Tres Palacios Creek Watershed: Pollutant Loads and Sources

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Overview – Chapter 3

- Needed Load Reductions
  - How much and when

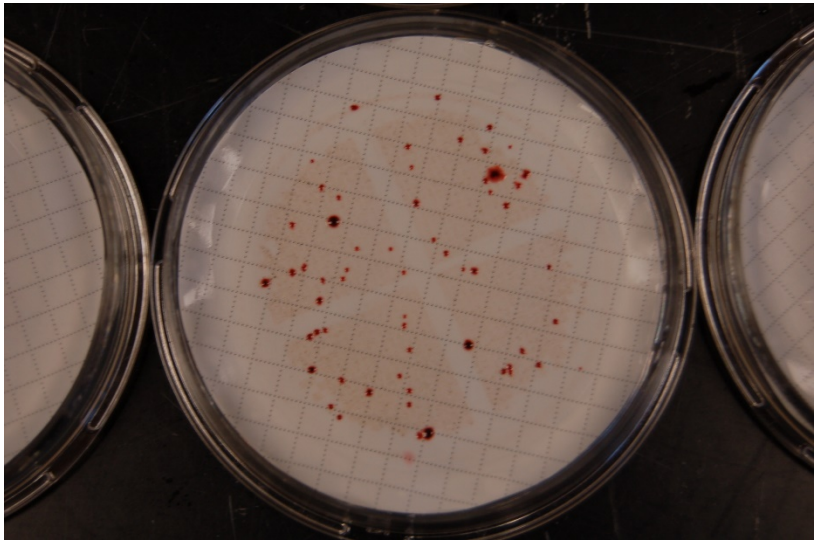
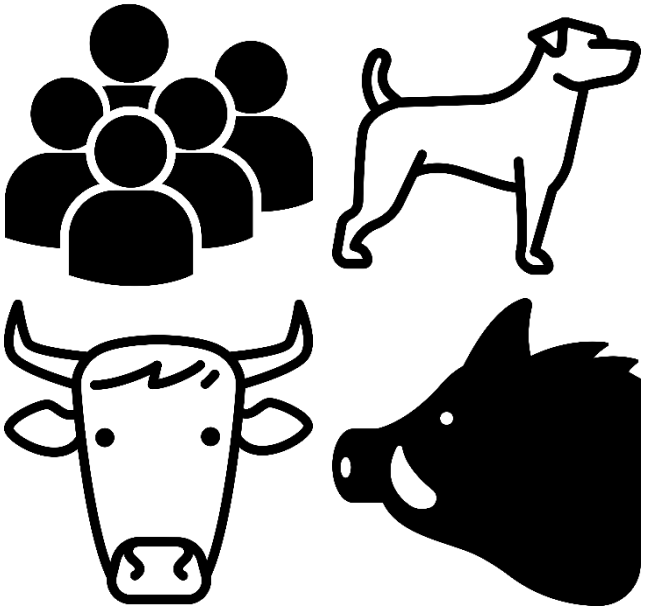


Image: Enterococci colonies growing on a selective agar membrane filtration.
Photo by C Hruby 2010

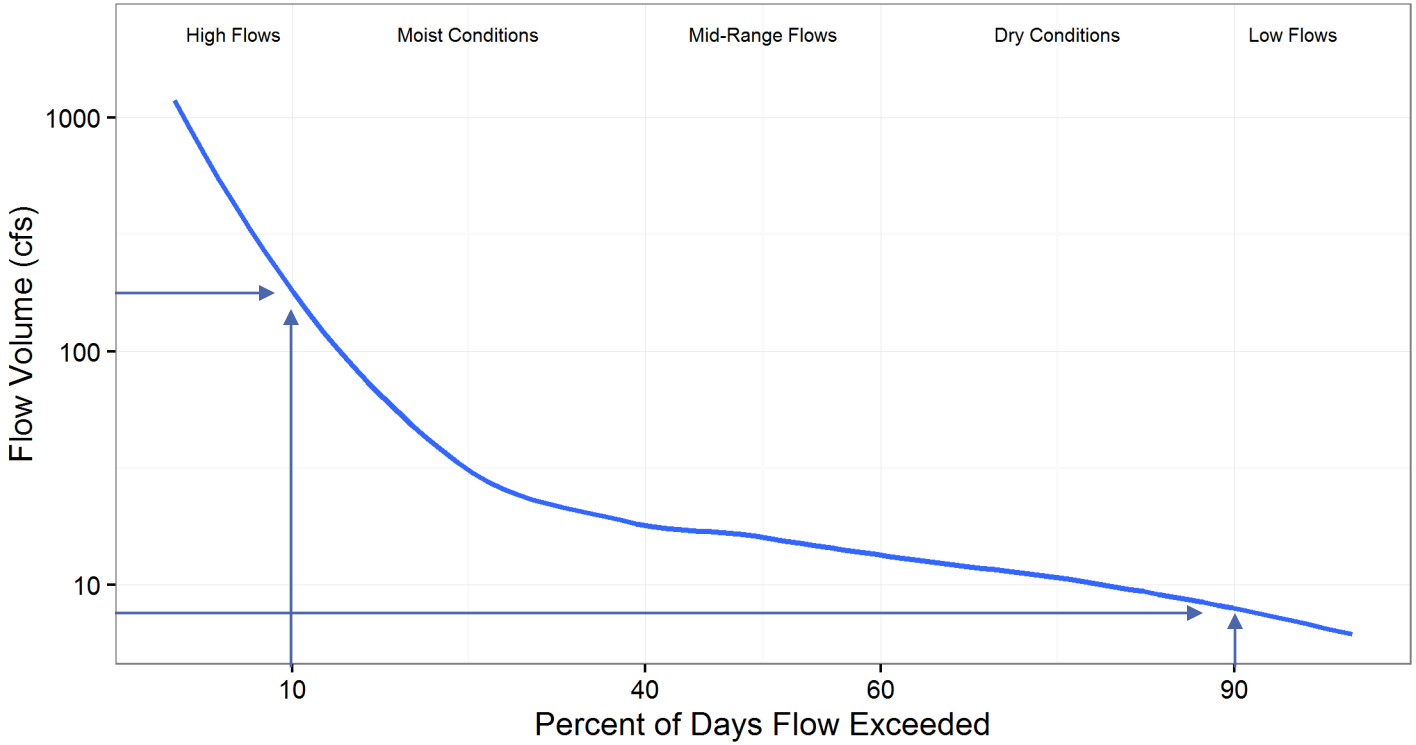
- Estimating Pollutant Source Loads
  - What and where



Images: Freepik from flaticon.com

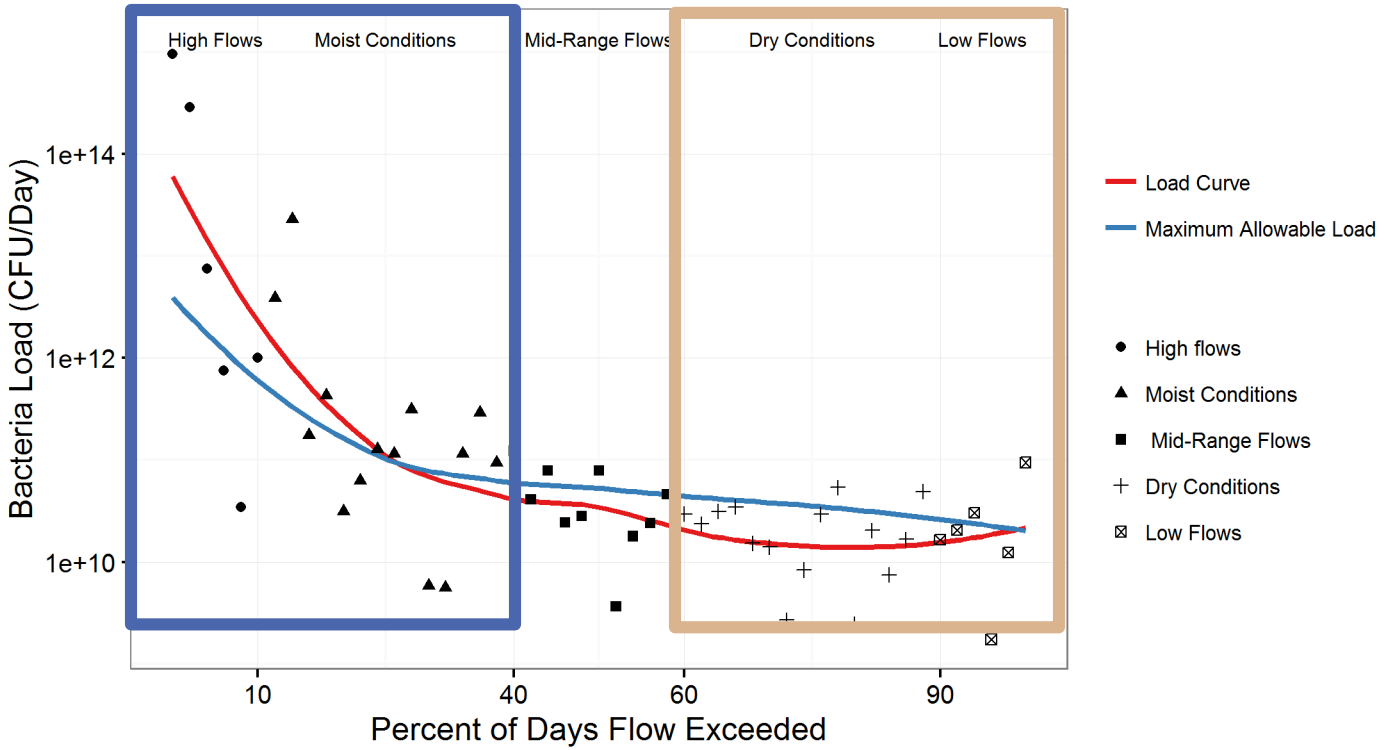
Needed Load Reductions

- Load Duration Curves - Visualize streamflow, pollutant capacity, and water quality data
- Begin with an example:



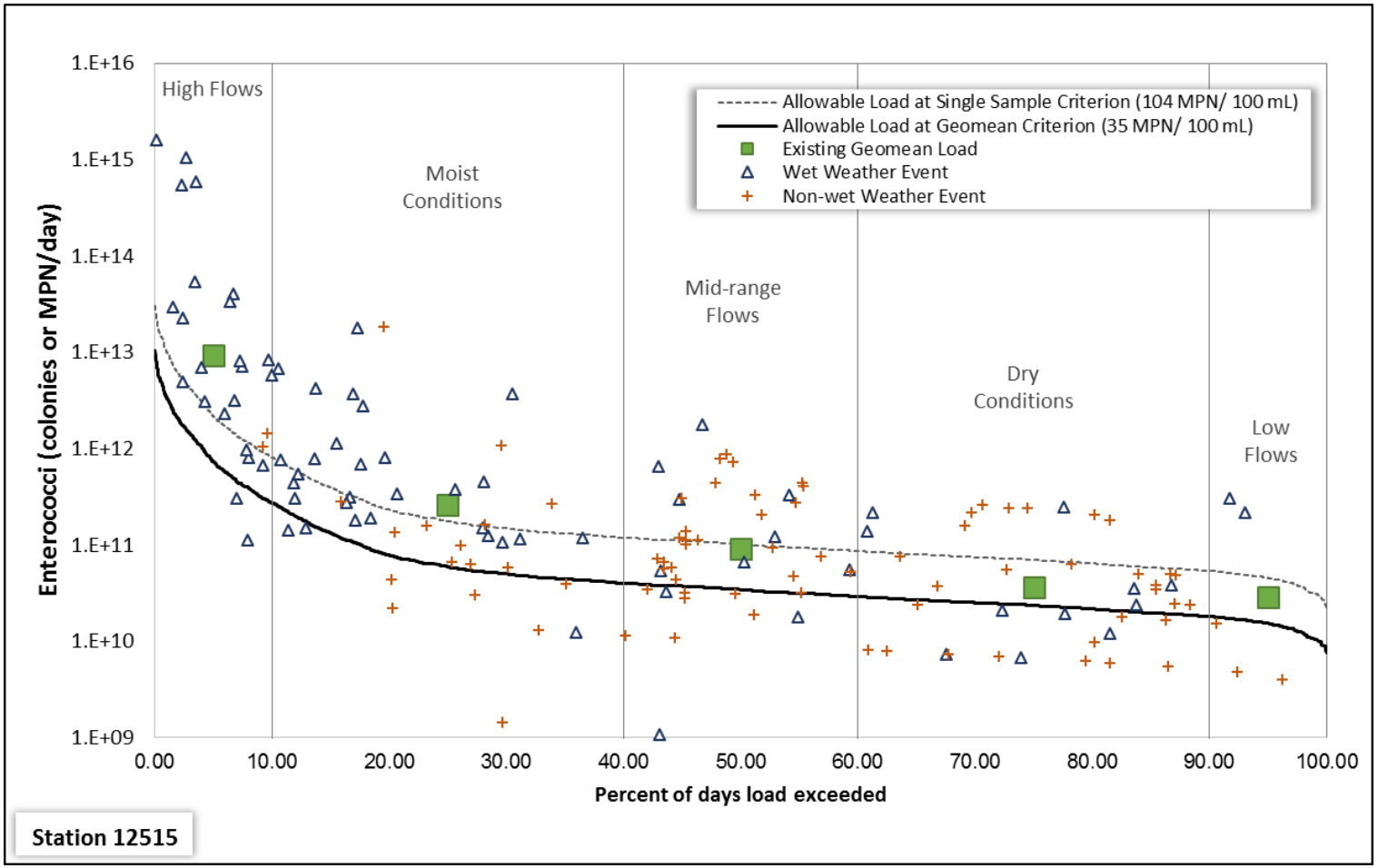
Needed Load Reduction

- Multiply allowable bacteria concentration (minus 10% margin of safety)
- Plot measured pollutant loads



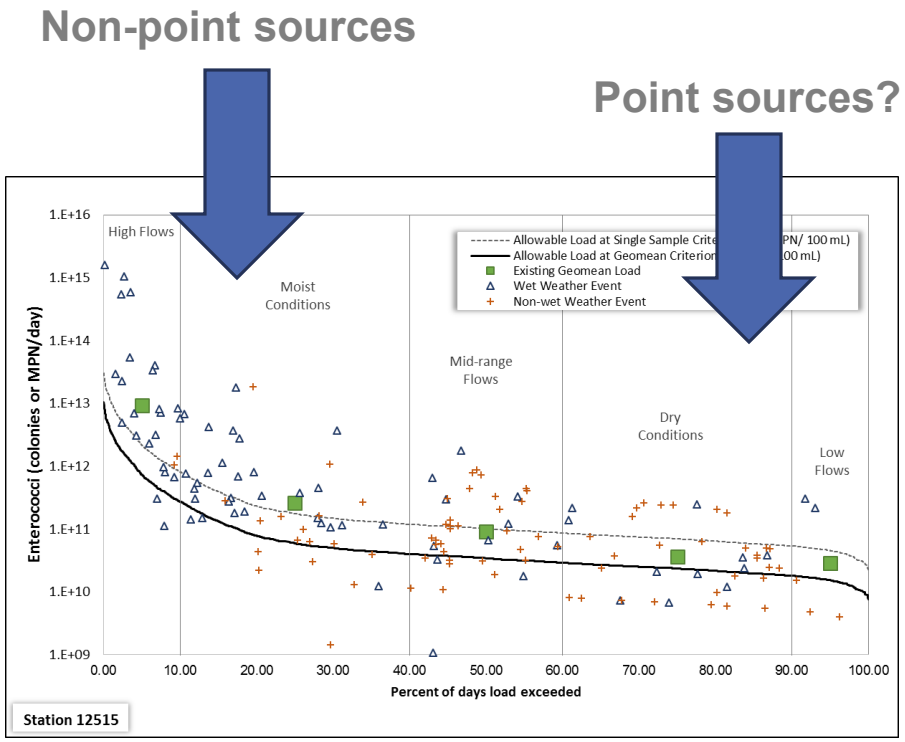
Needed Load Reduction

Load duration curve for Tres Palacios at tidal station 12515



Needed Load Reduction

- 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



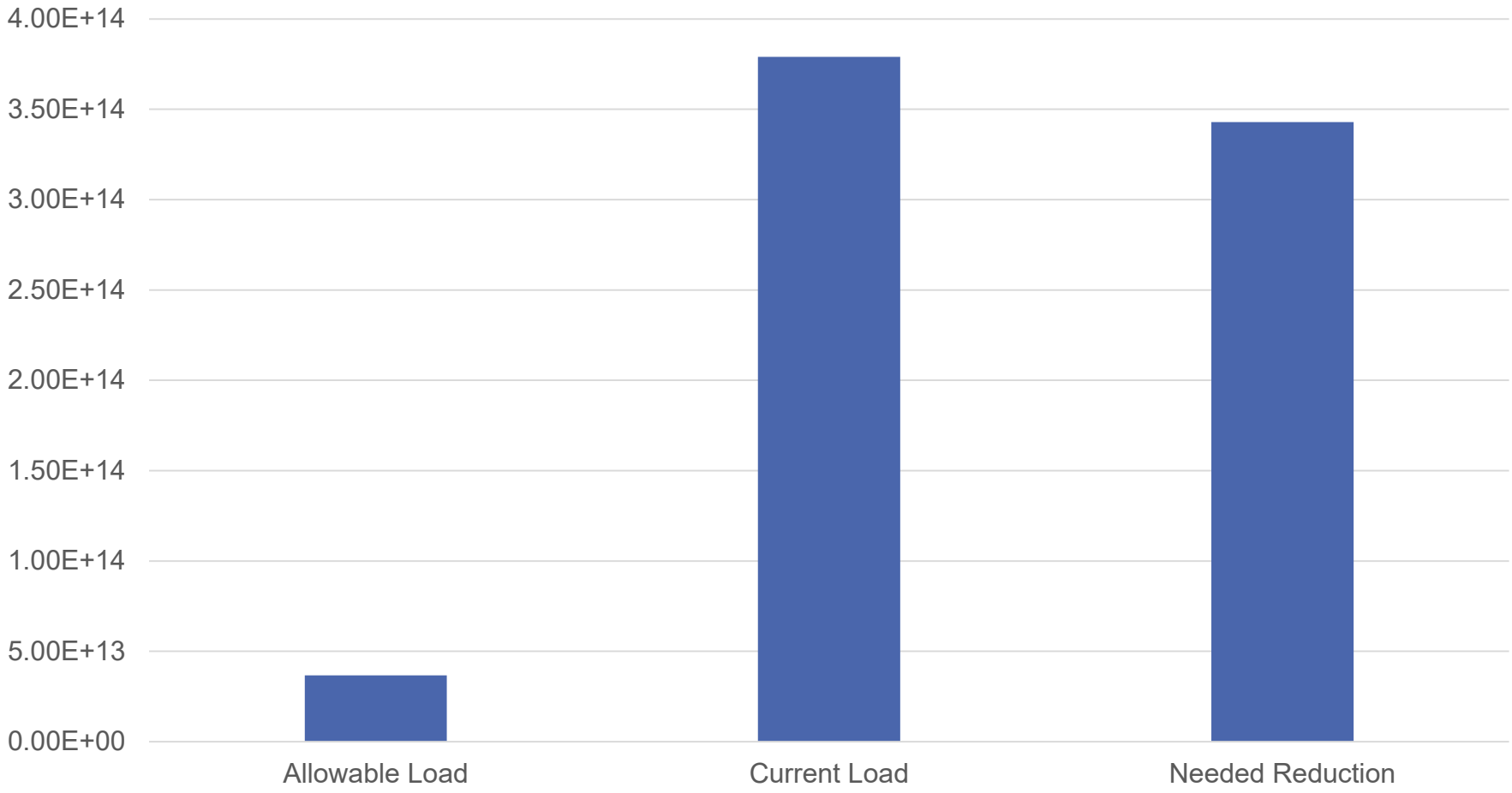
Needed Load Reduction

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}

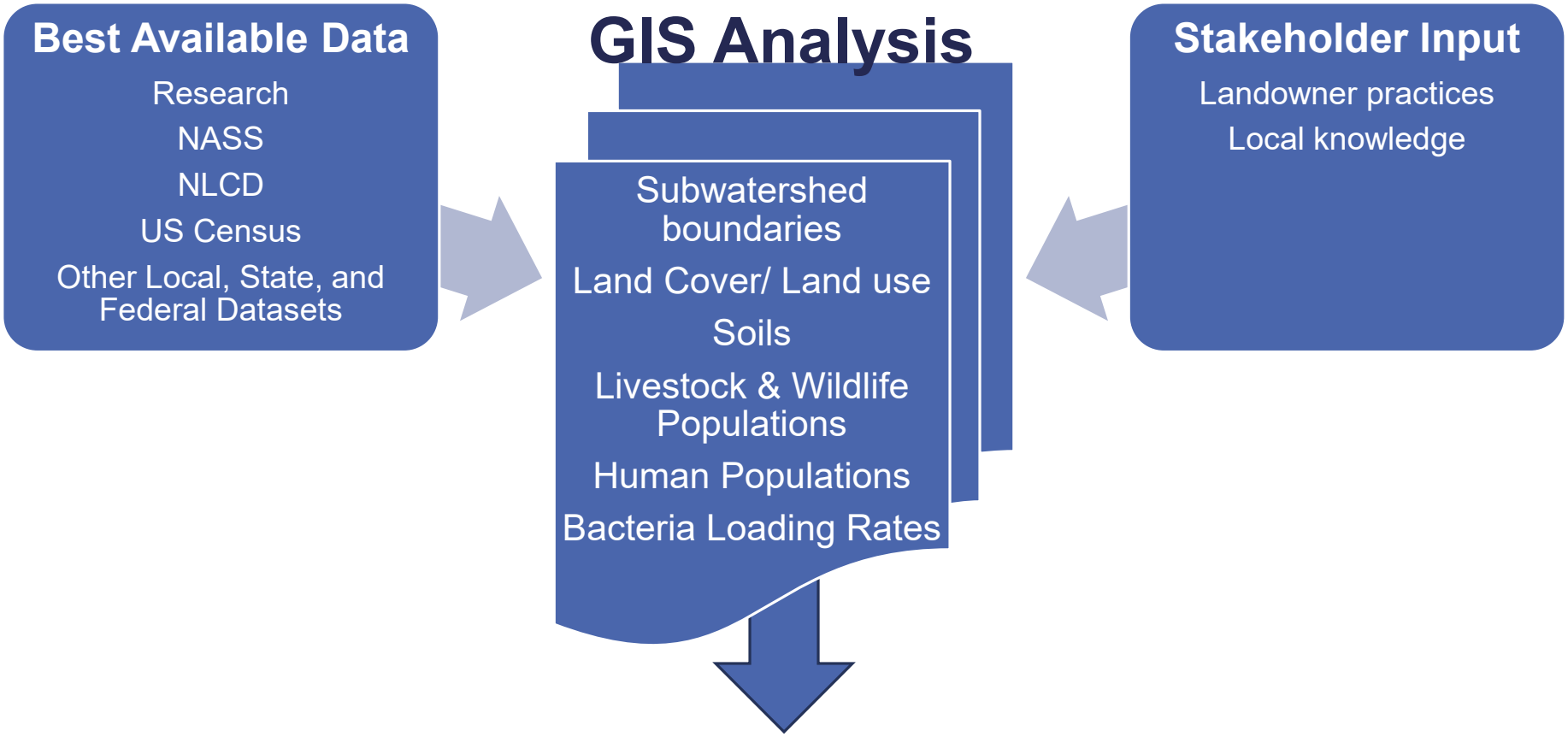
Annual loading reduction needed to meet existing water quality standard:

3.43×10^{14} CFU

Needed Load Reduction



Estimating Pollutant Source Loads



Total Potential Loading

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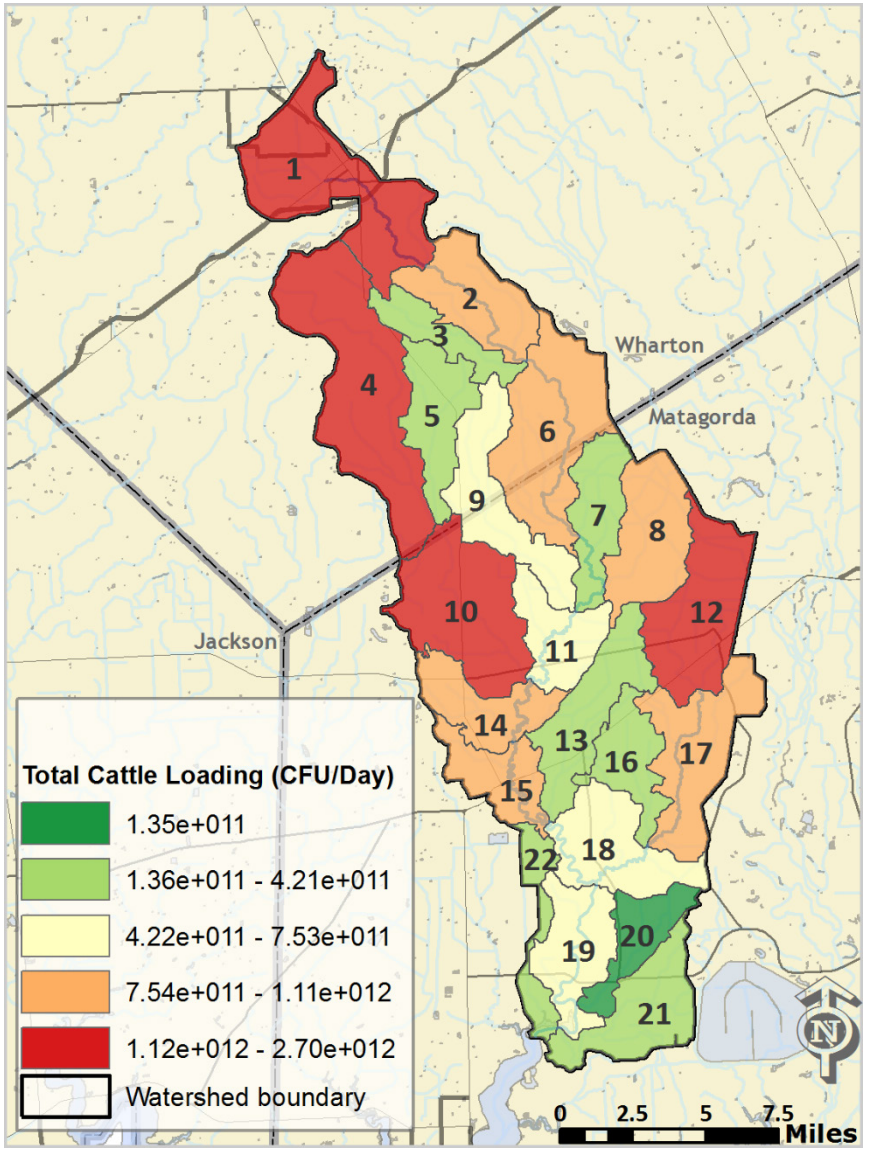
Estimating Pollutant Source Loads

- 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

Estimating Pollutant Source Loads

Potential Loading from Cattle

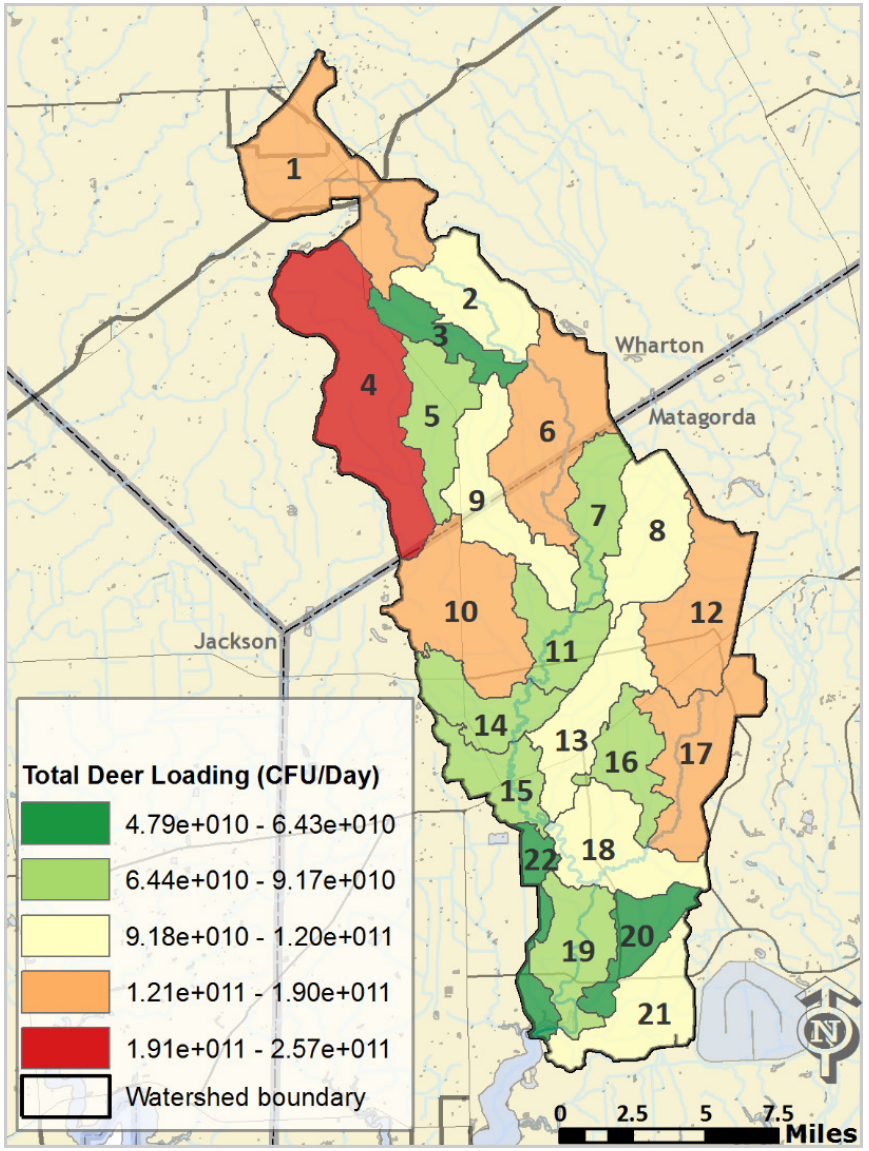
- Estimated 13,131 head
- Annual Load 7.2×10^{15} cfu/yr
- Subwatersheds 1, 4, 10, and 12



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



Estimating Pollutant Source Loads

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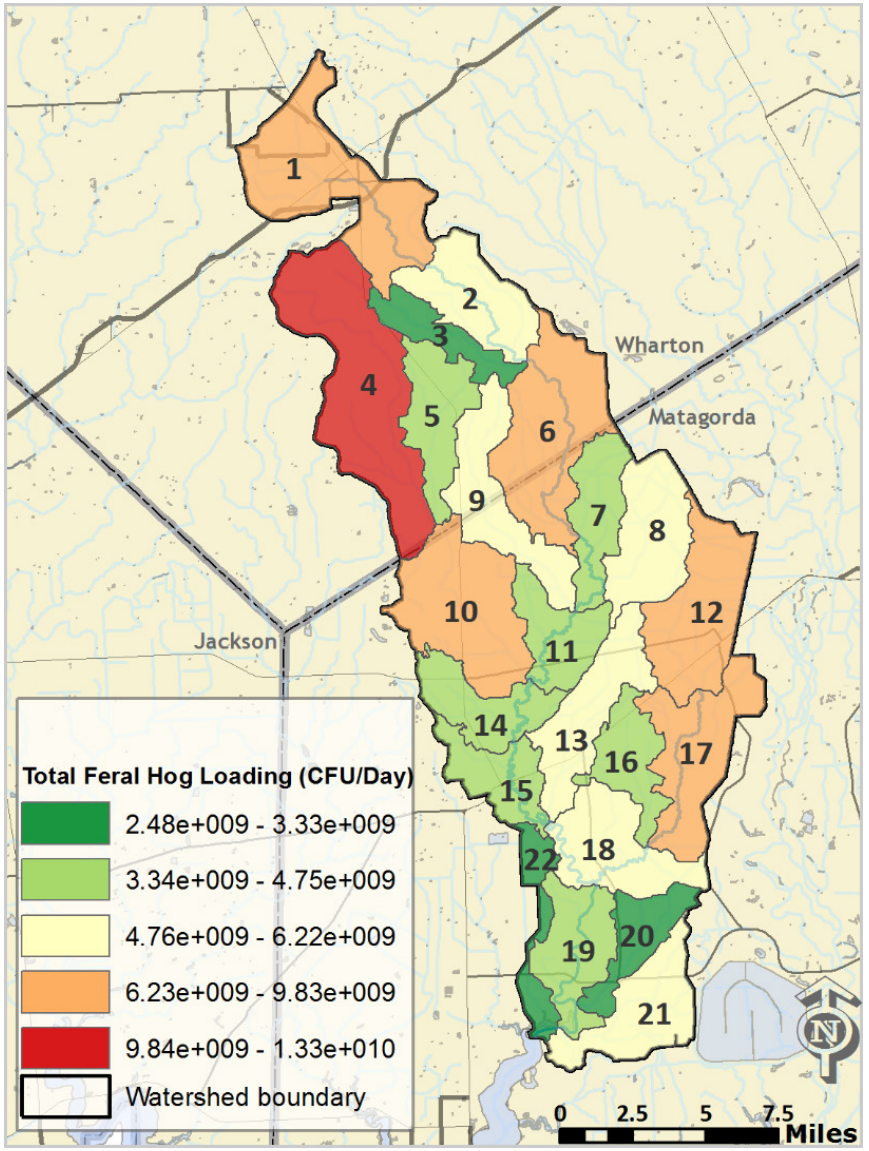
Potential Loading from Feral Hogs

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



Estimating Pollutant Source Loads

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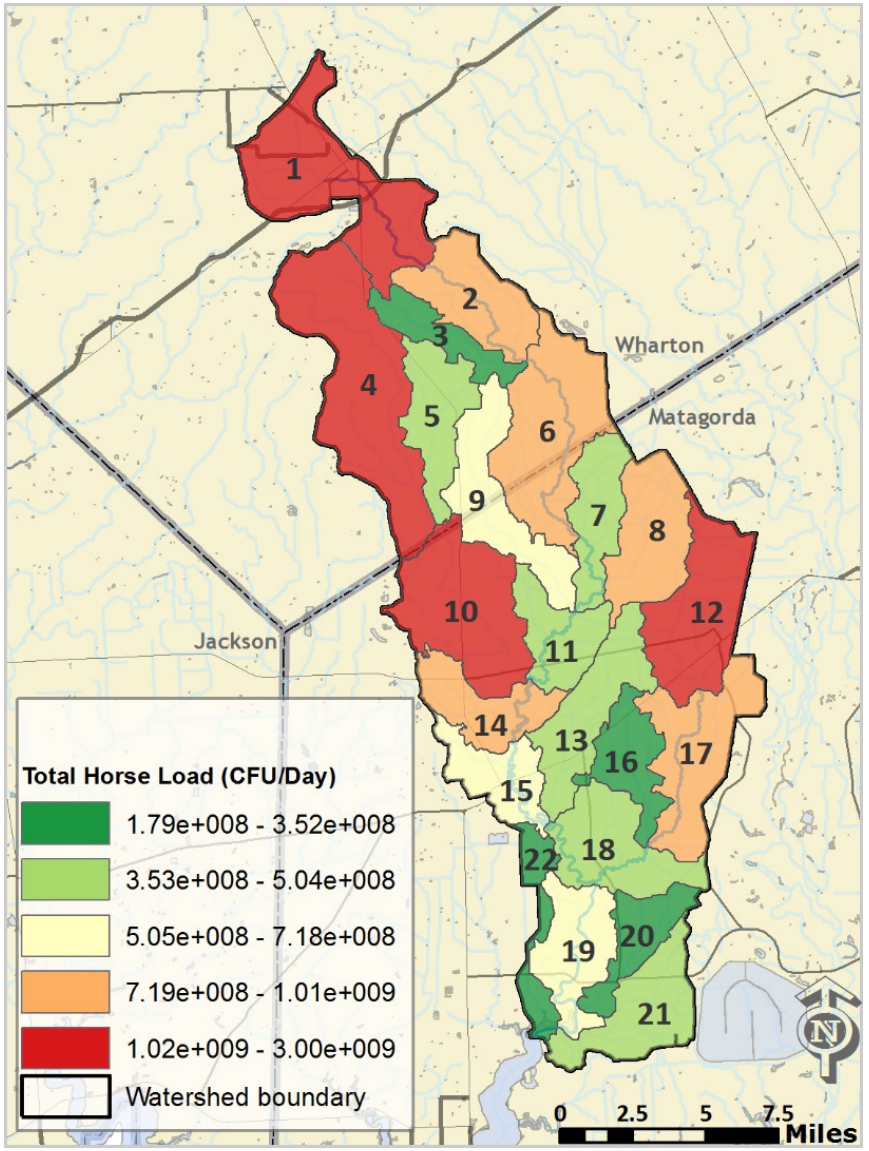
Potential Loading from Horses

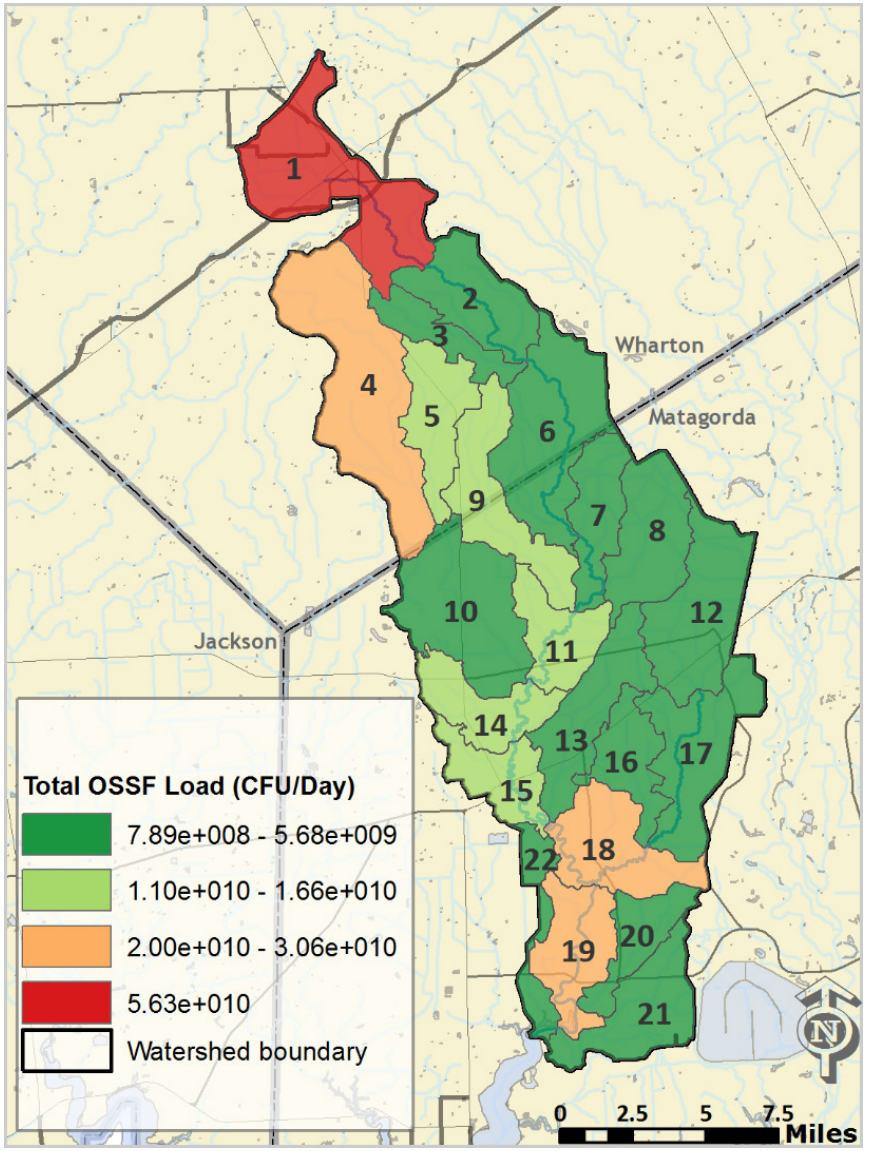
- Estimated 327 horses
- Annual Load 7.7×10^{12} cfu/yr
- Subwatersheds 1,10, 12, and 4



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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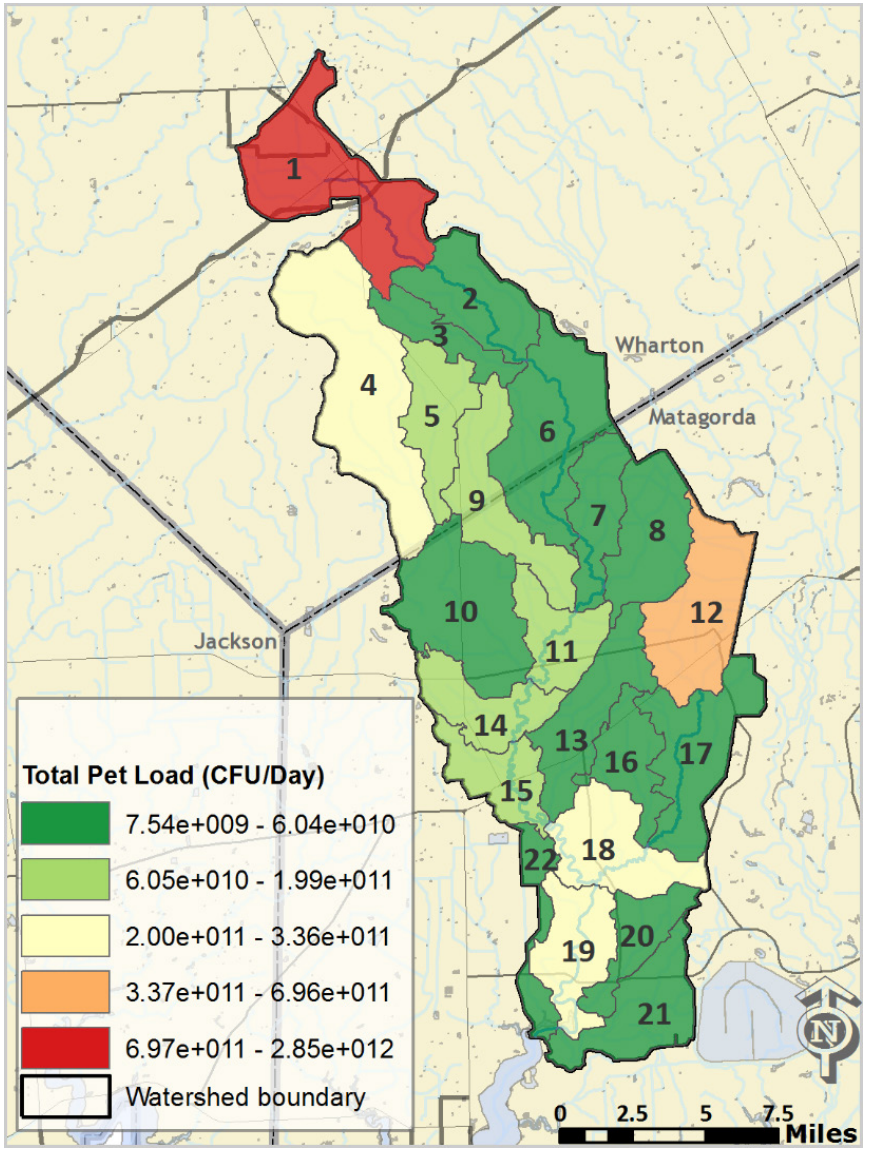
Potential Loading from Pets

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



Estimating Pollutant Source Loads

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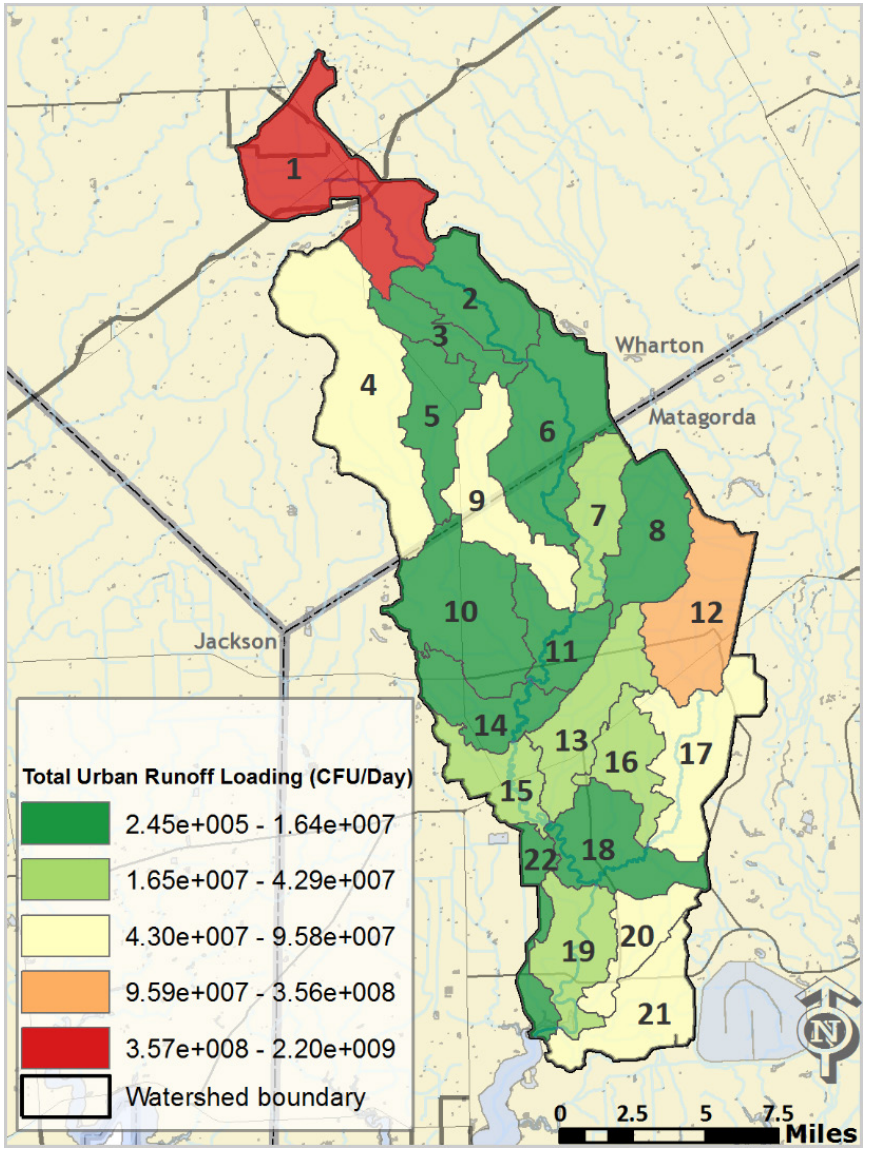
Potential Loading from Urban Runoff

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



Estimating Pollutant Source Loads

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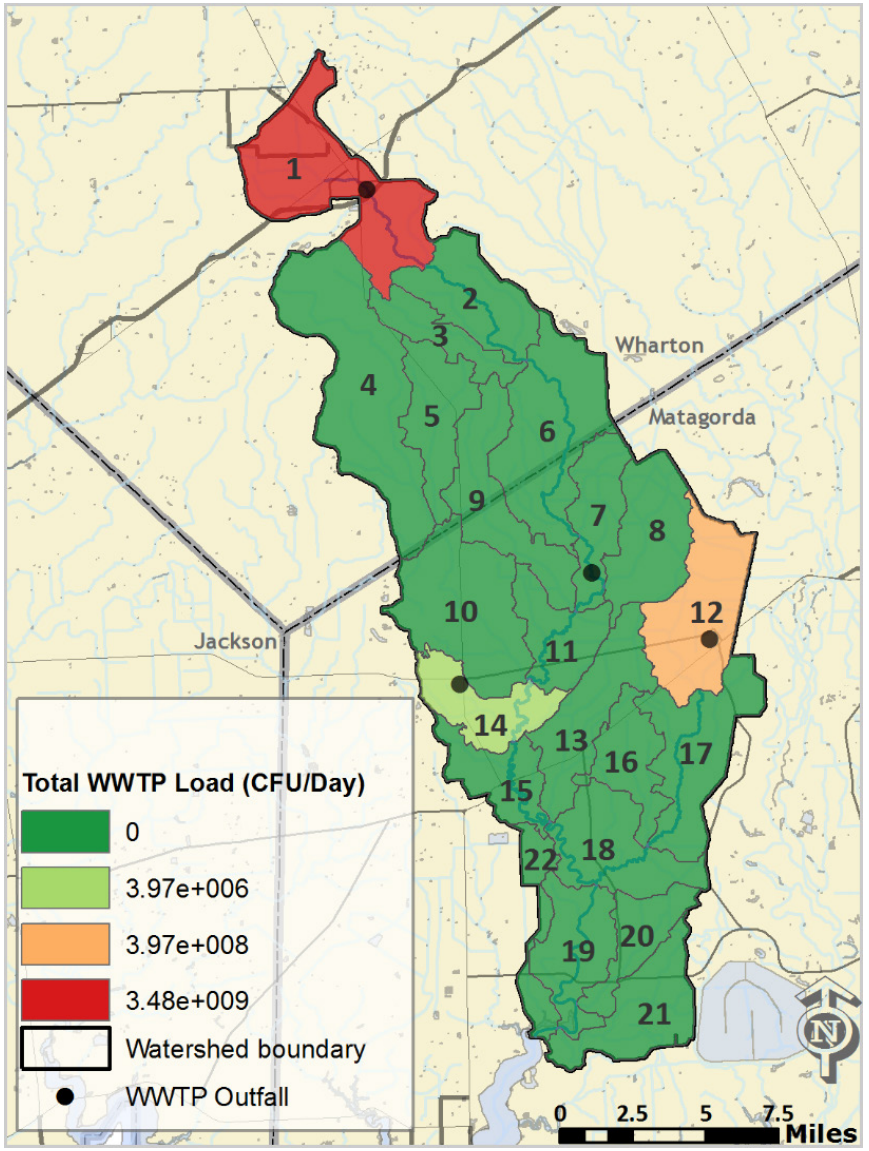
Potential Loading from WWTPs

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



Estimating Pollutant Source Loads

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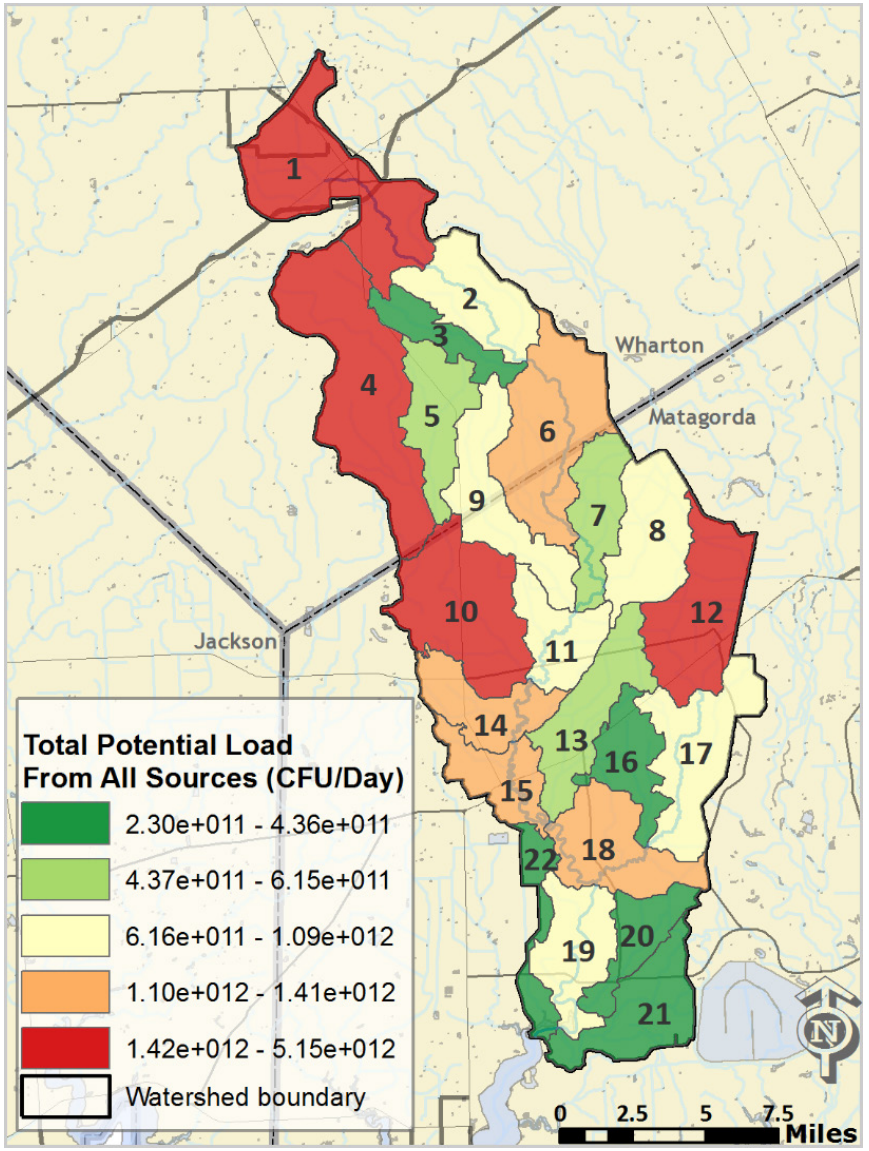
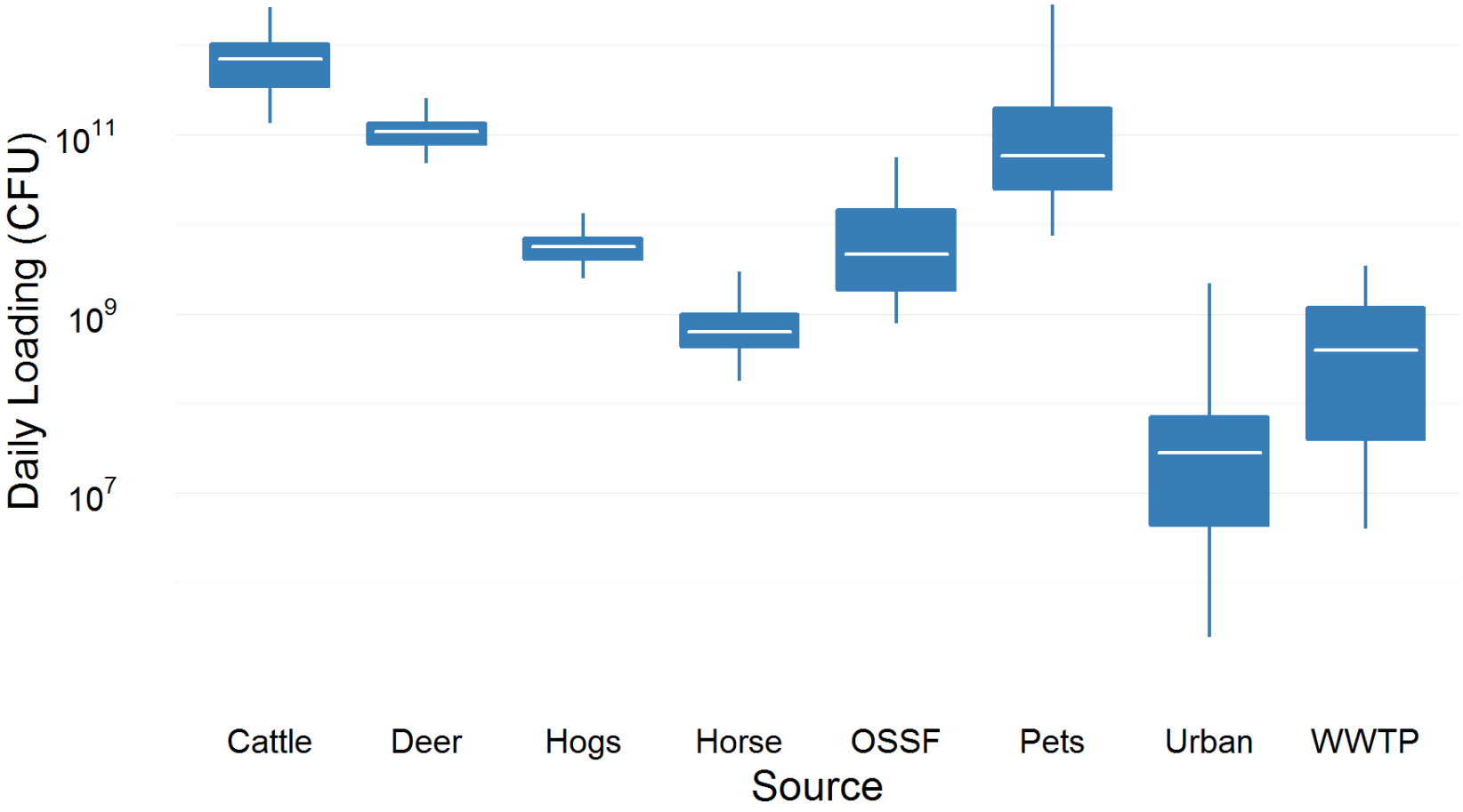
Total Potential Loadings

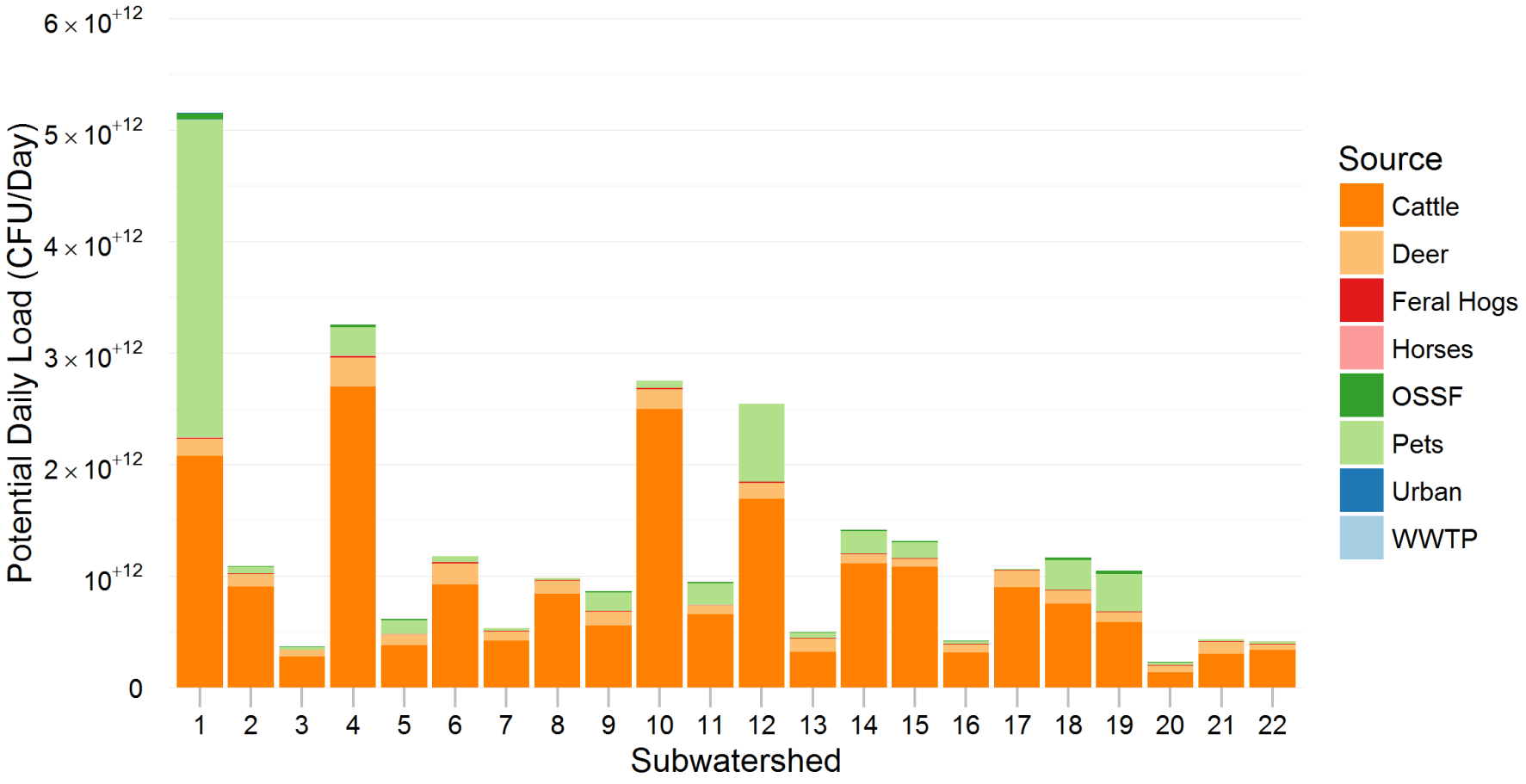
- Annual Load 1.0×10^{16} cfu/yr
- Subwatersheds 1, 4, 10, and 12



Estimating Pollutant Source Loads



Estimating Pollutant Source Loads



Conclusion

- LDC methodology indicates **3.45×10^{14} CFU** annual reduction needed to meet water quality standard
- Presented results from GIS analysis describing potential loads and sources within subwatersheds
- Do the population estimates used in the GIS analysis still appear reasonable?
- Did we miss potential major or minor sources?
- Any concerns/questions with the information presented today?

Questions?

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