Modeling Support for Big Cypress Creek Watershed—SELECT
(06/13/11)

Kyna McKee
Jasjeet Kaur
R. Karthikeyan
Biological and Agricultural Engineering

Aaron Hoff
Allen Berthold
Texas Water Resources Institute
Input Data

- Census Blocks (U.S. Census Bureau)
- Soils (USDA-NRCS)
- Digital Elevation Map (BASINS)
- Urban Areas
- Sub-watersheds & stream network

- Livestock
  - Stakeholder input
  - Agricultural Statistics (USDA)
  - Poultry Operations within the watershed (TSSWCB)

- Wildlife
  - Stakeholder input
  - Wildlife experts input, Resource Management Unit data for Deer (TPWD)
Big Cypress Creek Watershed
Watershed Segments
Land Use

- Open Water
- Developed, Roads
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- BarrenLand
- Mixed Forest
- Riparian Forest
- Rangeland
- Managed Pasture
- Watershed Boundary

Copyright © Biological and Agricultural Engineering Department, Texas A&M University
Septic Systems

- **E. coli Load = Number of Systems * Failure Rate * People/home * Concentration * Discharge * Conversion Factors**
  - Number of Systems:
    - Number of occupied homes in 2010 census
    - 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
    - 2010 Census Blocks: Average Household Size
  - Concentration
    - Fecal Coliform $10 \times 10^6/100 \text{ mL} = 5 \times 10^6 \text{ E. coli}/100 \text{ mL}$
  - Discharge
    - 60 gallons/person/day
Potential *E. coli* Load Resulting From Septic Systems

Septic Systems E. coli Load
CFU/day

- Green: 5.43e+014 - 2.12e+015
- Light Green: 2.13e+015 - 3.65e+015
- Yellow: 3.66e+015 - 4.53e+015
- Orange: 4.54e+015 - 6.02e+015
- Red: 6.03e+015 - 8.53e+015

- Subwatersheds
- Roads

Copyright © Biological and Agricultural Engineering Department, Texas A&M University
Dogs

• 1 dog per household
• Estimated Population: 6182
  – From 2010 census occupied households
• *E. coli* Load per Dog
  – $5.0 \times 10^9$ Fecal Coliform = $2.5 \times 10^9 E. coli$
Potential *E. coli* loads resulting from Dogs

Dog *E. coli* Load
CFU/day

- Green: 2.71e+014 - 1.12e+015
- Light Green: 1.13e+015 - 1.98e+015
- Yellow: 1.99e+015 - 2.30e+015
- Orange: 2.31e+015 - 2.75e+015
- Red: 2.76e+015 - 3.92e+015

- Subwatersheds
- Roads

0 1 2 3 4 Miles

Copyright © Biological and Agricultural Engineering Department, Texas A&M University
Wastewater Treatment Facilities

- Assume 126 CFU/100 mL
- Permitted Discharge
  - Mt. Pleasant WWTF: 2.9 MGD
  - Pilgrim’s Pride Distribution Center: 3.75 MGD
Potential *E. coli* loads resulting from Wastewater Treatment Facilities
Horses

• Population calculated using 2007 NASS data
• Estimated Population: 575
• Land Use
  – Rangeland
• E. coli Load per Horse
  – $4.2 \times 10^8$ Fecal Coliform $= 2.1 \times 10^8$ E. coli
Potential *E. coli* loads resulting from Horses

**Horse E.coli Load**
**CFU/day**

- Green: $2.99e+009 - 3.90e+009$
- Light Green: $3.91e+009 - 7.57e+009$
- Yellow: $7.58e+009 - 9.71e+009$
- Orange: $9.72e+009 - 1.60e+010$
- Red: $1.61e+010 - 2.53e+010$

- Subwatersheds
- Roads

*Copyright © Biological and Agricultural Engineering Department, Texas A&M University*
Cattle

• Pasture Cattle
  – Population calculated using 3 ac/animal stocking rate
  – Estimated Population: 10,298
  – Land Use
    • Managed Pasture

• Range Cattle
  – Population calculated using 5 ac/animal stocking rate
  – Estimated Population: 1,637
  – Land Use
    • Rangeland

• \textit{E. coli} Load per head of cattle
  – \(10 \times 10^{10}\) Fecal Coliform = \(5 \times 10^{10}\) \textit{E. coli}
Potential *E. coli* loads resulting from Cattle

Range and Pasture Cattle *E. coli* Load

CFU/day

- Green: 1.93e+013 - 2.53e+013
- Light Green: 2.54e+013 - 3.28e+013
- Yellow: 3.29e+013 - 4.21e+013
- Orange: 4.22e+013 - 4.74e+013
- Red: 4.75e+013 - 6.59e+013

Subwatersheds

Roads

Miles

Copyright © Biological and Agricultural Engineering Department, Texas A&M University
Poultry Operations

• Review of WQMP data suggests that more input is needed regarding poultry litter application
  – How much poultry litter is leaving the watershed?
Deer

- Density: 15 acres per animal
- Estimated Population: 2,462
- Land Use
  - Mixed Forest
  - Riparian Forest
  - Barren Land
  - Rangeland
  - Managed Pasture
- \textit{E. coli} Load per Deer
  - $3.5 \times 10^8$ Fecal Coliform $= 1.75 \times 10^8 \textit{E. coli}$
Potential *E. coli* loads resulting from Deer
Feral Hogs

• Density: 7.5 acres per animal
• Estimated Population: 4,923
• Land Use
  – Mixed Forest
  – Riparian Forest
  – Barren Land
  – Rangeland
  – Managed Pasture
  – 100 meter buffer around streams
• *E. coli* Load per Hog
  – $1.1 \times 10^9$ Fecal Coliform $= 5.5 \times 10^8 E. coli$
Potential *E. coli* loads resulting from Feral Hogs

**Feral Hog E.coli Load**
**CFU/day**

- **7.52e+011**
- **7.53e+011 - 1.37e+012**
- **1.38e+012 - 1.88e+012**
- **1.89e+012 - 2.68e+012**
- **2.69e+012 - 3.10e+012**

- Subwatersheds
- Roads

---

Copyright © Biological and Agricultural Engineering Department, Texas A&M University
Thanks