

WATERSHED POLLUTANT SOURCE ASSESSMENT

ENNIS RIOS

ENNIS.RIOS@AG.TAMU.EDU

CH4: POLLUTANT SOURCES

Point Source

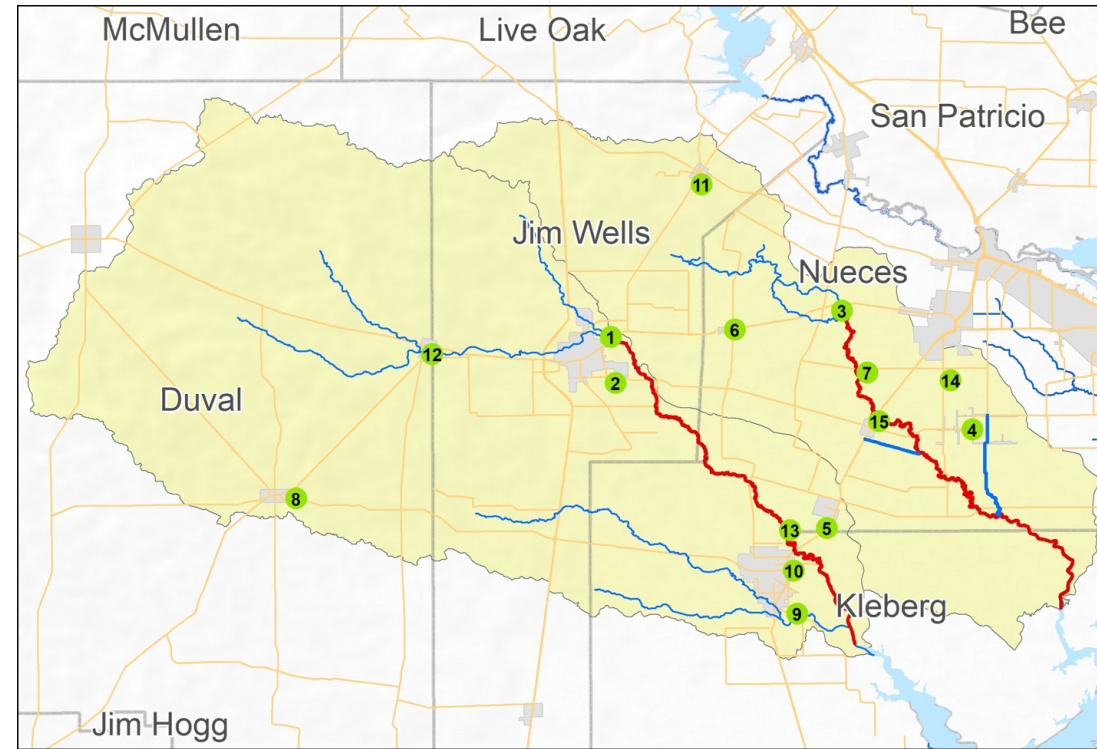
- Sources with a defined, easily identifiable location
- Permitted discharges: WWTFs

Nonpoint Source

- Sources that are diffuse in nature
- Animals scattered across the watershed
- OSSFs across the watershed
- Stormwater runoff

WASTEWATER TREATMENT FACILITIES (WWTFs)

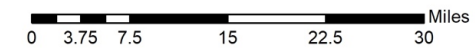
POTENTIAL
POLLUTANTS:
- BACTERIA
- NUTRIENTS
- ORGANIC
MATERIALS
- OTHERS



Petronila & San Fernando Creek WWTPs



Sources:
Outfall Permits - TCEQ
Stream Segments - TCEQ
Counties, Cities, Roads - TNRIS



● Active Permitted WWTP

- | | |
|---|--------------------------|
| 1: Alice Northeast WWTF | 10: Kingsville III WWTF |
| 2: Alice Southside WWTF | 11: Orange Grove WWTF |
| 3: Banquete WWTF | 12: San Diego MUD 1 |
| 4: Bishop CISD | 13: Ticona Polymers Inc |
| 5: City of Bishop WWTP | 14: US Ecology Texas Inc |
| 6: City of Agua Dulce WWTP | 15: City of Driscoll |
| 7: Coastal Bend Detention Center WWTF | |
| 8: Duval Co Conservation and Reclamation Dist | |
| 9: Kingsville I WWTF | |

SANITARY SEWER OVERFLOWS (SSOs)

Estimated SSO Volumes

Water Bodies	Total Received Gallons
Santa Gertrudis Creek	7,200
Tranquitas Creek	7,500
No water body provided	23,910

- Potential Pollutants:
 - Bacteria
 - Nutrients
 - Organic Materials
 - Others
- Volumes and events reported between January 1, 2016 and December 31, 2018

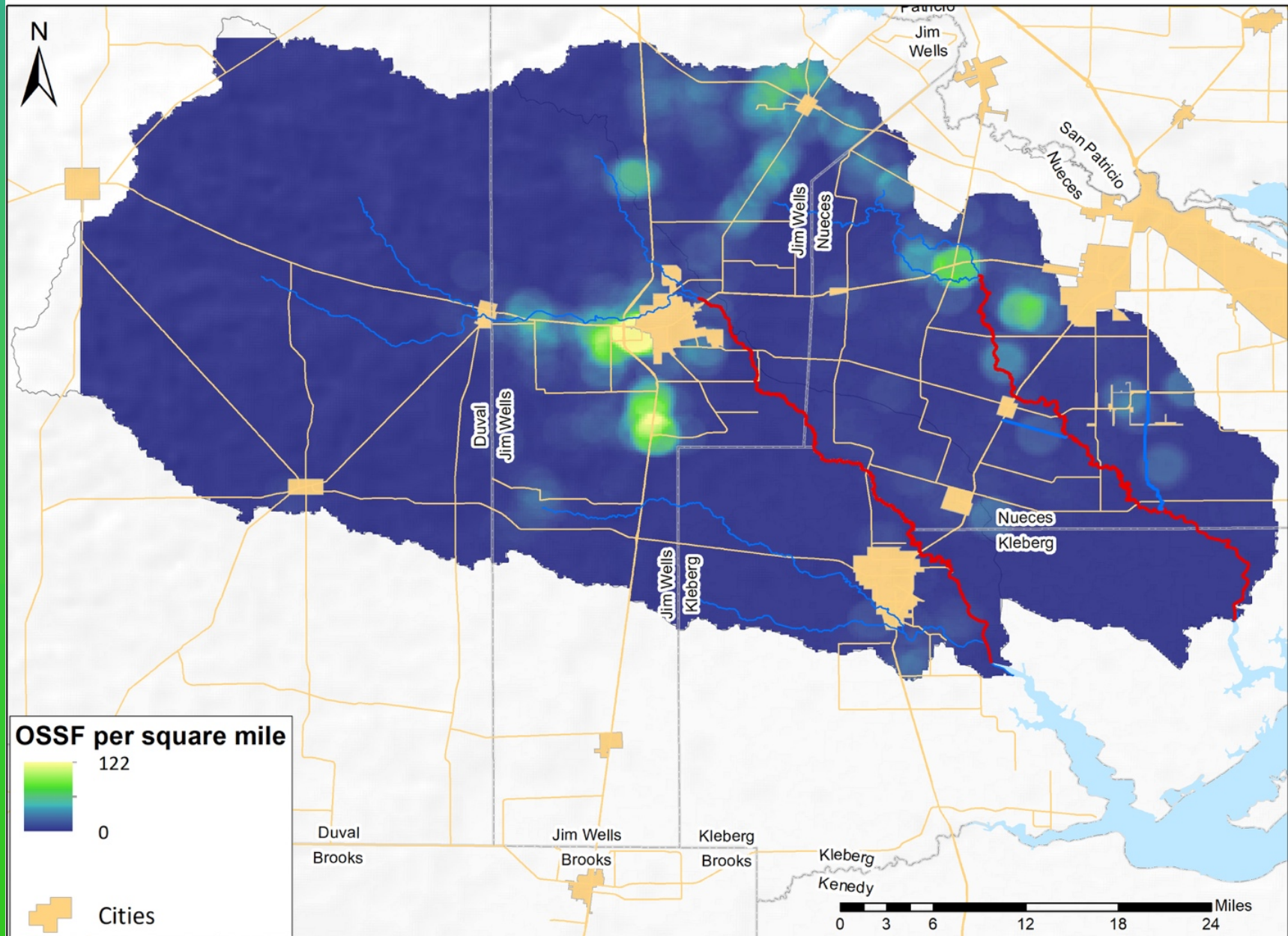
Reported SSO Events

Facility	Number of Events	Average gallons / event
Driscoll WWTF	1	1,000
Northeast WWTF (Alice)	2	10
Southside WWTF (Alice)	1	10
City of Kingsville I WWTF	5	1,440
City of Kingsville III WWTF	7	4,214
City of Bishop	1	600
Ticona Polymers Inc	2	15

Petronila & San Fernando Creek OSSF Density

ON-SITE SEWAGE FACILITIES (OSSFs)

- 9,086 OSSFs in watershed
- 25 OSSFs estimated within 100 yds of a waterbody
- Potential Pollutants:
 - Bacteria
 - Nutrients
 - Organic Materials
 - Others



LIVESTOCK

County	Livestock in Watershed				
	Cattle	Hog	Horse	Goat	Sheep
Duval	5,295	104	68	227	148
Jim Wells	22,012	130	643	1,670	338
Kleberg	6,252	63	112	295	103
Nueces	4,655	148	325	275	168
Total	38,214	445	1,148	2,467	757

- USDA National Ag Statistics data
- Verified against Farm Service Agency recommended stocking rates
- Confirmed by stakeholders



- Potential Pollutants:
 - Bacteria
 - Nutrients
 - Erosion



- Potential Pollutants:
 - Bacteria
 - Nutrients
 - Erosion

WILD ANIMALS

Watershed	Wildlife in Watershed	
	Feral Hogs	Deer
Petronila Creek	3,933	4,071
San Fernando Creek	17,826	13,522
Total	23,759	17,593

- Deer: Texas Parks and Wildlife survey density
- Feral Hogs: Stakeholder adjusted density based on area and statewide assessments
- No population estimates for other species

PETS

- American Vet Medical Association average density estimates (2018)
 - 0.614 dogs per household
 - 0.457 cats per household

County	Households*	Cat	Dog
Duval	3,339	1,855	1,159
Jim Wells	13,660	7,589	4,743
Kleberg	11,091	6,162	3,851
Nueces	4,830	2,683	1,677
Total	32,920	18,289	11,431

Potential Pollutants:

- Bacteria
- Nutrients

ILLEGAL DUMPING

- Debris and refuse disposed of outside a landfill
- Road crossings/rural access points on creeks and bay are prime locations



NUTRIENTS

Concern:

- Not directly related to bacteria
- Bacteria do require food (nutrients) for survival
- Excess nutrients in water can cause too much aquatic vegetation growth
 - Leads to low dissolved oxygen
 - May lead to toxic algae blooms

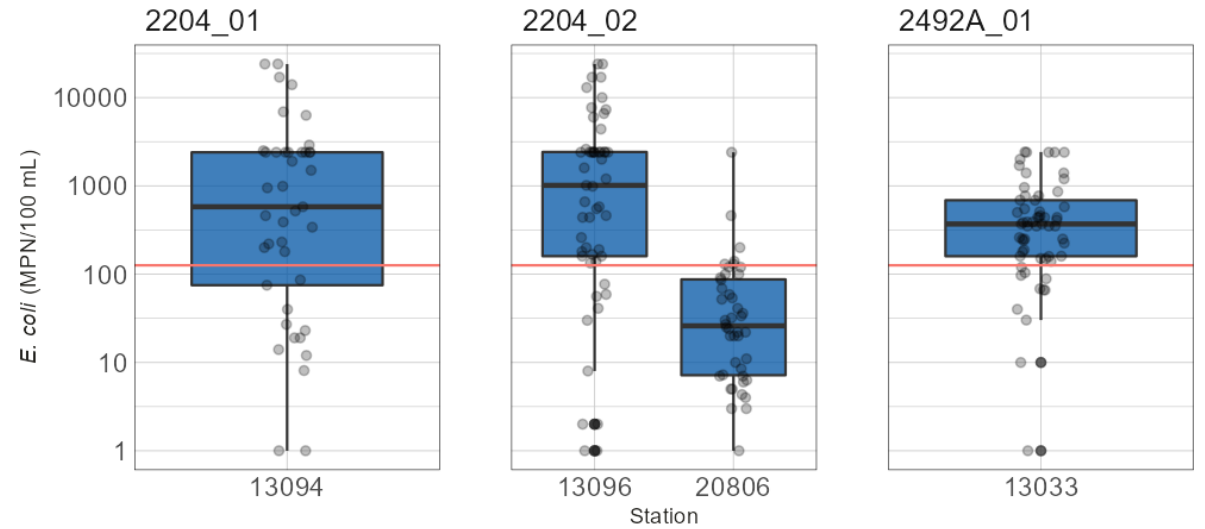
Potential Sources

- Fecal waste
 - Animals
 - Humans
- Fertilizers
 - Agricultural
 - Landscape
- Industrial discharges
- Naturally occurring

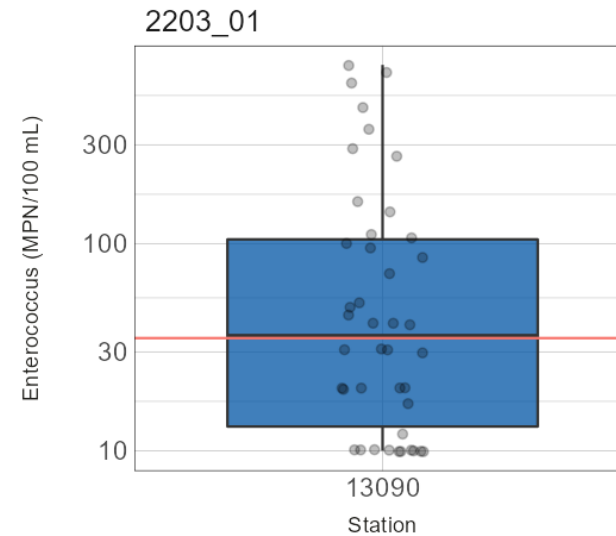
CH5: SOURCE ASSESSMENT

BACTERIA DATA REVIEW

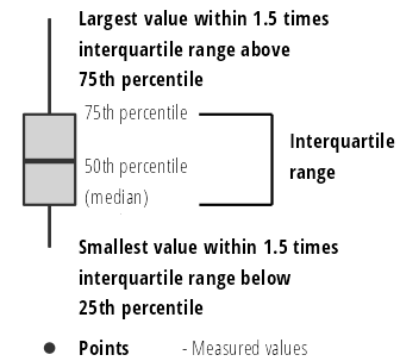
- All assessment units exceed water quality standard
- *E. coli* exceedances much greater than Enterococcus



— Geomean criterion (126 MPN/100mL)



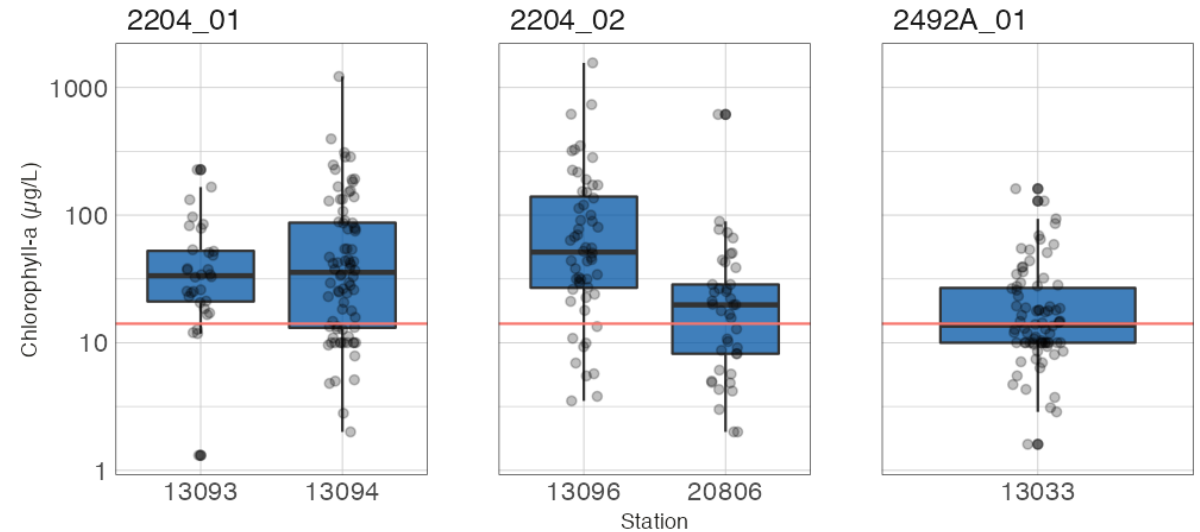
— Geomean criterion (35 MPN/100mL)



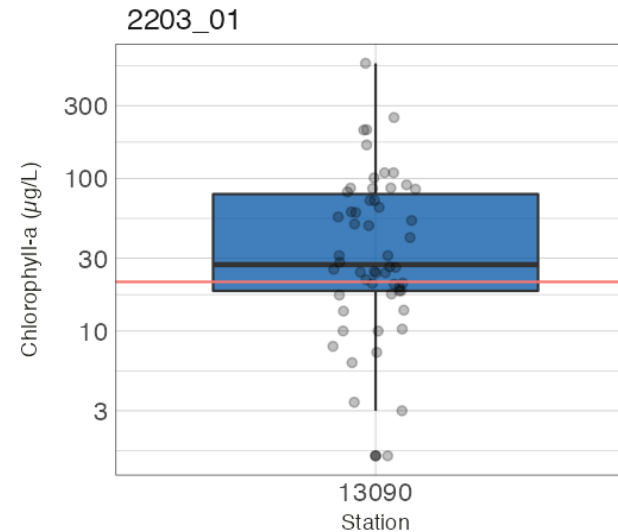
CHLOROPHYLL-A DATA REVIEW

- All assessment units exceed water quality screening level
- Concentrations variable across watershed
- Indicative of aquatic plant growth
- Surrogate for nutrient loading

Ammonia, Nitrate, Total Phosphorus exhibit periodic spikes but averages are below screening levels



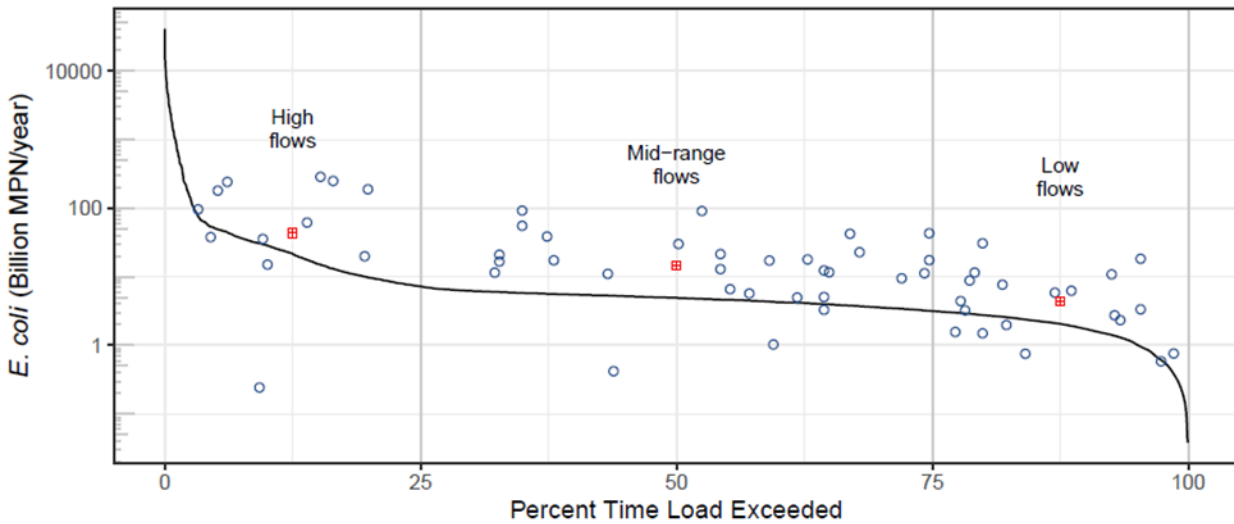
— Screening level (14.1 µg/L)



— Screening level (21 µg/L)

BACTERIA LOADING

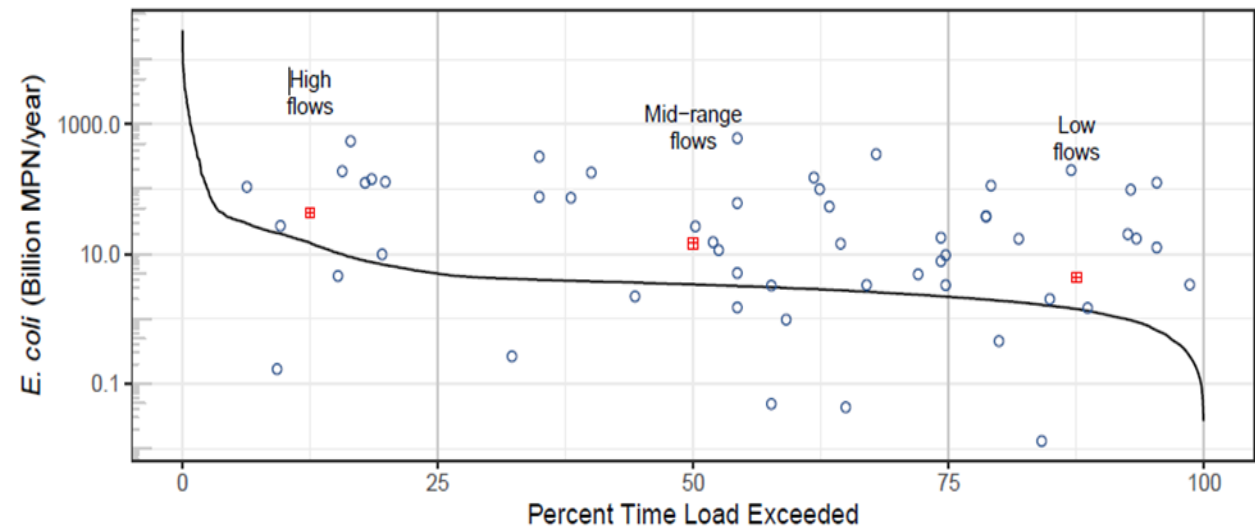
San Fernando Creek, E. Coli Load Duration Curve: Station 13033, 1990–2021



■ Existing Geomean Load (MPN/year) — Allowable Load at Geomean Criterion (126 MPN/100 mL)
○ Measurement Value (MPN/year)

- 3,983 Billion MPN Load Reduction Needed: ~56%

Petronila Creek, E. Coli Load Duration Curve: Station 13096, 1990–2021



■ Existing Geomean Load (MPN/year) — Allowable Load at Geomean Criterion (126 MPN/100 mL)
○ Measurement Value (MPN/year)

- 5,912 Billion MPN Load Reduction Needed: ~74%

POTENTIAL *E. COLI* LOADING ASSESSMENT

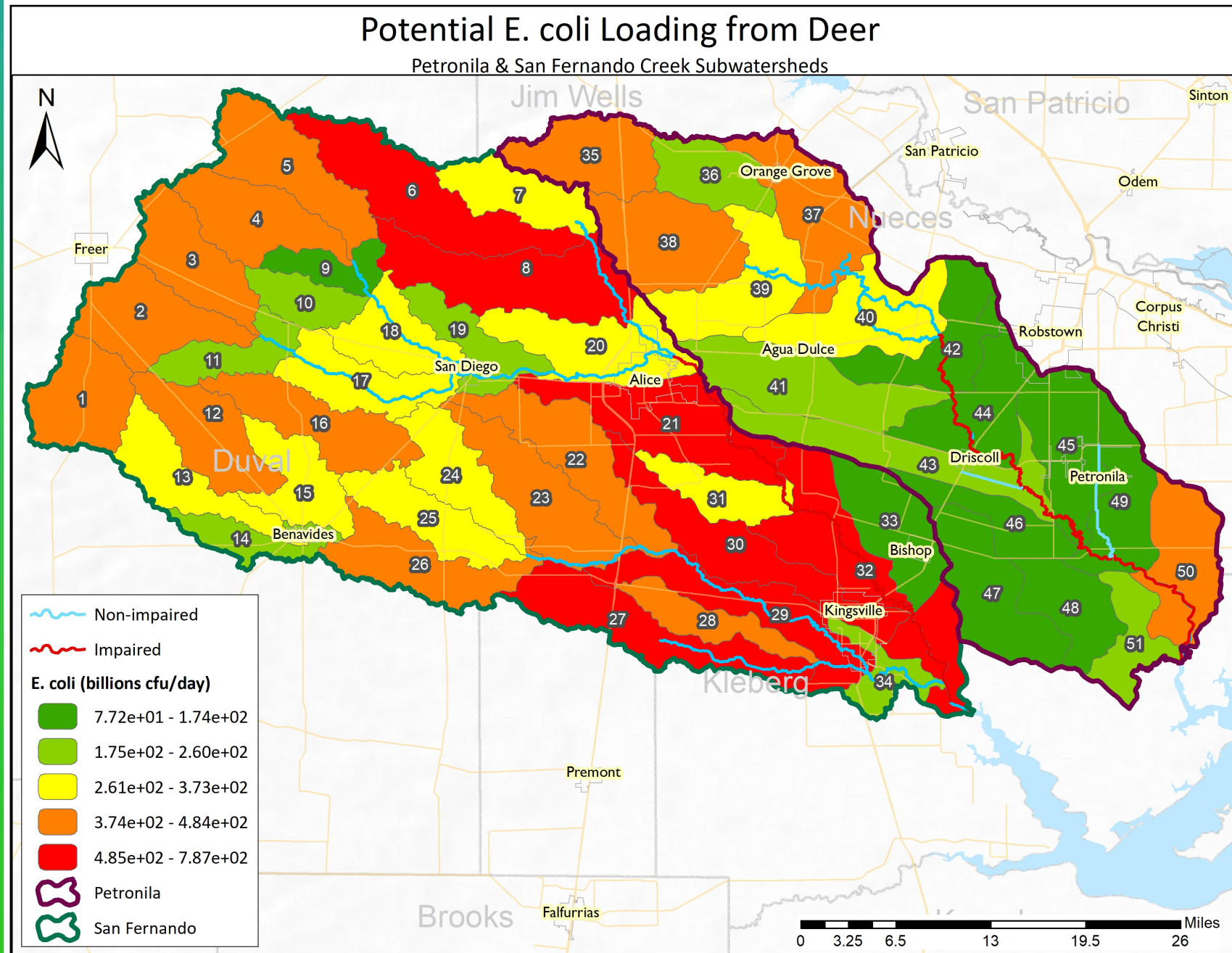
- Considers watershed characteristics
 - Soil, slope, land cover and land use
- Hydrologic network
- Populations
 - Animal counts
 - Human density
- Published bacteria loading rates
- Compares potential loads between watershed subbasins
 - Useful in helping identify priority areas for management recommendations based on need

WHITE-TAILED DEER

HIGHEST POTENTIAL SUBBASINS

PETRONILA
35, 37, 38, 50

SAN FERNANDO
6, 8, 21, 27,
29, 30, 32

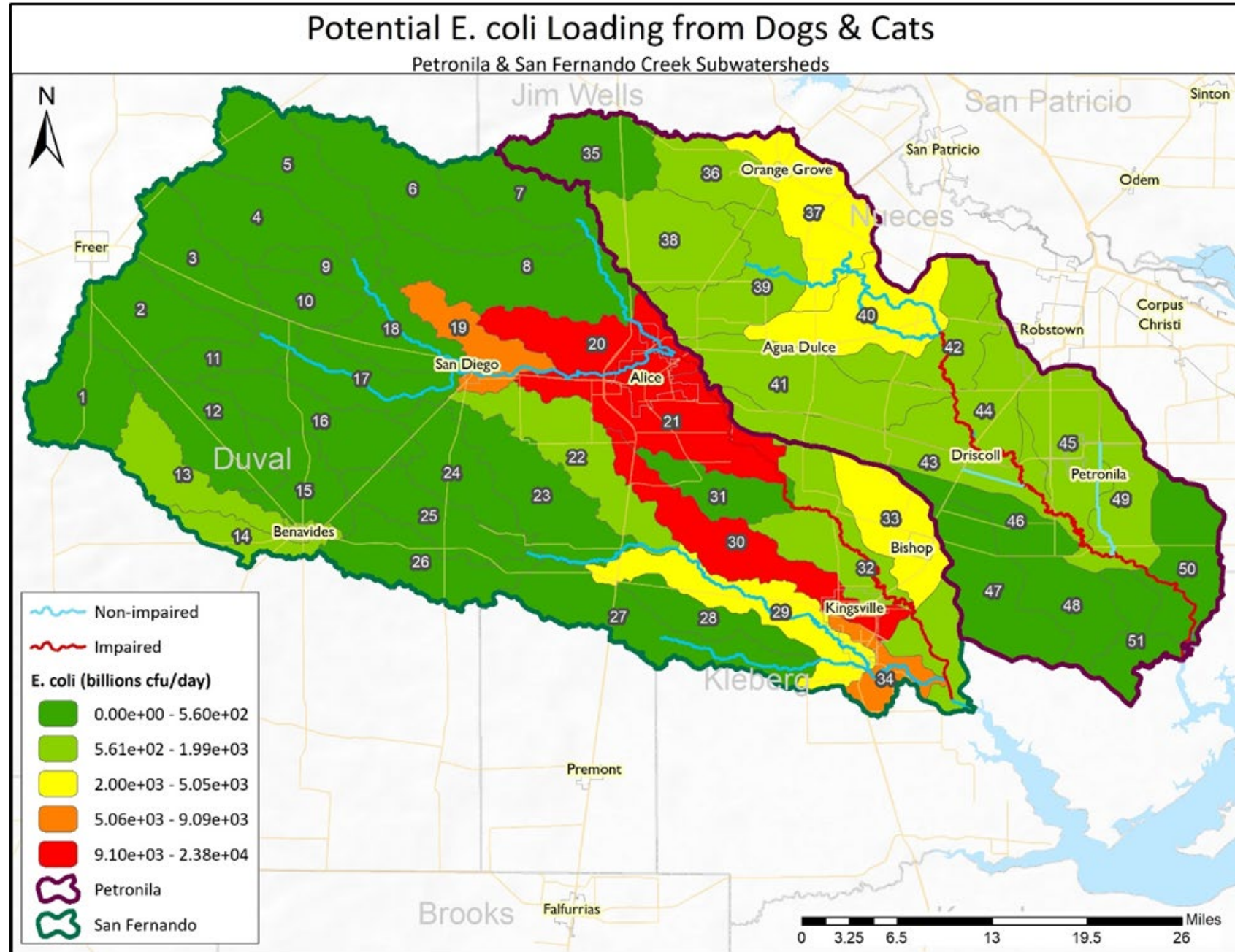


PETS

HIGHEST POTENTIAL SUBBASINS

PETRONILA
37, 40

SAN FERNANDO
20, 21, 27, 30

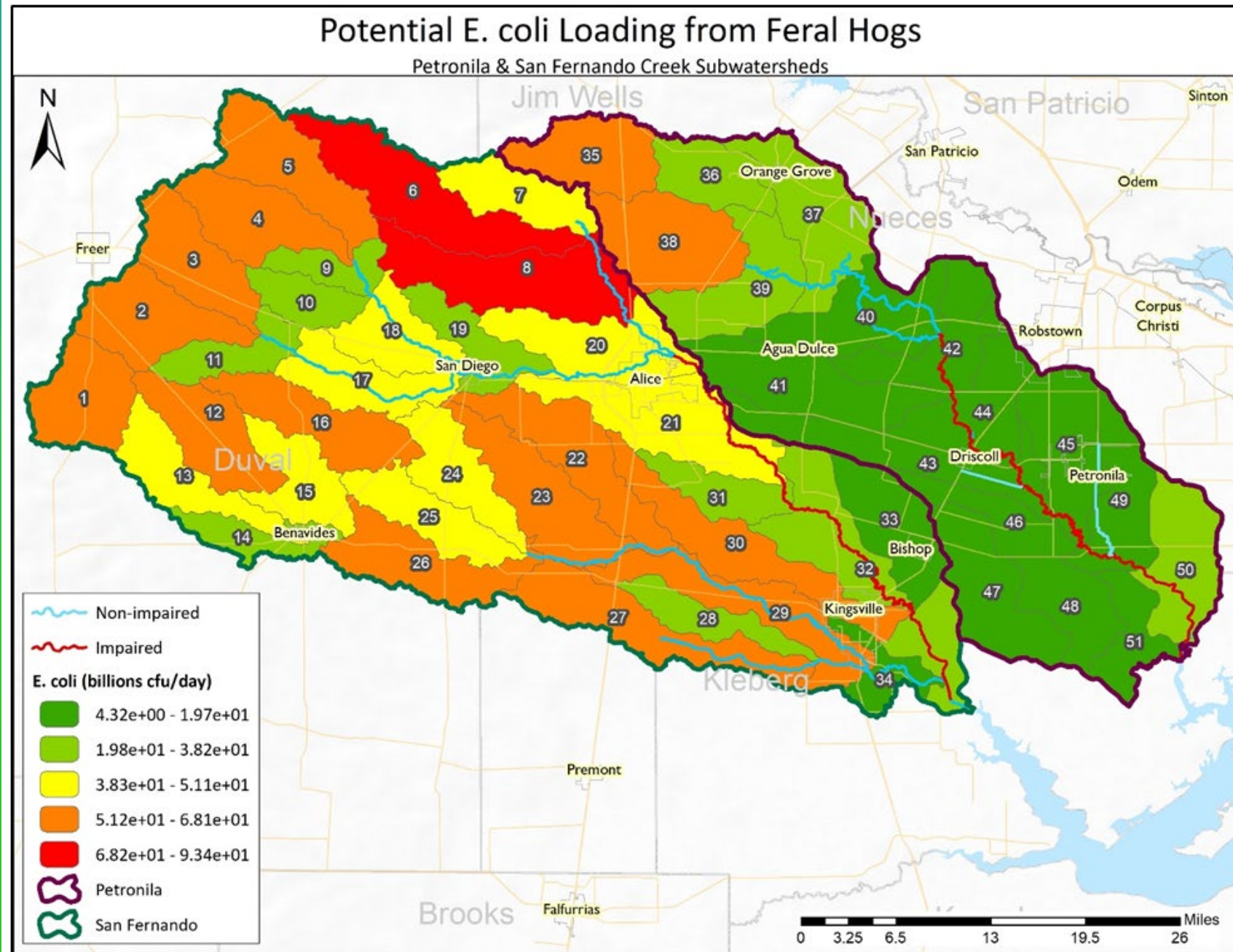


FERAL HOGS

HIGHEST POTENTIAL SUBBASINS

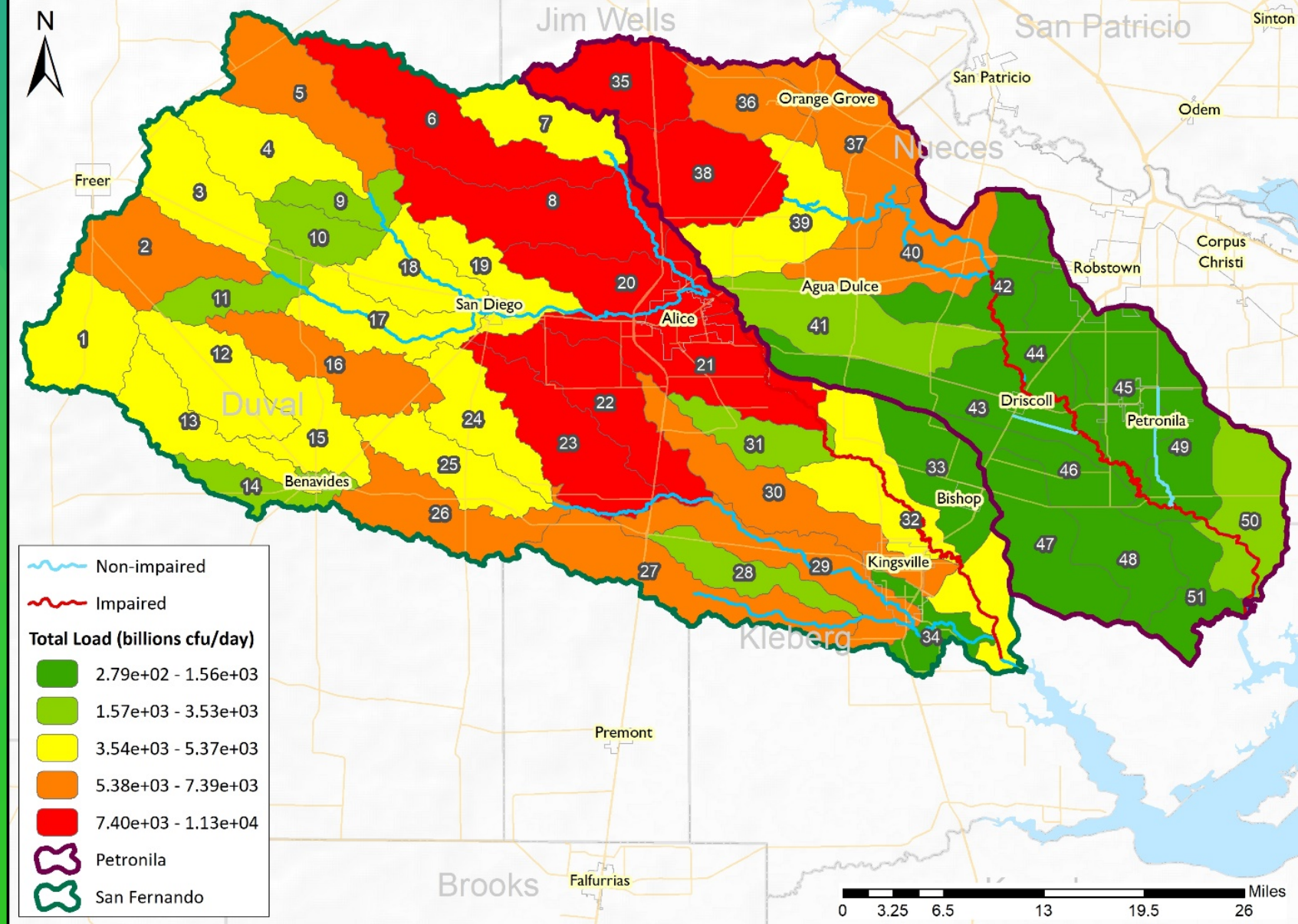
PETRONILA
35, 38

SAN FERNANDO
6, 8



Total Potential Livestock E. coli Load

Petronila & San Fernando Creek Subwatersheds



LIVESTOCK

HIGHEST
POTENTIAL
SUBBASINS

PETRONILA
35, 38

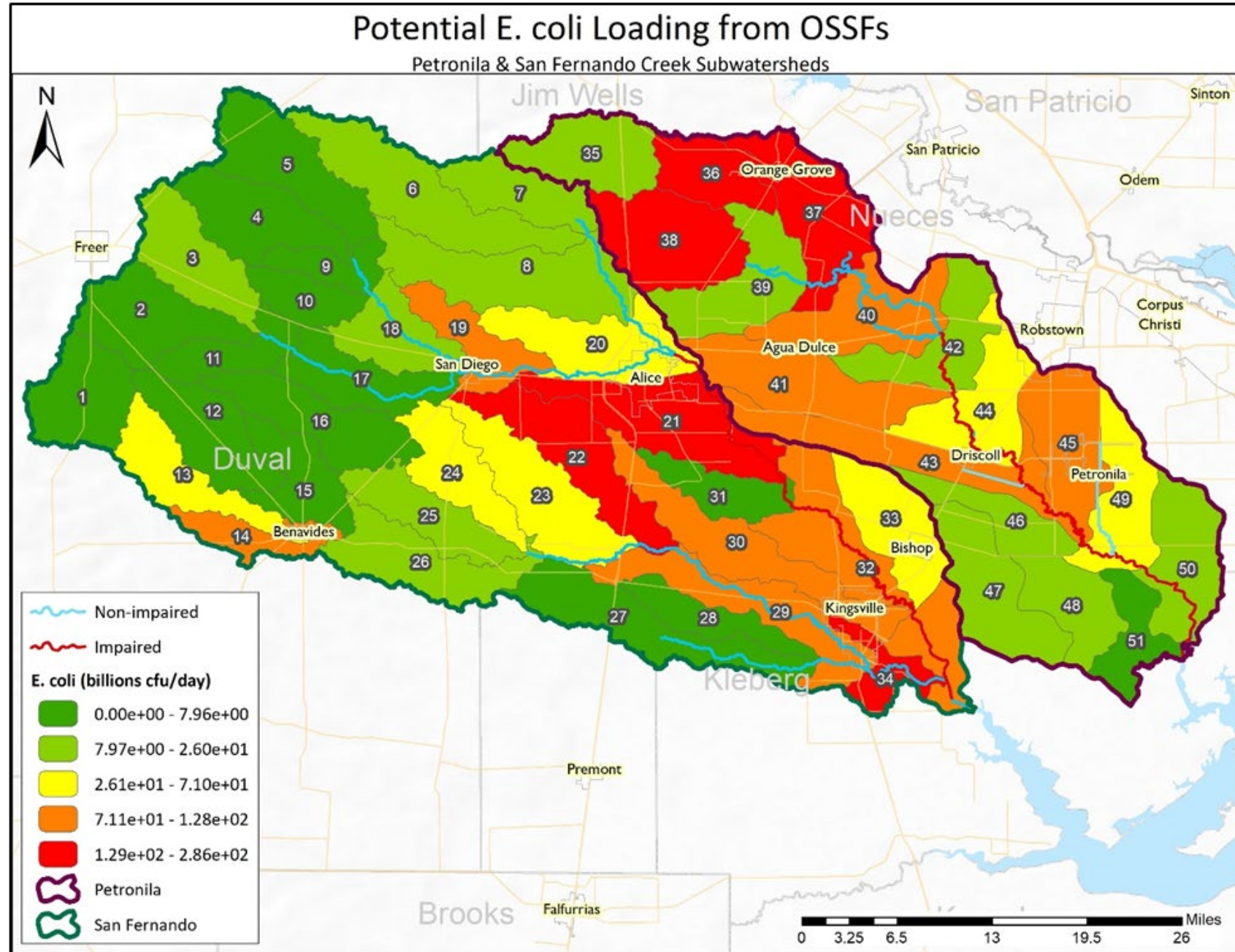
SAN FERNANDO
6, 8, 20, 21,
22, 23

OSSFs

HIGHEST POTENTIAL SUBBASINS

PETRONILA
36, 37, 38

SAN FERNANDO
21, 22, 34

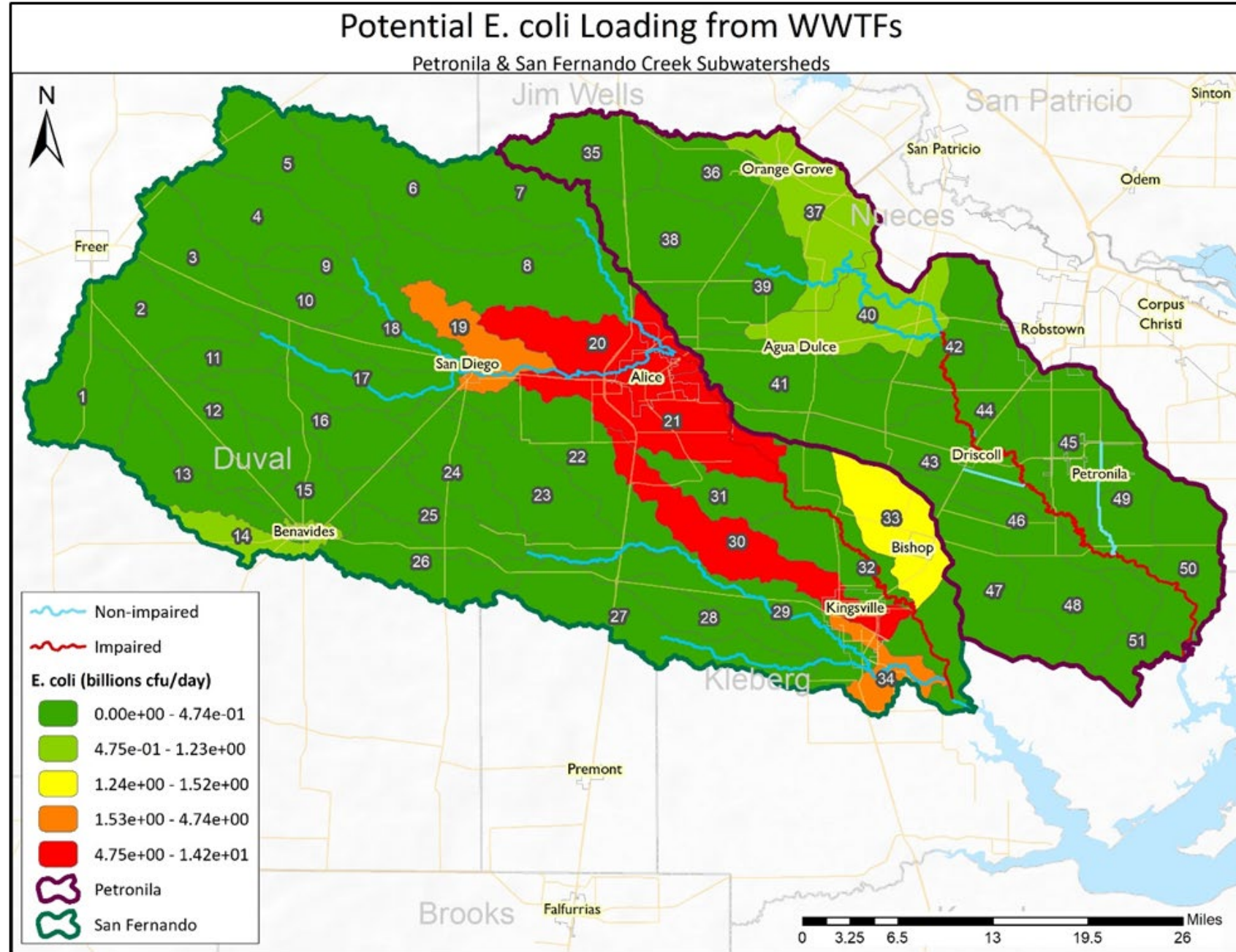


WWTFs

HIGHEST
POTENTIAL
SUBBASINS

PETRONILA
37, 40

SAN FERNANDO
20, 21, 30

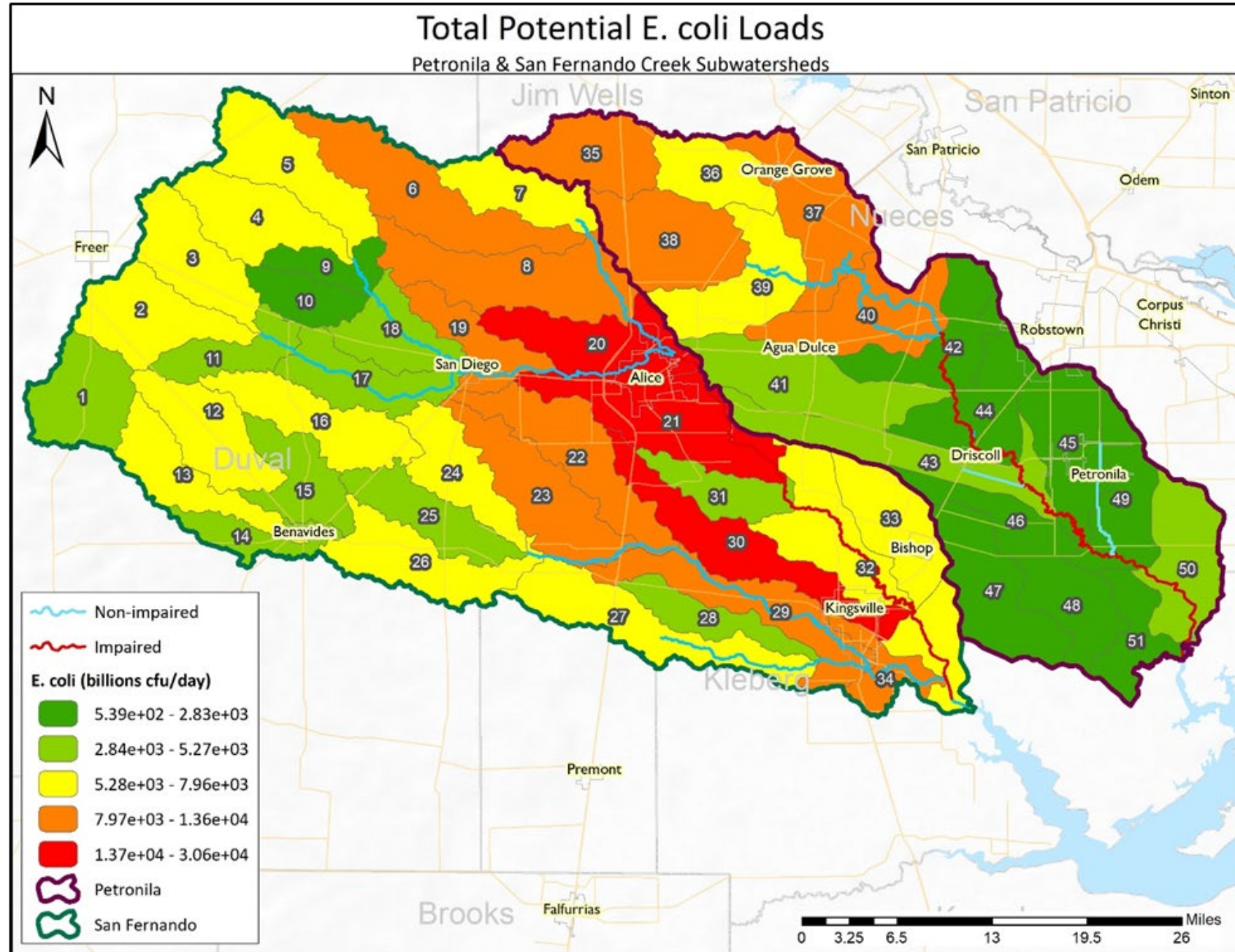


TOTAL POTENTIAL LOAD

HIGHEST POTENTIAL SUBBASINS

PETRONILA
35, 37, 38, 40

SAN FERNANDO
20, 21, 30



QUESTIONS?

ENNIS RIOS

ENNIS.RIOS@AG.TAMU.EDU