PETRONILA & SAN FERNANDO CREEKS POLLUTANT LOADS & MANAGEMENT MEASURES

Texas Water Resources Institute

September 1, 2021

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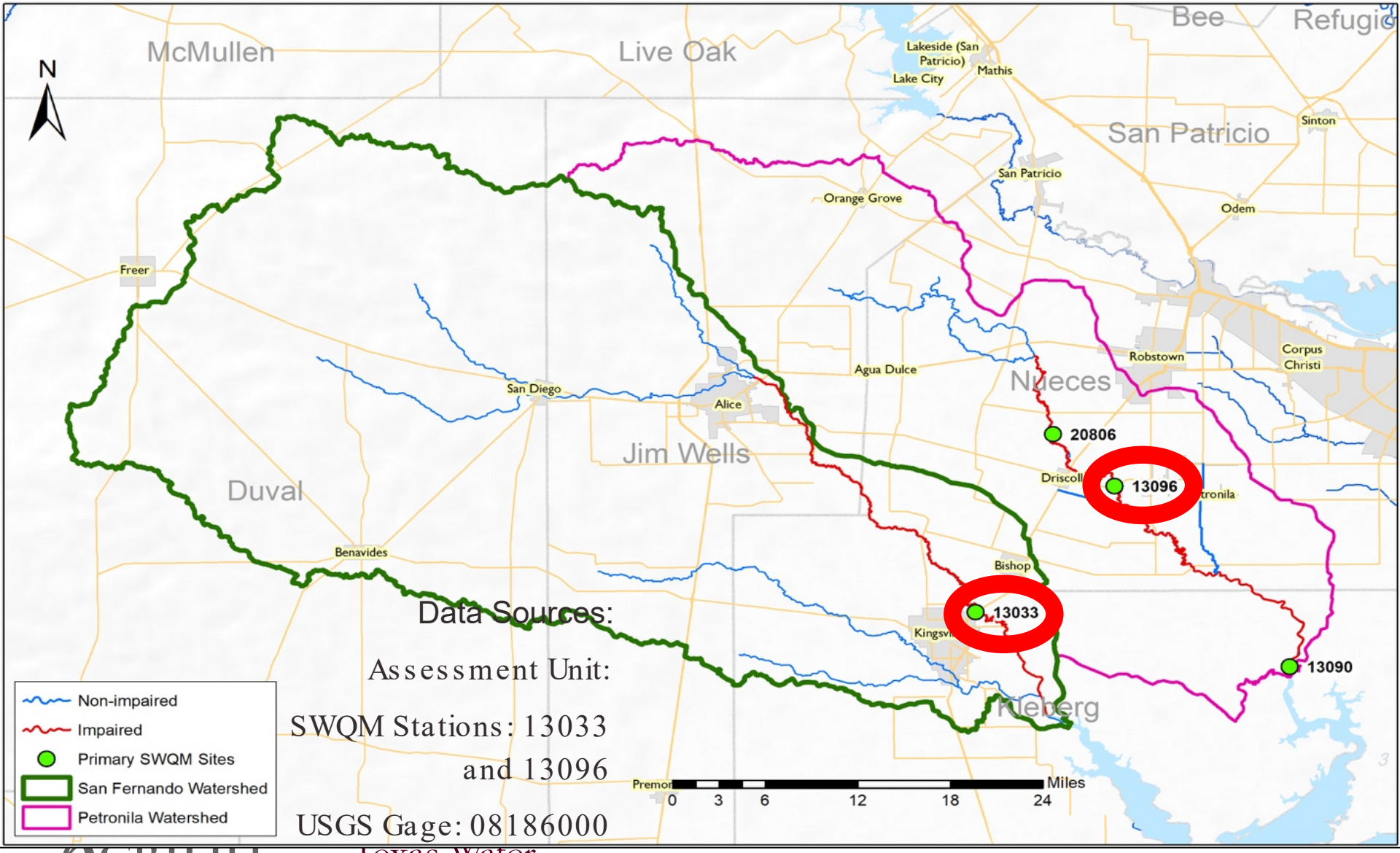
Methods

- **Load Duration Curves (LDC)** estimate current bacteria loads and needed bacteria load reductions
- LDCs were calculated at assessment units with sufficient bacteria and mean daily flow records
- Data used:
  - Water quality monitoring data from TCEQ SWQIM Database (samples collected by TCEQ or NRA)
  - Instantaneous flow measurements collected by NRA
- Data available that we are still evaluating:
  - Mean daily streamflow from nearest USGS streamgage

Petronila & San Fernando Creek



Data Sources:

Assessment Unit:

SWQM Stations: 13033 and 13096

USGS Gage: 08186000

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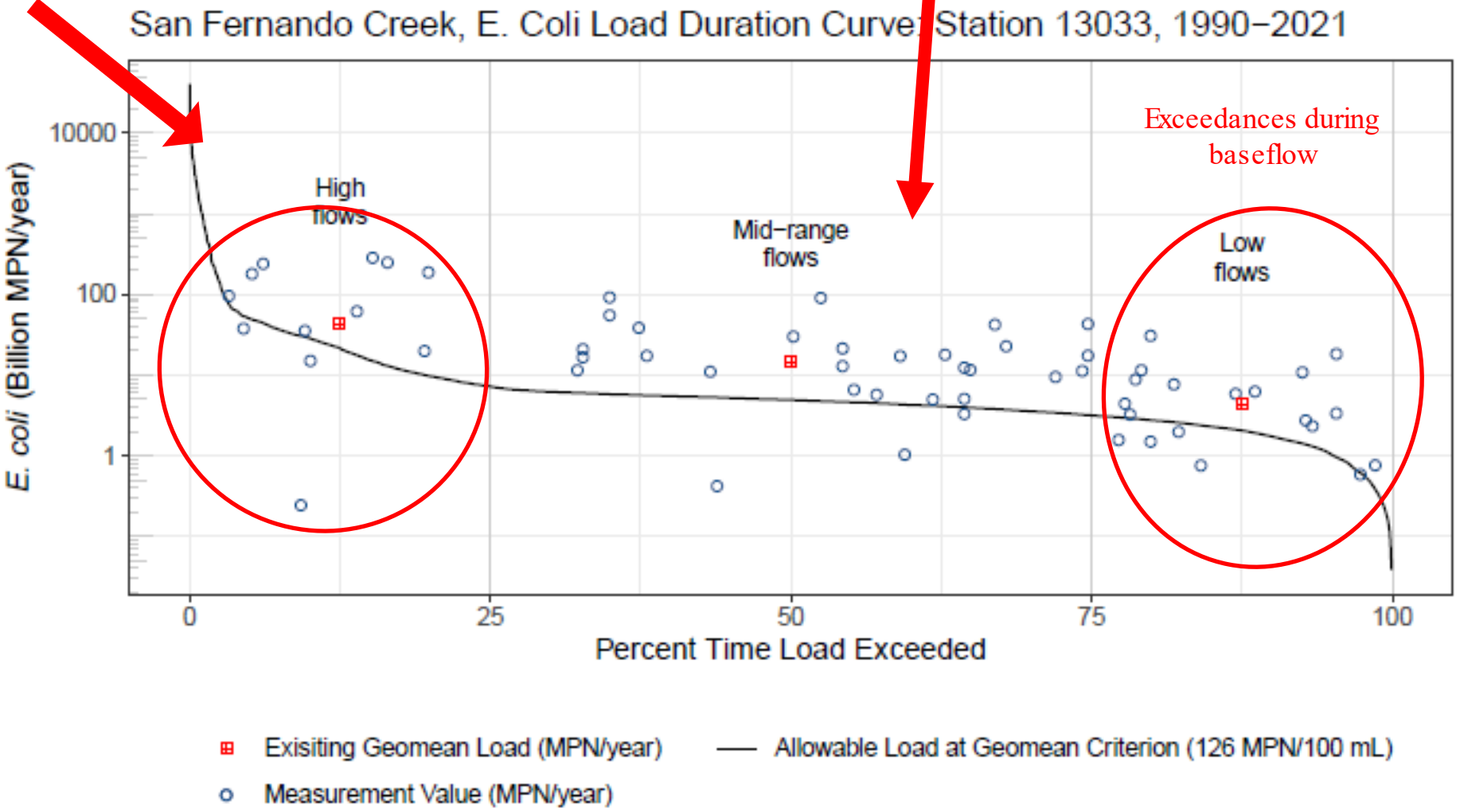
Exceedances associated with higher flow rates; stormflow perhaps

Normal, non-runoff flow conditions



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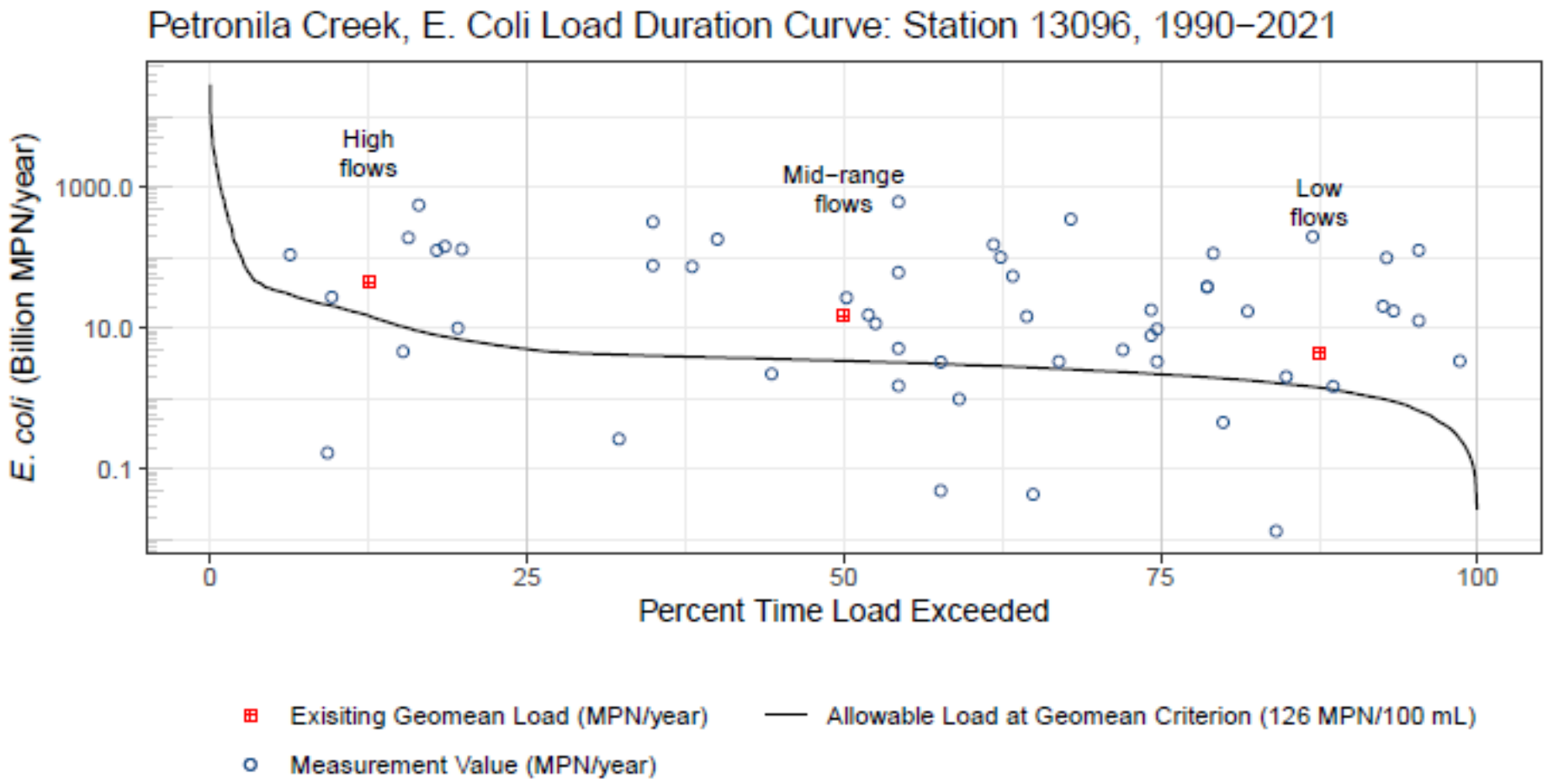

Petronila Creek, E. Coli Load Duration Curve: Station 13096, 1990–2021
E. coli (Billion MPN/year)
1000.0
10.0
0.1
High flows
Mid–range flows
Low flows
0
25
50
75
100
Percent Time Load Exceeded
Exisiting Geomean Load (MPN/year)
Allowable Load at Geomean Criterion (126 MPN/100 mL)
Measurement Value (MPN/year)

Linking exceedances to sources:

Possible Sources	Range of Flow Conditions High Flow	Moist	Mid-Range	Dry	Low
Stormwater-Impervious Areas	High	High	Medium		
Upland and riparian runoff	High	High	Medium		
Sanitary sewer overflows	High	Medium	Medium		
Resuspension	High	High	Medium		
Failing/non-existent Septic	High	High	Medium	Medium	Medium
Direct deposition (wildlife feral hogs, livestock, pet			Medium	High	High
Illegal dumping			Medium	Medium	Medium
Point Sources				Medium	High

San Fernando Creek	Flow Condition		
	Lowest Flows	Mid-Range Flows	Highest Flows
Days per year	91.25	182.5	91.25
Median Flow (cubic feet per second)	**0.673**	**1.595**	**7.033**
Exsisiting Geomean Concentration (MPN/100 mL)	265.647	376.154	252.875
Allowable Daily Load (Billion MPN)	**2.075**	**4.917**	**21.68**
Allowable Annual Load (Billion MPN)	189.311	897.33	1,978.35
Existing Daily Load (Billion MPN)	**4.374**	**14.678**	**43.511**
Existing Annual Load (Billion MPN)	399.13	2,678.84	3,970.33
Annual Load Reduction Needed (Billion MPN)	**209.82**	**1,781.51**	**1,992.08**
Percent Reduction Needed	52.57%	66.50%	50.17%
Total Annual Load (Billion MPN)	**7,048.39**		
Total Annual Load Reduction (Billion MPN)	3,983.41		
Total Percent Reduction	**56.52%**		
MPN - Most probable number			

All load numbers are in billions of CFUs (count of *E. coli*)

Petronila Creek	Flow Condition		
Station: 13096	Lowest Flows	Mid-Range Flows	Highest Flows
Days per year	91.25	182.5	91.25
Median Flow (cubic feet per second)	**0.463**	**1.097**	**4.838**
Exsisiting Geomean Concentration (MPN/100 mL)	1103.478	480.515	419.054
Allowable Daily Load (Billion MPN)	**1.427**	**3.382**	**14.914**
Allowable Annual Load (Billion MPN)	130.24	617.16	1,360.90
Existing Daily Load (Billion MPN)	**12.499**	**12.897**	**49.601**
Existing Annual Load (Billion MPN)	1,140.61	2,353.61	4,526.12
Annual Load Reduction Needed (Billion MPN)	**1,010.37**	**1,736.45**	**3,165.22**
Percent Reduction Needed	88.58%	73.78%	69.93%
Total Annual Load (Billion MPN)	**8,020.34**		
Total Annual Load Reduction (Billion MPN)	5,912.04		
Total Percent Reduction	**73.71%**		
MPN - Most probable number			

All load numbers are in billions of CFUs (count of *E. coli*)

What does that mean?

- Most of the year Petronila and San Fernando Creeks are above the water quality standard
- The LDC indicates that a diverse set of sources contribute to bacteria loads
  - Perhaps more so under normal to dry conditions than wet, BUT
  - General lack of water quality data collected under high flow conditions; so LDCs are not wholly representative of instream conditions
    - Why don't we have this data?
      - Low frequency of occurrence
      - Personnel safety and can't be in multiple places at once
- Requires a diverse set of solutions
  - All sources are contributors
  - Need to think about what can be done to feasibly manage each source

POTENTIAL MANAGEMENT MEASURES

Overview

Potential Management Measures

Livestock and Agriculture

- Promote, develop, and implement Conservation Plans or Water Quality Management Plans on agricultural lands
- Education and outreach

Wild Pigs

- Provide technical support to landowners for wild pig management
- Promote removal of wild pigs
- Education and outreach

Overview

Potential Management Measures

Dogs and Cats

- Maintain and expand pet waste stations
- Maintain and promote spay neuter programs
- Education and outreach

Illegal Dumping

- Host watershed cleanup events
- Host household and hazardous waste collection events

Overview

Potential Management Measures

Urban Stormwater Runoff

- Comply with MS4 requirements
- Retrofit existing SW detention ponds where possible
- Riparian restoration project
- Educate/require restaurant/commercial trash bin covers (manage urban birds and wildlife)
- Education and outreach

Potential Management Measures

Septic Systems

- Develop repair and replacement program
- Education and outreach

Promote, develop, and implement Conservation Plans or Water Quality Management Plans on agricultural lands

- On average each implemented CP or WQMP is estimated to reduce potential bacteria loadings by 1,359 - 2,347 billion colonies per year in this watershed.
- Over ten years how many CPs or WQMPs can we implement?

Estimate within 10 years we can implement 200 CPs in San Fernando watershed and 200 CPs in Petronila watershed.

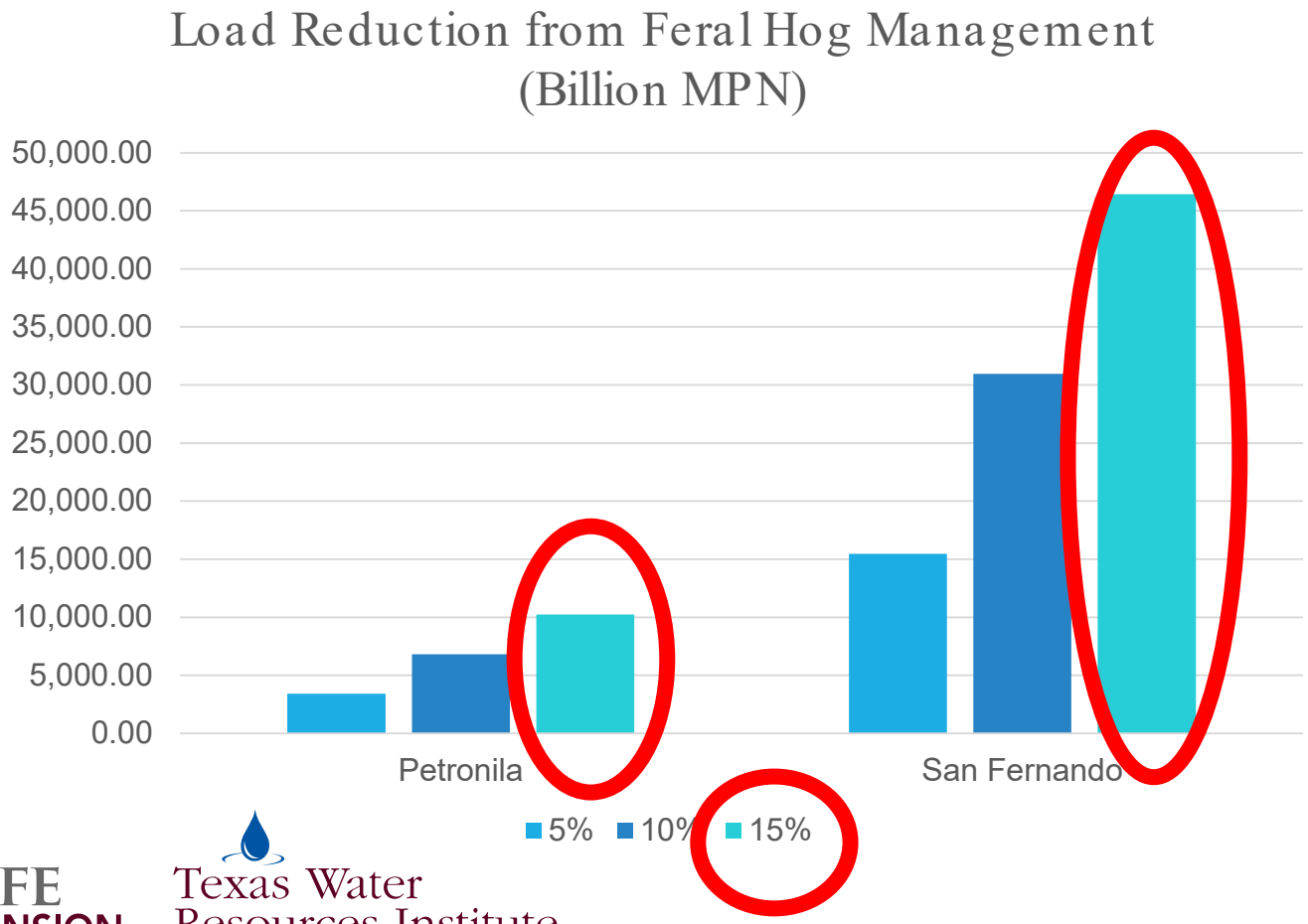
- Historically about 10-13 CPs are completed each FY
  - With additional support estimate we can increase participation to 20 plans per year.

Provide technical assistance and promote removal of wild pigs

- On average each wild pig can contribute a potential 34.7 billion cfu bacteria annually
- Can we establish a goal or removing a set number of hogs annually?

Petronila Creek

- 5% = 197 hogs
- 10% = 393 hogs
- 15% = 590 hogs



San Fernando Creek

- 5% = 891 hogs
- 10% = 1,783 hogs
- 15% = 2,674 hogs

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Repair and replace faulty septic systems, or decommission and connect to central wastewater treatment

- Estimated 9,086 systems in the watershed with an estimated 15% failure rate through much of the watershed (1,363 OSSFs needed for repair)
- Petronila (4,860 OSSFs→ 729 OSSFs failing) San Fernando (4,226 OSSFs → 634 OSSFs Failing)
- What is an appropriate replacement goal?

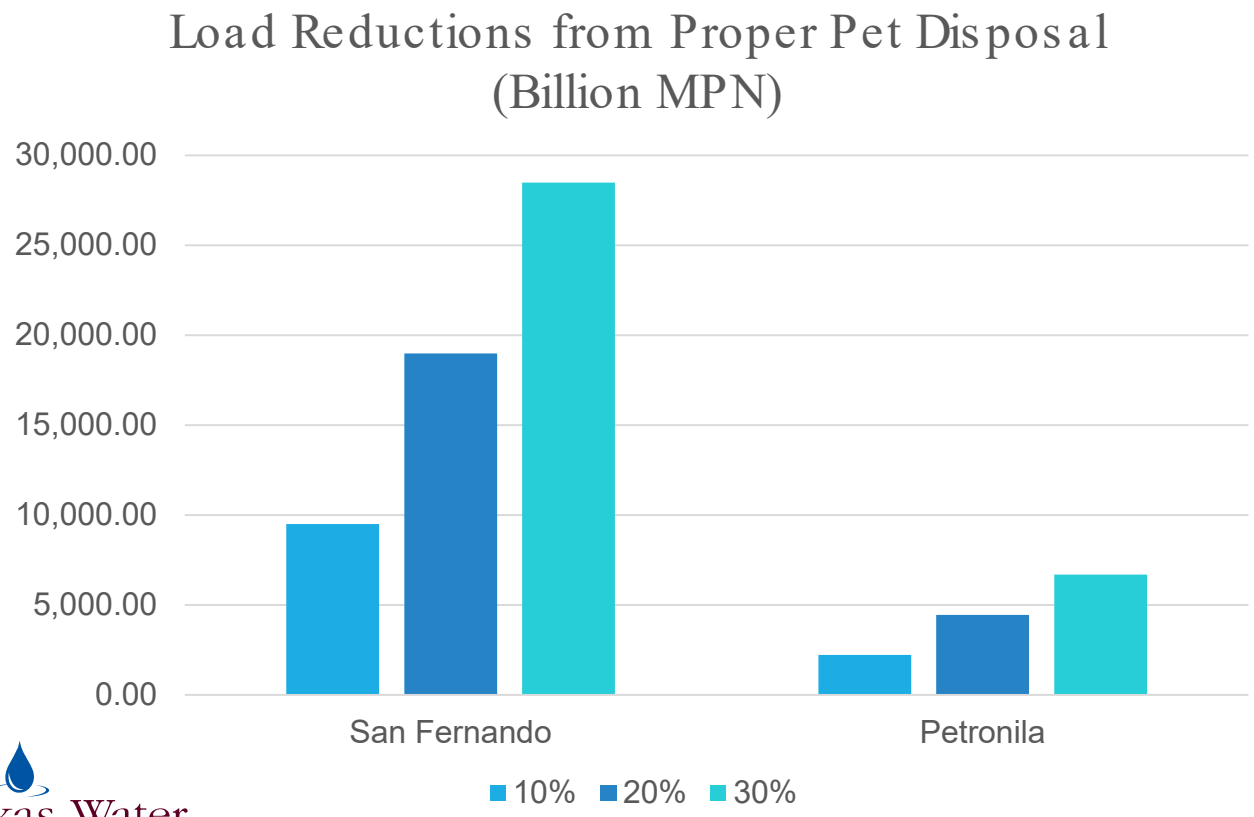
Estimate within 10 years we can repair/replace 60 septic systems in San Fernando watershed and 40 septic systems in Petronila watershed.

- TCEQ NPS funding typically can replace 15 septics in 3 year period
- Additional funding for repair/replacement of septics from USDA and GLO.

Maintain and expand pet waste stations, expand education and outreach

- Estimated 20,383 dogs in the watershed.
- Estimated 40% don't pick up after pets, 20% of those people are typically willing to change behavior (Swann 1999)
- Can we establish a goal of reaching a set number of pet owners annually?

- Petronila: 6,311 households → estimated 3,875 dogs
- San Fernando: 26,885 households → estimated 16,507 dogs



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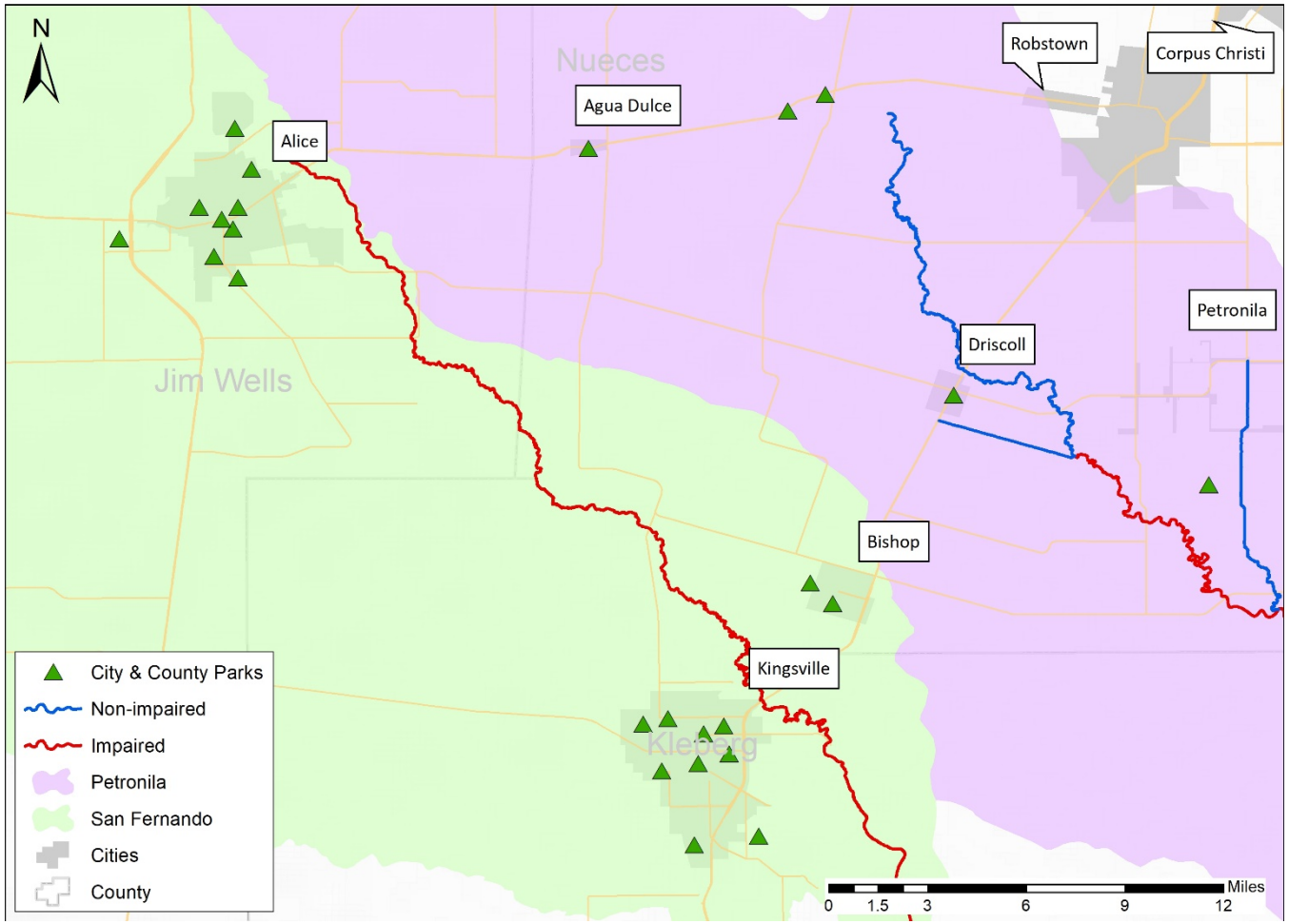
Petronila & San Fernando Creek Parks



27 city/county parks in the watershed

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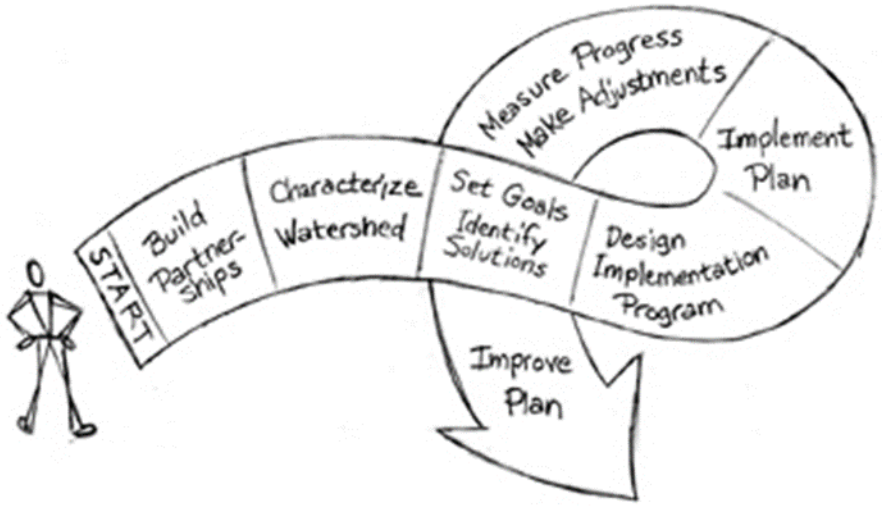
Other Management Measures

- Illegal dumping
  - Potential loadings and reductions are highly variable, reductions were not calculated
- Wildlife
  - Potential loadings and reductions are highly variable, reductions were not calculated
- Outreach to Septic System Homeowners/Colonias
  - Educational Programs
  - Extension Publications
  - Targeted Mailing
  - Distribute informational flyers at food drives, local events
- Urban Stormwater Management
  - Potential load reductions were not calculated since reductions will be highly dependent on the project specifications and catchment size
- WWTFs
  - Nueces River Authority is seeking funding to take over management and provide infrastructure improvement on WWTFs around the watershed
  - Develop SSO initatives
  - Education and Outreach for plant operations and homeowners
    - Proper disposal of Fats, Oils, and Grease and sanitary wipes

Next Steps – Near Term

- Revise Draft Chapters of WPP
  - Please send edits in by September 15th.
- Begin drafting management measure chapters to present at next meeting
- Next Stakeholder Meeting will be in early November.



Questions?

Clare Escamilla
Texas Water Resources Institute
clare.entwistle@ag.tamu.edu

Lucas Gregory, PhD
Texas Water Resources Institute
LFGregory@ag.tamu.edu

Ennis Rios
Texas Water Resources Institute
Ennis.Rios@ag.tamu.edu

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