Professional

Engineering

Services

Curry's Fork Watershed Plan

Report

Oldham County Fiscal

Court, KY

September 2011

Revised March 2012

STRAND ASSOCIATES®

Report for

Oldham County Fiscal Court, Kentucky

Curry's Fork Watershed Plan

USEPA Grant No.: C9994861-06
KDOW Application Number: 06-06
Memorandum of Agreement Number: PON2-129-0600002538
Project Period: July 1, 2006 through September 30, 2013

STATE OF KENTUCKY
PAUL G. MARON
23397
LICENSED
PROFESSIONAL ENGINEER

Paul G. Maron
3-23-2012

Prepared by:

STRAND ASSOCIATES, INC.®
On behalf of the
Oldham County Fiscal Court

September 2011
Revised March 2012

STRAND ASSOCIATES®

The Environmental and Public Protection Cabinet (EPPC) and the Oldham County Fiscal Court do not discriminate on the basis of race, color, national origin, sex, age, religion, or disability. The EPPC and Oldham County Fiscal Court will provide, on request, reasonable accommodations including auxiliary aids and services to afford an individual with a disability an equal opportunity to participate in all services, programs, and activities. To request materials in an alternate format, contact the Kentucky Division of Water, 200 Fair Oaks Lane, Frankfort, Kentucky 40601, call (502) 564-3410, or contact the Oldham County Fiscal Court.

Funding for this project was provided in part by a grant from the United States Environmental Protection Agency through the Kentucky Division of Water, Nonpoint Source Section, to the Oldham County Fiscal Court as authorized by the Clean Water Act Amendments of 1987, §319(h) Nonpoint Source Implementation Grant #C9994861-06. Mention of trade names or commercial products, if any, does not constitute endorsement. This document was printed on recycled paper.

TABLE OF CONTENTS

Page No.
or Following

TABLE OF CONTENTS Continued

Page No.
or Following

TABLE OF CONTENTS Continued

Page No.
or Following

TABLE OF CONTENTS Continued

Page No.
or Following

TABLES

(Tables too large for incorporation into the text are presented on the page following the first notation of that table in the text.)

TABLE OF CONTENTS Continued

Page No.
or Following

TABLES (Continued)

FIGURES

(Figures too large for incorporation into the text are presented on the page following the first notation of that figure in the text.)

TABLE OF CONTENTS Continued

Page No.
or Following

FIGURES (Continued)

APPENDICES

EXECUTIVE SUMMARY

INTRODUCTION

The Curry's Fork Watershed is located in Northern Kentucky in Oldham County, Kentucky, and is a tributary of Floyds Fork. Figure ES-1 shows the location of the Curry's Fork Watershed and delineates the four subwatersheds within the watershed. The Kentucky Division of Water (KDOW) contracted funds to the Oldham County Fiscal Court (OCFC) to develop and begin implementation of a Watershed Plan (WP) as part of the FFY2006 Clean Water Act Section 319(h) Grant awarded by the United States Environmental Protection Agency (USEPA) to the state. Curry's Fork is impaired and does not meet water quality standards for Primary Contact Recreation (PCR) (nonsupport) and Warm Water Aquatic Habitat (WAH) (partial support) according to the *2008 Integrated Report to Congress on the Condition of Water Resources in Kentucky, Volume II,* 303(d) List of Surface Waters (303(d) List). A WP was developed to restore and protect the water quality of Curry's Fork and its tributaries. This Executive Summary summarizes the Curry's Fork WP.

DESCRIPTION OF WATERSHED

The Curry's Fork watershed is approximately 29 square miles and is located along Interstate 71 and is a tributary of Floyds Fork in Oldham County, Kentucky. The Curry's Fork watershed is composed of four smaller subwatersheds listed below:

1. North Curry's Fork
2. South Curry's Fork
3. Asher's Run
4. Curry's Fork (Main Stem)

The Curry's Fork watershed is rural suburban in nature, with the highest concentrations of development in and around the City of La Grange.

IDENTIFIED IMPAIRMENTS AND SOURCES

The 303(d) 2008 list identifies pollutants of concern that are the cause of stream impairment. Pollutants of concern for the Curry's Fork main stem listed in the 303(d) list are:

1. Fecal Coliform
2. Nutrient/Eutrophication Biological Indicators
3. Dissolved Oxygen (DO)
4. Sedimentation/Siltation

Table ES-1 shows the impairment status as it is listed in the 303(d) 2008 List.

The Curry's Fork watershed also has one additional stream segment listed in the *Integrated Report to Congress on the Condition of Water Resources in Kentucky 2010, Volume I, 305(b) Report* (305(b) Report). Table ES-2 shows the additional stream segment 305(b) Report listing in the Curry's Fork watershed.

Curry's Fork–Miles 0.0 to 4.8 — Oldham County
Into Floyds Fork — Segment Length: 4.8 miles

Impaired Use(s):	Warm Water Aquatic Habitat (Partial Support); Primary Contact Recreation Water (Nonsupport)
Pollutant(s):	Fecal Coliform; Nutrient/Eutrophication Biological Indicators; Oxygen, Dissolved; Sedimentation/Siltation
Suspected Sources:	Agriculture; Discharges from Municipal Separate Storm Sewer Systems (MS4); Habitat Modification–other than Hydromodification; Highway/Road/Bridge Runoff (Nonconstruction Related); Municipal (Urbanized High Density Area); Package Plant or Other Permitted Small Flows Discharges

Table ES-1 Curry's Fork 303(d) 2008 Listing

Name	Unnamed Tributary to North Curry's Fork
County	Oldham
Segment Length	0.1 Miles (0.0 to 0.1)
Basin	Salt River
8-Digit Hydrologic Unit Code	5140102
WAH / CAH	5-NS[1]
PCR	3[2]
SCR	3[2]
Fish Consumption	3[2]
DWS	3[2]
Assessment Date	9/28/2005
Designated Uses	WAH, FC, PCR, SCR

WAH–Warm Water Aquatic Habitat
CAH–Cold Water Aquatic Habitat
PCR–Primary Contact Recreation
SCR–Secondary Contact Recreation
FC–Fish Consumption
DWS–Drinking Water Supply
NS–Nonsupport

[1]A report category of 5-NS on the 305(b) List indicates the stream segment is not supporting the designated use and a Total Maximum Daily Load report (TMDL) is required.
[2]A report category of 3 on the 305(b) List indicates the designated use has not been assessed because of insufficient or no available data.

Table ES-2 Curry's Fork 305(b) 2010 Report Listing

PROJECT GOALS AND OBJECTIVES

Project goals and objectives were established by the Technical Committee (TC) with input from the community. The TC was formed in August 2008 and is comprised of over 70 members from more than one dozen local agencies and organizations. The TC met 20 times during the WP development process to discuss project goals, sampling and assessment results, identify pollutant sources, and develop proposed solutions.

Three Community Roundtable events were held to discuss the community's concerns within the watershed and to identify project goals and solutions for the WP. The first Roundtable event on September 24, 2009, allowed watershed residents to express their concerns for the watershed and help identify the goals for the watershed. More than 90 members of the community attended the Roundtable to express their opinions. A summary of the September 24, 2009, Roundtable is shown in Appendix A. The TC used the results of the Roundtable to develop four goals for the Curry's Fork WP that were unanimously agreed upon by the TC members and are as follows.

1. Improve and protect water quality for our generation and future generations.
2. Promote a safe, healthy, and accessible watershed for recreation and wildlife.
3. Utilize programs and practices to decrease potential flooding impacts.
4. Develop and implement a cost-effective WP that economically utilizes funds.

The goals of the WP will be met through the implementation of BMPs, which are projects or practices to prevent or reduce pollution of waters of the United States. The selection of appropriate BMPs for the watershed is a critical portion of the WP.

The second and third community Roundtables events were held on July 15, 2010, and February 2, 2011. The July 2010 event focused on bacteria data and the February 2011 event focused on WAH data. The purpose of these Roundtables was to share the results from the sampling and assessment program within the Curry's Fork watershed community and collect feedback on proposed solutions and remediation activities. Detailed summaries of the bacteria and WAH Roundtables are included in Appendix B and C, respectively.

SUMMARY OF WATER QUALITY DATA

A comprehensive water quality sampling and assessment program was conducted throughout the watershed to identify the level of pollutants, various stream conditions, and subwatersheds and tributaries contributing to the impairments.

The sampling and assessment program included:

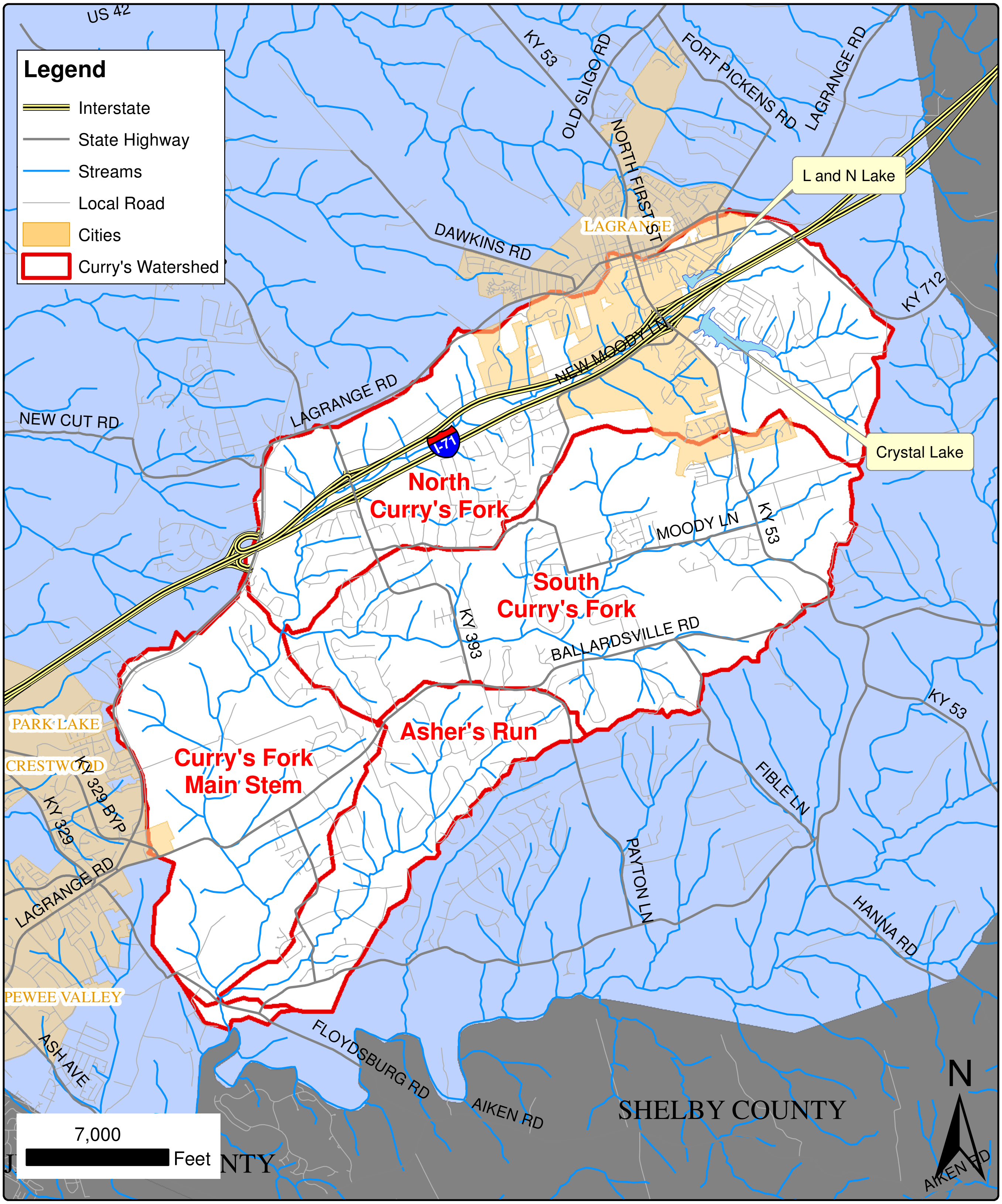
1. Water sampling to establish levels of bacteria and the properties of streams within the watershed.

2. Physical habitat assessments to rate in-stream habitat conditions on a numeric scale compared to a reference stream.

3. Biological assessments that include a variety of fish and macroinvertebrate counts to determine the quantity and diversity of aquatic life within the watershed.

4. Fluvial geomorphic assessments, stream channel condition assessments, measurements in sediment yields, quantification of sediment productions along stream reaches and upland areas, and sediment transport patterns in the watershed.

Refer to Figure ES-1 for the location of the watershed.



CURRY'S FORK WATERSHED

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.®
ENGINEERS

FIGURE ES-1
5994.100

To address the challenge of assessing multiple data conclusions from numerous monitoring approaches, a multidiscipline team was formed called the Water Quality Data Analysis Team (WQDAT). The WQDAT was comprised of aquatic bioligists, engineers, watershed managers, total maximum daily load (TMDL) developers, nutrient specialists, and watershed modelers. The WQDAT used its expertise to provide data summaries and insight on the sampling and assessment program to the TC. The TC then used its local knowledge of the watershed along with feedback from the WQDAT to identify pollutant sources.

Tables ES-3 through ES-6 summarize the results of the sampling and assessment program and shows potential pollutant sources identified through the development of the WP. Tables ES-3 and ES-4 summarize the nutrient and DO priority areas and pollutant sources. Tables ES-5 and ES-6 summarize the results of the biological and habitat assessments and the fluvial geomorphic assessments. For additional sampling and assessment information, please refer to Section 4 of the WP.

Subwatershed	Stream Section	Nutrient Priority	Pollutant Sources
North Curry's Fork	Upper	Low	On-site wastewater systems Lawn fertilizers
	Lower	High	Permitted dischargers On-site wastewater systems
South Curry's Fork	Upper	Low	None identified
	Lower	Low	None identified
Asher's Run	Upper	Low	None identified
	Lower	Low	None identified
Curry's Fork–Main Stem	Main Stem	Medium	Upstream contributions from North Curry's Fork

Table ES-3 Nutrient Data Summary

Subwatershed	Stream Section	DO Priority	Pollutant Sources
North Curry's Fork	Upper	Low	None identified
	Lower	Low	None identified
South Curry's Fork	Upper	High	Lack of canopy cover Lack of riparian vegetation Corridor development Stream channel straightening Stream channel alteration
	Lower	High	
Asher's Run	Upper	Low	None identified
	Lower	Low	None identified
Curry's Fork–Main Stem	Main Stem	Medium	Upstream contributions from South Curry's Fork

Table ES-4 Dissolved Oxygen Data Summary

Subwatershed	Biological and Habitat Assessments		Physical Habitat RBP Score
	MBI	IBI	
North Curry's Fork	Fair	Very poor	Not supporting
South Curry's Fork	Fair	Fair	Not supporting
Asher's Run	Poor	Very poor	Not supporting
Curry's Fork–Main Stem	Good	Poor	Partially supporting

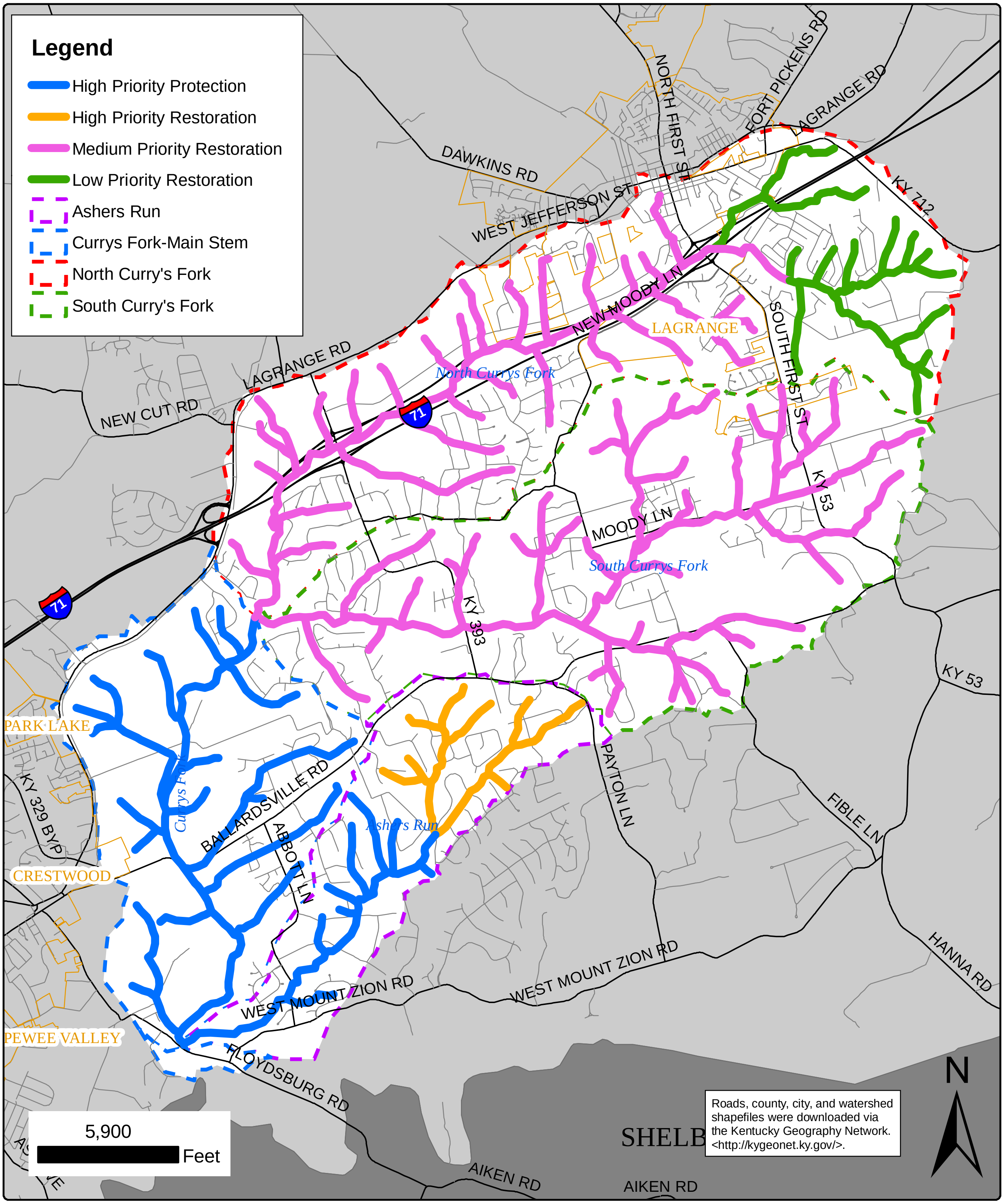
MBI=Macroinvertebrate Biotic Index
IBI=Index of Biological Integrity
RBP=Rapid Bioassessment Protocols

Table ES-5 Biological and Habitat Assessment Summary

Subwatershed	Stream Bank Erosion Rates			Fine Sediment Yield		Upland Erosion	
	Downstream Confluence	Main Stem Downstream	Main Stem Upstream	Total	Per Area Basis	Total	Per Area Basis
North Curry's Fork	High	High	Low	Medium	Low	High	Medium
South Curry's Fork	High	Medium	High	High	High	High	Low
Asher's Run	High	Low	-	Low	Low	Low	Low
Curry's Fork–Main Stem	High	High	High	High	High	High	High

Table ES-6 Fluvial Geomorphic Assessment Summary

Pathogen data is summarized in Table ES-7. Although this report references pathogens and pathogen data, stream samples were not directly analyzed for pathogens. Water quality samples were analyzed for fecal coliform and *E. coli* bacteria, which is an indicator organism for pathogens. Indicator organisms are used to demonstrate the potential presence or absence of a group of pathogens because of a strong correlation that exists between the presence of the indicator organism and the presence of pathogens. Indicator organisms are often used in water quality sampling programs because analyzing directly for pathogens is complex and costs substantially more than analyzing for the indicator organism. Therefore, the term pathogens is used in this report to reference data and discussion related to fecal coliform and *E. coli* bacteria. The priority areas for pathogens were further prioritized into restoration and protection areas. The location of the pathogen priority protection and restoration areas is shown in Table ES-7 and Figure ES-2.



PATHOGEN PRIORITY AREAS

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE ES-2
5994.100

Subwatershed	Section	Bacteria Priority		Pollutant Source
		Restoration	Protection	
North Curry's Fork	Upper	Medium	-	On-site wastewater systems
	Lower	Medium	-	Identified failing onsite wastewater systems Stormwater from Municipal Separate Storm Sewer Systems (MS4) area Permitted dischargers Stormwater infiltration into sewers
South Curry's Fork	Upper	Medium	-	Package treatment plants
	Lower	Medium	-	Package treatment plans On-site wastewater systems
Asher's Run	Upper	High	-	Low intensity animal operations On-site wastewater systems Wildlife
	Lower	-	High	Wildife Upstream contributions
Curry's Fork–Main Stem	Main Stem	-	High	Upstream contributions Permitted dischargers Package treatment plants

Table ES-7 Pathogen Data Summary

RECOMMENDED CONTROL MEASURES WITH RESPONSIBLE PARTIES

It is important that watershed plans document, utilize, and build on existing programs. A plethora of water quality, land management, and watershed activities exist within a multitude of agencies and organizations that work within the Curry's Fork watershed. To avoid duplicity and redundancy, the Curry's Fork Technical Committee conducted a thorough review of existing programs in the watershed before identifying new BMPs or solutions. For details on those existing watershed programs and initiatives this WP builds on, please see Section 2.06

BMPs and solutions were identified for individual subwatersheds and for the Curry's Fork watershed as a whole. Potential BMPs were compiled into a single list and were prioritized for implementation purposes into Tier 1 BMPs, Tier 2 BMPs, and Tier 3 BMPs. The tiers represent the priority of the solutions based on feasibility of implementation and the impact the solution can potentially have on addressing pollutants of concern. Tier 1 BMPs represent the highest priority and Tier 2 and Tier 3 BMPs represent lower priorities. Table ES-8, ES-9, and ES-10 show the Tier 1, Tier 2, and Tier 3 BMPs and solutions, respectively, for the Curry's Fork watershed.

IMPLEMENTATION MONITORING AND EVALUATION

After the WP has been completed and recommended solutions and BMPs are being implemented, the monitoring and evaluation phase of the WP will begin. This phase involves tracking the implementation of solutions and determining if it is meeting its intended purpose.

Communities implementing a WP must use an adaptive approach to the implementation and management of solutions. Impacts on the watershed, human or natural, are dynamic. The success of a WP depends on tracking these changes, tracking implemented solutions, and making changes to improve water quality based on the current status of the watershed. Monitoring and evaluation of implemented solutions are the responsibility of the parties identified in Tables ES-8, ES-9, and ES-10.

Curry's Fork is fortunate to have several active water quality sampling efforts and more planned for the future. Evaluation efforts can be aided and bolstered through the use of quantitative data and should be utilized whenever possible.

Interagency collaboration between the responsible parties will also help with the implementation and evaluation of BMPs. Numerous agencies and organizations are often listed as responsible parties in Tables ES-8, ES-9, and ES-10. Interagency collaboration will reduce the workload on any single entity and provide a more well-rounded BMP by having numerous agencies with different points of view helping implement the BMP.

One BMP that will help increase interagency collaboration and aid in all aspects of the WP implementation and evaluation process is to engage a Watershed Coordinator, which is listed as a BMP in Table ES-8. The Watershed Coordinator would be a link between responsible parties, funding agencies, watershed residents, and technical resources. The Watershed Coordinator would also monitor the progress of WP-related projects or activities and provide updates on progress made.

TABLE ES-8

TIER 1 WATERSHED PLAN SOLUTIONS

BMP No.	Best Management Practice(s) and Description	Feasibility	Impairment Addressed	Responsible Party/Parties
	ENTIRE WATERSHED TIER 1 BEST MANAGEMENT PRACTICES			
1	Conduct a septic system survey program to identify failing systems for replacement, repair, or elimination.	High	PCR	OCHD; Oldham County Environmental Authority (OCEA); OCFC; LUC
2	Develop and implement a marketing program for the WP.	High	PCR and WAH	OCFC
3	Develop and implement a monitoring plan to monitor solutions implemented as part of the WP.	High	PCR and WAH	OCFC
4	Develop and implement Curry's Fork watershed education and awareness program, including information about the watershed, WP, WP recommendations, project activities, and community activities.	High	PCR	OCFC; Extension Office; Conservation District; Natural Resources Conservation Service (NRCS); Salt River Watershed Watch; Stormwater District(s); OCEA; La Grange Utility Commission (LUC); City of La Grange;
5	Ensure recommendations in the WP are formally communicated to USACE, KDOW, and United States Fish and Wildlife Service (FWS) and encourage these agencies to use recommendations from WP for mitigation projects.	High	WAH	OCFC
6	Establish one "Bad Septic Area Map" for all county planning purposes.	High	PCR	Oldham County Health Department (OCHD); OCEA; OCFC; LUC
7	Evaluate/create an on-site Wastewater Authority to provide oversight on on-site wastewater management, operation and maintenance.	High	PCR	OCEA; OCHD; OCFC; LUC
8	Expand water quality enhancing landscaping practices, such as rain barrels, rain gardens, pervious pavers, etc.	High	WAH	OCEA; Extension (Master Gardeners)
9	Engage a Watershed Coordinator to be a link between implementation project responsible parties, funding agencies, watershed residents, OCFC, and technical resources.	High	PCR and WAH	OCFC
10	Implement education program for elected officials and Board members on the results and findings of the WP.	High	WAH	OCFC; OCEA
11	Monitor streams in the watershed to estimate human vs. animal sources of bacterial contamination to support future decision making by OCFC.	High	PCR	OCEA; OCFC
12	Review local ordinances and regulations to identify and resolve impediments to low-impact development and green infrastructure.	High	WAH	OCFC; OCEA
13	Coordinate wastewater expansions in conjunction with planned water line expansions.	Medium	PCR	OCEA; LUC; OCWD; OCFC
14	Educate and provide training to planners, designers, and reviewers about implementing stormwater retrofits in currently developed areas.	Medium	WAH	OCFC; OCEA
15	Educate and provide training to planners, designers, and reviewers of developments about low-impact design/green infrastructure and current and pending stormwater permit requirements.	Medium	WAH	OCFC; OCEA
16	Ensure communication, guidelines and preplanning/approval for any wastewater system improvements, modifications, or upgrades on a watershed scale with a focus on the priority pathogen protection and restoration areas.	Medium	PCR	OCEA; LUC; OCFC
	NORTH CURRY'S FORK TIER 1 BEST MANAGEMENT PRACTICES			
17	Eliminate Buckner Treatment Plant in the next 2 years.	High	PCR	OCEA; OCFC
	SOUTH CURRY'S FORK TIER 1 BEST MANAGEMENT PRACTICES			
18	Complete a stream restoration project on the downstream section of the main stem of South Curry's Fork near the confluence with North Curry's Fork.	Medium	WAH	OCFC; NRCS; FWS
19	Complete a stream restoration project on the main stem reach adjacent to Centerfield Elementary.	High	WAH	OCFC; NRCS; FWS
20	Eliminate Green Valley Treatment Plant in the next 2 years.	High	PCR	OCEA; OCFC; LUC
21	Plant streamside vegetation and other streamside habitat improvement projects in the upstream section of the main stem.	High	WAH	OCFC; Property Owners; Future Watershed Group; Oldham County Greenways
	ASHER'S RUN TIER 1 BEST MANAGEMENT PRACTICES			
22	Promote on-site wastewater system maintenance, operation and management education, targeting systems that are in low-lying areas and in proximity to waterways in the upper portion of the watershed	High	PCR	OCHD; Extension Office; KDOW
23	Replace or repair aging/failing on-site wastewater systems targeting systems that are in low-lying areas and in proximity to waterways in the upper portion of the watershed.	High	PCR	OCHD; OCEA; Property Owners
24	Educate owners of nontraditional animals/livestock on appropriate BMPs for pathogen reduction in the upper portion of the watershed	Medium	PCR	Extension Office; NRCS; Producer Organization(s); Conservation District
	CURRY'S FORK MAIN STEM TIER 1 BEST MANAGEMENT PRACTICES			
25	Complete a stream restoration project in the downstream portion of Curry's Fork main stem near the confluence with Floyds Fork. Cost of project may significantly increase because of the amount of earthmoving involved unless a demand for the soil can be identified.	Low	WAH	OCFC; NRCS; FWS

Note: A full list of acronyms and abbreviations is shown in Section 1.06.

TABLE ES-9

TIER 2 WATERSHED PLAN SOLUTIONS

BMP No.	Best Management Practice(s) and Description	Feasibility	Impairment Addressed	Responsible Party/Parties
ENTIRE WATERSHED TIER 2 BEST MANAGEMENT PRACTICES				
26	Engage community with watershed issues by providing watershed educational and recreational opportunities, including stream cleanups, and water testing, and storm sewer stenciling.	High	WAH	OCFC; Board of Education; Restoration project property owners; Solid Waste Department; Oldham County Greenways
27	Improve stream connection to floodplain. Evaluate using National Floodplain Managers Association's "No Adverse Impact" Program to maintain or reduce current peak flow levels, therefore minimizing any increases in flooding of property.	Medium	WAH	OCFC; OCEA
NORTH CURRY'S FORK TIER 2 BEST MANAGEMENT PRACTICES				
28	Promote on-site wastewater system maintenance, operation and management education, targeting systems that are in low-lying areas and in proximity to waterways in the upper portion of the watershed.	High	PCR	OCHD; Extension Office; OCFC
29	Use enhanced development guidelines in undeveloped areas and retrofits in developed areas that promote the incorporation of low-impact design elements and water quality BMPs into the design and construction.	High	WAH	OCFC; OCEA
30	Complete a stream restoration project on the downstream section after diverging from I-71, which was identified as having very high restoration potential to reduce high bank erosion rates.	Low	WAH	OCFC; NRCS; FWS
SOUTH CURRY'S FORK TIER 2 BEST MANAGEMENT PRACTICES				
31	Eliminate Lakewood Treatment Plant in the next 11 to 20 years.	High	PCR	OCEA; OCFC
32	Eliminate Lockwood Treatment Plant in the next 11 to 20 years.	High	PCR	OCEA; OCFC
ASHER'S RUN TIER 2 BEST MANAGEMENT PRACTICES				
33	Increase/require the number of inspections of on-site wastewater systems. Possible triggers for inspection might be when property is bought/sold, or when utilities change names in the upper portion of the watershed.	High	PCR	OCHD; OCEA; Louisville Gas & Electric (LG&E); OCFC
34	Educate owners of livestock animals on appropriate BMPs for pathogen reduction in the upper portion of the watershed.	Medium	PCR	Extension Office; NRCS; Producer Organization(s); Conservation District(s); Agricultural Water Quality Authority (AWQA)
35	Encourage producers with marginal pasture lands to put their land into conservation easements, wildlife habitats, and land stewardships.	Medium	WAH	OCFC; NRCS; Extension Office; Conservation District; FSA
36	Expand use of riparian buffers/filters strips around creek including enhancing "no-disturb" ordinance to require creating designed buffer/filter strips instead of just open space in the lower portion of the watershed.	Medium	PCR	OCFC; NRCS; Extension Office; Conservation District
37	Implement Agricultural BMPs in the upper portion of the watershed.	Low	PCR	Extension Office; NRCS; Producer Organization(s); AQWA; Conservation District
CURRY'S FORK MAIN STEM TIER 2 BEST MANAGEMENT PRACTICES				
38	Educate owners of livestock animals on appropriate BMPs for pathogen reduction in the upper portion of the watershed.	High	PCR	OCHD; OCEA; LG&E; OCFC
39	Expand use of riparian buffers/filters strips around creek including enhancing "no-disturb" ordinance to require creating designed buffer/filter strips instead of just open space in the lower portion of the watershed.	Medium	PCR	OCFC; NRCS; Extension Office; Conservation District
40	Eliminate Country Village Treatment Plant in the next 11 to 20 years.	Medium	PCR	OCEA; OCFC
41	Encourage producers with marginal pasture lands to put their land into conservation easements, wildlife habitats, and land stewardships.	Medium	WAH	OCFC; NRCS; Extension Office; Conservation District; FSA
42	Expand and protect riparian zones/no-disturbance zones around creeks.	Medium	PCR	OCFC; NRCS; FSA; Conservation District
43	Evaluate existing Purchase Development Programs for applicability in Oldham County. Purchase (or place in conservation easements) properties and/or development rights along creeks to preserve streamside areas and encourage access to streams.	Medium	WAH	OCFC; NRCS; FSA; Conservation District

Note: A full list of acronyms and abbreviations is shown in Section 1.06.

TABLE ES-10

TIER 3 WATERSHED PLAN SOLUTIONS

BMP No.	Best Management Practice(s) and Description	Feasibility	Impairment Addressed	Responsible Party/Parties
ENTIRE WATERSHED TIER 3 BEST MANAGEMENT PRACTICES				
44	Enhance roadside swales to include water-quality improvement functionality, such as using native grass species, elevated grates to trap first flush runoff, use of highly permeable soil, and utilization of an underdrain system.	High	WAH	Kentucky Transportation Cabinet (KYTC);OCEA; OCFC Road Department
45	Evaluate adopting a on-site wastewater inspection program that will establish the number of inspections of on-site systems.	High	PCR	OCHD; OCEA; LG&E; OCFC; LUC
46	Reassess, and update as appropiate, design criteria for on-site wastewater requirements, including lot size requirements.	High	PCR	OCEA; OCHD; OCFC; LUC;
47	Support and encourage full and expedient development and implementation of OCEA Stormwater Quality Management Plans (SWQMPs).	High	PCR	La Grange; OCFC; OCEA
48	Support the formation of a citizen-based watershed group.	High	WAH	OCFC; Watershed residents
49	Use stream restoration projects to educate decision makers and the community on stream conditions and function(s).	High	WAH	OCFC; NRCS; Extension Office; Conservation District
50	Expand use of riparian buffers/filters strips around creek including enhancing "no-disturb" ordinance to require creating designed buffer/filter strips instead of just open space.	Medium	WAH	OCFC; NRCS; Extension Office; Conservation District
51	Evaluate existing Purchase Development Programs for applicability in Oldham County. Purchase (or place in conservation easements) properties and/or development rights along creeks to preserve streamside areas and encourage access to streams.	Medium	WAH	OCFC; NRCS; United States Department of Agriculture Farm Service Agency (FSA); Conservation District
52	Incentivize low-impact design/green infrastructure inclusion in new developments and retrofits to existing developments.	Low	WAH	OCFC; La Grange; OCEA
NORTH CURRY'S FORK TIER 3 BEST MANAGEMENT PRACTICES				
53	Eliminate Sewer Overflows consistent with the proposed consent decree.	High	PCR	LUC; OCEA; OCFC
54	Increase/require the number of inspections of on-site wastewater systems. Possible triggers for inspection might be when property is bought/sold, or when utilities change names.	High	PCR	OCHD; OCEA; LG&E; Oldham County
55	Promote on-site wastewater system maintenance, operation and management education, targeting systems that are in low-lying areas and in proximity to waterways.	High	PCR	OCHD; Extension Office; KDOW; OCEA
56	Conduct a stream survey along the middle section of North Curry's Fork to identify potential KYTC drainage improvement areas. Identify and implement stormwater reduction, storage and treatment opportunities along the I-71 corridor.	Medium	WAH	University of Louisville ; OCFC; KYTC;
SOUTH CURRY'S FORK TIER 3 BEST MANAGEMENT PRACTICES				
57	Complete stream restoration or protection projects on the upstream tributaries, which were identified as very high restoration and protection potential.	High	WAH	OCFC; NRCS; FWS
58	Complete a stream restoration project in the middle section of the main stem.	High	WAH	OCFC; NRCS; FWS
59	Replace or repair aging/failing on-site wastewater systems targeting systems that are in low-lying areas and in proximity to waterways.	High	PCR	OCHD; OCEA; Property Owners
ASHER'S RUN TIER 3 BEST MANAGEMENT PRACTICES				
60	Complete a stream restoration project on the lower/downstream portion of Ashers Run near the confluence to address stream bank.	Low	WAH	OCFC; NRCS; FWS
CURRY'S FORK MAIN STEM TIER 3 BEST MANAGEMENT PRACTICES				
61	Complete a stream protection project on the single main stem tributary identified as having very high protection potential.	Low	WAH	OCFC; NRCS; FWS
62	Complete a stream restoration or protection project on the upstream tributaries, which were identified as high restoration and high protection potential.	Low	WAH	OCFC; NRCS; FWS
63	Eliminate Sewer Overflows consistent with the propsed consent decree.	High	PCR	LUC; OCEA; OCFC

Note: A full list of acronyms and abbreviations is shown in Section 1.06.

SECTION 1
INTRODUCTION

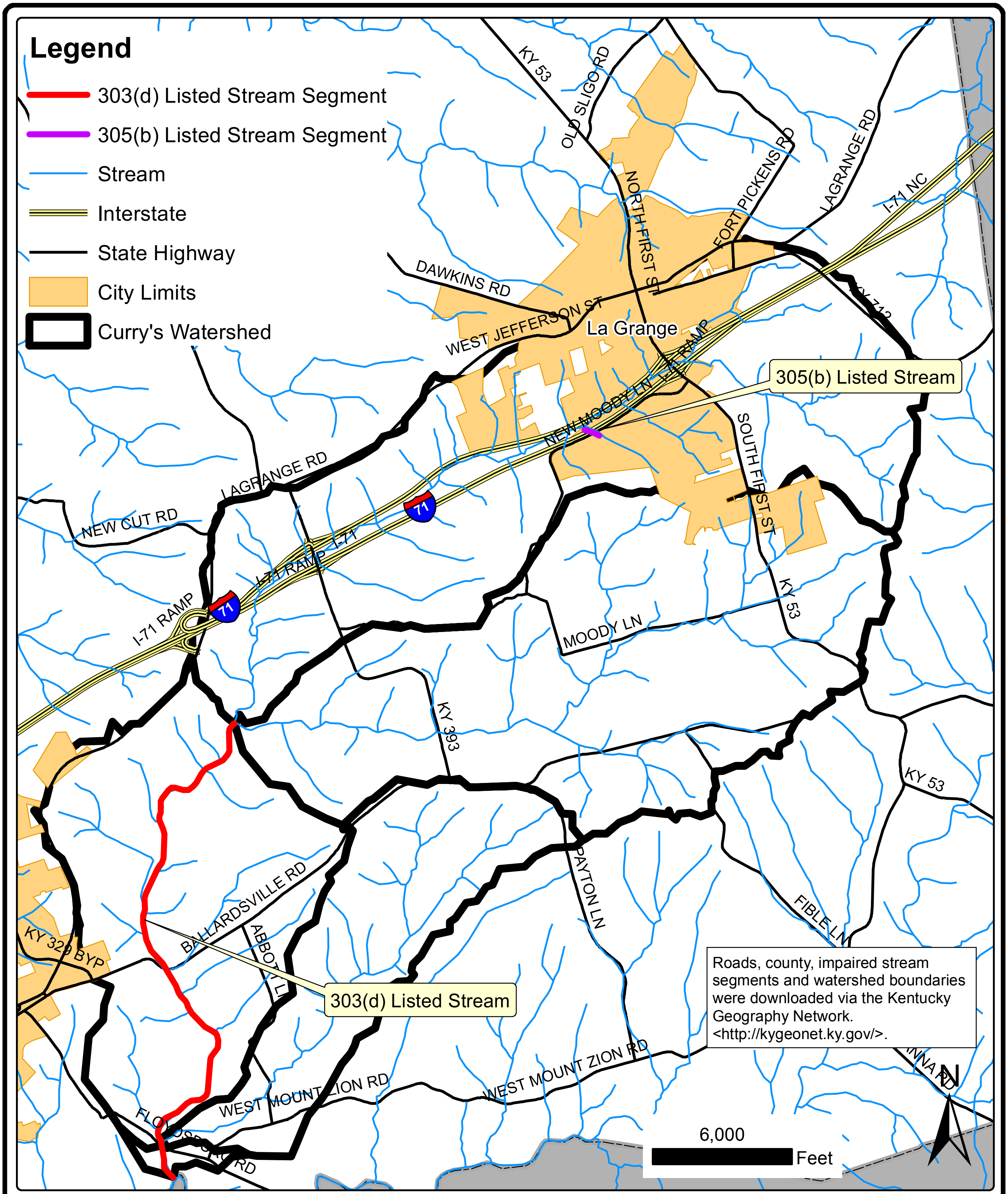
1.01 PROJECT BACKGROUND

This Watershed Plan (WP) focuses on the Curry's Fork watershed in Oldham County, Kentucky and its subwatersheds: Curry's Fork [Hydrologic Unit Code (HUC) 05140102180140 and 05140102180120], North Curry's Fork (HUC 05140102180100), South Curry's Fork (HUC 05140102180110), and Asher's Run (HUC 05140102180130). The Curry's Fork watershed was selected by Kentucky Division of Water (KDOW) and United States Environmental Protection Agency (USEPA) to receive FFY2006 Clean Water Act Section 319(h) Nonpoint Source Funding to address the pollutants that cause designated use impairments. Curry's Fork is listed as a first priority stream on the Clean Water Act (CWA) 303(d) List of Impaired Waters 2008 [303(d) List] with pollutants of fecal coliform, nutrients/eutrophication biological indicators, dissolved oxygen (DO), and sedimentation/siltation. Curry's Fork has one stream segment listed on the 303(d) List. Table 1.01-1 show the impairment status as it is listed in the 303(d) List.

Curry's Fork–Miles 0.0 to 4.8 Into Floyds Fork	Oldham County Segment Length: 4.8 miles
Impaired Use(s):	Warm Water Aquatic Habitat (Partial Support); Primary Contact Recreation Water (Nonsupport)
Pollutant(s):	Fecal Coliform; Nutrient/Eutrophication Biological Indicators; Oxygen, Dissolved; Sedimentation/Siltation
Suspected Sources:	Agriculture; Discharges from Municipal Separate Storm Sewer Systems (MS4); Habitat Modification–other than Hydromodification; Highway/Road/Bridge Runoff (Nonconstruction Related); Municipal (Urbanized High Density Area); Package Plant or Other Permitted Small Flows Discharges

Table 1.01-1 Curry's Fork 303(d) 2008 Listing

The Curry's Fork watershed also has one additional stream segment listed in the 2010 305(b) Report. Table 1.01-2 shows the additional stream segment 305(b) Report listing in the Curry's Fork watershed. Figure 1.01-1 shows the location of the 303(d) and 305(b) stream segments in the Curry's Fork watershed.



CURRY'S FORK

303(d) AND 305(b) STREAM SEGMENT LOCATIONS

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 1.01-1
5994.100

Name	Unnamed Tributary to North Curry's Fork
County	Oldham
Segment Length	0.1 Miles (0.0 to 0.1)
Basin	Salt River
8-Digit Hydrologic Unit Code	5140102
WAH / CAH	5-NS[1]
PCR	3[2]
SCR	3[2]
Fish Consumption	3[2]
DWS	3[2]
Assessment Date	9/28/2005
Designated Uses	WAH, FC, PCR, SCR

WAH–Warm Water Aquatic Habitat
CAH–Cold Water Aquatic Habitat
PCR–Primary Contact Recreation
SCR–Secondary Contact Recreation
FC–Fish Consumption
DWS–Drinking Water Supply
NS–Nonsupport

1.) A report category of 5-NS on the 305(b) List indicates the stream segment is not supporting the designated use and a Total Maximum Daily Load report (TMDL) is required.
2.) A report category of 3 on the 305(b) List indicates the designated use has not been assessed because of insufficient or no available data.

Table 1.01-2 Curry's Fork 305(b) 2010 Report Listing

The purpose of the WP is to improve water quality to meet water quality standards in the watershed. Section 319(h) funding for the Curry's Fork WP was used to complete the following tasks:

1. Form a Technical Committee (TC) of local agencies and organization leaders.
2. Organize and involve stakeholders.
3. Compile and analyze existing information and data about the watershed.
4. Collect additional water quality data.
5. Analyze sampling data.
6. Quantify pollutant loads.
7. Identify pollutant sources.
8. Determine measurable goals.
9. Implement actions needed to meet those goals.
10. Implement a stream restoration project.

1.02 PROJECT AREA

Curry's Fork watershed covers approximately 28 square miles and is located within Oldham County, Kentucky. A portion of the City of La Grange (La Grange) is located in the northeastern part of the watershed. Refer to Section 2 for a detailed description of watershed characteristics.

1.03 PROJECT GOALS

Three community roundtable events were held to discuss the community's concerns within the watershed and to identify project goals for the WP. Input from the first roundtable event, held September 24, 2009, was used to establish goals for the watershed and WP. A detailed summary of the first roundtable appears in Appendix A. The four primary goals of the watershed are:

1. Improve and protect water quality for our generation and future generations.
2. Promote a safe, healthy, and accessible watershed for recreation and wildlife.
3. Utilize programs and practices to decrease potential flooding impacts.
4. Develop and implement a cost-effective watershed plan that economically utilizes funds.

The second and third community roundtables were held on July 15, 2010, and February 2, 2011. The July 2010 roundtable focused on bacteria data and the February 2011 roundtable focused on Warm Water Aquatic Habitat (WAH) data. The purpose of the bacteria and WAH roundtables was to share the results from the sampling and assessment program with the Curry's Fork watershed community and collect feedback on proposed solutions and remediation activities. Detailed summaries of the bacteria and WAH roundtables are located in Appendix B and C, respectively.

1.04 PLANNING AND DECISION MAKING PROCESS

A. Planning Guides

Two primary planning guides were used in the development of the WP: (1) USEPA's *Handbook for Developing Watershed Plans to Restore and Protect Our Waters* and (2) Kentucky Waterways Alliance (KWA) and KDOW's *Draft Watershed Planning Guidebook for Kentucky Communities*. The KWA and KDOW guidebook was created to help Kentuckians work together to improve waterways and provide a step-by-step process that Kentucky communities may use to create effective WPs. Although the final version of the *Watershed Planning Guidebook for Kentucky Communities* is now available, significant changes were made to it from the draft version and it was not available until the near the end of the Curry's Fork WP development process. Therefore, the final version was not used to guide the development of this WP. The USEPA handbook has a similar purpose but is not specific to Kentucky. Both provide information to help communities meet the Section 319(h) grant requirements and the required nine key elements of WPs as defined by the USEPA. These elements include:

1. Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve needed load reductions and any other goals identified in the watershed plan.

2. An assessment of the load reductions expected from management measures.

3. A description of nonpoint source management measures that will need to be implemented to achieve required load reductions and a description of the critical areas in which those measures will be needed to implement this plan.

4. A projection of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement the plan.

5. An information and education component used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the nonpoint source management measures.

6. A schedule for implementing nonpoint source management measures identified in this plan that is reasonably expeditious.

7. A description of interim measureable milestones for evaluating whether nonpoint source management measures or other control actions are being implemented.

8. A set of criteria that can be used to assess whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards.

9. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against criteria established under Item 8.

B. Decision-Making Process

The Oldham County Fiscal Court (OCFC) was the lead organization in developing the WP. OCFC was responsible for making recommendations and providing oversight of the planning and implementation process using its local knowledge of the community and the watershed. An independent Watershed Advisor provided project guidance, oversight, and review. Strand Associates, Inc.® (Strand) provided technical services that included collecting and analyzing stream sampling, drafting the WP, and organizing stakeholder activities. These parties comprised the Curry's Fork Internal Project Team and met at least bimonthly to achieve the objectives of the project. Additional contractors were also utilized, including Third Rock Consultants, LLC (Third Rock), which provided biological sampling and habitat assessments. The University of Louisville (UL) Stream Institute provided a fluvial geomorphology study and designed the stream restoration projects. WP recommendations were contributed by these organizations and others. Three roundtable events were also held to allow the community to express their concerns and provide feedback on potential best management practices (BMPs).

Available data was compiled and reviewed by the Internal Project Team. The Internal Project Team used its knowledge of the watershed and geographical information system (GIS) to develop a list of preliminary pollutant sources and priority restoration and protection areas based on the data. The TC used its local knowledge of the watershed to verify pollutant sources, priority restoration/protection areas, and develop the list of proposed solutions. Proposed solutions were evaluated and rated based on their effectiveness by the TC. Proposed solutions that ranked high were presented to the Curry's Fork community through two community roundtable events where residents ranked their top solutions. The community input was then reviewed and incorporated into the solutions. The Internal Project Team then reviewed the compiled list of solutions and reviewed its estimated costs, feasibility, and if any existing programs were already working on similar programs. From this evaluation, the Internal Project Team formed the final solutions list.

1.05 PARTNERS AND STAKEHOLDERS

The following local entities, agencies, and organizations have participated in the development of this WP:

1. Eagle Resource Conservation and Development Program
2. Home Builders Association of Louisville
3. Independent Watershed Consultant
4. Kentuckiana Regional Planning and Development Agency
5. Kentucky Department of Fish and Wildlife Resources
6. Kentucky Division of Water (Frankfort Office)
7. Kentucky Division of Water (Local Field Office)
8. Kentucky Nature Preserves Commission
9. La Grange Stormwater Program
10. La Grange Utilities Commission
11. Oldham County Board of Education
12. Oldham County Citizens
13. Oldham County Conservation District
14. Oldham County Department of Health
15. Oldham County Environmental Authority (new entity comprised from Oldham County Sewer District and Oldham County Municipal Separate Storm Sewer System (MS4)
16. Oldham County Extension Office
17. Oldham County Fiscal Court
18. Oldham County Planning and Development Services
19. Oldham County Sewer District (now OCEA)
20. Oldham County Solid Waste and Recycling Department
21. Oldham County Water District
22. Salt River Watershed Watch
23. Strand Associates, Inc.®
24. Third Rock Consultants, LLC.
25. United States Army Corps of Engineers
26. United States Geological Survey
27. University of Louisville Stream Institute
28. United States Department of Agriculture Natural Resources Conservation Service
29. Veolia Water

Numerous agencies, organizations, and entities were invited to become members of the Curry's Fork TC. The TC was formed in August 2008 and is comprised of over 70 members from over a dozen of the local agencies and organizations listed above. The TC met 20 times during the WP development process to discuss sampling and assessment results, identify pollutant sources, and develop proposed solutions.

1.06 ACRONYMS AND ABBREVIATIONS

201	Section of the Clean Water Act requiring facilities planning.
303(d) List	Clean Water Act 303(d) List of Impaired Waters
304(a)	USEPA requirement to develop water quality criteria to protect environmental and human health based on scientific data and assessment.
305(b) Report	A National Water Quality Inventory Report required to be submitted to Congress by the USEPA.
319	Section of the Clean Water Act established the Section 319 Nonpoint Source Management Program to provide technical and financial assistance to mitigate nonpoint source pollution.
402 (p)	Section of the Clean Water Act establishing phased approach to permitting certain stormwater discharges.
404 and 401	Sections of the Clean Water Act that regulates impacts to the waters of the United States
AWQA	Agriculture Water Quality Authority
BEHI	bank erosion hazard index
BMPs	best management practices
BOD	biochemical oxygen demand
CFR	Code of Federal Regulations
col/100mL	colonies (bacteria) per 100 milliliters
CWA	Clean Water Act
DMRs	discharge monitoring reports
DO	Dissolved oxygen
E. coli	*Escherichia coli*
E-Waste	Electronic waste such as TVs, stereos, and computers
EPPC	Kentucky Environmental Public Protection Cabinet
EPT	*Ephemeroptera, Plecotera, Trichoptera* Index
Extension Office	Oldham County Cooperative Extension Service
FEMA	Federal Emergency Management Agency
FSA	United States Department of Agriculture, Farm Service Agency
FWS	United States Department of Agriculture, Fish and Wildlife Service
GeoWEPP	geospatial water erosion prediction project model
GIS	geographical information system
GPP	groundwater protection plan
HUC	Hydrolic Unit Code
IBI	Index of Biological Integrity
I/I	inflow and infiltration
KAR	Kentucky Administrative Regulation
KDFWR	Kentucky Department of Fish and Wildlife Resources
KDOW	Kentucky Division of Water
KGS	Kentucky Geologic Service
KOWA	Kentucky On-site Wastewater Association
KPDES	Kentucky Pollutant Discharge Elimination System
KSNPC	Kentucky State Natural Preserves Commission

KSR	Kentucky State Reformatory
KWA	Kentucky Waterways Alliance
KYTC	Kentucky Transportation Cabinet
La Grange	City of La Grange, Kentucky
LDC	load duration curve
LG&E	Louisville Gas & Electric
LUC	La Grange Utilities Commission
MBI	Macroinvertebrate Biotic Index
mgd	million gallons per day
mg/L	milligrams per liter
mi	mile
mm/h	millimeters per hour
MS4	municipal separate storm sewer system
MSD	Louisville and Jefferson County Metropolitan Sewer District
N	Nitrogen
NAI	No Adverse Impact
NBS	near-bank stress
NH_3N	Ammonia Nitrogen
NPDES	National Pollutant Discharge Elimination System
NPS	nonpoint source
NRCS	Natural Resources Conservation Service
OCBE	Oldham County Board of Education
OCEA	Oldham County Environmental Authority
OCFC	Oldham County Fiscal Court
OCHD	Oldham County Health Department
OCPDS	Oldham County Planning and Development Services
OCSD	Oldham County Sewer District
OCWD	Oldham County Water District
ORSANCO	Ohio River Valley Sanitation Commission
OWA	Onsite Wastewater Authority
P	phosphorus
PCR	Primary Contact Recreation
PCS	Permit Compliance System
PDR	Purchase Development Rights
POC	pollutants of concern
PTP	package treatment plant
QAPP	Quality Assurance Project Plan
RBP	Rapid Bioassessment Protocols
RC&D	Resource Conservation and Development
Strand	Strand Associates, Inc.®
SCR	Secondary Contact Recreation
SD1	Sanitation District No. 1 of Northern Kentucky
SIC	standard industrial classification
sq mi	square mile
SWQMP	Stormwater Quality Management Plan

SRF	State Revolving Fund
SRWW	Salt River Watershed Watch
STP	sewage treatment plant
TC	Technical Committee
Third Rock	Third Rock Consultants, LLC
TMDL	total maximum daily load
TSS	total suspended solids
UL	University of Louisville
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WAH	Warm Water Aquatic Habitat
WP	Watershed Plan
WQ	water quality
WQDR	Curry's Fork Water Quality Data Report
WQDAT	Curry's Fork Water Quality Data Analysis Team
WQS	Water Quality Standards
WWTP	wastewater treatment plant
yr	year

1.07 REFERENCES

References are denoted by number in superscript. The following list of references pertain to the superscript notations throughout this report.

[1]Kentucky Geography Network GIS, Various Dates

[2]Beth Stuber, Oldham County Fiscal Court, 2009

[3]United States Geological Survey GIS, 2000

[4]www.uky.edu/KGS/water/library/gwatlas/Oldham/Geology.htm, 2004

[5]Soil Survey of Oldham County, Soil Conservation Service, 1978

[6]*Water-Resources Engineering*, David A. Chin, 2006

[7]Oldham County Comprehensive Zoning Ordinance, 2007

[8]*2007 Census of Agriculture*, United States Department of Agriculture and Kentucky Agricultural Statistics Service, 2007

[9]*Kentucky Cattle County Estimates*, National Agricultural Statistics Services, 2010

[10]*Outlook 2020–Oldham County Comprehensive Plan*, 2002

[11]*2000 Census of Population and Housing*, United States Census Bureau, 2000

[12]http://cfpub.epa.gov/npdes/stormwater/swbasicinfo.cfm.

[13]http://www.epa.gov/waterscience/standards/about/imp.htm

[14]http://www.epa.gov/waterscience/standards/about/crit.htm

[15]McMurray, Steve, Rodney Pierce, and John Brumley. *Qualitative Mussel Survey of the Floyds Fork Watershed*. Kentucky Division of Water, 2003.

[16]Ohio River Valley Sanitation Commission (ORSANCO). *Ohio River Water Quality Fact Book.* 1994.

[17]Kentucky Division of Water. *Standard Methods for Assessing Biological Integrity of Surface Waters in Kentucky*. 2002 and 2008.

[18]United States Environmental Protection Agency. *Permit Compliance System (PCS)*. 2010.

[19]United States Environmental Protection Agency, 2008. *Handbook for Developing Watershed Plans to Restore and Protect our Waters.* EPA 841-B-08-002.

[20]Kentucky Waterways Alliance and Kentucky Division of Water. *Draft Watershed Planning Guidebook for Kentucky Communities*.

[21]Kentucky Division of Water. *2008 Integrated Report to Congress on the Condition of Water Resources in KY, Vol II, 303(d) List of Surface Waters*.

[22]Federal Emergency Management Agency. Flood Insurance Rate Map. Various dates.

[23]Croasdaile and Parola, Jr., *Sediment and Geomorphic Assessment of the Curry's Fork Watershed,* University of Louisville Stream Institute, 2011.

[24]Kentucky Department of Environmental Protection, Division of Water, Groundwater Branch. *Groundwater Sensitivity Regions of Kentucky*. 1994.

Masters, Gilbert. *Introduction to Environmental Engineering*. 1998.

SECTION 2
WATERSHED INVENTORY

2.01 GENERAL WATERSHED CHARACTERISTICS

Watershed characteristics such as land use, geology, land cover, topography, and hydrology play a role in the overall health of a waterway. Each characteristic impacts the amount and quality of runoff entering streams; and therefore, is important to understand when evaluating water quality conditions and in identifying potential sources of pollutants and the selection of controls. This section summarizes the physical and natural features of the watershed, land use, and land cover characteristics, and the demographics of the watershed.

The Curry's Fork watershed is approximately 28.52 square miles and is a tributary of Floyds Fork.[1] The major city within the Curry's Fork watershed is La Grange, located on the northeastern side of the watershed off of Interstate 71. See Figure 2.01-1 for the location of the Curry's Fork watershed in Kentucky. Although the watershed is fairly rural in nature, it has become developed with subdivisions throughout watershed. The most developed portion of the watershed is in and around La Grange. See Figure 2.01-2 for more detailed information regarding the location of the Curry's Fork watershed within Oldham County, Kentucky.

A. Physical and Natural Features

1. Subwatershed Boundaries

Curry's Fork includes four primary subwatersheds: North Curry's Fork, South Curry's Fork, Curry's Fork (main stem), and Asher's Run. They are located within the Floyds Fork Basin in Kentucky, specifically within the 10-digit Hydrolic Unit Code (HUC) #05140-102-180. The Floyds Fork Basin is located within the Salt River Basin (HUC 05140-102). Floyds Fork drains into the Salt River and the Salt River drains into the Ohio River at the southwest tip of Jefferson County.

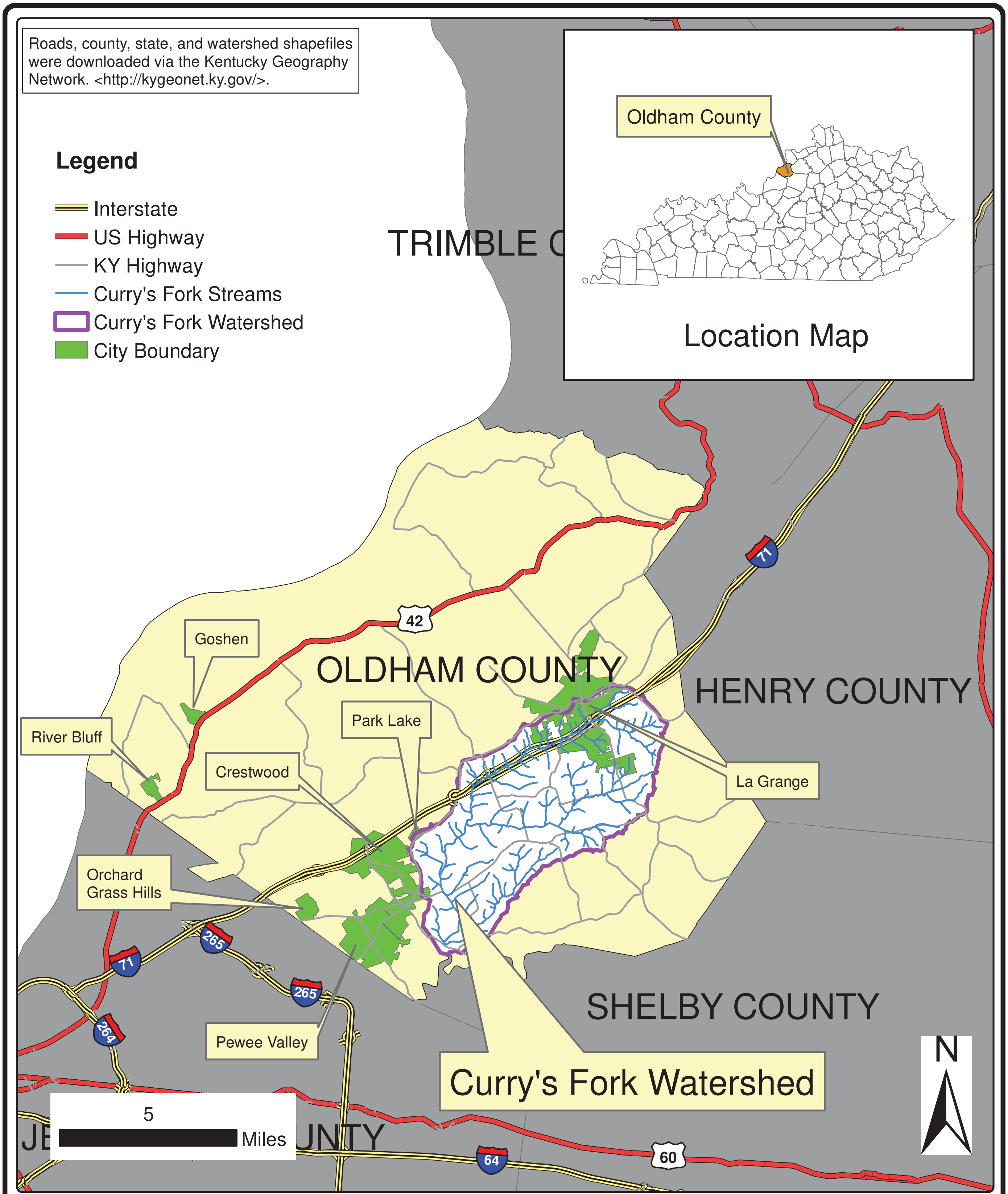
A list of the subwatersheds and their associated HUC numbers and drainage areas are shown in Table 2.01-1. See Figure 2.01-2 for the subwatershed delineations.

Name	HUC	Area (sq mi)
North Curry's Fork	05140-102-180-100	10.05
South Curry's Fork	05140-102-180-110	9.27
Curry's Fork	05140-102-180-120	5.81
Asher's Run	05140-102-180-130	3.39
	Total Watershed Area	28.52

Table 2.01-1 Subwatershed Areas

South Curry's Fork and North Curry's Fork join together south of the Buckner exit off Interstate 71. The confluence of Asher's Run and Curry's Fork is located at West Mount Zion Road and Floydsburg Road in close proximity to the Oldham County/Shelby County line.

The Curry's Fork watershed is located in the Salt River Basin. Curry's Fork discharges into Floyds Fork, which discharges into the Salt River. The Salt River, in turn, discharges into the Ohio River.[1]

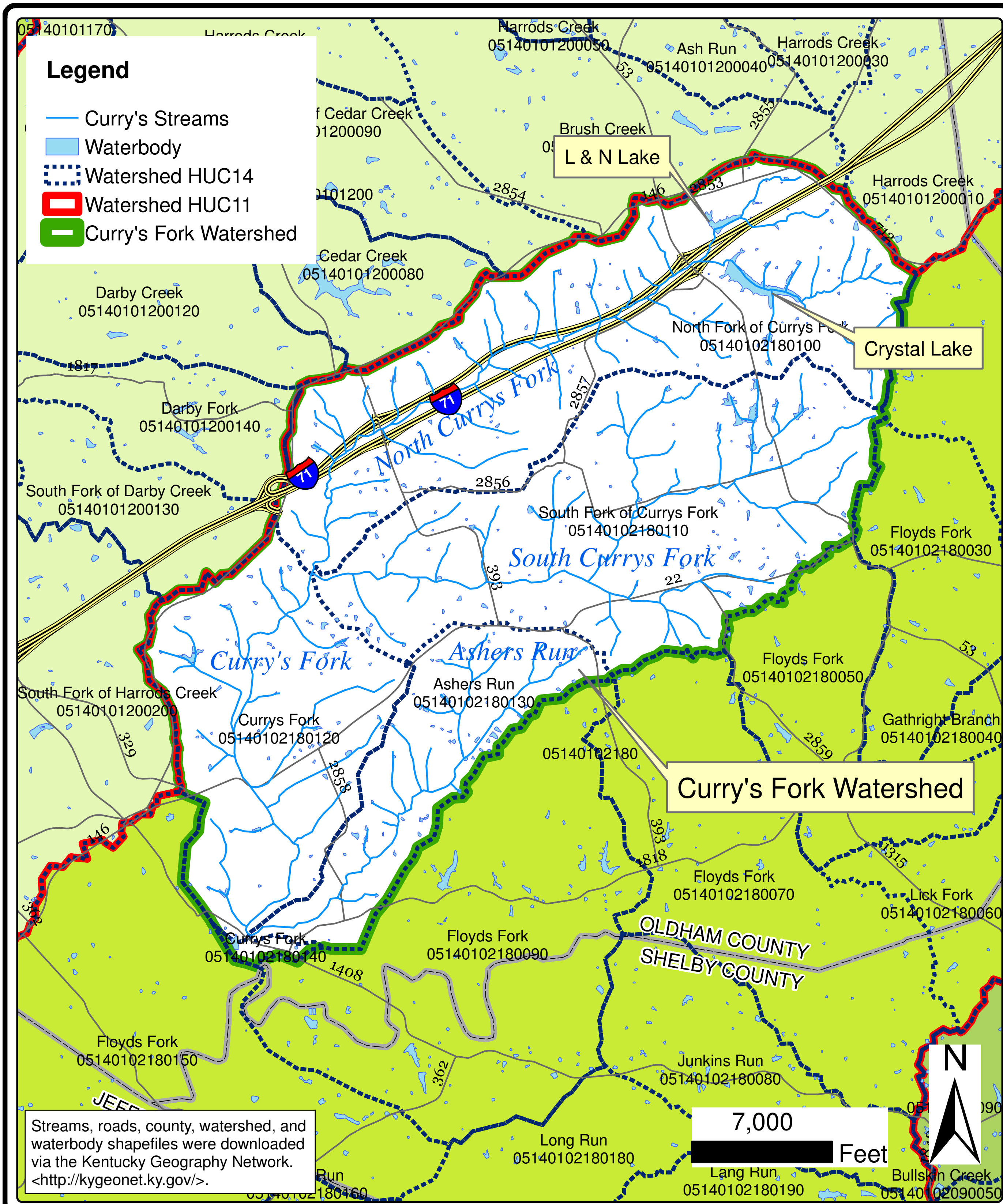


CURRY'S FORK LOCATION

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC. ENGINEERS

FIGURE 2.01-1
5994.100



CURRY'S FORK SUBWATERSHEDS

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.01-2
5994.100

2. Precipitation and Climate

Oldham County receives a moderate amount of precipitation, averaging approximately 49 inches a year. Table 2.01-2 represents the total annual rainfall information generally representative of Oldham County. This historic rainfall data is taken from the rain gauge at the Hite Creek Wastewater Treatment Plant (WWTP), which is located on the northeastern border of Jefferson County, just southwest of Oldham County outside the Curry's Fork watershed. The Louisville and Jefferson County Metropolitan Sewer District (MSD) operates this rain gauge, which automatically telemeters rainfall conditions to MSD's central computer every five minutes.

Year	Rainfall (in)
2004	49.02
2005	42.27
2006	53.50
2007	49.79
2008	48.38

Source: http://www.msdlouky.org/aboutmsd/rainfall.cfm

Table 2.01-2 Annual Precipitation

As shown in Table 2.01-3, the majority of rainfall occurs during the spring and summer months, and much occurred during the primary contact recreation season. Table 2.01-3 represents 30 years of data measured in Louisville, Kentucky.

Month	Typical Rainfall (in)
January	2.86
February	3.3
March	4.66
April	4.23
May	4.62
June	3.46
July	4.51
August	3.54
September	3.16
October	2.71
November	3.7
December	3.64
Annual	44.39

Source: Ohio River Water Quality Fact Book, ORSANCO-1994

Table 2.01-3 Monthly Typical Precipitation

Like most regions located in the midwest, Oldham County experiences warm summer months and cold winter months. January is typically the coldest month of the year in Oldham County, with average low and high temperatures ranging from 20°F to 40°F, respectively. July is typically the warmest month of the year, with average low and high temperatures ranging from 62°F to 88°F, respectively.

Table 2.01-4 shows the typical temperatures for each month of the year in Oldham County.

Month	Max °F	Mean °F	Min °F
January	40.2	29.8	19.3
February	45.9	33.8	21.6
March	56.2	43	29.8
April	66.9	52.4	37.9
May	76.4	62.5	48.5
June	84.3	70.8	57.3
July	88.1	75.1	62
August	86.6	73.3	60
September	80.3	66.2	52
October	69	54.4	39.7
November	56.2	44.1	32
December	44.8	34.3	23.8
Average	66.2	53.3	40.3

Source: http://www.idcide.com/weather/ky/la-grange.htm

Table 2.01-4 Typical Temperatures (Shelbyville Weather Station)

3. Hydrology and Surface Water Resources

Streams are traditionally classified by the Strahler Stream Order, a method used for measuring the relative size of streams. This Strahler method uses the number of tributary streams adjoining other stems of the stream to define the size of the stream. For example, when two first-order streams converge, they form a second-order stream, and when the second-order stream converges with another second-order stream, they form a third order stream. Therefore, larger streams have a greater stream order number. The stream order can range from 1 to 12. For example, a small headwater stream with no adjoining tributaries would be classified as having a stream order of 1, the Ohio River has a stream order of 8, and the Amazon River has a stream order of 12. Curry's Fork streams are classified as stream orders of 1 through 4 indicating the relatively small nature of the streams. Based on National Hydrography Dataset, there are approximately 21 miles of waterways within the Curry's Fork watershed.

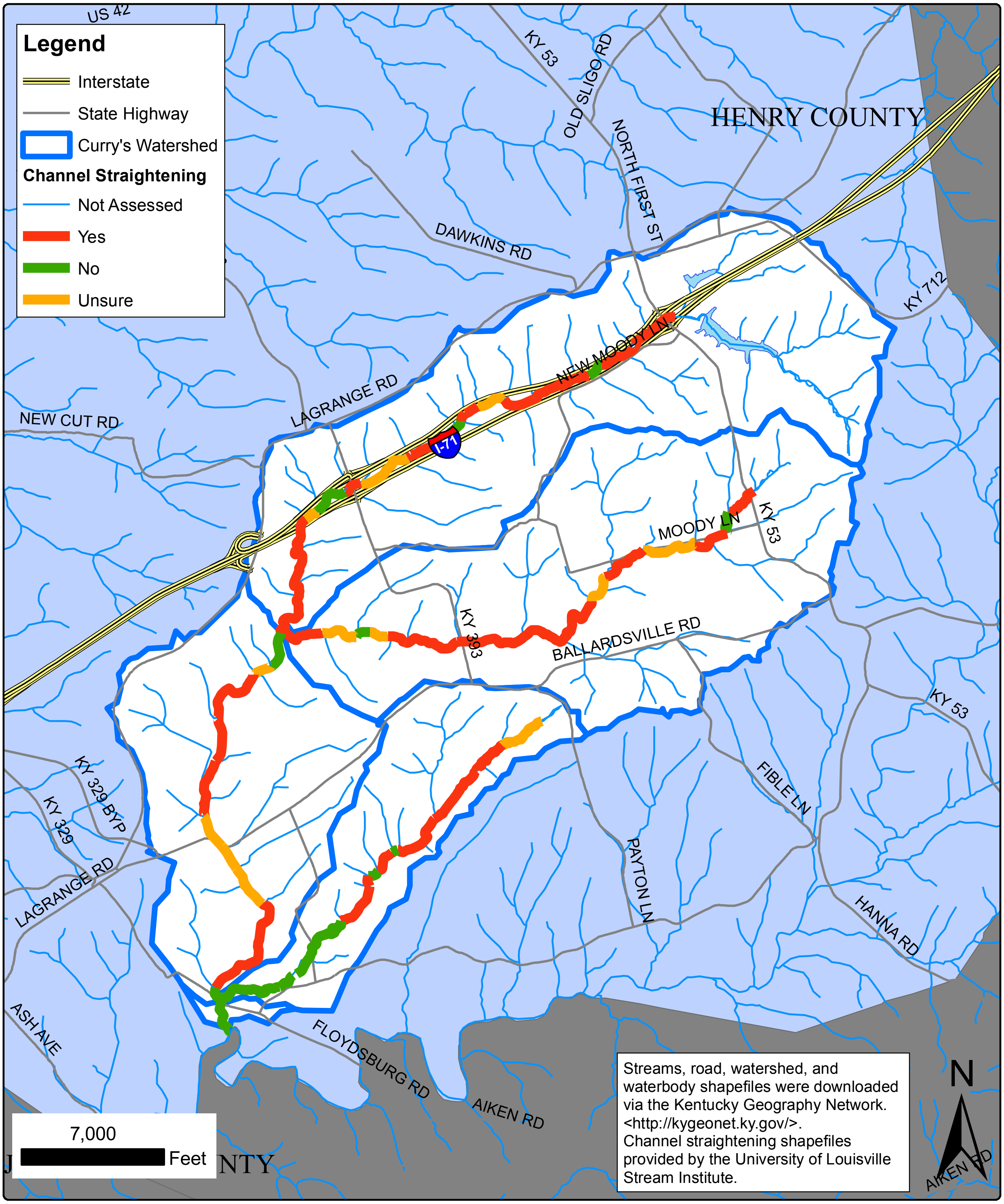
Some Curry's Fork streams can have no flow during periods of drought. The upper portions of North Curry's Fork and all of Asher's Run and South Curry's Fork experienced periods of no flow in drought conditions during sampling in the recreational contact season. The main stem of Curry's Fork and the lower portion of North Curry's Fork receives a small amount of flow regardless of weather conditions. During spring, most streams maintain a small amount of flow as a result of increased rain and groundwater recharge. During periods of heavy rain, flow can exceed the height of the stream banks and flow depth can be in excess of 10 feet in the main stem of Curry's Fork.

The major reservoirs located within the Curry's Fork watershed include Crystal Reservoir and the L&N Reservoir. Both reservoirs are located in the North Curry's Fork subwatershed. The Crystal Reservoir and L&N Reservoir are known locally as Crystal Lake and L&N Lake. Therefore, they are referred to as lakes in the WP for simplicity purposes. The main surface water resources in the watershed are the Curry's Fork streams that drain into Floyds Fork. See Figure 2.01-2 for identified water bodies from the National Hydrography Dataset. The locations of impoundments throughout the watershed are important for analyzing in-stream nutrient, sediment, and dissolved oxygen (DO) levels. Impounded or pooled areas can affect water quality downstream.

Direct modification of stream channels is common in developed areas. Stream channel straightening is one the typical methods of stream modification with the intent of increasing flow velocity and quantity in a stream to reduce the risk of flooding. Increased velocity and flow conditions above what naturally occurs within a stream can have numerous detrimental effects, including increased bank erosion, lack of stable substrates, unstable habitats, and more. Figure 2.01-3 shows the stream segments affected by channel straightening in the Curry's Fork watershed identified by the University of Louisville (UL) Stream Institute.

4. Groundwater/Surface Water Interaction

Groundwater from alluvium in the county is typically hard to very hard and may contain salt or hydrogen sulfide. According to KDOW Groundwater Section of the Watershed Management Branch, the watershed primarily has areas of moderate hydrogeologic sensitivity to groundwater pollution.[24]



STREAM REACHES AFFECTED BY CHANNEL STRAIGHTENING

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.01-3
5994.100

Figure 2.01-4 shows the potential karst areas for the Curry's Fork watershed. It is important to note that Figure 2.01-4 shows karst potential areas based on data and field experience of Kentucky karst experts; therefore, it is not guaranteed that karst regions will be encountered in an area designated as major or moderate potential karst. A review of the KDOW's *Groundwater Sensitivity Regions of Kentucky* was also conducted and supported the findings in the karst potential map.[24] Additional studies and field investigations are required to determine specific karst locations. While Kentucky has some of the most karst prone areas in the world, Oldham County is primarily located in a moderate karst potential area and is therefore not known for significant karst topography. The moderate karst areas in Curry's Fork are associated with a moderate hydrogeologic sensitivity to groundwater pollution.

Although Oldham County is not located in a major karst potential area, field investigations have confirmed that some karst topography exists. Karst regions are susceptible to unique problems such as sinkhole collapses and sinkhole flooding. They are also a direct link to groundwater in many cases and can result in rapid groundwater pollution.[1] The general consensus of professionals working in this area is that karst topography does not play a major role in this watershed or in the transport of groundwater.

5. Floodplains

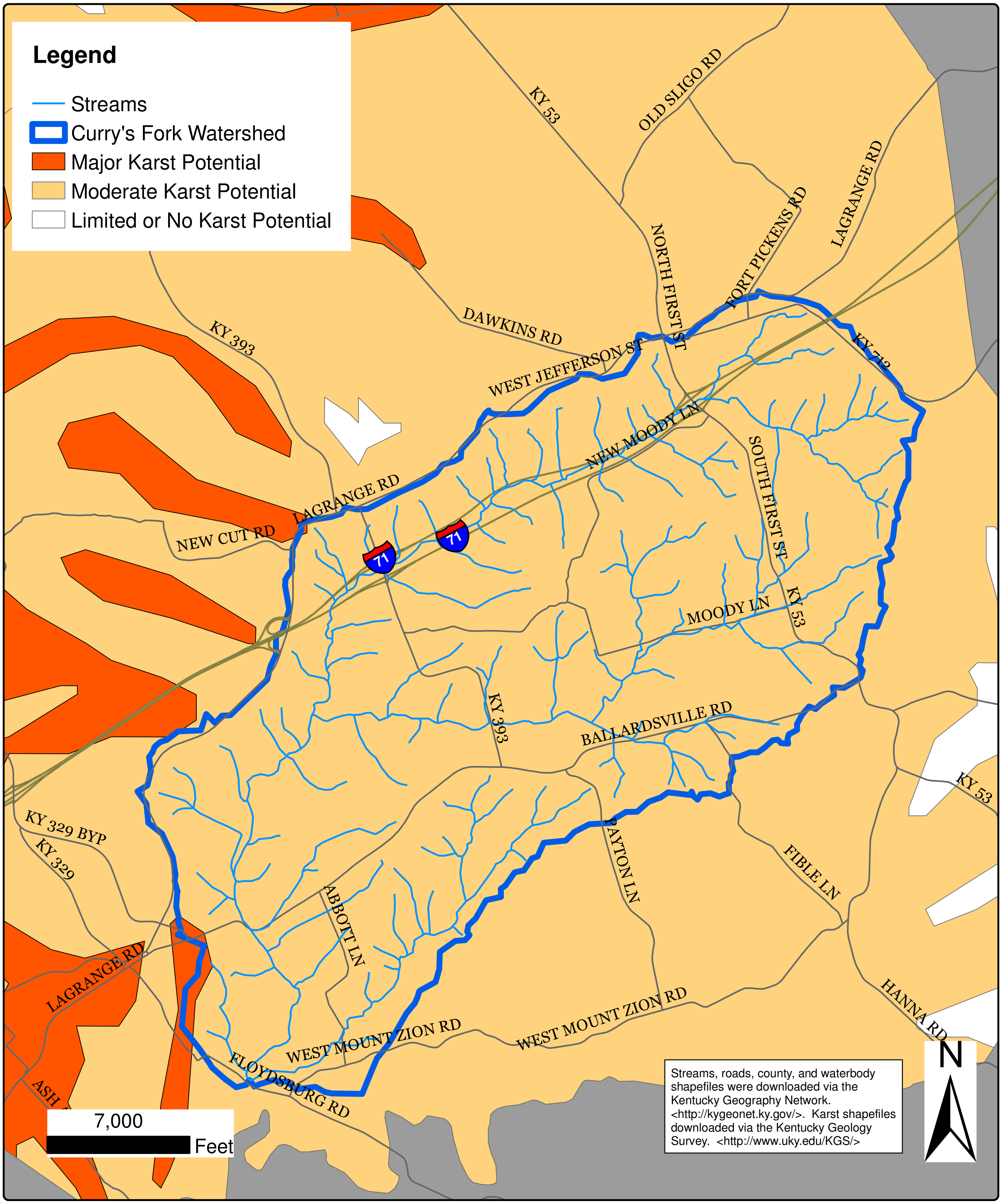
According to the Federal Emergency Management Agency (FEMA), the 100-year floodplains are located along South Curry's Fork, portions of North Curry's Fork and Asher's Run and the entire main stem of Curry's Fork.[22] It is important to note that increases in impervious surfaces such as buildings and roadways may increase the potential for flooding unless properly managed. The floodplains must be examined as the population continues to grow. Figure 2.01-5 shows the floodplain classifications for the watershed identified by FEMA. Streams in Curry's Fork generally have limited floodplain area to provide overflow relief for streams during higher flow, such as wet weather events.

a. Flooding and Ponding Issues

Flooding was a common concern expressed by residents within the Curry's Fork watershed at the 2009 roundtable. Residents also provided feedback regarding the location of areas that commonly flood.

The most flood-prone areas identified by residents within the Curry's Fork watershed include an area north of the Lakewood Valley Subdivision, the Lakewood Valley Subdivision along Moody Lane, and the Borowick Subdivision area.[2]

See Figure 2.01-6 for the locations of these subdivisions. Refer to Appendix A for more information regarding the 2009 Roundtable.

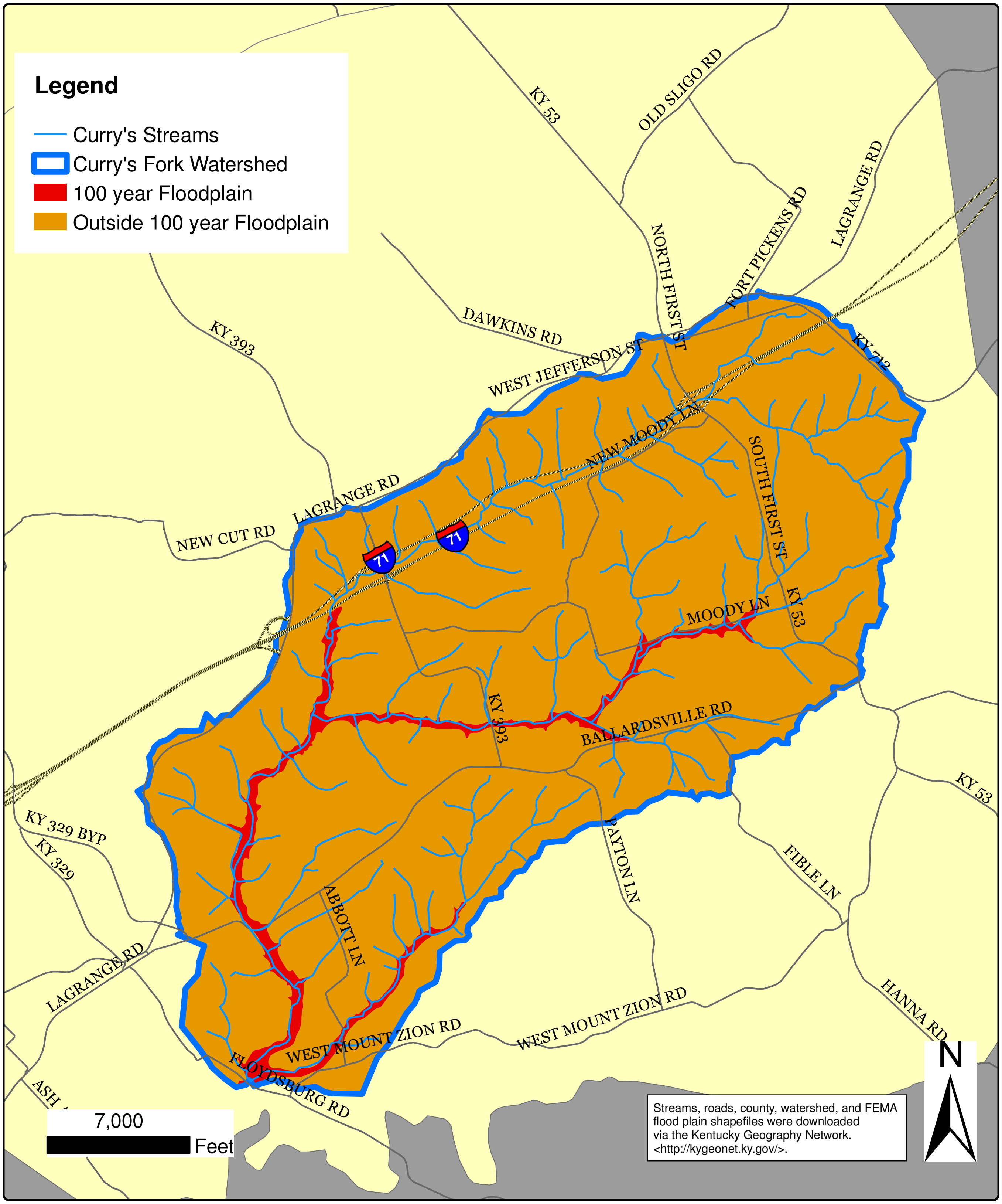


CURRY'S FORK KARST POTENTIAL

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.®
ENGINEERS

FIGURE 2.01-4
5994.100

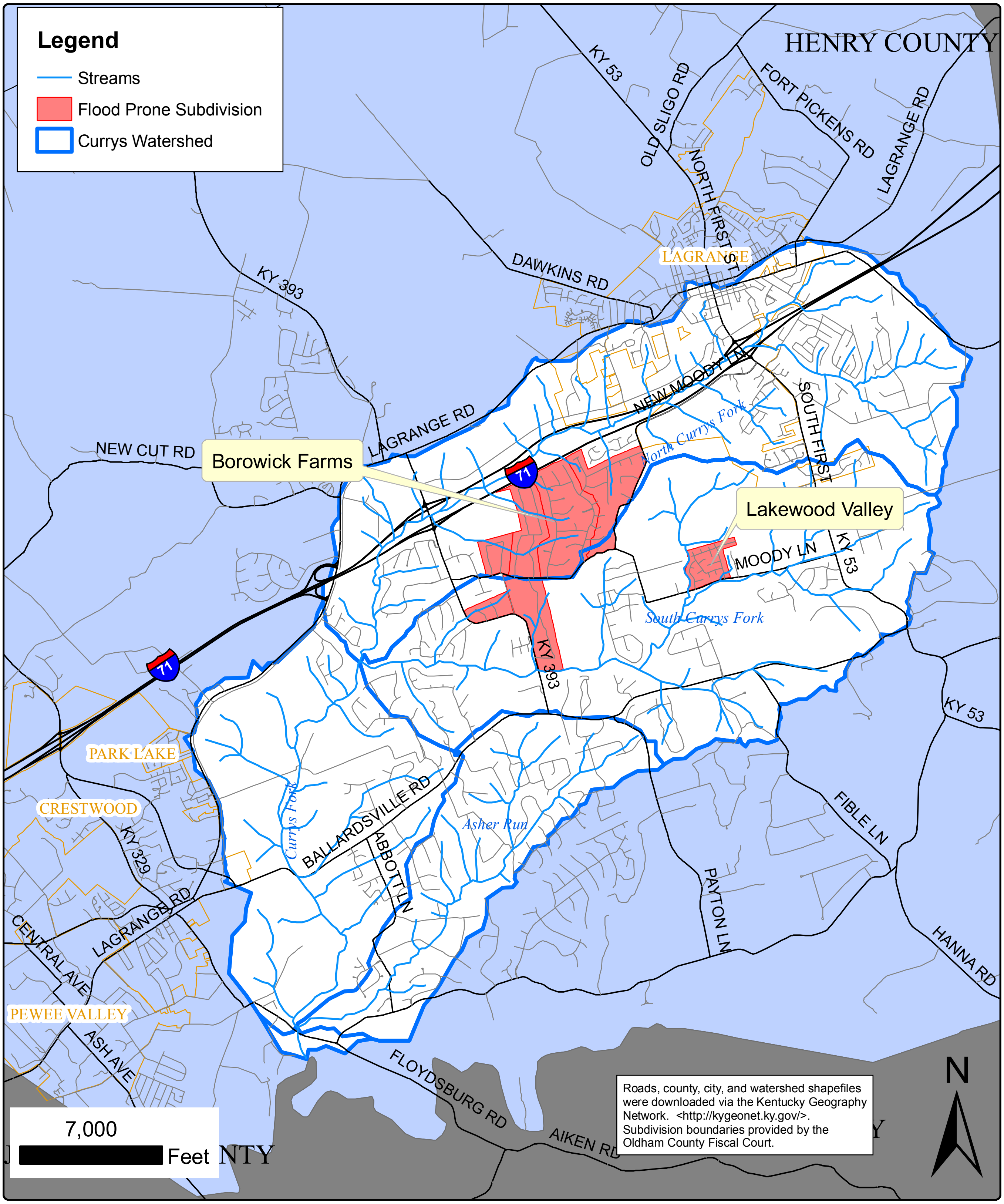


CURRY'S FORK 100 YEAR FLOODPLAINS

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.01-5
5994.100



FLOOD PRONE SUBDIVISIONS

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.01-6
5994.100

6. Wetlands

Wetlands are essential to the Curry's Fork watershed. They provide wildlife habitat, recharge the groundwater table, and provide stormwater retention. Wetlands are identified by certain characteristics, including the presence of hydrophytic plants, hydric soils, and wetland hydrologic patterns. Figure 2.01-7 shows the wetlands in the Curry's Fork watershed.

7. Topography

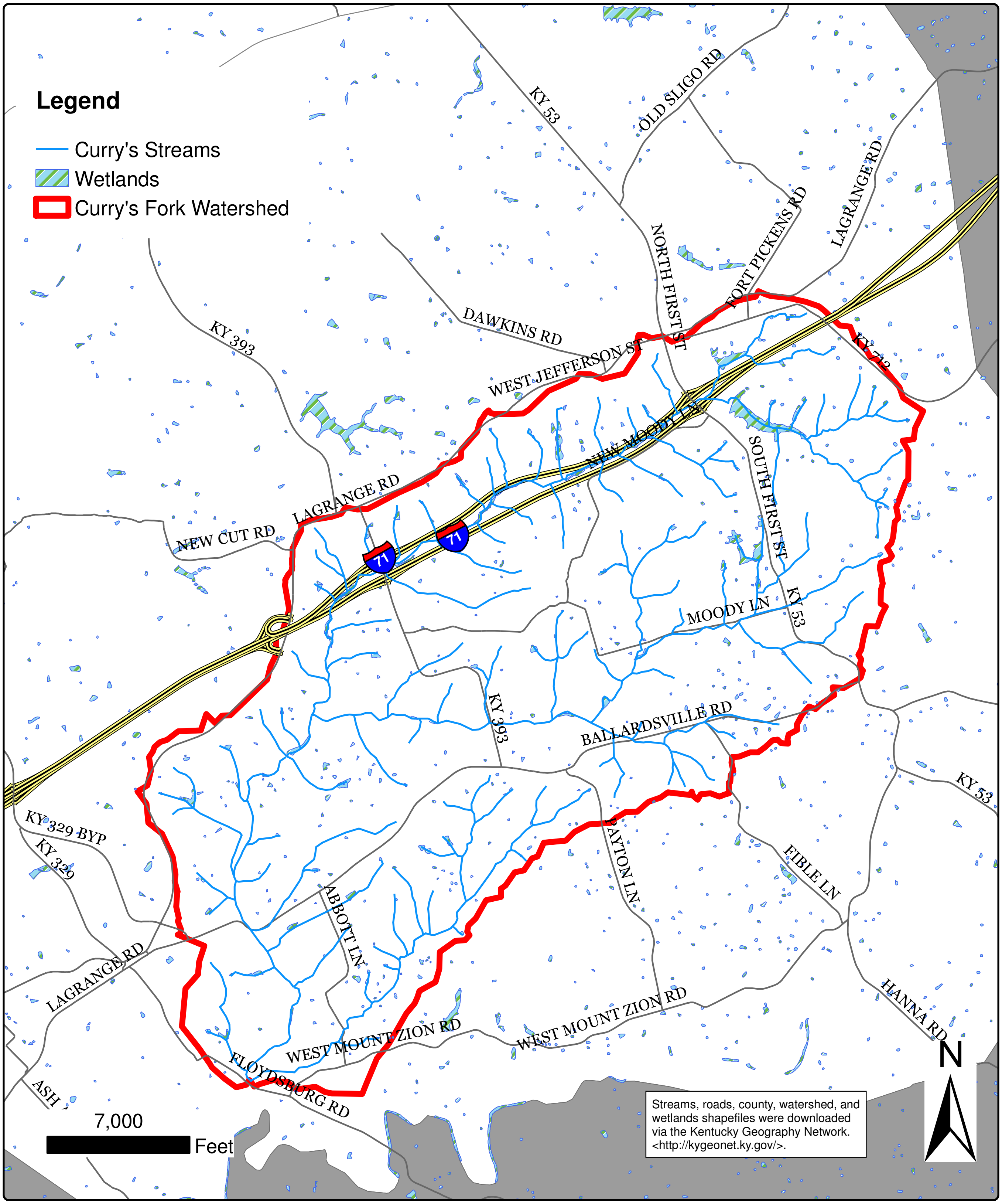
The watershed consists mostly of gently rolling to hilly terrain. Local elevation percent slope rarely exceeds 20 percent grade. The highest elevation point in Oldham County is 920 feet and the lowest elevation is 420 feet. La Grange is at 876 feet; Buckner, 831 feet; and Crestwood, 798 feet.[3] See Figure 2.01-8 for a digital elevation model.

8. Geology and Soils

The Kentucky Geological Survey prepared a report for the Water Resource Development Commission which described the geologic conditions of Oldham County (1940 to 2000). It states:

> "In Oldham County, water is obtained from consolidated sedimentary rocks of Ordovician, Silurian, and Devonian ages, and from unconsolidated sediments of Quaternary age. The oldest rocks found on the surface in Oldham County, the Drakes Formation, were deposited in shallow seas 490 million years ago during the Ordovician Period. In the Late Ordovician, the seas became relatively shallow, as indicated by the amounts of mud (shale) in the sediments. When the waters were clear and warm, a profusion of animal life developed, particularly brachiopods and bryozoa. Lying on top of the Ordovician rocks are the Silurian rocks, which were also deposited in warm seas, 430 million years ago. In Kentucky, the Silurian seas were commonly warm and clear, although the presence of some shale beds suggests that muddy conditions prevailed at times. Locally, numerous corals and brachiopods can be found in the Silurian limestones and dolomites. The Devonian New Albany Shale lies above the Silurian rocks.
>
> This shale, also called the black shale, was formed when the deep sea floor became covered with an organic black muck 400 million years ago. The muck is now hard black shale (an oil shale) and is one of the most distinctive of all geologic formations in Kentucky. Over the last million years, unconsolidated Quaternary sediments have been deposited along the larger streams and rivers."[4]

Figure 2.01-9 shows the Curry's Fork watershed overlain on its associated USGS geologic quadrangles. As Figure 2.01-9 shows, Curry's Fork is primarily underlain by rocks of the Ordovician ages with Silurian and some Devonian age along the watershed boundary, particularly on the north and west boundaries of the watershed.

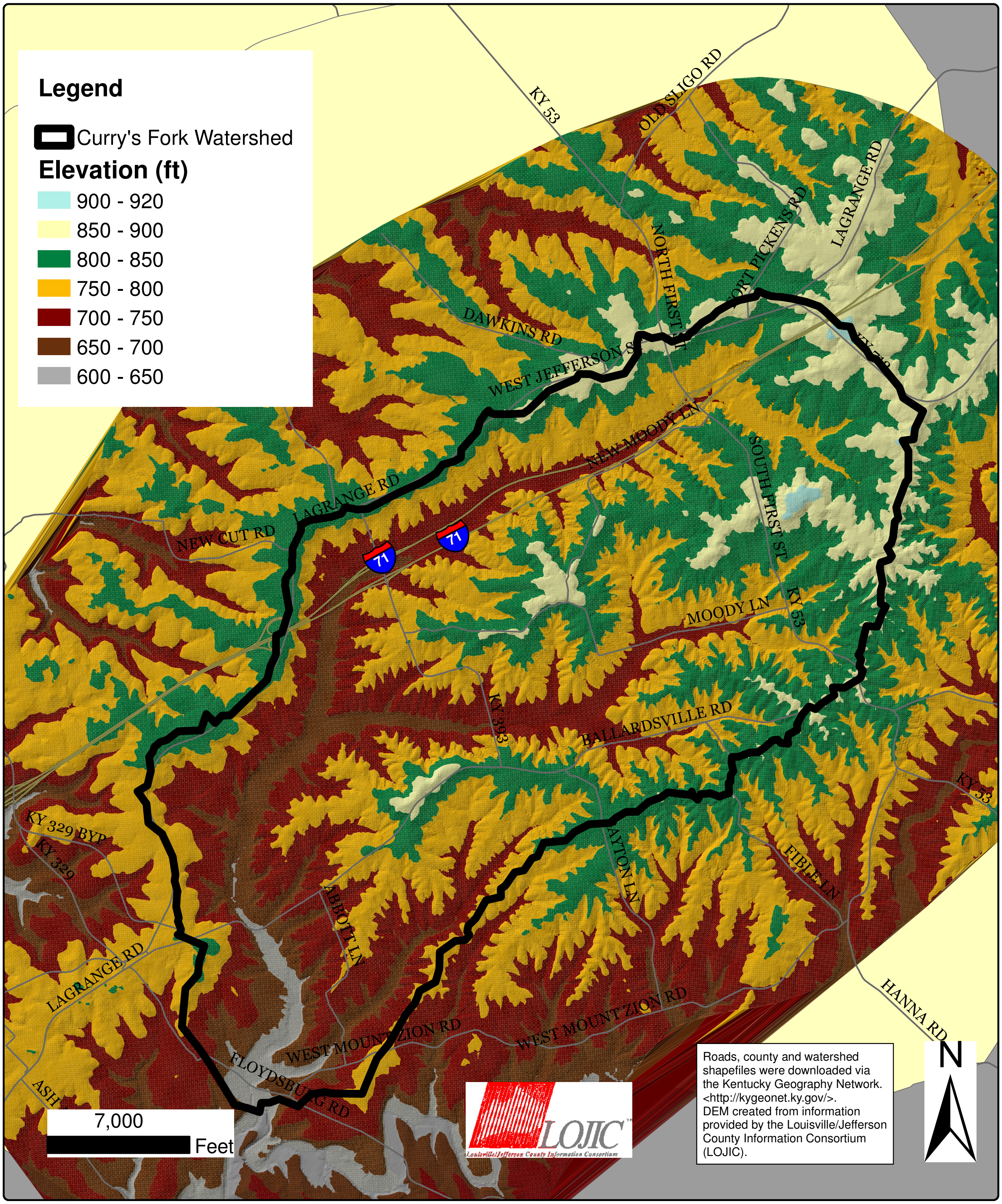


CURRY'S FORK WETLANDS

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.01-7
5994.100



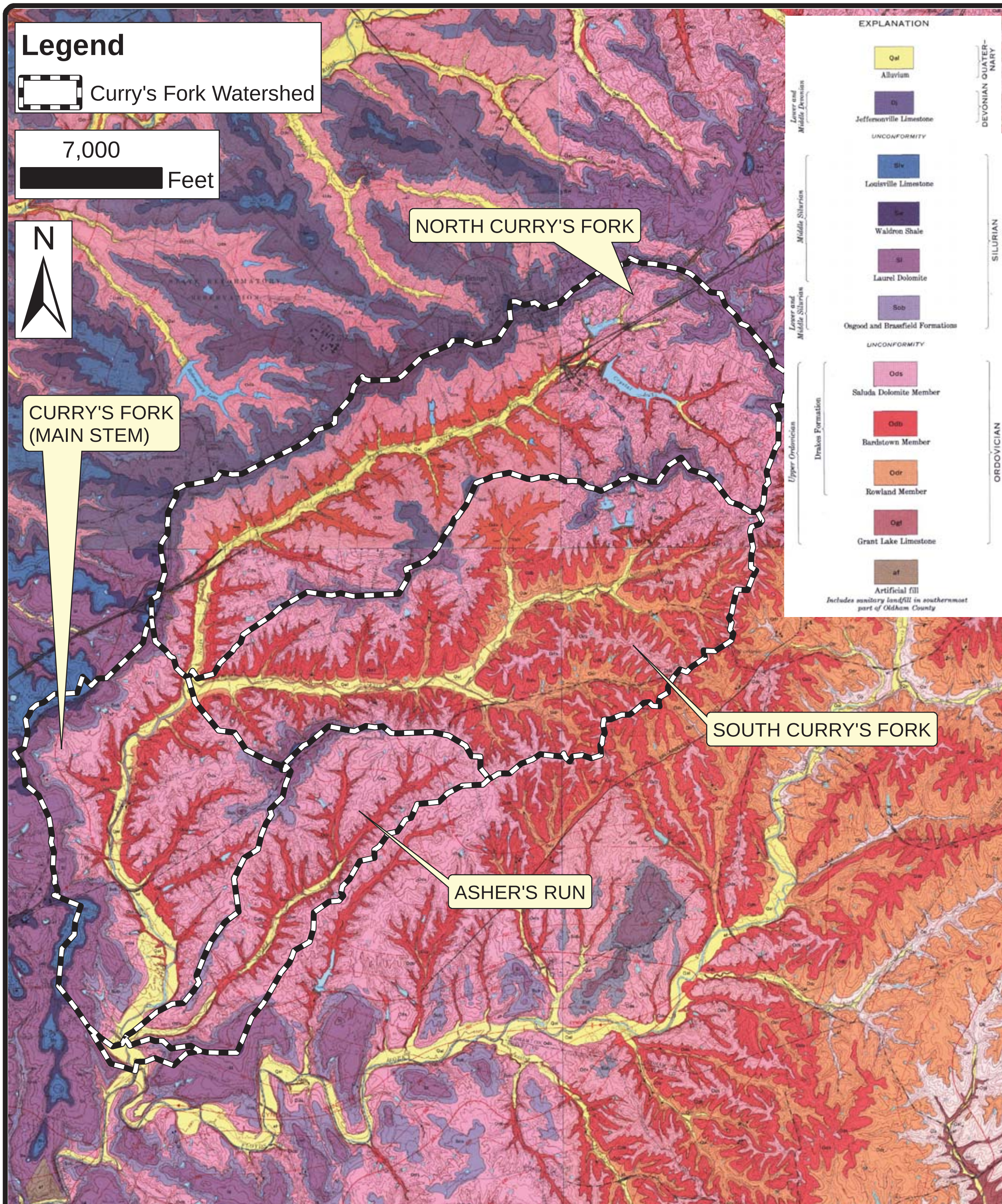
Roads, county and watershed shapefiles were downloaded via the Kentucky Geography Network. <http://kygeonet.ky.gov/>. DEM created from information provided by the Louisville/Jefferson County Information Consortium (LOJIC).

CURRY'S FORK DIGITAL ELEVATION MODEL

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.01-8
5994.100



CURRY'S FORK
GEOLOGIC QUADRANGLES

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.01-9
5994.100

The soils in Curry's Fork tend to delineate with the drainage patterns of the streams, as shown in Figure 2.01-10. The range of soil types contained in Curry's Fork is classified primarily as silt loam or loam. Furthermore, the Natural Resources Conservation Service (NRCS) classifies soils into four hydrologic groups based on potential soil runoff. The four classifications range from A to D, where A has the smallest potential for runoff and D the largest.

See Table 2.01-5 for a description of soil groups and the acreage in Curry's Fork designated as each soil type.

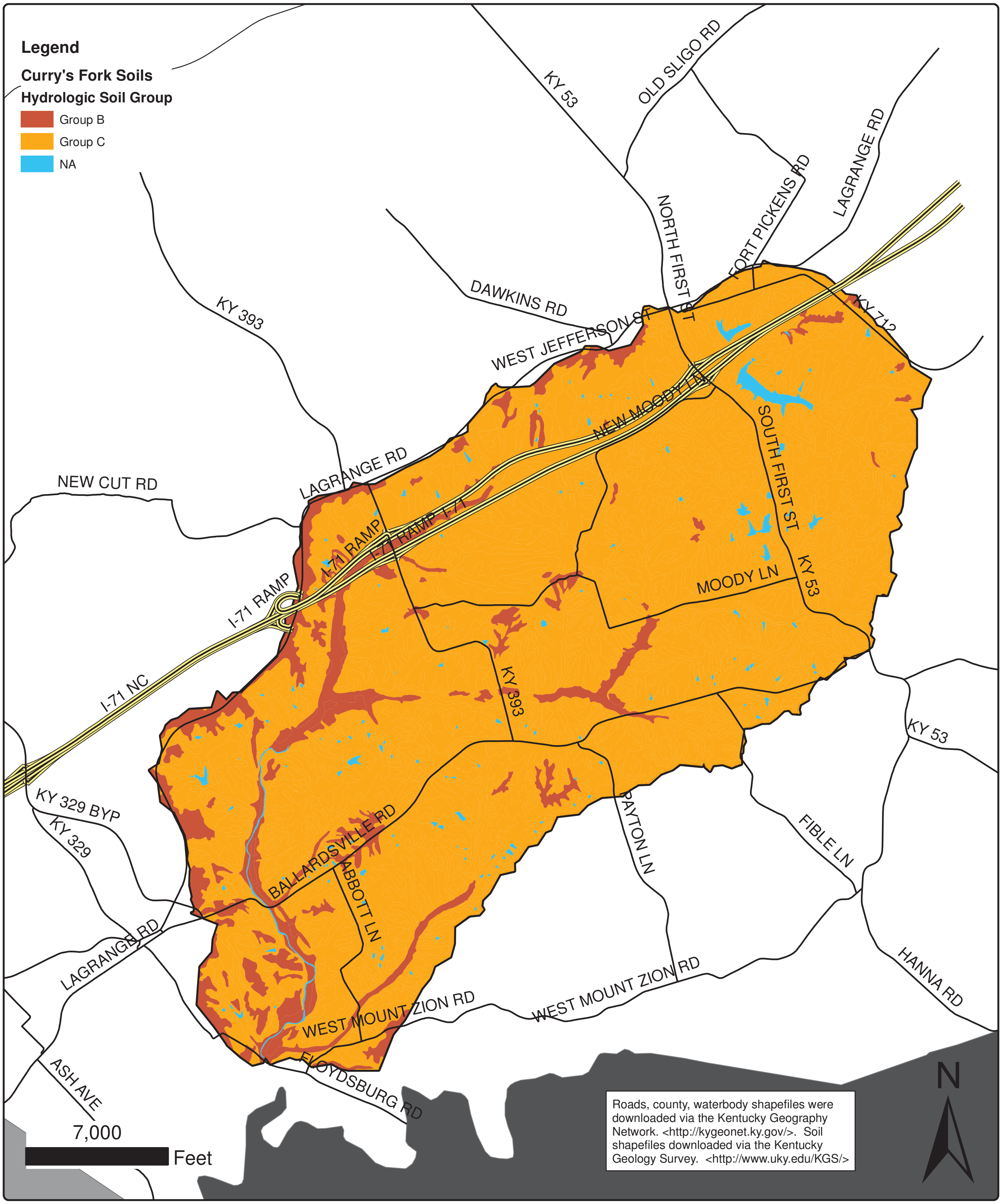
Group	Description	Minimum Infiltration Rate (mm/h)	Acreage Within Curry's Fork Designated to Each Soil Group
A	Deep sand; deep loess; aggregated silts.	>7.6	0
B	Shallow loess; sandy loam.	3.8-7.6	3,778
C	Clay loams' shallow sandy loam; soils low in organic content; soils usually high in clay.	1.3-3.8	19,002
D	Soils that swell significantly when wet; heavy plastic clays; certain saline soils.	0-1.3	0

Table 2.01-5 National Resource Conservation Service Soils

As shown in Figure 2.01-9, the majority of Curry's Fork is classified as Group C with small areas around the stream classified as Group B. Group C soils cover 82 percent of the watershed and Group B soils cover 16 percent of the watershed. The remaining area includes streams and lakes.

Class B soils are noted for high infiltration rates. However, as mentioned previously, in certain areas of the watershed the groundwater table is high, and therefore, these areas are classified as regions of moderate to high hydrogeologic sensitivity to groundwater pollution.

The Soil Conservation Service has published a book, *Soil Survey of Oldham County,* that details the attributes of the different types of soils located throughout Oldham County.[5, 6]



CURRY'S FORK SOIL HYDROLOGIC GROUP

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC. ENGINEERS

FIGURE 2.01-10
5994.100

2.02 LAND USE AND LAND COVER

A. Land Use and Land Cover Data

Land use characteristics are important factors in determining the sources of pollution throughout the watershed. Table 2.02-1 shows the 2001 land use data for the Curry's Fork watershed.

See Figure 2.02-1 for a map of the land use throughout the watershed. As shown, the primary land uses throughout the Curry's Fork watershed are forests, pasture/hay, and developed/open green space.

Extensive tree and other vegetative cover surrounding a stream is an important characteristic for protecting the stream from harmful pollutants and erosive flow. Large agricultural regions can denote fertilizer and pesticide pollutants, and regions designated as pasture/hay land use can add pollutants such as bacteria and nutrient from animal waste. These land use characteristics are particularly a concern when the buffer area surrounding the stream is limited.

Land Use	Acres	Square Miles	Percentage	Rank
Deciduous Forest	7,695	12.0	42.2%	1
Pasture/Hay	5,583	8.7	30.6%	2
Developed, Open Space	1,995	3.1	10.9%	3
Cultivated Crops	820	1.3	4.5%	4
Developed, Low Intensity	676	1.1	3.7%	5
Evergreen Forest	421	0.7	2.3%	6
Grassland/Herbaceous	393	0.6	2.2%	7
Developed, Medium Intensity	217	0.3	1.2%	8
Open Water	170	0.3	0.9%	9
Developed, High Intensity	86	0.1	0.5%	10
Mixed Forest	81	0.1	0.4%	11
Scrub/Shrub	50	0.1	0.3%	12
Emergent Herbaceous Wetlands	37	0.1	0.2%	13
Barren Land	27	0.0	0.1%	14
Woody Wetlands	2	0.0	0.0%	15
TOTAL	**18,253**	**28.5**		

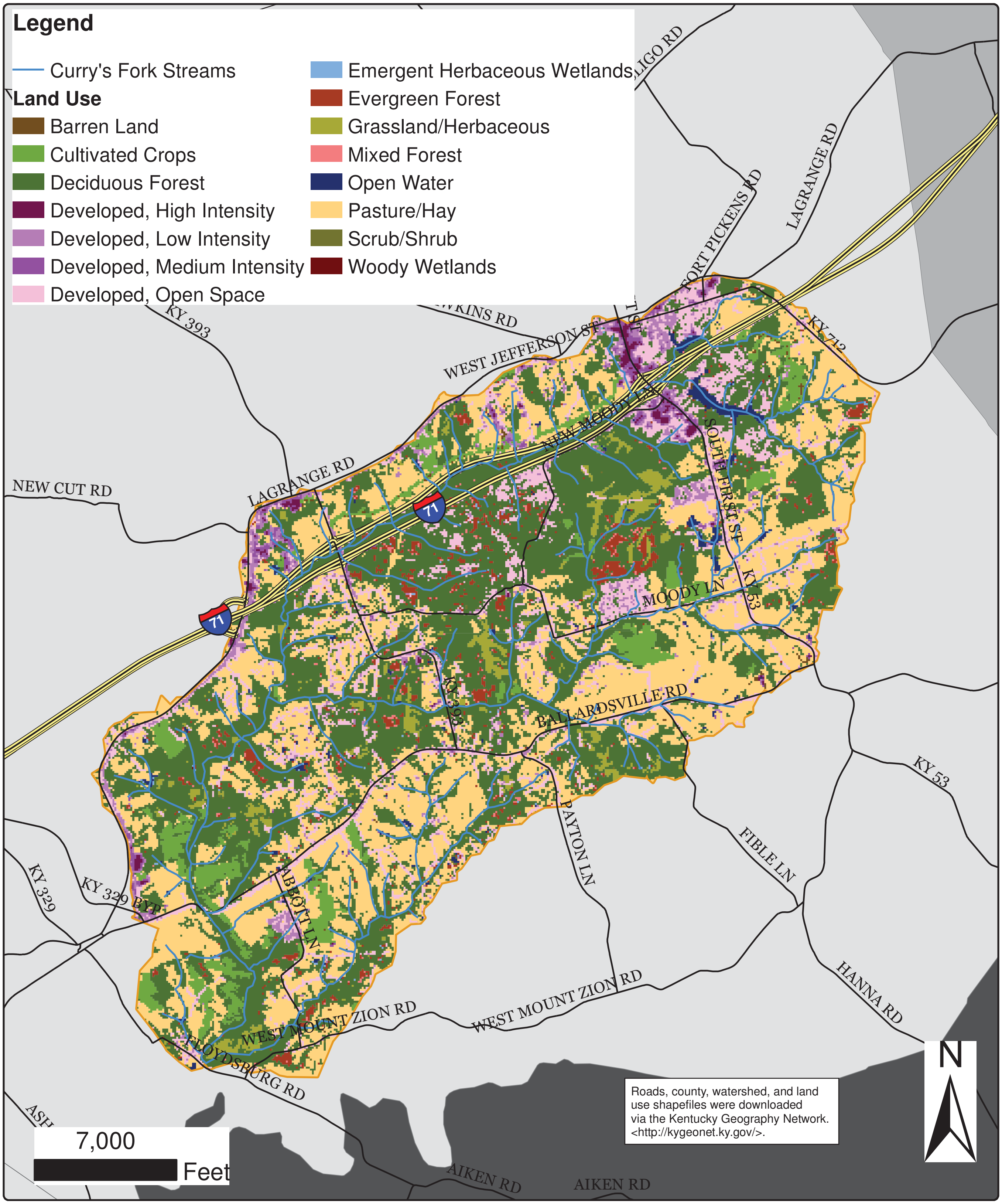
Source: http://landcover.usgs.gov/pdf/NLCD_pub_august.pdf

Table 2.02-1 2001 Watershed Land Use and Land Cover

Developed/open space includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn and landscaping. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.

Based on the 2001 data, low, medium, and high density development accounted for only 5 percent of the total watershed area. This type of development can result in increased bacteria, nutrients, and other pollutants in runoff and increases in erosive flows if not managed properly.

Since the 2001 land use data was published, Oldham County has experienced changes in land use because of growth and development. Within the Curry's Fork watershed, the percentage of developed/open space has increased with additional residential development while agricultural and forest space has decreased. Since 2001, twelve new residential subdivisions have been built within the watershed. The majority of development occurred before 2001 though so the land use changes are not as pronounced as other areas of Oldham County. The recent economic downtown has all but stopped this development activity. Since 2008 there has been little significant change to land use in the watershed.



2001 CURRY'S FORK LAND USE

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC. ENGINEERS

FIGURE 2.02-1
5994.100

B. Vegetation

The Kentucky Department for Environmental Protection, United State Environmental Protection Agency (USEPA), and Eastern Kentucky University partnered to develop and define ecoregions within Kentucky. An ecoregion is an area of land that has similarities in ecosystems and in type, quality, and quantity of environmental resources. Oldham County is located within the Outer Bluegrass ecoregion.

The land is mainly vegetated with pastureland and cropland along with interspersed wooded areas. Natural features such as trees and other vegetation protect the streams in terms of a buffer zone and provide habitat for wildlife.

C. Forested Areas and Riparian Buffers

The natural vegetative buffer strip or riparian vegetation is important and provides many benefits for a stream. The right combination of trees, shrubs, and native grasses can improve water quality by filtering chemicals and sediment before they reach the surface water. Riparian vegetation can also stabilize stream banks, prevent soil erosion, help moderate flooding, help recharge underground water supplies, and provide wildlife habitats.[6a]

Riparian vegetation can also help increase DO concentrations. The maximum DO concentration water can have is inversely proportional to the temperature. This means the lower the temperature, the higher the maximum DO concentration water can have until it becomes saturated and cannot hold more oxygen. Riparian vegetation provides shade for streams during the day, lowers stream temperature, and therefore increases the maximum potential DO.

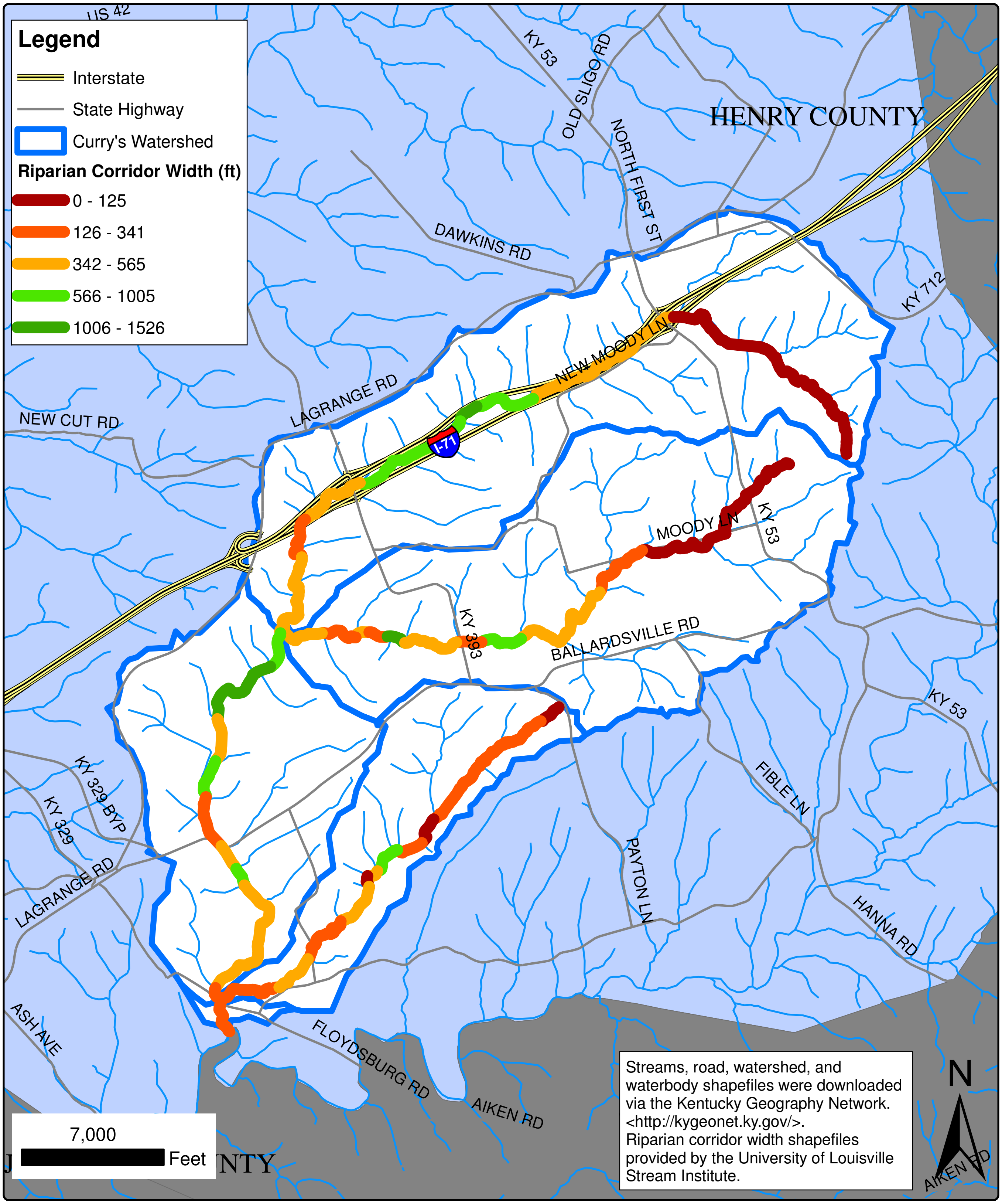
A review of aerial photography, land use, and field investigations indicates a lack of riparian vegetation primarily in the headwater areas of Upper North Curry's Fork, Upper South Curry's Fork, and Upper Asher's Run, and at the confluence of Curry's Fork and Asher's Run.

The middle and upper portion of the Curry's Fork main stem and Lower North Curry's Fork, especially between I-71, typically have wide, healthy riparian vegetation. Lower South Curry's and Lower Asher's Run have a mix of riparian vegetation widths that are dependent on development that has occurred near the streams. Figure 2.02-2 shows the measured riparian widths throughout Curry's Fork.

D. Zoning

In Oldham County, the zoning type is dependent on lot size, intended use, and required setbacks set by OCFC. The zone districts and setback requirements are shown in Appendix E.

Zoning information for the Curry's Fork watershed is described in Figure 2.02-3 and Table 2.02-2. There are three leading zoning codes that are predominate in the Curry's Fork watershed. The leading zoning codes include R-2 Residential District, which makes up 48 percent of the watershed; CO-1 Conservation District, which accounts for 20 percent; and R-1 Agricultural/Residential Districts, which makes up 12 percent. These zoning districts guide development in the watershed.

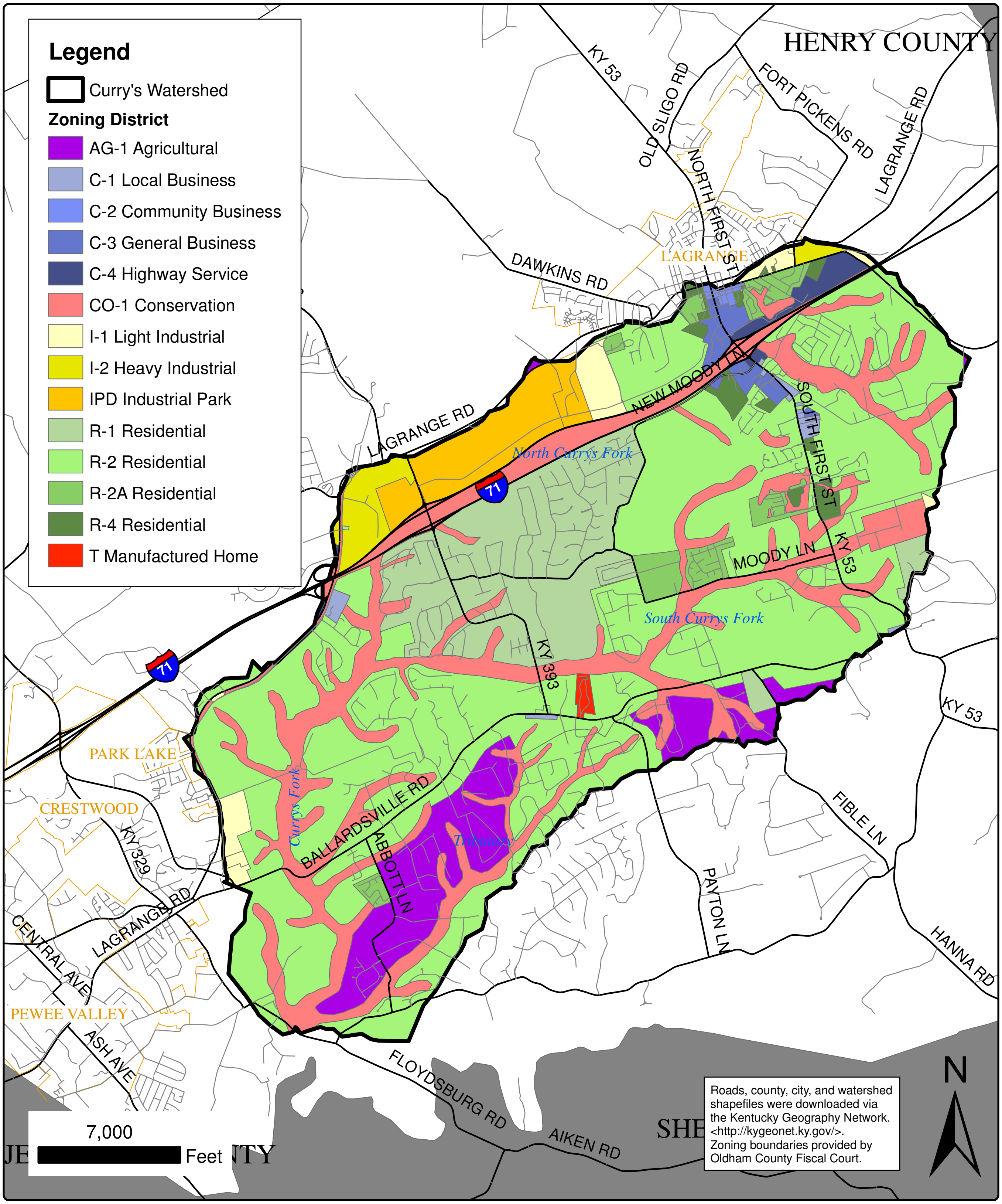


RIPARIAN CORRIDOR WIDTH

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.02-2
5994.100



CURRY'S FORK ZONING

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.02-3
5994.100

Category	Zone	Acres	Percentage
Agriculture	AG-1	1,206	7%
Agriculture	Industrial Park District	498	3%
Agriculture		***1,704***	***9%***
Commercial	C-1 (local business)	85	0%
Commercial	C-2 (community business)	0	0%
Commercial	C-3 (general business)	181	1%
Commercial	C-4 (highway service)	149	1%
Commercial		***415***	***2%***
Conservation	CO-1	3,682	20%
Conservation		***3,682***	***20%***
Industrial	I-1 (light industrial)	332	2%
Industrial	I-2 (heavy industrial)	291	2%
Industrial	Industrial Park District	179	1%
Industrial		***803***	***4%***
Residential	R-1 (lower density)	2,217	12%
Residential	R-2 (lower density)	8,635	48%
Residential	R-2A (medium density)	446	2%
Residential	R-4 (high density)	188	1%
Residential		***11,486***	***63%***
Special	T (manufactured home)	37	0%
Special		***37***	***0%***

Table 2.02-2 Curry's Fork Zoning

The residential zones are the most conducive for development and most of the new subdivisions in the watershed are located in these zoning districts. The Oldham County Comprehensive Zoning Ordinance describes the purpose of the R-2 Residential District as follows:

> "The purpose of the R-2 Residential District is to allow, preserve, and protect the character of low density, detached single-family areas and neighborhoods at densities of up to 3.63 dwelling units per acre" (p. 15).

Page 9 of the Comprehensive Zoning Ordinance also states:

> "The Conservation District is intended to promote and protect significant natural features, wooded areas, water courses, existing, and potential lake sites, other recreational and conservation resources, wildlife, habitat, present and future water supplies, and to minimize erosion of soil and the siltation and pollution of streams and lakes".

The conservation zone is located primarily along stream corridors in the watershed and provides protection for the streams.

Oldham County has developed guidelines to minimize impacts on wetlands as development occurs around and within these areas. For example, the Oldham County Comprehensive Zoning Ordinance protects all wetlands that meet the United States Army Corps of Engineers' (USACE) jurisdictional wetland standards. According to this ordinance, "the USACE defines wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances, do support a prevalence of vegetation typically adapted to life in saturated soil conditions." This ordinance also calls for the protection of other natural resources.[7]

Finally, the R-1 Agricultural/Residential District is the third most prominent zoning district in the watershed whose purpose is described as follows in the Oldham County Comprehensive Zoning Ordinance:

> "The purpose of the R-1 Residential District is to allow, preserve, and protect the character of low density, detached single-family areas and neighborhoods at densities ranging from one dwelling unit per acre up to 2.17 dwelling units per acre."

This zoning district also limits the types of development possible in the watershed, largely in the northwest section.[7]

E. Subdivisions and Developed Areas

As one of the fastest growing areas in the Commonwealth of Kentucky, according to population estimates from 2000 to 2009 by the United States Census Bureau, Oldham County is becoming more densely developed (see Subsection 2.03 for more information regarding population trends in Oldham County). In addition, an increased number of subdivisions were developed throughout the Curry's Fork watershed. Increased development results in more impervious areas, which typically leads to increased sources of pollution and higher quantities of stormwater runoff entering streams at faster runoff rates. The increase in development also results in the need for new or expanded private and public [Kentucky Pollutant Discharge Elimination System (KPDES)-permitted] wastewater treatment systems. If not properly managed, development can have a negative impact on local streams. Figure 2.02-4 represents the subdivisions throughout the watershed and shows the year they were constructed. As shown in this figure, development tends to congregate along major roads with access to and from I-71 that are appropriately zoned.

F. Transportation

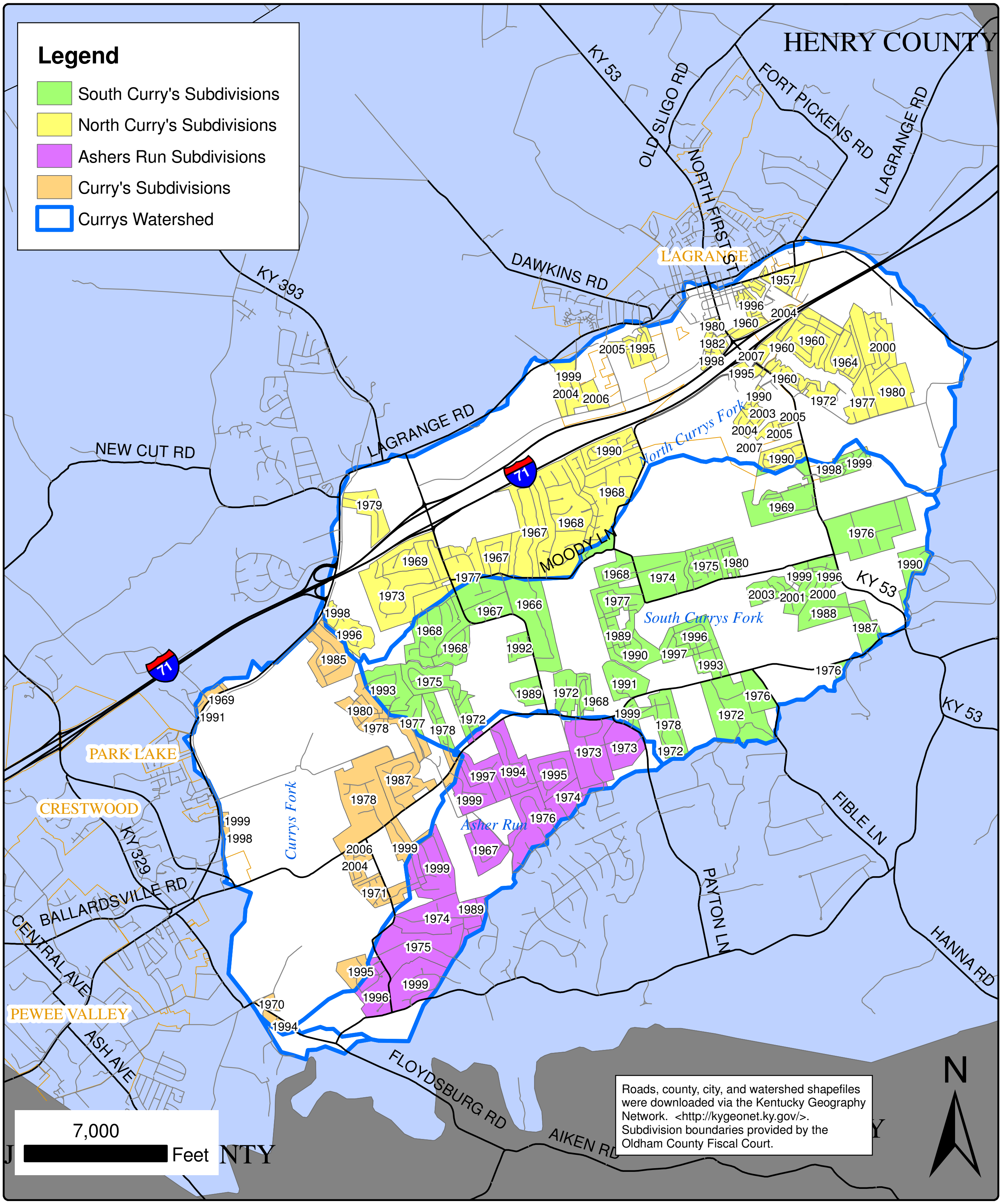
Interstate 71 runs through the north section of the Curry's Fork watershed that connects Crestwood to La Grange and on a larger scale Louisville to Cincinnati. State highways and local roads provide transportation infrastructure. The major state and local roads are Ballardsville Road, Moody Lane, KY 393, Abbott Lane, and Floydsburg Road (see Figure 2.02-5).

There is an active railroad line located along the northwestern border of the watershed.

Roads and highways increase the amount of impervious area and can be a source of pollutants such as total suspended solids (TSS), metals, and salts. Furthermore, highway/road/bridge runoff is listed as a source of impairment in the 303(d) List.

G. Livestock

As defined in Subsection 2.02: Land Use and Land Cover and shown in Table 2.02-1, pasture/hay is one of the predominant land use characteristic in the Curry's Fork watershed. Sporadic pasture-based livestock operations are located within the watershed. Despite the significant amount of land designated as pasture/hay, livestock operations are not a common practice throughout the watershed.

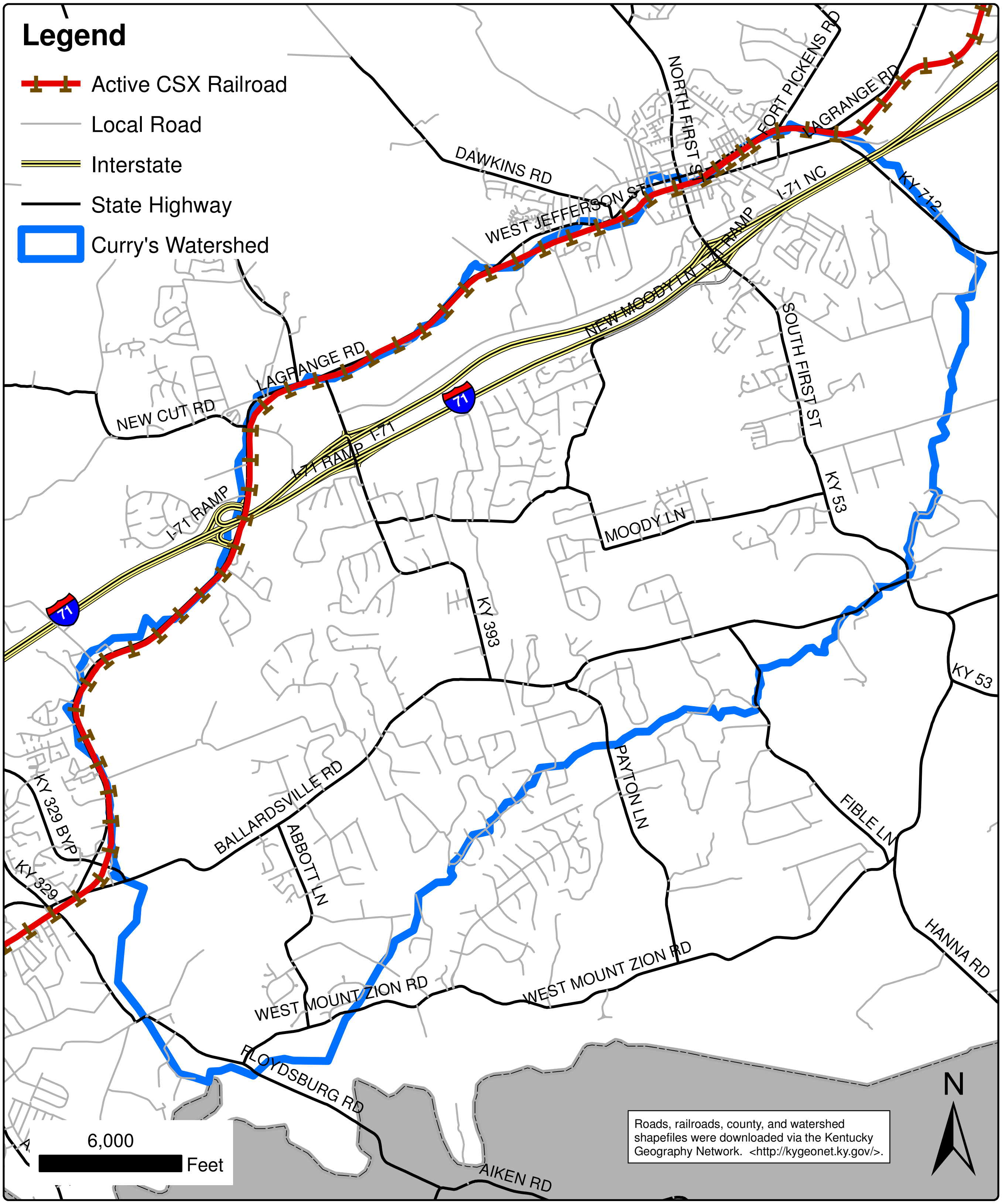


CURRY'S FORK SUBDIVISIONS

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.02-4
5994.100



CURRY'S FORK TRANSPORTATION

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.02-5
5994.100

The 2007 Census of Agriculture, published by the United States Department of Agriculture (USDA) and Kentucky Agricultural Statistics Service, reports on farms and ranches in the United States. It provides information regarding land use and ownership, operator characteristics, production practices, and income and expenditures. Most importantly for this document, it provides information on the number of livestock located in each county throughout the United States.

Table 2.02-3 represents the livestock inventory throughout Oldham County.[8] Based on the January 2010 county cattle estimates, cattle is split approximately equally between beef and dairy cows.[9] Horses are relatively common in Oldham County but are primarily located outside of the Curry's Fork watershed.

Livestock	No.
Cattle	8,319
Ducks	323
Hogs/Pigs	18
Horses/Ponies	2,838
Layers	669
Other Poultry	526
Other/Livestock	280
Sheep/Lambs	73
Turkeys	N/A

Table 2.02-3 2007 Oldham County Livestock Estimates

There are 461 farms in Oldham County. Within the Curry's Fork watershed, many farms tend to be smaller operations consisting of only a few animals or are marginally active. There are a few small farm operations in the South Curry's Fork, Curry's Fork main stem, and Asher's Run subwatersheds. The relatively high rank of "other animals" support reports of nontraditional farm animals being kept.

H. <u>Fish and Wildlife</u>

The Kentucky Department of Fish and Wildlife Resources (KDFWR) publishes a list of species observations for selected counties. In this list, the Kentucky State Nature Preserves Commission (KSNPC) specifies whether the species is endangered, threatened, special concern, historic, extirpated, or not of concern. Table 2.02-4 lists the species and status included in the December 2009 KSNPC County List Report.

(remainder of page intentionally left blank)

TABLE 2.02-4

THREATENED AND/OR ENDANGERED SPECIES IN OLDHAM COUNTY

Taxonomy Group	Scientific Name	Common Name	KSNPC Status	US Fish and Wildlife Status
Vascular Plants	*Castanea pumila*	Allegheny Chinkapin	T	
Vascular Plants	*Dichanthelium boreale*	Northern Witchgrass	S	
Vascular Plants	*Dryopteris carthusiana*	Spinulose Wood Fern	S	
Vascular Plants	*Heteranthera dubia*	Grassleaf Mud-plantain	S	
Vascular Plants	*Ranunculus ambigens*	Waterplantain Spearwort	S	
Vascular Plants	*Vallisneria americana*	Eelgrass	S	
Vascular Plants	*Veratrum woodii*	Wood's Bunchflower	T	
Vascular Plants	*Vitis labrusca*	Northern Fox Grape	S	
Freshwater Mussels	*Cyprogenia stegaria*	Fanshell	E	LE
Freshwater Mussels	*Fusconaia subrotunda*	Longsolid	S	
Freshwater Mussels	*Lampsilis abrupta*	Pink Mucket	E	LE
Freshwater Mussels	*Lampsilis ovata*	Pocketbook	E	
Freshwater Mussels	*Obovaria retusa*	Ring Pink	E	LE
Freshwater Mussels	*Plethobasus cyphyus*	Sheepnose	E	C
Freshwater Mussels	*Pleurobema plenum*	Rough Pigtoe	E	LE
Freshwater Mussels	*Pleurobema rubrum*	Pyramid Pigtoe	E	SOMC
Freshwater Mussels	*Quadrula fragosa*	Winged Mapleleaf	X	LE
Freshwater Mussels	*Villosa lienosa*	Little Spectaclecase	S	
Crustaceans	*Orconectes jeffersoni*	Louisville Crayfish	E	SOMC
Insects	*Nehalennia irene*	Sedge Sprite	E	
Insects	*Satyrium favonius ontario*	Northern Hairstreak	S	
Fishes	*Percopsis omiscomaycus*	Trout-perch	S	SOMC
Breeding Birds	*Aimophila aestivalis*	Bachman's Sparrow	E	SOMC
Breeding Birds	*Ammodramus henslowii*	Henslow's Sparrow	S	SOMC
Breeding Birds	*Bartramia longicauda*	Upland Sandpiper	H	
Breeding Birds	*Botaurus lentiginosus*	American Bittern	H	
Breeding Birds	*Chondestes grammacus*	Lark Sparrow	T	
Breeding Birds	*Cistothorus platensis*	Sedge Wren	S	
Breeding Birds	*Dolichonyx oryzivorus*	Bobolink	S	
Breeding Birds	*Passerculus sandwichensis*	Savannah Sparrow	S	
Breeding Birds	*Riparia riparia*	Bank Swallow	S	
Breeding Birds	*Thryomanes bewickii*	Bewick's Wren	S	SOMC
Mammals	*Myotis grisescens*	Gray Myotis	T	LE

KSNPC Status:		US Fish and Wildlife Status:		
N or Blank =	None	Blank =	None	
E =	Endangered	C =	Candidate	
T =	Threatened	LT =	Listed as Threatened	
S =	Special Concern	LE =	Listed as Endangered	
H =	Historic	SOMC =	Species of Management	
X =	Expirated		Concern	

Source: County Report of Endangered, Threatened, and Special Concern Plants, Animals, and Natural Communities of Kentucky. Kentucky State Nature Preserve Commission, December 2009.

I. Impervious Cover

Figure 2.02-6 and Table 2.02-5 show the amount of impervious cover in the Curry's Fork subwatersheds. Curry's Fork has an overall percent impervious cover of about 8 percent. The subwatershed with the highest percentage of impervious cover is North Curry's Fork at 10.5 percent because part of La Grange is located within its boundary. All other subwatersheds have an impervious cover of less than 8 percent because there are no other large impervious areas or cities located within them.

Subwatershed	Building Area (acres)	Road Area (acres)	Driveway Area (acres)	Total Impervious Area (acres)	Watershed Area (acres)	Percent Impervious
North Curry's Fork						
Upper	29.1	27.1	42.2	98.4	1,396.0	7.0%
Lower	153.9	185.2	238.4	577.5	5,037.1	11.5%
Subtotal	**182.9**	**212.3**	**280.6**	**675.9**	**6,433.1**	**10.5%**
South Curry's Fork						
Upper	28.8	27.5	42.5	98.8	1,670.0	5.9%
Lower	92.5	76.1	127.2	295.8	4,260.7	6.9%
Subtotal	**121.2**	**103.6**	**169.7**	**394.6**	**5,930.7**	**6.7%**
Asher's Run						
Upper	27.6	25.4	33.0	86.0	1,010.2	8.5%
Lower	20.7	23.4	28.8	72.9	1,157.9	6.3%
Subtotal	**48.3**	**48.8**	**61.8**	**158.8**	**2,168.2**	**7.3%**
Curry's Fork - Main Stem						
Main Stem	49.6	56.5	88.5	194.6	3,721.0	5.2%
Curry's Fork - Entire Watershed						
Watershed Total	**402.0**	**421.2**	**600.6**	**1,423.9**	**18,252.9**	**8%**

Source: Impervious areas created from information provided by the Louisville/Jefferson County Information Consortium (LOJIC).

Table 2.02-5 Curry's Fork Impervious Cover

J. Future Land Use Changes

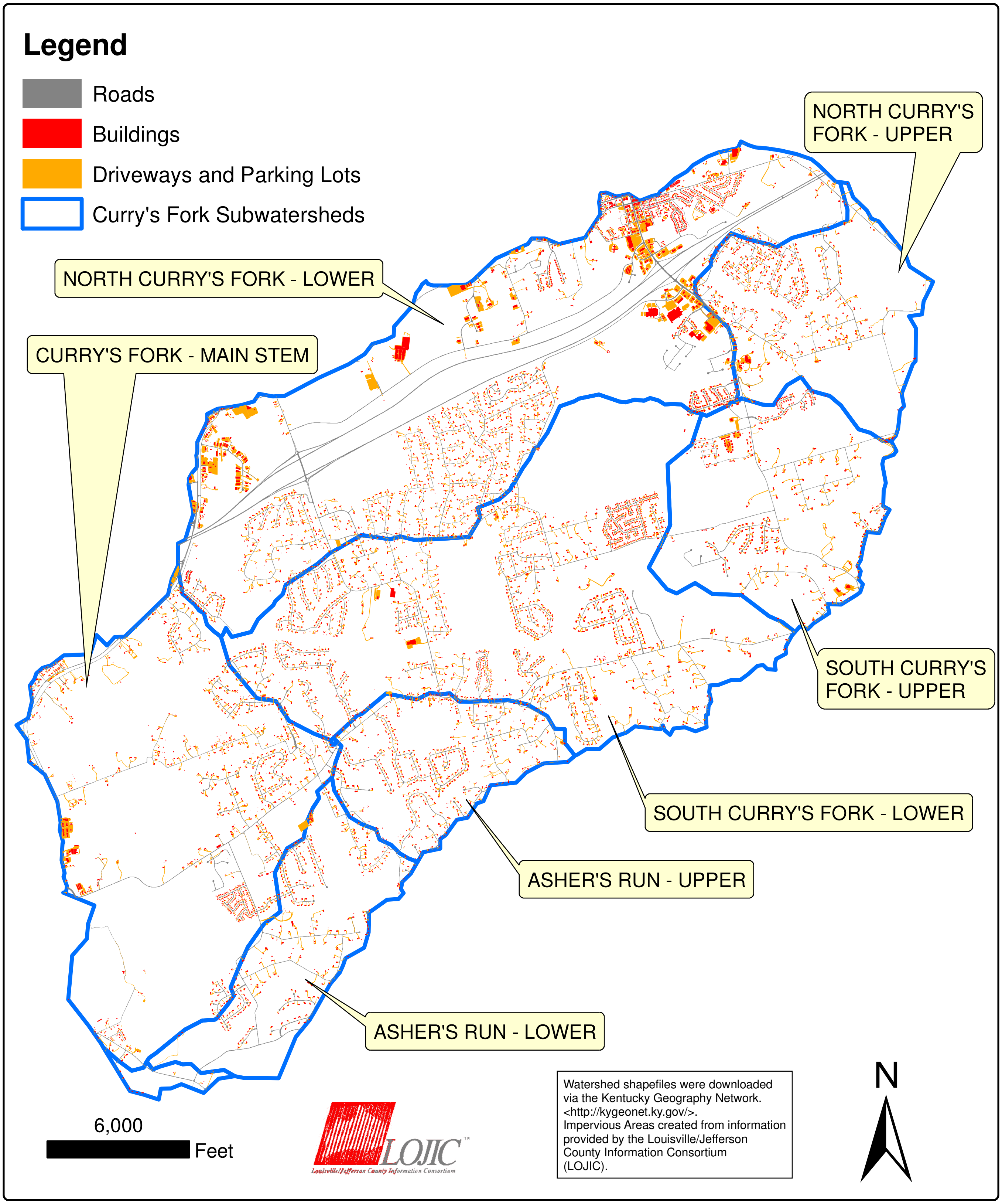
In May of 1999, Oldham County elected officials, Planning Commission members, and vested stakeholders began developing a document that created a vision for the future of Oldham County: Outlook 2020; The Future by Design. This document establishes the goals and objectives for the community as it develops and grows. It includes policies related to land use, transportation, community facilities, the environment, the government, business, and industry.

Future land use goals from the Outlook 2020 document include the following:

1. Provide for planned and orderly growth to protect land from premature or unsuitable development.

2. Encourage the preservation and development of a range of housing opportunities.

3. Plan for economic development that provides for increased tax revenues with a wide variety of employment opportunities that support the maintenance of a high level of community facilities and services and provide job opportunities for Oldham County residents.



CURRY'S FORK IMPERVIOUS AREAS

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.02-6
5994.100

4. Maintain a consistent and understandable development review process that encourages and accommodates citizen involvement in decisions affecting and implementing the Comprehensive Plan.

Transportation goals include the following:

1. Provide the citizens of Oldham County with a well-planned and coordinated system of major thoroughfares and collectors that are safe, cost-effective, and responsive to planned growth and development.

2. Coordinate the Major Thoroughfare Plan with other modes of travel, including bus transit, rail, airport, pedestrian, and bicycle to comprehensively address mobility issues and needs within Oldham County.

3. Protect and preserve scenic or culturally important transportation corridors and resources.

Community facility goals include the following:

1. Provide for needed community facilities and services (where infrastructure can support it), through the wise, planned, and equitable use of the community's monetary, physical, and human resources.

2. Plan, establish guidelines, and coordinate efforts for appropriate levels of sewage disposal, potable water, and solid waste collection and disposal services to urban and rural areas within Oldham County in conjunction with the agencies that have jurisdiction of these services.

3. Maintain Oldham County's high level of educational and enrichment opportunities through continued investment in the human and physical resources necessary to meet educational, informational, and diverse recreational needs of a growing population.

4. Provide a system of public parks, diverse recreation facilities, open spaces, and greenways that support the preservation of the county's natural and scenic resources, wildlife habitats, and serve neighborhoods and communities.

Environmental goals include the following:

1. Preserve and improve the quality of Oldham County's natural resources, including water, air, and soil, while protecting the health, safety, and welfare of its citizens through a watershed based approach to environmental planning and stormwater management.

2. Allow site development that does not adversely impact environmental features and resources, or air quality, and minimizes noise and lighting impacts to or from adjacent and nearby uses.

3. Protect and enhance the Ohio River corridor, and its tributaries as a valuable county natural resource.

Governmental goals include the following:

1. Participate with local jurisdictions, neighboring and regional counties, cities, governmental agencies, transportation agencies, utilities, planning commissions, stakeholders, landowners, and business development groups in developing solutions for common issues or opportunities.

2. Provide a high level of police, fire, and emergency medical services to all areas of the county.

Business and industrial goals include the following:

1. Promote business and industrial development that is compatible with Oldham County's vision statement to provide an increased and balanced property tax base, and more jobs in Oldham County, with higher average wages.

2. Maintain the county's incorporated cities as attractive centers for public and private business activity.

3. Support and encourage agriculture for the purpose of recognizing the cultural heritage of the community and the agricultural contribution to the economic base.[10]

Several areas within Curry's Fork are identified for additional development; the two largest areas are Commerce Parkway and the Oldham Reserve. Potential Commerce Parkway development would be located along Commerce Parkway on the north side of I-71 between Highway 393 and Button Lane.

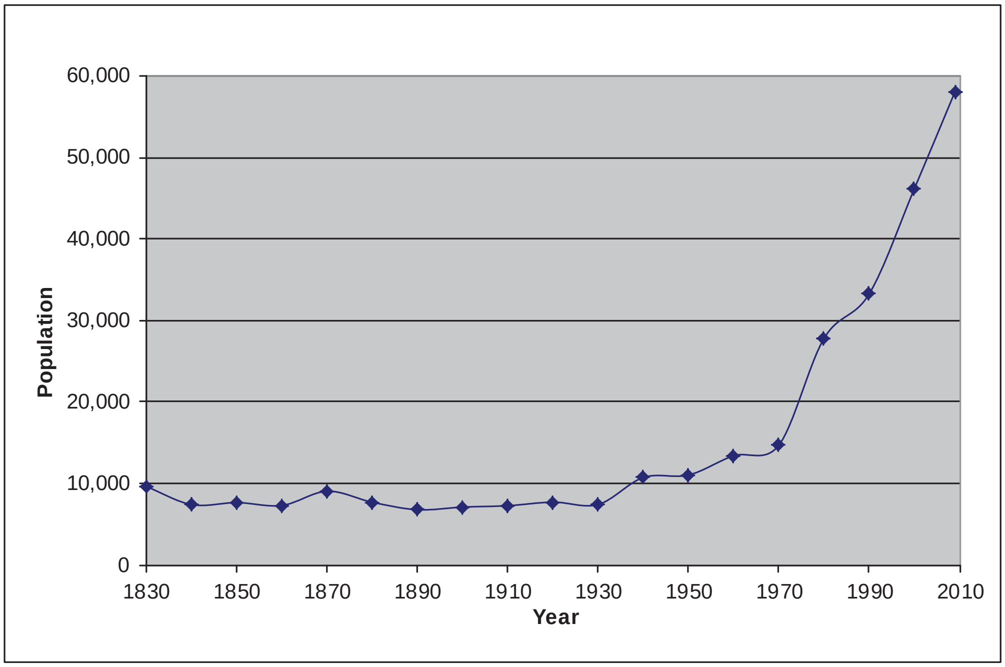
The Oldham Reserve is approximately 1,000 acres planned for office, retail, and residential development located immediately southwest of La Grange along New Moody Lane. Additional residential development is also anticipated in South Curry's Fork between Evergreen Road and Fox Trail Drive.[10]

2.03 DEMOGRAPHIC CHARACTERISTICS

A. Population Growth

Oldham County had the eighth highest population increase and the sixth highest percent population increase in Kentucky with a 26 percent increase in population from 2000 to 2009 based on population from the United States Census Bureau.

The population was relatively stable from its formation in 1823 until about 40 years ago. Since 1970, the population has more than tripled and has grown at a consistent rate of approximately 1,100 capita per year (see Figure 2.03-1 for historical population trends).



Source: 2010 United States Census Bureau

Figure 2.03-1 Oldham County Historical Population Trends: Years 1840 to 2009

Although this county was previously a predominantly rural and agricultural community, development from the Louisville metropolitan area has spread into Oldham County causing a significant increase in suburban growth in this area. This increase in population results in new developments, urbanization, and increased impervious area throughout the watersheds.

Furthermore, significant population growth and development results in more sources of pollution and higher quantities of stormwater runoff entering streams at faster runoff rates, as well as an increased demand for wastewater needs throughout the region. Oldham County experienced a large growth spurt from 1980 to 2000 when the population jumped from approximately 27,000 to 46,000 (increasing 66 percent). From 2000 to 2009, the county population increased approximately 26 percent. The Oldham County Outlook 2020 Comprehensive Plan reports that the percent change in population from 1990 to 2020 is projected to be 38.8 percent. La Grange alone is predicted to have a population increase of 41.5 percent.[10,11]

B. Demographics

Table 2.03-1 presents the 2010 census information for Oldham County. The 2010 census table summarizes demographic information and provides a frame of reference. The national average is included. As noted, the median age is 38.6 years and 73.3 percent of the people in Oldham County are between the ages of 18 and 66.

Oldham County is one of the most educated counties in the state of Kentucky; 90.6 percent of the population are high school graduates or higher, and 37.1 percent have earned a bachelor's degree or higher.[11]

C. Economics

As shown in Table 2.03-1, Oldham County is relatively wealthy in comparison to the national averages.

The median household income is $25,000 or more above the national average. The percentage of individuals and families below the poverty line is also about one-third of the national average. Furthermore, according to the Oldham County Outlook 2020 Comprehensive Plan, the predicted job growth increase from 1990 to 2020 represents more than 14,400 new jobs, a percentage increase of about 110 percent over the 30-year period.

However, the current economic condition may skew these predictions, as they were made about 10 years ago.[11]

(remainder of page intentionally left blank)

TABLE 2.03-1–OLDHAM COUNTY CENSUS DATA 2010

	Oldham County No.	Oldham County Percentage	United States Statistics
General Characteristics			
Total population	56,194		
Male	29,895	53.2	49.30%
Female	26,299	46.8	50.70%
Median age (years)	38.6	(X)	36.5
Under 5 years	3,208	5.7	6.90%
18 years and over	41,204	73.3	75.40%
65 years and over	4,711	8.4	12.60%
One race	55,673	99.1%	97.8%
White	51,748	92.1	74.50%
Black or African American	2,816	5	12.40%
American Indian and Alaska Native	105	0.2	0.80%
Asian	565	1	4.40%
Native Hawaiian and Other Pacific Islander	52	0.1	0.10%
Some other race	387	0.7	5.60%
Two or more races	521	0.9	2.20%
Hispanic or Latino (of any race)	1,350	2.4%	15.1%
Household population	51,944		
Group quarters population	(X)	(X)	(X)
Average household size	2.71	(X)	2.6
Average family size	3.02	(X)	3.19
Total housing units	20,168		
Occupied housing units	19,144	94.9%	88.2%
Owner-occupied housing units	16,483	86.1%	66.9%
Renter-occupied housing units	2,661	13.9%	33.1%
Vacant housing units	1,024	5.1%	11.8%
Social Characteristics			
Population 25 years and over	36,985		
High school graduation or higher	(X)	90.6%	84.6%
Bachelor's degree or higher	(X)	37.1%	27.5%
Civilian veterans (civilian population 18 years and over)	4,597	11.2%	10.1%
Disability status (population 5 years and over)	(X)	(X)	(X)
Foreign born	1,629	2.9%	12.4%
Male, now married, except separated (population 15 years and over)	14,779	62.1	52.3%
Female, now married, except separated (population 15 years and over)	13,142	65.2	48.4%
Speak a language other than English at home (population 5 years and over)	1,965	3.7	19.6%
Economic Characteristics			
In labor force (population 16 years and over)	28,015	65.3	65.0%
Mean travel time to work in minutes (workers 16 years and over)	25.3	(X)	25.2
Median household income (in 2009 inflation adjusted dollars)	78,460	(X)	51,425
Median family income (in 2009 inflation adjusted dollars)	90,159	(X)	62,363
Per capita income (in 2009 inflation adjusted dollars)	34,731	(X)	27,041
Families below poverty level	(X)	3.3	9.9%
Individuals below poverty level	(X)	5.4	13.5%

Source: 2000 US Census

2.04 WASTEWATER, WATER, AND STORMWATER

A. Kentucky Pollutant Discharge Elimination System Permits

The National Pollutant Discharge Elimination System (NPDES) Program was established by the Federal Water Pollution Control Act Amendments of 1972 and has significantly reduced the amount of pollutant discharges in streams across the country. The program requires states to quantify and develop the pollutant loadings that can be discharged into the streams without being detrimental to water quality. Kentucky waters are regulated by the KPDES program. Under KPDES, all facilities that discharge waste from any point source into waters of the United States must obtain a permit from the Commonwealth of Kentucky. A point source is considered to be any concentrated discharge into the environment, for example, end-of-pipe discharges from a WWTP.

The permit process provides two levels of control including technology-based limits and water quality-based limits. Technology-based limits are determined by the ability of the same industrial or municipal dischargers to treat wastewater.

If technology-based limits are not adequate, water quality-based limits are set to protect the water body. Furthermore, the three categories of pollutants regulated by the NPDES program include conventional pollutants, such as the five-day biochemical oxygen demand, total suspended solids (TSS), pH, fecal coliform, oil and grease; toxic pollutants such as metals and manmade organics; and nonconventional pollutants such as ammonia, nitrogen, phosphorus, chemical oxygen demand, and whole effluent toxicity.

Through the permitting process, the locations of point sources are known and it is relatively easy to characterize the flow and type of pollutants that may be discharging. KPDES-permitted discharge points typically have a registered latitude and longitude point. Many permitted facilities are required to monitor their discharge for specified pollutants based on industry standards.

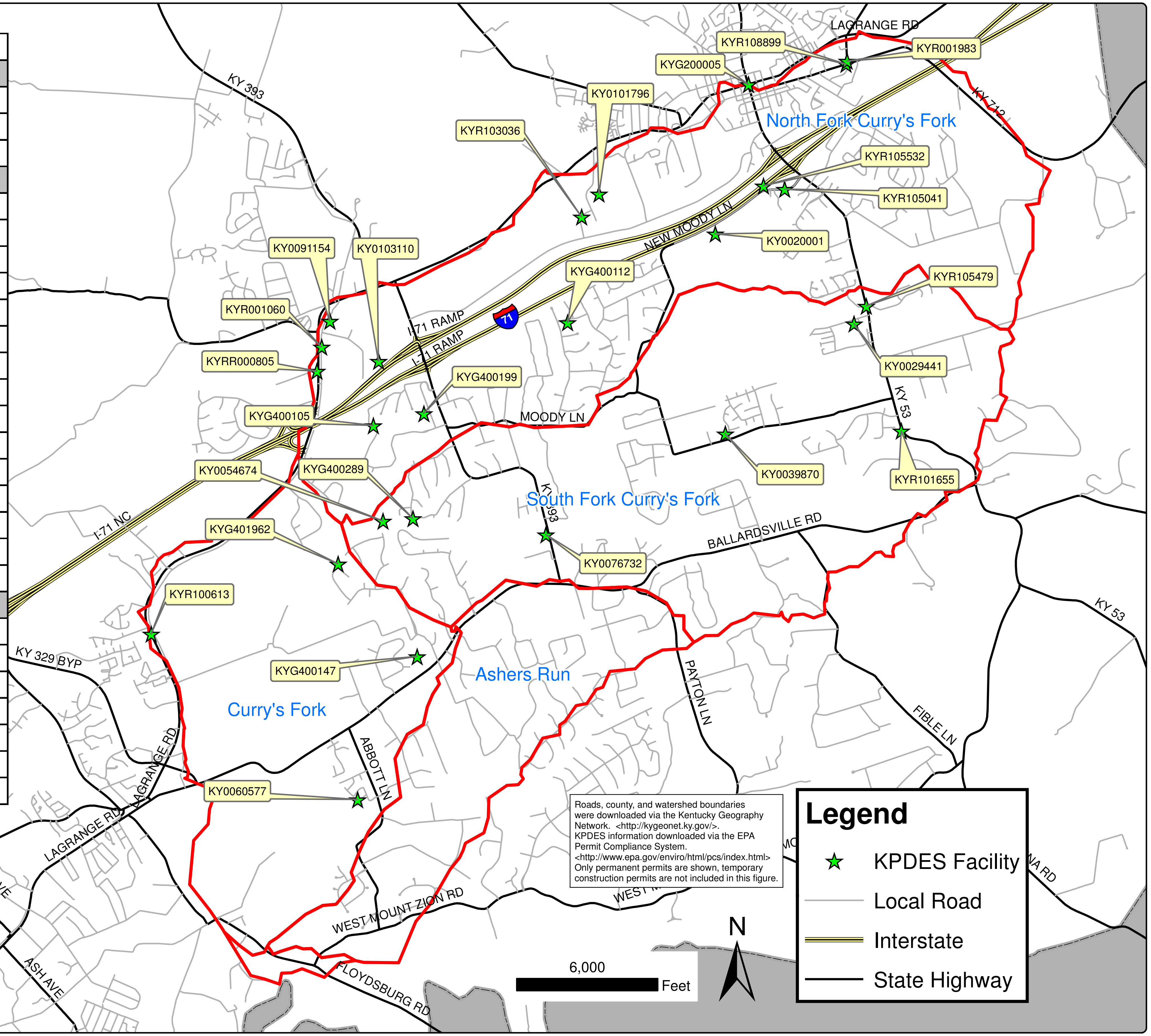
Over 25 KPDES-permitted facilities were located throughout the Curry's Fork watershed at the time of this report. Stormwater KPDES permits and their associated construction/erosion control permitting for the municipal separate stormwater system (MS4) communities are discussed separately in Subsection 2.06. Figure 2.04-1 shows the location of KPDES sites within the Curry's Fork watershed. Table 2.04-1 lists the KPDES sites and their standard industrial classification (SIC) code. SIC codes are used by business and governments to classify business establishments according to the type of economic activity. There are no KPDES facilities within Asher's Run; temporary construction and stormwater permits are not included in Figure 2.04-1 and Table 2.04-1.

Table 2.04-1 lists the primary WWTPs and package treatment plants (PTP) in the watershed. WWTPs and PTPs differ in the fact that PTPs are typically small waste treatment facilities that are either prefabricated or prebuilt and handle the specific needs of a small community or development. WWTPs are typically larger facilities with multiple wastewater treatment processes. WWTPs and PTPs are sometimes referred to as sanitary or sewage treatment plants (STP) as part of the facility name in permits. Facilities in this section will be named in accordance with the wording used in the KPDES permit.

CURRY'S FORK KPDES PERMITTED FACILITIES

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KY

KPDES ID	Facility Name
Curry's Fork Subwatershed	
KY0060577	Country Village STP
KYG400147	Ebbs Residence
KYR100613	Camden Manor Subdivision
North Curry's Fork Subwatershed	
KYG400105	McCarson Residence
KYG400199	Von Kannel Residence
KYRR000805	Torbitt & Castleman Co.
KY0103110	Buckner STP
KYR001060	East & Westbrook Constructoin Co. Inc.
KYG400112	Parrott Residence
KY0091154	Catalyst Technology Midwest
KY0020001	La Grange STP
KYR103036	La Grange Commerce Center
KY0101796	Allstate Ready Mix Inc.
KYR105041	Tri County Baptist Hosptial
KYR105532	Heritage Hills Subdivision
KYG200005	Oldham Co. Fiscal Court
KYR108899	Summit Parks Subdivision
KYR001983	Lesco Design & Manufacturing Co. Inc.
South Curry's Fork Subwatershed	
KY0076732	Centerfield Elementary
KY0054674	Lockwood Estates Subdivision STP
KYG400289	Gibson Residence
KY0039870	Lakewood Valley Subdivision STP
KYR101655	Prestwick Estates
KY0029441	Green Valley Apartments
KYR105479	La Grange Presbyterian Church



Roads, county, and watershed boundaries were downloaded via the Kentucky Geography Network. <http://kygeonet.ky.gov/>.
KPDES information downloaded via the EPA Permit Compliance System. <http://www.epa.gov/enviro/html/pcs/index.html>
Only permanent permits are shown, temporary construction permits are not included in this figure.

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.04-1
5994.100

TABLE 2.04-1

KPDES SITES AND FACILITIES

KPDES ID	Facility Name	SIC Code[1]	SIC Description
Curry's Fork Subwatershed			
KY0060577	Country Village STP	6552	Land Subdividers and Developers, Except Cemeteries
KYG400147	Ebbs Residence	6514	Operators of Dwellings other than Apartment Buildings
KYR100613	Camden Manor Subdivision	8741	Management Services
North Curry's Fork Subwatershed			
KYG400105	McCarson Residence	6514	Operators of Dwellings other than Apartment Buildings
KYG400199	Von Kannel Residence	6514	Operators of Dwellings other than Apartment Buildings
KYRR000805	Torbitt & Castleman Co.	2099	Miscellaneous Food Preparations
KY0103110	Buckner STP	4952	Sewerage Systems
KYR001060	East & Westbrook Construction Co. Inc.	3273	Ready-mixed Concrete
KYG400112	Parrott Residence	6514	Operators of Dwellings other than Apartment Buildings
KY0091154	Catalyst Technology Midwest	8711	Engineering Services
KY0020001	La Grange STP	4952	Sewerage Systems
KYR103036	La Grange Commerce Center	8741	Management Services
KY0101796	Allstate Ready Mix Inc.	3273	Ready-mixed Concrete
KYR105041	Tri County Baptist Hospital	8741	Management Services
KYR105532	Heritage Hills Subdivision	8741	Management Services
KYG200005	Oldham County Fiscal Court	9511	Air and Water Resource and Solid Waste Management
KYR108899	Summit Parks Subdivision	1794	Excavation Work
KYR001983	Lesco Design & Manufacturing Co. Inc.	3535	Conveyors and Conveying Equipment
South Curry's Fork Subwatershed			
KY0076732	Centerfield Elementary	8211	Elementary and Secondary Schools
KY0054674	Lockwood Estates Subdivision STP	6552	Land Subdividers and Developers, Except Cemeteries
KYG400289	Gibson Residence	6514	Operators of Dwellings other than Apartment Buildings
KY0039870	Lakewood Valley Subdivision STP	6552	Land Subdividers and Developers, Except Cemeteries
KYR101655	Prestwick Estates	8741	Management Services
KY0029441	Green Valley Apartments	6513	Operators of Apartment Buildings
KYR105479	La Grange Presbyterian Church	8741	Management Services

[1]Standard Industrial Classification

Source: USEPA Permit Compliance System (PCS), 2010

The wastewater needs of this watershed are met by both sewer and on-site systems (typically septic systems). Only 16 percent of the watershed area is served by public sewers. Sewer services are supplied by both the Oldham County Environmental Authority (OCEA) formerly the Oldham County Sewer District (OCSD) and La Grange Utility Commission (LUC). Refer to Subsection 2.06 for more information about the OCEA and LUC.

The OCEA provides for collection and treatment of wastewater throughout the county with the exception of the cities of La Grange (portions of which are in Curry's Fork) and Crestwood, which is outside of Curry's Fork.

Sanitary sewer services within these cities is provided by the LUC. Within the Curry's Fork watershed, the OCEA operates the five PTPs listed below:

1. Buckner
2. Country Village
3. Green Valley
4. Lakewood Valley
5. Lockwood Estates

The LUC manages and operates the one WWTP in the watershed, La Grange WWTP located in the northeast portion of the watershed.

The Oldham County Board of Education owns and operates a PTP at Centerfield Elementary. Based on reviews of discharge monitoring reports (DMRs), WWTP, and PTP effluent in the watershed has shown exceedances of the allowable pollutant levels within the past 5 years.

The pollutants being discharged into the stream by these KPDES facilities can be detrimental to the health of the streams in excessive amounts. Furthermore, these sites are not required to monitor the nutrient content of the effluent, and most are not required to monitor the phosphorus content within the effluent.

A summary of permit violations by many of the KPDES sites throughout each subwatershed can be found in Table 2.04-2.

La Grange WWTP is located in the North Curry's Fork subwatershed and serves the entire La Grange including areas located outside the Curry's Fork watershed but within the city limits. Although Table 2.04-2 shows La Grange fecal coliform, DO, and TSS with the highest historical percentage exceedance rates, recent plant upgrades have improved the effluent water quality.

(remainder of page intentionally left blank)

TABLE 2.04-2–KPDES EXCEEDANCE SUMMARY

KPDES Facility	Sample Period	Pollutant	Number of Violations	Number of Samples	Percent Exceedance
North Curry's Fork Subwatershed					
La Grange WWTP	January 1998 to January 2010	Fecal Coliform	27	143	19%
		E. coli	0	1	0%
		Nitrogen, Ammonia (As N)	7	150	5%
		Nitrogen, Total (As N)	0	1	0%
		Dissolved Oxygen	10	142	7%
		pH	1	142	1%
		Phosphorus	0	1	0%
		TSS	18	160	11%
Buckner STP	March 2000 to January 2010	Fecal Coliform	29	105	28%
		E. coli	0	14	0%
		Nitrogen, Ammonia (As N)	21	140	15%
		Nitrogen, Total (As N)	0	14	0%
		Dissolved Oxygen	1	119	1%
		pH	2	119	2%
		Phosphorus	95	119	80%
		TSS	47	167	28%
South Curry's Fork Subwatershed					
Green Valley Apartments PTP	December 1996 to December 2009	Fecal Coliform	30	148	20%
		Nitrogen, Ammonia (As N)	29	148	20%
		Dissolved Oxygen	24	148	16%
		pH	1	148	1%
		TSS	39	148	26%
Lakewood Valley Subdivision PTP	July 1992 to January 2010	Fecal Coliform	9	137	7%
		E. coli	1	9	11%
		Nitrogen, Ammonia (As N)	4	147	3%
		Nitrogen, Total (As N)	0	9	0%
		Dissolved Oxygen	16	146	11%
		pH	3	146	2%
		Phosphorus	0	63	0%
		TSS	5	146	3%
Lockwood Estates Subdivision PTP	December 1996 to January 2010	Fecal Coliform	8	138	6%
		E. coli	0	8	0%
		Nitrogen, Ammonia (As N)	9	150	6%
		Nitrogen, Total (As N)	0	8	0%
		Dissolved Oxygen	5	150	3%
		pH	1	150	1%
		Phosphorus	0	8	0%
		TSS	16	150	11%
Curry's Fork Subwatershed					
Country Village PTP	August 1997 to January 2010	Fecal Coliform	26	142	18%
		E. coli	1	7	14%
		Nitrogen, Ammonia (As N)	8	146	5%
		Nitrogen, Total (As N)	0	7	0%
		Dissolved Oxygen	15	146	10%
		pH	0	146	0%
		Phosphorus	0	7	0%
		TSS	28	146	19%

Source: USEPA PCS, 2010

La Grange WWTP experienced no fecal coliform or DO permit exceedances and only one TSS exceedance within the past three years.

The Buckner STP is located in the North Curry's Fork subwatershed and serves the Buckner area, which includes areas outside the Curry's Fork watershed. DMRs indicate improvements to the chemical treatment process have reduced effluent phosphorus levels. Construction to decommission the Buckner STP was initiated in 2011.

The Green Valley Apartments PTP is located in the South Curry's Fork subwatershed and serves the Green Valley apartment complex located south of La Grange. A review of DMRs for the Green Valley Apartments PTP indicates it has not experienced a substantial increase or decrease in effluent quality. DMRs did note that some high TSS levels were a result of hydraulic overloading caused by inflow and infiltration (I/I) issues. The Green Valley Apartment PTP is scheduled to be decommissioned beginning in 2012.

The Lakewood Valley PTP is located in the South Curry's Fork subwatershed and serves the Lakewood Valley subdivision on the north side of Moody Lane. DMRs indicate most parameters have been in compliance within the past three years except DO. Eleven of the 16 total permit exceedances for DO occurred within the past three years. The Lakewood Valley PTP is selected for decommissioning as part of OCEA's plan to regionalize wastewater treatment in Oldham County in the next 11 to 20 years.

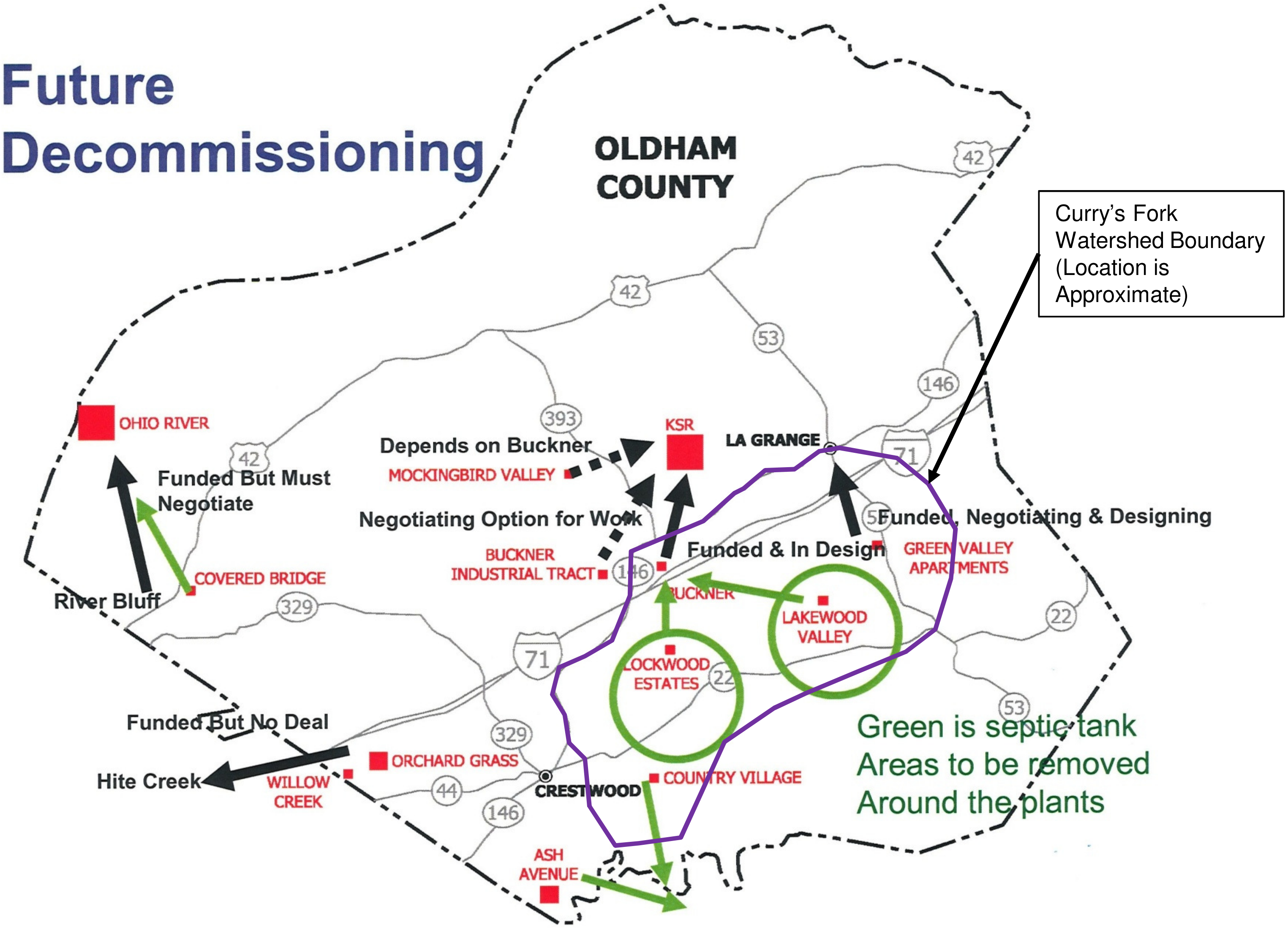
The Lockwood Estates PTP is located in the South Curry's Fork subwatershed and serves the Lockwood Estates subdivision. Lockwood Estates PTP performance has been mostly consistent throughout the time period analyzed except for nitrogen, which has improved over the past 5 years. The Lockwood Estates PTP is selected for decommissioning as part of OCEA's plan to regionalize wastewater treatment in Oldham County in the next 11 to 20 years.

The Country Village PTP is located in the Curry's Fork main stem subwatershed and serves the Country Village subdivision. On several occasions, DMRs indicated the plant suffered from hydraulic overloads caused by I/I issues that resulted in effluent not meeting permit standards. The Country Village PTP was selected for decommissioning as part of OCEA's plan to regionalize wastewater treatment in Oldham County in the next 11 to 20 years.

The OCEA is in the planning process of regionalizing treatment facilities within Oldham County. Figure 2.04-2 shows the preliminary plan for the future decommissioning and regionalization of OCEA facilities. In this plan, all STPs and PTPs within Curry's Fork will be decommissioned except for La Grange WWTP. Sewer service will be extended to areas adjacent to decommissioned STPs and PTPs. Wastewater from the decommissioned plants will be pumped to the Kentucky State Reformatory (KSR) WWTP or La Grange WWTP except for the Country Village PTP. The regionalization projects will also include sewer remediation to reduce I/I.

Five residents within Curry's Fork operate their own permitted residential treatment systems as shown on Table 2.04-1. A review of the discharge records indicated four of the five permitted residential systems were generally in compliance with permit requirements.

Future Decommissioning



PRELIMINARY PLAN FOR FUTURE DECOMMISSIONING AND REGIONALIZATION
CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.04-2
5994.100

B. Septic System and Other On-site Wastewater Areas

As previously mentioned, 16 percent of the watershed area is served by public sewers and PTPs; therefore, 84 percent of the population within this watershed is served by on-site systems such as septic systems.

Figure 2.04-3 represents the areas of the watershed that are not served by the sewer district or the utilities commission, and therefore, use on-site systems. On-site sewage disposal systems include septic tank absorption fields, septic lagoons and wetlands, septic spray systems, and septic holding tanks. OCEA is currently exploring options to provide wastewater treatment to unsewered portions of Oldham County. This includes evaluating alternative approaches beyond traditional gravity sewers. Plans are under development and will be included as part of the overall regional approach being finalized in negotiations between KDOW and OCEA.

In Oldham County, the septic tank absorption field is the most widely utilized on-site wastewater system and the success of this system is dependent on soil permeability, construction methods, depth of groundwater table, depth to bedrock, slopes, and user maintenance.

A failing septic system can contribute to nonpoint source pollution and groundwater pollution by allowing improperly treated waste to be carried into waterways by runoff and into groundwater sources through infiltration.

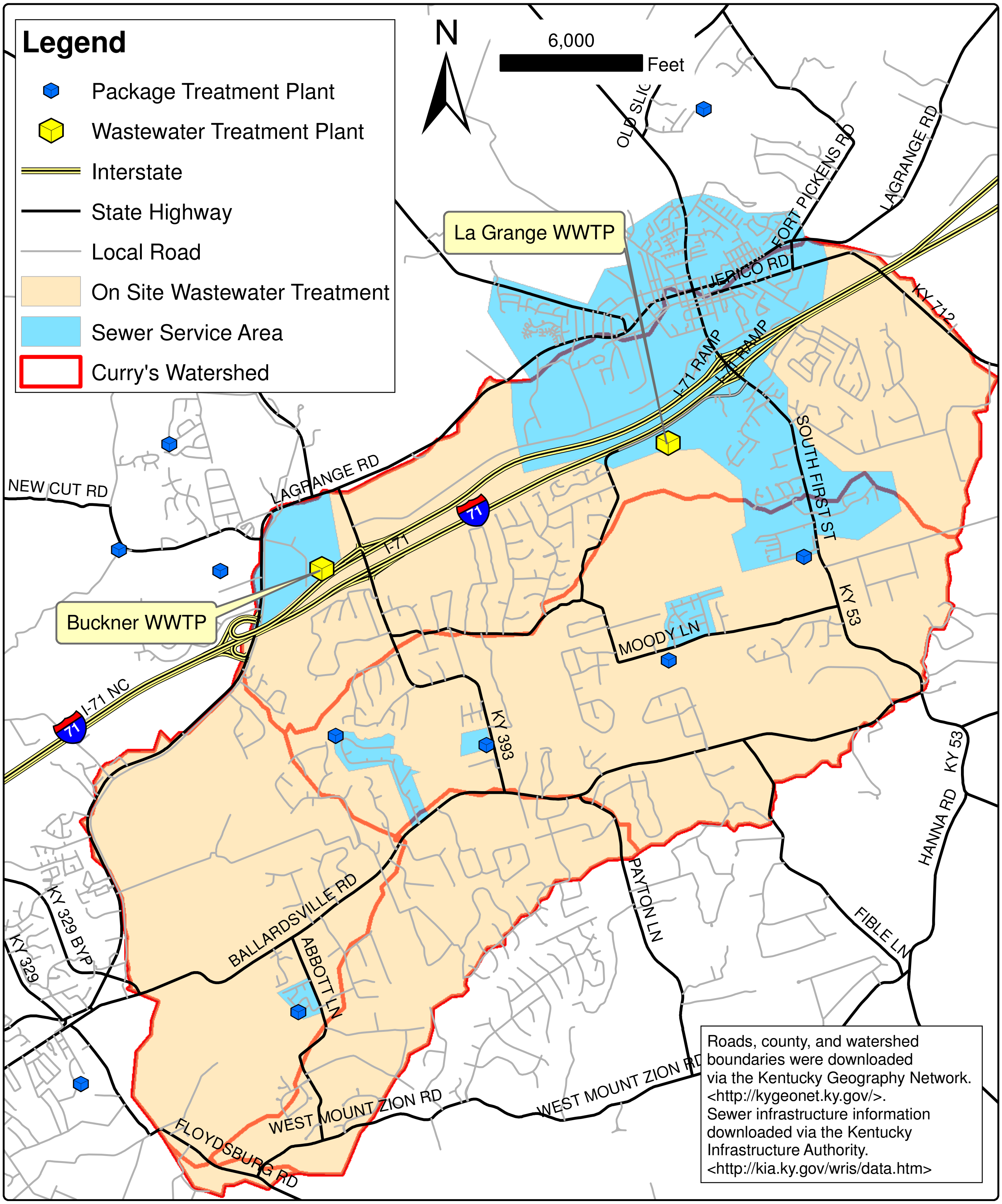
According to the Oldham County Health Department (OCHD) and input from other local stakeholders, very few on-site systems are failing in Curry's Fork. Borowick Farms, Woods of Hillview, Foxwood, Westwood, and Croftboro Farms Subdivisions were identified as areas of potential concern for failing systems in the watershed by the Technical Committee (TC).

Some areas with inadequate soil conditions that are not served by public sewer systems utilize septic tank absorption fields.

The NRCS has compiled extensive information regarding the nature of Kentucky's soils. Two important factors included in this information include the soil suitability for septic tank absorption fields and soil suitability for sewage lagoons. The effluent from septic tanks is distributed into the soil in septic tank absorption fields.

According to NRCS soils report, unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage can affect public health.[5]

As shown in Figure 2.04-4, the soils throughout the Curry's Fork watershed have very limited suitability for septic tank absorption fields; and therefore, NRCS has deemed the soil properties and site features as unfavorable or difficult to overcome and that special design, significant increases in construction costs, and possibly increased maintenance are required.[5] It is sometimes possible to use an alternative on-site wastewater treatment system under these conditions. Otherwise, holding tanks may be used, which need to be pumped out periodically and the contents may be landspread or hauled to a WWTP.

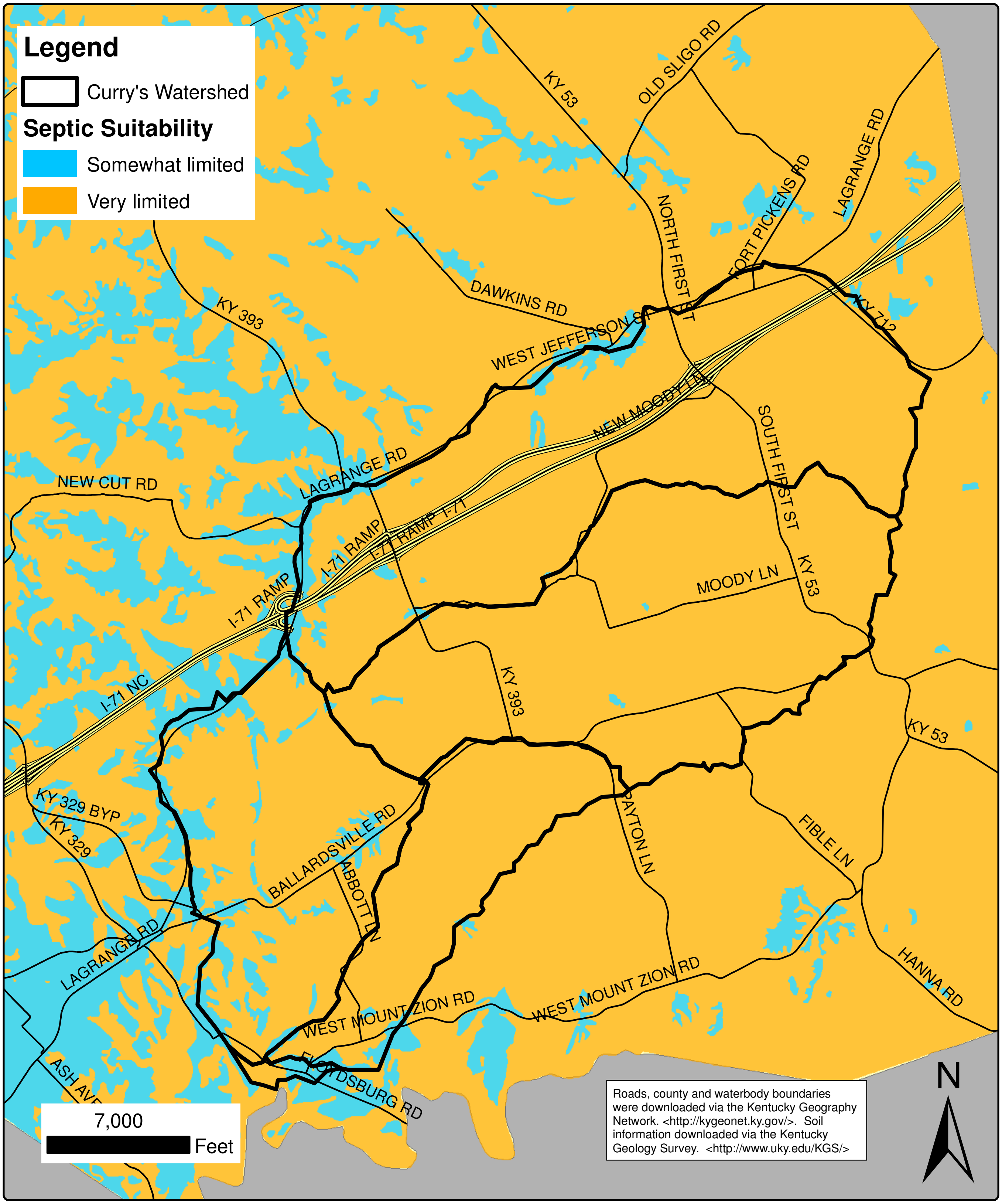


SEWER SERVICE AND ON-SITE WASTEWATER SYSTEM AREAS

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.04-3
5994.100



CURRY'S FORK SOILS SEPTIC SUITABILITY

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.04-4
5994100

Groundwater Protection Plans are required for all site sewage treatment systems, including alternative systems, holding tanks, and land spreading.

Furthermore, any shallow pond that is constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes is considered to be a sewage lagoon. According to the NRCS soil report, to minimize seepage and contamination of groundwater, soils must be nearly impervious for the lagoon floor and sides.

Figure 2.04-5 shows the results of the soil report as being very limited for such an application. Once again, this means that NRCS has deemed the soil properties and site features as unfavorable or difficult to overcome and that special design, significant increases in construction costs, and possibly increased maintenance are required.

This analysis indicates that soils throughout the Curry's Fork watershed are not suitable for septic systems without special considerations during construction and operation.

C. Drinking Water Supply and Distribution

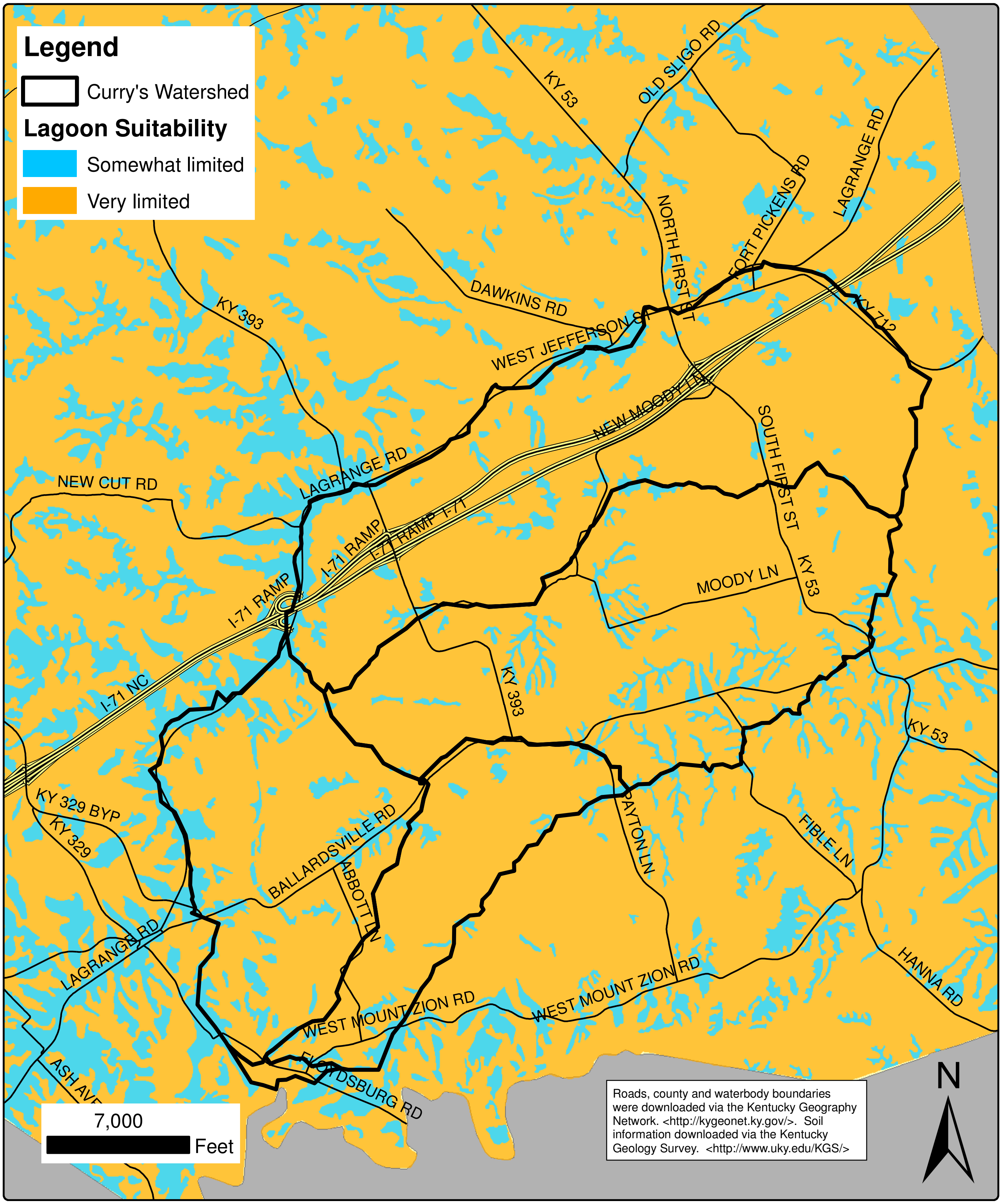
Drinking water needs in Oldham County are primarily met by public utilities and a small amount of private domestic water supplies. The water service in Oldham County is provided by five utilities, including Oldham County Water District (OCWD), Louisville Water Company, and LUC. The OCWD and LUC supply water to the Curry's Fork community. The majority of the water supply is from groundwater resources. The WTP treats water obtained from a series of wells in the Ohio River alluvium, which holds several billion gallons of water. There are no intakes for drinking water in the Curry's Fork watershed; therefore, there are no source water protection plans in the watershed.

D. MS4 Program

Oldham County and La Grange are considered Phase 2 communities under the KPDES Stormwater Program. The program "regulates stormwater discharges from three potential sources: MS4s, construction activities, and industrial activities.

Most stormwater discharges are considered point sources, and operators of these sources may be required to obtain a KPDES permit before they can discharge. This permitting mechanism is designed to prevent stormwater runoff from washing harmful pollutants into local surface waters such as streams, rivers, lakes or coastal waters."[12] Figure 2.04-6 shows the boundaries of the MS4 programs in Curry's Fork.

More detailed information on the MS4 program is located in Subsection 2.06.

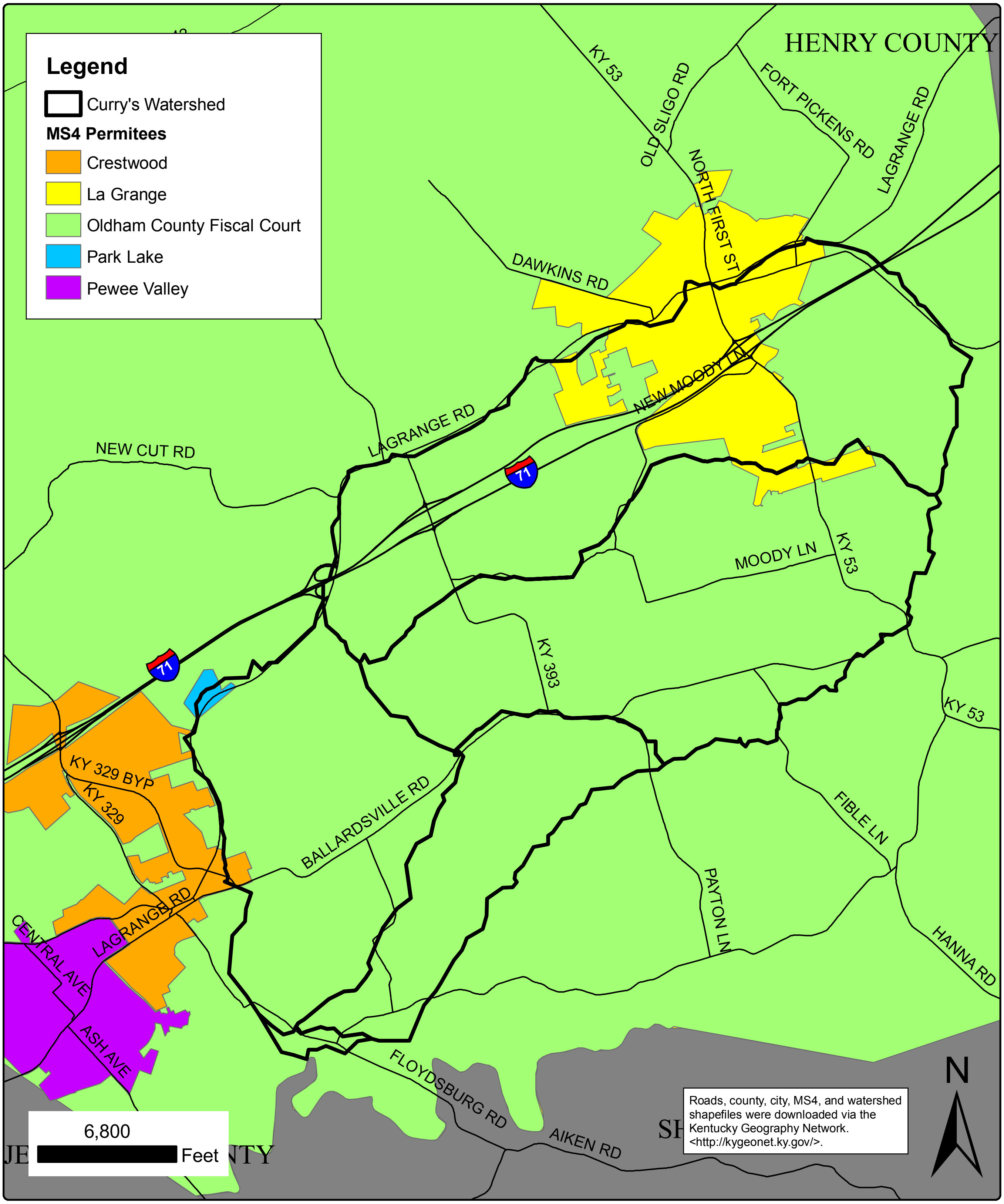


CURRY'S FORK SOILS LAGOON SUITABILITY

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.04-5
5994100



CURRY'S FORK MS4 AREAS

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.04-6
5994.100

2.05 REGULATORY STATUS OF WATERWAYS

State regulatory agencies are required to develop water quality standards (WQS) to support the goals of the Clean Water Act (CWA). In accordance with the Code of Federal Regulations (CFR), 40 CFR 131.2, the goal of WQS should:

1. Include provisions for restoring and maintaining chemical, physical, and biological integrity of State waters.

2. Provide, wherever attainable, water quality for the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water ("fishable/swimmable").

3. Consider the use and value of state waters for public water supplies, propagation of fish and wildlife, recreation, agricultural and industrial purposes, and navigation.

The three major components of WQS include designated uses, numeric and narrative water quality criteria, and antidegradation policies. The USEPA defines the importance of WQS as government regulations to help "protect and restore the quality of the nation's surface waters and to help identify water quality problems caused by improperly treated wastewater discharges, runoff, or discharges from active or abandoned mining sites, sediment, fertilizers, and chemicals from agricultural areas, and erosion of stream banks caused by improper grazing practices."

These standards also support efforts to achieve and maintain protective water quality conditions. These efforts include total maximum daily loads (TMDLs) for point sources of pollution, load allocations for nonpoint sources of pollution, water quality management plans, NPDES water quality-based effluent limitations for point source discharges, water quality certifications under Clean Water Act 401, various reports that document current water quality conditions, and Clean Water Act 319 management plans for the control of nonpoint sources of pollution.[13]

A. <u>Designated Uses</u>

Appropriate uses of the water body, which are established by the states, are determined through consideration of the use and value of the water body as well as the suitability of a water body for these uses. The USEPA defines the suitability of a water body through consideration of "the physical, chemical, and biological characteristics of the water body, its geographical setting and scenic qualities, and economic considerations."[14] The states must conduct a use attainability analysis for any water body that does not include the fishable/swimmable goal identified in the CWA.

Kentucky WQS, outlined in Kentucky Administrative Regulation (KAR) KAR 10:026, define six different designated uses, including warm water aquatic habitat, cold water aquatic habitat, primary contact recreation, secondary contact recreation, domestic water supply, and outstanding state resource water. Although fish consumption is listed as an impaired use on the 303(d) List, it is not considered a designated use in Kentucky numeric quality standards. Fish consumption is an implied use in 401 KAR 10:031 Section 2, and through human health criteria in Section 6. Fish consumption, in conjunction with aquatic life use, assesses the attainment of fishable goals of the CWA. In 1992, assessment of the fishable goal was separated into these two categories because the fish consumption advisory does not preclude attainment of the aquatic life use and vice versa. The separation of fish consumption and aquatic life use support gives a clear picture of water quality conditions [2010 305(b) List, Kentucky Environmental and Public Protection Cabinet (EPPC)]. Although this statute specifically identifies many surface waters throughout Kentucky and their respective designated uses, any surface water that is not specifically listed in the Kentucky WQS is, by default, designated as suitable for support of warm water aquatic habitat, primary contact recreation, secondary contact recreation, and domestic water supply.

The designated uses of Curry's Fork are specifically established within 401 KAR 10:026 as: warm water aquatic habitat, primary contact recreation, and secondary contact recreation. The designated uses for the other tributaries within the watershed, including North Curry's Fork, South Curry's Fork, and Asher's Run, are not specified in the Kentucky WQS; and therefore, by default their uses include warm water aquatic habitat, primary contact recreation, secondary contact recreation and domestic water supply.

1. Numeric and Narrative Criteria

States must adopt water quality criteria that properly protect the designated uses of the waterbodies throughout the state.

States may adopt the criteria established by the USEPA in Section 304(a) of the CWA, modify these criteria to meet site-specific conditions, or adopt criteria based on other scientifically-defended methods.[14]

These criteria include both numeric and narrative standards. Throughout the water quality data analysis section of this report, maximum allowable values denote the limits established by the Kentucky WQS. For certain parameters such as TSS and nutrients, the State has not established numeric water quality criteria. However, the USEPA has established recommended values of pollutant concentrations. These are nonenforceable values recommended to promote healthy water quality and aquatic habitats. The values are noted and used for data comparison purposes, which lead to source identification and target implementation.

In addition, Kentucky Division of Water (KDOW) developed draft ranges of target averages for several nutrients for Curry's Fork ecoregion.

Water quality criteria used for this report is discussed further in detail in Section 4.

2. Antidegredation Policies

The WQS regulations established in the CWA require states to develop a tiered antidegradation program. This program provides for the prevention, abatement, and control of water pollution. According to Kentucky WQS, "it is the policy of the commonwealth to conserve its waters for legitimate uses and to safeguard from pollution the uncontaminated waters of the commonwealth, prevent the creation of any new pollution in the waters of the commonwealth, and abate any existing pollution." The antidegradation policy requires surface waters to be placed into one of the four categories including outstanding national resource waters, exceptional waters, high quality water, and impaired water. Amongst the categories, Curry's Fork is considered a high quality water.

B. Impairment Status

Curry's Fork has one stream segment listed on the 303(d) List and one additional stream segment in the 305(b) report; their locations are shown in Figure 1.01-1.

Refer to Table 1.01-1 for the impairment status as it is listed in the 303(d) List and Table 1.01-2 for the impairment status of the additional stream segment listed in the 305(b) report.

C. Special Use Waters

There are no special use waters located within the Curry's Fork Watershed. Special use waters are rivers, streams, and lakes listed in KAR or the Federal Register as: cold water aquatic habitat, exceptional waters, reference reach waters, outstanding state resource waters, outstanding national resource waters, state wild rivers, or federal wild and scenic rivers.

However, during review of the biological data at a Water Quality Data Analysis Team (WQDAT) meeting, KDOW staff noted that species collected and identified during the project would warrant consideration for listing as a Outstanding State Resource Water and/or Exceptional Water. KDOW is encouraged to review the biological species list for consideration.

D. TMDL Reports

A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards. One TMDL has been approved that includes portions of the Curry's Fork watershed, the *Floyds Fork Drainage Biological and Water Quality Investigation for Stream Use Designation*. The TMDL was approved in 1997. Because new DO data was being collected for this WP and the data used in the 1997 TMDL was deemed too old to be applicable conditions, the data from this TMDL was not used for this WP.

2.06 EXISTING RELEVANT PROGRAMS

The information in this section was provided in narrative and written format by representatives of the respective programs/agencies during a series of TC meetings in the summer of 2010.

A. Oldham County Sewer District (now OCEA)

The OCSD provides sanitary sewer service to residents in Oldham County with the exception of the cities of La Grange and Crestwood. In November 2008, Oldham County engaged Veolia Water North America to manage the operations of the District.

The OCSD has engaged in a successful program to enhance the system's performance and meet regulatory compliance. Numerous improvements to the system's piping, pumping, and treatment facilities have resulted in a 93 percent reduction in violations. OCSD has a long-term plan to decommission the failing treatment plants in the system and reroute flows to the treatment facility at the Kentucky State Reformatory.

1. Funding Sources

OCSD is funded by utility fees, grants, federal, or state loans.

2. Watershed Programs and Initiatives

OCSD is currently engaging (or planning to engage) in the following activities:

a. Decommission the Buckner, Lockwood Estates, Lakewood Valley, and Green Valley treatment plants.

b. Conduct a septic tank study/survey to assess the condition of septic tanks within the District's service area and attempt to quantify its impacts on water quality.

c. Upgrade and/or rehabilitate the treatment plants.

d. Repair the wastewater system to reduce I/I.

e. Explore the feasibility of establishing a responsible management entity for septic systems and other on-site wastewater disposal systems.

f. Include numerous approaches to wastewater management including cluster systems, traditional sewers with treatment plants, managed septic systems, and other strategies as appropriate.

g. Work with the Health Department to complete a septic system inspection program to better assess the true status of septic systems throughout the OCSD's service area.

h. Establish a water quality monitoring program throughout the watershed that will include sampling sites tested as part of this WP so that water quality changes can be quantified over time.

The OCSD has merged with the Oldham County Storm Water Management District to form the Oldham County Environmental Authority.

B. Oldham County Storm Water Management District (now OCEA)

The Oldham County Storm Water Management District was established by ordinance of the OCFC on August 6, 2008. The MS4 program serves Oldham County and its copermittees: City of Crestwood, Goshen, Orchard Grass Hills, Pee Wee Valley and River Bluff. La Grange is currently evaluating whether to be a copermittee. In September 2009, Oldham County engaged Veolia Water North America to manage the stormwater district. The Oldham County Storm Water Management District and the OCSD merged to form the OCEA, which is the lead copermittee of the MS4 program.

The Storm Water Management District's MS4 program follows the KPDES permit. The program is intended to improve the water quality by reducing the quantity of pollutants that flow into the MS4 system during rain events.

There are six components of a MS4 Program:

1. Public Education and Outreach.
2. Public Participation and Involvement.
3. Illicit Discharge Detection and Elimination.
4. Construction Site Runoff Control.
5. Postconstruction Runoff Control.
6. Pollution Prevention/Good Housekeeping.

1. Funding Sources

The MS4 program is funded entirely by stormwater fees. Grants or low interest government loans for improvement projects may be sought to implement the MS4 program.

2. Watershed Programs and Initiatives

The Storm Water Management District is currently engaging or planning to engage in the following activities that relate to watershed management:

a. Create and distribute educational material related to water quality and best management practices (BMPs) via www.oldhamcountycleanwater.com, brochures/fact sheets, media outlets, schools, and community events.

b. Identify appropriate BMPs for the Storm Water Management District and assist with its implementation.

c. Work with other agencies and groups to improve water quality in the watershed such as the Solid Waste Department's E-waste collection.

d. Map the stormwater management system.

e. Find and eliminate any illicit discharges into the stormwater system.

f. Enforce ordinances and proper erosion and sediment control. These efforts include reviewing drawings before construction and on-site inspections.

g. Educate Oldham County employees on good housekeeping and pollution prevention practices.

h. Fund grants to build rain gardens. Six grants of up to $500 each have been awarded to offset the costs for materials and equipment to create new rain gardens. This program is expected to continue on a yearly basis. These grants are targeted towards homeowners and other smaller scale construction opportunities.

i. Seek opportunities to construct larger demonstration projects in high visibility public areas/buildings. School and municipal buildings are being targeted especially as potential demonstration sites.

j. Take water quality samples across the county beginning in the summer of 2010, (in conjunction with the Oldham County Sanitation District). This sampling effort has been coordinated with the Watershed Plan so that the sampling sites used in the Watershed Plan will be included in the District's program. Sampling is planned to occur twice a year (once in the summer and once in the winter) and will include the major waterways throughout the county.

k. Document activities and progress through annual reports to KDOW.

l. Update the Stormwater Quality Management Plan (SWQMP) as required or necessary.

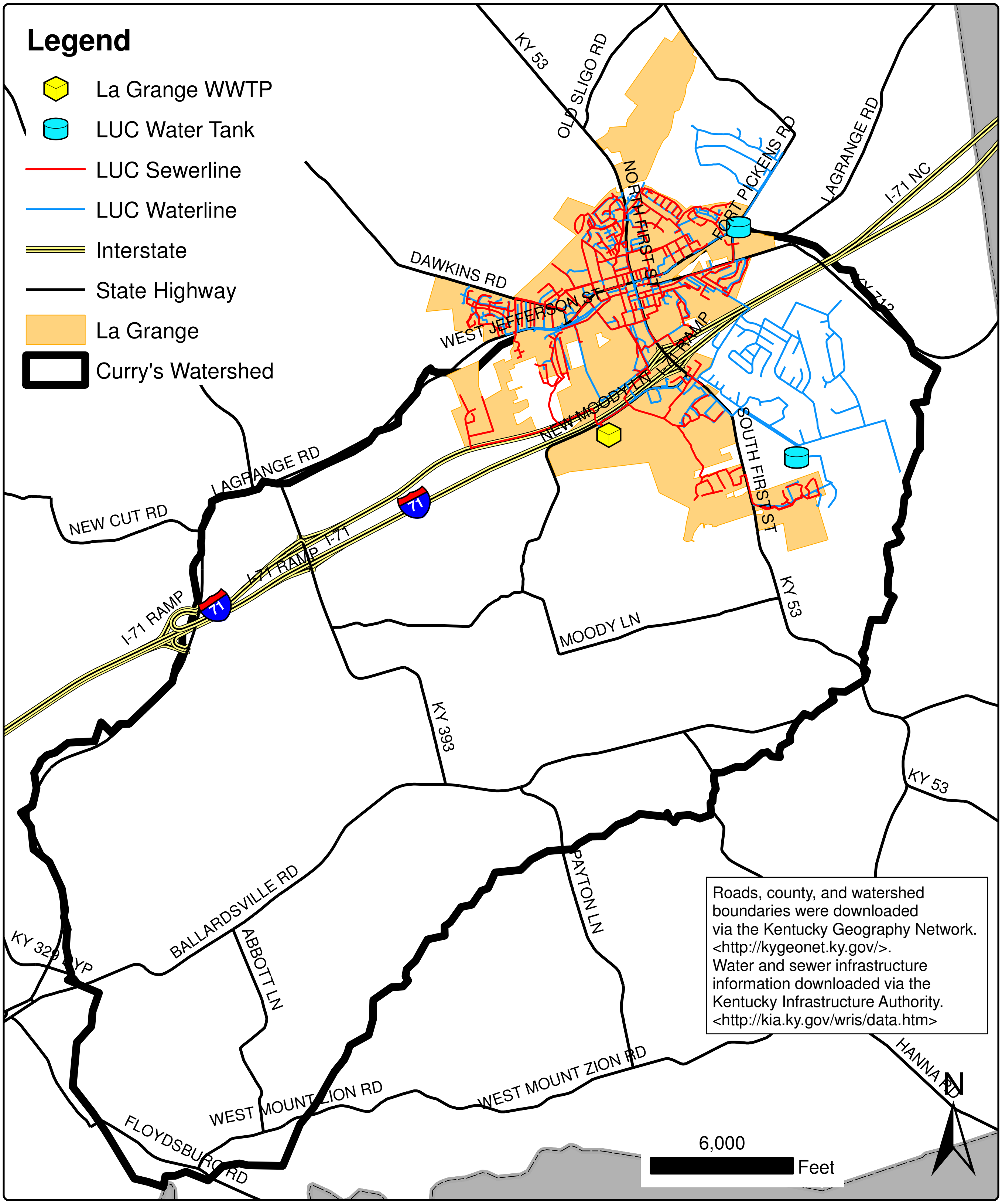
C. La Grange Utilities Commission (LUC)

The LUC provides water and sewer services to residents of La Grange and some of the surrounding areas. Water is purchased from the OCWD and is pumped from wells under the Ohio River bed at Westport, Kentucky, and then processed, treated, and pumped into the water lines. Since the Ohio River is outside of Curry's Fork, there is no drinking water protection plan that is applicable. LUC provides drinking water service to approximately 3,200 customers and wastewater service to nearly 2,700 customers, the majority of whom are located within the Curry's Fork watershed.

Figure 2.06-1 shows the extent of LUC's water and wastewater service within the watershed. All wastewater flows to La Grange WWTP, which discharges to Curry's Fork. LUC also bills and provides garbage service for La Grange, which has a franchise agreement with Industrial Disposal Company.

1. Funding Sources

Operation of LUC is funded primarily through monthly water and sewer charges. Bonds, loans, and grants have also been used to fund capital water and wastewater projects.



LA GRANGE UTILITY COMMISSION
WATER AND SEWER LINES

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.06-1
5994.100

2. Watershed Programs and Initiatives

LUC is currently engaging or planning to engage in the following activities that relate to watershed management:

a. LUC is treating wastewater to meet new, lower, phosphorous limits in its KPDES permit. Chemicals are currently being added to the treatment process to remove phosphorous before effluent is discharged into the watershed.

b. In May 2008, a significant upgrade project was completed at La Grange WWTP that improved its ability to treat wastewater and installed an ultraviolet radiation system as the disinfection process.

c. Expansion of the LUC water distribution and wastewater collection system is anticipated to occur as vacant land in its service areas is developed in the future. The LUC water and wastewater service area is bordered on all sides by county water or sewer providers. LUC is focused on improving its existing system as well as participating in a regional wastewater treatment program.

D. Oldham County Water District (OCWD)

The OCWD was created in 1964 with the financial help of Farmers Home Administration.

The OCWD presently serves 8,000 residential customers within the county, which includes most of the residents in Curry's Fork, and three institutions of the Kentucky State Reformatory. It also provides bulk water for resale to La Grange. The OCWD treats groundwater from the Ohio River alluvium to supply its customers and also has an emergency interconnection with Henry County Water.

The OCWD has a supply capacity of approximately 6 million gallons per day (mgd) and has reached that limit on a few peak demand days, typically in the summer. The existing treatment plant was constructed in 1981 and with a ongoing expansion and is expected to meet the needs of the county until 2025 without any major additions. When the expansion project is complete, the new supply capacity will be approximately 13 mgd. See Figure 2.06-2.

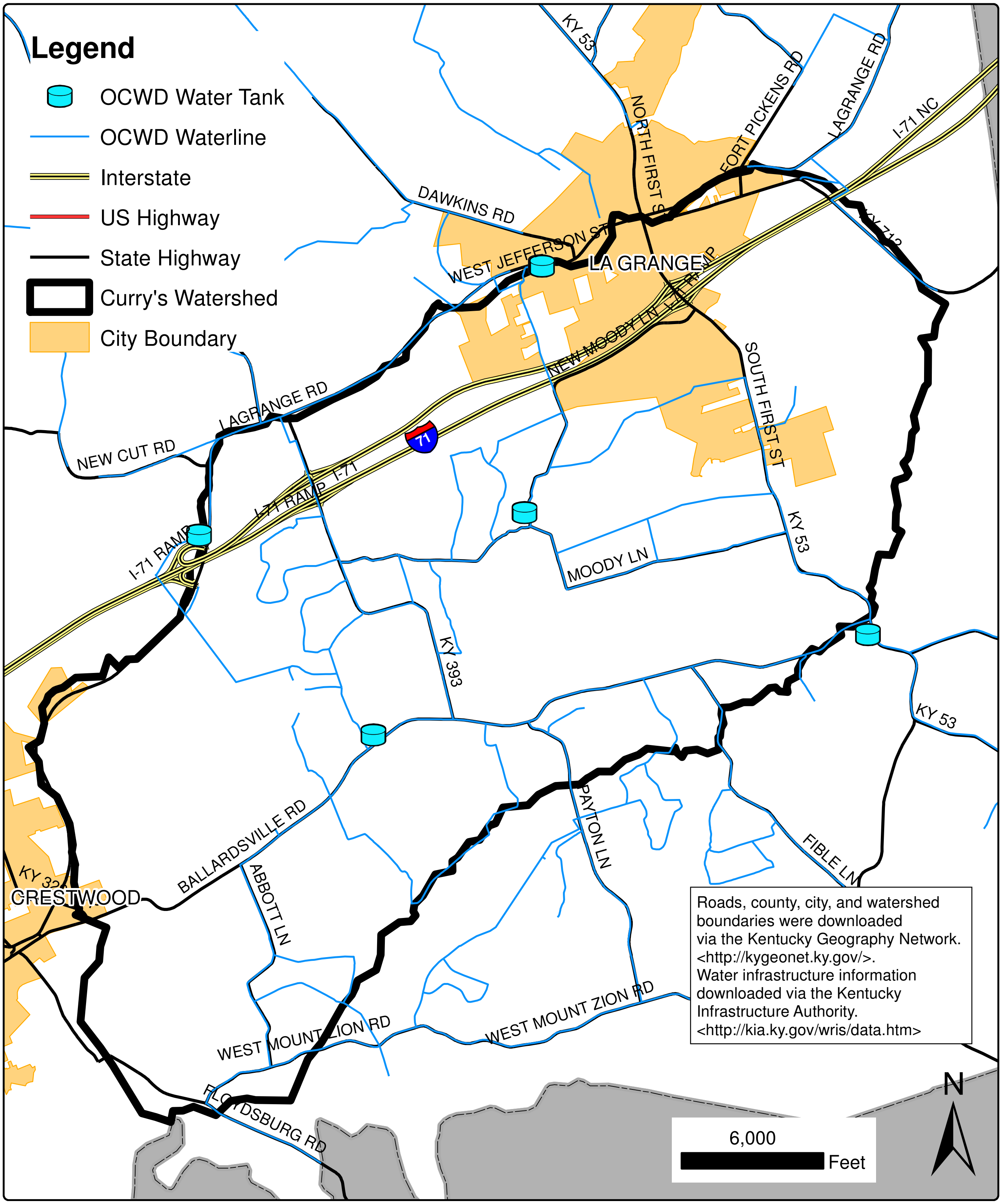
1. Funding Sources

The OCWD is funded by utility bills paid by its customers. Grants and loans also finance projects and programs, when available.

2. Watershed Programs and Initiatives

The OCWD is currently engaging or planning to engage in activities that relate to watershed management:

a. In its role of providing water throughout the county, the OCWD is one of the first groups to become aware of proposed construction projects and growth. Knowledge of where growth is occurring or is planned to occur can help identify



OLDHAM COUNTY WATER DISTRICT
WATER INFRASTRUCTURE

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.06-2
5994.100

potential opportunities to incorporate watershed restoration or protection within these projects, install BMPs, and other activities to improve water quality.

b. The OCWD already invests a significant level of attention and funds to make certain that work completed in and around streams has a minimal impact and is properly restored. These efforts can be used as an example for others doing work in the watershed.

E. Oldham County Cooperative Extension Office

Kentucky's two land grant universities, the University of Kentucky and Kentucky State University, serve as partners in conducting research, providing educational program materials, and technical assistance through the local Cooperative Extension Service offices.

The program delivery process involves extension faculty, county agents, advisory council members, volunteer leaders, and the general public.

The extension office's goal is to distribute research-based advice and information on anything that grows. The Oldham County office has staff that focuses on horticultural/agriculture/natural resource programs, family/consumer sciences, and youth development (4-H).

Locally, the horticultural, agricultural, and natural resources programs focus on two basic categories:

- Help farm enterprises be profitable using environmentally sound practices.
- Help homeowners grow their own food and landscapes using environmentally sound practices.

Programs are geared to helping businesses earn a profit and/or homeowners save money in addition to being environmentally sound.

1. Funding Sources

Oldham County Cooperative Extension Service is funded by the University of Kentucky, College of Agriculture, and OCFC.

2. Watershed Programs and Initiatives

The extension office is currently engaging or planning to engage in activities that relate to watershed management:

a. The equine industry is Oldham County's top agricultural moneymaker. The extension office offers three programs geared toward improving equine management: Horse Cents, Horse Grazing School, and Horse College.

b. The Oldham County Cattleman's Association was formed in the fall of 2009 and builds on other extension programs such as Master Cattleman, Advanced Master Cattleman, and Master Grazer.

c. With a goal of minimizing the amount of pesticide being applied while maximizing crop yields, the extension office offers training on pesticide application and insect trapping. Similarly, the extension office has classes on pest management for nurseries, greenhouse basics, and hosts nursery field days.

d. The extension office has programs geared toward the private home owner as well. Popular programs include the Master Gardner as well as classes on rain gardens, landscape design, and vegetable gardening. The Master Gardner program requires participants to contribute volunteer hours to the community and has been utilized in other watersheds for reforesting efforts, creating rain gardens, and reestablishing vegetative buffers.

e. Pasture assessments, crop/landscape/garden advice and information, soil testing, plant disease diagnosis, and plant/weed/insect identification are all traditional extension services that are also provided by the Oldham County Extension Office.

f. Programs that will become available in 2009 include a lawn care seminar (a 2007 soils survey that found a significantly large number of private lawns were over fertilized with potassium and phosphorous versus agricultural lands), basic/introductory farming ("Green Acres"), and classes on selecting trees for home landscaping.

F. <u>Oldham County Planning and Development Services (OCPDS)</u>

The OCPDS office is a land use agency created by local government to guide the county's physical development. To achieve this, the Planning and Development office prepares long-range plans to provide for balanced growth. It reviews development proposals for compliance with locally adopted plans and regulations. It monitors development activity and requires conformance through property code enforcement. It is also responsible for issuing construction permits within Oldham County.

1. Funding Sources

The Planning and Development Services office is funded through fees and the county's general fund.

2. Watershed Programs and Initiatives

The Planning and Development Services office is currently engaging or planning to engage in activities related to watershed management:

a. As the coordinator of long-term planning in the county and issuer of construction permits, the Planning and Development Services office is in a unique position to understand where growth is occurring or planning to occur.

b. Enforcement of the Wastewater Capacity Assurance ordinance helps promote responsible development by making certain that sufficient wastewater treatment collection and treatment capacity is available for a proposed development. Mitigation is an option for projects that cannot assure capacity without additional efforts. Example mitigation measures include evidence of preliminary approval by KDOW for the construction of a new facility or improvements to an existing facility and that the new treatment facility capacity or the improved treatment plant capacity will be sufficient to serve the proposed development. Mitigation measures are described in detail in the Oldham County Comprehensive Zoning Ordinance, Division 270 Capacity Standards, Part 5: Mitigation, which is available on the Oldham County Fiscal Court Web site (http://www.oldhamcounty.net/). These mitigations efforts can be leveraged with watershed planning/protection/restoration projects to extend their benefits.

c. Enforcement of the Floodplain and No Disturb Zone Ordinances: The Planning and Development Services office requires that a No Disturb Zone of a minimum of 25 feet of vegetative buffer be maintained between the top of the stream bank and any proposed development. In addition, the Floodplain Ordinance forbids construction within the floodplain and requires that any development greater than five acres or with more than 50 homes establish a floodplain elevation. Construction will not be allowed within the area defined by the newly established floodplain.

d. Enforcement of the Green Space Ordinance: The Planning and Development Services office limits the amount of impervious surface in a commercial zone to 60 percent. This is significantly more stringent than most areas and provides a high level of protection for the watershed. The county allows developers to use trade-offs such as rain gardens and pervious pavement to earn credits toward meeting the required level of pervious space.

G. Oldham County Health Department (OCHD)

OCHD is responsible for permitting the construction of on-site sewage treatment systems, such as septic tanks and leach fields. It also responsible for enforcing applicable standards and investigating potentially failing systems. The OCHD relies on a compliant system to identify potentially failing systems. A typical example would be a neighbor calling to report unusual/unpleasant smells from the house next door. The OCHD would visit the house in question and investigate the complaint to determine if the cause is related to the property's on-site system. Fortunately, there are few areas within the watershed that have chronic failures of systems and complaints are few.

1. Funding Sources

The OCHD is funded through the State's executive budget.

2. Watershed Programs and Initiatives

The OCHD is currently engaging (or planning to engage) in the following activities related to watershed management:

a. Evaluate any potential building/construction site for the suitability of an on-site treatment system. This allows the OCHD to serve as a screen tool to prevent builders from using an unsuitable site.

b. Permit any new construction within the watershed that will utilize an on-site treatment system for sewage to make certain systems are properly sized and constructed.

c. Investigate reports of failing systems. This gives the OCHD the ability to enforce codes and remove potential pollution sources from the watershed.

H. Oldham County Solid Waste and Recycling Department (Solid Waste Department)

The Solid Waste Department is responsible for all solid waste and recycling service delivery for the residents of Oldham County without city-provided service. The Department of Solid Waste also addresses illegal dumping, permitting of waste haulers, preparation of the annual state report, and implementation of the Solid Waste Five-Year Plan. Services to the unincorporated area of Oldham County are completed through a franchise agreement with a private waste hauler. Incorporated cities may join the agreement.

The Solid Waste Department provides once weekly collection of garbage and yard waste. In addition, there is an annual large item pick-up service. The department encourages residents to recycle and dispose of wastes properly.

The Solid Waste Department operates a recycling center and is responsible for collected recyclables from Oldham County Schools and government facilities/offices. To help educate residents, the department has produced several short videos on recycling and solid waste management.

The recycling center is open 24 hours a day and is staffed to help residents. The center also collects electronic waste (E-waste) all year, in addition to a special E-waste collection event held after Christmas every year.

1. Funding Sources

The Solid Waste Department is funded by quarterly bills to users of their services. The recycling center is funded through the Oldham County general fund. Some specific programs, such as the hazardous household waste collection, are funded through grants.

2. Watershed Programs and Initiatives

The Solid Waste Department is currently engaging or planning to engage in the following activities that relate to watershed management:

a. Host several specialty waste collection events such as:

(1) E-waste (electronics, computers, and TVs).
(2) Household hazardous waste.

(3) Shredding events.
(4) Drug and medicine collection program (in the planning stages).

b. Organize a roadside litter pick-up program that utilizes nonprofit groups and community organizations.

I. Oldham County Conservation District (Conservation District)

The Conservation District's mission is to help in the protection of Oldham County's natural resources by working hand-in-hand with government agencies, industry, schools, businesses, and individual landowners. The Oldham County Soil and Water Conservation District was formed as a local subdivision of state government in 1946.

1. Funding Sources

The Conservation District is funded through the State of Kentucky through the Division of Conservation under the Department for Natural Resources.

2. Watershed Programs and Initiatives

The Conservation District is currently engaging or planning to engage in the following activities that relate to watershed management:

a. The Conservation District provides assistance to landowners in developing and implementing Agriculture Water Quality Plans. An Agricultural Water Quality Plan is a compilation of BMPs from six different areas: sliviculture, pesticides/fertilizers, farmstead, crops, livestock, streams, and other waters.

b. The Kentucky Water Quality Cost Share Program provides between 50 percent and 75 percent of cost share assistance for a variety of practices intended to improve water quality.

J. Natural Resources Conservation Service (NRCS)

As part of the United States Department of Agriculture, NRCS leads conservation efforts for all natural resources to ensure that private lands are conserved, restored, and are more resilient to environmental challenges. NRCS works with landowners through conservation planning and assistance designed to benefit the soil, water, air, plants, and animals that result in productive lands and healthy ecosystems.
The local office of NRCS works to help in the protection of Oldham County's natural resources by working hand in hand with government agencies, industry, schools, businesses, and individual landowners.

1. Funding Sources

The NRCS is funded through Congress. Programs are generally funded through the Farm Bill which requires landowners to register their property with the United States Department of Agriculture Farm Service Agency (FSA) to be eligible for programs.

2. Watershed Programs and Initiatives

The NRCS is currently engaging or planning to engage in activities related to watershed management:

a. The Environmental Quality Incentives Program offers financial and technical assistance to agriculture and forestry producers to promote production, management, and environmental quality as compatible goals. It is primarily a livestock and water quality cost shared program.

b. The Wildlife Habitat Incentives Program offers financial and technical assistance to agriculture and forestry producers to promote wildlife friendly habitat. Applicable practices for this program include:

(1) Fencing sensitive areas.
(2) Establishing tree and shrub plantings.
(3) Developing buffers.
(4) Establishing shallow water areas.
(5) Establishing native grasses.
(6) Fescue eradication.
(7) Managing woodlands for invasive species and timber stand improvement.

c. The Conservation Security Program offers financial and technical assistance to agriculture and forestry producers to enhance current conservation programs through BMPs and better management. The program will make payments for improving existing systems and requires documentation of those systems. Landowners that participate in this program will have to certify the work that may be verified with spot checks by NRCS personnel.

d. The Continuous Conservation Reserves Program offers financial and technical assistance to agriculture and forestry producers to implement buffer systems along streams, waterways, sinkholes, and cropland field borders. Buffers must be made of native species and be 120 feet wide. Payments are made as part of annual 10- to 15-year rental program based on soil productivity.

e. The Wetland Reserves Program offers financial and technical assistance to agriculture and forestry producers to protect, preserve, and enhance critical wetland on agricultural lands. The Program offers conservation easements, wetland restoration, and annual payments. There are a range of easement program options that allow funding opportunities to increase as the length of the easement increases. To be eligible, wetlands must have been converted previously.

f. The local NRCS office provides personnel and assistance to residents on soils, water, geology, woodland management, wildlife habitat management, and conservation planning.

g. Information on other NRCS programs can be found at www.nrcs.usda.gov/programs.

K. Oldham County Board of Education (OCBE)

OCBE is responsible for the education of approximately 12,000 students throughout the county. Student enrollment has increased and is expected to continue to grow in the future. Oldham County schools are among the best performing districts in the Commonwealth. OCBE consists of a preschool, 10 elementary schools, four middle schools, three high schools, an alternative school, a career center, and a center for the arts and community education. Figure 2.06-3 shows the locations of OCBE's facilities within the county.

OCBE continues to promote environmental education in and out of the classroom in mandated curriculum and in unique methods. One unique way has been the granting of an easement on OCBE property for a stream restoration project.

The property is planned to be developed into a new high school and the location of the project will create numerous engagement opportunities for students, teachers, parents, and the general public.

1. Funding Sources

OCBE is funded primarily by local property taxes. Educational grants also contribute towards funded district activities.

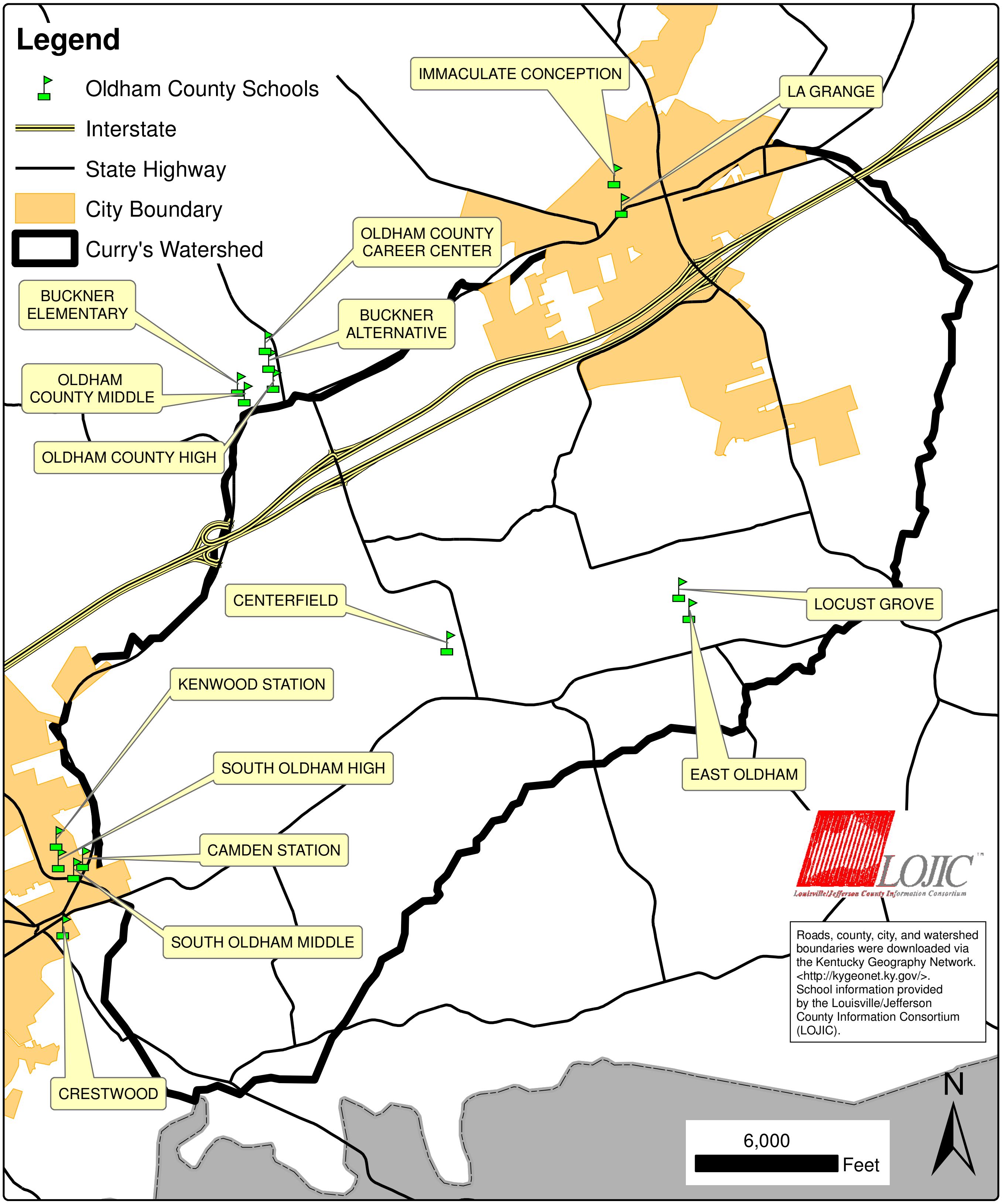
2. Watershed Programs and Initiatives

OCBE is currently engaging or planning to engage in activities that relate to watershed management:

a. State curriculum standards require OCBE to engage in environmental education. These efforts include indoor classroom/laboratory and outdoor field trips/outdoor classrooms education.

b. OCBE has granted a large easement at the site of a future high school to allow for a stream restoration project.

c. OCBE owns and operates two STPs. One of which, Centerfield Elementary, is within the Curry's Fork Watershed. At schools that are not served by traditional sewers, violations have occurred during the summer months because of low flow conditions. OCBE would prefer to decommission these plants and would take them out of service if sewers were extended to the schools.



OLDHAM COUNTY BOARD OF EDUCATION
SCHOOL LOCATIONS

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.06-3
5994.100

L. University of Louisville (UL) Stream Institute

The UL Stream Institute conducts applied research in the assessment, design, and restoration of streams, wetlands, and watersheds. The primary goal of the institute is to improve the techniques and methods used in aquatic resource mitigation. Designs and assessments incorporate the interaction of channel hydraulics and stream morphology with ecological functions so that restored stream systems are physically and biologically sustainable.

1. Funding Sources

The Stream Institute works closely with numerous local, state, and federal agencies to coordinate funding opportunities.

2. Watershed Programs and Initiatives

The Stream Institute is currently engaging or planning to engage in the following activities that relate to watershed management:

a. Lead the design and construction of a stream restoration project on Moody Lane. This project will restore approximately 3,700 linear feet of stream on the site of a future high school. The property is owned by the Board and was made possible through an easement granted by the Board and a grant from the United States Fish and Wildlife Service (FWS). This project is being used as the matching funds for the 319(h) grant that paid for the development and implementation of this watershed plan.

b. Complete geomorphic and sediment studies as part of the restoration project and the watershed plan that will assist in documenting and understanding the dynamics of the watershed and identify priorities for restoration/protection.

c. Coordinate a Natural Channel Design Working Group to educate and collaborate with agencies involved in stream restoration.

The stream restoration site is located off Moody Lane in the South Curry's Fork watershed. A total of 3,700 linear feet is being restored. UL Stream Institute watershed management activities include the following:

a. Stream Restorations (limited to reach-scale mitigation projects).

b. Geomorphic and sediment assessments to assist in sediment reduction programs.

The Stream Institute works closely with KDOW, the USACE, KDFWR (in lieu fee recipient), United States Fish and Wildlife Service (FWS), United States Forest Service, Kentucky Division of Forestry, and the Kentucky Transportation Cabinet (KYTC)-Environmental Analysis Department.

M. Kentucky Division of Water (KDOW)

The mission of the KDOW is to manage, protect, and enhance the quality and quantity of the Commonwealth's water resources for present and future generations through voluntary, regulatory, and educational programs. Two programs have been specifically identified that are ongoing within the Curry's Fork watershed. Other programs may be developed or implemented at a later date that would also be applicable.

1. 401 Permitting Process

Projects that involve the discharge of dredged or fill materials into waters of the United States, including wetlands, are regulated by the United States Army Corps (USACE) of Engineers under CWA Section 404 and require Section 401 certification. Examples of activities that may require a Section 404 permit and Section 401 water quality certification are stream relocations, road crossings, stream bank protection, construction of boat ramps, placing fill, grading, dredging, ditching, mechanically clearing a wetland, building in a wetland, constructing a dam or dike, and stream diversions.

The CWA Section 401 Water Quality Certification Program in Kentucky ensures that activities involving a discharge into waters of the state and requiring a federal permit or license are consistent with Kentucky's WQS in Title 401, Chapter 5, of the KAR.

KDOW 401 program's goal is minimizing and mitigating in-stream and near-stream disturbances. Monitoring, assessing, and permitting are all required certification activities.

a. Funding Sources

The 401 Permitting Program is funded through the state's general fund, permitting fees, and federal grants.

b. Watershed Programs and Initiatives

The 401 Permitting Program is currently engaging or planning to engage in activities that relate to watershed management:

(1) The permitting process allows KDOW staff to be aware of upcoming projects that may impact the waters of Curry's Fork.

(2) Monitoring and mitigation requirements can be directed towards improvements within the watershed.

2. Groundwater Protection Plans

Anyone engaged in activities that have the potential to pollute groundwater must develop and implement a groundwater protection plan (GPP). A GPP identifies activities at a facility and defines the best management practices (BMPs) that will be used to protect the groundwater nearby. Administrative regulations for GPPs are described in 401 KAR 5:037.

Typical activities that require a GPP include:

(1) Pesticide storage, handling, or commercial application.
(2) Land treatment and/or disposal of a pollutant or waste.
(3) Storage of bulk materials in tanks, drums, or other containers.
(4) Transmission pipe lines.
(5) On-site sewage treatment and disposal systems.
(6) Storage, handling, or application of road oil, dust suppressants, or deicing agents in a central location.
(7) Mining or related activities.
(8) Installing, constructing, operating wells or borings.

a. Funding Sources

The GPP program is funded through the state's general fund, permitting fees, and federal grants.

b. Watershed Programs and Initiatives

The GPP program is currently engaging or planning to engage in activities that relate to watershed management:

(1) Protecting the quality of groundwater inherently benefits the streams within the Curry's Fork watershed. A significant amount of the stream flow in the watershed comes from groundwater.

(2) Providing generic GPPs to homeowners with residential septic systems.

(3) GPPs can be used to identify potential threats to the watershed.

(4) BMPs defined in GPPs can be leveraged to also protect/improve surface water.

(5) GPPs are not required to be submitted to the state unless:
 (a) Called in by a Department of Environment inspector.
 (b) Called in by the Groundwater Section's GPP program.
 (c) Required by Division of Enforcement through an Agreed Order.

N. United States Army Corps of Engineers (USACE)

The USACE, Regulatory Branch, implements Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the CWA which includes the following:

1. Regulation of the placement of any structure or work in, under, or over "traditionally navigable water."

2. Regulates the discharge of dredged or fill material into "waters of the U.S."

The CWA 404 program addresses protecting streams and wetlands. There are two major divisions under this program; Section 10 (rivers and harbors) and the CWA 404. The CWA 404 includes wetlands, ponds, and streams. If construction activities are occurring in the waters of the United States, an alternatives analysis shall be developed. The analysis reviews the location of construction, the process to minimize impacts to the body of water, and the cumulative impacts. Depending on the action, it may require mitigation to replace the environmental value of the disturbance. Preferred mitigation includes bank stabilization in lieu of fee, and on-site or off-site permittee responsibility.
The USACE's role is regulatory in nature; therefore, no special agency programs exist.

1. Funding Sources

USACE is funded through Congress.

2. Watershed Programs and Initiatives

The USACE is currently engaging or planning to engage in activities that relate to watershed management:

a. The goal of the USACE's regulatory authority is to facilitate navigation and to avoid, minimize, and mitigate physical impacts to the waters of the United States. The avoidance, minimization, and mitigation of impacts to the waters of the United States are consistent with the goals of the watershed plan.

b. In its role in reviewing and approving activities that may impact the waters within Curry's Fork, the USACE is often aware of planned projects within the watershed as long as the projects involve waters of the United States.

c. The 2008 Mitigation Rule [332.3(c)] requires to the extent appropriate and practicable, the USACE to use a watershed approach to establish compensory mitigation. These projects would likely be consistent with other watershed efforts and would likely contribute to the improvement of the quality of the watershed.

O. Source Water Protection Plans

Source Water Protection Plans are required by the Safe Drinking Water Act and state statutes. Counties are required to develop long-range supply assessment and protection plans. The Kentuckiana Regional Planning and Development Agency led the preparation of the Oldham County plan.

P. Wellhead Protection Areas

The Safe Drinking Water Act requires wellhead protection programs to be developed for public water supplies that draw from groundwater. As there are no public drinking water supply sources within Curry's Fork, there are no applicable plans or programs within the watershed.

Q. Past and Current Watershed Plans

1. Floyds Fork WP

Efforts on developing a watershed plan for Floyds Fork were suspended in May 2008 pending resolution of legal disputes.

Curry's Fork drains into Floyds Fork, which is a major tributary of the Salt River. The main stem of Floyds Fork and several tributaries are listed as impaired on the 2008 303(d) List. To address the nonpoint source pollution in the Floyds Fork watershed, the Floyds Fork Environmental Association, KWA, and Fuller, Mossbarger, Scott, and May Engineers (now Stantec) teamed up to develop a WP. The Floyds Fork WP is funded in part by a FFY2003 Clean Water Act Section 319(h) grant awarded by the USEPA through KDOW. For more information about the Floyds Fork WP, visit the KWA Web site at http://www.kwalliance.org/.

2. Darby Creek WP

The Darby Creek WP was completed in June 2010 and can be viewed at www.kwalliance.org. Darby Creek is located in Oldham County but is not part of the Curry's Fork watershed.

SECTION 3
WATER QUALITY SAMPLING

3.01 WATER QUALITY SAMPLING

To develop a comprehensive Watershed Plan (WP), the condition of the watershed must be well-documented through water quality data. Existing water quality data was compiled and reviewed by the WP Internal Project Team and considered insufficient for developing a WP. For additional information on existing water quality data compiled and reviewed for the WP, see the Curry's Fork Water Quality Data Report (WQDR) in Appendix D. Thus, a Curry's Fork Watershed Sampling Program was developed, approved, and conducted specifically for the development of the WP. The WP data collection effort included bacteria, physicochemical parameters, biology and habitat assessments, and a sediment and geomorphic assessment collected by Strand Associates, Inc.® (Strand), Third Rock Consultants, LLP (Third Rock), and University of Louisville (UL). An existing mussel study performed by Kentucky Division of Water (KDOW) was also used in the development of the WP.

Results from the WP Sampling Program were used to identify potential pollutant sources, priority areas for protection and restoration, probable causes, and solutions for remediating water pollution problems in Curry's Fork. The WP Sampling Program ensured water quality data collected were recent enough to be used for planning purposes and were collected using KDOW-approved sampling plans, sampling methods, or procedures to confirm accuracy and reduce risks of contaminating samples. The Quality Assurance Project Plan (QAPP) used for the WP Sampling Program is shown in Appendix D.

The following subsections briefly discuss sampling data collected by Strand, Third Rock, and UL for the WP Sampling Program including the types of data collected, why it was collected, the time frame of data collection, and the quantity of data. Refer to each subsection for a list of sampling sites and sampling locations. See the WQDR in Appendix D for all data reviewed and collected for the WP. A summary of sampling sites for the WP Sampling Program is shown in Table 3.01-1. Please note that sampling sites in the Asher's Run were referred to with Site IDs that began with "TB" in the beginning stages of the field data.

Site ID	Stream	Site Description	Data Type(s)	Latitude	Longitude
CF1	Curry's Fork	Project Site	PC, B, H, P	38.30588	-85.45044
CF2	Curry's Fork	Project Site	PC, P	38.30938	-85.45159
CF3	Curry's Fork	Project Site	PC, P	38.35554	-85.44050
Station #21	Curry's Fork	KDOW Site	B	38.30750	-85.45080
AR1	Asher's Run	Project Site	PC, B, H, P	38.30894	-85.44429
AR1a	Asher's Run	Project Site	PC, P	38.33167	-85.41222
Station #22	North Curry's Fork	KDOW Site	B	38.37720	-85.42750
NC1	North Curry's Fork	Project Site	PC, B, H, P	38.35926	-85.43942
NC1a	North Curry's Fork	Project Site	PC, P	38.37722	-85.42750
NC1b	North Curry's Fork	Project Site	PC, P	38.38872	-85.39703
NC2	North Curry's Fork	Project Site	PC, P	38.40033	-85.36715
SC1	South Curry's Fork	Project Site	PC, B, H, P	38.35679	-85.43863
SC2	South Curry's Fork	Project Site	PC, P	38.36812	-85.37460

Data Type Notes: PC = Physicochemical; B = Biological; H = Habitat; P = Pathogen

Table 3.01-1 Curry's Fork WP Sampling Sites

3.02 PHYSICOCHEMICAL SAMPLING DATA

Parameter	Analysis Type
Temperature	Field Data
pH	Field Data
Dissolved oxygen	Field Data
Conductivity	Field Data
Stream depth	Field Data
Stream velocity	Field Data
Fecal coliform	Laboratory Data
Total suspended solids	Laboratory Data
Nutrients	Laboratory Data
Sulfate	Laboratory Data
Ammonia	Laboratory Data
5-Day biochemical oxygen demand	Laboratory Data

Table 3.02-1 Physicochemical Data Summary

Table 3.02-1 summarizes the physicochemical parameters measured for the WP Sampling Program.

A. Data Sources

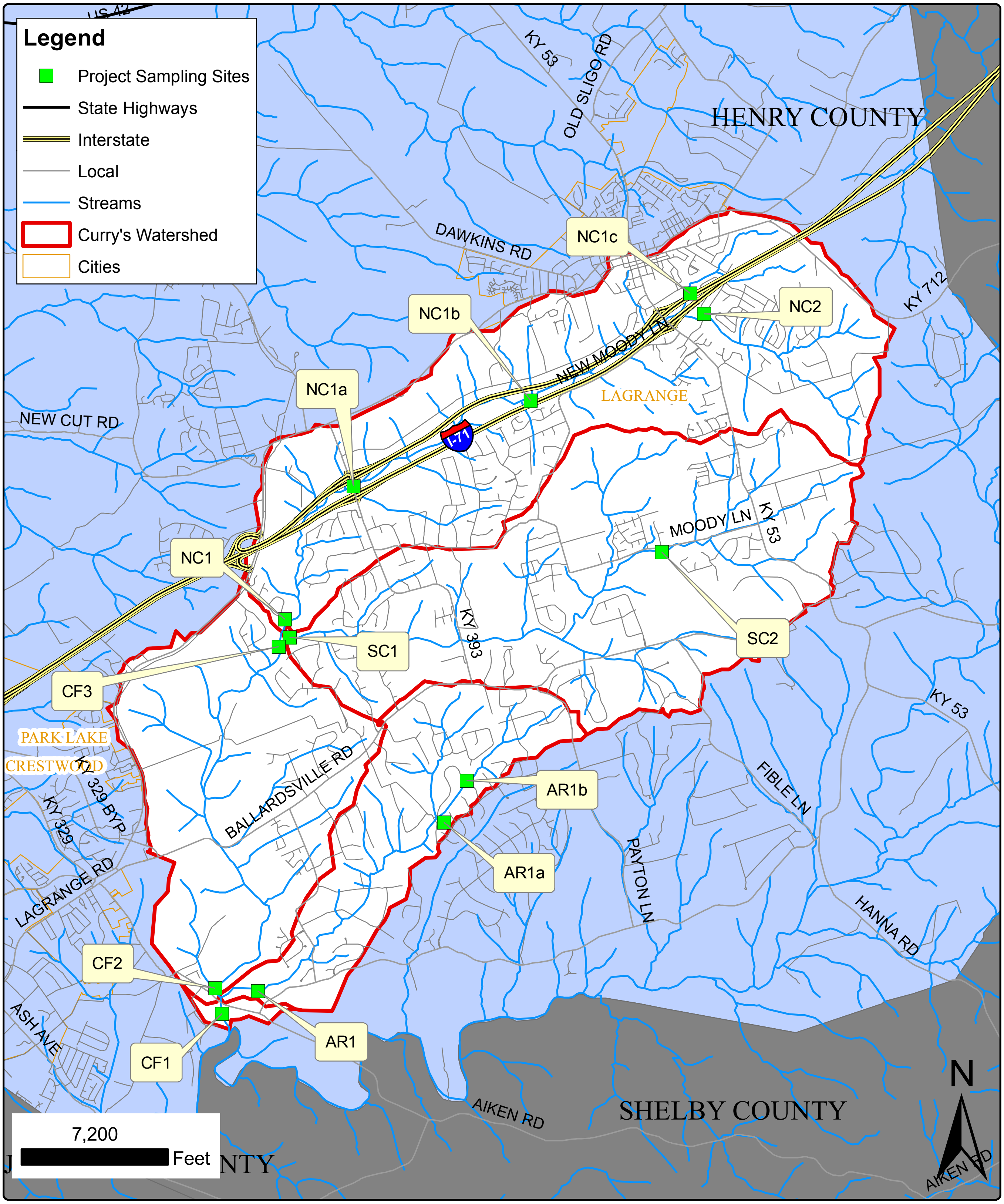
Physicochemical data sources include sampling conducted by Strand, Third Rock, and UL. Figure 3.02-1 shows the primary bacteria and physicochemical sampling site locations. UL collected physicochemical data at numerous other sampling sites as part of its geomorphic assessment. See Appendix D for additional information.

Strand's physicochemical portion of the WP Sampling Program provided baseline conditions in the Curry's Fork watershed and was used by the Water Quality Data Analysis Team (WQDAT) and the Technical Committee (TC) to identify pollutants of concern, priority protection and restoration areas, pollutant sources, and pollutant causes to develop pollutant loads for select parameters and select appropriate solutions and best management practices (BMPs).

Physicochemical water quality samples were collected as part of the WP Sampling Program during the 2007 primary contact recreational season at eight sampling sites within Curry's Fork. Four of the eight initial sampling sites had portable automatic samplers with flow metering equipment installed to take continuous flow velocity and depth measurements; these sites were NC1, SC1, AR1, and CF2. See Figure 3.02-1 for the location of these sites. Physicochemical water quality samples were taken approximately every other week for a total of 12 sampling dates. Samples were taken as close to the same day each week as possible regardless of weather conditions.

Sampling sites AR1a and NC1c are headwater sampling sites in Asher's Run and North Curry's Fork. These sampling sites were sampled to attempt to identify pollutant sources in the upstream reaches of their respective watersheds. These sampling sites did not yield results significantly different than sites regularly sampled and were only sampled one time. Therefore, results of these sites are not included in results tables or sampling data result discussions. As indicated in Table 3.01-1, sites AR1a and NC1c had physicochemical and pathogen samples taken the one time they were sampled.

As a result of drought conditions observed in May through September 2007 and the subsequent missed sampling events because of low flow or no flow conditions in streams, the physicochemical water quality sampling conducted in 2007 was repeated in 2009 with the addition of three sampling sites. The area in and around Curry's Fork typically receives 19.26 inches of rainfall between May and September [Ohio River Valley Sanitation Commission (ORSANCO, 1994)]. Between May and September of 2007, Curry's Fork received 15.66 inches of rainfall according to the Jeffries Farm rain gauge (Jeffries Farm has a privately-owned weather station that was used to provide local weather conditions for this report)



PRIMARY BACTERIA AND PHYSICOCHEMICAL SAMPLING SITES

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 3.02-1
5994.100

located in South Curry's Fork, which is 3.6 inches or approximately 19 percent less than average. The three additional sites were added in consultation with KDOW and others to further aid identification of pollutant sources based on 2007 sampling results. The QAPP was updated to reflect changes made to the sampling program in 2009. Curry's Fork received 32.42 inches of rain between May and September of 2009.

Two storm events were also sampled intensively during the recreational contact season in 2009 to obtain additional wet weather sampling data, one on September 20, 2009, and one on October 30, 2009, to obtain pollutant load information over rain-influenced hydrograph. Samples were taken at Hour 0 (start of the storm), Hour 4 (4 hours after the start of the storm, and Hour 12 (12 hours after the start of the storm) to determine wet weather influences on stream water quality. Storm event samples were taken at all WP project sites except NC1a, NC1b, and NC2 for safety reasons.

B. Normal vs. Rain Influenced Events

To differentiate between normal and rain influenced WP sampling events during 2007 and 2009 physicochemical water quality sampling, sampling dates were compared with rainfall information obtained from the Jeffries Farm rain gauge located in the South Curry's Fork watershed. It is important to identify which sampling events were affected by stormwater/runoff conditions so that the types and sources of pollutants are determined throughout the watershed.

Rainfall and stream flow conditions (depth and velocity) were also used to help determine if an event was dry weather or wet weather. Initially, any sampling event that occurred within 24 hours of a precipitation event (defined for this evaluation as > 0.1 inches from the Jeffries Farm rain gauge) was tagged as a potential wet weather event.

Stream flow conditions were then reviewed for each potential wet weather event. If stream flow conditions were elevated and indicative of runoff conditions in response to rainfall, the event was considered a wet weather event. If stream flow conditions were indicative of base flow conditions (dry conditions), the rainfall had not impacted the stream and the event was considered a dry weather event. This process was repeated for each sampling event.

3.03 BACTERIA DATA

Fecal coliform bacteria data was collected as part of the WP sampling program. Fecal coliform and *E. coli* bacteria data is collected for many water quality sampling programs because it is an indicator organism. Indicator organisms, while not pathogenic themselves, may indicate the presence of waterborne pathogens. Indicator organisms are typically used in water quality monitoring because testing for the pathogens themselves is impractical. There are many types of pathogens, and they typically require a specific test with special materials or equipment, making the cost for directly monitoring pathogens expensive. Testing for indicator organisms can identify areas of concern in a watershed but at a fraction of the cost. Therefore, the term pathogen is used to reference data and discussion related to fecal coliform bacteria.

A. Primary Data Sources

Fecal coliform bacteria data was collected at the same time as physicochemical data at project sites during biweekly sampling and the two storm events described in Subsection 3.02. See Figure 3.02-1 for sampling site locations.

3.04 GEOMORPHOLOGIC DATA

Geomorphological data was collected by UL as part of the WP sampling program.

UL conducted a sediment and geomorphic assessment to assess and quantify water pollutant loads being contributed from different sources within the watershed. The three objectives of the assessment were to calculate loads of fine sediment from the four subwatersheds, evaluate the relative contributions of different sediment sources, and interpret possible links between sediment production and Warm Water Aquatic Habitat (WAH) impairment.

The assessment comprised three main activities: measurement of sediment yields at the mouth of each subwatershed, assessment of sediment production along stream reaches and uplands within each subwatershed, and a geomorphic assessment to identify potential causes of WAH impairment. UL utilized numerous instream measurements and modeling software to perform the sediment and geomorphic assessment. Sampling site selections, data collection, and data analysis methods are described in the WQDR shown in Appendix D.

The four sampling sites installed with portable samplers mentioned in Subsection 3.02 collected total suspended solids (TSS) and flow data to support the geomorphology study. Between November 2007 and July 2008, the portable samplers were programmed to collect samples at specified time intervals once the stream depth reached a specified value such as a flow depth indicative of wet weather flow. The samples were used to determine TSS loads throughout the length of a storm event.

Table 3.04-1 summarizes the number of events sampled by the portable samplers.

Event Date	NC1	AR1	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		
Total Events Sampled	**9**	**9**	**6**	**6**

Table 3.04-1 Portable Sampler Event Summary

3.05 BIOLOGICAL AND PHYSICAL HABITAT DATA

Aquatic, biological, and physical habitat data conducted or used as part of the WP sampling program included mussels, benthic macroinvertebrates (visible bottom-dwelling invertebrates), fish, algae, and instream and near stream physical habitat assessments. Biological and physical habitat assessments were performed at sites CF2, AR1, SC1, and NC1. Mussel surveys were performed at Station #21 and Station #22. Refer to Figure 3.05-1 for the locations of biological and physical habitat assessments sites.

Biological and physical habitat assessments were performed to evaluate the biological and physical habitat condition of surface water using biological surveys, stream surveys, and other direct measurements. These assessments integrate the collection and analysis of algal, mussel, macroinvertebrate, fish, habitat, and water chemistry data to arrive at conclusions on the health of the surface water and the subwatersheds of Curry's Fork.

A. Data Sources

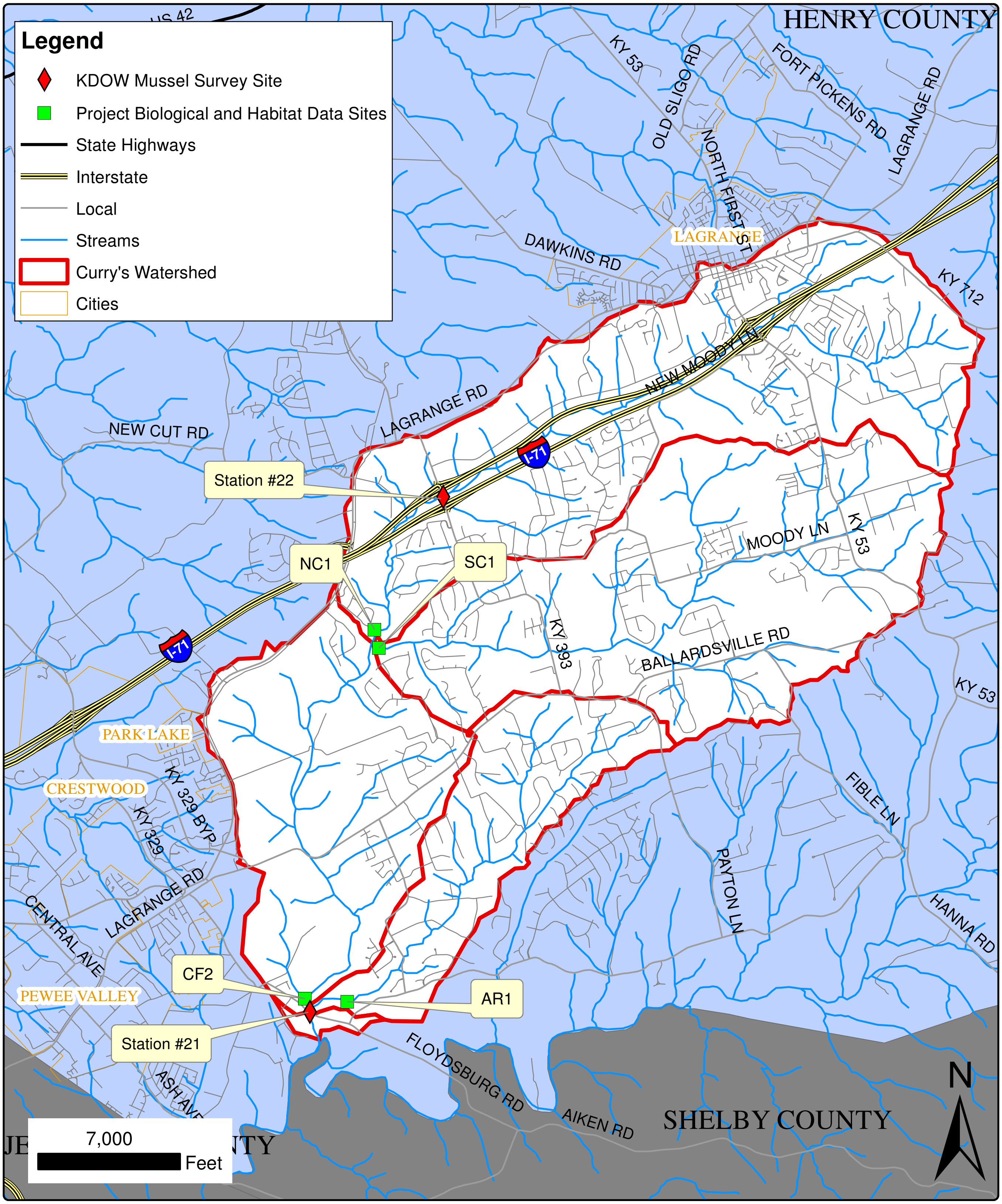
Biological and physical habitat data sources used to develop the WP include sampling conducted by Third Rock and KDOW.

1. Third Rock

Biological and habitat assessments were performed in the summer of 2007 at four sampling sites within Curry's Fork; these sites are NC1, SC1, AR1, and CF2. Sampling data was collected as part of the WP sampling program.

2. KDOW

KDOW conducted a qualitative mussel survey for Floyds Fork during the summer and fall of 2003. Twenty-three sites were surveyed during this study and results were compared to a previous study conducted in 1978 to provide updated mussel information and to document the changes in mussel population. Curry's Fork is a tributary of Floyds Fork and two of the 23 project sites are located in the Curry's Fork watershed. See Figure 3.05-1 for the location of mussel survey sites within Curry's Fork and the Appendix of the WQDR (see Appendix D of this report) for a copy of the study.[15]



BIOLOGICAL AND PHYSICAL HABITAT SAMPLING SITES

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 3.05-1
5994.100

SECTION 4
WATER QUALITY DATA ANALYSIS

4.01 DATA COLLECTION AND ANALYSIS CHALLENGES

A. Water Quality Data Use

The following sections discuss how the data collected in Section 3 was used to identify or verify pollutants of concern (POC), identify potential pollutant sources, and identify priority areas for restoration and protection. Data results were divided into two categories for the purposes of identifying pollutant sources and selecting remediation measures: Primary Contact Recreation (PCR) and Warm Water Aquatic Habitat (WAH). PCR included bacteria data collected during the biweekly sampling in 2007 and 2009 and WAH included the physicochemical, biological, physical habitat, and geomorphic assessment data. For a full discussion of all monitored data and results, please refer to the Water Quality Data Report (WQDR) in Appendix D.

B. Project Challenges

Data collection for the Curry's Fork Watershed Plan (WP) consisted of numerous sampling and assessment programs performed by different agencies and organizations. A substantial amount of field work and coordination was required to obtain the necessary water quality data needed to develop the WP. As with any project of this magnitude and level of coordination, a number of challenges were encountered, some beyond what can reasonably be planned for. Before discussing the data results, it is important to note some of the challenges encountered during the data collection and analysis process and how they were addressed over the course of the project.

The University of Louisville (UL) Stream Institute originally planned to team with a professor from the UL Biology Department to perform the necessary biological and habitat assessments. The unfortunate passing of the UL Biology professor caused the UL Biology Department to be short-staffed and unable to perform the biological and habitat assessments, which delayed finalizing the contracts and the start of the assessments. Third Rock Consultants, LLC (Third Rock) was contracted in place of the UL Biology Department to perform the biological and habitat assessments. The delay resulted in some testing and analysis to be performed outside of the optimal periods.

During review of the biological and habitat data, concerns were raised over the identification of algal samples by an out-of-state subcontractor. A detailed review by the Curry's Fork Water Quality Data Analysis Team (WQDAT) led to the eventual exclusion of the algae data from the WP. Additional algae data collection was deemed unnecessary because enough nutrient data was collected within the WP sampling program to appropriately identify eutrophication concerns. Further, insufficient time remained to repeat the algal data collection, identification, and analysis. In lieu of funds spent on the algal data, Third Rock provided an additional and in-depth analysis on the macroinvertebrate data that was used extensively to target priority areas.

Unforeseen insurance issues were encountered between the organizations performing the sediment and geomorphological sampling and the watershed technical advisor that did not allow them to work as subconsultants. This caused delays while contracts were revised. The challenge was resolved by having the organizations contract directly with Oldham County Fiscal Court (OCFC). These challenges each added to delays in conducting and completing the geomorphic assessment in the watershed, a critical component to understanding stressors and impacts in the watershed.

Drought conditions in the 2007 recreational contact season resulted in a number of missed samples because of low or no flow conditions. This created data gaps and caused difficulties with establishing baseline conditions in Curry's Fork. With the approval from Kentucky Division of Water (KDOW), additional sampling was conducted in 2009 to supplement data collected in 2007 during the drought-like conditions. In addition, based on field conditions observed in 2007, three new sampling sites were added during the 2009 sampling program to further aid in the identification of pollutant sources.

Draft nutrient target ranges described later in Subsection 4.03 had not been established when nutrient samples were taken as part of the WP sampling program. When analyzing a water sample, the type of lab analysis used determines the detection limit or limit of detection. The lower detection limit is the lowest quantity of a substance the analysis can distinguish from a sample absent of that substance. Phosphorus sampling results are the only sampling results where lower detection limit of the lab analysis used was higher than the target values established for the WP. The typical detection limit for phosphorus for the sampling method used is 0.15 milligrams per liter (mg/l) and the draft phosphorus target ranges are 0.07 mg/l to 0.1 mg/l. Phosphorus concentrations at NC2, SC2, SC1, and AR1 were typically at the lower detection limit which is why sampling results for these sites are similar. Therefore, it is unknown whether the sampling results at NC2, SC2, SC1, and AR1 were at or below the established draft target range. Samples from NC1, CF3, CF2, and CF1 typically exceeded the phosphorus lower detection limit.

Originally, the bank erosion hazard index (BEHI) readings, near-bank stress (NBS) readings and erosion pin measurements were used to estimate bank erosion. BEHI is an assessment procedure that measures the potential for a streambank to erode when a stress is applied to it. NBS enables indexing of energy distribution within a stream reach. Unfortunately, none of the BEHI or NBS parameters were significantly correlated with erosion rates. The lack of a usable BEHI-NBS relationship can be attributed primarily to the lack of variability in key parameters within the watershed: bank materials were relatively similar, mass wasting was absent, and weathering, which is independent of NBS, appeared to be a strong control on erosion rate at all sites. Therefore, a simplified volumetric rate of sediment production was used for each subwatershed based on the erosion pin measurements. See the WQDR in Appendix D for more details and explanations.

The original intent of the data collection efforts was to perform all sampling and assessments during the same time period. Unfortunately, because of the delays discussed above, the various sampling programs were not on their original schedule and could not be implemented nor completed at the same time. To keep the Technical Committee (TC) and the community involved and to prevent significant delays with producing the WP, the Internal Project team moved forward with analyzing the PCR pollutants and developing potential sources and best management practices (BMPs) while WAH data was still being collected.

4.02 DATA ANALYSIS TEAM APPROACH

To ensure data conclusions were unbiased and that the decision making process was balanced among all data types, a team approach was taken to reviewing sampling results, assessment results, and identifying pollutants of concern.

First, the raw data was collected, compiled, and analyzed by the individual agencies and organizations that performed the sampling or assessment. Data results were divided into two categories for the purposes of identifying pollutant sources and selecting remediation measures: PCR and WAH. PCR included bacteria data collected during the biweekly sampling in 2007 and 2009 and WAH included the physicochemical, biological, physical habitat, and geomorphic assessment data. From this initial data review, a POC list was developed for PCR and WAH data.

To address the challenge of assessing multiple data conclusions from numerous monitoring approaches, a multidiscipline team was formed called the WQDAT. Representatives from Third Rock, Strand Associates, Inc.® (Strand), UL Stream Institute, KDOW, United States Geological Survey (USGS), independent consultants, and an independent watershed technical advisor participated on the WQDAT, which met three times. The WQDAT included water quality data expertise from the following disciplines: aquatic biologists, engineers, watershed managers, fluvial geomorphologists, total maximum daily load (TMDL) developers, nutrient specialists, and modelers. The first meeting of the WQDAT was in August 2009 and discussed the goals of the team as well as an overall review of available PCR and WAH data. The second in February 2010 focused on the PCR data and the third meeting in September 2010 focused on the WAH data. The value and contributions made by the WQDAT should not be understated. Having water quality data professionals with various areas of specialization evaluating multiple data sets of PCR and WAH data to reach subwatershed conclusions and identify priority areas for remediation and protection efforts was invaluable.

Data summaries from the WQDAT were then presented to the Curry's Fork TC, which met 20 times between August 2008 and February 2011. During TC meetings, members discussed the sampling results and compared it to characteristics of the Curry's Fork watershed discussed in Section 2. As discussed in Section 2, characteristics of the Curry's Fork watershed were documented through geographical information system (GIS) and the TC's local knowledge. A GIS analysis allowed the TC to review numerous characteristics about the watershed, including but not limited to land use, impervious area, point source locations, and potential development areas. Using their local knowledge of the watershed along with the sampling data, assessment results, and the GIS analysis, TC members identified potential pollutant sources within each of the Curry's Fork subwatersheds for each POC and data category. Potential pollutant sources were then further reviewed and placed into two categories: more probable sources and less probable sources. Finally, the data results were presented to watershed residents through a series of three Community Roundtables for community input, reaction, and support before being included in the WP. Figure 4.02-1 illustrates the data collection and dissemination process.

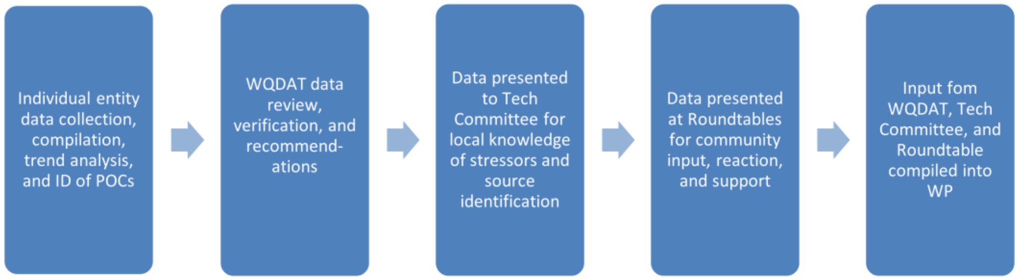


Figure 4.02-1 Data Collection and Dissemination Process

4.03 WATER QUALITY BENCHMARKS AND TARGETS

Establishing benchmarks and target water quality values is critical for determining watershed goals and for assessing data results. Benchmarks and target values can be Water Quality Standards (WQS), recommended values, average values from reference streams, or target goals set for the watershed. A mix of these benchmarks and targets as used for the WP.

As mentioned in Section 3 of this report, surface WQS for the Commonwealth of Kentucky are defined in 401 Kentucky Administrative Regulation (KAR) 10:031. This section of the regulation establishes specific in-stream criteria for a number of parameters. Applicable criteria for the POC in the Curry's Fork watershed are as follows:

1. Dissolved oxygen (DO) shall be maintained at a minimum concentration of 5.0 mg/L daily average; the instantaneous minimum shall not be less than 4.0 mg/L.

2. Un-ionized ammonia nitrogen (NH_3N) concentrations shall not be greater than 0.05 mg/L.

3. PCR: Fecal coliform and *Escherichia coli* (*E. coli)* content shall not exceed 200 colonies per 100 milliliters (col/100 mL) or 130 col/100 mL, respectively, as a geometric mean based on not less than five samples taken during a 30-day period. Content also shall not exceed 400 col/100 mL in 20 percent or more of all samples taken during a 30-day period for fecal coliform or 240 col/100 mL for *E. coli*.

   Secondary Contact Recreation (SCR): Fecal coliform shall not exceed 1,000 col/100 mL as a geometric mean based on not less than five samples taken during a 30-day period. Content also shall not exceed 2,000 col/100 mL in 20 percent or more of all samples taken during a 30-day period for fecal coliform.

In addition to the above parameters and the associated water quality criteria, the 303(d) List also included total suspended solids (TSS) as a POC in the Curry's Fork watershed. While Kentucky has narrative water quality criteria for sediment and TSS, numeric water quality criteria does not exist. Further, in-stream target values for TSS were not available either. Therefore, for purposes of comparing and evaluating TSS for this project, the commonly used Kentucky Pollutant Discharge Elimination System (KDPES) permit limit of 30 mg/L was used as a TSS benchmark value.

KDOW recently developed draft target ranges for phosphorous and total nitrogen for the Outer Bluegrass ecoregion. Nutrient data was collected from numerous streams in the ecoregion and reviewed to develop the average draft ranges. It is important to note these ranges are averages from different streams. While each stream was in the same ecoregion and will have similar characteristics, each stream is still subject to some unique conditions based on the surrounding land use and will have different baseline conditions. It is also important to note these are only draft ranges and do not represent WQS. Currently there are no numeric nutrient water quality standards for Kentucky surface waters for the designated uses of WAH and PCR. KDOW's draft nutrient ranges were used for this WP as a general target in the absence of specific numeric criteria. The following draft target average ranges are:

- Phosphorous: 0.07 mg/L to 0.1 mg/L
- Total Nitrogen: 1.2 mg/L to 1.4 mg/L

Habitat and biological data use a variety of metrics to determine the condition of a stream and whether or not it is meeting its intended use. Biological and habitat metrics for the WP were evaluated using the 2002 and 2008 KDOW versions of the Standard Methods for Assessing Biological Integrity of Surface Waters in Kentucky. Table 4.03-1 summarizes the habitat and biological assessment metric benchmarks for streams with a designated use of WAH from the 2002 and 2008 KDOW assessment methods. The metrics used for the WP sampling program shown on Table 4.03-1 are the Rapid Bioassessment Protocols (RBP), the Macroinvertebrate Biotic Index (MBI), Index of Biological Integrity (IBI) and Ephemeroptera-Plecoptera-Trichoptera taxa (EPT). Refer to Subsection 4.16 for additional information.

Designated Use: Warm Water Aquatic Habitat	Criteria				
	Habitat		Macroinvertebrates		Fish
	Drainage Area > 5.0 mi^2	Drainage Area < 5.0 mi^2	Drainage Area > 5.0 mi^2	Drainage Area < 5.0 mi^2	
Fully Supports	RBP ≥ 130	RBP ≥ 130	MBI ≥ 61 (Good or Excellent)	MBI ≥ 51 (Good or Excellent)	IBI ≥ 47: expected number of species and intolerant species present, few omnivores and tolerant species, balanced community. (Good or Excellent)
	Stable Substrate with no embeddedness, good instream cover, riparian zones wide, no bank erosion.		High number of EPT and sensitive taxa present, low modified Hilsenhoff biotic index (MHBI), high MBI.		
Partially Supports	RBP = 114 to 129	RBP = 142 to 155	MBI = 41 to 60 (Fair)	MBI = 39 to 50 (Fair)	IBI = 31 to 46: lower species and intolerant forms, more omnivores and tolerant species, few top predators. (Fair)
	Substrates moderately stable, some instream cover, more narrow riparian zone, some bank erosion.		EPT lower than expected, reduction of sensitive taxa, higher MHBI		
Does Not Support	RBP ≤ 113	RBP ≤ 141	MBI ≤ 40 (Poor or Very Poor)	MBI ≤ 38 (Poor or Very Poor)	IBI ≤ 30: no sensitive species present, omnivores and tolerant species dominate, hybrids and diseased fish often present. (Poor or Very poor)

Table 4.03-1 Habitat and Biological Assessment Metrics

4.04 POLLUTANTS OF CONCERN

POC were identified based on the 303(d) List and verified through results from sampling data and assessments in Curry's Fork. POC for the Curry's Fork watershed are:

- Bacteria (Fecal Coliform)
- Nutrient/Eutrophication Biological Indicators
- DO
- Sedimentation/Siltation

After the primary stressors to the watershed were identified, the data was further analyzed on a subwatershed level following the process discussed in Section 4.02. The following subsections discuss the additional analysis for each POC and discuss the priority areas and potential pollutant sources identified from the analysis.

4.05 BOX-PLOT AND LOAD DURATION CURVE ANALYSES

Water quality parameters, such as bacteria, are commonly shown as box plots or "whisker" plots. Box plots are a quick way of examining data sets graphically by showing the data through five-number summaries: the 10th percentile value (10 percent of readings are lower than this value), the lower quartile (25 percent of readings are lower than this value), the median (50 percent of readings are lower than this value), the upper quartile (75 percent of readings are lower than this value), and the 90th percentile value (90 percent of readings are lower than this value). The average value of the data set is also sometimes shown for reference. For bacteria data, the average was calculated as a geometric mean to allow comparisons to WQS. By showing this wide range of information in a single figure, box plots can be used to quickly evaluate the range of readings for a sampling site and the distribution of the readings within that range. See Figure 4.05-1 for an example box plot. Box plots will be used to display bacteria sampling results for each project sampling site and nitrate results.

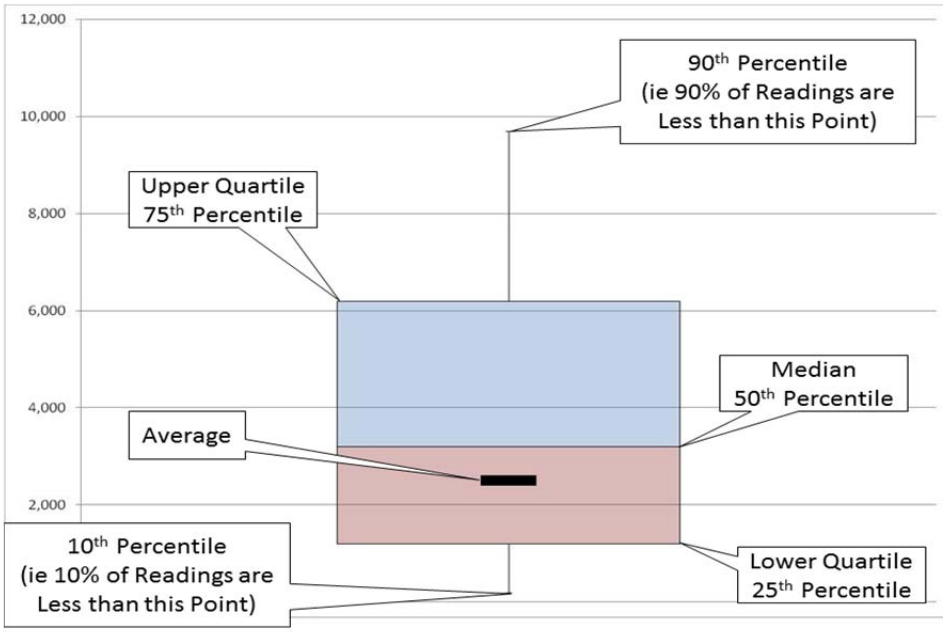


Figure 4.05-1 Example Box Plot

For subwatersheds with more than one project sampling site, the most upstream sampling site is always displayed on the left side of the box plot and the most downstream sampling site is always displayed on the right side of the box plot.

Initially to differentiate between normal and rain-influenced sampling events during biweekly sampling, sampling dates were compared with rainfall information from the Jeffries Farm rain gauge located on the South Curry's Fork subwatershed. Rainfall and stream flow conditions (depth and velocity) were also considered when determining if a sample was taken during normal or rain influenced conditions. Originally, any sampling event that occurred within 24 hours of precipitation (defined as greater than 0.1 inches) was tagged as a potential rain influenced event. Stream flow conditions were then reviewed for each potential rain influenced event. If stream flow conditions were elevated and indicative of runoff conditions in response to rainfall, the sample was counted as a rain influenced event. If stream flow conditions are indicative of baseline conditions, the rainfall did not impact the stream enough and the sample was considered a normal event. This process was repeated for each sample.

This data includes nearly two years of 15-minute interval flow data. While this provides an encompassing understanding of the flows at the time of the study, it does not have the breadth of a longer documentation period. Often load durations are constructed with at least 10 years of daily flow data. However, that extent of information was not available and the decision was made to use in-depth local data rather than data from a gauge outside the watershed.

Load Duration Curves (LDC) were also developed for selected parameters fecal coliform, nutrients, conductivity, and TSS. LDCs were developed to determine pollutant loads and to visually review pollutant loads over the streams flow regime. A LDC is developed by multiplying a numeric water quality target or benchmark and a conversion factor by all observed stream flow conditions to calculate an associated pollutant load for a particular parameter. The Y-axis represents the pollutant load, and the X-axis relates the flow values to the percent of time those values have been met or exceeded. Measured pollutant concentrations and stream flows are then plotted on top of this curve to see the actual pollutant loads in the stream compared to the acceptable load. Refer to the Curry's Fork WQDR to review LDCs for the WP sampling sites.

Two storm events were also targeted for additional sampling to help differentiate between normal and rain-influenced events, one on September 20, 2009, and one on October 30, 2009. Samples were collected at Hour 0 (start of the storm), Hour 4 (4 hours after the start of the storm), and Hour 12 (12 hours after the start of the storm). Refer to the Curry's Fork WQDR for a detailed listing of storm event sampling results.

After analyzing the normal events, rain-influenced events, and the LDCs, it was agreed upon by the WQDAT and the TC that weather conditions did not have a significant impact on the sampling results. All subwatersheds show the effects of rain-influenced nonpoint source (NPS) pollution with a slight tendency to more exceedances during higher flows, but the increase in exceedances was not observed to be substantial. Sampling sites found to have elevated pollutants levels typically showed elevated levels regardless of weather conditions.

To arrive at this conclusion, the WQDAT and TC considered normal and rain-influenced conditions extensively in their review of the sampling results. The WQDAT and TC sampling results review consisted of a significant amount of data to identify trends. Project specific sampling included 24 biweekly sampling events, of which 14 were determined to be under wet weather influence and 10 were determined to be dry. In addition, two wet weather events were sampled to examine the watershed's reaction to wet weather during an event. In total, over 300 bacteria samples, nearly 400 nutrient samples, and over 1,000 TSS samples were used as part of the WQDAT and TC review.

Certain sampling sites at times showed increased pollutant levels during or following rain events, but the more consistent trend was that weather did not have a significant impact on pollutant levels. For example, Figures 4.05-1 through 4.05-11 show the fecal coliform LDCs complied using data collected as part of the development of the WP. As shown in Figures 4.05-1 through 4.05-11, exceedances occur during every flow regime and wet weather-influenced samples are found across all flows. This made the targeting of sources or BMPs based on flow regimes caused by weather conditions questionable and, thus, the WQDAT and TC recommendations were not focused on wet weather. Fecal coliform LDCs are shown here only as an example. LDCs for nutrients (nitrogen and phosphorus) also show similar trends. All LDCs created as part of this WP are shown in Appendix D.

4.06 BACTERIA DATA ANALYSIS

Fecal coliform and *E. coli* bacteria is considered an indicator organism that, while not pathogenic themselves, may indicate the presence of waterborne pathogens such as Cryptosporidium or Giardia or those causing illnesses like typhoid fever, dysentery, and cholera. Therefore, elevated levels of the indicator organisms may represent an increased risk of disease to human beings that contact these waters. The term "pathogen" is used to reference data and discussion related to fecal coliform and *E. coli* bacteria.

A. Sampling and Assessment Results Analysis

Table 4.06-1 summarizes the fecal coliform data collected in the Curry's Fork watershed. Please note all bacteria summary data uses a geometric mean to allow for easier comparisons to WQS. Figure 4.06-1 shows the fecal coliform box plots for all sampling sites and the PCR (red line) and SCR (orange line) standards for comparison. For detailed sampling information, refer to the WDQR in Appendix D. Figures 4.06-2 through 4.06-5 show the fecal coliform LDCs for the most downstream sampling site in each watershed, which are NC1, SC1, AR1, and CF2, respectively. Refer to the WQDR to view LDCs for all sampling sites in Curry's Fork. Refer to Figure 3.02-1 for the location of the bacteria sampling sites.

Subwatershed	Site ID	Geometric Mean	Number of Samples	Percent Exceeding PCR Standard (>400)	Percent Exceeding SCR Standard (>2,000)
North Curry's	NC2	267	17	47%	12%
	NC1b	673	10	60%	40%
	NC1a	935	18	72%	39%
	NC1	1,276	24	77%	40%
South Curry's	SC2	789	30	53%	33%
	SC1	1,722	24	85%	37%
Asher's Run	AR1a	1,301	18	83%	44%
	AR1	908	26	65%	27%
Curry's Fork Main Stem	CF3	1,371	30	73%	30%
	CF2	1,264	30	73%	40%
	CF1	822	29	62%	31%

All values represent fecal coliform sampling results in col/100 mL

Table 4.06-1 Curry's Fork Bacteria Data Summary

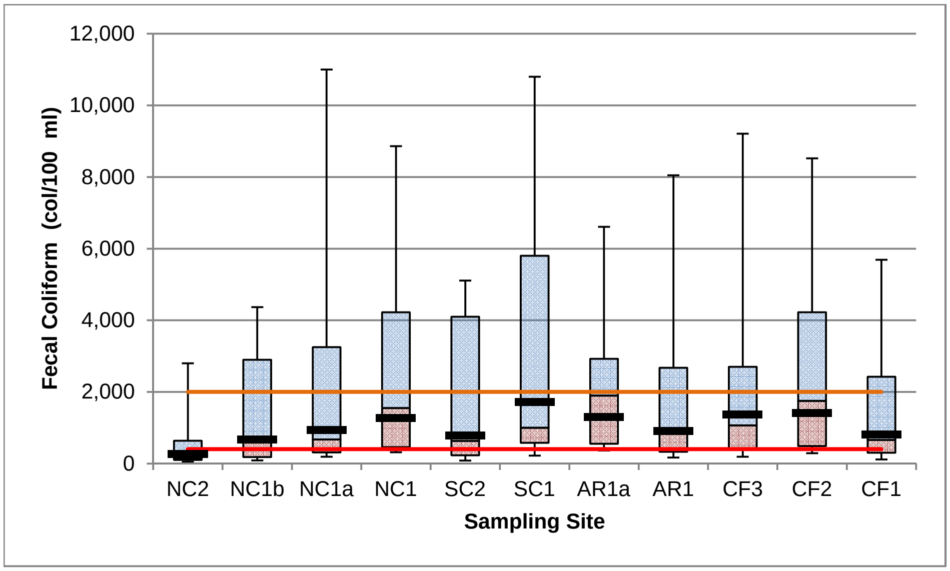


Figure 4.06-1 Curry's Fork Fecal Coliform Box Plots

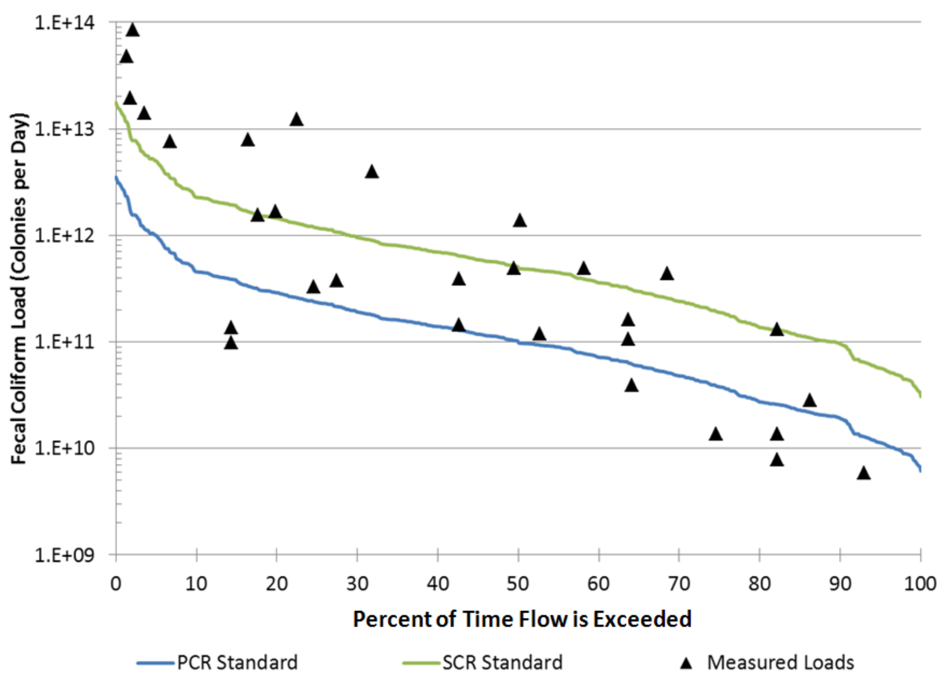


Figure 4.06-2 NC1 Fecal Coliform Load Duration Curve

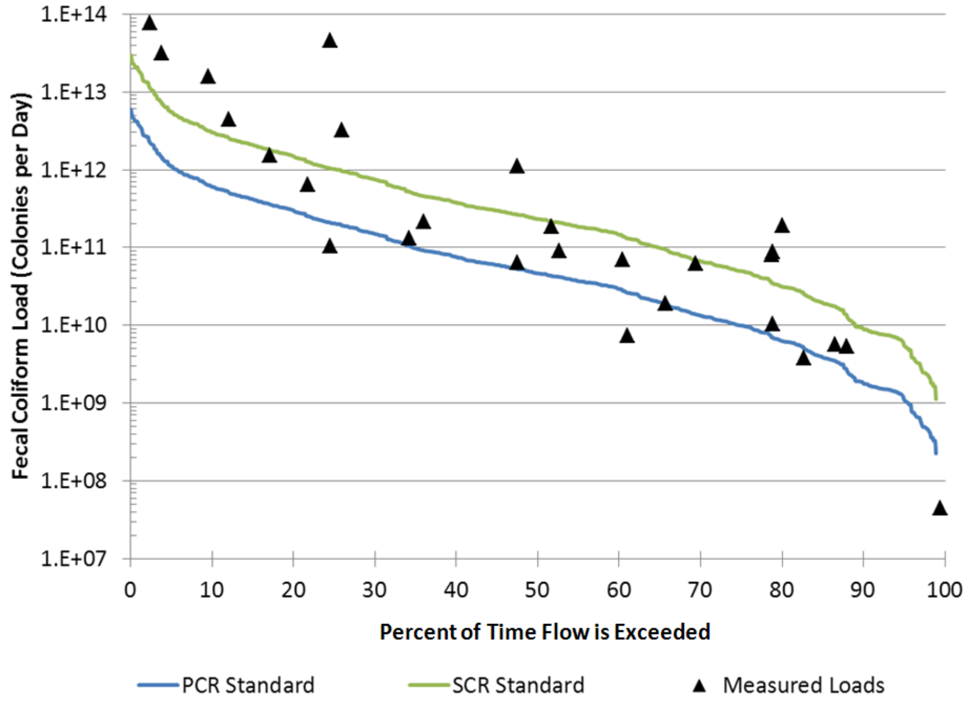


Figure 4.06-3 SC1 Fecal Coliform Load Duration Curve

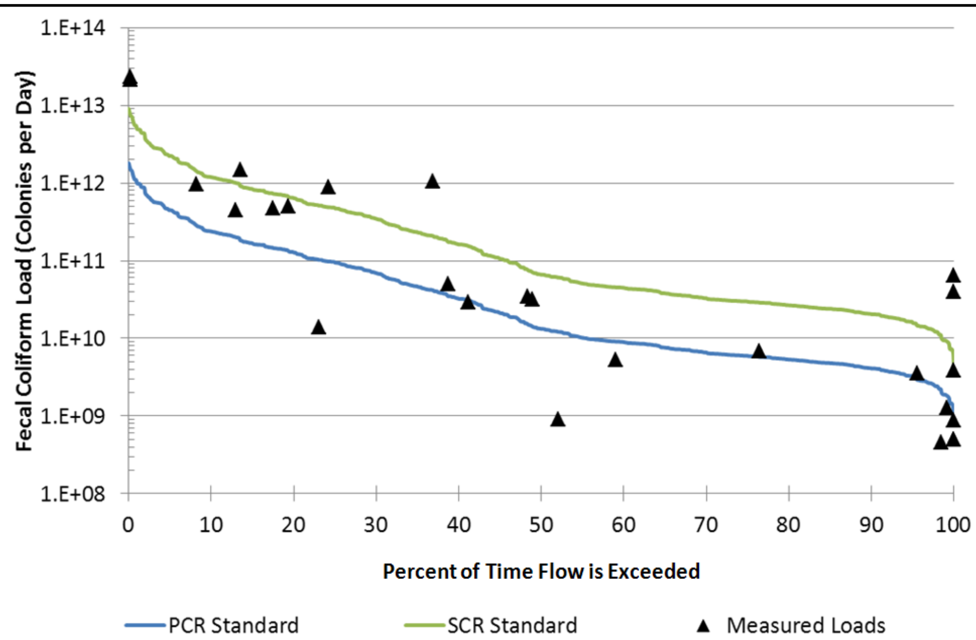


Figure 4.06-4 AR1 Fecal Coliform Load Duration Curve

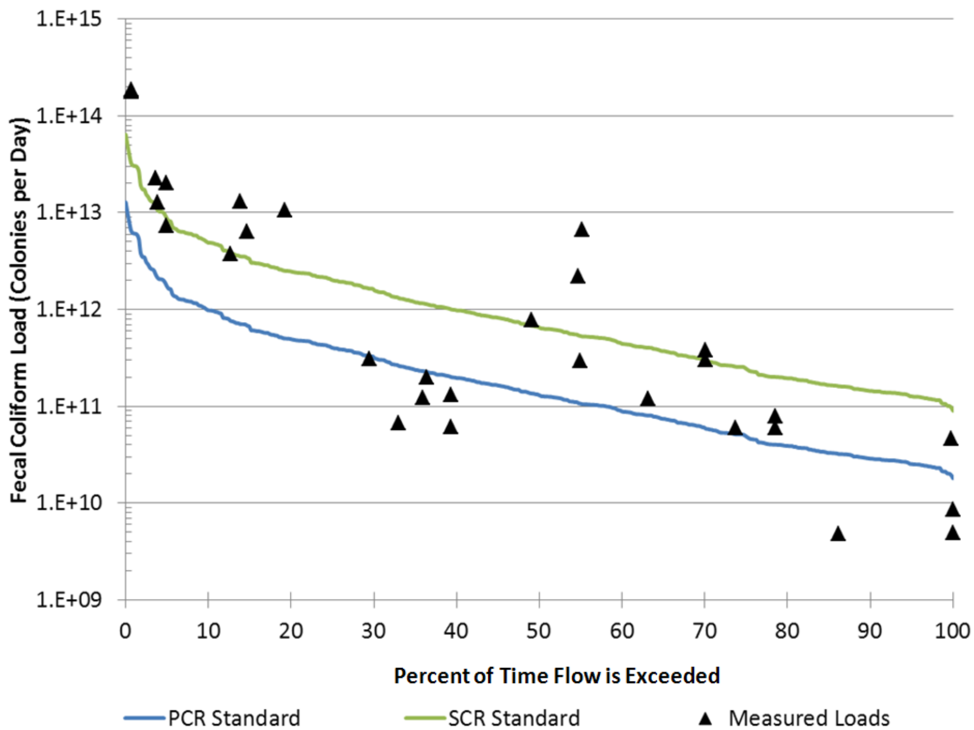


Figure 4.06-5 CF2 Fecal Coliform Load Duration Curve

As the LDCs display, fecal coliform levels exceeded PCR and SCR standards during high and low flow conditions for all sites. All sampling sites exceeded PCR and SCR standards; therefore, all sites considered fecal coliform as a POC. South Curry's Fork and Asher's Run subwatersheds generally showed the poorest results when compared to other subwatersheds. North Curry's upstream of NC1 yielded the best fecal coliform results.

While PCR exceedances were prevalent throughout Curry's Fork, it was indicated during the WQDAT meetings that bacteria concentrations in Curry's Fork are relatively low when compared to other streams in the same ecoregion. Fecal coliform levels observed in nearby streams (of similar size) are often orders of magnitude higher than levels observed in Curry's Fork. Therefore, while Curry's Fork had SCR and PCR exceedences, it can be considered in relatively good condition compared to neighboring streams in the same ecoregion.

4.07 BACTERIA PRIORITY AREAS

Priority areas for bacteria were identified by the WQDAT for each subwatershed by comparing data results to the benchmarks and target values discussed in Section 4.03 and reviewing watershed characteristics. Each subwatershed was designated as a restoration or protection area with a high, medium, or low priority. Subwatersheds designated as restoration areas generally had more exceedances of benchmarks and target values and have areas identified where remediation measures could be implemented to improve water quality. Subwatersheds designated as protection areas generally had fewer exceedances of benchmarks and target values and have the potential to be impacted in the future by land use changes. Subwatersheds designated as protection also had lower bacteria levels than upstream inputs indicating stream recovery and a lack of bacteria inputs, thus a need to protect the area of recovery. Protection areas will be targeted with solutions focused more on maintaining and protecting current water quality conditions and less on reducing bacteria inputs.

Figure 4.07-1 shows the priority restoration and protection designations for bacteria for each subwatershed. Discussions of each subwatershed explain the individual elements taken into consideration for each subwatershed that led to the final priority designations.

A. North Curry's Fork

The upper section of North Curry's Fork was designated as a Low Priority Restoration Area. Fecal coliform levels were the best compared to other subwatershed, therefore this area was considered a lower priority.

The lower section of North Curry's Fork (downstream of NC2) was designated as a Medium Priority Restoration Area. Table 4.06-1 and Figure 4.06-1 are data and fecal box plots showing an increase in bacteria levels in the downstream section. Based on this increase, the WQDAT considered the lower portion of North Curry's Fork warranted a higher priority designation than the upstream section. It was designated a medium priority restoration area.

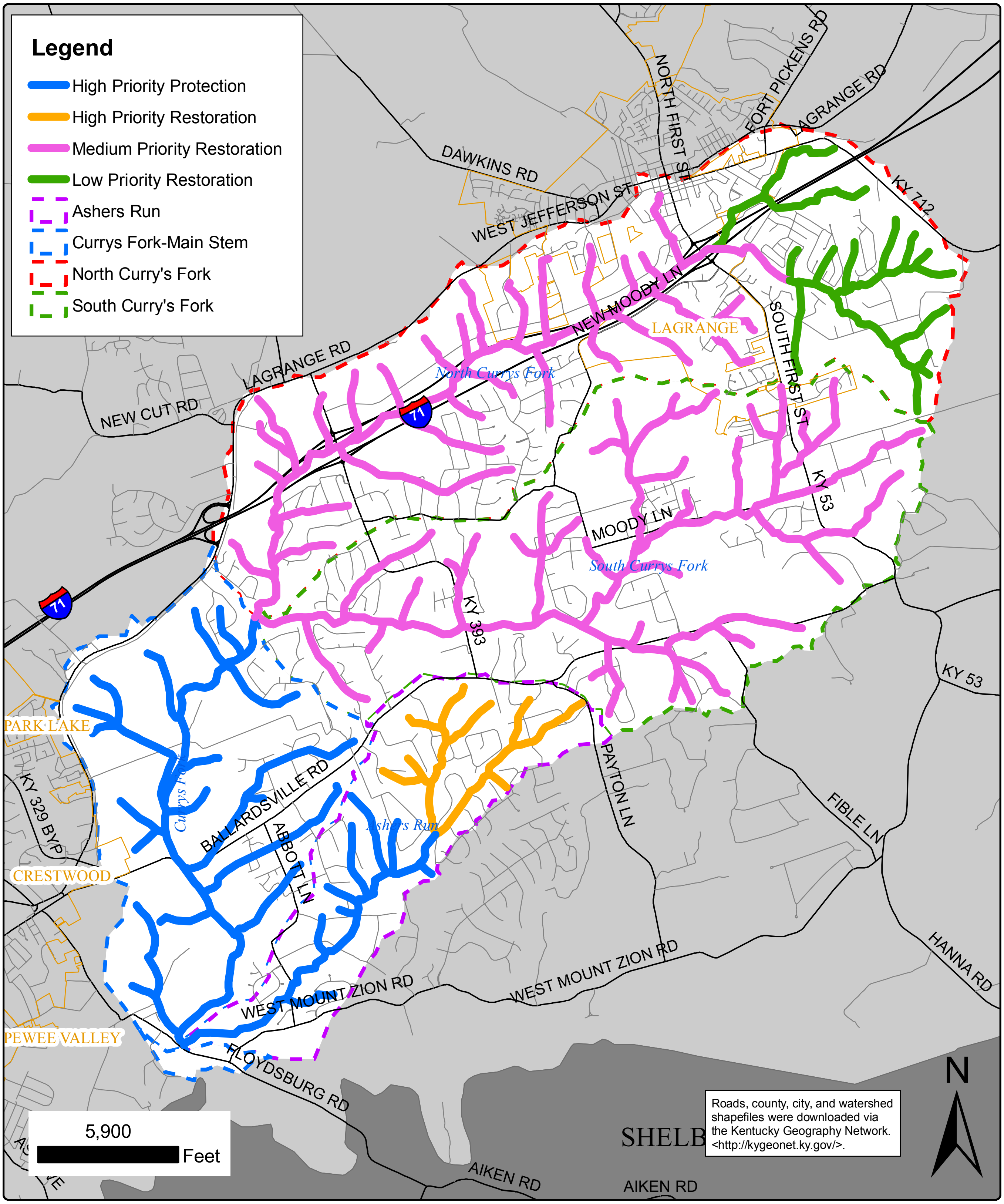
B. South Curry's Fork

South Curry's Fork showed low bacteria levels in the upper section (upstream of SC2) compared to other subwatersheds but had an increase in the downstream section. The downstream section had high bacteria levels compared to other subwatersheds. These factors would normally imply a High Priority Restoration Area designation but, as discussed in Section 4.08, the more probable bacteria pollution sources in the subwatershed are treatment plants slated to be eliminated from the subwatershed. To make certain that implementation funds are used in a cost-effective manner, the subwatershed was given a Medium Priority Restoration Area designation since the more probable pollutant sources would be removed from the subwatershed and additional efforts beyond the treatment plant decommissioning might not be necessary.

C. Asher's Run

The upper section of Asher's Run (upstream of AR1a) was designated a High Priority Restoration area. AR1a had high bacteria levels compared to other sampling sites, and the land use in the area is not predicted to change; therefore, without remediation measures, bacteria levels will remain elevated.

Bacteria levels improve from the upper section to the lower section of Asher's Run as shown in the results of sampling site AR1. Decreased bacteria levels in the lower section indicate that the stream is recovering and that there are no new significant bacteria sources in the lower section. The lower section of Asher's Run has fewer residential impacts, lower impervious area, and less corridor development than the upper section. Lower Asher's was designated a High Priority Protection Area to help ensure the downstream conditions are maintained and continue to reduce bacteria levels from the upper section.



PATHOGEN PRIORITY AREAS

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 4.07-1
5994.100

D. Curry's Fork Main Stem

While bacteria levels in Curry's Fork main stem are some of the highest in the watershed, they typically decline through the subwatershed from upstream (CF3) to downstream (CF1). CF3 yielded the highest geometric mean bacteria levels, directly after the confluence of North Curry's Fork at NC1 and South Curry's Fork at SC1. Bacteria levels are elevated in the Curry's Fork main stem subwatershed primarily as a result of upstream influences from North and South Curry's Fork. Bacteria levels actually show a slight decrease from upstream to downstream indicating there are no significant sources of bacteria in the subwatershed and that additional flow from tributaries decreases bacteria concentrations. The largely undeveloped stream corridor helps to insulate the creek from additional pollution. This effect of bacteria levels staying level to slightly decreasing from upstream to downstream is a positive attribute that would allow for improvements made upstream to be seen throughout the subwatershed and should be preserved. Therefore, the Curry's Fork main stem was designated a High Priority Protection area.

4.08 BACTERIA POTENTIAL POLLUTANT SOURCES

As discussed in Section 4.02, potential pollutant sources were identified using the data team approach and were separated in two categories: more probable sources and less probable sources. The term "sources" includes both point and nonpoint sources. Sources were categorized as more or less probable due to the lack of direct data to tie pollutant loads to sources. During the data review process, no obvious causes were found that would indicate specific sources. Therefore, identified potential sources were evaluated for their likelihood to contribute to water quality exceedances. In cases where permitted facilities are listed as sources, DMRs were reviewed to assist in the categorization process. Final pollutant sources identified for each subwatershed and unanimously agreed upon by the TC are listed below.

A. North Curry's Fork

Table 4.08-1 summarizes the location and sources of the more probable and less probable pollutant sources in the North Curry's Fork subwatershed.

Location	Category	Pollutant Source
Upper Area (Low Priority Restoration)	More Probable Source	Failing on-site wastewater systems in Crystal Lake subdivision
	Less Probable Source	Pets Resuspended sediment from Crystal Lake with bacteria loads as a result of dredging
Downstream Area (Medium Priority Restoration)	More Probable Source	Failing onsite wastewater systems in Borowick Farms subdivision Stormwater from MS4 Area (Oldham Co.–Permit No. KYG2000005) Package treatment plant (Buckner–Permit No. KY0103110) Wastewater treatment plant (La Grange–Permit No. KY0020001) Permitted household discharger (Permit No. KY400105) Stormwater leaking into sewers and taking up capacity, causing overflows and/or plant upsets
	Less Probable Source	Wildlife Pets Failing on-site wastewater systems (other than Borowick Farms subdivision)

Table 4.08-1 North Curry's Potential Pollutant Sources

In general, more probable bacteria sources include numerous permitted discharges within the North Curry's Fork subwatershed. North Curry's Fork is the most developed subwatershed, and has the most permitted dischargers. As discussed previously in this report, dischargers are compliant with their permits but still contribute toward the pollutant load. Other more probable sources include on-site wastewater systems in the Borowick Farms subdivision, which were specifically identified during the TC meetings as having problematic on-site wastewater systems.

B. South Curry's Fork

Table 4.08-2 summarizes the location and sources of the more probable and less probable pollutant sources in the South Curry's Fork subwatershed.

Location	Category	Pollutant Source
Upper Area (Medium Priority Restoration)	More Probable Source	Package treatment plant (Green Valley–Permit No. KY0029441)
	Less Probable Source	Wildlife Small farms/livestock operations (horse and cattle, primarily) Stormwater leaking into sewers and taking up capacity, causing overflows and/or plant upsets Failing on-site wastewater systems
Downstream Area (Medium Priority Restoration)	More Probable Source	Package treatment plant (Lakewood–Permit No. KY0054674) Package treatment plant (Lockwood–Permit No. KY0039870) Package treatment plant (Centerfield Elementary–Permit No. KY0076732)
	Less Probable Source	Wildlife Permitted household discharger (Permit No. KYG400289)

Table 4.08-2 South Curry's Potential Pollutant Sources

Similar to North Curry's Fork, the more probable bacteria sources include numerous permitted dischargers in the South Curry's Fork subwatershed, specifically the PTP discharges. South Curry's Fork also has residential impacts and a few isolated livestock operations which are considered to be the less probable bacteria sources.

C. Asher's Run

Table 4.08-3 summarizes the location and sources of the more probable and less probable pollutant sources in the Asher's Run subwatershed.

Location	Category	Pollutant Source
Upper Area (High Priority Restoration)	More Probable Source	Low intensity animal operations (small numbers of goats, horses, etc. as well as some 'nontraditional' livestock on relatively small properties) Failing on-site wastewater systems Wildlife
	Less Probable Source	Pets
Downstream Area (High Priority Protection)	More Probable Source	Wildlife Upstream contributions
	Less Probable Source	Small farms/livestock operations Pets Failing on-site wastewater systems

Table 4.08-3 Asher's Run Potential Pollutant Sources

Low intensity animal operations with some traditional and nontraditional livestock have been identified in the upper portion of the subwatershed during field investigations. The upper portion of Asher's Run has the most area contained within subdivisions (70 percent) of any subwatershed and has the second highest percent impervious area (8.5 percent) only following the lower portion of North Curry's Fork downstream of NC2 which contains the city of La Grange.

As mentioned previously, bacteria levels reduce downstream of AR1a, indicating no new significant pollutant sources in the downstream section.

D. Curry's Fork Main Stem

Table 4.08-4 summarizes the location and sources of the more probable and less probable pollutant sources in the Curry's Fork main stem subwatershed.

Location	Category	Pollutant Source
Main Stem (High Priority Protection)	More Probable Source	North Curry's upstream contributions South Curry's upstream contributions Permitted household discharger (Permit No. KYG401962) Package treatment plant (Country Village–Permit No. KY0060577)
	Less Probable Source	Pets Wildlife Agriculture Stormwater from MS4 areas (Oldham County–Permit No. KYG2000005) Failing on-site Wastewater Systems Permitted household discharger (Permit No. KYG400147)

Table 4.08-4 Curry's Fork Main Stem Potential Pollutant Sources

The Curry's Fork main stem had the lowest percent impervious and subdivision area (5.2 and 22 percent, respectively) of any subwatershed. Stream corridor development was low compared to other subwatersheds. The main stem has permitted dischargers identified as more probable pollutant sources for the Curry's Fork main stem. As discussed previously in this report, dischargers are compliant with their permits but still contribute toward the pollutant load. Because of elevated bacteria levels in North and South Curry's Fork, upstream contributions have also been identified as more probable bacteria sources.

4.09 NUTRIENT DATA ANALYSIS

Water bodies require nutrients to remain healthy and support life, but too many nutrients can be harmful. Nutrient enrichment can lead to blooms of algae, which eventually die and decompose. The process of decomposition removes oxygen from the water, reducing DO levels potentially insufficient enough to sustain aquatic life. Algae blooms and decaying matter can also add color, turbidity, odor, and objectionable tastes to water that are difficult to remove and reduce the waters acceptability as a drinking water source. This process of nutrient enrichment is called eutrophication (Masters, 1998).

Tables 4.09-1 and 4.09-2 summarize the phosphorus and total nitrogen data collected in the Curry's Fork watershed, respectively. The blue horizontal line in Figures 4.09-1 and 4.09-2 represents the lower draft target range and the orange horizontal line represents the upper draft target range, which is 0.07 mg/l to 0.1 mg/l for phosphorus and 1.1 mg/l to 1.4 mg/l for nitrogen. Refer to the WQDR in Appendix D to view detailed sampling results for all sampling sites in Curry's Fork. Figures 4.09-1 and 4.09-2 show the box plots for phosphorus and total nitrogen, respectively. Refer to Figure 3.02-1 for the location of sampling sites.

As discussed in Subsection 4.02, the lower detection limit for phosphorus was above the draft target ranges used for this WP. The lower detection limit for nitrogen samples was lower than the draft target range of 1.1 to 1.4 mg/l. Nitrogen levels at NC2, SC2, SC1, and AR1 were all within or below the draft target range. Because the phosphorus concentrations at these sites were typically at the lower detection limit and the nitrogen concentrations were acceptable, nutrient levels at NC2, SC2, SC1, and AR1 were not considered a concern.

Field observations and biological and habitat assessments also support that nutrients are not a concern at NC2, SC2, SC1, and AR1. No algae or eutrophication concerns were identified in the biological and habitat assessments.

Subwatershed	Site ID	Average	Number of Samples
North Curry's	NC2	0.41	8
	NC1	2.41	12
South Curry's	SC2	0.42	12
	SC1	0.39	9
Asher's Run	AR1	0.38	9
Curry's Fork–Main Stem	CF3	1.73	12
	CF2	0.71	12
	CF1	0.71	12

All values represent phosphorus sampling results in mg/l

Table 4.09-1 Curry's Fork Phosphorus Data Summary

Subwatershed	Site ID	Average	Number of Samples	Percent Above Upper Draft Target Range of 1.4 mg/l
North Curry's	NC2	0.82	17	6%
	NC1b	8.36	10	90%
	NC1a	6.06	18	78%
	NC1	8.44	30	90%
South Curry's	SC2	1.01	27	17%
	SC1	1.68	30	44%
Asher's Run	AR1a	1.01	27	17%
	AR1	0.92	30	15%
Curry's Fork Main Stem	CF3	6.29	30	67%
	CF2	3.97	30	77%
	CF1	3.65	30	70%

All values represent nitrogen sampling results in mg/l

Table 4.09-2 Curry's Fork Total Nitrogen Data Summary

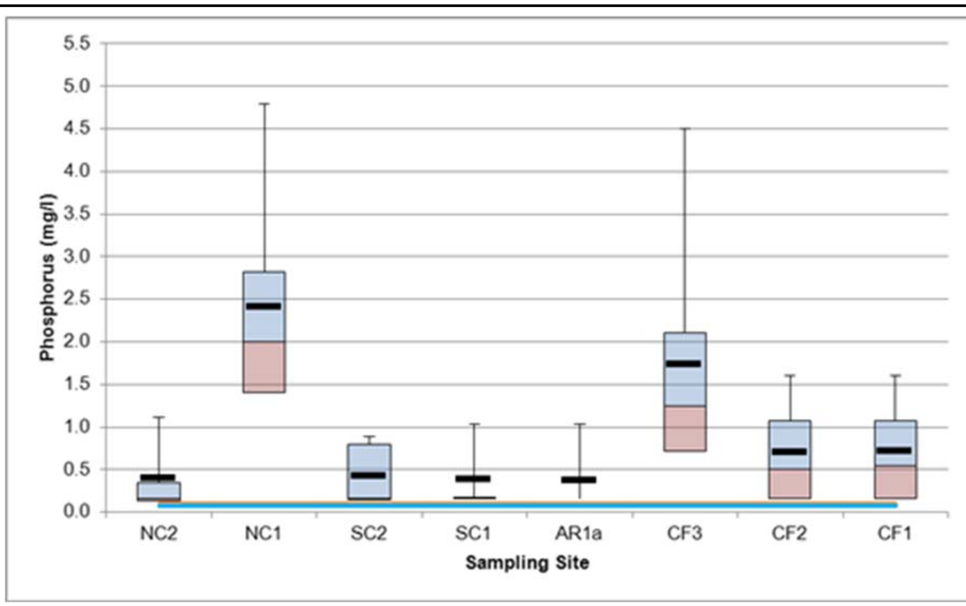


Figure 4.09-1 Curry's Fork Phosphorus Box Plots

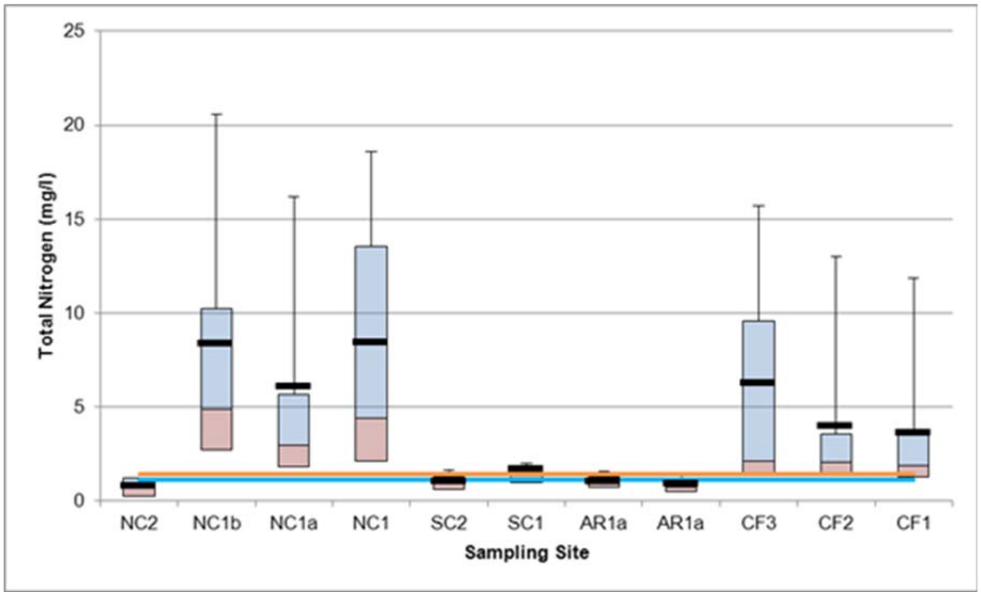


Figure 4.09-2 Curry's Fork Nitrogen Box Plots

Data results show a clear increase in nutrients downstream of NC2 in the North Curry's Fork subwatershed. These values are elevated through the North Curry's subwatershed and typically decline after the confluence of North and South Fork as flow moves downstream through the Curry's Fork main stem subwatershed.

South Curry's Fork and Asher's Run have considerably lower nutrient levels compared to North Curry's Fork and the Curry's Fork main stem subwatersheds, which can clearly be seen in Figures 4.09.1 and 4.09-2. Nitrogen levels for South Curry's Fork and Asher's Run were typically at or below the draft target values used. Phosphorus levels were slightly elevated above draft target values but that is partially due to lab analysis detection limits being higher than 0.1 mg/l. Phosphorus results in South Curry's Fork and Asher's Run were typically at the lowest detection limit. Because of these factors, nutrient levels were considered to be at appropriate levels; therefore potential pollutant sources and remediation measures were not evaluated for South Curry's Fork and Asher's Run.

4.10 NUTRIENT SUMMARY

As discussed in the previous section, sampling results indicate the downstream section of North Curry's Fork is the primary source of nutrients in the Curry's Fork watershed. Nutrient levels generally decreased downstream of NC1 through the Curry's Fork main stem, indicating the stream is recovering. Sampling results in Asher's Run and South Curry's Fork indicate nutrient levels that are mostly within the established draft nutrient target ranges. Remediation activities to reduce nutrient levels should focus on the downstream section of North Curry's Fork.

4.11 NUTRIENT POTENTIAL POLLUTANT SOURCES

Table 4.11-1 summarizes the probable pollutant sources in the North Curry's Fork subwatershed.

Location	Category	Pollutant Source
Upper Area (Low Priority Restoration / Protection)	More Probable Source	On-site wastewater systems in Crystal Lake subdivision Lawn fertilizers
	Less Probable Source	Pets Wildlife
Downstream Area (High Priority Restoration)	More Probable Source	Package treatment plant (Buckner–Permit No. KY0103110) Wastewater treatment plant (La Grange–Permit No. KY0020001)
	Less Probable Source	Wildlife Pets On-site wastewater systems

Table 4.11-1 North Curry's Fork Potential Nutrient Sources

The two more probable nutrient sources in the downstream area of North Curry's Fork subwatershed were the La Grange wastewater treatment plant (WWTP) and the Buckner WWTP. A review of both plants' DMR data showed they were in compliance with meeting their permitted nutrient effluent limits during the sampling period. Though both plants were in compliance with their permits, effluents still contributed to the subwatershed and the cumulative impact can affect water quality. After extensive deliberation, assessement and evaluation by the TC, the plants were determined to be the more probable source of nutrients in the subwatershed.

The more probable nutrient source for the Curry's Fork main stem is upstream contributions from the North Curry's Fork subwatershed. Nutrient levels typically decline moving downstream through the Curry's Fork main stem subwatershed, indicating no additional significant nutrient sources. No other nutrient sources were identified for the Curry's Fork main stem subwatershed.

4.12 DISSOLVED OXYGEN DATA RESULTS

Sufficient levels of DO are necessary to support healthy aquatic life. When DO concentrations drop below the allowable criteria, aquatic life is stressed and in extreme situations may lead to the death of certain organisms because of the lack of oxygen.

Table 4.12-1 summarizes the DO data collected in the Curry's Fork watershed. For detailed sampling information, refer to the Curry's Fork WDQR in Appendix D. Refer to Figure 3.02-1 for the location of the DO sampling sites.

Subwatershed	Site ID	Minimum	Maximum	Average	Number of Samples	Percent Less Than 5 mg/l	Percent Less Than 4 mg/l
North Curry's	NC2	4.46	14.50	8.01	16	6%	0%
	NC1b	6.88	8.12	7.47	9	0%	0%
	NC1a	3.90	9.30	7.69	16	6%	6%
	NC1	4.20	12.60	7.56	29	3%	0%
South Curry's	SC2	1.55	10.30	6.40	28	21%	11%
	SC1	2.80	10.50	7.46	25	12%	12%
Asher's Run	AR1a	2.90	10.30	7.31	17	6%	6%
	AR1	4.60	10.30	7.66	27	7%	0%
Curry's Fork Main Stem	CF3	3.90	15.60	8.34	28	7%	4%
	CF2	3.30	10.10	7.22	30	17%	10%
	CF1	3.76	11.05	7.31	31	10%	6%

Table 4.12-1 Curry's Fork DO Data Summary

South Curry's Fork yielded the lowest DO measurements compared to the other subwatersheds. Curry's Fork main stem typically yielded the next lowest DO measurements but the WQDAT agreed this was likely because of low DO influence from South Curry's Fork. DO levels in North Curry's Fork and Asher's Run were good compared to South Curry's and Curry's Fork main stem. NC2, NC1a, AR1a, and AR1 only had one DO sample each below WQS listed in Subsection 4.03 and all DO samples at NC1b were within acceptable ranges. Therefore, South Curry's Fork was identified as a priority area for low DO pollutant source identification and remediation measures.

4.13 DISSOLVED OXYGEN POTENTIAL POLLUTANT SOURCES

Field investigations during water quality sampling indicate the source of DO impairment in the South Curry's Fork is attributed to a number of physical habitat and land use features. An analysis of the nutrient data showed relatively low levels and the field habitat assessments also did not indicate the presence of nuisance algae blooms. The physical habitat and land use features that may be contributing to low DO levels in South Curry's Fork are:

- Lack of canopy cover
- Lack of riparian vegetation
- High degree of corridor development
- Stream channel straightening
- Stream channel alteration

These factors impact DO for a number of reasons. A reduction in canopy cover causes stream temperatures to rise because of increased exposure to sunlight. Temperature inversely controls the solubility of oxygen in water; therefore, when stream temperature is higher, oxygen is less soluble and DO decreases. Reduction in aquatic plants also decreases DO in water as photosynthesis is one of the main ways oxygen enters water. Sampling data indicated SC2 had the second highest average stream temperature exceeded only by NC2. Temperatures at NC2 were expected to be the highest because of the sampling location, which was on a concrete pad outfall from Crystal Lake. Although temperatures were higher at NC2, DO results were lower at SC2.

Figures 4.13-1 and 4.13-2 show DO levels in South Curry's Fork at the time of day they were taken. The lowest DO values tended to occur during the warmer parts of the day when stream temperature would be expected to be higher.

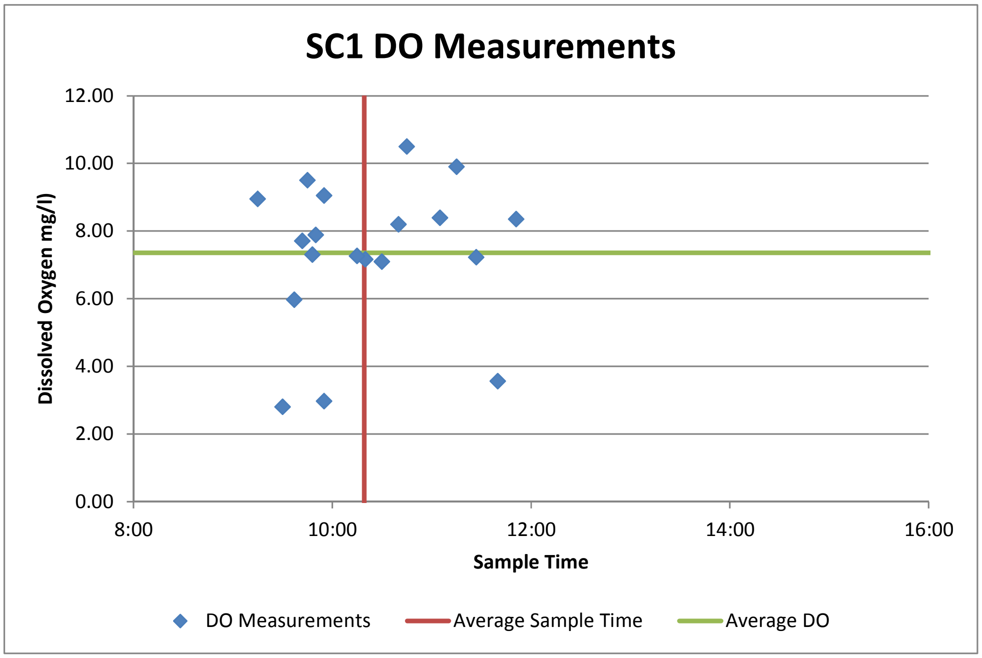


Figure 4.13-1 SC1 DO Measurements vs. Sample Time

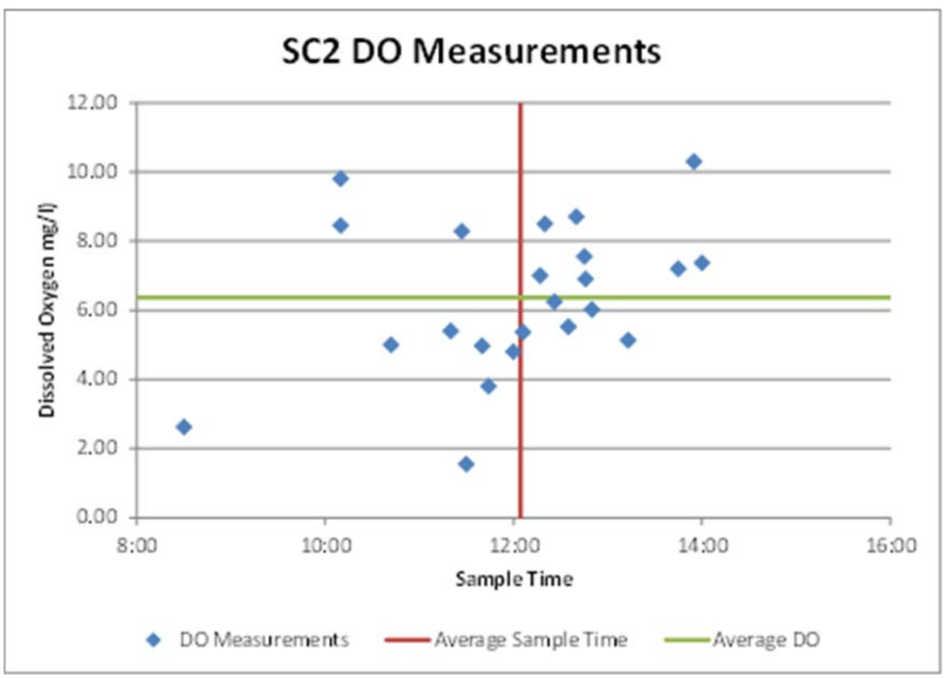


Figure 4.13-2 SC2 DO Measurements vs. Sample Time

Stream channel alterations and straightening reduce the riffle/pool frequencies. Riffles often cause water flow to become turbulent, which promotes oxygen dissolving in water. Additionally, stream channel straightening often results in streams becoming disconnected from their groundwater flows and thus, negatively affecting stream recharge, stream flows, and DO levels.

The introduction of organic wastes such as improperly treated sewage or animal manure to streams can lower DO by increasing the biological oxygen demand (BOD). The wastes are decomposed by microorganisms that delete oxygen in the stream, and the increase in organic matter increases the amount oxygen consumed in the stream. South Curry's Fork has several PTPs that discharge to the streams, but the facilities have been meeting their effluent limits and do not appear to be a source of low DO in the subwatershed.

4.14 SEDIMENT/SILTATION AND GEOMORPHIC ASSESSMENT RESULTS

The following tables, figures, and discussions are taken and summarized from the WQDR in Appendix D.

Siltation, or sedimentation, is one of the most common causes of stream impairment in the Commonwealth and within the United States. Siltation affects aquatic communities by choking spawning gravels, impairing food sources, and reducing habitat complexity. Sediment impairment can be the product of several factors, including sediment supply in excess of transport capacity, inadequate filtering by floodplains, and uniform in-channel deposition promoted by incision and entrenched channels.

The goal of the sediment assessment was to assess and quantify water pollutant loads being contributed from different sources within the watershed. The three objectives of the sediment assessment were to calculate loads of fine sediment from each subwatershed, evaluate the relative contributions of different sediment sources, and interpret the possible links between sediment production and WAH impairment.

A. Fine Sediment Yield

Fine sediment yield is the mass of sediment leaving a watershed over a specific period of time. Both suspended sediment and turbidity were assessed and monitored for this project. A suspended sediment concentration/turbidity relationship was developed to better utilize the much larger turbidity data set. Turbidity was plotted against stream flow discharge for individual storm events to determine whether sediment fluxes are coming from local sources or being carried from distant upstream sources. The vast majority of storm events indicates a dominance of local sources as sediment concentrations are higher before the flood peak. When comparing winter and summer storm events, the data suggests that local sediment sources are more important when ice-related weathering processes, specifically freeze-thaw, are active on the stream banks.

Total sediment loads for all subwatersheds from January through December 2009 are shown in Table 4.14-1.

Subwatershed	Drainage Area (sq mi)	Total Load (tons/yr)	Total Yield (tons/yr/sq mi)
Curry's Fork Main Stem	5.3	21,275	4,037
North Curry's Fork	10	17,100	1,703
South Curry's Fork	9.2	38,410	4,175
Asher's Run	3.3	4,998	1,506

Table 4.14-1 Curry's Fork Sediment Yield

The total sediment loads for all subwatersheds from January through December 2009 showed the greatest total load was from the South Curry's Fork subwatershed. The yields, normalized by area, however, show the main stem Curry's Fork subwatershed contributed a similar amount of sediment as South Curry's Fork.

B. Sediment Production

The major sources of fine sediment that were selected for measurement in each subwatershed were the contributions from stream bank erosion, unmapped headwater channels, and upland surface erosion.

1. Stream Bank Erosion

Annual erosion rates were determined by installing erosion pins in eroding banks. A total of 86 erosion pin measurements were made in all subwatersheds at a total of 29 sites. Table 4.14-2 summarizes the mass of sediment produced by bank erosion.

Subwatershed	Mass (tons/yr)	Unit Rate (tons/mi/yr)	Channel Length (mi)
Asher's Run	**923.6**	**35.7**	**25.8**
Main Stem	720.6	147.9	4.9
Blue Line Tributaries	83.1	11.2	7.4
Unmapped Tributaries	119.9	8.9	13.5
Curry's Fork	**1612.8**	**35.6**	**45.4**
Main Stem (downstream)	730.2	322.5	2.3
Main Stem (upstream)	470.0	185.6	2.5
Blue Line Tributaries	163.3	12.9	12.6
Unmapped Tributaries	249.3	8.9	27.9
North Curry's Fork	**1491.8**	**18.7**	**79.9**
Main Stem (downstream)	361.6	257.4	1.4
Main Stem (upstream)	381.4	94.7	4
Blue Line Tributaries	331.6	12.8	26
Unmapped Tributaries	417.2	8.6	48.5
South Curry's Fork	**1770.3**	**23.0**	**76.9**
Main Stem (downstream)	576.3	195.6	2.95
Main Stem (upstream)	521.0	152.9	3.41
Blue Line Tributaries	239.4	10.9	21.9
Unmapped Tributaries	433.6	8.9	48.6

Table 4.14-2 Sediment Produced by Bank Erosion

The highest rates of sediment production because of bank erosion occurred in the lower reach of the Curry's Fork main stem. The primary reason for the sediment production in the lower reaches is the very high banks, which average over 9 feet; bank heights of 12 feet were not uncommon. Photographs depicting high banks are included in the WQDR in Appendix D.

2. Stream Bank Erosion Priority Areas

Given the high variability of erosion rates, general trends were difficult to discern, but one clear temporal pattern was evident from field observations: weathering of the banks during winter months loosened large amounts of sediment that could be entrained by subsequent flows. The bank material composition in Curry's Fork watershed (primarily silt and clay) is particularly susceptible to freeze-thaw weathering, suggesting this is a long-term contributing factor of bank erosion.

Removal of the high banks through stream restoration would remove a significant source of sediment but would be expensive because of the large amount of earthmoving. If a demand for the soil could be identified, cost would be reduced considerably. A similar situation of high banks and high sediment production was found in the lower reaches of North Curry's Fork in the downstream section after diverging from I-71. Stream restoration projects could significantly reduce sediment production in this area.

The lowest rates of sediment production from a main stem were measured at NC1b, which runs between the south and northbound lanes of I-71. The banks at NC1b are relatively low, are not eroding for a high percentage of their length, and are well vegetated; this is an area suitable for protection rather than restoration. The North Curry's Fork subwatershed was the only subwatershed where the main stem contributed (in the area within I-71) less than half of the sediment production from bank erosion. Many tributaries flow through a culvert under the north- or southbound lanes of I-71, which would make a sensible site for a sediment trapping BMP because of the backwater from the culvert and the presence of a stable grade control.

The main stem of Asher's Run has lower banks and a smaller drainage area than the main stem in the other subwatersheds, but the sediment production rate was still relatively high, especially near the confluence with Curry's Fork. The downstream reaches of Asher's Run have higher banks than upstream reaches, so from a sediment production standpoint, they would be the best places to focus on stream restoration efforts.

This pattern of higher banks near the confluence with a larger stream reach was found in all subwatersheds and is more dramatic when the drainage areas confluencing streams are very different (e.g., where Asher's Run confluences with Curry's Fork). Sites near confluences are often sampling sites, and the original determination of Curry's Fork as impaired was based on biological sampling near the confluence with Floyds Fork.

3. Upland Surface Erosion

Soil erosion models are a widely used method of estimating upland erosion rates because instrumenting every hillslope and valley in a watershed is time- and cost-prohibitive. Use of soil erosion models without field measurements, however, is subject to great uncertainty and may produce results contrary to observed conditions. For this project, field measurements at a number of ponds were made to obtain local sediment loads. These were coupled with a geo-spatial water erosion prediction project model (GeoWEPP) to cover as much of the watershed as possible. Additional measurements at pond sites were used to assess the accuracy of the modeling efforts to ensure that the results were sensible and realistic.

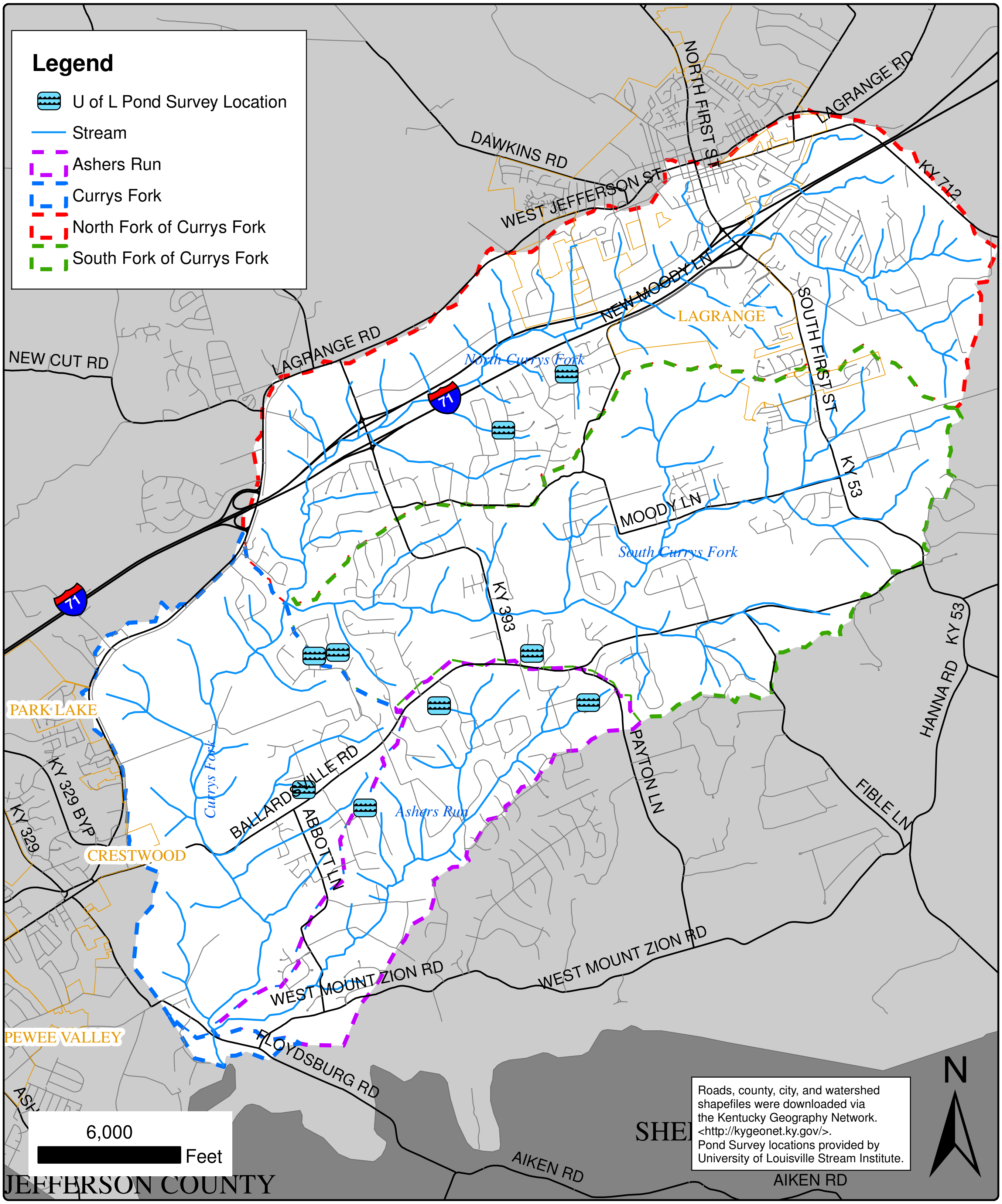
In the Curry's Fork watershed, many headwater channels not shown as blue line streams on United States Geological Survey (USGS) topographic maps are deeply incised gullies. Estimating the sediment production contribution from bank erosion requires an estimate of the extent of these unmapped channels. Channel networks were defined using standard GIS routines to determine the drainage area, or flow accumulation area, at which channel heads occur. Sediment production from unmapped channels as estimated, along with the length of the eroding bank. Bank heights were mapped in the field, and the erosion rate was estimated from erosion pin measurements.

Tables 4.14-3 and 4.14-4 show the results of the pond surveys and GeoWEPP modeling conducted by the UL Stream Institute, respectively. Figures 4.14-1 and 4.14-2 show the location of the pond surveys and the results of the GeoWEPP modeling, respectively.

Pond ID	Drainage Area (acres)	Date Built / Cleaned	Sediment Volume (ft^3)	Hillside Erosion Rate (tons/acre/yr)	Subwatershed
Cooper	4.0	1981*	29,277.45	0.33	South Curry's
Diebel	5.6	1959-1961	49,714.29	0.67	Asher's Run
Ennes	3.1	1981*	36,771.84	0.74	North Curry's
Forrest	4.6	1981*	34,943.13	0.62	North Curry's
Ghad2	13.1	1981	69,390.00	0.36	Asher's Run
Lanham	7.0	1993	21,852.45	0.38	Asher's Run
Northwood	5.5	1983	47,162.79	1.09	Asher's Run
Seymour	2.5	1995	15,133.23	0.66	Curry's Fork Main Stem
Yates	8.2	1979	29,679.48	0.19	South Curry's
Young	6.4	1981	22,062.51	0.15	South Curry's

*Date estimated from USGS Topographical quadrangles and KYTC aerial photo graphs

Table 4.14-3 Pond Survey Results

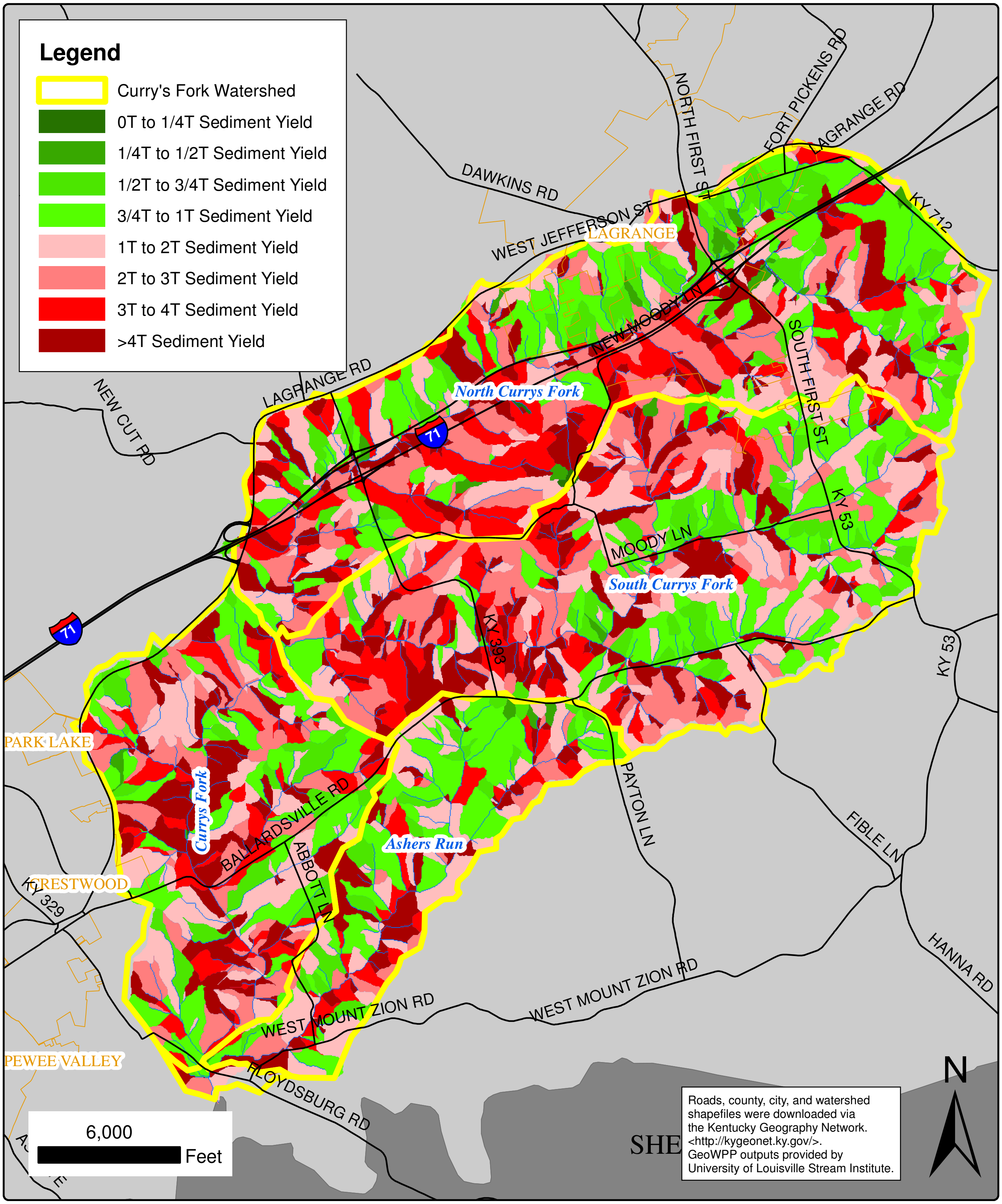


UNIVERSITY OF LOUISVILLE
POND SURVEY LOCATIONS

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 4.14-1
5994.100



GEOWEPP MODEL RESULTS

CURRY'S FORK WATERSHED PLAN
OLDHAM COUNTY FISCAL COURT
OLDHAM COUNTY, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 4.14-2
5994.100

Subwatershed	Soil Loss (tons/yr)	Sediment Deposition (tons/yr)	Sediment Yield (tons/acre/yr)
Asher's Run	3,601	192	2.19
Curry's Fork Main Stem	15,449	954	5.65
North Curry's	15,894	418	3.26
South Curry's	12,129	512	2.56

Table 4.14-4 GeoWEPP Output

Overall, the GeoWEPP model performed well, with predicted sediment mass being the same order of magnitude as that in measured pond surveys. Although erosion rates calculated in the model may have some errors, no evidence was found of systematic bias that might indicate whether sediment mass calculations were too low or too high.

4. Upland Surface Erosion Priority Areas

Curry's Fork main stem had the highest upland erosion rates per unit area based on GeoWEPP model estimations and Asher's Run had the lowest. No clear patterns were identified in or between subwatersheds based on erosion rates, which is indicative of the lack of variation in topography, geography, and land use. Curry's Fork main stem also had the highest proportion of sediment deposition because of the main stem's wide floodplain and long hillslopes with deposition zones at the base of the slope.

The mass of sediment deposited was relatively insignificant in each subwatershed, varying from 2.6 percent to 6.1 percent of the total mass of sediment eroded. The Curry's Fork main stem subwatershed had the highest proportion of sediment deposition because of the mainstem's wide floodplain and long hillslopes with deposition zones at the base of the slope. Based on a comparison of bank erosion and upland erosion, the upland areas appear to offer the greatest opportunity to reduce overall loads. The output from the GeoWEPP model estimated that more sediment was produced from hill slope erosion than from bank erosion in all four subwatersheds. However, sediment production from upland surface erosion occurs over a large area, making implementation of sediment reducing BMPs difficult. Also, if streambank erosion is converted into a per unit area rate using floodplain width, both upland surface erosion and bank erosion are of similar magnitude.

A different approach to reducing sediment would be to focus on the delivery of sediment from upland surface erosion to downstream waters rather than reduce the soil loss directly. Legacy impacts to the streams of the Eastern United States are well documented and have resulted in widespread incision of stream channels and their tributaries. In the headwaters, this incision propagates upslope, extending the drainage network. One consequence of this drainage expansion is that natural sediment storage zones could be effective in reducing the delivery of NPS to downstream waters.

C. Geomorphic Assessment

Sediment production and deposition are complex processes that are based on local morphology and the recent history and water and sediment delivery to particular reach. A geomorphic assessment of Curry's Fork was undertaken to identify some of the local morphological controls on sediment erosion and deposition and to investigate how these controls influence the physical habitat.

The geomorphic assessment for Curry's Fork included a desk-based GIS analysis and supplemental field investigations. An array of parameters as measured through the GIS analysis (sinuosity, valley width, stream width, and riparian corridor width) and others were observed through field investigations and aerial imagery (dams and weirs, bridges and culverts, floodplain development, bank armoring, berms and roads, and channel pattern). The presence or absence of each of these ten parameters was recorded in spreadsheet format for each reach. (Refer to the WQDR for additional details). Field investigations also included additional habitat observations and assessments for specific stream functions for each subwatershed.

The focus of the geomorphic assessment was the main stem of each subwatershed. A total of eight reaches of the main stem blue line streams in all four subwatersheds as selected for the field geomorphic assessment. The length of the assessment reach was typically between 1,400 feet and 3,000 feet to include representative variability in morphology and habitat function.

Various functions that contribute to physical habitat were assessed in each reach. Structural habitat and indicators of processes directly driving physical morphology were documented regularly, as were hydrologic/hydraulic habitat and indicators of processes related to flow interaction with physical morphological boundary conditions. The grade control in each reach was also recorded as this determines the potential for each reach to degrade.

Numeric results (e.g., riparian corridor width) from the GIS data collected were plotted over topographic base maps to visualize the spatial distribution of each parameter. For nonnumeric results, the percentage of total stream length with and without each feature was calculated. The data from the field assessment was collated in a spreadsheet and plotted in GIS to visually identify patterns in physical habitat function parameters.

1. North Curry's Fork Field Investigations

North Curry's Fork can be organized into three distinct groups of reaches: those downstream of I-71, those between I-71, and those upstream of I-71. Downstream of I-71, the main stem and its tributaries are entrenched, incised to bedrock, and lacking in habitat variability. Reaches of the main stem downstream of I-71 could potentially be very good for stream restoration projects because the valley is wide relative to the stream width, and residential encroachment is limited. A significant reduction in sediment loading to the stream could be expected if the long stretches of eroding banks were restored. The tributaries to the main stem downstream of I-71 were reasonably contrained by development and would provide logistical challenges to stream restoration. However, most of the tributaries do have good riparian buffers that should be preserved.

The reaches between north and southbound lanes of I-71 offer insight into the potential of Curry's Fork with no floodplain development, no removal of large woody material, and no bridge crossings or culverts to locally limit lateral migration. The channel is gradually increasing sinuosity after it was straightened in several reaches and has a wide riparian corridor. Eroding banks are common and provide good habitat, but because the banks are low, the mass of sediment supplied by the channel is low. The habitat in these reaches is the most varied in the subwatershed, if not all of Curry's Fork, with well-developed riffles and pools, and a well-connected floodplain. This reach also did not appear to dry out during summer months, although this may be related to the effluent from WWTPs. Future changes in WWTP effluent discharge quantities and locations may affect the availability of low flow.

The reaches upstream of I-71 are dominated by L and N Lake to the north of I-71 and Crystal Lake to the south. Above the lakes are minor headwaters that were not extensively investigated because of their low potential for remediation and small impact on the watershed.

2. South Curry's Fork Field Investigations

South Fork can be organized into two groups of reaches: those downstream of SC2 and those upstream of SC2. Reaches downstream of SC2 have residential development or are immediately adjacent to a subdivision, whereas reaches upstream of SC2 have less residential impact but have agricultural land occupying most of the valley flat, with only isolated houses. The riparian corridor downstream of SC2 is generally wide, although it is not continuous; upstream of SC2, the riparian corridor is very narrow and limited in extent.

Lower reaches of the main stem have good habitat, especially in anabranched reaches, except near the confluence with North Curry's Fork, where very high banks and a flat bedrock bed were evidence of incision and lack of habitat. The anabranched reaches coincided with reaches with large woody debris both from fallen trees and small jams in the channel. In the anabrached reaches, a lower floodplain or bar deposits were acting to trap sediment and, presumably, nutrients and contaminants associated with fine sediment. These sections had diverse physical habitat with riffles, pools, runs, and backwater areas. In contrast, the single-thread sections had limited riffle and pool development, less available cover, and little evidence of interaction between channel and floodplain. Anabranched reaches also have more eroding banks, so the net storage and sources of sediment are difficult to determine; scientific research on anabranched channels in incised systems is particularly lacking and would provide useful information for their role in affecting NPS pollution loads.

Stream restoration projects in the single thread main stem reaches would have the main benefit of reducing sediment supply by reducing the bank height and increasing the connectivity between floodplain and main channel. One main stem reach adjacent to Centerfield Elementary School could provide a suitable site for improving stream function and provide a demonstration of the improvements that could be made in physical habitat in these stream reaches. Most of the tributaries to these reaches of South Fork are extensively developed to the extent that stream restoration potential is limited, although channel improvements may be possible close to the confluence with the main stem.

The habitat in the upper reaches of South Fork showed the most consistent siltation of all reaches assessed in the Curry's Fork watershed. None of these reaches met the target condition for any of the assessed functions. These reaches also had the least extensive riparian corridor of all assessed reaches. Moreover, the quality of the riparian corridor is generally poor, with a significant percentage of invasive species such as osage orange. One cause of the suspended sediment deposition in the upper reaches of South Fork was sediment delivery from the tributaries during low flow periods. Siltation may be caused not by high loads of sediment but by relatively small amounts delivered when the flow in the channel is insufficient to influx. Restoration will locally reduce the input of fine sediment from these side channels when the flow in the main channel is low. The other potential source for fine sediment is the agricultural land use upstream, but results from GeoWEPP and field observations suggest that sediment production from these fields is relatively low.

3. Asher's Run Investigations

Asher's Run can be classified into three groups of reaches: those reaches in the immediate vicinity of Curry's Fork main stem, those reaches upstream of this confluence but downstream of Camden Lane, and those reaches upstream of Camden Lane. Reaches downstream of Camden Lane generally have a good riparian buffer and limited development, whereas reaches upstream have a less extensive riparian buffer and more direct channel impacts from development.

In the stream reaches immediately upstream of the confluence with the main stem of Curry's Fork, the influence of the larger stream is clear: banks are high and signs of frequent overbank flooding because of backwater effects are evident. Both banks in these reaches are eroding, so the local sediment production is relatively high, although for a short distance. Above the influence of the main stem, the bank height decreases, the amount of coarse sediment deposition increases, and the variability in physical habitat improves. There are alternating single-thread and anabranched reaches up to Camden Lane bridge. The anabranched reaches have a lot of available cover, varied substrate, and varied flow conditions.

Asher's Run upstream of Camden Lane is straighter, less forested, and has fewer anabranched reaches than downstream. Some reaches show signs of floodplain modification, whereas in others the stream itself has been modified. Although a stream restoration project in this group of reaches may be beneficial in terms of improving physical habitat, a number of constraints from adjacent roads and residential development would limit the ability to enact major changes in floodplain configuration. An alternative strategy would be to focus restoration efforts on the lower reaches of Asher's Run, where fewer landowners and more valley width would facilitate restoration work, and treatment of upstream water quality during low flow could be incorporated into the project design.

4. Curry's Fork Main Stem Field Investigations

The main stem of Curry's Fork can be classified into two main groups of reaches: those influenced by Floyds Fork and those upstream of the backwater influence. The main stem near the confluence with Floyds Fork has very high banks, and as a result of this entrenchment, little course sediment is deposited, limiting potential for bar or riffle formation. Some pea gravel is typically present, but this sediment is frequently mobilized and hence poor habitat for many benthic organisms that require a stable substrate. Improving habitat function in this downstream reach would involve a considerable amount of earthmoving to reduce entrenchment and improve floodplain-channel interaction. The floodplain of the downstream-most reach was inundated during the study period but only when Floyds Fork was also in flood and causing backwater. Away from the backwater influence of Floyds Fork, the stream reaches have lower banks, more stable substrate, and more connectivity with the floodplain. The channel configuration is relatively consistent up to the confluence of the North and South Fork with alternating single-thread and anabranched reaches. The single-thread channels have higher banks and are generally eroding on one bank. The anabranched reaches have a mixture of eroding and depositing regions. The anabranched reaches are the results of local erosion of the floodplain because of fallen woody debris and are typically three channels or less. The impact of these multiple channels on the storage of NPS pollutants has received limited scientific study but would be valuable information, especially for stream restoration design. Field observations suggest that these anabranched reaches could be very useful for providing diverse habitat and storing sediment and associated pollutants.

D. General Habitat Findings

Although each subwatershed had particular reaches that both met and did not meet target functions, higher-quality reaches shared similar characterisitics throughout the Curry's Fork watershed: the reaches that met the target functions had lower banks, more floodplain accessibility, greater groundwater connection, and more diverse morphology, and they were typically located away from the valley walls. Field investigations throughout the watershed at different times of the year also suggest that the presence or absence of low-flow habitat is significantly variable in the watershed. Many reaches in Asher's Run, South Fork, and North Fork were observed to dry out, whereas others maintained at least some standing water throughout the year. The main stem typically did not dry out except in isolated circumstances. Low or absent base flow has indirect impacts on aquatic communities through secondary effects such as elevated temperatures, decreased DO, elevated biochemical oxygen demand (BOD), and increased concentrations of contaminants and nutrients because of lack of mixing and dilution. Hence, impacts on the quantity of water during summer months will also impact water quality.

4.15 SEDIMENT/SILTATION AND GEOMORPHIC SUMMARY

To help develop effective watershed-scale management strategies for reducing NPS pollution, a study was conducted focusing on fine sediment loads and geomorphology, specifically relating to physical habitat functions. Annual loads of fine sediment in each of Curry's Fork's four major subwatersheds were measured, the contribution from bank erosion and upland surface erosion was measured, and the physical habitat functions were assessed in representative reaches of each subwatershed.

The highest subwatershed sediment loads were measured in South Curry's Fork and the lowest loads were measured in Asher's Run. The highest rates of sediment production from bank erosion were measured in the lower reaches of Curry's Fork main stem close to the confluence with Floyds Fork. Although the highest sediment production from upland surface erosion was predicted to be Curry's Fork main stem based on the GeoWEPP model results, no clear patterns were identified in or between subwatersheds based on erosion rates, which is indicative of the lack of variation in topography, geography, and land use.

The vast majority of stream reaches in all subwatersheds were incised to bedrock, at least in pools, had a dearth of instream cover/submerged structures, and showed signs of channel straightening. Stream restoration projects to improve surface-groundwater connectivity, increase habitat diversity, reduce shear stress, reduce bank erosion, and create floodplain wetlands could be implemented in most stream reaches, with the exception of the reach of North Curry's Fork between the divided interstate. Specific restoration and protection solutions based on this data are presented in Section 5.

For all subwatersheds, the mass of sediment from upland surface erosion was greater than from bank erosion. This difference was due to the much smaller area occupied by stream channels. When normalized by floodplain width, sediment production from bank erosion is greater than or similar to that from upland surface erosion. Importantly, sediment produced by bank erosion goes straight into the channel, whereas sediment produced by upland erosion may deposit at the base of the hill slope, deposit on the floodplain of receiving stream, or may be washed through the watershed without interacting with the channel bed.

4.16 BIOLOGICAL AND PHYSICAL HABITAT METRICS ANALYSIS

The following tables, figures, and discussions are taken and summarized from the WQDR in Appendix D.

Four stream reaches within Curry's Fork watershed were sampled for aquatic macroinvertebrates, fish, and physical habitat during the summer of 2007. Additionally, two locations in the Curry's Fork watershed were sampled for mussels as part of a larger KDOW sampling event in the Floyds Fork watershed during the summer and fall of 2003. Refer to Figure 3.05-1 for the biological monitoring locations. According to KDOW guidance, Asher's Run is considered a headwater stream (<5 mi^2 watershed), and the other streams are considered wadable (>5 mi^2 watershed).

For the aquatic macroinvertebrates, fish, and physical habitat assessments, the goal was to identify potential stressors to the sampled biological communities. Multiple metrics and multivariate tests were performed to achieve these results. Results were evaluated using KDOW *Standard Methods for Assessing Biological Integrity of Surface Waters in Kentuck*y (KDOW 2002) and supplements with multivariate community assessment. Habitat assessment field data sheets, physicochemical results, macroinvertebrate sampling results and fish sampling results are provided in the WQDR Appendix D.

Macroinvertebrate communities for each stream were evaluated through calculation of the MBI, as well as other metrics including functional feeding group abundances and community similarity between stations. The 2008 edition of KDOW Standard Methods for Assessing Biological Integrity of Surface Waters in Kentucky was used for calculations as it became available after the survey (KDOW 2008)

Tables 4.16-1, 4.16-2, and 4.16-3 show the physical habitat, macroinvertebrate, and fish assessment results collected at the four assessment sites in Curry's Fork. Table 4.16-4 summarizes the biological and physical habitat metrics calculated by Third Rock.

RBP Habitat Parameter	Sampling Site			
	NC1	SC1	AR1	CF2
Epifaunal Substrate / Available Cover	8	7	12	10
Embeddedness	17	15	13	18
Velocity / Depth Regime	13	8	13	8
Sediment Deposition	14	6	9	11
Channel Flow Status	13	16	9	16
Channel Alteration	16	16	14	17
Frequency of Riffles (or Bends)	9	17	15	16
Bank Stability (Left Bank)	3	8	7	8
Bank Stability (Right Bank)	3	7	7	9
Vegetative Protection (Left Bank)	2	8	5	8
Vegetative Protection (Right Bank)	2	8	5	8
Riparian Vegetative Zone Width (Left Bank)	2	10	2	10
Riparian Vegetative Zone Width (Right Bank)	2	10	2	2
Total Score	**104**	**136**	**113**	**141**

Table 4.16-1 Physical Habitat Assessment Results

Site	Taxa Richness (+)	EPT Richness (+)	MBHI (-)	%EPT (+)	% Mayflies (+)	% Midges and Worms (-)	% Clingers (+)	MBI Score (+)	MBI Rating
NC1	29	6	6.11	28.4	7.2	13.1	73.1	56.9	Fair
SC1	38	8	6.08	7.9	3.6	39.6	44.2	44.4	Fair
AR1	27	3	5.99	7	6.7	13.5	42.2	37.8	Poor
CF2	41	11	5.44	20.4	5.3	3.9	86.6	63.9	Good

Note: (+) or (-) indicates if metric will increase (+) or decrease (-) with improving water quality.

Table 4.16-2 Macroinvertebrate Core Metric Results

Site	Native Species Richness (+)	Darter, Madtom, Sculpin Richness (+)	% Facultative Headwater Individuals (-)	% Tolerant Individuals (-)	Intolerant Species Richness (+)	% Insectivore Individuals (+)	Simple Lithophile Richness (+)	IBI Score (+)	IBI Rating
NC1*	0 (5)	0 (3)	0 (77)	0 (50)	0 (0)	0 (50)	0 (2)	0 (24)	Very Poor (Poor)
SC1	8	2	81	86	0	14	1	32	Fair
AR1	0	0	0	0	0	0	0	0	Very Poor
CF2	11	2	85	70	0	29	2	28	Poor

Notes: (+) or (-) indicates if metric will increase (+) or decrease (-) with improving water quality.
* NC1 only had 30 individuals encountered during the fish survey. According to KDOW protocols if fewer than 50 individuals are collected then metrics are scored as zero. Numbers in () are actual values collected.

Table 4.16-3 Fish Core Metric Results

Site	Subwatershed	RBP (Physical Habitat)		MBI (Macroinvertebrate Analysis)		IBI (Fish Analysis)	
		Score	Rating	Score	Rating	Score	Rating
NC1	North Curry's	104	Not Supporting	56.9	Fair	0 (24)	Very Poor
SC1	South Curry's	136	Not Supporting	44.4	Fair	32	Fair
AR1	Asher's Run	113	Not Supporting	37.8	Poor	0	Very Poor
CF2	Curry's Fork Main Stem	141	Partially Supporting	63.9	Good	28	Poor

Note: RBP = Rapid Bioassessment Protocols; MBI = Macroinvertebrate Biotic Index; IBI = Index of Biotic Integrity

Table 4.16-4 Biological and Physical Habitat Data Summary

EPT richness and mayfly-stonefly-caddisfly richness are known to increase with improving water quality and with habitat diversity/suitability. Curry's Fork main stem at CF2 and South Curry's Fork at SC1 had the largest taxa richness and USEPA scores of all stations sampled. Physical stream integrity was found to correlate with these results as embeddedness was low, riffles were frequent, banks were stable, and riparian vegetation protection at the samples sites were good with these two locations. The physical characteristics for CF2 and SC1 could contribute to increased richness scores because of the availability of different habitat niches. At Asher's Run (AR1) and North Curry's Fork (NC1), the nonsupportive total habitat scores are closely associated with the low taxa and EPT richness.

Modified EPT abundance ranged from 7 percent (Asher's Run) to 28.4 percent (North Curry's Fork). Curry's Fork main stem and North Curry's Fork had higher EPT abundances than the other stations with 20.4 and 28.4 percent, respectively. While North Curry's Fork had a higher USEPA abundance score, most of the EPT individuals were fairly common or tolerate species. Many physical habitat parameters (i.e., frequency of riffles, bank stability, vegetative protection) scored within the marginal or poor categories for North Curry's Fork. Therefore, the EPT abundance score for North Curry's Fork may be a result of the presence of common EPT species rather than improved habitat availability.

Midges and aquatic worms are generally pollution tolerant organisms, and their abundance should increase with decreasing water quality conditions. Midges and worms were fairly abundant at South Curry's Fork comprising 39.6 percent of the community. Conversely, midges and worms represent a much smaller percentage of the macroinvertebrate community at the other stations.

Clingers are organisms that require hard, silt-free substrates to "cling" to. A decline in clingers could indicate sedimentation of substrates or unstable substrates. Lower clinger abundances at the Asher's Run and South Curry's Fork location, coupled with suboptimal embeddedness scores, indicate unstable substrates may be a concern.

Macroinvertebrate functional feeding group information can provide insight into the balance of feeding strategies and trophic dynamics within the benthic community. Table 4.16-5 shows the percent functional feeding group at each assessed sampling site. If food dynamics (and/or physical habitat) are not stable within a stream, an imbalance in functional feeding groups may occur, indicating a stressed community. Generalist taxa such as collector-gathers or collector-filterers are often more dominant in impaired streams. South Curry's Fork and Asher's Run had the highest percentage of collector-gatherer tax. However, Asher's Run had the lowest collector-filterer percent taxa among all the stations assessed. It is important to note that filter feeders are sensitive to low flow conditions, which may occur in Asher's Run since it is a headwater stream.

Functional Feeding Group*	Station (% Functional Feeding Group)			
	CF2	**NC1**	**SC1**	**AR1**
Predator	4.9	13.4	4.1	1.3
Collector-Gatherer	9.8	16.4	34.1	35.4
Shredder	2.5	0.7	0.2	0.0
Scraper	21.1	25.8	28.6	55.4
Collector-Filterer	61.7	43.7	32.9	7.8

* No piercers were collected in samples.

Table 4.16-5 Percent Functional Feeding Groups

Macroinvertebrate data from the four sites was compared through multivariate ordination to the measured environmental variables to determine potential correlations that exhibited ecological significance. Only two variables were found to be significantly correlated with the marcoinvertebrate communities: watershed size and stream flow. It appears from the association that the larger the watershed and the greater the flow, the greater the diversity and abundance of taxa collected. The sites having less flow and smaller watersheds had poorer MBI scores.

Fish communities for each station were evaluated through calculation of the IBI, as well as community similarity between stations. Refer to Table 4.16-3. South Curry's Fork had a rating of "Fair" and Curry's Fork main stem had a "Poor" rating. Asher's Run had no fish; it is a headwater stream that is either too intermittent or too impaired to support a fish community. North Curry's Fork had insufficient numbers of fish collected (only 30 individuals collected) for the fish community analysis to be meaningful. Thus, only two of the four stations resulted in usable fish community data information.

In 2003, the KDOW conducted a mussel survey in the Floyds Fork watershed of which Curry's Fork is a tributary. As part of this mussel survey, two sampling stations were established in the Curry's Fork watershed, one on the main stem of Curry's Fork and one on North Curry's Fork. Mussel data was collected utilizing timed, visual-based, qualitative searches at each sampling locations. The results of the mussel survey in the Curry's Fork watershed are described in the Table 4.16-6.

Species	Station # 21 Curry's Fork	Station # 22 North Curry's Fork
Actinonaias ligamentina, Mucket–A	0.5WD	
Alasmidonta viridis, Slippershell–C	0.5WD	
Lampsilis siliquoidea, Fatmucket–A	3LV8.5WD	1LV8.5WD
Pyganodon grandis, Giant Floater–A	3.5WD	1LV3WD
Toxolasma parvus, Lilliput–O	0.5WD	3.5WD

Note: A = Abundant (found in > 10 survey stations); C = Common (found in 6 to 10 of survey stations); O = Occasional (found in 2 to 5 survey stations); LV = Live specmimen; WD = Weathered, dry valve

Table 4.16-6 2003 Kentucky Division of Water Mussel Survey Results

The following summarizes the discussions from the Curry's Fork Biological Data Assessment by Third Rock and KDOW. Please refer to the WQDR for additional information.

A. <u>North Curry's Fork</u>

RBP score indicated a poor physical habitat with a rating of "Not Supporting," but there was a fair embeddedness score. Cover was typically poor as was bank stability and vegetative protection. Shading was less than optimal, and there was a chlorine odor noted during the assessment, indicating a treated water source nearby. Bedrock was the dominant substrate and therefore available in-stream cover was lacking.

NC1 had the highest percentage of EPT of 28.4 percent with 6 EPT taxa, which resulted in a "Fair" MBI rating.

Low fish numbers were found in the stream, which resulted in a "Very Poor" IBI rating. As indicated in Table 4.08-4, NC1 only had 30 individuals encountered during the fish survey. According to KDOW protocols, if fewer than 50 individuals are collected, metrics are scored as zero. Numbers in "()" are actual values collected.

The following is an excerpt from the 2003 KDOW Qualitative Mussel Survey summarizing the findings at Station #22 that is located within the North Curry's Fork subwatershed.

> "Station #22 – North Fork Curry's Fork
>
> On August 14th, only three native mussel species were found at this North Fork Curry's Fork station (*Lampsilis siliquoidea, Pyganodon grandis* and *Toxolasma parvus*). Live specimens of *Lampsilis siliquoidea* and *Pyganodon grandis* were recorded. As with other stations in this survey, *Lampsilis siliquoidea* was the most abundant species at this location with one live specimen and eight and a half weathered valves observed."

Mussel survey results show similar results to the biological, habitat, and geomorphic assessments indicating the middle section of North Curry's Fork between I-71 is generally in better condition than the downstream portion where the biological and habitat assessments were performed. Nine of the 23 sites surveyed had no live specimens; it is a good indicator that two live specimens were found at Station #22.

B. South Curry's Fork

SC1 had an RBP rating of "Not Supporting." SC1 had low embeddedness with frequent riffles and good riparian protection. SC1 had a bedrock-dominated substrate. Overall, available instream cover was lacking and the velocity/depth regime was poor as well. Sediment deposition was prevalent. Bank stability was typically poor although the vegetative protection and riparian zone widths were fair. This could indicate excessive flows from the upstream areas.

SC1 has a "Fair" MBI rating that was due to the moderate taxa richness and large abundance of midges and worms. The mayfly abundance was also the lowest at this site.

SC1 yielded the highest IBI rating of "Fair." SC1 had similar fish results to CF2 but because of its smaller drainage area, the resulting IBI rating was considered "Fair" instead of "Poor."

C. Asher's Run

Physical habitat results yielded a RBP rating of "Not Supporting" for AR1. Low RBP scores were primarily in sediment deposition, channel flow, bank stability, vegetative protection, and riparian zone widths categories. The stream typically had good canopy cover and riffle/run/pool ratios.

AR1 had an MBI rating of "Poor" because of the low taxa richness, low EPT taxa, and abundance, although the abundance of midges and worms was not too large.

No fish were found at AR1 during the assessment, which resulted in a "Very Poor" IBI rating. Asher's Run is a headwater stream that is either too intermittent or too impaired to support a fish community.

D. Curry's Fork Main Stem

CF2 had the best RBP rating of any assessment location with a RBP rating of "Partially Supporting." This was a result of good channel flow status, minimal channel alteration, and good bank stability and vegetative protection on both stream banks.

CF2 also had the best MBI rating of any assessment location with a MBI rating of "Good." The data showed high taxa richness and a fair number of EPT taxa with a low percentage of midges and worms.

The fish assessment results in a "Poor" IBI rating for CF2. This was mainly a result of an abundance of tolerant individuals, absence of intolerant taxa, and low darter-madtom-sculpin richness.

The following is an excerpt from the 2003 KDOW Qualitative Mussel Survey summarizing the findings at Station #21 that is located within the Curry's Fork main stem subwatershed.

> "Station #21 – Curry's Fork
>
> In Curry's Fork on August 18th, five native species were identified (*Actinonaias ligamentina, Alasmidonta viridis, Lampsilis siliquoidea, Pyganodon grandis* and *Toxolasma parvus*). Three live specimens of *Lampsilis siliquoidea* were observed during the survey and this species was the most abundant taxa with an additional eight and a half weathered valves recorded."

As discussed for North Curry's Fork, 9 of the 23 sampling sites yielded no live specimens. Station #21 had three live specimens and numerous weathered valves. This is a good indication the biological and physical habitats are still functioning and can be improved upon.

4.17 BIOLOGICAL AND PHYSICAL HABITAT PRIORITY AREAS

The analysis of the biological samples yielded results indicative of moderate impairment. It appears the found impairments could be more indicative of a lack of available habitat (including stream flow) and substrate than altered water chemistry.

In the macroinvertebrate and fish metric analyses, the calculated metrics generally indicated that some type of physical impairment was affecting the stream communities at all stations. Indications of community impacts pertaining to watershed size and stream permanence were observed with the function feeding group analysis. Fish data also indicated that stream permanence affected the present communities, though the correlation was not as apparent as with the macroinvertebrates. The results from the multivariate analysis of the macroinvertebrate and environmental data further supported this evidence through correlation between watershed size/stream flow and macroinvertebrate community diversity.

supported this evidence through correlation between watershed size/stream flow and macroinvertebrate community diversity.

With regard to flow in streams, an adequate hydrologic continuum is important for a diversity of aquatic species. The physical degradation of the sampled stream reaches from Curry's Fork did not exhibit a diversity of habitat, as bedrock was the common substrate found. As observed in the field, stream flow permanency was intermittent in the smaller streams of Curry's Fork during drier conditions. It is therefore believed that within Curry's Fork watershed, the primary stressor to the biological communities is a combination of a lack of flow and habitat cover. In the case of Curry's Fork, many stream channels are incised to bedrock, which offers little habitat for macroinvertebrates and fish.

According to the contractors for the biological and physical habitat assessments, remediation efforts should focus on a reduction of surface runoff through BMPs that promote infiltration. Focused efforts for stream restoration are recommended in conjunction with infiltration BMPs.

The biological and physical habitat data corresponded with the geomorphological data assessments performed by the UL. After reviewing all the biological and habitat data, the WQDAT concluded that South Curry's Fork subwatershed was the highest priority subwatershed for restoration efforts, and Curry's Fork main stem subwatershed was the highest priority subwatershed of protection efforts.

4.18 SUBWATERSHED SUMMARIES

Table 4.18-1 summarizes the final subwatershed bacteria priority area designations. Table 4.18-2 summarizes the nutrient and DO priority areas. Table 4.18-3 summarizes the biological and physical habitat parameters for each subwatershed. Table 4.18-4 summarizes the geomorphology results for each subwatershed.

Subwatershed	Section	Bacteria Priority	
		Restoration	Protection
North Curry's Fork	Upper	Medium	-
	Lower	Medium	-
South Curry's Fork	Upper	Medium	-
	Lower	Medium	-
Asher's Run	Upper	High	-
	Lower	-	High
Curry's Fork - Main Stem	Main Stem	-	High

Table 4.18-1 Bacteria Priority Area Subwatershed Summary

Subwatershed	Section	DO Priority	Nutrients Priority
North Curry's Fork	Upper	Low	Low
	Lower	Low	High
South Curry's Fork	Upper	High	Low
	Lower	High	Low
Asher's Run	Upper	Low	Low
	Lower	Low	Low
Curry's Fork - Main Stem	Main Stem	Medium	Medium

Table 4.18-2 Nutrient Subwatershed Summary

Subwatershed	Biological Habitat Assessments		Physical Habitat RBP Score
	MBI	IBI	
North Curry's Fork	Fair	Very Poor	Not Supporting
South Curry's Fork	Fair	Fair	Not Supporting
Asher's Run	Poor	Very Poor	Not Supporting
Curry's Fork–Main Stem	Good	Poor	Partially Supporting

Table 4.18-3 Biological and Physical Habitat Subwatershed Summary

Subwatershed	Stream Bank Erosion			Fine Sediment Yield		Upland Erosion	
	Downstream Confluence	Main Stem Downstream	Main Stem Upstream	Total	Per Area Basis	Total	Per Area Basis
North Curry's Fork	High	High	Low	Medium	Low	High	Medium
South Curry's Fork	High	Medium	High	High	High	High	Low
Asher's Run	High	Low	-	Low	Low	Low	Low
Curry's Fork–Main Stem	High	High	High	High	High	High	High

Table 4.18-4 Geomorphology Subwatershed Results Summary

SECTION 5
WATERSHED GOALS AND OBJECTIVES

5.01 GOALS SELECTION PROCESS

Watershed goals were developed based on input, expertise, and recommendations from the Curry's Fork Technical Committee (TC) and the watershed community.

A Watershed Roundtable meeting was held on September 24, 2009, to allow watershed residents to express their concerns for the watershed and to help identify the goals for their watershed. Over 90 members of the community attended the Roundtable to express their opinions and answer three important questions, which were:

1. How and why is the Curry's Fork watershed important to you?
2. What are the problems in the Curry's Fork watershed?
3. What are your goals for the Curry's Fork watershed?

The community feedback was summarized and presented to the TC. Figures 5.01-1, 5.01-2, and 5.01-3 show the responses from the watershed community to the three above questions, respectively. The TC used the results of the Roundtable and developed four goals for the Curry's Fork watershed.

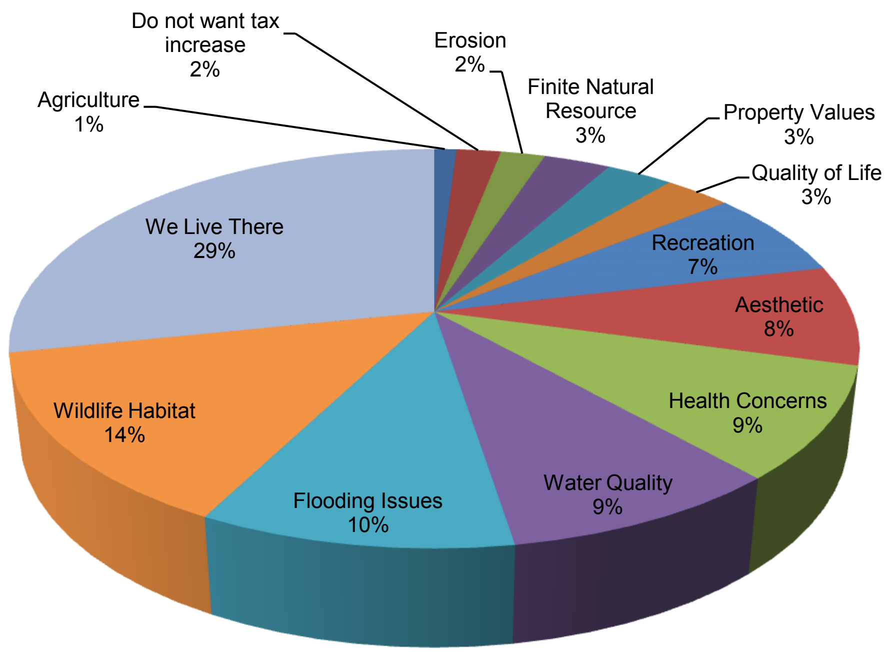


Figure 5.01-1 Community Roundtable Response: How and why is the Curry's Fork watershed important to you?

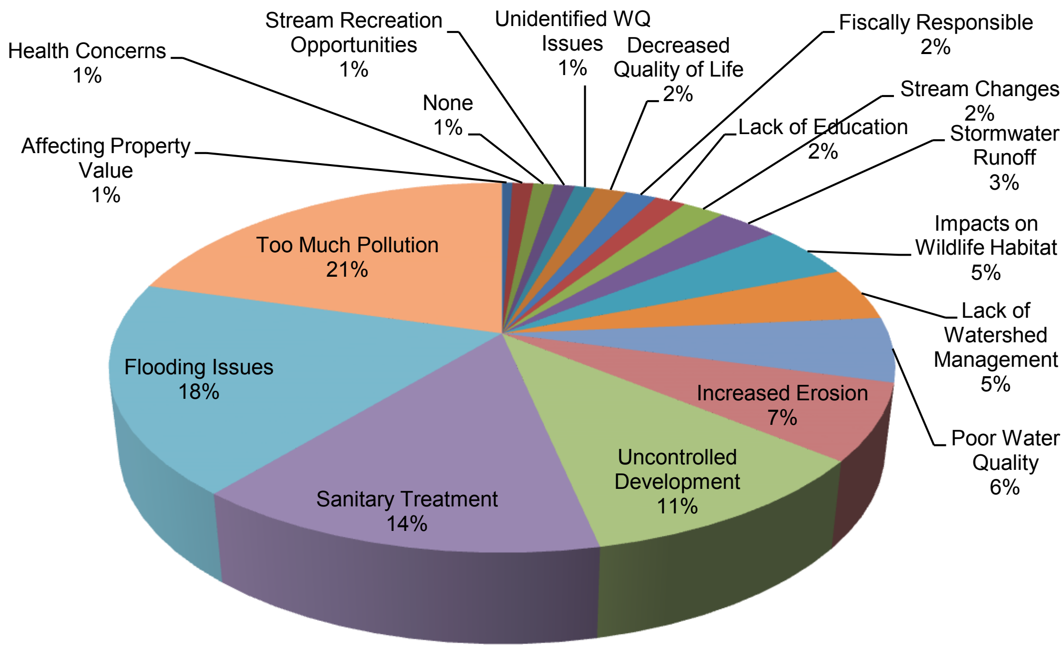


Figure 5.01-2 Community Roundtable Response: What are the problems in Curry's Fork watershed?

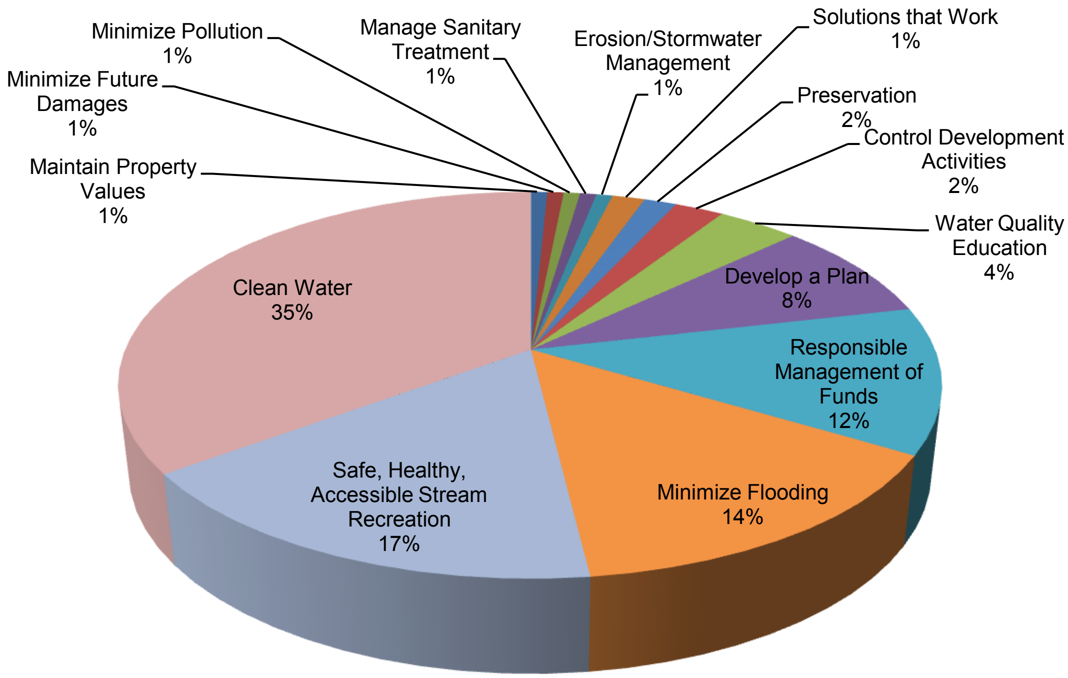


Figure 5.01-3 Community Roundtable Response: What are your goals for the Curry's Fork watershed?

5.02 WATERSHED GOALS

The four primary goals for Curry's Fork Watershed unanimously agreed upon by TC members are the following:

1. Improve and protect water quality for our generation and future generations.
2. Promote a safe, healthy, and accessible watershed for recreation and wildlife.
3. Utilize programs and practices to decrease potential flooding impacts.
4. Develop and implement a cost-effective watershed plan that economically utilizes funds.

Water quality goals of the WP include reducing pollutant loads to meet WQS and water quality targets. Tables 5.02-1 and 5.02-2 show reductions required for fecal coliform and total nitrogen to meet WQS or water quality targets. Refer to Section 4.14 for sediment loads in Curry's Fork. Average loads for fecal coliform and total nitrogen for each sampling site were calculated using the average measured flow and average pollutant concentration. Target loads to meet WQS and water quality targets were calculated using the average measured flow, a fecal coliform concentration of 400 colonies/100 ml and a nutrient concentration of 1.4 mg/l. Because the lower detection limit used on the phosphorus samples was higher than the draft target ranges, discussed in further detail in Section 4.01.B., phosphorus loads and associated load reductions were not calculated. Showing a required load reduction based on phosphorus results would be misleading and show a significant reduction required for all sampling sites.

Sampling Site	Load at WQS (Colonies/day)	Average Measured Load (Colonies/day)	Load Reduction to Meet WQS (Colonies/day)	Percent Reduction Required to Meet WQS
NC2	2.6E+10	3.7E+10	1.2E+10	31%
NC1b	1.2E+11	8.6E+11	7.4E+11	86%
NC1a	6.7E+11	1.0E+13	9.8E+12	94%
NC1	3.8E+11	6.9E+12	6.5E+12	95%
SC2	7.9E+10	8.5E+11	7.7E+11	91%
SC1	2.5E+11	6.7E+12	6.5E+12	96%
AR1a	7.8E+10	1.0E+12	9.5E+11	92%
AR1	1.7E+11	2.0E+12	1.8E+12	91%
CF3	5.0E+11	1.1E+13	1.1E+13	96%
CF2	9.4E+11	1.6E+13	1.5E+13	94%
CF1	1.2E+12	1.9E+13	1.8E+13	94%

Table 5.02-1 Fecal Coliform Loads and Load Reduction Targets

Sampling Site	Load at WQS (lbs/day)	Average Measured Load (lbs/day)	Load Reduction to Meet Water Quality Target (lbs/day)	Percent Reduction Required to Meet Water Quality Target
NC2	19.8	19.1	Meets Water Quality Target, No Reduction Required	
NC1b	95.5	170.0	74.6	44%
NC1a	513.6	1,596.8	1,083.2	68%
NC1	291.8	673.0	381.2	57%
SC2	61.1	45.7	Meets Water Quality Target, No Reduction Required	
SC1	191.7	148.2	Meets Water Quality Target, No Reduction Required	
AR1a	60.6	33.7	Meets Water Quality Target, No Reduction Required	
AR1a	83.1	130.1	47.0	36%
CF3	384.4	532.2	147.8	28%
CF2	816.1	27,682.0	26,865.9	97%
CF1	893.4	989.8	96.4	10%

Table 5.02-2 Nitrogen Loads and Load Reduction Targets

The goals of the Watershed Plan (WP) will be met through the implementation of best management practices (BMPs) and were selected based on the decision-making process described in Subsection 1.04.

5.03 BEST MANAGEMENT PRACTICES

The United States Environmental Protection Agency (USEPA) defines BMPs in the Code of Federal Regulations (CFR), 40 CFR 122.2 as:

> "…schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of "waters of the United States". BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage."

BMPs are the projects and practices implemented within the watershed to meet the goals and objectives of the watershed. The selection of appropriate BMPs (or solutions) for the watershed is a critical portion of the WP.

BMPs were selected by the community and TC to address the identified pollutants of concern and pollutant sources in the watershed after a thorough inventory of existing programs. Refer to Subsection 1.04 for a description of the decision-making process.

Effective implementation of the WP requires that the information learned about the watershed be translated into appropriate BMPs and solutions. The following information in this section provides an overview for how BMPs and solutions were selected based on data and activities in the watershed.

A. Entire Watershed

Curry's Fork has characteristics that are generally found across the watershed:

1. Educated and affluent population.
2. Community interest in environmental issues and desire to improve the environment.
3. Significant portion of the area (84 percent) served by on-site wastewater systems such as septic tanks.
4. Rapid growth in the last 40 years with projections for continued growth in the future.
5. Environmentally progressive local government.

Although each subwatershed in Curry's Fork is unique, there are common issues found in most of the subwatersheds such as:

1. Exceedances in WQS for bacteria.
2. Poor biological and physical habitat assessments (with the exception of a few locations).
3. Insufficient riparian buffer and/or encroached floodplains in numerous locations within the watershed.
4. Erosion and sediment production in varying levels of severity.
5. Incidents of high nutrient levels.

Many BMPs at the watershed scale will address both impairments in Curry's Fork (PCR and WAH), while some will need to be focused on one more than the other.

Education and outreach to the general public and specific stakeholders about the watershed and the WP, including recommendations and effectiveness over time, will be essential to effectively implement solutions and achieve improvements in water quality. When considering which BMPs to apply throughout the watershed, the educated population and well-regarded school system make education-based BMPs particularly attractive. The high percentage of college-educated adults indicates the community's receptiveness to education, but information from the TC indicated the majority of adults had little to no environmental education or awareness of proper practices to prevent pollution or improve water quality. Addressing the entire population, including residents and leaders, will promote better environmental practices that can be taught to other members of the community.

1. PCR

With such a significant portion of the watershed relying on on-site wastewater systems, making certain those systems are properly installed and maintained, as well as identifying systems that are failing (so they can be addressed), will likely promote lower bacteria levels in the watershed. As wastewater needs increase in response to further growth in the watershed, appropriate planning will be essential to provide an efficient wastewater system that meets the needs of the community and the environment at a bearable cost.

2. WAH

From a watershed perspective, the primary drivers of WAH impairment are related to poor or insufficient physical/biological habit and higher nutrient concentrations. Habitat issues have been linked to stream channel modification, encroachment within the floodplain, and loss of riparian buffer as well as increased impervious area that increases the speed and volume of stormwater reaching the streams. BMPs can help to protect and/or restore the floodplain and riparian buffer will help establish more natural systems that can better support life and provide more stable streams. Along the same lines, practices that slow the speed and volume of stormwater reaching the waterways will allow for the banks to stabilize and reduce the amount of sediment and other nonpoint source pollutants from reaching the streams.

B. North Curry's Fork

North Curry's Fork has the largest amount and the highest percentage of developed land in Curry's Fork. Two of the areas identified for potentially failing septic tanks are located in North Curry's Fork. The watershed has the two WWTPs and two permitted residential treatment systems. Pollutant levels generally increased from the upstream to the downstream portions of the subwatershed. Stream bank erosion was high except for the upper reaches that contain only minor headwaters and two lakes. A significant portion of the stream is located between I-71, which serves to protect it from many negative influences. The segments within I-71 show improved habitat than the downstream section (outside of I-71). Although biological surveys were not completed within the area between I-71, it is suspected they would be improved as well. Overall, the subwatershed was given a Medium Priority Restoration for bacteria and a high nutrients priority in the lower section.

1. PCR

The more probable pollutant sources of bacteria in North Curry's Fork were failing on-site wastewater treatment systems, stormwater issues, the Buckner PTP, and the La Grange WWTP. The La Grange WWTP has recently been upgraded and is in the process of a second upgrade. A review of its discharge information shows it contributes a very low amount of bacteria to the stream. The Buckner PTP recently improved the quality of its discharges but has struggled in the past to meet permit requirements. It has been scheduled for decommissioning in the next few years as part of OCEA's consent judgment.

Because the watershed contains two of the areas specifically identified for potentially failing septic systems, targeted efforts to address this issue may be warranted.

2. WAH

The high degree of development in this watershed increases the volume and velocity of stormwater entering streams. Encouraging retrofit or development guidelines to mitigate these effects would improve stream habitat and reduce bank erosion in the subwatershed. Restoration projects particularly outside the protected area of I-71 could have significant benefits for reestablishing healthy biological and physical habitats.

C. South Curry's Fork

South Curry's Fork is more developed in the upper watershed, and particularly along the tributaries. The subwatershed has four small PTPs; one permitted residential system and areas identified with potentially failing septic systems. The streams tend to be channelized with little to no riparian vegetation, especially in the upper reaches of the subwatershed. This high degree of channelization combined with a lack of riparian vegetation contributes to high amounts of stream bank erosion and low DO, which further diminishes the ability to support healthy habitats. There are small nontraditional animal operations in the watershed that were often near the creek and/or its tributaries. Overall, PCR impairment was of less concern than WAH impairment (the watershed was given a Medium Restoration

Priority). BMPs selected specifically for South Curry's Fork should complement but not repeat watershed-wide BMPs.

1. PCR

The more probable pollutant sources of bacteria in the South Curry's Fork were PTPs. The majority of them are slated to be decommissioned in the next few years as part of OCEA's Consent Judgment. Working with OCEA to prioritize the schedule based on the plants' performance and maintenance costs addresses these potential bacteria sources in an effective manner. BMPs focused on making certain these planned plant eliminations occur in the near future will help address bacteria levels and other pollutant levels. BMPs associated with on-site wastewater systems would be better applied on a larger watershed wide scale than focused on just the a subwatershed because of economy of scale and the need for fair enforcement across the entire County. Because livestock operations tend to be smaller and of a nontraditional nature, proprietors may not be as familiar with or exposed to BMPs as traditional and larger operations. Targeting this group may address an overlooked segment of the population.

2. WAH

The more probable sources of WAH impairment were primarily associated with lack of riparian vegetation and channelization with contributions from potentially failing on-site wastewater systems. The subwatershed was given the highest priority for biological and physical habitat restoration. BMPs to address WAH should focus on improving and protecting the riparian zone as well as restoration efforts to address the effects of channelization. Examples might include planting streamside vegetation or other habitat improvements, restoring natural channel sinuosity, or reestablishing floodplains.

D. Asher's Run

Asher's Run is the smallest of the four watersheds. It is the only subwatershed without any KPDES facilities. The majority of development in the watershed is in the upper reaches and on tributaries, which translates to a smaller riparian buffer in those areas. Smaller low intensity animal operations have been established in the upper segment. Bacteria levels decreased from upstream to downstream, which led to the upper reaches having a High Priority Restoration designation and the lower reaches having a High Priority Protection designation. Nutrients and physicochemical levels were not a concern. The downstream area near the confluence was noted for particularly high bank erosion. Otherwise the geomorphology of the subwatershed was a low priority.

1. PCR

More probable sources of bacteria pollution in the subwatershed were low intensity animal operations and failing on-site wastewater systems. Wildlife was also listed as a more probable source but would be difficult, if not impossible, to control. BMPs should be targeted to these sources and in the upper portion of the subwatershed where bacteria loading was more pronounced.

2. WAH

Selected restoration projects could be beneficial to the subwatershed. The geomorphological study identified several locations that were good candidates for stream restoration projects. In addition, the fact most of the agricultural activity is low-intensity implies that space would be available in unused or nonmaximized agricultural lands for BMPs.

E. Curry's Fork (Main Stem)

Curry's Fork (main stem) is the largest in area of all the subwatersheds and has the highest percentage of cultivated crops in the watershed. There are three KPDES permitted facilities in Curry's Fork: the Country Village STP and two permitted residential systems. There are areas of suspected failing septic tanks and the homes tend to be on larger lots (five acres and larger). The stream corridor is still largely undeveloped but is noted for very high banks with channel straightening. Macroinvertebrate, habitat, and fish assessments yielded highest ratings in Curry's Fork. Because these ratings and the potentially prohibitive cost of remediation activities due to the stream size, Curry's Fork was identified as having higher protection potential. During high flows, Floyd's Fork can back-up into Curry's Fork near the confluence.

1. PCR

The Curry's Fork (main stem) was designated as a High Priority Protection Area for bacteria. The most probable pollution sources were upstream contributions, the permitted residential system, and the Country Village STP, which is slated for eventual decommissioning. Because the subwatershed was assigned a protection designation, BMPs should be focused on maintaining the attributes of the watershed that promote water quality such as the low amount of development along the stream corridor. Education on proper practices and opportunities for conservation would promote good stewardship of this resource and allow water quality to continue to improve.

2. WAH

Opportunities for geomorphological improvements or restoration are available throughout the subwatershed but may be cost-prohibitive outside the upper portion. Working with the agricultural community or other streamside property owners to educate them on protecting and preserving the riparian corridor will help keep land use changes from impacting water quality.

BMPs were identified for individual subwatersheds and for the Curry's Fork watershed as a whole. Potential BMPs were compiled into a single list and were prioritized for implementation purposes into Tier 1 BMPs, Tier 2 BMPs, and Tier 3 BMPs. The tiers represent the priority the solutions were given by the Internal Project Team based on feasibility of implementation and the impact the solution can potentially have on addressing pollutants of concern. Tier 1 BMPs represent the highest priority and Tier 2 and 3 represent lower priorities. Tables 5.03-1, 5.03-2, and 5.03-3 provide information on Tier 1, Tier 2, and Tier 3 BMPs and solutions, respectively, which were necessary to implement in order to achieve recovery of the Curry's Fork watershed. Tables 5.03-1 through 5.03-3 also identify other items vital to the successful implementation of identified solutions. These items include:

a. Impairment(s) addressed.
b. Parties responsible for implementing the solution.
c. Target audience or target area.
d. Feasibility of implementation.

e. Cost of implementation.
f. Expected pollutant load reduction.
g. Pollutant load reduction per dollar spent.
h. Potential funding sources or mechanisms.
i. Technical resources.

A large list of solutions was compiled for the Curry's Fork WP and not all were selected as Tier 1 through Tier 3 solutions. Additional solutions compiled for the WP that were not designated Tier 1 through Tier 3 are shown in Appendix F. The appendix of additional BMPs may be an important resource for future watershed managers charged with evaluating and monitoring WP implementation.

Tables 5.03-4, 5.03-5, and 5.03-6 provides details on action items and milestones associated with implementing Tier 1, Tier 2, and Tier 3 BMPs, respectively. Milestones are critical to creating and tracking progress of a WP. Milestones are planned to implement BMPs and associated action items within certain time categories depending on the difficulty and expected time it takes to implement a BMP. Milestones for this WP were divided into three categories:

1. Short-Term Milestones (less than 3 years).
2. Mid-Term Milestones (between 3 and 10 years).
3. Long-Term Milestones (greater than 10 years).

By breaking down action items into milestones, progress can be tracked easily and expectations of responsible parties will be clearly defined throughout the life of the project.

TABLE 5.03-1–TIER 1 BEST MANAGEMENT PRACTICES

BMP No.	Best Management Practice(s) and Description	Feasibility	Impairment Addressed	Responsible Party/Parties	Targeted Audience/Area	Cost	Expected Pollutant Load Reduction	Pollutant Load Reduction/Dollar	Funding Source(s) and Mechanism(s)	Technical Assistance Needed
ENTIRE WATERSHED TIER 1 BEST MANAGEMENT PRACTICES										
1	Conduct a septic system survey program to identify failing systems for replacement, repair, or elimination.	High	PCR	OCHD; OCEA; OCFC; LUC	Nonsewered Areas with an emphasis on identified pathogen priority areas (Refer to Figure 4.07-1)	$200 per system	Dependent Upon Action Taken	Dependent Upon Action Taken	319 Grant; OCEA; OCFC General Funds; OCHD	On-site System Inspector; Kentucky On-Site Water Authority (KOWA); OCHD; Certified Laboratory; Sampling Personnel
2	Develop and implement a marketing program for the WP.	High	PCR and WAH	OCFC	Watershed Wide	$6,000 to develop program. Additional costs vary based on selected advertising and marketing venues	Not Calculable	Not Calculable	319 Grant; SRF; OCFC General Fund	KDOW; OCEA; Consultant(s)
3	Develop and implement a monitoring plan to monitor solutions implemented as part of the WP.	High	PCR and WAH	OCFC	Watershed Wide	$5,000 to develop program $25/parameter tested $650/sampling trip	Not Calculable	Not Calculable	319 Grant; SRF; OCFC General Fund	KDOW; OCEA; Consultant(s)
4	Develop and implement Curry's Fork watershed education and awareness program, including information about the watershed, WP, WP recommendations, project activities, and community activities.	High	PCR	OCFC; Extension Office; Conservation District; NRCS; Salt River Watershed Watch; OCEA; LUC; City of La Grange; OCEA	Property Owners; Extension Office; Conservation District; OCFC; Oldham County Board of Education; LaGrange and Oldham County Stormwater Programs; LUC; OCWD; OCHD, NRCS	$2,000 per event	Not Calculable	Not Calculable	SRF; 319 Grant; OCFC; Extension Office; Conservation District; NRCS; Salt River Watershed Watch; OCEA; LUC; City of La Grange;	OCFC; Extension Office; Conservation District; NRCS; SRWW; Stormwater District(s); OCEA; LUC; City of La Grange; KDOW
5	Ensure recommendations in the WP are formally communicated to USACE, KDOW, and FWS and encourage these agencies to use recommendations from WP for mitigation projects.	High	WAH	OCFC	KDOW; USGS; FWS; Permit Applicants	$400	Not Calculable	Not Calculable	SRF; 319 Grant; Stormwater fees	USACE; KDOW; FWS
6	Establish one "Bad Septic Area Map" of failing septic systems for all county planning purposes.	High	PCR	OCHD; OCEA; OCFC; LUC	Watershed Wide	$1,000	Not Calculable	Not Calculable	SRF; 319 Grant; NRCS; OCFC; OCEA	NRCS; County Extension Office; OCHD; OCEA
7	Evaluate/create an On-site Wastewater Authority (OWA) to provide oversight on on-site wastewater management, operation, and maintenance.	High	PCR	OCEA; OCHD; OCFC; LUC; OCPDS	nonsewered Areas	Dependent Upon Action Taken	Not Calculable	Variable	SRF; 319 Grant; Utility Fees; Stormwater Fees	OCEA; KDOW; Licensed Engineer; KOWA
8	Expand water quality enhancing landscaping practices, such as rain barrels, rain gardens, pervious pavers, etc.	High	WAH	OCEA; Extension Office (Master Gardeners); La Grange; OCPDS	Property Owners; Developers; Elected Officials; Neighborhood Associations	Dependent Upon Action Taken	Dependent Upon Action Taken	Dependent Upon Action Taken	SRF; Stormwater Fees; Property Owners	OCFC; OCEA; KDOW; SD1; MSD
9	Engage a Watershed Coordinator to be a link between implementation project responsible parties, funding agencies, watershed residents, OCFC, and technical resources.	High	PCR and WAH	OCFC	Watershed Wide	Part time: $15,000 per year Full time: $45,000 per year	Not Calculable	Not Calculable	319 Grant; SRF; OCFC General Fund; Extension Office; NRCS; Conservation District	KDOW; OCEA; Consultant(s)
10	Implement education program for elected officials and Board members on the results and findings of the WP.	High	WAH	OCFC; OCEA; La Grange	Elected Officials; Policy Makers; Board Members; Community Leaders	$2,000 per seminar	Not Calculable	Not Calculable	319 Grant; Stormwater fees; SRF	OCFC; NRCS; Extension Office; Conservation District(s); Consultant(s)
11	Monitor streams in the watershed to estimate human vs. animal sources of bacterial contamination to support future decision making by OCFC.	High	PCR	OCEA; OCFC	Watershed Wide; Elected Officials	$250 / sample test $650 / trip	Not Calculable	Not Calculable	SRF; 319 Grant; Stormwater Fees; Utility Fees	USGS; KDOW; Consultant(s); Certified Laboratory; Sampling personnel
12	Review local ordinances and regulations to identify and resolve impediments to low-impact development and green infrastructure.	High	WAH	OCFC; OCEA; OCPDS; La Grange	Watershed Wide	$11,000	Dependent Upon Action Taken	Dependent Upon Action Taken	Stormwater Fees; Developer Fees; OCFC General Funds	KDOW; Licensed Engineer; Licensed Attorney
13	Coordinate wastewater expansions in conjunction with planned water line expansions.	Medium	PCR	OCEA; LUC; OCWD; OCFC	Nonsewered Areas; planned water expansion areas	$2,000/year	Not Calculable	Not Calculable	Stormwater fees; Utility fees; SRF	OCWD; LUC; OCEA; KDOW
14	Educate and provide training to planners, designers, and reviewers about implementing stormwater retrofits in currently developed areas.	Medium	WAH	OCFC; OCEA; OCPDS; La Grange	Designers; Planners; Reviewers; High percentage impervious areas (Refer to Figure 2.02-6 and Table 2.02-5)	$2,000 per seminar	Not Calculable	Not Calculable	Developer Fees; Stormwater Fees; SRF	Licensed Engineer; KDOW; SD1; MSD
15	Educate and provide training to planners, designers, and reviewers of developments about low-impact design/green infrastructure and current and pending stormwater permit requirements.	Medium	WAH	OCFC; OCEA; OCPDS; La Grange	Planners; Designers; Reviewers; Areas targeted for development (Oldham Reserve; Upper North Curry's above Crystal Lake)	$2,000 per seminar	Not Calculable	Not Calculable	Developer Fees; Stormwater SRF	Licensed Engineer; KDOW; SD1; MSD
16	Ensure communication, guidelines and preplanning/approval for any wastewater system improvements, modifications, or upgrades on a watershed scale with a focus on the priority pathogen protection and restoration areas.	Medium	PCR	OCEA; LUC; OCFC	Watershed Wide	$1,500/year	Not Calculable	Not Calculable	Sewer fees; OCFC sewer funds; SRF	OCEA; LUC; KDOW; Licensed Engineer
NORTH CURRY'S FORK TIER 1 BEST MANAGEMENT PRACTICES										
17	Eliminate Buckner Treatment Plant in the next 2 years.	High	PCR	OCEA; OCFC	Buckner STP Service Area	$1,500,000	4.56×10^8 colonies /day	304 colonies / day / dollar	SRF; Sewer Rates	OCEA; KDOW; Licensed Engineer; LUC; La Grange City
SOUTH CURRY'S FORK TIER 1 BEST MANAGEMENT PRACTICES										
18	Complete a stream restoration project on the downstream section of the main stem of South Curry's Fork near the confluence with North Curry's Fork.	Medium	WAH	OCFC; NRCS; FWS; OCPDS	Downstream section of South Curry's Fork near confluence with North Curry's Fork	$225 per foot for construction* $25 per foot for design *May increase depending on additional earthmoving	Dependent Upon Action Taken	Dependent Upon Action Taken	SRF; 319 Grant; FWS; NRCS; FEMA	Division of Forestry; NRSC; Extension Office; Conservation Office; Universities; KDFWR; FWS; KDOW
19	Complete a stream restoration project on the main stem reach adjacent to Centerfield Elementary.	High	WAH	OCFC; NRCS; FWS; OCPDS	Main stem reach adjacent to Centerfield Elementary	$225 per foot for construction $25 per foot for design	Dependent Upon Action Taken	Dependent Upon Action Taken	SRF; 319 Grant; FWS; NRCS; FEMA	Division of Forestry; NRSC; Extension Office; Conservation Office; Universities; KDFWR; FWS; KDOW
20	Eliminate Green Valley Treatment Plant in the next 2 years.	High	PCR	OCEA; OCFC; LUC	Green Valley STP Service Area	$510,000	9.8×10^6 colonies / day	19 colonies / day / dollar	SRF; Utility Rates	OCEA; LUC; KDOW; Licensed Engineer
21	Plant streamside vegetation and other streamside habitat improvement projects in the upstream section of the main stem.	High	WAH	OCFC; Property Owners; Future Watershed Group; Oldham County Greenways; OCPDS	Upstream South Curry's Fork main stem areas that are lacking riparian vegetation (Refer to Figure 2.02-2)	$10 per linear foot of stream	Dependent Upon Action Taken	Dependent Upon Action Taken	SRF; 319 Grant; Arbor Day Foundation; Stormwater Fees; Neighborhood Associations; Future Watershed Group; KDOW; FEMA	Division of Forestry; NRSC; Extension Office; Conservation Office
ASHER'S RUN TIER 1 BEST MANAGEMENT PRACTICES										
22	Promote on-site wastewater system maintenance, operation and management education, targeting systems that are in low-lying areas and in proximity to waterways in the upper portion of the watershed.	High	PCR	OCHD; Extension Office; KDOW; OCPDS	Property Owners and Associations	$450 per year $2,000 per mailing	Not Calculable	Not Calculable	SRF; NRCS; County Extension Office; 319 Grant	OCHD; Licensed on-site Wastewater System installers; KOWA
23	Replace or repair aging/failing on-site wastewater systems targeting systems that are in low-lying areas and in proximity to waterways in the upper portion of the watershed.	High	PCR	OCHD; OCEA; Property Owners	Property Owners	$4,000 per system	3.79×10^8 colonies / day / system	94,750 colonies / day / dollar	SRF; 319 Grant; Property Owners	OCHD; Licensed on-site Wastewater System installers; KOWA
24	Educate owners of nontraditional animals/livestock on appropriate BMPs for pathogen reduction in the upper portion of the watershed.	Medium	PCR	Extension Office; NRCS; Producer Organization(s); Conservation District	Nontraditional animal/livestock Producers	$350 per livestock owner	Not Calculable	Not Calculable	SRF; NRCS; Extension Office; 319 Grant; Conservation District	NRCS; Extension Office; Conservation District
CURRY'S FORK MAIN STEM TIER 1 BEST MANAGEMENT PRACTICES										
25	Complete a stream restoration project in the downstream portion of Curry's Fork main stem near the confluence with Floyds Fork. Cost of project may significantly increase due to amount of earthmoving involved unless a demand for the soil can be identified.	Low	WAH	OCFC; NRCS; FWS; OCPDS	Downstream section of Curry's Fork main stem near the confluence of Floyds Fork	$225 per foot for construction* $25 per foot for design * May increase depending on additional earthmoving costs	Dependent Upon Action Taken	Dependent Upon Action Taken	SRF; 319 Grant; FWS; NRCS; FEMA	Division of Forestry; NRSC; Extension Office; Conservation Office; Universities; KDFWR; FWS; KDOW

TABLE 5.03-2–TIER 2 BEST MANAGEMENT PRACTICES

BMP No.	Best Management Practice(s) and Description	Feasibility	Impairment Addressed	Responsible Party/Parties	Targeted Audience/Area	Cost	Expected Pollutant Load Reduction	Pollutant Load Reduction/Dollar	Funding Source(s) and Mechanism(s)	Technical Assistance Needed
ENTIRE WATERSHED TIER 2 BEST MANAGEMENT PRACTICES										
26	Engage community with watershed issues by providing watershed educational and recreational opportunities, including stream clean-ups, water testing, and storm sewer stenciling.	High	WAH	OCFC; Board of Education; Restoration project property owners; Solid Waste Dept.; Oldham County Greenways	Watershed wide	$1,500 per opportunity	Not Calculable	Not Calculable	319 Grant; SRF; Stormwater Fees; Solid Waste Management; SRWW	OCFC; NRCS; Extension Office; Conservation District; Solid Waste Management; SRWW
27	Improve stream connection to floodplain. Evaluate using National Floodplain Managers Association's "No Adverse Impact" (NAI) Program to maintain or reduce current peak flow levels, thus minimizing any increases in flooding of property.	Medium	WAH	OCFC; OCEA; La Grange; OCPDS	Areas in or adjacent to Floodplains	$500 to review program applicability to WP $4,000 to conduct a NAI seminar in Oldham County	Dependent Upon Action Taken	Dependent Upon Action Taken	319 Grant; USDA; NRCS; SRF	FEMA; Association of State Floodplain Managers; Licensed Engineer
NORTH CURRY'S FORK TIER 2 BEST MANAGEMENT PRACTICES										
28	Promote on-site wastewater system maintenance, operation and management education, targeting systems that are in low-lying areas and in proximity to waterways in the upper portion of the watershed.	High	PCR	OCHD; Extension Office; OCFC; OCPDS	Property Owners and Associations	$5,000/year	Not Calculable	Not Calculable	NRCS; County Extension Office; 319 Grant; SRF	OCHD; Licensed on-site Wastewater System installer; KOWA
29	Use enhanced development guidelines in undeveloped areas and retrofits in developed areas that promote the incorporation of low-impact design elements and water quality BMPs into the design and construction.	High	WAH	OCFC; OCEA; OCPDS; La Grange	Developers; Land-owners; Areas targeted for development; High percent impervious areas; Identified flood prone areas on Moody Lane and Lakewood Valley subdivision	$7,000	Dependent Upon Action Taken	Dependent Upon Action Taken	Stormwater Fees; OCFC General Funds	Licensed Engineer; KDOW; SD1; MSD
30	Complete a stream restoration project on the downstream section after diverging from I-71, which was identified as having very high restoration potential to reduce high bank erosion rates.	Low	WAH	OCFC; NRCS; FWS; OCPDS	Downstream section of North Curry's Fork	$225 per foot for construction $25 per foot for design	Dependent Upon Action Taken	Dependent Upon Action Taken	SRF; 319 Grant; FWS; NRCS; FEMA	Division of Forestry; NRSC; Extension Office; Conservation Office; Universities; KDFWR; FWS; KDOW
SOUTH CURRY'S FORK TIER 2 BEST MANAGEMENT PRACTICES										
31	Eliminate Lakewood Treatment Plant in the next 11 to 20 years.	High	PCR	OCEA; OCFC	Lakewood STP Service Area	$1,090,000	$5.2x10^6$ colonies /day	5 colonies /day /dollar	SRF; Utility Rates	OCEA; KDOW; Licensed Engineer
32	Eliminate Lockwood Treatment Plant in the next 11 to 20 years.	High	PCR	OCEA; OCFC	Lockwood STP Service Area	$342,000	$3.5x10^7$ colonies /day	102 colonies /day /dollar	SRF; Utility Rates	OCEA; KDOW; Licensed Engineer
ASHER'S RUN TIER 2 BEST MANAGEMENT PRACTICES										
33	Increase/require the number of inspections of on-site wastewater systems. Possible triggers for inspection might be when property is bought/sold, or when utilities change names in the upper portion of the watershed.	High	PCR	OCHD; OCEA; LG&E; OCFC; OCPDS	Property Owners with on-site systems; Realtors; on-site Wastewater System Inspectors; Areas in the upper portion of Ashers Run	$300 per inspection	Not Calculable	Not Calculable	NRCS; County Extension Office; 319 Grant; SRF	OCHD; Licensed on-site Wastewater System installer
34	Educate owners of livestock animals on appropriate BMPs for pathogen reduction in the upper portion of the watershed.	Medium	PCR	Extension Office; NRCS; Producer Organization(s); Conservation District; AWQA	Livestock Producers	$350 per livestock owner	Not Calculable	Not Calculable	NRCS; County Extension Office; 319 Grant; Conservation District; SRF	NRCS; Extension Office; Conservation District; AWQA
35	Encourage producers with marginal pasture lands to put their land into conservation easements, wildlife habitats, and land stewardships.	Medium	WAH	OCFC; NRCS; Extension Office; Conservation District; FSA	Farm-owner;	$10,000 per acre	Over 70 percent nutrient and TSS reduction per acre converted	Nitrogen: 0.6 mg/yr/dollar Phos. : 0.13 mg/yr/dollar TSS: 175 mg/yr/dollar	OCFC; NRCS; Extension Office; Conservation District; 319 Grant; SRF	OCFC; NRCS; Extension Office; Conservation District(s); FSA
36	Expand use of riparian buffers/filters strips around creek including enhancing 'no-disturb' ordinance to require creating designed buffer/filter strips instead of just open space in the lower portion of the watershed.	Medium	PCR	OCFC; NRCS; Extension Office; Conservation District; OCPDS	Land-owners; Developers; Areas in the lower portion of Ashers Run	$10 per linear foot of stream	Typically over 50 percent sediment and nutrient removal	Nitrogen: 80 mg/yr/dollar Phos.: 30 mg/yr/dollar TSS: 90 lbs/yr/dollar	OCFC; Developer Fees; NRCS; USDA; Extension Office; Conservation District; SRF; 319 Grant	OCFC; NRCS; Extension Office; Conservation District
37	Implement Agricultural BMPs in the upper portion of the watershed.	Low	PCR	Extension Office; NRCS; Producer Organization(s); AQWA; Conservation District	Farm-owners and Livestock Producers	Site Specific	Dependent Upon Action Taken	Dependent Upon Action Taken	NRCS; County Extension Office; 319 Grant; Conservation District; SRF	NRCS; Extension Office; Conservation District(s); AWQA
CURRY'S FORK MAIN STEM TIER 2 BEST MANAGEMENT PRACTICES										
38	Educate owners of livestock animals on appropriate BMPs for pathogen reduction in the upper portion of the watershed.	Medium	PCR	Extension Office; NRCS; Producer Organization(s); Conservation District; AWQA	Livestock Producers	$350 per livestock owner	Not Calculable	Not Calculable	NRCS; County Extension Office; 319 Grant; Conservation District; SRF	NRCS; Extension Office; Conservation District; AWQA
39	Expand use of riparian buffers/filters strips around creek including enhancing "no-disturb" ordinance to require creating designed buffer/filter strips instead of just open space in the lower portion of the watershed.	Medium	PCR	OCFC; NRCS; Extension Office; Conservation District; OCPDS	Land-owners; Developers; Areas in the lower portion of Ashers Run	$10 per linear foot of stream	Typically over 50 percent sediment and nutrient removal	Nitrogen: 80 mg/yr/dollar Phos.: 30 mg/yr/dollar TSS: 90 lbs/yr/dollar	OCFC; Developer Fees; NRCS; USDA; Extension Office; Conservation District; SRF; 319 Grant	OCFC; NRCS; Extension Office; Conservation District
40	Eliminate Country Village Treatment Plant in the next 11 to 20 years.	Medium	PCR	OCEA; OCFC	Country Village STP Service Area	$900,000	$5.6x10^7$ colonies / day	63 colonies / day / dollar	SRF; Utility Rates	OCEA; KDOW; Licensed Engineer
41	Encourage producers with marginal pasture lands to put their land into conservation easements, wildlife habitats, and land stewardships.	Medium	WAH	OCFC; NRCS; Extension Office; Conservation District; FSA	Farm-owner;	$10,000 per acre	Over 70 percent nutrient and TSS reduction per acre converted	Nitrogen: 0.6 mg/yr/dollar Phos. : 0.13 mg/yr/dollar TSS: 175 mg/yr/dollar	OCFC; NRCS; Extension Office; Conservation District; 319 Grant; SRF	OCFC; NRCS; Extension Office; Conservation District(s); FSA
42	Expand and protect riparian zones/no-disturbance zones around creeks.	Medium	PCR	OCFC; NRCS; FSA; Conservation District; OCPDS	Land-owners; Developers	$10,000 per acre	Typically over 50 percent sediment and nutrient removal	Nitrogen: 4.7 mg/yr/dollar Phos.: 1.7 mg/yr/dollar TSS: 5.6 lbs/yr/dollar	Developer Fees	OCFC; NRCS; Extension Office; FSA
43	Evaluate existing Purchase Development Programs for applicability in Oldham County. Purchase (or place in conservation easements) properties and/or development rights along creeks to preserve streamside areas and encourage access to streams.	Medium	WAH	OCFC; NRCS; FSA; Conservation District; OCPDS	Land-owners; Developers	$10,000 per acre	Over 70 percent nutrient and TSS reduction per acre converted	Nitrogen: 0.6 mg/yr/dollar Phos. : 0.13 mg/yr/dollar TSS: 175 mg/yr/dollar	Developer Fees; New Funding through PDR type Program	OCFC; NRCS; Extension Office

TABLE 5.03-3–TIER 3 BEST MANAGEMENT PRACTICES

BMP No.	Best Management Practice(s) and Description	Feasibility	Impairment Addressed	Responsible Party/Parties	Targeted Audience/Area	Cost	Expected Pollutant Load Reduction	Pollutant Load Reduction/Dollar	Funding Source(s) and Mechanism(s)	Technical Assistance Needed
ENTIRE WATERSHED TIER 3 BEST MANAGEMENT PRACTICES										
44	Enhance roadside swales to include water-quality improvement functionality, such as using native grass species, elevated grates to trap first flush runoff, use of highly permeable soil, and utilization of an underdrain system.	High	WAH	KYTC; OCFC Road Department; OCEA	Watershed Wide; Neighborhood Groups	$5 per foot, plus $2,000 to develop education program.	20 to 40 percent TSS reduction typical	Site Specific	Stormwater Fees; KYTC	KYTC; Stormwater District(s); Licensed Engineer; SD1; MSD
45	Evaluate adopting a on-site wastewater inspection program that will establish the number of inspections of on-site systems.	High	PCR	OCHD; OCEA; LG&E; OCFC; LUC; OCPDS	Property Owners; Realtors; on-site Wastewater System Inspectors	$3,000 to evaluate program adoption $200 per inspection	Not Calculable	Not Calculable	County Extension Office; 319 Grant; SRF; Stormwater Fees	OCHD; Licensed on-site Wastewater System installers; KOWA
46	Reassess, and update as appropriate, design criteria for on-site wastewater requirements, including lot size requirements.	High	PCR	OCEA; OCHD; OCFC; LUC; OCPDS	Non-sewered Areas	$2,600	Not Calculable	Variable	319 Grant; SRF; Utility Rates; Utility Fees	OCEA; KDOW; Licensed Engineer
47	Support and encourage full and expedient development and implementation of Oldham County Environmental Authorities (OCEA) Stormwater Quality Management Plans (SWQMPs).	High	PCR	City of La Grange; OCFC; OCEA; OCPDS	High Percentage Impervious Areas	Dependent on Program Size/Objectives	Dependent Upon Action Taken	Dependent Upon Action Taken	Stormwater Fees	LUC; KDOW; Licensed Engineer
48	Support the formation of a citizen-based watershed group.	High	WAH	OCFC; Watershed residents	Watershed wide	$1,000 for initial formation	Not Calculable	Not Calculable	319 Grant; SRF; SRWW	OCFC; NRCS; Extension Office; Conservation District; SRWW
49	Use stream restoration projects to educate decision makers and the community on stream conditions and function(s).	High	WAH	OCFC; NRCS; Extension Office; Conservation District	Land-owners; Elected Officials; Students; Developers	$1,000 per event	Not Calculable	Not Calculable	319 Grant; SRF; Stormwater Fees	OCFC; NRCS; Extension Office; Conservation District; FWS; KDOW;
50	Expand use of riparian buffers/filters strips around creek including enhancing 'no-disturb' ordinance to require creating designed buffer/filter strips instead of just open space.	Medium	WAH	OCFC; NRCS; Extension Office; Conservation District; OCPDS	Land-owners; Developers	$10 per linear foot of stream	N/A (BMP primarily used for protection activities)	Not Calculable	OCFC; Developer Fees; NRCS; USDA; Extension Office; Conservation District; 319 Grant; SRF	OCFC; NRCS; County Extension Office; Conservation District
51	Evaluate existing Purchase Development Rights (PDR) programs for applicability in Oldham County. Purchase (or place in conservation easements) properties and/or development rights along creeks to preserve streamside areas and encourage access to streams.	Medium	WAH	OCFC; NRCS; FSA; Conservation District; OCPDS	Land-owners; Developers	$3,000 to research and evaluate program applicability $10,000 per acre purchase cost	Over 70 percent nutrient and TSS reduction per acre converted	Nitrogen: 0.6 mg/yr/dollar Phos. : 0.13 mg/yr/dollar TSS: 175 mg/yr/dollar	Developer Fees; New Funding through PDR type Program	OCFC; NRCS; County Extension Office
52	Incentivize low-impact design/green infrastructure inclusion in new developments and retrofits to existing developments.	Low	WAH	OCFC; City of La Grange; OCEA; OCPDS	Developers; Property owners; High percentage impervious areas	Site Specific	Dependent Upon Action Taken	Dependent Upon Action Taken	Stormwater Fees	Stormwater District(s); KDOW; Licensed Engineer
NORTH CURRY'S FORK TIER 3 BEST MANAGEMENT PRACTICES										
53	Eliminate Sewer Overflows consistent with the proposed consent decree.	High	PCR	LUC; OCEA; OCFC	Sewered Areas	Dependent Upon Action Taken	500,000 colonies/overflow (median value)	Dependent Upon Action Taken	SRF; Utility Rates	OCFC; OCEA; KDOW; Licensed Engineer
54	Increase/require the number of inspections of on-site wastewater systems. Possible triggers for inspection might be when property is bought/sold, or when utilities change names.	High	PCR	OCHD; OCEA; LG&E; OCFC	Property Owners; Realtors; on-site Wastewater System Inspectors	$300 per inspection	Not Calculable	Not Calculable	County Extension Office; 319 Grant; SRF	OCHD; Licensed on-site Wastewater System installer; KOWA
55	Promote on-site wastewater system maintenance, operation and management education, targeting systems that are in low-lying areas and in proximity to waterways.	High	PCR	OCHD; Extension Office; KDOW	Property Owners and Associations	$1,000	Not Calculable	Not Calculable	County Extension Office; 319 Grant; SRF	OCHD; Licensed on-site Wastewater System installer; KOWA
56	Conduct a stream survey along the middle section of North Curry's Fork to identify potential KYTC drainage improvement areas. Identify and implement stormwater reduction, storage and treatment opportunities along the I-71 corridor.	Medium	WAH	UL; OCFC; KYTC;	I-71 corridor; State Right of Way areas; Middle section Tributaries of North Curry's Fork; KYTC	Site specific	Dependent Upon Action Taken	Dependent Upon Action Taken	Stormwater Fees; KYTC; OCFC General Funds; 319 Grant	Licensed Engineer; KYTC; KDOW; UL
SOUTH CURRY'S FORK TIER 3 BEST MANAGEMENT PRACTICES										
57	Complete stream restoration or protection projects on the upstream tributaries, which were identified as very high restoration and protection potential.	High	WAH	OCFC; NRCS; FWS; OCPDS		$225 per foot for construction $25 per foot for design	Dependent Upon Action Taken	Dependent Upon Action Taken	SRF; 319 Grant; FWS; NRCS; FEMA	Division of Forestry; NRSC; Extension Office; Conservation Office; Universities; KDFWR; FWS; KDOW
58	Complete a stream restoration project in the middle section of the main stem.	High	WAH	OCFC; NRCS; FWS; OCPDS	Middle section of the main stem of South Curry's Fork	$225 per foot for construction $25 per foot for design	Dependent Upon Action Taken	Dependent Upon Action Taken	SRF; 319 Grant; FWS; NRCS; FEMA	Division of Forestry; NRSC; Extension Office; Conservation Office; Universities; KDFWR; FWS; KDOW
59	Replace or repair aging/failing on-site wastewater systems targeting systems that are in low-lying areas and in proximity to waterways.	High	PCR	OCHD; OCEA; Property Owners	Property Owners	$4,000 per system	$3.79x10^8$ colonies / day / system	94,750 colonies / day / dollar	319 Grant; SRF; Property Owners	OCHD; Licensed on-site Wastewater System installer; KOWA
ASHERS RUN TIER 3 BEST MANAGEMENT PRACTICES										
60	Complete a stream restoration project upstream of Camden Lane in the upstream portion of Ashers Run subwatershed.	Low	WAH	OCFC; NRCS; FWS; OCPDS	Upstream of Camden Lane	$225 per foot for construction $25 per foot for design	Dependent Upon Action Taken	Dependent Upon Action Taken	319 Grant; FWS; NRCS; SRF; FEMA	Division of Forestry; NRSC; Extension Office; Conservation Office; Universities; KDFWR; FWS; KDOW
61	Complete a stream restoration project on the lower/downstream portion of Ashers Run near the confluence to address stream banks.	Low	WAH	OCFC; NRCS; FWS; OCPDS	Upstream of Camden Lane	$225 per foot for construction $25 per foot for design *May increase depending on additional earth moving	Dependent Upon Action Taken	Dependent Upon Action Taken	319 Grant; FWS; NRCS; SRF; FEMA	Division of Forestry; NRSC; Extension Office; Conservation Office; Universities; KDFWR; FWS; KDOW
CURRY'S FORK MAIN STEM TIER 3 BEST MANAGEMENT PRACTICES										
62	Complete a stream protection project on the single main stem tributary identified as having very high protection potential.	Low	WAH	OCFC; NRCS; FWS; OCPDS	Identified Tributary of Curry's Fork main stem	$225 per foot for construction $25 per foot for design	Dependent Upon Action Taken	Dependent Upon Action Taken	SRF; 319 Grant; FWS; NRCS; FEMA	Division of Forestry; NRSC; Extension Office; Conservation Office; Universities; KDFWR; FWS; KDOW
63	Complete a stream restoration or protection project on the upstream tributaries, which were identified as high restoration and high protection potential.	Low	WAH	OCFC; NRCS; FWS	Upstream tributaries of Curry's Fork main stem	$225 per foot for construction $25 per foot for design	Dependent Upon Action Taken	Dependent Upon Action Taken	SRF; 319 Grant; FWS; NRCS; FEMA	Division of Forestry; NRSC; Extension Office; Conservation Office; Universities; KDFWR; FWS;
64	Eliminate Sewer Overflows consistent with the proposed consent decree.	High	PCR	LUC; OCEA; OCFC	Sewered Areas	Dependent Upon Action Taken	500,000 colonies/overflow (median value)	Dependent Upon Action Taken	SRF; Utility Rates	OCEA; KDOW; Licensed Engineer

TABLE 5.03-4–TIER 1 BEST MANAGEMENT PRACTICES MILESTONES

BMP No.	BMP(s)	Feasibility	Impairment Addressed	Action Items	Milestones		
					Short Term (1 to 3 years)	Mid-Term (3 to 10 years)	Long Term (10+ years)
ENTIRE WATERSHED TIER 1 BMP MILESTONES							
1	Conduct a septic system survey program to identify failing systems for replacement, repair, or elimination.	High	PCR	-Evaluate existing programs and develop a program for Curry's Fork/Oldham County. -Secure funding. -Conduct outreach/public awareness about program. -Conduct surveys.	-Evaluate existing programs in other communities. -Meet with responsible parties and technical resources to review and develop a program for Curry's Fork/Oldham County. -Secure funding for implementation. -Focus program implementation in Curry's Fork high priority pathogen restoration areas (see Figure 4.07-1). -Pilot the survey program.	-Evaluate pilot program and make changes as needed. -Continue program implementation in at least one high priority area a year. -Revise priority maps as new data is made available. -Conduct outreach/public awareness about results	-Continue surveys in high priority areas at least once a year.
2	Develop and implement a marketing program for the WP.	High	PCR and WAH	-Identify target audiences. -Develop marketing approaches and materials. -Market Watershed Plan. -Revise marketing approaches and materials as warranted.	-Identify target audiences. -Tailor Watershed Plan outreach and marketing to meet various audiences using social marketing concepts. -Use Watershed Plan Executive Summary as basis for outreach and marketing efforts. -Prioritize audiences and implement marketing via multiple avenues (agency meetings, newspaper and articles).	-Review marketing venues annually for effectiveness. -Modify marketing efforts as needed and as opportunities arise. -Continue marketing Watershed Plan.	-Continue to review marketing venues annually for effectiveness. -Emphasize changes to Watershed Plan based on effectiveness of Plan implementation. -Continue marketing Watershed Plan.
3	Develop and implement a monitoring plan to monitor solutions implemented as part of the WP.	High	PCR and WAH	-Coordinate efforts with other agencies and organizations conducting sampling in Curry's Fork. -Determine parameters that will be monitored. -Request KDOW monitoring as part of Basin Cycle Monitoring Program. -Modify Watershed Plan based on data results.	-Meet with agencies and organizations conducting sampling in Curry's Fork to discuss monitoring needs of the WP. -Coordinate WP sampling with other ongoing sampling efforts. -Prepare and send correspondence from OCFC for KDOW requesting monitoring in Curry's Fork as part of KDOW's Basin Cycle Monitoring - -Program (correspondence to be sent no later than summer 2013 for monitoring in 2014).	-Assess all available data (including approved TMDL results) to determine if changes in in-stream water quality have changed over 5 years of implementation. -Meet with agencies and organizations conducting sampling in Curry's Fork to discuss monitoring results and additional monitoring needs. -Coordinate WP sampling with other ongoing sampling efforts. -Modify Watershed Plan implementation as warranted based on monitoring results.	-Meet to discuss and update sampling needs of WP. -Continue WP sampling in coordination with other ongoing sampling efforts. -Prepare and send correspondence from OCFC for KDOW requesting monitoring in Curry's Fork as part of KDOW's Basin Cycle Monitoring Program (correspondence to be sent no later than summer 2018 for monitoring in 2019). -Continue to modify Watershed Plan as warranted based on monitoring results.
4	Develop and implement Curry's Fork watershed education and awareness program, including information about the watershed, WP, WP recommendations, project activities, and community activities.	High	PCR	-Identify target audiences, education goals and existing outreach materials. -Modify existing materials as necessary. -Utilize multiple avenues and social marketing techniques. -Utilize existing programs to carry watershed messages. -Implement at least one watershed education event a year.	-Meet with responsible parties and technical resources to prioritize target audiences, target areas, develop program goals, and secure educational materials. -Review and utilize existing educational materials from USEPA and KDOW. -Modify educational materials for Curry's Fork as necessary. -Utilize multiple avenues and techniques to raise watershed awareness. -Conduct at least one watershed education event a year. -Provide educational materials and opportunities at community events as appropriate. -Coordinate efforts with other educational BMPs.	-Convene responsible parties at least annually for program updates. -Modify education/outreach approaches as warranted. -Continue to conduct at least one watershed education event a year. -Continue to provide educational materials and opportunities at community events as appropriate. -Continue to coordinate efforts with other educational BMPs.	-Convene responsible parties at least annually for program updates. -Continue to modify education/outreach approaches as warranted. -Continue to conduct at least one watershed education event a year. -Continue to provide educational materials and opportunities at community events as appropriate. -Continue to coordinate efforts with other educational BMPs.
5	Ensure recommendations in the WP are formally communicated to United States Army Corps of Engineers (USACE), KDOW, and United States Fish and Wildlife Service (FWS) and encourage these agencies to use recommendations from WP for mitigation projects.	High	WAH	-Communicate stream restoration and protection recommendations with USACE, KDOW, and FWS. -Encourage agencies to target activities in identified priority areas	-Summarize WP stream restoration and protection recommendations. -Meet with USACE, KDOW, and FWS to discuss WP recommendations and opportunities for implementation. -Encourage agencies to target activities in identified priority areas.	-As necessary or warranted, meet with USACE, KDOW, and FWS with any new information or WP changes. -Continue to encourage agencies to target activities in identified priority areas.	-As necessary or warranted, meet with USACE, KDOW, and FWS with any new information or WP changes. -Continue to encourage agencies to target activities in identified priority areas.
6	Establish one "Bad Septic Area Map" for failing septic systems for all county planning purposes.	High	PCR	-Obtain agreement from responsible parties on one "Bad Septic Area Map" for the Curry's Fork Watershed. -Update map as new information is obtained.	-Convene responsible parties and resource agencies to review similarities and differences with bad septic areas. -Obtain agreement on one map to be used for Curry's Fork. -Distribute map.	-Meet to identify new priority areas and update the map as necessary.	-Meet to identify new priority areas and update the map as necessary.

BMP No.	BMP(s)	Feasibility	Impairment Addressed	Action Items	Milestones		
					Short Term (1 to 3 years)	Mid-Term (3 to 10 years)	Long Term (10+ years)
7	Evaluate/create an On-site Wastewater Authority (OWA) to provide oversight on on-site wastewater management, operation, and maintenance.	High	PCR	-Review and present information on existing OWAs to appropriate/responsible parties. -Develop OWA. -Implement OWA. -Coordinate efforts with other BMPs related to and agencies responsible for on-site wastewater systems.	-Review and evaluate existing OWAs in other communities. -Summarize and present OWA information to appropriate parties. -Discuss and develop framework for establishing OWA for Oldham County/Curry's Fork. -Establish and implement OWA. -Coordinate OWA efforts with other BMPs related to on-site wastewater systems. -Develop GWPP.	-OWA meetings at least annually -Begin implementing practices to achieve OWA goals and objectives -Continue to coordinate OWA efforts with other BMPs related to on-site wastewater systems	-Continue to meet annually. -Track progress and activities. -Continue implementing practices to achieve OWA goals and objectives. -Continue to coordinate OWA efforts with other BMPs related to on-site wastewater systems.
8	Expand water quality enhancing landscaping practices, such as rain barrels, rain gardens, pervious pavers, etc.	High	WAH	-Develop demonstration projects on municipal property. -Target education and implementation n areas prone to flooding. -Encourage/support local grant program (using stormwater fees) for implementing BMPs. -Use existing materials and programs to educate property owners and others about BMPs. -Implement at least 2 water quality enhancing landscaping practices per year.	-Ensure SWQMP(s) support and encourage all appropriate BMPs. -Develop a Demonstration Project on municipal property with signage and other educational/outreach potential. -Support/encourage development of a stormwater fee-based grant program for neighborhood associations and other groups to obtain funding for BMP implementation. -Obtain and use existing BMP education materials. -Target those areas identified in the watershed with existing flooding issues and concerns for education and implementation. -Implement water quality enhancing landscaping practices on at least two properties ayear	-Revise landscaping enhancements and target areas as necessary based on land-use and property owner changes. -Continue to implement water quality enhancing landscaping and practices on at least two properties a year.	-Continue to meet with willing homeowners and businesses. -Continue to implement water quality enhancing landscaping and practices on at least two properties a year.
9	Engage a Watershed Coordinator to be a link between project responsible parties, funding agencies, watershed residents, OCFC, and technical resources.	High	PCR and WAH	-Develop job description and goals of position. -Interview qualified candidates. -Engage a Watershed Coordinator.	-Evaluate hiring opportunities (in-house, through partnering agencies, and contract). -Develop job goals, job descriptions, and job responsibilities. -Interview qualified candidates; include selected partnering agencies with selection process as feasible. -Engage a Watershed Coordinator. -Begin involving Watershed Coordinator in all WP related activities.	-Watershed Coordinator continues to be lead and be involved in all WP activities. -Watershed Coordinator acts as a link between all involved parties in watershed activities.	-Watershed Coordinator continues to be lead and be involved in all WP activities. -Watershed Coordinator acts as a link between all involved parties in watershed activities.
10	Implement education program for elected officials and Board members on the results and findings of the WP.	High	WAH	-Develop presentation(s) based on Executive Summary from Watershed Plan. -Provide an overview and focused Watershed Plan information to elected officials and Board Members. -Solicit feedback and identify subject areas where additional information and training is needed.	-Present a Watershed Plan overview to the Fiscal Court. -Solicit feedback on both areas of interest and training needs. -Use existing materials and partners to provide training on specific water quality, target areas, BMPs or program areas that have been identified. -Conduct at least one educational event a year. -Coordinate efforts with other educational BMPs.	-Continue educational and training events at least once per year or as new officials are elected. -Update training materials to represent updated water quality regulations and current condition of Curry's Fork.	-Continue educational and training events at least once per year or as new officials are elected. -Update training materials to represent updated water quality regulations and current condition of Curry's Fork.
11	Monitor streams in the watershed to estimate human vs. animal sources of bacterial contamination to support future decision making by OCFC	High	PCR	-Coordinate efforts with other agencies and organizations conducting sampling in Curry's Fork. -Conduct sampling. -Use results for future decision making.	-Meet with other agencies and organizations conducting sampling in Curry's Fork. -Develop an agreed upon sampling protocol. -Coordinate with other sampling efforts. -Develop a single sampling results data base. -Summarize and present sampling results to OCFC.	-If water quality monitoring indicates continue PCR impairment, assess if additional human vs. animal monitoring would assist decision makers.	-If water quality monitoring indicates continue PCR impairment, assess if additional human vs. animal monitoring would assist decision makers.
12	Review local ordinances and regulations to identify and resolve impediments to low-impact development and green infrastructure	High	WAH	-Identify impediments to low-impact practices and green-infrastructure in local ordinances. -Resolve impediments by changing ordinances appropriately.	-Review existing development ordinances. -Identify impediments to low-impact practices and green-infrastructure in local ordinances. -Propose and review potential changes to development ordinances to remove impediments.	-Change development ordinances to remove impediments. -Assess success of ordinance modifications and determine if any additional changes are warranted.	-Assess success of ordinance modifications and determine if any additional changes are warranted
13	Coordinate wastewater expansions in conjunction with planned water line expansions	Medium	PCR	-Compile list and map of planned and proposed wastewater and water expansions. -Modify project schedules to ensure adequate wastewater treatment for areas receiving new water lines.	-Meet to discuss planned and potential projects. -Develop a schedule and comprehensive map of planned wastewater and water expansions/projects. -Modify planned projects to ensure adequate wastewater treatment. -Coordinate construction schedules as necessary. -Develop GWPP.	-Annually meet to discuss and coordinate projects. -Update schedules and comprehensive project map as necessary.	-Annually meet to discuss and coordinate projects. -Update schedules and comprehensive project map as necessary.

BMP No.	BMP(s)	Feasibility	Impairment Addressed	Action Items	Milestones: Short Term (1 to 3 years)	Milestones: Mid-Term (3 to 10 years)	Milestones: Long Term (10+ years)
14	Educate and provide training to planners, designers, and reviewers about implementing stormwater retrofits in currently developed areas.	Medium	WAH	-Ensure SWQMP(s) support BMPs and provide training opportunities. -Supplement training where needed. -Conduct a minimum of one training a year for first three years and one every 3 years thereafter. -Evaluate/support/conduct recognition programs. -Establish tracking procedures to monitor implementation low-impact designs and green infrastructure. -Focus on areas identified in Figure 2.02-6 and Table 2.02-5.	-Ensure SWQMP(s) support and encourage all appropriate stormwater retrofit BMPs and provide training opportunities. -Identify audiences not met by SWQMP training (i.e., reviewers) and provide additional training. -Review existing educational materials from KDOW and USEPA.. -Work with Stormwater District(s) to utilize existing materials for educational and training materials; modify for Curry's Fork if necessary. -Conduct one training seminar or workshop a year. -Encourage local business, planners, and designers to participate in KY Excel Program.	-Continue to provide training opportunities (minimum one every 3 years). -Revise educational and training materials as necessary based on land-use changes in Curry's Fork and new technologies. -Begin monitoring projects incorporating low-impact design and green infrastructure. -Recognize projects and raise awareness through local newspaper articles. -Evaluate and develop a local awards program to recognize outstanding local leaders.	-Continue to provide training opportunities (minimum one every 3 years). -Revise educational and training materials as necessary based on land-use changes in Curry's Fork and new technologies. -Monitoring projects incorporating low-impact design and green infrastructure. -Recognize projects and raise awareness through local newspaper articles. -Conduct local awards program to recognize outstanding local leaders.
15	Educate and provide training to planners, designers, and reviewers of developments about low-impact design/green infrastructure and current and pending stormwater permit requirements.	Medium	WAH	-Ensure SWQMP(s) support BMPs and provide training opportunities. -Supplement training where needed. -Conduct a minimum of one training a year for first three years and one every 3 years thereafter. -Evaluate/support/conduct recognition programs. -Establish tracking procedures to monitor implementation low-impact designs and green infrastructure .	-Ensure SWQMP(s) support and encourage all appropriate stormwater retrofit BMPs and provide training opportunities. -Identify audiences not met by SWQMP training (i.e., reviewers) and provide additional training -Review existing educational materials from KDOW and USEPA.. -Work with Stormwater District(s) to utilize existing materials for educational and training materials; modify for Curry's Fork if necessary. -Conduct one training seminar or workshop a year. -Encourage local business, planners, designers, etc. to participate in KY Excel Program.	-Continue to provide training opportunities (minimum one every 3 years). -Revise educational and training materials as necessary based on land-use changes in Curry's Fork and new technologies. -Begin monitoring projects incorporating low-impact design and green infrastructure. -Recognize projects and raise awareness through local newspaper articles. -Evaluate and develop a local awards program to recognize outstanding local leaders.	-Continue to provide training opportunities (minimum one every 3 years). -Revise educational and training materials as necessary based on land-use changes in Curry's Fork and new technologies. -Monitoring projects incorporating low-impact design and green infrastructure. -Recognize projects and raise awareness through local newspaper articles. -Conduct local awards program to recognize outstanding local leaders.
16	Ensure communication, guidelines and preplanning/approval for any wastewater system improvements, modifications, or upgrades on a watershed scale with a focus on the priority pathogen protection and restoration areas.	Medium	PCR	-Use pathogen protection and restoration priority map to guide wastewater system improvements.	-Meet with responsible parties prior to wastewater system improvements. -Review pathogen protection and restoration map developed from WP to focus on high priority areas.	-Continue to meet with responsible parties prior to any wastewater system improvements. -Update and review pathogen map based on any new sampling data and wastewater system improvements.	-Continue to meet with responsible parties prior to any wastewater system improvements. -Update and review pathogen map based on any new sampling data and wastewater system improvements.
NORTH CURRY'S FORK TIER 1 BMP MILESTONES							
17	Eliminate Buckner Treatment Plant in the next 2 years.	High	PCR	-Propose and review feasible alternatives. -Identify and secure funding sources. -Decommission Buckner WWTP.	-Review and select feasible elimination alternative and funding sources. -Eliminate Buckner Treatment Plant using alternative identified in feasibility analysis. -Provide/require sewer hook-ups to residences in proximity to WWTP (implement concurrent with decommissioning). -Support 201 Wastewater Plan implementation with a focus on priority pathogen protection and restoration areas.	-Begin post-elimination water quality monitoring. -Review post-elimination water quality data. -Utilize post-elimination water quality data to support elimination of other package treatment plants.	-Continue post-elimination water quality monitoring.
SOUTH CURRY'S FORK TIER 1 BMP MILESTONES							
18	Complete a stream restoration project on the downstream section of the main stem of South Curry's Fork near the confluence with North Curry's Fork.	Medium	WAH	-Meet property owners of potential project locations to discuss proposed remediation activities. -Secure funding. -Acquire appropriate easement/properties. -Review and approve restoration design. -Monitor conditions pre-and post-restoration. -Implement restoration. -Implement education program.	-Contact property owner(s) and secure cooperation/buy-in. -Engage property owners in decision making. -Secure funding through identified funding sources. -Ensure restoration design will meet environmental and property owner goals. -Work with property owners to acquire necessary property rights for project. -Acquire appropriate easement/properties.	-Continue with easement/acquisitions. -Review and approve restoration design. -Secure funding. -Assess pre-construction WQ, biological, and habitat conditions at project location. -Begin post-construction water quality monitoring. -Coordinate construction and implementation with other BMPs to utilize project as an educational to monitoring. -Coordinate construction and implementation with other BMPs and utilize project as an education tool. -Implement restoration.	-Maintain restoration/protection project as necessary. -Continue post-construction water quality monitoring. -Continue to coordinate with other BMPs to utilize project as an educational tool. -Evaluate improvements to WQ, biology, and habitat. -Continue to use restoration site as an educational tool for demonstrating stream dynamics and restoration techniques.

BMP No.	BMP(s)	Feasibility	Impairment Addressed	Action Items	Milestones: Short Term (1 to 3 years)	Milestones: Mid-Term (3 to 10 years)	Milestones: Long Term (10+ years)
19	Complete a stream restoration project on the main stem reach adjacent to Centerfield Elementary	High	WAH	-Meet property owners of potential project locations to discuss proposed remediation activities. -Secure funding. -Acquire appropriate easement/properties. -Review and approve restoration design -Monitor conditions pre-and post-restoration. -Implement restoration. -Implement education program.	-Contact property owner(s) and secure cooperation/buy-in. -Engage property owners in decision making. -Secure funding through identified funding sources. -Ensure restoration design will meet environmental and property owner goals. -Work with property owners to acquire necessary property rights for project. -Acquire appropriate easement/properties.	-Continue with easement/acquisitions. -Review and approve restoration design. -Secure funding. -Assess pre-construction WQ, biological, and habitat conditions at project location. -Begin post-construction water quality monitoring. -Coordinate construction and implementation with other BMPs to utilize project as an educational to monitoring. -Coordinate construction and implementation with other BMPs and utilize project as an education tool. -Implement restoration.	-Maintain restoration/protection project as necessary. -Continue post-construction water quality monitoring. -Continue to coordinate with other BMPs to utilize project as an educational tool. -Evaluate improvements to WQ, biology, and habitat. -Continue to use restoration site as an educational tool for demonstrating stream dynamics and restoration techniques.
20	Eliminate Green Valley Treatment Plant in the next 2 years.	High	PCR	-Propose and review feasible alternatives. -Identify and secure funding sources. -Decommission Green Valley Treatment Plant.	-Review and select feasible elimination alternative and funding sources -Eliminate Green Valley Treatment Plant using alternative identified in feasibility analysis. -Provide/require sewer hook-ups to residences in proximity to WWTP (implement concurrent with decommissioning). -Support 201 Wastewater Plan implementation with a focus on priority pathogen protection and restoration areas.	-Begin post-elimination water quality monitoring. -Review post-elimination water quality data. -Utilize post-elimination water quality data to support elimination of other package treatment plants.	-Continue post-decommissioning water quality monitoring.
21	Plant streamside vegetation and other streamside habitat improvement projects in the upstream section of the main stem.	High	WAH	-Locate property owners willing to participate in stream side planting program. -Secure funding. -Engage public/neighbors with stream-side planting event. -Conduct at least one stream side planting event a year.	-Meet with property owners in targeted areas. -Select priority location for stream side plantings. -Coordinate with other planting programs to review and select native species for plantings. -Secure funding. -Coordinate stream side planting event; engage citizens/neighbors with project. -Implement at least one planting project per year along stream.	-Advertise/promote previous stream side planting events -Continue to implement at least one planting project a year along streams. -Continue to locate and facilitate meetings with willing property owners. -Coordinate planting efforts with other BMPs to utilize plantings as an educational tool.	-Continue to implement at least one planting project per year along streams. -Continue to locate and facilitate meetings with willing property owners. -Coordinate planting efforts with other BMPs to utilize plantings as an educational tool.
					ASHER'S RUN TIER 1 BMP MILESTONES		
22	Promote on-site wastewater system maintenance, operation and management education, targeting systems that are in low-lying areas and in proximity to waterways in the upper portion of the watershed.	High	PCR	-Develop and distribute educational material. -Identify and prioritize target areas.	-In consultation with technical and responsible entities, review existing educational materials; modify for Curry's Fork if necessary. -Disseminate educational materials through existing programs and agents in the watershed. -Using social marketing techniques, raise awareness and provide solutions through as many avenues as possible. -Target homeowners living in proximity to waterways. -Educate homeowners on GWPP requirements.	-Continue to distribute educational materials and implement education/awareness program activities. -Track maintenance changes in homeowners through surveys or phone calls to targeted neighborhoods. -Revise educational material based on new priority areas and feedback from neighborhoods already targeted.	-Continue to distribute educational materials and implement education/awareness program activities. -Track maintenance changes in homeowners through surveys or phone calls to targeted neighborhoods. -Revise educational material based on new priority areas and feedback from neighborhoods already targeted.
23	Replace or repair aging/failing on-site wastewater systems targeting systems that are in low-lying areas and in proximity to waterways in the upper portion of the watershed	High	PCR	-Target specific systems or areas for upgrades and repairs. -Assist with securing funding as appropriate. -Upgrade or replace at least 10 systems a year.	-Using results from on-site wastewater survey and "Bad Septic System" map, target specific systems or areas for upgrades and repairs. -Meet and work with willing homeowners in to upgrade/replace system. -Perform overdue maintenance on, repair or replace at least 10 priority on-site wastewater systems a year. -Enforce GWPP requirements.	-Continue to meet and work with willing homeowners on septic system maintenance, repairs and replacements. -Continue to perform overdue maintenance on, repair or replace at least 10 priority on-site wastewater systems.	-Continue to meet and work with willing homeowners on septic system maintenance, repairs and replacements. -Continue to perform overdue maintenance on, repair or replace at least 10 priority on-site wastewater systems .
24	Educate owners of nontraditional animals/livestock on appropriate BMPs for pathogen reduction in the upper portion of the watershed	Medium	PCR	-Identify owners of non-traditional animals and livestock. -Provide BMP information. -Support Agriculture Water Quality Authority (AWQA) compliance. -Implement BMP demonstration project if feasible.	-Review existing educational materials and modify, as necessary, for Curry's Fork. -Coordinate with existing programs to disseminate agricultural BMP information. -For qualifying producers, provide AWQA compliance assistance. -Use alternative education avenues to provide non-traditional animal BMP information. -Provide cost-share program information to qualifying producers. -Meet with at least two owners of non-traditional animals and livestock.	-Continue to meet with owners of non-traditional animals and livestock as necessary. -Revise educational material as necessary based on new owners of non-traditional animals/livestock. -Use previous program participants as examples for others to follow. -Support implementation of an agricultural BMP demonstration project.	-Continue to meet with owners of non-traditional animals and livestock as necessary. -Revise educational material as necessary based on new owners of non-traditional animals/livestock. -Use previous program participants as examples for others to follow.

BMP No.	BMP(s)	Feasibility	Impairment Addressed	Action Items	Milestones Short Term (1 to 3 years)	Mid-Term (3 to 10 years)	Long Term (10+ years)
CURRY'S FORK MAIN STEM TIER 1 BEST MANAGEMENT PRACTICES							
25	Complete a stream restoration project in the downstream portion of Curry's Fork main stem near the confluence with Floyds Fork. Cost of project may significantly increase due to amount of earthmoving involved unless a demand for the soil can be identified.	Low	WAH	-Meet property owners of potential project locations to discuss proposed remediation activities. -Secure funding. -Acquire appropriate easement/ properties -Review and approve restoration design. -Monitor conditions pre-and post-restoration. -Implement restoration. -Implement education program..	-Contact property owner(s) and secure cooperation/buy-in. -Engage property owners in decision making. -Secure funding through identified funding sources. -Ensure restoration design will meet environmental and property owner goals. -Work with property owners to acquire necessary property rights for project. -Acquire appropriate easement/properties.	-Continue with easement/acquisitions. -Review and approve restoration design. -Secure funding. -Assess pre-construction WQ, biological, and habitat conditions at project location. -Begin post-construction water quality monitoring. -Coordinate construction and implementation with other BMPs to utilize project as an educational to monitoring. -Coordinate construction and implementation with other BMPs and utilize project as an education tool. -Implement restoration.	-Maintain restoration/protection project as necessary. -Continue post-construction water quality monitoring. -Continue to coordinate with other BMPs to utilize project as an educational tool. -Evaluate improvements to WQ, biology, and habitat. -Continue to use restoration site as an educational tool for demonstrating stream dynamics and restoration techniques.

TABLE 5.03-5–TIER 2 BEST MANAGEMENT PRACTICES MILESTONES

BMP No.	BMP(s)	Feasibility	Impairment Addressed	Action Items	Milestones		
					Short Term (1 to 3 years)	Mid-Term (3 to 10 years)	Long Term (10+ years)
ENTIRE WATERSHED TIER 2 BMP MILESTONES							
26	Engage community with watershed issues by providing watershed educational and recreational opportunities, including stream clean-ups, water testing, storm sewer stenciling.	High	WAH	-Identify education goals and identify opportunities for community engagement. -Modify existing materials or secure new materials for events. -Organize community events that focus on water quality. -Implement at least one watershed education event a year.	-Meet with responsible parties and technical resources to develop program goals and identify opportunities. -Review and utilize existing educational materials from USEPA, and KDOW. -Modify educational materials for Curry's Fork as necessary. -Utilize multiple avenues and techniques to raise watershed awareness and engage community members. -Conduct at least one watershed education event a year. -Provide educational materials and recreational opportunities at community events as appropriate. -Coordinate efforts with other educational BMPs.	-Convene responsible parties at least annually for program updates . -Select new educational/engagement opportunities as warranted. -Continue to conduct at least one watershed education event a year. -Continue to provide educational materials and recreational opportunities at community events as appropriate. -Continue to coordinate efforts with other educational BMPs. -Monitor success by documenting attendance at events and materials distributed.	-Convene responsible parties at least annually for program updates. -Select new educational/engagement opportunities as warranted. -Continue to conduct at least one watershed education event a year. -Continue to provide educational materials and recreational opportunities at community events as appropriate. -Continue to coordinate efforts with other educational BMPs. -Monitor success by documenting attendance at events and materials distributed.
27	Improve stream connection to floodplain. Evaluate using National Floodplain Managers Association's "No Adverse Impact" (NAI) Program to maintain or reduce current peak flow levels, thus minimizing any increases in flooding of property.	Medium	WAH	-Secure funding through identified funding sources. -Identify opportunities to improve stream connection to floodplain.	-Review the "No Adverse Impact" Program's applicability in Oldham County/Curry's Fork. -Use existing no adverse impact (NAI) presentations to present NAI information to responsible parties and technical agencies. -If appropriate, develop NAI program. -Conduct NAI outreach.	-Implement applicable "No Adverse Impact" program items through local ordinances -Begin implementation of program items in identified high priority areas.	-Continue implementation in lower priority areas.
NORTH CURRY'S FORK TIER 2 BMP MILESTONES							
28	Promote on-site wastewater system maintenance, operation and management education, targeting systems that are in low-lying areas and in proximity to waterways in the upper portion of the watershed.	High	PCR	-Develop and distribute educational material. -Identify and prioritize target areas.	-In consultation with technical and responsible entities, review existing educational materials; modify for Curry's Fork if necessary. -Disseminate educational materials through existing programs and agents in the watershed. -Using social marketing techniques, raise awareness and provide solutions through as many avenues as possible. -Target homeowners living in proximity to waterways. -Educate homeowners on GWPP requirements.	-Continue to distribute educational materials and implement education/awareness program activities. -Track maintenance changes in homeowners through surveys or phone calls to targeted neighborhoods. -Revise educational material based on new priority areas and feedback from neighborhoods already targeted.	-Continue to distribute educational materials and implement education/awareness program activities. -Track maintenance changes in homeowners through surveys or phone calls to targeted neighborhoods. -Revise educational material based on new priority areas and feedback from neighborhoods already targeted.
29	Use enhanced development guidelines in undeveloped areas and retrofits to developed areas that promote the incorporation of low-impact design elements and water quality BMPs into the design and construction.	High	WAH	-Review low-impact designs and BMPs. -Review local ordinances.	-Review and select low-impact designs and BMPs appropriate for Curry's Fork. -Review local ordinances to identify any impediments to installing 'green' infrastructure or BMPs.	-Revise local ordinances to promote incorporation of 'green' infrastructure. -Begin implementation and enforcement of ordinance changes. -Annually review ordinances applicability. -Meet with developers and designers incorporating 'green' designs and discuss if the 'green' designs would have previously been included.	-Continue to meet with developers and designers. -Continue to annual review ordinances applicability.
30	Complete a stream restoration project on the downstream section after diverging from I-71, which was identified as having very high restoration potential to reduce high bank erosion rates.	Low	WAH	-Meet property owners of potential project locations to discuss proposed remediation activities. -Secure funding. -Acquire appropriate easement/properties. -Review and approve restoration design. -Monitor conditions pre-and post-restoration. -Implement restoration. -Implement education program.	-Contact property owner(s) and secure cooperation/buy-in. -Engage property owners in decision making. -Secure funding through identified funding sources. -Ensure restoration design will meet environmental and property owner goals. -Work with property owners to acquire necessary property rights for project. -Acquire appropriate easement/properties.	-Continue with easement/acquisitions.. -Review and approve restoration design. -Secure funding. -Assess pre-construction water quality (WQ), biological, and habitat conditions at project location. -Begin post-construction water quality monitoring. -Coordinate construction and implementation with other BMPs to utilize project as an educational to monitoring. -Coordinate construction and implementation with other BMPs and utilize project as an education tool. -Implement restoration.	-Maintain restoration/protection project as necessary. -Continue post-construction water quality monitoring. -Continue to coordinate with other BMPs to utilize project as an educational tool. -Evaluate improvements to WQ, biology, and habitat. -Continue to use restoration site as an educational tool for demonstrating stream dynamics and restoration techniques.

BMP No.	BMP(s)	Feasibility	Impairment Addressed	Action Items	Milestones: Short Term (1 to 3 years)	Milestones: Mid-Term (3 to 10 years)	Milestones: Long Term (10+ years)
SOUTH CURRY'S FORK TIER 2 BMP MILESTONES							
31	Eliminate Lakewood Treatment Plant in the next 11 to 20 years.	High	PCR	-Propose and review feasible alternatives. -Identify and secure funding sources. -Decommission Lakewood Treatment Plant.	-Review and select feasible elimination alternative and funding sources. -Eliminate Lakewood Treatment Plant using alternative identified in feasibility analysis. -Provide/require sewer hook-ups to residences in proximity to WWTP (implement concurrent with decommissioning). -Support 201 Wastewater Plan implementation with a focus on priority pathogen protection and restoration areas.	-Begin post-elimination water quality monitoring. -Review post-elimination water quality data. -Utilize post-elimination water quality data to support elimination of other package treatment plants.	-Continue post-decommissioning water quality monitoring.
32	Eliminate Lockwood Treatment Plant in the next 11 to 20 years.	High	PCR	-Propose and review feasible alternatives. -Identify and secure funding sources. -Decommission Lockwood Treatment Plant.	-Review and select feasible elimination alternative and funding sources. -Eliminate Lockwood Treatment Plant using alternative identified in feasibility analysis. -Provide/require sewer hook-ups to residences in proximity to WWTP (implement concurrent with decommissioning). -Support 201 Wastewater Plan implementation with a focus on priority pathogen protection and restoration areas.	-Begin post-elimination water quality monitoring. -Review post-elimination water quality data. -Utilize post-elimination water quality data to support elimination of other package treatment plants.	-Continue post-decommissioning water quality monitoring.
ASHER'S RUN TIER 2 BMP MILESTONES							
33	Increase/require the number of inspections of on-site wastewater systems. Possible triggers for inspection might be when property is bought/sold, or when utilities change names in the upper portion of the watershed.	High	PCR	-Establish inspection triggers. -Incorporate triggers into local ordinances.	-Discuss and select appropriate inspection triggers. -Develop inspection program guidelines and procedures. -Establish who will perform inspections. -Review and propose changes to local development/housing ordinances to incorporate triggers.	-Change local ordinances based on previous review. -Begin inspections. -Document inspection locations and results. -Coordinate inspection results with other BMPs related to on-site wastewater systems. -Enforce the development of GWPPs for on-site wastewater systems.	-Continue inspections. -Continue coordinating inspection results with other BMPs related to on-site wastewater systems.
34	Educate owners of livestock animals on appropriate BMPs for pathogen reduction in the upper portion of the watershed.	Medium	PCR	-Identify owners of livestock. -Provide BMP information. -Support AWQA compliance. -Implement BMP demonstration project if feasible.	-Review existing educational materials and modify, as necessary, for Curry's Fork. -Coordinate with existing programs to disseminate agricultural BMP information. -For qualifying producers, provide AWQA compliance assistance. -Provide cost-share program information to qualifying producers. -Meet with at least two owners of livestock.	-Continue to meet with owners of livestock as necessary. -Revise educational material as necessary based on new owners of livestock. -Use previous program participants as examples for others to follow. -Support implementation of an agricultural BMP demonstration project.	-Continue to meet with owners of livestock as necessary. -Revise educational material as necessary based on new owners of livestock. -Use previous program participants as examples for others to follow.
35	Encourage producers with marginal pasture lands to put their land into conservation easements, wildlife habitats, land and stewardships.	Medium	WAH	-Identify producers with marginal pasture lands lands. -Provide information to landowners on existing conservation easement type programs.	-Identify agriculture areas with marginal pasture lands. -Review existing conservation easement type program materials and modify, as necessary, for Curry's Fork. -Coordinate with existing programs to disseminate BMP information. -For qualifying producers, provide AWQA compliance assistance. -Provide cost-share and incentive payment program information to qualifying producers. -Meet with at least two owners of livestock. -Facilitate funding with willing property owners of marginal pasture land.	-Secure funding. -Remove at least one pasture from production and into a conservation easement type program. -Continue to identify marginal pasture lands that can be placed into conservation easements.	-Continue to meet with property owners to identify marginal pasture lands that can be placed into conservation easements. -Continue to facilitate information and funding. -Use previous program participant(s) as examples for others to follow.
36	Expand use of riparian buffers/filters strips around creek including enhancing "no-disturb" ordinance to require creating designed buffer/filter strips instead of just open space in the lower portion of the watershed.	Medium	PCR	-Review County "set back" ordinances to improve water quality benefit. -Identify needed changes to local ordinances. -Conduct outreach on proposed changes. -Implement revised design standards .	-Review Oldham County's current "set-back" standards and identify potential ways to expand water quality protection. -Collaborate with responsible parties and technical resources to revise local ordinances as warranted. -Establish revised design standards buffer/filter strips.	-Conduct outreach changes on proposed changes. -Change local ordinances based on previous review. -Begin implementation and enforcement of ordinance changes. -Document number of cases buffer strips were implemented where previously open space would have been sufficient.	-Annually review ordinances applicability. -Continue to enforce ordinance changes. -Continue to document use of buffer strips.
37	Implement Agricultural BMPs in the upper portion of the watershed.	Low	PCR	-Identify producers. -Provide BMP information. -Provide AWQA compliance assistance. -Implement BMP demonstration project if feasible.	-Review existing educational materials and modify, as necessary, for Curry's Fork. -Coordinate with existing programs to disseminate agricultural BMP information. -For qualifying producers, provide AWQA compliance assistance. -Provide cost-share and incentive program information to qualifying producers. -Meet with at least two owners of livestock.	-Continue to meet with owners of livestock as necessary -Revise educational material as necessary based on new owners of livestock. -Use previous program participants as examples for others to follow. -Support implementation of an agricultural BMP demonstration project.	-Continue to meet with owners of livestock as necessary. -Revise educational material as necessary based on new owners of livestock. -Use previous program participants as examples for others to follow.

BMP No.	BMP(s)	Feasibility	Impairment Addressed	Action Items	Milestones: Short Term (1 to 3 years)	Milestones: Mid-Term (3 to 10 years)	Milestones: Long Term (10+ years)
				CURRY'S FORK MAIN STEM TIER 2 BMP MILESTONES			
38	Educate owners of livestock animals on appropriate BMPs for pathogen reduction in the upper portion of the watershed.	Medium	PCR	-Establish inspection triggers. -Incorporate triggers into local ordinances.	-Discuss and select appropriate inspection triggers. -Develop inspection program guidelines and procedures. -Establish who will perform inspections. -Review and propose changes to local development/housing ordinances to incorporate triggers.	-Change local ordinances based on previous review. -Begin inspections. -Document inspection locations and results. -Coordinate inspection results with other BMPs related to on-site wastewater systems.	-Continue inspections. -Continue coordinating inspection results with other BMPs related to on-site wastewater systems.
39	Expand use of riparian buffers/filters strips around creek including enhancing "no-disturb" ordinance to require creating designed buffer/filter strips instead of just open space in the lower portion of the watershed.	Medium	PCR	-Review County "set back" ordinances to improve water quality benefit. -Identify needed changes to local ordinances. -Conduct outreach on proposed changes. -Implement revised design standards .	-Review Oldham County's current "set-back" standards and identify potential ways to expand water quality protection. -Collaborate with responsible parties and technical resources to revise local ordinances as warranted. -Establish revised design standards buffer/filter strips.	-Conduct outreach changes on proposed changes. -Change local ordinances based on previous review. -Begin implementation and enforcement of ordinance changes. -Document number of cases buffer strips were implemented where previously open space would have been sufficient.	-Annually review ordinances applicability. -Continue to enforce ordinance changes. -Continue to document use of buffer strips.
40	Eliminate Country Village Treatment Plant in the next 11 to 20 years.	Medium	PCR	-Propose and review feasible alternatives. -Identify and secure funding sources. -Decommission Country Village Treatment Plant.	-Review and select feasible elimination alternative and funding sources. -Eliminate Country Village Treatment Plant using alternative identified in feasibility analysis. -Provide/require sewer hook-ups to residences in proximity to WWTP (implement concurrent with decommissioning). -Support 201 Wastewater Plan implementation with a focus on priority pathogen protection and restoration areas.	-Begin post-elimination water quality monitoring. -Review post-elimination water quality data. -Utilize post-elimination water quality data to support elimination of other package treatment plants.	-Continue post-decommissioning water quality monitoring.
41	Encourage producers with marginal pasture lands to put their land into conservation easements, wildlife habitats, and land stewardships.	Medium	WAH	-Identify producers with marginal pasture lands. -Provide information to landowners on existing conservation easement type programs.	-Identify agriculture areas with marginal pasture lands -Review existing conservation easement type program materials and modify, as necessary, for Curry's Fork. -Coordinate with existing programs to disseminate BMP information. -For qualifying producers, provide AWQA compliance assistance. -Provide cost-share and incentive payment program information to qualifying producers. -Meet with at least two owners of livestock. -Facilitate funding with willing property owners of marginal pasture land.	-Secure funding. -Remove at least one pasture from production and into a conservation easement type program. -Continue to identify marginal pasture lands that can be placed into conservation easements.	-Continue to meet with property owners to identify marginal pasture lands that can be placed into conservation easements. -Continue to facilitate information and funding. -Use previous program participant(s) as examples for others to follow.
42	Expand and protect riparian zones/no-disturbance zones around creeks.	Medium	PCR	-Identify changes required in local ordinances. -Implement a riparian education program.	-Review local ordinances to identify required changes. -Change local ordinances based on previous review. -Review existing riparian educational materials and modify, as necessary, for Curry's Fork. -Use multiple avenues to raise awareness about the importance of riparian zones.	-Begin implementation and enforcement of ordinance changes. -Annually review ordinances applicability. -Continue to enforce ordinance changes. -Modify educational outreach efforts as necessary.	-Annually review ordinances applicability. -Continue to enforce ordinance changes. -Continue to modify and conduct educational and outreach programs targeted towards protecting riparian areas.
43	Evaluate existing Purchase Development Programs for applicability in Oldham County. Purchase (or place in conservation easements) properties and/or development rights along creeks to preserve streamside areas and encourage access to streams.	Medium	WAH	-Propose and review feasible alternatives. -Identify and secure funding sources. -Establish at least one conservation easement.	-Evaluate existing Purchase Development Rights (PDR) programs and summarize for responsible parties and technical agency staff. -Adopt or modify a PDR-type incentive program. -Identify and prioritize specific locations for preservation or conversion to parks. -Contact and meet with owners of identified areas. -Secure funding through identified funding sources. -Facilitate funding with willing property owners of marginal pasture land.	-Secure funding. -Promote/advertise opportunities. -Establish at least one conservation easement. -Continue to meet with property owners to facilitate information and funding.	-Continue to meet with property owners to potential properties to facilitate information and funding. -Acquire easements as opportunities arise.

TABLE 5.03-6–TIER 3 BEST MANAGEMENT PRACTICES MILESTONES

BMP No.	BMP(s)	Feasibility	Impairment Addressed	Action Items	Milestones: Short Term (1 to 3 years)	Milestones: Mid-Term (3 to 10 years)	Milestones: Long Term (10+ years)
					ENTIRE WATERSHED TIER 3 BMP MILESTONES		
44	Enhance roadside swales to include water-quality improvement functionality, such as using native grass species, elevated grates to trap first flush runoff, use of highly permeable soil, and utilization of an underdrain system.	High	WAH	-Compile list of swale enhancement BMPs. -Identify potential swale enhancement locations. -Secure funding. -Implement at least 1 enhancement per year in flood prone areas .	-Identify and prioritize potential swale enhancement project areas with a focus on flood prone areas. -Review and compile a list of feasible swale enhancement alternatives for Curry's Fork. -Complete at least 1 swale enhancement per year in identified flood prone areas.	-Promote swale enhancement BMPs and initiatives through local media and other outlets. -Complete at least 1 swale enhancement per year in flood prone areas. -Begin swale enhancement alternatives in other areas in the watershed. -Review available swale enhancement alternatives annually for new technologies or improvements.	-Continue to implement swale enhancement alternatives . -Continue to promote swale enhancement program. -Review available swale enhancement alternatives annually for new technologies or improvements.
45	Evaluate adopting a on-site wastewater inspection program that will establish the number of inspections of on-site systems.	High	PCR	-Establish program guidelines and procedures. -Incorporate triggers into local ordinances.	-Develop inspection program guidelines and procedures. -Establish who will perform inspections. -Review and propose changes to local development/housing ordinances to incorporate triggers. -Develop GWPP for systems.	-Change local ordinances based on previous review. -Begin inspections. -Document inspection locations and results. -Coordinate inspection results with other BMPs related to on-site wastewater systems.	-Continue inspections. -Continue coordinating inspection results with other BMPs related to on-site wastewater systems.
46	Reassess, and update as appropriate, design criteria for on-site wastewater requirements, including lot size requirements.	High	PCR	-Compile and review existing design criteria. -Change as necessary.	-Review and discuss design intent of current regulations. -Discuss new potential regulations and requirements based on an enhanced design to improve operation, maintenance and management of system. Include GWPP requirements in regulations. -Propose changes, as necessary, to update existing design criteria.	-Review and reassess on-site wastewater design criteria. -Update design criteria as necessary.	-Review and reassess on-site wastewater design criteria. -Update design criteria as necessary.
47	Support and encourage full and expedient development and implementation of Oldham County Environmental Authorities (OCEA) Stormwater Quality Management Plans (SWQMP).	High	PCR	-Use findings of WP to support development and implementation of OCEA's SWQMP.	-Modify/update SWQMP(s) as necessary to improve and expedite stormwater program implementation and as required by new Clean Water Act 402(p) guidelines. -Collaborate with watershed partners to reduce duplicity and obtain implementation assistance.	-Annually meet to review and discuss progress on implementing SWQMP. -Continue to coordinate WP efforts and utilize WP recommendations to support development of the SWQMP.	-Annually meet to review and discuss progress on implementing SWQMP. -Continue to coordinate WP efforts and utilize WP recommendations to support development of the SWQMP.
48	Support the formation of a citizen-based watershed group.	High	WAH	-Coordinate efforts with other watershed educational and outreach activities. -Facilitate initial meeting to form citizen-based watershed group. -Advertise and assist with recruiting participants.	-Facilitate initial watershed group meetings to form citizen-based watershed group. -Help group establish specific goals and objectives. -Provide technical support and resources for citizen-based watershed group. -Advertise group on website and during other watershed plan activities	-Continue to provide technical support and resources for citizen-based watershed group. -Advertise group with other watershed activities and functions. -Coordinate watershed plan activities with watershed group.	-Continue to provide technical support and resources for citizen-based watershed group. -Advertise group with other watershed activities and functions. -Coordinate watershed plan activities with watershed group.
49	Use stream restoration projects to educate decision makers and the community on stream conditions and function(s).	High	WAH	-Coordinate efforts with other stream protection and restoration projects. -Invite community to stream restoration projects that are completed or under construction. -Allow project designer to discuss project.	-Compile list of completed and ongoing WP stream restoration projects. -Meet with responsible parties to review and prioritize stream restoration projects used for education. -Advertise stream restoration project and educational opportunity. -Prepare educational materials.	-Conduct one educational opportunity a year at identified stream restoration projects. -Continue these activities for new stream restoration projects.	-Conduct one educational opportunity a year at identified stream restoration projects. -Continue these activities for new stream restoration projects.
50	Expand use of riparian buffers/filters strips around creek including enhancing 'no-disturb' ordinance to require creating designed buffer/filter strips instead of just open space.	Medium	WAH	-Review County "set back" ordinances to improve water quality benefit. -Identify needed changes to local ordinances. -Conduct outreach on proposed changes. -Implement revised design standards .	-Review Oldham County's current "set-back" standards and identify potential ways to expand water quality protection. -Collaborate with responsible parties and technical resources to revise local ordinances as warranted. -Establish revised design standards buffer/filter strips.	-Conduct outreach changes on proposed changes. -Change local ordinances based on previous review. -Begin implementation and enforcement of ordinance changes. -Document number of cases buffer strips were implemented where previously open space would have been sufficient.	-Annually review ordinances applicability. -Continue to enforce ordinance changes. -Continue to document use of buffer strips.
51	Evaluate existing Purchase Development Rights (PDR) programs for applicability in Oldham County. Purchase (or place in conservation easements) properties and/or development rights along creeks to preserve streamside areas and encourage access to streams.	Medium	WAH	-Propose and review feasible alternatives. -Identify and secure funding sources.	-Identify and prioritize areas for preservation or conversion to parks. -Contact and meet with owners of identified areas. -Secure funding through identified funding sources. -Facilitate funding with willing property owners of marginal pasture land.	-Secure funding. -Establish at least one conservation easement. -Continue to meet with property owners to potential.l properties to facilitate information and funding.	-Continue to meet with property owners to potential properties to facilitate information and funding. -Acquire easements as opportunities arise.

BMP No.	BMP(s)	Feasibility	Impairment Addressed	Action Items	Milestones: Short Term (1 to 3 years)	Mid-Term (3 to 10 years)	Long Term (10+ years)
52	Incentivize low-impact design/green infrastructure inclusion in new developments and retrofits to existing developments.	Low	WAH	-Work with developers to identify appropriate incentives. -Include incentives in development/ redevelopment ordinances.	-Meet with local developers to identify potential incentives. -Review potential incentives for incorporation of low-impact design/green infrastructure. -Review existing development ordinances. -Identify changes required in ordinances to incorporate green incentives. -Identify funding source/mechanism.	-Select appropriate incentives to include in ordinances. -Change development ordinances to include green incentives. -Begin providing incentives for green infrastructure in new developments and retrofits to developed areas. -Advertise and promote incentives to developers working within Curry's Fork.	-Review incentives and ordinances annually for potential updates. -Add/subtract incentives and qualifiers for incentives as necessary.
NORTH CURRY'S FORK TIER 3 BMP MILESTONES							
53	Eliminate Sewer Overflows consistent with the proposed consent decree.	High	PCR	-Review identified sewer overflow locations. -Implement corrective actions to eliminate sewer overflows.	-Develop a map of known and identified problem areas. -Review and select feasible alternatives to eliminate sewer overflows on a site specific basis. -Secure funding.	-Secure funding. -Begin implementing feasible alternatives. -Update map as problems are resolved or new problems are identified.	-Continue implementing feasible alternatives. -Update map as problems are resolved or new problems are identified.
54	Increase/require the number of inspections of on-site wastewater systems. Possible triggers for inspection might be when property is bought/sold, or when utilities change names.	High	PCR	-Establish inspection triggers. -Incorporate triggers into local ordinances.	-Discuss and select appropriate inspection triggers. -Develop inspection program guidelines and procedures. -Establish who will perform inspections. -Review and propose changes to local development/housing ordinances to incorporate triggers. -Develop GWPPs for systems.	-Change local ordinances based on previous review. -Begin inspections. -Document inspection locations and results. -Coordinate inspection results with other BMPs related to on-site wastewater systems.	-Continue inspections. -Continue coordinating inspection results with other BMPs related to on-site wastewater systems.
55	Promote on-site wastewater system maintenance, operation and management education, targeting systems that are in low-lying areas and in proximity to waterways.	High	PCR	-Develop and distribute educational material. -Identify and prioritize target areas.	-In consultation with technical and responsible entities, review existing educational materials; modify for Curry's Fork if necessary. -Disseminate educational materials through existing programs and agents in the watershed. -Using social marketing techniques, raise awareness and provide solutions through as many avenues as possible. -Target homeowners living in proximity to waterways. -Educate homeowners on GWPP requirements.	-Continue to distribute educational materials and implement education/awareness program activities. -Track maintenance changes in homeowners through surveys or phone calls to targeted neighborhoods. -Revise educational material based on new priority areas and feedback from neighborhoods already targeted.	-Continue to distribute educational materials and implement education/awareness program activities. -Track maintenance changes in homeowners through surveys or phone calls to targeted neighborhoods. -Revise educational material based on new priority areas and feedback from neighborhoods already targeted.
56	Conduct a stream survey along the middle section of North Curry's Fork to identify potential KYTC drainage improvement areas. Identify and implement stormwater reduction, storage and treatment opportunities along the I-71 corridor.	Medium	WAH	-Conduct a site reconnaissance with KYTC and University of Louisville Stream Institute staff to identify problem drainage areas. -Collaborate on solutions -Secure funding. -Remediate drainage issues.	-Review recommendations and results of UL Geomorphology study. -Conduct a stream reconnaissance along the middle section of North Curry's Fork to identify potential KYTC drainage improvement areas. -Collaborate on drainage solutions. -Secure funding. -Implement solutions.	-Continue to implement I/I drainage remediation projects. -Promote water quality improvement practices in local media.	-Continue to implement I/I drainage remediation projects. -Continue to promote water quality improvement practices in local media.
SOUTH CURRY'S FORK TIER 3 BMP MILESTONES							
57	Complete stream restoration or protection projects on the upstream tributaries, which were identified as very high restoration and protection potential.	High	WAH	-Meet property owners of potential project locations to discuss proposed remediation activities. -Secure funding. -Acquire appropriate easement/properties. -Review and approve restoration design. -Monitor conditions pre-and post-restoration. -Implement restoration. -Implement education program.	-Contact property owner(s) and secure cooperation/buy-in. -Engage property owners in decision making. -Secure funding through identified funding sources. -Ensure restoration design will meet environmental and property owner goals. -Work with property owners to acquire necessary property rights for project. -Acquire appropriate easement/properties.	-Continue with easement/acquisitions. -Review and approve restoration design. -Secure funding. -Assess pre-construction WQ, biological, and habitat conditions at project location. -Begin post-construction water quality monitoring. -Coordinate construction and implementation with other BMPs to utilize project as an educational to monitoring. -Coordinate construction and implementation with other BMPs and utilize project as an education tool. -Implement restoration.	-Maintain restoration/protection project as necessary. -Continue post-construction water quality monitoring. -Continue to coordinate with other BMPs to utilize project as an educational tool. -Evaluate improvements to WQ, biology, and habitat. -Continue to use restoration site as an educational tool for demonstrating stream dynamics and restoration techniques.
58	Complete a stream restoration project in the middle section of the main stem.	High	WAH	-Meet property owners of potential project locations to discuss proposed remediation activities. -Secure funding. -Acquire appropriate easement/properties. -Review and approve restoration design. -Monitor conditions pre-and post-restoration. -Implement restoration. -Implement education program.	-Contact property owner(s) and secure cooperation/buy-in. -Engage property owners in decision making. -Secure funding through identified funding sources. -Ensure restoration design will meet environmental and property owner goals. -Work with property owners to acquire necessary property rights for project. -Acquire appropriate easement/properties.	-Continue with easement/acquisitions. -Review and approve restoration design. -Secure funding. -Assess pre-construction WQ, biological, and habitat conditions at project location. -Begin post-construction water quality monitoring. -Coordinate construction and implementation with other BMPs to utilize project as an educational to monitoring. -Coordinate construction and implementation with other BMPs and utilize project as an education tool. -Implement restoration.	-Maintain restoration/protection project as necessary. -Continue post-construction water quality monitoring. -Continue to coordinate with other BMPs to utilize project as an educational tool. -Evaluate improvements to WQ, biology, and habitat. -Continue to use restoration site as an educational tool for demonstrating stream dynamics and restoration techniques.

BMP No.	BMP(s)	Feasibility	Impairment Addressed	Action Items	Milestones: Short Term (1 to 3 years)	Milestones: Mid-Term (3 to 10 years)	Milestones: Long Term (10+ years)
59	Replace or repair aging/failing on-site wastewater systems targeting systems that are in low-lying areas and in proximity to waterways.	High	PCR	-Target specific systems or areas for upgrades and repairs. -Assist with securing funding as appropriate. -Upgrade or replace at least 10 systems a year.	-Using results from on-site wastewater survey and "Bad Septic System" map, target specific systems or areas for upgrades and repairs. -Meet and work with willing homeowners in to upgrade/replace system. -Perform overdue maintenance on, repair or replace at least 10 priority on-site wastewater systems a year. -Enforce GWPP requirements.	-Continue to meet and work with willing homeowners on septic system maintenance, repairs and replacements. -Continue to perform overdue maintenance on, repair or replace at least 10 priority on-site wastewater systems.	-Continue to meet and work with willing homeowners on septic system maintenance, repairs and replacements. -Continue to perform overdue maintenance on, repair or replace at least 10 priority on-site wastewater systems .
					ASHER'S RUN TIER 3 BMP MILESTONES		
60	Complete a stream restoration project upstream of Camden Lane in the Asher's Run subwatershed.	Low	WAH	-Meet property owners of potential project locations to discuss proposed remediation activities. -Secure funding. -Acquire appropriate easement/properties. -Review and approve restoration design. -Monitor conditions pre-and post-restoration. -Implement restoration. -Implement education program.	-Contact property owner(s) and secure cooperation/buy-in. -Engage property owners in decision making. -Secure funding through identified funding sources. -Ensure restoration design will meet environmental and property owner goals. -Work with property owners to acquire necessary property rights for project. -Acquire appropriate easement/properties.	-Continue with easement/acquisitions. -Review and approve restoration design. -Secure funding. -Assess pre-construction WQ, biological, and habitat conditions at project location. -Begin post-construction water quality monitoring. -Coordinate construction and implementation with other BMPs to utilize project as an educational to monitoring. -Coordinate construction and implementation with other BMPs and utilize project as an education tool. -Implement restoration.	-Maintain restoration/protection project as necessary. -Continue post-construction water quality monitoring. -Continue to coordinate with other BMPs to utilize project as an educational tool. -Evaluate improvements to WQ, biology, and habitat. -Continue to use restoration site as an educational tool for demonstrating stream dynamics and restoration techniques.
61	Complete a stream restoration project on the lower/downstream portion of Asher's Run near the confluence to address stream banks.	Low	WAH	-Meet property owners of potential project locations to discuss proposed remediation activities. -Secure funding. -Acquire appropriate easement/properties. -Review and approve restoration design. -Monitor conditions pre-and post-restoration. -Implement restoration. -Implement education program.	-Contact property owner(s) and secure cooperation/buy-in. -Engage property owners in decision making. -Secure funding through identified funding sources. -Ensure restoration design will meet environmental and property owner goals. -Work with property owners to acquire necessary property rights for project. -Acquire appropriate easement/properties.	-Continue with easement/acquisitions. -Review and approve restoration design. -Secure funding. -Assess pre-construction WQ, biological, and habitat conditions at project location. -Begin post-construction water quality monitoring. -Coordinate construction and implementation with other BMPs to utilize project as an educational to monitoring. -Coordinate construction and implementation with other BMPs and utilize project as an education tool. -Implement restoration.	-Maintain restoration/protection project as necessary. -Continue post-construction water quality monitoring. -Continue to coordinate with other BMPs to utilize project as an educational tool. -Evaluate improvements to WQ, biology, and habitat. -Continue to use restoration site as an educational tool for demonstrating stream dynamics and restoration techniques.
					CURRY'S FORK MAIN STEM TIER 3 BMP MILESTONES		
62	Complete a stream protection project on the single main stem tributary identified as having very high protection potential.	Low	WAH	-Meet property owners of potential project locations to discuss proposed remediation activities. -Secure funding. -Acquire appropriate easement/properties. -Review and approve restoration design. -Monitor conditions pre-and post-restoration. -Implement restoration. -Implement education program.	-Contact property owner(s) and secure cooperation/buy-in. -Engage property owners in decision making. -Secure funding through identified funding sources. -Ensure restoration design will meet environmental and property owner goals. -Work with property owners to acquire necessary property rights for project. -Acquire appropriate easement/properties.	-Continue with easement/acquisitions. -Review and approve restoration design. -Secure funding. -Assess pre-construction WQ, biological, and habitat conditions at project location. -Begin post-construction water quality monitoring. -Coordinate construction and implementation with other BMPs to utilize project as an educational to monitoring. -Coordinate construction and implementation with other BMPs and utilize project as an education tool. -Implement restoration.	-Maintain restoration/protection project as necessary. -Continue post-construction water quality monitoring. -Continue to coordinate with other BMPs to utilize project as an educational tool. -Evaluate improvements to WQ, biology, and habitat. -Continue to use restoration site as an educational tool for demonstrating stream dynamics and restoration techniques.
63	Complete a stream restoration or protection project on the upstream tributaries, which were identified as high restoration and high protection potential.	Low	WAH	-Meet property owners of potential project locations to discuss proposed remediation activities. -Secure funding. -Acquire appropriate easement/properties -Review and approve restoration design. -Monitor conditions pre-and post-restoration. -Implement restoration. -Implement education program.	-Contact property owner(s) and secure cooperation/buy-in. -Engage property owners in decision making. -Secure funding through identified funding sources. -Ensure restoration design will meet environmental and property owner goals. -Work with property owners to acquire necessary property rights for project. -Acquire appropriate easement/properties.	-Continue with easement/acquisitions. -Review and approve restoration design. -Secure funding. -Assess pre-construction WQ, biological, and habitat conditions at project location. -Begin post-construction water quality monitoring. -Coordinate construction and implementation with other BMPs to utilize project as an educational to monitoring. -Coordinate construction and implementation with other BMPs and utilize project as an education tool. -Implement restoration.	-Maintain restoration/protection project as necessary. -Continue post-construction water quality monitoring. -Continue to coordinate with other BMPs to utilize project as an educational tool. -Evaluate improvements to WQ, biology, and habitat. -Continue to use restoration site as an educational tool for demonstrating stream dynamics and restoration techniques.
64	Eliminate Sewer Overflows consistent with the proposed consent decree.	Low	PCR	-Review identified sewer overflow locations. -Implement corrective actions to eliminate sewer overflows.	-Develop a map of known and identified problem areas. -Review and select feasible alternatives to eliminate sewer overflows on a site specific basis. -Secure funding.	-Secure funding. -Begin implementing feasible alternatives. -Update map as problems are resolved or new problems are identified.	-Continue implementing feasible alternatives. -Update map as problems are resolved or new problems are identified.

5.04 BEST MANAGEMENT PRACTICE IMPLEMENTATION COORDINATION

It is important to note a number of BMPs listed in Tables 5.03-1 through 5.03-3 will be more efficient and feasible if the responsible parties involved implement them in coordination with each other. Many entities and organizations listed as responsible parties and as technical assistance have existing watershed programs and initiatives in place that can be participated in, built upon, or used as a basis for the proposed BMPs in Tables 5.03-1, 5.03-2, and 5.03-3. Subsection 2.06 lists many of the current watershed programs and initiatives within the Curry's Fork watershed. Not only can existing programs be used as a reference, but BMPs that are being implemented can be implemented in coordination with one another to increase their overall effectiveness, reach a larger audience, and decrease implementation costs. BMPs should not be implemented before reviewing other recommended BMPs and ongoing projects within a project area. The subheadings below summarize what topics the Tier 1 BMPs focus on.

A. Sewage Discharge Eliminations and Changes BMPs

1. Coordinate wastewater and drinking line expansions (BMP No. 13).
2. Elimination of WWTP or identified package treatment plants (BMP Nos. 17, 20, 31, 32, and 40).
3. Communicate WP priority areas with planning of wastewater system improvements (BMP No. 16).
4. Eliminate sewer overflows (BMP Nos. 53 and 64).

B. On-Site Wastewater System BMPs

1. Implement a septic system survey or inspection program (BMP Nos. 1, 33, 45, and 54).
2. Establish a "Bad Septic Area Map" for Oldham County (BMP No. 6).
3. Evaluate/Create an on-site wastewater authority (BMP No. 7).
4. Promote on-site wastewater system maintenance (BMP Nos. 22, 28, and 55).
5. Replace or repair failing on-site wastewater systems (BMP Nos. 23 and 59).
6. Reassess on-site wastewater system design criteria (BMP No. 46).
7. Work with local entities and state and federal agencies to promote and implement recommendations from the WP (BMP No. 5).

C. Watershed Education, Participation, Coordination, and Marketing BMPs

1. Engage a Watershed Coordinator (BMP No. 9).
2. Develop and implement a WP marketing program (BMP Nos. 2 and 5).
3. Develop and implement various WP education and awareness programs (BMP Nos. 4, 10, 14, and 15).
4. Engage the community with watershed issues (BMP No. 26).
5. Support the formation of a citizen-based watershed group (BMP No. 48).
6. Use stream restoration projects as educational tools (BMP No. 49).

D. Stormwater BMPs

1. Expand water quality enhancing landscaping practices (BMP No. 8).
2. Review ordinances for impediments to low-impact development (BMP No. 12).
3. Implement enhanced development guidelines in undeveloped areas and retrofits to developed areas (BMP No. 29).
4. Enhance roadside swales (BMP No. 44).
5. Incentivize low-impact development/green infrastructure (BMP No. 52).
6. Support the development and implementation of the OCEA SWQMP (BMP No. 47).

E. Restoration and Protection Project BMPs

1. Implement stream restoration and protection projects in identified priority areas (BMP Nos. 18, 19, 21, 25, 30, 56, 57, 58, 60, 61, 62, and 63).
2. Improve stream connection with floodplain (BMP No. 27).

F. Water Quality Sampling BMPs

Develop and implement a monitoring plan (BMP Nos. 3 and 11).

G. Agriculture BMPs

1. Provide support and educational resources for agricultural landowners (BMP Nos. 24, 34, and 38).
2. Implement agricultural BMPs (BMP No. 37).
3. Encourage producers with marginal pasture lands to put land into conservation easements (BMP Nos. 35 and 41).

H. Streamside BMPs

1. Expand use of riparian buffers around creek and enhance "no-disturb" ordinance (BMP Nos. 36, 39, 42, and 50).
2. Purchase properties or development rights along streams to preserve streamside areas (BMP Nos. 43 and 51).

SECTION 6
KEY COMPONENTS OF WATERSHED PLAN SUCCESS

6.01 WATERSHED PLAN IMPLEMENTATION EVALUATION

To evaluate the effectiveness of the Watershed Plan (WP) and implemented best management practices (BMPs), the implementation plan should be monitored and evaluated on a regular basis. This section discusses methods to evaluate the implementation plan.

6.02 ORGANIZATION

The following entities, agencies, and organizations are identified as responsible parties for implementing various solutions identified in the WP:

- Agriculture Water Quality Authority
- City of La Grange, Kentucky
- Future Watershed Group
- Kentucky Division of Water
- Kentucky Transportation Cabinet
- La Grange Utilities Commission
- Louisville Gas & Electric
- Oldham County Board of Education
- Oldham County Conservation District
- Oldham County Environmental Authority
- Oldham County Cooperative Extension Office
- Oldham County Fiscal Court
- Oldham County Greenways
- Oldham County Health Department
- Oldham County Planning and Development Services
- Oldham County Road Department
- Oldham County Solid Waste Department
- Oldham County Water District
- Producer Organization(s)
- Property Owners
- Salt River Watershed Watch
- United States Department of Agriculture, Farm Service Agency
- United States Department of Agriculture, Natural Resources Conservation Service
- United States Department of Agriculture, Fish and Wildlife Services
- University of Louisville
- Watershed Residents

The cooperation and collaboration of these groups and completion of their respective tasks are vital to meeting the goals of the WP. Each individual group should be accountable for its assigned action items for each BMP through the implementation plan evaluation and review is critical for implementing the plan and improving water quality conditions in Curry's Fork.

Because of the number of involved parties, studies conducted, and recommendations made within the WP, it is recommended to engage a Watershed Coordinator. The Watershed Coordinator would be a link between responsible parties, funding agencies, watershed residents, and technical resources. The Watershed Coordinator would also monitor the progress of WP-related projects or activities and provide updates on progress made.

6.03 MARKETING THE WATERSHED PLAN

The Curry's Fork Watershed Coordinator will work to ensure that responsible agencies, organizations, and groups understand the objectives and recommendations of the WP. Using the WP Executive Summary as a reference, presentations will be made to responsible parties. The Watershed Coordinator will tailor presentations to meet local group's needs and expectations. Marketing the Curry's Fork WP will be an important role and function of the Watershed Coordinator. In addition to agency, organization, and group presentations, the WP will be marketed via the Web site, newspaper articles, public meetings, community events, one-on-one interaction, and other forums as appropriate.

The Watershed Coordinator will also encourage and support the formation of a citizen-based watershed group for the watershed, which currently does not exist.

6.04 FUNDING FOR IMPLEMENTATION

Depending on the type of solution and involved parties, a variety of funding sources may be pursued. The Watershed Coordinator will seek local sponsorship(s) for smaller projects. Larger projects may require contributions from involved parties or applications for state and/or federal funding. As discussed in Subsection 6.02, the Watershed Coordinator would work as a link between responsible parties and potential funding sources to ensure solutions have the necessary funding.

Creating a watershed group to receive sponsorship, grants, or other funding is often the first step. Creating the watershed group as a nonprofit organization often makes it easier to secure donations or grants. As an alternative, partnering with nonprofit groups can be equally as effective and expands involvement.

6.05 MONITORING PLAN

A number of agencies have conducted water quality sampling within Oldham County and Curry's Fork for various purposes, such as Salt River Watershed Watch, Kentucky Waterways Alliance (KWA), Kentucky Division of Water (KDOW), and United States Geological Survey (USGS). Stormwater sampling will also be conducted throughout Oldham County for municipal separate stormwater system (MS4) permit compliance. Oldham County Fiscal Court (OCFC) and the Watershed Coordinator will coordinate with these organizations and utilize their sampling and assessment results for implementation monitoring. OCFC will compare results from implementation sampling and assessments to baseline data already collected as part of the WP to assess the impacts of installed BMPs and solutions implemented.

OCFC will also request that Curry's Fork be a part of KDOW's Basin Cycle Monitoring Program for 2014 and 2019 to provide critical sampling information within the watershed.

Establishing overarching criteria for assessing the effectiveness of the plan is a useful tool to capture a "big-picture" view of the overall health of the watershed through the implementation process. The following metrics are recommended to be monitored to evaluate the Curry's Fork Watershed Plan:

1. WAH Support–Currently the watershed is listed for partial support of WAH. The change in designation to full support of WAH would indicate that improvements are happening in the watershed and the Watershed Plan is part of that shift. A decrease in support to nonsupport or no movement in the level of support would indicate that the Plan is not being effective at improving WAH and its implementation should be reevaluated.

2. PCR Support–Currently the watershed is listed for non-suport of primary contact recreation. The change in designation to partial or full support of PCR would indicate that improvements are happening in the watershed and the Watershed Plan is part of the that shift. A continuation of the current status would indicate that the Plan is not being effective at improving PCR and its implementation should be reevaluated.

Monitoring should not be confined to sampling and assessments alone. Records of educational material developed, seminars conducted, participation in public education programs, and other watershed events should be documented and reviewed to see if outreach efforts are reaching the appropriate audiences and resulting in changes in behavior that help to improve water quality.

6.06 EVALUATION FRAMEWORK

It is important to periodically step back from implementation of BMPs and evaluate progress. Potential items to consider during these evaluations are discussed further.

A. Implementation

At a minimum, progress updates should be provided for BMPs and milestones by the Watershed Coordinator on a quarterly to annual basis, although certain BMPs may require more frequent evaluation depending on the requirements. Progress updates should include, at minimum, whether the BMP implementation is on schedule, a brief evaluation of available postimplementation assessment results, any problems or concerns encountered during the implementation process, and plans to alleviate these problems and concerns. Sharing progress updates during future meetings of the Technical Committee (TC) could be especially effective. The Watershed Coordinator should prepare updates on a quarterly to annual basis as established by OCFC. Posting reports online for public viewing can help maintain interest in the project.

B. Outcome Indicators

Section 5.04-4 has suggested indicators for each of the BMPs recommended. However, during the detailed planning and/or implementation of the BMP other indicators may be identified that are more useful, illustrative, easier to collect, or have other attributes that make them a better option to use as an indicator than the suggestions in Section 5. Identifying alternative indicators is encouraged and should be considered before actual implementation of any BMP. Quantitative indicators are encouraged as they can often more readily assess progress. During progress updates and meetings, involved parties should refer back to the selected indicators.

C. Outreach

Outreach activities are important for a number of reasons and should be evaluated on at least an annual basis. Outreach activities serve a number of functions, including educating the public, maintaining public involvement, maintaining involvement of involved parties, promoting the successes of the plan, and potentially identifying new funding sources.

As mentioned in Subsection 6.05, outreach activities should be monitored and documented to assess whether they are using appropriate advertising venues, reaching appropriate audiences, and facilitating the involvement of watershed residents in projects and activities in the watershed.

D. Adaptive Management

Goals and objectives described in this WP were developed based on the best available information and the current and predicted future needs of the community, but the needs of the community or watershed can change. Impacts within watersheds are dynamic, meaning they are continually changing. Land use changes, human impacts, and naturally occurring changes within the watershed can create new problems or concerns and alleviate existing ones.

Because of this, the WP development and implementation are an iterative process. It is important for involved parties to establish tracking procedures, follow these procedures by evaluating the progress and impacts of BMP implementation, and be prepared to adjust plans as necessary based on BMP results and the changing needs of the watershed. As mentioned in item A, practical times to perform evaluations are at milestone stages annually, and/or semiannually. As milestones are reached, responsible parties should answer the following questions:

1. Is this BMP helping us reach our goal(s)?
2. Is it costing more or less than expected?
3. Are there changes we could make to improve it?
4. Should we revise or set new goals based on what we know now?

Answering such questions and evaluating the implementation plan can help identify and correct problems early in the process, preventing them from becoming very large problems later.

To assist in the adaptive management process, a list of other potential BMPs is included in Appendix F. These BMPs were identified through the same process as the BMPs in Section 5 but are determined to be likely less effective. They are included as potential alternatives to the recommended BMPs if the recommended BMPs turn out to be less effective than originally though. With an approved TMDL, there may be adjustments to WP, or based on WP implementation, the allocations of the TMDL may need to be adjusted.