

REVISED
2009 604(b) Water Quality Management Program
American Recovery and Reinvestment Act of 2009
(ARRA)

CA# 2P-96690801, Project 2

Assessment of Habitat Limited Aquatic Community (Formerly Habitat Limited Fisheries) and Secondary Body Contact Recreation Waterbodies for the 2013 Triennial Revision



WATER QUALITY PROGRAMS DIVISION
OKLAHOMA WATER RESOURCES BOARD

May 17, 2011
Revised October, 2011

Table of Contents

Introduction	2
Methods and Secondary Data.....	11
Fish Assessments	13
Benthic Macroinvertebrate Assessments	14
Habitat Assessments.....	14
Stakeholder Review and Input.....	16
Summary of Recommendations.....	18
Appendices:Data Used in the Individual Re-evaluation of the 14 Selected Waterbodies.....	20
Bitter Creek (OK311600-02-0110)	- 1 -
Canadian River (OK520610020010).....	- 1 -
Coffee Creek (OK520710-01-0090).....	- 1 -
Little Deep Creek (OK520620-06-0040).....	- 1 -
Rush Creek (OK310810-01-0090).....	- 1 -
Salt Creek (OK620910-02-0100D)	- 1 -
Sandy Creek (OK311600-01-0040).....	- 1 -
Sergeant Major (OK310840020140)	- 1 -
Skeleton Creek (OK620910-03-0240E).....	- 1 -
Stillwater Creek (OK620900-04-0070)	- 1 -
Tar Creek (OK121600-04-0060)	- 1 -
Trail Creek (OK520620-02-0090)	- 1 -
 <u>List of Tables</u>	
Table 1. Stream Segments Listed as HLAC and/or SBCR.....	5
Table 2. Streams Reviewed with Consideration to Additional Data.....	11
Table 3. Results of Review for Additional Available Data for Consideration.....	12
Table 4. Waterbodies with Associated Recommendations.	18
 <u>List of Figures</u>	
Figure 1. Map of Stream Segments Designated in the OWQS as HLAC and/or SBCR.....	4

Introduction

Water Quality Standards (WQS) are the foundation of the water quality-based pollution control program mandated by the Clean Water Act. These WQS define the goals for a waterbody (reservoirs, lakes, streams or rivers) by designating its uses, setting criteria to protect those uses, and establishing provisions such as antidegradation policies to protect waterbodies from pollutants.

Regulations governing WQS require that states and authorized Indian tribes specify appropriate water uses to be achieved and protected. Appropriate uses are identified by taking into consideration the use and value of the waterbody for public water supply, for protection of fish, shellfish, and wildlife, and for recreational, agricultural, industrial, and navigational purposes. In designating uses for a waterbody, states and tribes examine the suitability of a waterbody for the uses based on the physical, chemical, and biological characteristics of the waterbody, its geographical setting and scenic qualities, and economic considerations. Each waterbody does not necessarily require a unique set of uses. Instead, the characteristics necessary to support a use can be identified so that waterbodies having those characteristics can be grouped together as supporting particular uses.

Where water quality standards specify designated uses less than those which are presently being attained, the state or tribe is required to revise its standards to reflect the uses actually being attained.

A Use Attainability Analysis (UAA) must be conducted for any waterbody with designated uses that do not include the "fishable/swimmable" goal uses identified in Section 101(a)(2) of the Act. Such waterbodies must be reexamined every three years to determine if new information has become available that would warrant a revision of the standard. If new information indicates that "fishable/swimmable" uses can be attained, such uses must be designated.

Designated uses are an important component of Oklahoma's Water Quality Standards (OWQS). Designated uses are specified in the OWQS for each waterbody or waterbody segment, whether or not that use is being attained. There are various categories of uses, such as public water supplies, agricultural uses, and navigation uses. So called "fishable/swimmable" uses must be designated for each waterbody unless the State can adequately demonstrate, via a UAA, that these uses cannot be attained.

The designated use may be removed, or subcategories of a use established, only under the conditions given in 40 CFR, Section 131.10(g). The state must be able to demonstrate that attaining the designated use is not feasible because:

1. Naturally occurring pollutant concentrations prevent the attainment of the use;
2. Natural, ephemeral, intermittent, or low-flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met;
3. Human-caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place;

4. Hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the waterbody to its original condition or to operate such modification in a way that would result in the attainment of the use;
5. Physical conditions related to the natural features of the waterbody, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to [chemical] water quality, preclude attainment of aquatic life protection uses; or
6. Controls more stringent than those required by Sections 301(b)(1)(A) and (B) and 306 of the Act would result in substantial and widespread economic and social impact.

Habitat Limited Aquatic Community (HLAC) is a subcategory of the beneficial use “Fish and Wildlife Propagation” (FWP), established in the OWQS, where the water chemistry and habitat are not adequate to support a “Warm Water Aquatic Community” (WWAC) because of one of the six reasons to remove a beneficial use. Secondary Body Contact Recreation (SBCR) is a subcategory of the beneficial use “Recreation” where the ingestion of water is not anticipated. Associated activities may include boating, fishing or wading.

Currently, there are 112 waterbodies listed in Appendix A of the OWQS with HLAC (formerly called Habitat Limited Fisheries) or SBCR beneficial use designations. These streams were added to Appendix A following completion of a UAA to determine appropriate stream uses for a municipal or industrial discharge permit due to limited flow or habitat. Some streams were so designated as a result of unsuitable natural or irreversible water quality. Each of these waterbodies should be re-examined for new information indicating attainment of WWAC or Primary Body Contact Recreation (PBCR) beneficial uses to comply with the federal requirement.

The objective of this project is to review the original basis for designating the 112 waterbodies with the less than fishable or swimmable uses of HLAC and/or SBCR and to evaluate intervening conditions that may mitigate the reason for the less than fishable or swimmable designation as required by CFR 132.20.

“Any waterbody segment with water quality standards that do not include the uses specified in section 101(a)(2) of the Act shall be re-examined every three years to determine if any new information has become available. If such new information indicates that the uses specified in section 101(a)(2) of the Act are attainable, the State shall revise its standards accordingly. CFR 131.20”

Guidance provided by the U.S. EPA and 40 CFR 131.20 (a) require the re-evaluation of all waterbody segments once every three years which are designated with other than primary fish and recreation uses. In an effort to comply with these requirements, the staff of the Oklahoma Water Resources Board (OWRB) has undertaken an extensive literature review, as well as selected site inspection, to verify existing and designated uses.

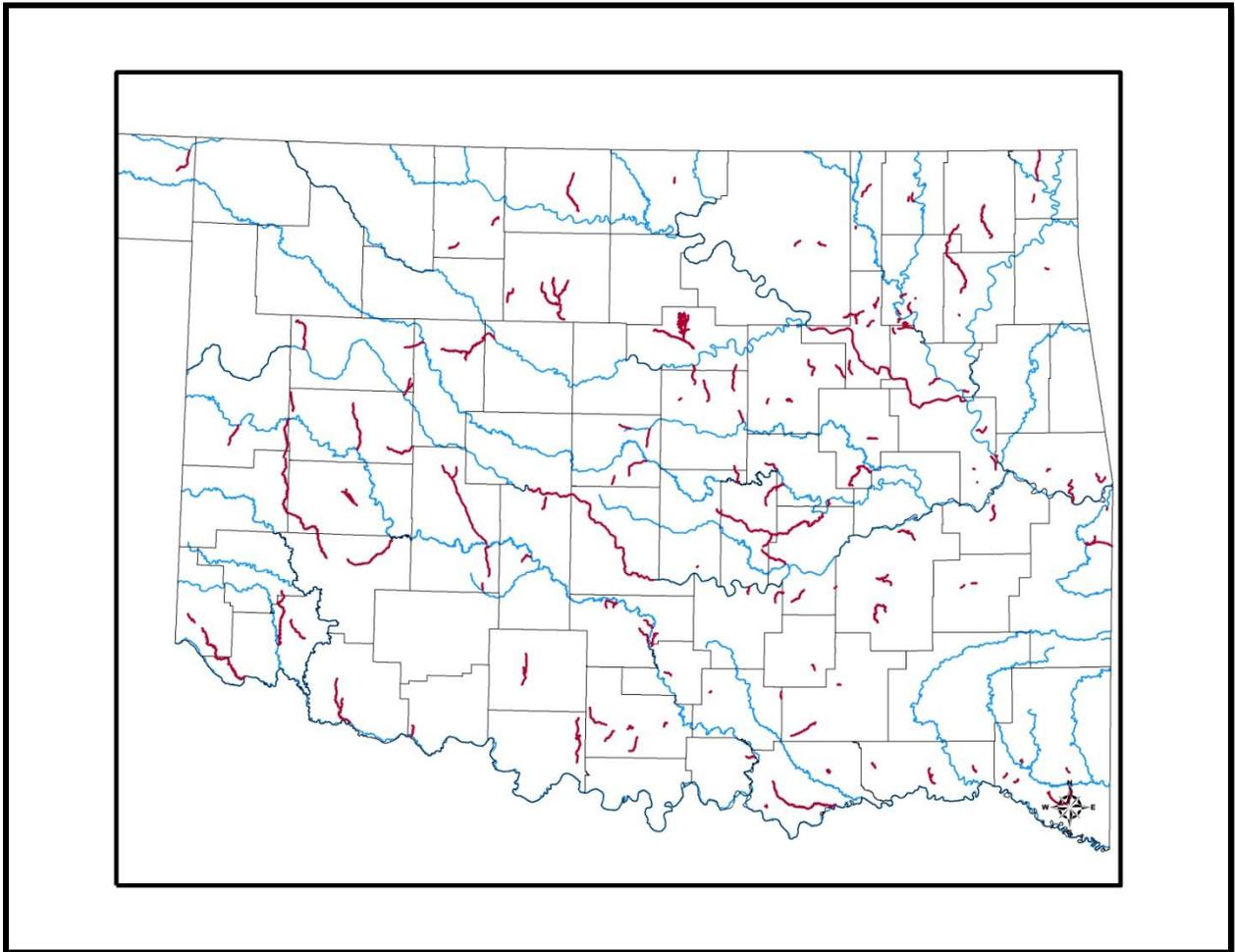


Figure 1. Map of Stream Segments Designated in the Oklahoma Water Quality Standards as HLAC and/or SBCR.

Table 1. Stream Segments Listed as HLAC and/or SBCR

F=Fully Supporting. N=Not Supporting. I=Insufficient Data. X=No Data Available. Based on data submitted for the 2010 Integrated Report.

Name_1	WBID_1	Size	Unit	WWAC	HLAC	PBCR	SBCR
Arkansas River	OK120410010080_00	41.9	Miles	N			N
Arkansas River	OK120410010080_10	4.8	Miles	I			N
Arkansas River	OK120420010010_00	16.7	Miles	N			N
Arkansas River	OK120420010010_10	7.3	Miles	N			N
Arkansas River	OK120410010010_00	1.8	Miles	X			X
Arkansas River	OK120420010130_00	12.5	Miles	N		F	X
Beaver Creek	OK310830030190_00	22.5	Miles	I			I
Beaver Creek, West	OK520700040170_00	7.9	Miles	X			X
Beef Creek	OK310810010230_00	6.9	Miles		X		X
Beef Creek, Unnamed Tributary of	OK310810010232_00	4.0	Miles		X		X
Bellcow Creek, Unnamed Tributary of	OK520700050260_00	1.5	Miles		X		X
Big Cabin Creek	OK121600060220_00	11.6	Miles	F			F
Big Cabin Creek	OK121600060060_10	4.2	Miles	N			I
Big Cabin Creek	OK121600060300_00	3.8	Miles	X			X
Big Timber Lake Creek	OK620920040030_00	4.4	Miles		X		X
Birch Creek, Unnamed Tributary of	OK121300030055_00	3.1	Miles		X		X
Bird Creek	OK520800010050_00	13.8	Miles		N		F
Bird Creek, Unnamed Tributary of	OK121300030070_00	2.7	Miles		X		X
Bird Creek, Unnamed Tributary of	OK520800010150_00	5.2	Miles	X			X
Bitter Creek	OK311600020110_05	7.8	Miles		N		N
Bitter Creek	OK311600020110_10	18.6	Miles		X		X
Bitter Creek	OK311600020110_00	3.6	Miles	X			X
Bokchito Creek, Unnamed Tributary of	OK410600010095_00	2.0	Miles		X		X
Boley Creek!	OK520510000055_00	5.9	Miles		X		X
Boswell Creek!	OK410400020025_00	3.0	Miles		X		X
Brier Creek, Unnamed Tributary of	OK410400050585_00	3.0	Miles		X		X
Brush Creek	OK620900040090_00	1.9	Miles		X		X
Bull Creek	OK311100030060_00	7.0	Miles		X		X
Bullwacker Creek	OK621000050080_00	20.2	Miles		X		X
Caddo Creek Tributary	OK310800030035_00	2.4	Miles		X		X

Name_1	WBID_1	Size	Unit	WWAC	HLAC	PBCR	SBCR
Cameron Creek	OK220100010130_00	4.1	Miles		X		X
Canadian River	OK520610010010_05	32.7	Miles	N			N
Canadian River	OK520610010010_10	11.5	Miles	X			X
Canadian River	OK520610010010_20	6.9	Miles	X			X
Canadian River	OK520610020010_00	19.6	Miles	X			X
Canadian River	OK520610020150_00	2.9	Miles	X			X
Canadian River, North, Unnamed Tributary	OK520510000320_00	1.8	Miles		X		X
Canadian River, North, Unnamed Tributary	OK520530000200_00	5.3	Miles		X		X
Canadian River, Unnamed Tributary of	OK220600010128_00	1.8	Miles		X		X
Canadian River, Unnamed Tributary of	OK520600010120_00	3.6	Miles		X		X
Canadian River, Unnamed Tributary of	OK520610020155_00	3.5	Miles		X		X
Caney Creek	OK410400030020_00	12.4	Miles	F			I
Cat Creek, Unnamed Tributary of	OK520600020165_00	1.0	Miles		X		X
Cavalry Creek, North	OK310830030090_00	9.9	Miles		X		X
Cavalry Creek, Unnamed Tributary of North	OK310830030095_00	6.8	Miles		X		X
Cherry Creek	OK520520000110_00	7.3	Miles	N	X		X
Childres Creek	OK120420020160_00	7.0	Miles		X		X
Choctaw Creek	OK520520000030_00	9.8	Miles		N		I
Choctaw Creek, Unnamed Tributary of	OK520520000035_00	2.3	Miles		X	X	
Chun Creek	OK220600030060_10	15.3	Miles	X			X
Chun Creek, Unnamed Tributary of	OK220600030065_00	1.9	Miles		X		X
Coal Creek	OK120420020030_10	5.5	Miles		I	X	
Coal Creek	OK520700010140_00	21.7	Miles	N			X
Coffee Creek	OK520710010090_00	4.2	Miles		I	X	
Cottonwood Creek, Unnamed Tributary of	OK311100030190_00	4.9	Miles		X		X
Cow Creek, East	OK311200000100_00	12.2	Miles		X		X
Cow Creek, East, Unnamed Tributary of	OK311200000160_00	3.5	Miles		X		X
Crutcho Creek	OK520520000070_10	2.4	Miles		X		X

Name_1	WBID_1	Size	Unit	WWAC	HLAC	PBCR	SBCR
Crutcho Creek	OK520520000090_00	3.1	Miles	N	X		X
Cussetah Creek, Unnamed Tributary of	OK520700010310_00	3.4	Miles		X		X
Dead Indian Creek, Unnamed Tributary of	OK620910050085_00	5.3	Miles		X		X
Delaware Creek	OK121510020060_00	4.1	Miles		X		X
Delaware Creek	OK310830010030_00	11.7	Miles	I			I
Dirty Butter Creek	OK121300010140_00	4.2	Miles		X		X
Dirty Creek, Unnamed Tributary of	OK120400020015_00	3.4	Miles		X		X
Dry Salt Creek	OK620910060140_00	6.7	Miles		X		X
Dry Salt Creek, Unnamed Tributary of	OK620910060145_00	0.2	Miles		X		X
Dry Sandy Creek, Unnamed Tributary of	OK310800020152_00	2.0	Miles		X		X
East Keeler Creek	OK121400010322_00	2.3	Miles		X		X
Elk Creek	OK311500030030_10	12.4	Miles		X		X
Euchee Creek	OK620900010290_10	12.4	Miles	X			X
Fairmont Creek	OK620910030230_00	10.3	Miles		X		X
Fay Creek, West	OK520620010160_00	5.4	Miles		X		X
Flat Rock Creek	OK121300010120_00	9.9	Miles	I			X
Fourche Maline Creek, Tributary	OK220100040110_00	2.0	Miles		X		X
Garrison Creek, Unnamed Tributary of	OK220200050070_00	6.3	Miles		X		X
Gibson Creek	OK220600050020_00	5.0	Miles		X		X
Gibson Creek, Unnamed Tributary of	OK220600050023_00	0.6	Miles		X		X
Gladys Creek	OK310820020150_00	2.1	Miles		X		X
Gray Horse Creek	OK520700040030_00	4.5	Miles		X		X
Hackberry Creek	OK620910030220_00	17.4	Miles	X			X
Hitchcock Creek	OK620910020120_00	12.4	Miles		X		X
Horse Creek	OK410400010040_10	6.9	Miles	X			X
Horse Creek	OK620930000060_00	12.8	Miles	X			X
Horse Creek, Unnamed Tributary of	OK410400010045_00	2.5	Miles		X		X
Horse Head Creek, Unnamed Tributary of	OK410210010065_00	1.3	Miles		X		X
Howland Creek	OK120400020120_00	4.7	Miles		X		X
Hudson Creek, Unnamed Tributary of	OK121600040043_00	4.2	Miles		X		X

Name_1	WBID_1	Size	Unit	WWAC	HLAC	PBCR	SBCR
Island Bayou	OK410700000040_00	41.2	Miles	F			I
Keetonville Creek	OK121500030050_00	3.4	Miles		X		X
Lebos Creek, Unnamed Tributary of	OK311600010065_00	2.3	Miles		X		X
Little Deep Creek	OK520620060040_00	12.8	Miles		I	I	
Little Deep Fork Creek	OK520700060130_00	4.6	Miles		X		X
Little Deep Fork Creek, Unnamed Tributary of	OK520700060220_00	2.1	Miles		X		X
Little Polecat Creek	OK120420020260_00	8.2	Miles	X			X
Little River, Unnamed Tributary of	OK520800010200_00	2.0	Miles		X		X
Little Sandy Creek	OK410400060270_00	7.8	Miles		X		X
Marland Creek	OK621200050070_00	7.1	Miles		X		X
Millerton Tributary!	OK410100010456_00	2.5	Miles		N		X
Minnehaha Creek	OK520530000190_00	7.9	Miles	X			X
Mosquito Creek	OK520620050120_00	6.6	Miles		X		X
Mossy Creek	OK121500020430_00	1.7	Miles		X		X
Mud Creek	OK410200010210_00	17.7	Miles	N			X
Mud Creek, North	OK311100040030_00	27.9	Miles		I	I	
Mud Creek, Unnamed Tributary of	OK410200010218_00	0.7	Miles		X		X
Muddy Boggy Creek, Unnamed Tributary of	OK410400050495_00	4.1	Miles		X		X
Narragansett Creek	OK620910060025_00	2.5	Miles		X		X
Negro Creek	OK410300010060_00	2.5	Miles		X		X
North Boggy Creek, Unnamed Tributary of	OK410400050415_00	3.3	Miles		X		X
North Branch	OK310840010080_00	19.0	Miles		X		X
North Mud Creek, Unnamed Tributary of	OK311100040035_00	1.4	Miles		X		X
Okay Creek!	OK121500010280_00	2.6	Miles		X		X
Old Channel Washita, Unnamed Tributary of	OK310800010055_00	5.8	Miles		X		X
Onion Creek	OK220200010100_00	11.2	Miles		X		X
Owasso Creek	OK121300010055_00	2.8	Miles		X		X
Owasso Creek, Unnamed Tributary of	OK121300010057_00	1.1	Miles		X		X
Pourum Creek, East	OK120400020060_00	4.2	Miles		X		X
Pryor Creek	OK121610000090_00	2.4	Miles	N			N
Pryor Creek	OK121610000090_10	12.1	Miles	X			X
Rainy Mountain Creek	OK310830020060_10	32.3	Miles	N			I

Name_1	WBID_1	Size	Unit	WWAC	HLAC	PBCR	SBCR
Red Branch	OK310810010070_00	7.1	Miles	I			X
Red River, Unnamed Tributary of	OK311310010035_00	4.6	Miles		X		X
Red River, Unnamed Tributary of	OK410400010090_00	2.8	Miles		X		X
Riddle Creek	OK220100010120_00	12.6	Miles		X		X
Rush Creek	OK310810010090_00	3.8	Miles		I		X
Salt Creek	OK620910020100_10	24.5	Miles		I		I
Salt Creek	OK620910020100_00	4.4	Miles	F			F
Salt Creek	OK121500020270_00	7.6	Miles	X			X
Salt Creek, Unnamed Tributary of	OK621200040270_00	3.0	Miles		X		X
Salt Creek, Unnamed Tributary of	OK121500020275_00	3.1	Miles		X		X
Sand Creek	OK120400010240_00	5.1	Miles		X		X
Sand Creek	OK520510000050_00	15.0	Miles		X		X
Sand Creek	OK620900030040_00	8.2	Miles		X		X
Sand Creek, Unnamed Tributary of	OK520510000053_00	4.3	Miles		X		X
Sandy Creek	OK220600020090_00	5.7	Miles	X			X
Sandy Creek (Lebos)	OK311600010040_00	39.7	Miles		N		N
Sandy Creek, Unnamed Tributary of	OK410700000255_00	1.0	Miles		X		X
Sandy Creek, Unnamed Tributary of	OK220600020093_00	5.2	Miles	X			X
Sandy Creek, West Fork (Lebos)	OK311600010060_00	13.2	Miles		X		X
Sergeant Major Creek	OK310840020140_00	11.6	Miles		X		X
Shan Creek	OK520510000120_00	7.9	Miles		X		X
Shiloh Branch, Unnamed Tributary of	OK220200030035_00	3.3	Miles		X		X
Skeleton Creek	OK620910030170_10	22.4	Miles		I		I
Smith Creek	OK520710010020_00	6.4	Miles		X	X	
Snake Creek	OK220300000030_00	7.3	Miles	X			X
Soldier Creek, Unnamed Tributary of	OK520520000290_00	1.2	Miles	X			X
Spring Creek	OK621000030110_00	2.5	Miles		X		X
Spring Creek, Unnamed Tributary of	OK620910020115_00	4.7	Miles		X		X

Name_1	WBID_1	Size	Unit	WWAC	HLAC	PBCR	SBCR
Spunky Creek, Unnamed Tributary of	OK121500020500_00	4.7	Miles		X		X
Stillwater Creek	OK620900040070_10	16.4	Miles		N		F
Stillwater Creek	OK620900040270_00	2.2	Miles		X		X
Stillwater Creek	OK620900040070_00	5.9	Miles		X	X	
Stinking Creek, Unnamed Tributary of	OK311500010055_00	11.9	Miles		X		X
Strawberry Creek	OK121500010170_00	4.1	Miles		X		X
Sugar Creek	OK310830050010_00	32.4	Miles	I			F
Suttle Creek	OK311310010070_00	19.4	Miles	N			I
Suttle Creek, Unnamed Tributary of	OK311310010090_00	9.3	Miles		X		X
Tar Creek	OK121600040060_00	11.7	Miles		N		N
Tim's Creek	OK520610010215_00	3.1	Miles		X		X
Town Branch	OK410400060310_00	2.7	Miles		X		X
Trail Creek	OK520620020090_00	14.3	Miles		F	N	X
Tributary of Threemile Creek	OK310800010205_00	0.9	Miles		X		X
Valiant Creek	OK410100010470_00	1.9	Miles		X		X
Verdigris River, Unnamed Tributary of	OK121500020465_00	2.2	Miles		X		X
Wagon Creek, Unnamed Tributary of	OK621000020210_00	5.2	Miles		X		X
Walnut Creek, Unnamed Tributary of	OK311100030180_00	7.6	Miles		X		X
Wapanucka Creek	OK410400030290_00	1.8	Miles		X		X
West Creek	OK520610020090_00	5.4	Miles		X		X
West Sandy Creek	OK310810010065_10	6.0	Miles		X		X
Wetumka Creek!	OK520500020035_00	2.4	Miles		X		X
Wewoka Creek	OK520500020010_00	43.0	Miles		F	N	
Wewoka Creek	OK520500020240_00	5.4	Miles		N	X	
Wewoka Creek	OK520500020240_10	10.3	Miles		X		X
Wewoka Creek, Unnamed Tributary of	OK520500020290_00	1.5	Miles		X		X
Whiskey Creek	OK311100030140_00	5.9	Miles		X		X
White Shield Creek	OK310840010120_00	18.2	Miles		X		X
Yanubbe Creek, Unnamed Tributary of	OK410200010155_00	2.5	Miles		X		X

Methods and Secondary Data

The following data were utilized to indicate if the original basis for the HLAC designated use continues to exist.

- Water chemistry data was obtained from OWRB's Beneficial Use Monitoring Program (BUMP) and Oklahoma Conservation Commission (OCC) Rotating Basin Monitoring Program to determine if naturally occurring water chemistry prevents attainment of WWAC.
- Stream discharge, as well as rainfall data and watershed size, were obtained from OWRB, OCC, and United States Geological Survey (USGS). Rainfall data were obtained from the Oklahoma Mesonet. These data were reviewed to determine if naturally occurring flow conditions prevent attainment of WWAC.
- Water quality data or other data that would indicate sources of pollution that cannot be remedied, were obtained and reviewed to determine if human caused conditions or sources of pollution that cannot be remedied prevent attainment of WWAC.
- GIS coverage of land use and land use changes was reviewed. OWRB GIS data, USGS topographical maps, and aerial photography were evaluated for land use and other hydrologic modifications. These data were reviewed to determine if dams, diversions or other types of hydrologic modifications are preventing attainment of WWAC.
- Habitat assessment data were obtained from OWRB and OCC and were evaluated to determine the physical conditions in the stream in order to determine if physical conditions in-stream are preventing attainment of WWAC. This was the primary data available to give any indication of the potential for Primary Body Contact Use attainment.
- Biological data were obtained from OWRB and OCC. Biological data were reviewed to evaluate the fish communities which were then compared to the ecoregional thresholds in order to determine if WWAC is an existing use.

The following data were utilized to indicate if the original basis for the SBCR designated use continues to exist.

- Habitat assessment data were obtained from OWRB and OCC and were evaluated to determine the physical conditions in the stream in order to determine if physical conditions in-stream have the depths necessary for the potential for Primary Body Contact Use attainment.

Table 2. Streams Reviewed with Consideration to Additional Data.

Waterbody ID	Stream
OK520800-01-0050G	Bird Creek
OK311600-02-0110G	Bitter Creek
OK520610-02-0010	Canadian River
OK520710-01-0090C	Coffee Creek
OK520620-06-0040C	Little Deep Creek
OK310810-01-0090G	Rush Creek
OK620910-02-0100D	Salt Creek
OK311600-01-0040G	Sandy Creek
OK310840-02-0140	Sergeant Major
OK620910-03-0240E	Skeleton Creek
OK620900-04-0070M	Stillwater Creek
OK121600-04-0060D	Tar Creek
OK520620-02-0090G	Trail Creek
OK520500-02-0010A	Wewoka Creek

After thorough review of available data was conducted, it was determined that there were 14 streams that had available data to consider. New data or information was not available for the remainder of the 112 waterbodies.

Table 3. Results of Review for Additional Available Data for Consideration.

Stream Name	WB ID	OWRB Water Quality Data	OCC Water Quality Data	Gauged Flow Data	Mesonet Rainfall	GIS, Topographical maps, aerial photography	Stream Habitat and Depth	Fish Data
Bird Creek	OK520800-01-0050G	Available	Available	Not Available	Available	Available	Available	Available
Bitter Creek	OK311600-02-0110G	Available	Available	Not Available	Available	Available	Available	Available
Canadian River	OK520610-02-0010	Available	Not Available	Available	Available	Available	Available	Available
Coffee Creek	OK520710-01-0090C	Not Available	Available	Not Available	Available	Available	Available	Available
Little Deep Creek	OK520620-06-0040C	Not Available	Available	Not Available	Available	Available	Available	Available
Rush Creek	OK310810-01-0090G	Not Available	Available	Not Available	Available	Available	Available	Available
Salt Creek	OK620910-02-0100D	Not Available	Available	Not Available	Available	Available	Available	Not Available
Sandy Creek	OK311600-01-0040G	Available	Available	Not Available	Available	Available	Available	Available
Sergeant Major	OK310840-02-0140	Available	Not Available	Not Available	Available	Available	Not Available	Available
Skeleton Creek	OK620910-03-0240E	Available	Available	Not Available	Available	Available	Available	Available
Stillwater Creek	OK620900-04-0070M	Not Available	Available	Not Available	Available	Available	Available	Available
Tar Creek	OK121600-04-0060D	Not Available	Available	Available	Available	Available	Available	Available
Trail Creek	OK520620-02-0090G	Not Available	Available	Not Available	Available	Available	Available	Available
Wewoka Creek	OK520500-02-0010A	Not Available	Available	Not Available	Available	Available	Available	Available

Fish Assessments

All reviewed fish collections were done with common protocols utilizing effective collection techniques. A review was conducted to ensure that the data met the data quality objectives (DQOs) and requirements established in the secondary data Quality Assurance Project Plan (QAPP). The results from the fish collections were analyzed using the state adopted bio-criteria, as well as an alternative Index of Biotic Integrity (IBI), that has been commonly used by the OCC. The data analysis and support determination were compared to the Oklahoma biocriteria for WWAC for the particular ecoregion that the stream site is located in.

Analysis of Fish Biological Condition:

Fish data are analyzed using two indices of biological integrity (IBI) commonly used in Oklahoma bioassessment studies. Primarily, state biocriteria methods are outlined in Oklahoma's Use Support Assessment Protocols. In addition, an IBI commonly used by the OCC's Water Quality Division (OCCFIBI) is used to provide an alternative bioassessment, in the event that biocriteria analysis results are indeterminate or biocriteria has not been developed in a particular ecoregion or tiered aquatic life use. All metrics and IBI calculations are made using the OWRB's "Fish Assessment Workbook", an automated calculator OWRB staff built in Microsoft Excel.

Oklahoma's biocriteria methodology (OKFIBI) uses a common set of metrics throughout the state. Each metric is scored a 5, 3, or 1 depending on the calculated value, and scores are summed to reach two subcategory totals for sample composition and fish condition (OWRB, 2008b). The two subcategories are then summed for a final IBI score. The score is compared to ecoregion biocriteria to determine support status. For example, if the final IBI score is between 25-34, the status for sites in the Ouachita Mountain Ecoregion is deemed undetermined. Likewise, for scores greater than 34 and less than 25, the status is supported or not supported, respectively.

The OCCFIBI uses "a modified version of Karr's Index of Biotic Integrity (IBI) as adapted from Plafkin et al., 1989". The metrics as well as the scoring system are in Table 2. Metric scores are calculated in two ways for both the test site and composite reference metric values of high-quality streams in the ecoregion. Species richness values (total, sensitive benthic, sunfish, and intolerant) are compared to composite reference value to obtain a "percent of reference". A score of 5, 3, or 1 is then given the site depending on the percentages outlined in Table 2, while the reference composite is given a default score of 5. Proportional metrics (% individuals as tolerant, insectivorous cyprinids, and lithophilic spawners) are scored by comparing the base metric score for both the test site and the reference composite to the percentile ranges given in Table 2. After all metrics are scored, total scores are calculated for the test and composite reference sites. Finally, the site final score is compared to the composite reference final score and a percent of reference is obtained. The percent of reference is compared to the percentages in Table 3 and an integrity classification is assigned with scores falling between assessment ranges classified in the closest scoring group.

Benthic Macroinvertebrate Assessments

All benthic macroinvertebrate collections reviewed were made using common collection methods. A review was conducted to ensure that the data met the DQOs established in the secondary data QAPP. The results from the collections were also analyzed using an IBI. The Benthic IBI utilizes the following metrics

Analysis of Macroinvertebrate Biological Condition:

Macroinvertebrate data are analyzed using a Benthic-IBI (B-IBI) developed for Oklahoma benthic communities and commonly used by the OCC and OWRB Water Quality Divisions. The metrics and scoring criteria are taken from the original “Rapid Bioassessment Protocols for Use in Streams and Rivers” (Plafkin et al., 1989) with slight modifications to the EPT/Total and Shannon-Weaver tolerance metrics.

Calculation of the B-IBI is similar to the fish OCCFIBI discussed previously. Metric scores are calculated in two ways for both the test site and the composite reference metric values of high-quality streams in each ecoregion. Species richness (total and EPT) and modified HBI values are compared to the composite reference value to obtain a “percent of reference”. A score of 6, 4, 2 or 0 is then given the site depending on the percentages outlined in Table 4, while the reference composite is given a default score of 6. Proportional metrics (% dominant 2 taxa and %EPT of total) as well as the Shannon-Weaver Diversity Index are scored by comparing the base metric score for both the test site and the reference composite to the percentile ranges given in Table 4. After all metrics are scored, total scores are calculated for the test and composite reference sites. The site final score is then compared to the composite reference final score and a percent of reference is obtained. The percent of reference is compared to the percentages in Table 5 and an integrity classification is assigned with scores falling between assessment ranges classified in the closest scoring group.

Habitat Assessments

All habitat assessments reviewed were done according to common habitat assessment protocols based on methods described in OWRB’s Technical Report 99-3 (*Standard Operating Procedures for Stream Assessments and Biological Collections Related to Biological Criteria in Oklahoma*). A review was conducted to ensure that the data met the DQOs established in the secondary data QAPP. All habitat assessments reviewed for this project used the following metrics:

In-stream Cover – This metric grades the total stream reach on the percentage of stable habitat that is available to some type of fish or invertebrate. It includes gravel or cobble bottomed riffles and runs, as well as submerged large and small woody debris, any type of aquatic vegetation, bedrock ledges, large boulders, etc. This metric does not imply that proper habitat is present for all animals that require stable habitat. A stream could be devoid of pools, riffles, large woody debris or any number of other things and still score quite high. This is simply a measure of the overall presence of habitat that should be ideally suited to some types of animal that require specific habitat with structure.

Pool Bottom Substrate – This is a measure of the amount of high quality substrate, such as coarse particulate organic matter (CPOM), large woody debris, submerged and floating leafed

aquatic vegetation, large boulders, etc. present in pool bottoms. It is graded on the amount of low quality substrate (bedrock, silt, and loose sand) that is present.

Pool Variability – This is a measure of the relative amounts of deep and shallow pools that are present. Deep pools are defined as pools whose maximum depth is greater than 0.5 meters. Ideally, deep pools should be present in roughly equal numbers to shallow pools.

Canopy Cover – This is a measure of the amount and quality of shade on the stream. Ideally, a mix of conditions from bright sun to dense shade should cover the stream, but dappled light shade should predominate. If dappled shade is not present, dense shade is preferable to full sun and is graded accordingly.

Rocky Runs and Riffles – This is a measure of the quality of the substrate in runs and riffles. Gravel, cobble and boulder offer permanent attachment sites and excellent cover, in addition to providing a wide variety of micro flow regimes and are therefore, far more desirable than silt or sand substrates.

Flow – This is a measure of the amount of water moving down a stream per unit time. The benefits of increased flow include a wider range of velocity regimes within the stream, a greater ability to dilute pollution and carry it away, and a higher reaeration potential, among other things.

Channel Alteration – This is an indicator of streambed and watershed instability. As more point bars and islands are seen, streams are changing at a faster rate. A high degree of channel alteration may indicate pools that are becoming shallower and whose bottoms are becoming silt covered.

Channel Sinuosity – This is a surrogate measure for several other parameters already discussed, and as such it is redundant. A highly sinuous channel tends to have more in-stream cover in the form of root wads and undercut banks, along with slight tendency towards higher pool variability and greater habitat diversity in the form of a more even mix of runs and pools.

Bank Stability – This is an indication of the expected amount and rate of change of pool bottom substrate, pool variability, canopy cover, presence of rocky runs and riffles and number of islands and point bars seen.

Vegetative Stability – This estimates what percent of the total stream bank is stabilized by vegetation. It does not include, rip rap, concrete or rock.

Dominant Streamside Vegetation – This is an estimate of the growth habit of the dominant streamside (riparian) vegetation. A mixture of grasses and forbes, trees, and shrubs and vines with dominance by shrubs and vine is considered ideal. Shrubs, with their short flexible stems and large root systems are better able to withstand floods without up-rooting, allow more light penetration to the stream preventing dense shade or full sun on the stream, and encourage a higher degree of allochthonous energy input to the stream with their associated fauna and their leaves.

Stakeholder Review and Input

It was determined that the stakeholders affected by any recommendations to upgrade a beneficial use to either Warm Water Aquatic Community or Primary Body Contact Recreation would be other Oklahoma environmental agencies and communities or companies that hold a National Pollutant Discharge Elimination System (NPDES) permit in which they discharge into one of the affected streams.

The OCC and the Oklahoma Department of Environmental Quality (ODEQ) have been involved in this process through informal updates, as well as data request.

For the purpose of this report, OWRB requested from the ODEQ a determination of possible effects that proposed recommendations may have on NPDES permit holders. That review is as follows:

Canadian River (OK520610-02-0010)

(*MAL – Monthly Average Permit Limitation)

(**DML – Daily Maximum Permit Limitation)

Lexington Public Works Authority Wastewater Treatment (WWT)

- Upgrade to Primary Body Contact Recreation (PBCR) would result in coliform restrictions during the May 1 – Sept. 30 period to MAL - 200CFU/100mL and DML 400CFU/100mL

Mustang Improvement Authority WWT

- Upgrade to PBCR would result in coliform restrictions during the May 1 – Sept. 30 period to MAL* - 200CFU/100mL and DML** 400CFU/100mL

Purcell WWT

- Upgrade to PBCR would result in coliform restrictions during the May 1 – Sept. 30 period to MAL - 200CFU/100mL and DML 400CFU/100mL

Tuttle WWT

- Does not have a fecal limit because it satisfies construction standards in OAC 252:656

Noble North WWT

- The permit issued in May 2009 protects Secondary Body Contact Recreation (SBCR) (1000/2000 fecal limits) year round. The facility has put in UV to comply with SBCR. Complying with PBCR may not be possible.

Rush Creek (OK310810-01-0090G)

- Upgrade to WWAC will not have an effect on any permit.

Wewoka Creek (OK520500-02-0010A) (lower Segment)

Wewoka WWT

- Upgrade to Warm Water Aquatic Community (WWAC) would result in dissolved oxygen (DO) limit changes to 6 mg/L for the early life stage season, 5 mg/L for the summer season (already implemented at this facility), and 6 mg/L for the winter season

Seminole WWT

- Upgrade to WWAC would result in DO limit changes to 6 mg/L for the early life stage season, 5 mg/L for the summer season (already implemented at this facility), and 6 mg/L for the winter season

Wetumka (all facilities)

- Upgrade to WWAC would result in DO limit changes to 6 mg/L for the early life stage season, 5 mg/L for the summer season, and 6 mg/L for the winter season

Further Stakeholder Review:

The recommendations made in this report are planned to be introduced into the next triennial revision of the OWQS scheduled to begin in 2012. A major component of the triennial revision process, required by state and federal law, is the opportunity for public input and participation. The State of Oklahoma and federal law require extensive public participation. Once the revision process begins, the cities identified in this report that may be affected, will be notified of the potential changes to the stream beneficial use designations and will be given the information that is in this report. Representatives of those cities will be invited to participate in the informal Water Quality Standards (WQS) meetings as well as the formal hearing, if they so desire. The public participation process set forth in Oklahoma and federal law regarding the WQS will be employed as further stakeholder input for this project.

Summary of Recommendations

Table 4. Waterbodies with Associated Recommendations.

Waterbody ID	Stream	Recommendation	
		WWAC / HLAC	PBCR / SBCR
OK520800-01-0050G	Bird Creek	Remain HLAC	Remain SBCR
OK311600-02-0110G	Bitter Creek	Remain HLAC	Remain SBCR
OK520610-02-0010	Canadian River	Remain WWAC	Upgrade to PBCR
OK520710-01-0090C	Coffee Creek	Remain HLAC	Remain PBCR
OK520620-06-0040C	Little Deep Creek: Weatherford, Upstream of Treatment Plant	Remain HLAC	Remain PBCR
OK310810-01-0090G	Rush Creek	Upgrade to WWAC	Remain SBCR
OK620910-02-0100D	Salt Creek	Remain HLAC	Remain SBCR
OK311600-01-0040G	Sandy Creek	Remain HLAC	Remain SBCR
OK310840-02-0140	Sergeant Major	Remain HLAC	Remain SBCR
OK620910-03-0240E	Skeleton Creek	Remain HLAC	Remain SBCR
OK620900-04-0070M	Stillwater Creek	Remain HLAC	Remain SBCR
OK121600-04-0060D	Tar Creek	Remain HLAC	Remain SBCR
OK520620-02-0090G	Trail Creek	Remain HLAC	Remain SBCR
OK520500-02-0010A	Wewoka Creek	Upgrade to WWAC	Remain PBCR

This Page Intentionally Left Blank

Appendices:

Data Used in the Individual Re-evaluation of the 14 Selected Waterbodies.

This Page Intentionally Left Blank

Bird Creek (OK520800-01-0050)
Re-evaluation

Bird Creek (OK520800-01-0050)

Description: Bird Creek is located in Seminole and Hughes Counties. This stream has been identified as a Habitat Limited Aquatic Community (HLAC) and as Secondary Body Contact Recreation (SBCR). The original reason for categorizing Bird Creek as HLAC was that physical conditions related to natural features of the waterbody, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection. The original reason for categorizing Bird Creek as SBCR is that the lack of adequate depth precluded Primary Body Contact Recreation (PBCR). This stream drains a watershed that has had historic oil and gas production, with much of the land use being pasture and forest. Bird Creek is in the Central Oklahoma / Texas Plains ecoregion.

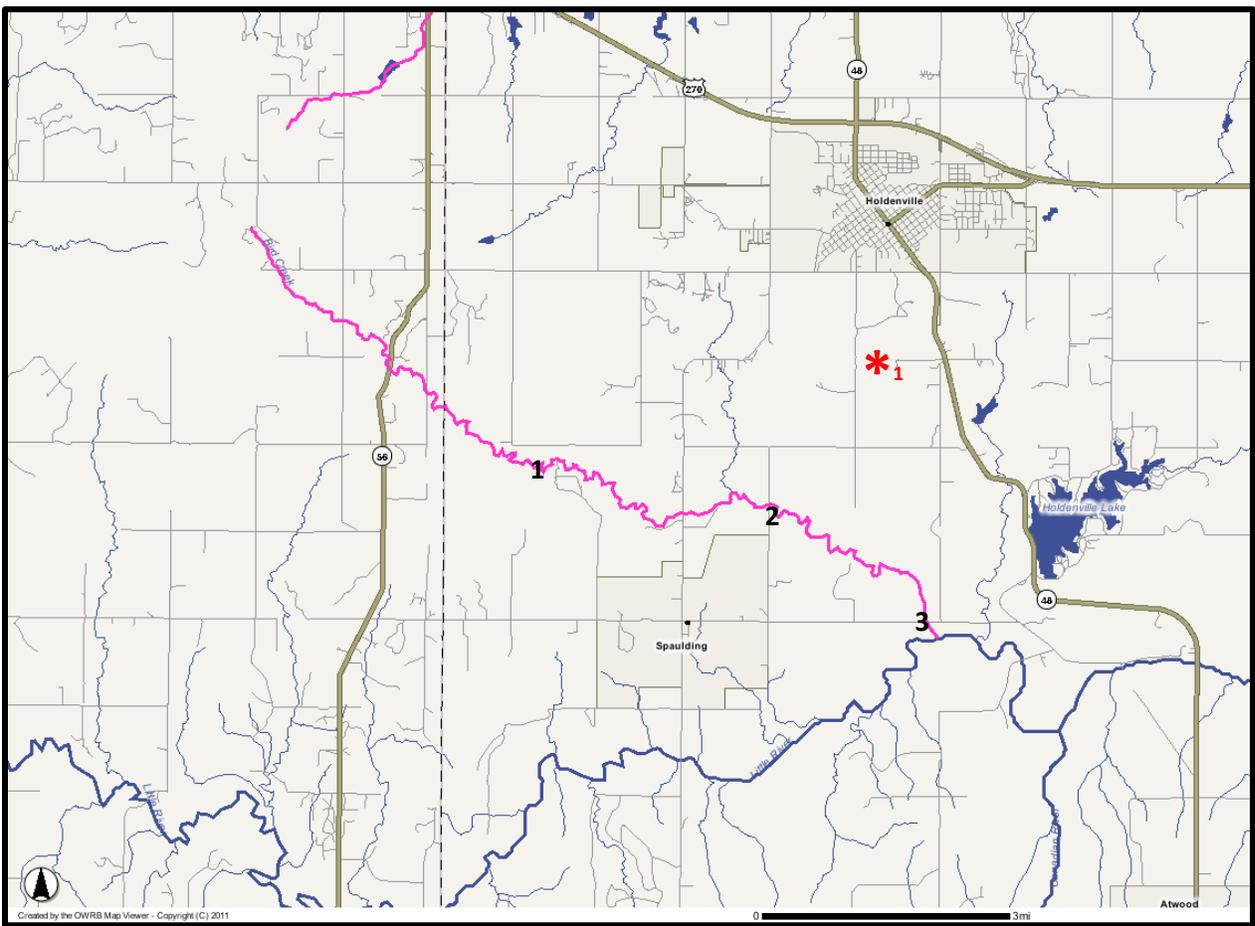


Figure 1. Approximate sample site locations and NPDES Discharges. Site 1 is the approximate location of OKPB01-060 sampled by OWRB on 06/06/2007. Site 2 is the approximate location of Bird Creek: Upstream sampled by OCC on 09/10/1996. Site 3 is the approximate location of Bird Creek: Downstream sampled by OCC on 09/06/1996 and 07/29/2003. The location marked *1 is the approximate site of the Holdenville waste water treatment plant discharge.

Historical Descriptions: Sampling done for Use Attainability Analysis (UAA) in 1990 identified the stream as braided with a sandy bottom substrate and very little flow. Much of the site consisted of shallow runs with a few deeper pools having a habitat score of 60. Water quality analysis measured

extremely high salinity, conductivity, alkalinity, and hardness. Eight species of fish were collected with Red shiners being numerous.

Water Quality: Water quality data was available for Bird Creek ranging from 1995 to 2009.

Site 2: Bird Creek: Upstream

OK520800-01-0050M				
	Median	Min	Max	N
Turbidity	9.6	4.05	68.6	21
Temperature	21.6	1.4	33	21
pH	7.755	6.48	8.03	16
Ammonia	0.021	0.003	0.543	14
Chloride	673.1	92.7	1789.9	19
Nitrate	0.07	0.02	1.73	19
Nitrite	0.02	0.001	0.02	14
Sulfate	41.9	17.8	58	19
Total Dissolved Solids	1018	334	3293	13
Total Kjeldahl Nitrogen	0.41	0.11	0.92	19
Total Ortho-Phosphate	0.0095	0.004	0.304	16
Total Phosphorus	0.0375	0.013	0.331	16
Total Suspended Solids	10	2.5	39	19
Flow	0	0	24.294	12

Site 3: Bird Creek: Downstream

OK520800-01-0050G				
	Median	Min	Max	N
Turbidity	9.955	2.45	>1000	40
Temperature				
pH	7.85	5.94	9.36	39
Ammonia	0.07	0.015	11.892	32
Chloride	104.9	6.1	2314.9	37
Nitrate	1.29	0.02	8.2	37
Nitrite	0.02	0.007	0.45	34
Sulfate	30.1	4.6	54.7	37
Total Dissolved Solids	381	36	2055	31
Total Kjeldahl Nitrogen	0.851	0.08	14.94	37
Total Ortho-Phosphate	0.681	0.005	2.642	34
Total Phosphorus	0.8135	0.046	3.139	34
Total Suspended Solids	10	6	1400	37
Flow	1.6195	0	21.848	32

Site 2: Bird Creek: Upstream

OK520800-01-0050M

	Median	Min	Max	N
E Coli	10	<10	155	5
Enterococcus	10	10	320	5

Site 3: Bird Creek: Downstream

OK520800-01-0050G

	Median	Min	Max	N
Dissolved Oxygen	10.07	4.2	19.56	18

Site 3: Bird Creek: Downstream

OK520800-01-0050G

	Median	Min	Max	N
E Coli	40	5	>10000	15
Enterococcus	110	<10	>10000	15

Point Sources in the watershed:

facility_n	permit_num
HOLDENVILLE WWT	OK0028428

Flow Conditions: There are no gauging stations associated with this waterbody. The current designed flow for the Holdenville WWTP is 0.8 million gallons (MG) per day. A search was conducted, but no data were available in any accessible format to indicate what the past designed flows may have been.

Hydrologic Modifications: A visual assessment of topographical maps and aerial photographs indicate that there are no major hydrologic modifications in this watershed. This visual assessment also indicated that no major or significant land use changes have occurred over the past 20 years.

Physical Conditions in Stream:

Habitat Assessments														
	Date	Agency	Instream Cover	Pool Bottom Substrate	Pool Variability	Canopy Cover Shading	Presence of Rocky Runs or Riffles	Flow	Channel Alteration	Channel Sinuosity	Bank Stability	Bank Vegetation Stability	Streamside Cover	Total Points
Bird Creek: OKPB01-060	06/06/2007	OWRB	4.0	14.3	3.1	5.9	0.1	2.3	2.3	4.2	5.8	10.0	9.9	61.7
Bird Creek: Upstream	09/10/1996	OCC	0.6	2.5	19	3	0	0.2	7.7	1.4	9.4	0.3	4	48.1
Bird Creek: Downstream	09/06/1996	OCC	0.5	2.1	19.6	3	0	5.8	6.7	0.3	7.5	0.1	8.9	54.5
Bird Creek: Downstream	07/29/2003	OCC	4.0	1.7	2.6	5.1	0	5	1.8	0	9.9	7.4	10.0	47.5

Stream Name	Date	Max Depth	Average Depth
Site 1: Bird Creek: OKPB01-060	6-6-07	0.6	0.18
Site 2: Bird Creek: Upstream	9-10-96	1.3	0.43
Site 3: Bird Creek: Downstream	9-6-96	1.0	0.32
Site 3: Bird Creek: Downstream	7-29-03	0.6	0.14

All measurements of in-stream cover fall within the 'Poor' category, indicating that there is less than 10% stable habitat. One assessment of pool bottom substrate falls within the 'Adequate' category while the other three measurements fall within the 'Poor' category, indicating that there is a lack of desirable pool bottom substrate. Two sampling events indicated that the pool variability was optimal, but later sampling at that site, and at other sites, indicate a pool variability that is of 'Poor' quality, represented by a majority of pools being shallow or absent. The sampled areas on Bird Creek had a lack of canopy cover shading resulting in scores within the 'Poor' range. There was also a lack of rocky runs or riffles with scored measurements falling in the 'Poor' category. The representative low flow at the times of measurement can be categorized as 'Poor' with values around 1 cubic feet per second (cfs) or less. Channel alteration on Bird Creek can be categorized as 'Fair' to 'Poor', with moderate to heavy deposition of fine materials and pools that are partially to mostly filled with silt. The channel sinuosity can be categorized as 'Fair' to 'Poor.' Bank stability measurements indicate that Bird Creek has, at times, anywhere from 'Adequate' to 'Poor' amounts of eroded banks. The streamside cover measurements indicate that Bird Creek has 'Optimal' levels of vegetation within 10ft of the water's edge.

Biological Data:

Benthic Macroinvertebrates (BMI) Assessments

Site 1

Bird Creek	OKPB01-060	BMI Assessment Results:	Good - 93	Non-impaired - Good
------------	------------	-------------------------	-----------	---------------------

Site 3

Sitename	WBID	Sample Type	Winter or Summer	Total Species	EPT Taxa	Percent EPT	Shannon Diversity	HBI	Percent Dominant 2 Taxa	Total Points	% of Reference	Condition	Number of Samples
Bird Creek	OK520800-01-0050G	Wood	S	14	3	0.039	1.636	7.295	0.681	12	0.47	Moderately Impaired	2
		Wood	W	12.5	2	0.182	2.185	6.265	0.4048	16	0.73	Slightly Impaired	2
		Riffle	W	10	7	0.49	1.482	2.115	0.3077	22	0.88	Non Impaired	1

Fish Assessments

Site 1: Bird Creek (OKPB01-060) 6-6-07

ID'd in Lab			Lab Comments	Total Specimen Count	Common Name	Species
From Shock	From Seine	Shock/Seine Combined				
0	46	46		46	Bluegill sunfish	<i>Lepomis macrochirus</i>
0	6	6		6	Green sunfish	<i>Lepomis cyanellus</i>
0	34	34		34	Largemouth bass	<i>Micropterus salmoides</i>
0	7	7		7	Longear sunfish	<i>Lepomis megalotis</i>
0	47	47		47	Mosquitofish	<i>Gambusia affinis</i>
0	2	2		2	Orangespotted sunfish	<i>Lepomis humilis</i>
0	30	30		30	Red shiner	<i>Cyprinella lutrensis</i>
0	6	6		6	Redear sunfish	<i>Lepomis microlophus</i>
0	2	2		2	Suckermouth minnow	<i>Phenacobius mirabilis</i>

Watershed < 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	9	refer to fig 1	refer to fig1	refer to fig 1	3
Shannon's Diversity based upon numbers	1.77	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	6	>3	2 to 3	<2	5
# of species comprising 75% of sample	4	>5	3 to 4	<3	3
Number of Intolerant Species (<100mi ² area)	1	>5	3 to 5	<3	1
Percentage of Tolerant Species	98.89	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					15
Percentage of Lithophils	0.00	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	180	>200	75 to 200	<75	3
TOTAL SCORE FOR FISH CONDITION					9
TOTAL SCORE					24

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Alabama Ck: Above	Alabama Ck: Above				
	County	Okfuskee	Okfuskee				
	Order	2	2				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	9	17	17	17	52.9%	3	5
Number of Sensitive Benthic Species	1	3	3	3	33.3%	3	5
Number of Centrarchid species	6	6	6	6	100.0%	5	5
Number of Intol Species	1	1	1	1	100.0%	5	5
Proportion of Individuals as Tolerant	98.889	40	40	40	98.9	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	1.111	6	6	6	1.1	1	1
Proportion of Individuals as Lithophilic Spawners	0.000	30	30	30	0.0	1	3
TOTAL SCORES						19	25
PROPORTION OF REFERENCE						76	
INTEGRITY CLASSIFICATION OF SITE						FAIR	

Based on the state-adopted biological assessment for fish, this site is Undetermined. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 76% of reference, giving it an integrity classification of 'FAIR'.

Site 2: Bird Creek 9-6-96

ID'd in Lab			Lab Comments	Total Specimen Count	Common Name	Species
From Shock	From Seine	Shock/Seine Combined				
1				1	Spotted gar	<i>Lepisosteus oculatus</i>
11	14			25	Gizzard shad	<i>Dorosoma cepedianum</i>
643	117			760	Red shiner	<i>Cyprinella lutrensis</i>
39	109			148	Plains minnow	<i>Hybognathus placitus</i>
266	35			301	Emerald shiner	<i>Notropis atherinoides</i>
	2			2	Sand shiner	<i>Notropis stramineus</i>
1				1	Suckermouth minnow	<i>Phenacobius mirabilis</i>
1				1	Bluntnose minnow	<i>Pimephales notatus</i>
264	154			418	Bullhead minnow	<i>Pimephales vigilax</i>
9	46			55	River carpsucker	<i>Carpiodes carpio</i>
				1	Smallmouth buffalo	<i>Ictiobus bubalus</i>
7	6			13	Mosquitofish	<i>Gambusia affinis</i>
	1			1	Brook silverside	<i>Labidesthes sicculus</i>
5				5	Green sunfish	<i>Lepomis cyanellus</i>
6	2			8	Warmouth sunfish	<i>Lepomis gulosus</i>
2	7			9	Orangespotted sunfish	<i>Lepomis humilis</i>
11	2			13	Bluegill sunfish	<i>Lepomis macrochirus</i>
19	14			33	Longear sunfish	<i>Lepomis megalotis</i>
	1			1	Freshwater drum	<i>Aplodinotus grunniens</i>
	7		YOYSeine-7	7	Unidentified sunfish spp.	Unidentified <i>Lepomis</i> spp.

Watershed < 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	20	refer to fig 1	refer to fig1	refer to fig 1	5
Shannon's Diversity based upon numbers	1.63	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	6	>3	2 to 3	<2	5
# of species comprising 75% of sample	3	>5	3 to 4	<3	3
Number of Intolerant Species (<100mi ² area)	3	>5	3 to 5	<3	3
Percentage of Tolerant Species	99.50	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					19
Percentage of Lithophils	0.06	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	1803	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					30

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Alabama Ck: Above	Little Wewoka Ck: S		Metric Score	Site Score	Reference Score
	County	Okfuskee	Hughes				
	Order	2	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	20	17	18	18	114.3%	5	5
Number of Sensitive Benthic Species	3	3	3	3	100.0%	5	5
Number of Centrarchid species	6	6	6	6	100.0%	5	5
Number of Intol Species	3	1	2	2	200.0%	5	5
Proportion of Individuals as Tolerant	99.501	40	80	60	99.5	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	0.055	6	10	8	0.1	1	1
Proportion of Individuals as Lithophilic Spawners	0.055	30	9	20	0.1	1	3
TOTAL SCORES						23	25
PROPORTION OF REFERENCE						92	
INTEGRITY CLASSIFICATION OF SITE						EXCELLENT	

Based on the state-adopted biological assessment for fish, this site is Fully Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 92% of reference, giving it an integrity classification of 'EXCELLENT'.

Site 2: Bird Creek (upstream) 9-10-96

ID'd in Lab			Lab Comments	Total Specimen Count	Common Name	Species
From Shock	From Seine	Shock/Seine Combined				
	2			2	Central stoneroller	<i>Camptostoma anomalum</i>
	251			251	Red shiner	<i>Cyprinella lutrensis</i>
	48			48	Sand shiner	<i>Notropis stramineus</i>
	5			5	Suckermouth minnow	<i>Phenacobius mirabilis</i>
	85			85	Bullhead minnow	<i>Pimephales vigilax</i>
	1			1	Channel catfish	<i>Ictalurus punctatus</i>
6	19			25	Mosquitofish	<i>Gambusia affinis</i>
5	8			13	Green sunfish	<i>Lepomis cyanellus</i>
	5			5	Orangespotted sunfish	<i>Lepomis humilis</i>
	20			20	Bluegill sunfish	<i>Lepomis macrochirus</i>
11	56			67	Longear sunfish	<i>Lepomis megalotis</i>
1	4			5	Largemouth bass	<i>Micropterus salmoides</i>
	2			2	White crappie	<i>Pomoxis annularis</i>
	34		YOYSeine-34	34	Unidentified sunfish spp.	<i>Unidentified Lepomis spp.</i>

Watershed < 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	14	refer to fig 1	refer to fig1	refer to fig 1	3
Shannon's Diversity based upon numbers	1.80	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	7	>3	2 to 3	<2	5
# of species comprising 75% of sample	4	>5	3 to 4	<3	3
Number of Intolerant Species (<100mi ² area)	3	>5	3 to 5	<3	3
Percentage of Tolerant Species	92.72	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					17
Percentage of Lithophils	0.36	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	563	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					28

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Alabama Ck: Above	Little Wewoka Ck: S		Metric Score	Site Score	Reference Score
	County	Okfuskee	Hughes				
	Order	2	4				
Metric	Value	Reference Value	Reference Value	Value	Metric Score	Site Score	Reference Score
Total # of Species	14	17	18	18	80.0%	5	5
Number of Sensitive Benthic Species	2	3	3	3	66.7%	3	5
Number of Centrarchid species	7	6	6	6	116.7%	5	5
Number of Intol Species	3	1	2	2	200.0%	5	5
Proportion of Individuals as Tolerant	92.718	40	80	60	92.7	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	1.243	6	10	8	1.2	1	1
Proportion of Individuals as Lithophilic Spawners	0.355	30	9	20	0.4	1	3
TOTAL SCORES						21	25
PROPORTION OF REFERENCE						84	
INTEGRITY CLASSIFICATION OF SITE						GOOD	

Based on the state-adopted biological assessment for fish, this site is Fully Supported. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 84% of reference giving it an integrity classification of 'Good'.

Site 2: Bird Creek 7-1-09

ID'd in Lab			Lab Comments	Total Specimen Count	Common Name	Species
From Shock	From Seine	Shock/Seine Combined				
	45			45	Red shiner	<i>Cyprinella lutrensis</i>
	1			1	Sand shiner	<i>Notropis stramineus</i>
	5			5	Bluntnose minnow	<i>Pimephales notatus</i>
	1			1	Bullhead minnow	<i>Pimephales vigilax</i>
	10			20	Mosquitofish	<i>Gambusia affinis</i>
	13			36	Brook silverside	<i>Labidesthes sicculus</i>
	1			10	Bluegill sunfish	<i>Lepomis macrochirus</i>
	1			44	Longear sunfish	<i>Lepomis megalotis</i>
	2			2	Redear sunfish	<i>Lepomis microlophus</i>
	3		YOYSeine-3	3	Largemouth bass	<i>Micropterus salmoides</i>
				1	Hybrid, green x redear sunfish	<i>Unidentified Lepomis hybrid</i>

Watershed < 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	11	refer to fig 1	refer to fig1	refer to fig 1	3
Shannon's Diversity based upon numbers	1.78	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	5	>3	2 to 3	<2	5
# of species comprising 75% of sample	4	>5	3 to 4	<3	3
Number of Intolerant Species (<100mi ² area)	1	>5	3 to 5	<3	1
Percentage of Tolerant Species	78.57	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					15
Percentage of Lithophils	2.98	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	168	>200	75 to 200	<75	3
TOTAL SCORE FOR FISH CONDITION					9
TOTAL SCORE					24

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	OKS20500-01-0200U	OKS20500-02-0050A			Metric Score	Site Score	Reference Score
	Site Name	Alabama Ck: Above	Little Wewoka Ck: S				
	County	Okfuskee	Hughes				
Order	2	4		Composite Reference Value	TOTAL SCORES		
Metric	Value	Reference Value	Reference Value		17	25	
Total # of Species	11	17	18	18	62.9%	3	5
Number of Sensitive Benthic Species	1	3	3	3	33.3%	3	5
Number of Centrarchid species	5	6	6	6	83.3%	5	5
Number of Intol Species	1	1	2	2	66.7%	3	5
Proportion of Individuals as Tolerant	78.571	40	80	60	78.6	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	0.000	6	10	8	0.0	1	1
Proportion of Individuals as Lithophilic Spawners	2.976	30	9	20	3.0	1	3
TOTAL SCORES					17	25	
PROPORTION OF REFERENCE					68		
INTEGRITY CLASSIFICATION OF SITE					FAIR		

Based on the state-adopted biological assessment for fish, this site is Undetermined. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 68% of reference giving it an integrity classification of 'FAIR'.

Site 3: Bird Creek 7-29-03

ID'd in Lab			Lab Comments	Total Specimen Count	Common Name	Species
From Shock	From Seine	Shock/Seine Combined				
1				3	Gizzard shad	<i>Dorosoma cepedianum</i>
	1			1	Central stoneroller	<i>Camptostoma anomalum</i>
35	50			142	Red shiner	<i>Cyprinella lutrensis</i>
11	36			47	Sand shiner	<i>Notropis stramineus</i>
11	7			18	Suckermouth minnow	<i>Phenacobius mirabilis</i>
9	6			15	Bullhead minnow	<i>Pimephales vigilax</i>
	1			4	River carpsucker	<i>Carpiodes carpio</i>
10				10	Yellow bullhead	<i>Ameiurus natalis</i>
				2	Channel catfish	<i>Ictalurus punctatus</i>
	1			1	Plains killifish	<i>Fundulus zebrinus</i>
9	19			84	Mosquitofish	<i>Gambusia affinis</i>
	3			27	Brook silverside	<i>Labidesthes sicculus</i>
1	1			2	Green sunfish	<i>Lepomis cyanellus</i>
3	1			6	Bluegill sunfish	<i>Lepomis macrochirus</i>
4	2			12	Longear sunfish	<i>Lepomis megalotis</i>
1	1			32	Largemouth bass	<i>Micropterus salmoides</i>
						<i>Stizostedion canadense</i> x <i>Stizostedion vitreum</i>
	1			1	Saugeye hybrid	

Watershed < 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	17	refer to fig 1	refer to fig1	refer to fig 1	3
Shannon's Diversity based upon numbers	2.02	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	4	>3	2 to 3	<2	5
# of species comprising 75% of sample	4	>5	3 to 4	<3	3
Number of Intolerant Species (<100mi ² area)	3	>5	3 to 5	<3	3
Percentage of Tolerant Species	88.70	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					17
Percentage of Lithophils	0.25	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	407	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					28

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Alabama Ck: Above	Little Wewoka Ck: S		Metric Score	Site Score	Reference Score
	County	Okfuskee	Hughes				
	Order	2	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	17	17	18	18	97.1%	5	5
Number of Sensitive Benthic Species	2	3	3	3	66.7%	3	5
Number of Centrarchid species	4	6	6	6	66.7%	3	5
Number of Intol Species	3	1	2	2	200.0%	5	5
Proportion of Individuals as Tolerant	88.698	40	80	60	88.7	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	4.668	6	10	8	4.7	1	1
Proportion of Individuals as Lithophilic Spawners	0.246	30	9	20	0.2	1	3
TOTAL SCORES						19	25
PROPORTION OF REFERENCE						76	
INTEGRITY CLASSIFICATION OF SITE						FAIR	

Based on the state-adopted biological assessment for fish, this site is Fully Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 76% of reference, giving it an integrity classification of 'FAIR'.

Site 3: Bird Creek Downstream 7-9-08

From Shock	ID'd in Lab		Lab Comments	Total Specimen Count	Common Name	Species
	From Seine	Shock/Seine Combined				
	1			1	Gizzard shad	<i>Dorosoma cepedianum</i>
4	195			466	Red shiner	<i>Cyprinella lutrensis</i>
	2			2	Golden shiner	<i>Notemigonus crysoleucas</i>
	6			6	Sand shiner	<i>Notropis stramineus</i>
	6			6	Suckermouth minnow	<i>Phenacobius mirabilis</i>
	9			9	Bluntnose minnow	<i>Pimephales notatus</i>
2	82			84	Bullhead minnow	<i>Pimephales vigilax</i>
	1			1	Smallmouth buffalo	<i>Ictiobus bubalus</i>
2				2	Yellow bullhead	<i>Ameiurus natalis</i>
1				1	Channel catfish	<i>Ictalurus punctatus</i>
1				1	Flathead catfish	<i>Pylodictis olivaris</i>
	1			1	Blackstripe topminnow	<i>Fundulus notatus</i>
	53			149	Mosquitofish	<i>Gambusia affinis</i>
	18			43	Brook silverside	<i>Labidesthes sicculus</i>
	1			1	White bass	<i>Morone chrysops</i>
3	5			8	Green sunfish	<i>Lepomis cyanellus</i>
1	6			13	Orangespotted sunfish	<i>Lepomis humilis</i>
5	1			31	Bluegill sunfish	<i>Lepomis macrochirus</i>
2	1			30	Longear sunfish	<i>Lepomis megalotis</i>
1	10		YOY Shock-1, Seine-10	11	Largemouth bass	<i>Micropterus salmoides</i>
	2		YOY Seine-1	2	White crappie	<i>Pomoxis annularis</i>

Watershed < 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	21	refer to fig 1	refer to fig1	refer to fig 1	5
Shannon's Diversity based upon numbers	1.61	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	6	>3	2 to 3	<2	5
# of species comprising 75% of sample	3	>5	3 to 4	<3	3
Number of Intolerant Species (<100mi ² area)	3	>5	3 to 5	<3	3
Percentage of Tolerant Species	94.24	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					19
Percentage of Lithophils	1.04	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	868	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					30

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Alabama Ck: Above	Little Wewoka Ck: S		Metric Score	Site Score	Reference Score
	County	Okfuskee	Hughes				
	Order	2	4				
Metric	Value	Reference Value	Reference Value	Value	Metric Score	Site Score	Reference Score
Total # of Species	21	17	18	18	120.0%	5	5
Number of Sensitive Benthic Species	2	3	3	3	66.7%	3	5
Number of Centrarchid species	6	6	6	6	100.0%	5	5
Number of Intol Species	3	1	2	2	200.0%	5	5
Proportion of Individuals as Tolerant	94.240	40	80	60	94.2	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	0.691	6	10	8	0.7	1	1
Proportion of Individuals as Lithophilic Spawners	1.037	30	9	20	1.0	1	3
TOTAL SCORES						21	25
PROPORTION OF REFERENCE						84	
INTEGRITY CLASSIFICATION OF SITE						GOOD	

Based on the state-adopted biological assessment for fish, this site is Fully Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 84% of reference, giving it an integrity classification of 'GOOD'.

Biological Community Summary:

Four (4) sampling events resulted in a Fully Supporting determination based on the state's fish IBI with alternative IBI assessments in agreement. Two sampling events resulted in Undetermined determination based on the state's fish IBI with an alternative IBI assessment categorizing this site as 'Fair'.

Benthic macroinvertebrate (BMI) analysis of Site 3 ranged from Slightly Impaired to Moderately Impaired using woody debris samples, and Non-impaired when using the preferred riffle samples. Analysis of Site 1 indicated a "Good" community. Benthic IBI sampling gave no indication of extreme impairment and, when combined with the fish assessment data, gives indication that the biological community is in decent condition.

Pictures from Bird Creek taken during OWRB sampling events

Site 1: (OKPB01-060) 6-6-07







Recommendation for Bird Creek:

The habitat quality of Bird Creek is considered 'Poor'. The aquatic community is Fully Supporting of a WWAC based on fish assessments, where BMI assessments seem to confirm this. However, with the lack of fish population age structure data, it cannot be determined conclusively that these populations are able to successfully reproduce and grow. With the shallow depths found in Bird Creek, especially in the upstream site, there is high likelihood of this stream becoming dry during times of low rainfall.

Based on the poor quality of habitat, it is the OWRB's recommendation that Bird Creek remain a Habitat Limited Aquatic Community (HLAC). Based on the relatively shallow depths and unlikelihood of full body immersion and recreational use, it is our recommendation to keep Bird Creek categorized as Secondary Body Contact Recreation (SBCR).

This Page Intentionally Left Blank

Bitter Creek (OK311600-02-0110)
Re-evaluation

Bitter Creek (OK311600-02-0110)

Description: Located in Jackson County, this stream is utilized as part of the Lugert-Altus Irrigation District. Bitter Creek is designated as an Emergency Water Supply (EWS), a Habitat Limited Aquatic Community (HLAC), and as Secondary Body Contact Recreation (SBCR). The original reason for categorizing Bitter Creek as a Habitat Limited Fishery (HLF) or HLAC (upstream from Section 3 & 2, T 1 N, R 21 W, IM) and SBCR was that natural, ephemeral, or low-flow conditions or water levels prevent the attainment of the use. This stream drains a watershed where cotton is grown extensively. Bitter Creek is in the Central Great Plains ecoregion.

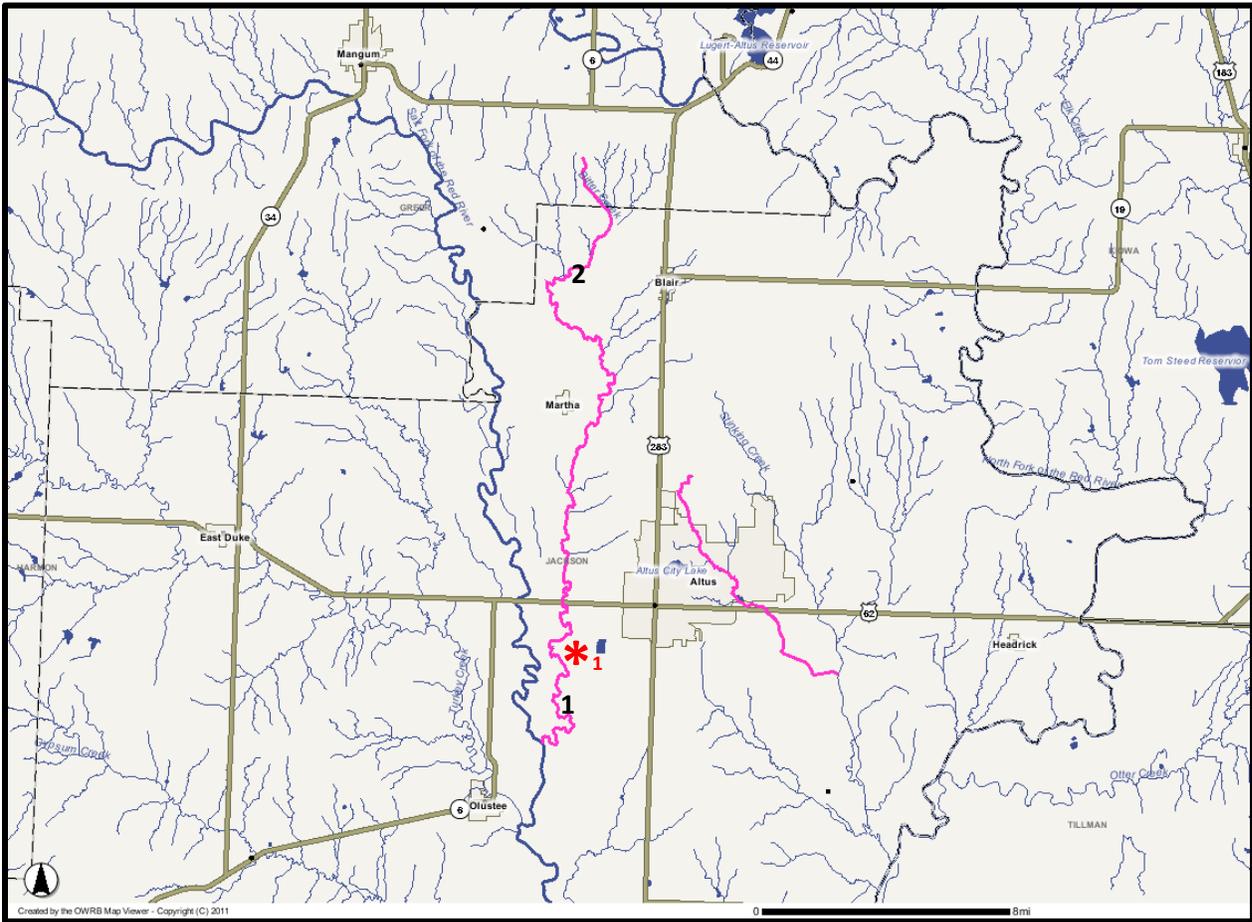


Figure 2. Approximate sample site locations and NPDES Discharges. The locations marked 1 and 2 are the approximate locations of sampling sites. The location marked *1 is the approximate site of the Altus waste water treatment plant discharge.

Historical Descriptions: Sampling done for Use Attainability Analysis (UAA) in 1985 described the stream as having very poor habitat with little to no riparian buffer and very nutrient rich with lots of odor. Maximum depths observed were 3.5-5.0 feet. Minimum Depths were 0.2-0.3 feet. Average mid-channel depths were 1.5-2.0 feet. It was noted that the smell, color, and excessive muck and organic detritus would hinder Primary Body Contact Recreation.

Water Chemistry: Water quality data was available for Bitter Creek ranging from 1998 to 2006.

Site 1: Bitter Creek

OK311600-02-0110G

	Median	Min	Max	N
Turbidity	34.9	1.56	469	23
Temperature	21.05	1.9	31.1	24
pH	8.01	7.75	8.42	22
Ammonia	0.11	0.015	0.88	19
Chloride	772	250	899	19
Nitrate	2.28	1.31	3.54	10
Nitrite	0.01	0.01	0.087	10
Sulfate	1223	406	1714.3	19
Total Dissolved Solids	3883	3883	3883	1
Total Kjeldahl Nitrogen	0.93	0.413	2.67	16
Total Ortho-Phosphate	0.058	0.003	0.319	19
Total Phosphorus	0.188	0.061	1.25	19
Total Suspended Solids	70	15	297	19
Flow	14.909	4.439	55.34	19

Site 1: Bitter Creek

OK311600-02-0110G

	Median	Min	Max	N
E Coli	70	<10	527	11
Enterococcus	392.5	30	19000	12

Flow Conditions: There are no gauging stations associated with this waterbody. The current designed flow for the City of Altus wastewater treatment plant is 4.0 MG per day. A search was conducted, but no data were available in any accessible format to indicate what past designed flows may have been. The flow in this watershed is influenced primarily by the operation of the Lugert-Altus Irrigation District.

Sources of Pollution:

facility_n	permit_num
ALTUS WEST WWT	OK0028045

Hydrologic Modifications: A visual assessment of topographical maps and aerial photographs indicate that there are no major hydrologic modifications in this watershed. This visual assessment also indicated that no major or significant land use changes have occurred in the last 20 years. The primary land use in the watershed is extensive cotton production.

Physical Conditions in Stream:

Habitat Assessments													
	Date	Instream Cover	Pool Bottom Substrate	Pool Variability	Canopy Cover Shading	Presence of Rocky Runs or Riffles	Flow	Channel Alteration	Channel Sinuosity	Bank Stability	Bank /Vegetation Stability	Streamside Cover	Total Points
Bitter Creek	06/26/2001	1.6	2.4	19.4	17.9	0	17.2	16.5	2.4	10	6.9	10	104.3
Bitter Creek: OKPB01-027	07/05/2006	3.4	16.5	0.6	2.5	0	11.9	20.0	4.3	7.4	10.0	8.6	85.1
Bitter Creek: OKPB01-027 revisit	09/20/2006	3.8	11.3	0.6	2.5	0.0	2.1	2.3	4.3	6.7	10.0	8.6	52.2

Stream Name	Date	Max Depth	Average Depth
Bitter Creek	6-26-2001	0.8	0.43
Bitter Creek: OKPB01-027	7-05-2006	0.7	0.42
Bitter Creek: OKPB01-027 revisit	9-20-2006	0.4	0.21

All measurements of in-stream cover fall within the ‘Poor’ category, indicating that there is less than 10% stable habitat. One assessment of pool bottom substrate falls within the ‘Poor’ category while the other two measurements fall within the ‘Adequate’ and ‘Optimal’ categories. One sampling event indicated that the pool variability was ‘Optimal’, but sampling at another site, indicated a pool variability that is if ‘Poor’ quality, represented by a majority of pools being shallow or absent. The upstream site on Bitter Creek had very poor canopy cover shading while the downstream site had ‘Optimal’ canopy cover shading. There was also a lack of rocky runs or riffles with all scored measurements falling in the ‘Poor’ category. The representative low flows at the times of measurements were categorized as ‘Poor’, ‘Adequate’, and ‘Optimal’ at the different times of sampling. The flow in this stream system seems to be dependent upon irrigation, as it acts as a conduit of the Altus-Lugert Irrigation System. Channel alteration on Bitter Creek is categorized as ‘Optimal’ and ‘Poor’ due to the presence of point bars when the water level and flow are decreased as a result of irrigation system operations. The channel sinuosity can be categorized as ‘Poor’ indicating that the channel is almost straight. Measurements indicate that Bitter Creek has ‘Adequate’ to ‘Optimal’ bank stability indicating that erosion may be evident but is not the dominate feature of the banks. The streamside cover measurements indicate that Bitter Creek has ‘Adequate’ to ‘Optimal’ levels of vegetation within 10ft of the water’s edge.

Biological Data:

Benthic Macroinvertebrates (BMI) Assessments

Site 2

Benthic IBI % of Reference	BIBI Binomial	BIBI Binomial
75%	Slightly Impaired	Poor

Fish Assessments

Site 1: Bitter Creek 6-26-01

Common Name	Species	Total Specimen Count
Longnose gar	<i>Lepisosteus osseus</i>	1
Red shiner	<i>Cyprinella lutrensis</i>	111
Common carp	<i>Cyprinus carpio</i>	1
Channel catfish	<i>Ictalurus punctatus</i>	10
Mosquitofish	<i>Gambusia affinis</i>	39
Bluegill sunfish	<i>Lepomis macrochirus</i>	1
Longear sunfish	<i>Lepomis megalotis</i>	2

Watershed < 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	7	refer to fig 1	refer to fig1	refer to fig 1	1
Shannon's Diversity based upon numbers	0.92	>2.50	2.49-1.50	<1.50	1
# of Sunfish Species	2	>3	2 to 3	<2	3
# of species comprising 75% of sample	2	>5	3 to 4	<3	3
Number of Intolerant Species (<100mi ² area)	0	>5	3 to 5	<3	1
Percentage of Tolerant Species	100.00	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					9
Percentage of Lithophils	0.00	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	165	>200	75 to 200	<75	3
TOTAL SCORE FOR FISH CONDITION					9
TOTAL SCORE					18

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Blue Beaver Ck	Deer Ck: Greer Co.		Metric Score	Site Score	Reference Score
	County	Comanche	Greer				
	Order	2	3				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	7	17	13	15	46.7%	3	5
Number of Sensitive Benthic Species	0	5	1	3	0.0%	1	5
Number of Centrarchid species	2	6	4	5	40.0%	3	5
Number of Intol Species	0	1	1	1	0.0%	1	5
Proportion of Individuals as Tolerant	100.000	21	86	53	100.0	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	0.000	23	2	13	0.0	1	1
Proportion of Individuals as Lithophilic Spawners	0.000	54	12	33	0.0	1	3
TOTAL SCORES						11	25
PROPORTION OF REFERENCE						44	
INTEGRITY CLASSIFICATION OF SITE						POOR	

Based on the State-adopted biological assessment for fish, this site is Not Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 44% of reference, giving it an integrity classification of 'Poor'.

Site 2: Bitter Creek (OKPB01-027) 7-5-06

	Taxon Name	Total Fish
Bluegill sunfish	<i>Lepomis macrochirus</i>	1
Bullhead minnow	<i>Pimephales vigilax</i>	1
Channel catfish	<i>Ictalurus punctatus</i>	5
Fathead minnow	<i>Pimephales promelas</i>	116
Green sunfish	<i>Lepomis cyanellus</i>	4
Longear sunfish	<i>Lepomis megalotis</i>	15
Mosquitofish	<i>Gambusia affinis</i>	109
Orangespotted sunfish	<i>Lepomis humilis</i>	24
Red shiner	<i>Cyprinella lutrensis</i>	733
Yellow bullhead	<i>Ameiurus natalis</i>	3

Metric	Value	Scoring			Score
		5	3	1	
Watershed < 100 square miles					
Total # of Species	10	refer to fig 1	refer to fig1	refer to fig 1	3
Shannon's Diversity based upon numbers	0.95	>2.50	2.49-1.50	<1.50	1
# of Sunfish Species	4	>3	2 to 3	<2	5
# of species comprising 75% of sample	2	>5	3 to 4	<3	1
Number of Intolerant Species (<100mi ² area)	0	>5	3 to 5	<3	1
Percentage of Tolerant Species	100.00	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					11
Percentage of Lithophils	0.00	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	1011	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					22

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Deer Ck: Greer Co.	Deer Ck: Greer Co.		Metric Score	Site Score	Reference Score
	County	Greer	Greer				
	Order	3	3				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	10	13	13	13	76.9%	5	5
Number of Sensitive Benthic Species	0	1	1	1	0.0%	1	5
Number of Centrarchid species	4	4	4	4	100.0%	5	5
Number of Intol Species	0	1	1	1	0.0%	1	5
Proportion of Individuals as Tolerant	100.000	86	86	86	100.0	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	0.000	2	2	2	0.0	1	1
Proportion of Individuals as Lithophilic Spawners	0.000	12	12	12	0.0	1	1
TOTAL SCORES						15	23
PROPORTION OF REFERENCE						65	
INTEGRITY CLASSIFICATION OF SITE						FAIR	

Based on the State-adopted biological assessment for fish, this site is Fully Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 65% of reference, giving it an integrity classification of 'Fair'.

Site 2: Bitter Creek (OKPB01-027 Re-visit) 9-20-06

	Taxon Name	Total Fish
Bluegill sunfish	<i>Lepomis macrochirus</i>	1
Fathead minnow	<i>Pimephales promelas</i>	5
Green sunfish	<i>Lepomis cyanellus</i>	1
Longear sunfish	<i>Lepomis megalotis</i>	15
Mosquitofish	<i>Gambusia affinis</i>	259
Orangespotted sunfish	<i>Lepomis humilis</i>	5
Red shiner	<i>Cyprinella lutrensis</i>	34
Yellow bullhead	<i>Ameiurus natalis</i>	1

Watershed < 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	8	refer to fig 1	refer to fig1	refer to fig 1	1
Shannon's Diversity based upon numbers	0.74	>2.50	2.49-1.50	<1.50	1
# of Sunfish Species	4	>3	2 to 3	<2	5
# of species comprising 75% of sample	1	>5	3 to 4	<3	1
Number of Intolerant Species (<100mi ² area)	0	>5	3 to 5	<3	1
Percentage of Tolerant Species	100.00	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					9
Percentage of Lithophils	0.00	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	321	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					20

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	OK31900-00-0070C	OK31900-00-0070C	OK31900-00-0070C		Metric Score	Site Score	Reference Score
	Site Name	Deer Ck: Greer Co.	Deer Ck: Greer Co.				
	County	Greer	Greer				
Order	3	3		Composite Reference Value			
Metric	Value	Reference Value	Reference Value				
Total # of Species	8	13	13	13	61.5%	3	5
Number of Sensitive Benthic Species	0	1	1	1	0.0%	1	5
Number of Centrarchid species	4	4	4	4	100.0%	5	5
Number of Intol Species	0	1	1	1	0.0%	1	5
Proportion of Individuals as Tolerant	100.000	86	86	86	100.0	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	0.000	2	2	2	0.0	1	1
Proportion of Individuals as Lithophilic Spawners	0.000	12	12	12	0.0	1	1
TOTAL SCORES						13	23
PROPORTION OF REFERENCE						57	
INTEGRITY CLASSIFICATION OF SITE						POOR	

Based on the State-adopted biological assessment for fish, this site is Undetermined. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 57% of reference, giving it an integrity classification of 'Poor'.

Water Quality:

Site 2

Station ID	OKPB01-027
Sample Date	09/20/2006
NH₃ (mg/L)	0.12
TKN (mg/L)	2.52
NO₃ (mg/L)	0.34
NO₂ (mg/L)	0.05
TN (mg/L)	2.91
AN (mg/L)	0.51
P-Ortho (mg/L)	0.056
P-Total (mg/L)	0.52
DO (mg/L)	13.51
pH (std units)	7.98
Turbidity (NTU)	25
Water Temp. (°C)	21.93
Conductivity (us/cm)	3164
Cl (mg/L)	480
Total Dissolved Solids (mg/L)	1970
Su (mg/L)	797

Station ID	Sample Date	E. Coli (cfu/mL)	Fecal Coliform (cfu/mL)	Enterococci (cfu/mL)
OKPB01-027	07/05/2006	314.0	12400.0	496.0

Station ID	Benthic Chl-a (mg/m²)	Sestonic Chl-a (mg/m³)
OKPB01-027	126.28	55.8

Photos of Bitter Creek obtained from OWRB sampling events

Site 2 (OKPB01-027)



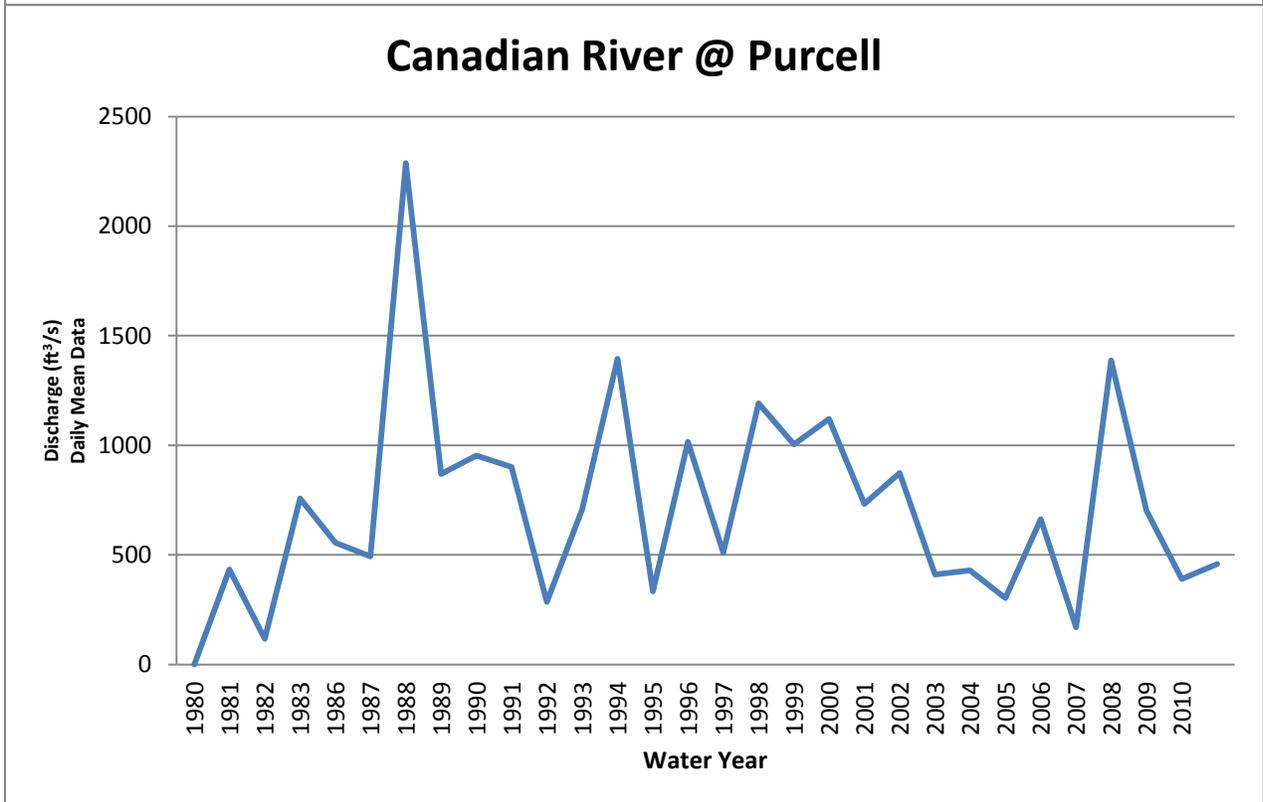
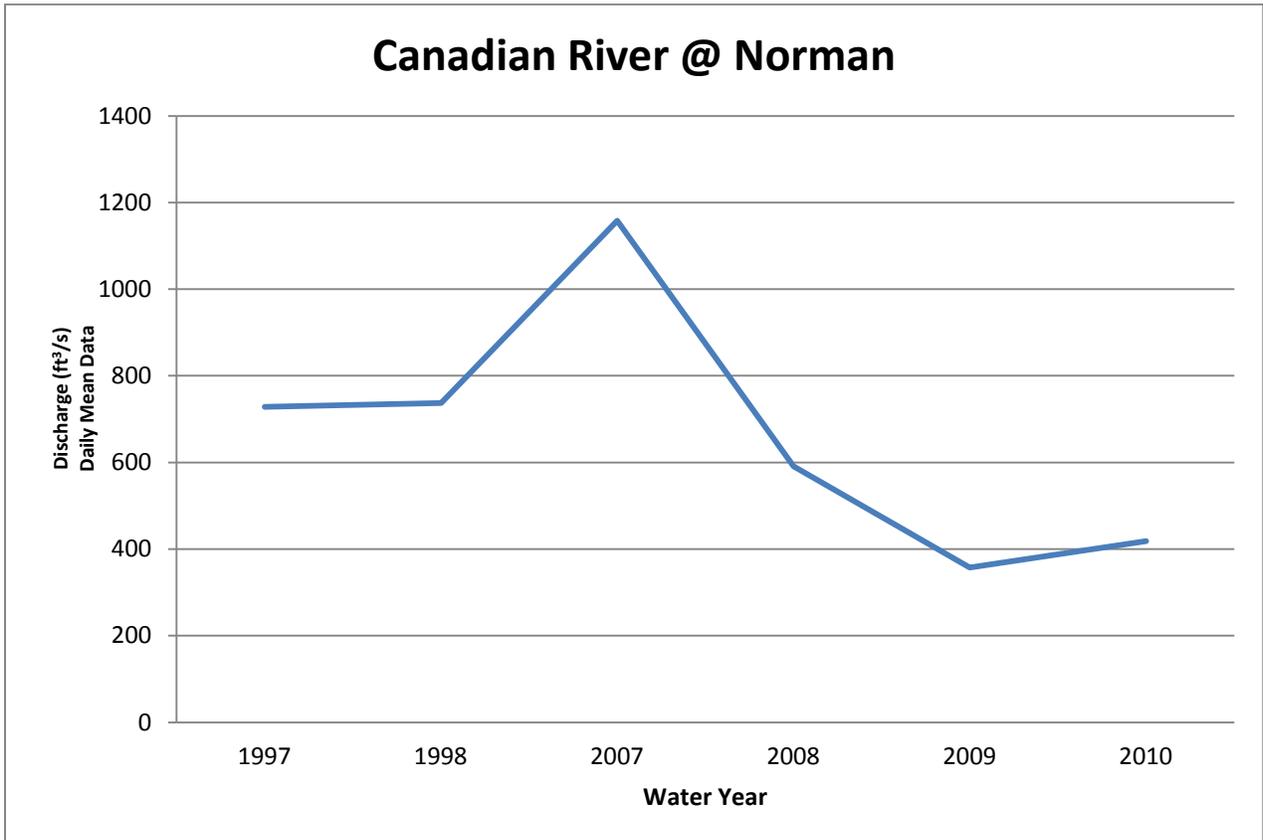


Recommendation:

The fish data are highly variable. The creek has an unnatural flow regime due its use as an irrigation return water conduit. The one higher habitat score comes from an earlier sampling date in June rather than July and September. The later assessments have very low habitat assessment scores and are congruent with the photo documentation. Based on variable fish assessments and poor quality habitat, as well as a relatively limited number of sampling events, we recommend for Bitter Creek to remain a Habitat Limited Aquatic Community (HLAC) and as Secondary Body Contact Recreation (SBCR).

Canadian River (OK520610020010)
Re-evaluation

Flow Conditions:



Canadian River @ Purcell	
Water Year	Discharge (ft ³ /s)
1980	433.6
1981	117.5
1982	756.8
1983	555.3
1986	493.3
1987	2287
1988	869
1989	953.9
1990	900.3
1991	286
1992	708.6
1993	1395
1994	333.5
1995	1015
1996	510.3
1997	1192
1998	1004
1999	1120
2000	732.5
2001	873.8
2002	410.7
2003	429.9
2004	302.3
2005	662.5
2006	168.7
2007	1387
2008	702.6
2009	390
2010	458.9

Canadian River @ Norman	
Water Year	Discharge (ft ³ /s)
1997	728.1
1998	736.9
2007	1158
2008	590.7
2009	357.5
2010	418.4

Sources of Pollution:

facility_n	permit_num
DOLESE BROS S NORMAN BATCH PLT	OK0001350
LEXINGTON PWA WWT	OK0022756
MUSTANG IMPROVEMENT ATHRTY WWT	OK0026816
MOORE PWA WWT	OK0027391
PURCELL WWT	OK0028533
NEWCASTLE WWT	OK0028614
TUTTLE WWT	OK0029173
NORMAN WWT	OK0029190
NOBLE NORTH WWT	OK0031755
MINCO WWT	OK0032182
OKLAHOMA CITY COW CREEK WWT	OK0038385
UNION CITY WWT	OK0038393
BRIDGE CREEK SCHOOL WWT	OK0038458
MUSTANG CAR WASH	OK0041513
US FAA MIKE MORONEY AERO CTR	OK0043931
US FAA MIKE MORONEY AERO CTR	OK0043931
US FAA MIKE MORONEY AERO CTR	OK0043931
US FAA MIKE MORONEY AERO CTR	OK0043931
MCCLAIN RWD NUMBER 8	OK0045314
DOLESE BROS S NORMAN BATCH PLT	OKG110006
TUTTLE WWT	OKG580054
MINCO WWT	OKG580057
KEELER CAR WASH FORMERLY BLANCHARD CAR WASH	OKG750001
MUSTANG CAR WASH	OKG750003

Hydrologic Modifications:

Much urbanization population increase has occurred in this watershed in the last 20 years. This has increased impervious surfaces, as well as increased the capacity of wastewater facilities.

Physical Conditions in Stream:

Habitat Assessments													
	Date	Instream Cover	Pool Bottom Substrate	Pool Variability	Canopy Cover Shading	Presence of Rocky Runs or Riffles	Flow	Channel Alteration	Channel Sinuosity	Bank Stability	Bank Vegetation Stability	Streamside Cover	Total Points
Canadian River OKPB01-021	07/20/2005	3.1	18.6	3.1	2.7	0.0	20.0	2.3	0.5	9.3	10.0	8.6	78.2
Canadian River OKPB01-369	05/02/2006	2.8	18.8	0.6	1.9	0.0	20.0	2.3	0.4	2.1	10.0	10.0	68.9
Canadian River OKPB01-369	08/09/2006	2.6	19.6	0.6	2.0	0.0	20.0	2.3	0.4	4.6	10.0	8.6	70.7

Stream Name	Date	Max Depth	Average Depth
Site 1: Canadian River OKPB01-021	07/20/2005	1.1	0.24
Site 2: Canadian River OKPB01-369	05/02/2006	0.8	0.18
Site 2: Canadian River OKPB01-369	08/09/2006	0.3	0.08

All measurements of in-stream cover fall within the ‘Poor’ category, indicating that there is less than 10% stable habitat. Assessments of pool bottom substrate all fall within the ‘Optimal’ category. Sampling indicated that the Canadian River’s pool variability was ‘Poor’ represented by a majority of pools being shallow or absent. Canopy cover shading measurements scored is the ‘Poor’ range indicating that there is a lack of canopy. However, this is to be expected on a large prairie river. There was also a lack of rocky runs or riffles with all scored measurements falling in the ‘Poor’ category. The representative low flows at the times of measurements were categorized as ‘Optimal’ with values ≥ 20 cfs. Channel alteration on the Canadian River is categorized as ‘Poor’ due to heavy deposition of fine material and most pools being filled with silt. The channel sinuosity can be categorized as ‘Poor’ indicating that the channel is almost straight. However, this is to be expected on a large river where the meander lengths are much greater than those of most wadeable streams. Measurements indicate that the Canadian River has bank stability categorized as ‘Optimal’ in the upstream sampled segment and ‘Fair’ in the downstream sampled segment. The streamside cover measurements indicate that the Canadian River has ‘Adequate’ to ‘Optimal’ levels of vegetation within 10ft of the water’s edge.

Photos from Canadian River obtained from OWRB sampling events

Site 1: (OKPB01-021) 7-20-05







Photos from Canadian River obtained from OWRB sampling events

Site 2: (OKPB01-021) 7-20-05









Recommendation:

Due to its location near highly populated areas, ease of access, and broad sandy banks, the Canadian River attracts many recreational users. Some of the common uses observed are wading, sunbathing, and ATV and off-road use. These ongoing recreational activities create a high likelihood for ingestion of water. Further documentation of existing uses is needed to assess primary body contact use.

The OWRB recommends that upon photo documentation of these uses, the Recreational beneficial use be upgraded to Primary Body Contact Recreation (PBCR).

This Page Intentionally Left Blank

Coffee Creek (OK520710-01-0090)
Re-evaluation

Coffee Creek (OK520710-01-0090)

Description: This segment of Coffee Creek is located in Oklahoma County. This stream has been identified as a Public Private Water Supply (PPWS), a Habitat Limited Aquatic Community (HLAC), and Primary Body Contact Recreation (PBCR). The original reason for categorizing Coffee Creek as a Habitat Limited Fishery (HLF) or HLAC, is that physical conditions related to natural features of the waterbody, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection. Coffee Creek is in the Cross Timbers ecoregion.

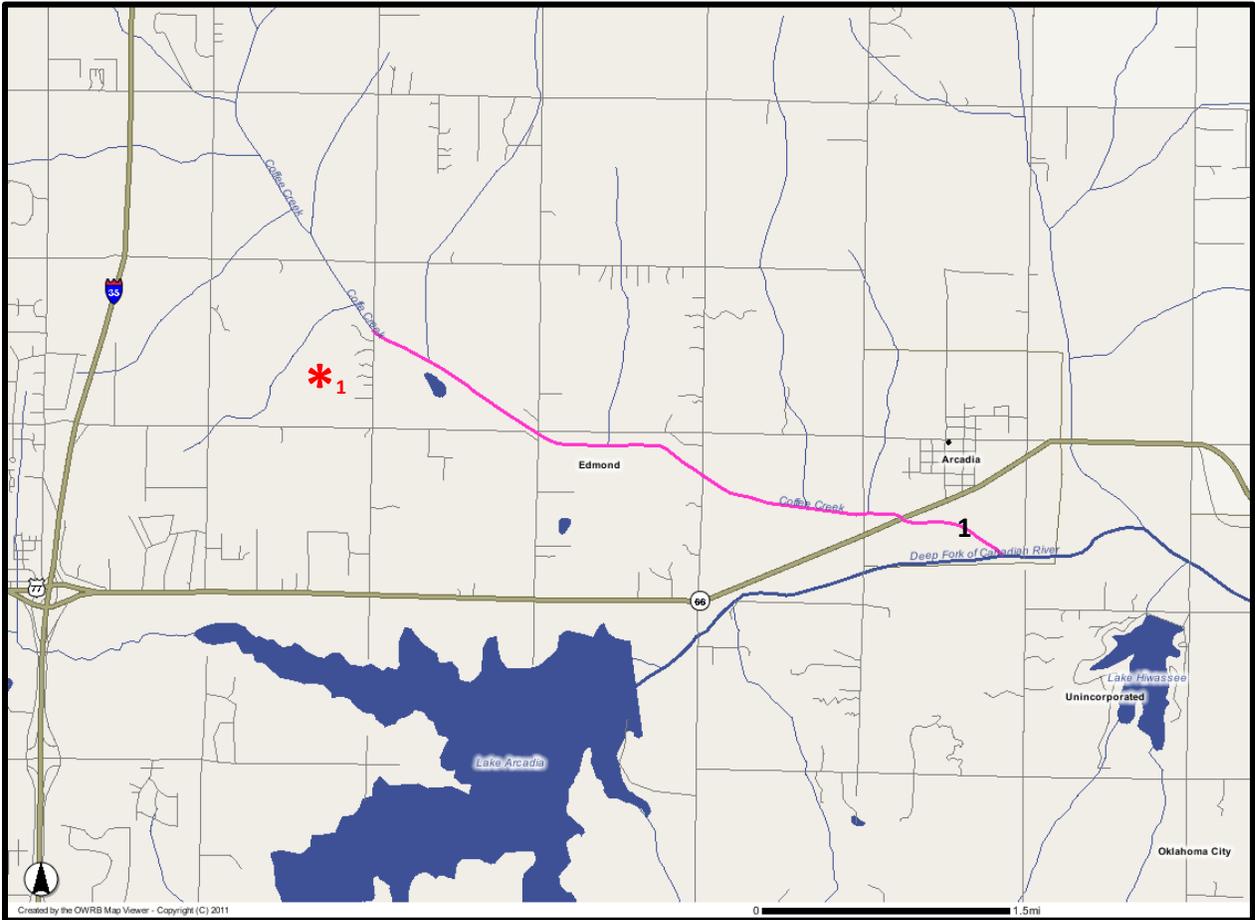


Figure 4. Approximate sample site locations and NPDES Discharges. Site 1 is the approximate location of the stream location sampled by BlueThumb. The location marked *1 is the approximate site of the Edmond Coffee Creek waste water treatment plant discharge.

Historical Descriptions: A Use Attainability Analysis (UAA) conducted in 1985 indicated that Coffee Creek had very poor habitat. It was observed that the stream channel was straightened and that the riparian area was altered. There appeared to be no complex habitat. Habitat consisted of shallow runs with high velocity. No riffles or pools were present in the sampled locations. It was noted that high levels of chlorine was in the water. Upstream of WWTP had much better and more complex habitat with intact riparian areas.

Water Chemistry: Data was not available.

Flow Conditions: There are no gauging stations associated with this waterbody. The current designed flow for the Edmond Coffee Creek wastewater treatment plant is 3.0 MG per day. A search was conducted, but no data were available in any accessible format to indicate what past designed flows may have been.

Sources of Pollution:

facility_n	permit_num
EDMOND COFFEE CREEK WWT	OK0026026

Hydrologic Modifications: A visual assessment of topographical maps and aerial photographs indicate that there are no major hydrologic modifications in this watershed. This visual assessment also indicated that no major or significant land use changes have occurred in the past 20 years.

Physical Conditions in Stream:

Habitat Assessments															
	Date	Instream Cover	Pool Bottom Substrate	Pool Variability	Canopy Cover Shading	Presence of Rocky Runs or Riffles	Flow	Channel Alteration	Channel Sinuosity	Bank Stability	Bank Vegetation Stability	Streamside Cover	Total Points		
Coffee Creek (highway 66)	08/11/2006	12.8	2.2	16.5	3.8	10.3	17.3	8.7	0	4.6	4.6	8.9	89.7		

Stream Name	Date	Max Depth	Average Depth
Coffee Creek	08/11/2006	1.4	0.43

Measurements of in-stream cover fall within the ‘Adequate’ category, indicating that there is 30% to 50% mix of stable habitat. Assessment of pool bottom substrate falls within the ‘Poor’ category indicating 1 or fewer types of stable habitat are present with mud, loose sand and bedrock making up 81% to 100% of pool bottom. Sampling indicated that the Coffee Creek’s pool variability was ‘Optimal’ represented by a mixture of desirable substrates. Canopy cover shading measurements scored is the ‘Poor’ range indicating that there is a lack of canopy. Rocky runs and riffles had scored measurements falling in the ‘Fair’ category indicating that these are infrequent in this segment of the creek. The representative low flow at the time of measurements was categorized as ‘Optimal’ with a value between 5 and 20 cfs. Channel alteration Coffee Creek is categorized as ‘Adequate’ indicating some increase in new bar or island formation. The channel sinuosity can be categorized as ‘Poor’ indicating that the channel is almost straight. Measurements indicate that Coffee Creek has a bank stability categorized as ‘Fair’ indicating a moderate amount of bank erosion. The streamside cover measurement indicates that Coffee Creek has nearly ‘Optimal’ levels of vegetation within 10ft of the water’s edge.

Biological Data: The following biological and habitat data was collected by the Conservation Commission’s Blue Thumb volunteer monitoring program.

Benthic Macroinvertebrate (BMI) Assessments

Site Name	WBID	Sample Type	Winter or Summer	Total Species	EPT Taxa	Percent EPT	Shannon Diversity	HBI	Percent Dominant 2 Taxa	Total Points	% of Reference	Condition	Number of Samples
Coffee Creek: Hwy 66	OK520710-01-0090C	Riffle	S	15	2.5	0.093	2.996	5.185	0.303273	20	0.769	slightly impaired	4
		Riffle	W	10.5	2	0.164	2.105	4.66	0.555	12	0.4	moderately impaired	2

Fish Assessments

Total Specimen Count	Common Name	Species
21	Red shiner	<i>Cyprinella lutrensis</i>
2	Common carp	<i>Cyprinus carpio</i>
6	Sand shiner	<i>Notropis stramineus</i>
1	Suckermouth minnow	<i>Phenacobius mirabilis</i>
1	Black bullhead	<i>Ameiurus melas</i>
1	Channel catfish	<i>Ictalurus punctatus</i>
49	Mosquitofish	<i>Gambusia affinis</i>
17	Bluegill sunfish	<i>Lepomis macrochirus</i>
51	Longear sunfish	<i>Lepomis megalotis</i>
7	Largemouth bass	<i>Micropterus salmoides</i>
13	Unidentified sunfish spp.	<i>Unidentified Lepomis spp.</i>

Watershed < 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	11	refer to fig 1	refer to fig 1	refer to fig 1	3
Shannon's Diversity based upon numbers	1.80	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	4	>3	2 to 3	<2	5
# of species comprising 75% of sample	4	>5	3 to 4	<3	3
Number of Intolerant Species (<100mi ² area)	2	>5	3 to 5	<3	1
Percentage of Tolerant Species	91.72	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					15
Percentage of Lithophils	0.00	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	169	>200	75 to 200	<75	3
TOTAL SCORE FOR FISH CONDITION					9
TOTAL SCORE					24

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING			
	Site Name	Clear Ck	Little Wewoka Ck: S		Composite Reference Value	Metric Score	Site Score	Reference Score
	County	Osage	Hughes					
	Order	3	4					
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score	
Total # of Species	11	19	18	19	59.5%	3	5	
Number of Sensitive Benthic Species	2	5	3	4	50.0%	3	5	
Number of Centrarchid species	4	8	6	7	57.1%	3	5	
Number of Intol Species	2	1	2	2	133.3%	5	5	
Proportion of Individuals as Tolerant	91.716	25	80	53	91.7	1	1	
Proportion of Individuals as Insectivorous Cyprinid Species	0.592	1	10	5	0.6	1	1	
Proportion of Individuals as Lithophilic Spawners	0.000	68	9	38	0.0	1	5	
TOTAL SCORES					17	27		
PROPORTION OF REFERENCE					63			
INTEGRITY CLASSIFICATION OF SITE					FAIR			

Based on the state-adopted biological assessment for fish, this site is Undetermined. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 63% of reference, giving it an integrity classification of 'Fair'.

Recommendation:

There is not enough information available indicating the present designated use needs to be upgraded. The biological data collected indicates an undetermined support status.

The OWRB recommends continued sampling of this stream segment and recommends that Coffee Creek remain a HLAC.

This Page Intentionally Left Blank

Little Deep Creek (OK520620-06-0040)
Re-evaluation

Little Deep Creek (OK520620-06-0040)

Description: Little Deep Creek is located in Custer County. This stream has been identified as a Habitat Limited Aquatic Community (HLAC) and as Primary Body Contact Recreation (PBCR). Little Deep Creek is in the Central Great Plains ecoregion.

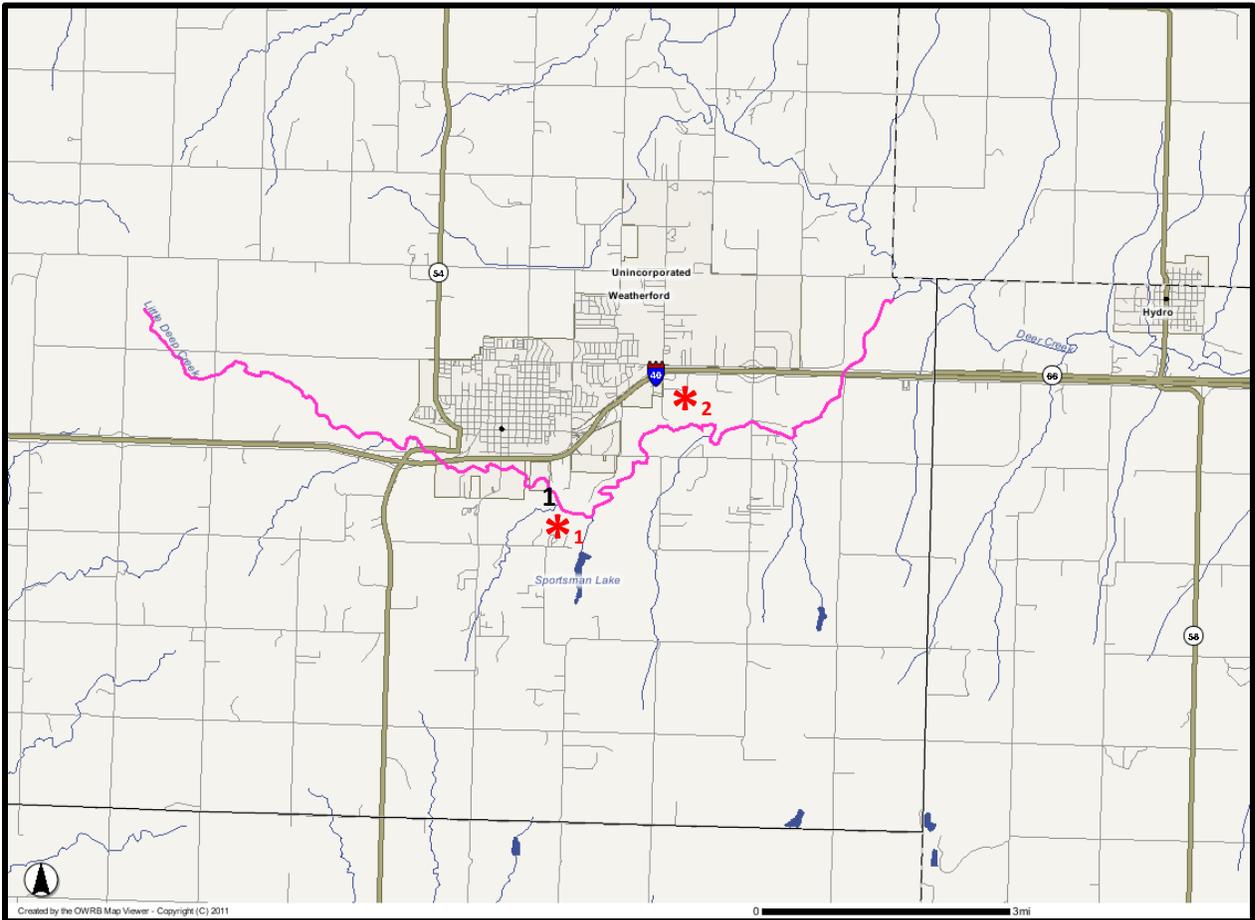


Figure 5. Approximate sample site locations and NPDES Discharges. Site 1 is the approximate location of the stream location sampled by Blue Thumb. The location marked *1 is the approximate site of the Weatherford waste water treatment plant discharge. The location marked *2 is the approximate site of the Eastman Kodak permitted discharge.

Historical Descriptions: A Use Attainability Analysis (UAA) conducted in 1992 found very few fish above the WWTP. The stream discharge above the WWTP was <1 cfs, and the stream discharge below the WWTP was 4.78 cfs. The upstream site had very little depth, while the downstream site had slightly more depth. Habitat Measurements indicated very few pools with mostly shallow runs.

Water Chemistry: Data not available

Flow Conditions: There are no gauging stations associated with this waterbody. The current designed flow for the Weatherford WWTP is 2.0 MGD per day. A search was conducted, but no data is available

in any accessible format to indicate what past designed flows may have been. The Eastman Kodak facility does not have a permitted designed flow.

Sources of Pollution:

facility_n	permit_num
WEATHERFORD WWT	OK0021563
EASTMAN KODAK	OK0041785

Hydrologic Modifications: A visual assessment of topographical maps and aerial photographs indicate that there are no major hydrologic modifications in this watershed. This visual assessment also indicated that no major or significant land use changes have occurred in the past 20 years.

Physical Conditions in Stream:

Habitat Assessments														
	Date	Instream Cover	Pool Bottom Substrate	Pool Variability	Canopy Cover Shading	Presence of Rocky Runs or Riffles	Flow	Channel Alteration	Channel Sinuosity	Bank Stability	Bank Vegetation Stability	Streamside Cover	Total Points	
Little Deep Creek	08/17/2006	11.6	5.1	19.8	15.5	5.9	10.4	1	1.6	5.7	2.2	10	88.8	

Stream Name	Date	Max Depth	Average Depth
Little Deep Creek	08/17/2006	0.6	0.2

Measurements of in-stream cover fall within the ‘Adequate’ category, indicating that there is 30% to 50% mix of stable habitat. Assessment of pool bottom substrate falls within the ‘Poor’ category indicating 1 or fewer types of stable habitat are present with mud, loose sand and bedrock making up 81% to 100% of pool bottom. Sampling indicated that the Little Deep Creek’s pool variability was ‘Optimal’ represented by a mixture of desirable substrates. Canopy cover shading measurements scored on the border of ‘Adequate’ and ‘Optimal’ indicating a sparse to moderate canopy. Rocky runs and riffles had scored measurements falling near the border of the ‘Fair’ and ‘Poor’ categories, indicating that these are infrequent to rare in this segment of the creek. The representative low flow at the time of measurement was categorized as ‘Fair’ with a value around 2 cfs. Channel alteration of Little Deep Creek is categorized as ‘Poor’ indicating heavy deposition of fine material and most pools filled with silt. The channel sinuosity can be categorized as ‘Fair’ indicating that the channel is 1.2 to 2 times straight line distance. Measurements indicate that Little Deep Creek has a bank stability categorized as borderline ‘Adequate’ indicating that bank erosion is quite evident but may not be dominant. The streamside cover measurement indicates that Little Deep Creek has ‘Optimal’ levels of vegetation within 10ft of the water’s edge.

Biological Data:

Fish Assessments

Total Specimen Count	Common Name	Species
302	Red shiner	<i>Cyprinella lutrensis</i>
277	Sand shiner	<i>Notropis stramineus</i>
107	Suckermouth minnow	<i>Phenacobius mirabilis</i>
1	Fathead minnow	<i>Pimephales promelas</i>
26	Bullhead minnow	<i>Pimephales vigilax</i>
33	Yellow bullhead	<i>Ameiurus natalis</i>
9	Plains killifish	<i>Fundulus zebrinus</i>
40	Mosquitofish	<i>Gambusia affinis</i>
1	Green sunfish	<i>Lepomis cyanellus</i>
18	Bluegill sunfish	<i>Lepomis macrochirus</i>
123	Longear sunfish	<i>Lepomis megalotis</i>
11	Largemouth bass	<i>Micropterus salmoides</i>
59	Unidentified sunfish spp.	<i>Unidentified Lepomis spp.</i>

Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	13	refer to fig 1	refer to fig1	refer to fig 1	3
Shannon's Diversity based upon numbers	1.89	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	5	>3	2 to 3	<2	5
# of species comprising 75% of sample	4	>5	3 to 4	<3	3
Number of Intolerant Species (<100mi ² area)	2	>5	3 to 5	<3	1
Percentage of Tolerant Species	83.52	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					15
Percentage of Lithophils	0.00	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	1007	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					26

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Blue Beaver Ck	Trail Ck		Metric Score	Site Score	Reference Score
	County	Comanche	Kingfisher				
	Order	2	2				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	13	17	12	15	89.7%	5	5
Number of Sensitive Benthic Species	2	5	2	4	57.1%	3	5
Number of Centrarchid species	5	6	4	5	100.0%	5	5
Number of Intol Species	2	1	1	1	200.0%	5	5
Proportion of Individuals as Tolerant	83.515	21	91	56	83.5	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	10.626	23	2	13	10.6	1	1
Proportion of Individuals as Lithophilic Spawners	0.000	54	6	30	0.0	1	3
TOTAL SCORES						21	25
PROPORTION OF REFERENCE						84	
INTEGRITY CLASSIFICATION OF SITE						GOOD	

Based on the State-adopted biological assessment for fish, this site is Fully Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 84% of reference, giving it an integrity classification of 'Good'.

Recommendation:

There is not enough information available indicating the designated use needs to be upgraded. The biological data collected does indicate fully supporting status. However, with only one sample, collected by volunteers, it is difficult to know if the stream regularly achieves this community. It is also difficult to know if any other factors may be affecting this water body.

The OWRB recommends continued sampling of this stream segment and recommends that Little Deep Creek remain a HLAC.

This Page Intentionally Left Blank

Rush Creek (OK310810-01-0090)
Re-evaluation

Rush Creek (OK310810-01-0090)

Description: This segment of Rush Creek is located in Garvin County near the city of Pauls Valley. This stream segment has been identified as a Habitat Limited Aquatic Community (HLAC) and as Secondary Body Contact Recreation (SBCR). The original reason for categorizing this stream segment as a Habitat Limited Fishery (HLF) or HLAC (downstream from U.S. 77), is that the physical conditions related to natural features of the waterbody, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection. The original reason for categorizing this stream segment as Secondary Body Contact Recreation (SBCR) (downstream from U.S. 77) is that natural, ephemeral, intermittent, or low-flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservations requirements to enable uses to be met. This portion of Rush Creek is in the Central Oklahoma / Texas Plains ecoregion.

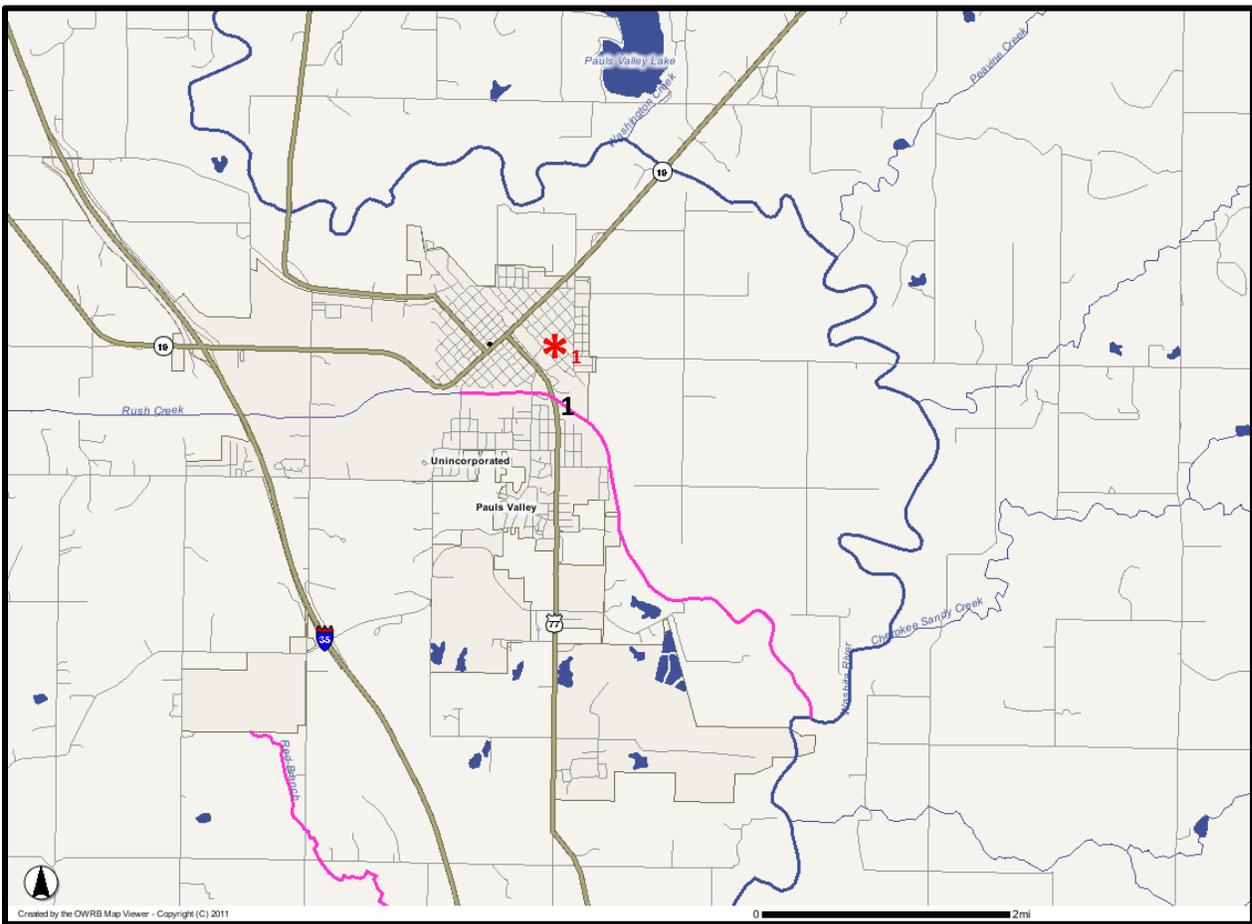


Figure 5. Approximate sample site locations and NPDES Discharges. Site 1 is the approximate location sampled by OCC on 07/21/2004. The location marked *1 is the approximate site of the Oklahoma Gas and Electric Pauls Valley SVC CTR discharge.

Historical Descriptions: A Use Attainability analysis (UAA) was conducted in 1982. During this analysis, the upstream fish collection yielded 8 species, most of which were species that are tolerant of water quality degradation. The downstream fish collection yielded 9 species. The discharge "Impact Zone" was described as minimal (<1/2 mile). The benthic macroinvertebrate assemblage contained several intolerant taxa. The habitat was considered good. Access to the site was difficult, but there were signs of recreation use (fishing). The maximum depth observed was 0.4 m, with an average depth 0.1-0.2 m.

Water Chemistry: Water quality data was available for Rush Creek ranging from 2004 to 2006.

Rush Creek

OK310810-01-0090G

	Median	Min	Max	N
Turbidity	20.15	3.52	>1000	20
Temperature	21	4.1	32.7	20
pH	8.035	6.99	8.35	18
Ammonia	0.015	0.015	0.267	19
Chloride	161.8	26.6	285.3	19
Nitrate	0.05	0.02	0.54	19
Nitrite	0.02	0.02	0.05	19
Sulfate	166.2	23.5	231	19
Total Dissolved Solids	840	22	1141	19
Total Kjeldahl Nitrogen	0.29	0.11	0.67	19
Total Ortho-Phosphate	0.027	0.005	0.426	19
Total Phosphorus	0.058	0.019	0.487	19
Total Suspended Solids	30	10	1539	19
Flow	10.126	0	81.142	17

Rush Creek

OK310810-01-0090G

	Median	Min	Max	N
E Coli	210	15	>2000	10
Enterococcus	50	15	>2000	10

Flow Conditions: There are no gauging stations associated with this waterbody.

Sources of Pollution:

facility_n	permit_num
OKLA GAS AND ELEC O G AND E PAULS VALLEY SVC CTR	OKG830007

Hydrologic Modifications: A visual assessment of topographical maps and aerial photographs indicate that there are no major hydrologic modifications in this watershed. This visual assessment also indicated that no major or significant land use changes have occurred in the last 20 years.

Physical Conditions in Stream:

Habitat Assessments														
	Date	Instream Cover	Pool Bottom Substrate	Pool Variability	Canopy Cover Shading	Presence of Rocky Runs or Riffles	Flow	Channel Alteration	Channel Sinuosity	Bank Stability	Bank Vegetation Stability	Streamside Cover	Total Points	
Rush Creek	07/21/2004	3.7	2.5	6.8	7.9	4.1	16.2	1	0.3	7	2.8	10	62.3	

Stream Name	Date	Max Depth	Average Depth
Rush Creek	07/21/2004	0.8	0.25

Measurements of in-stream cover fall within the ‘Poor’ category, indicating that there is less than 10% stable habitat. Assessment of pool bottom substrate falls within the ‘Poor’ category indicating 1 or fewer types of stable habitat are present with mud, loose sand and bedrock making up 81% to 100% of pool bottom. Sampling indicated that Rush Creek’s pool variability was ‘Fair’ represented by shallow pools being more prevalent than deep pools. Canopy cover shading measurements scored ‘Fair’ indicating a dense canopy. Rocky runs and riffles had scored measurements falling ‘Poor’ category, indicating that these are rare or absent in this segment of the creek. The representative low flow at the time of measurement was categorized as ‘Optimal’ with a value between 5 and 20 cfs. Channel alteration of Rush Creek is categorized as ‘Poor’ indicating heavy deposition of fine material and most pools filled with silt. The channel sinuosity can be categorized as ‘Poor’ indicating that the channel is almost straight. Measurements indicate that Rush Creek has a bank stability categorized as ‘Adequate’ indicating that bank erosion is quite evident but not the dominant feature of the banks. The streamside cover measurement indicates that Rush Creek has ‘Optimal’ levels of vegetation within 10ft of the water’s edge.

Biological Data:

Fish Assessments

Total Specimen Count	Common Name	Species
2	Gizzard shad	<i>Dorosoma cepedianum</i>
3	Central stoneroller	<i>Campostoma anomalum</i>
212	Red shiner	<i>Cyprinella lutrensis</i>
1	Golden shiner	<i>Notemigonus crysoleucas</i>
94	Sand shiner	<i>Notropis stramineus</i>
4	Suckermouth minnow	<i>Phenacobius mirabilis</i>
93	Bullhead minnow	<i>Pimephales vigilax</i>
3	River carpsucker	<i>Carpionodes carpio</i>
1	Smallmouth buffalo	<i>Ictiobus bubalus</i>
25	Channel catfish	<i>Ictalurus punctatus</i>
5	Mosquitofish	<i>Gambusia affinis</i>
1	Green sunfish	<i>Lepomis cyanellus</i>
1	Bluegill sunfish	<i>Lepomis macrochirus</i>
19	Longear sunfish	<i>Lepomis megalotis</i>
1	Spotted bass	<i>Micropterus punctulatus</i>
2	Largemouth bass	<i>Micropterus salmoides</i>
1	Freshwater drum	<i>Aplodinotus grunniens</i>

Watershed > 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	17	>23	12 to 22	<12	3
Shannon's Diversity based upon numbers	1.57	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	5	>3	2 to 3	<2	5
# of species comprising 75% of sample	4	>5	3 to 4	<3	3
Number of Intolerant Species (>100mi ² area)	3	>5	3 to 5	<3	3
Percentage of Tolerant Species	98.29	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					17
Percentage of Lithophils	0.85	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	468	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					28

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Glasses Ck	Elm Ck		Metric Score	Site Score	Reference Score
	County	Marshall	Cleveland				
	Order	4	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	17	20	18	19	89.5%	5	5
Number of Sensitive Benthic Species	2	3	2	3	80.0%	5	5
Number of Centrarchid species	5	6	7	7	76.9%	5	5
Number of Intol Species	3	2	1	2	200.0%	5	5
Proportion of Individuals as Tolerant	98.291	64	86	75	98.3	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	1.496	1	3	2	1.5	1	1
Proportion of Individuals as Lithophilic Spawners	0.855	7	11	9	0.9	1	1
TOTAL SCORES						23	23
PROPORTION OF REFERENCE						100	
INTEGRITY CLASSIFICATION OF SITE						EXCELLENT	

Based on the State-adopted biological assessment for fish, this site is Fully Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 100% of reference, giving it an integrity classification of 'Excellent'.

Recommendation:

Habitat seems to be of poor to fair quality, although, the fish population seems to be diverse. There currently appears to be an existing use of WWAC in this stream segment. The fish IBI scores were very good, with the alternate IBI scoring at this site as 100% of reference.

The upstream segments of Rush Creek are designated as WWAC. There seems to be an incongruity in the designation of Rush Creek by this furthest downstream segment being designated as HLAC with the upper reaches being WWAC.

The OWRB recommends that this segment of Rush Creek be upgraded to WWAC. By upgrading this small segment of Rush Creek to WWAC, the incongruity will be resolved. Based on shallow depths and lack of new and relevant information on recreational use, we recommend that Rush Creek remain a SBCR.

This Page Intentionally Left Blank

Salt Creek (OK620910-02-0100D)
Re-evaluation

Salt Creek (OK620910-02-0100D)

Description: Salt Creek is located in Kingfisher and Blaine counties. This stream has been identified as a Warm Water Aquatic Community (WWAC) and as Secondary Body Contact Recreation (SBCR). The original reason for categorizing Salt Creek as a Habitat Limited Fishery (HLF) or HLAC (from Blaine-Kingfisher county line) is that natural, ephemeral, intermittent, or low-flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservations requirements to enable uses to be met. Salt Creek is in the Central Oklahoma / Texas Plains ecoregion.

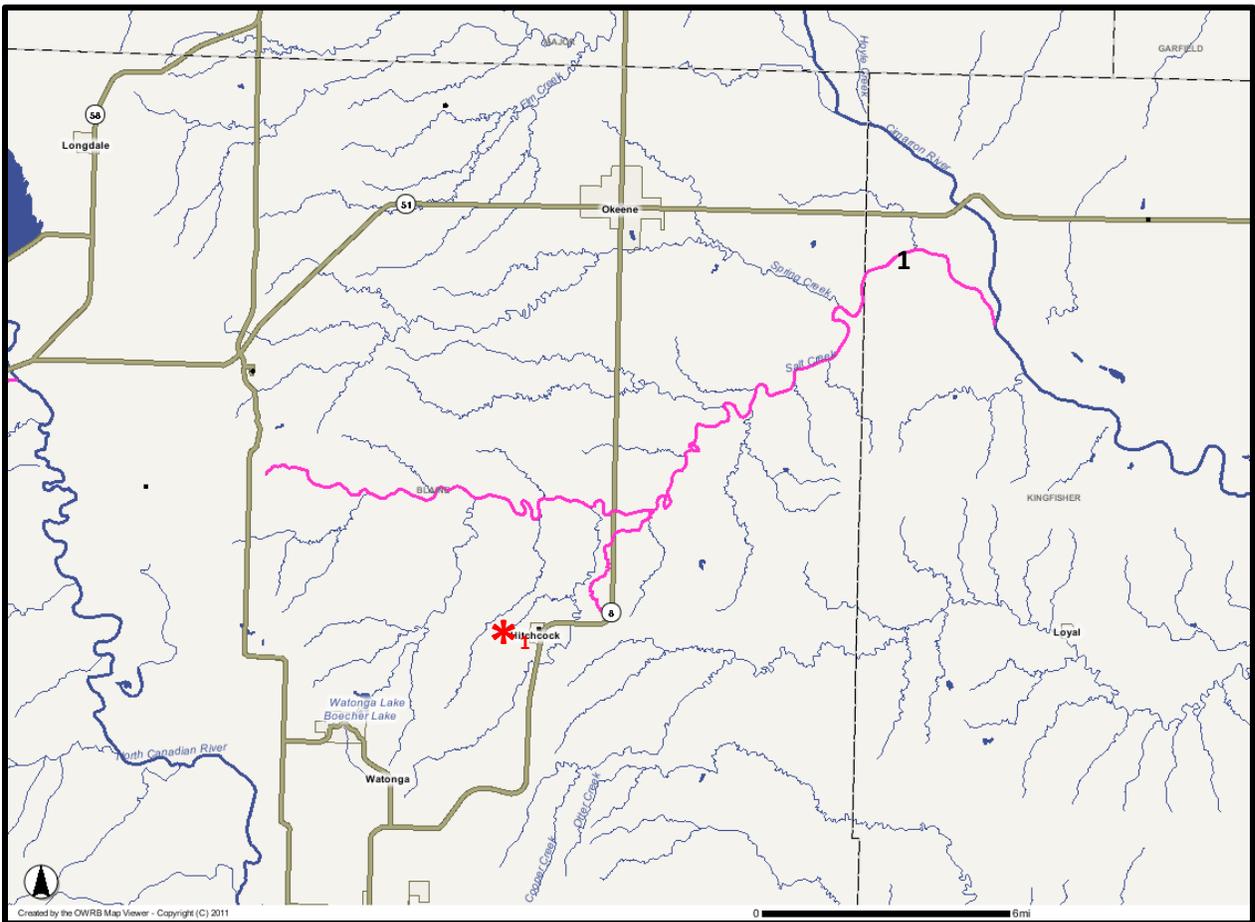


Figure 6. Approximate sample site locations and NPDES Discharges. Site 1 is the approximate location of the stream site sampled by OCC on 08/16/2002. The location marked *1 is the approximate site of the Hitchcock waste water treatment plant discharge.

Historical Descriptions: A Use Attainability Analysis (UAA) conducted in 1985 described this stream as slow flowing and shallow. Shallow depth, difficult access and substrate type were described as being hindrances to PBCR attainment.

Water Chemistry: Water quality data was available for Salt Creek ranging from 2002 to 2009.

Salt Creek

OK620910-02-0100D

	Median	Min	Max	N
Turbidity	5.76	1.28	>1000	41
Temperature	17.4	-0.5	35.5	42
pH	7.96	7.07	8.49	41
Ammonia	0.015	0.015	0.155	39
Chloride	5311.2	708.4	10276.8	39
Nitrate	1.24	0.01	3.12	39
Nitrite	0.02	0.01	1.1	39
Sulfate	1188.7	771.3	1609.7	39
Total Dissolved Solids	10534	2502	18266	39
Total Kjeldahl Nitrogen	0.399	0.11	2.01	39
Total Ortho-Phosphate	0.011	0.005	0.459	39
Total Phosphorus	0.0515	0.005	0.931	38
Total Suspended Solids	14	10	1217	39
Flow	17.454	3.436	674.786	39

Salt Creek

OK620910-02-0100D

	Median	Min	Max	N
E Coli	105	<10	1050	24
Enterococcus	135	5	1800	24

Flow Conditions: There are no gauging stations associated with this waterbody.

Sources of Pollution:

facility_n	permit_num
HITCHCOCK WWT	OK0025801

Hydrologic Modifications: A visual assessment of topographical maps and aerial photographs indicate that there are no major hydrologic modifications in this watershed. This visual assessment also indicated that no major or significant land use changes have occurred in last 20 years.

Physical Conditions in Stream:

Habitat Assessments														
	Date	Instream Cover	Pool Bottom Substrate	Pool Variability	Canopy Cover Shading	Presence of Rocky Runs or Riffles	Flow	Channel Alteration	Channel Sinuosity	Bank Stability	Bank Vegetation Stability	Streamside Cover	Total Points	
Salt Creek	08/16/2002	1.7	3.8	0	4.2	0	16.5	0.4	0	9.4	4.4	9.9	50.2	

Stream Name	Date	Max Depth (m)	Average Depth (m)
Salt Creek	08/16/2002	1.0	0.35

Measurements of in-stream cover fall within the ‘Poor’ category, indicating that there is less than 10% stable habitat. Assessment of pool bottom substrate falls within the ‘Poor’ category indicating 1 or fewer types of stable habitat are present with mud, loose sand and bedrock making up 81% to 100% of pool bottom. Sampling indicated that Salt Creek’s pool variability was ‘Poor’ represented by a majority of pools being shallow or absent. Canopy cover shading measurements scored ‘Poor’ indicating a lack of canopy cover. Rocky runs and riffles had scored measurements falling ‘Poor’ category, indicating that these are rare or absent in this segment of the creek. The representative low flow at the time of measurement was categorized as ‘Optimal’ with a value between 5 and 20 cfs. Channel alteration of Salt Creek is categorized as ‘Poor’ indicating heavy deposition of fine material and most pools filled with silt. The channel sinuosity can be categorized as ‘Poor’ indicating that the channel is almost straight. Measurements indicate that Salt Creek has a bank stability categorized as ‘Optimal’ indicating that bank erosion is absent or infrequent. The streamside cover measurement indicates that Salt Creek has ‘Optimal’ levels of vegetation within 10ft of the water’s edge.

Biological Data

Benthic Macroinvertebrate (BMI) Assessments

Sitename	WBID	Sample Type	Winter or Summer	Total Species	EPT Taxa	Percent EPT	Shannon Diversity	HBI	Percent Dominant 2 Taxa	Total Points	% of Reference	Condition	Number of Samples
Salt Creek: Kingfisher Co.	OK620910-02-0100D	riffle	S	7	1	0.01	0.99	6.24	0.84	6	0.21	Moderately Impaired	1
		veg	S	7	1	0.01	1.22	7.05	0.85	6	0.21	Moderately Impaired	1
		veg	W	3	0	0	0.66	6	0.99	6	0.27	Moderately Impaired	1
		woody	S	7.5	1	0.03	1.23	6.62	0.81	6	0.21	Moderately Impaired	2
		woody	W	7	1	0.01	0.91	5.93	0.95	8	0.36	Moderately Impaired	1

Recommendation: There is currently not enough information indicating that there is a need to upgrade the beneficial use.

The OWRB recommends continued monitoring of this stream and recommends that Salt Creek remain a HLAC and SBCR.

Sandy Creek (OK311600-01-0040)
Re-evaluation

Sandy Creek (OK311600-01-0040)

Description: Sandy Creek is located in Harmon and Jackson counties. This stream segment has been identified as a Habitat Limited Aquatic Community (HLAC) and as Secondary Body Contact Recreation (SBCR). The original reason for categorizing this segment of Sandy Creek as a Habitat Limited Fishery (HLF) or HLAC is that physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to [chemical] water quality, preclude attainment of aquatic life protection uses. The original reason for categorizing this segment of Sandy Creek as SBCR is that natural, ephemeral, intermittent, or low-flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservations requirements to enable uses to be met. Sandy Creek is in the Central Great Plains ecoregion.

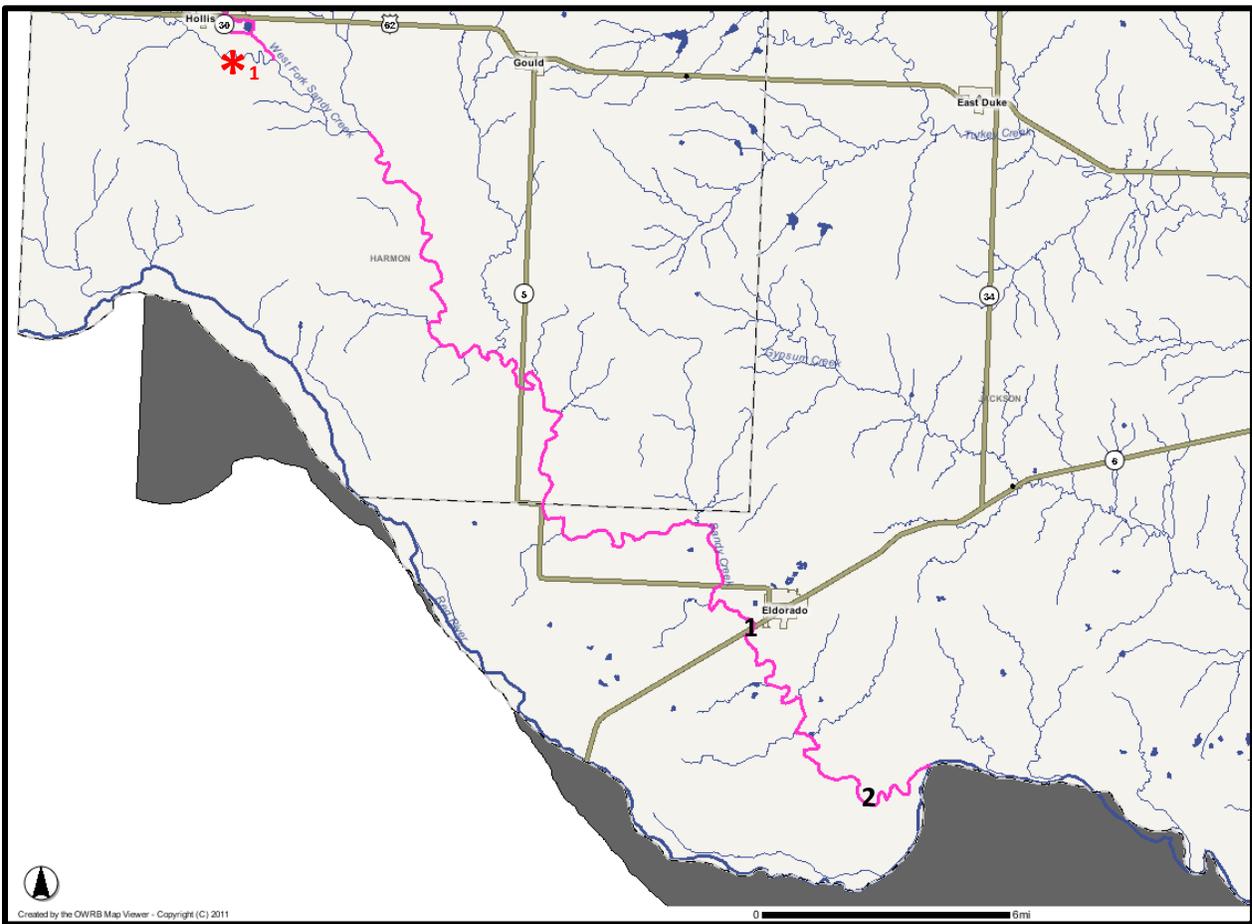


Figure 7. Approximate sample site locations and NPDES Discharges. Site 1 is the approximate location of the stream site sampled by OCC. Site 2 is the approximate location of Sandy Creek near Eldorado sampled by OWRB. The location marked *1 is the approximate site of the Hollis waste water treatment plant discharge.

Water Chemistry: Water quality data was available for Salt Creek ranging from 1998 to 2009.

Site 1: Sandy Creek, SH 6, Eldorado

	Median	Min	Max	N
Arsenic, Total	10	10	10	13
Barium, Total	47.8	41.1	54.5	2
Cadmium, Total	1	1	10	13
Chloride	2060	46.5	3750	107
Chromium, Total	5	5	13	13
Copper, Total	5	5	20	13
DISS OXY SATURATION	116.85	0	2466	102
DISSOLVED OXYGEN	11.88	0	17.84	11
DISSOLVED OXYGEN, analysis by probe	11.28	3.46	22.54	101
Flow, Instantaneous	7.5175	1.64	442	54
Hardness, Total	2040	446	3784	21
Hardness, Total (as CaCO3)	2450	190	3974	83
Lead, Total	5	3	10	13
Mercury, Total	0.1	0.05	0.5	13
Nickel, Total	5	5	25	13
Nitrogen, Ammonia	0.05	0	0.53	87
Nitrogen, Ammonia Total (mg/L as N) (Hach)	0.085	0	0.54	12
Nitrogen, Kjeldahl	1.245	0.2	4.74	106
Nitrogen, Nitrate as N	2.285	0.05	4.69	62
Nitrogen, Nitrate/Nitrite as N	2.03	0.54	3.64	45
Nitrogen, Nitrite as N	0.09	0.05	0.62	62
Nitrogen, Organic	0.78	0.2	1.62	16
Ortho Phosphate, method 8048	0.06	0.01	0.24	11
Phosphorous, Ortho	0.0205	0	1.18	92
Phosphorous, Total	0.093	0	1.356	107
Selenium, Dissolved	19.3	0	43.7	27
Selenium, Total	23	10	51	42
Silver, Total	2	2	10	13
Solids, Settleable	0.1	0.1	0.75	20
Solids, Suspended	70	0	356	23
Solids, Total Dissolved	6397	2042	6940	43
Specific Conductance	9167	803.3	10565	102
Sulfate	1920	191	3680	107
TOT ALK FIELD CaCO3	157	58	2253	104
Thallium, Total	5.5	1	16	18
Turbidity	42	10	145	11
Turbidity, Field	47	4	1000	104
Zinc, Total	8	5	70	13

Site 2: Sandy Creek**OK311600-01-0040G**

	Median	Min	Max	N
Turbidity	16.7	3.73	280	29
Temperature	20.3	4.2	27.1	30
pH	7.8	6.76	9.17	29
Ammonia	0.0445	0.015	0.407	26
Chloride	4836.8	749.8	8993.8	26
Nitrate	1.145	0.02	3.06	26
Nitrite	0.02	0.02	1.26	24
Sulfate	2334.75	2.35	3519.8	26
Total Dissolved Solids	10227.5	1986	13482	26
Total Kjeldahl Nitrogen	0.615	0.11	1.63	26
Total Ortho-Phosphate	0.0115	0.005	0.26	26
Total Phosphorus	0.058	0.005	0.312	25
Total Suspended Solids	20	10	250	26
Flow	6.8445	2.734	46	24

Site 2: Sandy Creek**OK311600-01-0040G**

	Median	Min	Max	N
Dissolved Oxygen	10.33	5.84	14.49	21

Site 2: Sandy Creek**OK311600-01-0040G**

	Median	Min	Max	N
E Coli	220	10	860	13
Enterococcus	100	10	380	13

**Site 1: Sandy Creek, SH 6,
Eldorado**

	Median	Min	Max	N
Coliform, Fecal	380	10	6000	20
E. coli Quanti Tray	97	2	3448	20
Enterococci	250.5	10	37300	20

Flow Conditions: There are no gauging stations associated with this waterbody. OWRB has measured instantaneous flow on 54 occasions with a median value of 7.5 cfs. OCC has measured instantaneous flow on 24 occasions with a median value of 6.8 cfs.

Sources of Pollution:

facility_n	permit_num
HOLLIS WWT	OK0021547
HOLLIS WWT	OKG580015

Hydrologic Modifications: A visual assessment of topographical maps and aerial photographs indicate that there are no major hydrologic modifications in this watershed. This visual assessment also indicated that no major or significant land use changes have occurred in the last 20 years.

Physical Conditions in Stream:

Site 2

Habitat Assessments													
	Date	Instream Cover	Pool Bottom Substrate	Pool Variability	Canopy Cover Shading	Presence of Rocky Runs or Riffles	Flow	Channel Alteration	Channel Sinuosity	Bank Stability	Bank Vegetation Stability	Streamside Cover	Total Points
Sandy Creek	05/19/2004	1.9	0.4	19.1	5.5	0	17.3	13.7	0	7.7	5.3	10	80.9

Stream Name	Date	Max Depth (m)	Average Depth (m)
Site 2: Sandy Creek	05/19/2004	0.8	0.47

Measurements of in-stream cover fall within the ‘Poor’ category, indicating that there is less than 10% stable habitat. Assessment of pool bottom substrate falls within the ‘Poor’ category indicating 1 or fewer types of stable habitat are present with mud, loose sand and bedrock making up 81% to 100% of pool bottom. Sampling indicated that Sandy Creek’s pool variability was ‘Optimal’ represented by an even mix of deep and shallow pools. Canopy cover shading measurements scored borderline between ‘Poor’ and ‘Fair’ indicating a lack of canopy cover. Rocky runs and riffles had scored measurements falling in the ‘Poor’ category, indicating that these are rare or absent in this segment of the creek. The representative low flow at the time of measurement was categorized as ‘Optimal’ with a value between 5 and 20 cfs. Channel alteration of Sandy Creek is categorized as ‘Optimal’ indicating little or no enlargement of islands or point bars. The channel sinuosity can be categorized as ‘Poor’ indicating that the channel is almost straight. Measurements indicate that Sandy Creek has a bank stability categorized as ‘Fair’ indicating a moderate amount of bank erosion. The streamside cover measurement indicates that Sandy Creek has ‘Optimal’ levels of vegetation within 10ft of the water’s edge.

Biological Data:

Benthic Macroinvertebrate(BMI) Assessments

Site 2

Sitename	WBID	Sample Type	Winter or Summer	Total Species	EPT Taxa	Percent EPT	Shannon Diversity	HBI	Percent Dominant 2 Taxa	Total Points	% of Reference	Condition	Number of Samples
Sandy Creek	OK311600-01-0040G	rif	W	7	0.5	0.0052	0.7255	5.9650	0.9105	8	0.33	Moderately Impaired	2
		veg	S	6	0	0.0000	1.2940	7.3846	0.6838	10	0.36	Moderately Impaired	1
			W	5.5	0.5	0.0049	0.5142	6.1176	0.9354	8	0.36	Moderately Impaired	2
		wood	S	8	1	0.0374	1.6580	6.8131	0.6262	14	0.50	Moderately Impaired	1
W	4		0	0.0000	0.3660	6.0884	0.9510	6	0.27	Moderately Impaired	2		

Fish Assessments

Site 2

Total Specimen Count	Common Name	Species
105	Red shiner	<i>Cyprinella lutrensis</i>
100	Plains minnow	<i>Hybognathus placitus</i>
9	Speckled chub	<i>Machybopsis aestivalis</i>
73	Red River shiner	<i>Notropis bairdi</i>
66	Fathead minnow	<i>Pimephales promelas</i>
1	Freshwater drum	<i>Aplodinotus grunniens</i>

Watershed > 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	6	>23	12 to 22	<12	1
Shannon's Diversity based upon numbers	1.47	>2.50	2.49-1.50	<1.50	1
# of Sunfish Species	0	>3	2 to 3	<2	1
# of species comprising 75% of sample	3	>5	3 to 4	<3	3
Number of Intolerant Species (>100mi ² area)	1	>5	3 to 5	<3	1
Percentage of Tolerant Species	97.46	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					7
Percentage of Lithophils	0.00	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	354	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					18

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	OK311600-02-0060G	Turkey Ck	OK311600-02-0070C		Metric Score	Site Score	Reference Score
	Site Name	Beckham	Deer Ck: Greer Co.				
	County	4	3				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	6	9	13	11	54.5%	3	5
Number of Sensitive Benthic Species	2	1	1	1	200.0%	5	5
Number of Centrarchid species	0	3	4	4	0.0%	1	5
Number of Intol Species	1	1	1	1	100.0%	5	5
Proportion of Individuals as Tolerant	97.458	86	86	86	97.5	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	0.000	14	2	8	0.0	1	1
Proportion of Individuals as Lithophilic Spawners	0.000	0	12	6	0.0	1	1
TOTAL SCORES					17	23	
PROPORTION OF REFERENCE					74		
INTEGRITY CLASSIFICATION OF SITE					FAIR		

Based on the State-adopted biological assessment for fish, this site is Not Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 74% of reference, giving it an integrity classification of 'Fair'.

Recommendation:

There is currently not enough information indicating that there is a need to upgrade the beneficial use.

The OWRB recommends continued monitoring of this stream and recommends that Sandy Creek remain a HLAC and SBCR.

Sergeant Major (OK310840020140)
Re-evaluation

Sergeant Major (OK310840020140)

Description: Located in Roger Mills County, Sergeant Major Creek has been identified as a Habitat Limited Aquatic Community (HLAC) and as Secondary Body Contact Recreation (SBCR). The original reason for categorizing this stream as a Habitat Limited Fishery (HLF) or HLAC is physical conditions related to the natural features of the waterbody, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to [chemical] water quality, preclude attainment of aquatic life protection uses. The original reason for listing this stream as SBCR is that natural, ephemeral, intermittent, or low-flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservations requirements to enable uses to be met. Sergeant Major Creek is in the Central Great Plains ecoregion.

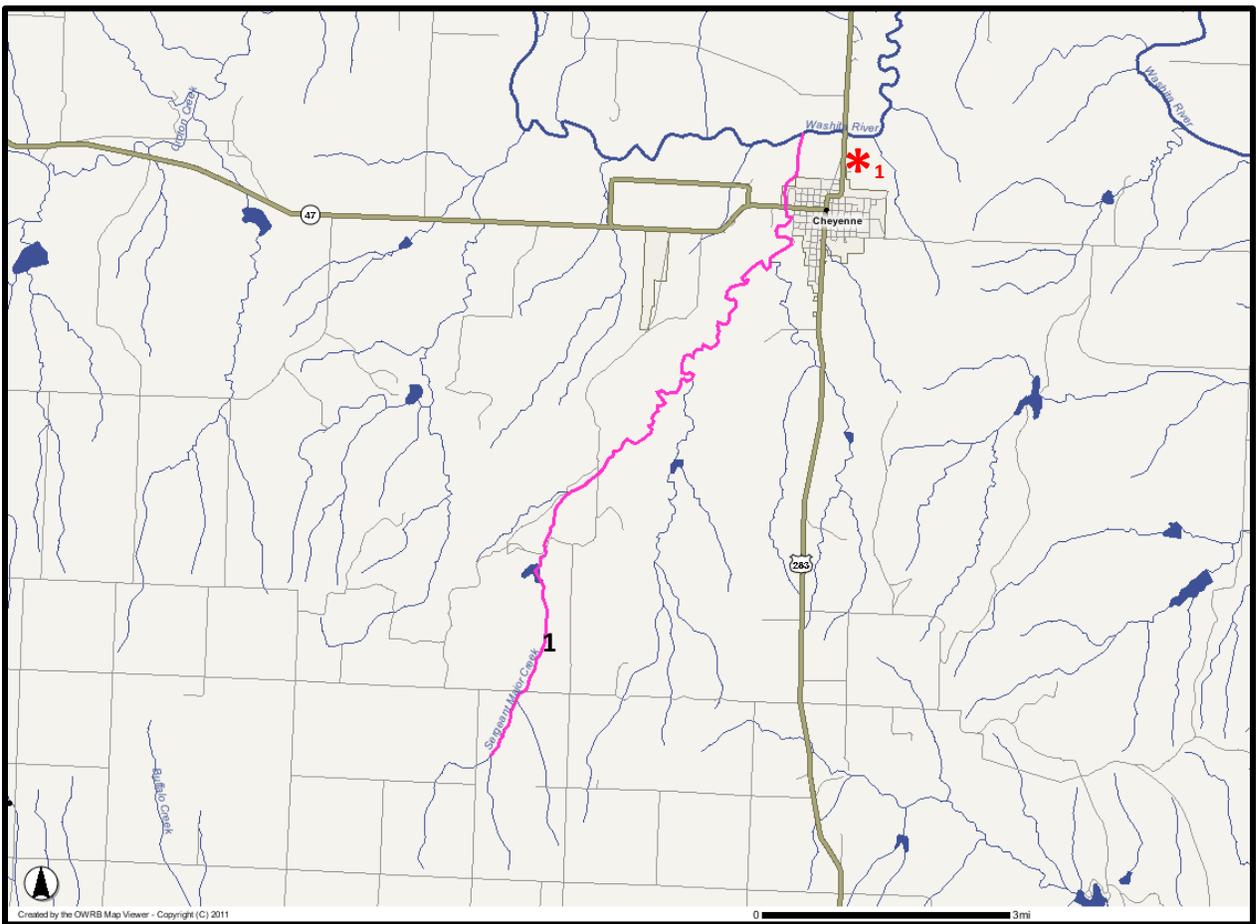


Figure 8. Approximate sample site locations and NPDES Discharges. Site 1 is the approximate location of the stream site sampled by OWRB. The location marked *1 is the approximate site of the Cheyenne waste water treatment plant discharge. The Cheyenne waste water treatment plant discharges to the Washita River, not Sergeant Major Creek.

Historical Descriptions: A Use Attainability Analysis (UAA) conducted in 1985 indicated that there was no flow above the wastewater treatment discharge. Substrate and water color were noted as being hindrances to Primary Body Contact Recreation attainment.

Water Chemistry: Water chemistry data not available.

Flow Conditions: There are no gauging stations associated with this waterbody.

Sources of Pollution: There are no longer any permitted discharges in the watershed.

Hydrologic Modifications: A visual assessment of topographical maps and aerial photographs indicate that there are no major hydrologic modifications in this watershed. This visual assessment also indicated that no major or significant land use changes have occurred in last 20 years. However, locally at the sampling site, beaver dams had created a small impoundment that had affected the hydrologic flow on a localized scale.

Physical Conditions in Stream: Habitat assessment data not available.

Biological Data:

Fish Assessment

Common Name	Taxon Name	Total Fish
Black bullhead	<i>Ameiurus melas</i>	20
Bluegill sunfish	<i>Lepomis macrochirus</i>	4
Central stoneroller	<i>Campostoma anomalum</i>	144
Green sunfish	<i>Lepomis cyanellus</i>	118
Mosquitofish	<i>Gambusia affinis</i>	37
Spotted bass	<i>Micropterus punctulatus</i>	6
Yellow bullhead	<i>Ameiurus natalis</i>	20

Watershed < 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	7	refer to fig 1	refer to fig1	refer to fig 1	3
Shannon's Diversity based upon numbers	1.42	>2.50	2.49-1.50	<1.50	1
# of Sunfish Species	3	>3	2 to 3	<2	3
# of species comprising 75% of sample	0	>5	3 to 4	<3	1
Number of Intolerant Species (<100mi ² area)	2	>5	3 to 5	<3	1
Percentage of Tolerant Species	57.02	fig 3	fig 3	fig 3	3
TOTAL SCORE FOR SAMPLE COMPOSITION					12
Percentage of Lithophils	42.98	>36	18 to 36	<18	5
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	349	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					15
TOTAL SCORE					27

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
		CK31800-02-0060G	CK31800-09-0070C				
	Site Name	Blue Beaver Ck	Deer Ck: Greer Co.				
	County	Comanche	Greer				
	Order	2	3				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	7	17	13	15	46.7%	3	5
Number of Sensitive Benthic Species	0	5	1	3	0.0%	1	5
Number of Centrarchid species	3	6	4	5	60.0%	3	5
Number of Intol Species	2	1	1	1	200.0%	5	5
Proportion of Individuals as Tolerant	57.020	21	86	53	57.0	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	41.261	23	2	13	41.3	3	1
Proportion of Individuals as Lithophilic Spawners	42.980	54	12	33	43.0	5	3
TOTAL SCORES						21	25
PROPORTION OF REFERENCE						84	
INTEGRITY CLASSIFICATION OF SITE						GOOD	

Based on the State-adopted biological assessment for fish, this site is Fully Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 84% of reference, giving it an integrity classification of ‘Good’.

Photos from Sergeant Major Creek obtained from OWRB sampling events





Sergeant Major Creek: From UAA file, photo taken near Cheyenne.



Recommendation:

There was not enough relevant information to upgrade the beneficial use on Sergeant Major Creek. This newer data does not represent the full stream segment due to the location within the watershed. The sampling location (which was a probabilistic sampling site) was not typical of the entire stream reach as this location was high in the watershed and heavily influenced by beaver dams and small downstream impoundment.

The OWRB recommends that Sergeant Major Creek remain a HLAC and SBCR.

Skeleton Creek (OK620910-03-0240E)
Re-evaluation

Skeleton Creek (OK620910-03-0240E)

Description: This segment of Skeleton Creek is located in Garfield County. The stream segment is designated as a Habitat Limited Aquatic Community (HLAC) and as Secondary Body Contact Recreation (SBCR). The original reason for categorizing as a Habitat Limited Fishery (HLF) or HLAC (from Bitter to Boggy Creek) is physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to [chemical] water quality, preclude attainment of aquatic life protection uses. The original reason for categorizing as SBCR (from Bitter to Boggy Creek) is that natural, ephemeral, intermittent, or low-flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservations requirements to enable uses to be met. This portion of Skeleton Creek is in the Central Great Plains ecoregion.

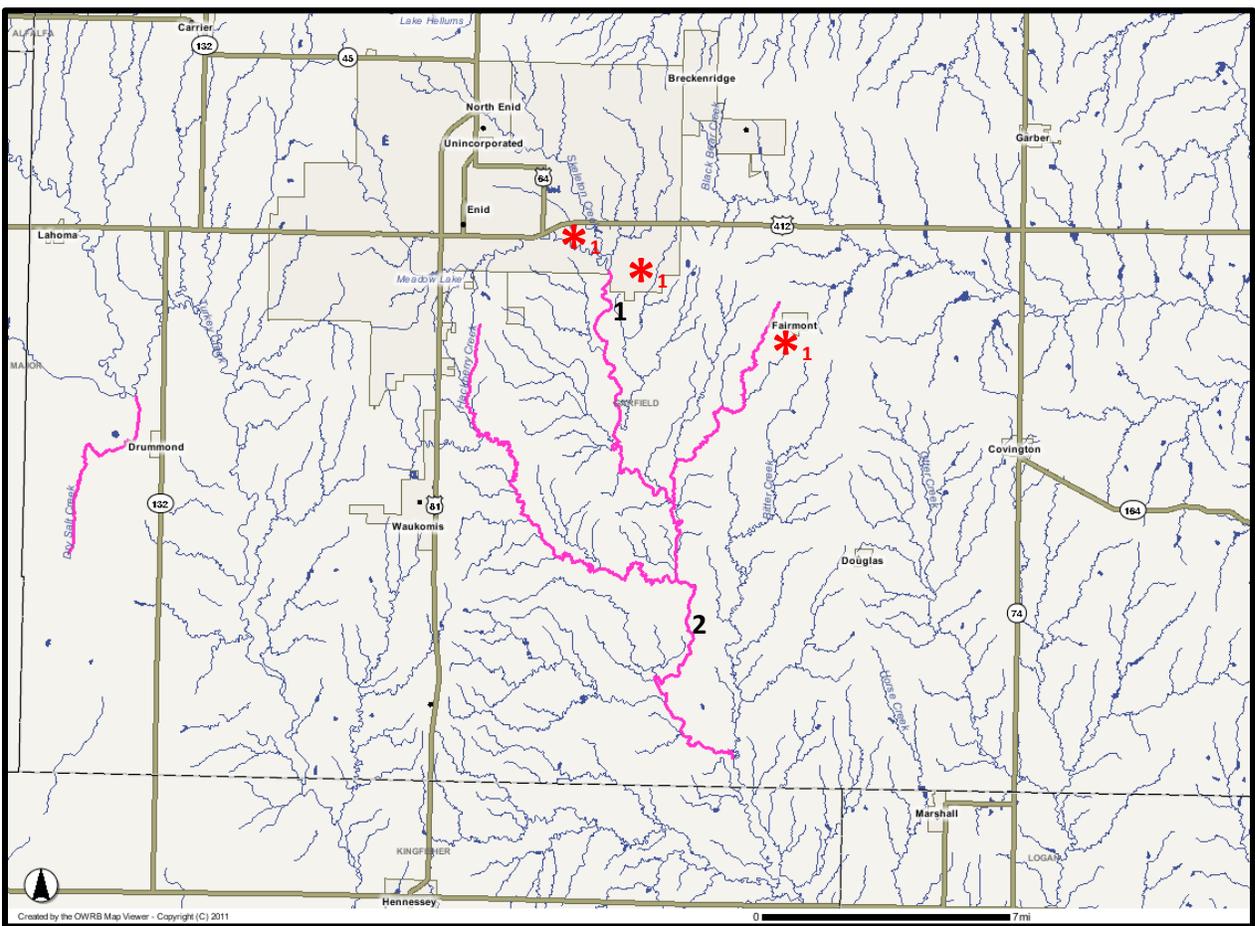


Figure 9. Approximate sample site locations and NPDES Discharges. Site 1 is the approximate location of the stream site sampled by OCC. Site 2 is the approximate location of the OWRB probabilistic site OKPB01-283. The location marked *1 is the approximate site of the Koch Nitrogen Enid facility discharge.

Historical Descriptions: A Use Attainability Analysis (UAA) conducted in 1982 found that the stream was very limited for fish. The analysis also indicated that recreational access was difficult. Average depths observed were 1 to 1.5 ft, with 1.5 ft being the maximum observed depth.

Water Chemistry: Water quality data was available for Salt Creek ranging from 2000 to 2002.

Site 1: Skeleton Creek

OK620910-03-0240E

	Median	Min	Max	N
Turbidity	5.39	1.23	144	21
Temperature	19.3	3.3	33	22
pH	8.39	7.02	9.05	21
Ammonia	0.31	0.01	2.531	20
Chloride	223	134.1	373.9	20
Nitrate	7.2	4.53	20.95	10
Nitrite	0.01	0.01	0.75	10
Sulfate	162	90.9	342.7	20
Total Kjeldahl Nitrogen	1.74	1.14	3.71	17
Total Ortho-Phosphate	1.025	0.093	2.546	20
Total Phosphorus	1.1825	0.481	2.76	20
Total Suspended Solids	12	1	124	20
Flow	10.4595	3.853	44.428	22

Site 1: Skeleton Creek

OK620910-03-0240E

	Median	Min	Max	N
E Coli	189	10	3169	11
Enterococcus	80	6	17000	11

Site 2

Station ID	OKPB01-283
Station Description	Skeleton Creek
Sample Date	08/07/2007
Arsenic, Total	10
Barium, Total	159
Benthic (Periphyton) Chlorophyll-a	400
Benthic (Periphyton) Pheophytin-a	857
COLIFORM, FECAL	310
Cadmium, Total	1
Calcium, Total	99
Chloride	288
Chromium, Total	5
Copper, Total	5
Corrected Chlorophyl A	20.39
DISS OXY SATURATION	83.2
DISSOLVED OXYGEN, analysis by probe	6.62
E. COLI QUANTI TRAY	160
ENTEROCOCCI	41
Hardness, Total (as CaCO3)	432
Iron, Total	728
Lead, Total	5
Magnesium, Total	39
Mercury, Total	0.05
Nickel, Total	5
Nitrogen, Ammonia	0.05
Nitrogen, Kjeldahl	1.19
Nitrogen, Nitrate as N	3.38
Nitrogen, Nitrite as N	0.09
PH (FIELD)	7.77
Pheophytin A	7.49
Phosphorous, Ortho	0.401
Phosphorous, Total	0.487
Potassium, Total	9.5
Selenium, Total	5
Silver, Total	2
Sodium, Total	271
Solids, Settleable	0.1
Solids, Suspended	22
Solids, Total Dissolved	1150
Specific Conductance	1911
Sulfate	258
TOT ALK FIELD CaCO3	317
Thallium, Total	10

Flow Conditions: There are no gauging stations associated with this waterbody.

Sources of Pollution: The following facilities are in the Skeleton Creek watershed, but do not necessarily discharge into the segment of the stream that is identified as HLAC and SBCR.

facility_n	permit_num
FAIRMONT WWT	OK0020273
WAUKOMIS WWT	OK0020648
KOCH NITROGEN ENID FACLT	OK0021024
ENID WWT	OK0021628
NORTH ENID WWT	OK0027880
DOLESE BROS ENID BATCH PLT	OK0042765
ADM GRAIN ELEVATOR Z	OK0043371
ADM GRAIN ELEVATOR B	OK0044580
DOLESE BROS ENID BATCH PLT	OKG110026
NORTH ENID WWT	OKG580002
PA BEC NUMBER 2	OKG830017

Hydrologic Modifications: A visual assessment of topographical maps and aerial photographs indicate that there are no major hydrologic modifications in this watershed. This visual assessment also indicated that no major or significant land use changes have occurred in the past 20 years.

Physical Conditions in Stream:

Site 1

Habitat Assessments													
	Date	Instream Cover	Pool Bottom Substrate	Pool Variability	Canopy Cover Shading	Presence of Rocky Runs or Riffles	Flow	Channel Alteration	Channel Sinuosity	Bank Stability	Bank Vegetation Stability	Streamside Cover	Total Points
Skeleton Creek	07/05/2000	3.3	4.9	0	5.3	4.1	17.1	15.1	0.8	6.4	4.7	4	65.7

Site 2

Stream Name	Date	Instream cover	Streambed/substrate Composition	Pool Variability	Canopy cover (shading)	Riffle/ROCKY run prevalence	Flow at representative level	Channel alteration	Channel sinuosity	Bank stability	Bank vegetative stability	Streamside cover	TOTAL SCORE
Skeleton Creek OKPB01-283	07/24/2007	3.8	17.5	9.5	5.0	0.2	20.0	9.3	0.9	5.2	9.9	9.5	90.7

Stream Name	Date	Max Depth (m)	Average Depth (m)
Site 1: Skeleton Creek	07/05/2000	0.4	0.18
Site 2: Skeleton Creek (OKPB01-283)	07/24/2007	1.4	0.4

Measurements of in-stream cover fall within the ‘Poor’ category, indicating that there is less than 10% stable habitat. Assessment of pool bottom substrate falls within the ‘Poor’ category indicating 1 or fewer types of stable habitat are present with mud, loose sand and bedrock making up 81% to 100% of pool bottom. Sampling indicated that Skeleton Creek’s pool variability was ‘Poor’ represented by the majority of pools being shallow or absent. Canopy cover shading measurements scored as ‘Fair’ indicating a dense canopy cover. Rocky runs and riffles had scored measurements falling in the ‘Poor’ category, indicating that these are rare or absent in this segment of the creek. The representative low flow at the time of measurement was categorized as ‘Optimal’ with a value between 5 and 20 cfs. Channel alteration of Skeleton Creek is categorized as ‘Optimal’ indicating little or no enlargement of islands or point bars. The channel sinuosity can be categorized as ‘Poor’ indicating that the channel is almost straight. Measurements indicate that Skeleton Creek has a bank stability categorized as ‘Adequate’ indicating that erosion is quite evident but not the dominant feature. The streamside cover measurement indicates that Skeleton Creek has ‘Fair’ levels of vegetation within 10ft of the water’s edge.

Biological Data:

Site 2

Common Name	Taxon Name	Total Fish
Bluegill sunfish	Lepomis macrochirus	1
Bullhead minnow	Pimephales vigilax	58
Channel catfish	Ictalurus punctatus	16
Common carp	Cyprinus carpio	13
Fathead minnow	Pimephales promelas	28
Flathead catfish	Pylodictis olivaris	4
Gizzard shad	Dorosoma cepedianum	11
Green sunfish	Lepomis cyanellus	72
Largemouth bass	Micropterus salmoides	2
Longear sunfish	Lepomis megalotis	15
Longnose gar	Lepisosteus osseus	3
Mosquitofish	Gambusia affinis	4
Orangespotted sunfish	Lepomis humilis	56
Red shiner	Cyprinella lutrensis	947
River carsucker	Carpodes carpio	11
Sand shiner	Notropis stramineus	66
Smallmouth buffalo	Ictiobus bubalus	3
Suckermouth minnow	Phenacobius mirabilis	51
Yellow bullhead	Ameiurus natalis	6

Watershed > 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	19	>23	12 to 22	<12	3
Shannon's Diversity based upon numbers	1.35	>2.50	2.49-1.50	<1.50	1
# of Sunfish Species	5	>3	2 to 3	<2	5
# of species comprising 75% of sample	3	>5	3 to 4	<3	3
Number of Intolerant Species (>100mi ² area)	1	>5	3 to 5	<3	1
Percentage of Tolerant Species	96.27	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					13
Percentage of Lithophils	0.00	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.001	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	1367	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					24

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Turkey Ck: Middle	Otter Ck		Metric Score	Site Score	Reference Score
	County	Garfield	Logan				
	Order	4	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	19	13	15	14	135.7%	5	5
Number of Sensitive Benthic Species	2	1	2	2	133.3%	5	5
Number of Centrarchid species	5	2	3	3	200.0%	5	5
Number of Intol Species	1	1	1	1	100.0%	5	5
Proportion of Individuals as Tolerant	96.269	64	91	77	96.3	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	3.731	38	8	23	3.7	1	3
Proportion of Individuals as Lithophilic Spawners	0.000	0	1	1	0.0	1	1
TOTAL SCORES						23	25
PROPORTION OF REFERENCE						92	
INTEGRITY CLASSIFICATION OF SITE						EXCELLENT	

Based on the State-adopted biological assessment for fish, this site is Fully Supporting for WWAC. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 92% of reference, giving it an integrity classification of 'Excellent'.

Recommendation: There is not enough information available indicating the designated use needs to be upgraded. The biological data collected at the downstream site (Site 2) indicates a good fish community. The upstream site has poorer habitat than the downstream station. It seems that the stream management segments may need to be further studied and possibly re-assigned.

More information is needed to determine accurately categorize this waterbody. The OWRB recommends continued sampling of this stream segment and we recommend that this segment of Skeleton Creek remain a HLAC and SBCR.

Stillwater Creek (OK620900-04-0070)
Re-evaluation

Stillwater Creek (OK620900-04-0070)

Description: This segment of Stillwater Creek is located in Payne County. The stream segment is designated as an Emergency Water Supply (EWS), a Habitat Limited Aquatic Community (HLAC) and as Secondary Body Contact Recreation (SBCR). The original reason for categorizing as a Habitat Limited Fishery (HLF) or HLAC (from Lake Carl Blackwell to Little Stillwater) is that hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the waterbody to its original condition or to operate such modification in a way that would result in the attainment of the use; and (from little Stillwater to Cimarron) natural, ephemeral, intermittent, or low-flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservations requirements to enable uses to be met. The original reason for categorizing as SBCR is that was physical conditions related to natural features of the waterbody, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to [chemical] water quality, preclude attainment of aquatic life protection uses. Stillwater Creek is in the Central Great Plains ecoregion.

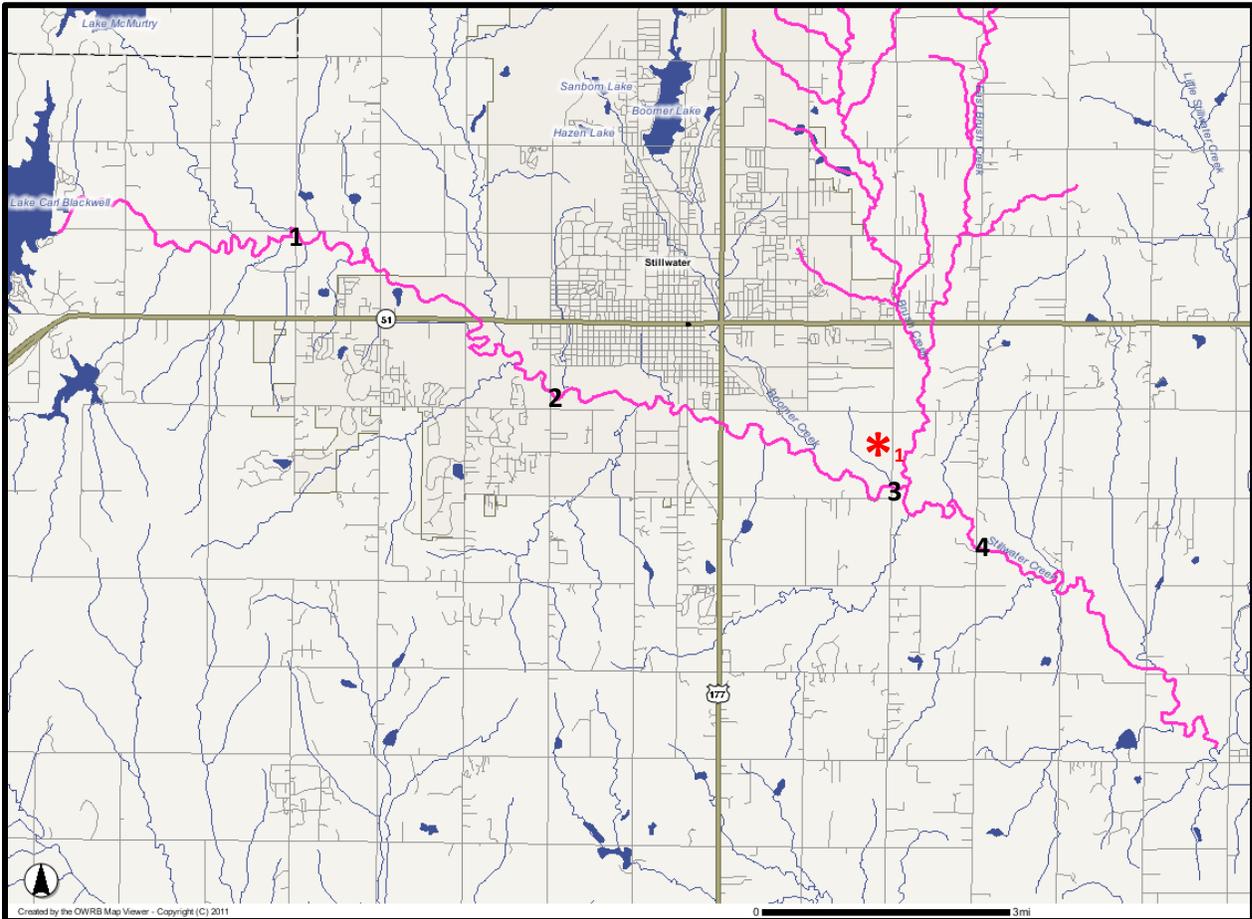


Figure 10. Approximate sample site locations and NPDES Discharge. Site 1 is the approximate location of Stillwater Creek (Upper). Site 2 is the approximate location of Stillwater Creek (Babcock Park). The location marked *1 is the approximate site of the Stillwater waste water treatment plant discharge.

Historical Descriptions: A Use Attainability Assessment (UAA), finalized in 1985, found that there were pollution-tolerant fish and benthic macroinvertebrates both above and below the Stillwater wastewater treatment plant (WWTP). Upstream of the WWTP, the habitat was very poor. Downstream of WWTP, the habitat was much better due to the increase of flow. Upstream sites did not have enough depth for immersion, while downstream of the WWTP there were depths of up to 4 ft.

Water Chemistry: Water quality data was available for Salt Creek ranging from 2002 to 2009.

Site 1: Stillwater Creek: Upper

OK620900-04-0070T

	Median	Min	Max	N
Turbidity	31.4	4.59	297	65
Temperature	18.6	0.1	29.6	67
pH	7.655	7.03	8.3	64
Ammonia	0.0165	0.015	0.635	64
Chloride	32.15	12.6	157.4	64
Nitrate	0.18	0.02	1.76	64
Nitrite	0.02	0.01	0.24	64
Sulfate	27.3	12.3	306	64
Total Dissolved Solids	297	108	796	64
Total Kjeldahl Nitrogen	0.39	0.11	1.541	64
Total Ortho-Phosphate	0.044	0.005	0.571	64
Total Phosphorus	0.11	0.029	0.382	63
Total Suspended Solids	24.5	10	274	64
Flow	0.783	0	195.658	55

Site 3: Stillwater Creek: Mid 1

OK620900-04-0070J

	Median	Min	Max	N
Turbidity	65.8	40.6	176	3
Temperature	24.2	23.4	24.2	3
pH	7.44	7.35	7.49	3
Ammonia	0.05	0.043	0.104	3
Chloride	88.2	39.4	111.4	3
Nitrate	2.23	0.76	9.23	3
Nitrite	0.02	0.02	0.07	3
Sulfate	46.8	23.8	58.4	3
Total Dissolved Solids	348	127	463	3
Total Kjeldahl Nitrogen	0.62	0.11	1.1	3
Total Ortho-Phosphate	0.151	0.084	1.598	3
Total Phosphorus	0.182	0.096	1.668	3
Total Suspended Solids	29	17	50	3
Flow	1.844	0.915	11.83	3

Site 4: Stillwater Creek: Mid 2**OK620900-04-0070H**

	Median	Min	Max	N
Turbidity	37.8	25.3	89.3	3
Temperature	25	24.3	25.3	3
pH	7.4	7.28	7.5	3
Ammonia	0.068	0.055	0.093	3
Chloride	186.8	21.1	187.6	3
Nitrate	14.6	0.42	15.05	3
Nitrite	0.02	0.02	0.08	3
Sulfate	75.2	19.2	80.4	3
Total Dissolved Solids	547	249	624	3
Total Kjeldahl Nitrogen	0.72	0.63	1.15	3
Total Ortho-Phosphate	2.123	0.158	2.524	3
Total Phosphorus	2.156	0.28	2.803	3
Total Suspended Solids	31	26	35	3
Flow	10.159	4.725	26.778	3

Site 1: Stillwater Creek: Upper**OK620900-04-0070T**

	Median	Min	Max	N
E Coli	140	10	770	38
Enterococcus	285	<20	1750	38

**Site 1: Stillwater Creek:
Upper****OK620900-04-0070T**

	Median	Min	Max	N
Dissolved Oxygen	6.145	0.93	16.05	44

**Site 3: Stillwater Creek:
Mid 1****OK620900-04-0070J**

	Median	Min	Max	N
E Coli	440	50	640	3
Enterococcus	220	95	690	3

**Site 4: Stillwater Creek:
Mid 2****OK620900-04-0070H**

	Median	Min	Max	N
E Coli	330	85	420	3
Enterococcus	160	90	470	3

Flow Conditions: There are no gauging stations associated with this waterbody. The current designed flow for the Stillwater wastewater treatment plant is 10.0 MG per day. In 1982, the designed flow for the Stillwater wastewater treatment plant was reported to be 6.29 MGD with an actual discharge of 2.862 MGD.

Sources of Pollution:

facility_n	permit_num
DOLESE BROS STILLWATER BATCH PLT	OK0001449
DOLESE BROS STILLWATER BATCH PLT	OK0001449
CITY OF STILLWATER STILLWATER UTILITY BOOMER LAKE	OK0022586
STILLWATER WWT	OK0027057
DOLESE BROS STILLWATER NUMBER 2 BATCH PLT	OK0042668
DOLESE BROS STILLWATER BATCH PLT	OKG110013
OKLA STATE UNIV	OKG380002
FINA OIL AND CHEMICAL	OKG830013

Hydrologic Modifications: A visual assessment of topographical maps and aerial photographs indicate that hydrologic modifications in this watershed have occurred due to the creation of Lake Carl Blackwell. This visual assessment also indicated that there have been no major land use changes in the past 20 years; however there has been a small degree of urbanization in the Stillwater area.

Physical Conditions in Stream:

Habitat Assessments														
	Date	Instream Cover	Pool Bottom Substrate	Pool Variability	Canopy Cover Shading	Presence of Rocky Runs or Riffles	Flow	Channel Alteration	Channel Sinuosity	Bank Stability	Bank Vegetation Stability	Streamside Cover	Total Points	
Stillwater Creek: Upper	07/10/2008	10.8	1.1	14.6	19.3	0	19.2	3.5	4.7	8.1	3.8	9.3	94.4	
Stillwater Creek: Babcock Park	08/18/2005	15.6	0.9	13.2	19.3	0	12.9	0.5	2.4	3.6	2.4	10	80.8	
Stillwater Creek: Upper	07/30/2002	4.9	1	15.7	19.8	0	17.7	15.1	2.4	7.2	2.7	8.7	95.2	

Stream Name	Date	Max Depth (m)	Average Depth (m)
Site 1: Stillwater Creek : Upper	07/10/2008	1.5	0.69
Site 2: Stillwater Creek: Babcock Park	08/18/2005	1.0	0.40
Site 1: Stillwater Creek: Upper	07/30/2002	1.1	0.43

Measurements of in-stream cover fall within the ‘Poor’, ‘Fair’, and ‘Adequate’ categories, indicating that there is a mix of stable habitat among these stream reaches. The assessments of pool bottom substrate all fall within the ‘Poor’ category indicated that there are 1 or less types of stable habitat present. All sampling events indicated that the pool variability was ‘Adequate’ indicating that a majority of the pools were large and deep with very few being shallow. The sampled areas on Stillwater Creek had canopy cover shading resulting in scores within the ‘Optimal’ range. There was a lack of rocky runs or riffles with scored measurements falling in the ‘poor’ category. The representative low flow at the times of measurement can be categorized as ‘Optimal’ with values between 5 and 20 cfs. Channel alteration on Stillwater Creek was categorized as ‘Optimal’ in the upstream site and categorized as ‘Poor’ in the other site and other sampling event. The channel sinuosity can be categorized as ‘Fair’ to ‘Poor.’ Bank stability measurements in the downstream sampled site scored as ‘Fair’ indicating a moderate amount of bank erosion while the upstream sampled sites scored as ‘Optimal’ indicating that bank erosion was absent or frequent. The streamside cover measurements indicate that Stillwater Creek has ‘Adequate’ to ‘Optimal’ levels of vegetation within 10ft of the water’s edge.

Biological Data:

Benthic Macroinvertebrate (BMI) Assessments

Site 1

Sitename	WBID	Sample Type	Winter or Summer	Total Species	EPT Taxa	Percent EPT	Shannon Diversity	HBI	Percent Dominant 2 Taxa	Total Points	% of Reference	Condition	Number of Samples
Stillwater Creek: Upper	OK620900-04-0070T	riffle	S	12	4	0.42	1.6	5.5	0.72	16	0.57	Slightly Impaired	1
		riffle	W	13	4	0.48	2	5.39	0.51	26	1.08	Non Impaired	1
		woody	S	7	4	0.51	1.65	5.45	0.56	16	0.57	Slightly Impaired	2
		woody	W	15	4	0.6	1.94	5	0.54	22	1	Non Impaired	1

Fish Assessments

Site 1: Stillwater Creek (Upper) 7-10-08

Total Specimen Count	Common Name	Species
3	Yellow bullhead	<i>Ameiurus natalis</i>
2	Channel catfish	<i>Ictalurus punctatus</i>
3	Flathead catfish	<i>Pylodictis olivaris</i>
5	Mosquitofish	<i>Gambusia affinis</i>
53	Green sunfish	<i>Lepomis cyanellus</i>
3	Bluegill sunfish	<i>Lepomis macrochirus</i>
3	Longear sunfish	<i>Lepomis megalotis</i>
1	Black crappie	<i>Pomoxis nigromaculatus</i>
2	Freshwater drum	<i>Aplodinotus grunniens</i>
1	Unidentified bass spp.	<i>Unidentified Morone spp.</i>

Watershed > 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	10	>23	12 to 22	<12	1
Shannon's Diversity based upon numbers	1.25	>2.50	2.49-1.50	<1.50	1
# of Sunfish Species	4	>3	2 to 3	<2	5
# of species comprising 75% of sample	2	>5	3 to 4	<3	1
Number of Intolerant Species (>100mi ² area)	0	>5	3 to 5	<3	1
Percentage of Tolerant Species	100.00	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					9
Percentage of Lithophils	0.00	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	76	>200	75 to 200	<75	3
TOTAL SCORE FOR FISH CONDITION					9
TOTAL SCORE					18

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Clear Ck	Sand Ck		Metric Score	Site Score	Reference Score
	County	Osage	Osage				
	Order	3	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	10	19	22	21	48.8%	3	5
Number of Sensitive Benthic Species	0	5	6	6	0.0%	1	5
Number of Centrarchid species	4	8	8	8	50.0%	3	5
Number of Intol Species	0	1	4	3	0.0%	1	5
Proportion of Individuals as Tolerant	100.000	25	43	34	100.0	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	0.000	1	14	8	0.0	1	1
Proportion of Individuals as Lithophilic Spawners	0.000	68	27	47	0.0	1	5
TOTAL SCORES						11	27
PROPORTION OF REFERENCE						41	
INTEGRITY CLASSIFICATION OF SITE						VERY POOR	

Based on the State-adopted biological assessment for fish, this site is Not Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 41% of reference, giving it an integrity classification of 'Very Poor'.

Site 1: Stillwater Creek (Upper) 7-30-02

Total Specimen Count	Common Name	Species
1	Shortnose gar	<i>Lepisosteus platostomus</i>
1	Central stoneroller	<i>Camptostoma anomalum</i>
79	Red shiner	<i>Cyprinella lutrensis</i>
3	Common carp	<i>Cyprinus carpio</i>
2	Golden shiner	<i>Notemigonus crysoleucas</i>
1	Suckermouth minnow	<i>Phenacobius mirabilis</i>
31	Bullhead minnow	<i>Pimephales vigilax</i>
1	River carpsucker	<i>Carpionodes carpio</i>
12	Black bullhead	<i>Ameiurus melas</i>
6	Yellow bullhead	<i>Ameiurus natalis</i>
1	Channel catfish	<i>Ictalurus punctatus</i>
1	Flathead catfish	<i>Pylodictis olivaris</i>
59	Mosquitofish	<i>Gambusia affinis</i>
27	Green sunfish	<i>Lepomis cyanellus</i>
24	Bluegill sunfish	<i>Lepomis macrochirus</i>
54	Longear sunfish	<i>Lepomis megalotis</i>
7	Largemouth bass	<i>Micropterus salmoides</i>
2	White crappie	<i>Pomoxis annularis</i>
1	Hybrid, redear x bluegill sunfish	Unidentified <i>Lepomis</i> hybrid

Watershed < 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	19	refer to fig 1	refer to fig1	refer to fig 1	3
Shannon's Diversity based upon numbers	2.13	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	6	>3	2 to 3	<2	5
# of species comprising 75% of sample	5	>5	3 to 4	<3	5
Number of Intolerant Species (<100mi ² area)	2	>5	3 to 5	<3	1
Percentage of Tolerant Species	99.36	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					17
Percentage of Lithophils	0.32	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	313	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					28

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Clear Ck	Sand Ck		Metric Score	Site Score	Reference Score
	County	Osage	Osage				
	Order	3	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	19	19	22	21	92.7%	5	5
Number of Sensitive Benthic Species	1	5	6	6	18.2%	1	5
Number of Centrarchid species	6	8	8	8	75.0%	5	5
Number of Intol Species	2	1	4	3	80.0%	5	5
Proportion of Individuals as Tolerant	99.361	25	43	34	99.4	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	0.639	1	14	8	0.6	1	1
Proportion of Individuals as Lithophilic Spawners	0.319	68	27	47	0.3	1	5
TOTAL SCORES						19	27
PROPORTION OF REFERENCE						70	
INTEGRITY CLASSIFICATION OF SITE						FAIR	

Based on the State-adopted biological assessment for fish, this site is Fully Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 70% of reference, giving it an integrity classification of 'Fair'.

Site 2: Stillwater Creek (Babcock Park) 8-18-05 [sampled by Blue Thumb]

Total Specimen Count	Common Name	Species
	3	Gizzard shad
1	Central stoneroller	<i>Camptostoma anomalum</i>
20	Red shiner	<i>Cyprinella lutrensis</i>
2	Emerald shiner	<i>Notropis atherinoides</i>
1	Sand shiner	<i>Notropis stramineus</i>
8	Suckermouth minnow	<i>Phenacobius mirabilis</i>
13	Bullhead minnow	<i>Pimephales vigilax</i>
5	Yellow bullhead	<i>Ameiurus natalis</i>
2	Channel catfish	<i>Ictalurus punctatus</i>
13	Mosquitofish	<i>Gambusia affinis</i>
15	Green sunfish	<i>Lepomis cyanellus</i>
28	Bluegill sunfish	<i>Lepomis macrochirus</i>
19	Longear sunfish	<i>Lepomis megalotis</i>
1	Redear sunfish	<i>Lepomis microlophus</i>
1	Largemouth bass	<i>Micropterus salmoides</i>
1	White crappie	<i>Pomoxis annularis</i>
2	Logperch	<i>Percina caprodes</i>
30	Unidentified sunfish spp	<i>Unidentified Lepomis spp.</i>

Metric	Value	Scoring			Score
		5	3	1	
Watershed > 100 square miles					
Total # of Species	18	>23	12 to 22	<12	3
Shannon's Diversity based upon numbers	2.37	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	7	>3	2 to 3	<2	5
# of species comprising 75% of sample	6	>5	3 to 4	<3	5
Number of Intolerant Species (>100mi ² area)	4	>5	3 to 5	<3	3
Percentage of Tolerant Species	75.15	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					19
Percentage of Lithophils	0.61	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	165	>200	75 to 200	<75	3
TOTAL SCORE FOR FISH CONDITION					9
TOTAL SCORE					28

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Clear Ck	Sand Ck		Metric Score	Site Score	Reference Score
	County	Osage	Osage				
	Order	3	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	18	19	22	21	87.8%	5	5
Number of Sensitive Benthic Species	3	5	6	6	54.5%	3	5
Number of Centrarchid species	7	8	8	8	87.5%	5	5
Number of Intol Species	4	1	4	3	160.0%	5	5
Proportion of Individuals as Tolerant	75.152	25	43	34	75.2	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	6.667	1	14	8	6.7	1	1
Proportion of Individuals as Lithophilic Spawners	0.606	68	27	47	0.6	1	5
TOTAL SCORES						21	27
PROPORTION OF REFERENCE						78	
INTEGRITY CLASSIFICATION OF SITE						GOOD	

Based on the State-adopted biological assessment for fish, this site is Fully Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 78% of reference, giving it an integrity classification of 'Good'.

Recommendation:

Due to variable fish assessment scores as well as a lack of biological data downstream of the WWTP, the OWRB recommends that monitoring of Stillwater Creek continue. In order to fill data gaps, the OWRB also recommends that targeted biological monitoring be conducted downstream of the WWTP.

The OWRB recommends that Stillwater Creek remain a HLAC and SBCR.

Tar Creek (OK121600-04-0060)
Re-evaluation

Tar Creek (OK121600-04-0060)

Description: Tar Creek is located in Ottawa County and has been identified as a Habitat Limited Aquatic Community (HLAC) and as Secondary Body Contact Recreation (SBCR). The original reason for listing as Tar Creek as a Habitat Limited Fishery (HLF) or HLAC is that hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use. The original reason for listing as Tar Creek as SBCR is that natural, ephemeral, intermittent, or low-flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservations requirements to enable uses to be met. Tar Creek is in the Central Irregular Plains ecoregion.

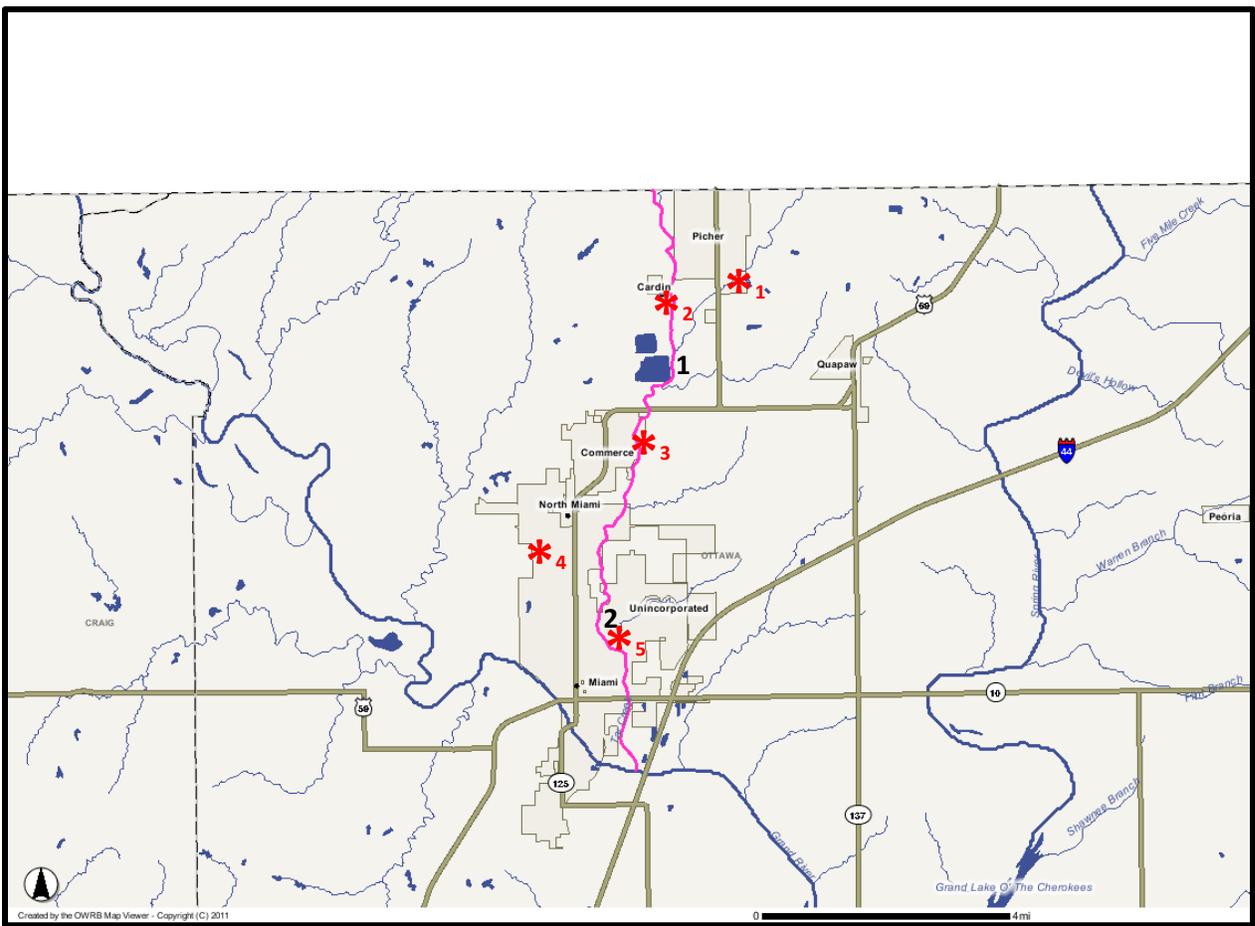


Figure 11. Approximate sample site locations and NPDES Discharges. Site 1 and 2 are the approximate locations of stream sites sampled by the Oklahoma Conservation Commission. The location marked *1 is the approximate site of the Picher waste water treatment plant discharge. The location marked *2 is the approximate site of the Cardin waste water treatment plant discharge. The location marked *3 is the approximate site of the Commerce waste water treatment plant discharge. The location marked *4 is the approximate site of the Blitz USA facility. The location marked *5 is the approximate site of the Miami North waste water treatment plant discharge.

Historical Descriptions: This stream has had major impacts from lead and zinc mining. The stream drains the Tar Creek Superfund site.

Tar Creek site description:

The Tar Creek Superfund Site is a 40-square mile former lead and zinc mining area. Located in northeastern Oklahoma, the site is part of a larger area known as the Tri-State Mining District. This 2,500-square-mile District in parts of Missouri, Kansas and Oklahoma once ranked as one of the world's largest producers of lead and zinc. The Tar Creek site includes the five towns of Picher, Cardin, Quapaw, Commerce and North Miami, as well as other areas within Ottawa County. A significant amount of land at the site is allotted Indian Land.

Underground mining for lead and zinc by the room-and-pillar method began in 1891 and lasted through early 1970. As water filled the mines, the native sulfide minerals dissolved creating acid mine water. Acid mine drainage containing high concentrations of heavy metals began discharging into Tar Creek in 1979 from natural springs, boreholes, and open mine shafts. It is estimated that seventy six thousand (76,000) acre-feet of shallow ground water is contaminated, approximately 75 million tons of mining waste piles (known as "chat") remain on the surface of the ground, and flotation ponds (wet or dry ponds containing mine tailings) cover approximately 800 acres. The chat contains heavy metal pollutants, such as lead, cadmium, and zinc. The principal groundwater-bearing units within the Site are the Mississippian Boone Formation and the Cambro-Ordovician Roubidoux Formation. The headwaters of Tar Creek are located in Cherokee County, Kansas; the creek flows southward through the Site and into the Neosho River. Lytle Creek is a major tributary of Tar Creek. The headwaters of Beaver Creek are located north of Quapaw; the creek flows through the Quapaw powwow grounds and into the Spring River. Tar Creek and Beaver Creek are impacted by contaminated mine drainage, and the entire site is located within the watershed of Grand Lake O' The Cherokees. Water impairments include surface water degradation by the discharge of acid mine water, and the threat of contamination of the Roubidoux Aquifer – the regional water supply – by downward migration of acid mine water from the overlying Boone Aquifer through abandoned wells connecting the two.

Water Chemistry: Water quality data was available for Salt Creek ranging from 2001 to 2008.

Site 1: Tar Creek

OK121600-04-0060D

	Median	Min	Max	N
Turbidity	7.3	1.22	295	40
Temperature	15.5	1.2	28	41
pH	7.33	6.35	10.67	39
Ammonia	0.1	0.015	0.535	38
Chloride	34.4	6	118.8	39
Nitrate	0.67	0.17	4.08	39
Nitrite	0.02	0.01	0.12	39
Sulfate	596.8	70.1	1055.9	39
Total Dissolved Solids	1154	215.5	1980	39
Total Kjeldahl Nitrogen	0.469	0.11	1.986	38
Total Ortho-Phosphate	0.066	0.018	0.662	38
Total Phosphorus	0.113	0.026	0.864	37
Total Suspended Solids	10	7	230	39
Flow	4.454	0	152.831	37

Site 1: Tar Creek

OK121600-04-0060D

	Median	Min	Max	N
Dissolved Oxygen	9.38	3.62	12.76	20

Site 1: Tar Creek

OK121600-04-0060D

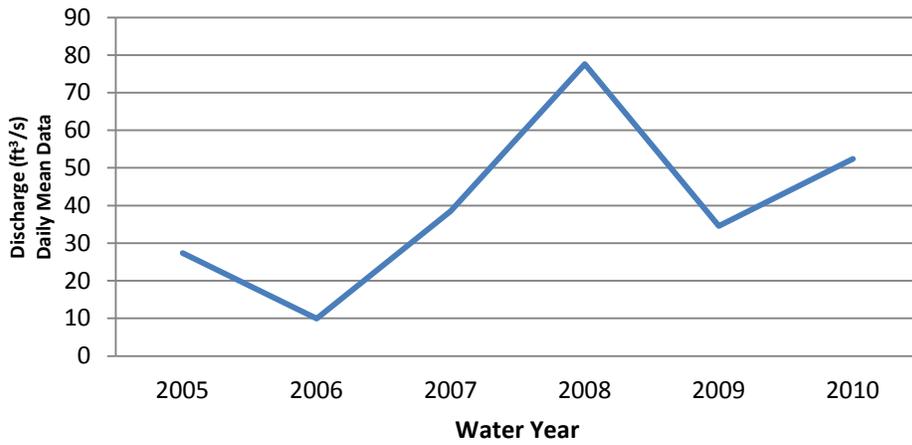
	Median	Min	Max	N
E Coli	480	10	7600	20
Enterococcus	197.5	5	>10000	20

Flow Conditions:

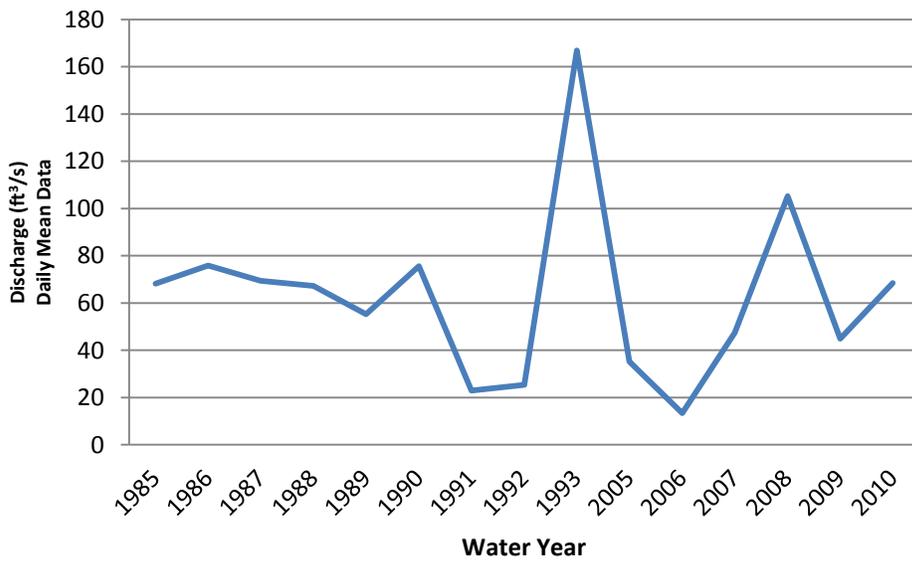
Tar Creek @ Commerce	
Water Year	Discharge (ft3/s)
2005	27.4
2006	9.94
2007	38.5
2008	77.6
2009	34.6
2010	52.4

Tar Creek @ Miami	
Water Year	Discharge (ft3/s)
1985	68.2
1986	75.9
1987	69.4
1988	67.2
1989	55.2
1990	75.6
1991	22.9
1992	25.4
1993	166.9
2005	35.2
2006	13.4
2007	47.4
2008	105.2
2009	44.9
2010	68.5

Tar Creek @ Commerce



Tar Creek @ Miami



Sources of Pollution:

facility_n	permit_num
COMMERCE LAGOON	OK0020320
MIAMI NORTH WWT	OK0031801
PICHER WWT	OK0032263
CARDIN SPECIAL UTILITIES WWT	OK0038962
BLITZ USA	OK0042285
BLITZ USA	OK0042285

Hydrologic Modifications: A visual assessment of topographical maps and aerial photographs indicate that there are no major hydrologic modifications in this watershed. This visual assessment also indicated that no major or significant land use changes have occurred in the last 20 years. It is also to be noted that the populations in certain parts of this watershed have been relocated due to the environmental effects associated with the EPA Superfund site, therefore it would be expected that the municipal wastewater treatment plants will continue to have a reduction, or possibly elimination, of flow.

Physical Conditions in Stream:

Habitat Assessments													
	Date	Instream Cover	Pool Bottom Substrate	Pool Variability	Canopy Cover Shading	Presence of Rocky Runs or Riffles	Flow	Channel Alteration	Channel Sinuosity	Bank Stability	Bank Vegetation Stability	Streamside Cover	Total Points
Tar Creek	08/07/2001	7.8	2.2	2	16.2	2.2	8	16.5	0	10	6.2	6	77
Tar Creek	8/1/2006	1.9	2.2	0	19.8	0	5.6	15.1	0.5	9.2	6.3	10	70.6
Tar Creek: H Street N.E.	8/7/2008	1.9	2.2	0	19.8	0	5.6	15.1	0.5	9.2	6.3	10	70.6

Stream Name	Date	Max Depth (m)	Average Depth (m)
Site 1: Tar Creek	08/07/2001	0.6	0.21
Site 1: Tar Creek	08/01/2006	0.4	0.13
Site 2: Tar Creek: H Street N.E.	08/07/2008	1.1	0.48

Two measurements of in-stream cover fall within the ‘Poor’ category while one measurement fell within the ‘Fair’ category. Assessments of pool bottom substrate all fall within the ‘Poor’ category indicating 1 or less types of stable habitat being present. Sampling indicated that the Tar Creek’s pool variability was ‘Poor’ represented by a majority of pools being shallow or absent. Canopy cover shading measurements scored in the ‘Optimal’ range indicating that there is a mixture of conditions where some areas of water surface are fully shaded, some fully exposed and others receiving various degrees of filtered light. There

was is a lack of rocky runs or riffles resulting in all scored measurements falling in the 'Poor' category. The representative low flows at the times of measurements were categorized as 'Fair' with values from about 1 to 2 cfs. Channel alteration on Tar Creek is categorized as 'Optimal' with little or no enlargement of islands or point bars. The channel sinuosity can be categorized as 'Poor' indicating that the channel is almost straight. Measurements indicate that Tar Creek has bank stability categorized as 'Optimal' with bank erosion being absent or infrequent. The streamside cover measurements indicate that Tar Creek has 'Adequate' to 'Optimal' levels of vegetation within 10ft of the water's edge.

Biological Data:

Benthic Macroinvertebrate (BMI) Assessments

Site 1

Sitename	WBID	Sample Type	Winter or Summer	Total Species	EPT Taxa	Percent EPT	Shannon Diversity	HBI	Percent Dominant 2 Taxa	Total Points	% of Reference	Condition	Number of Samples
Tar Creek	OK121600-04-0060D	rifle	S	11	2.5	0.52	1.34	6.11	0.75	14	0.54	Slightly Impaired	2
		rifle	W	12	1	0.25	1.89	4.02	0.51	16	0.68	Slightly Impaired	1

Fish Assessments

Site 1: Tar Creek 8-7-01

Total Specimen Count	Common Name	Species
2	Gizzard shad	<i>Dorosoma cepedianum</i>
5	Central stoneroller	<i>Campostoma anomalum</i>
19	Red shiner	<i>Cyprinella lutrensis</i>
14	Redfin shiner	<i>Lythrurus umbratilis</i>
2	Golden shiner	<i>Notemigonus crysoleucas</i>
1	Smallmouth buffalo	<i>Ictiobus bubalus</i>
1	Yellow bullhead	<i>Ameiurus natalis</i>
4	Channel catfish	<i>Ictalurus punctatus</i>
13	Blackstripe topminnow	<i>Fundulus notatus</i>
25	Mosquitofish	<i>Gambusia affinis</i>
10	Brook silverside	<i>Labidesthes sicculus</i>
40	Green sunfish	<i>Lepomis cyanellus</i>
1	Warmouth sunfish	<i>Lepomis gulosus</i>
2	Orangespotted sunfish	<i>Lepomis humilis</i>
11	Bluegill sunfish	<i>Lepomis macrochirus</i>
10	Largemouth bass	<i>Micropterus salmoides</i>

Watershed < 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	16	refer to fig 1	refer to fig1	refer to fig 1	3
Shannon's Diversity based upon numbers	2.30	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	5	>3	2 to 3	<2	5
# of species comprising 75% of sample	6	>5	3 to 4	<3	3
Number of Intolerant Species (<100mi ² area)	4	>5	3 to 5	<3	3
Percentage of Tolerant Species	73.75	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					17
Percentage of Lithophils	3.13	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	160	>200	75 to 200	<75	3
TOTAL SCORE FOR FISH CONDITION					9
TOTAL SCORE					26

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING			
	Site Name	Big Ck	Cloud Ck		Composite Reference Value	Metric Score	Site Score	Reference Score
	County	Nowata	Muskogee					
	Order	4	4					
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score	
Total # of Species	16	29	28	29	56.1%	3	5	
Number of Sensitive Benthic Species	1	7	6	7	15.4%	1	5	
Number of Centrarchid species	5	7	9	8	62.5%	3	5	
Number of Intol Species	4	4	4	4	100.0%	5	5	
Proportion of Individuals as Tolerant	73.750	27	83	55	73.8	1	1	
Proportion of Individuals as Insectivorous Cyprinid Species	3.125	6	2	4	3.1	1	1	
Proportion of Individuals as Lithophilic Spawners	3.125	39	8	23	3.1	1	3	
TOTAL SCORES						15	25	
PROPORTION OF REFERENCE						60		
INTEGRITY CLASSIFICATION OF SITE						POOR		

Based on the State-adopted biological assessment for fish, this site is Not Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 60% of reference, giving it an integrity classification of 'Poor'.

Site 1: Tar Creek 8-1-06

Total Specimen Count	Common Name	Species
2	Central stoneroller	<i>Campostoma anomalum</i>
1	Red shiner	<i>Cyprinella lutrensis</i>
1	Flathead catfish	<i>Pylodictis olivaris</i>
1	Mosquitofish	<i>Gambusia affinis</i>
1	Green sunfish	<i>Lepomis cyanellus</i>
4	Largemouth bass	<i>Micropterus salmoides</i>

Watershed < 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	6	refer to fig 1	refer to fig1	refer to fig 1	1
Shannon's Diversity based upon numbers	1.61	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	2	>3	2 to 3	<2	3
# of species comprising 75% of sample	4	>5	3 to 4	<3	3
Number of Intolerant Species (<100mi ² area)	1	>5	3 to 5	<3	1
Percentage of Tolerant Species	80.00	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					11
Percentage of Lithophils	20.00	>36	18 to 36	<18	3
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	10	>200	75 to 200	<75	1
TOTAL SCORE FOR FISH CONDITION					9
TOTAL SCORE					20

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Big Ck	Cloud Ck		Metric Score	Site Score	Reference Score
	County	Nowata	Muskogee				
	Order	4	4				
				Composite Reference Value			
Metric	Value	Reference Value	Reference Value				
Total # of Species	6	29	28	29	21.1%	1	5
Number of Sensitive Benthic Species	0	7	6	7	0.0%	1	5
Number of Centrarchid species	2	7	9	8	25.0%	1	5
Number of Intol Species	1	4	4	4	25.0%	1	5
Proportion of Individuals as Tolerant	80.000	27	83	55	80.0	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	20.000	6	2	4	20.0	3	1
Proportion of Individuals as Lithophilic Spawners	20.000	39	8	23	20.0	3	3
TOTAL SCORES						11	25
PROPORTION OF REFERENCE						44	
INTEGRITY CLASSIFICATION OF SITE						POOR	

Based on the State-adopted biological assessment for fish, this site is Not Supporting. As an additional measure, an alternative Index of Biological Integrity that compares to reference streams was analyzed and this site scored out at 44% of reference, giving it an integrity classification of 'Poor'.

Site 2: Tar Creek 8-7-08 [Blue Thumb]

Total Specimen Count	Common Name	Species
12	Central stoneroller	<i>Campostoma anomalum</i>
1	Golden shiner	<i>Notemigonus crysoleucas</i>
2	Channel catfish	<i>Ictalurus punctatus</i>
2	Flathead catfish	<i>Pylodictis olivaris</i>
2	Blackstripe topminnow	<i>Fundulus notatus</i>
1	Blackspotted topminnow	<i>Fundulus olivaceus</i>
2	Mosquitofish	<i>Gambusia affinis</i>
25	Brook silverside	<i>Labidesthes sicculus</i>
31	Green sunfish	<i>Lepomis cyanellus</i>
14	Warmouth sunfish	<i>Lepomis gulosus</i>
11	Orangespotted sunfish	<i>Lepomis humilis</i>
123	Bluegill sunfish	<i>Lepomis macrochirus</i>
42	Longear sunfish	<i>Lepomis megalotis</i>
6	Redear sunfish	<i>Lepomis microlophus</i>
11	Largemouth bass	<i>Micropterus salmoides</i>
7	White crappie	<i>Pomoxis annularis</i>
3	Black crappie	<i>Pomoxis nigromaculatus</i>
5	Logperch	<i>Percina caprodes</i>
1	Hybrid, green x bluegill sunfish	<i>Unidentified Lepomis hybrid</i>

Metric	Value	Scoring			Score
		5	3	1	
Watershed < 100 square miles					
Total # of Species	19	refer to fig 1	refer to fig1	refer to fig 1	1
Shannon's Diversity based upon numbers	2.06	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	10	>3	2 to 3	<2	5
# of species comprising 75% of sample	5	>5	3 to 4	<3	5
Number of Intolerant Species (<100mi ² area)	5	>5	3 to 5	<3	3
Percentage of Tolerant Species	85.05	fig 3	fig 3	fig 3	3
TOTAL SCORE FOR SAMPLE COMPOSITION					20
Percentage of Lithophils	3.99	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	301	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					31

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Big Ck	Cloud Ck		Metric Score	Site Score	Reference Score
	County	Nowata	Muskogee				
	Order	4	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	19	29	28	29	66.7%	3	5
Number of Sensitive Benthic Species	0	7	6	7	0.0%	1	5
Number of Centrarchid species	10	7	9	8	125.0%	5	5
Number of Intol Species	5	4	4	4	125.0%	5	5
Proportion of Individuals as Tolerant	85.050	27	83	55	85.0	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	5.648	6	2	4	5.6	1	3
Proportion of Individuals as Lithophilic Spawners	3.987	39	8	23	4.0	1	3
TOTAL SCORES						17	25
PROPORTION OF REFERENCE						68	
INTEGRITY CLASSIFICATION OF SITE						FAIR	

Based on the State-adopted biological assessment for fish, this site is Undetermined. As an additional measure, an alternative Index of Biological Integrity that compares to reference streams was analyzed and this site scored out at 68% of reference, giving it an integrity classification of 'Fair'.

Recommendation:

Based on the collected data and the unique nature of impairments to this watershed we recommend that Tar Creek remain listed as Habitat Limited Aquatic Community (HLAC) and as Secondary Body Contact Recreation (SBCR).

This Page Intentionally Left Blank

Trail Creek (OK520620-02-0090)
Re-evaluation

Trail Creek (OK520620-02-0090)

Description: Trail Creek is located in Dewey County and has been identified as an Emergency Water Supply (EWS), a Habitat Limited Aquatic Community (HLAC) and as Secondary Body Contact Recreation (SBCR). Trail Creek is in the Central Great Plains ecoregion.

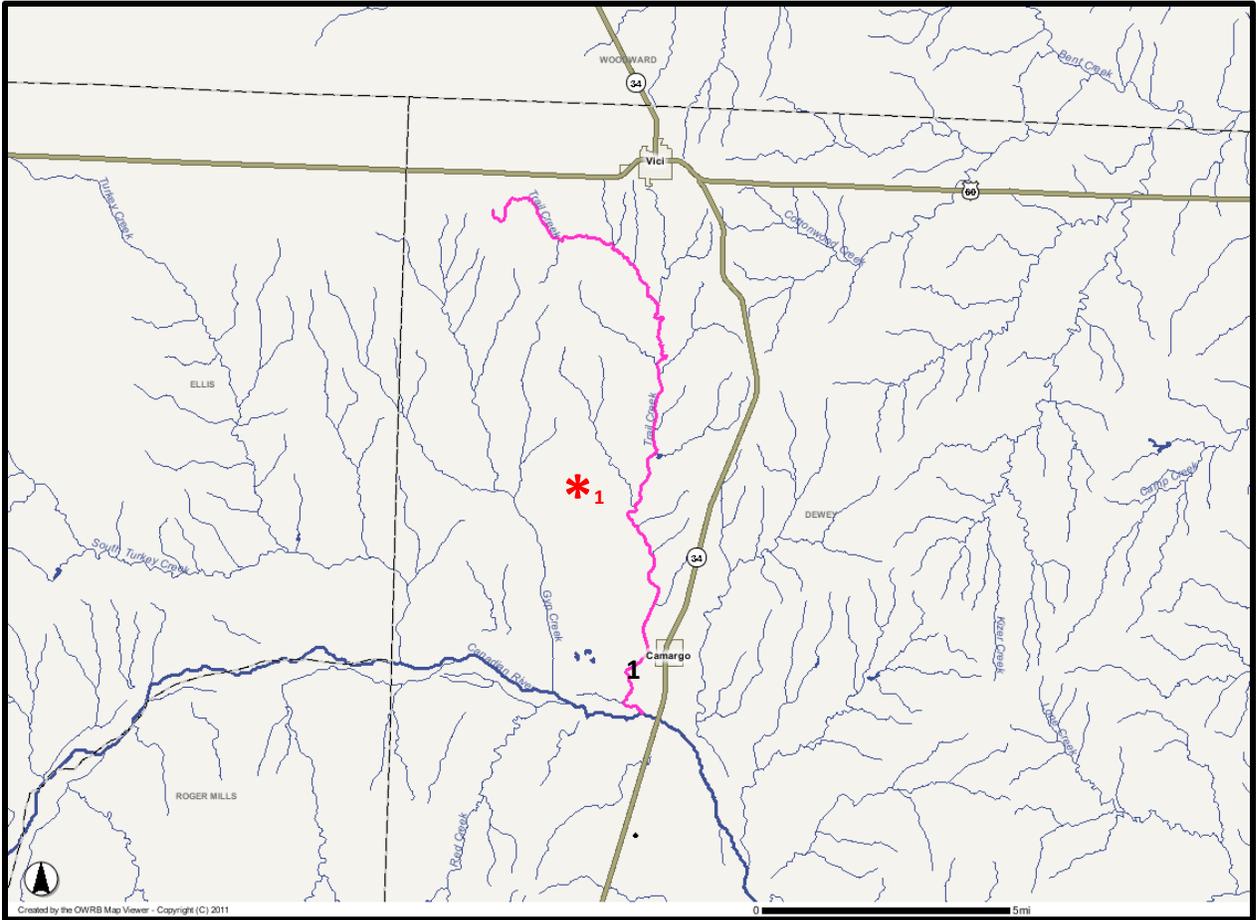


Figure 12. Approximate sample site locations and NPDES Discharges. Site 1 is the approximate location of the stream site sampled by the Oklahoma Conservation Commission. The location marked *1 is the approximate site of the Kline Materials discharge point.

Historical Descriptions: No historical descriptions were found.

Water Chemistry: Water quality data was available for Salt Creek ranging from 2000 to 2008.

Trail Creek: Dewey Co.

OK520620-02-0090G

	Median	Min	Max	N
Turbidity	7.97	1.07	379	55
Temperature	16.6	1.4	38.2	55
pH	8.035	7.07	8.31	54
Ammonia	0.05	0.015	0.504	53
Chloride	25.86	5	40	53
Nitrate	0.21	0.01	0.78	43
Nitrite	0.014	0.01	0.09	43
Sulfate	1494.3	817.7	3042.8	53
Total Dissolved Solids	2486	1680	2661	39
Total Kjeldahl Nitrogen	0.31	0.11	2.6	50
Total Ortho-Phosphate	0.022	0.005	0.557	52
Total Phosphorus	0.0575	0.017	0.647	50
Total Suspended Solids	24	1	1511	53
Flow	3.961	0.003	29.575	54

Trail Creek: Dewey Co.

OK520620-02-0090G

	Median	Min	Max	N
Dissolved Oxygen	9	5.74	12.43	20

Trail Creek: Dewey Co.

OK520620-02-0090G

	Median	Min	Max	N
E Coli	230	10	3654	31
Enterococcus	300	<10	8000	31

Flow Conditions: There are no gauging stations associated with this waterbody.

Sources of Pollution:

facility_n	permit_num
KLINE MATL	OK0044016

Hydrologic Modifications: A visual assessment of topographical maps and aerial photographs indicate that there are no major hydrologic modifications in this watershed. This visual assessment also indicated that no major or significant land use changes have occurred in the past 20 years.

Physical Conditions in Stream:

Habitat Assessments													
	Date	Instream Cover	Pool Bottom Substrate	Pool Variability	Canopy Cover Shading	Presence of Rocky Runs or Riffles	Flow	Channel Alteration	Channel Sinuosity	Bank Stability	Bank Vegetation Stability	Streamside Cover	Total Points
Trail Creek: Dewey Co.	8/17/1993	4.2	0.7	0	8.9	0	4.1	16.5	1.1	10	0.2	0	45.7
Trail Creek: Dewey Co.	6/7/2001	2.1	0.7	9.9	8.9	0	15.3	0.5	1.1	8.6	4.1	4.6	55.8
Trail Creek: Dewey Co.	5/18/2006	5.6	2.4	0	14.5	0	6.8	0.4	5	5.9	5.3	4.2	50.1

Stream Name	Date	Max Depth (m)	Average Depth (m)
Trail Creek	08/17/1993	0.45	0.1
Trail Creek	06/07/2001	0.7	0.28
Trail Creek	05/18/2006	2.0	0.22

All measurements of in-stream cover fall within the ‘Poor’ category indicating that there is 10% or less stable habitat. Assessments of pool bottom substrate all fall within the ‘Poor’ category indicating 1 or less types of stable habitat being present. Two sampling events indicated that Trail Creek’s pool variability was ‘Poor’ represented by a majority of pools being shallow or absent while one sampling event indicated that the pool variability was ‘Fair’ with shallow pools being more prevalent than deep pools. Two of the canopy cover shading measurements scored in the ‘Fair’ range indicating that the creek was covered by dense canopy while one measurement scored in the ‘Adequate’ range indicating that creek was covered by sparse canopy. There was a lack of rocky runs or riffles resulting in all scored measurements falling in the ‘Poor’ category. The representative low flows at the times of measurements were categorized as ‘Poor’, ‘Fair’, and ‘Optimal’ indicating differing flows at various sampling events. Channel alteration on Trail Creek is categorized as ‘Optimal’ with little or no enlargement of islands or point bars at one sampling event while being categorized as ‘Poor’ with heavy deposition of fine material at the other sampling events. The channel sinuosity can be categorized as ‘Poor’ to ‘Fair’. Measurements indicate that Trail Creek has bank stability categorized as ‘Adequate’ to ‘Optimal’. The streamside cover measurements indicate that Trail Creek has ‘Poor’ to ‘Fair’ levels of vegetation within 10ft of the water’s edge.

Biological Data:

Benthic Macroinvertebrate (BMI) Assessments

Sitename	WBID	Sample Type	Winter or Summer	Total Species	EPT Taxa	Percent EPT	Shannon Diversity	HBI	Percent Dominant 2 Taxa	Total Points	% of Reference	Condition	Number of Samples
Trail Creek	OK520620-02-0090G	veg	S	11	2.5	0.56	1.56	7.91	0.67	16	0.57	Slightly Impaired	2
		veg	W	11	3.5	0.11	1.7	5.86	0.61	20	0.91	Non Impaired	2

Trail Creek 6-7-01

Total Specimen Count	Common Name	Species
757	Red shiner	<i>Cyprinella lutrensis</i>
1	Common carp	<i>Cyprinus carpio</i>
17	Plains minnow	<i>Hybognathus placitus</i>
55	Sand shiner	<i>Notropis stramineus</i>
1	Suckermouth minnow	<i>Phenacobius mirabilis</i>
7	Bullhead minnow	<i>Pimephales vigilax</i>
1	Yellow bullhead	<i>Ameiurus natalis</i>
2	Channel catfish	<i>Ictalurus punctatus</i>
1	Plains killifish	<i>Fundulus zebrinus</i>
1	Mosquitofish	<i>Gambusia affinis</i>
1	Bluegill sunfish	<i>Lepomis macrochirus</i>
1	Largemouth bass	<i>Micropterus salmoides</i>

Watershed < 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	12	refer to fig 1	refer to fig1	refer to fig 1	3
Shannon's Diversity based upon numbers	0.46	>2.50	2.49-1.50	<1.50	1
# of Sunfish Species	2	>3	2 to 3	<2	3
# of species comprising 75% of sample	1	>5	3 to 4	<3	3
Number of Intolerant Species (<100mi ² area)	1	>5	3 to 5	<3	1
Percentage of Tolerant Species	99.88	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					11
Percentage of Lithophils	0.00	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	845	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					22

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Traders Ck	Deer Ck: Greer Co.				
	County	Woodward	Greer				
	Order	4	3				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	12	13	13	13	92.3%	5	5
Number of Sensitive Benthic Species	2	1	1	1	200.0%	5	5
Number of Centrarchid species	2	4	4	4	50.0%	3	5
Number of Intol Species	1	0	1	1	200.0%	5	5
Proportion of Individuals as Tolerant	99.882	64	86	75	99.9	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	0.118	37	2	20	0.1	1	1
Proportion of Individuals as Lithophilic Spawners	0.000	2	12	7	0.0	1	1
TOTAL SCORES						21	23
PROPORTION OF REFERENCE						91	
INTEGRITY CLASSIFICATION OF SITE						EXCELLENT	

Based on the State-adopted biological assessment for fish, this site is Fully Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 91% of reference, giving it an integrity classification of 'Excellent'.

Trail Creek 5-18-06

Total Specimen Count	Common Name	Species
103	Red shiner	<i>Cyprinella lutrensis</i>
126	Sand shiner	<i>Notropis stramineus</i>
5	Suckermouth minnow	<i>Phenacobius mirabilis</i>
1	Bullhead minnow	<i>Pimephales vigilax</i>
23	Plains killifish	<i>Fundulus zebrinus</i>
7	Mosquitofish	<i>Gambusia affinis</i>
2	Bluegill sunfish	<i>Lepomis macrochirus</i>
2	Longear sunfish	<i>Lepomis megalotis</i>

Watershed < 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	8	refer to fig 1	refer to fig1	refer to fig 1	1
Shannon's Diversity based upon numbers	1.20	>2.50	2.49-1.50	<1.50	1
# of Sunfish Species	2	>3	2 to 3	<2	3
# of species comprising 75% of sample	2	>5	3 to 4	<3	3
Number of Intolerant Species (<100mi ² area)	1	>5	3 to 5	<3	1
Percentage of Tolerant Species	98.14	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					9
Percentage of Lithophils	0.00	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	269	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					20

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Traders Ck	Deer Ck: Greer Co.		Metric Score	Site Score	Reference Score
	County	Woodward	Greer				
	Order	4	3				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	8	13	13	13	61.5%	3	5
Number of Sensitive Benthic Species	2	1	1	1	200.0%	5	5
Number of Centrarchid species	2	4	4	4	50.0%	3	5
Number of Intol Species	1	0	1	1	200.0%	5	5
Proportion of Individuals as Tolerant	98.141	64	86	75	98.1	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	1.859	37	2	20	1.9	1	1
Proportion of Individuals as Lithophilic Spawners	0.000	2	12	7	0.0	1	1
TOTAL SCORES						19	23
PROPORTION OF REFERENCE						83	
INTEGRITY CLASSIFICATION OF SITE						GOOD	

Based on the State-adopted biological assessment for fish, this site is Undetermined. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 83% of reference, giving it an integrity classification of 'Good'.

Recommendation:

There is not enough information available indicating the designated use needs to be upgraded. The more recent fish collections have shown lower fish assessment scores.

The OWRB recommends continued monitoring of this stream and recommends that Trail Creek remain a HLAC and SBCR.

Wewoka Creek (OK520500-02-0010)
Re-evaluation

Wewoka Creek (OK520500-02-0010)

Description: Wewoka Creek is located in Pottawatomie, Seminole and Hughes Counties. In Appendix A of the Oklahoma Water Quality Standards, this stream is divided into two segments having slightly different designated uses. The Upstream segment begins upstream of Sections 27 & 28 of T 9 N, R 6 E IM. This stream has been identified as a Public Private Water Supply (PPWS), as a Habitat Limited Aquatic Community (HLAC) and as Secondary Body Contact Recreation (SBCR). The downstream segment begins downstream of the boundary of Sections 27 & 28 of T 9 N, R 6 E IM. This stream has been identified as an Emergency Water Supply (EWS), as a Habitat Limited Aquatic Community (HLAC) and as Primary Body Contact Recreation (PBCR). The original reason for categorizing Wewoka Creek as a Habitat Limited Fishery (HLF) or HLAC is physical conditions related to natural features of the waterbody, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to [chemical] water quality, preclude attainment of aquatic life protection uses. Wewoka Creek is in the Central Oklahoma / Texas Plains ecoregion.

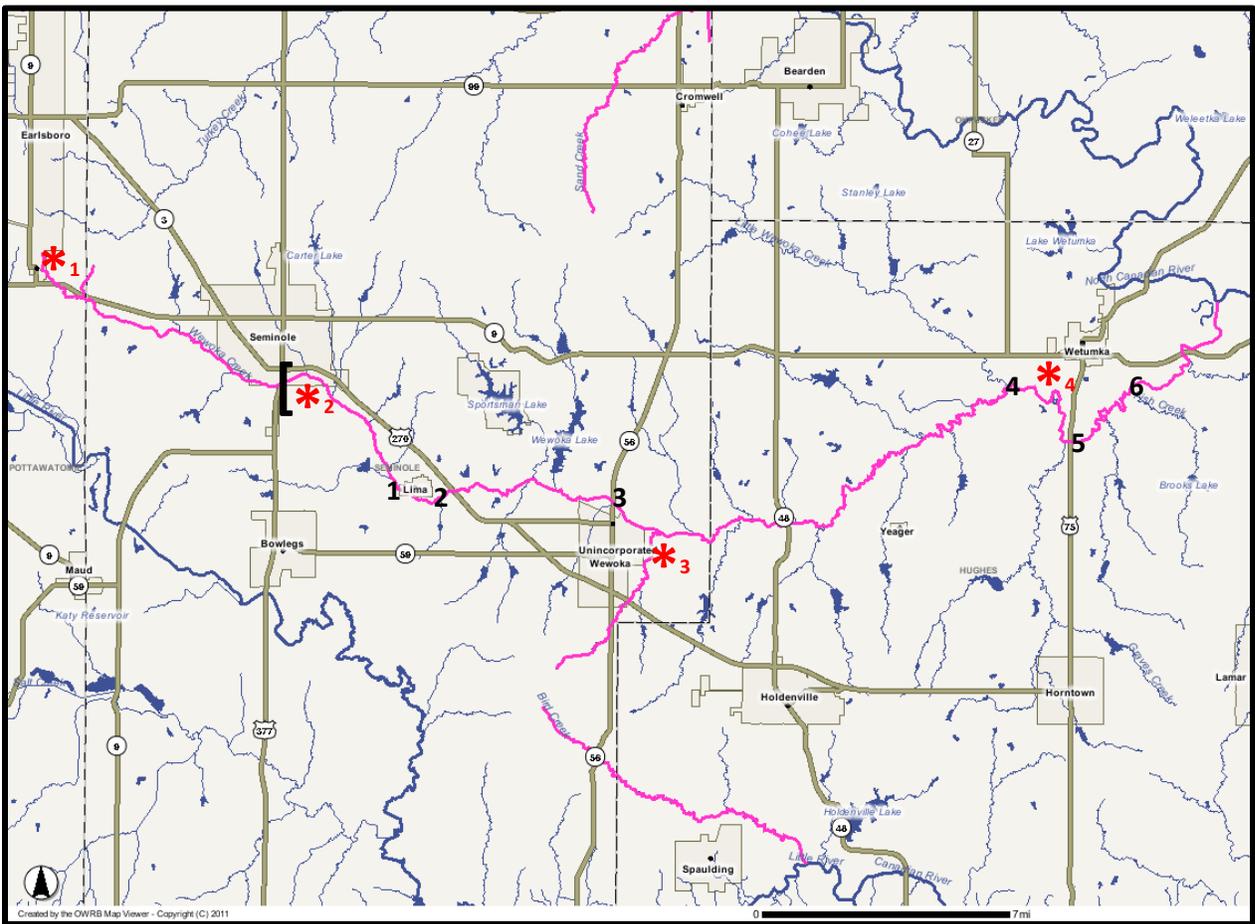


Figure 13. Approximate sample site locations and NPDES Discharges. Site 1 is the approximate location of OKPB01-060 sampled by OWRB on 06/06/2007. Site 2 is the approximate location of Bird Creek: Upstream sampled by OCC on 09/10/1996. Site 3 is the approximate location of Bird Creek: Downstream sampled by OCC on 09/06/1996 and 07/29/2003. The location marked *1 is the approximate site of the Earlsboro waste water treatment plant discharge. The location marked *2 is the approximate site of the Seminole waste water treatment plant discharge. The location marked *3 is the

approximate site of the Wewoka waste water treatment plant discharge. The location marked *4 is the approximate site of the Wetumka waste water treatment plant discharge.

Historical Descriptions: A Use Attainability Analysis (UAA) conducted in 1982, near Seminole, reported no fish were collected other than gambusia. This analysis also indicated that the stream was heavily impacted from oil and gas activities. The water was described as gray and odorous and oil sheens were present. It was also noted that oil and salt deposits were on the bank. Another UAA conducted in 1985, near Earlsboro, reported that the stream segment was heavily impacted by oilfield activities. Oil spills were noted in the area.

Water Chemistry: Water quality data was available for Salt Creek ranging from 1995 to 2010.

Site 1: Wewoka Creek

OK520500-02-0010T				
	Median	Min	Max	N
Turbidity	17.4	4.32	488	23
Temperature	20.7	3.6	34.6	23
pH	8.355	7.24	9.52	18
Ammonia	0.05	0.004	0.366	19
Chloride	329	5	1100	21
Nitrate	1.33	0.027	8.32	13
Nitrite	0.034	0.006	0.518	13
Sulfate	33.2	6.4	99.6	21
Total Dissolved Solids				
Total Kjeldahl Nitrogen	1.04	0.45	2.67	21
Total Ortho-Phosphate	0.213	0.068	1.68	20
Total Phosphorus	0.409	0.149	2.463	21
Total Suspended Solids	22.8	14	461	21
Flow	8.3315	0.572	74.148	22

Site 3: Wewoka Creek

OK520500-02-0010M				
	Median	Min	Max	N
Turbidity	27.9	6.5	>1000	41
Temperature	18.55	3.5	32.1	42
pH	8.145	7.18	9.05	40
Ammonia	0.021	0.015	0.781	40
Chloride	218.2	41.9	1247.1	40
Nitrate	0.21	0.02	5.55	40
Nitrite	0.02	0.02	0.23	39
Sulfate	22.6	9.4	90.5	40
Total Dissolved Solids	554	127	1781	40
Total Kjeldahl Nitrogen	0.57	0.11	3.6	40
Total Ortho-Phosphate	0.0725	0.005	2.504	40
Total Phosphorus	0.187	0.047	3.106	36
Total Suspended Solids	25.5	10	4820	40
Flow	2.299	0	231.388	31

Site 4: Wewoka Creek**OK520500-02-0010A**

	Median	Min	Max	N
Turbidity	49.3	7	122	10
Temperature	24.2	3.8	32.1	9
pH	8.025	7.76	8.57	8
Ammonia	0.05	0.05	0.6	3
Chloride	370	35	515	8
Nitrate	0.38	0.05	2.66	8
Nitrite	0.005	0.001	0.014	5
Sulfate	26.35	10.5	34.6	8
Total Dissolved Solids	696	402	990	2
Total Kjeldahl Nitrogen	0.645	0.33	0.99	8
Total Ortho-Phosphate	0.016	0.01	0.06	5
Total Phosphorus	0.13	0.05	0.17	8
Total Suspended Solids	45.6	9.5	70	8
Flow	27.4795	0.914	54.045	2

Site 5: Wewoka Creek**OK520500-02-0010E**

	Median	Min	Max	N
Turbidity	59.1	12.3	743	23
Temperature	20	3.2	33.1	23
pH	8.19	6.98	8.82	17
Ammonia	0.052	0.021	0.21	19
Chloride	196	17	650	21
Nitrate	0.33	0.027	0.99	13
Nitrite	0.011	0.003	0.056	13
Sulfate	29.2	1	102	21
Total Dissolved Solids				
Total Kjeldahl Nitrogen	0.8	0.2	2.86	21
Total Ortho-Phosphate	0.047	0.004	0.485	20
Total Phosphorus	0.181	0.046	2.7	21
Total Suspended Solids	67.5	6	600	21
Flow	15.132	0.494	1028.773	17

Site 6: Wewoka Creek: Downstream**OK520500-02-0010C**

	Median	Min	Max	N
Turbidity	36.75	3.46	>1000	42
Temperature	20.5	0.5	35.5	42
pH	7.85	6.72	9.07	39
Ammonia	0.0265	0.015	0.443	40
Chloride	205.5	23.8	569.1	40
Nitrate	0.075	0.02	0.56	40
Nitrite	0.02	0.02	0.02	38
Sulfate	21	4.9	36.1	40
Total Dissolved Solids	537.5	111	1271	40
Total Kjeldahl Nitrogen	0.579	0.11	1.65	40
Total Ortho-Phosphate	0.0365	0.005	0.361	40
Total Phosphorus	0.1245	0.031	1.066	36
Total Suspended Solids	37.5	10	3253	40
Flow	26.2465	0.017	9532.787	38

Site 1: Wewoka Creek**OK520500-02-0010T**

	Median	Min	Max	N
E Coli	359	10	4100	7
Enterococcus	800	10	8000	6

Site 3: Wewoka Creek**OK520500-02-0010M**

	Median	Min	Max	N
E Coli	60	<5	9900	19
Enterococcus	60	<5	>10000	19

	Median	Min	Max	N
Dissolved Oxygen	9.33	5.75	16.51	21

Site 5: Wewoka Creek**OK520500-02-0010E**

	Median	Min	Max	N
E Coli	983.5	<10	2495	6
Enterococcus	1600	1100	12000	5

**Site 6: Wewoka Creek:
Downstream****OK520500-02-0010C**

	Median	Min	Max	N
Dissolved Oxygen	8.7	6.41	12.32	18

	Median	Min	Max	N
E Coli	27.5	<10	>10000	20
Enterococcus	47.5	<10	>10000	20

Flow Conditions: There are no gauging stations associated with this waterbody. The current designed flow for the City of Earlsboro wastewater treatment plant (WWTP) is 0.015 MG per day, the designed flow for the City of Seminole WWTP is 2.38 MG per day, the designed flow for the City of Wewoka WWTP is 0.5 MG per day, and the designed flow for the Wetmuka WWTP is 0.102 MG per day. A search was conducted, but no data is available in any accessible format to indicate what past designed flows may have been.

Sources of Pollution:

facility_n	permit_num
WEWOKA WWT	OK0022659
SEMINOLE WWT	OK0022870
EARLSBORO PUBLIC WORKS WWT	OK0030244
WETUMKA SOUTH WWT	OK0032417
WETUMKA NORTH WWT	OK0032425
WETUMKA WTP	OK0039110
OKLA CUSTOM COATING LLC SEMINOLE CNTY FACLTY	OKP003014
HOLDENVILLE ONE STOP	OKP003042
WETUMKA SOUTH WWT	OKG580005
WETUMKA NORTH WWT	OKG580006

Hydrologic Modifications: A visual assessment of topographical maps and aerial photographs indicate that there are no major hydrologic modifications in this watershed. This visual assessment also indicated that no major or significant land use changes have occurred in the past 20 years. The stream flow has likely been altered from the natural condition due to the presence of the many flood control dams that make up the Wewoka Creek flood control project. However, these structures have been in place since the 1960s and the primary purpose is to control flooding during high-water events.

Physical Conditions in Stream:

Habitat Assessments													
	Date	Instream Cover	Pool Bottom Substrate	Pool Variability	Canopy Cover Shading	Presence of Rocky Runs or Riffles	Flow	Channel Alteration	Channel Sinuosity	Bank Stability	Bank Vegetation Stability	Streamside Cover	Total Points
Wewoka Creek	9/12/1996	1.7	1.6	14.6	3.3	2.2	20	13.7	0.5	9	0.1	8.5	75.2
Wewoka Creek	8/31/1998	2.2	2.9	14.6	4.1	1.8	4.6	10.9	0.5	7.9	0.4	9.6	59.5
Wewoka Creek	9/1/1998	7	5.7	18	5.5	2.2	4.2	0.4	0	6.6	5.8	10	65.3
Wewoka Creek	10/15/1999	7.9	2.4	14	5.3	2.2	8.2	0.5	0.8	5.1	6.2	9.5	62.1
Wewoka Creek	7/1/2003	5.5	1.4	0	7.6	5.9	12	11.1	0	9.9	6.1	9.9	69.3
Wewoka Creek: Downstream	7/31/2003	0.7	2.5	18.8	0	0	1.2	9.9	4.1	4.2	3.2	10	54.6
Wewoka Creek: Lima (N 3610)	9/1/2004	0.6	1.8	7.1	15	0	13.3	11.1	0	9.8	0.5	10	69.2
Wewoka Creek: Lima (N 3610)	8/9/2006	7.3	3.1	18.5	15.4	2.2	13.3	16.5	0	8.3	5.8	10	100.4

Stream Name	Date	Max Depth (m)	Average Depth (m)
Site 4: Wewoka Creek	09/12/1996	1.8	1.08
Site 4: Wewoka Creek	08/31/1998	1.6	1.0
Site 5: Wewoka Creek	09/01/1998	1.5	0.44
Site 1: Wewoka Creek	10/15/1999	1.3	0.32
Site 3: Wewoka Creek	07/01/2003	1.0	0.35
Site 6: Wewoka Creek: Downstream	07/31/2003	1.0	0.38
Site 2: Wewoka Creek: Lima (N 3610)	09/01/2004	0.8	0.25
Site 2: Wewoka Creek: Lima (N 3610)	08/09/2006	0.8	0.40

Two measurements of in-stream cover fall within the 'Fair' category indicating that there is 10% to 30% of stable habitat while the rest of the measurements fall within the 'Poor' category indicating less than 10% stable habitat. Assessments of pool bottom substrate mostly fall within the 'Poor' category indicating 1 or less types of stable habitat being present. The measurements of pool variability scored from 'Poor' to 'Optimal' indicating different levels of pool variability among the sampling sites and events. Six of the canopy cover shading measurements scored in the 'Poor' range indicating that the creek had a lack of canopy while two measurements scored in the 'Adequate' range indicating that creek was covered by sparse canopy. There was a lack of rocky runs or riffles resulting in seven scored measurements falling in the 'Poor' category while one measurement fell within the 'Fair' category. The representative low flows at the times of measurements were categorized as 'Adequate' and 'Optimal' for the flows at the various sampling events. Channel alteration on Wewoka Creek is categorized from 'Poor' to 'Adequate'. The channel sinuosity can be categorized as 'Poor' to 'Fair'. Measurements indicate that Wewoka Creek has bank stability categorized as 'Fair', 'Adequate' and 'Optimal'. The streamside cover measurements indicate that Trail Creek has 'Adequate' to 'Optimal' levels of vegetation within 10ft of the water's edge.

Biological Data:

Benthic Macroinvertebrate (BMI) Assessments

Site 3

Sitename	WBID	Sample Type	Winter or Summer	Total Species	EPT Taxa	Percent EPT	Shannon Diversity	HBI	Percent Dominant 2 Taxa	Total Points	% of Reference	Condition	Number of Samples
Wewoka Creek: Upper	OK520500-02-0010M	Veg	S	8	1	0.385	1.562	6.462	0.7179	14	0.53	Slightly Impaired	1
		Veg	W	13	10	0.803	1.886	3.131	0.5902	24	0.98	Non Impaired	1
		Wood	S	4	0	0	0.383	7.889	0.9722	4	0.16	Severely Impaired	1

Site 6

Sitename	WBID	Sample Type	Winter or Summer	Total Species	EPT Taxa	Percent EPT	Shannon Diversity	HBI	Percent Dominant 2 Taxa	Total Points	% of Reference	Condition	Number of Samples
Wewoka Creek: Lower	OK520500-02-0010C	Riffle	W	11.5	5	0.203	1.837	4.933	0.4324	18	0.72	Slightly Impaired	2
		Wood	S	12	6	0.223	1.544	6.519	0.7161	20	0.78	Slightly Impaired	2

Fish Assessments

Site 1: Wewoka Creek (Lima West) 10-15-99

Total Specimen Count	Common Name	Species
4	Gizzard shad	<i>Dorosoma cepedianum</i>
1	Central stoneroller	<i>Campostoma anomalum</i>
214	Red shiner	<i>Cyprinella lutrensis</i>
1	Common carp	<i>Cyprinus carpio</i>
200	Sand shiner	<i>Notropis stramineus</i>
5	Suckermouth minnow	<i>Phenacobius mirabilis</i>
11	Bullhead minnow	<i>Pimephales vigilax</i>
1	Yellow bullhead	<i>Ameiurus natalis</i>
4	Channel catfish	<i>Ictalurus punctatus</i>
5	Flathead catfish	<i>Pylodictis olivaris</i>
177	Mosquitofish	<i>Gambusia affinis</i>
101	Green sunfish	<i>Lepomis cyanellus</i>
18	Orangespotted sunfish	<i>Lepomis humilis</i>
1	Bluegill sunfish	<i>Lepomis macrochirus</i>
40	Longear sunfish	<i>Lepomis megalotis</i>
18	Largemouth bass	<i>Micropterus salmoides</i>
2	White crappie	<i>Pomoxis annularis</i>

Watershed < 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	17	refer to fig 1	refer to fig1	refer to fig 1	3
Shannon's Diversity based upon numbers	1.84	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	6	>3	2 to 3	<2	5
# of species comprising 75% of sample	4	>5	3 to 4	<3	3
Number of Intolerant Species (<100mi ² area)	2	>5	3 to 5	<3	1
Percentage of Tolerant Species	99.25	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					15
Percentage of Lithophils	0.12	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	803	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					26

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Alabama Ck: Above	Little Wewoka Ck: S		Metric Score	Site Score	Reference Score
	County	Okfuskee	Hughes				
	Order	2	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	17	17	18	18	97.1%	5	5
Number of Sensitive Benthic Species	2	3	3	3	66.7%	3	5
Number of Centrarchid species	6	6	6	6	100.0%	5	5
Number of Intol Species	2	1	2	2	133.3%	5	5
Proportion of Individuals as Tolerant	99.253	40	80	60	99.3	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	0.747	6	10	8	0.7	1	1
Proportion of Individuals as Lithophilic Spawners	0.125	30	9	20	0.1	1	3
TOTAL SCORES						21	25
PROPORTION OF REFERENCE						84	
INTEGRITY CLASSIFICATION OF SITE						GOOD	

Based on the State-adopted biological assessment for fish, this site is Fully Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 84% of reference, giving it an integrity classification of 'Good'.

Site 2: Wewoka Creek (Lima East Blue Thumb) 9-1-04

Total Specimen Count	Common Name	Species
1	Gizzard shad	<i>Dorosoma cepedianum</i>
314	Red shiner	<i>Cyprinella lutrensis</i>
9	Sand shiner	<i>Notropis stramineus</i>
154	Suckermouth minnow	<i>Phenacobius mirabilis</i>
93	Bullhead minnow	<i>Pimephales vigilax</i>
1	River carpsucker	<i>Carpionodes carpio</i>
8	Channel catfish	<i>Ictalurus punctatus</i>
25	Mosquitofish	<i>Gambusia affinis</i>
100	Green sunfish	<i>Lepomis cyanellus</i>
12	Orangespotted sunfish	<i>Lepomis humilis</i>
72	Longear sunfish	<i>Lepomis megalotis</i>
1	Redear sunfish	<i>Lepomis microlophus</i>
6	Largemouth bass	<i>Micropterus salmoides</i>

Watershed < 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	13	refer to fig 1	refer to fig1	refer to fig 1	3
Shannon's Diversity based upon numbers	1.74	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	5	>3	2 to 3	<2	5
# of species comprising 75% of sample	4	>5	3 to 4	<3	3
Number of Intolerant Species (<100mi ² area)	1	>5	3 to 5	<3	1
Percentage of Tolerant Species	80.65	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					15
Percentage of Lithophils	0.00	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	796	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					26

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Elm Ck	Little Wewoka Ck: S		Metric Score	Site Score	Reference Score
	County	Cleveland	Hughes				
	Order	4	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	13	18	18	18	72.2%	5	5
Number of Sensitive Benthic Species	2	2	3	3	80.0%	5	5
Number of Centrarchid species	5	7	6	7	76.9%	5	5
Number of Intol Species	1	1	2	2	66.7%	3	5
Proportion of Individuals as Tolerant	80.653	86	80	83	80.7	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	19.347	3	10	6	19.3	1	1
Proportion of Individuals as Lithophilic Spawners	0.000	11	9	10	0.0	1	1
TOTAL SCORES						21	23
PROPORTION OF REFERENCE						91	
INTEGRITY CLASSIFICATION OF SITE						EXCELLENT	

Based on the State-adopted biological assessment for fish, this site is Fully Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 91% of reference, giving it an integrity classification of 'Excellent'.

Site 2: Wewoka Creek (Lima East Blue Thumb) 8-9-06

Total Specimen Count	Common Name	Species
	4	Gizzard shad
2	Central stoneroller	<i>Camptostoma anomalum</i>
262	Red shiner	<i>Cyprinella lutrensis</i>
1	Common carp	<i>Cyprinus carpio</i>
146	Sand shiner	<i>Notropis stramineus</i>
11	Suckermouth minnow	<i>Phenacobius mirabilis</i>
206	Bullhead minnow	<i>Pimephales vigilax</i>
1	River carpsucker	<i>Carpiodes carpio</i>
1	Black bullhead	<i>Ameiurus melas</i>
9	Channel catfish	<i>Ictalurus punctatus</i>
1	Flathead catfish	<i>Pylodictis olivaris</i>
169	Mosquitofish	<i>Gambusia affinis</i>
8	Green sunfish	<i>Lepomis cyanellus</i>
59	Orangespotted sunfish	<i>Lepomis humilis</i>
26	Bluegill sunfish	<i>Lepomis macrochirus</i>
281	Longear sunfish	<i>Lepomis megalotis</i>
1	Largemouth bass	<i>Micropterus salmoides</i>
6	White crappie	<i>Pomoxis annularis</i>
2332	Unidentified sunfish spp.	<i>Unidentified Lepomis spp.</i>
		<i>Unidentified Lepomis hybrid</i>
1	Hybrid, sunfish	

Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	20	refer to fig 1	refer to fig1	refer to fig 1	3
Shannon's Diversity based upon numbers	1.30	>2.50	2.49-1.50	<1.50	1
# of Sunfish Species	8	>3	2 to 3	<2	5
# of species comprising 75% of sample	3	>5	3 to 4	<3	3
Number of Intolerant Species (<100mi ² area)	3	>5	3 to 5	<3	3
Percentage of Tolerant Species	33.51	fig 3	fig 3	fig 3	3
TOTAL SCORE FOR SAMPLE COMPOSITION					18
Percentage of Lithophils	0.06	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	3527	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					29

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Em Ck	Little Wewoka Ck: S		Metric Score	Site Score	Reference Score
	County	Cleveland	Hughes				
	Order	4	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	20	18	18	18	111.1%	5	5
Number of Sensitive Benthic Species	2	2	3	3	80.0%	5	5
Number of Centrarchid species	8	7	6	7	123.1%	5	5
Number of Intol Species	3	1	2	2	200.0%	5	5
Proportion of Individuals as Tolerant	33.513	86	80	83	33.5	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	0.369	3	10	6	0.4	1	1
Proportion of Individuals as Lithophilic Spawners	0.057	11	9	10	0.1	1	1
TOTAL SCORES						23	23
PROPORTION OF REFERENCE						100	
INTEGRITY CLASSIFICATION OF SITE						EXCELLENT	

Based on the State-adopted biological assessment for fish, this site is Fully Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 100% of reference, giving it an integrity classification of 'Excellent'.

Site 3: Wewoka Creek (Wewoka SH 56) 7-1-03

Total Specimen Count	Common Name	Species
	4	Gizzard shad
454	Red shiner	<i>Cyprinella lutrensis</i>
2	Common carp	<i>Cyprinus carpio</i>
70	Emerald shiner	<i>Notropis atherinoides</i>
2	Suckermouth minnow	<i>Phenacobius mirabilis</i>
17	Bullhead minnow	<i>Pimephales vigilax</i>
8	River carpsucker	<i>Carpionodes carpio</i>
1	Channel catfish	<i>Ictalurus punctatus</i>
13	Mosquitofish	<i>Gambusia affinis</i>
1	White bass	<i>Morone chrysops</i>
2	Green sunfish	<i>Lepomis cyanellus</i>
31	Orangespotted sunfish	<i>Lepomis humilis</i>
14	Longear sunfish	<i>Lepomis megalotis</i>
1	Spotted bass	<i>Micropterus punctulatus</i>
1	Logperch	<i>Percina caprodes</i>
1	Freshwater drum	<i>Aplodinotus grunniens</i>

Metric	Value	Scoring			Score
		5	3	1	
Watershed > 100 square miles					
Total # of Species	16	>23	12 to 22	<12	3
Shannon's Diversity based upon numbers	1.21	>2.50	2.49-1.50	<1.50	1
# of Sunfish Species	6	>3	2 to 3	<2	5
# of species comprising 75% of sample	2	>5	3 to 4	<3	1
Number of Intolerant Species (>100mi ² area)	2	>5	3 to 5	<3	1
Percentage of Tolerant Species	99.44	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					11
Percentage of Lithophils	0.38	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	533	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					22

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Bird Ck	Little Wewoka Ck: S		Metric Score	Site Score	Reference Score
	County	Osage	Hughes				
	Order	5	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	16	23	18	21	78.0%	5	5
Number of Sensitive Benthic Species	2	8	3	6	36.4%	3	5
Number of Centrarchid species	6	6	6	6	100.0%	5	5
Number of Intol Species	2	4	2	3	66.7%	3	5
Proportion of Individuals as Tolerant	99.437	83	80	82	99.4	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	0.188	1	10	5	0.2	1	1
Proportion of Individuals as Lithophilic Spawners	0.375	13	9	11	0.4	1	1
TOTAL SCORES						19	23
PROPORTION OF REFERENCE						83	
INTEGRITY CLASSIFICATION OF SITE						GOOD	

Based on the State-adopted biological assessment for fish, this site is Undetermined. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 83% of reference giving it an integrity classification of 'Good'.

Site 3: Wewoka Creek (Wewoka SH 56) 7-17-08

Total Specimen Count	Common Name	Species
1	Spotted gar	<i>Lepisosteus oculatus</i>
206	Red shiner	<i>Cyprinella lutrensis</i>
2	Suckermouth minnow	<i>Phenacobius mirabilis</i>
23	Bullhead minnow	<i>Pimephales vigilax</i>
2	River carpsucker	<i>Carpiodes carpio</i>
8	Mosquitofish	<i>Gambusia affinis</i>
2	Green sunfish	<i>Lepomis cyanellus</i>
1	Orangespotted sunfis	<i>Lepomis humilis</i>
6	Longear sunfish	<i>Lepomis megalotis</i>
2	Spotted bass	<i>Micropterus punctulatus</i>
1	Largemouth bass	<i>Micropterus salmoides</i>
1	Unidentified Catostomidae spp. (smallmouth buffalo or river carpsucker)	<i>Unidentified Catostomidae spp.</i>

Metric	Value	Scoring			Score
		5	3	1	
Watershed > 100 square miles					
Total # of Species	12	>23	12 to 22	<12	3
Shannon's Diversity based upon numbers	0.83	>2.50	2.49-1.50	<1.50	1
# of Sunfish Species	5	>3	2 to 3	<2	5
# of species comprising 75% of sample	1	>5	3 to 4	<3	1
Number of Intolerant Species (>100mi ² area)	3	>5	3 to 5	<3	3
Percentage of Tolerant Species	98.04	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					13
Percentage of Lithophils	1.18	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	255	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					24

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Bird Ck	Little Wewoka Ck: S		Metric Score	Site Score	Reference Score
	County	Osage	Hughes				
	Order	5	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	12	23	18	21	58.5%	3	5
Number of Sensitive Benthic Species	1	8	3	6	18.2%	1	5
Number of Centrarchid species	5	6	6	6	83.3%	5	5
Number of Intol Species	3	4	2	3	100.0%	5	5
Proportion of Individuals as Tolerant	98.039	83	80	82	98.0	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	0.784	1	10	5	0.8	1	1
Proportion of Individuals as Lithophilic Spawners	1.176	13	9	11	1.2	1	1
TOTAL SCORES						17	23
PROPORTION OF REFERENCE						74	
INTEGRITY CLASSIFICATION OF SITE						FAIR	

Based on the State-adopted biological assessment for fish, this site is Undetermined. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 74% of reference, giving it an integrity classification of 'Fair'.

Site 4: Wewoka Creek (Wetumka West) 9-12-96

Total Specimen Count	Common Name	Species
3	Gizzard shad	<i>Dorosoma cepedianum</i>
36	Red shiner	<i>Cyprinella lutrensis</i>
5	Emerald shiner	<i>Notropis atherinoides</i>
1	Suckermouth minnow	<i>Phenacobius mirabilis</i>
27	Bullhead minnow	<i>Pimephales vigilax</i>
2	Flathead catfish	<i>Pylodictis olivaris</i>
1	Mosquitofish	<i>Gambusia affinis</i>
2	Green sunfish	<i>Lepomis cyanellus</i>
7	Orangespotted sunfish	<i>Lepomis humilis</i>
8	Longear sunfish	<i>Lepomis megalotis</i>
1	Largemouth bass	<i>Micropterus salmoides</i>

Metric	Value	Scoring			Score
		5	3	1	
Watershed > 100 square miles					
Total # of Species	11	>23	12 to 22	<12	1
Shannon's Diversity based upon numbers	1.71	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	4	>3	2 to 3	<2	5
# of species comprising 75% of sample	3	>5	3 to 4	<3	3
Number of Intolerant Species (>100mi ² area)	1	>5	3 to 5	<3	1
Percentage of Tolerant Species	98.92	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					13
Percentage of Lithophils	0.00	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	93	>200	75 to 200	<75	3
TOTAL SCORE FOR FISH CONDITION					9
TOTAL SCORE					22

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Bird Ck	Little Wewoka Ck: S		Metric Score	Site Score	Reference Score
	County	Osage	Hughes				
	Order	5	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	11	23	18	21	53.7%	3	5
Number of Sensitive Benthic Species	2	8	3	6	36.4%	3	5
Number of Centrarchid species	4	6	6	6	66.7%	3	5
Number of Intol Species	1	4	2	3	33.3%	3	5
Proportion of Individuals as Tolerant	98.925	83	80	82	98.9	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	1.075	1	10	5	1.1	1	1
Proportion of Individuals as Lithophilic Spawners	0.000	13	9	11	0.0	1	1
TOTAL SCORES						15	23
PROPORTION OF REFERENCE						65	
INTEGRITY CLASSIFICATION OF SITE						FAIR	

Based on the State-adopted biological assessment for fish, this site is Undetermined. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 65% of reference giving it an integrity classification of 'Fair'.

Site 4: Wewoka Creek (Wetumka West) 8-31-98

Total Specimen Count	Common Name	Species
1	Spotted gar	<i>Lepisosteus oculatus</i>
1	Longnose gar	<i>Lepisosteus osseus</i>
3	Shortnose gar	<i>Lepisosteus platostomus</i>
1	Gizzard shad	<i>Dorosoma cepedianum</i>
1	Central stoneroller	<i>Campostoma anomalum</i>
87	Red shiner	<i>Cyprinella lutrensis</i>
1	Common carp	<i>Cyprinus carpio</i>
1	Sand shiner	<i>Notropis stramineus</i>
9	Suckermouth minnow	<i>Phenacobius mirabilis</i>
76	Bullhead minnow	<i>Pimephales vigilax</i>
4	River carpsucker	<i>Carpionodes carpio</i>
7	Smallmouth buffalo	<i>Ictiobus bubalus</i>
11	Channel catfish	<i>Ictalurus punctatus</i>
2	Flathead catfish	<i>Pylodictis olivaris</i>
3	Mosquitofish	<i>Gambusia affinis</i>
1	Brook silverside	<i>Labidesthes sicculus</i>
16	Orangespotted sunfish	<i>Lepomis humilis</i>
2	Bluegill sunfish	<i>Lepomis macrochirus</i>
107	Longear sunfish	<i>Lepomis megalotis</i>
1	Redear sunfish	<i>Lepomis microlophus</i>
4	Spotted bass	<i>Micropterus punctulatus</i>
2	Largemouth bass	<i>Micropterus salmoides</i>
1	White crappie	<i>Pomoxis annularis</i>
1	Logperch	<i>Percina caprodes</i>
9	Freshwater drum	<i>Aplodinotus grunniens</i>

Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	25	>23	12 to 22	<12	5
Shannon's Diversity based upon numbers	1.99	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	7	>3	2 to 3	<2	5
# of species comprising 75% of sample	3	>5	3 to 4	<3	3
Number of Intolerant Species (>100mi ² area)	5	>5	3 to 5	<3	3
Percentage of Tolerant Species	95.45	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					19
Percentage of Lithophils	1.42	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	352	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					30

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Bird Ck	Little Wewoka Ck: S		Metric Score	Site Score	Reference Score
	County	Osage	Hughes				
	Order	5	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	25	23	18	21	122.0%	5	5
Number of Sensitive Benthic Species	2	8	3	6	36.4%	3	5
Number of Centrarchid species	7	6	6	6	116.7%	5	5
Number of Intol Species	5	4	2	3	166.7%	5	5
Proportion of Individuals as Tolerant	95.455	83	80	82	95.5	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	3.125	1	10	5	3.1	1	1
Proportion of Individuals as Lithophilic Spawners	1.420	13	9	11	1.4	1	1
TOTAL SCORES						21	23
PROPORTION OF REFERENCE						91	
INTEGRITY CLASSIFICATION OF SITE						EXCELLENT	

Based on the State-adopted biological assessment for fish, this site is Fully Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 91% of reference, giving it an integrity classification of 'Excellent'.

Site 5: Wewoka Creek (Wetumka SH 75) 9-1-98

Total Specimen Count	Common Name	Species
	7	Gizzard shad
98	Threadfin shad	<i>Dorosoma petenense</i>
7	Central stoneroller	<i>Campostoma anomalum</i>
133	Red shiner	<i>Cyprinella lutrensis</i>
2	Redfin shiner	<i>Lythrurus umbratilis</i>
2	Sand shiner	<i>Notropis stramineus</i>
19	Suckermouth minnow	<i>Phenacobius mirabilis</i>
102	Bullhead minnow	<i>Pimephales vigilax</i>
1	River carpsucker	<i>Carpiodes carpio</i>
54	Channel catfish	<i>Ictalurus punctatus</i>
14	Flathead catfish	<i>Pylodictis olivaris</i>
13	Mosquitofish	<i>Gambusia affinis</i>
1	Brook silverside	<i>Labidesthes sicculus</i>
6	Green sunfish	<i>Lepomis cyanellus</i>
4	Orangespotted sunfish	<i>Lepomis humilis</i>
74	Longear sunfish	<i>Lepomis megalotis</i>
2	Largemouth bass	<i>Micropterus salmoides</i>
1	Logperch	<i>Percina caprodes</i>
17	Unidentified sunfish spp.	<i>Unidentified Lepomis spp.</i>

Metric	Value	Scoring			Score
		5	3	1	
Watershed > 100 square miles					
Total # of Species	19	>23	12 to 22	<12	3
Shannon's Diversity based upon numbers	2.14	>2.50	2.49-1.50	<1.50	3
# of Sunfish Species	5	>3	2 to 3	<2	5
# of species comprising 75% of sample	5	>5	3 to 4	<3	5
Number of Intolerant Species (>100mi ² area)	7	>5	3 to 5	<3	5
Percentage of Tolerant Species	91.56	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					21
Percentage of Lithophils	1.26	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	557	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					32

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Bird Ck	Little Wewoka Ck: S		Metric Score	Site Score	Reference Score
	County	Osage	Hughes				
	Order	5	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	19	23	18	21	92.7%	5	5
Number of Sensitive Benthic Species	3	8	3	6	54.5%	3	5
Number of Centrarchid species	5	6	6	6	83.3%	5	5
Number of Intol Species	7	4	2	3	233.3%	5	5
Proportion of Individuals as Tolerant	91.562	83	80	82	91.6	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	4.847	1	10	5	4.8	1	1
Proportion of Individuals as Lithophilic Spawners	1.257	13	9	11	1.3	1	1
TOTAL SCORES					21	23	
PROPORTION OF REFERENCE					91		
INTEGRITY CLASSIFICATION OF SITE					EXCELLENT		

Based on the State-adopted biological assessment for fish, this site is Fully Supporting. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 91% of reference giving it an integrity classification of 'Excellent'.

Site 5: Wewoka Creek (Wetumka SH 75) 6-11-02

Watershed > 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	15	>23	12 to 22	<12	3
Shannon's Diversity based upon numbers	0.86	>2.50	2.49-1.50	<1.50	1
# of Sunfish Species	3	>3	2 to 3	<2	3
# of species comprising 75% of sample	1	>5	3 to 4	<3	1
Number of Intolerant Species (>100mi ² area)	4	>5	3 to 5	<3	3
Percentage of Tolerant Species	98.69	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					11
Percentage of Lithophils	0.37	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	534	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					22

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Bird Ck	Little Wewoka Ck: S		Metric Score	Site Score	Reference Score
	County	Osage	Hughes				
	Order	5	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	15	23	18	21	73.2%	5	5
Number of Sensitive Benthic Species	2	8	3	6	36.4%	3	5
Number of Centrarchid species	3	6	6	6	50.0%	3	5
Number of Intol Species	4	4	2	3	133.3%	5	5
Proportion of Individuals as Tolerant	98.689	83	80	82	98.7	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	0.749	1	10	5	0.7	1	1
Proportion of Individuals as Lithophilic Spawners	0.375	13	9	11	0.4	1	1
TOTAL SCORES						19	23
PROPORTION OF REFERENCE						83	
INTEGRITY CLASSIFICATION OF SITE						GOOD	

Based on the State-adopted biological assessment for fish, this site is Undetermined. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 83% of reference, giving it an integrity classification of 'Good'.

Site 6: Wewoka Creek (Downstream Wetumka) 7-31-03

Total Specimen Count	Common Name	Species
	3	Spotted gar
1	Longnose gar-- MOST LIKELY ID	<i>Lepisosteus osseus-- MOST LIKELY ID</i>
4	Gizzard shad	<i>Dorosoma cepedianum</i>
383	Red shiner	<i>Cyprinella lutrensis</i>
4	Sand shiner	<i>Notropis stramineus</i>
1	Suckermouth minnow	<i>Phenacobius mirabilis</i>
42	Bullhead minnow	<i>Pimephales vigilax</i>
10	River carpsucker	<i>Carpionodes carpio</i>
3	Smallmouth buffalo	<i>Ictiobus bubalus</i>
12	Mosquitofish	<i>Gambusia affinis</i>
5	Green sunfish	<i>Lepomis cyanellus</i>
19	Orangespotted sunfish	<i>Lepomis humilis</i>
16	Bluegill sunfish	<i>Lepomis macrochirus</i>
26	Longear sunfish	<i>Lepomis megalotis</i>
2	Spotted bass	<i>Micropterus punctulatus</i>
2	Largemouth bass	<i>Micropterus salmoides</i>

Watershed > 100 square miles					
Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	16	>23	12 to 22	<12	3
Shannon's Diversity based upon numbers	1.09	>2.50	2.49-1.50	<1.50	1
# of Sunfish Species	4	>3	2 to 3	<2	5
# of species comprising 75% of sample	2	>5	3 to 4	<3	1
Number of Intolerant Species (>100mi ² area)	3	>5	3 to 5	<3	3
Percentage of Tolerant Species	99.36	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					13
Percentage of Lithophils	0.16	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	622	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					24

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Bird Ck	Little Wewoka Ck: S		Metric Score	Site Score	Reference Score
	County	Osage	Hughes				
	Order	5	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	16	23	18	21	78.0%	5	5
Number of Sensitive Benthic Species	2	8	3	6	36.4%	3	5
Number of Centrarchid species	4	6	6	6	66.7%	3	5
Number of Intol Species	3	4	2	3	100.0%	5	5
Proportion of Individuals as Tolerant	99.357	83	80	82	99.4	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	0.482	1	10	5	0.5	1	1
Proportion of Individuals as Lithophilic Spawners	0.161	13	9	11	0.2	1	1
TOTAL SCORES						19	23
PROPORTION OF REFERENCE						83	
INTEGRITY CLASSIFICATION OF SITE						GOOD	

Based on the State-adopted biological assessment for fish, this site is Undetermined. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 83% of reference, giving it an integrity classification of 'Good'.

Site 6: Wewoka Creek (Downstream Wetumka) 7-10-08

Total Specimen Count	Common Name	Species
	1	Spotted gar
2	Gizzard shad	<i>Dorosoma cepedianum</i>
224	Red shiner	<i>Cyprinella lutrensis</i>
46	Suckermouth minnow	<i>Phenacobius mirabilis</i>
30	Bullhead minnow	<i>Pimephales vigilax</i>
104	Channel catfish	<i>Ictalurus punctatus</i>
1	Flathead catfish	<i>Pylodictis olivaris</i>
2	Mosquitofish	<i>Gambusia affinis</i>
3	Green sunfish	<i>Lepomis cyanellus</i>
5	Bluegill sunfish	<i>Lepomis macrochirus</i>
14	Longear sunfish	<i>Lepomis megalotis</i>
2	Spotted bass	<i>Micropterus punctulatus</i>
2	Largemouth bass	<i>Micropterus salmoides</i>
1	Freshwater drum	<i>Aplodinotus grunniens</i>
1	Unidentified Catostomidae spp. (smallmouth buffalo or river carpsucker)	Unidentified Catostomidae spp.

Metric	Value	Scoring			Score
		5	3	1	
Total # of Species	15	>23	12 to 22	<12	3
Shannon's Diversity based upon numbers	1.45	>2.50	2.49-1.50	<1.50	1
# of Sunfish Species	5	>3	2 to 3	<2	5
# of species comprising 75% of sample	2	>5	3 to 4	<3	1
Number of Intolerant Species (>100mi ² area)	3	>5	3 to 5	<3	3
Percentage of Tolerant Species	88.81	fig 3	fig 3	fig 3	0
TOTAL SCORE FOR SAMPLE COMPOSITION					13
Percentage of Lithophils	0.68	>36	18 to 36	<18	1
Percentage of DELT Anomalies	0.000	<0.1	0.1-1.3	>1.3	5
Fish Numbers (total individuals)	438	>200	75 to 200	<75	5
TOTAL SCORE FOR FISH CONDITION					11
TOTAL SCORE					24

ALTERNATE IBI	Sta ID	Reference Site 1	Reference Site 2	Composite Reference Score	SCORING		
	Site Name	Bird Ck	Little Wewoka Ck: S		Metric Score	Site Score	Reference Score
	County	Osage	Hughes				
	Order	5	4				
Metric	Value	Reference Value	Reference Value	Composite Reference Value	Metric Score	Site Score	Reference Score
Total # of Species	15	23	18	21	73.2%	5	5
Number of Sensitive Benthic Species	1	8	3	6	18.2%	1	5
Number of Centrarchid species	5	6	6	6	83.3%	5	5
Number of Intol Species	3	4	2	3	100.0%	5	5
Proportion of Individuals as Tolerant	88.813	83	80	82	88.8	1	1
Proportion of Individuals as Insectivorous Cyprinid Species	10.502	1	10	5	10.5	1	1
Proportion of Individuals as Lithophilic Spawners	0.685	13	9	11	0.7	1	1
TOTAL SCORES						19	23
PROPORTION OF REFERENCE						83	
INTEGRITY CLASSIFICATION OF SITE						GOOD	

Based on the State-adopted biological assessment for fish, this site is Undetermined. As an additional measure, an alternative Index of Biological Integrity (IBI) that compares to reference streams was analyzed and this site scored out at 83% of reference, giving it an integrity classification of 'Good'.

Pictures from Site 5: Wewoka Creek (Wetumka SH 75) from OWRB sampling event



Recommendation:

All of the data that has been collected and reviewed as part of this re-evaluation is related to the downstream segment of Wewoka Creek. Therefore, our recommendations only pertain to the downstream segment.

The fish populations seem to be healthy with many species present. Several of the species collected were sunfish. The fish assessment indicated that there were moderate to high levels of pollution-tolerant fish species. The Fish IBIs assessments indicated both Undetermined and Fully Supporting status regarding the WWAC beneficial use. The BMI assessments indicate slight impairment for most sites.

Many of the tributaries to Wewoka Creek are listed as HLAC and have high to very high TDS and chloride levels. It is possible that the water chemistry (salts) limits the biotic communities in some of these tributaries. Based on the historic data, there seems to have been impacts to this stream that occurred from historic oil and gas activities.

Based on the data that was reviewed, it is the OWRB's recommendation that the lower segment of Wewoka Creek (downstream from the boundaries of Sec. 27 & 28, T 9 N, R 6 E IM) be upgraded to Warm Water Aquatic Community (WWAC). Since there is a lack of information regarding the upstream segment, we recommend that segment to remain a HLAC.