Missouri Department of Natural Resources

Biological Stream Assessment Report

Dry Auglaize Creek
Laclede County

March 15, 2000 and
September 25, 2000

Prepared for:

Missouri Department of Natural Resources
Division of Environmental Quality
Water Pollution Control Program

Prepared by:

Missouri Department of Natural Resources
Division of Environmental Quality
Environmental Services Program

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Attachments

1.0 Introduction

At the request of the Water Pollution Control Program (WPCP), the Environmental Services Program (ESP) conducted a biological assessment of Dry Auglaize Creek below the Lebanon Wastewater Treatment Facility (WWTF). The sampling was conducted on March 15, and September 25, 2000, to provide data to the WPCP for use in evaluating the biological integrity of a stream receiving effluent from a municipal owned wastewater treatment facility. Randy Sarver, Cecilia Campbell and others of the Environmental Services Program, Division of Environmental Quality, conducted the sampling.

In addition to this study a recent water quality investigation was conducted on Dry Auglaize Creek and the Lebanon WWTF by personnel of the ESP. This Stream Survey was conducted on September 14 & 15, 1999, and is on file at the WPCP.

2.0 Study Area

Dry Auglaize Creek originates near the middle of Laclede County just inside the northeast limits of the City of Lebanon. The two stream reaches assessed are class "P" with beneficial use designations of "warm water aquatic life protection, human health/fish consumption, and livestock and wildlife watering." The stream does not normally have visible flow upstream of the Lebanon WWTF and in most seasons is an effluent dominated stream. Dry Auglaize Creek is also listed in the Missouri Water Quality Standards as a losing stream.

Dry Auglaize Creek is located within the Ozark/Osage Ecological Drainage Unit (EDU). An EDU is a region in which biological communities and habitat conditions can be expected to be similar. Please see Appendix A for maps of the EDU and the local sampling locations. Table 1 compares the land cover percentages from the Ozark/Osage EDU and the 14 digit Hydrologic Unit (HU), #10290109060002, that contains the sampling reach of Dry Auglaize Creek. Land cover data were derived from Thematic Mapper satellite data from 1991-1993, and interpreted by the Missouri Resource Assessment Partnership (MoRAP).

Table 1
Percent Land Cover

	Urban	Crops	Grassland	Forest
EDU	0.3	1.5	49.7	43.4
14 digit HU	2.5	0.2	65.1	31.5

3.0 Site Descriptions

Station #1 (N. ½, Sec. 19, T. 35 N., R. 15 W.) was the most downstream station on Dry Auglaize Creek and was located upstream of the bridge on Iowa Road. Geographic coordinates of the crossing are Latitude 37.72935, Longitude –92.6319. The sampling location was approximately 5.2 miles downstream of the Lebanon WWTF. (This location was immediately upstream from Station #4 of the stream survey conducted by ESP in 1999

referred to above). The three standard habitats (coarse substrate, depositional substrate, and rootmat substrate) of a riffle/pool stream, as defined in the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure, were present and sampled. Livestock had access to the stream. Discharge was measured at 2.5 cubic feet/second (cfs).

Station #2 (N. ½, Sec. 31, T. 35 N., R. 15 W.) was the closest station to the Lebanon WWTF on Dry Auglaize Creek and was located upstream of the low water crossing on Pacific Road. Geographic coordinates of the crossing are Latitude 37.76127, Longitude –92.62725. The sampling location was approximately 2.4 miles downstream of the Lebanon WWTF. (This location was assigned Station #2 during the stream survey conducted by ESP in 1999 referred to above). The three standard habitats (coarse substrate, depositional substrate, and rootmat substrate) of a riffle/pool stream, as defined in the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure, were present and sampled. Livestock had access to the stream. Discharge was measured at 3.6 cubic feet/second (cfs).

4.0 Methods

4.1 Macroinvertebrates Collection

A standardized sample collection procedure was followed as described in the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure.

4.2 Discharge Measurements

Stream velocity was measured using a Marsh-McBirney, Flo-Mate Model 2000. Discharge was calculated per the methods in the Standard Operating Procedure MDNR-FSS-113 (Flow Measurements in Open Channels).

4.3 Chain-of-Custody

All samples received a numbered label affixed to the sampling jar and an internal label after preservation with formalin. The corresponding label number was entered onto a chain-of-custody form indicating the date, time, and location of collection and parameters to be analyzed. The ESP field personnel maintained custody of the samples for analyses.

4.4 Macroinvertebrate Analyses

A standardized sample analyses procedure was followed as described in the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure.

4.5 Quality Assurance/Quality Control (QA/QC)

QA/QC procedures were followed as described in the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure.

5.0 Observations

Stream stage appeared to be at base flow. There was no evidence of recent high water events. The odor of treated wastewater was present at both sampling stations.

6.0 Data Results

Data were evaluated as described in the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure. The following four metrics were used in the evaluation: 1) Total Taxa (TT); 2) Ephemeroptera/Plecoptera/Trichoptera Taxa (EPTT); 3) Biotic Index (BI); and, 4) Shannon Index (SI). The numeric biological criteria for this evaluation were determined by metric values calculated for each of two seasons from reference streams within the Ozark/Osage EDU. Those criteria are listed in Table 2 for spring and in Table 3 for fall.

Table 2
Biological Criteria for Spring/Warm Water Streams in the Ozark/Osage EDU

	Score = 5	Score = 3	Score =1
TT	>88	88–44	43-0
EPTT	>26	26–13	12-0
BI	<6.26	6.26–8.13	8.14-10
SI	>3.1	3.1–1.55	1.54-0

Table 3
Biological Criteria for Fall/Warm Water Streams in the Ozark/Osage EDU

	Score = 5	Score = 3	Score = 1
TT	>85	85-42	41-0
EPTT	>20	20-10	9-0
BI	<6.54	6.54-8.27	8.28-10
SI	>3.26	3.26-1.63	1.62-0

The metric values for Dry Auglaize Creek Stations #1 and #2 are listed in Table 4 for spring and Table 5 for fall. The values for each metric are scored against the criteria in their respective Tables. The total scores for spring are: Station #1 = 10 points out of a total of 20; Station #2 = 6 points out of a total of 20. The total scores for fall are: Station #1 = 12 points out of a total of 20; Station #2 = 8 points out of a total of 20.

Three categories of impairment were determined during the development of biological criteria. Stream reaches that score from 20 – 16 are considered fully biologically sustaining, scores from 14 – 10 are considered as partially biologically sustaining, and scores of 8 – 4 are considered non-biologically sustaining.

Table 4
Dry Auglaize Creek
Spring 2000

Sample #	00-10192		00-10193	
Date	3/15/2000		3/15/2000	
	Station #1 Value	Station #1 Score	Station #2 Value	Station #2 Score
TT	55	3	37	1
EPTT	4	1	3	1
BI	6.94	3	6.83	3
SI	2.03	3	1.42	1
Total Score		10		6
Sustainability		Partial		Non

Table 5
Dry Auglaize Creek
Fall 2000

Sample #	00-20220		00-20221	
Date	9/25/2000		9/25/2000	
	Station #1 Value	Station #1 Score	Station #2 Value	Station #2 Score
TT	57	3	38	1
EPTT	11	3	7	1
BI	7.3	3	7.3	3
SI	2.77	3	2.32	3
Total Score		12		8
Sustainability		Partial		Non

7.0 Discussion

Dry Auglaize Creek had impaired macroinvertebrate communities with biological ratings in both seasons of partially sustaining for Station #1 and non-sustaining for Station #2. A major reason in a lower than acceptable biological rating is the fact that the stream is 100% WWTF effluent. This effluent includes high concentrations of nutrients that remain elevated several miles downstream. For example, data from the ESP 1999 Stream Survey Sampling Report of Dry Auglaize Creek at Station #4 (immediately downstream of this study's Station #1), located approximately 5.2 miles below the WWTF, show nitrite plus nitrate levels generally greater than 14.1 mg/L and total phosphorus concentrations greater than 5.12 mg/L. The typical biological assessment involving point source impact is an improvement at subsequent downstream stations. Dry Auglaize Creek does exhibit a partial recovery at station #1, the most downstream station.

Other factors that may influence the biological community are the loss of surface water to groundwater. Dry Auglaize Creek becomes smaller with distance traveled from the headwaters. Approximately 1.1 cfs is lost in a distance of 2.8 miles. In addition the land cover in the 14 digit hydrologic unit containing the Dry Auglaize Creek sampling stations has higher urban and grassland percentages than the Ozark/Osage EDU. These factors are indicators that both urban and livestock influences could contribute to the rating of the stations on Dry Auglaize Creek as partial or biologically non-sustaining.

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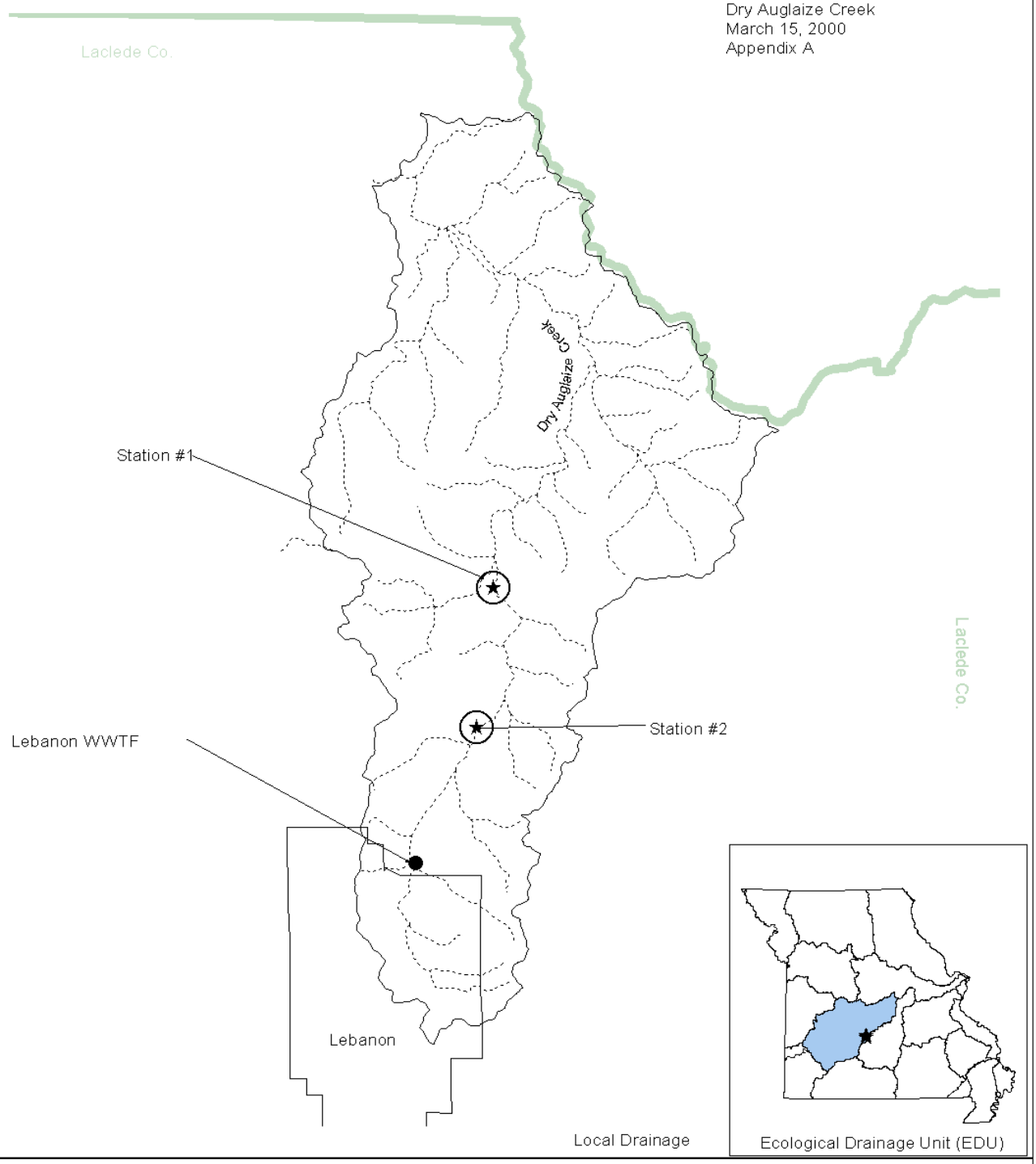
Appendix A

Maps

Dry Auglaize Creek &
Ozark/Osage EDU

Biological Stream Assessment Report
Dry Auglaize Creek
March 15, 2000
Appendix A



Local Drainage and Biological Sampling Site Location

1 0 1 2 3 4 Miles

Ecological Drainage Unit (EDU) - An EDU is an area that contains a unique combination of habitats and organisms. Missouri is divided into 19 EDUs as shown in the inset map above. This site is located in the highlighted EDU.

Local Drainage - The local drainage area, also known as a 14 Digit Hydrologic Unit, is shown in the main map above. This area is a portion of your local watershed. Missouri is split into over 1500 such units.