Lampasas River Watershed Partnership

Steering Committee Meeting
July 15, 2010

Lisa Prcin
Watershed Coordinator
Texas AgriLife Research at
Blackland Research & Extension Center

Introductions

Past Business

2010 Integrated Report

- Public Comment Period ended March 8th, 2010
- Surface Water Quality Monitoring staff has reviewed and incorporated comments
- DRAFT 2010 Texas Integrated Report will be presented to the TCEQ Commission for its consideration to approve the IR and submit to the EPA at the August 25th agenda.
- Final draft and responses to public comments will be posted on the following web site upon Commissioner approval: http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/10twqi/10twqi

Work Group Reports

- Agricultural Issues
- Habitat and Wildlife
- Outreach & Education
- Urban/ Suburban Issues
- Wastewater Infrastructure

Ground Rules Changes

WORK GROUPS

Current:

Topical work groups formed by the Steering Committee will carry out specific assignments from the Steering Committee. Initially formed standing work groups are:

- *Wastewater Infrastructure Work Group*
- *Agricultural Issues Work Group*
- *Habitat and Wildlife Work Group*
- *Urban/ Suburban Issues Work Group*
- *Outreach and Education Work Group*

Proposed:

Topical work groups formed by the Steering Committee will carry out specific assignments from the Steering Committee. Standing work group include:

- *Agriculture and Wildlife Work Group*
- *Urban Nonpoint Source Work Group*
- *Outreach and Education Work Group*

Texas Surface Water Quality Standards

Water Quality Goals for the Lampasas River WPP

Water Quality Goals for the Lampasas River WPP

- Adopt State Surface Water Quality Standards
  - Fecal Coliform: geomean < 200 cfu per 100 ml
  - *E. coli* : geomean < 126 cfu per 100 ml
  - Chloride: mean < 500 mg/l
  - Sulfate: mean < 100 mg/l
  - Total Dissolved Solids: mean < 1200 mg/l
  - Dissolved Oxygen: ≥3.0 mg/l
  - Nitrate Nitrogen**: mean < 2.76 mg/l
  - Orthophosphate**: mean < 0.5 mg/l
- More protective?
- Less restrictive?

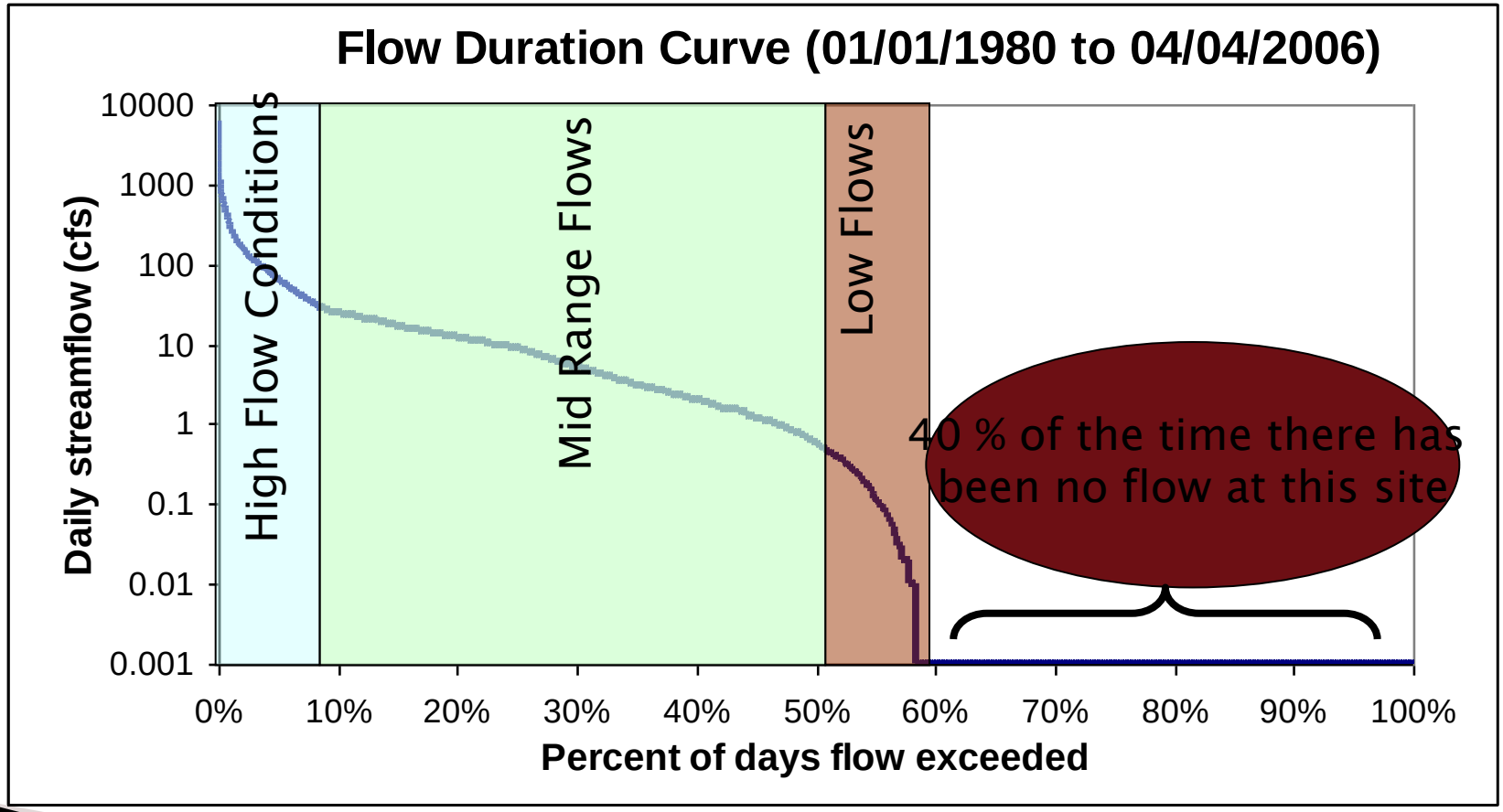
State screening criteria – 85% of state's waterbodies are below this level

Review of Water Quality Data

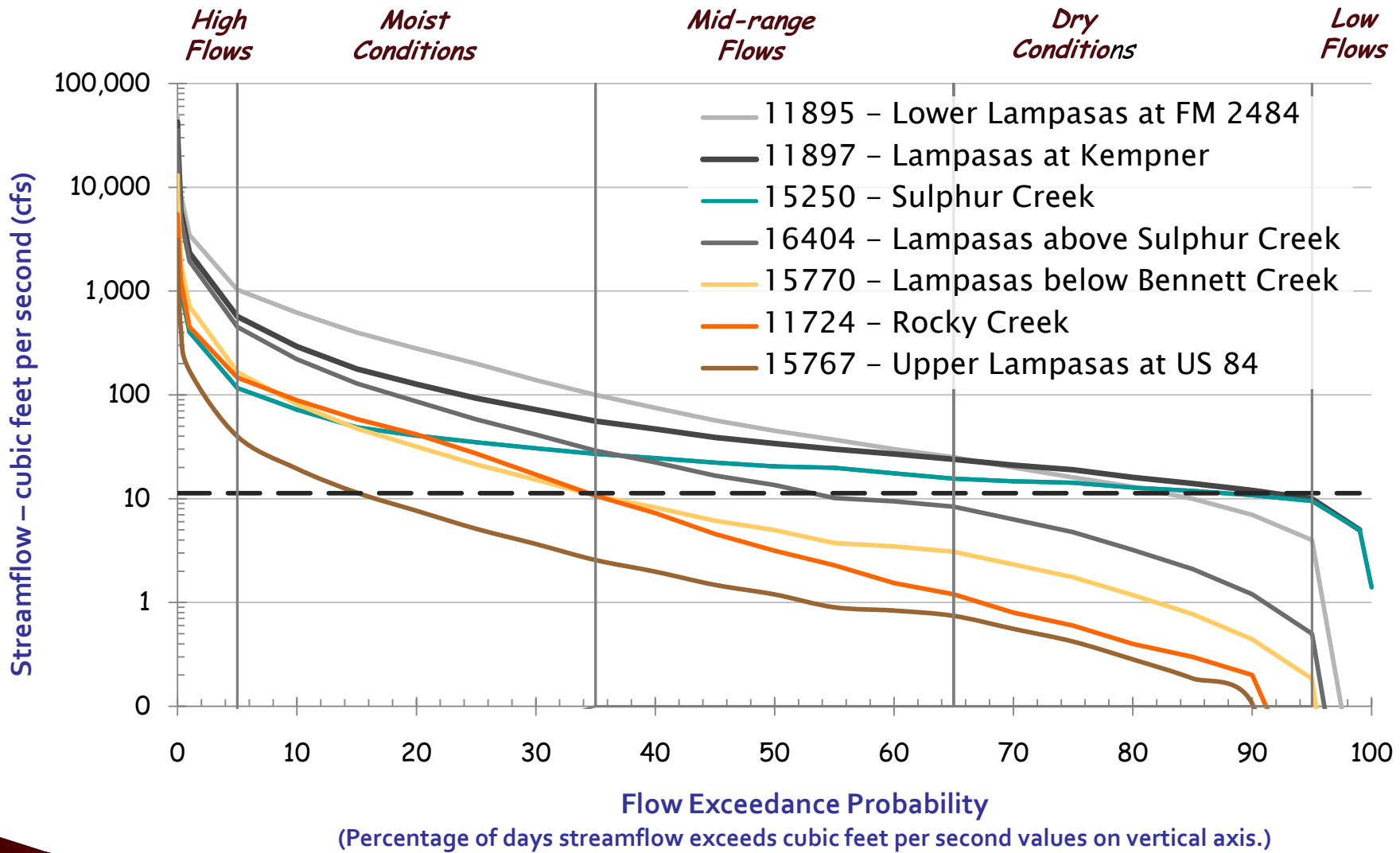
Flow Duration Curve Defined

- Describes the percent of time a flow rate is met or exceeded
- Cumulative frequency of flow data over a period of time
- Creating a Flow Duration Curve (FDC)
  - Gather daily flow data
  - Load data into a spreadsheet
  - Sort the flows from largest to smallest
  - Calculate percentage of days flow was exceeded

Example of an FDC



Lampasas River Watershed FDCs



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Load Duration Curves (LDC) Defined

- A graph showing the percentage of time a pollutant load meets or exceeds a target level
- Based upon 2 datasets
  - Flow
  - Water quality parameter, i.e. fecal coliform or *e. coli*
- Can include a “margin of safety”

Daily Load Estimates

- Use daily flow rates and observed concentration to get daily load estimates

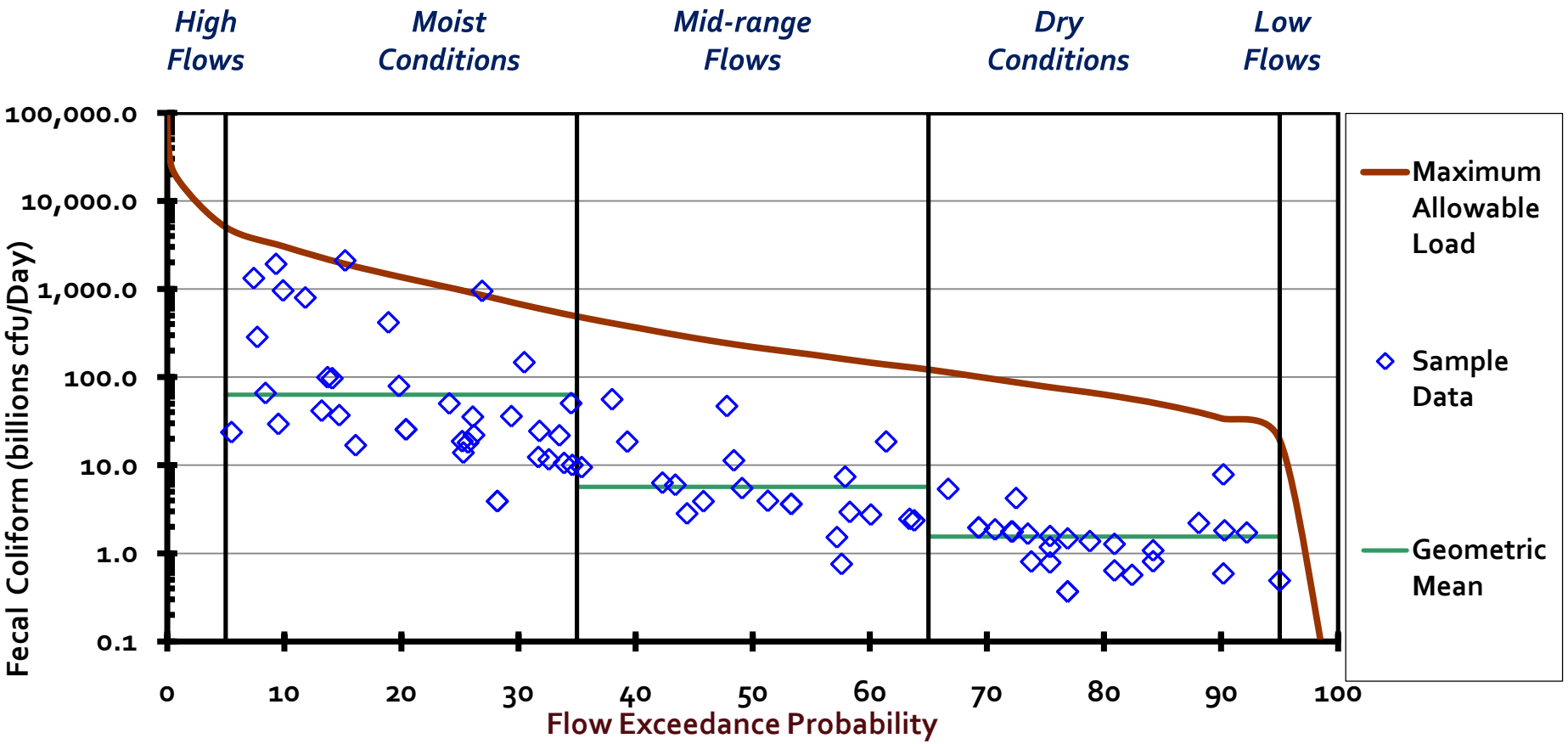
$$load = flow\ rate \times concentration \times conversion\ factor$$

- Repeat for all observed concentration data

EXAMPLE SITE
1973 – 2004

Adequate Sample Points

Fecal Coliform
Target: 200 cfu per 100 ml
Sample Count: 84



(Percentage of days streamflow exceeds cubic feet per second values on Flow Duration chart vertical axis.)

Flood ← → Drought

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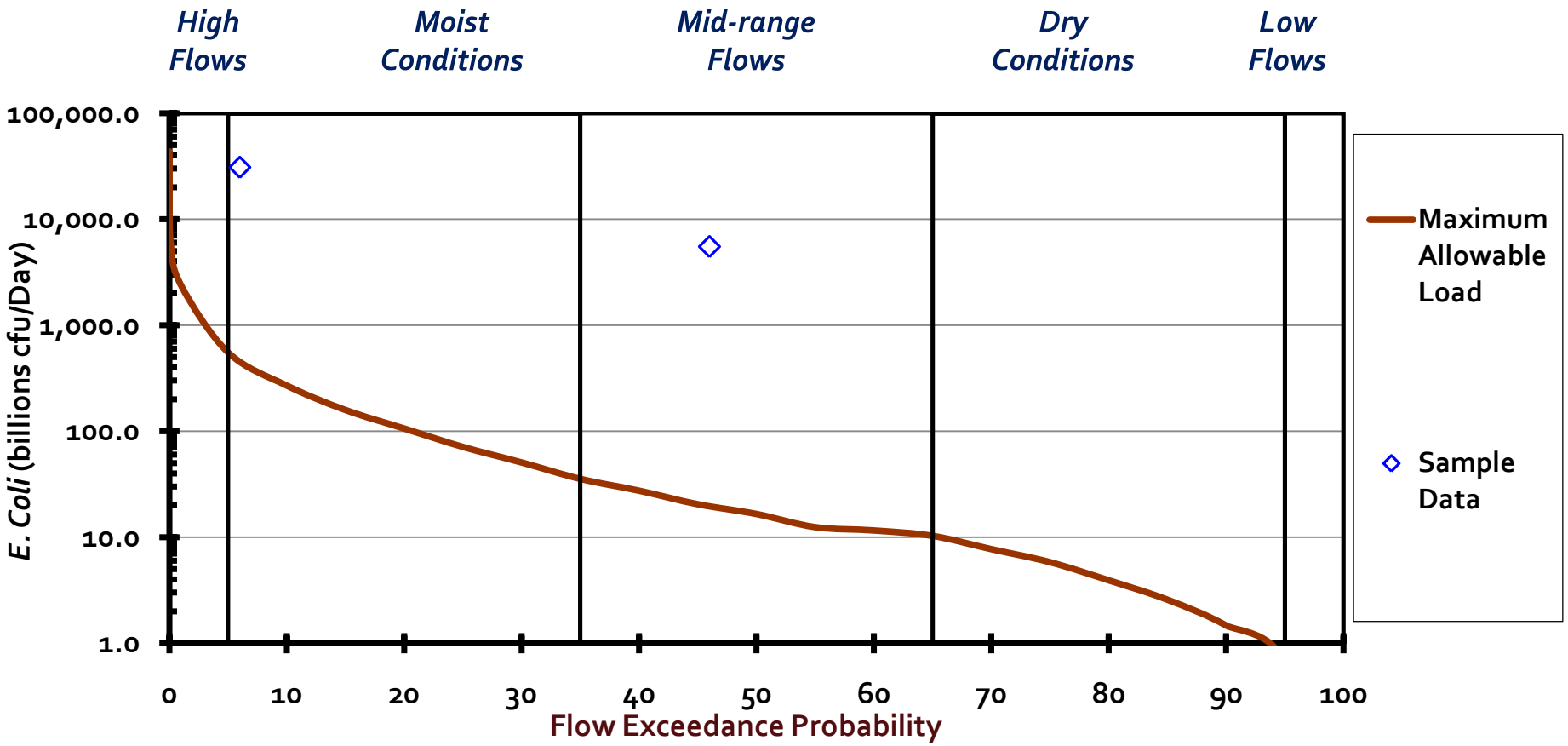
EXAMPLE SITE
2009

E. Coli
Criteria: 126 cfu per 100 ml
Sample Count: 2

Inadequate Sample Points



(Percentage of days streamflow exceeds cubic feet per second values on Flow Duration chart vertical axis.)

Flood ← → Drought

Interpretation

- Pollutant loads above the Load Duration Curve show the target level has been exceeded
- Clusters of data may help identify when problems occur
  - Example:
    - high loads occur primarily during low flows may be direct deposition
    - high loads occur primarily during high flow periods may be nonpoint source pollutants

LDC Uses

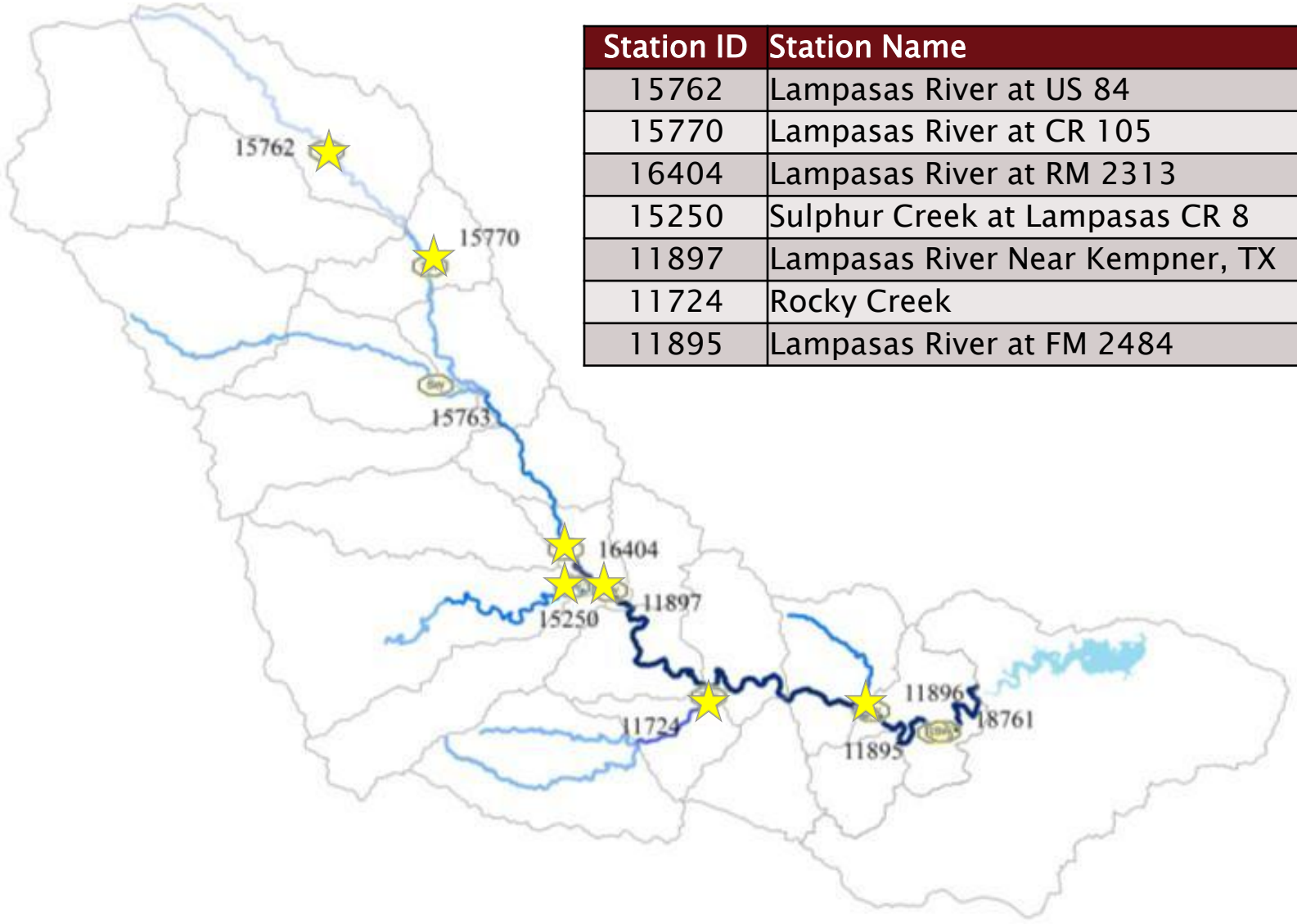
- Easy-to-understand display of water quality
- Helps cull extreme condition data
  - Percentage of 0-10%* may represent extreme floods that are almost impossible to control
  - Percentage of 90-100%* may be associated with extreme drought
- May help identify nonpoint or point source issues
- May help identify seasonal trends
- Allows comparison of different locations
- May help develop water quality goals
- Can help identify additional sampling needs

these percentages maybe site specific

Determining Load Reductions

- Difference between average maximum allowable load and geometric mean for 3 middle flow regimes
  - Moist Conditions
  - Mid-range Flows
  - Dry Conditions

Map of Sampling Sites



Station ID	Station Name
15762	Lampasas River at US 84
15770	Lampasas River at CR 105
16404	Lampasas River at RM 2313
15250	Sulphur Creek at Lampasas CR 8
11897	Lampasas River Near Kempner, TX
11724	Rocky Creek
11895	Lampasas River at FM 2484

Limitations of Fecal Coliform Data

- Fecal coliform is bacteria that is typically found in feces of war-blooded animals
- *E. coli* is a major specific subset of fecal coliform bacteria that are more indicative of contamination
- Prior to 2001, most bacteria measurements were of fecal coliform
- After 2004, most bacteria measurements were of *e.coli*
- If no new fecal coliform data is collected, then how do we measure a load reduction?
- To be able to use historical fecal coliform data, we must do a conversion to *e.coli*
- This is not a one to one conversion
- Several conversion methods available

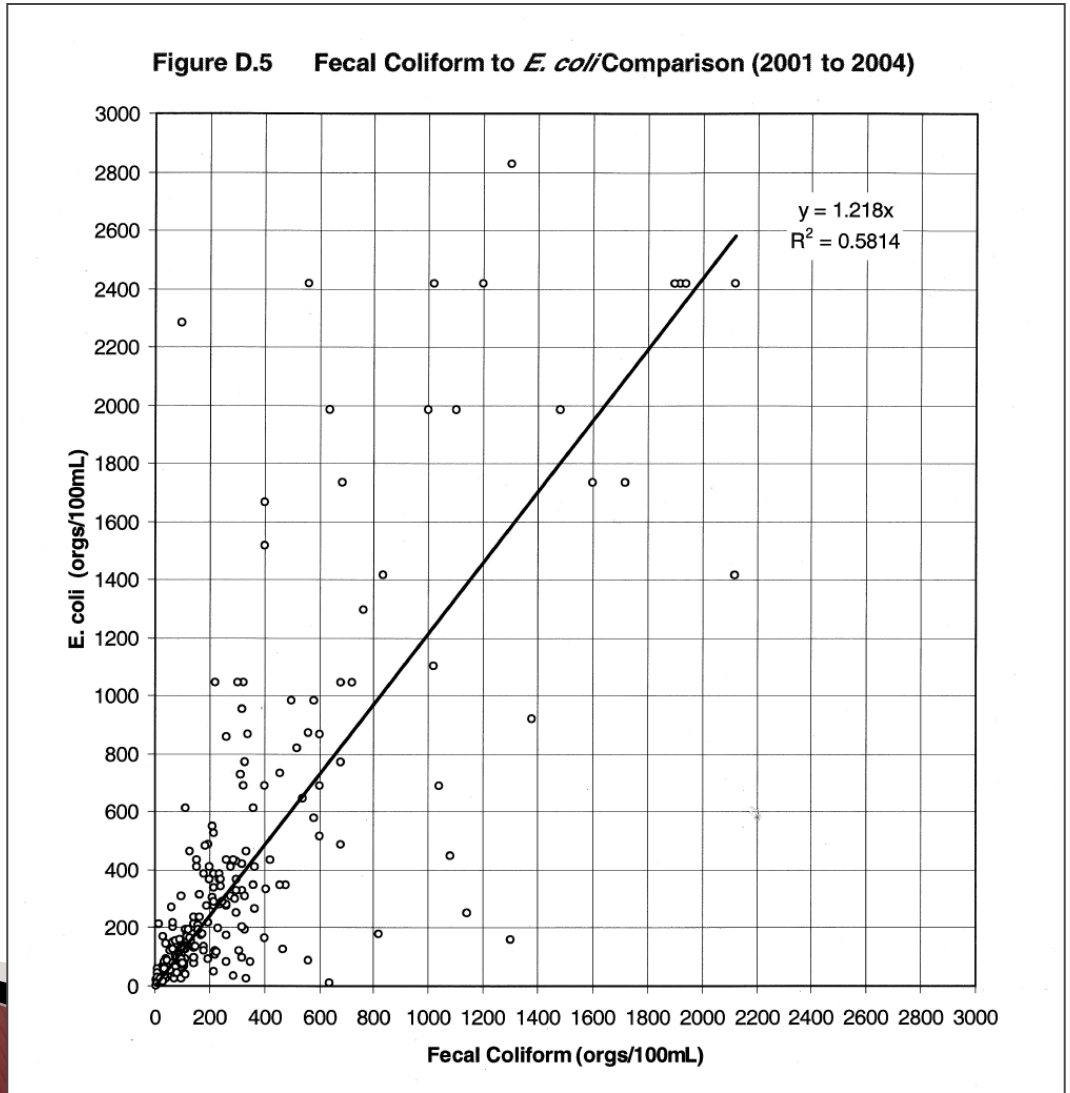
Conversion Methods – Published Data

- Use *e.coli* to fecal ratios found within published work – all, one or average (average = 0.76)

Literature Source	*E. Coli* / FC
Madison WI – Nine Springs WWTF	0.42
Denver CO – South WWTF	0.45
Metropolitan Water Reclamation District of Greater Chicago – John Eagan WWTF	0.61
E. Coli geometric mean to fecal coliform geometric mean ration (SWQS)	0.63
MWRDGC's Hanover Park WWTF	0.70
Green Bay WI – WWTF	0.70
Elmund Paper (1966 – 1997)	0.74
U.S. Geological Survey	0.77
Gannon, John J. and Busse, Michael K.	0.82 – 1.34
Parkersburg WV – WWTF	0.89
MWRDGC's – James Kirie WWTF	1.09

Conversion Methods – Regression

Example from the Leon River WPP



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Conversion Methods – Texas Surface Water Quality Standards

- *E. coli* geometric mean to fecal coliform geometric mean ration (SWQS)
- *E. coli*/ Fecal coliform = 0.63

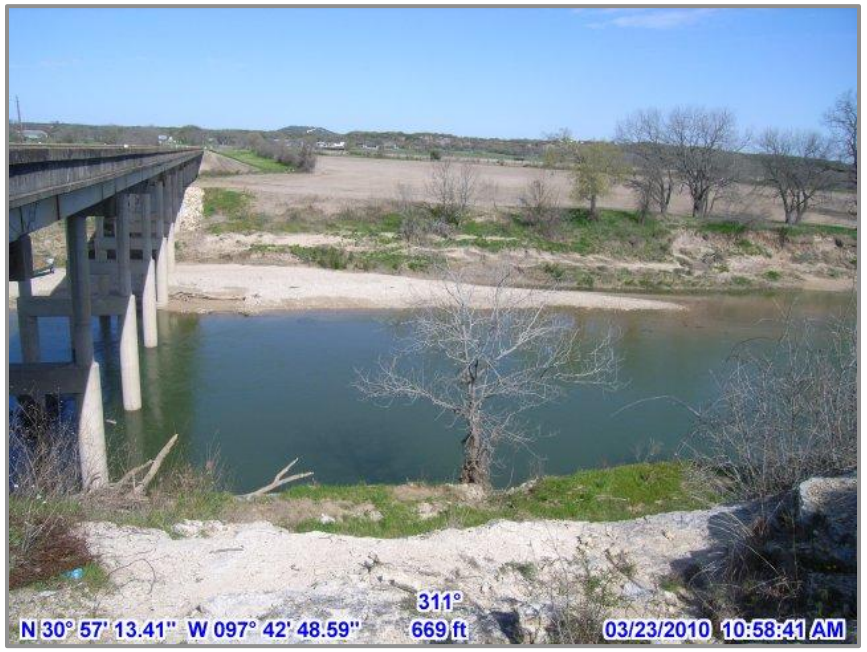
Land Use/Land Cover Analysis Recommendations from Work Groups

Methods Used

- **National Agriculture Imagery Program (NAIP) Digital Ortho Imagery**:
  - NAIP Ortho photos are collected and compiled each year by the United States Department of Agriculture (USDA) Farm Service Agency (FSA) during a portion of the agricultural growing season at a one or two meter resolution (2008).
- **National Land Cover Dataset:**
  - The NLCD was developed using a decision-tree classification approach for multi-temporal Landsat imagery and several ancillary datasets. The category of urban land was extracted from the dataset using the ArcGIS Spatial Analyst extension to compare and compliment the NAIP classification (2001).
- **Crop Data Layer:**
  - The CDL was used in the classification process to gather in depth cropland points in the watershed. A CDL is a small unit of land that has a permanent, contiguous boundary, with a common land use and owner, and a common producer in agricultural land associated with USDA farm programs. CDL boundaries are delineated from relatively permanent features such as fence lines, roads, and/or waterways (FSA)(2008).
- **Ground Truth Data**:
  - Samples for each LU/LC class within the study were gathered using Trimble GeoXH 2005 and RICOH Caplio 500SE 1.38 Rev 2 units, as well as digital sampling of high-resolution aerial photography. The primary focus of the field collection process was to collect ground control points across the entire area, particularly in classes which were difficult to distinguish.

Land Use Definitions

- Water: All areas of open water, generally with less than 25% cover of vegetation or soil



Land Use Definitions continued

- Urban: Includes areas with a mixture of some constructed materials and lawn grasses. These areas most commonly include residential and commercial developments

Land Use Definitions continued

- Forest: Areas dominated by trees generally greater than 15 feet tall, greater than 50% of total vegetation cover and areas adjacent to streams, creeks and/or rivers

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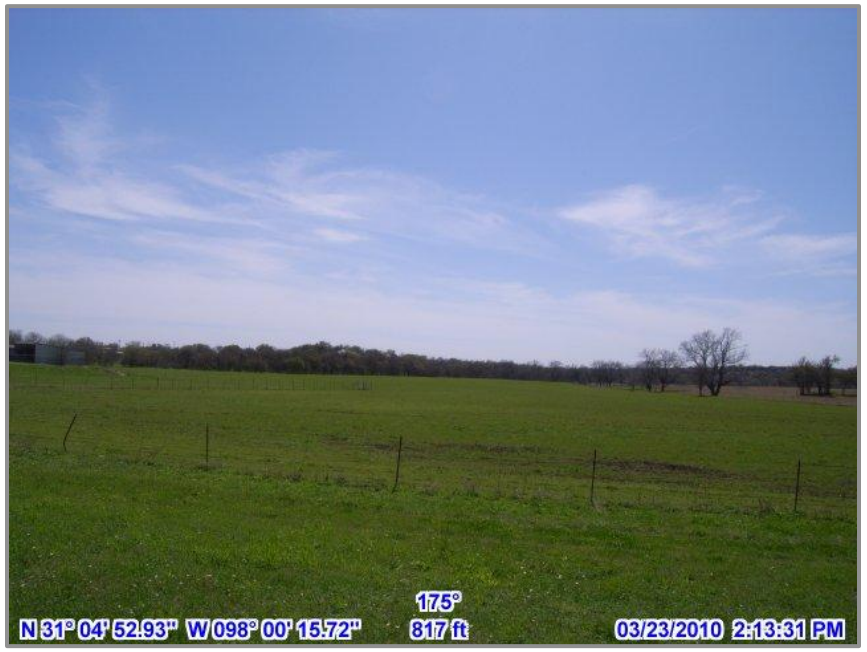
Land Use Definitions continued

- Pasture:
  Transitional area between unmanaged rangeland and managed pasture

Land Use Definitions continued

- Managed Pasture: Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops



Land Use Class Definitions continued

- Rangeland: Areas of unmanaged shrubs, grasses, or shrub-grass mixtures

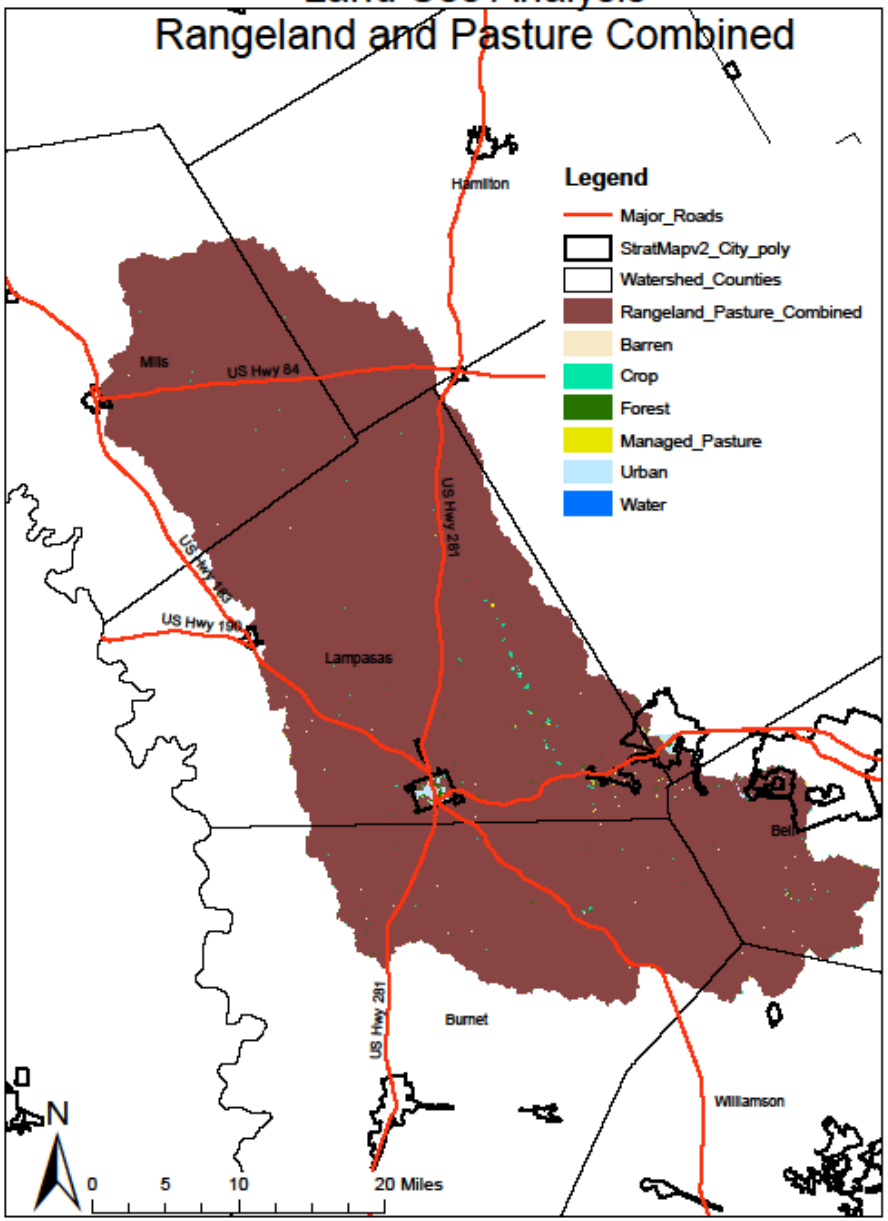
Land Use Class Definitions continued

- Barren: (Rock/Sand/Clay) – Barren areas of bedrock, desert pavement, scarps, slides, strip mines, gravel pits, construction sites and other accumulations of earthen material – vegetation accounts for less than 15% of total cover and includes transitional areas

Land Use Class Definitions continued

- Crops: Areas used for the production of annual crops, such as corn, soybeans, vegetables and cotton and also perennial crops such as orchards – also includes all land being actively tilled

Lampasas River Watershed
Land Use Analysis
Rangeland and Pasture Combined



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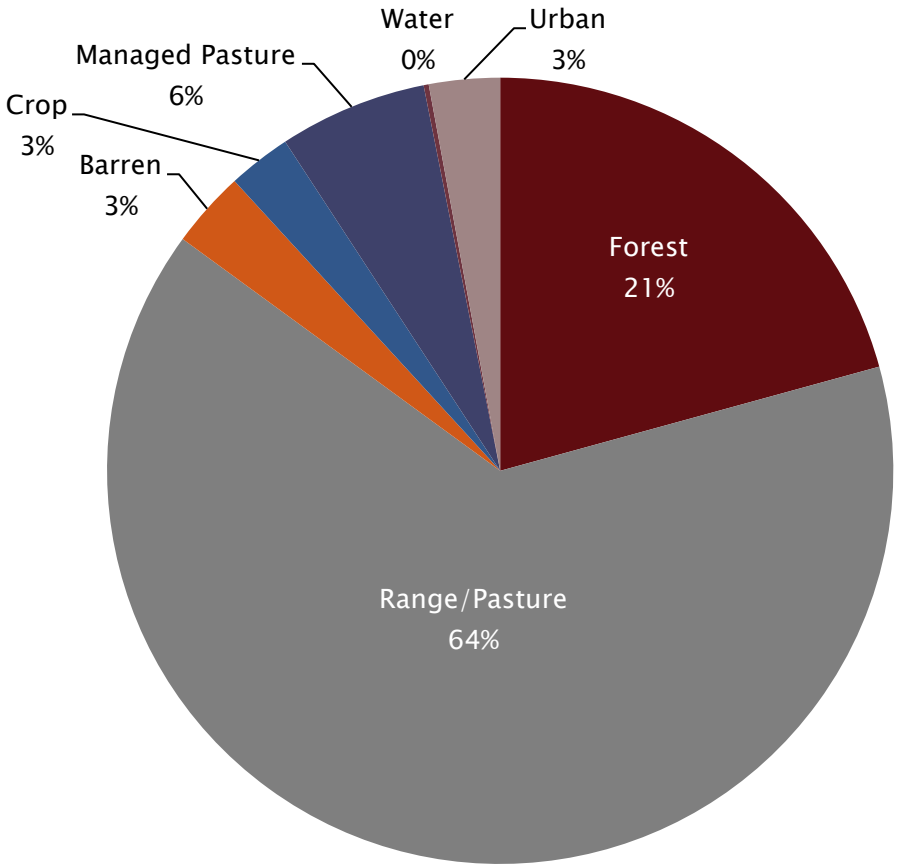
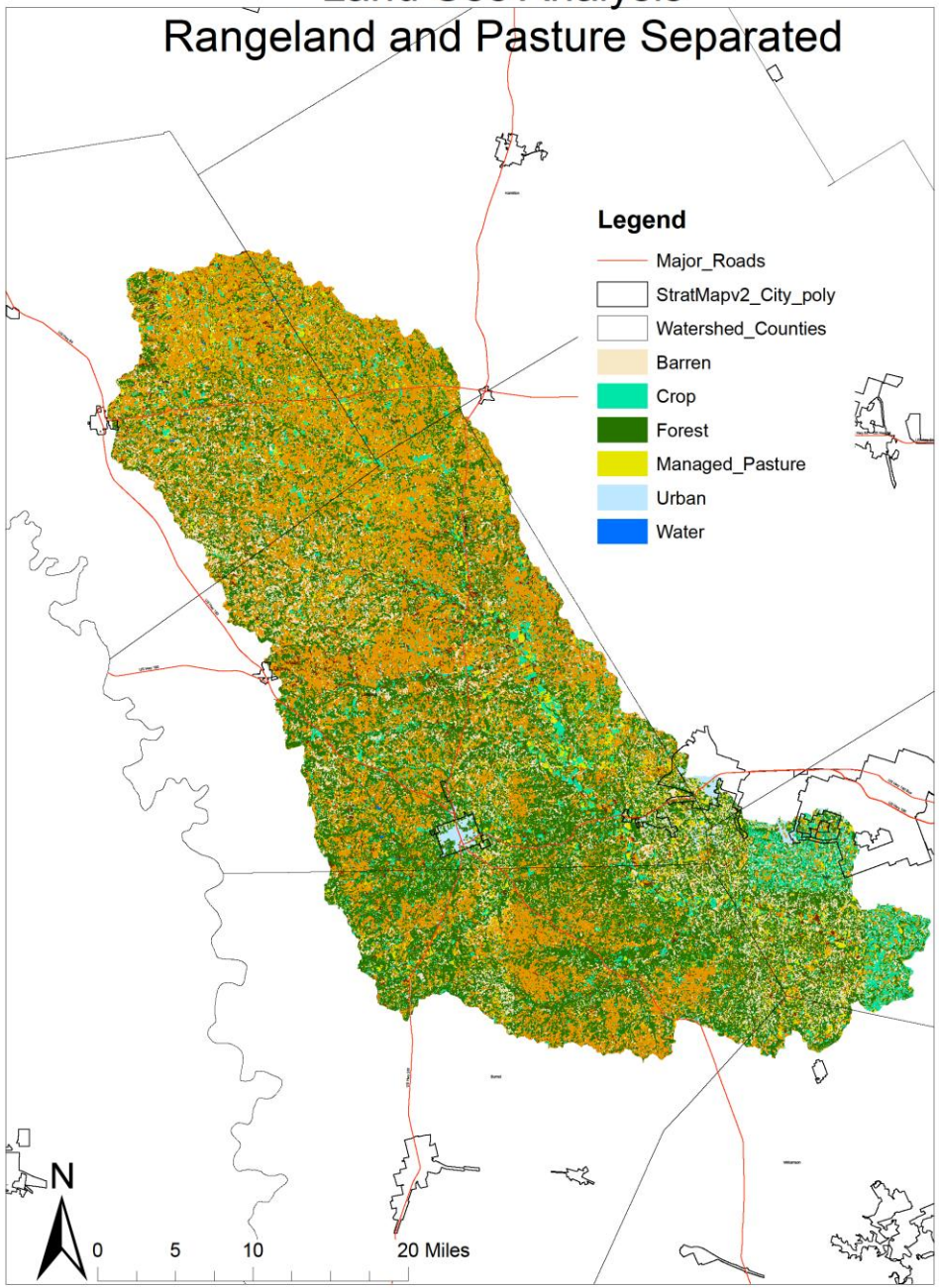
Watershed Land Use/Land Cover

Rangeland and Pasture Combined



- Forest – 195,945
- Range/Pasture – 607,769
- Barren – 29,799
- Crop –24,560
- Managed Pasture – 57,550
- Water – 1,973
- Urban – 27,544

Lampasas River Watershed
Land Use Analysis
Rangeland and Pasture Separated



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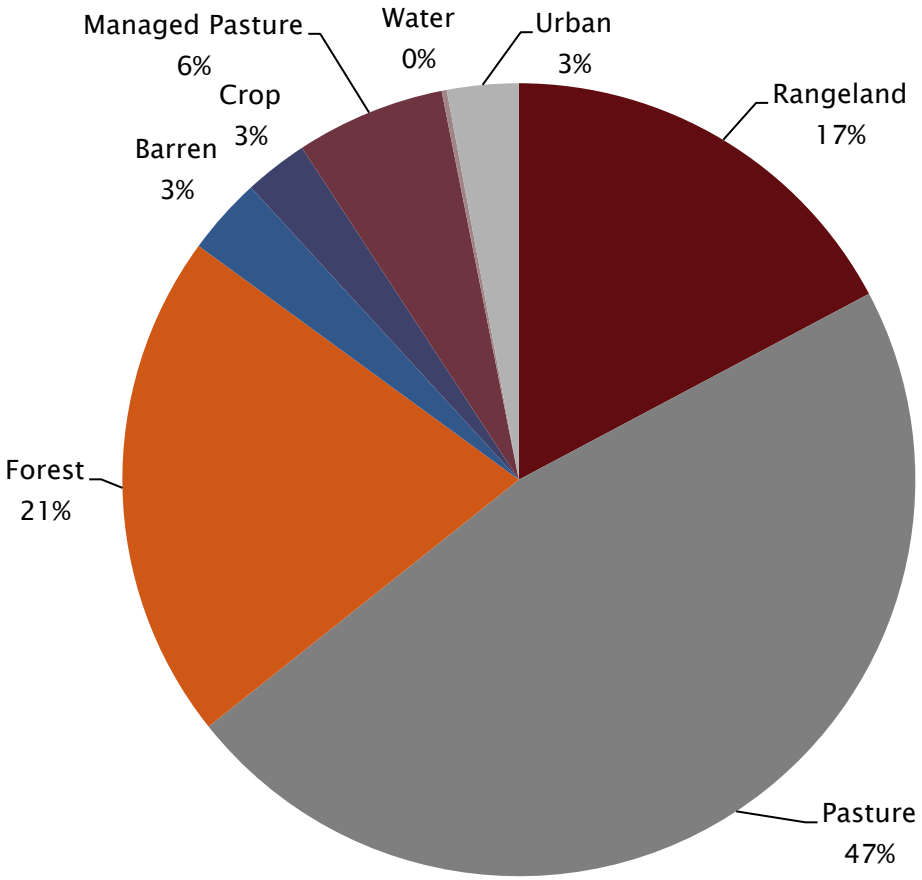
Watershed Land Use/Land Cover

Rangeland and Pasture Separated



- Rangeland – 162,870
- Pasture – 444,900
- Forest – 195,945
- Barren – 29,799
- Crop –24,560
- Managed Pasture – 57,550
- Water – 1,973
- Urban – 27,544

Watershed Land Use/Land Cover

- Accuracy based on ground-truthing
  - Rangeland and Pasture Combined = 87%
  - Rangeland and Pasture Separated = 71%
    - Difficult to distinguish between rangeland and pasture digitally

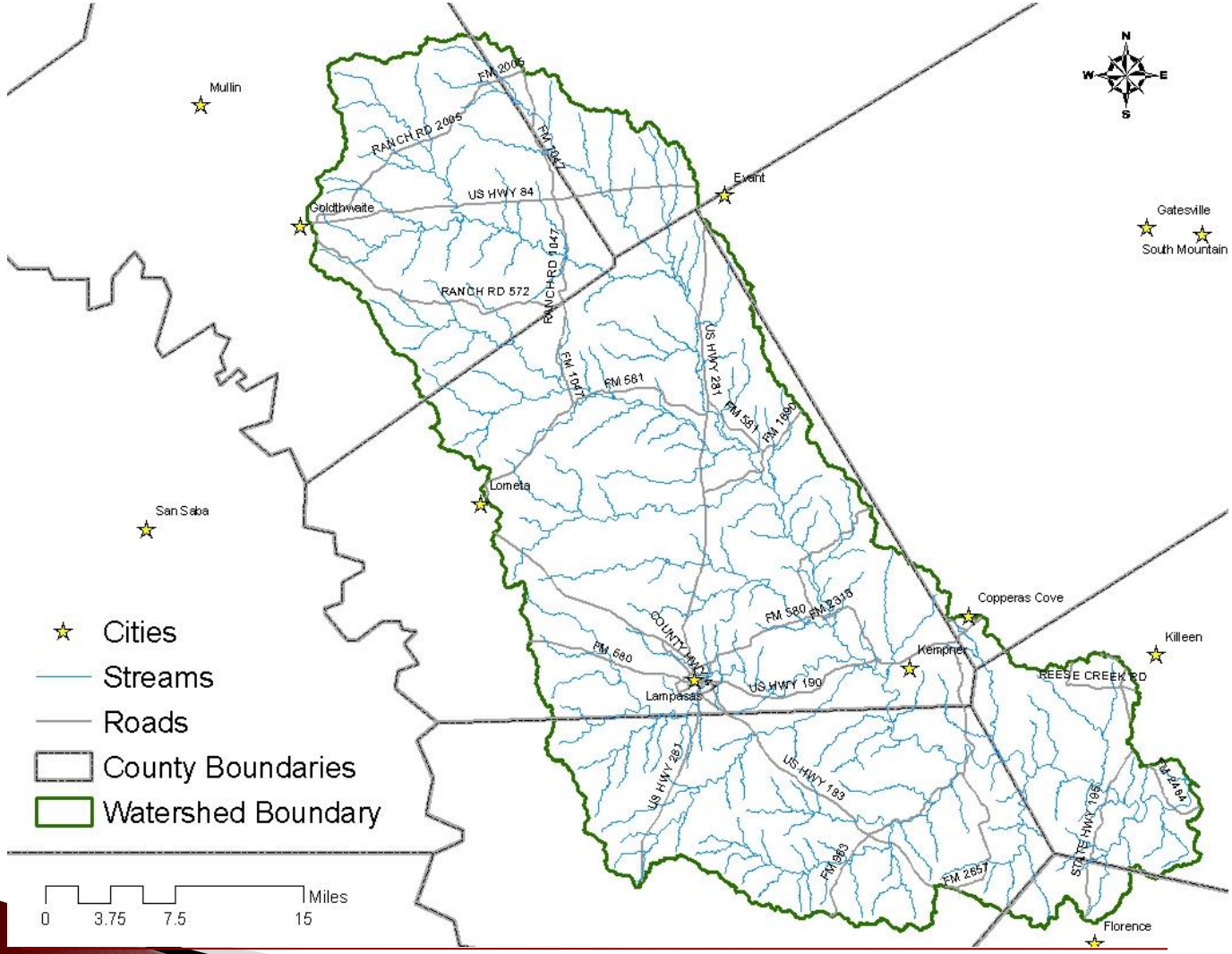
SELECT Recommendations from Work Groups

Kyna McKee
R. Karthikeyan
Biological and Agricultural Engineering

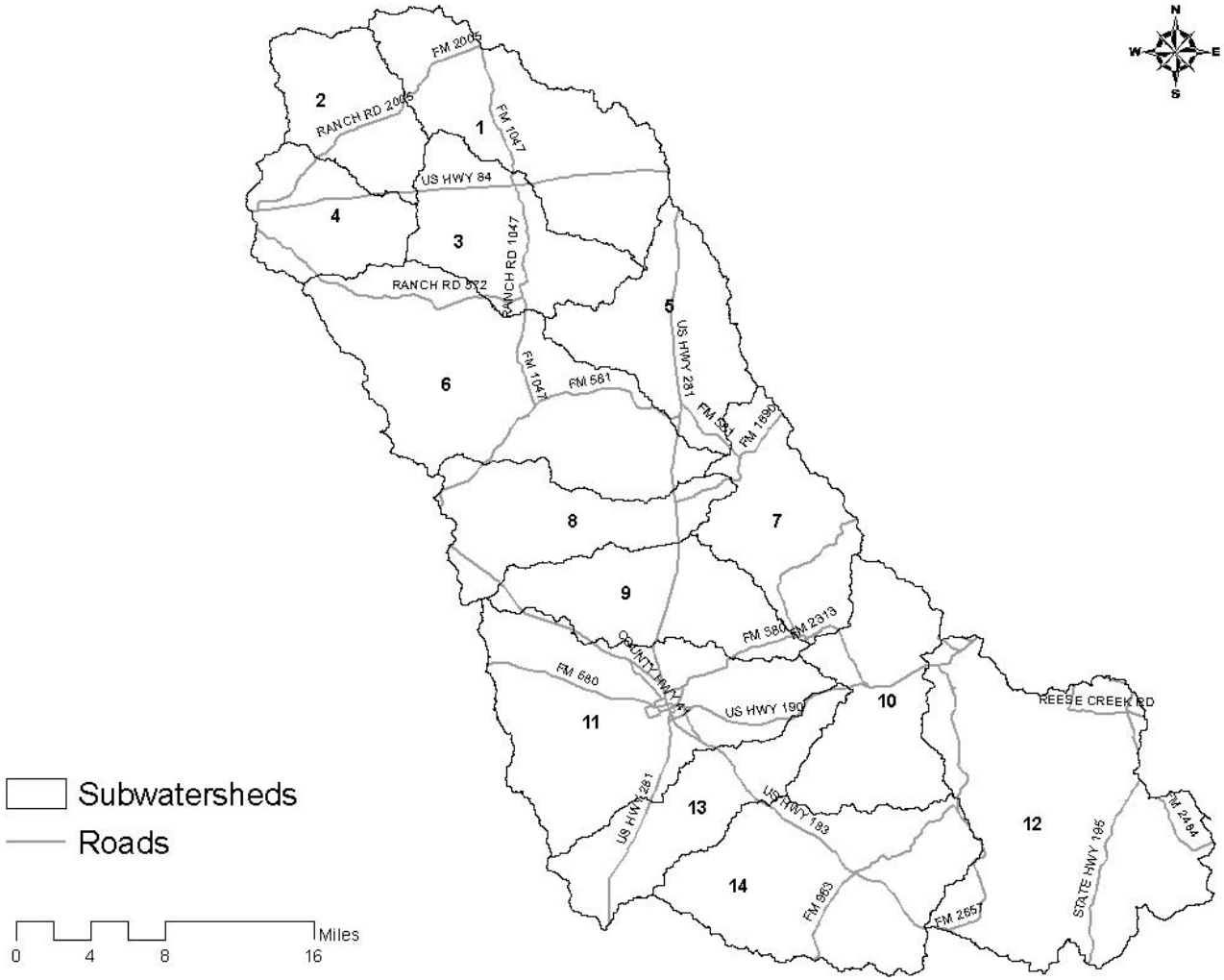
SELECT

- Land use/ land cover data updated
- Watersheds delineated
- Data layers needed for SELECT
  - Land use
  - Hydrography (stream network)
  - Urban areas
  - Watershed boundary
  - County boundary
  - Soils
  - Wastewater treatment facilities
  - CCN
  - Census
  - 911 addresses
  - Population density
    - Cattle
    - Wildlife (Deer)
    - Feral Hogs

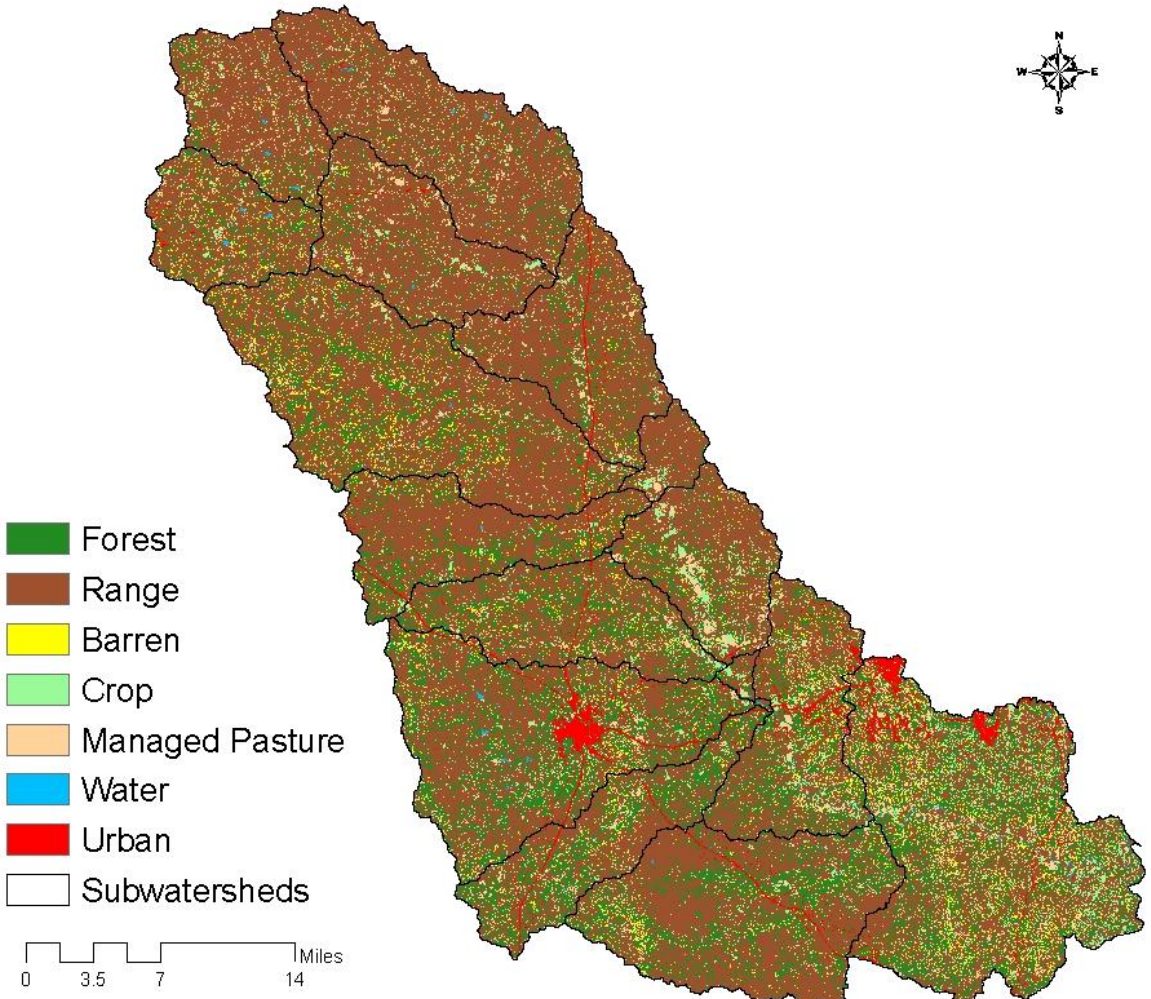
Lampasas River Watershed



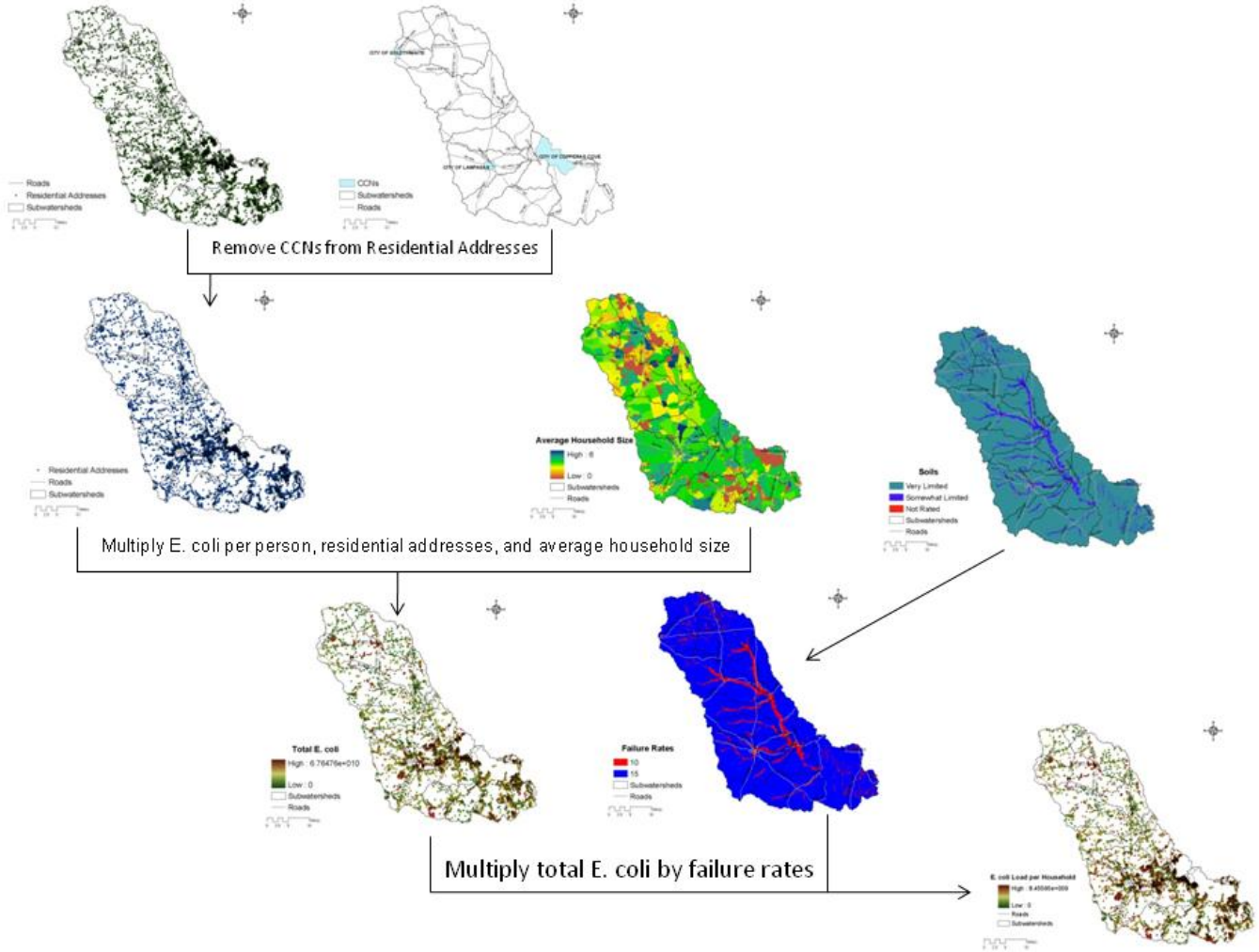
Watershed Segments



Land Use



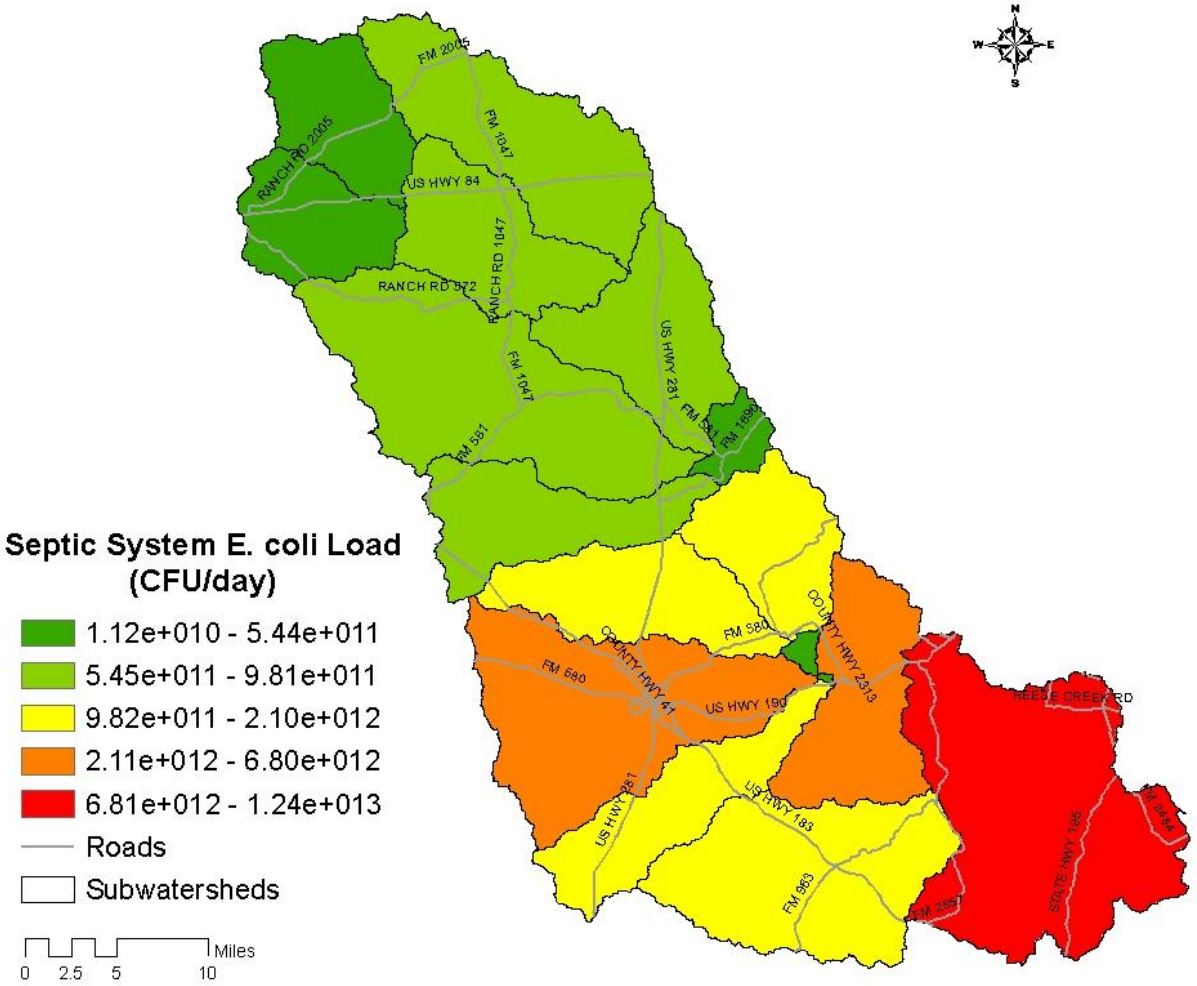
Septic System



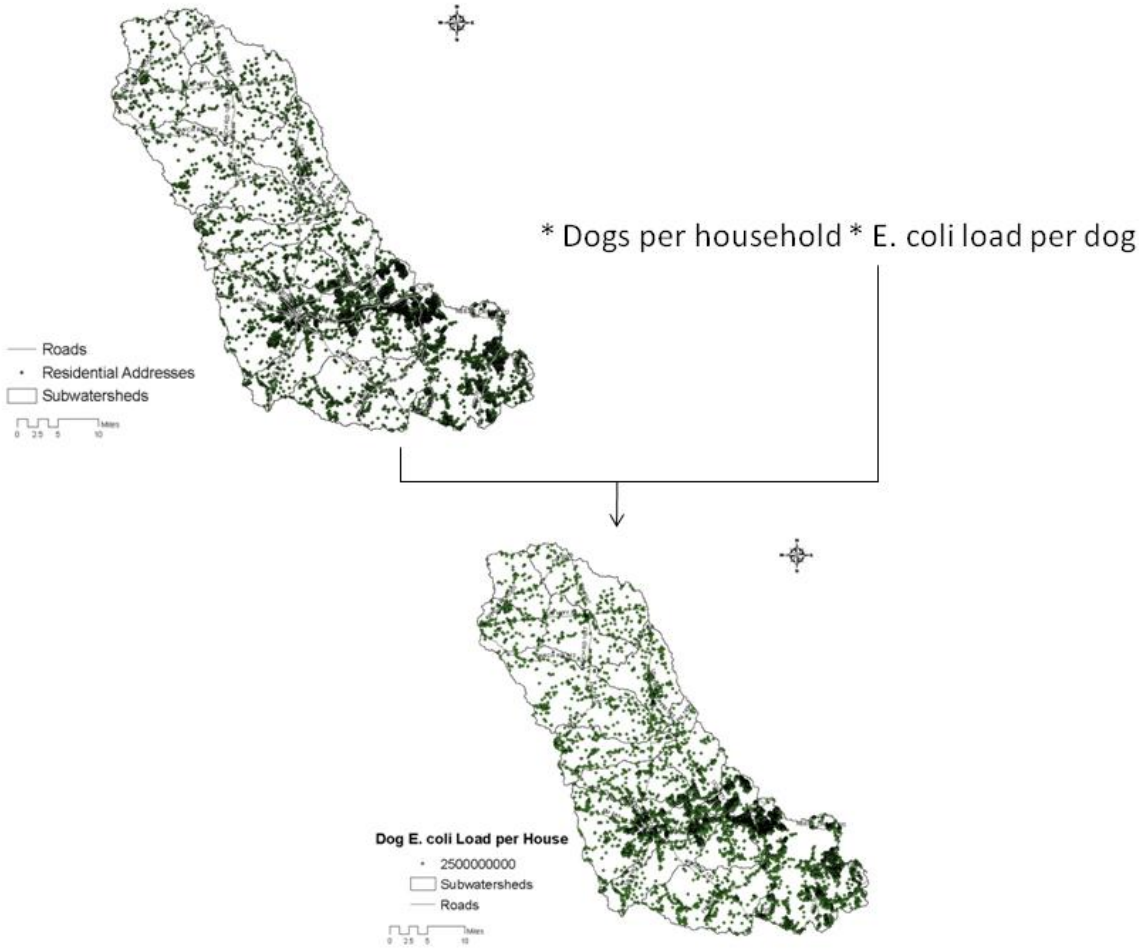
Septic System

- *E. coli* Load = Number of Systems * Failure Rate * People/home * Concentration * Discharge * Conversion Factors
  - Number of Systems:
    - Number of homes from 911 addresses that are classified as residential
    - Remove homes within CCN boundary
  - Failure Rate
    - Septic Drainfield Limitation Class – SSURGO soil
    - Very Limited (15%), Somewhat Limited (10%), Not Rated (15%)
  - People per Home
    - 2000 Census Blocks: Average Household Size
  - Concentration
    - Fecal Coliform $10*10^6$/100 mL = $5*10^6$ E. coli/100 mL
  - Discharge
    - **60 gallons/person/day**

Potential *E. coli* Load Resulting From Septic Systems



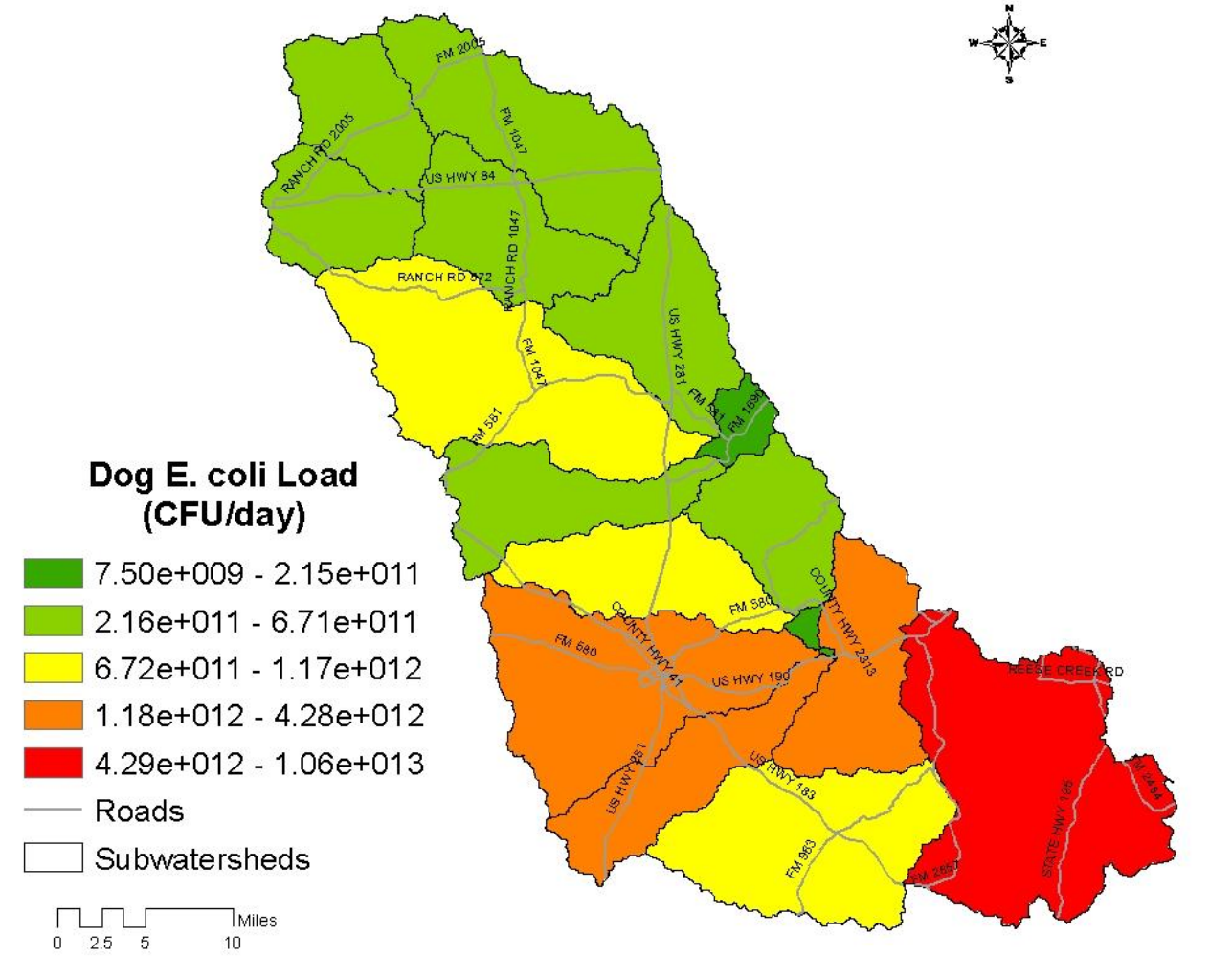
Dogs



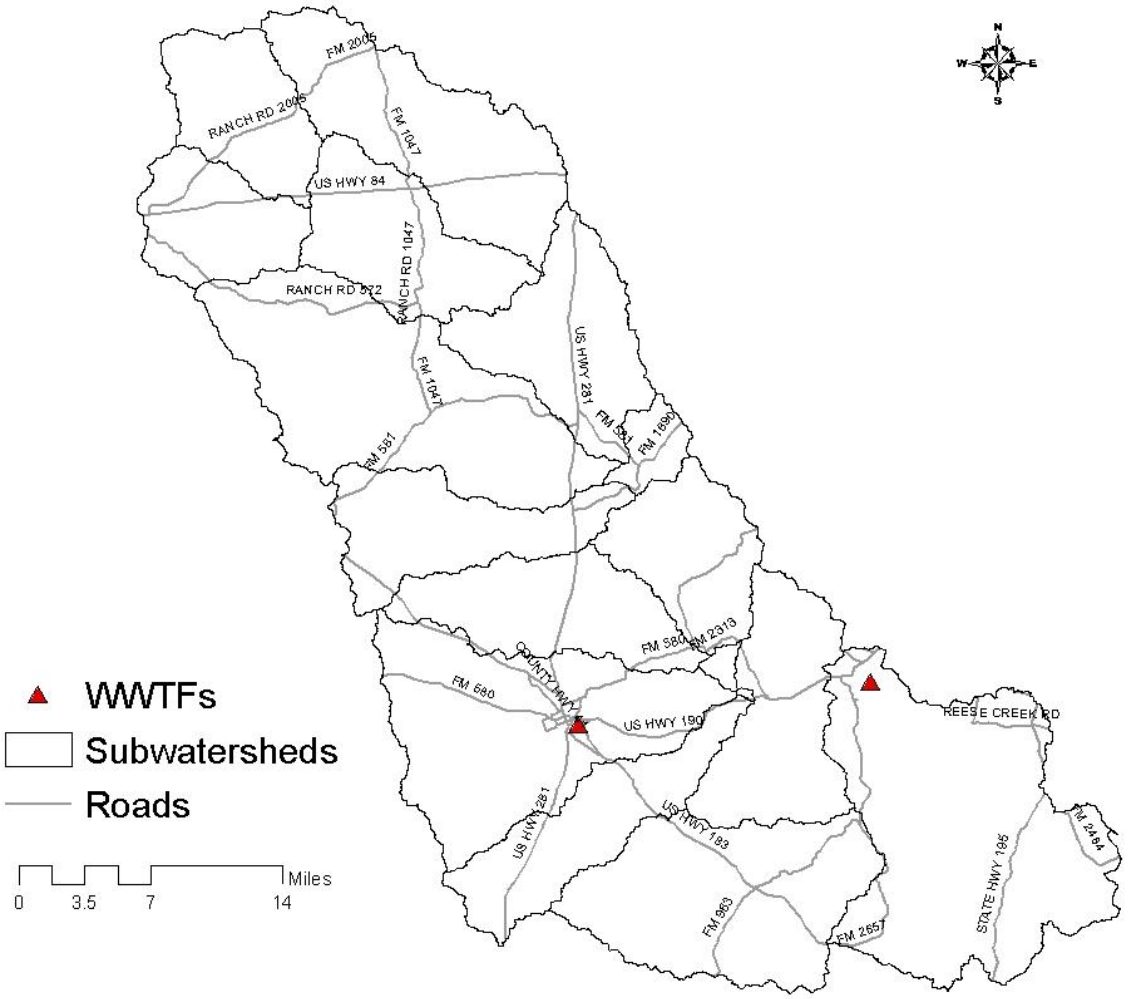
Dogs

- 1 dog per household
- Estimated Population: 10,775
  - From 911 addresses classified as residential
- *E. coli* Load per Dog
  - 5.0×10^9 Fecal Coliform = 2.5×10^9 *E. coli*

Potential *E. coli* loads resulting from Dogs



Wastewater Treatment Facilities



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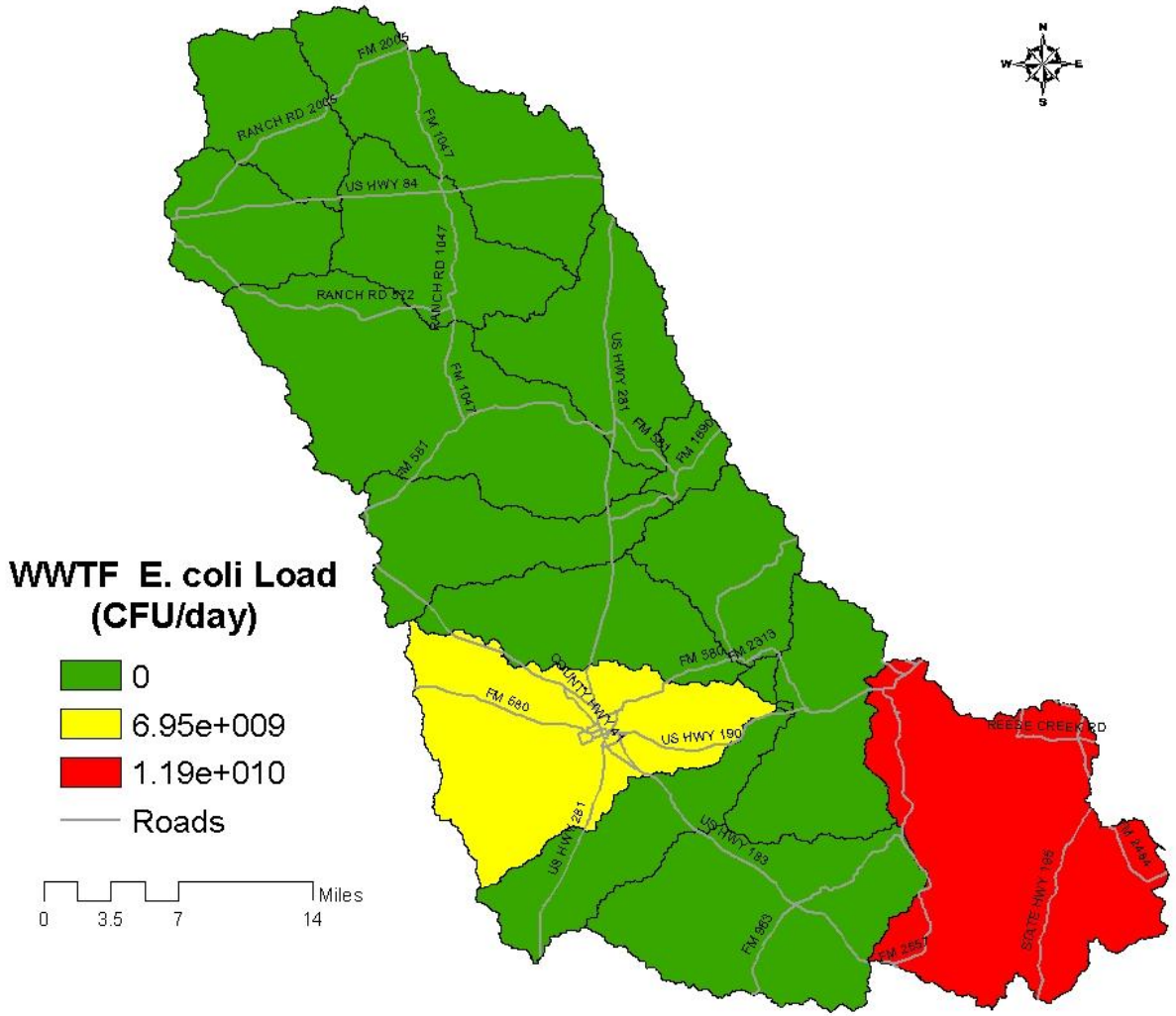
Wastewater Treatment Facilities

- Assume 126 CFU/100 mL
- Permitted Discharge
  - City of Lampasas: 1.457 MGD
  - City of Copperas Cove: 2.5 MGD

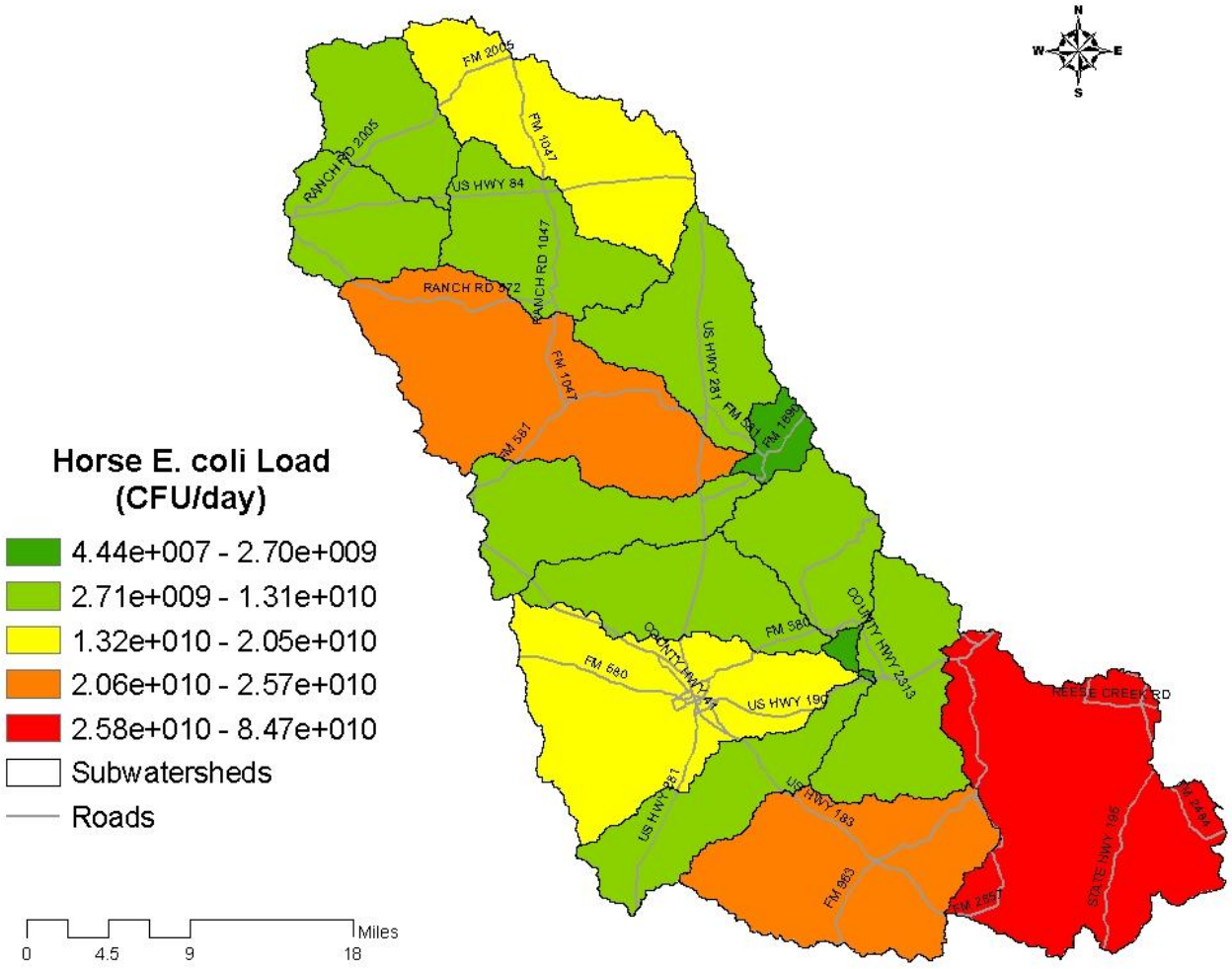
Potential *E. coli* loads resulting from Wastewater Treatment Facilities



Horses

- Population calculated using NAS data
- Estimated Population: 1,288
- Land Use
  - Range

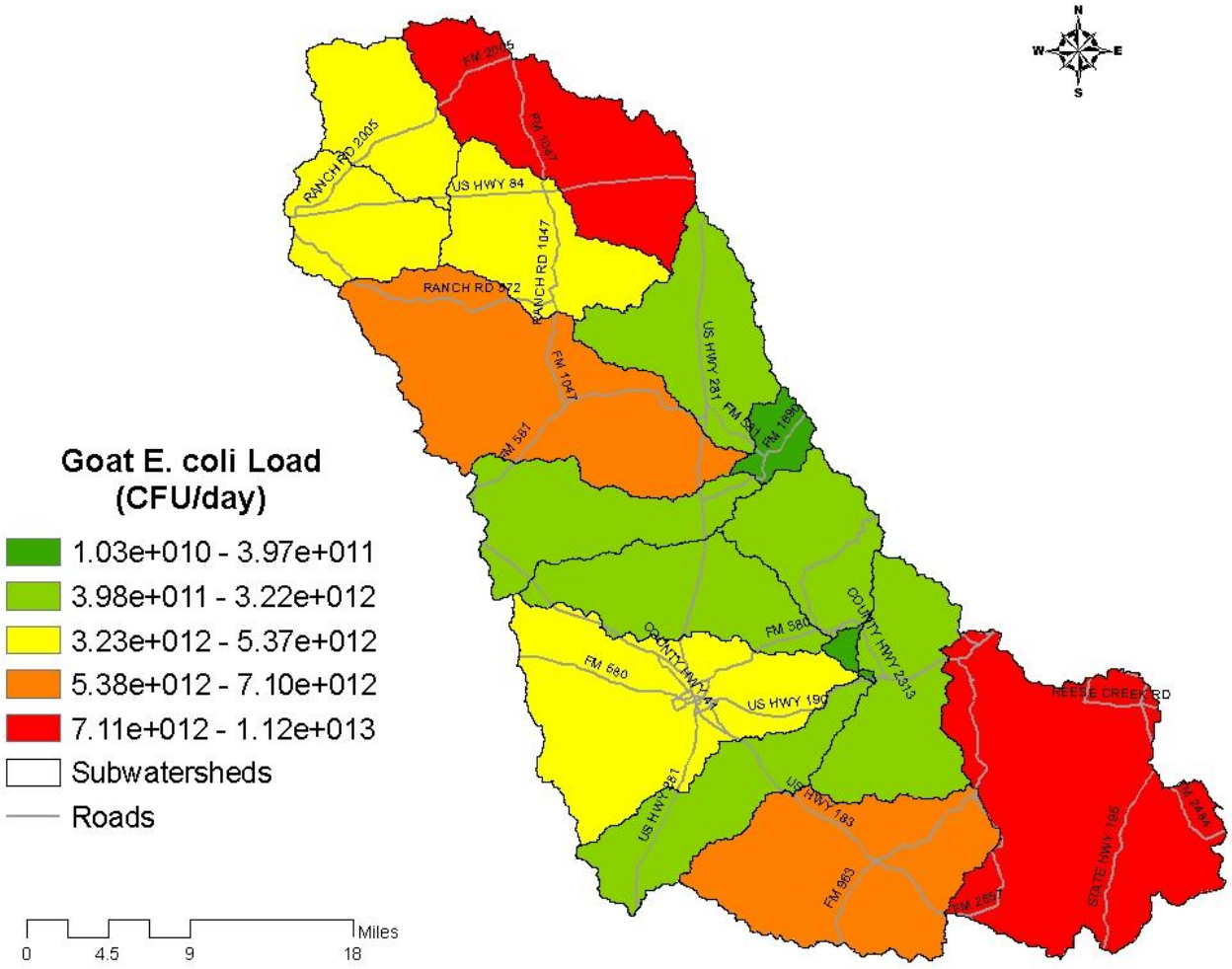
Potential *E. coli* loads resulting from Horses



Goats

- Population calculated using NAS data
- Estimated Population: 11,162
- Land Use
  - Range
  - Forest
  - Managed Pasture

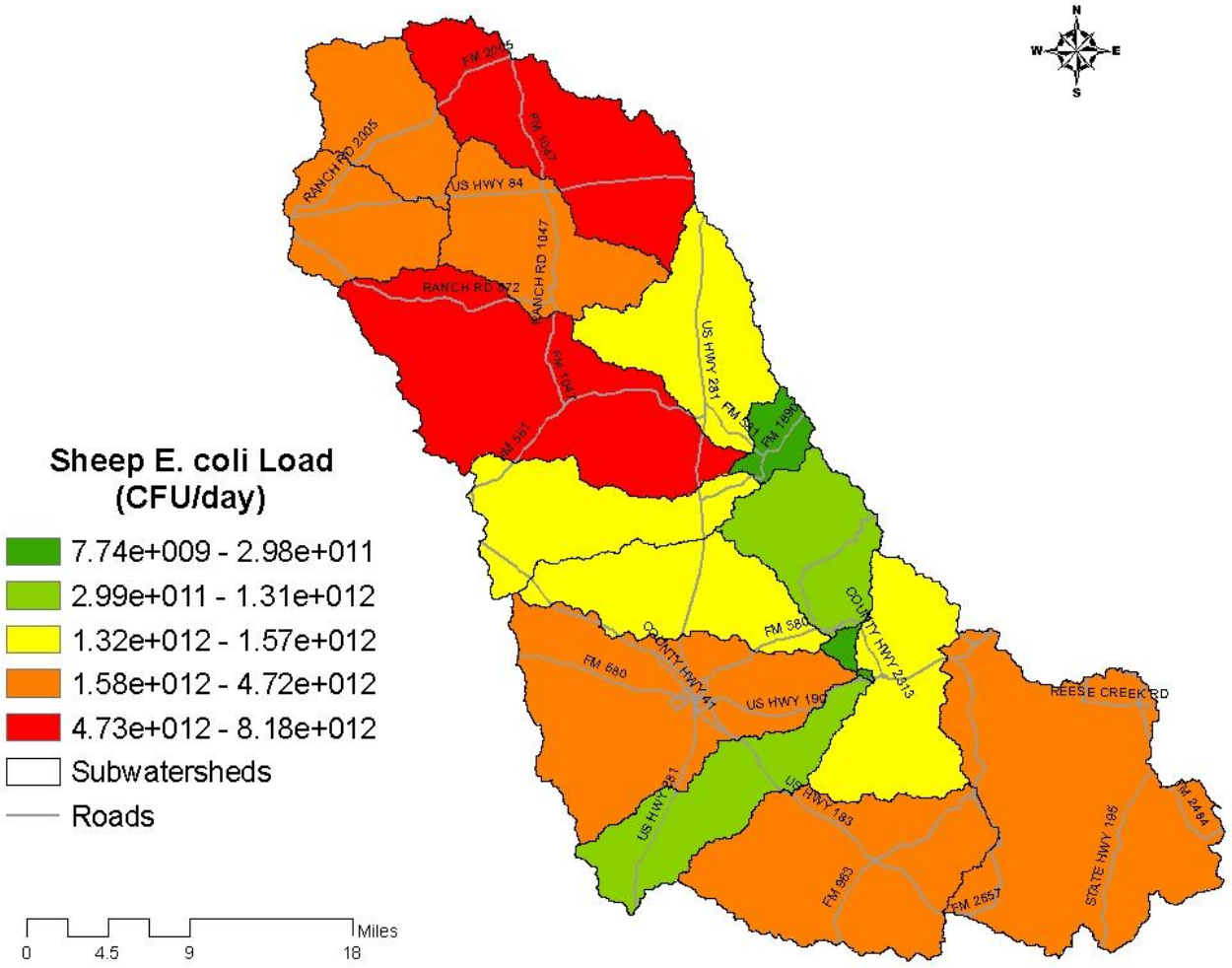
Potential *E. coli* loads resulting from Goats



Sheep

- Population calculated using NAS data
- Estimated Population: 7,311
- Land Use
  - Range
  - Forest
  - Managed Pasture

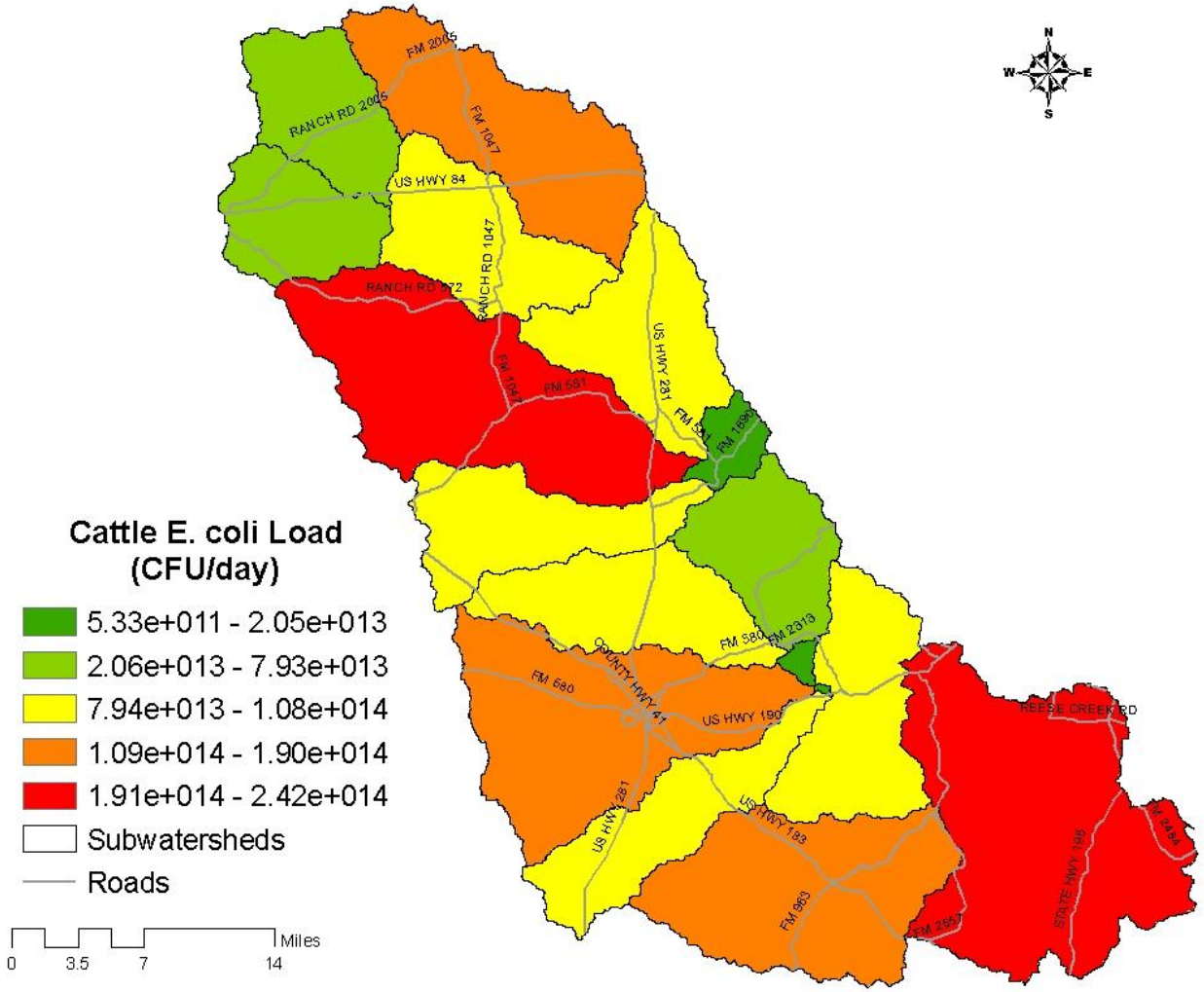
Potential *E. coli* loads resulting from Sheep



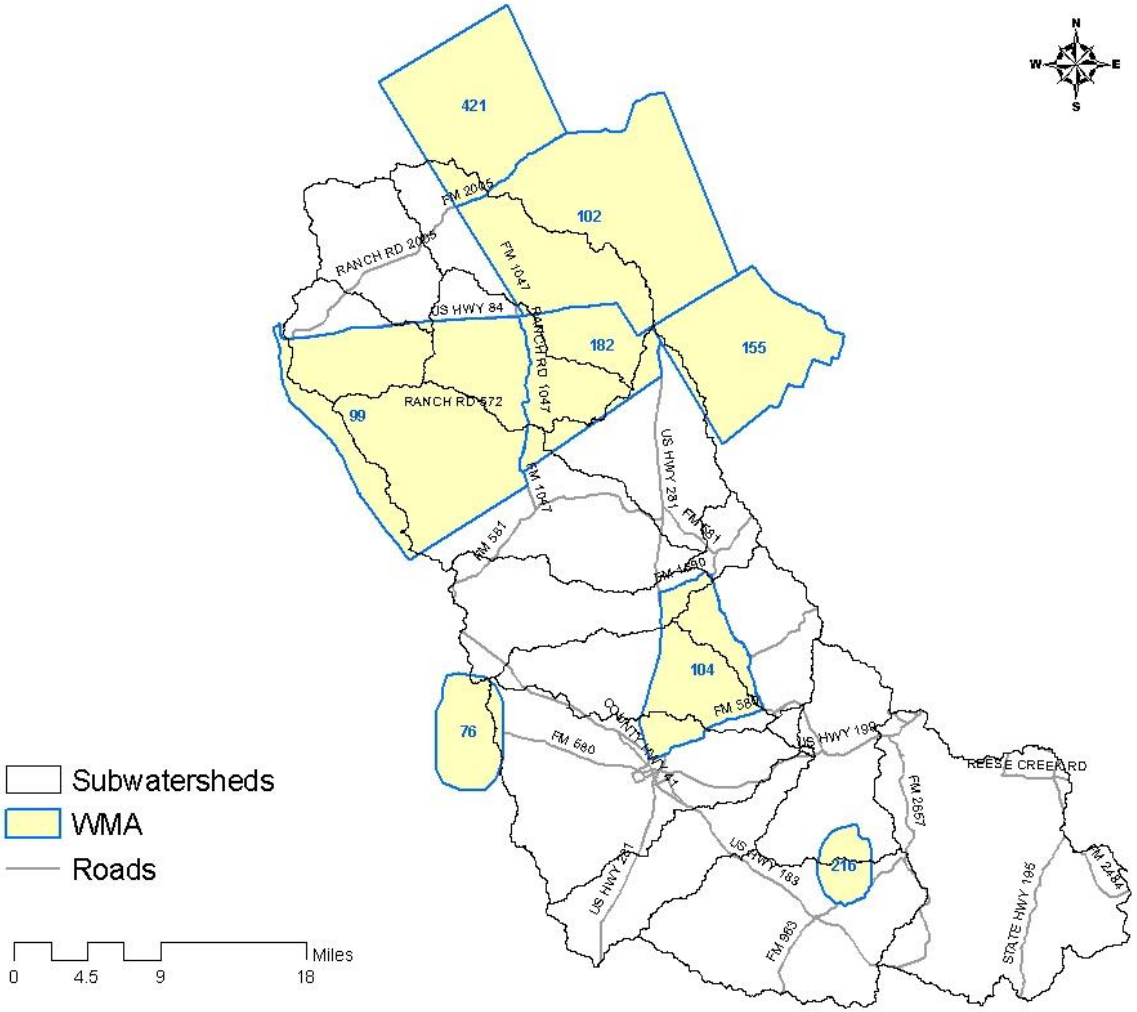
Cattle

- Population calculated using NAS data
- Estimated Population: 38,153
- Land Use
  - Range
  - Forest
  - Managed Pasture

Potential *E. coli* loads resulting from Cattle (NAS data)



Deer



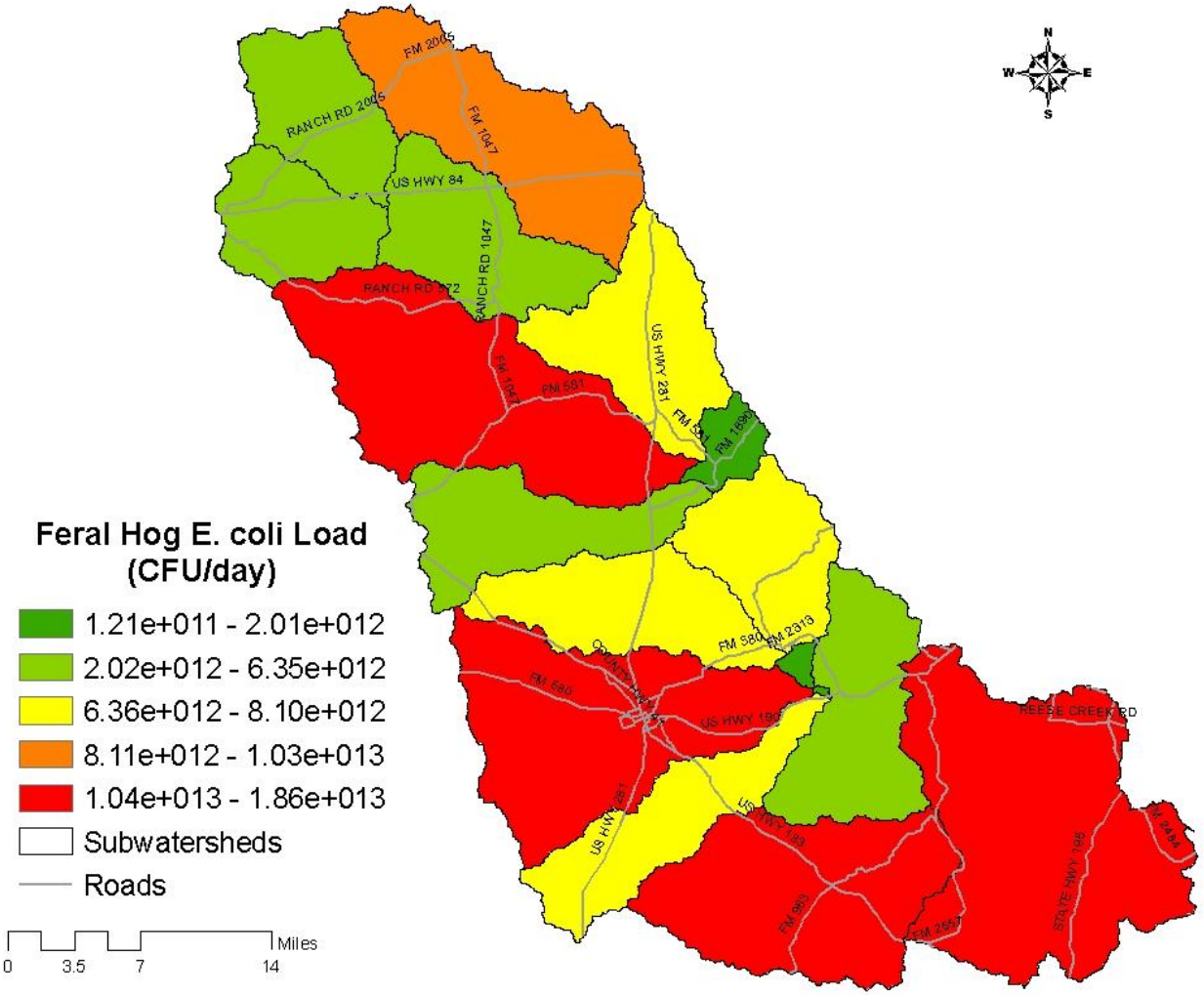
Deer

- Within the WMAs used the WMA density
- Outside of the WMAs applied a density of 100 deer per 1000 acres over the entire area of the watershed
- Estimated Population: 84,739

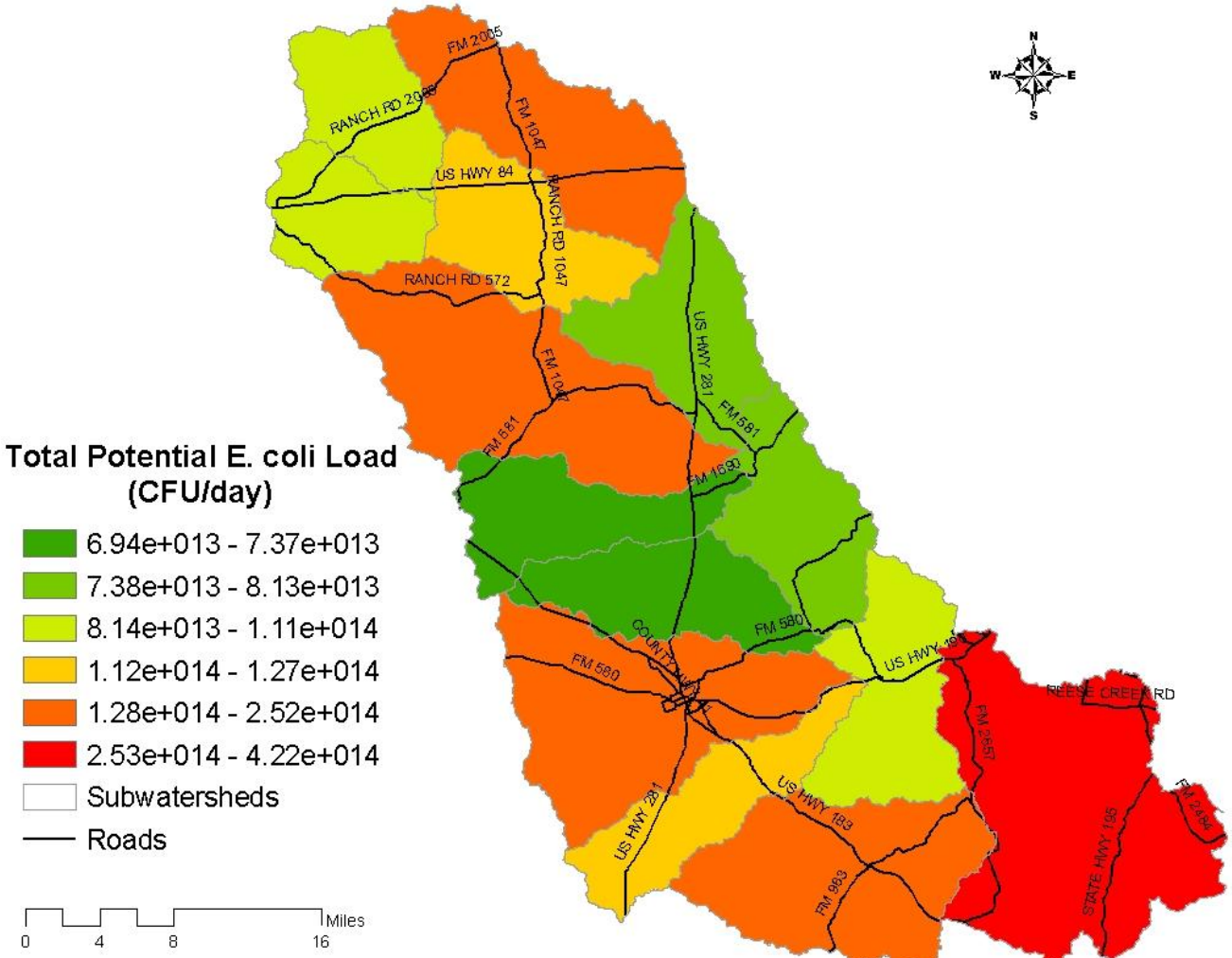
Feral Hogs

- Density: 32 acres per animal
- Estimated Population: 24,263
- Land Use
  - Forest
  - Range
  - Barren
  - Crop
  - Managed Pasture
  - 100 meter buffer around streams

Potential *E. coli* loads resulting from Feral Hogs



Daily Total Potential *E. coli* load



Next Steps

Update on NRCS Riparian Function workshop

- NRCS has offered to host several workshops about proper riparian function
- One-day course; ½ Classroom, ½ Field
- Tentatively planning 2 course sessions:
  - One in upper portion of watershed (Mills/ Hamilton/ Lampasas Counties)
  - One in lower portion of watershed (Lampasas/ Burnet/ Bell Counties)
- Will need volunteers for field sites; must have river or stream-front property
- September/October time-frame

August Work Group Meetings

- Agriculture & Wildlife – Monday, Aug 16th, 6-9pm; Lampasas County Farm Bureau Building
- Urban NPS – Friday, Aug 20th, 9am-noon; City of Killeen Solid Wastes Building
- Education and Outreach – No meeting in August