

CURRY'S FORK TECHNICAL COMMITTEE MEETING NO. 1
 Oldham County Fiscal Court
 October 1, 2008, 10 A.M.

Present	Representing	Contact
Bryant Willard	Oldham County Sewer District	bwillard@oldhamcountysewer.com
Todd Lafollette	Oldham County Health Dept	Toddg.lafollette@ky.gov
Margi Jones	Kentucky Division of Water	margi.jones@ky.gov
John Webb	Salt River Basin Coordinator	john.webb@ky.gov
Stuart Strickler	Oldham County Board of Education	stuart.strickler@oldham.kyschools.us
Clark Dorman	Kentucky Division of Water	Clark.Dorman@ky.gov
Mike Croasdaile	University of Louisville	m.croasdaile@louisville.edu
John Bennett	La Grange Utility Commission	luc@insightbb.com
Paul Maron, P.E.	Strand Associates, Inc. (Engineer)	Paul.Maron@strand.com
Andrea Rogers	Strand Associates, Inc. (Engineer)	Andrea.Rogers@strand.com

1. Purpose of Meeting

The purpose of the technical committee meeting was to review the water quality data for the Curry's Fork watershed. Paul Maron began the presentation by discussing the project background of the Curry's Fork watershed and describing the watershed in terms of location, sub watershed, geographic area, and land use. Land use consists of 75 percent grassland and 17 percent developed land.

2. Data Resources and Collection

Data resources utilized were Kentucky Division of Water (KDOW), Salt River Water Watch (SRWW), the Floyds Fork Watershed Based Plan and Curry's Fork Watershed Based Plan. The United States Geological Survey is currently collecting data and will be contacted to retrieve the data. The water quality data was compared to benchmark water quality standards or recommended standards. The water quality data from KDOW and SRWW indicates elevated levels of bacteria throughout the watershed with South Curry's subwatershed demonstrating the highest levels of fecal bacteria. Nutrients increase as you travel downstream through the watershed. The herbicide and pesticide data shows no overall problems.

From May until October 2007, Strand collected dry samples to establish baseline conditions. Grab samples and field measurements were collected regardless of the weather conditions. The sampling sites were selected based on the stream confluences and previously selected sampled sites for comparison purposes. Results were similar to the SRWW and KDOW. The levels of bacteria were elevated above water quality standards. Dissolved oxygen was on average above the 5 mg/L minimum criteria although there were recorded values below the allowable limit.



Strand has been assisting the University of Louisville (UofL) in collecting turbidity, flow, and rain event-related total suspended solids (TSS) data. The TSS samples are collected at four sample sites throughout the watershed during wet weather events. The flow data is being collected continuously utilizing a 6712 ISCO unit. When the stream depth reaches an elevated level because of a rain event, the auto sampler triggers and collects up to 24 samples. The correlation between TSS and turbidity is being developed by UofL. The three data components have a real time comparison between turbidity, flow, and TSS. The relationship between TSS and the storm peak indicates the distance the sediment traveled to the stream. The data shows the peak of TSS prior to the storm peak which suggests travel time is minimal or in close proximity to the stream. The likely sediment source is stream bank erosion.

Biological surveys were conducted in 2007 at the four wet weather sites. The results were mixed ranging from poor to fair to excellent depending on which four biological index was used. The watershed conditions were in a drought which may have impacted the survey. The minimal fish diversity could be linked to poor water quality.

University of Louisville has completed one year of a two-year geomorphologic study. The preliminary findings show evidence of stream straightening throughout the entire watershed.

The suspected pollutant sources identified by the 303d list were confirmed by the water quality data analysis. The package treatment plants are producing effluents that do not meet permit limits. Through the efforts of the watershed based plan, critical areas will be identified with the greatest water quality enhancement potential. The Oldham County Health Department agreed to identify priority subdivisions with septic tanks on a map provided by Strand Associates.

3. Potential Stressors

Stressors within the watershed were discussed. The five potential stressors identified are development, wildlife, sewage disposal, stream modifications, and agricultural practices. Clark Dorman suggested that we should review industrial discharges and compliance history. It was also suggested to review the bacteria data versus stream flow and wet weather events.

South Curry's Fork demonstrates the highest levels of bacteria. Potential stressors include Lockwood subdivision, Centerfield, and the mobile homes located on small plots with septic tanks.

The water quality issues for the entire watershed are bacteria and TSS. By subwatershed, North Curry's Fork has high nutrient loads. South Curry's has elevated levels of bacteria. Infrastructure plans for the area include proposed sewers to the mobile homes. Tributary 1 is influenced by agriculture. The dairy farm may be contributing to water quality issues. The critical time for sewer overflows are during rain events when the conveyance system is overloaded.

A quarterly newsletter produced by Oldham County Fiscal Court called *What's Happening in Oldham County* should be utilized to distribute information regarding the watershed plan. Stakeholders suggest inviting USGS and Oldham County Conservation District to technical meetings.

4. Next Meeting

The next committee meeting is scheduled for October 29, 2008 at 10 A.M. An investigation of each sub watershed for stressors will be conducted. Figures of each subwatershed are enclosed for stakeholder input.

Respectfully Submitted,

STRAND ASSOCIATES, INC.



Prepared by Andrea Rogers and respectfully submitted to all in attendance.

Enclosure(s)

c/enc: All Participants
Stakeholders

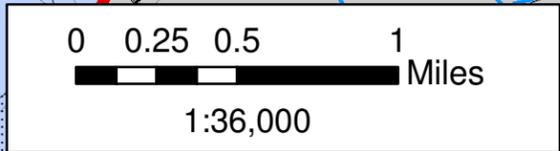
Legend

- ★ KPDES Permit
- Strand Sampling Sites
- Streams
- ▨ Recorded Subdivisions
- ▭ LaGrange
- ▭ North Fork Curry's Fork
- ▭ Currys Watershed
- Sewer
- Lift Station

LAGRANGE WTP
 No Nutrient Effluent Restrictions
 Bacteria, TSS, Chlorine, Flow greater than 10% Exceedance of KPDES Permit

BUCKNER STP
 Phosphorus Levels greater than 80% Exceedance of KPDES Permit
 TSS, Suspended Solids greater than 40% Exceedance of KPDES Permit
 Bacteria greater than 20% Exceedance of Permit
 No Nitrogen Effluent Restrictions

NORTH CURRYS NOTES
 Watershed has highest percentage of urban area with city of La Grange.
 NC1- Discharge Point
 Highest Nutrients
 Highest Conductivity
 Ammonia Spikes
 Elevated Bacteria
 NC 2- Headwaters
 Low Nutrients



MAP 1
NORTH CURRYS WORKING MAP
CURRYS FORK COMPREHENSIVE WATERSHED BASED PLAN
OLDHAM COUNTY FISCAL COURT
LA GRANGE, KENTUCKY



Map 1
5994.102

Legend

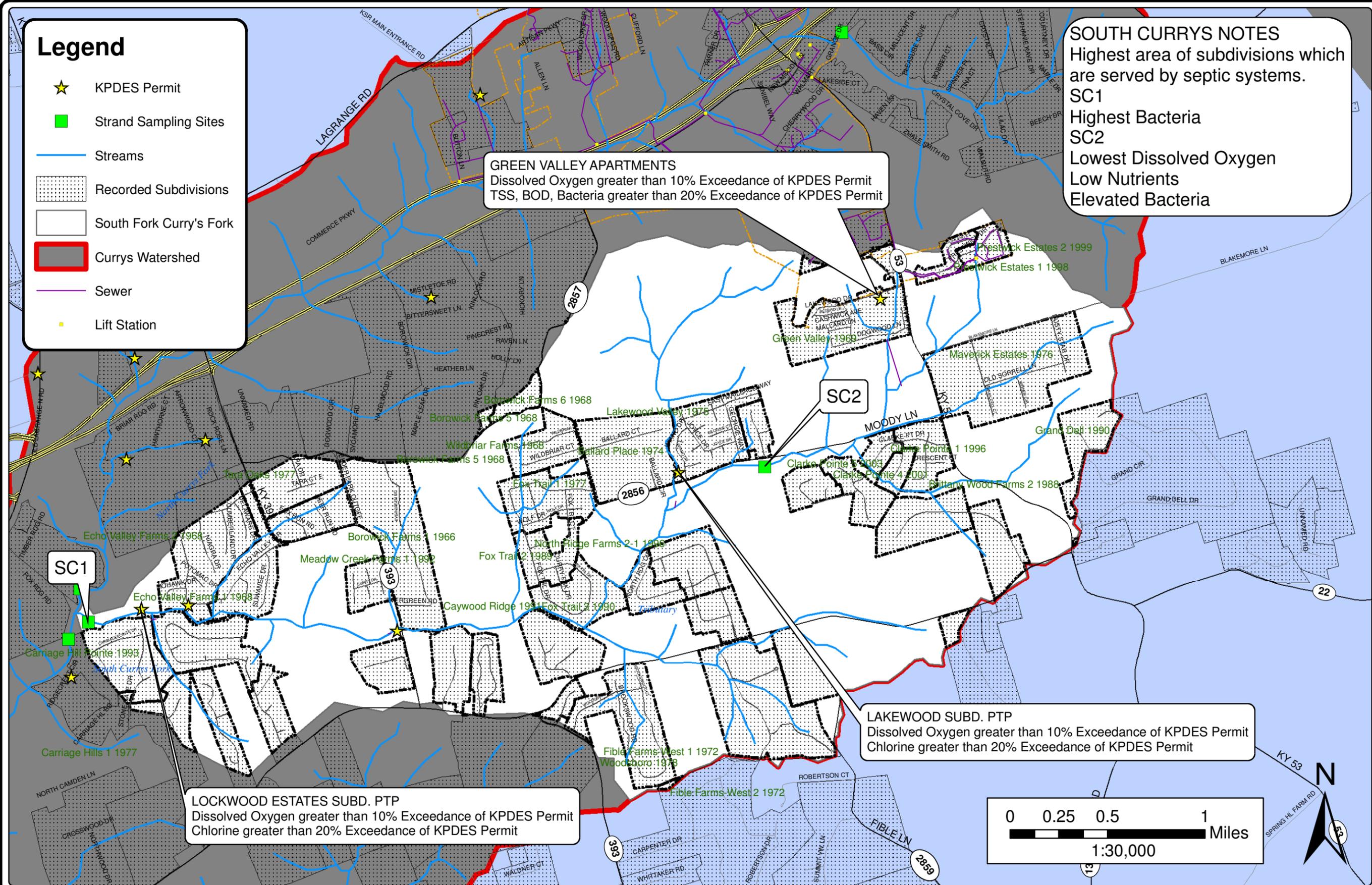
- ★ KPDES Permit
- Strand Sampling Sites
- Streams
- ▨ Recorded Subdivisions
- South Fork Curry's Fork
- ▭ Curry's Watershed
- Sewer
- Lift Station

SOUTH CURRYS NOTES
 Highest area of subdivisions which are served by septic systems.
 SC1
 Highest Bacteria
 SC2
 Lowest Dissolved Oxygen
 Low Nutrients
 Elevated Bacteria

GREEN VALLEY APARTMENTS
 Dissolved Oxygen greater than 10% Exceedance of KPDES Permit
 TSS, BOD, Bacteria greater than 20% Exceedance of KPDES Permit

LAKWOOD SUBD. PTP
 Dissolved Oxygen greater than 10% Exceedance of KPDES Permit
 Chlorine greater than 20% Exceedance of KPDES Permit

LOCKWOOD ESTATES SUBD. PTP
 Dissolved Oxygen greater than 10% Exceedance of KPDES Permit
 Chlorine greater than 20% Exceedance of KPDES Permit



MAP 2
SOUTH CURRYS WORKING MAP
 USE ALL CAPS FOR EVERYTHING IN TITLE BLOCK
 PROJECT TITLE
 CLIENT NAME
 CLIENT LOCATION



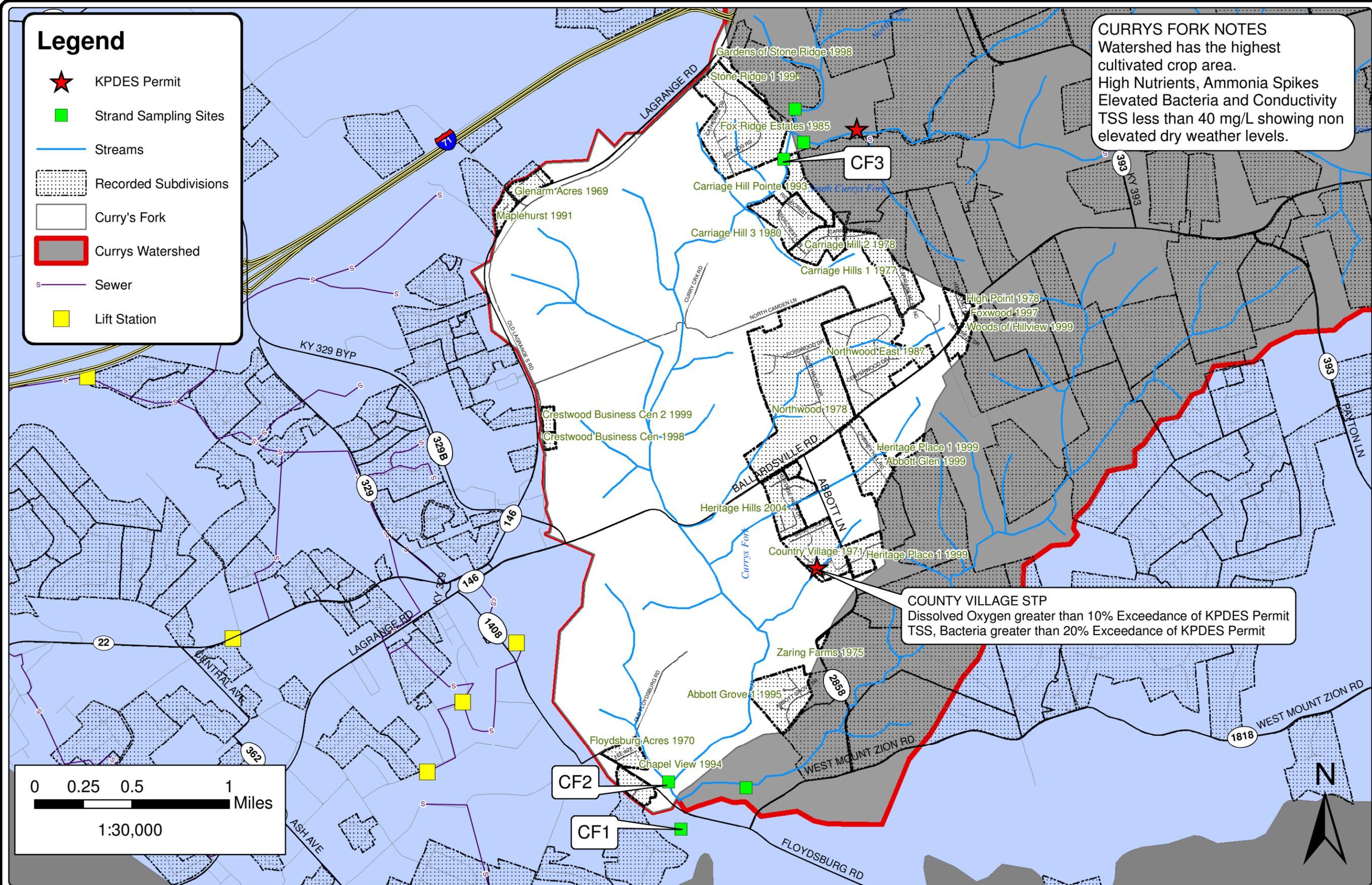
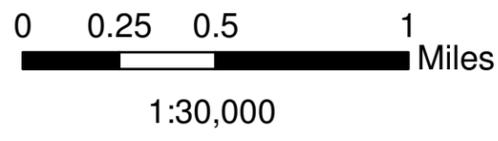
Map 2
 5994.102

Legend

- ★ KPDES Permit
- Strand Sampling Sites
- Streams
- Recorded Subdivisions
- Curry's Fork
- Currys Watershed
- Sewer
- Lift Station

CURRYS FORK NOTES
 Watershed has the highest cultivated crop area.
 High Nutrients, Ammonia Spikes
 Elevated Bacteria and Conductivity
 TSS less than 40 mg/L showing non elevated dry weather levels.

COUNTY VILLAGE STP
 Dissolved Oxygen greater than 10% Exceedance of KPDES Permit
 TSS, Bacteria greater than 20% Exceedance of KPDES Permit



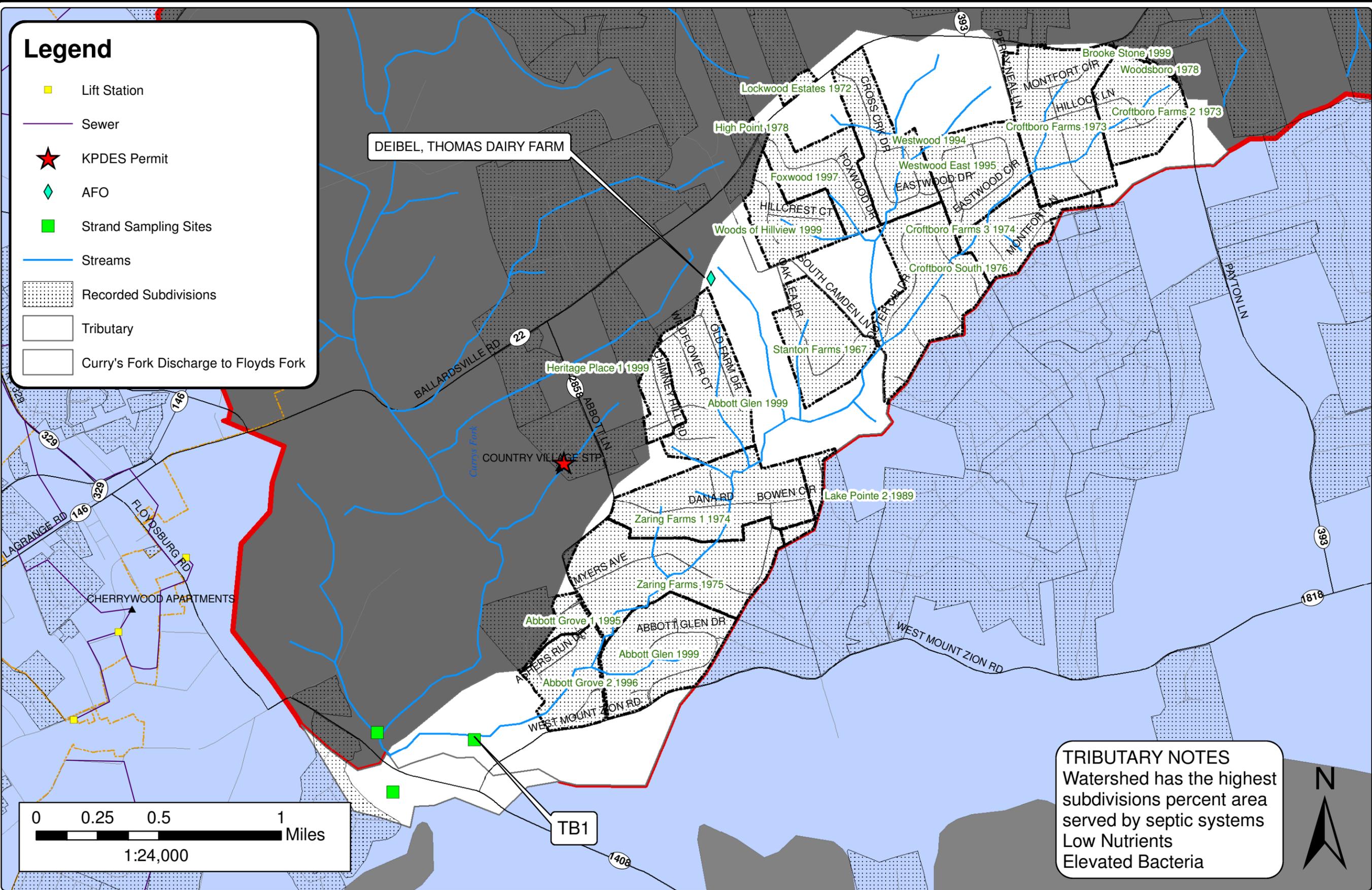
MAP 3
CURRYS WORKING MAP
CURRYS FORK COMPREHENSIVE WATERSHED BASED PLAN
OLDHAM COUNTY FISCAL COURT
LA GRANGE, KENTUCKY



MAP 3
5994.102

Legend

- Lift Station
- Sewer
- ★ KPDES Permit
- ◆ AFO
- Strand Sampling Sites
- Streams
- Recorded Subdivisions
- Tributary
- Curry's Fork Discharge to Floyds Fork



DEIBEL, THOMAS DAIRY FARM

Heritage Place 1 1999

COUNTRY VILLAGE STP

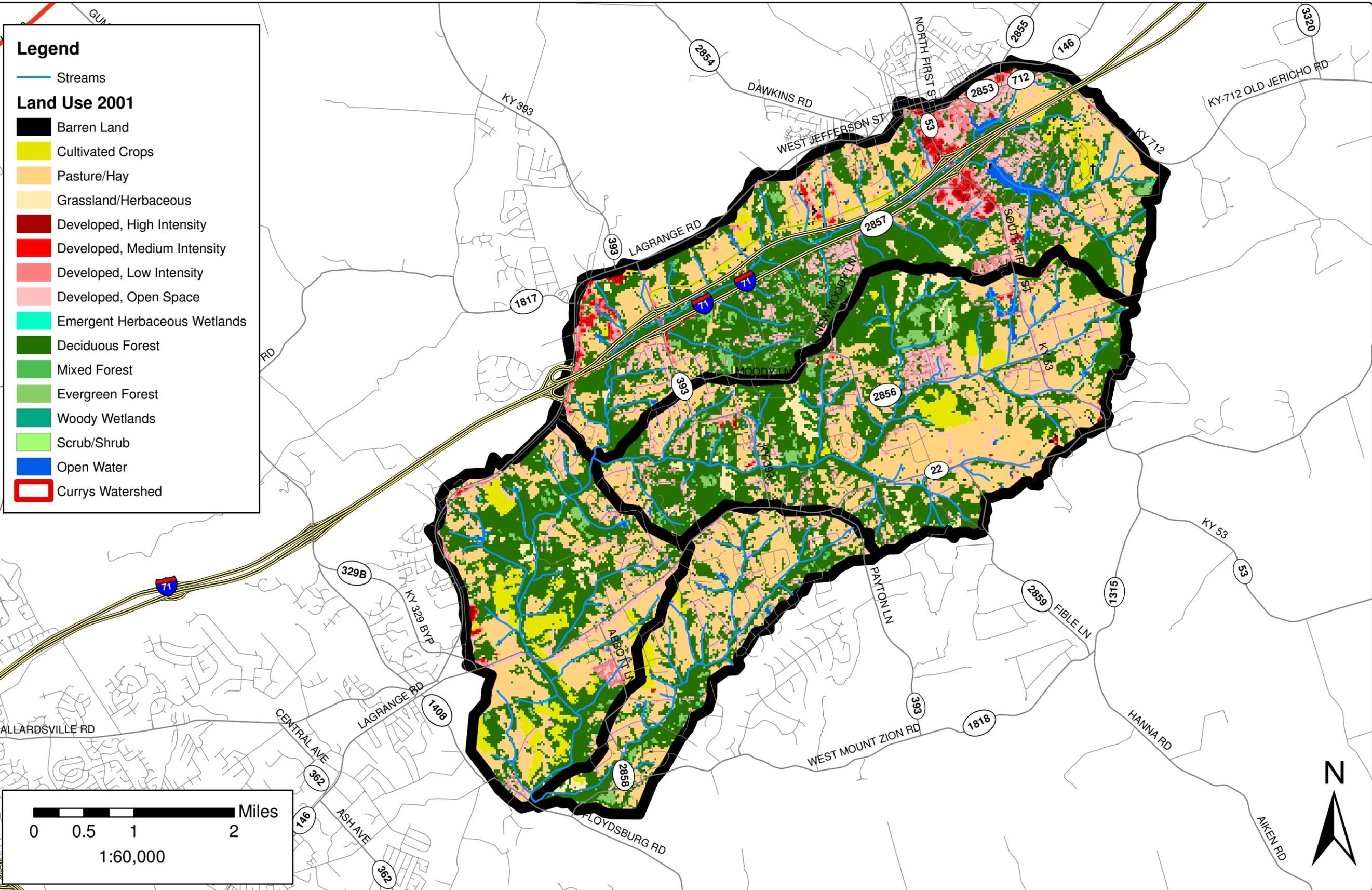
TB1

TRIBUTARY NOTES
 Watershed has the highest subdivisions percent area served by septic systems
 Low Nutrients
 Elevated Bacteria

MAP 4
TRIBUTARY CURRY'S WORKING MAP
CURRY'S FORK COMPREHENSIVE WATERSHED BASED PLAN
OLDHAM COUNTY FISCAL COURT
LAGRANGE, KENTUCKY



Map 4
5994.102



Legend

- Streams
- Land Use 2001**
- Barren Land
- Cultivated Crops
- Pasture/Hay
- Grassland/Herbaceous
- Developed, High Intensity
- Developed, Medium Intensity
- Developed, Low Intensity
- Developed, Open Space
- Emergent Herbaceous Wetlands
- Deciduous Forest
- Mixed Forest
- Evergreen Forest
- Woody Wetlands
- Scrub/Shrub
- Open Water
- Currys Watershed

MAP 5
LAND USE 2001
 CURRYS FORK COMPREHENSIVE WATERSHED BASED PLAN
 OLDHAM COUNTY FISCAL COURT
 LA GRANGE, KENTUCKY



MAP 5
 5994.102



Curry's Fork Technical Committee Meeting

October 1, 2008 – 10:00 a.m.

Curry's Fork Comprehensive
Watershed Based Plan
Draft Existing Data Analysis

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Curry's Fork Stream Team

- Beth Stuber
 - Oldham County Engineer
- Paul Maron
 - Project Manager – Strand Associates
- Andrea Rogers
 - Project Engineer– Strand Associates
- Andrew Esarey
 - Project Engineer- Strand Associates
- Mike Croasdaile
 - University of Louisville
- YOU!

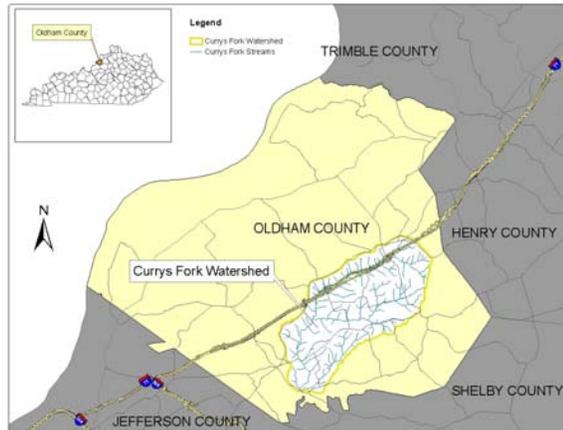
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Project Background

- Curry's Fork – Tributary of Floyds Fork
- Located in Oldham County
- Contains 1st Priority Streams in 303(d) List
- Pollutants of Concern:
 - Nutrients, Siltation, Organic Enrichment/Low Dissolved Oxygen, Pathogens, and Habitat Alteration (Other than Flow)

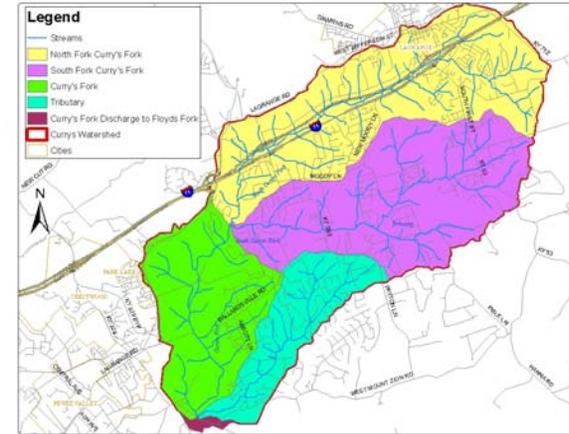
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Project Location



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Curry's Fork Subwatersheds



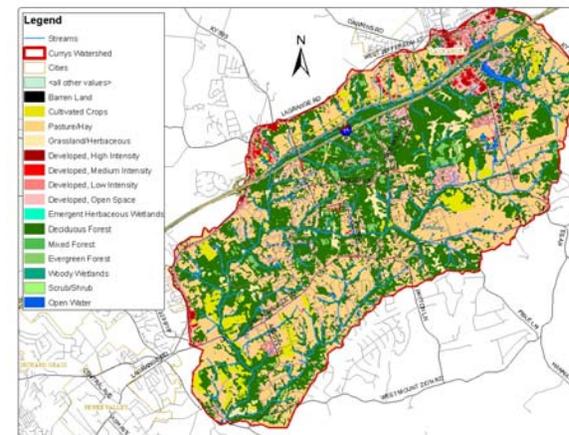
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Watershed Characteristics

- Increasing growth and development
- Land use mostly forest and pasture
- Located in Ecoregion 71d – Interior Plateau – Outer Bluegrass
- Streams within Ecoregion 71d are known to have high TSS and nutrients concentrations

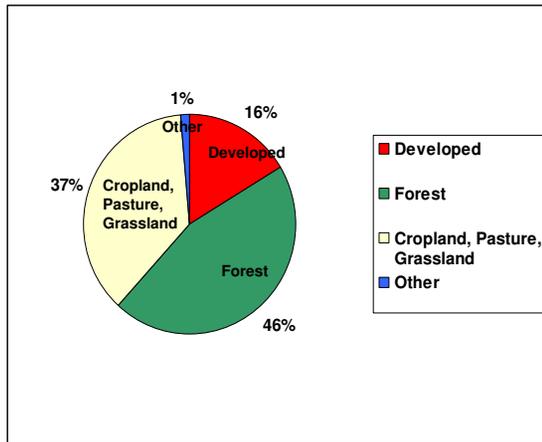
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Land Use



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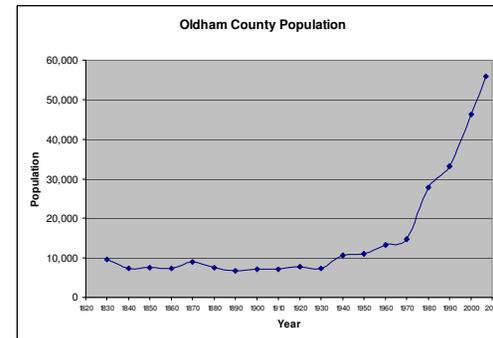
Land Use Characteristics



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Future Land Use Considerations

- Population growth and development will influence watershed characteristics



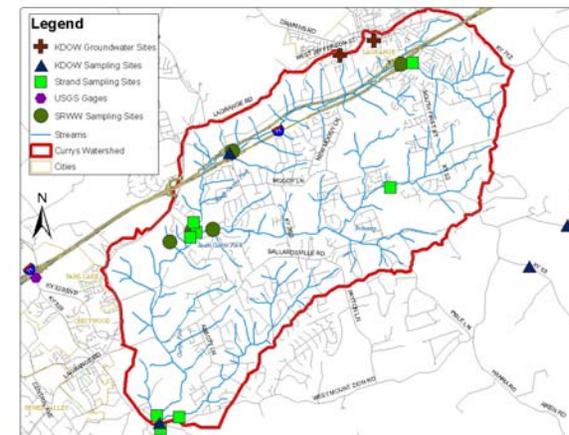
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Curry's Fork Sampling Data

- Variety of agencies and organizations captured sampling data in Curry's Fork and Floyds Fork
 - KDOW
 - Salt River Watershed Watch
 - Floyd's Fork WBP Data
 - Curry's Fork WBP Sampling
 - USGS Data for Floyd's Fork, but not in Curry's
- Data available from 1981 to 2008

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Sampling Site Locations



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Warm Water Aquatic Habitats

- DO –Daily average > 5 mg/l and instantaneous > 4 mg/l
- Un-ionized ammonia < 0.05 mg/l
- TDS, TSS, and flow shall not be changed to the extent that aquatic communities are adversely affected

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Primary Contact Recreation Water

- Fecal Coliform – Five sample geometric mean over 30 day period < 200 N/100ml and 20 percent of samples shall not exceed 400 N/100ml
- Escherichia Coli (E. Coli) – Five sample geometric mean over 30 day period < 130 N/100ml and 20 percent of samples shall not exceed 240 N/100ml

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Other Water Quality Criteria

- Phosphorus – recommended below 0.1 mg/l (EPA)
- Specific Conductivity – recommended below 1,000 μ S/cm (EPA)
- Nitrogen/Nitrates – recommended below 10 mg/l (DWS)

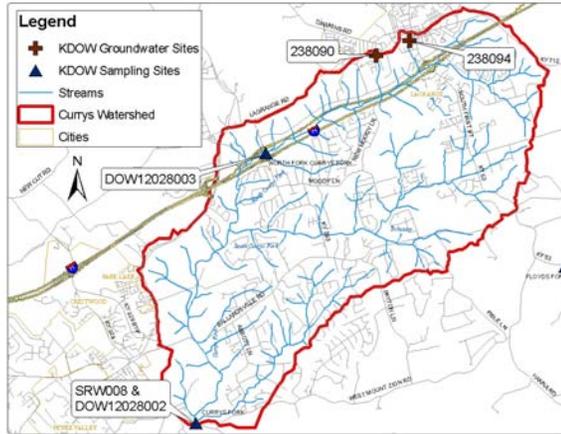
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KDOW Sampling Data

- Sampling data ranges from 1981 to 2004
- Two surface water sampling sites
 - DOW12028002 (Also SRW008)
 - DOW12028003 (Data only from 1981 and 1999)
- Two groundwater sampling sites
 - 238090
 - 238094

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KDOW Sampling Sites



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KDOW Sampling Results – SRW008

Parameter	Unit	Sample Size	Average	Max	Min	Normal Range	Samples Greater than WQS	Percent Exceedence
Alkalinity, Carbonate as CaCO ₃	mg/l	15	196	248	125	20-200	7	47%
Dissolved oxygen (DO)	mg/l	11	11	19.3	6	>5	0	0%
Fecal Coliform	Cfu / 100ml	8	481	1800	50	0-400	4	50%
Hardness	mg/l	15	256	307	211	0-80	15	100%
pH	none	12	7.9	8.4	7.5	6 to 9	0	0%
Temperature, water	deg C	12	13	22	2.2	0-33	0	0%

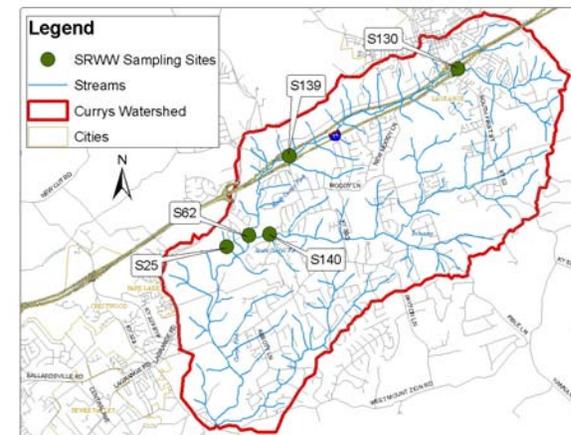
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SRWW Sampling Data

- ▣ Five sampling sites within Curry's Fork
- ▣ Three types of sampling events:
 - Herbicides and Pesticides – Spring
 - Bacteria – Summer
 - Low Flow/Nutrients – Fall
- ▣ Data collected from 1998 to 2007

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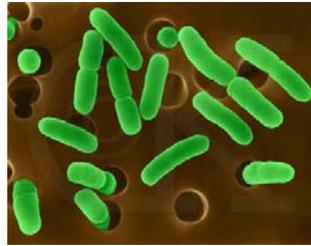
SRWW Sampling Sites



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SRWW Bacteria Sampling Data

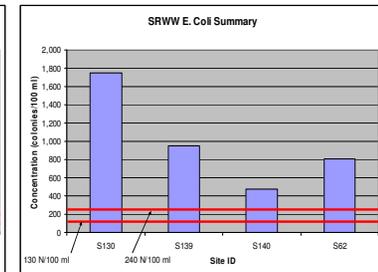
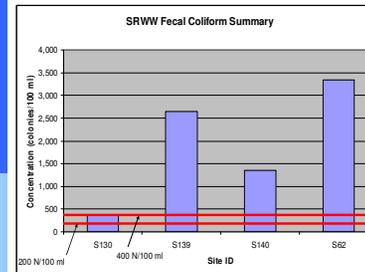
- All sites show elevated bacteria levels – no single source or ‘smoking gun’
- All sites show bacteria samples above criteria for primary contact recreational use water



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SRWW Bacteria Sampling Data

- Average Bacteria Levels for SRWW Sampling Sites



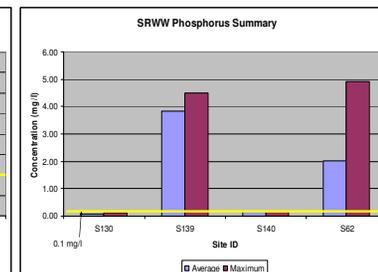
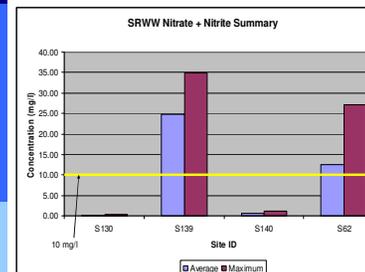
26

SRWW Low Flow Sampling Data

- Data indicates primary source of nutrients between S130 and S139 in North Curry's Fork
- Elevated phosphorus and nitrates + nitrites
- Limited total nitrogen and kjeldahl nitrogen data is elevated as well

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SRWW Low Flow Sampling Data



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SRWW Herbicide and Pesticide Sampling Data

- Herbicide and Pesticide data does not indicate any problems within the Curry's Fork watershed



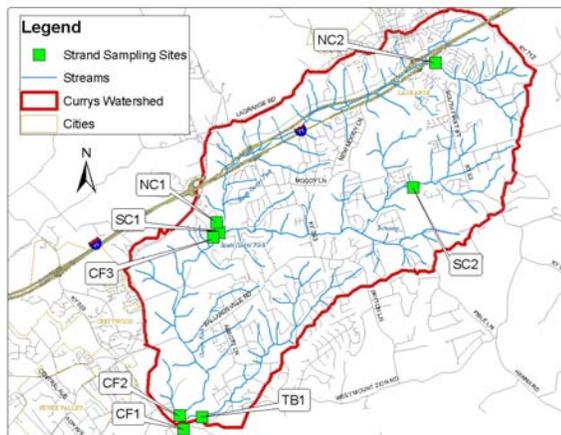
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SAI Dry Weather Sampling Data

- Eight Sampling Sites throughout Curry's Fork
- Two samples per month through the recreational contact season, May to October regardless of weather (2007 was a dry year)
- Sites distributed throughout watershed to identify entire watershed and subwatershed conditions

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SAI Dry Weather Sampling Sites



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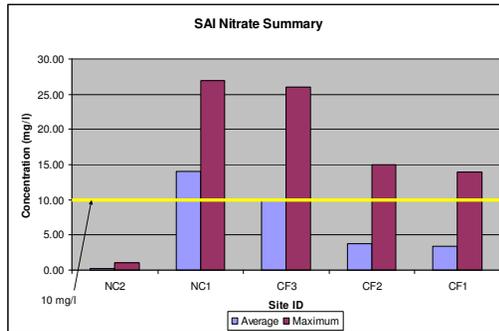
SAI Dry Weather Sampling Data

- Correlates with SRWW data, indicating primary nutrient source is between NC1 and NC2 in North Curry's Fork
- Scattered spikes of ammonia, data does not indicate specific source
- Ammonia spikes cause spikes of un-ionized ammonia

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SAI Dry Weather Sampling Data

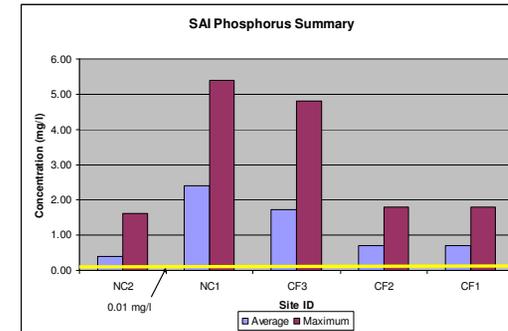
- Nutrient levels from NC2 to CF1



33

SAI Dry Weather Sampling Data

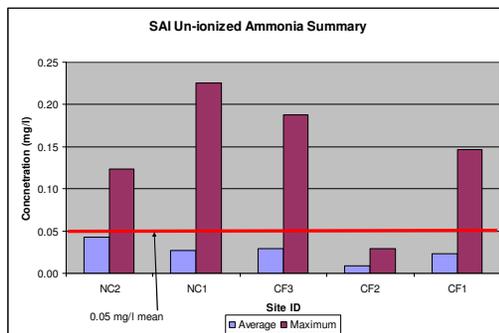
- Nutrient levels from NC2 to CF1



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SAI Dry Weather Sampling Data

- Un-ionized Ammonia levels from NC2 to CF1



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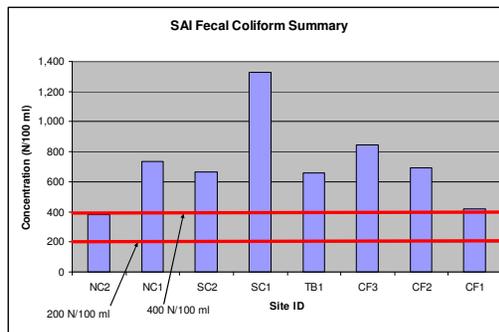
SAI Dry Weather Sampling Data

- Fecal coliform levels similar to SRWW data, indicating elevated levels throughout the watershed
- Dissolved Oxygen (DO) levels lowest in South Curry's Fork
- All sites show decreased DO levels during low flow periods

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SAI Dry Weather Sampling Data

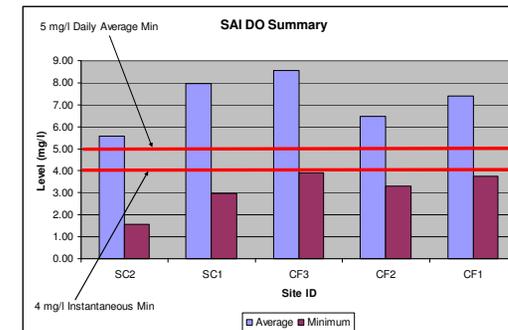
- Average Bacteria levels throughout Curry's Fork



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SAI Dry Weather Sampling Data

- DO levels from SC2 to CF1



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SAI Wet Weather Sampling Data

- Four Sites selected for wet weather sampling
 - NC1
 - SC1
 - CF2
 - TB1
- Turbidity monitor and ISCO 6712 Portable sampler installed at each site
- Collects turbidity data and captures rain events as they happen

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ISCO 6712 Portable Sampler

- Uses ISCO 750 Area Velocity Flow module
- Records depth, velocity, and flow every 15 minutes
- Programmed to capture samples during rain event as stream depth increases
- Captures 24 samples at a designated time interval



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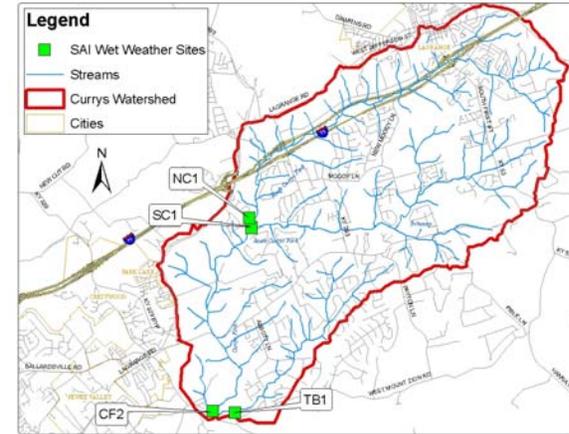
Turbidity Monitoring

- CR200 Datalogger
- OBS-3 Suspended Solids and Turbidity Monitor
- Continuous Turbidity Data
- Allows for correlation between turbidity data and TSS samples



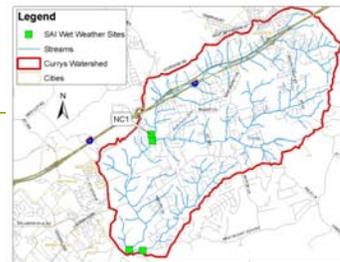
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SAI Wet Weather Sampling Sites

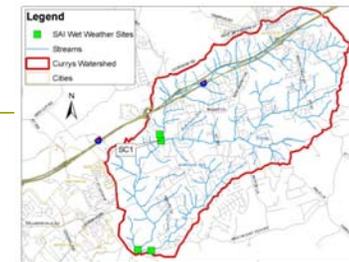


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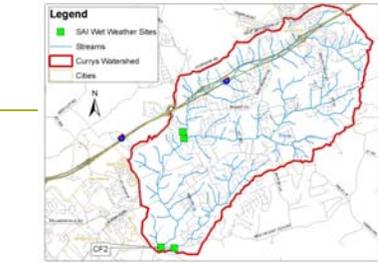
Site NC1



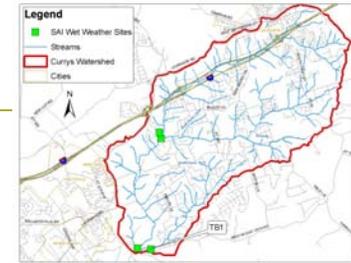
Site SC1



Site CF2



Site TB1



SAI Wet Weather Event Summary

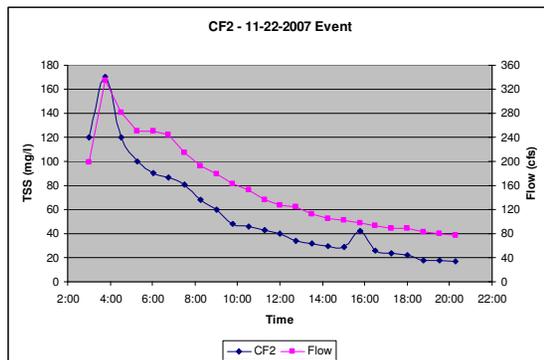
Event Date	NC1	TB1	CF2	SC1
November 22, 2007			1	
November 26, 2007	1	1		
December 9, 2007	1	1	1	
February 5, 2008		1	1	
February 12, 2008	1			
March 4, 2008		1		1
March 18, 2008	1	1	1	1
March 27, 2008	1	1	1	1
April 3, 2008	1			1
April 11, 2008			1	
May 3, 2008	1			
May 11, 2008	1			1
May 14, 2008	1	1		1
June 3, 2008		1		
July 31, 2008		1		47
Total Events Sampled	9	9	6	6

SAI Wet Weather Sampling Data

- Real time comparison of stream flow, TSS, and turbidity data
- Data used to indicate potential sediment sources based on correlations of peak stream flow and TSS concentrations

SAI Wet Weather Sampling Data

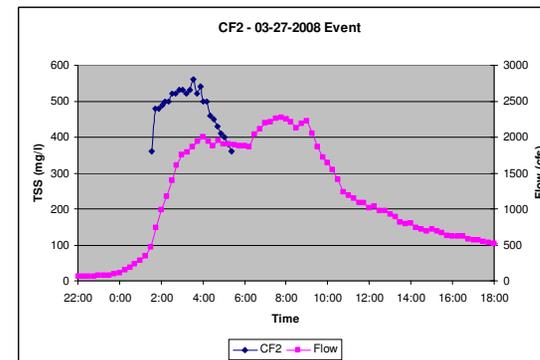
- Initial sample intervals set to 45 minutes to capture stream and TSS reaction to entire event



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SAI Wet Weather Sampling Data

- Sample interval later changed to 10 - 15 minutes to capture peak TSS concentrations



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SAI Wet Weather Sampling Data

- All sites show highly elevated TSS concentrations during rain events
- NC1 exhibited wet weather TSS peaking factors of over 150 from baseline average data collected from dry weather samples
- TSS peak occurs during or before stream flow peak for all events except at TB1 on March 27, 2008 and July 31, 2008

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SAI Wet Weather Sampling Data

- TSS peaks occurring before or during stream flow peaks indicate sediment source is close by
- Stream bank erosion
- Nearby agriculture on clear cut hill slopes

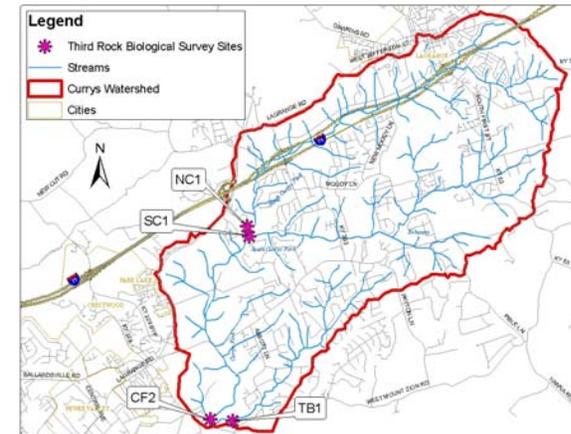
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Third Rock Biological Survey

- Biological surveys performed at same four sites
 - NC1
 - SC1
 - CF2
 - TB1
- Results for the four sites were mixed based on various surveys performed

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Third Rock Biological Survey Sites



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Third Rock Biological Survey

- Macroinvertebrates and algae results indicated a moderately diverse community
- Index of Biotic Integrity scores ranged from "Very Poor" to "Fair"
- Physical habitat scores were all "non-supporting", except CF2 which was "partially supporting"

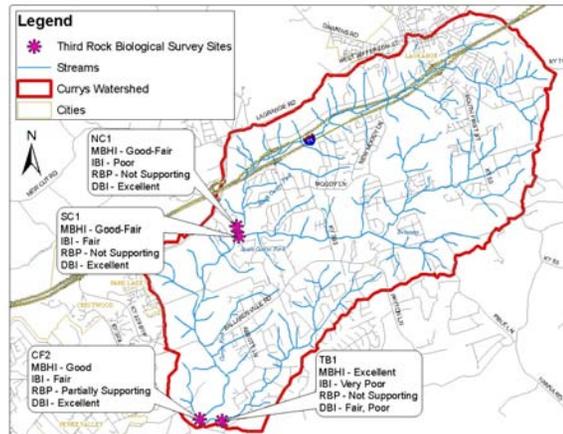
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Third Rock Biological Survey

- MBHI – Modified Hilsenhoff Biotic Index
- IBI – Index of Biotic Integrity
- RBP – Rapid Bioassessment Protocols
- DBI – Diatom Bioassessment Index

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Third Rock Biological Survey



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Third Rock Biological Survey

- Minimal fish diversity resulting from poor water quality
- Fish diversity may also be influenced by drought causing low flow in streams, especially at TB1

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U of L Geomorphic Assessment

- University of Louisville Stream Institute Preliminary Geomorphic Assessment
- Effects of straightening found at all surveyed stream reaches

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CF2 Geomorphic Assessment

- Very High eroding banks
- Isolated deposition of fine and coarse material
- Habitat limited to shallow pools and short, low amplitude riffles
- U/S bank heights increase, allowing access to floodplain and increasing sediment storage

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NC1 Geomorphic Assessment

- ❑ Good floodplain access, considerable amounts of storage
- ❑ Sediment production from eroding hillsides and banks
- ❑ Tributaries all same grade, indicating lack of recent incision
- ❑ Banks heights increase approaching South Fork Curry's Fork Confluence

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SC1 Geomorphic Assessment

- ❑ Confined with limited floodplain access
- ❑ Tributaries have limited vegetative buffer
- ❑ Diverse habitat near LWD jams
- ❑ LWD and trees are significant source of scour and deep pools
- ❑ Tributaries all same grade, indicating lack of recent incision

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TB1 Geomorphic Assessment

- ❑ Developed riffle-pool sequences with deep pools and relatively long riffles
- ❑ Good floodplain access and no sign of channel bed incision
- ❑ Bank erosion widespread but occurs near bank accretion. Banks not high unless near hillside or Curry's Fork confluence
- ❑ Bank erosion and meandering created large fine sediment storage potential

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Pollutant Sources

- ❑ Suspected Sources in 303(d):
 - Agriculture;
 - Discharges from Municipal Separate Storm Sewer Systems (MS4);
 - Habitat Modification – other than Hydromodification;
 - Highway, Road, Bridge Runoff (Non-construction Related);
 - Municipal (Urbanized High Density Area);
 - Package Plant or Other Permitted Small Flows Discharges

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Pollutant of Concern

- Sampling Data supports listed pollutants of concern on the 303(d) list

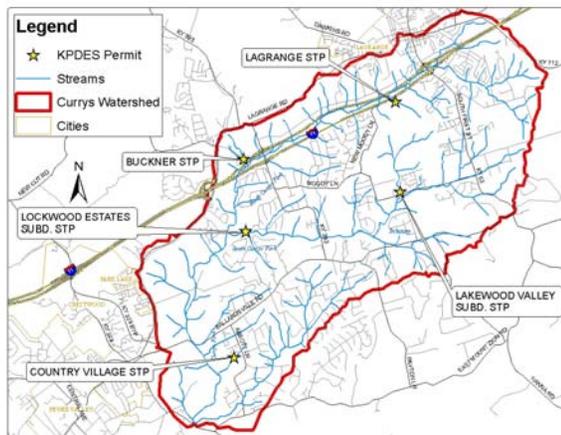
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Point Source Pollutant Assessment

- NPDES and KPDES Permitted Facilities
- CAFO and AFO Permitted Facilities

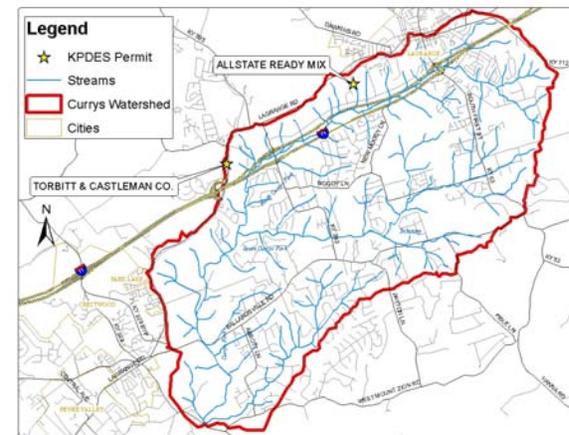
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KPDES Permit – Package Plants



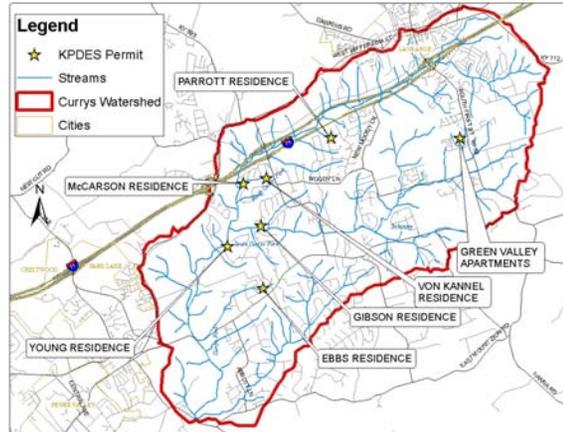
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KPDES Permit – Commercial



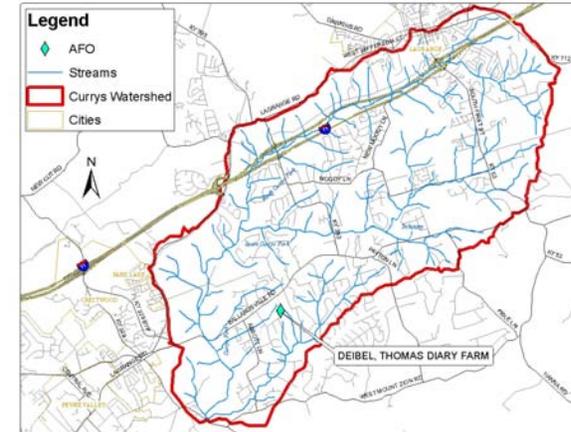
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KPDES Permit – Residents



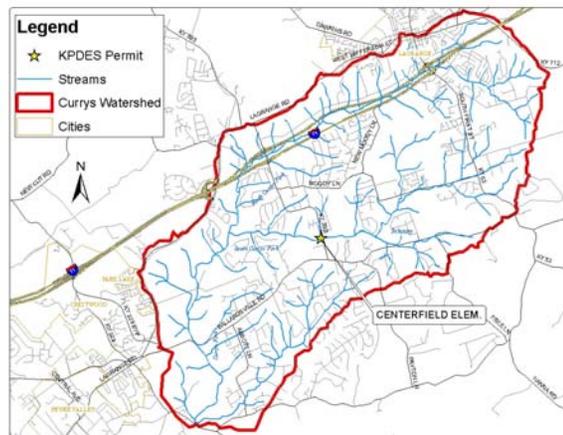
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KPDES Permit – AFO



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KPDES Permit – Schools



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Point Source Pollutant Assessment

- Local package plant effluent quality often very low
- Buckner STP frequently exceeds KPDES permit criteria for phosphorus, fecal coliform, and TSS
- Lagrange STP and Buckner STP both in North Fork Curry's Fork and are not required to remove nitrogen

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Point Source Pollutant Assessment

- Oldham County Sanitation District plans to construct two centralized treatment facilities
- Well maintained centralized treatment facilities could improve bacteria, nutrient, and TSS levels by eliminating package treatment plants

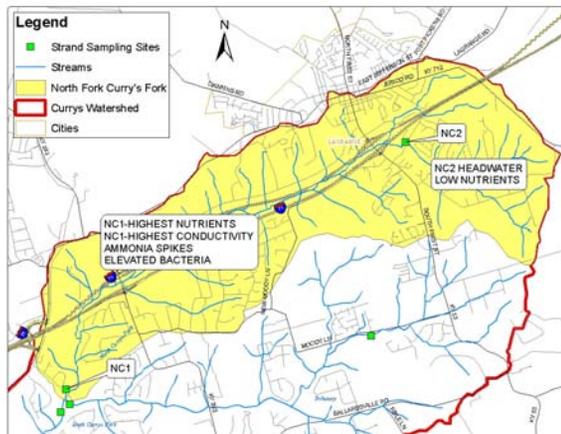
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Nonpoint Source Pollutant Assessment

- Development / Construction
- Wildlife
- Sewage Disposal
- Stream Channelization / Bank Erosion
- Agriculture

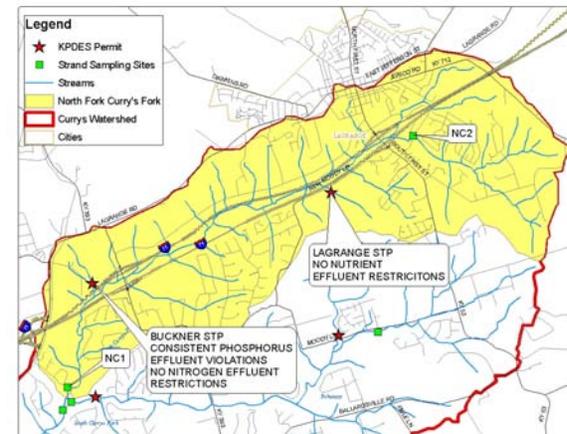


Pollutant Sources



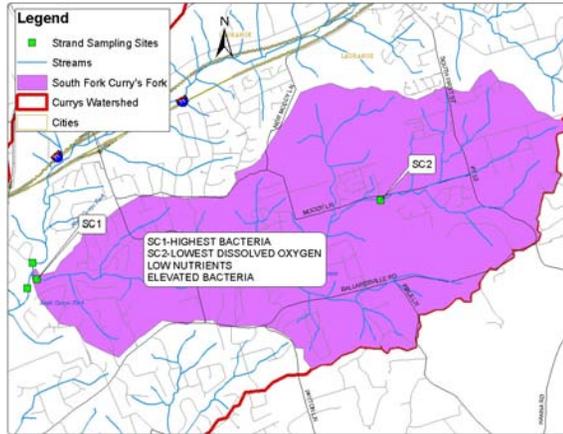
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Pollutant Sources

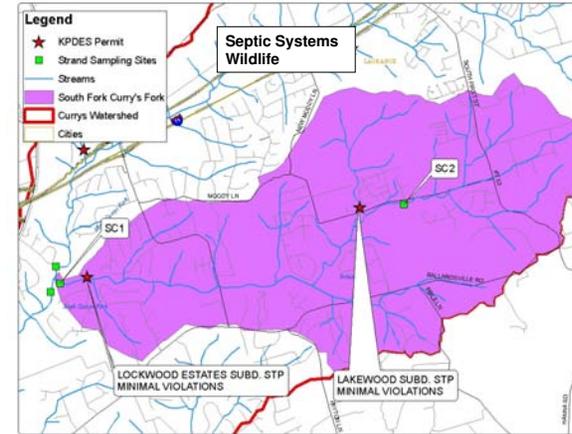


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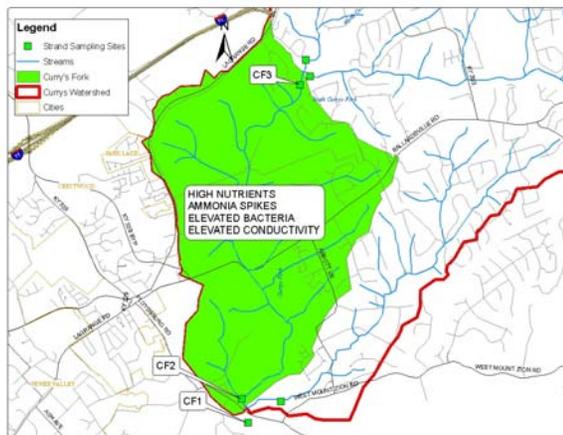
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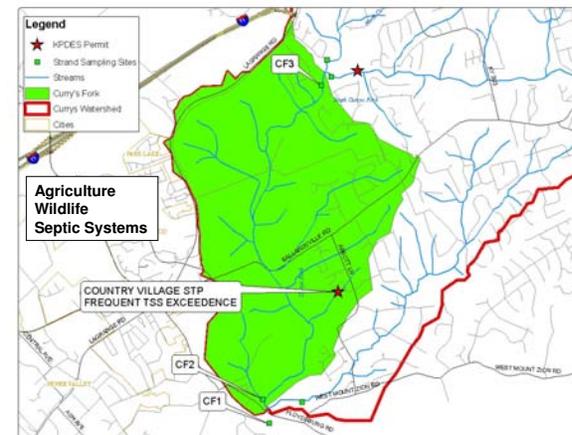
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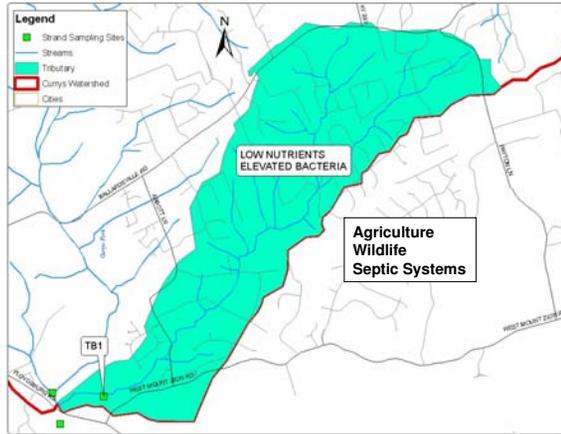
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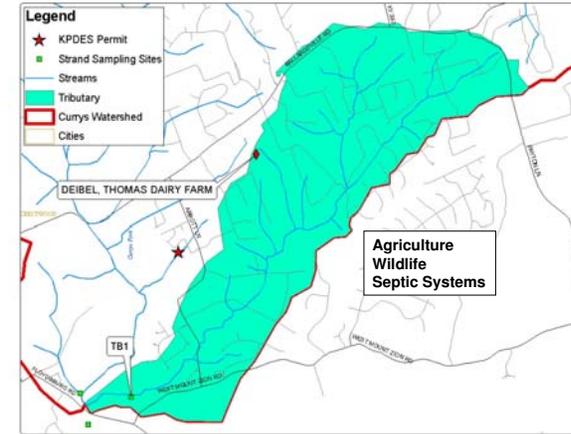
Pollutant Sources



Pollutant Sources



Pollutant Sources



Identified Potential Stressors

Development

- Increase in impervious area
- Increased runoff and stream flow rates
- Increased erosion potential
- Removal of riparian vegetation
- Population growth puts additional stress on already poorly performing package plants

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Identified Potential Stressors

Wildlife

- Increased bacteria loads

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Identified Potential Stressors

□ Sewage Disposal

- Poorly performing package plants
- Increased bacteria loads
- Increased nutrient loads
- Increased sediment loads

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Identified Potential Stressors

□ Stream Channelization / Bank Erosion

- Destabilization of stream banks
- Increased sediment loads
- Loss of riparian habitats and vegetation
- Decreased water quality
- Decreased aquatic habitat quality

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Identified Potential Stressors

□ Agriculture

- Livestock contributes to bacteria load
- Fertilizers increase nutrient loads
- Poor farming practices increase sediment and nutrient loads

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Questions? Comments?



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