**West Fork Black River in Missouri**
**Draft Total Maximum Daily Load (TMDL)**
**SUMMARY OF COMMENTS AND RESPONSES**
Prepared by the Environmental Protection Agency (EPA), Region 7
Water, Wetlands and Pesticides Division
December 2010

## INTRODUCTION

EPA public noticed a draft TMDL for West Fork Black River (water body identification MO_2755) from November 5 to December 6, 2010. A previous draft was public noticed from October 13 to November 5, 2010, but was rewritten in light of a Memorandum of Understanding between EPA and the Doe Run Resources Company. The rewritten draft TMDL was placed on public notice a full 30 days (November 5 to December 6, 2010) and the new public notice was distributed to all those who had received the first public notice.

EPA is establishing this TMDL to meet the obligations of the 2001 Consent Decree, *American Canoe Association, et al. v. EPA*, Consolidated Case No. 98-482-CV-W, (Consent Decree). This document summarizes and paraphrases comments received, EPA's response to comments and changes made to the final TMDL where appropriate. Included is a list of all commentors. This summary covers all comments received from October 13 to December 6, 2010

## RESPONSE TO COMMENTS (EPA responses in bold)

1. Comment: Several commentors wanted to know why the comment period was extended?

**1. Response: EPA made the decision to refine the wasteload allocation (WLA) calculations in West Fork Black River's TMDL and EPA extended public notice to offer the public a full 30 days to comment on the refined WLA. The extension was not made in response to a request to extend comment. EPA's decision to refine the WLA was based on a Memorandum of Understanding between the Doe Run Resources Corporation and EPA that wasn't available when the first draft was posted for public comment.**

2. Comment: According to the federal court order on the Consent Decree, this TMDL must be completed and approved by EPA Region 7 by December 31, 2010. If it isn't, EPA will be in violation of this court order.

**2. Response: EPA is working with Missouri to establish or approve all of the Consent Decree TMDLs by the December 31, 2010 deadline. EPA is ensuring that all of the TMDLs meet EPA's quality assurance protocols for scientific defensibility and provide public notice to all TMDL stakeholders.**

3. Comment: Several commentors object to sharing WLA reductions with the Doe Run continuous mine discharge outfalls because only Doe Run is contributing to the impairment of the receiving water. The commentors say that compared to Doe Run, they contribute minimal flow generated by small populations. Specifically, the actual permit flow for Bunker's WWTP [Wastewater Treatment Plant] is 20,300 gallons per day which accounts for 0.021% of West Fork Black River's flow during critical low flow conditions. The actual permit flow for Centerville's WWTP is 10,600 gallons per day which accounts for 0.011% of West Fork Black River's flow during critical low flow conditions. Both Centerville and Bunker have lost 1.2% population since the year 2000. Furthermore, the Bunker facility is a land-application (no discharge) system with only an emergency outfall from the irrigation lagoon that hasn't discharged since January 2009.

**3. Response: EPA recognizes the concerns that the communities have about the TMDL, but all regulated sources are considered to be point sources and therefore part of the assigned WLA, per Code of Federal Regulations (CFR) at 40 CFR § 130.7(c)(1)(ii). National Pollutant Discharge Elimination System (NPDES)-regulated storm water discharges must be addressed by the WLA component of a TMDL and cannot be removed from the TMDL. See 40 CFR § 130.2(h). If the source is considered non-discharging then a WLA of zero is assigned to that facility. The Missouri Department of Natural Resources (MDNR) will work with permitted facilities identified in the TMDL because the state incorporates the TMDL into its current water quality management plan for implementation (40 CFR § 130.7(d)(2). MDNR works with other Missouri communities on their Wastewater Treatment Facilities (WWTFs) and Municipal Separate Storm Sewer Systems (MS4s) and will work with communities on the economic and technical aspects of West Fork Black River's WLAs. Missouri has the authority to monitor and access state waters to ensure protection of the designated beneficial uses. Missouri may submit and EPA may approve a revised or modified TMDL for this water at any time.**

4. Comment: One commentor's family have been West Fork Black River stakeholders for several generations. The family used to swim in the river at a spot referred to as the Granddaddy Hole (just below where the West Fork Mine is today). Up to a 100 people gathered at the Granddaddy Hole on special occasions in the 1970s. In 1986, ASARCO opened the West Fork Mine next to the Ozark stream, West Fork Black River. ASARCO built a levy which increased flow and velocity resulting in flooding. The water quality degraded: the river water became grey, the bottom of the river turned black, there was an orange substance at outfall number 2, and the Granddaddy Hole was so foul that it smelled. No one swam in the river. The commentor included pictures from 1970 and 1992 which showed the different conditions at the Granddaddy Hole. The commentor says that Doe Run stopped using the mine when they bought it, but they continued to discharge water. Appearance improved somewhat, the black at the bottom of the river lessened. However, algae and bottom deposits continue and no one swims in the river. The commentor continues to eat fish from the river. Crayfish population has reduced to his finding only two in ten years – where crayfish had been abundant in the 1970s. The commentor says that the draft TMDL defines the problem well and thanks EPA for the efforts to clean up the river. The commentor hopes that more can be done to improve the metals in the sediment.

**4. Response: EPA thanks the commentor for his personal story of this water's importance to his family that included pictures and personal testimony about the water body's condition over time. Citizens who are interested in their watershed's health are encouraged to work with established watershed groups, such as Missouri Stream Team organization. Because the commentor took the time to put together such a comprehensive comment about the West Fork Black River, his comment is now part of the public notice record for this TMDL. All comments received during public are reviewed and organized for future reference when this water is addressed. If the data provided by commentors is found to meet MDNR's minimum quality assurance level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control (QA/QC) levels of Missouri's Listing Methodology document in the Code of State Regulations (CSR) at (10 CSR 20-7.031 and 10 CSR 20-7.050).**

5. Comment: A commentor asserts that there is no evidence that West Fork Black River is impaired and, because it is not impaired, a TMDL is not needed. Impairment is based on land owner complaints that aren't recent or explicit. There is more recent data that indicates total phosphorus and periphyton are upstream of West Fork Black River's impaired segment. Other reasons that the commentor believes that there is no evidence of the water body's impairment is that the TMDL ignores a MDNR 2003 study, problem definition in the TMDL is vague, none of the 2009 nutrients sampled exceeded the nutrient target for total phosphorus. Data from a 2009 study greatly differs from 2003 data and that discrepancy should be explained in the TMDL.

**5. Response: Changing the impaired waters list is beyond the scope of this TMDL public notice. West Fork Black River was listed as impaired (designated beneficial uses not meeting water quality standards) under EPA's Clean Water Act (CWA) 303(d) review requirements and authority. Regulations provide that each State shall establish, for waters listed pursuant to the CWA § 303(d)(1)(A), a TMDL for those pollutants which EPA has identified as suitable for such calculation, refer to CWA § 303(d)(1)(C), from (33 United States Code (USC) § 1313(d)(1)(C)). EPA is establishing this TMDL at this time to meet the requirements of the Consent Decree and based the TMDL on the best data available. The commentor's data will be shared with MDNR and with EPA's Missouri Water Quality Standards (WQS) Coordinator for consideration during the next Missouri 303(d) List review. If the data provided by commentors is found to meet MDNR's minimum quality assurance level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.**

6. Comment: The TMDL target is flawed because the reference condition approach is overly simplistic resulting in arbitrary nutrient criteria which yields inefficient and ineffective pollution control efforts. (The TMDL target is inappropriate because it is based on overly conservative approaches.)

The reference approach used in the TMDL fosters arbitrary decision-making: As an example, the selection of the TMDL's protective concentration is an arbitrary guess based on the

concentration value that is exceeded in 25% of all nutrient data of all sites in a given ecoregion (In each ecoregion observed the concentrations greatly varied.). EPA's own scientific board in 2010 described a range of approaches to be used to define nutrient criteria and said that the reference system approach is the least rigorous and does not directly consider the environmental consequences of resulting nutrient concentrations. Many states only use the reference approach in situations where insufficient resources are available to more rigorously define criteria. EPA guidance on developing nutrient criteria provides alternate methods for applying the reference conditions approach; the TMDL uses the least rigorous allowable method. The effect of combining the above assumptions (selecting the reference approach and applying it in the least rigorous method) results in an approach that defines 75% of all sites in the ecoregion to be impaired by nutrients.

**6. Response: EPA believes that the methodology described in the TMDL and its Appendices is technically defensible. MDNR has used the methodology in developing several TMDLs that were subsequently approved by EPA.**

**The development of nutrient targets using Ecoregion nutrient criteria with load duration curves follows MDNR's selection criteria for reference streams, per MDNR's Biological Criteria for Wadeable/Perennial Streams of Missouri, found online at http://www.dnr.mo.gov/env/esp/docs/BiologicalCriteriaforWadeableStreamsofMissouri.pdf Reference streams from the same Ecological Drainage Unit (EDU) were chosen to insure reference locations were similar to the impaired stream by virtue of what defines a collection of watersheds in one EDU: common zoogeographical history, physiography and climatic characteristics. The result of these shared characteristics is that watersheds in one EDU share similar distributions of animals, freshwater assemblages, habitats, weather and precipitation. To estimate the reference conditions of West Fork Black River, the synthetic (or representative) flow from the reference streams was derived from the average values of all the individual log transformed flow values (or median of the individual reference streams). Prior to the synthetic flow being derived from the average, all of the flows are normalized based on their respective watershed sizes. Please refer to Appendix B which discusses reference watersheds in greater depth and provides reference to additional scientific literature. Furthermore, Appendix B discusses the choice of the reference streams according to MDNR's criteria and applicable WQS (40 CFR §131).**

7. Comment: The TMDL has incorrect citations and typos. Criteria for Ecoregion 39 are provided in EPA guidance for Nutrient Ecoregion XI, not Nutrient Ecoregion IX as cited in the TMDL. The appropriate criteria are in Table 3c not Table 3e. Appendix B does not contain a detailed discussion of the method used to develop the TN and TP targets.

**7. Response: EPA thanks the commentor for information to improve the final TMDL. The typos and Appendix omission have been corrected in the final TMDL.**

8. Comment: The TMDL incorrectly identifies the West Fork Mine as the source of impairment and ignores the existence of a spring previously identified as a source of the perceived impairment.

Other research into potential impairments identified a spring across from Doe Run's West Fork Mine outfall as a key source of the historical impairment. The spring is never mentioned in the TMDL. The commentor presents information from a 2003 study that indicates that the alternate spring is the source for staining from oxidized manganese and a darkly stained river bottom. Additional information from a 1992 study describes how the black manganese coating of benthic rocks occurs where significant quantities of soluble manganese materials are brought to the surface. Even MDNR in 2003 concluded that because of the spring further studies should be done. Furthermore, data collected upstream of the mine showing higher phosphorus concentrations contradicts West Fork Mine as the source of impairment.

**8. Response: EPA appreciates feedback on the draft TMDL. EPA is establishing this TMDL at this time to meet the requirements of the Consent Decree and based the TMDL on the best data available at the time the TMDL was drafted. The commentor's information will be shared with MDNR. If the data provided by commentors is found to meet MDNR's minimum quality assurance level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data. The data needs to be representative of instream conditions and meet the QA/QC levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050).**

9. Comment: The calculations of the loading capacities and the allocation of pollutant loads are flawed. The commentor has not been able to replicate all of the allowable loads presented in the TMDL in Tables 9 and 10 using the flows provided and the specified TMDL targets. The commentor requests the detailed calculations from the TMDL to allow comment on the calculations.

**9. Response: EPA believes that the methodology described in the TMDL and its Appendices is technically defensible. Graphs and data in the draft TMDL have been analyzed and presented consistent with the procedures included in the Appendices; 40 CFR 130.2(i) and 40 CFR 130.7(c)(1). Additionally, MDNR has used the methodology in developing several TMDLs that were subsequently approved by EPA. (The commentor may go to the Appendices and Section 6 of the TMDL for detailed calculations.)**

**The following information will help the commentor better replicate the TMDL:**

- **The sources for all raw data used in the draft TMDL are listed in the References Section.**
- **The commentor is directed to the Appendices cited at relevant points in the body of the TMDL to find specific data and further analyses,**
- **Data used in the TMDL's calculations that are not in the draft TMDL is being placed into STORET for better data sharing, and**
- **All data used to list a water during any Missouri 303(d) listing cycle is on file with MDNR.**

**The STORET Data Warehouse is EPA's repository of the water quality monitoring data collected by water resource management groups across the country. The new water quality**

**exchange (WQX) makes uploading data to STORET easier so more groups are able to share data. Please access data for this TMDL at the following Website: http://www.epa.gov/STORET/dw_home.html. Assistance on using STORET is available at http://www.epa.gov/STORET/owners.html.**

**For data that was obtained from MDNR, the state's website offers several locations to retrieve water body data: http://www.dnr.mo.gov/env/wpp/waterquality/303d/2008/proposed-2008-303d-list-data.htm and http://www.dnr.mo.gov/env/wpp/tmdl/index.html. The commentor may also call MDNR's Water Quality Monitoring and Assessment Section who maintains information on the past and current quality of water in Missouri and makes the information available to other agencies and the general public (573-751-6623).**

10. Comments on the TMDL's calculations include:

- The TMDL did not allow for mixing or dilution.
- Point source flows in the calculations were average flows, not the maximum permitted flows.
- Because Stormwater is included as a point source, the wasteload allocations for point sources should increase at higher flows, rather than being held constant at the low-flow allocation.
- The draft TMDL allocates 75% of the allowable loads at low flow to nonpoint sources. This is unfounded because the majority of nonpoint sources are from runoff, which is expected to be associated with wet weather, elevated-flow conditions.
- The TMDL should quantify contributions from nonpoint sources and provide an equitable allocation for all flow conditions, including higher WLAs for the point sources.

**10. Response: All of the comments are addressed through the implementation of the TMDL, rather than when calculating the TMDL because TMDLs set a cumulative WLA and are written to meet water quality standards. Permit limits are calculated by MDNR to be consistent with the assumptions used in the TMDL. The draft TMDL allocates 75% of the allowable loads at low flow to nonpoint sources because Missouri targets the 25th percentile of low flow in TMDLs and does not allow for flow variable point sources in TMDLs. Flow variable permit limits and mixing zones are considered during the calculation of permit limits.**

**Per EPA regulations, the state incorporates the TMDL into its current water quality management plan for implementation (40 CFR 130.7(d)(2)). The conversion of WLAs to permit limits is specifically the purview of the MDNR's NPDES Permits and Engineering Section. Should you have questions regarding the determination of permit effluent limits, please contact Mr. Refaat Mefrakis, Chief, NPDES Permits and Engineering Section, at (573) 526-2928 or via email refaat.mefrakis@dnr.mo.gov.**

## LIST OF COMMENTORS

1. Ken Midkiff, Sierra Club, Missouri
2. Robert J. Brundage, Newman, Comley And Ruth, PC for Doe Run Resources Corporation, Missouri
3. Philip K. Walsack, Missouri Public Utility Alliance with the City of Bunker, Missouri
4. Dale Brooks, Citizen, Boss, Missouri
5. Philip K. Walsack, Missouri Public Utility Alliance with the City of Centerville, Missouri and for Ron Keeney the Contract Operator of the City of Centerville Waste Water Treatment Plant
6. Brittany A. Barrientos, Newman, Comley and Ruth, PC for Doe Run Resources Corporation, Missouri

## END SUMMARY OF COMMENTS AND RESPONSES

West Fork of the Black River
Ken Midkiff to: Debby White
Cc: Tom Kruzen

11/05/2010 05:25 PM

From: Ken Midkiff <12midkiff@centurylink.net>
To: Debby White/R7/USEPA/US@EPA
Cc: Tom Kruzen <tkruzen@gmail.com>

According to the federal court order, this TMDL must be completed and approved by EPA7 by December 31, 2010. If it is not, EPA will be in violation of this court order.

Is the reason for the extension due to Doe Run's comments??

Ken Midkiff
Sierra Club

FW: Comment Period for West Fork Black River's Draft TMDL is Extended until December 6, 2010.

Robert Brundage to: Debby White 11/09/2010 09:50 AM

From: "Robert Brundage" <rbrundage@ncrpc.com>
To: Debby White/R7/USEPA/US@EPA
History: This message has been replied to and forwarded.

Ms. White

Why was this comment period extended?

Did someone ask for an extension? If so, who?

Robert

-----Original Message-----
From: White.Debby@epa.gov [mailto:White.Debby@epa.gov] On Behalf Of R7TMDL@epamail.epa.gov
Sent: Friday, November 05, 2010 4:05 PM
To: undisclosed-recipients
Subject: Comment Period for West Fork Black River's Draft TMDL is Extended until December 6, 2010.

A copy of the public notice is also attached to this email.

PUBLIC NOTICE
U.S. Environmental Protection Agency, Region 7
Water, Wetlands and Pesticides Division
901 North 5th Street
Kansas City, Kansas 66101

NOTICE OF EXTENDED AVAILABILITY
DRAFT TOTAL MAXIMUM DAILY LOAD (TMDL)
FOR WEST FORK BLACK RIVER IN THE STATE OF MISSOURI

Section 303(d) of the Clean Water Act (CWA), 33 USC § 1313 (d)(1)(C), and the U.S. Environmental Protection Agency's (EPA) implementing regulation, 40 CFR § 130.7(c)(1), require the establishment of TMDLs for waters identified as not meeting water quality standards (WQS) under authority of § 303(d)(1)(A) of the CWA. TMDLs are established at a level necessary to implement applicable WQS with seasonal variations and a margin of safety that accounts for lack of knowledge concerning the relationship between pollutant loading and water quality.

EPA is establishing this TMDL to meet the milestones of 2001 Consent Decree, American Canoe Association, et al. v. EPA, No. 98-1195-CV-W in consolidation with No. 98-4282-CV-W, February 27, 2001, and in partnership with the state of Missouri. However, Missouri may submit and EPA may approve other TMDLs for this water segment at any time.

This draft TMDL addresses an impaired segment of the West Fork Black River (MO_2755) with a watershed area of approximately 163 square miles and a river distance of approximately 31.7 miles. It is located near the city of Centerville in Reynolds County, Missouri. The West Fork Black River watershed is within the confines of Missouri's only national forest, the Mark Twain National Forest. The river is on the 2008 Missouri § 303(d) List of Impaired Waters due to a nutrients impairment

(3) ✓

# MPUA
## Missouri Public Utility Alliance

November 15, 2010

United States Environmental Protection Agency – Region 7
Water, Wetlands, & Pesticides
501 North 5th Street
Kansas City, Kansas 66101
ATTN: Debby White

**Re: Total Daily Maximum Load (TMDL) for the West Fork of the Black River – Comments in Support of the Municipal Government of Bunker, Missouri**

Dear Mrs. White:

The Missouri Public Utility Alliance (MPUA) appreciates the opportunity to serve our member municipalities with technical assistance and regulatory support/advocacy. MPUA serves over 110 municipal utilities in Missouri, representing nearly 1.2 million citizens. In addition, MPUA advocates on behalf of non-members municipalities by intervening during regulatory issues. One such issue has arisen for the city of Bunker (NPDES Permit MO-0117951). This letter is authored with the concurrence of Mayor Linda Vest and the City of Bunker.

Specifically, MPUA strongly objects to the notion illustrated in the Draft TMDL which reads: "Because the three Doe Run continuous mine discharge outfalls each discharge TN and TP to the West Fork of the Black River, all three of these facilities, along with the **Bunker** and Centerville **WWTPs, should share the WLA for these pollutants**" (emphasis added). MPUA believes that the City of Bunker is not causing or contributing to the impairment of this receiving water. To support this assertion the following data is provided.

Flow

The lowest flow estimate for the West Fork of the Black River is 88.2 $ft^3$/sec (estimated at the outlet of the watershed). This represents the 95% flow exceedance value. The Bunker Wastewater Treatment Plant has a very low design flow (45,000 gallons per day). The actual flow, as stated in the NPDES Permit, is 20,300 gallons per day or 1.88 $ft^3$/sec. This accounts for just 0.021% of the flow of the West Fork of the Black River during critical low flow (7Q10) conditions. Bunker's wastewater effluent flow is not adding appreciably to the watershed.

Pop

The community has had a very stable population since 2000. According to a web-based population estimator (citidata.com), Bunker's population was 428 in 2000. As of 2009, the Bunker population was 422 people. This represents a loss of 1.2% of its population since 2000. Flows, based solely on the number of people using the system, have not and are not projected to rise.

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Finally and most importantly, Bunker is a land-application (i.e. no discharge system). While they maintain an emergency outfall from the irrigation lagoon, there have not been any discharge events since January 2009. Data prior to this date is not available from the Missouri Department of Natural Resources. This data supports the fact that this facility is not causing or contributing to the impairment of this receiving water.

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Missouri Association of Municipal Utilities
Missouri Joint Municipal Electric Utility Commission
Municipal Gas Commission of Missouri

In light of the supporting data, this facility should not be considered to be the causing or contributing to any impairment of the West Fork of the Black River. It is our strong recommendation that no new wasteload allocation for nutrients, dissolved oxygen, total suspended solids, and/or biochemical oxygen demand be developed that would affect this community.

As always, the Missouri Public Utility Alliance appreciates the Agency's consideration of our request. We thank you for the opportunity to comment on this Draft TMDL during the public comment period.

Sincerely,

Philip K. Walsack
Manager of Environmental Services

cc: John Hoke; Missouri Department of Natural Resource; Central Office; TMDL; Unit Chief
Linda Vest; City of Bunker; Mayor
Barbara Smith; City of Bunker; City Clerk

✓(4)

15 Nov, 2010

WQMB-Rec'd NOV 2 2 2010

EPA Region 7
Water Wetlands and Pesticides Division
Attn: Ms Debby White, Water Quality Management Branch
901 North 5th Street
Kansas City, Kansas 66101

SUBJECT: West Fork Black River TMDL

I was pleased to learn that a Draft TMDL document has been developed for the West Fork of Black River in Reynolds Co MO. I know first hand about the water quality degradation since I live two miles below the West Fork mine. I own approximately one mile of river frontage beginning about 1.3 miles below the mine. I purchased part of the property in 1963 and the remainder in 1970. I have been living here full time for 20 years. I was born about one mile above the mine and my parents, grandparents and great-grandparents were also born nearby so I am as knowledgeable as anyone about this stream.

This stream has been a major part of my life for a long as I can remember. It was as clear and clean as any open water I have ever seen. I spent countless hours in it through the years. I even saw many people drink from it long ago. I saw generations of families swimming and fishing in it. My Grandparents were baptized in it before my Father was born. Large groups would get together to swim and socialize. I have seen over 100 people gather at the Granddaddy Hole (just below the West Fork mine) on the 4th of July. Unfortunately, by the time my grandchildren were old enough to enjoy it, the water was unfit to swim in. I have enclosed a picture of The Granddaddy hole in the early 1970s and another made in 1992 for comparison.

The degradation began soon after the ASARCO opened the West Fork Mine about 1986. I was shocked to see that they were permitted to put a mine right beside a high quality Ozark stream at the site of the old West Fork Post Office. They built a levy along the river to prevent flooding of their facilities. The levy resulted in increased flow and velocity downstream which increased flooding on my property. The water quality degraded rapidly and swimming within a few miles of the mine was no longer done. In the early days I saw the river gray with mine tailings inadvertently released. The river bottom later became black as coal. I had an aerial photo that showed the river black starting right at the mine discharge (Outfall #1). At Outfall #2 an orange substance was discharged that covered bottom and rocks for 100 ft or so. At the old granddaddy swimming hole the water was so foul it smelled. A treatment facility was installed later that probably helped with removal of metals but did little to reduce the nutrients and algae.

After Doe Run aquired the West Fork Mine they eventually stopped using it. Apparently all their mines were interconnected under ground and they brought the ore up at other mines. However, they continue to discharge the mine water at West Fork. The appearance of the river improved somewhat after that. The bottom is not black like it was but the algae and bottom deposits continue. Flooding improves the appearance for a while.

I used to turn over rocks along the edge of the river and could catch enough crayfish in a few minutes to fish with. I don't think I have seen two crayfish on our place in the last 10 years. And I can't remember the last time I saw a water snake. It breaks my heart that my grandchildren and great grandchildren can't swim here. I had looked forward to that all my adult life. Two generations of my family have missed out on the joys of this river. I still eat fish from it occasionally but I worry that they could be harmful.

I don't believe the West Fork could ever be restored to its condition prior to the mines but I am hopeful that the nutrients can be reduced and the appearance enhanced. I would also like to see something done about the metals in the sediment. Thank you for efforts to improve this beautiful stream. The Draft TMDL document defines the problem well.

Dale Brooks

Dale Brooks
1366 CR 844
Boss, MO 65440

(5)

WQMB-Rec'd NOV 2 2 2010 ✓

MPUA
Missouri Public Utility Alliance

November 16, 2010

United States Environmental Protection Agency – Region 7
Water, Wetlands, & Pesticides
501 North 5th Street
Kansas City, Kansas 66101
ATTN: Debby White

**Re: Total Daily Maximum Load (TMDL) for the West Fork of the Black River – Comments in Support of the Municipal Government of Centerville, Missouri**

Dear Mrs. White:

The Missouri Public Utility Alliance (MPUA) appreciates the opportunity to serve our member municipalities with technical assistance and regulatory support/advocacy. MPUA serves over 110 municipal utilities in Missouri, representing nearly 1.2 million citizens. In addition, MPUA advocates on behalf of non-members municipalities by intervening during regulatory issues. One such issue has arisen for the city of Centerville (NPDES Permit MO-0127940). This letter is authored with the concurrence of the City's contract operator (Mr. Ron Keeney and the City of Centerville.

Specifically, MPUA strongly objects to the notion illustrated in the Draft TMDL which reads: "Because the three Doe Run continuous mine discharge outfalls each discharge TN and TP to the West Fork of the Black River, all three of these facilities, along with the Bunker and **Centerville WWTPs, should share the WLA for these pollutants**" (emphasis added). MPUA believes that the City of Centerville is not causing or contributing to the impairment of this receiving water. To support this assertion, the following data is provided.

The lowest flow estimate for the West Fork of the Black River is 88.2 $ft^3$/sec (estimated at the outlet of the watershed). This represents the 95% flow exceedance value. The Centerville Wastewater Treatment Plant has a very low design flow (23,100 gallons per day). The actual flow, as stated on the NPDES Permit is 10,600 gallons per day or 0.98 $ft^3$/sec. This actual flow accounts for just 0.011% of the flow of the West Fork of the Black River during critical low flow (7Q10) conditions. Centerville's flow is not adding appreciably to the watershed.

The community has had a very stable population since 2000. According to a web-based population estimator (citidata.com), Centerville's population was 171 in 2000. As of 2008, the Centerville population was 169 people. This represents a loss of 1.2% of its population since 2000. Flows, based solely on the number of people using the system, have not and are not projected to rise.

In light of the supporting data, this facility should not be considered to be the causing or contributing to any impairment of the West Fork of the Black River. It is our strong recommendation that no new wasteload allocation for nutrients, dissolved oxygen, total suspended solids, and/or biochemical oxygen demand be developed that would affect this community.

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As always, the Missouri Public Utility Alliance appreciates the Agency's consideration of our request. We thank you for the opportunity to comment on this Draft TMDL during the public comment period.

Sincerely,

Philip K. Walsack
Manager of Environmental Services

cc: John Hoke; Missouri Department of Natural Resource; Central Office; TMDL; Unit Chief
Linda Miller; City of Centerville; City Clerk
Ron Keeney; Contract Operator

BRITTANY A. BARRIENTOS
ROBERT J. BRUNDAGE
EDWARD C. CLAUSEN
MARK W. COMLEY
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CATHLEEN A. MARTIN
STEPHEN G. NEWMAN
JOHN A. RUTH
NICOLE L. SUBLETT
ALICIA EMBLEY TURNER

December 6, 2010

**VIA EMAIL AND U.S. MAIL**

Ms. Debby White
Water Quality Management Branch
Environmental Protection Agency, Region 7
Water, Wetlands and Pesticides Division
901 North 5th Street
Kansas City, Kansas 66101
R7TMDL@epa.gov

RE: West Fork Black River TMDL (MO-2755)

Dear Ms. White:

I am providing you the enclosed memorandum from LimnoTech providing comment on the West Fork Black River TMDL. Specifically, the enclosed memorandum encourages the Environmental Protection Agency to recategorize the West Fork Black River as either a Category 1 or Category 4b water body. In support of this request, the memorandum presents four bases: (1) The TMDL lacks information indicating that a nutrient impairment currently exists in West Fork Black River; (2) The TMDL target it inappropriate because it is based on overly conservative approaches; (3) If this TMDL is finalized, a spring across from Doe Run's West Fork Mine be included as a source, as MDNR research and private research has identified the spring as a source; and (4) The calculation of loading capacity and pollutant allocation is flawed and should be revised. We thank you in advance for your consideration of the enclosed memorandum, and appreciate the opportunity to comment on this TMDL. We look forward to working with EPA on this matter. Please let me know if you have any questions or comments.

Sincerely,

NEWMAN, COMLEY & RUTH, P.C.

Robert J. Brundage

Robert J. Brundage
rbrundage@ncrpc.com

Enclosure

cc: John Hoke, Missouri Department of Natural Resources (w/encl.)
The Doe Run Company (w/encl.)
Hans Holmberg, LimnoTech (w/encl.)

LimnoTech
Water | Environment | Scientists | Engineers

# MEMORANDUM

**DATE:** December 6, 2010

**FROM:** Dave Dilks
Hans Holmberg
Kathy Hall

**TO:** Debby White, U.S. EPA Water Quality Management Branch

**CC:** Robert Brundage, Newman, Comley & Ruth, P.C.
John Carter, The Doe Run Company
Aaron Miller, The Doe Run Company

**SUBJECT:** Review of Draft TMDL for the West Fork Black River

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In cooperation with Newman, Comley & Ruth and The Doe Run Company, LimnoTech has completed a review of the draft Total Maximum Daily Load (TMDL) for the West Fork Black River. A draft of the West Fork Black River TMDL was issued by the U.S. Environmental Protection Agency (EPA) on October 12, 2010. A revised version of the draft was issued on November 5, 2010. This memorandum presents LimnoTech's comments and recommendations for the draft TMDL, offered on behalf of the Doe Run Resources Corporation d/b/a The Doe Run Company.

These comments are focused on four general categories

- **No evidence has been provided that impairment currently exists.** The Missouri Department of Natural Resources (MDNR) has previously concluded that the site is not impaired. The only historical justification used by MDNR for the site being impaired in 303(d) listings is not supported by recent sampling results.

- **Even if impairment exists, the TMDL target is inappropriate.** The reference condition approach used to set nutrient targets for this TMDL is overly simplistic, resulting in arbitrary nutrient criteria and, consequently, the implementation of inefficient and ineffective pollution control efforts.

- **The most extensive research into the issue has identified a spring across the river from one of Doe Run's outfalls as a key source.** This source is not mentioned nor taken into account in the draft TMDL.

- **The calculation of loading capacity and pollutant allocation is flawed.** EPA's approach results in overly stringent wasteload allocations.

Based on these considerations, Doe Run recommends that the West Fork Black River be re-categorized as either a Category 1 (not impaired) or Category 4b (existing controls are sufficient to result in attainment, no TMDL needed) water.

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**Comment #1 – The available data indicate that the West Fork Black River is not impaired by nutrients; therefore, a TMDL is not needed**

The TMDL does not provide evidence documenting impairment by nutrients. Instead, the TMDL includes information that suggests just the opposite. Because of the lack of data indicating impairment, no TMDL is needed.

- The only detail the TMDL provides that suggests there is impairment is as follows: "The Missouri Department of Natural Resources (MDNR) has received several complaints regarding unsightly algal growth in West Fork Black River (MDNR, 2004)." The TMDL does not provide any information about the complaint[1]. The TMDL should make clear when any complaints were received, and whether they are still relevant. The only explicit description of impairment LimnoTech's research has unearthed comes from Gale (1992), which described land owner complaints related to turbid water, discolored surfaces on the stream bottom, and mats of organic matter. If a more recent explicit description of impairment exists, it should be cited in the TMDL.
- The TMDL reports recent measurements of algal densities, but gives no indication whether these are representative of nuisance levels. Gale (1992) characterized algal blooms in West Fork Black River as moderate in intensity and nuisance impact, and limited in duration. He indicated that nitrate and phosphorus concentrations in the main river channel were generally below levels recognized as causing serious algal blooms. The only apparent justification for the impairment determination provided in historical 303(d) listing documents was a determination that historical summer chlorophyll levels were higher at sites downstream of the West Fork Mine discharge than they were at upstream sites. However, the more recent data collected in support of the TMDL provide results directly counter to that conclusion; total phosphorus concentrations and all measures of periphyton are higher at sites upstream of the West Fork Mine than they were at downstream sites.
- The TMDL apparently ignores the MDNR (2003) stream survey which concluded that there was "no evidence to support keeping the 0.2 mile of stream below the West Fork Black Doe Run (sic) discharge on the 303(d) list of impaired waters for nutrients." This survey is provided in Attachment 1 to these comments.
- Much of the problem definition language in the TMDL is generic and bears no relevance to what was observed in the West Fork Black River. Page 11 of the TMDL report states that:
  "Nutrient related water quality issues include the following:
  - Proliferation of nuisance algae and resultant unsightly, harmful blooms and deposits
  - Elevated turbidity due to suspended algae
  - High organic nutrient levels as a result of algae die off
  - Low DO resulting from the decomposition of algae and other organic materials"

  The data collected in support of the TMDL show none of the above four conditions occurring. No mention was given to nuisance algae and/or blooms. Suspended algae concentrations averaged

[1] The MDNR has published a Water Protection Program Fact Sheet entitled, "What are TMDLs?" (September 2009). That document lists components that will be included in a TMDL document, including "information on how/why the water body got on the List." Vague and undocumented complaints in an unknown time frame do not support this component.

less than 0.5 µg/l, which is an order of magnitude lower than concentrations that would contribute to turbidity. None of the total phosphorus concentrations (an indicator of organic nutrients) sampled in 2009 exceeded the nutrient target for total phosphorus. The TMDL monitoring plan called for diurnal dissolved oxygen monitoring, but such monitoring was never mentioned in the report. There is no evidence that the river is currently impaired by nutrients.

- The data presented in the TMDL suggest significantly lower periphyton chlorophyll a concentrations in 2009 than those reported previously, further raising the question of whether the West Fork Black River is impaired. Reported periphyton chlorophyll a concentrations generally differ by more than a factor of ten between those provided in the TMDL and those reported by MDNR (2003). While it is possible that these large changes are due to seasonal variability, or reporting/measurement error and not historical changes, this large difference should be discussed in the TMDL.
- Even if the West Fork Black River is impaired for nutrients, the TMDL for total nitrogen is unnecessary. The TMDL defines maximum allowable loads for both total nitrogen (TN) and total phosphorus (TP). However, the data indicate that the ratio of TN to TP is greater than 200[2]. The system is thus very strongly phosphorus-limited, and nitrogen controls will not be effective in controlling algal growth. A more appropriate approach would be to just control the limiting nutrient, i.e. phosphorus.

**Comment #2 – The approach used to set the TMDL target is overly simplistic and arbitrary**

In the section above, Doe Run disputes EPA's conclusion that the West Fork Black River is impaired. In the event EPA rejects Doe Run's assertion that the West Fork Black River is impaired, Doe Run describes in this section why the TMDL target is flawed.

The reference condition approach used to set nutrient targets for this TMDL is overly simplistic. The approach results in arbitrary nutrient criteria and, consequently, the implementation of inefficient and ineffective pollution control efforts.

The intent of water quality criteria is to maintain pollutant concentrations at levels below those which would prevent attainment of a designated use. Many site-specific factors (e.g. hydraulics, shading, water color) affect the relationship between nutrient concentrations and designated use support. Ideally, nutrient criteria for a given site would be based on scientific studies that consider the relationship between nutrient concentrations and designated use support. The nutrient targets used in this TMDL do not explicitly consider the concentrations required to support designated uses. They do not consider the relationship between nutrient concentrations and environmental response (e.g. algal growth), nor do they consider the relationship between environmental response and designated use support.

The nutrient targets used in this TMDL are based on the "reference condition" approach, which attempts to infer nutrient criteria values that may be protective of designated uses. The approach considers the observed nutrient data from all sites in a given ecoregion, and pre-supposes that the concentration value that is exceeded at 25% of these sites is the value that represents a "protective" level. To demonstrate the potential for arbitrary decision-making, observed concentrations at the sites used to define criterion values for the West Fork Black River ranged from 0.0025 to 2.145 mg/l for total phosphorus, with total nitrogen concentrations ranging from 0.035 to 9.474 mg/l. Selection of a single

[2] In general, TN:TP ratios greater than approximately 7.2 suggest that TP is the limiting nutrient (Chapra, 1997); that is, algal growth is controlled by the amount of phosphorus available, and will not be affected by a reduction in TN concentrations (unless the ratio drops below 7.2).

"protective" concentration value as a criterion from a range of data that span several hundred -fold, with no consideration of site-specific characteristics, is at best an arbitrary guess.

While this reference condition approach is one of the allowable approaches listed in EPA guidance, it must be emphasized that the approach taken for this was the bare minimum acceptable approach, applied using EPA's least rigorous allowable method. LimnoTech's concerns with this approach are discussed below:

Bare minimum approach

The EPA (2010) scientific advisory board review of proposed nutrient criteria development guidance describes a range of approaches to be used to define nutrient criteria. These include:

- The reference system approach,
- Mechanistic modeling (i.e., predicting the effects of changes in nutrient concentrations using site-specific parameters and equations that represent ecological processes), and
- Application of nutrient/algal thresholds, such as quantifying the relationship between nutrient concentrations and biological response measures related to the designated use of a waterbody.

The reference condition approach is recognized as the least rigorous of the three approaches, because it is the only approach that does not directly consider the environmental consequences of resulting nutrient concentrations.

The EPA (2000b) documents containing the reference condition data base clearly recognizes the limitations of the reference condition approach, stating:

> EPA strongly encourages States and Tribes to use the information contained in this document and to develop more refined criteria according to the methods described in EPA's technical guidance manuals for specific waterbody types.

Because of the above limitations, many States list the reference condition approach as a fall-back position to be used for criteria development only in cases where insufficient resources are available to more rigorously define criteria. The Kansas Department of Health and Environment (2004), for example, described the approach as "simplistic" and "questionable". The Virginia Department of Environmental Quality (2008) divides their nutrient criteria development approach into categories of "preferred" and "fall-back". The preferred approach uses effect-based criteria and the development of nutrient criteria that reflect localized conditions and protect specific designated uses. The use of reference conditions to define nutrient criteria is considered only as a "fall-back" approach.

Applied using EPA least rigorous allowable method

The EPA (2000a) guidance on developing nutrient criteria provides alternate methods for applying the reference conditions approach:

- The 75$^{th}$ percentile of the population of minimally disturbed reference streams within a region.
- The 25$^{th}$ percentile of the population of all streams within a region, as a surrogate to estimate the 75$^{th}$ percentile of the population of pristine reference streams.

The EPA (2000b) guidance document used to define criteria for this TMDL explicitly states that the first of these approaches is the preferred method to establish a reference condition. Because EPA did not have reference data available at the time this guidance was published, the reference stream column was

left blank in the guidance. EPA did state, in 2000, that it "anticipates that States/Tribes will provide information on reference streams." Ten years later, the non-preferred approach is still being used.

The second method, as used in this TMDL, adds an additional tenuous assumption to the specification nutrient criteria. Not only does it require the assumption that the 75th percentile of minimally disturbed reference streams is an accurate representative of the concentration required to support the designated use, it also assumes that the 25th percentile concentration of all streams is an accurate representation of the 75th percentile of minimally disturbed reference streams. The effect of combining the above assumptions results in an approach that defines 75% of all sites in the ecoregion to be impaired by nutrients, with no site-specific investigation regarding whether these nutrient levels support the designated uses.

Additional comment related to nutrient criteria

In addition to the above comments regarding the methods used to develop the nutrient targets, there are errors in the discussion of the criteria development. Page 24 of the revised draft TMDL states:

> Reference conditions for TN and TP in Level III Ecoregion 39 streams are provided in Table 3e of Ambient Water Quality Criteria Recommendations, Information Supporting the Development of State and Tribal Nutrient Criteria for Rivers and Streams in Nutrient Ecoregion IX (EPA, 2000) and in Section S.2 of this report. A detailed discussion of the method used to develop the TN and TP targets is provided in Appendix B.

The TMDL cites an incorrect guidance document. Criteria for Ecoregion 39 are provided in EPA (2000b) guidance for Nutrient Ecoregion XI, not Nutrient Ecoregion IX as cited in the TMDL. Additionally, the appropriate criteria are in Table 3c of that document, not Table 3e as cited in the TMDL. Finally, Appendix B does not contain a detailed discussion of the method used to develop the TN and TP targets, as stated in the TMDL. Doe Run asks that these inconsistencies be corrected if a final TMDL is issued.

**Comment #3 - The TMDL incorrectly identifies the West Fork Mine as the source of impairment, and ignores springs previously identified as a source of the perceived impairment**

The most extensive research into the e of any potential impairment in the West Fork Black River has identified a spring across the river from Doe Run's West Fork Mine outfall as a key source of the historical impairment. This source is never mentioned in the draft TMDL.[3]

- Gale (2003) described marked discoloration of rocks in the river due to staining by oxidized manganese, which might contribute to perceptions of the river as "unsightly". This report also indicates that the darkly stained river bottom that occurs in the vicinity of the mine outfall is restricted to the shoreline opposite the outfall, in the vicinity of an un-named spring.
- Gale and Patterson (1992) describe in great detail the black manganese coating of benthic rocks occurring where significant quantities of soluble manganous materials are brought to the surface.

[3] MDNR's "What are TMDLs?" Water Protection Program Fact Sheet also states that the identification of pollutants and their sources are a component of a TMDL. Here, research has indicated a known potential source that is entirely omitted from the TMDL. Doe Run asks that the TMDL be re-assessed in light of the information provided herein.

- The MDNR (2003) study also concludes "Because of the spring located just across from the outfall, further studies should focus on it as a potential influence on water quality and algal growth at this location." No further studies have been conducted by MDNR.
- As discussed above, the data collected in support of the TMDL indicate that total phosphorus concentrations and all measures of periphyton are higher at sites upstream of the West Fork Mine than they were at downstream sites. Gale (1992) also indicates that blooms, when they occur, have been observed along the entire river basin, upstream and downstream of the mine discharge. This information directly contradicts the identification of the West Fork Mine as the source of impairment.

**Comment #4 – The calculations of the loading capacities and the allocation of pollutant loads are flawed**

- LimnoTech has been unable to replicate all of the allowable loads presented in Tables 9 and 10 using the flows provided and the specified TMDL targets. Doe Run requests that EPA provide detailed calculation information for the TMDLs, and allow Doe Run and opportunity to comment on the calculations.
- Wasteload allocations were developed by applying the TMDL target concentration to the point source flow, with no allowance for mixing and dilution. This approach is overly stringent, particularly given that the data suggest existing instream concentrations of phosphorus are already below the TMDL target.
- Point source flows used in the calculations were the average flows, rather than the maximum permitted flows. This approach is illogical and results in overly stringent wasteload allocations. EPA's approach of applying the TMDL target concentration to the average point source flows requires point sources to meet concentrations more stringent than the TMDL target at all flows higher than the average flow. This is overly stringent and an unnecessary burden on the identified point sources.
- The draft TMDL allocates 75% of the allowable loads at low flow to nonpoint sources. This is unfounded because the majority of nonpoint sources are from runoff, which is expected to be associated with wet weather, elevated-flow conditions. The TMDL should quantify contributions from nonpoint sources and provide an equitable allocation for all flow conditions, including higher WLAs for the point sources.
- Because stormwater is included as a point source, the wasteload allocations for point sources should increase at higher flows, rather than being held constant at the low-flow allocation.

**References**

Chapra, SC, 1997. *Surface Water-Quality Modeling*. WCB/McGraw-Hill, Boston, MA.

EPA, 2000a. Nutrient Criteria Technical Guidance Manual Rivers and Streams. Office of Water. Washington, DC. EPA-822-B-00-002.

EPA, 2000b. Ambient Water Quality Criteria Recommendations. Information Supporting the Development of State and Tribal Nutrient Criteria. Rivers and Streams in Nutrient Ecoregion XI EPA 822-B-00-020. EPA, Washington, D.C.

Kansas Department of Health and Environment, 2004. Surface Water Nutrient Reduction Plan. KDHE Bureau of Water, December 29, 2004.

Missouri Department of Natural Resources (MDNR), 2003. 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.

Virginia Department of Environmental Quality, 2008. Nutrient Criteria Development Plan for the Commonwealth of Virginia. Water Division, Office Of Water Quality Programs, August 2008.

**Attachment 1**

**MDNR Stream Survey**

# 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 20$^{th}$ 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 20$^{th}$ 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.

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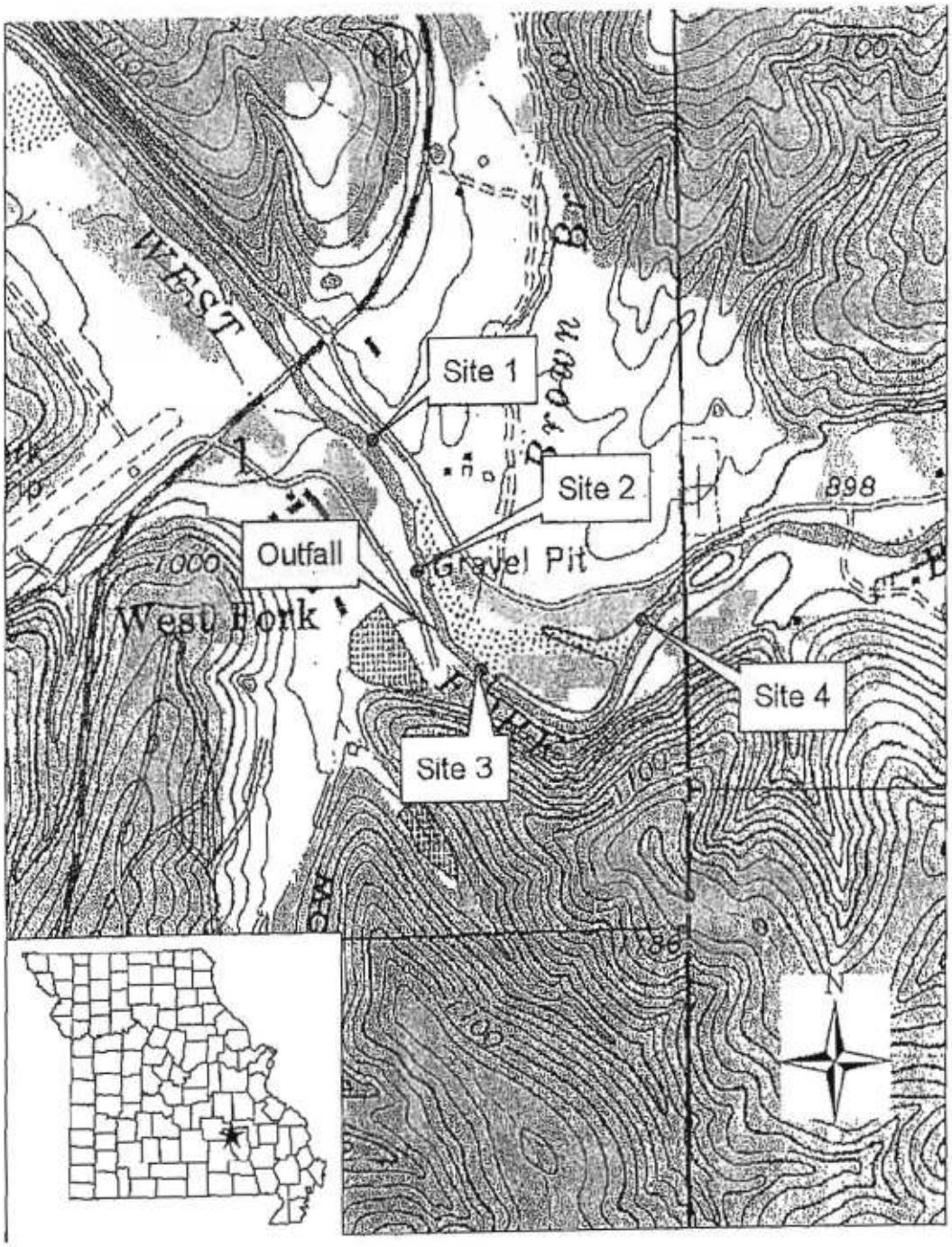
# Appendix A

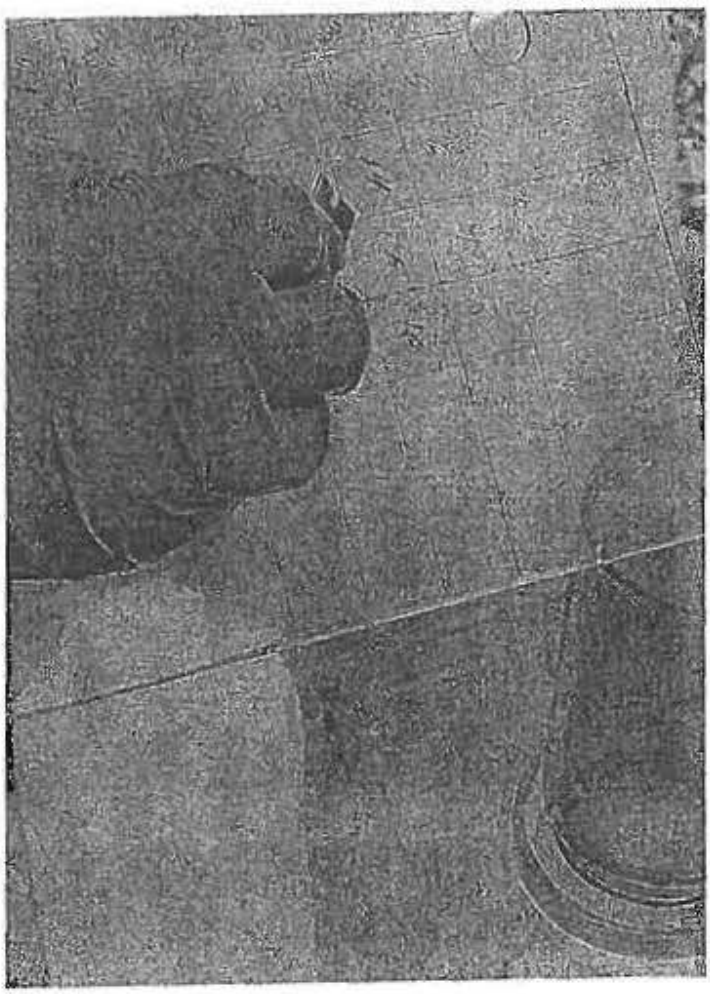
## Site Map and Photos

## 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

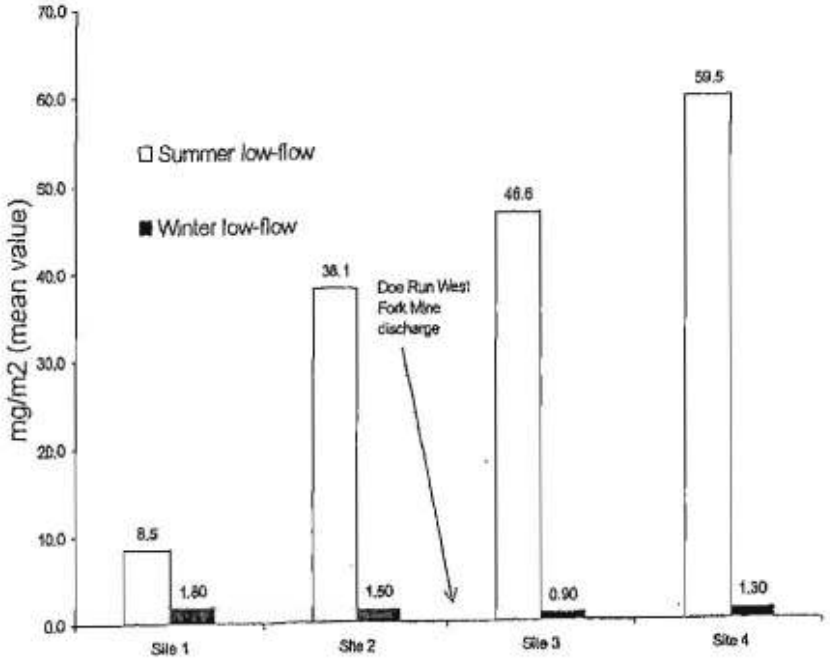
## Appendix C
## Figure C-1
## FY 2003 West Fork Black Summer Low-Flow Chlorophyll a Results
## Collected July 29, 2002
## Fourteen Day Colonization Period

| 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 | | | | |
| | | | | | | | | |
| | | | | | | | | |