MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

Draft 2016 303(d)
PUBLIC COMMENTS

Public Notice
October 1, 2015 – January 31, 2016

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Missouri Department of Natural Resources
Water Protection Program
PO Box 176
Jefferson City, MO 65102-0176
800-361-4827 / 573-751-1300

Boone County
Resource Management

ROGER B. WILSON BOONE COUNTY GOVERNMENT CENTER
801 E. WALNUT ROOM 315 COLUMBIA, MO 65201-7730
(573) 886-4330 FAX (573) 886-4340

STAN SHAWVER, DIRECTOR PLANNING – INSPECTIONS – ENGINEERING **DERIN CAMPBELL, CHIEF ENGINEER**

November 6, 2015

Trish Rielly
Monitoring and Assessment Unit
Water Protection Program
Missouri Department of Natural Resources
1101 Riverside Drive
Jefferson City, Missouri 65101

RE: Comments on proposed listing of Little Cedar Creek (WBID 744) on 2016 303(d) list

Dear Ms. Rielly,

As per our discussion at the public information session on Tuesday, Boone County is disputing the listing of Little Cedar Creek (WBID 744) on the 2016 303(d) list of impaired waters for failure to meet the dissolved oxygen standard. The reasons for the dispute are as follows:

1) The sampling point listed as "L Cedar Ck @ Zaring Rd" (actually near the intersection of Route Z and Maupin Lane) appears to only have flow following precipitation events. There is a pool in Little Cedar Creek immediately below a box culvert on Maupin Lane which retains water during baseflow conditions, but clearly this is not an appropriate site for sampling of dissolved oxygen. The "headwater stream" character of Little Cedar Creek (absence of baseflow) persists at least as far south as Judy School Road. I have photographs of the view upstream and downstream at both the Maupin Road and Judy School Road locations (with GIS coordinates embedded in the properties) available if they would be useful.

2) You indicated at the informational meeting that the USGS data did not include flow data, so we do not have any indication that flow patterns in Little Cedar Creek were different during the sampling years 1999 through 2002.

3) The sampling point listed as "L Cedar Ck @ Zaring Rd" is located far upstream from the section of the stream that is proposed for listing on the 2016 303(d) list. The proposed impaired section is from E. Carter School Road south of Interstate

70 to the mouth of Little Cedar Creek at Cedar Creek. There does not seem to be any rational basis for using the upstream data to list the downstream section.

Please let me know if you will need any additional information in this regard.

Thank you,

Lynne Hooper
Urban Hydrologist

Rielly, Trish

From: Mike McKee <Mike.McKee@mdc.mo.gov>
Sent: Thursday, December 10, 2015 10:38 AM
To: Voss, Robert
Cc: Rielly, Trish; Bataille, Karen
Subject: RE: Proposed 303(d) List/Worksheets - Sport Caught Fish Reference

Robert,

I would like to request that the information in the 303(d) Worksheets based on the citation "McKee, 2002 (Sport-Caught Fish Consumption in Missouri—2002 Mail Survey)" be removed. The reason for removing the information is because the report cited was a draft report. The final report is in preparation and the cited information in the 303(d) Worksheets will not appear in the final report (i.e. distributional analysis of g/day total fish consumption). The information was removed because total fish consumption (g/day) was not measured as part of the survey (only consumption rates for some individual species).

The draft report is in the final review process within MDC and I anticipate the final report being available in January/February 2016. I will send you a copy when finalized.

Thanks and let me know if you have questions.

Mike McKee
Missouri Department of Conservation

From: Voss, Robert [mailto:robert.voss@dnr.mo.gov]
Sent: Thursday, December 10, 2015 8:52 AM
To: Mike McKee
Cc: Rielly, Trish; Karen Bataille
Subject: RE: Proposed 303(d) List/Worksheets - Sport Caught Fish Reference

Mike, That won't be a problem. We can take the reference out completely if you want us to; it was only put in as additional justification of the EPA document meal size and to show that it may be a conservative number for those who may eat more than the amount EPA suggests. If you want us to a leave a reference in then we could discuss what you think would be a more appropriate summary of the document.

Thanks,

Robert Voss
Environmental Specialist
Water Protection Program\Monitoring and Assessment Unit
Missouri Department of Natural Resources
(573) 522-4505
robert.voss@dnr.mo.gov

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From: Mike McKee [mailto:Mike.McKee@mdc.mo.gov]
Sent: Wednesday, December 09, 2015 12:03 PM
To: Voss, Robert
Cc: Rielly, Trish; Bataille, Karen
Subject: RE: Proposed 303(d) List/Worksheets - Sport Caught Fish Reference

Robert,

As I look at this issue more closely, I see that DNR has referred to the 50 g/day median fish consumption rate that was in the draft report that I shared with John Ford several years ago. In the final version of the report, the distribution analysis will be eliminated and only species specific estimates included. I did not realize that the 50 g/day value from the draft report was included in the Worksheets. What would need to happen to get the text removed regarding this?

I am still in the process of finalizing the report, so have not provided a copy to Leslie yet. It will probably be a couple of more weeks before I get the report finalized. After we figure out how to handle the Worksheets, we probably should update her.

Thanks
Mike

From: Voss, Robert [mailto:robert.voss@dnr.mo.gov]
Sent: Friday, October 23, 2015 8:27 AM
To: Mike McKee
Cc: Rielly, Trish
Subject: Proposed 303(d) List/Worksheets - Sport Caught Fish Reference

Mike, see Leslie's e-mail below. I miss spoke on the phone, I don't think the survey is referenced in the LMD, but in our worksheets on fish tissue. See the attached worksheet for Bee Tree Lake for an example.

Thanks,

Robert Voss
Environmental Specialist
Water Protection Program\Monitoring and Assessment Unit
Missouri Department of Natural Resources
(573) 522-4505
robert.voss@dnr.mo.gov

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From: Rielly, Trish
Sent: Thursday, October 22, 2015 4:57 PM
To: Voss, Robert; McCord, Samuel
Cc: Rielly, Trish
Subject: FW: Proposed 303(d) List/Worksheets

From: Holloway, Leslie [lholloway@mofb.com]
Sent: Thursday, October 22, 2015 1:27 PM
To: Rielly, Trish
Subject: Proposed 303(d) List/Worksheets

Trish: Unless I missed something, I did not find the worksheets for Bens Branch (3980) and Mill Creek (4066) posted. Also, could you please tell me how to access the reference document "Sport-Caught Fish Consumption in Missouri—2002 Mail Survey"? Thanks—Leslie

Leslie Holloway | Director, Regulatory Affairs | Missouri Farm Bureau Federation
PO Box 658 | Jefferson City, MO 65102 | Ph: 573-893-1409 | Cell: 573-619-5250 | Fax: 573-893-1560

City of Independence

WATER POLLUTION CONTROL DEPARTMENT

P.O. BOX 1019 • INDEPENDENCE, MISSOURI 64051-0519 • (816) 325-7711 • FAX (816) 325-7722

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Water Protection Program

November 13, 2015

Ms. Trish Rielly
Missouri Department of Natural Resources
Water Protection Program
P.O. Box 176
Jefferson City, Missouri 65102

Re: Proposed 2016 303(d) listing for Spring Branch – WBID 5004

Dear Ms. Rielly:

The following comments regarding the proposed 303(d) listing for Spring Branch are submitted on behalf of the City of Independence Water Pollution Control Department.

The United States Geological Survey (USGS) has provided us with the following information:

1. On Spring Branch dissolved oxygen (DO) values, the Department of Natural Resources (Department) appears to have chosen the minimum daily value to use from USGS continuous monitoring data. With DO having a diurnal value due to the algae, this may not be very representative. Out of the 96 values taken each day only one was used.
2. The first 3 years of data (2005, 2006, & 2007) are bringing the DO values down. When USGS monitoring began it was on the new bridge at Holke Road. USGS subsequently relocated their gauging station downstream by approximately 1/8 mile after it was determined that the samples collected at the original site were not representative of the stream due to all the rip rap catching debris and sediment.
3. USGS rates their data as excellent, good, fair, or poor. Data that is rated poor may be off as much as ±30%. Since the Department may have used the data without conferring with USGS, the quality of the data values being used may not have been taken into consideration.

Water Pollution Control requests the following:

1. The Department should use all the available DO sample data, not just the minimum daily value. The data should be statistically evaluated in accordance with the 2016 Listing Methodology Document, which states that for DO, a water body is deemed to be in full compliance with Water Quality Standards for protection of aquatic life if no more than

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10% of all samples exceed criterion.

2. The Department should not use USGS continuous water quality data collected at the Holke Road site prior to relocation of the gauging station in August 2007 for listing of Spring Branch Creek. The older data were not representative of overall stream water quality.
3. The Department may want to take into consideration USGS quality ratings of continuous water quality data.
4. We request that Spring Branch be removed from the 303 (d) list.

Thank you for considering our comments. If you have any questions, please feel free to contact me. Eric Christensen, USGS, can provide more information about USGS data. His telephone number is (816) 554-3489 ext. 204; email is echriste@usgs.gov.

Sincerely,

Karla Pierce

Karla Pierce
Environmental Compliance Manager

c: Dick Champion, Jr.
Eric Christensen, USGS

Rielly, Trish

From: Perkins, Bruce <Perkins.Bruce@epa.gov>
Sent: Monday, November 30, 2015 8:01 AM
To: Rielly, Trish
Subject: Comments on the 2016 MO draft 303(d) list

Trish,

Here are the EPA's comments on your draft list. Also one on the 2018 methodology. Let me know if you have any questions.

EPA comments on the draft 2016 Missouri Section 303(d) List
The following comments are presented alphabetically by the water body name as it is expressed in the public notice draft version.
Barker Creek Tributary (WBID 4083) - This water body is proposed to be newly listed for impairment due to an excursion of the EPA-approved Missouri water quality criterion for dissolved oxygen. In review of the state supplied assessment spreadsheet, it was noted that the assessment also recommended impairment by chloride plus sulfate and pH. However, the draft list does not include those two impairments.
Bee Fork (WBID 2760) – This water is proposed to be listed for contaminated sediments (Lead). This water was previously listed for lead in water and the supplied assessment spreadsheet also identifies lead in water not sediment.
Blackberry Creek (WBID 3184) – This water body is proposed for listing due to an impairment cause of Total Dissolved Solids. It was previously listed for excursion of the chloride plus sulfate criterion. The EPA-approved Missouri water quality standards do not have a criterion for total dissolved solids but do for chloride plus sulfate, under section 303(d) a state's waters are assessed against the state's EPA-approved water quality standards. In this case a listing for total dissolved solids could be an assessment of the state's narrative criteria, however, the state must still assess against the criterion of chloride plus sulfate. In its action on the 2014 Missouri section 303(d) List, the EPA added this water body to the list for chloride plus sulfate.
Brush Creek (WBID 1371) -This water body is proposed to continue to be listed for the cause of dissolved oxygen. For the 2016 cycle an additional cause of total suspended solids has been added. In a review of the provided assessment spreadsheet it is noted that the assessment does not indicate an impairment for total suspended solids. The sheet explicitly states there are low levels of total suspended solids.
Brush Creek (WBID 3986) – The assessments sheet has errors. The calculations are not in the same column as the data being assessed. The state did not use the same data that was used by the EPA to list this water for PAHs in sediment. New data for this water body available at the KCwaters web site (the source was identified to the state during the 2014 listing cycle and therefore should be considered readily available) was not used in the 2016 cycle assessment.
Center Creek (WBID 3203) – This water body is proposed for delisting of lead contaminated sediments due to a change in the states methodology for assessing potentially toxic sediments. While the geometric mean of all sediment samples now falls below the narrative threshold, all samples collected from mile 1 through 11.6 are greater that the threshold. This indicates that the new methodology results in an overall average of nontoxic sediments, while all samples from the area located within historic mining areas still indicate potential toxicity based on the methodology. As such, the ten mile portion of this assessment unit with toxic sediments greater that the state's narrative threshold is masked and not acknowledged by this proposal.
Flat River Creek (WBID 2168) – This water body is proposed to have the cause lead in fish tissue added for the 2016 listing cycle. A review of the EPA-approved TMDL for this water body (Big River TMDL approved 3/24/2010) shows the TMDL targets specifically identified lead in fish tissue. As such, that TMDL applies to this cause and the water body / pollutant combination already has a TMDL. Additionally, the cadmium impairment has been shifted from water to sediment while the assessment spreadsheet indicates that the impairment remains in water and not sediment.
Joplin Creek (WBID 5006) - This water body is proposed for listing with causes of lead and cadmium. In review of the assessment spreadsheet no lead impairment is shown. The assessment identifies cadmium and zinc as impairments for

this water body. However, there is only one excursion of zinc criteria shown in the sheet. One excursion does not require the state to identify an impairment, the assessment target is typically more than one excursion in three years on average.

Mississippi River (WBID 1707, 1707.03) – This water body is proposed to continue its listing for *Escherichia coli*. The water body identification number is not consistent between the 2014 list and the 2016 proposal.

Peruque Creek (WBID 0216) – This water body is proposed for delisting based on a lack of fish kills since 2010. There is no information presented that the fish population has recovered so that there are any fish in the assessment unit. As such a delisting may be premature if the fish community is absent. Time itself is not considered "good cause" for delisting an assessment unit.

Turkey Creek (WBID 3217) – This water body is proposed for delisting of the cause lead contaminated sediment. The portion of the assessment unit between Hwy 66 and Hwy 249 are consistently above the target for listing with one exception. In addition, contaminated sediments using the new averaging methodology continue for cadmium and zinc. These multiple lines of evidence suggest continued impairment of this assessment unit. A proposal to delist this water body pollutant combination was disapproved by the EPA for Missouri's 2014 cycle list and it was listed by the EPA.

Willow Branch (WBID 3280) – This water body is proposed for delisting of the causes cadmium and lead contaminated sediments based on a new listing methodology. The listing is retained for zinc contaminated sediments. Similar to Turkey Creek (see above) this water body exhibits sediment concentrations of cadmium and lead in portions of the assessment unit that consistently exceed the concentration targets for listing. By taking the geometric mean of all samples this condition is masked.

Wilsons Creek (WBID 2375) – The data presented for delisting of PAH contaminated sediments in this water body do not agree with the data collected by the EPA. It seems there have been mix ups in the location of some of the samples as data is attributed to sites on dates where no samples were collected at those sites. If the state would like, the EPA could resupply the original data for reassessment.

General Comment

Please provide an edited Table H with the extent of assessed water bodies for those previously only identified as 8-20-13 MUDD V1.0.

Comment on 2018 listing methodology.

Hardness is defined in the state's EPA-approved WQS. A state's 303(d) list is based on water quality standards and is reviewed by the EPA based on standards.

Bruce Perkins
Regional Integrated Report Coordinator
US EPA Region 7
Water Wetlands and Pesticides Division
Water Quality Management Branch
11201 Renner Blvd.
Lenexa, KS 66219
(913) 551 7067

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January 29, 2016

Ms. Trish Rielly
Water Protection Program
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102

Subject: Public Comments Regarding the Proposed 2016 Section 303(d) List

Ms. Rielly:

The City of Springfield, Missouri (City) submits the following comments regarding the proposed 2016 303(d) List of impaired waters placed on public notice by the Missouri Department of Natural Resources (MDNR or Department) on October 1, 2015.

Ward Branch 303(d) Listing for pH

Ward Branch (WBID 2374) is newly listed on the proposed 2016 303(d) list for pH in water. According to the Department's data sheet for Ward Branch, this listing is based on the City's MS4 first flush monitoring data collected from 2009-2013. The City believes that Ward Branch should be removed from the 303(d) list for the following reasons: (1) first flush pH data were not measured according to USEPA procedures and should not be used for impairment decisions; (2) first flush data are not suitable for direct comparison with water quality criteria; and (3) data gathered as part of a 319 grant project show that Ward Branch does not have a pH impairment. The City respectfully provides the following information on these three issues.

1. Analytical methods for pH measurements specified in EPA Method 150.1 require that pH be measured as soon as possible, preferably in the field at the time of sampling. Measurement of pH of these first flush samples in the field at the time of sampling or soon after is not feasible. Depending on the time of day and length of the storm, the sample retrieval may be several hours up to 24 hours after the samples have collected. The samples are transported to the lab and pH measurement is taken using a benchtop probe. In addition, the City wishes to note that the laboratory pH measurements made for the 7/30/09 and 10/23/09 sampling events may not be valid. As noted in the City's MS4 annual report that year, first flush samples from all stream sites sampled during 4 separate events from July -October 2009 measured high for pH, ranging from 9.2-10.8, including the field blank. This likely indicates an issue with the pH meter. Therefore, MDNR should exclude our MS4 pH data for impairment decisions.

2. As required and approved by the Department, the City's MS4 in-stream monitoring program is designed to collect first flush samples using in-stream stage samplers that fill as the stream level rises and are retrieved after the stream level recedes. First flush storm event samples are not representative of stormwater contributions over the entire storm event. Rather than an event mean concentration, the first flush samples are taken as one way to assess potential stormwater runoff influences on in-stream water quality conditions and aid in detecting illicit discharges. These pollutant concentrations are short-term and not suitable for direct comparison with most water quality criteria. For example, water quality criteria are typically expressed in terms of 24-hour (acute) or 4- to 30-day (chronic) exposures, in particular the pH criterion range should be considered at least a 4-day average exposure. First flush samples represent a transient conditions that are not representative of water quality conditions over the 24-hour or 4-day exposure timeframes. Therefore, direct comparisons with water quality criteria should not be made.

3. The Ozarks Environmental and Water Resources Institute (OEWRI) completed pre- and post-construction monitoring from 2004 through 2007 for the Ward Branch Stream Restoration Project, a Section 319 Nonpoint Source Pollution Grant project funded by the Department. During the pre-construction monitoring period, 30 pH measurements were taken at 5 sites on Ward Branch from November 2004 through March 2006. These were field measurements taken at the time of stormwater grab sampling, which likely do not reflect stable, representative conditions for aquatic life impacts (i.e., long-term or chronic exposure). The pH ranged from 6.6 - 7.6. During the post-construction monitoring period, 42 pH measurements were taken at 5 sites on Ward Branch from February through August 2007. These were field measurements taken at the time of stormwater grab sampling. There were two measurements outside of the pH criteria range of 6.5-9. These were 6.3 and 6.1. The remaining 40 measurements ranged from 6.5-8.1. These reports are available at http://oewri.missouristate.edu/45204.htm. Based on these data, Ward Branch is not impaired because less than 10% of the samples fail to meet the water quality criteria range. Furthermore, this comparison to the pH criteria range is conservative as these data are likely not representative of pH conditions over the criteria duration.

Wilsons Creek 303(d) Delisting for PAHs

The City strongly supports MDNR's decision to delist Wilsons Creek for PAHs based on additional data resulting in a geomean less than 150 percent of the Probable Effect Concentration (PEC). While listing waterbodies solely based on sediment quality data is not justified in the first place, the additional data only further illustrates the lack of evidence that Wilsons Creek is impaired for aquatic life. Additionally and of much greater significance, toxicity data recently made available on the U.S. Environmental Protection Agencies' (USEPA) STORET website provides strong evidence that there are no toxicity issues in Wilsons Creek. As summarized in Table 1 below, survival rates in Wilsons Creek ranged from 92.5% to 100%, which should be considered excellent. Measured survival rates meet or even exceed those found in the Bull Creek biocriteria reference stream on the same dates. The USEPA toxicity data also shows evidence of growth, which is also suggestive of a healthy aquatic ecosystem.

Table 1. Toxicity Data from Wilsons Creek and Biocriteria Reference Site

Site	Date	Percent Survival		Biomass (mg)	
		Chironomus	Hyalella azteca	Chironomus	Hyalella azteca
Wilson 1	May 19, 2015	92.5%	100%	1.43	0.15
	June 23, 2015	92.5%	100%	1.08	0.16
Wilson 3	May 19, 2015	92.5%	97.5%	0.78	0.12
	June 23, 2015	92.5%	100%	1.16	0.15
Bull Creek-Dry Hollow Rd*	May 19, 2015	92.5%	85%	1.23	0.13
	June 23, 2015	92.5%	82.5%	1.10	0.11

*MDNR Biocriteria Reference Site

Pearson Creek 303(d) Listing for Aquatic Life Impairment

The City finds that the Department's rationale does not support listing Pearson Creek as impaired for 303(d) listing purposes. We have repeatedly commented that it is extremely important to identify and sample appropriate reference streams for biological comparison as required by the 2016 LMD and Missouri regulations (10 CSR 7.031). To that end, in April 2015, the City provided MDNR a report of potential reference streams for Wilsons, Jordan, and Pearson Creek. On January 25, 2016, the City received comments from MDNR on that report. We appreciate those comments but it appears that the Department intends to continue comparing Pearson Creek biological data to inappropriate reference stream data. The City looks forward to meeting with MDNR to discuss this issue in greater detail. At the meeting, we also hope to gain clarity on a number of items related to the collection and analysis of macroinvertebrate data presented in the assessment worksheet. These items include the following:

- We briefly reviewed the July 2010 URS report[1] which is the source of Spring 2009 data presented in the worksheets and noted several items of concern. First, the report refers to 10 reference streams that were used to make data comparisons but does not specify the streams. As we have already mentioned, we believe the selection of appropriate reference streams is critical to this evaluation. We also have concerns about the methodology used. The report indicates that the quantitative similarity index for taxa (QSIT) score calculated on the duplicate sample was well below the 70% required by MDNR's methodology. Furthermore, the report states that the target number of organisms for each habitat (600 for riffles and 300 for other habitats, +/- 10%) was not reached for all of the samples. We request the opportunity to discuss this report in more detail to better understand how these and other issues may have impacted the final results.
- In the assessment worksheet, only one habitat score (133) is presented. Our understanding of the methodology is that each sample in the test and reference streams is assigned a habitat score. Therefore, it is not clear what the value in the worksheet represents.
- The assessment worksheet indicates that 95% of the reference streams score 16 or higher. Does that mean that on the assessment date (8/7/15), 95% of the streams scored 16 or

[1] 2010. URS Corporation. Sampling for Consent Decree Waters in Missouri, Pearson Creek, Springfield, MO. Task Order No. 2008-54.

above, or is the value adjusted over time? Given that some of the data are almost 12 years old, it seems likely that the percentage would change over time.

- Four of the samples used in the sheet are more than seven years old from the original listing date (2014). We note that the LMD states that if MDNR uses data that predates the original listing by more than seven years, the Department is supposed to provide a written justification for using the data. Written justification was not provided in the worksheet. In the absence of justification, MDNR is compelled by the LMD to avoid using these data in the listing decision.

Additionally, toxicity data recently made available on the U.S. Environmental Protection Agencies' (USEPA) STORET website provides strong evidence that there are no toxicity issues in Pearson Creek. As summarized in Table 2 below, survival rates in Pearson Creek ranged from 92.5% to 100%, which should be considered excellent. Measured survival rates meet or even exceed those found in the Bull Creek biocriteria reference stream on the same dates. The USEPA toxicity data also shows evidence of growth, which is also suggestive of a healthy aquatic ecosystem. Therefore, the City requests that biologically-based impairment decisions be delayed until such time that appropriate reference stream data are available for comparison.

Table 2. Toxicity Data from Pearson Creek and Biocriteria Reference Site

Site	Date	Percent Survival		Biomass (mg)	
		Chironomus	Hyalella azteca	Chironomus	Hyalella azteca
Pearson 1	May 19, 2015	92.5%	97.5%	1.59	0.15
	June 23, 2015	92.5%	97.5%	1.66	0.14
Pearson 3	May 19, 2015	92.5%	100%	1.28	0.16
	June 23, 2015	92.5%	95%	1.48	0.17
Bull Creek-Dry Hollow Rd*	May 19, 2015	92.5%	85%	1.23	0.13
	June 23, 2015	92.5%	82.5%	1.10	0.11

*MDNR Biocriteria Reference Site

Jordan Creek 303(d) Listing for PAHs in Sediment

The City finds that MDNR's rationale for listing Jordan Creek as impaired does not meet the weight of evidence requirements outlined in the 2016 LMD. The draft 2016 303(d) List identifies Jordan Creek as impaired based on sediment samples that exceed 150 percent of the Probable Effect Concentration (PEC) for PAH compounds. However, sediment data alone is not sufficient for listing Jordan Creek as impaired as PEC criteria have not been addressed in Missouri's Water Quality Standards and narrative criteria require multiple lines of evidence, such as representative biological or toxicity data. While MDNR includes aquatic biological data as part of its rationale, as previously commented on above, until such time that appropriate reference stream data are available, it is inappropriate to making listing decisions based on such data.

Additionally, toxicity data recently made available on the U.S. Environmental Protection Agencies' (USEPA) STORET website provides strong evidence that there are no toxicity issues in Jordan Creek. As summarized in Table 3 below, survival rates in Jordan Creek ranged from 92.5% to 100%, which should be considered excellent. Measured survival rates meet or even exceed those found in the Bull Creek biocriteria reference stream on the same dates. The USEPA toxicity data also shows evidence of growth,

which is also suggestive of a healthy aquatic ecosystem. Therefore, without additional evidence and per the LMD, the existing data do not support listing Jordan Creek as impaired.

Table 3. Toxicity Data from Jordan Creek and Biocriteria Reference Site

Site	Date	Percent Survival		Biomass (mg)	
		Chironomus	Hyalella azteca	Chironomus	Hyalella azteca
Jordan 1	May 19, 2015	92.5%	100%	1.79	0.12
	June 23, 2015	92.5%	97.5%	0.77	0.12
Bull Creek-Dry Hollow Rd*	May 19, 2015	92.5%	85%	1.23	0.13
	June 23, 2015	92.5%	82.5%	1.10	0.11

*MDNR Biocriteria Reference Site

North Branch Wilsons Creek 303d Listing for Zinc in Sediment

The City finds the Department's supporting rationale for listing North Branch Wilsons Creek as impaired does not meet the weight of evidence requirements outlined in the 2016 LMD. The Department's Listing Worksheet indicates that North Branch Wilsons Creek is impaired for zinc based on sediment data that exceeds 150 percent of the PEC. Missouri's LMD states that the "Department will use a weight of evidence analysis for evaluating all narrative criteria" and "[i]n the case of toxic chemicals occurring in benthic sediment rather than in water, the numeric thresholds used to determine the ***need for further evaluation*** [emphasis added] will be the Probable Effect Concentration . . . ." Accordingly, exceedances of PEC values should only be used to place water bodies in Category 3 of the LMD, or as part of a weight of evidence analysis. Additionally, the true impact of sediment pollutant concentrations (i.e., the primary measure of sediment toxicity) is complicated by the actual bioavailability of contaminants, which can vary based upon site conditions. Without other relevant environmental data the toxicity of metals in sediment remains unclear. To better understand potential toxicity, other relevant physical and chemical data are required (e.g., carbon-normalized equilibrium sediment benchmarks (ESBs) for non-ionizable organic chemicals (NIOCs), porewater concentrations and simultaneously extracted metals/acid-volatile sulfide). Without these additional data or biological or toxicity data, there is insufficient evidence that North Branch Wilsons Creek is impaired. Therefore, consistent with the 2016 LMD, the City requests North Branch Wilsons Creek be delisted.

Requested Corrections to the 303d Assessment Worksheets

The Department's assessment worksheets include impairment decisions not reflected within the 303d List and that are inconsistent with the 2016 LMD and Missouri's Water Quality Standards. In particular, the assessment worksheets for Jordan Creek (3374), Pearson Creek (2373), Ward Branch (2374), and Wilsons Creek (2375) include findings of impairment based on inappropriate comparisons of macroinvertebrate and/or fish data to reference streams. The Department has rightfully disregarded these assessments in the 303d List (with the exception of Pearson Creek), but the worksheets need to be revised for purposes of clarity and to avoid any confusion. Therefore, the City requests the Department make the following revisions to address these and other concerns:

- **Jordan Creek (3374)** – Either completely remove tab "Community-4A" or clearly note that until such time that appropriate reference stream data are collected, existing biological data cannot

be used for impairment decisions. Additionally, references to macroinvertebrate score criteria (i.e., 16) and explicit statements of impairment should also be removed. Per the 2016 LMD, the City also notes that fish IBI scores only apply to streams 3rd to 5th order in size in the Ozark ecoregion. As Jordan Creek is at most a 2nd order stream, the worksheet should reflect that fish metrics do not apply. The City also suggests renaming tab "Community-4A", which incorrectly suggests that Jordan Creek is currently in 305b category 4A and has a completed TMDL.

- **Pearson Creek (2374)** – As previously discussed in this letter, the City requests that biologically-based impairment decisions be delayed until such time that appropriate reference stream data are available for comparison. Consistent with this request, worksheet tab "Invert-5" should either be removed or all references to impairment decisions should be deleted along with references to macroinvertebrate score criteria (i.e., 16). It should also be clearly noted that until such time that appropriate reference stream data are collected, existing biological data cannot be used for impairment decisions.
- **Ward Branch (2374)** - Either completely remove tab "Inverts" or clearly note that until such time that appropriate reference stream data are collected, existing biological data cannot be used for impairment decisions. Additionally, references to macroinvertebrate score criteria (i.e., 16) and explicit statements of impairment should also be removed.
- **Wilsons Creek (2375)** - Either completely remove tab "Community-4A" or clearly note that until such time that appropriate reference stream data are collected, existing biological data cannot be used for impairment decisions. Additionally, references to macroinvertebrate score criteria (i.e., 16) and explicit statements of impairment should also be removed. The City also finds the use of fish IBI metrics questionable and suggests renaming tab "Community-4A", which incorrectly suggests that Wilsons Creek is currently in 305b category 4A and has a completed TMDL.
- **Wilsons Creek (2375)** - The "Sediment PAHs" tab notes that PAHs exceed 150% of the PEC upstream of the Southwest Treatment Plant. However, this assertion is not supported by the data table, which shows the PAH geomean is below 150% upstream of the Southwest Treatment Plant. The City requests MDNR correct this issue in the Listing Worksheet.

The City appreciates the opportunity to provide public comment and looks forward to your thoughtful consideration of these comments. Please feel free to contact me at anytime to discuss any of these issues.

Sincerely,

Errin Kemper, P.E.
Assistant Director – Environmental Services
City of Springfield Missouri

CC:
Steve Meyer, P.E. – Director
Jan Y. Millington – Assistant City Attorney
Paul Calamita – Aqualaw
Trent Stober, P.E. - HDR

ROBERT J. BRUNDAGE
EDWARD C. CLAUSEN
MARK W. COMLEY
JOSHUA L. HILL
CATHLEEN A. MARTIN

NEWMAN COMLEY RUTH

STEPHEN G. NEWMAN
JOHN A. RUTH
NICOLE L. SUBLETT
ALICIA EMBLEY TURNER

January 29, 2016

Via Email

Missouri Department of Natural Resources
Attn.: Trish Rielly
Water Protection Program
P.O. Box 176, Jefferson City, MO 65102
trish.rielly@dnr.mo.gov

Re: Comment on Proposed 2016 303(d) List
Cave Springs Branch (WBID 3245U-01)

Dear Trish:

I am writing you on behalf of Simmons Foods, Inc. regarding the 303(d) listing for Cave Springs Branch (CSB). This letter requests the Missouri Department of Natural Resources recommend to the Clean Water Commission that Cave Springs Branch be removed from Missouri's 303d list are the TMDL be rescinded because the CSB is no longer impaired.

Simmons Foods operates a chicken processing and rendering plant near Southwest City, Missouri. The facility has a wastewater treatment plant that discharges to CSB pursuant to Missouri State Operating Permit MO-0036773. Simmons' plant employs approximately 1,400 employees who take pride in providing consumers with quality protein products while working to provide environmental protections.

Cave Springs Branch first appeared on the 303(d) List in 1998. No data was offered to support the listing other than a suggestion the watercourse had unsightly bottom deposits. These unsightly bottom deposits were likely comprised of filamentous algae. In 2010, the Clean Water Commission removed Cave Springs Branch (WBID 3245U-01) from Missouri's 303d list because the stream was no longer impaired. Unfortunately, EPA reinstated the listing without any additional data to suggest unsightly bottom deposits persisted.

As discussed below, changes at the Simmons Foods' treatment plant resulted in very clean effluent being discharged into Cave Springs Branch and the virtual elimination of filamentous in the watercourse. As a result, the watercourse is no longer impaired for unsightly bottom deposits.

In 1998 and 1999, Simmons Foods made a commitment to research, design and construct new and additional, state-of-the art treatment facilities to improve the quality of water in CSB.

Simmons is proud to say that it delivered on its commitment. For more than a decade Simmons Foods' wastewater treatment plant has produced a high-quality effluent that reduced ammonia and nutrient loadings to such an extent that it is now an industry leader in wastewater treatment.

Prior to wastewater treatment improvements made in 1995/1996 and again in 1999, the Simmons Foods' wastewater treatment plant ("Simmons' plant") discharged effluent containing upwards of 50 mg/L ammonia, 20 mg/L total phosphorus (TP) and 158 mg/L nitrate/nitrite nitrogen. After the new treatment systems were placed online, ammonia, TP and nitrate/nitrite levels dropped precipitously. Figure 1, below, demonstrates the dramatic reduction in total phosphorus in Simmons' effluent. This reduction, in addition to changes in watershed land-use practices has resulted in a virtual elimination of filamentous algae growths in CSB.

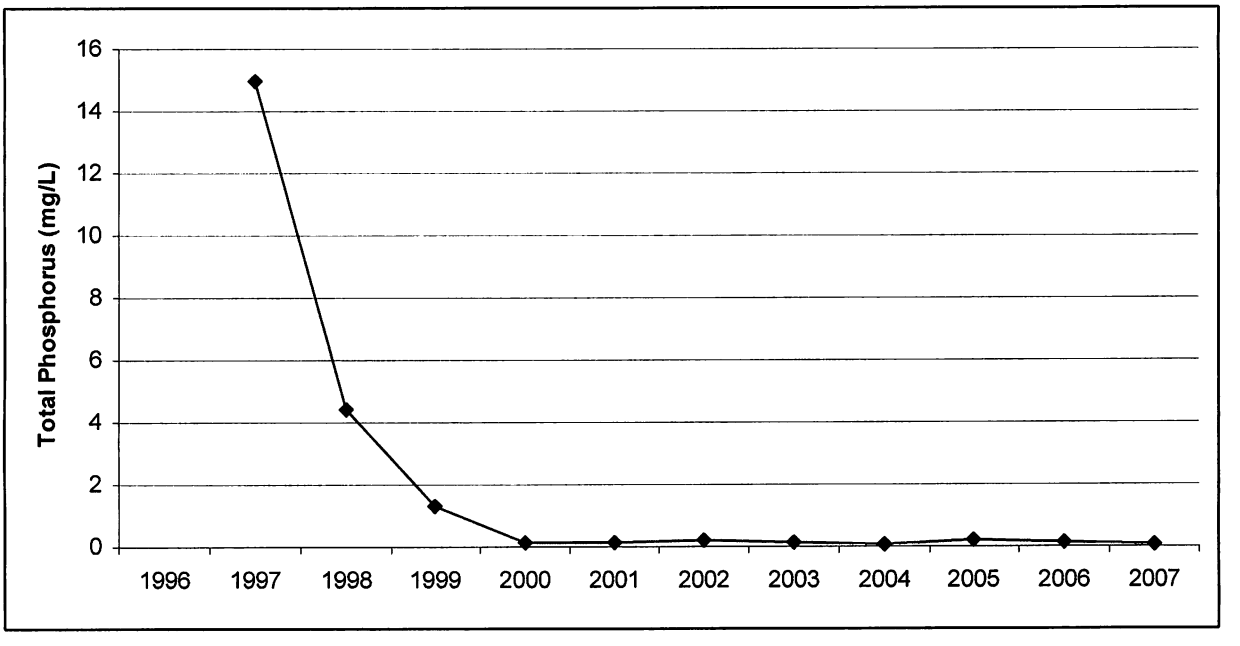


Figure 1: Total Phosphorous data from 1998-2007

MDNR Data and Observations Recommend Delisting

In 2004, the Department published a document discussing Nutrient Trends in Cave Springs Branch. The document is enclosed as Attachment 1. In this document, the Department stated:

> There have been large reductions in the amount of nutrients discharged to Cave Spring Branch beginning in 1999. These reductions are due primarily to improvement in wastewater treatment at the Simmons poultry processing plant ... In August 2004, the Missouri DNR conducted a visual and benthic survey of Cave Spring Branch ... There is currently no evidence of exceedance of narrative water quality standards.

In 2008, MDNR released another Nutrient Trends in Cave Springs Branch document and again stated, "There is currently no evidence of exceedance of narrative water quality standards." This document is also enclosed as Attachment 2.

The 1998 decision to list Cave Springs Branch may have relied in part on the results of a 1992 stream survey that noted heavy filamentous algae growth on rocks and substrate on the bottom of the stream. This filamentous algae growth was characterized as "objectionable bottom deposits," in Cave Springs Branch near the Simmons' facility. GBM^c & Associates' 2000 Bioassessment Study (previously submitted to MDNR) also noted heavy coverage of long-stranded filamentous algae. However, since 2000, growths of long, filamentous algae have all but disappeared.

In GBM^c & Associates' 2010 bioassessment study (Attachment 3), almost no filamentous algae was observed. Instead, a small amount of filamentous algae was observed (approximately 5 percent of the channel bottom), and what was observed was short-stranded, not long-stranded, algae. Additionally, no objectionable bottom deposits, surface sheens, or unusual water or sediment odors were observed. Overall, there was a vast improvement in the presence of filamentous algae.[1]

In conclusion, based on MDNR's repeated assertion that Cave Springs Branch does not exceed water quality standards and the elimination of filamentous algae, Simmons Foods requests CSB be removed from the 303d list and the TMDL be rescinded. Thank you for the opportunity to comment. Should you wish to discuss these comments further, feel free to contact me.

Sincerely,

NEWMAN, COMLEY & RUTH P.C.

By: Robert J. Brundage

Robert J. Brundage
rbrundage@ncrpc.com

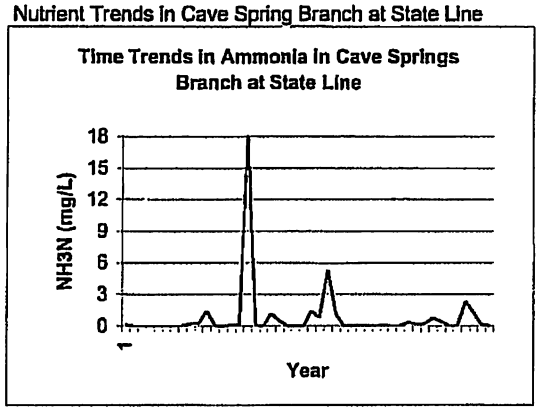
Enclosures
ec: Simmons Foods, Inc. (w/encls.)
John Elrod (w/encls.)
John Hoke (w/encls.)
John Madras (w/encls.)

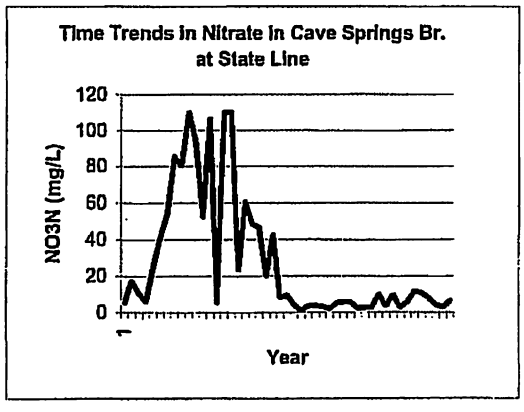
[1] This is also consistent with a 2004 MDNR visual and benthic survey of Cave Springs Branch, which found "the aquatic invertebrate community and levels of algae in the stream appeared to be similar to other streams viewed in this area on the same date," and MDNR's response to Simmons' comments on the Cave Springs Branch TMDL, which stated, "Water quality has improved such that algae production in the stream has been reduced and objectionable bottom deposits have also been reduced or eliminated."

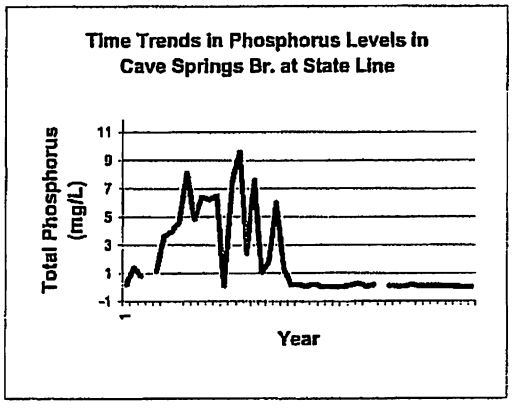
Missouri Department of Natural Resources
Water Protection Program
5737751-1300

Cave Spring Branch - WBID9002 (unclassified)

Nutrient Trends in Cave Spring Branch at State Line







There have been large reductions in the amount of nutrients discharged to Cave Spring Branch beginning in 1999. These reductions are due primarily to improvements in wastewater treatment at the Simmons poultry processing plant. Monitoring of fishes was done by Oklahoma DEQ in October, 1998. This study found a good diversity of fish species in the creek and concluded the stream had recovered from the acute pollution events that occurred in July 1997.

In August 2004, the Missouri DNR conducted a visual and benthic survey of Cave Spring Branch for the first four miles below the Simmons facility. The aquatic invertebrate community and levels of algae in the stream appeared to be similar to other streams viewed in this area on the same date.

There is currently no evidence of exceedence of narrative water quality standards. In addition, the Listing Methodology document does not include criteria for listing waters for protection of aquatic life.

Recommendation: delete this stream from the 2004 303(d) list.

Attachment 1

Missouri Department of Natural Resources
Water Protection Program
573/751-1300

Cave Springs Branch at State Line -WBID 9002 unclassified

Water Chemistry Data by Mo. DNR and Oklahoma DEQ

Org	Yr	Mo	Dy	NH3N	NO3N	TP	Org	Yr	Mo	Dy	NH3N	NO3N	TP
MDNR	1998	3	5		5.17	0.16	OKDEQ	1997	1		0.7	26.4	14.4
MDNR	1998	3	15	0.13	17.4	1.42	OKDEQ	1997	2		0.3	38.7	15.6
MDNR	1998	3	18	0.02499	10.8	0.82	OKDEQ	1998	1	28	0.93	30.39	2.71
MDNR	1998	3	26	0	5.87		OKDEQ	1998	2	4	0.4	7.36	0.13
MDNR	1998	4	6	0	25.1	1.16	OKDEQ	1998	2	11	0.86	29.49	2.88
MDNR	1998	4	14	0	40.3	3.63	OKDEQ	1998	2	18	1.11	39.38	4.69
MDNR	1998	4	30	0.04	53.8	3.96	OKDEQ	1998	2	22	2.15	44.32	6.12
MDNR	1998	5	19	0.02499	85.4	4.63	OKDEQ	1998	2	25	0.05	5.1	0.201
MDNR	1998	5	29	0.05	80.4	8.1	OKDEQ	1998	3	1	0.05	5.02	0.228
MDNR	1998	6	3	0.21	109.88	4.83	OKDEQ	1998	3	4	0.05	4.938	0.738
MDNR	1998	6	8	0.26	93.61	6.44	OKDEQ	1998	3	11	0.05	6.55	0.051
MDNR	1998	6	30	1.45	52.33	6.23	OKDEQ	1998	3	18	0.05	11.42	0.888
MDNR	1998	7	18	0.03	106.39	6.5	OKDEQ	1998	3	26	0.05	15.05	0.025
MDNR	1998	7	28	0.02499	5.35	0.09	OKDEQ	1998	4	1	0.07	17.5	1.51
MDNR	1998	8	27	0.11	110	7.56	OKDEQ	1998	4	7	0.12	22.06	1.156
MDNR	1998	9	10	0.13	110.43	9.61	OKDEQ	1998	4	15	0.05	45.56	4.223
MDNR	1998	10	8	18.2	23.43	2.37	OKDEQ	1998	4	22	0.05	61.57	6.178
MDNR	1998	10	20	0.12	60.7	7.62	OKDEQ	1998	4	29	0.18	52.5	4.986
MDNR	1998	12	9	0.02499	48.5	1.02	OKDEQ	1998	5	6	0.2	67.27	6.75
MDNR	1998	12	29	1.16	46.5	1.89	OKDEQ	1998	5	11	0.13	70.31	7.16
MDNR	1999	1	19	0.499	20	6	OKDEQ	1998	6	10	0.12	97.72	7.44
MDNR	1999	2	2	0.02499	42.6	1.38	OKDEQ	1998	7	15	0.28	93.41	10.66
MDNR	1999	6	3	0.0499	8.33	0.19	OKDEQ	1998	7	29	0.09	116	8.61
MDNR	1999	9	25	0.02499	9.66	0.2	OKDEQ	1998	8	6	0.16	65.48	4.72
MDNR	1999	12	29	1.44	4.56	0.06	OKDEQ	1998	8	19	0.1	92.99	9.424
MDNR	2000	2		0.83	1.14	0.21	OKDEQ	1998	9	16	0.16	59.33	6.271
MDNR	2000	2		5.26	3.8	0.06	OKDEQ	1998	9	30	0.24	92.98	19.61
MDNR	2000	3		1.15	3.96	0.05	OKDEQ	1998	10	14	0.33	37.08	3.303
MDNR	2000	3		0.0499	3.29	0.03	OKDEQ	1998	11	18	0.39	64.94	5.954
MDNR	2000	4	19	0.02499	2.05	0.06	OKDEQ	1998	12	9	0.12	55.94	1.507
MDNR	2000	6	29	0.05	5.29	0.15	OKDEQ	1998	12	16	0.45	68.79	5.621
MDNR	2000	7	13	0.02499	5.85	0.3	OKDEQ	1999	1	6	0.4	34.22	1.919
MDNR	2000	8	3	0.02499	5.77	0.06	OKDEQ	1999	1	20	0.65	49.02	4.469
MDNR	2000	8	14	0.06	2.4	0.18	OKDEQ	1999	2	3	0.05	47.67	2.817
MDNR	2000	8	31	0.02499	2.5		OKDEQ	1999	2	17	0.05	45.66	5.816
MDNR	2000	9	7	0.02499	2.97	0.1	OKDEQ	1999	3	10	0.1	13.54	1.106
MDNR	2000	9	19	0.4	9.93	0.12	OKDEQ	1999	3	24	0.16	5.74	1.194
MDNR	2001	6	14	0.13	3.89	0.05	OKDEQ	1999	4	4	0.05	9.47	0.253
MDNR	2002	8	4	0.23	9.57	0.22	OKDEQ	1999	4	5	0.07	7.65	2.157
MDNR	2003	1	6	0.76	2.82	0.11	OKDEQ	1999	4	21	0.05	9.47	0.25
MDNR	2003	6	17	0.44	5.97	0.12	OKDEQ	1999	5	5	0.05	3.69	0.46
MDNR	2003	7	31	0.01499	11.6	0.11	OKDEQ	1999	5	19	0.45	3.92	0.392
MDNR	2003	9	23	0.04	10.9	0.11	OKDEQ	1999	5	21	0.05	3.69	0.46
MDNR	2003	10	14	2.32	8.04	0.09	OKDEQ	1999	6	7	0.05	5.93	0.146
MDNR	2003	12	17	1.3	4.2	0.05	OKDEQ	1999	6	23	0.32	0.52	5.53
MDNR	2004	1	14	0.16	2.92	0.02	OKDEQ	1999	7	7	0.16	3.47	0.205
MDNR	2004	3	23	0.01499	6.61	0.02	OKDEQ	1999	8	4	0.14	2.62	0.162

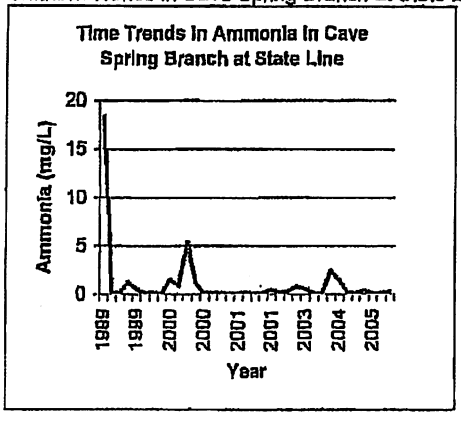
Missouri Department of Natural Resources
Water Protection Program
573/751-1300

Org	Yr	Mo	Dy	NH3N	NO3N	TP
OKDEQ	1999	8	25	0.06	16.33	0.115
OKDEQ	1999	9	15	0.05	13.99	0.124
OKDEQ	1999	10	6	0.32	14.56	
OKDEQ	1999	10	20	0.16	12.38	0.17
OKDEQ	1999	11	3	0.45	0.82	0.041
OKDEQ	1999	11	17	0.1	1.03	0.202
OKDEQ	1999	12	1	0.36	6.27	0.134
OKDEQ	1999	12	15	0.35	3.97	0.13
OKDEQ	2000	1	12	0.05	3.36	0.198
OKDEQ	2000	2	9	1.22	1.69	0.171
OKDEQ	2000	3	22	0.19	4.72	0.064
OKDEQ	2000	5	3	0.16	3.77	0.148
OKDEQ	2000	5	31	0.05	1.38	0.131
OKDEQ	2000	6	28	0.13	3.77	0.242
OKDEQ	2000	7	26	0.07	2.89	0.104
OKDEQ	2000	8	23	0.14	4.05	0.167
OKDEQ	2000	9	20	1.24	2.23	0.192
OKDEQ	2000	10	18	0.23	1.01	0.118
OKDEQ	2000	11	15	0.28	3.45	0.068
OKDEQ	2001	1	3	4.9	2.99	0.15
OKDEQ	2001	1	24	3.8	11.54	0.046
OKDEQ	2001	2	7	3.64	9.87	0.084
OKDEQ	2001	3	21	2.74	7.89	0.049
OKDEQ	2001	4	18	0.25	2.47	0.057
OKDEQ	2001	5	23	0.15	6.1	0.05
OKDEQ	2001	6	13	0.15	1.96	0.056
OKDEQ	2001	7	18	0.51	2.28	0.094
OKDEQ	2001	8	22	0.13	8.17	0.105
OKDEQ	2001	9	19	0.15	3.86	0.123
OKDEQ	2001	10	13	0.25	2.36	0.079
OKDEQ	2001	12	5	0.33	1.44	0.301
OKDEQ	2001	12	19	0.1	4.41	0.409

Note: The quality assurance program of Oklahoma DEQ has not yet been reviewed by Mo. DNR.

Missouri Department of Natural Resources
Cave Spring Branch - WBID 3245U001 (unclassified)
Water Chemistry Data by MoDNR and Oklahoma DEQ

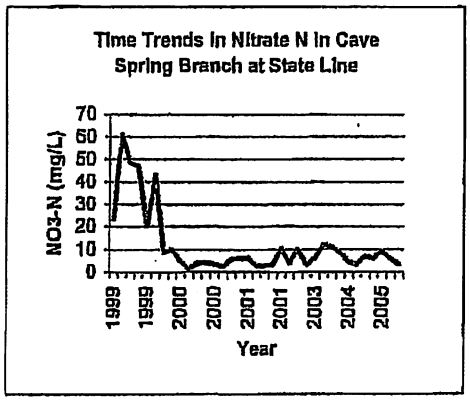
Nutrient Trends In Cave Spring Branch at State Line. Assessment date July 25, 2006

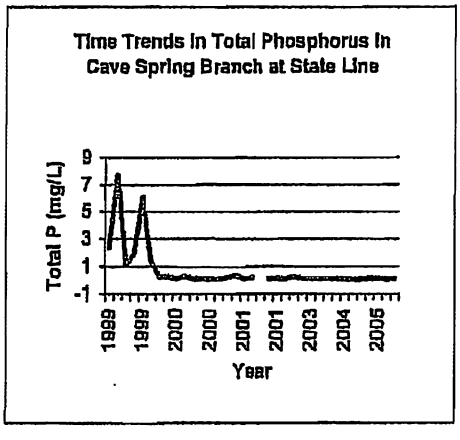


There have been large reductions in the amount of nutrients discharged to Cave Spring Branch beginning in 1999. These reductions are due primarily to improvements in wastewater treatment at the Simmons poultry processing plant. Monitoring of fishes was done by Oklahoma DEQ in October, 1998. This study found a good diversity of fish species in the creek and concluded the stream had recovered from the acute pollution events that occurred in July 1997.

In August 2004, the Missouri Department of Natural Resources conducted a visual and benthic survey of Cave Spring Branch for the first four miles below the Simmons facility. The aquatic invertebrate community and levels of algae in the stream appeared to be similar to other streams viewed in this area on the same date.

There is currently no evidence of exceedence of narrative water quality standards.





GBMc

Simmons Foods, Inc.
Bioassessment of Reach CSB-1 on Cave Springs Branch

October 28, 2010

GBMc & Associates
Strategic Environmental Services

Attachment 3

Bioassessment of Reach CSB-1 on Cave Springs Branch

Prepared for:

Simmons Foods, Inc.
P.O. Box 121
Southwest City, MO 64863

Prepared by:

GBM^{c} & Associates
219 Brown Lane
Bryant, AR 72022

October 28, 2008

CONTENTS

FIGURES

TABLE

ATTACHMENT

Bioassessment of Reach CSB-1 on Cave Springs Branch

Summary of Findings

Benthic macroinvertebrate sampling and habitat assessment were completed in Cave Springs Branch at CSB-1, upstream of the Missouri/Oklahoma state line on September 29, 2010. Collection and processing of macroinvertebrates were completed in a manner to replicate a previous assessment of the creek. Habitat assessment was completed to evaluate the potential effect of habitat on the macroinvertebrate community and as a comparison with the habitat assessment conducted in 2000 that found habitat conditions degraded by heavy cattle use at the site. The community collected in 2010 shows vast improvement over that collected in 2000. Each community characteristic assessed in 2010 scored better, indicating improvement, compared to that of 2000. Most noteworthy is the shift from a community dominated by flatworms and dipterans in 2000 to one dominated by Ephemeroptera and Trichoptera in 2010. Overall, the community depicted by the CSB-1 collection in 2010 appears typical for small Ozark Highland streams in the late summer/early fall seasonal period. The habitat was also found to have improved over time and no active use of stream or riparian zone by cattle was noted. Periphyton coverage was greatly reduced compared to 2000 (and almost no filamentous algae was observed), stream banks were better protected by vegetation, and the riparian areas showed no evidence of cattle impacts.

Macroinvertebrate Sampling and Analysis

Benthic macroinvertebrates inhabit the sediment or live on the bottom substrates of streams, rivers and lakes. The presence of these organisms and their diversity and tolerance to environmental perturbation at an expected level reflects the maintenance of a systems biological integrity. Monitoring these assemblages is useful in assessing the aquatic life status of the water body and detecting trends in ecological condition.

Benthic macroinvertebrate sampling was completed in Cave Springs Branch at CSB-1, upstream of the Missouri/Oklahoma state line on September 29, 2010. Cave Springs Branch was sampled as a riffle/pool predominant stream; and the samples were

collected in gravel and cobble riffles only. Collection and processing of macroinvertebrates were completed in a manner to replicate the work presented in the September 8, 2000 *Stream Assessment Report on Cave Springs Branch and Honey Creek* (GBM^c & Associates, 2000). Collection and sample processing was completed according to GBM^c SOP's and EPA protocols (Barbour, 1999) and are generally considered semi-quantitative.

Samples were condensed and processed in the field. Macroinvertebrate samples were processed according to GBM^c QAP protocol (GBM^c & Associates, 2008). The condensed sample was rinsed and a portion of it placed in a sorting tray. Organisms were picked randomly from the sample and preserved in 70% ethanol in small jars. One hundred organisms (+/- 10%) were picked from the sample in an effort to mimic observed abundance while still locating and removing a representative number of large or rare specimens. All organisms from the sample were identified to appropriate taxonomic levels (generally to genus). Identifications were completed using widely accepted taxonomic references including *An Introduction to the Aquatic Insects of North America* (Merritt and Cummins, 1996) and *Fresh Water Invertebrates of the United States* (Pennak, 1989). A series of biometrics were analyzed for each collection. The primary biometrics assessed were taxa richness (number of different taxa), EPT (Ephemeroptera, Plecoptera, and Trichoptera) richness, biotic index, Shannon-Weiner Diversity Index (base-e), percent EPT, and community ordinal and trophic composition structure. The biotic index was calculated following the formula developed by Hilsenhoff (EPA, 1989). Tolerance values used in the calculations were from a Missouri Department Natural Resources database (Sarver, 2001) which is based on tolerance values developed by Lenat, Hilsenhoff, Bode, and others, or from those provided in *Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers*, (EPA, 1999). A comprehensive listing of the macroinvertebrate taxa identified from the 2000 and 2010 samples are presented as an attachment to this letter. A summary of the biometric scores are presented in Table 1.

Table 1. Summary of macroinvertebrates metrics from collections at CSB-1.

Parameter	CSB-1 (2010)	CSB-1 (2000)
COMMUNITY MEASURES		
Total number of Taxa (Richness)	19	11
EPT Richness	5	0
EPT % Abundance	61.9	0.0
Diversity Indices (Shannon-Wiener)	2.33	1.85
Total % of 5 Dominant Taxa	83	87
PERCENTAGE OF THE 4 DOMINANT ORDINAL GROUPS		
Ephemeroptera	37	—
Trichoptera	25	—
Diptera	9	35
Crustacea	9	—
Turbellaria	—	34
Annelida	—	16
Megaloptera	—	10
FUNCTIONAL FEEDING ASSEMBLAGES %		
Shredders	0	0
Scrapers	4	2
Filterers	25	7
Collectors	59	55
Predators	13	36
Biometric Score*:	5.8	7.2

CSB-1 2010 Collection

The sample from Station CSB-1 collected in 2010 was dominated by Ephemeropterans (37%) and Trichopterans (25%). Taxa richness (total number of different taxa identified) and EPT richness (number of taxa representatives from the orders Ephemeroptera, Plecoptera and Trichoptera, which are generally considered to be more sensitive to water quality and habitat perturbation) were 19 and 5, respectively. The Biotic Index (a measure of macroinvertebrate tolerance to environmental perturbation) resulted in a value of 5.8 which portrays a somewhat intolerant community to water quality and habitat perturbation (value scored from 0-10, with 0 being the most intolerant). The lower the biotic index score the more indication that a community is healthy and experiencing no adverse impacts from water quality or habitat perturbation. Scores below 6 are common in healthy highland streams. A Shannon-Weiner Diversity Index (base-e) was calculated and resulted in a value of 2.33. The trophic structure of the community was dominated by collectors (55%) and filterers (25%) with

representatives present from each functional feeding group with the exception of shredders, which were absent.

CSB-1 2000 Collection

The CSB-1 sample collected in 2000 was dominated by Dipterans (35%) and Turbellarians (34%). Taxa richness and EPT richness were 11 and 0, respectively. The Biotic Index resulted in a value of 7.2 which portrays a community somewhat tolerant to water quality and habitat perturbation. A Shannon-Weiner Diversity Index (base-e) was calculated and resulted in a value of 1.85. The trophic structure of the community was dominated by collectors (55%) and predators (36%) with representatives present from each functional feeding group, including shredders which had 1% of the collection.

Comparison of 2010 and 2000 Collections

The community collected in 2010 shows vast improvement over that collected in 2000. Most noteworthy is the shift from a community dominated by the facultative flatworms and dipterans in 2000 to one dominated by the more desirable orders Ephemeroptera and Trichoptera in 2010 (Figure 1). The recent collection included 5 taxa representatives from the EPT that comprised 62% of the community while the 2000 collection had none (0) of these representatives. The biotic index decreased from 7.2 to 5.8 indicating an improved community that has become composed of more of intolerant (sensitive) taxa over the past 10 years. Additionally, taxa richness increased from 11 to 19, a positive increase of nearly 75% (Figure 2). A large increase in species diversity was observed in the 2010 collection as species diversity increased from 1.85 in 2000 to 2.33 in 2010. Overall the improved community depicted by the CSB-1 collection in 2010 appears typical for small Ozark Highland streams in the late summer/early fall seasonal period.

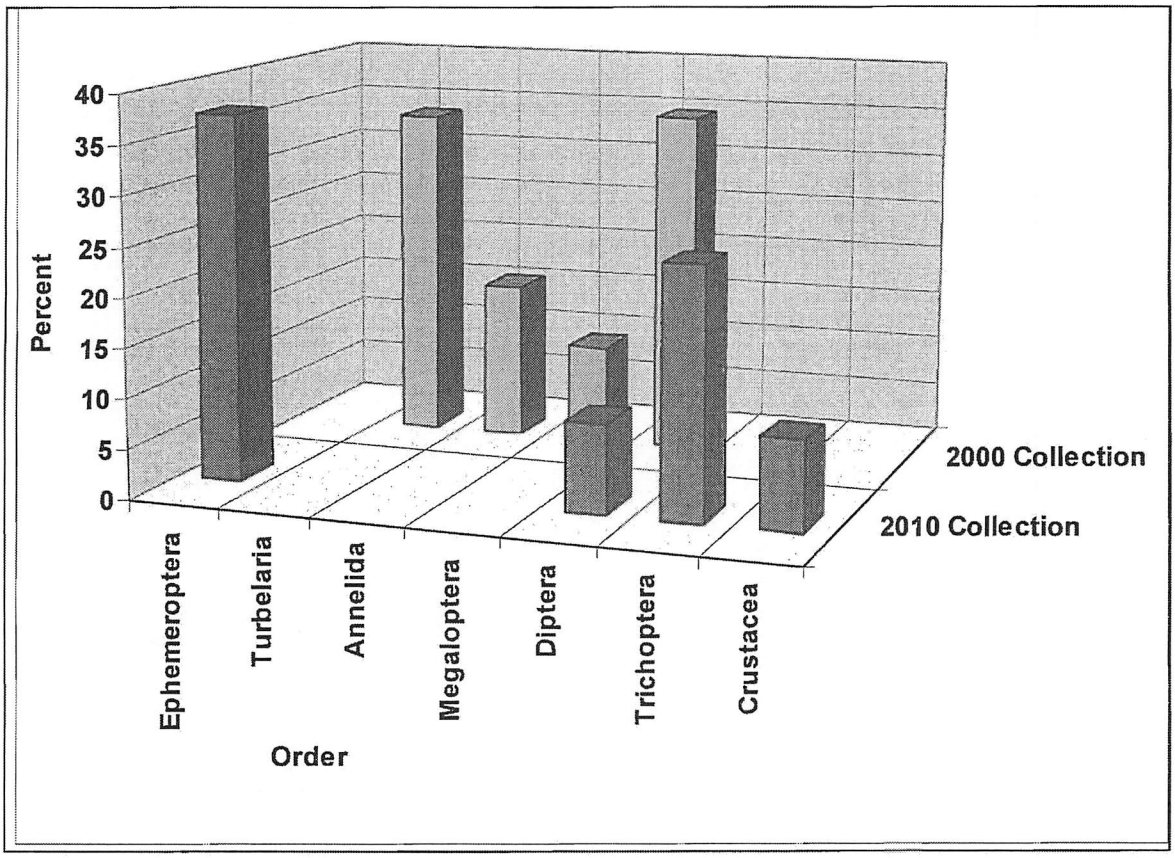


Figure 1. Comparison of dominant ordinal groups between collections.

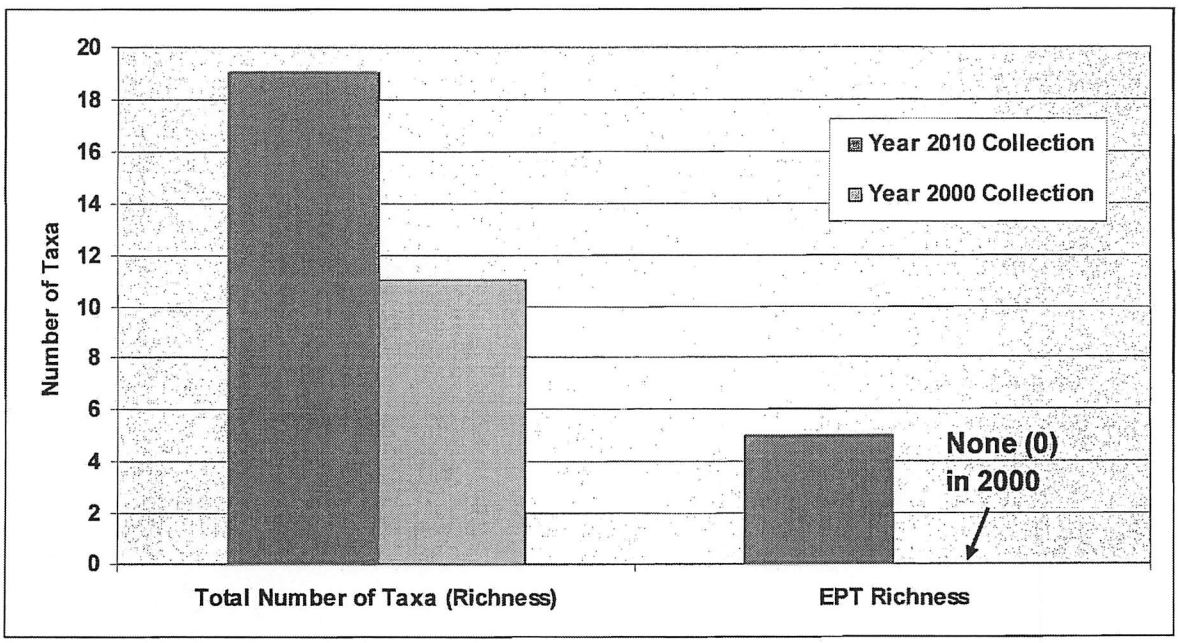


Figure 2. Depiction of richness data.

Stream Habitat Assessment

A semi-quantitative habitat assessment was completed on Cave Springs Branch in the CSB-1 reach. The assessment included visual and measured features of the stream reach as listed below.

1) Channel Morphology
   a) Reach Length Determination
   b) Riffle-Pool Sequence
   c) Depth and Width Regime

2) In-Stream Structure
   a) Epifaunal substrate
   b) Instream Habitat
   c) Substrate Characterization
   d) Embeddedness
   e) Sediment Deposition
   f) Aquatic Macrophytes and Periphyton coverage

3) Riparian Characteristics
   a) Canopy Cover
   b) Bank Stability and slope
   c) Vegetative Protection
   d) Riparian Vegetative Zone Width
   e) Land-use Stream Impacts

The stream can be described as a second order riffle-pool complex that is intermittent (bordering on ephemeral) in nature. The reach assessed contains water perennially due only to the presence of the Simmons Foods effluent discharge. The reach assessed is 38% riffle, 39% run and 23% shallow pool with a channel substrate of primarily cobble.

No objectionable bottom deposits (sludge, oils, foam, etc.), surface sheens or unusual water or sediment odors were noted. The heavy coverage of long strands of filamentous algae observed in 2000 was absent in 2010.

Emergent aquatic macrophytes were observed in the channel but coverage was minimal at only about 5% of the channel bottom. A submerged aquatic macrophyte believed to be a water moss (Fontinalis sp.) was fairly prominent on cobbles in the riffles and shallow runs but was often hard to distinguish from periphyton until observed from directly above. Its overall coverage is generally included in the periphyton estimates as it grows on the same rocky substrates along with the periphyton. Overall periphyton coverage on the channel bottom was about 68%. The majority of the periphyton was green algae and diatoms, with very little (less than 5%) filamentous algae observed. What filamentous algae were noted was short stranded (less than 2 inches in length).

The riparian area was dominated by immature forest on the right bank and grasses and wildflowers on the left bank. Riparian forest canopy shaded only 30% of the stream channel in the reach assessed, primarily due to the lack of mature trees on the left bank. Banks were about 75% covered by vegetation and no recent evidence was observed of cattle access to the stream or of grazing in the adjacent field. It appeared that there had been no grazing in the immediate vicinity of the stream in the past few years.

Habitat quality appears to have improved considerably since 2000. In the *Stream Assessment report on Cave Springs Branch and Honey Creek* (GBM^c & Associates, 2000) it was reported that "Cattle trails leading from the adjacent riparian zone directly to the stream caused the unstable and eroded areas of steam bank. Riparian cover was primarily grasses and the surrounding land use was pasture. Much of the riparian area close to the stream banks was littered with cow manure and was heavily trampled, suggesting high use of the area by cattle." The adverse impacts of heavy cattle use on habitat at CSB-1 upstream of the state line were not found in the 2010 assessment and the resulting habitat improvements undoubtedly contributed to improvements in the macroinvertebrate community.

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GBM^c & Associates. 2008. Quality Assurance Plan. GBM^c & Associates, Bryant, AR

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Attachment A

Macroinvertebrates collected in 2000 and 2010 from Cave Springs Branch

Taxa/Station I.D.	Biotic Index	Trophic Group	Cave Springs Branch CSB-1 (2000)	CSB-1 (2010)	
TURBELLARIA					
Planariidae	8	GC	34		
ANNELIDA					
Hirudinea	7.8	PR	16	3	
Oligochaeta	9.2	GC			
GASTROPODA					
Elimia	2.5	SC			
Glossosoma	---	SC			
Gyraulus	8	SC	2		
Hydrobidae	8	SC			
Lymnaeidae	---	SC			
Physella	9.1	SC		1	
Planorbidae	---	SC			
PELECYPODA					
Corbicula	6.3	FC			
Pelecypoda Sp1	---	FC			
Sphaeridae	7.7	FC			
CRUSTACEA					
Amphipoda	---	GC		9	
Cambaridae	---	GC	1	2	
Isopoda	7.7	GC			
Palaeomonetes	---	GC			
ARACHNOIDEA					
Acarina	---	PR			
EPHEMEROPTERA					
Baetis	6	GC		32	
Caenis	7.6	GC		11	
Callibaetis	9.3	GC			
Centroptilum	6.3	GC			
Choroterpes	2	GC			
Fallceon	6	GC			
Heptagenia	2.8	SC			
Isonychia	3.8	FC			
Paraleptophlebia	1.2	GC			
Ephemera	2.2	GC			
Ephemerella	1.7	GC			
Ephemeroptera Species1	---	GC			
Eurylophella	3	GC			
Stenacron	7.1	GC			
Stenonema	3.4	SC		1	
Tricorythodes	5.4	GC			
ODONATA					
Aechnidae	8	PR			
Aeshna	6.4	PR			
Argia	8.7	PR		3	
Arigomphus	6.4	PR			
Boyeria	6.3	PR			
Calopteryx	8.3	PR		3	
Celithemis	3.7	PR			
Cordulia	5	PR			
Corduligaster	6.1	PR			
Dromogomphus	6.3	PR			
Dythemis	3.7	PR			
Enallagma	9	PR			
Epithica (Epicordulia)	5.6	PR			
Erpetogomphus	5.5	PR			
Erythemis	7.7	PR			
Gomphus	6.2	PR		1	
Hagenius	4	PR	1		
Hesperagrion	---	PR			
Hetaerina	6.2	PR			
Ischnura	9.4	PR			
Ladona	---	PR			

Macroinvertebrates collected in 2000 and 2010 from Cave Springs Branch

Taxa/Station I.D.	Biotic Index*	Trophic Group	Cave Springs Branch CSB-1 (2000)	CSB-1 (2010)	
Libellula	9.8	PR			
Macromia	6.7	PR			
Miathyria	—	PR			
Nasiaeschna (Aeschnidae)	8	PR			
Neurocordulia	4	PR			
Pachydiplax	9.6	PR			
Perithemis	10	PR			
Progomphus	8.7	PR			
Somatochlora	8.9	PR			
Stylogomphus	4.8	PR			
Stylurus	4	PR			
Sympetrum	7.3	PR			
Tramea	—	PR			
PLECOPTERA					
Acroneuria	1.4	PR			
Alocapnia	2.8	SH			
Attaneuria	2.75	PR			
Haploperla	1.3	PR			
Isoperla	2	PR			
Neoperla	1.6	PR			
Perlesta	0	PR			
Phasgonophora (Agnetina)	2	PR			
Zealeuctra	0	SH			
HEMIPTERA					
Belostoma	9.8	PR			
Corixidae	6	PR			
Halobates	—	PR			
Hydrometra	7.3	PR			
Mesovelia	6.4	PR			
Metrobates	6.4	PR			
Microvelia	6.4	PR	1		
Neoplea	5.5	PR			
Notonecta	5.5	PR			
Notonectidae	5.5	PR			
Ranatra	7.5	PR			
Rhagovelia	7.3	PR		1	
Rheumatobates	6.4	PR			
Steinovelia	—				
Trepobates	6.4	PR			
Trichochorixa	5.5	PR			
MEGALOPTERA					
Chauloides	4	PR			
Corydalus	5.6	PR	10	3	
Sialis	7.5	PR		1	
TRICHOPTERA					
Chematopsyche	6.6	FC		22	
Ceraclea	2.3	GC			
Chimarra	2.8	FC		7	
Glyphopsyche	—	SH			
Helicopsyche	0	SC			
Hydropsyche	4	FC			
Hydroptila	6.2	SC			
Mystacides	3.5	SH			
Nectopsyche	4.1	SH			
Oecetes	5.1	PR			
Potamyia	5	FC			
Polycentropus	3.5	PR			
Pycnopsyche	2.3	SH			
Trianodes	3.7	SH			
LEPIDOPTERA					
Petrophila	1.8	SC			
COLEOPTERA					
Agabus	5	PR			

Macroinvertebrates collected in 2000 and 2010 from Cave Springs Branch

Taxa/Station I.D.	Biotic Index*	Trophic Group	Cave Springs Branch		
			CSB-1 (2000)	CSB-1 (2010)	
Ancyronyx	6.9	GC			
Berosus	8.6	PR			
Coptotomus	9	PR			
Dineutus	5.5	PR			
Dryopidae	5.5	SC			
Dubiraphia	6.4	GC		1	
Dytiscidae	---	PR			
Enochrus	8.5	PR			
Graphoderus	3.7	PR			
Gyrinus	6.3	PR			
Haliplus	5	SH			
Helichus	5.4	SC			
Helophorus	7.9	SH			
Hydaticus	---	PR			
Hydrochus	4.6	SH			
Hydroporous	8.9	PR			
Hydrovatus	3.7	PR			
Laccobius	10	PR			
Oreodytes	4.6	PR			
Peltodytes	8.5	SH			
Psephenus	2.5	SC		1	
Scirtidae	---	SH			
Stenelmis larvae	5.4	SC		2	
Stenelmis adult	5.4	GC		3	
Thermonectus	3.7	PR			
Tropisternus	9.8	PR			
Uvarus	4.6	PR			
DIPTERA					
Alluaudamyia (Ceratopogonidae)	6	PR			
Athericidae	2.1	PR			
Bezzia	6	GC			
Chironomidae	8	GC	20	11	
Chironominae	8	GC			
Chironomini	8	GC			
Ortholadiinae	8	GC			
Tanypodinae	8	PR			
Tanytarsini	8	FC			
Culex	10	FC			
Culicidae	---	GC			
Dasyhelea	6	GC			
Diptera Sp.1	---	GC			
Hemerodromia	6	PR			
Hexatoma	4.7	PR			
*Ormosia (*Tipulidae*)*	4.6	GC			
Probezzia	6	PR	7		
Prosimulium	2.6	FC			
Serromyia	6	PR			
Silvius	---	PR			
Simulidae	6	FC	7		
Simulium	4.4	FC			
Sphaeromias	6	PR			
Tabanidae	---	PR	1		
Tipula	7.7	SH			
Tipulidae	3	SH			
Sum of Percentages			100	100	100
Total Abundance			100	118	0
Species Richness			11	20	0
Shannon-Wiener Diversity Index			1.85	2.36	0.00

ROBERT J. BRUNDAGE
EDWARD C. CLAUSEN
MARK W. COMLEY
JOSHUA L. HILL
KIMBERLY J.Z. HUBBARD

NEWMAN COMLEY RUTH

CATHLEEN A. MARTIN
STEPHEN G. NEWMAN
JOHN A. RUTH
NICOLE L. SUBLETT
ALICIA EMBLEY TURNER

January 29, 2016

Missouri Department of Natural Resources
Attn.: Trish Rielly
Water Protection Program
P.O. Box 176, Jefferson City, MO 65102
trish.rielly@dnr.mo.gov

Re: Comment on Proposed 2016 303(d) List

Dear Trish:

I am writing you on behalf of The Doe Run Company requesting that the West Fork Black Rivers nutrient impairment be removed from the 303(d) list.

West Fork Black River first appeared on the 303(d) List in 1998 based upon a citizen complaint about the aesthetics of a small "swimming hole" located downstream of the West Fork Mine. To my knowledge, there were no photographs or other objective measurements taken to document any perceived condition in the river. As you are also aware, in 1998 there was no listing methodology, no recreational criteria or any other objective standards, other than the general criteria, on which to base a recreational listing. The department is aware there were a number of water bodies added to the 1998 list that were later determined to be in error or based upon little or no data.

The 1998 303(d) list only listed 0.2 miles of the river purportedly impaired by "nutrients" from the West Fork Mine. In response to this listing, the Department of Natural Resources initiated a study during 2002 and 2003. The department prepared the enclosed study titled *Stream Survey Sampling Report*. The Department performed an algae and nutrient study of West Fork Black River. The purpose of the survey was to "quantify benthic algal" (periphyton) density, identify dominant periphyton taxa, and quantify nutrient loading from the Doe Run West Fork Mine drainage."

Generally speaking, the department found low levels of chlorophyll in the stream. The report reported that "West Fork Black Doe Run discharge cannot be determined conclusively as contributing a significant nutrient load resulting in an increase in periphyton growth." The study "provides no evidence to support keeping the 0.2 mile of stream below West Fork Doe Run discharge on the 303(d) list of impaired waters for nutrients."

To date, neither the department nor EPA has produced any studies that document that the recreational use has been impaired by nutrients in the West Fork Black River. Furthermore, since Missouri does not have numeric nutrient criteria for recreational use, the general criteria have not been documented to be impaired in this stream. To the contrary, there is no evidence that benthic algae is impairing recreational uses on the river.

In conclusion, Doe Run respectively requests the Department recommend to the Missouri Clean Water Commission that the West Fork Black River be removed from the 303(d) List in regards to its purported recreational use impairment.

Thank you for the opportunity to comment. Should you wish to discuss these comments further, feel free to contact me.

Sincerely,

NEWMAN, COMLEY & RUTH P.C.

By: Robert J Brundage

Robert J. Brundage

Enclosure

Stream Survey Sampling Report

West Fork Black River Near Doe Run West Fork Mine
Bunker, Missouri
Reynolds County

July 15-29, 2002,
October 3, 2002,
January 8-28, 2003,
and
April 23, 2003

Prepared For:

Missouri Department of Natural Resources
Water Protection and Soil Conservation Division
Water Pollution Control Program

Prepared By:

Missouri Department of Natural Resources
Air and Land Protection Division
Environmental Services Program

Table of Contents

1.0 Introduction

At the request of the Water Protection and Soil Conservation Division, the Environmental Services Program (ESP) conducted an algae and nutrient study of West Fork Black River near the Doe Run West Fork Mine drainage. The purpose of the survey was to quantify benthic algal (periphyton) density, identify dominant periphyton taxa, and quantify nutrient loading from the Doe Run West Fork Mine drainage. Algae sampling was conducted during minimal summer and winter stream flows and water quality sampling was conducted quarterly. Artificial algae substrates were deployed several days prior to sampling. Algae and water quality sampling were conducted on July 29, 2002 and January 28, 2003 and water quality only sampling was conducted on October 3, 2002 and April 23, 2003. Sampling was conducted by Brian Nodine, Patricia Rielly, and Carl Wakefield of the ESP, Air and Land Protection Division.

2.0 Background

According to the 1998 list of waters designated under section 303(d) of the Federal Clean Water Act, 0.2 mile along West Fork Black River located in Reynolds County near Bunker is listed as impaired for nutrients. The Doe Run West Fork Mine discharge is listed as the source of impairment. In past years, landowners downstream of the discharge have complained about algae blooms in that segment of stream. A total maximum daily load (TMDL) for this segment of stream was scheduled for FY 2003 with a low priority.

West Fork Black River at the Doe Run West Fork Mine has been the subject of previous studies including a study of algal growth by Dr. Nord Gale from the University of Missouri at Rolla (UMR). In addition, at the request of the Water Pollution Control Program (WCPC), sampling was conducted for a variety of metals and nutrients in April 1997.

3.0 Study Area

West Fork Black River originates in the northwest corner of Reynolds County approximately eight miles northwest of Bunker, Missouri. It is located within the Ozark/Current/Black ecological drainage unit (EDU). The stream flows in a west-southwest direction and joins East Fork Black River where it becomes the Black River at SW ¼ NE ¼ sec. 21, T. 32 N., R. 2 E. The stream reach surveyed is a class "P" stream and its beneficial use designations are "livestock and wildlife watering and protection of warm water aquatic life and human health – fish consumption, cool water fishery, and whole body contact". Land use within the study area was predominantly mining along the south bank and forest with some residential use on the north side. See Appendix A for a study area map.

3.1 Site Descriptions

Four closely spaced sites (all sec. 1, T. 32 N., R. 2 W.) were sampled for periphyton density and dominant taxa assessment. Two sites were upstream from the Doe Run West Fork Mine discharge and two were downstream from the discharge. Quarterly water

quality samples were collected at the sites immediately upstream and downstream from the discharge.

Sites were selected to provide conditions that were as consistent as possible with regard to light, flow velocity, and depth to minimize variables that affect algae growth. All sampling sites were situated in areas with the least amount of canopy cover possible. All four sites were in runs whose maximum depths ranged from approximately 0.8 to 2.4 feet. Maximum flow velocities were approximately 0.5 to 1.0 feet per second.

Site 1 (GPS Lat. 37° 29' 35.8"N, Long. 91° 06' 30.9"W) is the most upstream site. It is along the lower end of a long gravel bar that extended approximately 200 to 300 yards downstream of the Highway KK crossing. Based on the appearance of the gravel bar, it was likely gravel mined in the past. The stream channel width at this site is approximately 50 feet with a maximum depth of approximately 1.5 feet. West Fork Black River at this site appeared clear and colorless with no observable odor. Substrate was mostly loose gravel with some cobble. Because water samples were not collected at this site, stream flow was not routinely measured. Flow was measured, however, on January 28, 2003 and was calculated at 14.2 cubic feet per second (cfs).

Site 2 (GPS Lat. 37° 29' 28.6"N, Long. 91° 06' 27.9"W) is the most immediate upstream site from the Doe Run West Fork Mine discharge. The stream channel width at this site is approximately 50 feet with a maximum depth of approximately 1.3 feet. The stream at this site appeared clear and colorless with no observable odor. The substrate is gravel, cobble, and some small boulders that are more compacted than at Site 1. Stream flow calculations were 12.9 cfs on July 29, 2002, 12.9 cfs on October 3, 2002, 13.3 cfs on January 28, 2003, and 33.1 cfs on April 23, 2003.

Site 3 (GPS Lat. 37° 29' 23.1"N, Long. 91° 06' 23.5"W) is immediately downstream of the Doe Run West Fork Mine discharge. Stream channel width at this site is approximately 40 feet with a maximum depth of 2.4 feet. The substrate is gravel, cobble, and boulders that are considerably compacted. There is a layer of deposits on the bottom at this site that are mostly rust colored with smaller amounts of black spreading from just past the outfall to the other side of the stream and downstream for several yards. The black deposits appeared more widespread during the final sampling day in the spring. Upon retrieval, the Plexiglas plates used for artificial substrates at this site were heavily incorporated with the reddish rust color while plates from all other sites remained mostly clear. With the exception of observable suspended deposits floating over the substrate, the water at this site appears clear, colorless, and without apparent odor. Stream flow calculations were 17.1 cfs on July 29, 2002, 16.3 cfs on October 3, 2002, 19.7 cfs on January 28, 2003, and 41.2 cfs on April 23, 2003.

Site 4 (GPS Lat. 37° 29' 25.5"N, Long. 91° 06' 12.2"W) is approximately one quarter mile downstream of the Doe Run West Fork Mine discharge. This site is beyond mining land use and is mostly forested. Immediately below this site, CR 844, a gravel road, closely parallels the stream at the high end of the north bank. Stream channel width at

this site is approximately 53 feet and the maximum depth is approximately 0.8 feet. The stream at this site was clear and colorless with no apparent odor. The substrate was loose gravel. Because water samples were not collected at this site, stream flow was not routinely measured, however, on January 28, 2003 stream flow was calculated at 18.7 cfs.

4.0 Methods

4.1 Field Procedures

Prior to sample collections, the ESP field personnel calibrated their water quality field instruments (pH, specific conductivity, and dissolved oxygen) per manufacturers' specifications. The ESP personnel determined the pH, specific conductivity, dissolved oxygen, and temperature of all water grab samples at the time of collection. Refer to Appendix B for chemical and field results.

4.1.1 Surface Water Samples

Surface water grab samples at sites 2 and 3 were collected on July 29 and October 3, 2002 and January 28 and April 23, 2003. The stream samples were collected mid-stream by immersing the sample containers directly into the stream.

4.1.2 Flow Measurements

Stream discharges were measured during quarterly water quality sampling at sites 2 and 3 and were measured at periphyton sites 1 and 4 during winter algae sampling. All discharge measurements were made using a Marsh McBirney digital flow meter.

4.2 Periphyton Sample Collection

The periphyton sample collection, field handling, and sample preservation procedures were conducted according to the MDNR standard operating procedure, which is consistent with procedures described in the 20th Edition of Standard Methods. Periphyton samples were collected during summer and winter low flow periods for chlorophyll a analysis to assess biomass density and for dominant taxa assessment.

Plexiglas plates (8" X 10") were deployed on July 15, 2002 and January 8, 2003 to provide artificial substrate for periphyton growth to assess biomass density (refer to Appendix A for photo). The plates were mounted to rebar that had been driven into the substrate. Sections of PVC pipe were installed around the rebar under the plates to keep the plates approximately two to four inches above the substrate to reduce effects of sedimentation. At each site, five plates were deployed with the exception of site 1 during the January 2003 sampling where only four plates were installed. On each plate were grids of 48 numbered squares of four square centimeters each. Periphyton samples were collected on July 29, 2002 (14-day exposure) and January 28, 2003 (20-day exposure). Periphyton samples were collected by scraping randomly selected squares of the substrate surface with a razor blade (refer to Appendix A for photo). At each site the samples were rinsed from the substrate and field filtered through a 1.0 µm (nominal) pore size glass

fiber filter. These filters were then folded into a four-inch paper filter, labeled, placed in a container of desiccant, and kept cool until they could be frozen upon return to the ESP laboratory.

The periphyton samples collected from each artificial substrate sampler were analyzed and reported separately. Two replicate areas were collected from every other artificial substrate plate. The replicates were analyzed separately then averaged to obtain the chlorophyll a value in mg/m^2 for that plate. Mean chlorophyll a values for each site were determined by averaging values of each filtered area (refer to the charts in Appendix C).

Periphyton was also collected for dominant taxa analysis on July 29, 2002 and January 28, 2003. Substrate that was representative of the composition along the cross section of each site was collected and placed into a plastic pan. Algae were scraped from the collected substrate with an Exacto-knife into vials. Slurry from the pan was also collected in the vials. The algae samples were preserved with a few drops of Lugol's solution in each vial and identified at the ESP laboratory.

4.3 Chain-of-Custody

All samples were given numbered labels. All samples except those for taxonomic identification were placed on ice in a cooler. The corresponding label number was entered onto a chain-of-custody form indicating the date, time, the location of sample collection, and parameters to be analyzed. Custody of the samples was maintained by the ESP field personnel until relinquishing them to the laboratory sample custodian within the ESP in Jefferson City, Missouri for analyses.

4.4 Chemical Analyses Requested

Quarterly water quality grab samples were collected and submitted for ammonia as nitrogen, nitrate plus nitrite as nitrogen, total kjeldahl nitrogen (TKN), and total phosphorus. Summer and winter periphyton samples were collected and submitted for chlorophyll a analyses. The chemical analysis results are attached in Appendix B.

4.5 Quality Assurance/Quality Control (QA/QC)

4.5.1 QA/QC Methods

All ESP analyses were conducted in accordance with the Fiscal Year 2003 Quality Assurance Project Plan for "Wasteload Allocations".

5.0 Results

5.1 Periphyton Analysis and Results

Periphyton samples collected from artificial substrates were analyzed using the Turner Designs model TD-700 Laboratory Fluorometer using an ethanol extraction method that

generally followed the EPA Method 445.0 without grinding. Refer to Appendix C for chlorophyll a results.

Pinnate diatoms were the dominant algal taxa collected with the exception of a dominance of filamentous *Spirogyra* at site 1 during summer sampling and filamentous *Mougeotia* at site 2 during winter sampling. There appeared to be high diatom diversity at all sites during summer and winter sampling. Refer to Appendix D for lists of identified periphyton genera for each site.

5.2 Nutrient Data Analysis and Results

Total phosphorus and ammonia as nitrogen results were all below detectable limits of 0.05 mg/L (due to an error, ammonia was not analyzed in spring samples). With the exception of a result of 0.21 mg/L at site 3 during summer sampling, all TKN results were below detectable limits of 0.2 mg/L. The maximum level of nitrate plus nitrite as nitrogen was 0.32 mg/L at site 3 during winter sampling. Tabular data for nutrients and field measurements are attached in Appendix B.

6.0 Observations

All surface water samples collected from West Fork Black River appeared clear and colorless with no observable odors or particulate (sediment) matter except at site 3 (see section 2.1).

The weather during July sampling was hot and humid with temperatures reaching the 90s (Fahrenheit). The day of sampling in July was overcast with thunderstorms in the area, however, it did not start raining at the study area until all sampling was completed.

The weather during the October sampling was warm with temperatures in the 80s (Fahrenheit) and partly cloudy. The weather the day the artificial substrates were deployed on January 8, 2003 was unseasonably warm with the temperature near 70° F. Between the deployment day and the sampling day temperatures dropped considerably, forming ice along the streamside and in back water areas. An attempt was made to collect samples on January 22, 2003, but ice formed on wet surfaces exposed to the air almost immediately. Because of a concern of ice crystals damaging algae cells during retrieval and filtration, sampling was postponed until the following week. On January 29, 2003, the day of sampling, the weather was cool with temperatures in the 40s (Fahrenheit) and over cast. During the spring sampling on April 23, 2003, the air temperature was approximately 70° F and the sky was clear.

7.0 Discussion

According to both chlorophyll a and water chemistry data of this study, the West Fork Black Doe Run discharge cannot be determined conclusively as contributing a significant nutrient load resulting in an increase in periphyton growth. The gradual increase in chlorophyll a concentrations from the most upstream to the most downstream sites does

not suggest an abrupt difference in periphyton biomass based on influence from the West Fork Black Doe Run discharge. The greatest measurable increase in nutrients between upstream and downstream sites was only 0.04 mg/L of nitrate plus nitrite as nitrogen during winter sampling.

Dr. Nord Gale of UMR conducted a study on algae growth in West Fork Black River that ran from June 1990 to November 1991 (Gale 1992). In this study, he concluded that intensity and nuisance impact of algae blooms were moderate in comparison with other streams in the area.

During all four seasons, the increase in stream flow from site 2 to site 3 is greater than the contribution of the actual discharge of approximately 2.7 cfs. This is especially true during the spring. The absence of any other observable source of flow into the stream other than the discharge combined with the increase in flow suggests an input of flow near the black and rust colored deposits at site 3. According to the UMR study, there is a spring along the north side of the riverbed in the area of the deposits. The UMR study suggests that after oxidizing, the iron and manganese precipitates, forming the rust colored and black deposits.

Results from water grab samples collected by ESP on April 3, 1997 (unpublished MDNR data, 1997) also provide evidence of an upwelling across from the discharge containing large quantities of iron and manganese. At the upwelling, total recoverable iron and manganese results were 1920 ug/L and 6930 ug/L, respectively. Results from other instream sites for iron and manganese were minimal. In comparison, results for total recoverable iron and manganese from the discharge were only 153 ug/L and 265 ug/L, respectively. Conductivity was 1100 µmohs/cm at the upwelling site, 829 µmohs/cm at the outfall, and a maximum of 292 µmohs/cm at all other instream sites. Nutrient results at the outfall were 1.41 mg/L for nitrate + nitrite as N, 0.299 mg/L for ammonia as N, and 0.03 mg/L for total phosphorus.

8.0 Recommendations

This study provides no evidence to support keeping the 0.2 mile of stream below the West Fork Black Doe Run discharge on the 303(d) list of impaired waters for nutrients. Further studies are needed to document the potential for nutrient impairment that would result in nuisance algae growth. Because of the spring just across from the outfall, further studies should also focus on it as a potential influence on water quality and algae growth at this location.

Several variables besides nutrient loading can affect the rate of periphyton growth in streams. These include light, flow, temperature, water depth, and substrate, for example. One recommended method for evaluating and comparing the productivity of water samples from different locations that eliminates these variables is to measure algal productivity. Methods for measuring biostimulation for algal productivity are found in the 20th Edition of Standard Methods Part 8111 (Standard Methods, 1998).

9.0 References

Gale, N.L., 1992, Algal Growth Problem in West Fork of the Black River. 44p.

Unpublished MDNR data, 1997.

Standard Methods for the Examination of Water and Wastewater, 1998, 20th Edition Part 8111.

Submitted by: _____

Brian L. Nodine
Environmental Specialist
Water Quality Monitoring Section
Environmental Services Program

Date: June 20, 2003

Approved by: _____

Earl Pabst
Director
Environmental Services Program

BLN:th

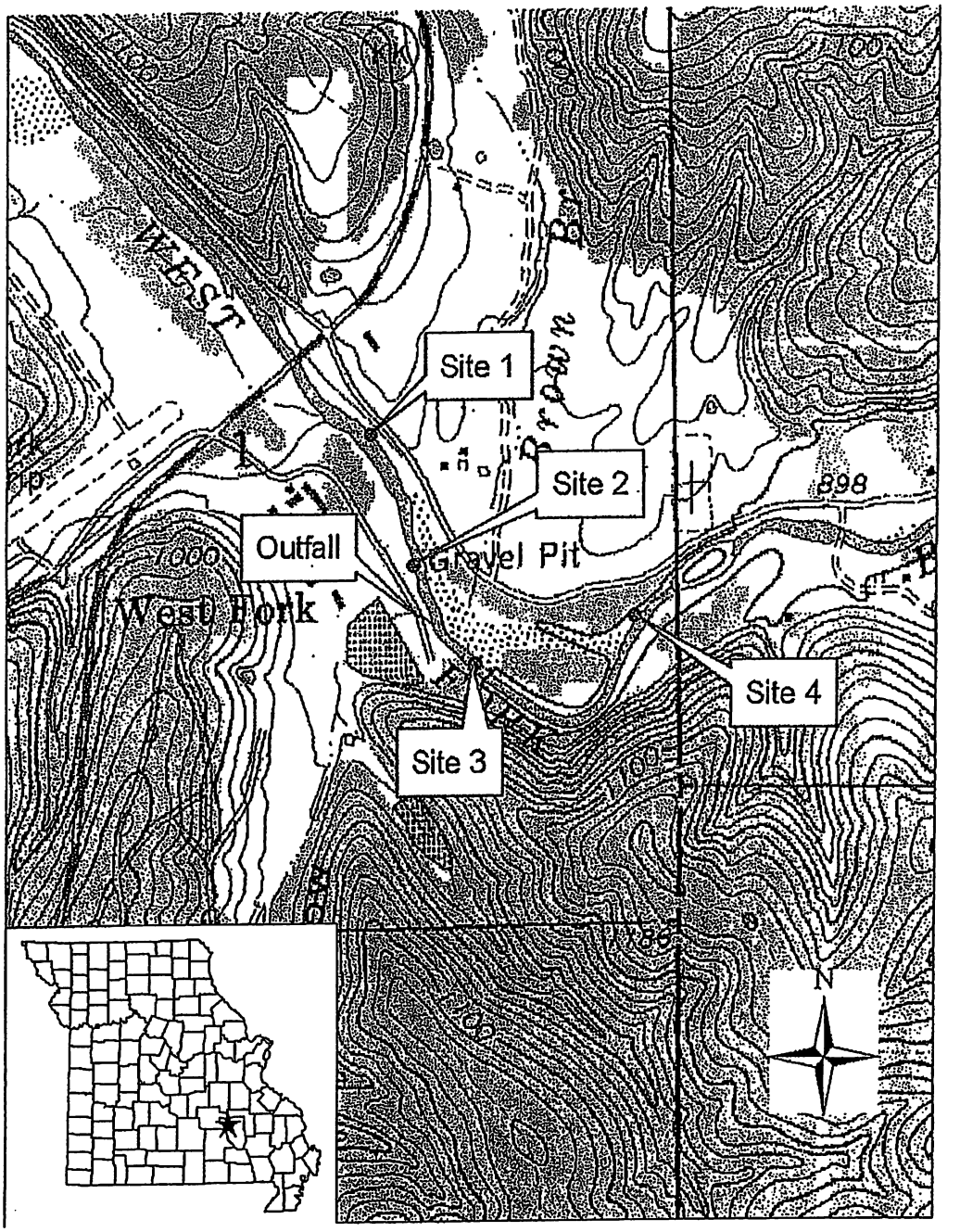
c: Gary Gaines, Director, Southeast Regional Office
John Ford, Environmental Specialist, Water Pollution Control Program
Sharon Clifford, Environmental Specialist, Water Pollution Control Program
Mohsen, Dhikli, Environmental Specialist, Water Pollution Control Program

Appendix A

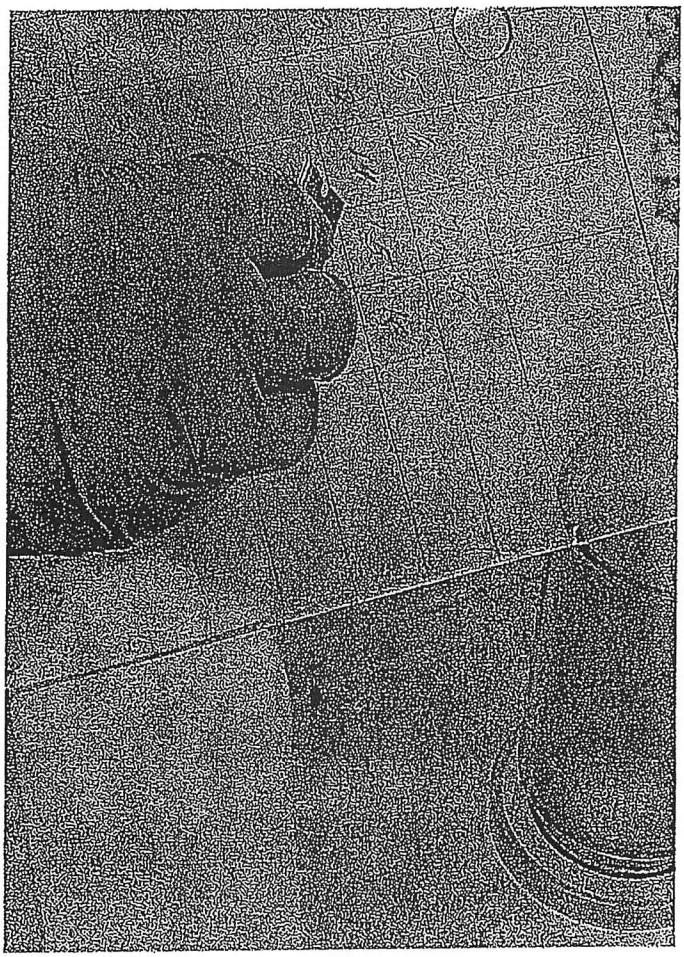
Site Map and Photos

West Fork Black River Near Doe Run West Fork Mine

Appendix A
Figure A-1
West Fork Black Nutrient and Periphyton Survey Site Map



Appendix A
Figure A-3
Periphyton (chlorophyll a) collection



Appendix B

Quarterly Water Quality Chemical and Field Data

West Fork Black River Near Doe Run West Fork Mine

Appendix B
FY 2003 West Fork Black Quarterly Water Quality Chemical and Field Data

Site #	Sample #	Date	Time	Temp (°C)	Dissolved Oxygen (mg/L)	Specific Conductivity (µmhos/cm)	pH	Stream Flow (cfs)	Nitrate + Nitrite as N (mg/L)	Ammonia as N (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Phosphorus (mg/L)
2	0226300	7/29/02	1255	26.3	9.4	388	8.25	12.9	0.12	<0.05	<0.2	<0.05
3	0226301	7/29/02	1413	26.7	9.2	452	8.40	17.1	0.09	<0.05	0.21	<0.05
2	0228863	10/3/02	1010	21.0	8.5	422	7.97	12.9	0.16	<0.05	<0.2	<0.05
3	0228864	10/3/02	1045	21.5	8.8	471	8.05	16.3	0.13	<0.05	<0.2	<0.05
2	0303950	1/28/03	1310	2.8	14.4	354	8.99	13.3	0.28	<0.05	<0.2	<0.05
3	0303951	1/28/03	1440	3.5	13.8	429	8.85	19.7	0.32	<0.05	<0.2	<0.05
2	0303986	4/23/03	1215	15.5	10.2	325	7.98	33.1	0.21	*	<0.2	<0.05
3	0303987	4/23/03	1230	15.5	10.2	361	8.21	41.2	0.22	*	<0.2	<0.05

* Not analyzed

Appendix C

Chlorophyll a Data

West Fork Black River Near Doe Run West Fork Mine

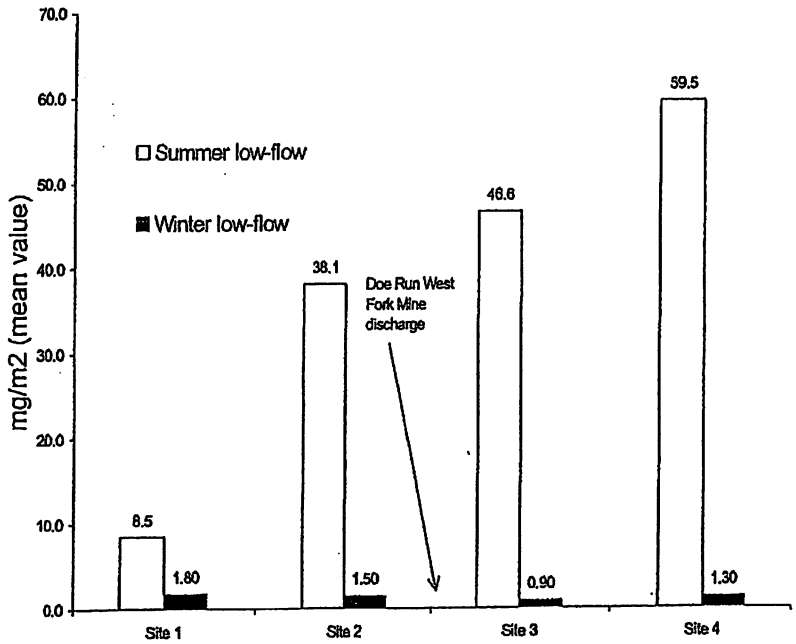
Appendix C
Figure C-1
FY 2003 West Fork Black Summer Low-Flow Chlorophyll a Results
Collected July 29, 2002
Fourteen Day Colonization Period

Site	Plate #	Sample #	Time	Result by replicate (mg/m^2)	Reported result (mg/m^2)
1	1	0226302	1045	17.8	12.3
				6.8	
1	2	0226303	1100	5.2	5.2
1	3	0226304	1105	6.1	12.6
				19.2	
1	4	0226305	1115	5.5	5.5
1	5	0226306	1120	2.8	3.9
				5.0	
2	5	0226307	1215	31.7	31.7
2	4	0226308	1225	44.0	37.2
				30.3	
2	3	0226309	1235	42.9	42.9
2	2	0226310	1240	28.2	31.4
				34.5	
2	1	0226311	1245	55.4	55.4
3	1	0226312	1415	64.3	65.7
				67.1	
3	2	0226313	1430	56.7	56.7
3	3	0226314	1435	38.8	38.8
3	4	0226315	1445	53.7	52.3
				50.8	
3	5	0226316	1455	19.2	20.5
				21.8	
4	1	0226317	1605	33.7	33.7
4	2	0226318	1615	46.0	47.0
				48.0	
4	3	0226319	1620	61.0	61.0
4	4	0226320	1625	52.1	70.7
				89.2	
4	5	0226321	1630	86.2	86.2

Appendix C
Figure C-2
FY 2003 West Fork Black Winter Low-Flow Chlorophyll a Results
Collected January 28, 2002
Twenty Day Colonization Period

Site	Plate #	Sample #	Time	Result by replicate (mg/m^2)	Reported result (mg/m^2)
1	1	0303956	1030	2.0	2.0
				1.9	
1	2	0303957	1040	0.9	1.3
				1.7	
1	3	0303958	1050	1.9	1.6
				1.3	
1	4	0303959	1115	2.2	2.4
				2.6	
2	1	0303960	1230	2.1	1.5
				0.9	
2	2	0303961	1240	3.4	3.4
2	3	0303962	1245	1.5	1.0
				0.4	
2	4	0303963	1250	0.2	0.2
2	5	0303964	1255	0.9	1.6
				2.3	
3	1	0303965	1420	0.8	1.0
				1.1	
3	2	0303966	1425	0.3	0.3
3	3	0303967	1430	1.3	0.8
				0.4	
3	4	0303968	1432	0.9	0.9
3	5	0303969	1435	1.2	1.3
				1.4	
4	1	0303970	1550	1.0	1.0
				1.0	
4	2	0303971	1555	0.9	0.9
4	3	0303972	1600	0.8	0.6
				0.5	
4	4	0303973	1602	1.2	1.2
4	5	0303974	1605	2.9	2.4
				1.8	

Appendix C
Figure C-3
FY 2003 West Fork Black Chlorophyll a Results
Overall Mean Values per Site



Appendix D

Periphyton Taxa

West Fork Black River Near Doe Run West Fork Mine

Appendix D
FY 2003 West Fork Black Periphyton Taxa

	Summer (July 29, 2002)				Winter (January 28, 2003)			
	Site 1	Site 2	Site 3	Site 4	Site 1	Site 2	Site 3	Site 4
Dominant Algal Taxa	Spirogyra	Cymbella	Fragilaria	Fragilaria	Cymbella	Mougeoria	Cymbella	Cymbella
					Gomphonema			
Moderately Present Algal Taxa	Cymbella	Navicula	Cymbella	Cymbella				
		Pithophora	Synedra					
Other Present Algal Taxa	Lyngbia	Gomphonema	Gomphonema	Navicula	Fragilaria	Cymbella	Meridian	Closterium
	Fragilaria	Cocconeis	Oedogonium	Mougeotia	Cocconeis	Tabellaria	Tabellaria	Fragillaria
	Oedogonium	Fragilaria	Gleocystis	Bulbochaete	Navicula	Meridion	Fragillaria	Meridian
	Gomphonema	Spirogyra	Navicula	Scenedesmis	Synedra	Gomphonema	Synedra	Synedra
	Cocconeis	Bumilleria	Scenedesmis	Gomphonema	Mougeotia	Synedra	Gomphonema	Cocconeis
	Oscillatoria	Scenedesmis	Acanthes	Spirotaenia	Meridion	Navicula	Mougeotia	Tabellaria
	Cladophora	Mougeotia	Mougeotia	Cosmarium				Gomphonema
	Cylindrocapsa	Oedogonium	Cladophora	Rhopalodia				
	Amphithrix	Cosmarium	Bulbochaete	Nitzschia				
	Calotherix	Oscillatoria	Spirogyra	Acanthes				
	Navicula	Gleocystis	Cocconeis	Staurastrum				
	Acanthes	Bulbochaete	Cosmarium	Ceratium				
	Synedra	Synedra	Stigeoclonium	Pediastrum				
			Stephanodiscus	Stephanodiscus				
			Rhopalodia	Closterium				
			Lyngbia	Synedra				