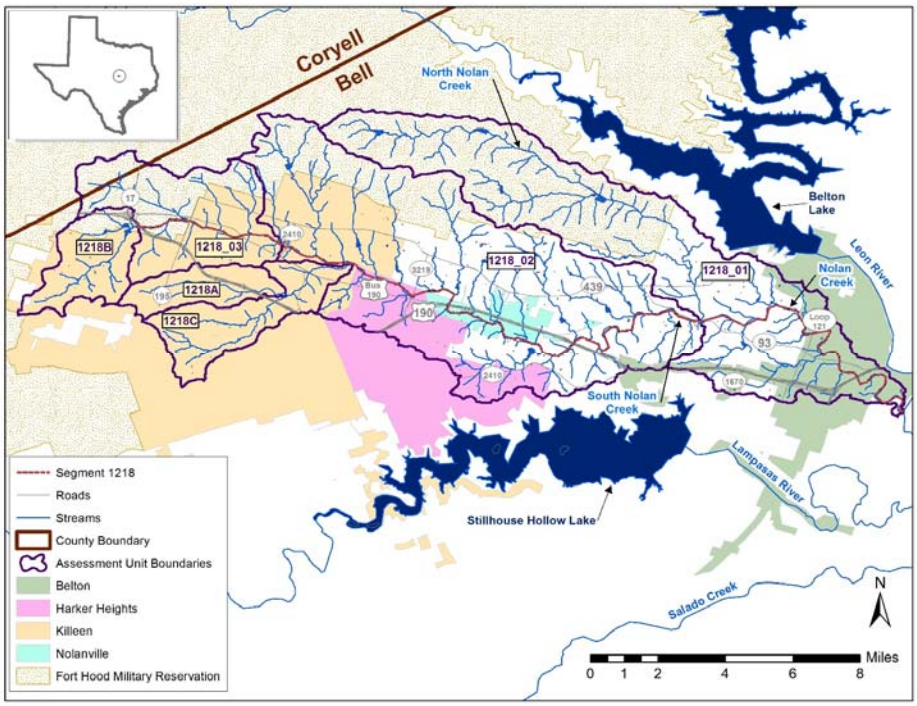
NOLAN CREEK

Partnership Meeting

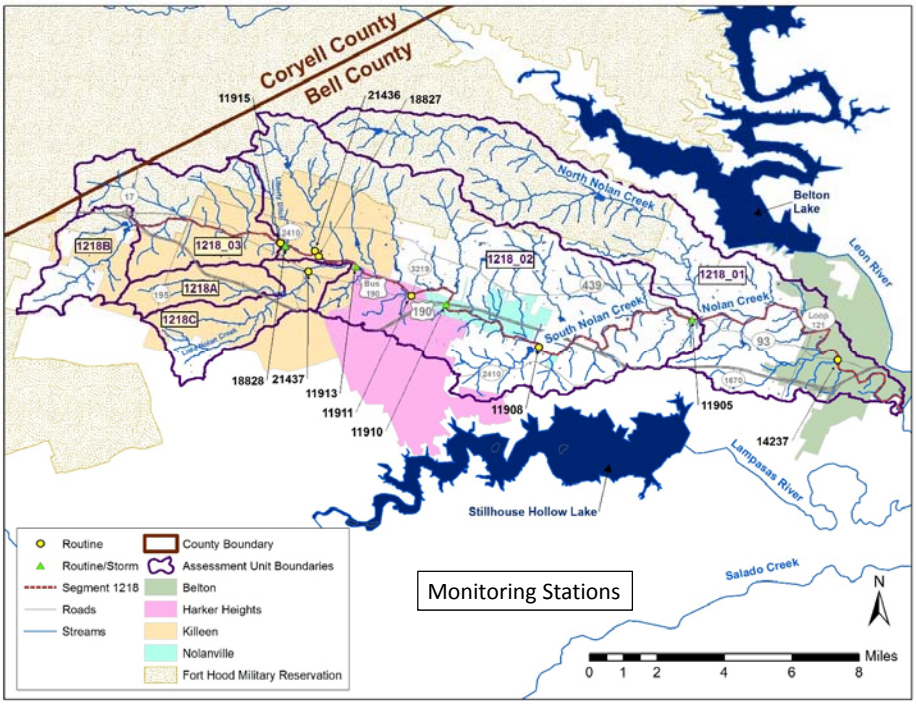
Sponsored by
Texas Commission on Environmental Quality (TCEQ)
Texas Institute for Applied Environmental Research (TIAER)
City of Killeen

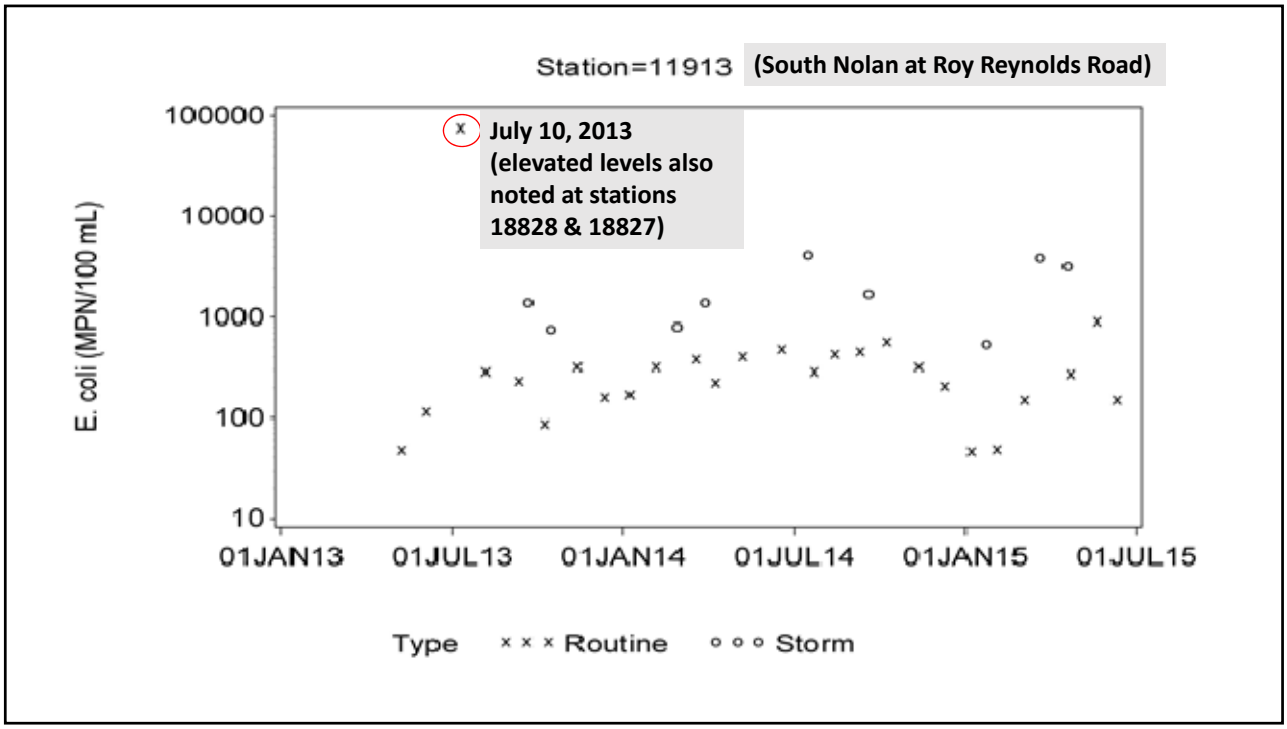
Water Quality Problem - Assessment Units 1218_02 & 1218C listed as impaired with elevated bacteria concentrations

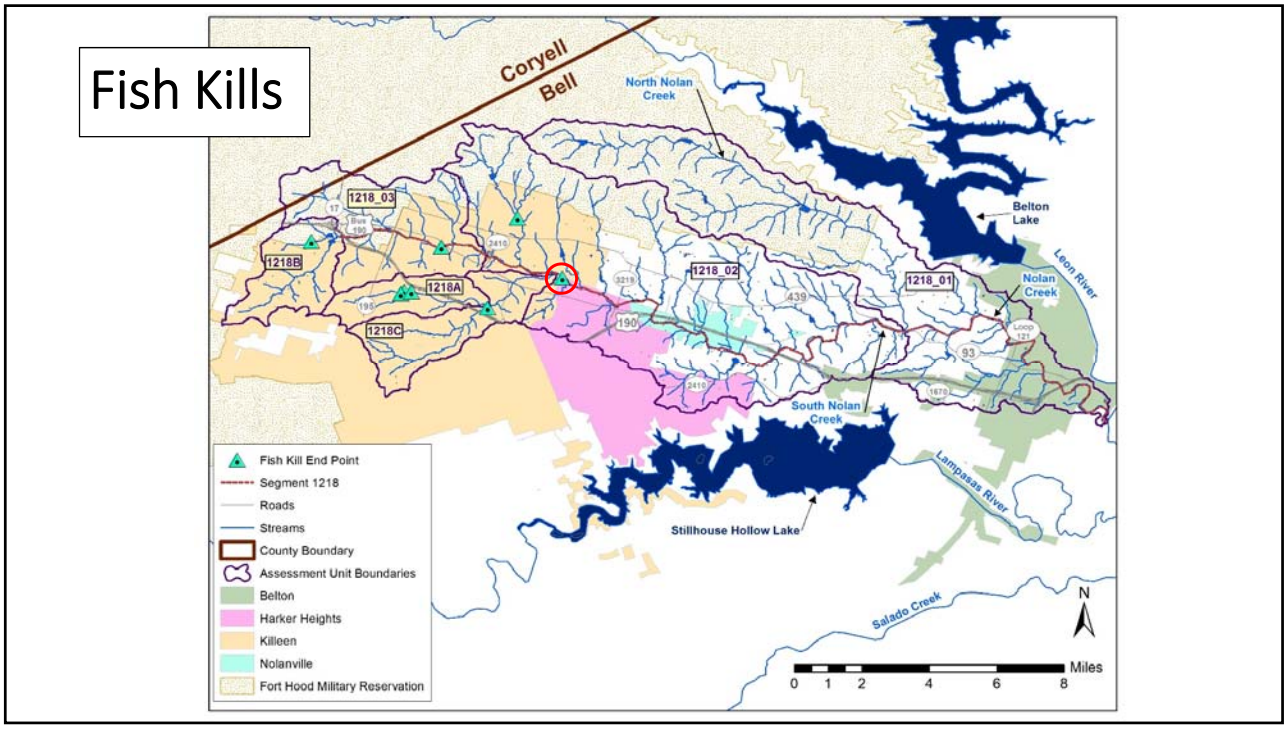


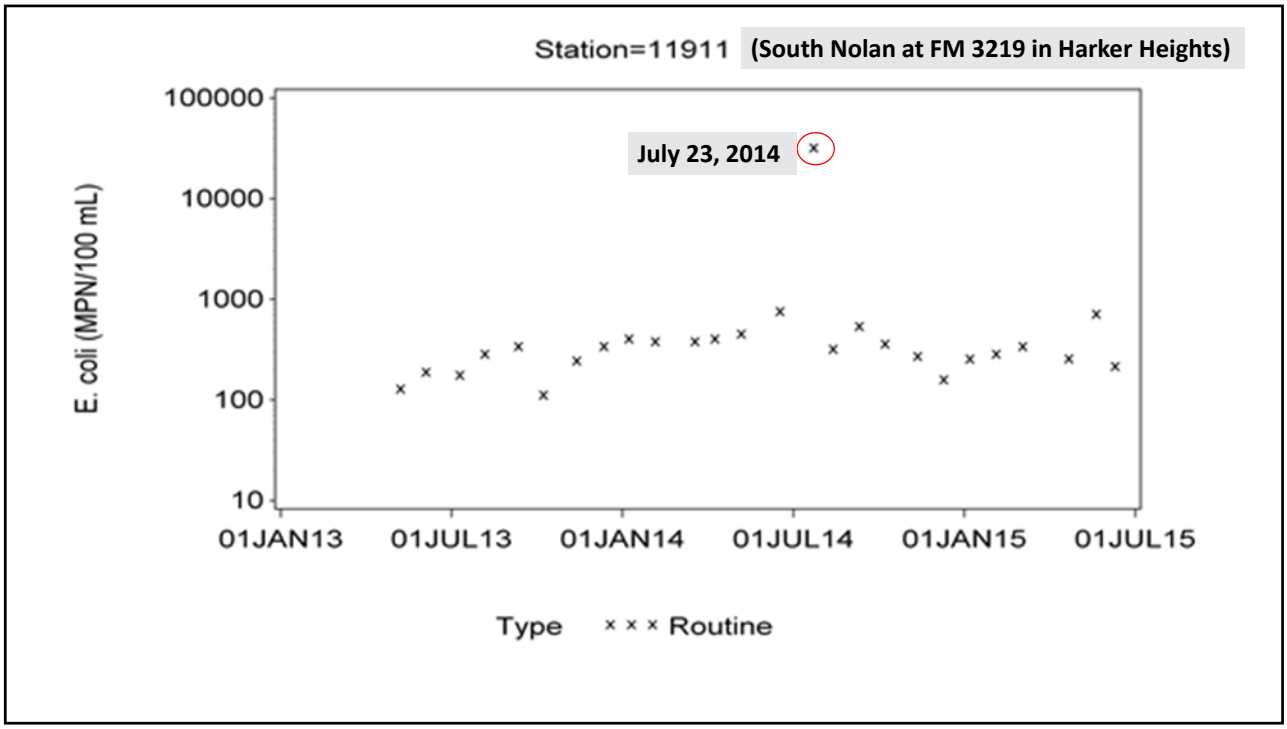
Overview of Monitoring Results

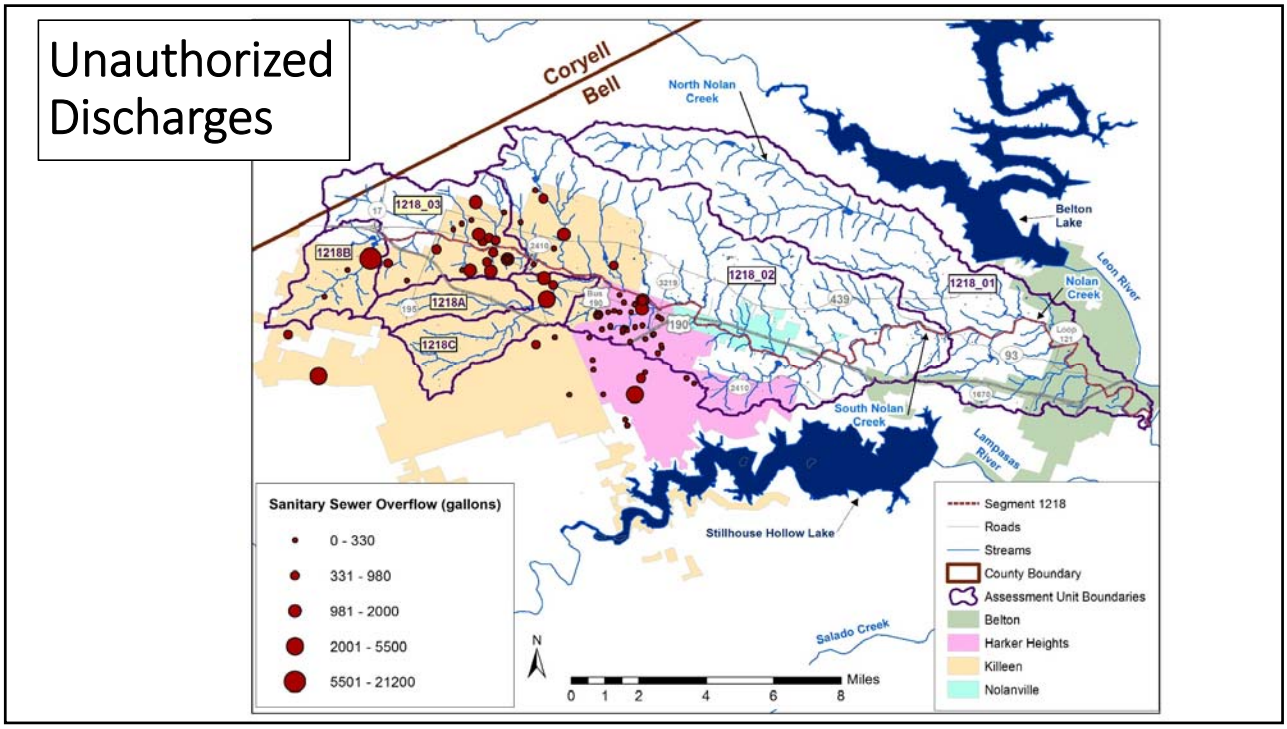
South Nolan Creek at Levi Crossing (station 11908) taken on August 6, 2013

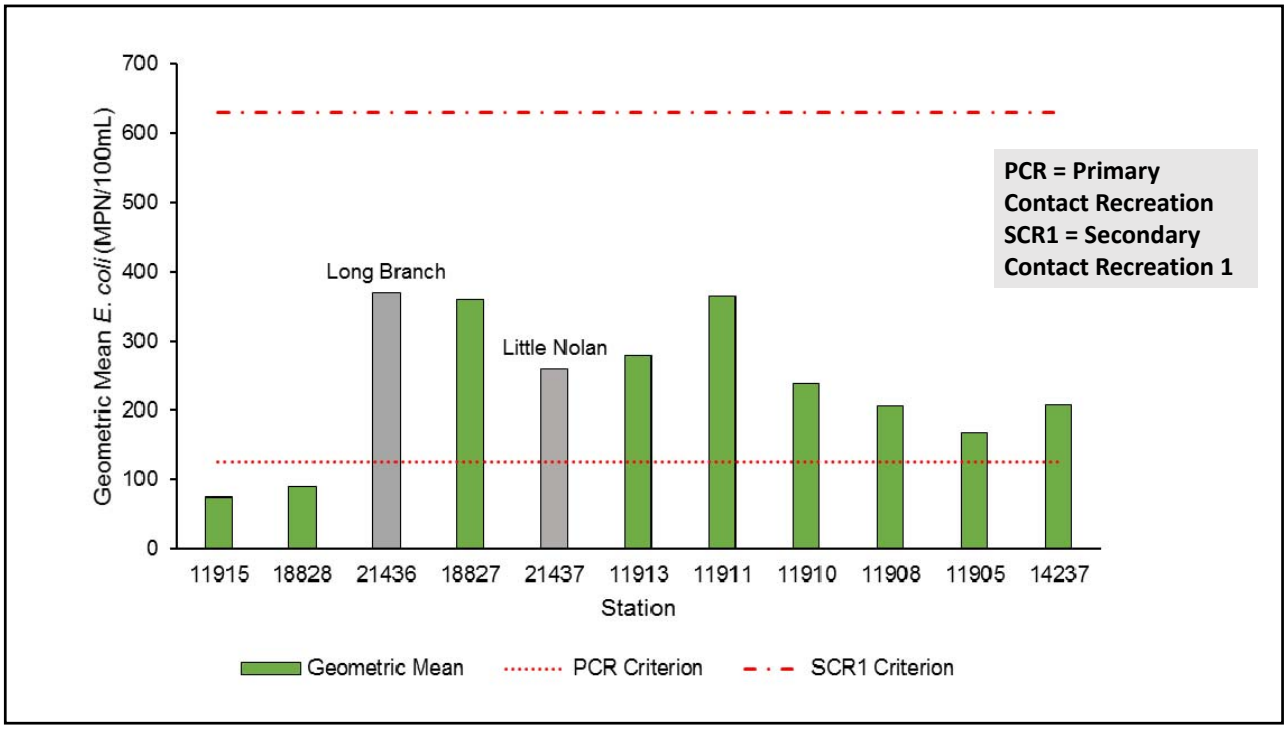


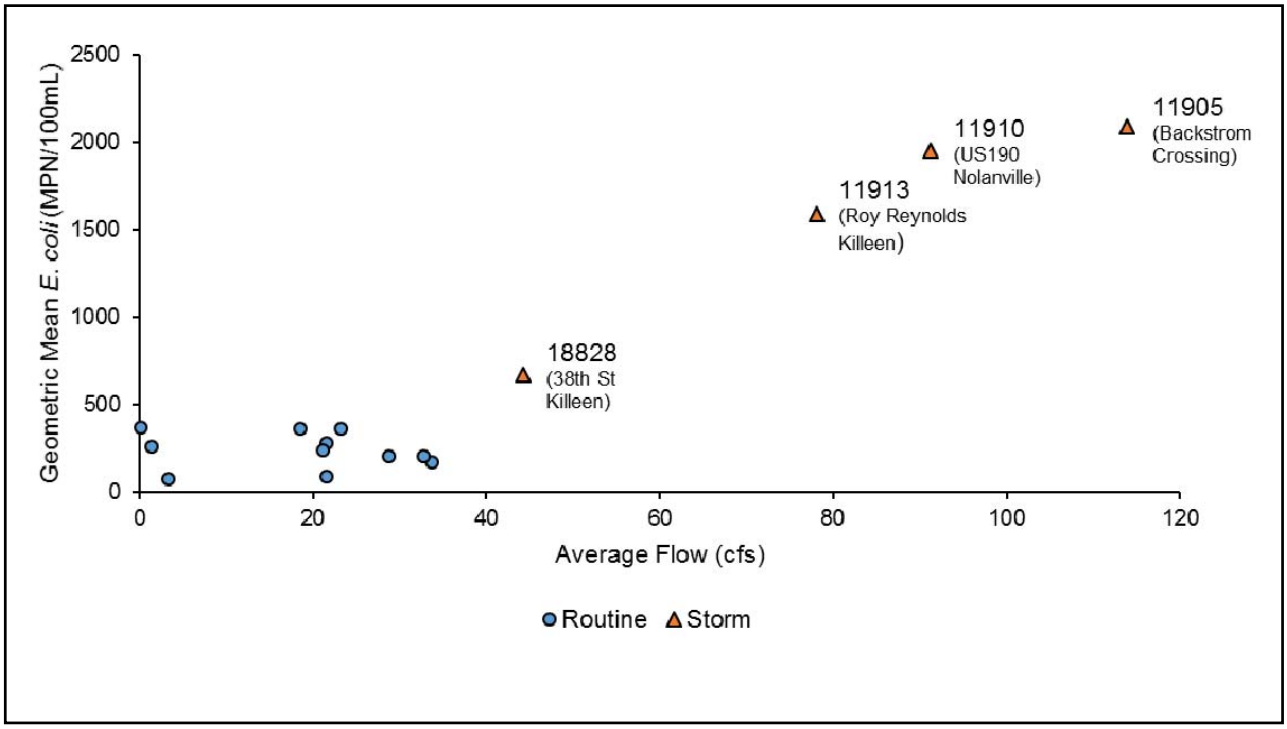

Station=11913
(South Nolan at Roy Reynolds Road)
July 10, 2013
(elevated levels also noted at stations 18828 & 18827)
E. coli (MPN/100 mL)
100000
10000
1000
100
10
01JAN13
01JUL13
01JAN14
01JUL14
01JAN15
01JUL15
Type
Routine
Storm

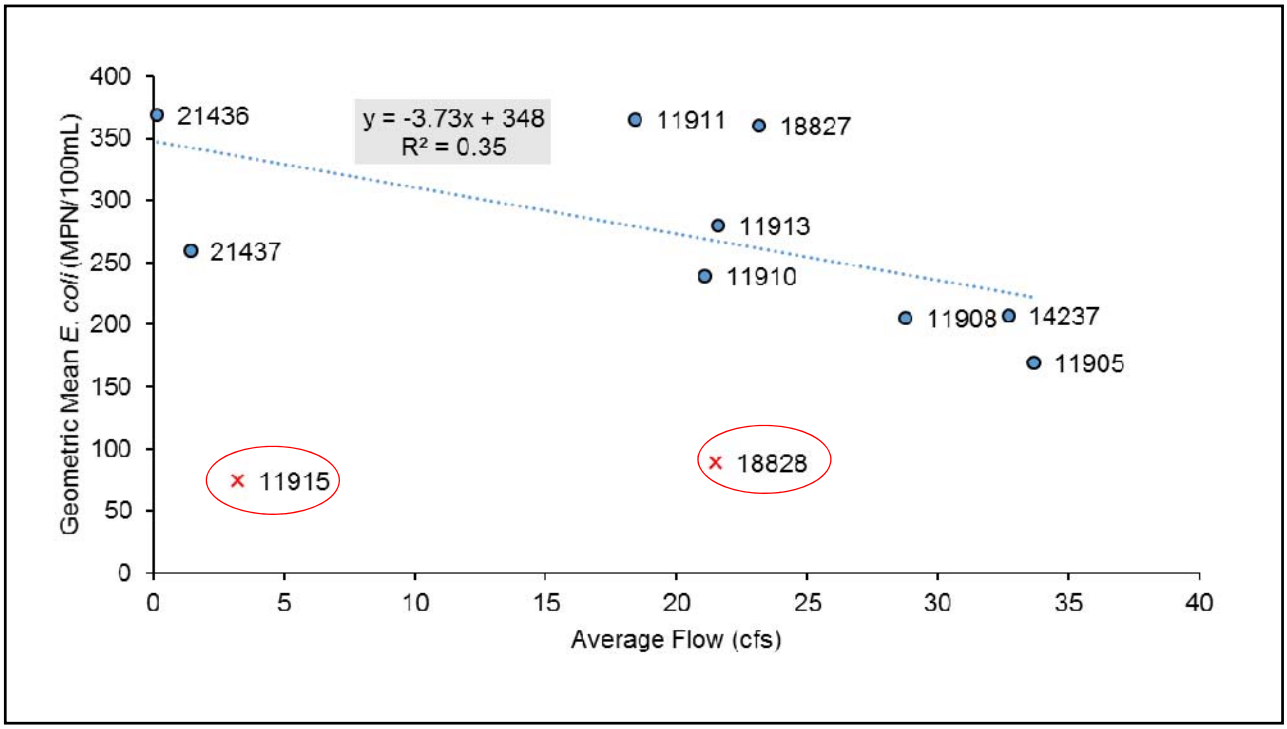

Fish Kills
Coryell
Bell
North Nolan Creek
Belton Lake
Leon River
Nolan Creek
South Nolan Creek
Lampasas River
Stillhouse Hollow Lake
Salado Creek
1218_03
1218B
1218A
1218C
1218_02
1218_01
Fish Kill End Point
Segment 1218
Roads
Streams
County Boundary
Assessment Unit Boundaries
Belton
Harker Heights
Killeen
Nolanville
Fort Hood Military Reservation
N
Miles
0 1 2 4 6 8

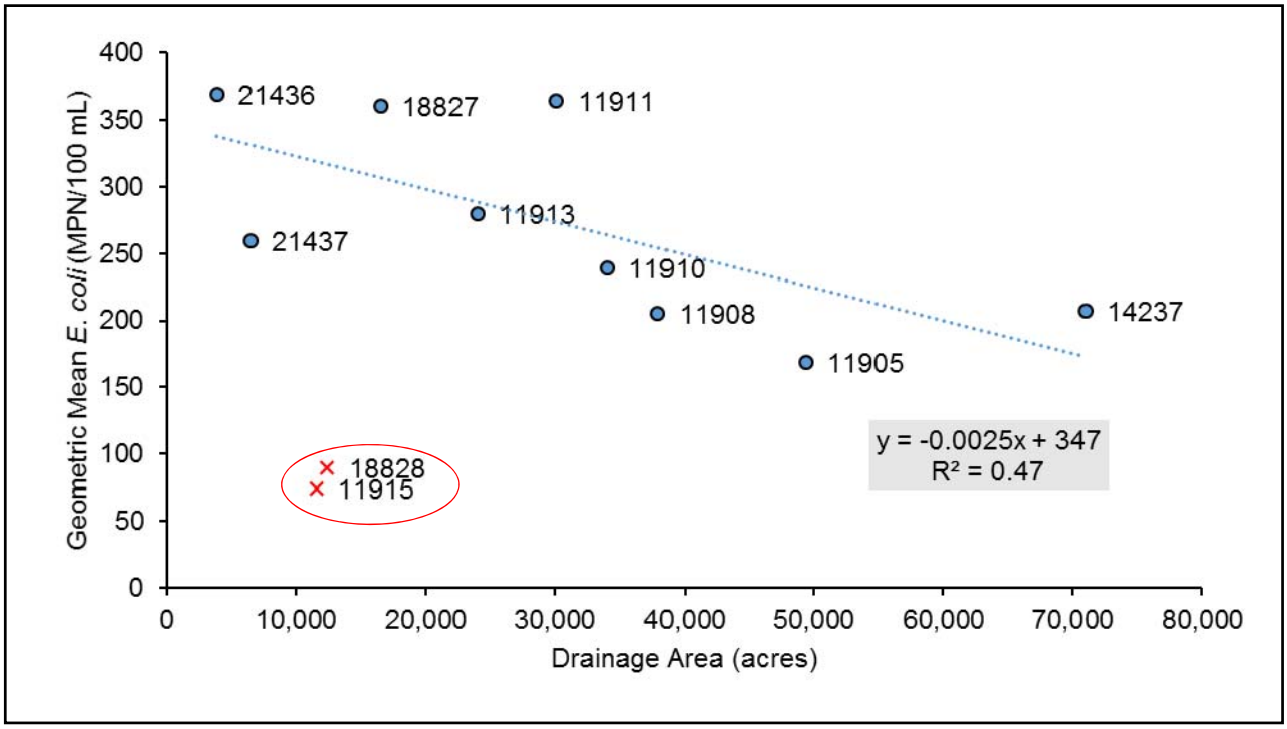

Station=11911 (South Nolan at FM 3219 in Harker Heights)
July 23, 2014
E. coli (MPN/100 mL)
100000
10000
1000
100
10
01JAN13
01JUL13
01JAN14
01JUL14
01JAN15
01JUL15
Type × × × Routine

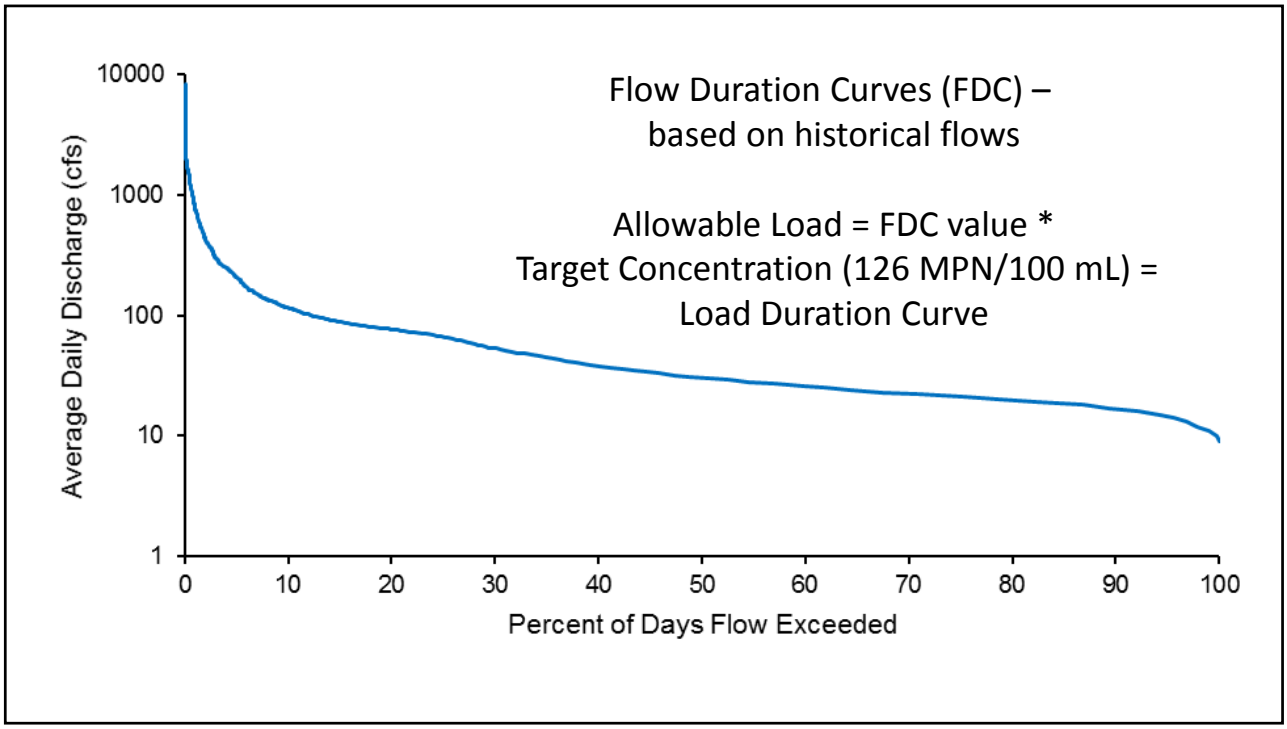

Unauthorized Discharges
Coryell
Bell
North Nolan Creek
Belton Lake
Leon River
Nolan Creek
South Nolan Creek
Lampasas River
Stillhouse Hollow Lake
Salado Creek
1218_03
1218B
1218A
1218C
1218_02
1218_01
Sanitary Sewer Overflow (gallons)
0 - 330
331 - 980
981 - 2000
2001 - 5500
5501 - 21200
Segment 1218
Roads
Streams
County Boundary
Assessment Unit Boundaries
Belton
Harker Heights
Killeen
Nolanville
N
Miles
0 1 2 4 6 8

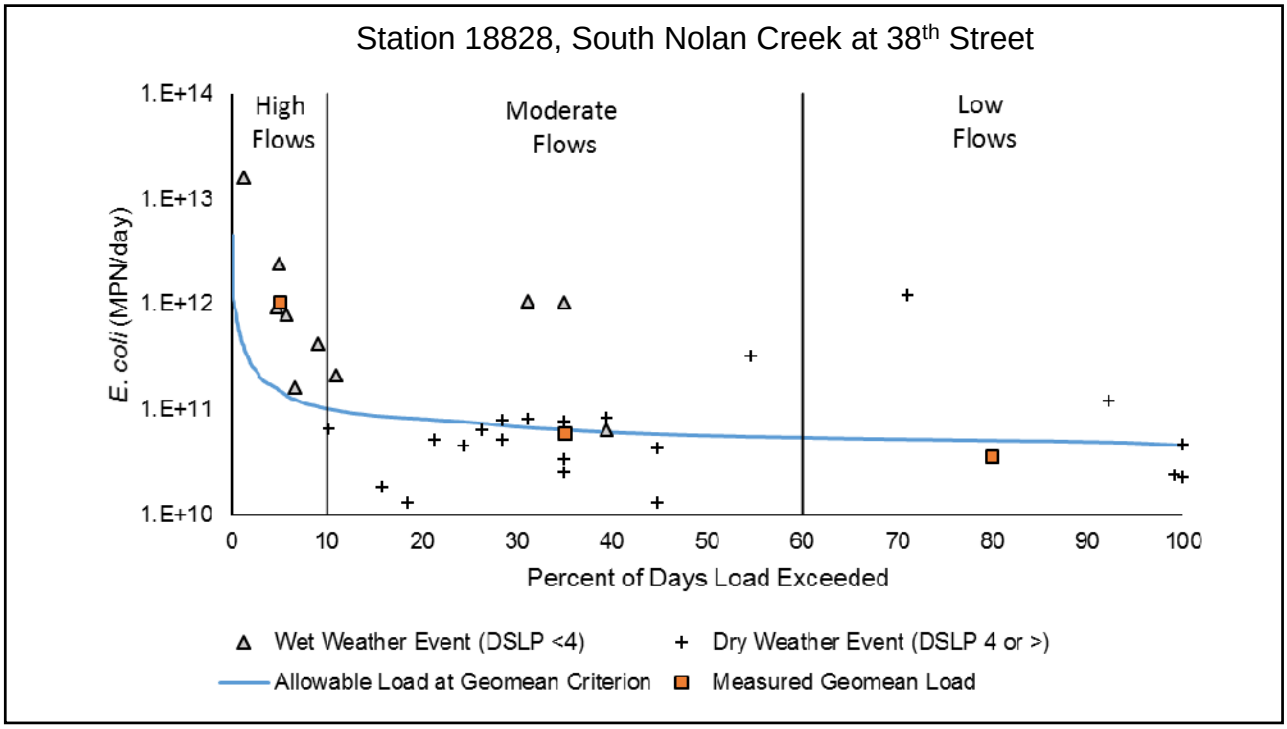

Geometric Mean E. coli (MPN/100mL)
700
600
500
400
300
200
100
0
Long Branch
Little Nolan
PCR = Primary Contact Recreation
SCR1 = Secondary Contact Recreation 1
11915
18828
21436
18827
21437
11913
11911
11910
11908
11905
14237
Station
Geometric Mean
PCR Criterion
SCR1 Criterion

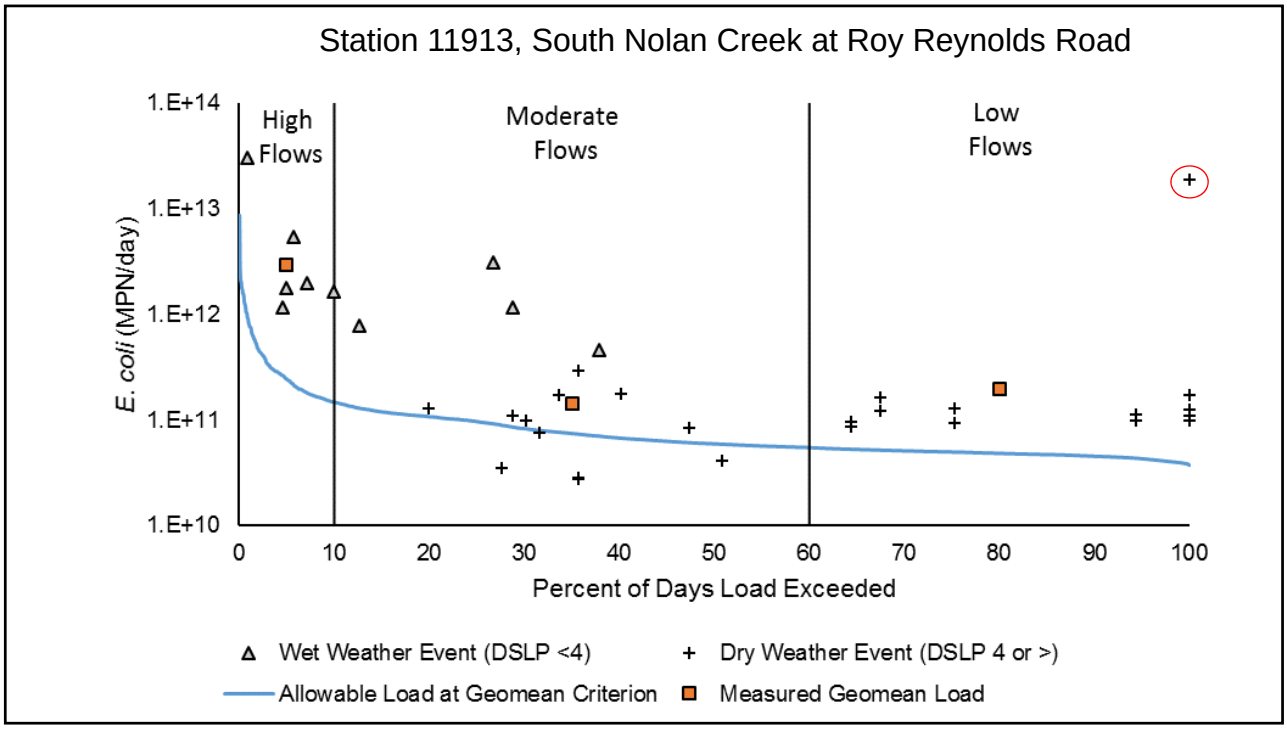

Geometric Mean E. coli (MPN/100mL)
2500
2000
1500
1000
500
0
11905 (Backstrom Crossing)
11910 (US190 Nolanville)
11913 (Roy Reynolds Killeen)
18828 (38th St Killeen)
0
20
40
60
80
100
120
Average Flow (cfs)
Routine
Storm

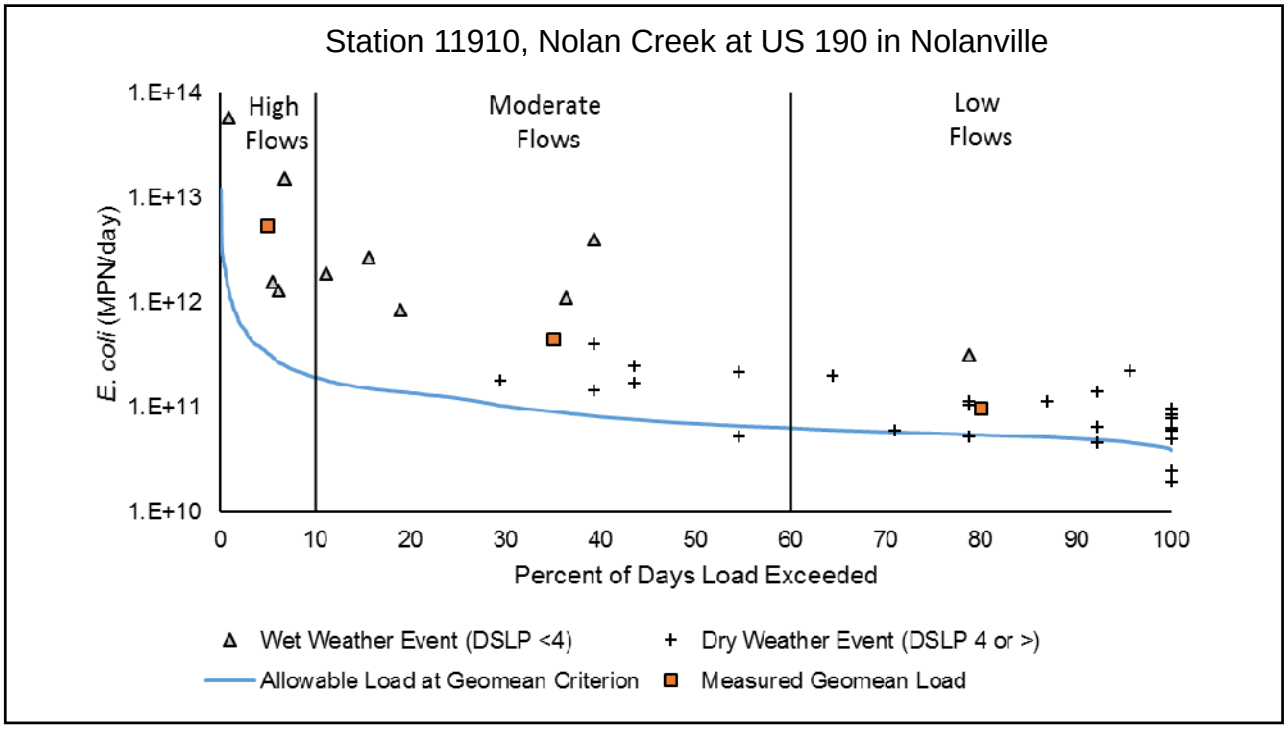

Geometric Mean E. coli (MPN/100mL)
Average Flow (cfs)
y = -3.73x + 348
R² = 0.35
21436
21437
11911
18827
11913
11910
11908
14237
11905
11915
18828
0
50
100
150
200
250
300
350
400
0
5
10
15
20
25
30
35
40

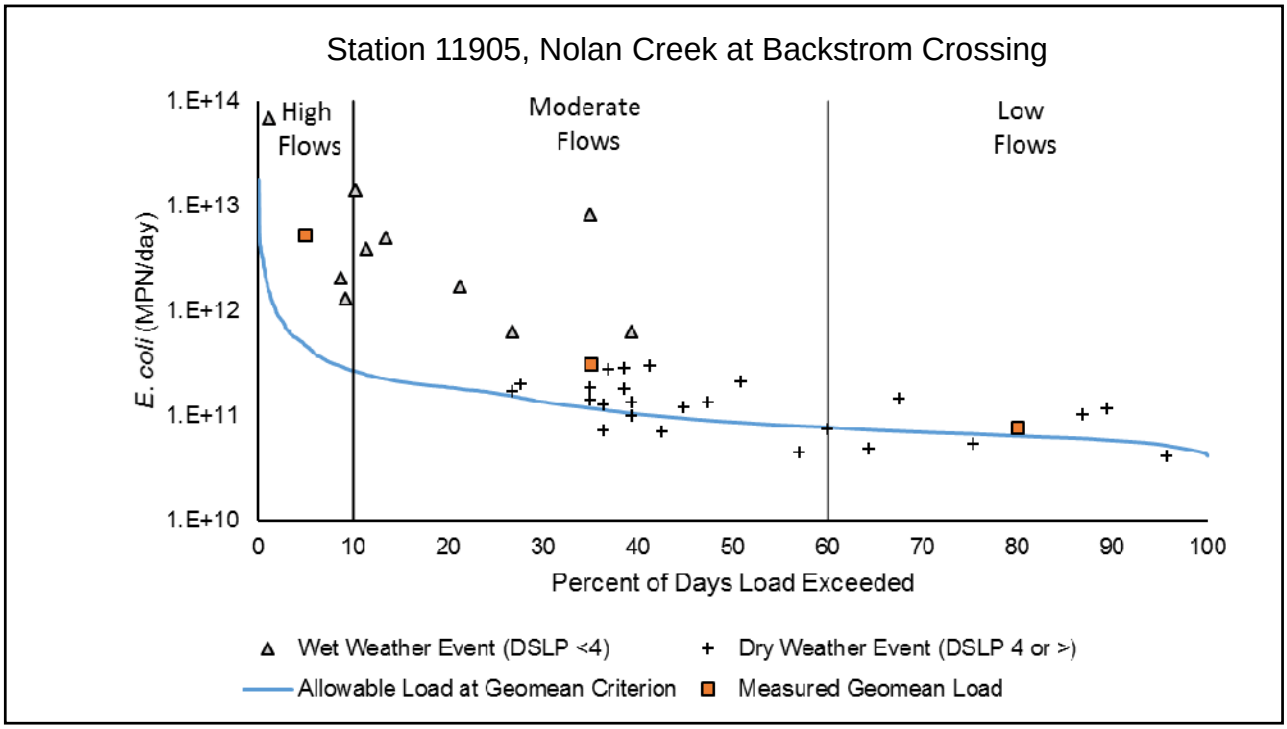

Geometric Mean E. coli (MPN/100 mL)
Drainage Area (acres)
y = -0.0025x + 347
R² = 0.47
21436
18827
11911
11913
21437
11910
11908
14237
11905
18828
11915
0
50
100
150
200
250
300
350
400
0
10,000
20,000
30,000
40,000
50,000
60,000
70,000
80,000

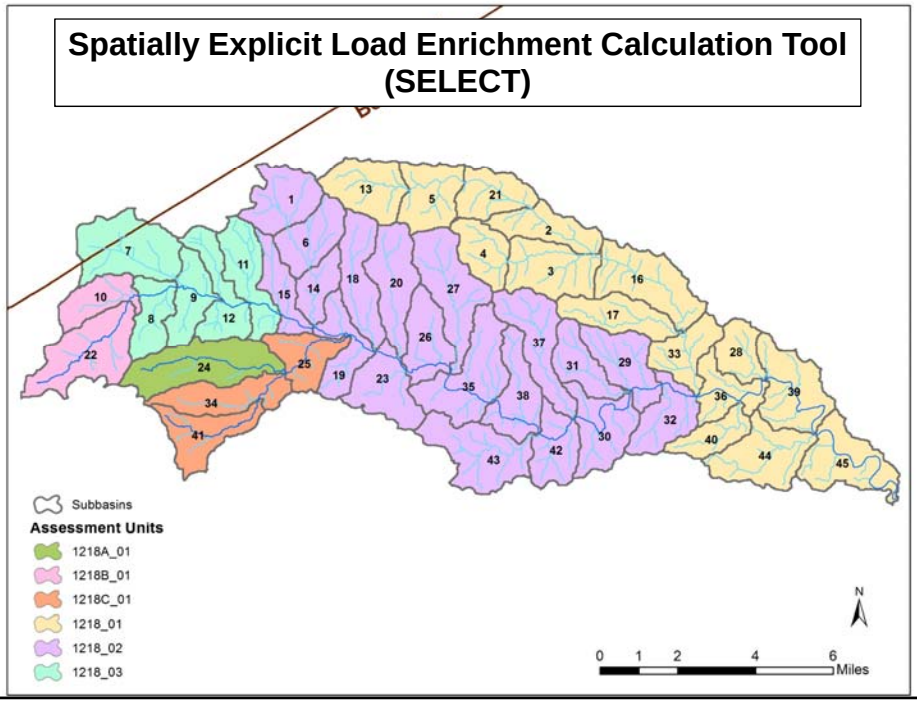

Flow Duration Curves (FDC) –
based on historical flows
Allowable Load = FDC value *
Target Concentration (126 MPN/100 mL) =
Load Duration Curve
Average Daily Discharge (cfs)
10000
1000
100
10
1
0
10
20
30
40
50
60
70
80
90
100
Percent of Days Flow Exceeded


Station 18828, South Nolan Creek at 38th Street
High Flows
Moderate Flows
Low Flows
E. coli (MPN/day)
1.E+14
1.E+13
1.E+12
1.E+11
1.E+10
0
10
20
30
40
50
60
70
80
90
100
Percent of Days Load Exceeded
Wet Weather Event (DSLP <4)
Dry Weather Event (DSLP 4 or >)
Allowable Load at Geomean Criterion
Measured Geomean Load


Station 11913, South Nolan Creek at Roy Reynolds Road
High Flows
Moderate Flows
Low Flows
1.E+14
1.E+13
1.E+12
1.E+11
1.E+10
E. coli (MPN/day)
0
10
20
30
40
50
60
70
80
90
100
Percent of Days Load Exceeded
Wet Weather Event (DSLP <4)
Dry Weather Event (DSLP 4 or >)
Allowable Load at Geomean Criterion
Measured Geomean Load

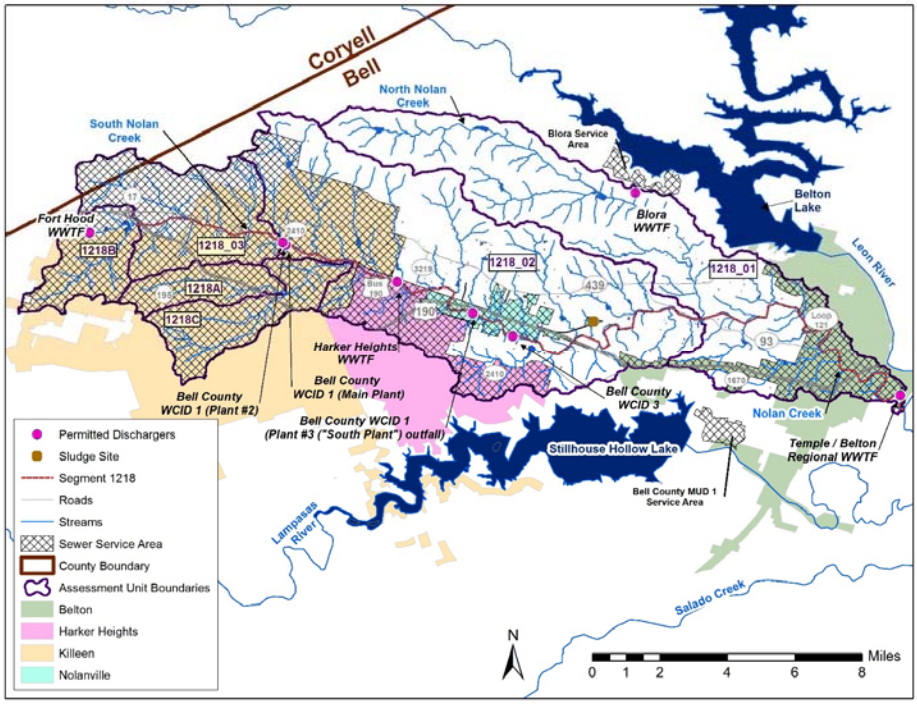

Station 11910, Nolan Creek at US 190 in Nolanville
High Flows
Moderate Flows
Low Flows
1.E+14
1.E+13
1.E+12
1.E+11
1.E+10
E. coli (MPN/day)
0
10
20
30
40
50
60
70
80
90
100
Percent of Days Load Exceeded
Wet Weather Event (DSLP <4)
Dry Weather Event (DSLP 4 or >)
Allowable Load at Geomean Criterion
Measured Geomean Load

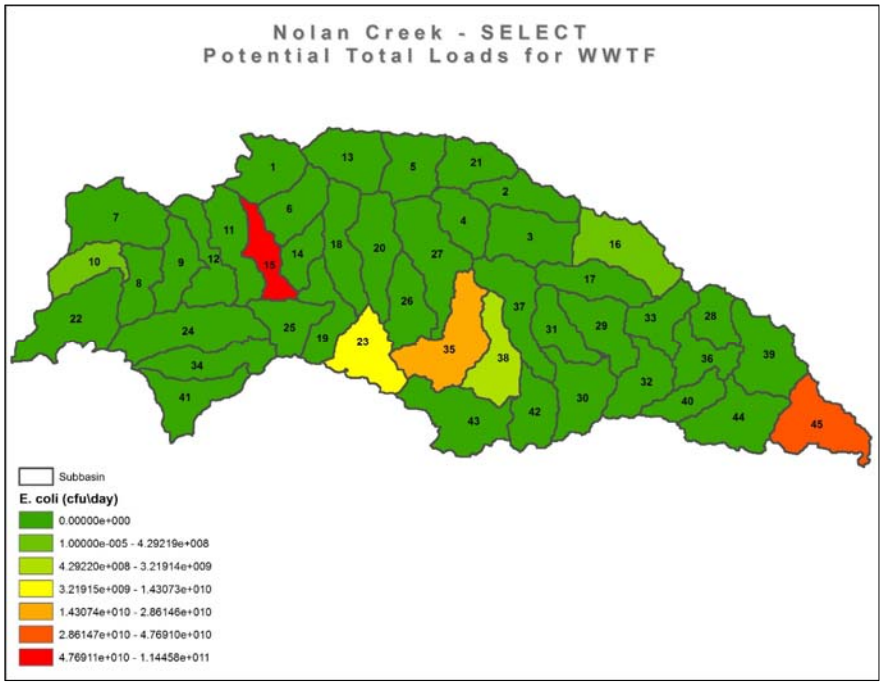

Station 11905, Nolan Creek at Backstrom Crossing
High Flows
Moderate Flows
Low Flows
1.E+14
1.E+13
1.E+12
1.E+11
1.E+10
E. coli (MPN/day)
0
10
20
30
40
50
60
70
80
90
100
Percent of Days Load Exceeded
Wet Weather Event (DSLP <4)
Dry Weather Event (DSLP 4 or >)
Allowable Load at Geomean Criterion
Measured Geomean Load


Spatially Explicit Load Enrichment Calculation Tool (SELECT)
Subbasins
Assessment Units
1218A_01
1218B_01
1218C_01
1218_01
1218_02
1218_03
N
0 1 2 4 6
Miles

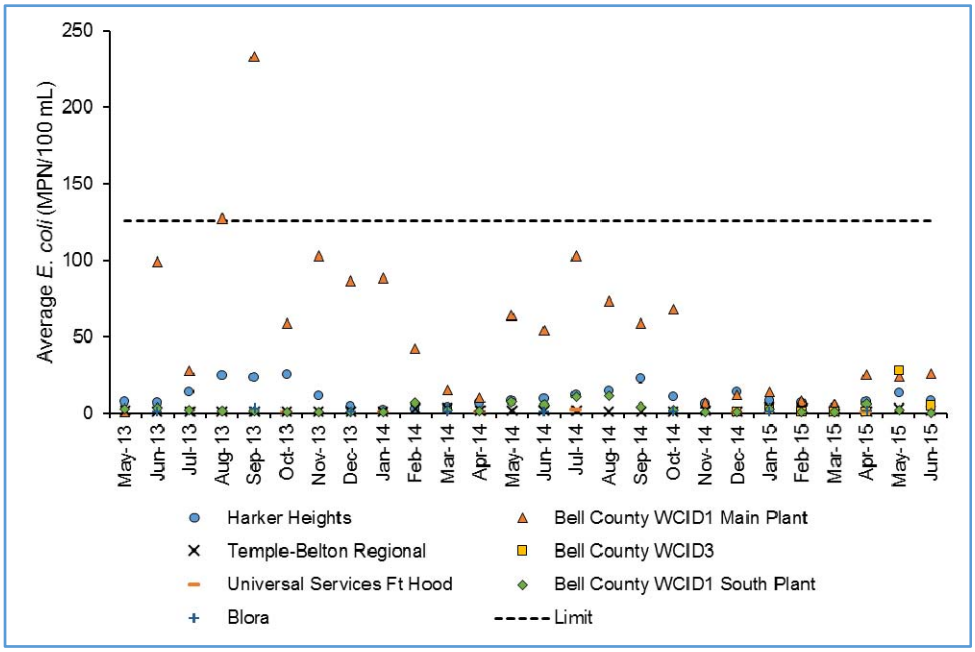
Regulated Sources - Wastewater Treatment Facility (WWTF) Discharges

Note: Service area for WWTF discharges extends beyond the watershed largely following municipal boundaries



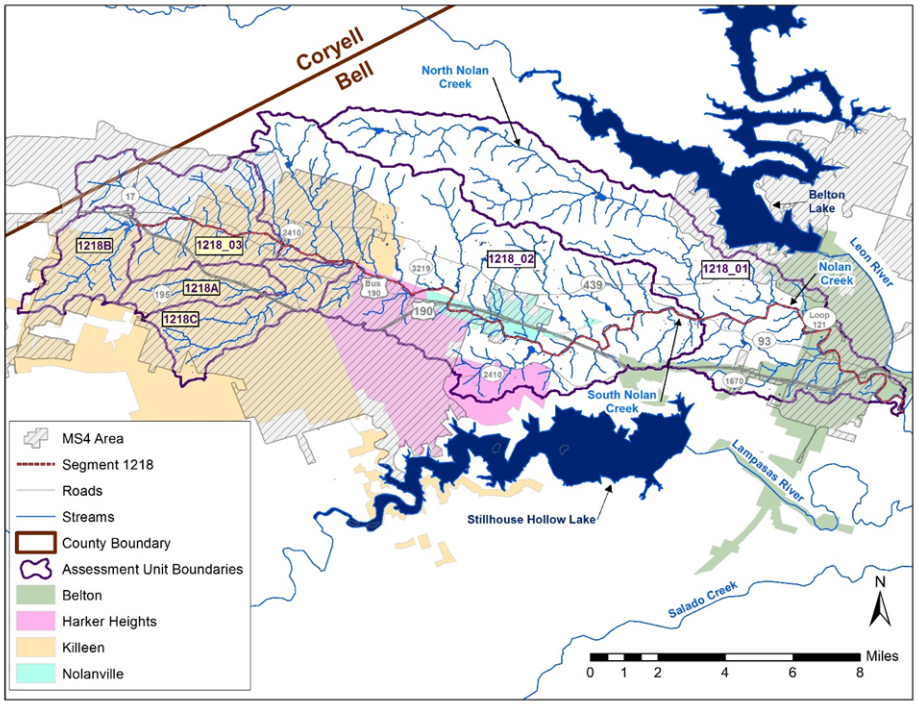


Regulated Sources - Wastewater Treatment Facility (WWTF) Discharges

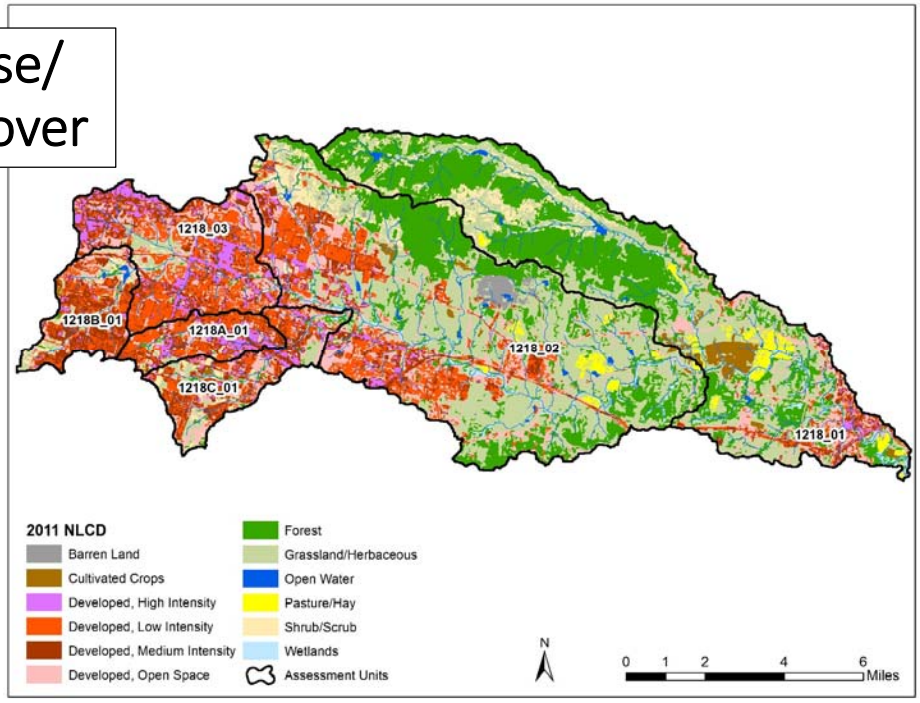


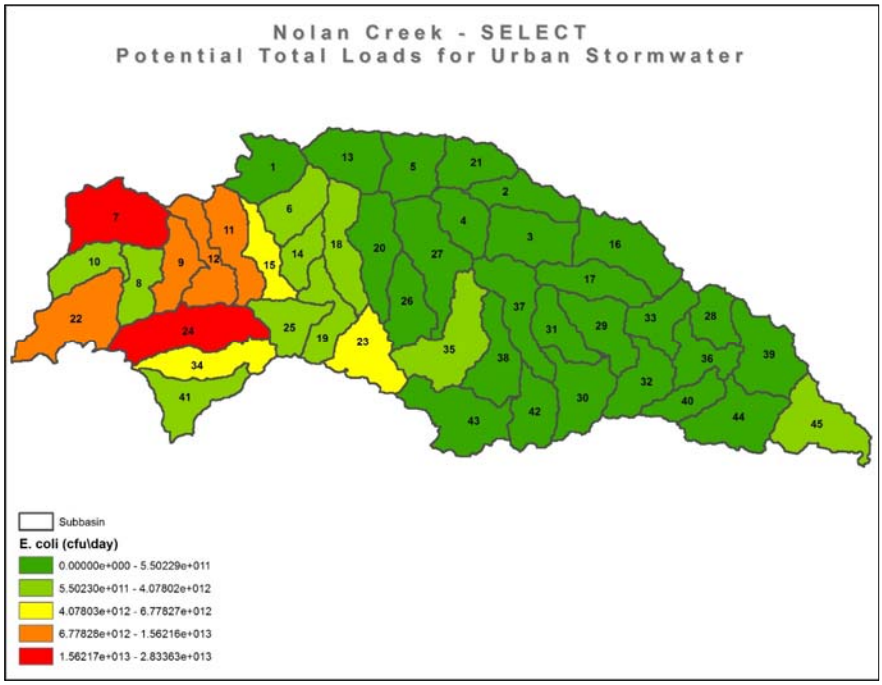
Regulated Sources - Municipal Separate Storm Sewer Systems (MS4s)

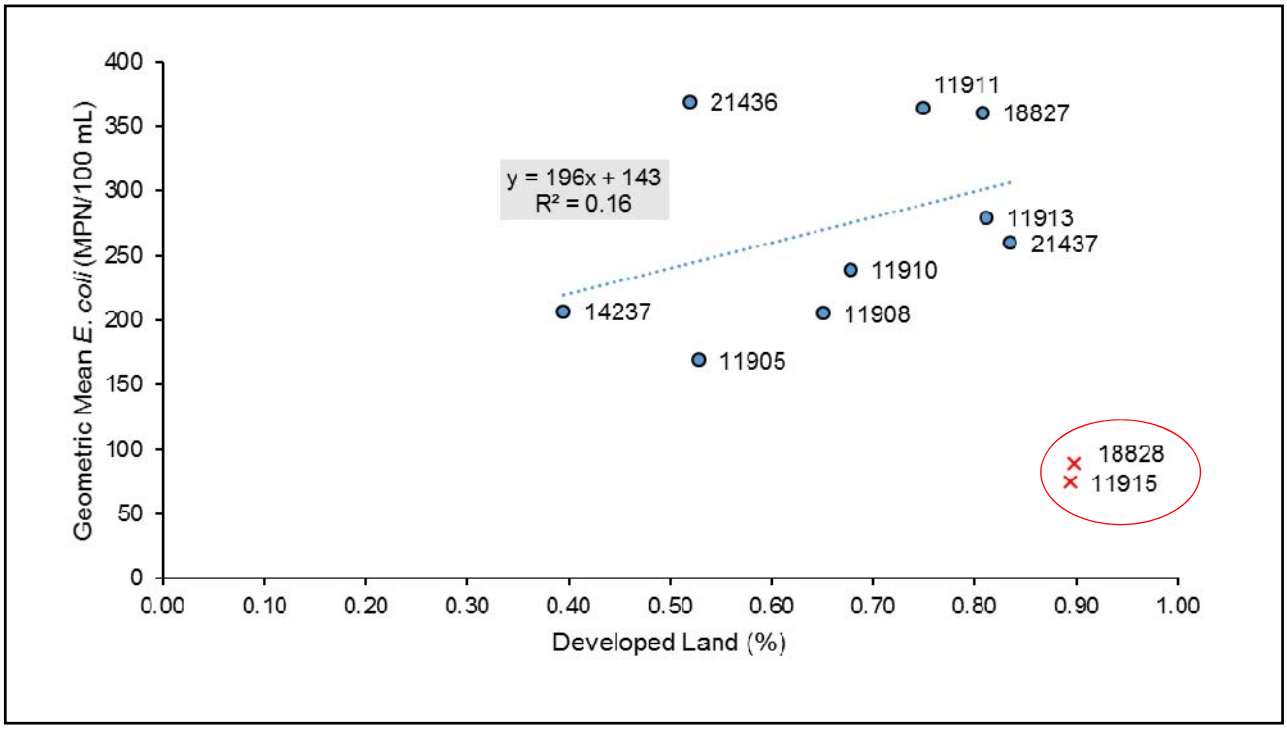
Note: MS4 area based on 2010 Census Urbanized Areas, but may extend to municipal boundaries



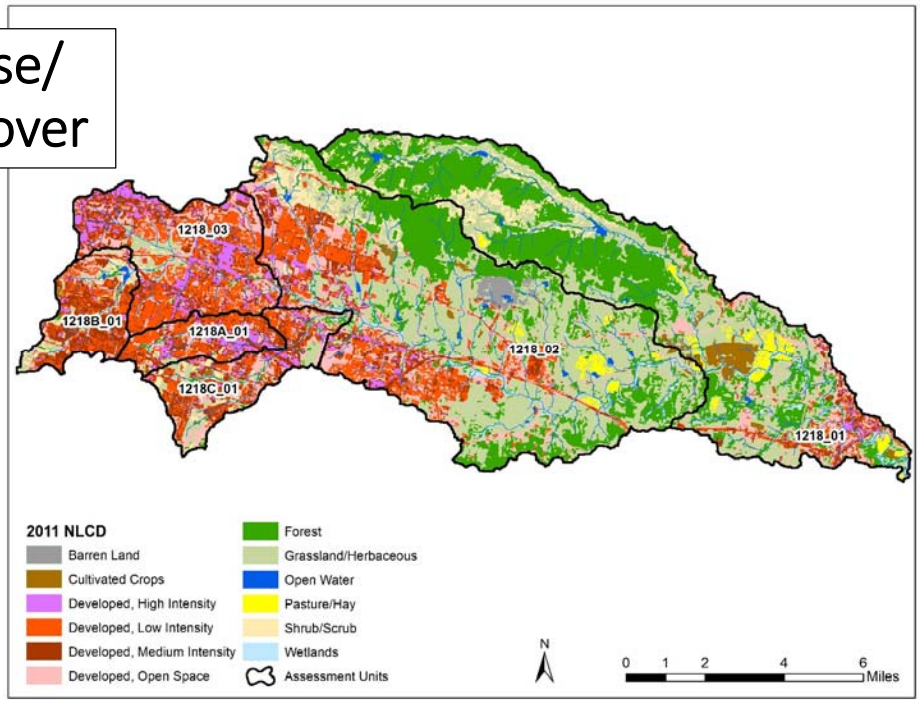
Land Use/ Land Cover

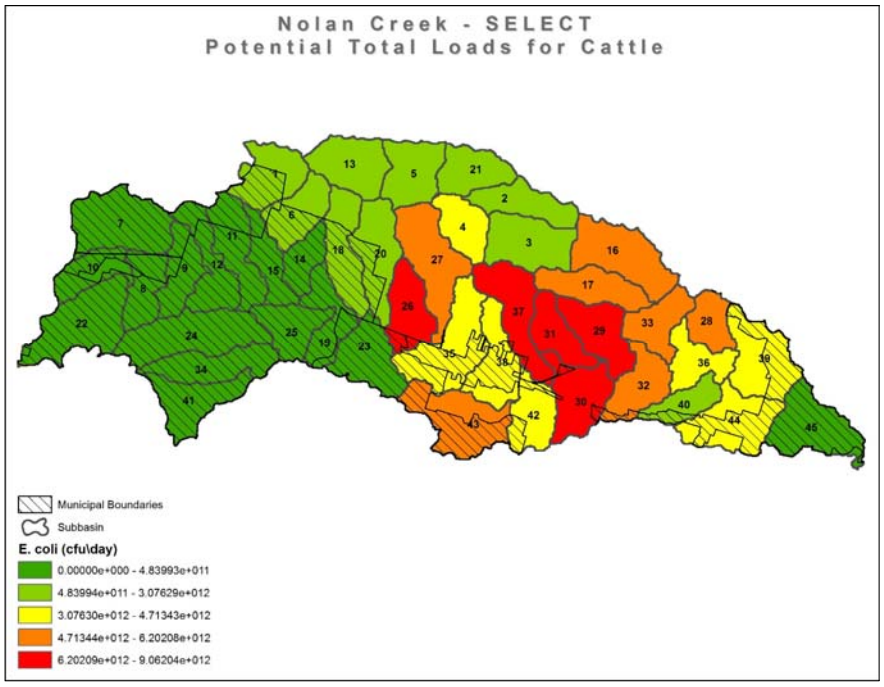


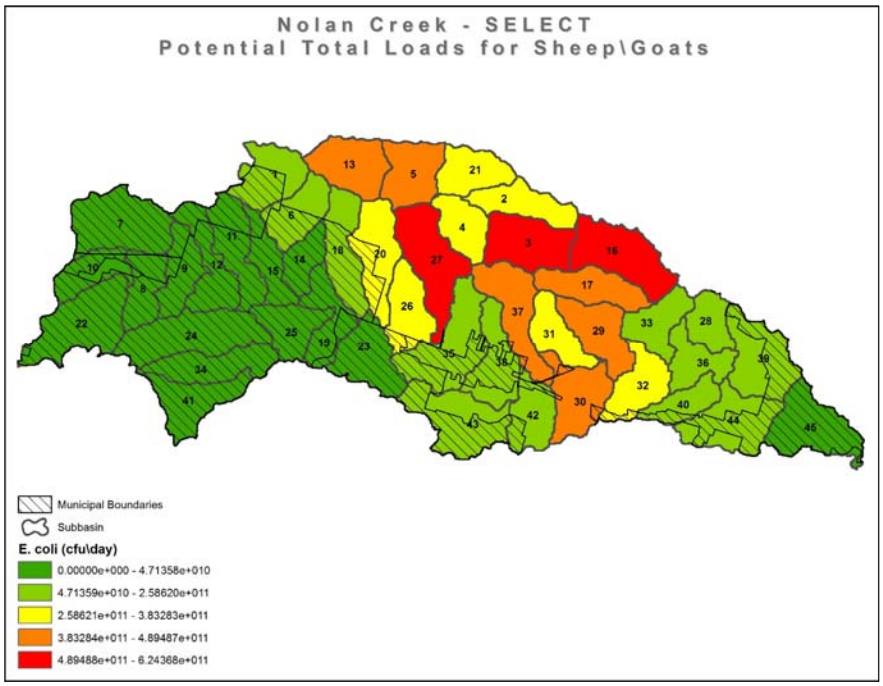


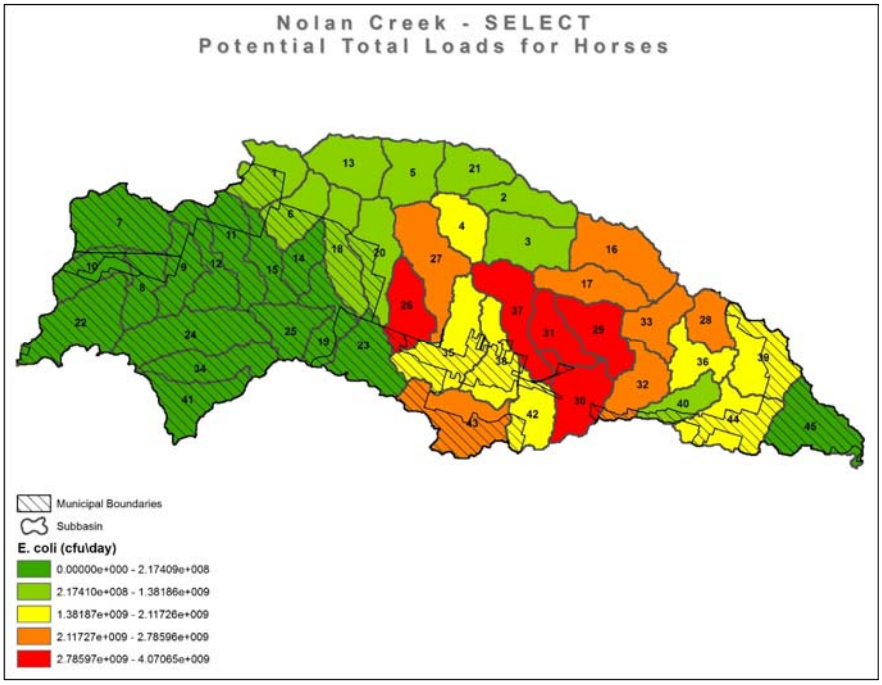


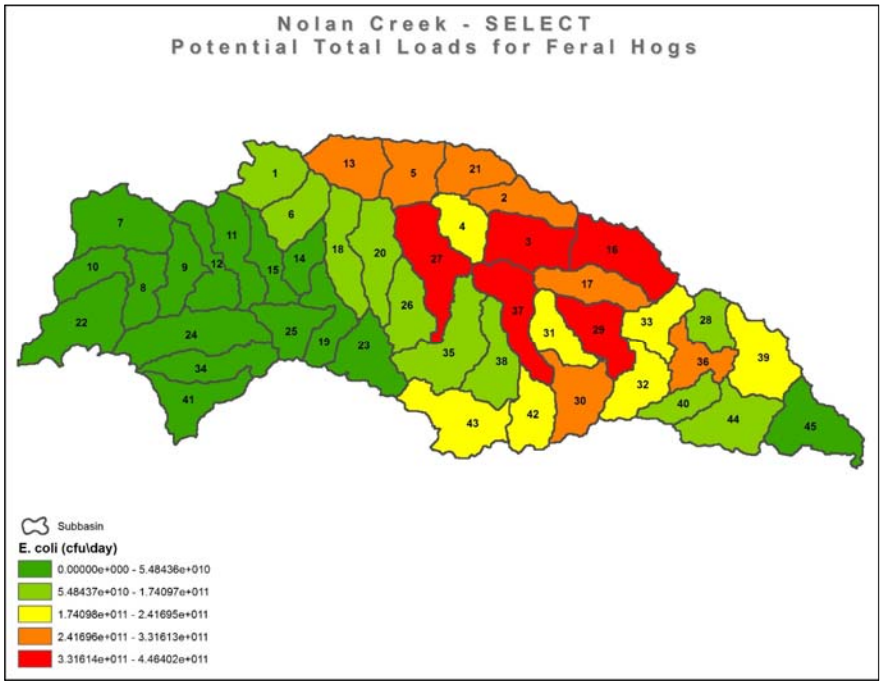
Land Use/ Land Cover

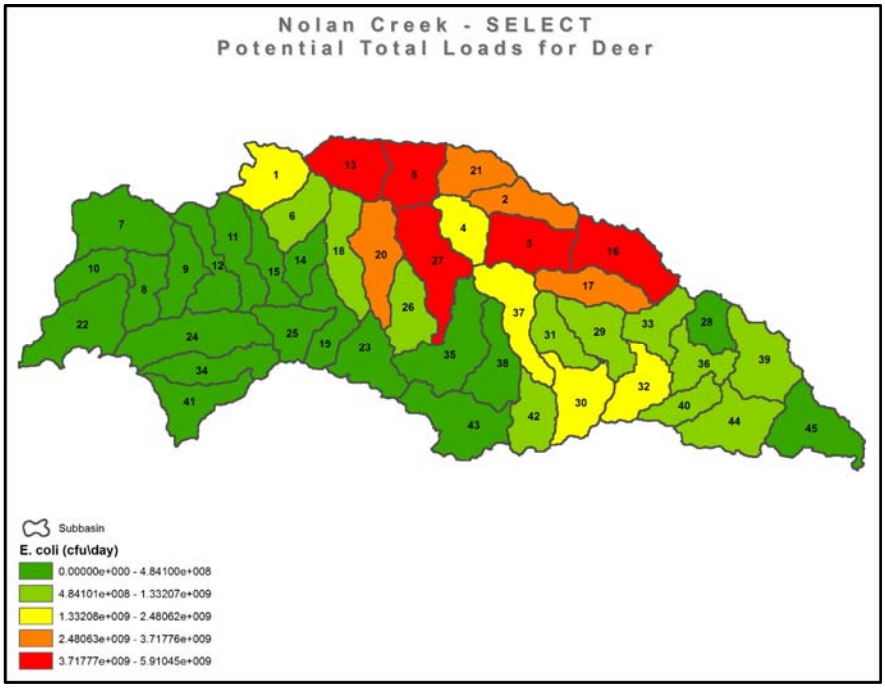


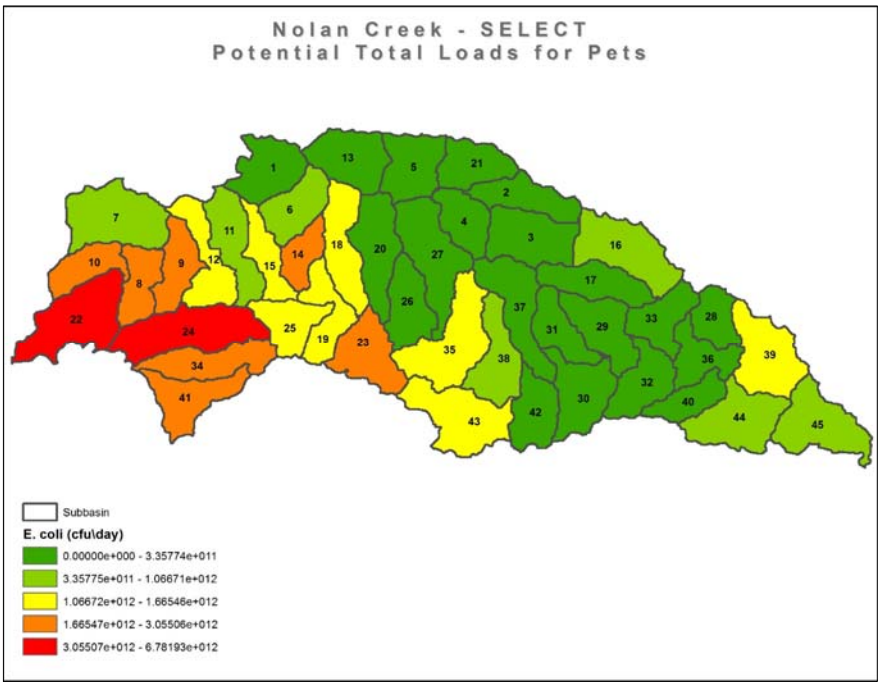

Nolan Creek - SELECT
Potential Total Loads for Cattle
Municipal Boundaries
Subbasin
E. coli (cfu\day)
0.00000e+000 - 4.83993e+011
4.83994e+011 - 3.07629e+012
3.07630e+012 - 4.71343e+012
4.71344e+012 - 6.20208e+012
6.20209e+012 - 9.06204e+012


Nolan Creek - SELECT
Potential Total Loads for Sheep\Goats
Municipal Boundaries
Subbasin
E. coli (cfu\day)
0.00000e+000 - 4.71358e+010
4.71359e+010 - 2.58620e+011
2.58621e+011 - 3.83283e+011
3.83284e+011 - 4.89487e+011
4.89488e+011 - 6.24368e+011


Nolan Creek - SELECT
Potential Total Loads for Horses
Municipal Boundaries
Subbasin
E. coli (cfu\day)
0.00000e+000 - 2.17409e+008
2.17410e+008 - 1.38186e+009
1.38187e+009 - 2.11726e+009
2.11727e+009 - 2.78596e+009
2.78597e+009 - 4.07065e+009

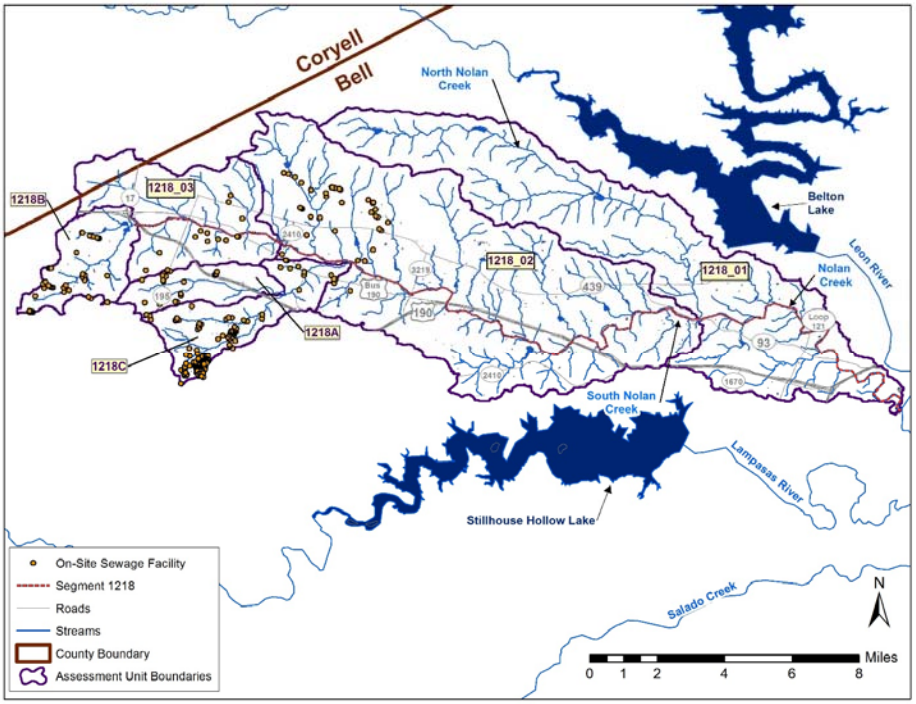

Nolan Creek - SELECT
Potential Total Loads for Feral Hogs
Subbasin
E. coli (cfu\day)
0.00000e+000 - 5.48436e+010
5.48437e+010 - 1.74097e+011
1.74098e+011 - 2.41695e+011
2.41696e+011 - 3.31613e+011
3.31614e+011 - 4.46402e+011

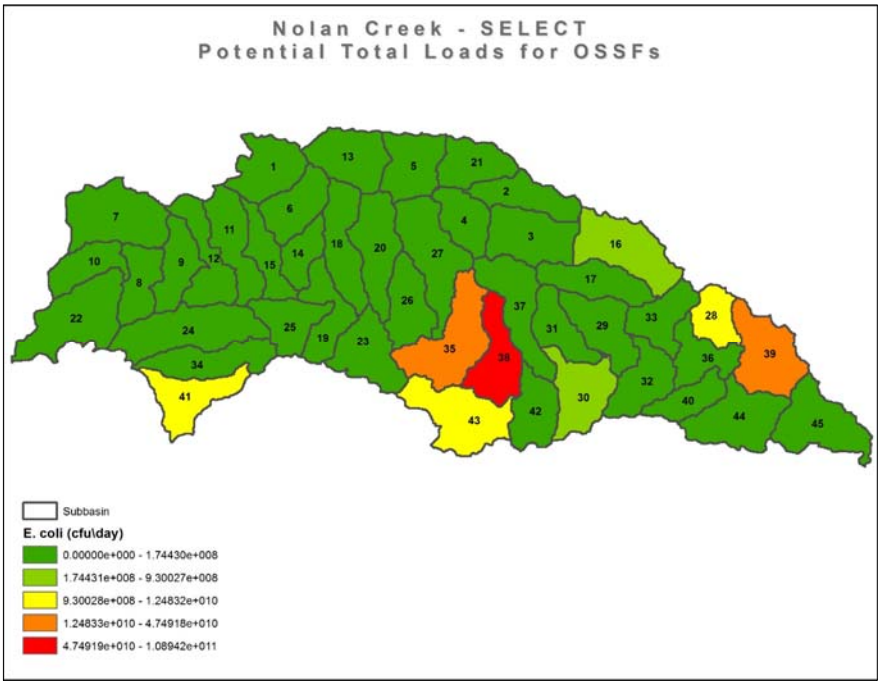

Nolan Creek - SELECT
Potential Total Loads for Deer
Subbasin
E. coli (cfu\day)
0.00000e+000 - 4.84100e+008
4.84101e+008 - 1.33207e+009
1.33208e+009 - 2.48062e+009
2.48063e+009 - 3.71776e+009
3.71777e+009 - 5.91045e+009

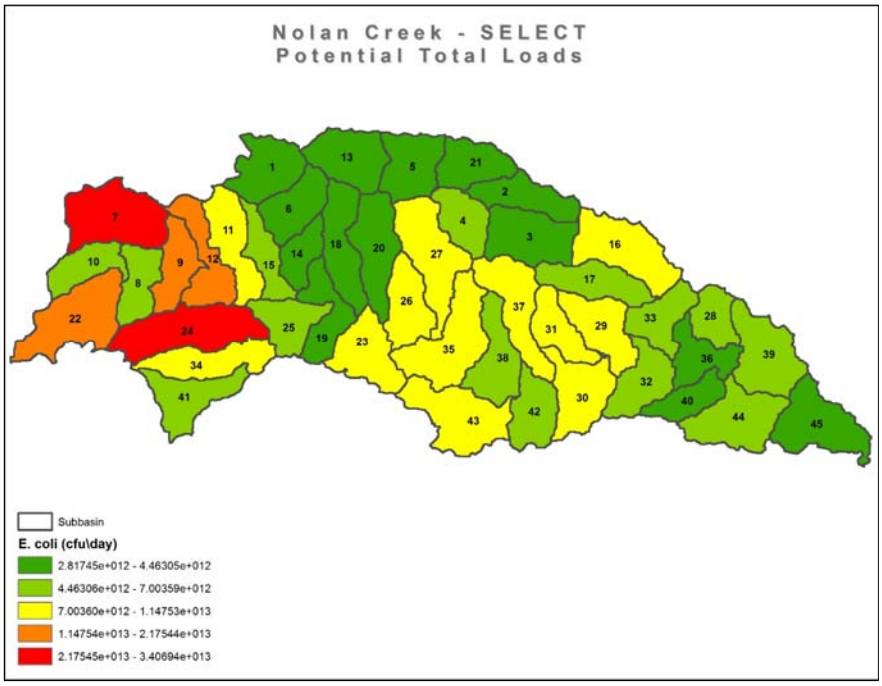

Nolan Creek - SELECT
Potential Total Loads for Pets
Subbasin
E. coli (cfu\day)
0.00000e+000 - 3.35774e+011
3.35775e+011 - 1.06671e+012
1.06672e+012 - 1.66546e+012
1.66547e+012 - 3.05506e+012
3.05507e+012 - 6.78193e+012

On-Site Sewage Facilities (OSSFs)

Map depicts OSSFs within City of Killeen based on information as of Sep2014.

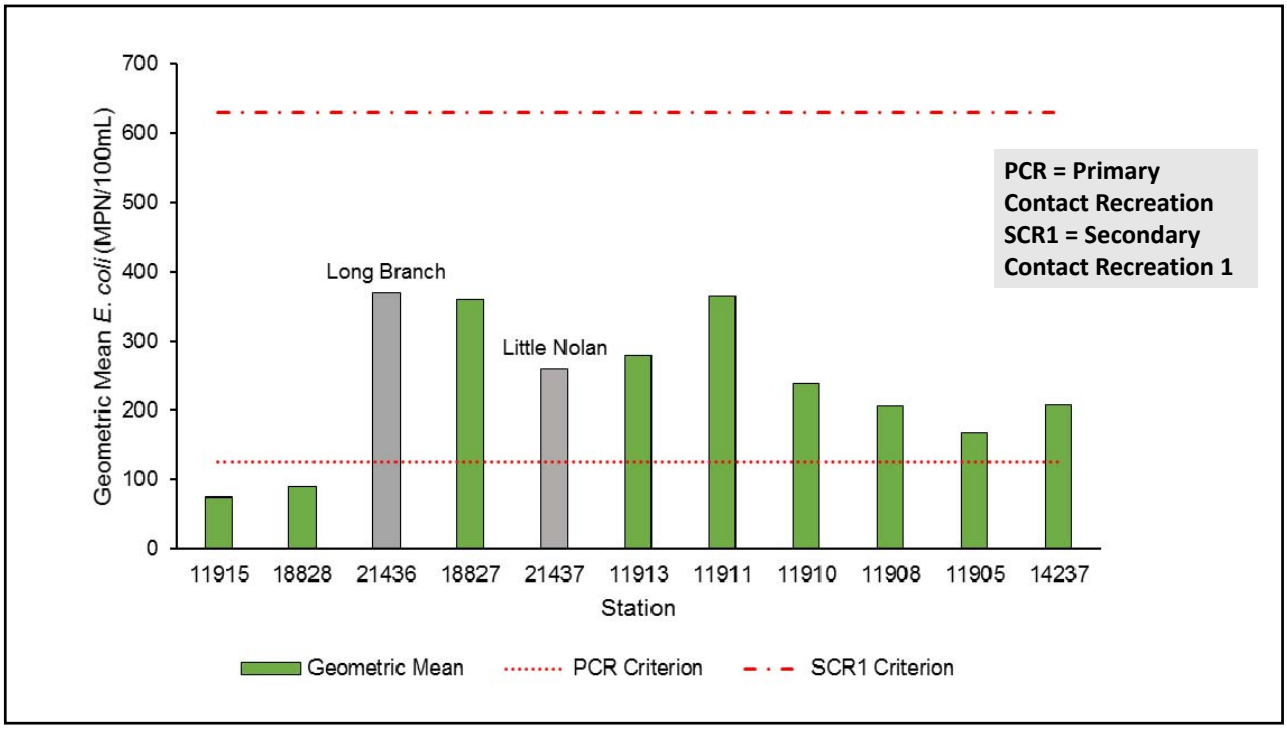






Sources -

- **Have we captured all the sources or are there others?**
- **What else might be contributing to these elevated bacteria concentrations?**
- **Is there a need for more monitoring to better isolate sources?**
- **Are there volunteer monitors who would like to be involved?**


700
600
500
400
300
200
100
0
Geometric Mean E. coli (MPN/100mL)
Long Branch
Little Nolan
PCR = Primary Contact Recreation
SCR1 = Secondary Contact Recreation 1
11915
18828
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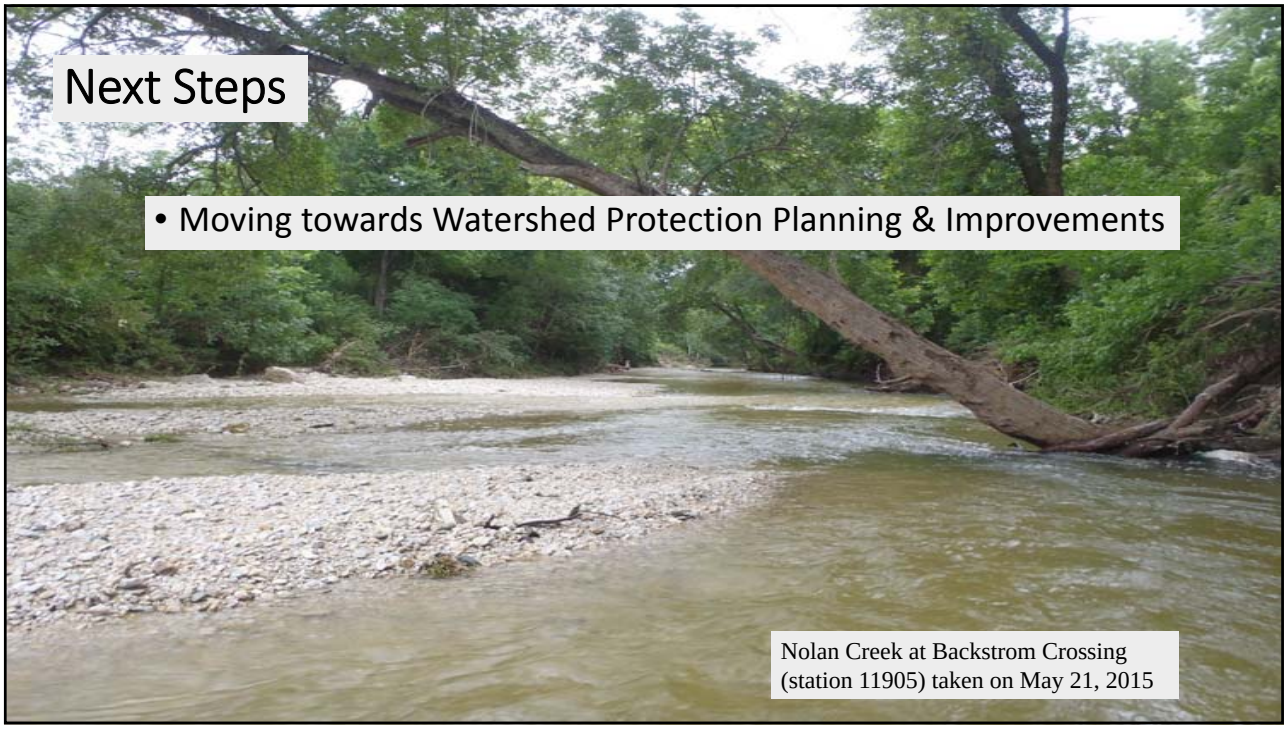
11913
11911
11910
11908
11905
14237
Station
Geometric Mean
PCR Criterion
SCR1 Criterion


Next Steps
• Moving towards Watershed Protection Planning & Improvements
Nolan Creek at Backstrom Crossing (station 11905) taken on May 21, 2015

Available & Upcoming Reports

- **Available Reports**
  - Data Inventory for the Nolan Creek/South Nolan Creek Watershed Segment 1218
  - Survey of Potential Bacteria and Nutrient Sources in the Nolan Creek/South Nolan Creek Watershed
  - Characterizing Water Quality within Nolan Creek/ South Nolan Creek
- **Upcoming Reports**
  - Characterizing Potential Pollutant Loads to Nolan Creek/ South Nolan Creek

http://www.killeentexas.gov/nolancreekwatershed