Lower Laguna Madre and Brownsville Ship Channel Watershed Protection Plan

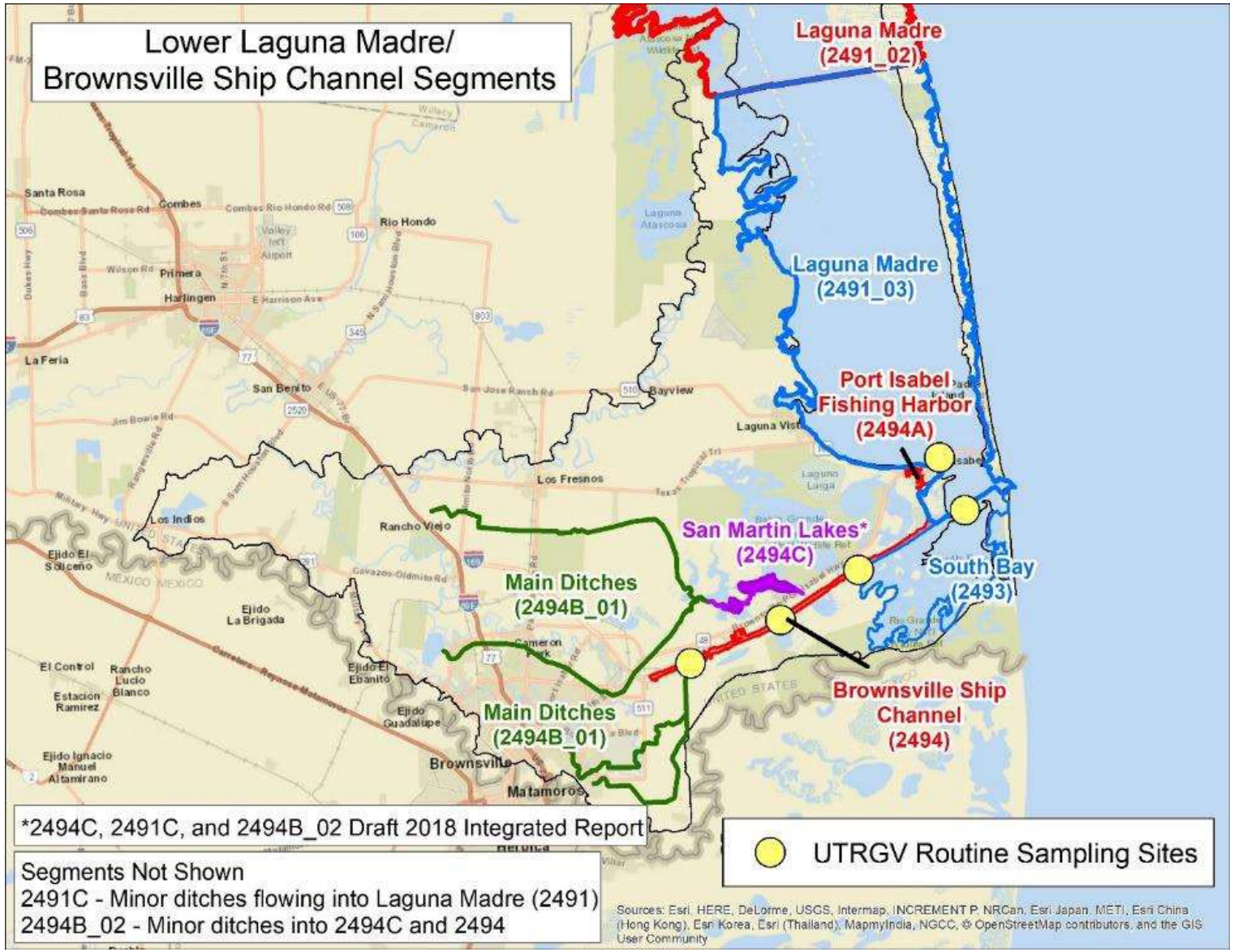
2024 REGIONAL SMALL CITIES COALITION

2024 Annual Conference

July 24, 2024

Background

- First watershed characterization
  - Performing Party: Texas Water Resources Institute/UTRVG
  - Performance Period:09/01/15-08/31/18
  - Project Outputs: Sub-basin delineation, routine monitoring sampling along the Ship Channel and Port Isabel causeway landing
  - Status: Project Closed



Background

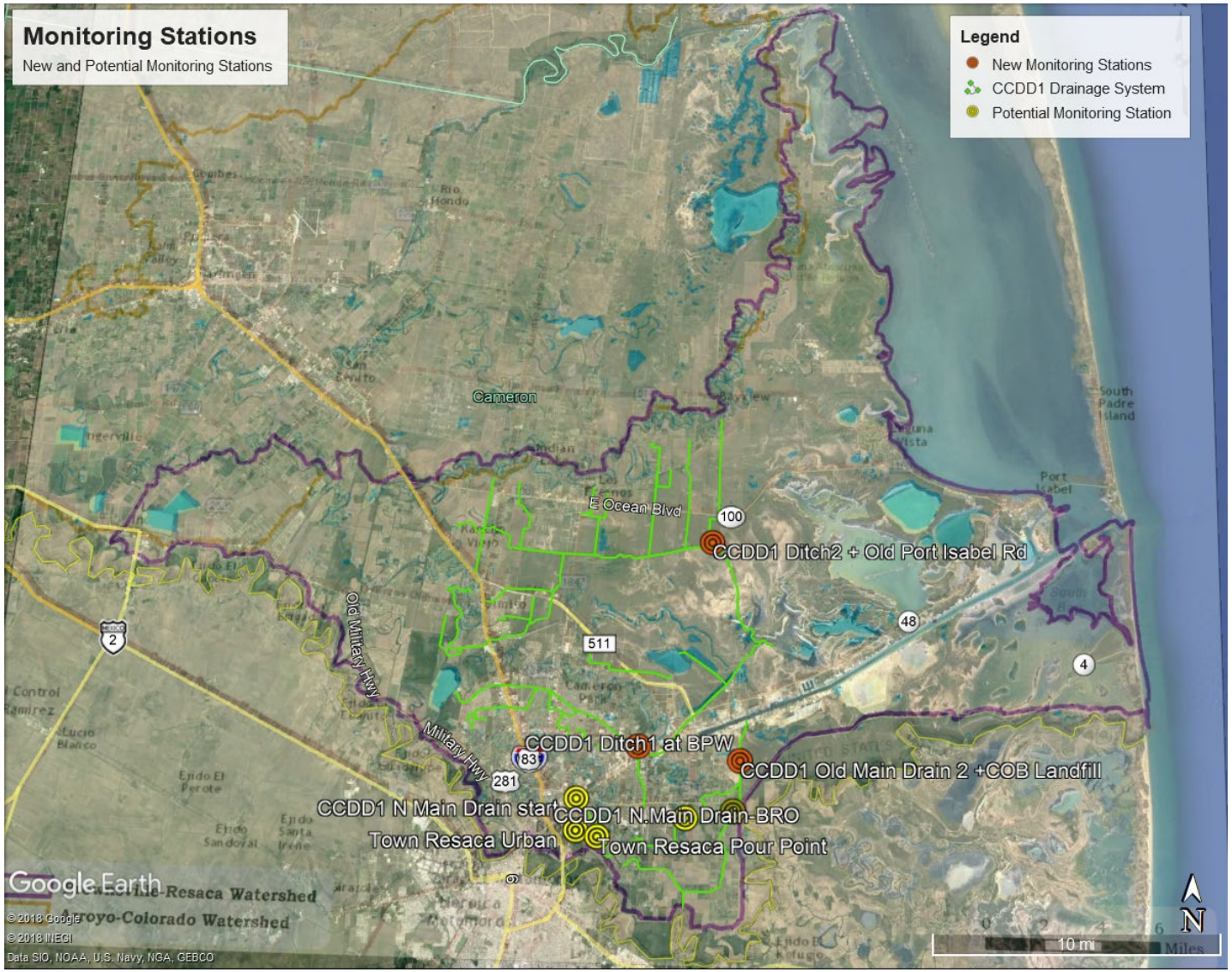
- Results for enterococci concentrations (CFU/100ml)

Major Events

- WPP Development-Phase 1
  - Performing Party: University of Texas Rio Grande Valley
  - Performance Period:09/01/17-08/31/20
  - Project Outputs: Watershed Characterization Based on Existing Data and Limited Monitoring Data
  - Status: Project Closed
- WPP Development- Phase 2
  - Performing Party: University of Texas Rio Grande Valley
  - Performance Period: ~09/01/19-08/31/22
  - Project Outputs: Development of approved monitoring QAPP including continuous water quality monitoring component and tidal prism modeling for San Martin Lake
  - Status: Project Closed

Phase I Project Scope

- Characterize water quality of 3 Brownsville Ship Channel Tributaries
  - Existing data
    - USGS Watershed Boundaries
  - Direct Data Collection
    - Approved QAPP
    - 8 Quarterly sampling events: water quality, flow, and stage height
    - Commissioning of Real-Time Hydrologic Stations
  - Load Duration Curves
    - Nutrients, *E. coli*
  - Watershed Delineation
  - Select Modeling
    - Modeling QAPP

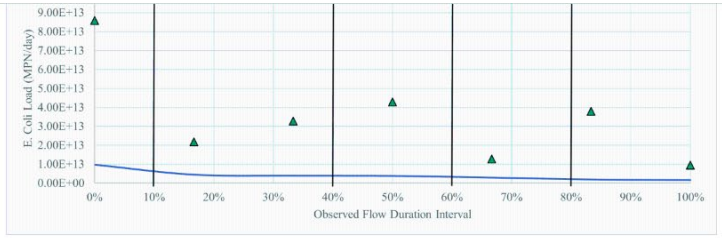


Phase I- Direct Data Collection

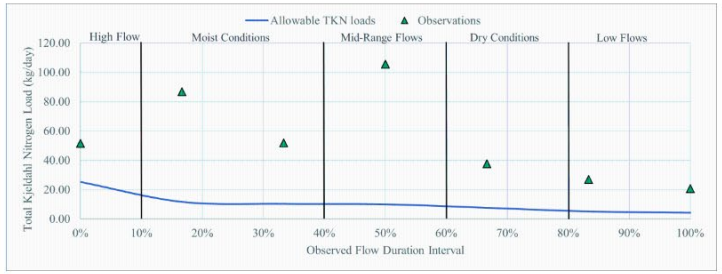
- 8 sampling campaigns
  - Feb 2020-Nov 2021
  - Water quality and flow
- Continuous stage height measurements
  - Real-Time-Hydrologic-Stations

Phase I- Load Duration Curves

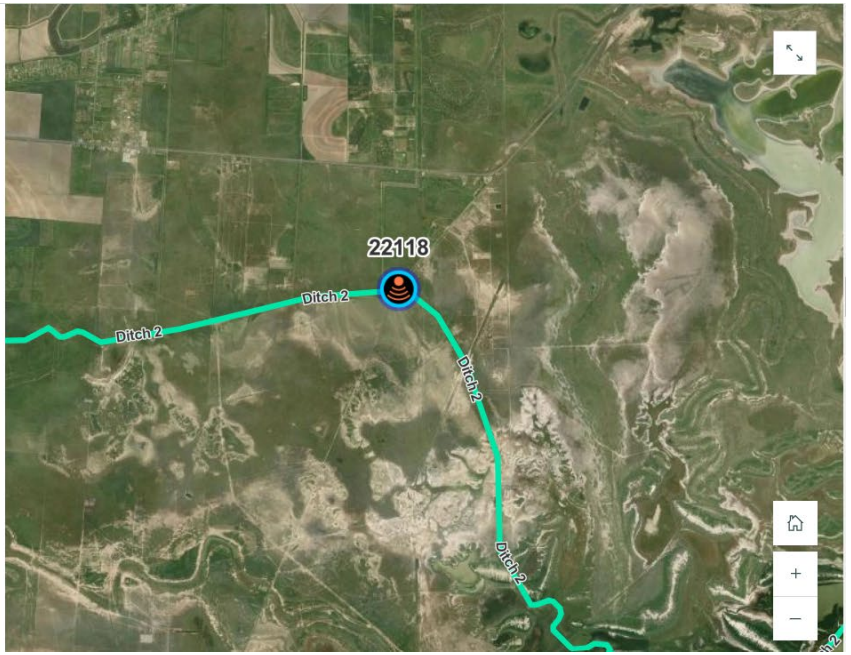
- Spread sheet model
- Loads calculated as product of concentration and flow rate
- Flows are percentile ranks
- Maximum daily loads *f(flow, water quality criteria)*
- Enables assessment of hydrologic conditions resulting in excessive NPS loads.
  - E.g. excessive load during high flow events suggest NPS loading
  - Excessive loads during low flow suggest continuous point source loading



LCD of E. Coli

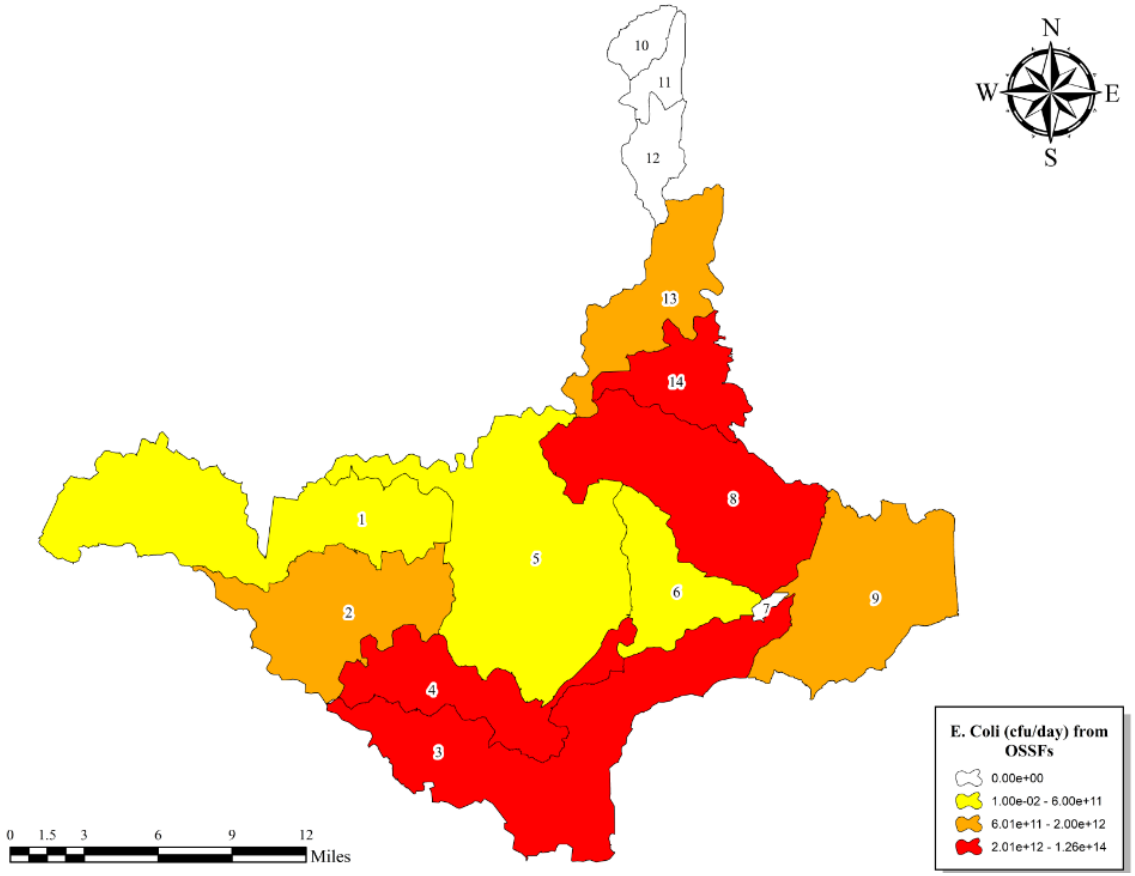


LDC of Total Kjeldahl Nitrogen



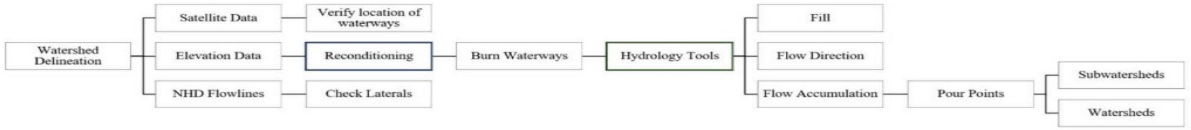
Phase 1- Spatially Explicit Load Enrichment Calculation Tool (SELECT)

- Predicts *E. coli* loads from various sources
  - *Point Sources*
    - *Concentrated Animal Feeding Operations, Wastewater Treatment Plants, OSSF*
  - *NPS*
    - *Livestock, pets, wildlife*
  - *Based on land use data*

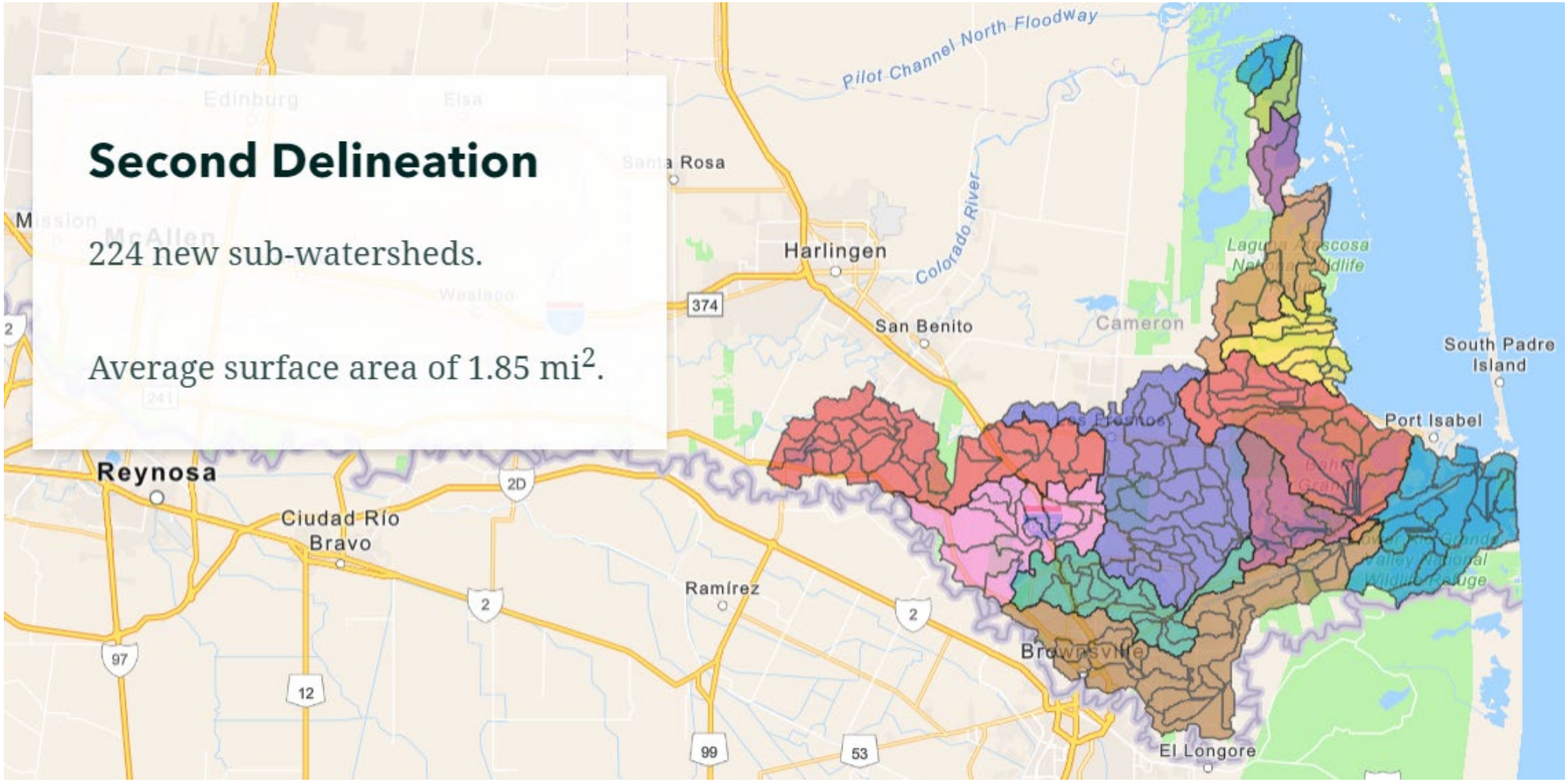


Phase I-Watershed Delineation

Digital Elevation Model (DEM) Reconditioning Process.



Watershed Delineation Methodology. Source: (Navarro et al., 2021).



Phase 1-Conclusions

- Fecal coliform loads exceeded recreational contact concentrations in all monitoring locations and sampling events.
- Other water quality observations
  - Ditch No. 1 (SWQM 22120) – always failed to meet water quality criteria for nutrients and fecal coliform
  - Ditch No. 2 (SWQM 22118)- failed to meet water quality criteria for nutrients (TKN, phosphorus, and Nitrogen).
  - Old Main Drain (SWQM 22121)- showed largest daily loads for fecal coliforms and always failed to meet water quality criteria for TKN.
- SELECT model supported fecal coliform observations

Phase 1- Publications

1. Navarro, L., Mahmoud, A., Ernest, A., Oubeidillah, A., Johnstone, J., Chavez, I.R.S., and Fuller, C. (2021) Development of a Cyberinfrastructure for Assessment of the Lower Rio Grande Valley North and Central Watersheds Characteristics. Sustainability, 13(20). https://doi.org/10.3390/su132011186.
2. Santos Chavez, Ivan Rene, "Water Quality Monitoring to Assess Pollutant Loadings in Brownsville Ship Channel Watershed" (2022). *Theses and Dissertations*. 1102. https://scholarworks.utrgv.edu/etd/1102

Phase 2-Project Scope

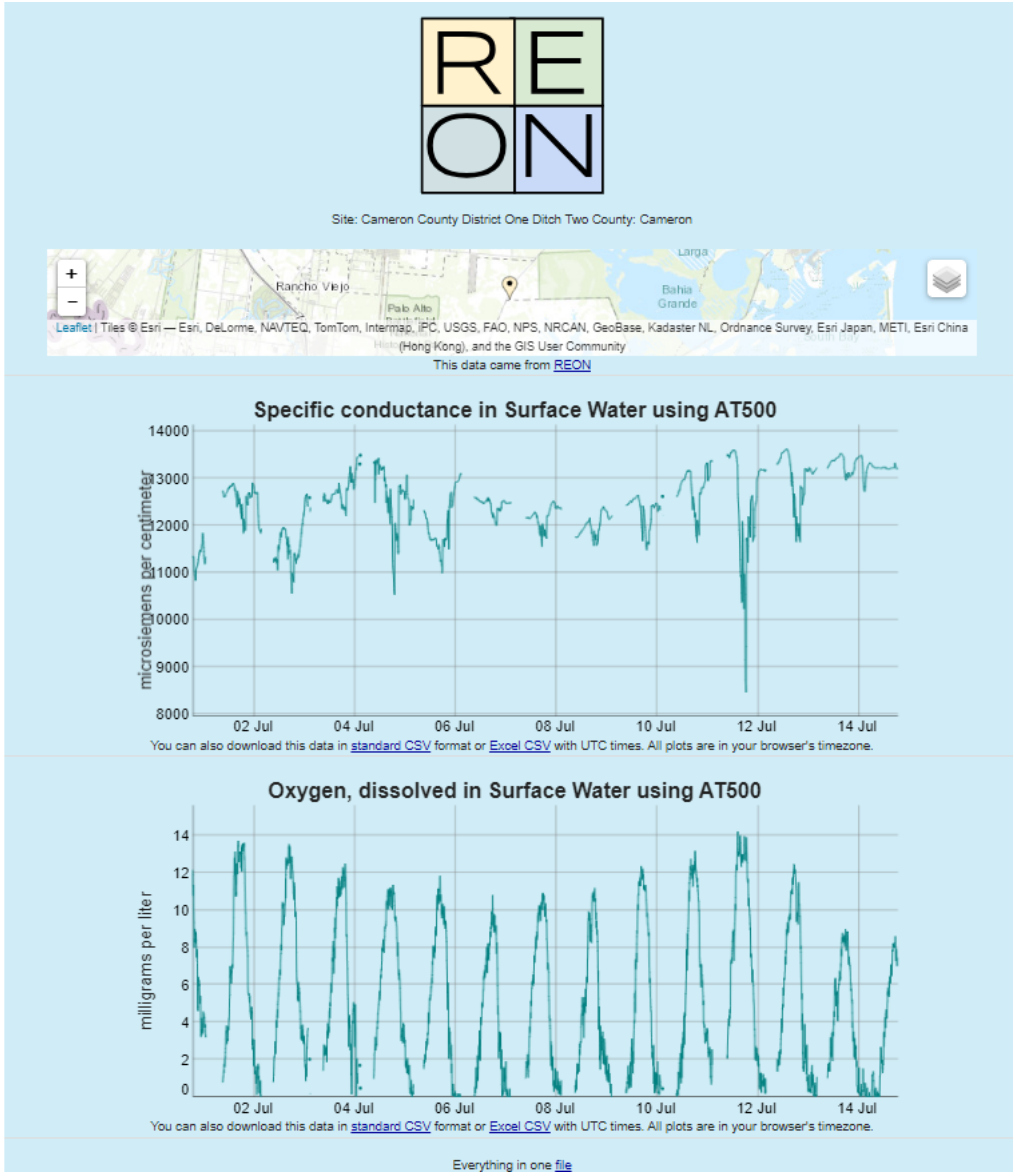
- Stakeholder development
- Data collection to fill gaps in initial watershed characterization
- Development of watershed model
- Education and outreach
- Development of a WPP

Phase 2-QAPP

- Phase 1 and 2- Water Quality Monitoring QAPP
  - Continued quarterly sampling events
  - Added limited monitoring at San Martin Lake (i.e. discharge measurements)
  - Continuous Monitoring
    - RTHS stream stage heights
    - Water quality (Temperature, Specific Conductance, Dissolved Oxygen)
- Modeling and Geospatial Data Collection-QAPP
  - Draft version: 11/2/21
  - Water Quality Data Analysis- trends, seasonal variation, spatial patterl
  - Load Characterization with SELECT
  - Load Duration Curves
  - Tidal PRISM (considered but deemed outside scope of WPP)

Phase 2- Monitoring

- Monitoring initiated by UTRGV
- Established continuous water quality monitoring at 3 SWQM stations.
- Project closed prior to completion following changes in project administrative structure.



Source: RATES Inc. @ http://rths.us/reonrgv.cgi

Continuing Efforts

- FY 2024- TCEQ CWA Section 319(h) Proposal
  - Completion of the Lower Laguna Madre Port of Brownsville WPP
  - Project Lead: Cameron County
  - Status: No Selected for Funding
- FY 2025- TCEQ CWA Section 319(h) Proposal
  - Lower Laguna Madre and Brownsville Ship Channel-Watershed Characterization
  - Project Lead: RATES, Inc.
  - Status: In development: Due: August 8, 2024
  - Scope:
    - Element A- Identify and quantify source of pollution
    - Element B- Identify water quality target goals and pollution reductions need to achieve goals
    - Element E- Develop and information and education component
  - 1st of 2 phased WPP development process
  - Period of Performance:
    - Phase 1: 36 months
    - Phase 2: 36 months