Tres Palacios WPP: Executive Summary & Chapter 1

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August 9, 2016

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- Problem (pg ix):
  - Water quality monitoring has indicated the fecal indicator bacteria levels are often above the state's water quality standard in the tidal segment of Tres Palacios Creek. The creek is currently listed on the state's 303(d) impaired water bodies list.

- Document overview (pg ix-xii):
  - Identified pollutant sources
  - Developed 9 recommended management measures
  - Documented needed education and outreach
  - Established how we will track progress through water quality monitoring and interim milestones
  - Set a goal of reducing bacteria levels in the creek to 33 cfu/100mL

Chapter 1 – Watershed Management

- WPP objective: reduce bacteria loadings and attain primary contact water quality standards
- Definition of a Watershed - Land Use that drains into a common waterway
- Watershed and Water Quality
  - Point source pollution
  - Nonpoint source pollution
- Benefits of a watershed approach - involving stakeholders and geographic boundaries rather than political boundaries
- Watershed Protection Planning – 9 Element Plan
- Adaptive Management – allows for changes to be made

Chapter 2 – Watershed Characterization

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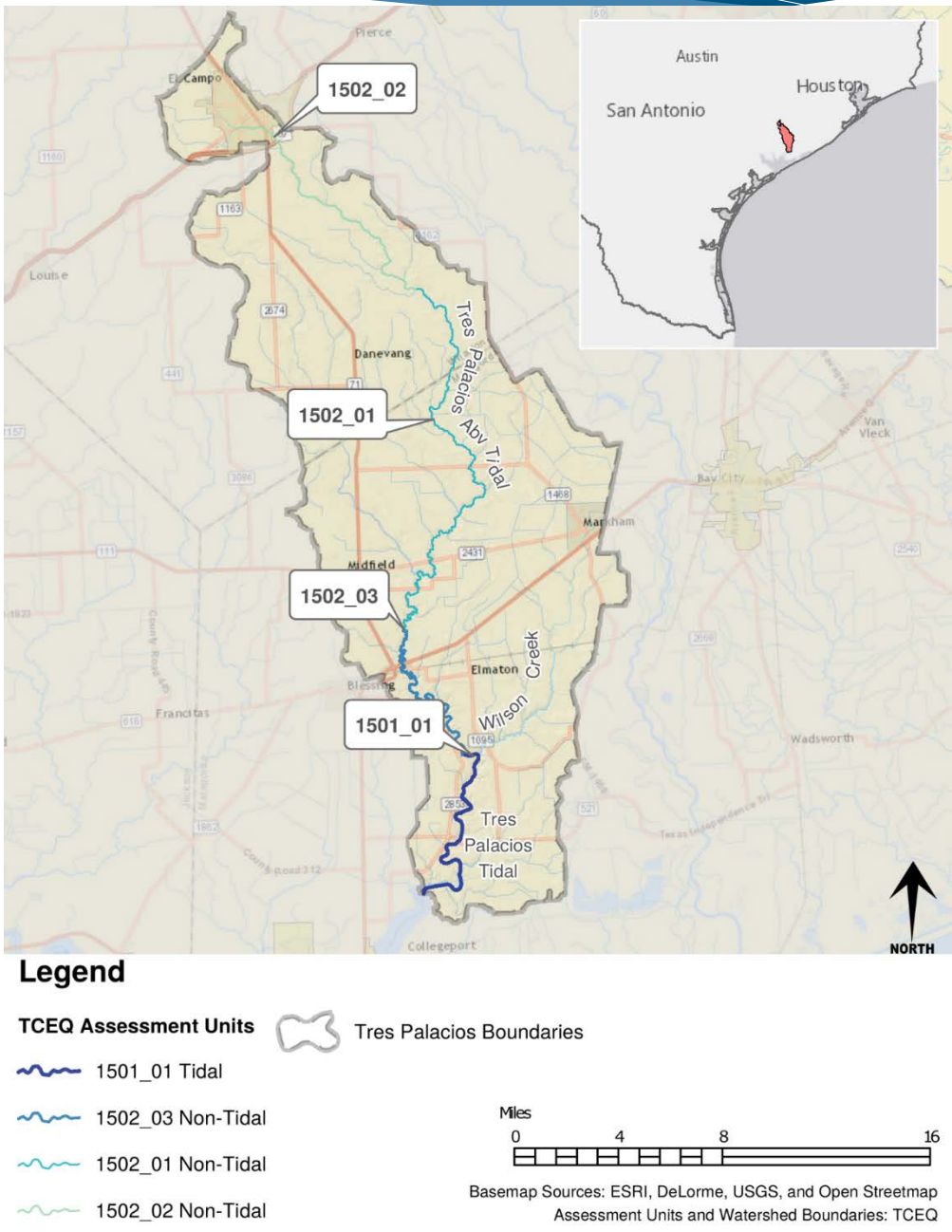
Overview

- Describes the current conditions of the watershed
- Developed through state and federal data resources and local stakeholder knowledge
- This information is used throughout the plan to identify pollution loadings, management measures, and prioritize critical areas.

Tres Palacios Watershed

- pgs 4-5
- 171,816 acres (268.5 square miles)
- 2010 population: 14,663
- Non-tidal segment: El Campo to Wilson Creek
- Tidal segment ~9 miles into Tres Palacios Bay



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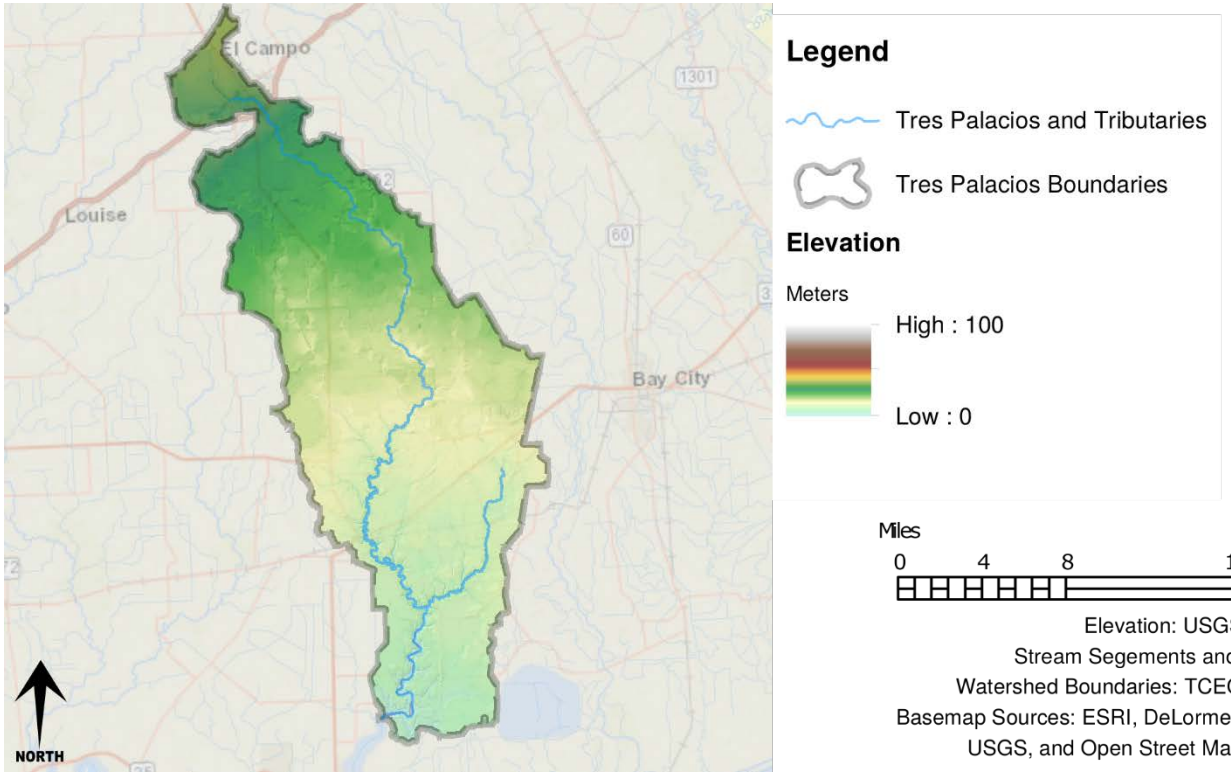
Topography

pg 6
FLAT!

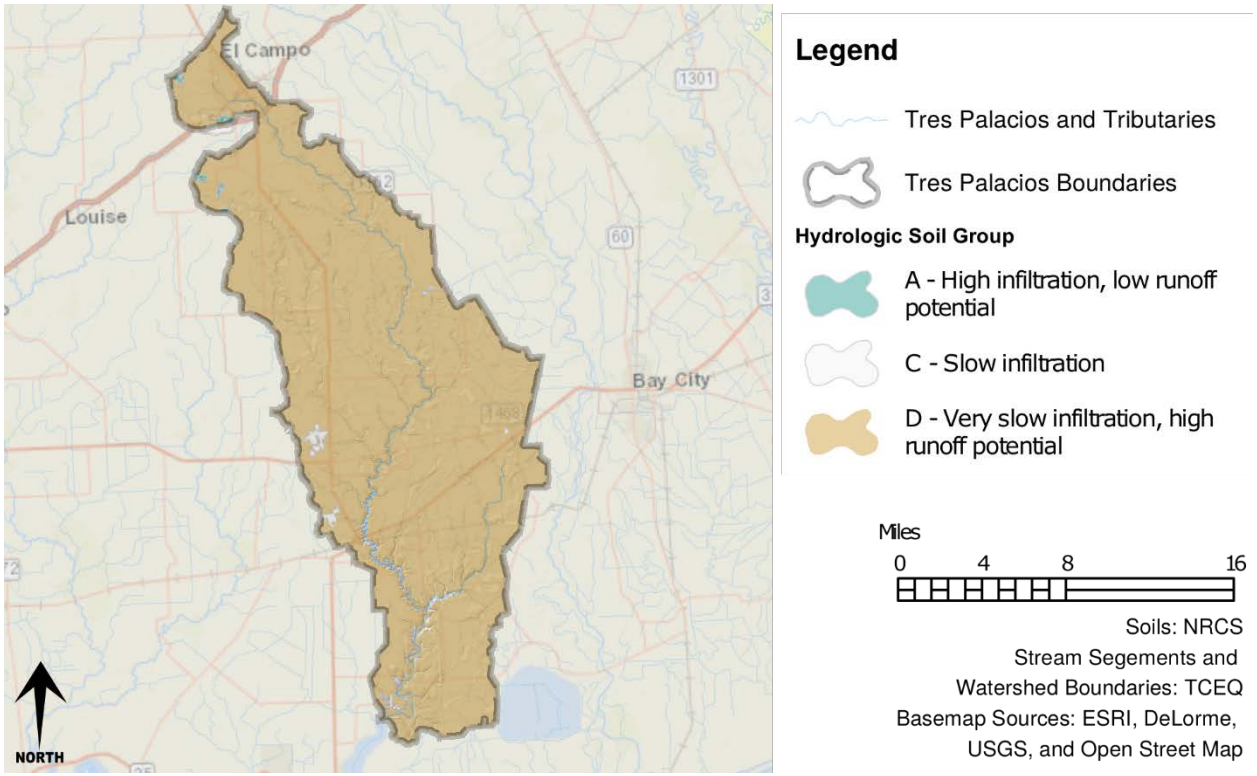
- 0-115 ft above MSL
- Avg Slope <1%



Soil

pg 7
Slow Infiltration
And high runoff

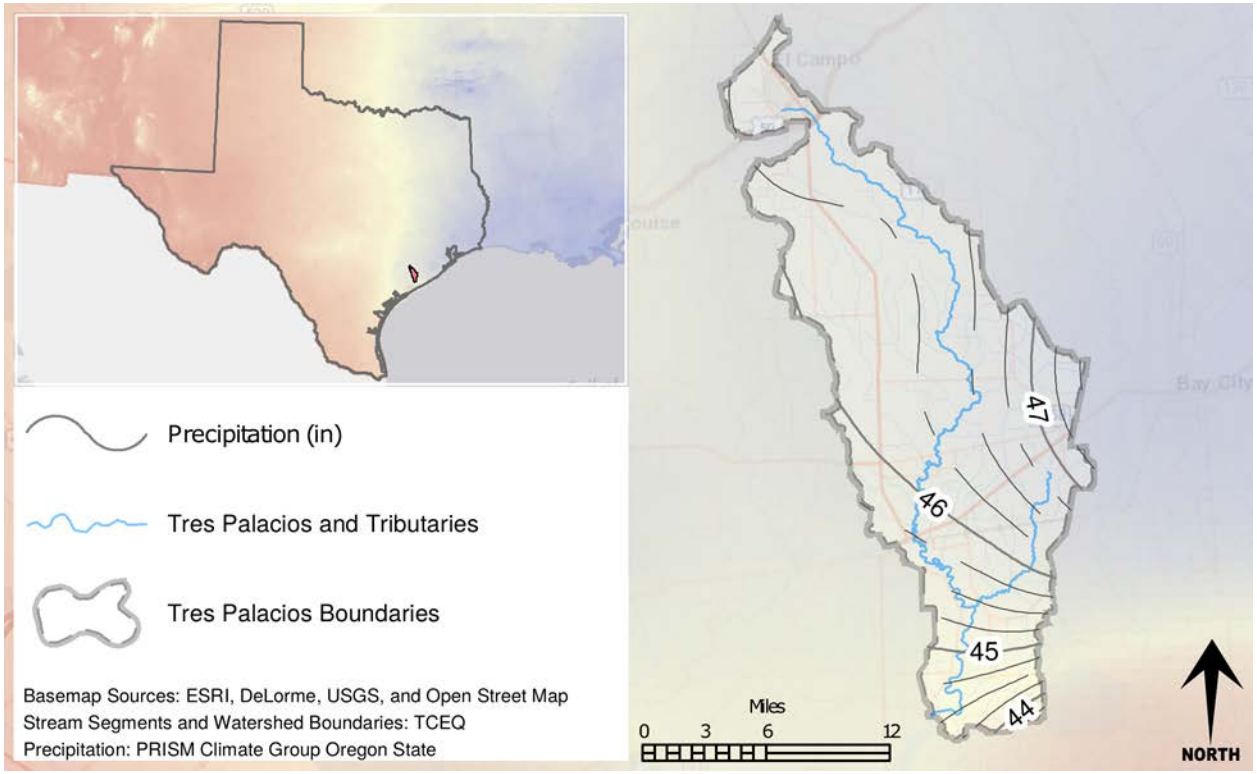
- 98% of soil is HSG Type D



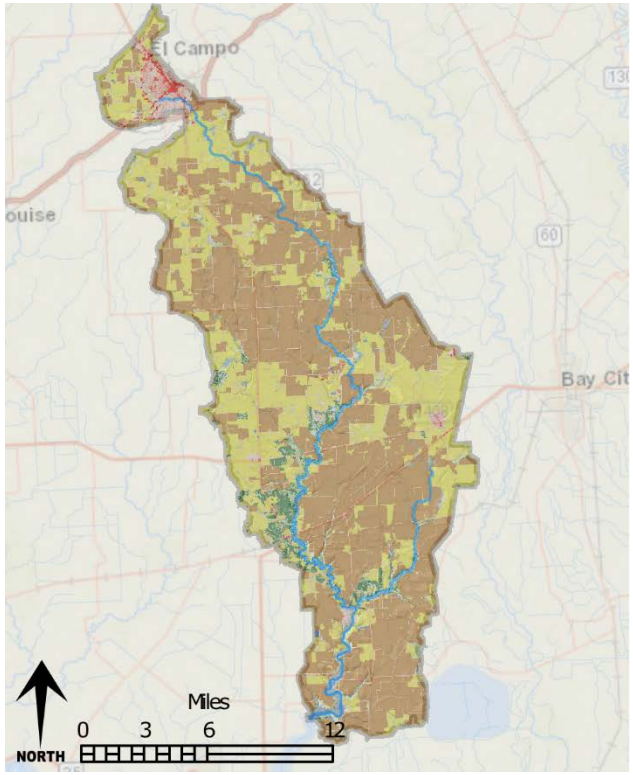
Climate

pg 7
Humid
Subtropical

- ~44-47in of rain



Land Cover



Tres Palacios and Tributaries

Tres Palacios Boundaries

Land Cover

Open Water

Developed, Open Space

Developed, Low Intensity

Developed, Medium Intensity

Developed, High Intensity

Barren Land

Deciduous Forest

Evergreen Forest

Mixed Forest

Shrub/Scrub

Herbaceuous

Hay/Pasture

Cultivated Crops

Woody Wetlands

Emergent Herbaceuous Wetlands

Land Cover: USGS NLCD
Stream Segements and Watershed Boundaries: TCEQ
Basemap: ESRI, DeLorme, USGS, and Open Street Map

- pg 9-10
- 52% Cropland
- 29% Pasture
- 6% Developed

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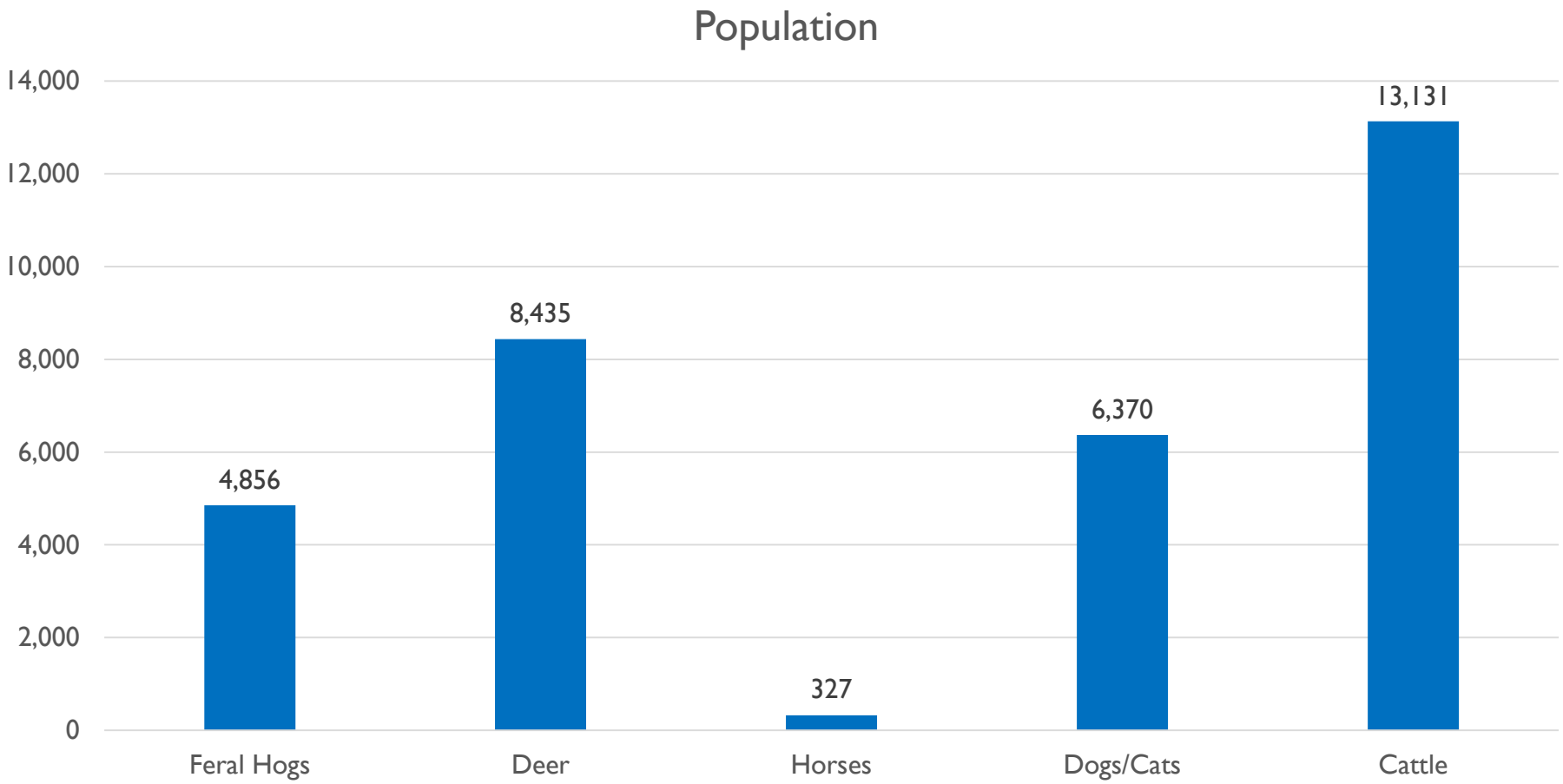
Bacteria Sources (pg 11-12)



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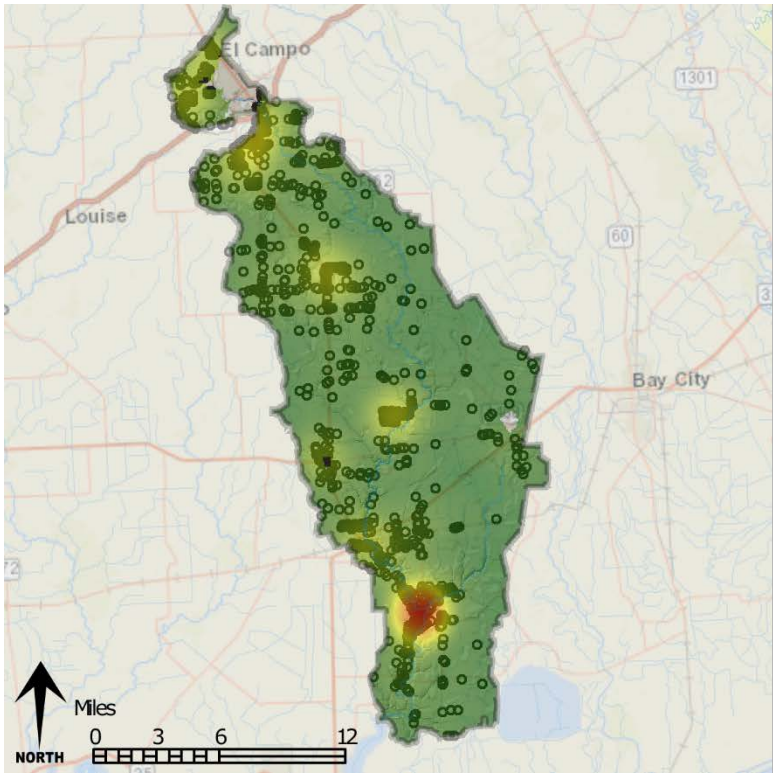
OSSF Estimates



Legend

OSSFs/acre

High : 0.07

Low : 0

OSSF Locations

Tres Palacios and Tributaries

Tres Palacios Boundaries

Residential 911 Addresses: Matagorda & Wharton County Governments
CCN Areas: Public Utility Commission of Texas
Water and Sewer Districts, Stream Segements and Watershed Boundaries: TCEQ
Basemap Sources: ESRI, DeLorme,USGS, and Open Street Map

- pg 12
- ~1490 OSSF's
- 95% in limited soils

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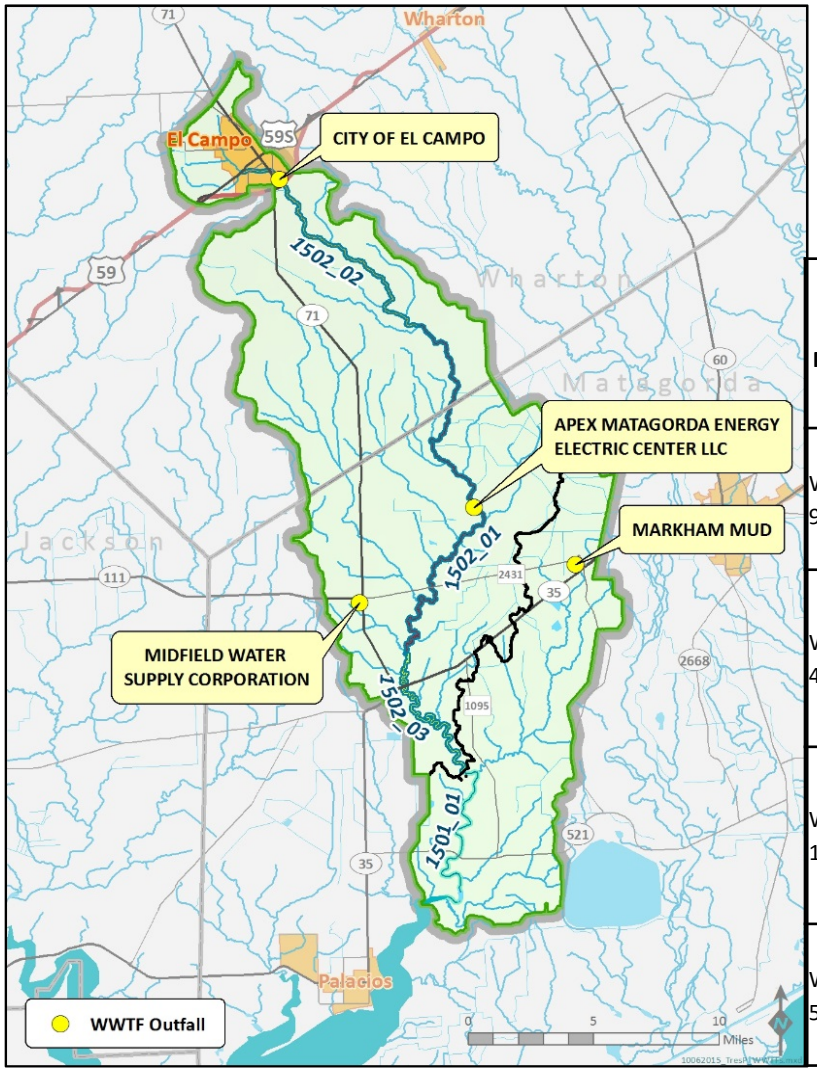

WWTFs pg 13-14

TPDES Permit No.	Facility	Held By	AU	Receiving Waters	Discharge Type	Permitted Discharge[a] (MGD)	Recent Discharge (MGD)
WQ0005009000	Apex Matagorda Energy Center	Apex Matagorda Energy Center, LLC	1502_01	Tres Palacios Creek Above Tidal	wastes from a compressed air energy storage facility	0.223 (daily avg)	0.079[b]
WQ0010844001	City of El Campo Wastewater Treatment Facility	City of El Campo	1502_02	Tres Palacios Creek Above Tidal	treated domestic wastewater	2.628 (annual avg)	1.015[b]
WQ0013091001	Midfield Wastewater Treatment Facility	Midfield Water Supply Corporation	1502_03	an unnamed tributary; thence to Wallace Creek; thence to Tres Palacios Creek Above Tidal	treated domestic wastewater	0.03 (daily avg)	0.016[b]
WQ0015075001	Markham MUD Wastewater Treatment Facility	Markham Municipal Utility District	1501_01	an unnamed ditch; thence to Wilson Creek; thence to Tres Palacios Creek Tidal	treated domestic wastewater	0.3 (daily avg)	0.045[c]

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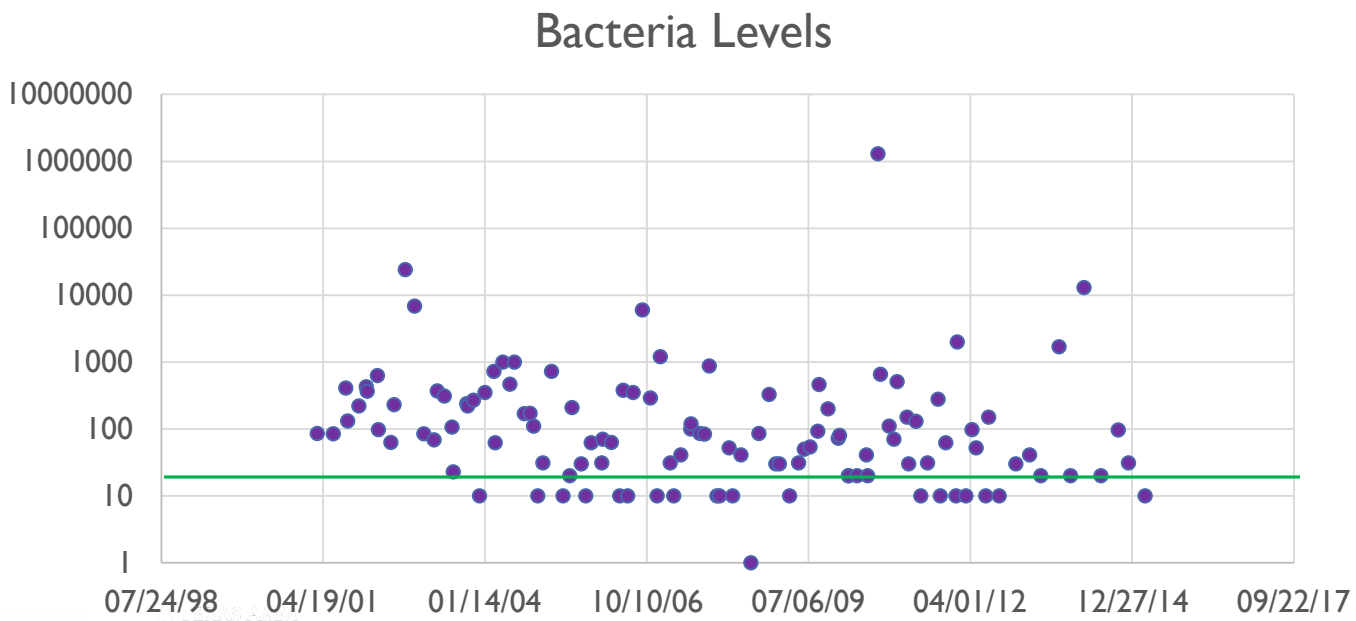
pg 17 - 19

Bacteria

Data used for:	Parameter	ASMT Start Date	ASMT End Date	# of samples	Geometric Mean	Criteria	Designated Use
Assessment	Enterococcus	12/1/2005	11/30/2012	64	67.19	35.00	Recreation
All Data	Enterococcus	3/14/2001	3/17/2015	115	92.42	35.00	Recreation



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Chapter 3 - Pollutant Loads and Sources

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Introduction – Chapter 3

- Needed Load Reductions
  - How much and when

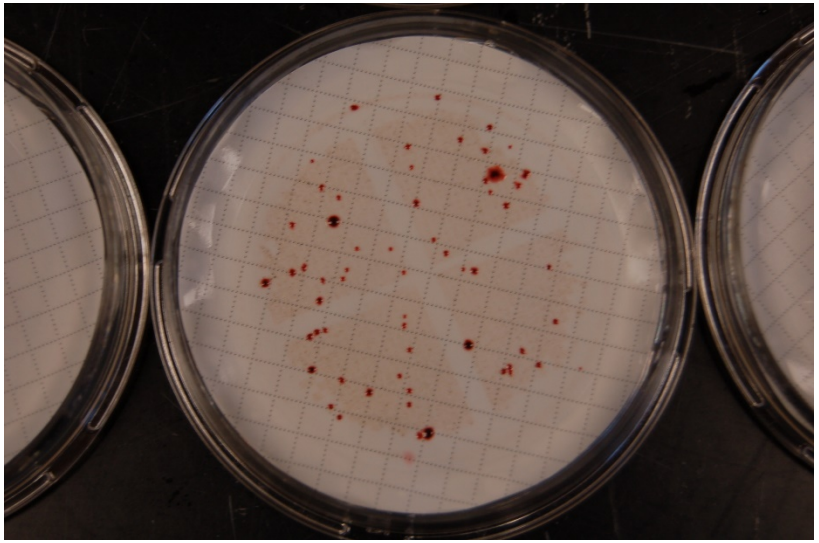
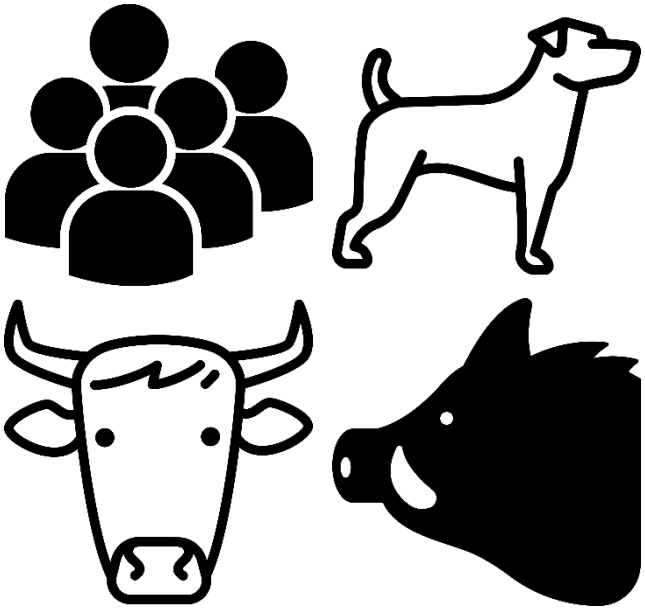


Image: Enterococci colonies growing on a selective agar membrane filtration.
Photo by C Hruby 2010

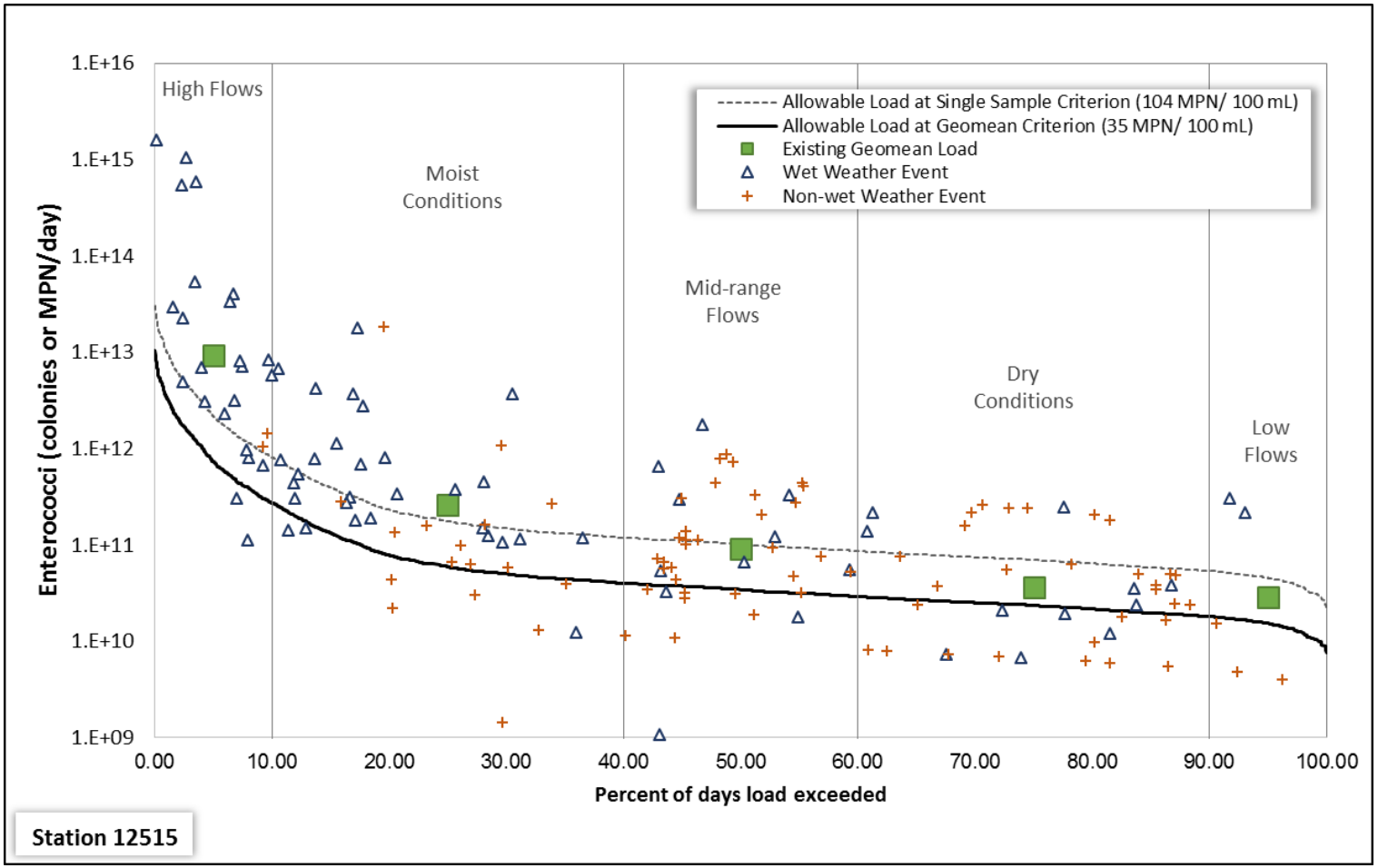
- Estimating Pollutant Source Loads
  - What and where



Images: Freepik from flaticon.com

Needed Load Reduction

Load duration curve for Tres Palacios at tidal station 12515

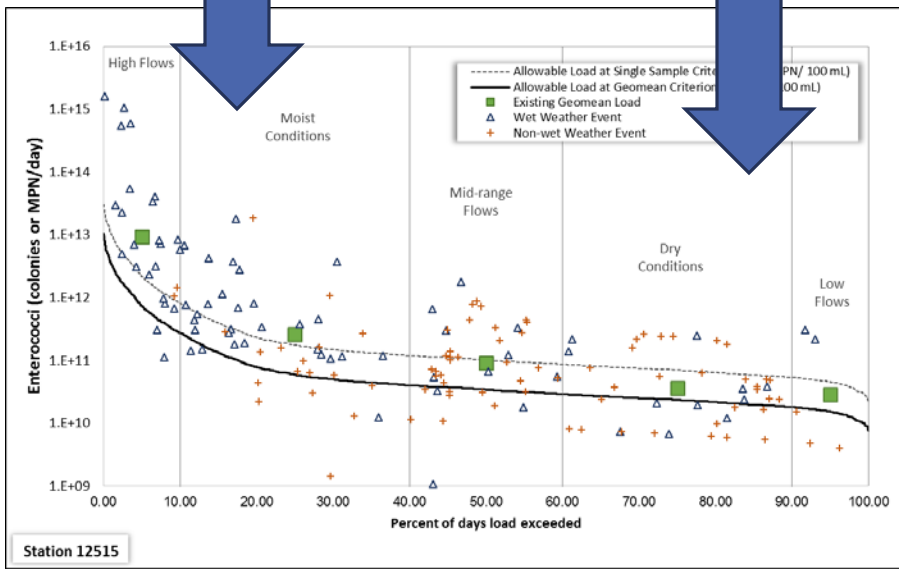


Needed Load Reduction pg 22-25

- What does this tell us?
  - Allowable load is exceeded across conditions but most elevated during the two highest flow conditions
  - Runoff is likely to contribute loadings during higher flow conditions
  - Direct deposition and point sources are more likely during lower flow conditions

Non-point sources

Point sources?



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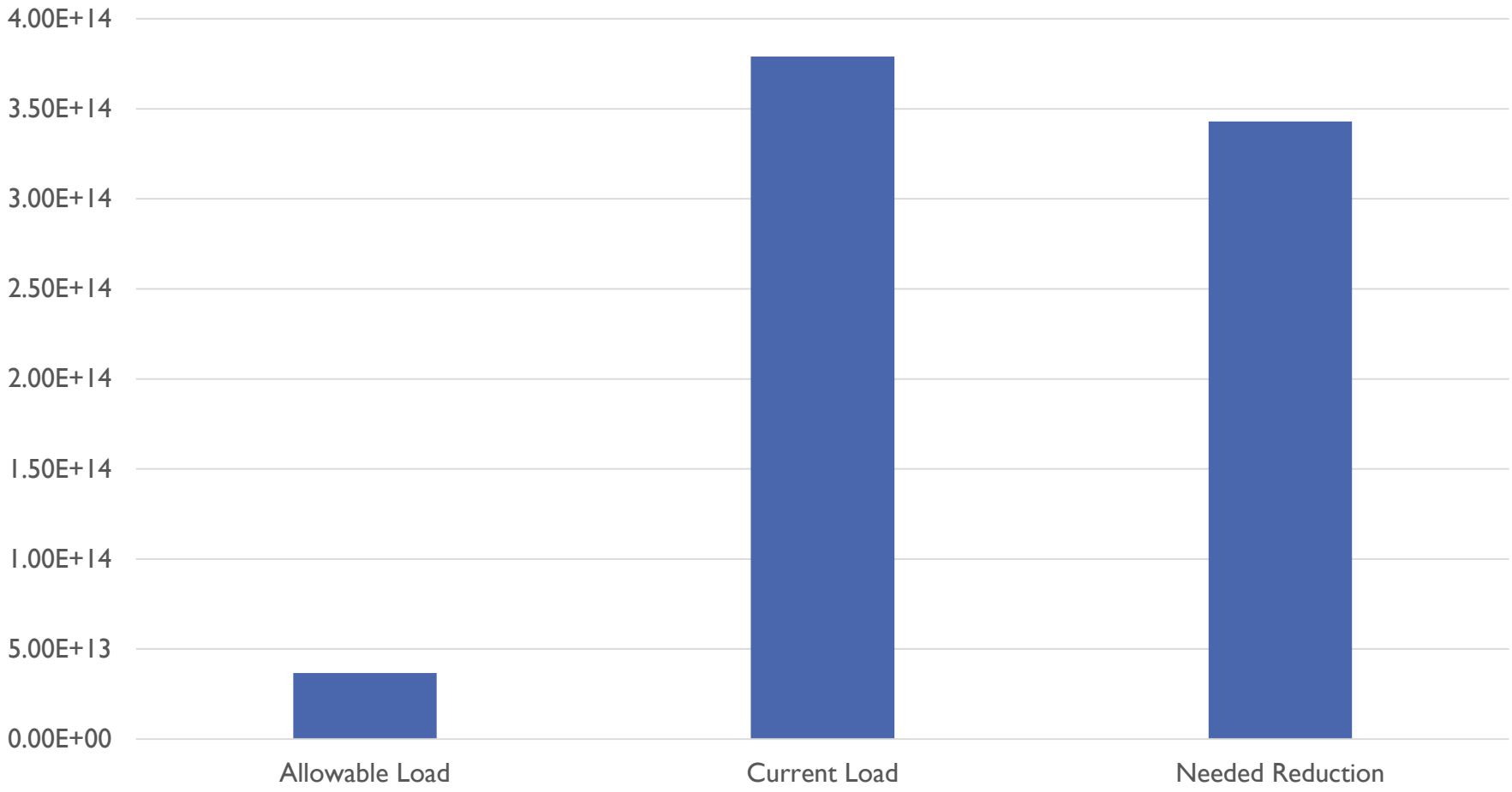
Needed Load Reduction (pg 25)

Flow Condition	Existing Load (cfu/day)	Allowable Load (cfu/day)	Needed Daily Reduction (cfu/day)	Needed Annual Reduction (cfu/yr)
High Flows	9.29×10^{12}	6.91×10^{11}	8.60×10^{12}	3.14×10^{14}
Moist	2.61×10^{11}	5.62×10^{10}	2.05×10^{11}	2.25×10^{13}
Mid-Range	9.10×10^{10}	3.25×10^{10}	5.85×10^{10}	4.27×10^{12}
Dry	3.65×10^{10}	2.20×10^{10}	1.44×10^{10}	1.58×10^{12}
Low Flows	2.86×10^{10}	1.45×10^{10}	1.41×10^{10}	5.15×10^{11}

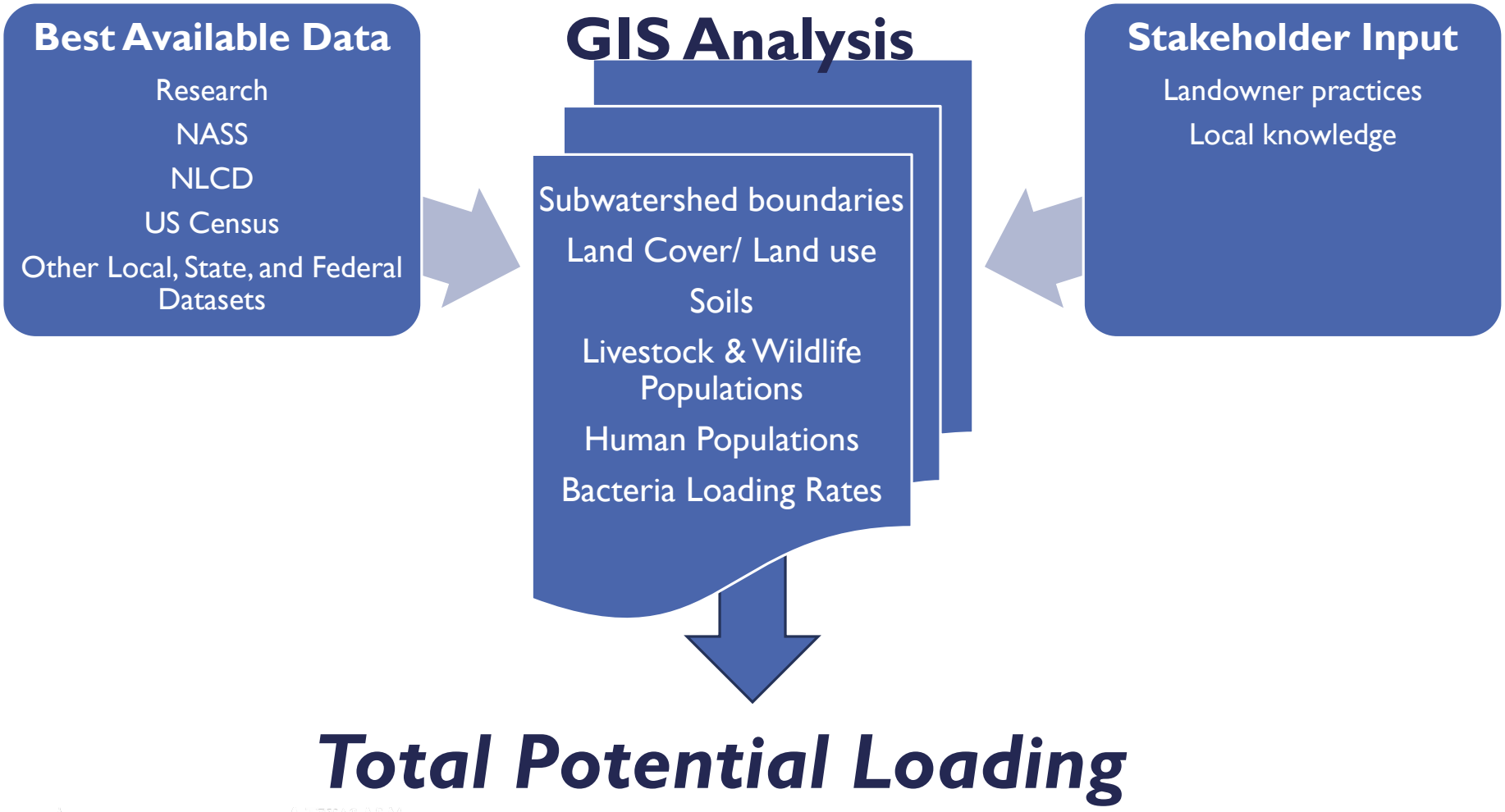
Annual loading reduction needed to meet existing water quality standard:

3.43×10^{14} CFU

Needed Load Reduction



Estimating Pollutant Source Loads pg 26



Estimating Pollutant Source Loads

- Estimates maximum *potential* loading
- Does not account for deposition, fate, or transport processes
- Informs the types of management measures that would be effective and where in a watershed to focus those efforts

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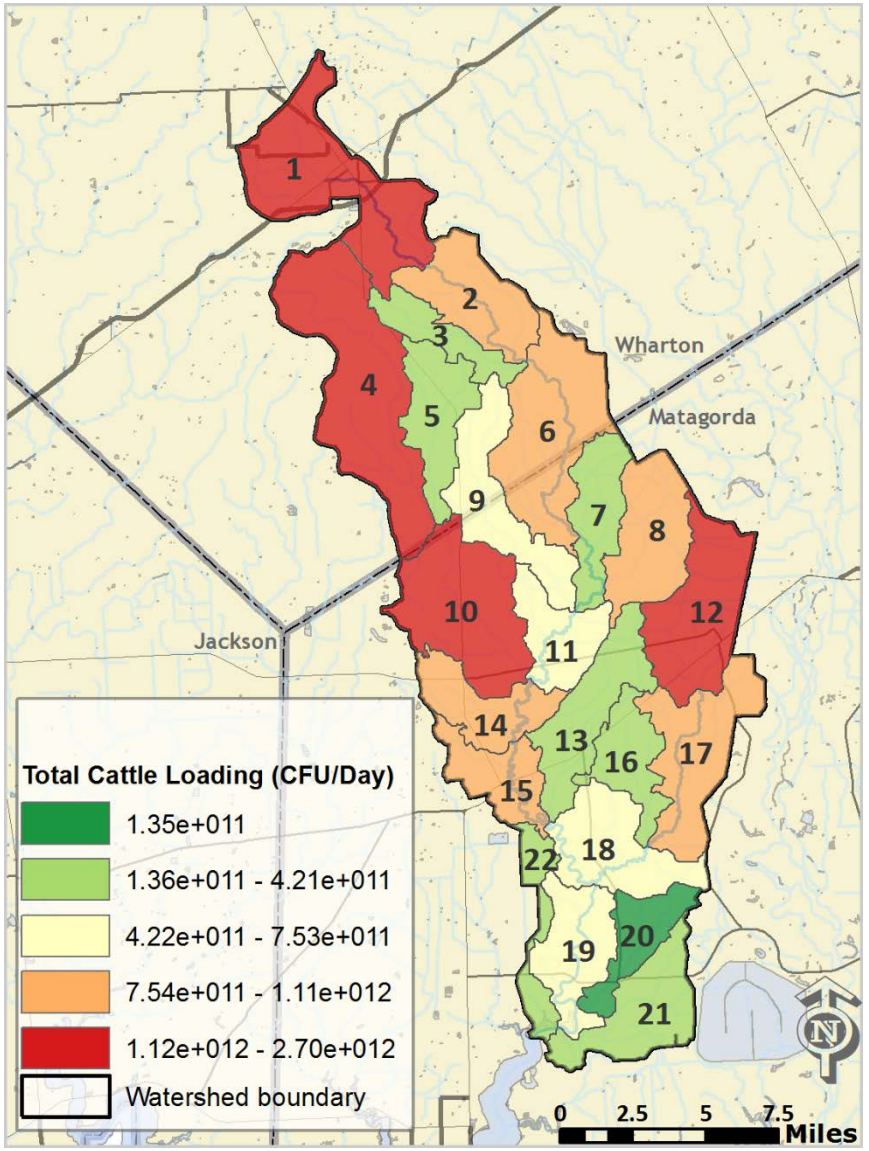
Estimating Pollutant Source Loads

Potential Loading from Cattle

- Estimated 13,131 head
- Annual Load 7.2×10^{15} cfu/yr
- Subwatersheds 1, 4, 10, and 12
- pg 27



Estimating Pollutant Source Loads

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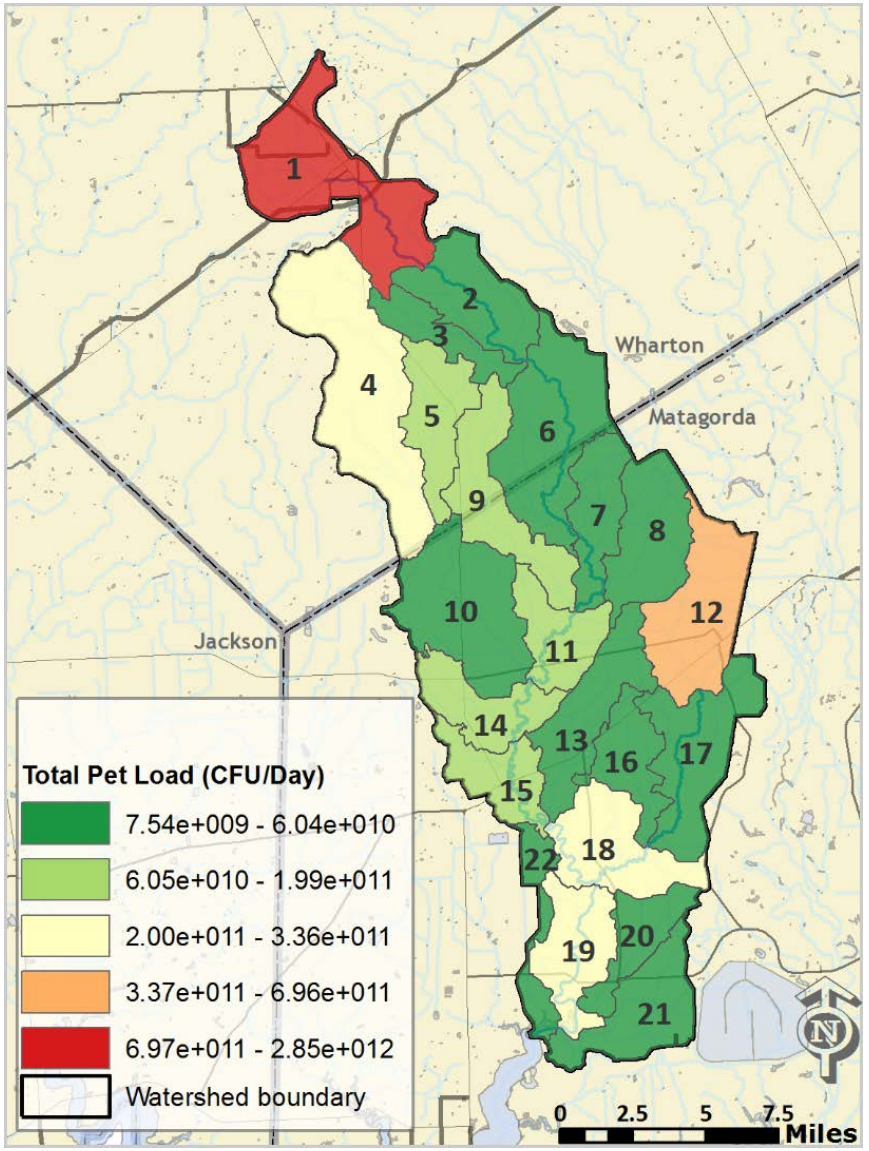
Potential Loading from Pets

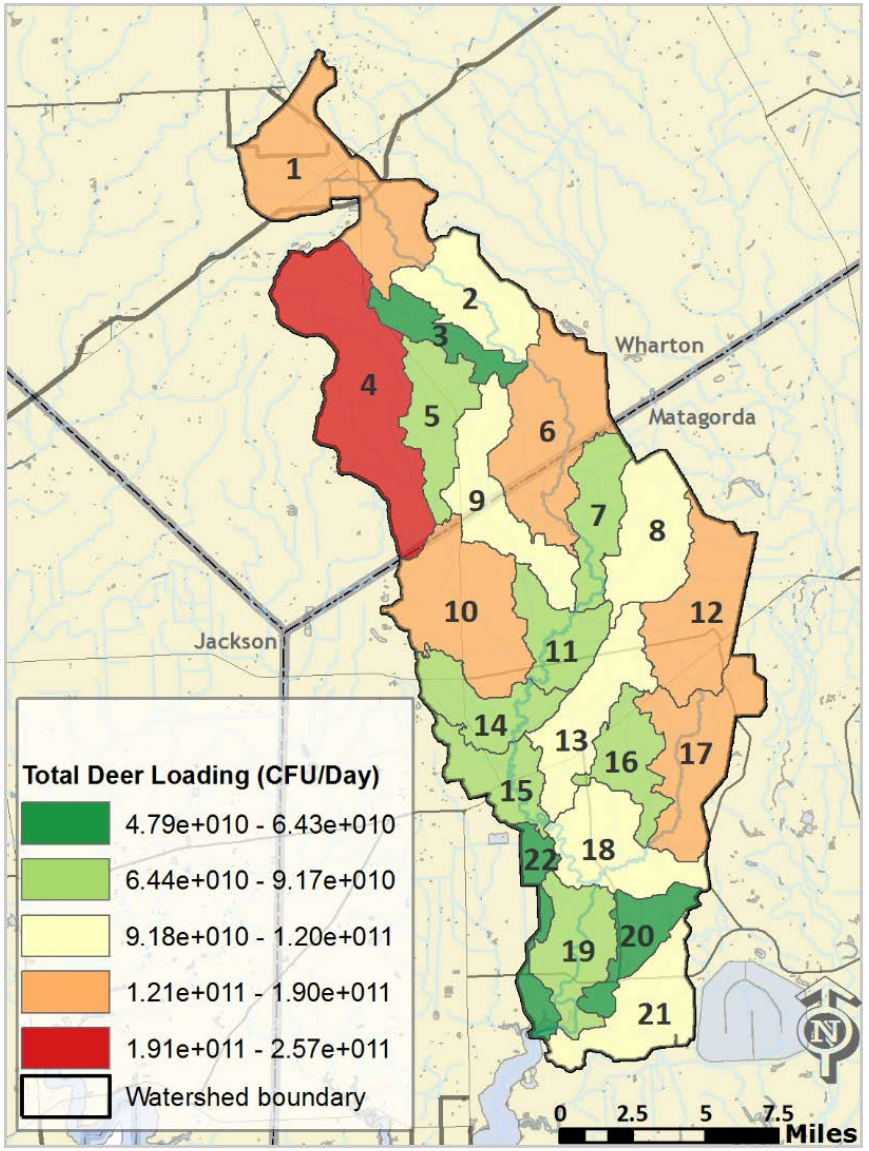
- Estimated 6,370 dogs and cats
- Annual Load 2.1×10^{15} cfu/yr
- Subwatersheds 1, 12, 19, and 18
- pg 28



Estimating Pollutant Source Loads

Potential Loading from Deer

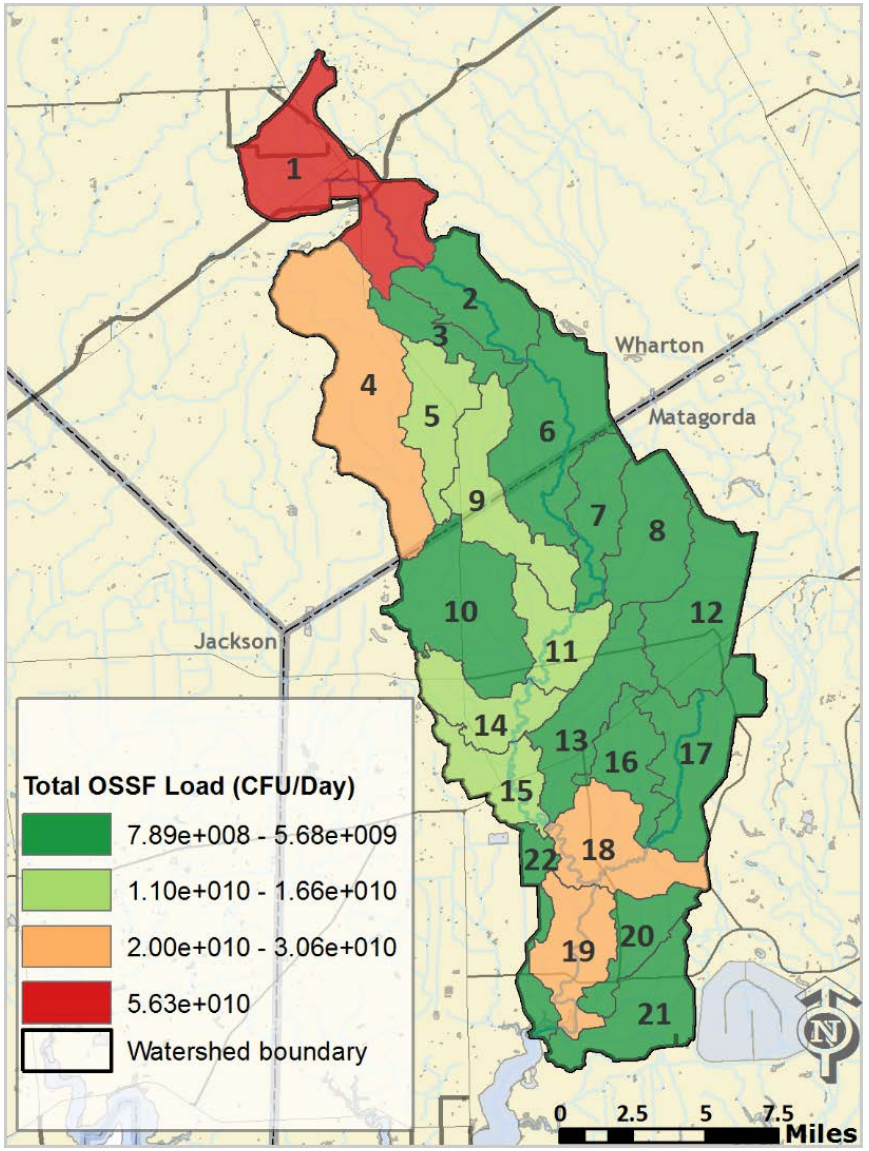
- Estimated 8,435 deer
- Annual Load 9.1×10^{14} cfu/yr
- Subwatersheds 4, 6, and 10
- pg 27



Estimating Pollutant Source Loads

Potential Loading from OSSFs

- Estimated 1,490 households
- Estimated 2.4 persons/household
- 15% Failure Rate
- Annual Load 8.6×10^{13} cfu/yr
- Subwatersheds 1, 4, 9, and 15



Estimating Pollutant Source Loads

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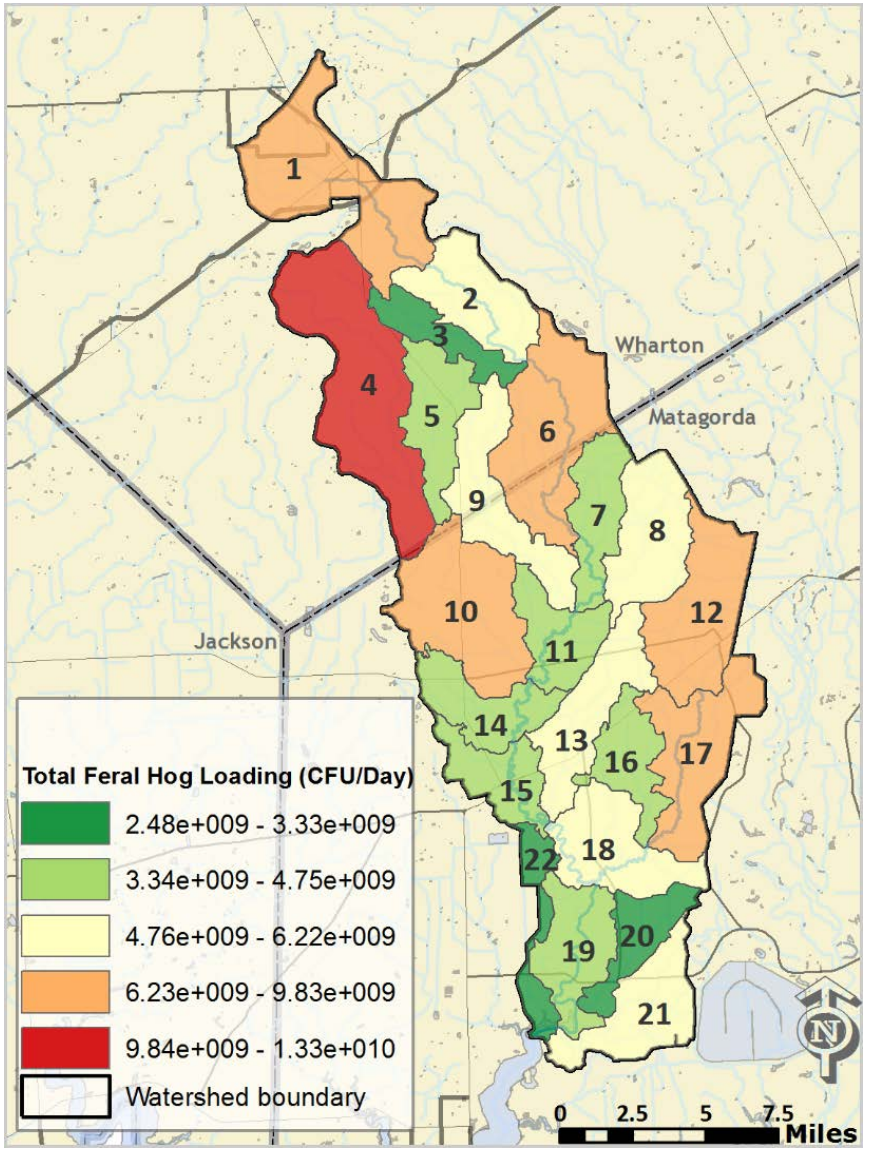
Potential Loading from Feral Hogs

- Estimated 4,856 feral hogs
- Annual Load 4.7×10^{13} cfu/yr
- Subwatersheds 4, 6, and 10
- pg 28



Estimating Pollutant Source Loads

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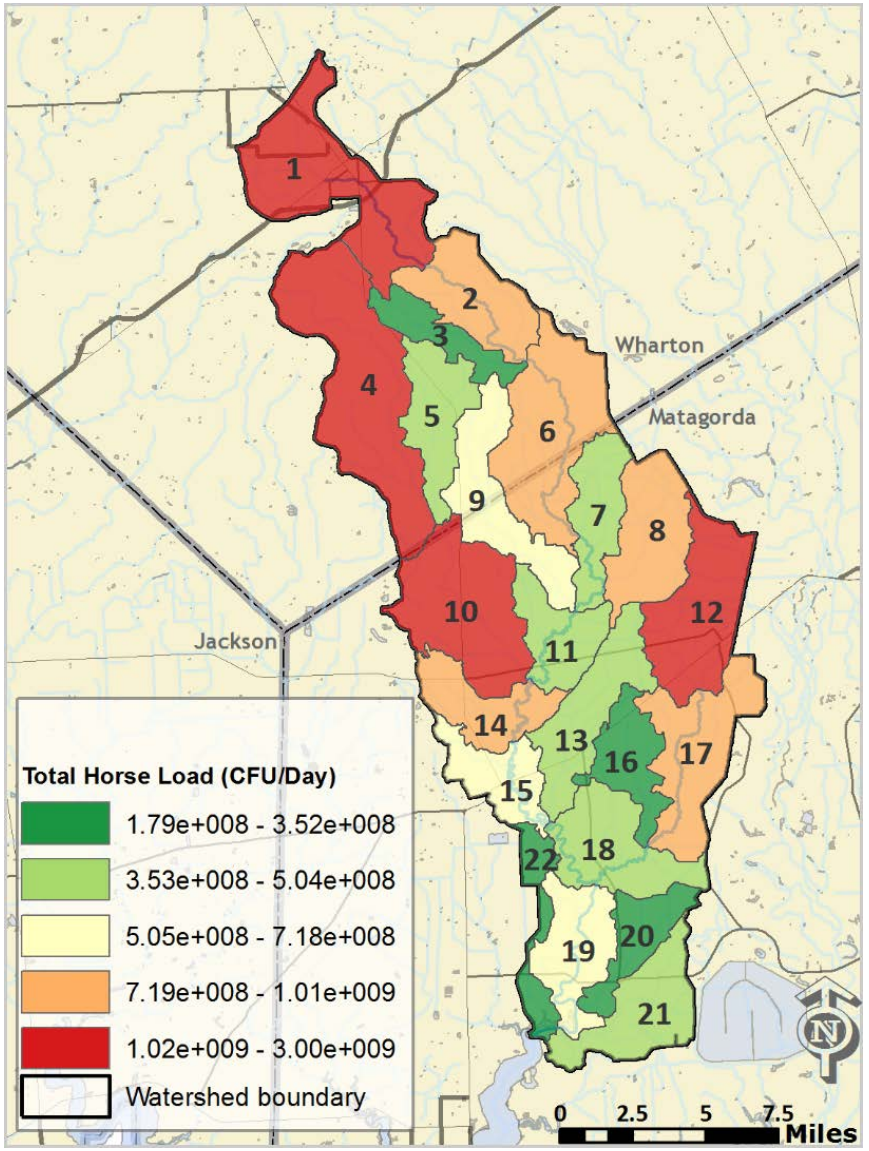
Potential Loading from Horses

- Estimated 327 horses
- Annual Load 7.7×10^{12} cfu/yr
- Subwatersheds 1,10, 12, and 4
- pg 28



Estimating Pollutant Source Loads

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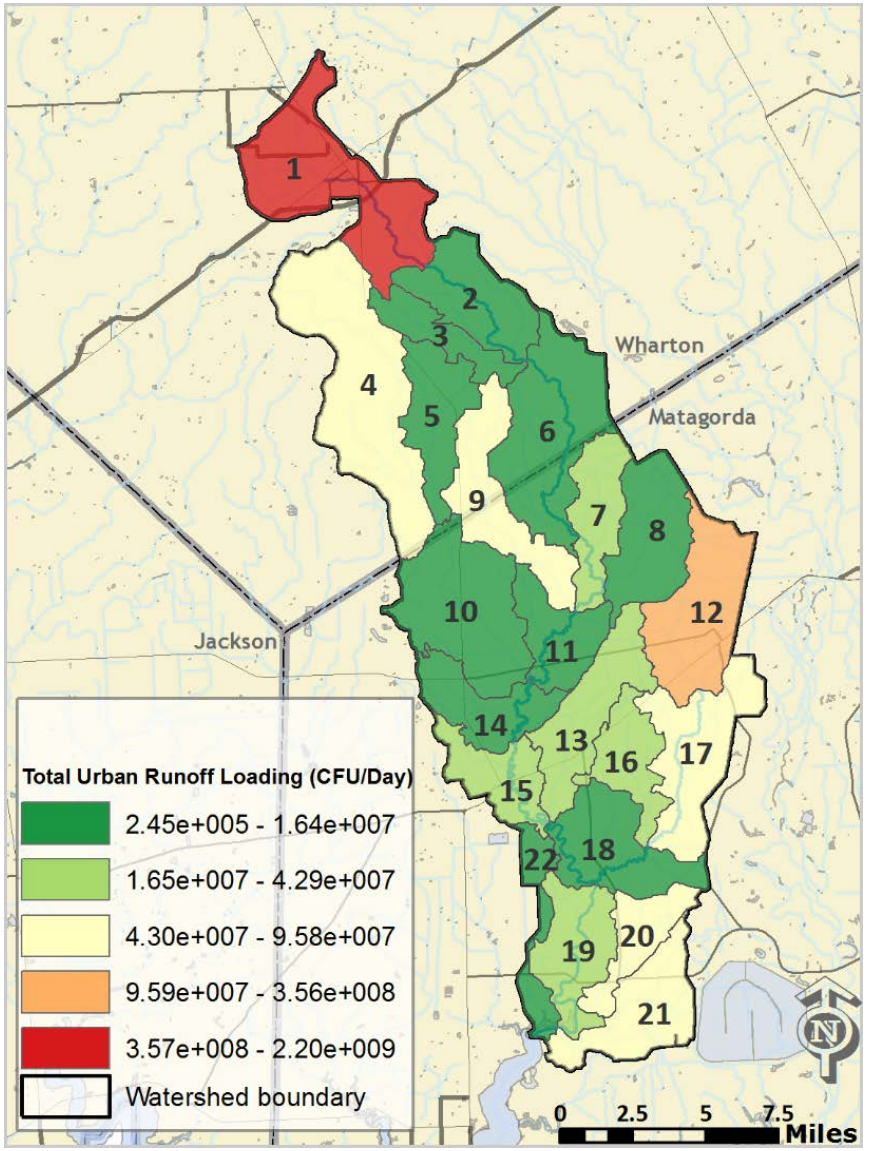
Potential Loading from Urban Runoff

- Annual Load 1.2×10^{12} cfu/yr
- Subwatersheds 1, 12
- pg 29



Estimating Pollutant Source Loads

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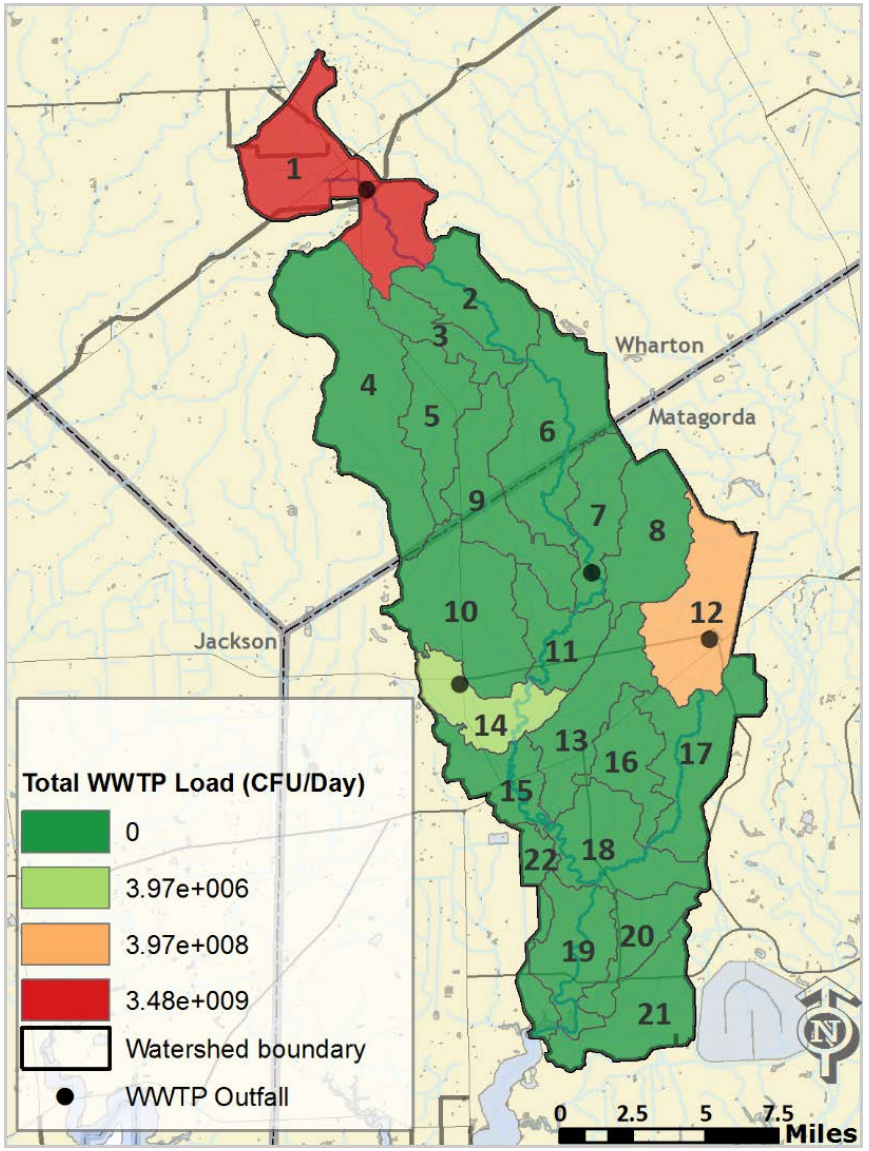
Potential Loading from WWTPs

- Three permitted dischargers
- Annual Load 1.4×10^{12} cfu/yr
- Subwatersheds 1, 12, and 14
- pg 29



Estimating Pollutant Source Loads

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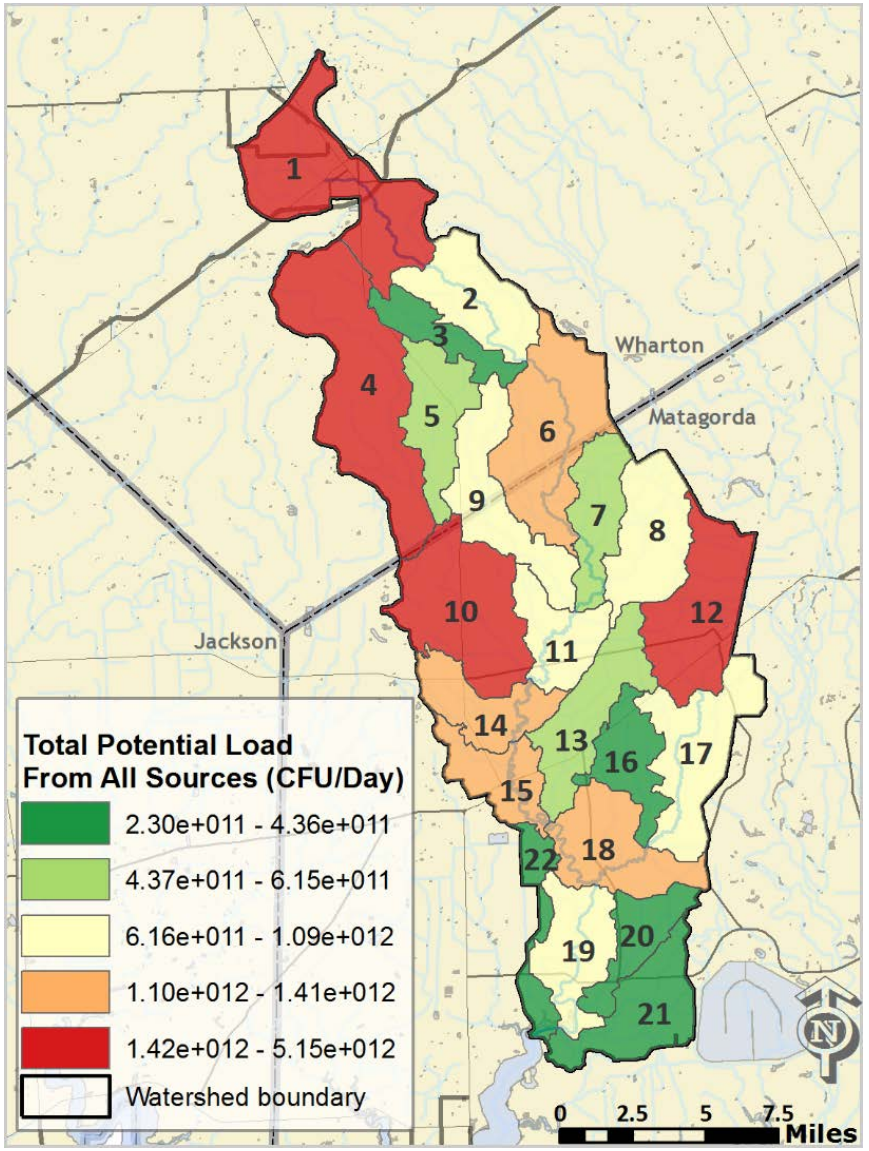
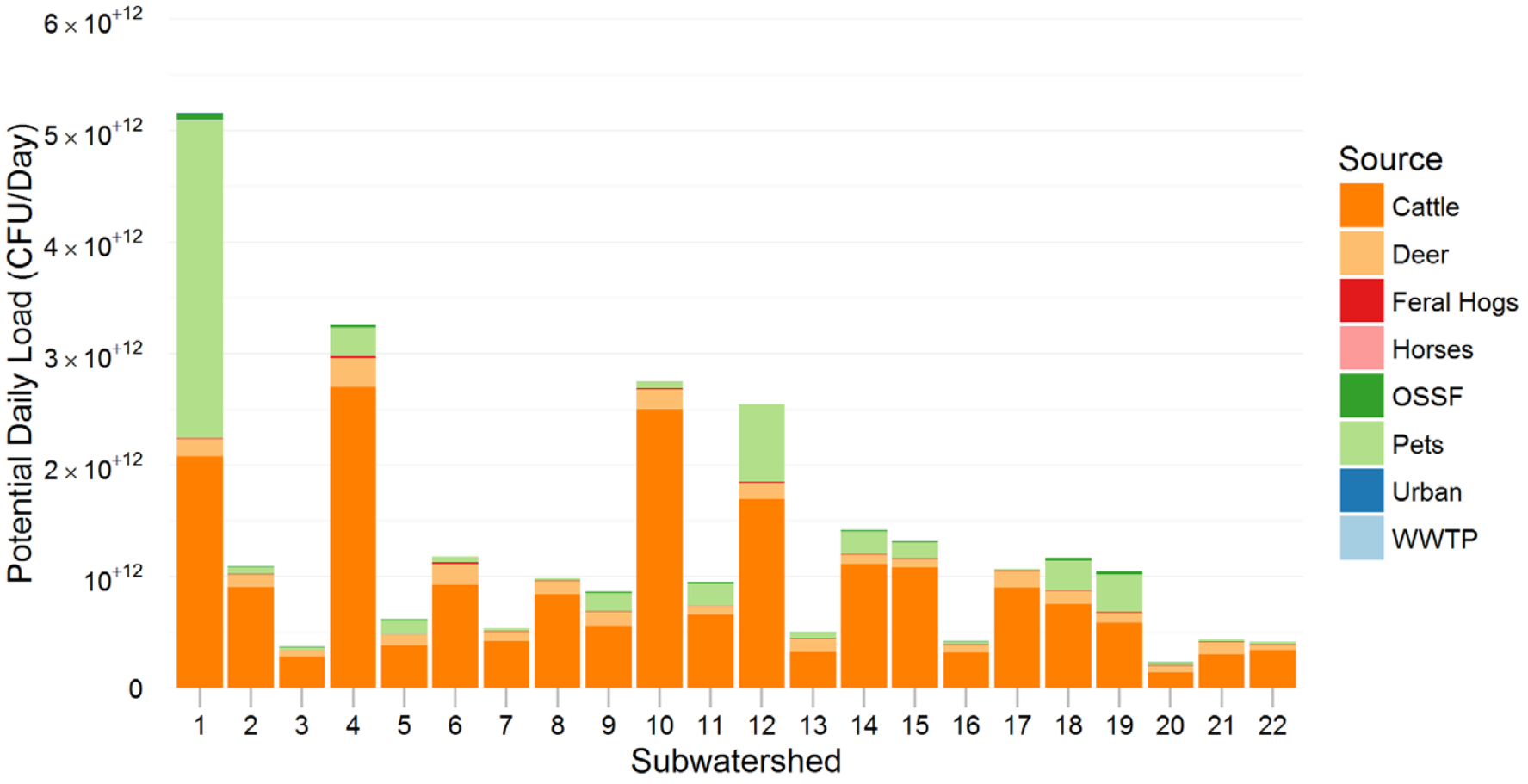
Total Potential Loadings

- Annual Load 1.0×10^{16} cfu/yr
- Subwatersheds 1, 4, 10, and 12
- pg 30



Estimating Pollutant Source Loads



Conclusion

- LDC methodology indicates **3.45×10^{14} CFU** annual reduction needed to meet water quality standard
- GIS analysis indicates Cattle, Deer, Pets, Hogs, and OSSFs have the highest potential loads in the watershed and indicated critical areas to target management measures