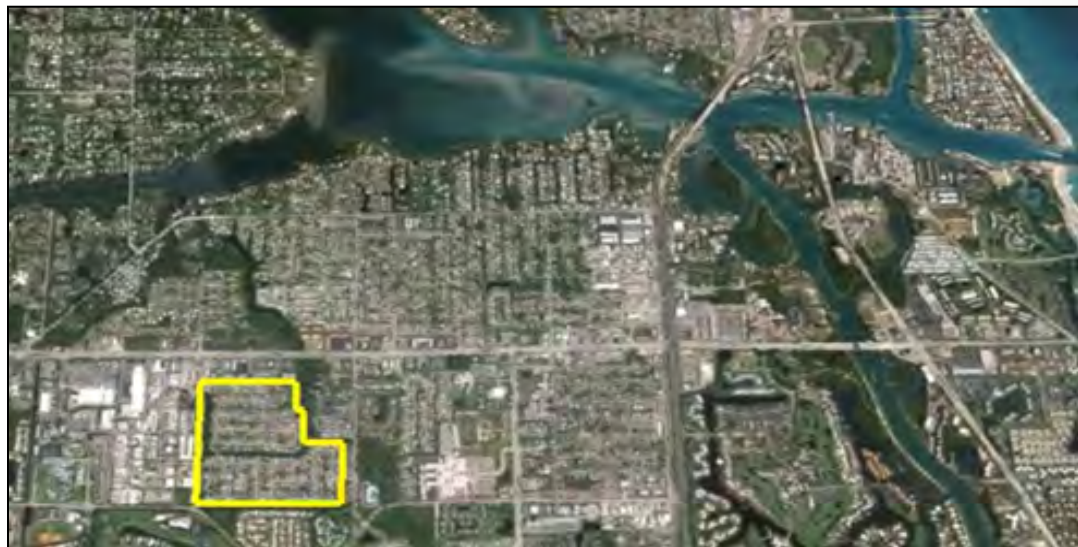


# **Impacts of on-site sewage disposal systems on Jupiter Creek, an urbanized tidal creek in Southeast Florida, USA**

Brian Lapointe, Marie Tarnowski\* and  
Steve Krupa

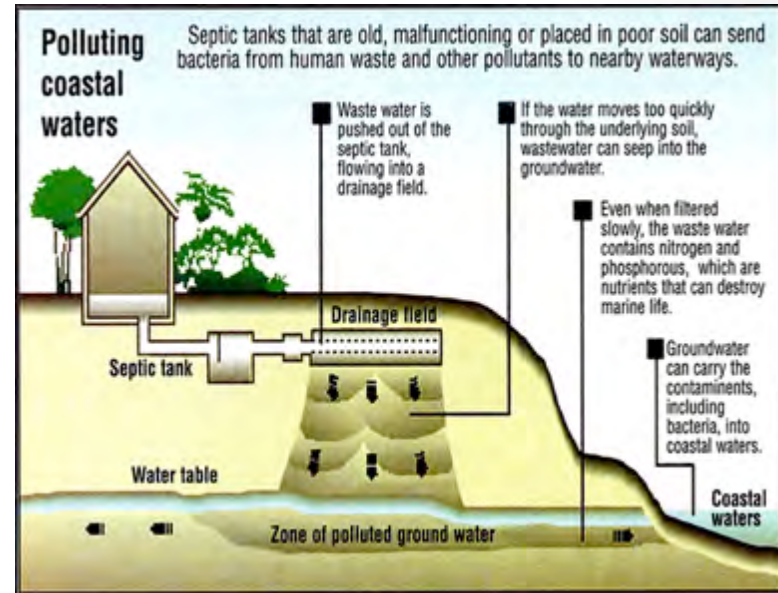
# Jupiter River Estates

- 359 homes using OSDS
- Surrounded by sensitive aquatic ecosystems
  - Loxahatchee River
  - Indian River Lagoon
  - Jupiter Creek
  - Groundwater



# Issues

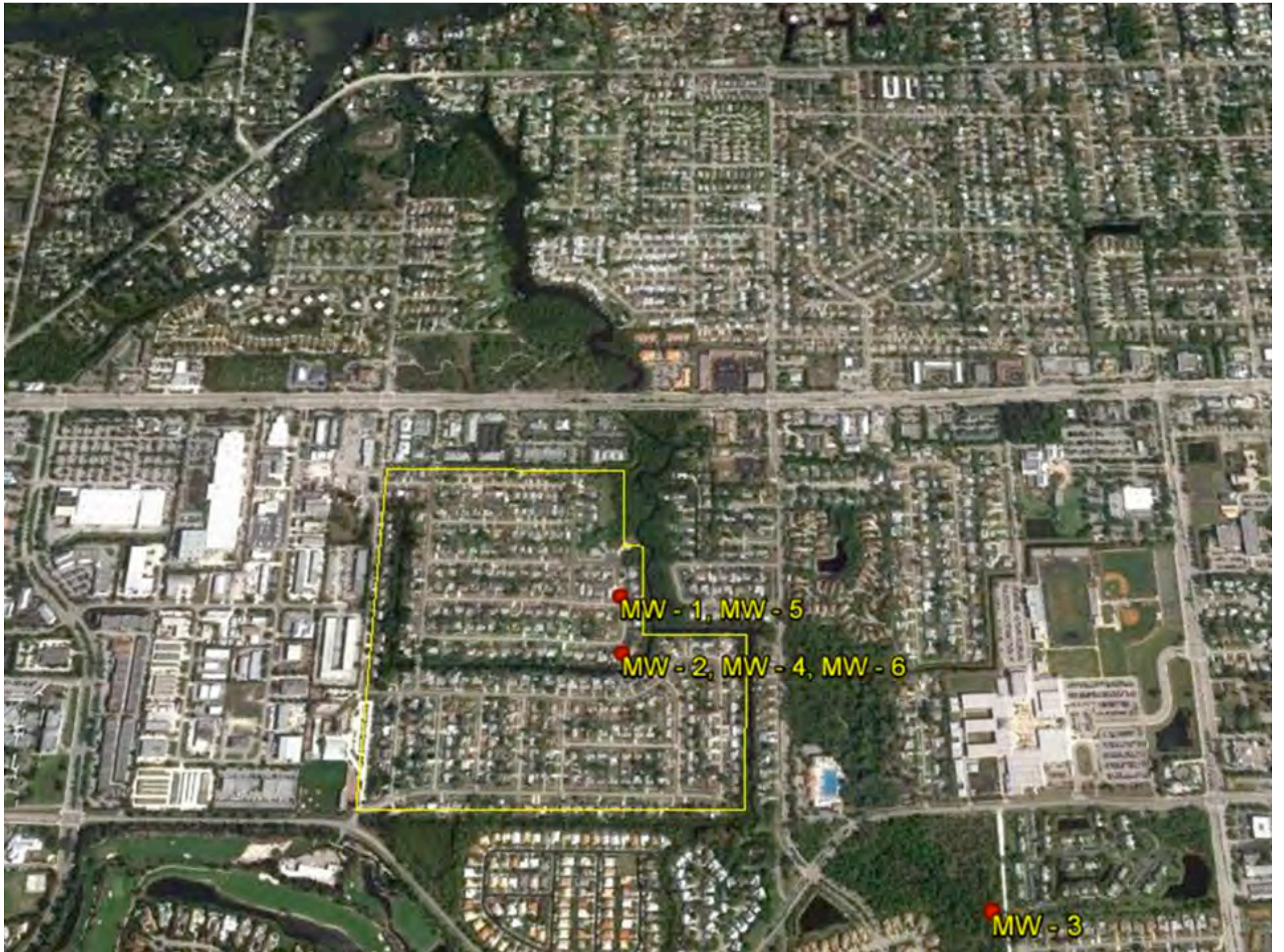
- Concern from multiple groups about the impacts of septic tanks on creek
- Multiple studies
  - Hydrogeological
  - Sediment assessment
  - Fecal coliform monitoring
- None linked septic tanks to groundwater and surface water contamination



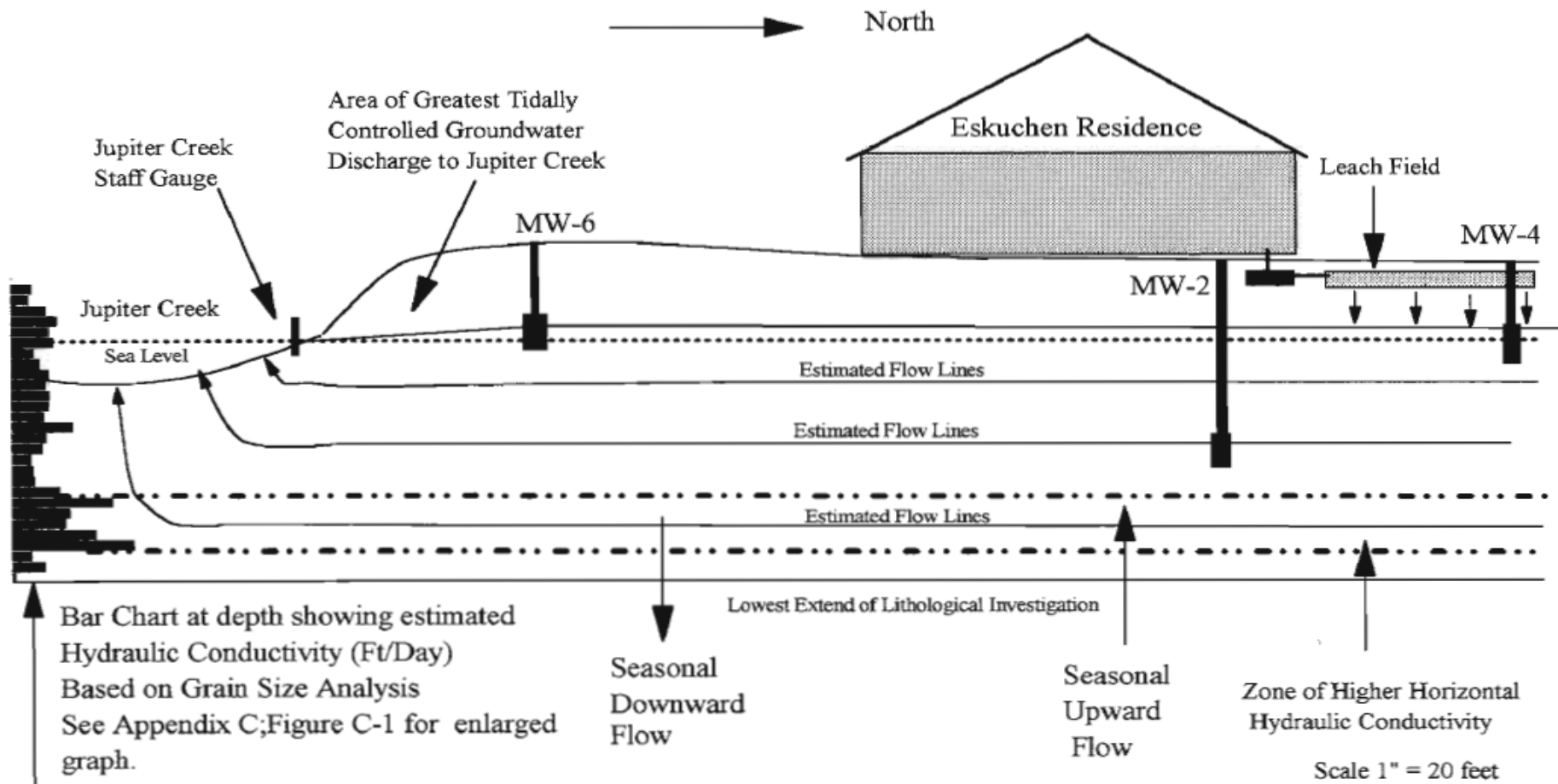
# Sampling

- Monitor Wells:
  - 2 residences
    - Shallow: MW 4, 5, 6
    - Deep: MW 1, 2
  - Reference
    - Shallow: MW 3
- Surface Water Samples
  - 5 locations along creek
- Sampling Seasons:
  - Wet Season (Oct. 1994)
  - Dry Season (March 1995)



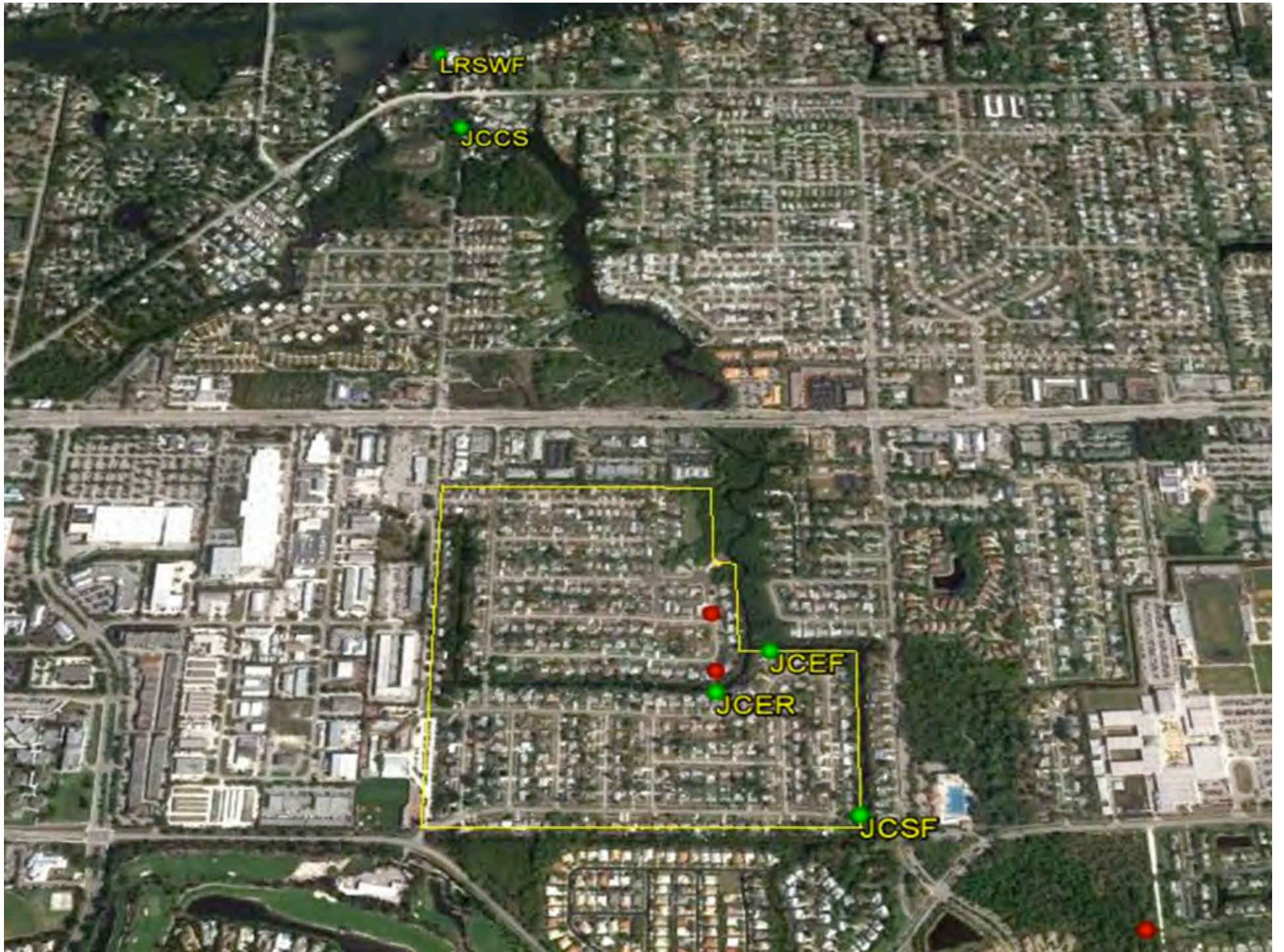


### Conceptual Model Of The Jupiter Creek Cross Section



Average	15.67
Maximum	46.80
Minimum	1.80

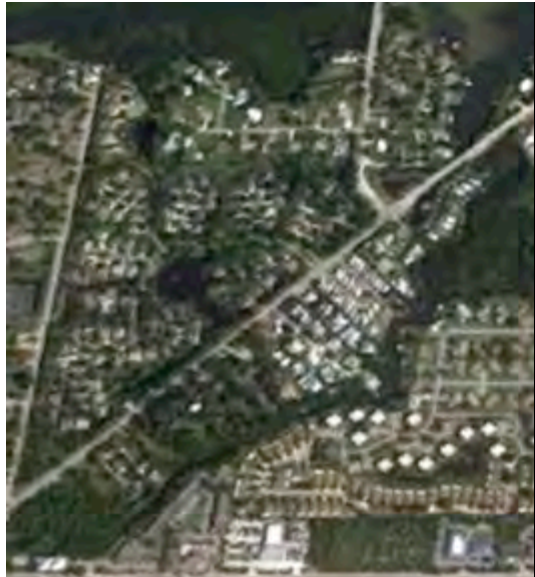
Figure 19. Conceptual model of theoretical flow lines of the Jupiter Creek cross-section drawn to scale.



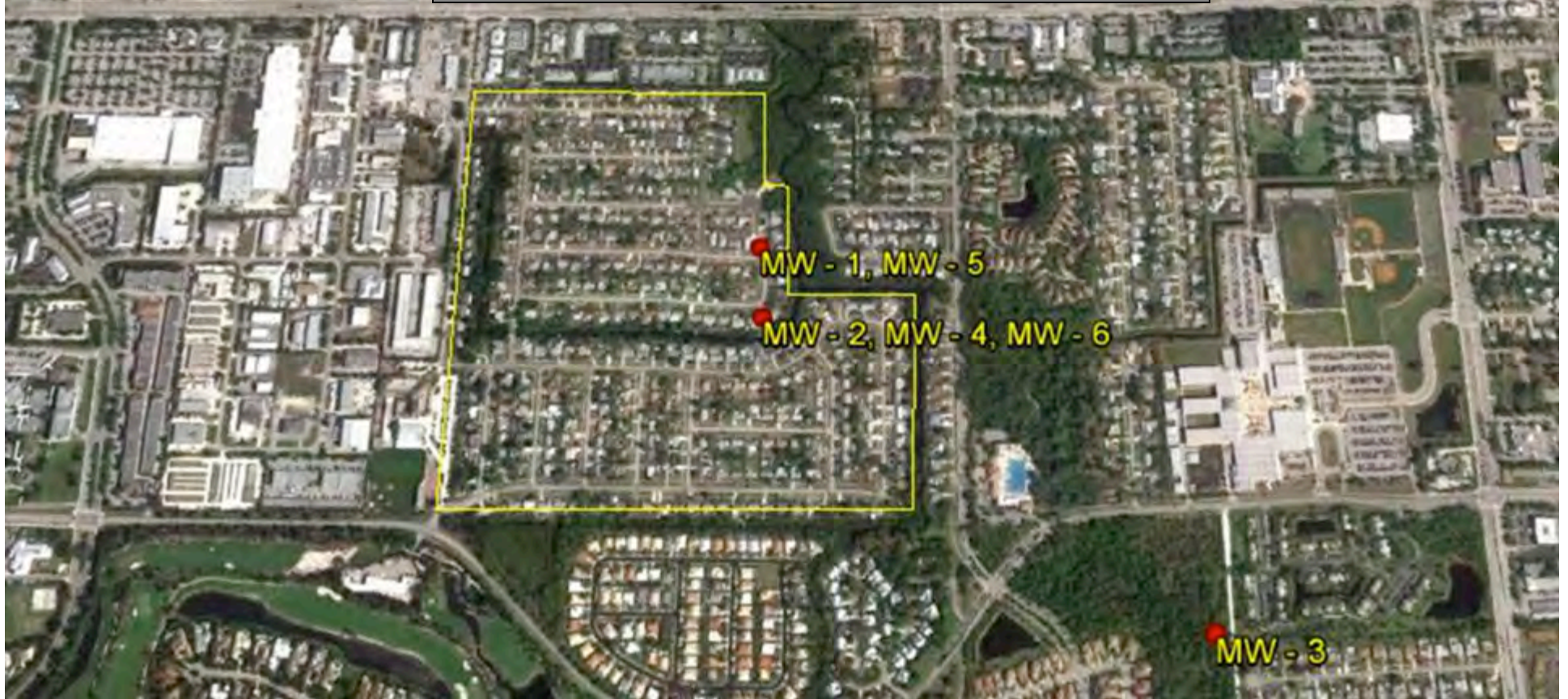
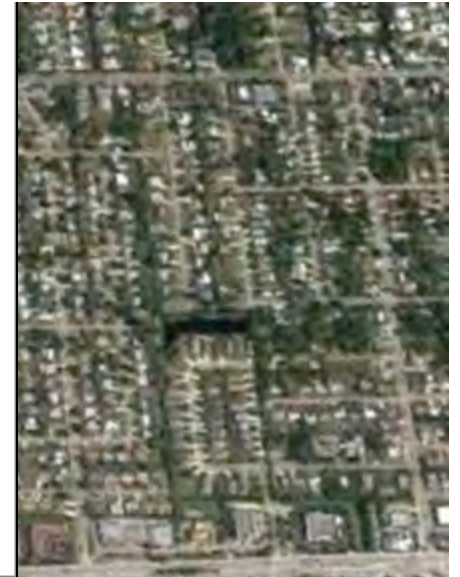
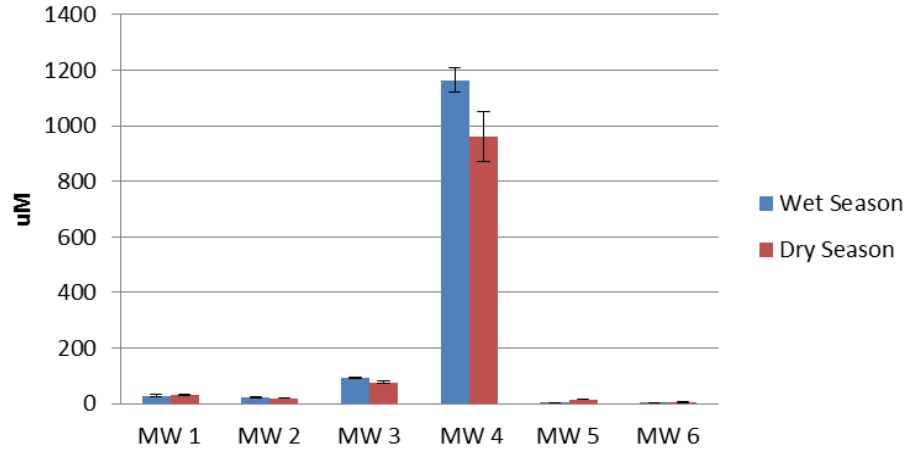
# Information Collected

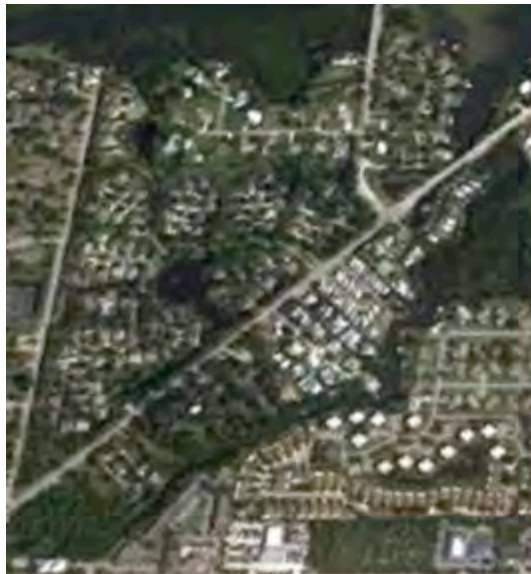
- Color
- Conductivity
- pH
- Temperature
- BOD
- COD
- Groundwater flow speed and direction
- Ammonium
- Nitrate/Nitrite
- SRP
- Total Phosphorus (P)
- Total Nitrogen (N)
- $\delta^{15}\text{N}$
- Fecal Coliform
- Coprostanol



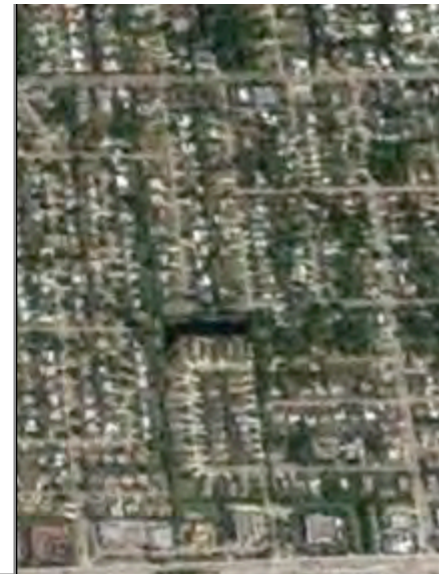
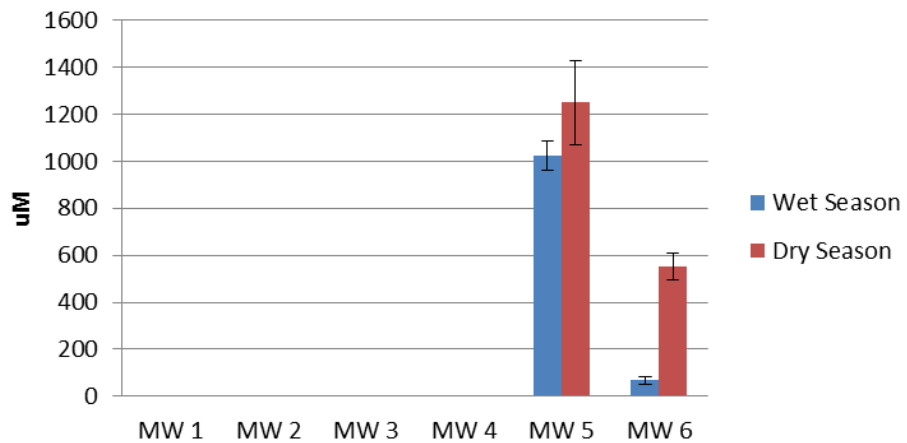


Monitor Well Ammonium ( $\mu\text{M}$ ) Levels:  
Wet vs Dry Season

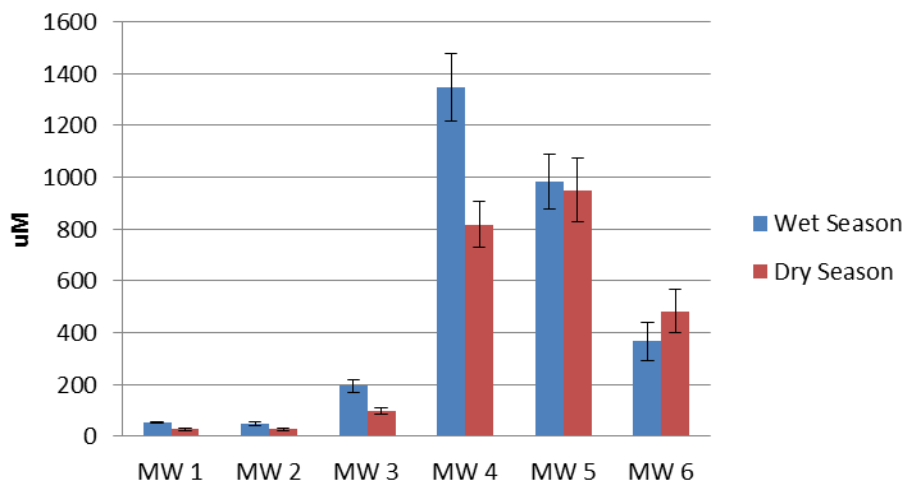




Monitor Wells 1-4 Nitrate/Nitrite (uM) Levels:  
Wet vs. Dry Season



Monitor Wells Total N (uM) Levels: Wet vs. Dry Season

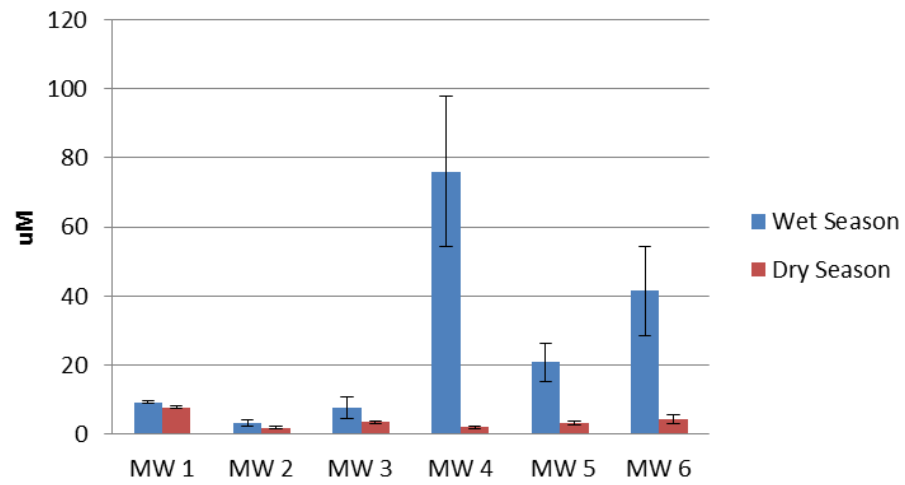


MW - 1, MW - 5

MW - 2, MW - 4, MW - 6

MW - 3

Monitor Well Total P ( $\mu\text{M}$ ) Levels: Wet vs. Dry Season

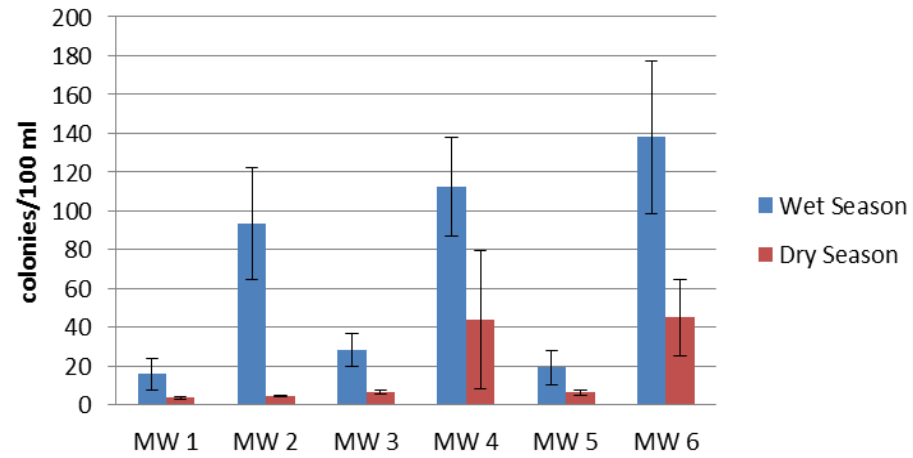


MW - 1, MW - 5

MW - 2, MW - 4, MW - 6

MW - 3

Monitor Wells Fecal Coliform (colonies/100 ml) Levels:  
Wet vs. Dry Season

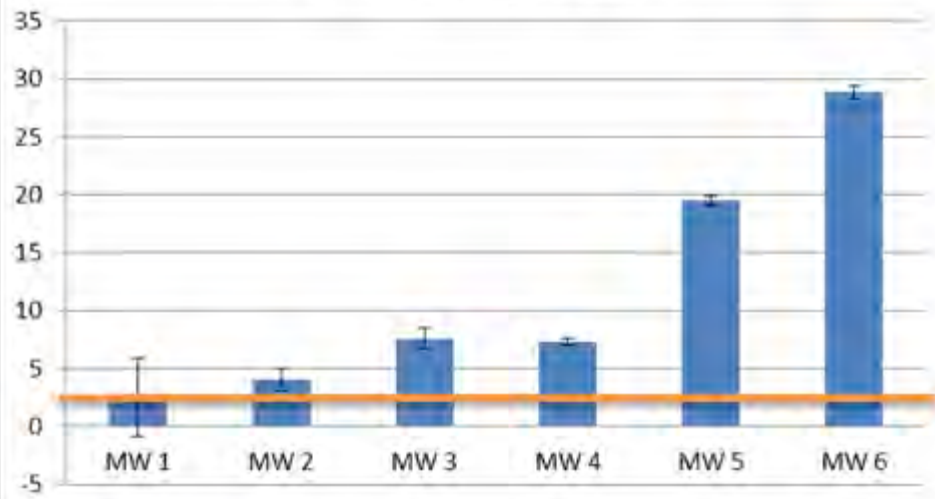


MW - 1, MW - 5

MW - 2, MW - 4, MW - 6

MW - 3

Monitor Well  $\delta^{15}\text{N}$ , 0/00



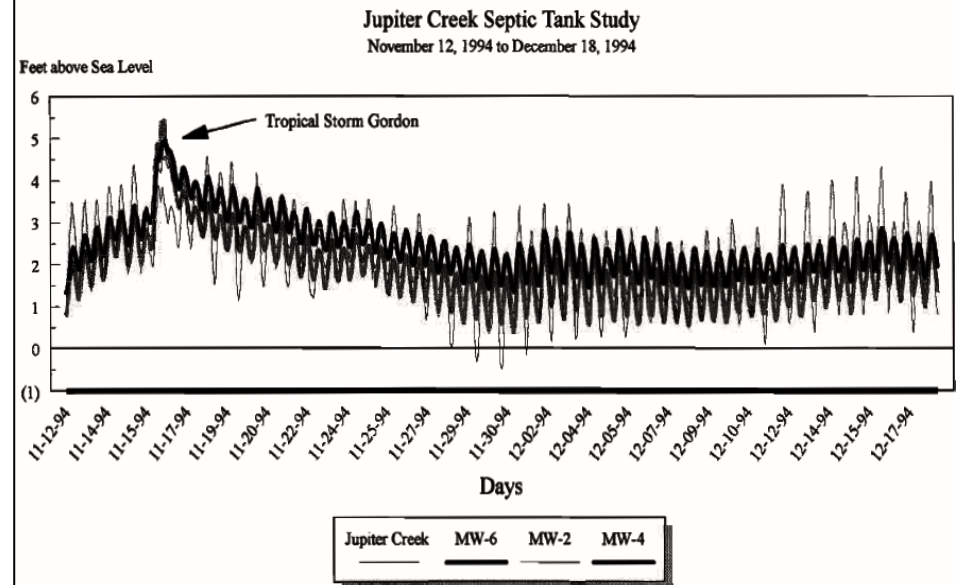
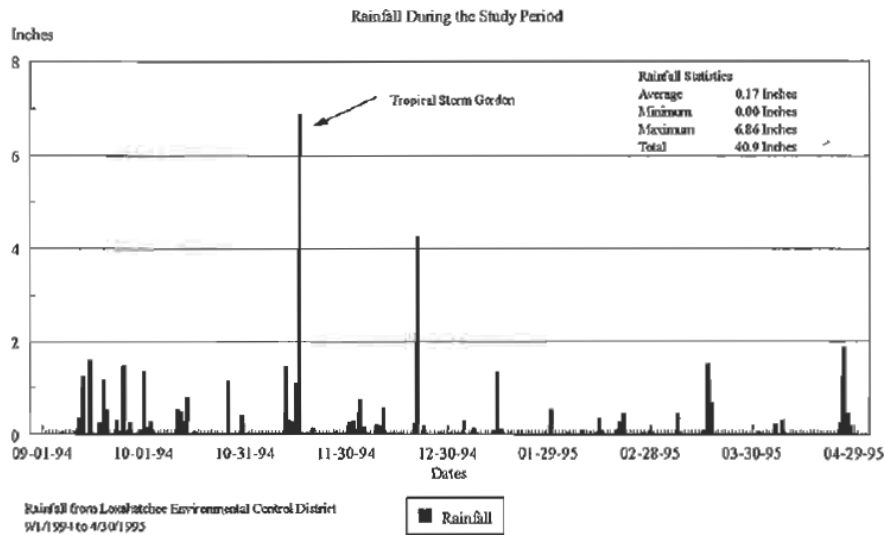
MW - 1, MW - 5

MW - 2, MW - 4, MW - 6

MW - 3

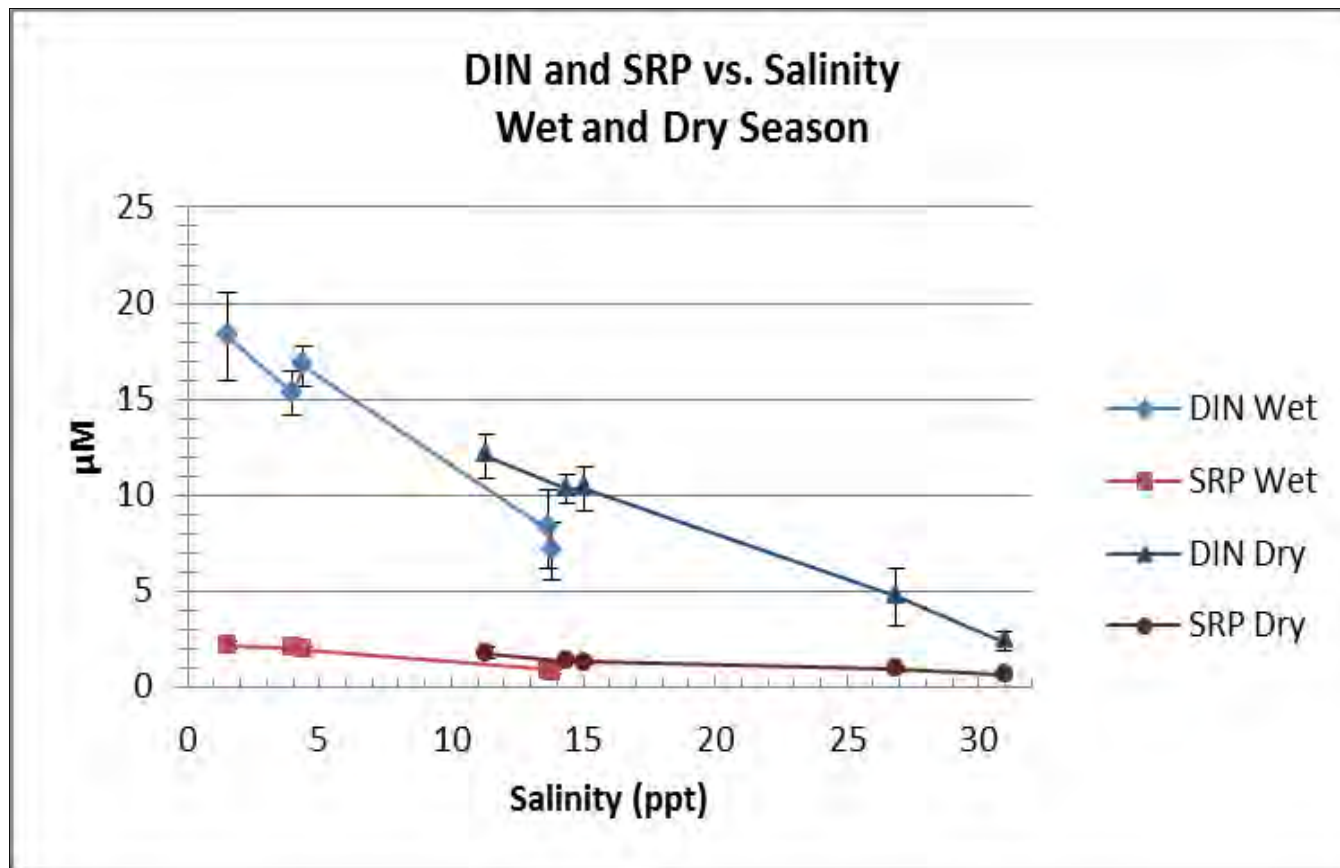
# Tidal Groundwater Flow

- Strong tidal influence on groundwater flow and direction
- Rain during wet season caused groundwater level to rise
  - Eskuchen residence septic tank in violation of 2 foot vadose rule

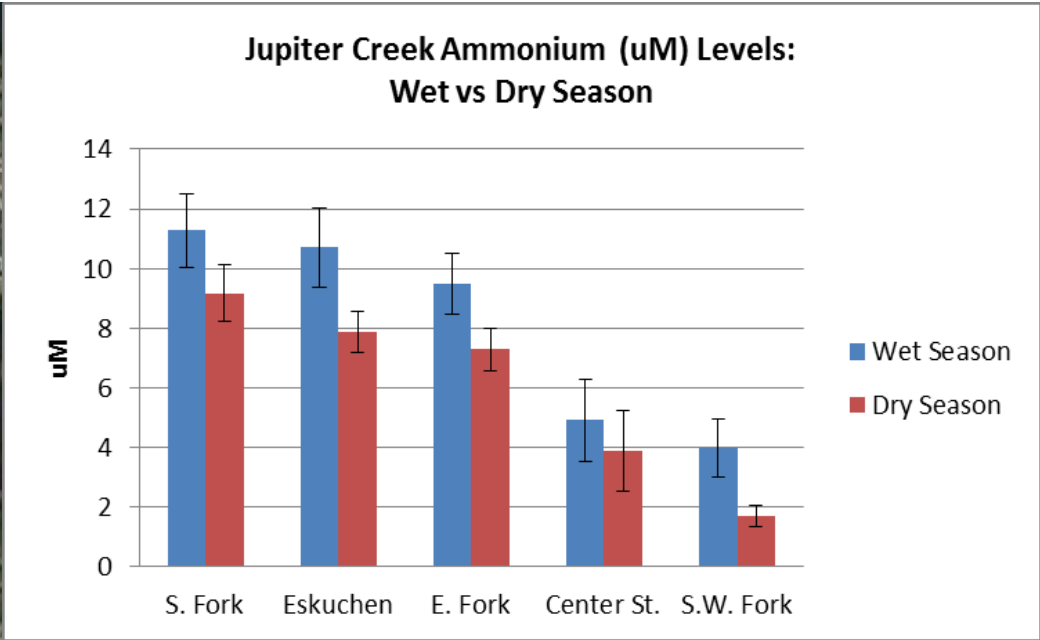
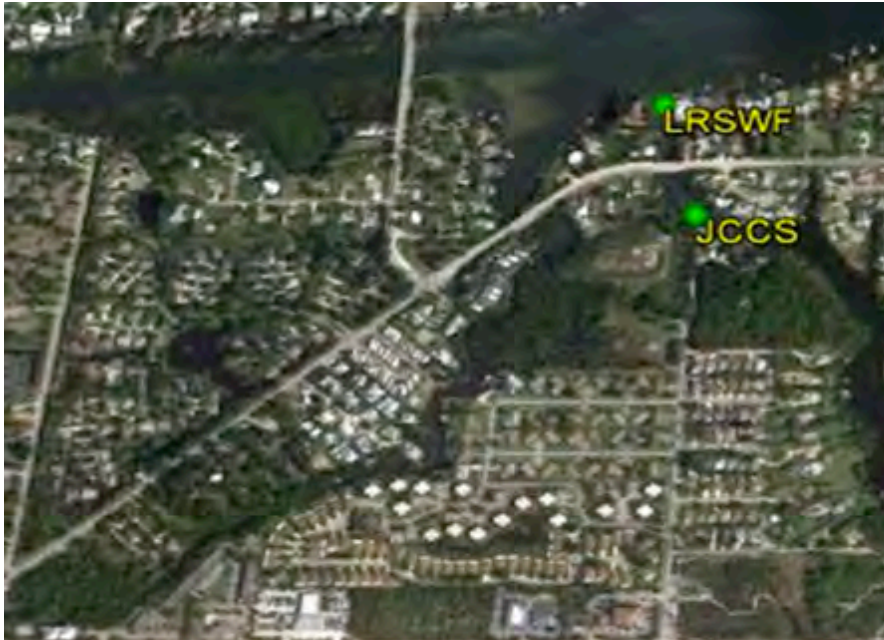


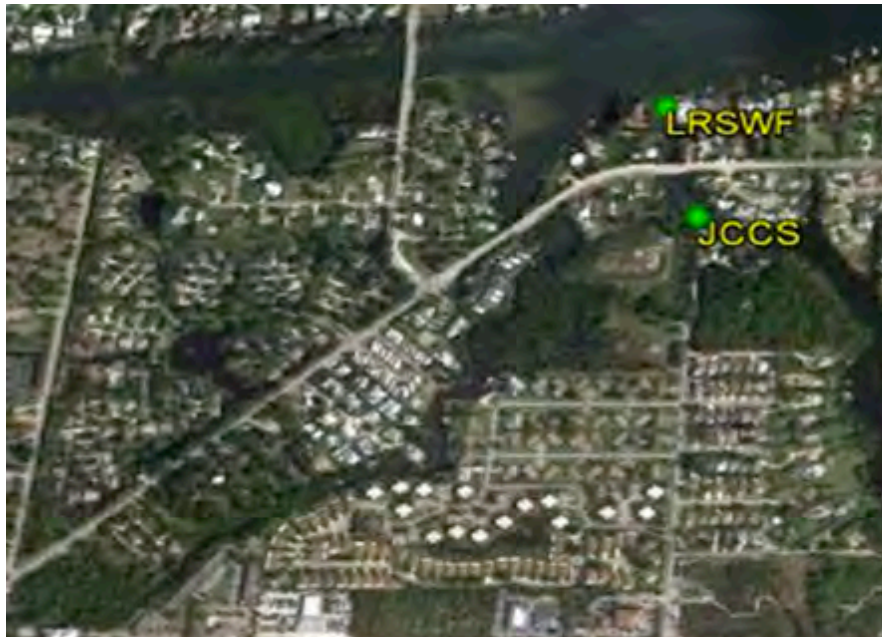
# Groundwater Nutrient Transport

- Groundwater flow 0.66 – 6.16 ft/day
  - All flow towards Jupiter Creek
- Sediments facilitated water movement and nutrient transport

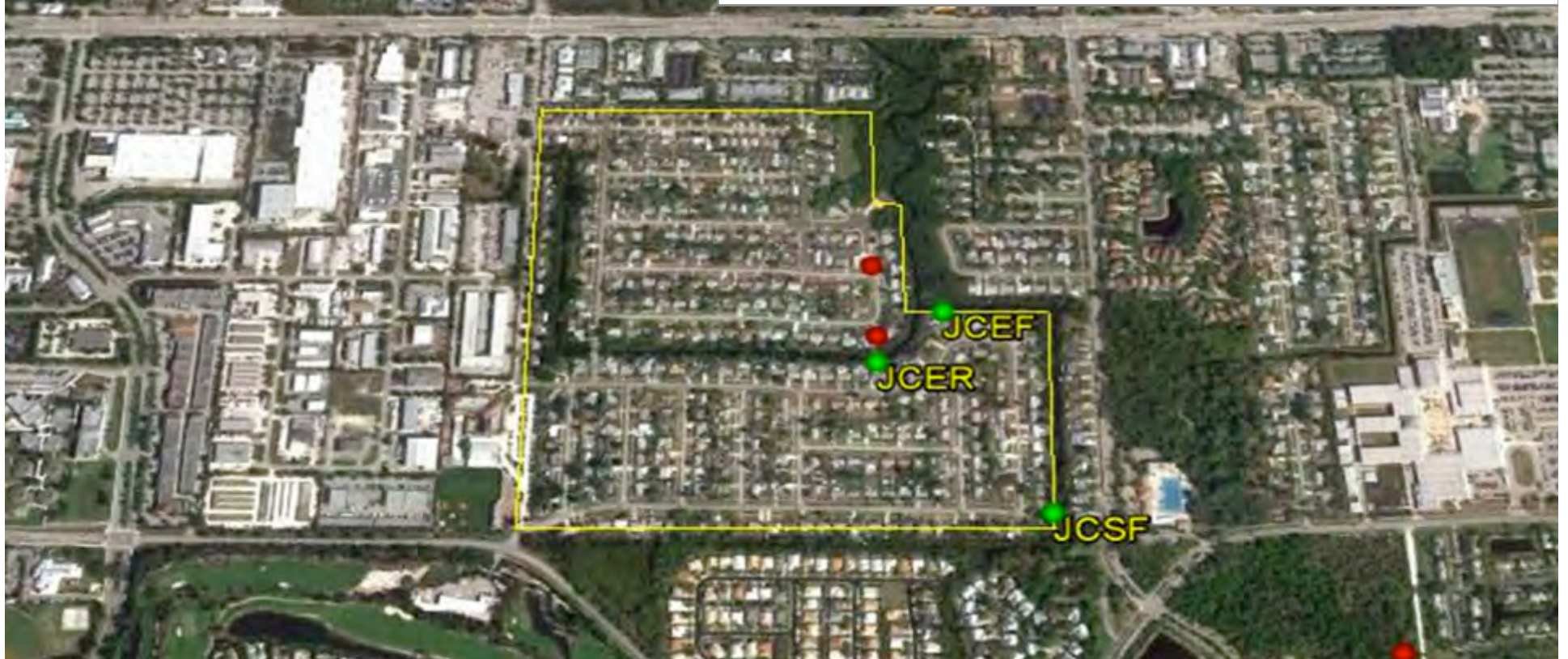
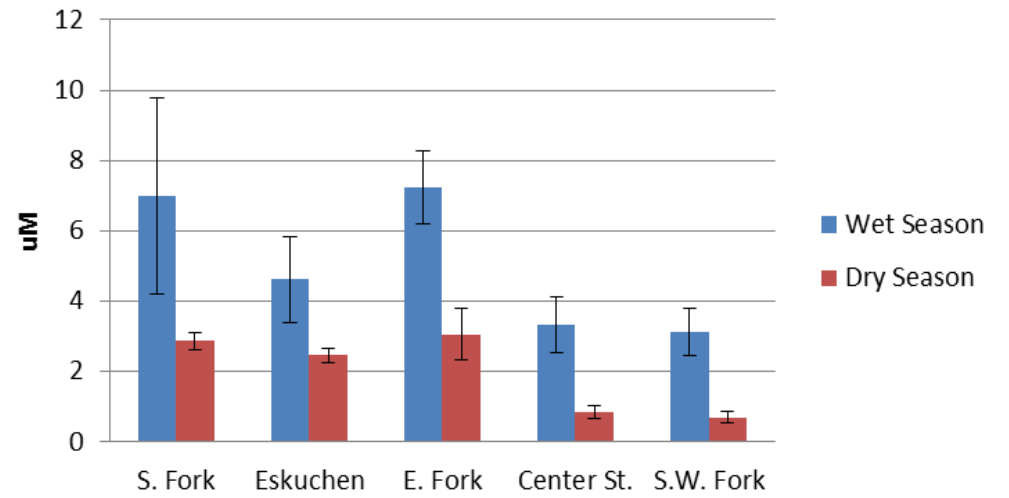


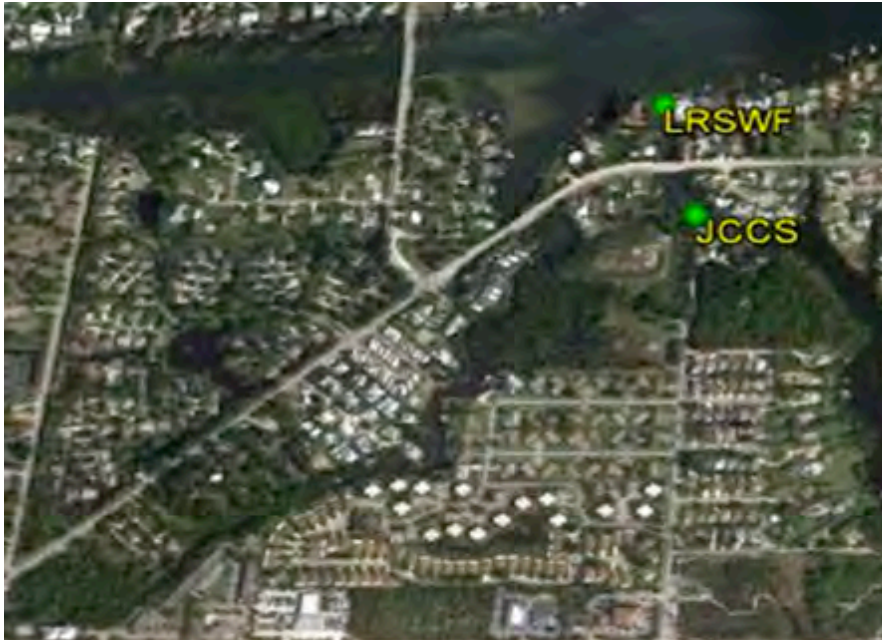




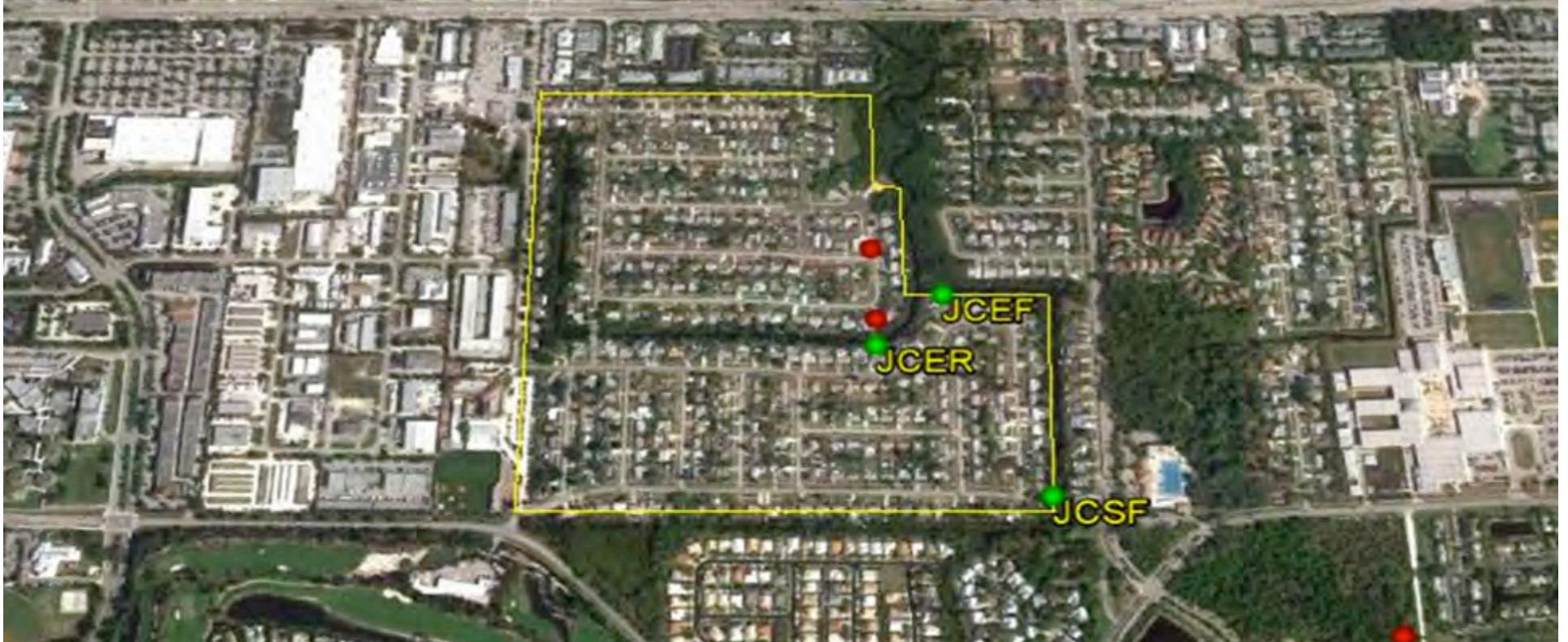
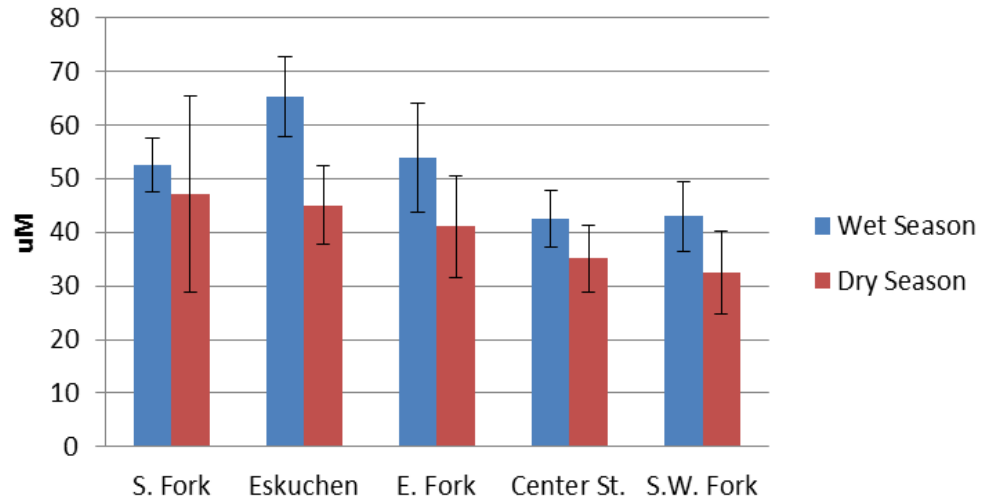


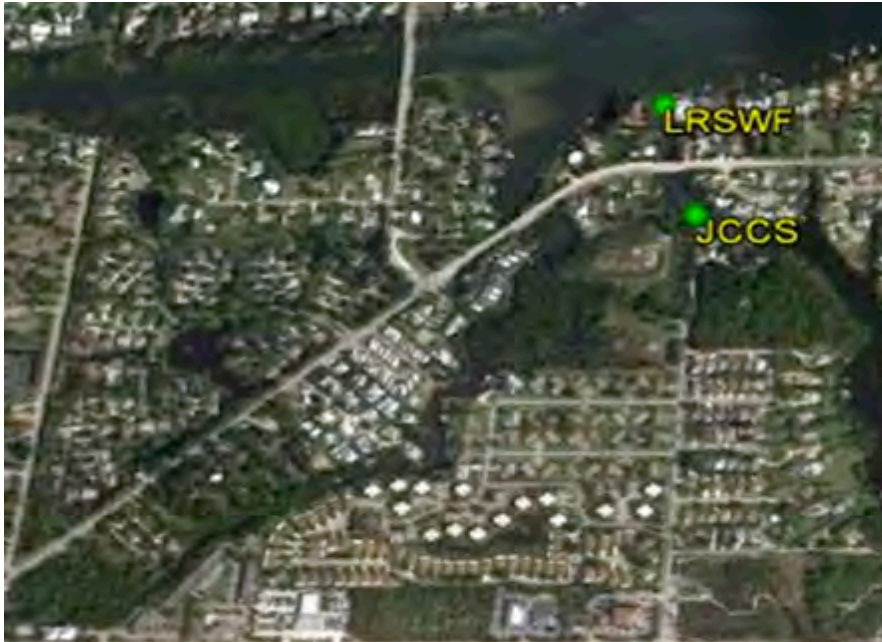
Jupiter Creek Nitrate/Nitrite (uM) Levels:  
Wet vs Dry Season



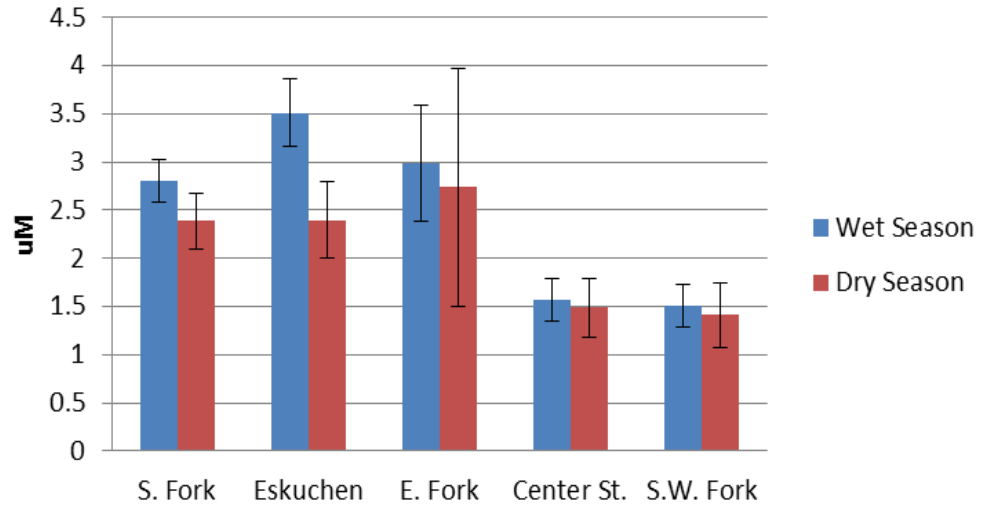


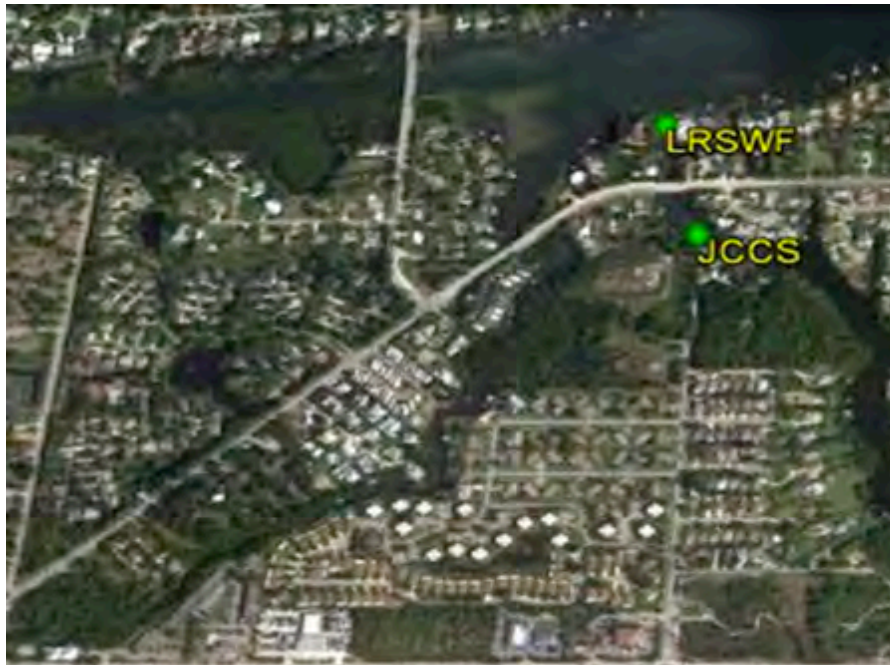
Jupiter Creek Total N (uM) Levels:  
Wet vs Dry Season



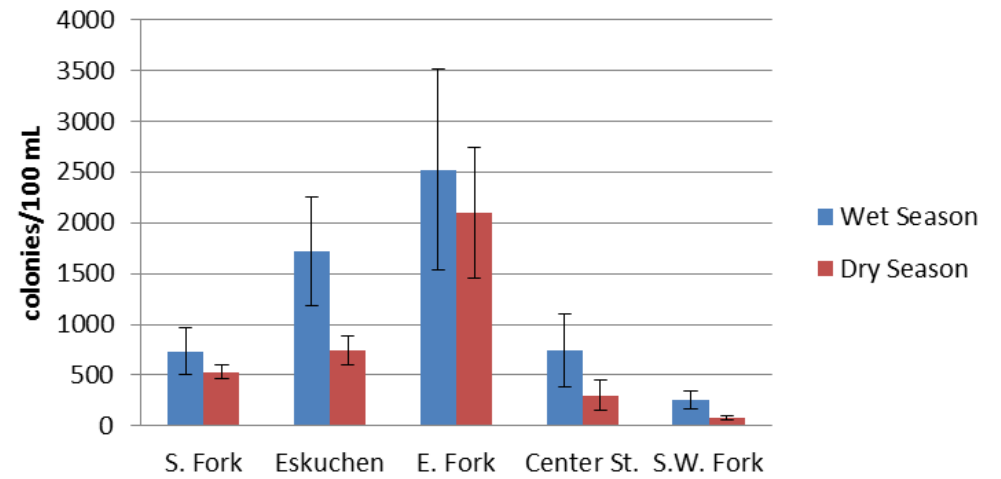


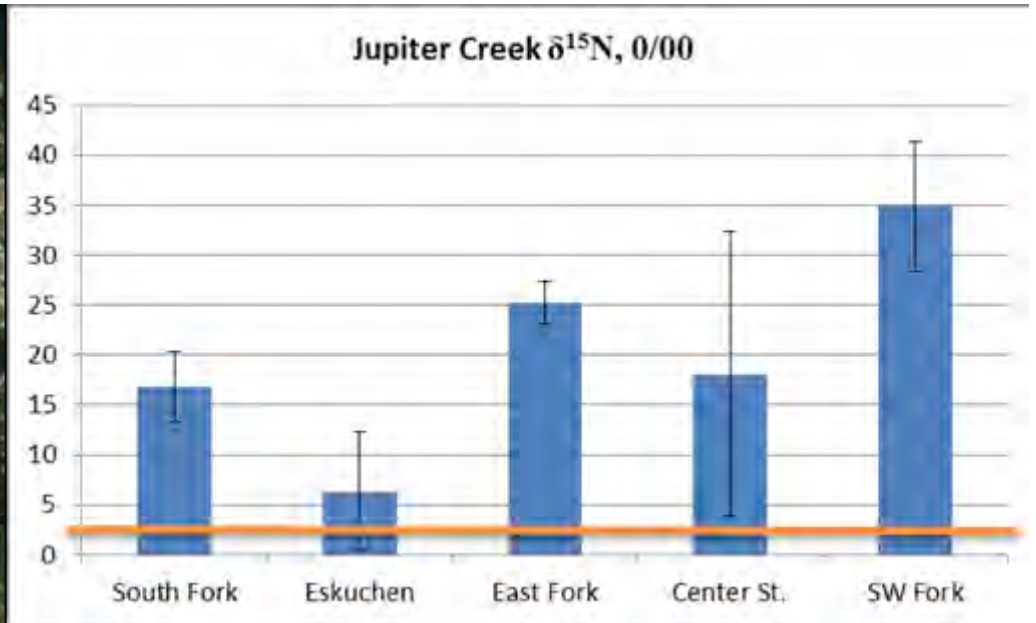
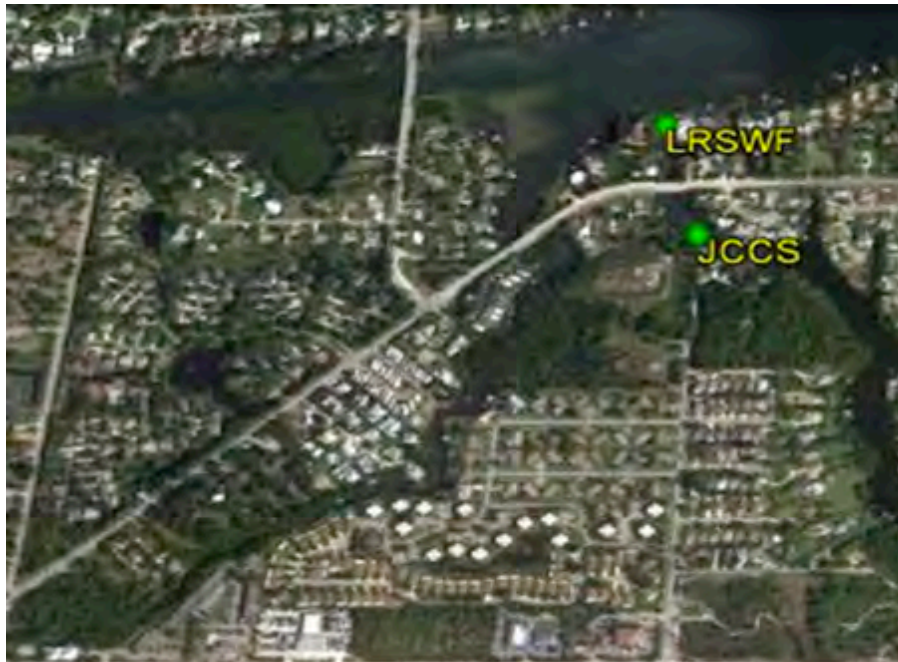
Jupiter Creek Total P (uM) Levels:  
Wet vs Dry Season

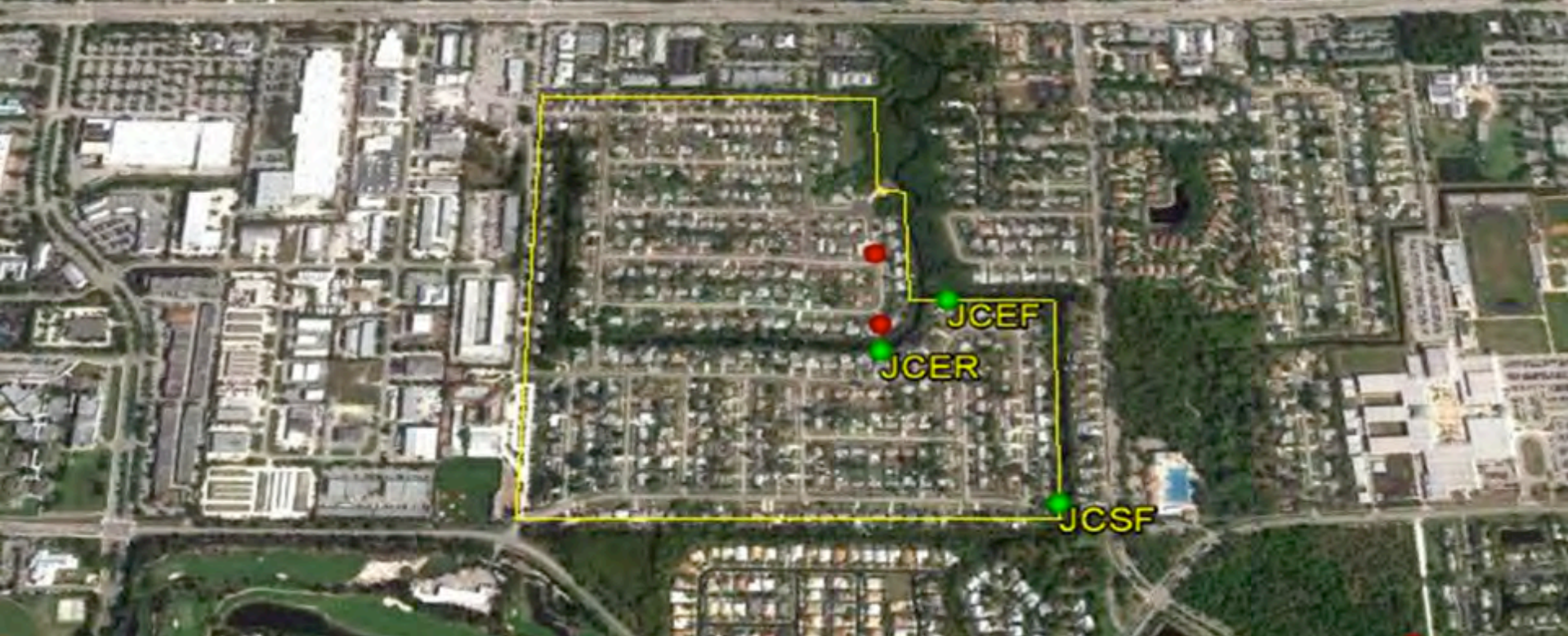
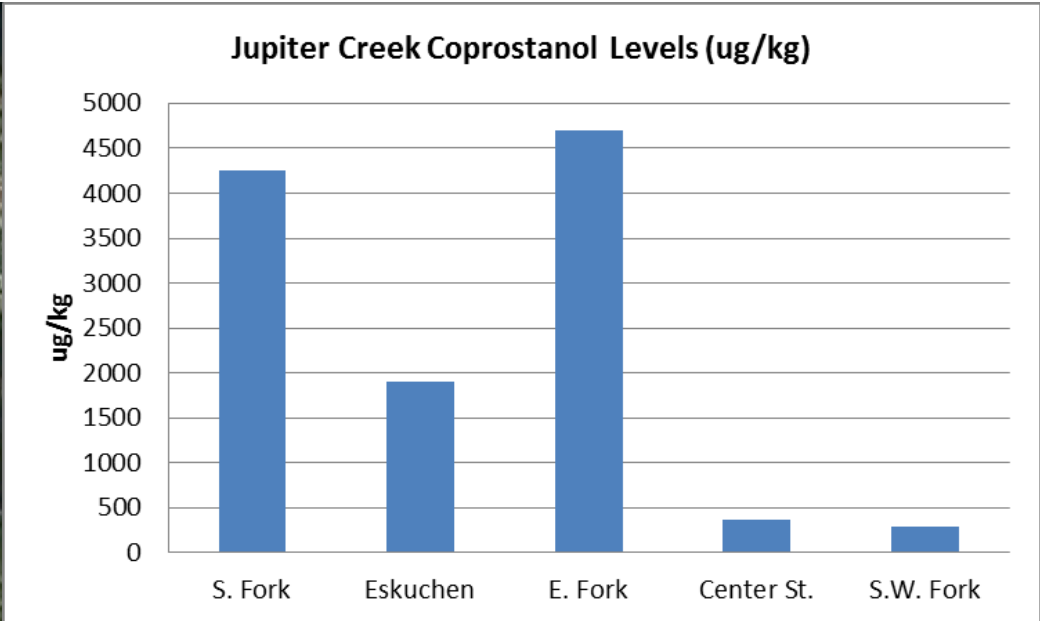
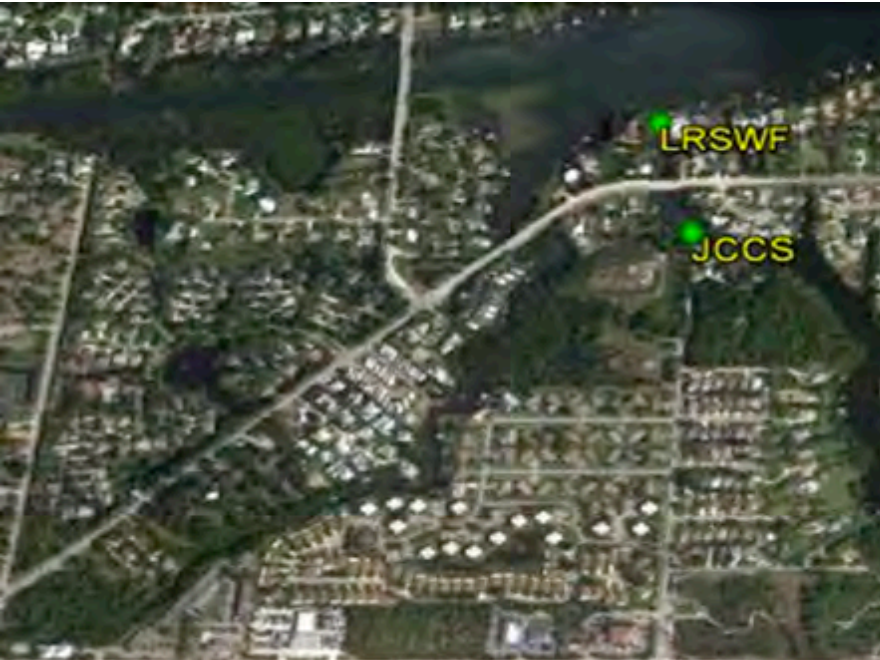




**Jupiter Creek Fecal Coliform (colonies/100 mL) Levels:  
Wet vs Dry Season**







# Conclusions


- Nutrient and fecal coliform contamination in groundwater 100' from Eskuchen Residence
- Groundwater wells violated FL State standards for fecal coliform and nitrogen levels
- High  $\delta^{15}\text{N}$  in groundwaters and surface waters and coprostanol in sediments confirmed human sewage
- The combination of sandy soils, high water tables and high density development leads to degradation of groundwaters and surrounding surface waters



# Actions Taken

- Jupiter River Estates switched to sewer 1996
- Gravity systems

CONSTRUCTION DRAWINGS  
FOR  
SANITARY SEWER SERVICE  
JUPITER RIVER ESTATES




LOXAHATCHEE RIVER  
DISTRICT

EXECUTIVE DIRECTOR:  
RICHARD C. DENT II

BOARD OF DIRECTOR:  
JOE O. ELLIS, CHAIRMAN  
GEORGE GENTILE  
SAVYER THOMPSON  
ALFRED "AL" S. DE MOTT  
LORING "SNAG" HOLMES

LOCATION MAP



INDEX OF SHEETS

1	PLAN
2	PROFILES
3	MANHOLE
4	CONCRETE
5	PIPE
6	VALVE
7	STRUCTURE
8	TRUCK
9	TRUCK

**RECORD DRAWINGS** PROJECT NO. 96-001

**RECORD DRAWING DATA AS-BUILT**



LOXAHATCHEE RIVER DISTRICT

SANITARY SEWER  
PLAN AND PROFILE

# Acknowledgments

- Harbor Branch Oceanographic Institute
- Loxahatchee Environmental Control District
- Harbor Branch Environmental Laboratory
- Isotope Analytical Services
- K-V Associates, Inc.



**Loxahatchee River  
Environmental  
Control District**

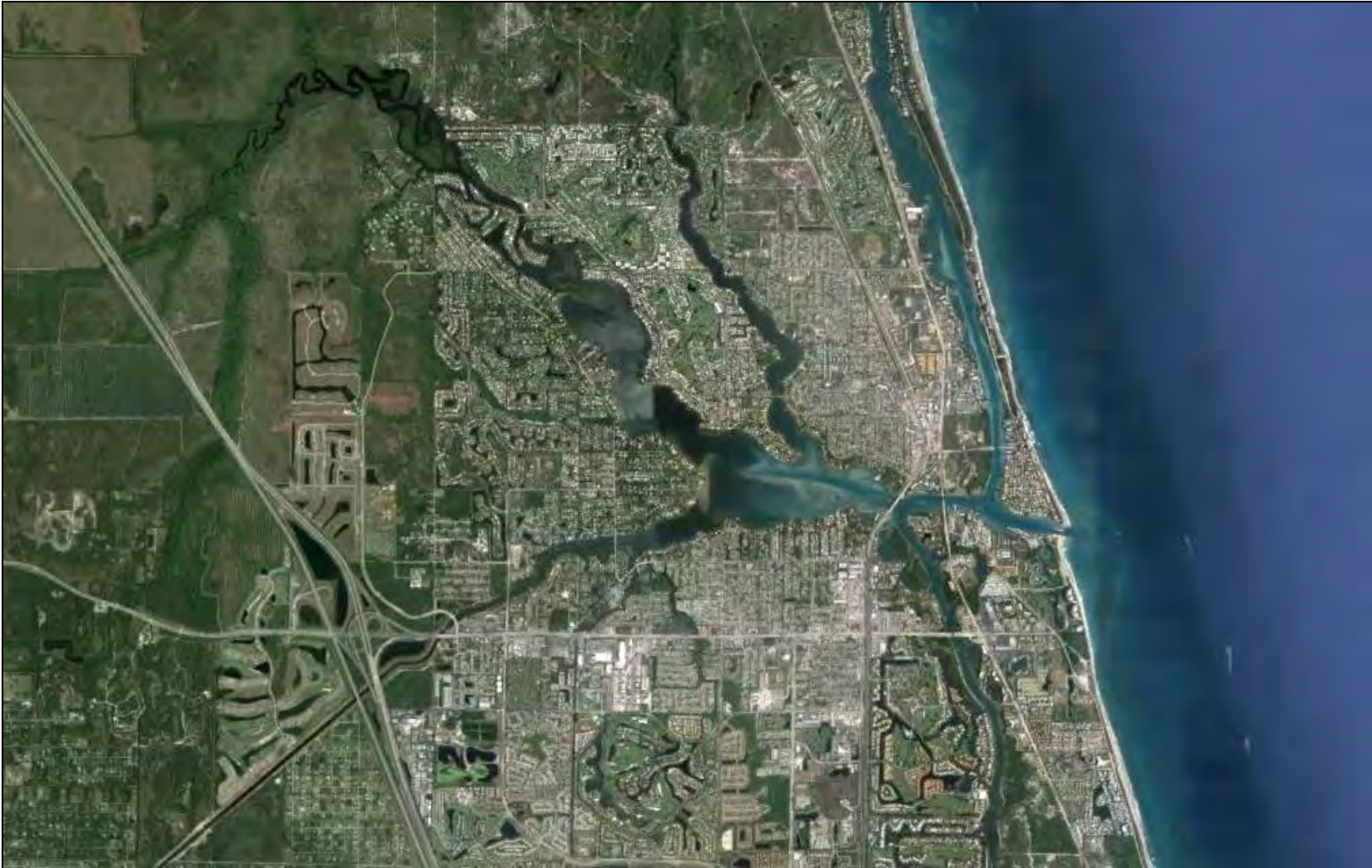
**HARBOR BRANCH**



FLORIDA ATLANTIC UNIVERSITY

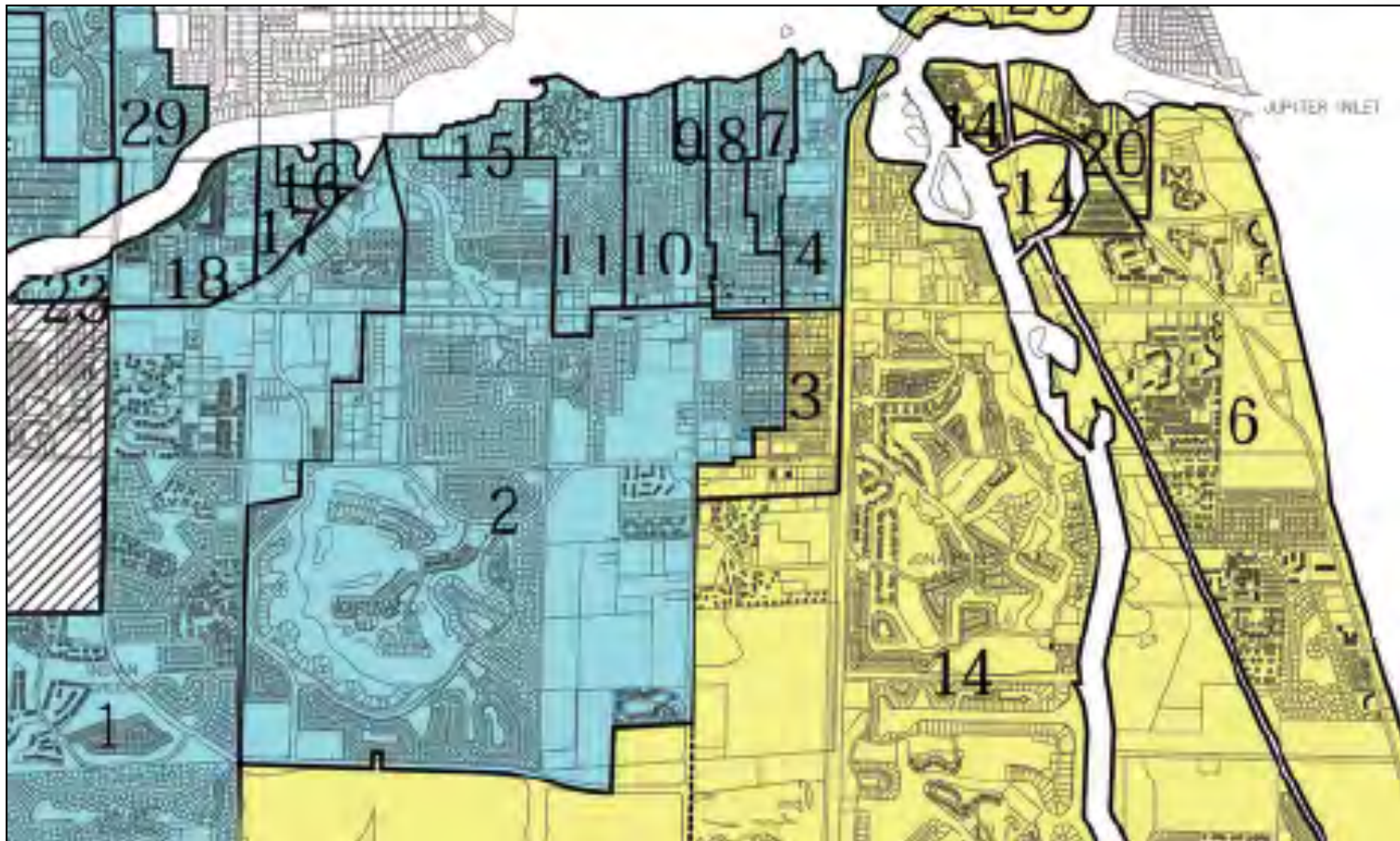
*Ocean Science for a Better World™*

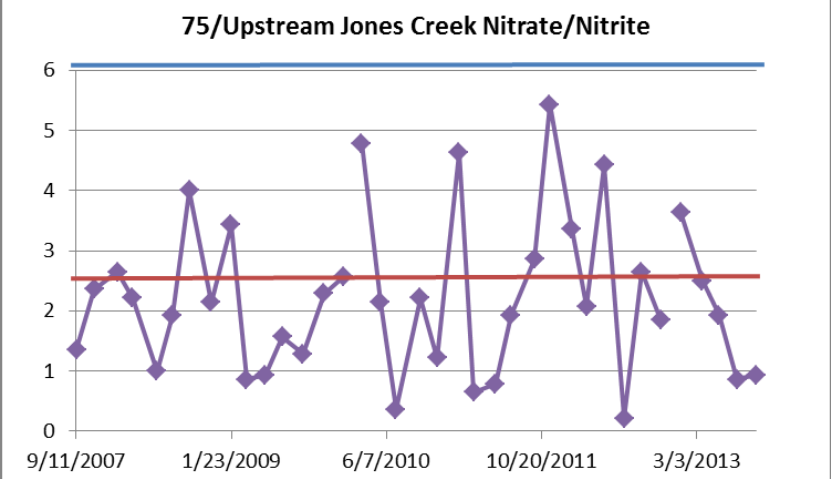
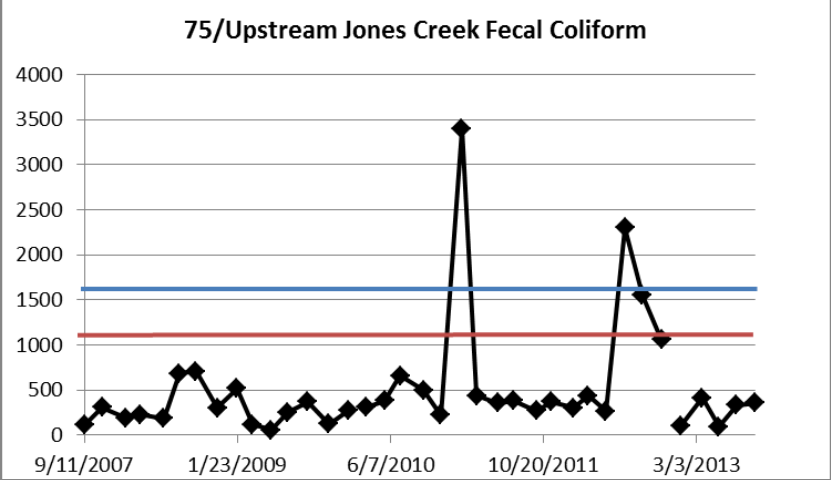
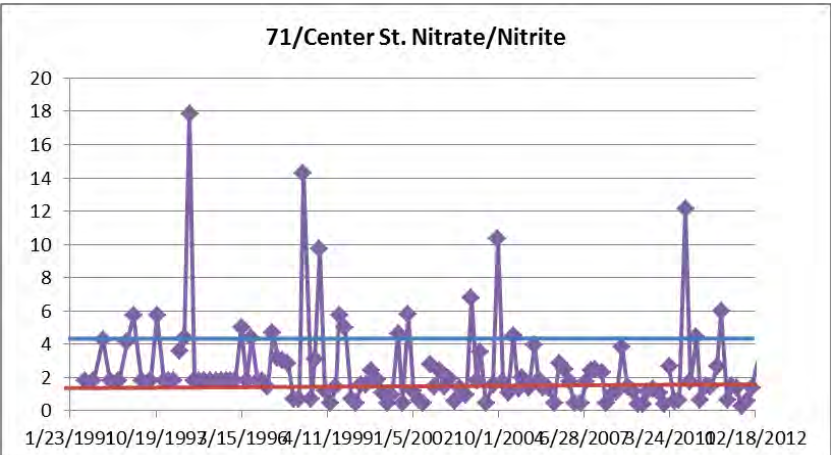
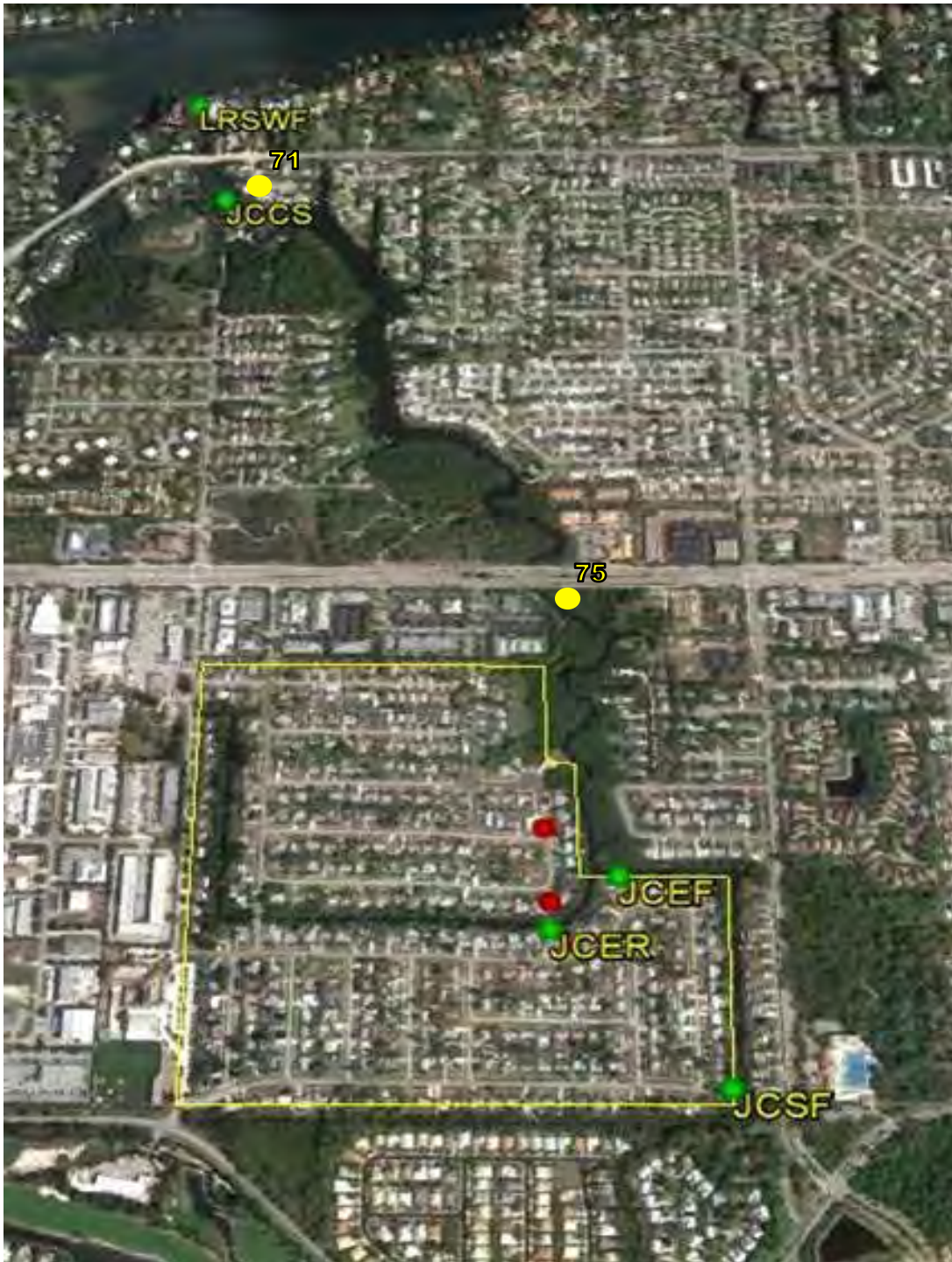
# Thank you!



# Recovery

- Difficult to assess because of large storm water drainage basin





# Recovery

- Sucralose
- Compare 2 adjacent tidal creeks

Site	Falling Tide	Rising Tide
73	5900 ng/L	340 ng/L
75	370 ng/L	400 ng/L

