



west virginia department of environmental protection

Division of Water and Waste Management
601 57th Street SE
Charleston, WV 25304
Phone: (304) 926-0495
Fax: (304) 926-0463

Earl Ray Tomblin, Governor
Randy C. Huffman, Cabinet Secretary
www.dep.wv.gov

**CONSENT ORDER
ISSUED UNDER THE
WATER POLLUTION CONTROL ACT
WEST VIRGINIA CODE, CHAPTER 22, ARTICLE 11**

TO: WV Division of Natural Resources
Wildlife Resources Section Operations Center
Robert A. Fala, Director
324 Fourth Avenue
South Charleston, WV 25303

DATE: September 18, 2015

ORDER NO.: 8080

INTRODUCTION

This Consent Order is issued by the Director of the Division of Water and Waste Management (hereinafter “Director”), under the authority of West Virginia Code, Chapter 22, Article 11, Section 1 et seq. to WV Division of Natural Resources (hereinafter “WVDNR”).

FINDINGS OF FACT

In support of this Order, the Director hereby finds the following:

Pendleton County Fish Hatchery

1. WVDNR operates a fish hatchery located near Franklin, Pendleton County, West Virginia. WVDNR was reissued WV/NPDES Water Pollution Control Permit No. WV0111821 on June 30, 2006 and May 31, 2011.
2. On January 11, 2011, West Virginia Department of Environmental Protection (WVDEP) personnel conducted an inspection of the facility. During the inspection, a violation of the following section of WV Legislative Rules was observed and documented:
 - a. 47CSR2 Section 3.2.b – WVDNR caused conditions not allowable in waters of the State by creating deposits and sludge banks. WVDNR allowed solids to build up on the bottom of the outlet pipe, resulting in a discharge of solids which covered the bottom of Reeds Creek.

Promoting a healthy environment.

As a result of the aforementioned violation, Notice of Violation (NOV) No. W11-36-049-206 was issued to WVDNR.

3. On April 25, 2013, WVDEP personnel conducted an inspection of the facility. During the inspection, a violation of the following section of WV Legislative Rules was observed and documented:

- a. 47CSR2 Section 3.2.b – WVDNR caused conditions not allowable in waters of the State by creating deposits and sludge banks. WVDNR allowed solids to build up in the recirculation tanks, in the pond, and on the bottom of the outlet pipe, resulting in a discharge of solids which covered the bottom of Reeds Creek for over one hundred (100) feet downstream of Outlet No. 001.

As a result of the aforementioned violation, NOV No. I13-36-001-TPD was issued to WVDNR.

4. On August 22, 2013, WVDEP personnel conducted an inspection of the facility. During the inspection, a violation of the following section of WV Legislative Rules was observed and documented:

- a. 47CSR2 Section 3.2.b – WVDNR caused conditions not allowable in waters of the State by creating deposits and sludge banks on the bottom of Reeds Creek. WVDNR allowed solids to build up on the bottom of the outlet pipe, resulting in a discharge of solids which covered the bottom of Reeds Creek for over one hundred (100) feet downstream of Outlet No. 001.

As a result of the aforementioned violation, NOV No. I13-36-018-TPD was issued to WVDNR.

5. On February 7, 2014, WVDEP personnel conducted an inspection of the facility. During the inspection, a violation of the following section of WV Legislative Rules was observed and documented:

- a. 47CSR2 Section 3.2.b – WVDNR caused conditions not allowable in waters of the State by creating deposits and sludge banks on the bottom of Reeds Creek. WVDNR allowed solids to build up in the recirculation tanks, in the pond, and on the bottom of the outlet pipe, resulting in a discharge of solids which covered the bottom of Reeds Creek downstream of Outlet Nos. 001 and 002.

As a result of the aforementioned violation, NOV No. I14-36-006-TPD was issued to WVDNR.

6. On January 15, 2015, WVDEP personnel conducted an inspection of the facility. During the inspection, violations of the following sections of WV Legislative Rules were observed and documented:

- a. 47CSR2 Sections 3.2.a, b, and c – WVDNR caused conditions not allowable in waters of the State by creating deposits, sludge banks, visible solids, and odors in Reeds Creek. Specifically, there were solids on the sides and bottom of the outlet pipes and on the bottom of the stream for more than one hundred (100) yards downstream of Outlet Nos. 001 and 002.

As a result of the aforementioned violations, NOV No. I15-36-006-TPD was issued to WVDNR.

7. On September 16, 2015, WVDEP personnel conducted a review of facility records from the time period of January 27, 2012 through July 31, 2015. During this review, the following violations of the terms and conditions of WVDNR's WV/NPDES Permit No. WV0111821 were observed:
 - a. Section C - Forty-four (44) exceedances of WVDNR's permit parameters were observed and documented (Table 1). These exceedances can be further defined as:
 - i. Minor violations-twenty-one (21)
 - ii. Moderate violations-eighteen (18)
 - iii. Major violations-five (5)

Pocahontas County Fish Hatchery

8. WVDNR operates a fish hatchery located near Edray, Pocahontas County, West Virginia.
9. On February 17, 1999, WVDEP personnel requested that WVDNR submit an administratively complete application for a WV/NPDES permit for regulated activities at the aforementioned fish hatchery.
10. On the following eleven (11) dates, inspections of the aforementioned fish hatchery were conducted by WVDEP personnel, and inspection reports documented that the requested administratively complete WV/NPDES permit application had not been submitted: February 26, 2001; June 4, 2001; September 24, 2001; August 8, 2002; December 3, 2003; March 4, 2004; March 29, 2005; November 7, 2005; October 24, 2007; January 8, 2013; and August 22, 2013.
11. On November 6, 2013, WVDEP personnel conducted an inspection of the facility and a follow-up record review. During the review, the following violation of WV Legislative Rules was observed and documented:
 - a. 47CSR10 Section 3.1 - WVDNR was operating the facility without authorization pursuant to a WV/NPDES permit.

As a result of the aforementioned violation, NOV No. I-13-38-34-TPD was issued to WVDNR.

12. On September 30, 2014, WVDNR was issued WV/NPDES Water Pollution Control Permit No. WV0115487 for regulated activity at the Edray hatchery facility.

13. On September 16, 2015, WVDEP personnel conducted a review of facility records from the time period of September 30, 2014 through July 31, 2015. During this review, a violation of the terms and conditions of WVDNR's WV/NPDES Permit No. WV0115487 was observed. Specifically, the May 2015 Outlet 002 sample resulted in an average Total Suspended Solids level of 16.9 Lbs/Day, which is above the permitted limit of 15.8 Lbs/Day.
14. On May 28, 2014, WVDEP personnel and representatives of WVDNR met to discuss the terms and conditions of this Order.
15. On May 13, 2015, WVDNR submitted a proposed Plan of Corrective Action (POCA) to WVDEP. The POCA (Attachment One) outlined action items and completion dates for how and when WVDNR achieved compliance with all pertinent laws and rules. The POCA and schedule are hereby incorporated into this Order. Failure to adhere to the approved POCA and schedule constitutes a violation of this Order.
16. On September 10, 2015, WVDNR submitted correspondence to WVDEP regarding a Supplemental Environmental Project (SEP) proposal (Attachment Two), which is an environmentally beneficial plan undertaken by WVDNR to mitigate a portion of the penalty assessed in this Order. The SEP proposal was approved by WVDEP personnel and has been incorporated into this Order.

ORDER FOR COMPLIANCE

Now, therefore, in accordance with Chapter 22, Article 11, Section 1 et seq. of the West Virginia Code, it is hereby agreed between the parties, and ORDERED by the Director:

1. WVDNR shall immediately take all measures to initiate compliance with all terms and conditions of its WV/NPDES permits and pertinent laws and rules.
2. WVDNR shall complete the SEP according to the plan and schedule proposed in its September 10, 2015 correspondence. Interim reports, as described in the approved SEP, shall be submitted annually to:

**Chief Inspector
Environmental Enforcement - Mail Code #031328
WV-DEP
601 57th Street SE
Charleston, WV 25304**

Annual reports shall also be submitted to:

**WVDEP Environmental Inspector Supervisor
NE Regional Environmental Enforcement Office
22288 Northwestern Pike
Romney, WV 26757-8005**

3. Within sixty (60) days after completion of the SEP, WVDNR shall submit an SEP Completion Report, listing expenditures and detailing all actions performed in regard to the SEP. The Report shall be mailed to the addresses contained within Order for Compliance No. Two (2) of this Order. Failure to complete the SEP in accordance with the approved plan and schedule is a violation of this Order, and WVDNR shall be required to pay the penalties stipulated in Order for Compliance No. Four (4) of this Order.

4. Because of WVDNR's Legislative Rule violations, WVDNR, LLC shall be assessed a civil administrative penalty of ninety two thousand two hundred seventy dollars (\$92,270) to be paid as follows:
 - a. One thousand dollars (\$1,000) shall be paid to the West Virginia Department of Environmental Protection for deposit in the Water Quality Management Fund within thirty (30) days of entry of this Order.
 - b. Nine thousand dollars (\$9,000) shall be held in abeyance for a two (2) year period after the effective date of this Order. WVDNR agrees to pay the nine thousand dollars (\$9,000) held in abeyance within thirty (30) days of notice from WVDEP that WVDNR has, at any time within the two (2) year period after the effective date of this Order, created conditions not allowable in waters of the State, as described in WV Legislative Rule 47CSR2 Section 3.2.
 - c. The remaining eighty-two thousand two hundred seventy dollars (\$82,270) shall be applied to the WVDEP approved SEP proposed by WVDNR on September 10, 2015. In the event that the SEP is not completed as proposed, the entire value placed upon the SEP shall become due and payable upon demand by WVDEP.

Payments made pursuant to this paragraph are not tax-deductible for purposes of State or federal law. **Payment shall include a reference to the Order No. and shall be mailed to:**

**Chief Inspector
Environmental Enforcement - Mail Code #031328
WV-DEP
601 57th Street SE
Charleston, WV 25304**

OTHER PROVISIONS

1. WVDNR hereby waives its right to appeal this Order under the provisions of Chapter 22, Article 11, Section 21 of the Code of West Virginia. Under this Order, WVDNR agrees to take all actions required by the terms and conditions of this Order and consents to and will not contest the Director's jurisdiction regarding this Order. However, WVDNR does not admit to any factual and legal determinations made by the Director and reserves all rights and defenses available regarding liability or responsibility in any proceedings regarding WVDNR other than proceedings, administrative or civil, to enforce this Order.
2. The Director reserves the right to take further action if compliance with the terms and conditions of this Order does not adequately address the violations noted herein and reserves all rights and defenses which he may have pursuant to any legal authority, as well as the right to raise, as a basis for supporting such legal authority or defenses, facts other than those contained in the Findings of Fact.
3. If any event occurs which causes delay in the achievement of the requirements of this Order, WVDNR shall have the burden of proving that the delay was caused by circumstances beyond its reasonable control which could not have been overcome by due diligence (i.e., force majeure). Force majeure shall not include delays caused or contributed to by the lack of sufficient funding. Within three (3) working days after WVDNR becomes aware of such a delay, notification shall be provided to the Director/Chief Inspector and WVDNR shall, within ten (10) working days of initial notification, submit a detailed written explanation of the anticipated length and cause of the delay, the measures taken and/or to be taken to prevent or minimize the delay, and a timetable by which WVDNR intends to implement these measures. If the Director agrees that the delay has been or will be caused by circumstances beyond the reasonable control of WVDNR (i.e., force majeure), the time for performance hereunder shall be extended for a period of time equal to the delay resulting from such circumstances. A force majeure amendment granted by the Director shall be considered a binding extension of this Order and of the requirements herein. The determination of the Director shall be final and not subject to appeal.
4. Compliance with the terms and conditions of this Order shall not in any way be construed as relieving WVDNR of the obligation to comply with any applicable law, permit, other order, or any other requirement otherwise applicable. Violations of the terms and conditions of this Order may subject WVDNR to additional penalties and injunctive relief in accordance with the applicable law.
5. The provisions of this Order are severable and should a court or board of competent jurisdiction declare any provisions to be invalid or unenforceable, all other provisions shall remain in full force and effect.
6. This Order is binding on WVDNR, its successors and assigns.

7. This Order shall terminate upon WVDNR's notification of full compliance with the "Order for Compliance" and verification of this notification by WVDEP.

Robert A. Fala

Robert A. Fala, Director
WV Division of Natural Resources
Wildlife Resources Section Operations Center

8-21-15

Date

Public Notice begin:

Date

Public Notice end:

Date

Scott G. Mandirola, Director
Division of Water and Waste Management

Date

revised March 2013

RECEIVED

SEP 24 2015

**ENVIRONMENTAL
ENFORCEMENT**

Table One: WVDNR DMR Exceedance Summary

Outlet 001 DMR Exceedances - AVG. MONTHLY - January 2012 - July 2015						Degree of non-compliance		
Date	Parameter	Units	Permitted avg. monthly	Reported avg. monthly	% Exceedance	Min	Mod	Maj
01/31/2013	BOD, 5-Day 20 Deg. C	mg/l	30	33	10%	X	-	-
02/28/2013	BOD, 5-Day 20 Deg. C	mg/l	30	40	33%	X	-	-
04/30/2013	BOD, 5-Day 20 Deg. C	mg/l	30	35	17%	X	-	-
05/31/2012	Coliform, Fecal	Cnts/100rr	200	400	100%	-	X	-
07/31/2012	Coliform, Fecal	Cnts/100rr	200	300	50%	-	X	-
08/31/2012	Coliform, Fecal	Cnts/100rr	200	1500	650%	-	-	X
09/30/2012	Coliform, Fecal	Cnts/100rr	200	480	140%	-	X	-
01/31/2013	Coliform, Fecal	Cnts/100rr	200	450	125%	-	X	-
04/30/2013	Coliform, Fecal	Cnts/100rr	200	330	65%	-	X	-
08/31/2012	Nitrogen Nitrite	mg/l	0.027	1.29	4678%	-	-	X
09/30/2012	Nitrogen Nitrite	mg/l	0.027	0.04	48%	-	X	-
12/31/2012	Nitrogen Nitrite	mg/l	0.027	0.04	48%	-	X	-
06/30/2012	TSS	lbs/day	423.35	1189	181%	-	X	-
01/31/2013	TSS	lbs/day	423.35	488	15%	X	-	-
01/31/2013	TSS	mg/l	30	45	50%	-	X	-
02/28/2013	TSS	lbs/day	423.35	531.26	25%	X	-	-
02/28/2013	TSS	mg/l	30	49	63%	-	X	-
04/30/2013	TSS	lbs/day	423.35	487.89	15%	X	-	-
04/30/2013	TSS	mg/l	30	45	50%	-	X	-
05/31/2013	TSS	mg/l	30	31	3%	X	-	-
07/31/2013	TSS	mg/l	30	37	23%	X	-	-
10/31/2013	TSS	lbs/day	423.35	910.73	115%	-	X	-
10/31/2013	TSS	mg/l	30	84	180%	-	X	-
12/31/2013	TSS	lbs/day	423.35	2428.6	474%	-	-	X
12/31/2013	TSS	mg/l	30	224	647%	-	-	X
3/31/2014	TSS	mg/l	30	38	27%	X	-	-
5/31/2014	TSS	mg/l	30	33	10%	X	-	-
6/30/2014	TSS	lbs/day	423.35	569.31	34%	X	-	-
6/30/2014	TSS	mg/l	30	55	83%	-	X	-
10/31/14	Coliform, Fecal	Cnts/100rr	200	230	15%	X	-	-

Outlet 001 DMR Exceedances - MAX. DAILY - January 2012 - July 2015						Degree of non-compliance		
Date	Parameter	Units	Permitted max. daily	Reported max. daily	% Exceedance	Min	Mod	Maj
08/31/2012	Coliform, Fecal	Cnts/100rr	400	1500	275%	-	X	-
09/30/2012	Coliform, Fecal	Cnts/100rr	400	480	20%	X	-	-
01/31/2013	Coliform, Fecal	Cnts/100rr	400	450	13%	X	-	-
08/31/2012	Nitrogen Nitrite	mg/l	0.06	1.31	2083%	-	-	X
06/30/2012	TSS	lbs/day	864.7	2378	175%	-	X	-
10/31/2013	TSS	lbs/day	864.7	910.7	5%	X	-	-
10/31/2013	TSS	mg/l	60	84	40%	X	-	-
12/31/2013	TSS	lbs/day	864.7	2428.6	181%	-	X	-
12/31/2013	TSS	mg/l	60	224	273%	-	X	-

Outlet 001 DMR Exceedances - D. O. INSTANTANEOUS MIN - January 2012 - July 2015						Degree of non-compliance		
Date	Parameter	Units	Permitted max. daily	Reported max. daily	% Exceedance	Min	Mod	Maj
08/31/2012	D.O.	mg/l	6.0	5	17%	X	-	-
12/31/2012	D.O.	mg/l	6.0	5	17%	X	-	-

Outlet 001 DMR Exceedances - ANNUAL - January 2012 - July 2015						Degree of non-compliance		
Date	Parameter	Units	Permitted	Reported	% Exceedance	Min	Mod	Maj
07/31/2012	Phosphorus, Total	lbs/year	2630	2636	0.2%	X	-	-
06/30/2013	Phosphorus, Total	lbs/year	2630	3210	22%	X	-	-
06/30/2014	Phosphorus, Total	lbs/year	2630	2715	3%	X	-	-

Outlet 001 Totals						Degree of non-compliance		
						Min	Mod	Maj
						21	18	5



DIVISION OF NATURAL RESOURCES

324 4th Avenue, Room 342
South Charleston, WV 25303-1228
Telephone (304) 558-2754
Fax (304) 558-2768
TDD (304) 558-1439
TDD (800) 354-6087

Earl Ray Tomblin
Governor

Robert A. Fala
Director

May 13, 2015

RECEIVED

MAY 29 2015

**ENVIRONMENTAL
ENFORCEMENT**

Mr. Jeremy Bandy
Department of Environmental Protection
601 57th Street SE
Charleston, WV 25304

Dear Mr. Bandy:

This letter is in response to the revised Consent Order 8080 issued to the West Virginia Division on Natural Resources (WVDNR) by the West Virginia Department of Environmental Protection (WVDEP) on June 26, 2014. Consent Order 8080 was issued for violations at Reeds Creek Hatchery in Pendleton County and Edray Hatchery in Pocahontas County.

This letter describes the plan of corrective action (POCA) taken by the WVDNR to address deficiency illustrated in Consent Order 8080.

Reeds Creek Hatchery: NPDES Permit No: WV0111821

The WVDEP issued a violation of WV Legislative Rule 47CSR2 Section 3.2.b, conditions not allowable in waters of the State. The conditions not allowable were created from Outlet 001 as a result of solids deposition on the stream bottom of Reeds Creek downstream from the outlet. [(NOV) No. W11-36-049-206, (NOV) No. I13-36-001-TPD, (NOV) No. I13-36-018-TPD, (NOV) No. I14-36-006-TPD]

Corrective Actions:

The sediments exiting Outlet 001 were the result of sediment buildup in the settling pond at the Reed Creek Hatchery. Sediments from the settling pond were removed on July 12, 2014. On February 25, 2015 the WVDEP conducted a Compliance Sampling Inspection (CSI) at the Reeds Creek Hatchery and the test results of all Discharge Monitoring Report (DMR) parameters fell within acceptable permit limits. Concerns were noted that inadequate sampler operation may have caused parameter estimation error.

In addition to sediment removal from the Reeds Creek settling pond, the WVDNR has installed pond baffles to further increase retention time in the settling pond. Three 75-foot baffles were stalled in an alternating fashion to increase water residence time and promote the deposition of solids in the settling pond. Previous dye testing indicated a 12 minute retention time from the onset of a raceway cleaning

Mr. Jeremy Bandy
Page 2
May 13, 2015

event. Since the installation of the pond baffles the retention for the dye test has increased and DMR parameters are well within acceptable permit limits.

The WVDNR has purchased three sediment bags that can be attached at three different locations throughout the effluent system. These sediment bags will be utilized in emergency situations to prevent suspended solids from entering Reeds Creek if the current treatment system fails.

The settling pond will be evaluated annually for buildup of solids. The solids will be evaluated either by changes in pond depth or through the use of a "sludge judge" instrument. When solids increase to 50 percent of the total volume in the upper third of the pond as defined by the furthest upstream baffle, solid removal will be initiated.

The WVDNR has hired an engineering company specializing in fish hatchery development and rehabilitation. The company is in the process of designing both a composite water sampling device and flow measurement device that will be installed at the Reeds Creek Hatchery. Once WVDNR receives final specifications, bid documents will be submitted to the Purchasing Division within one week. The composite sampler and a flow monitoring device will comply with section A.001 of the NPDES requirements.

Sediment deposited in Reeds Creek downstream of the hatchery discharge has been evaluated. Hatchery-generated sediment in Reeds Creek is at a reduced level compared to previous conditions. The WVDNR proposed removal of sediments with the use of a pump truck followed by sanitary disposal. Consultation with the private landowner revealed an unwillingness to permit large equipment in this area. The landowner was concerned with property damage due to moist soils and potential impacts to the existing trout habitat and population.

Additional consultation between WVDNR and WVDEP determined that removal of minimal sediments remaining in Reeds Creek would cause additional environmental damage to the stream. Because sediments cannot be removed without damage to the original stream substrate and removal of the associated macroinvertebrate fauna, it was deemed an inappropriate action at this time.

The WVDNR is consulting with the landowner and has proposed to conduct habitat improvements in the stream reach downstream from the Reeds Creek Hatchery discharge. This proposed instream habitat improvement project will be a cooperative project between WVDNR, WVDEP, the West Virginia Conservation Agency (WVCA) and Trout Unlimited (TU) to enhance the ecological condition and improve instream habitat in Reeds Creek.

A stream habitat improvement project will enhance existing trout habitat in Reeds Creek and increase sediment transport by narrowing over widened stream reaches. The proposed habitat enhancement would place instream flow control structures that would concentrate flow, prevent sediment buildup, and enhance instream macroinvertebrate and fish habitat. This proposed instream habitat structures will provide ecological benefits to Reeds Creek. The new flow regime of Reeds Creek will help prevent stream sedimentation from upstream agricultural, transportation and municipal sources.

Mr. Jeremy Bandy
Page 3
May 13, 2015

Edray Hatchery: NPDES #WV0115487

The WVDEP issued a violation of WV Legislative Rule 47CSR10 Section 3.1.b, for the operation of a facility without a WV/NPDES permit. [(NOV) No. I-13-38-34-TPD]

Corrective Actions:

On September 30th, 2014 the WVDNR received WV/NPDES Permit Number WV0115487. The WVDNR has hired an engineering company specializing in fish hatchery development and rehabilitation. The company is in the process of designing both a composite water sampling device and flow measurement device that will be installed at the Edray Hatchery. Once WVDNR receives final specifications, bid documents will be submitted to the Purchasing Division within one week. The composite sampler and flow monitoring device will comply with section A.001 of the NPDES requirements.

Thank you for your consideration. Please contact me if you have any questions.

Sincerely,



Robert A. Fala
Director

RAF:jh



DIVISION OF NATURAL RESOURCES

324 4th Avenue, Room 342
South Charleston, WV 25303-1228
Telephone (304) 558-2754
Fax (304) 558-2768
TDD (304) 558-1439
TDD (800) 354-6087

Earl Ray Tomblin
Governor

Robert A. Fala
Director

September 10, 2015

Mr. Jeremy Bandy
Chief Inspector, Environmental Enforcement
Department of Environmental Protection
Mail Code 031328
601 57th Street, SE
Charleston, WV 25304

Consent Order 8080
SEP Proposal

Dear Mr. Bandy:

This is to clarify the proposed Supplemental Environmental Project (SEP) submitted to your office on December 24, 2014 to help meet the requirements of Consent Order 8080. The proposed study is intended to obtain a better understanding of blue green algae and cyanotoxins and possible connections to recurrent fish kills in the South Branch of the Potomac and Cacapon rivers. The intent of the SEP is to assist the Division of Natural Resources and the Department of Environmental Protection to explore the potential cause of these fish kills and further our collective knowledge of blue green algae. Please contact Bret Preston in our Wildlife Resources Section if you have any questions.

Sincerely,

A handwritten signature in blue ink that reads "R. A. Fala".

Robert A. Fala
Director

RAF:bp

Cyanobacteria toxin effects on fish and bioaccumulation up the food web

A Research Proposal

October 10, 2014

Submitted to

West Virginia Division of Natural Resources

By

Patricia M. Mazik

USGS, West Virginia Cooperative Fish and Wildlife Research Unit

Room 322 Percival Hall

Morgantown, WV 26506-6125

Background

Cyanobacteria (Blue-green algae) produce toxins that have been implicated in human and animal illness and death. Cyanobacteria toxins (such as microcystin, saxitoxins, and anatoxins) can be sorted according to their primary effects which include neurotoxins, hepatotoxins, cytotoxins, and irritants/gastrointestinal toxins. Cyanobacteria toxins have been shown in fish to affect the liver and decrease opercular movement. These toxins have also been found to accumulate in the intestine, blood, muscle, liver, and kidney of fish and studies have indicated that they bioaccumulate up the food chain. Microcystins are hepatotoxins that are characterized by their toxic effects on hepatic tissue originating from various cyanobacteria taxa. Microcystin (MC) is likely the most prevalent cyanotoxin in the environment comprising up to 1% dry weight of the total cyanobacteria biomass. Anatoxin-a is a potent neurotoxin known to be produced by several genera of cyanobacteria including *Anabaena*. Consequently, Anatoxin-a can contaminate lakes, rivers and reservoirs.

Cyanotoxins have been found to cause immunosuppression in fish that can have important health implications for fish populations. Cyanotoxins have also been shown to produce estrogenic compounds. These estrogenic compounds can alter normal functioning of the endocrine and reproductive systems, causing abnormalities such as intersex, where oocytes are found in the testes of male fish.

Research has documented that fish can bioaccumulate microcystin and anatoxin-a from the food web and reportable levels have been found in the muscle, intestine, liver, bile, blood, and kidney of wild fish. Reported levels were highest in carnivorous and omnivorous fish and lowest in herbivorous fish. A better understanding of how microcystin and anatoxin-a are concentrated at different trophic levels in the food web will allow us to determine how the toxins enter the fish.

The composition and concentration of chemicals may change throughout the year and seasonal changes have been documented in fish tissue. Since microcystin toxin is known to bioaccumulate in fish tissue, there may be a differential exposure based on season. The analysis of algal toxin concentrations through the year may yield valuable information as to the severity of the eutrophic conditions present within the system.

Problem

Fish kills and fish lesions in the South Branch of the Potomac and the Shenandoah Rivers are currently unknown, but may be linked to cyanotoxins produced by blue green algae. Current unpublished research (R. Braham et al. and J. Hedrick et al.) has documented cyanotoxins in the muscle, liver and intestine of fish and in crayfish, a major food source.

Research Objectives

1. Investigate potential correlations between cyanobacteria toxins in water, sediment, macroinvertebrates, periphyton, and fish in selected sites in West Virginia.

2. Investigate possible bioaccumulation of cyanobacteria toxins in the food web
3. Evaluate data temporally to determine if correlations exist between cyanobacteria toxin levels, season, water temperature, and sampling locations

Approach/Methods

Water and periphyton samples will be collected from 5 sites and 1 reference site (to be determined) once a month October – February and twice a month from March – September over a 19 month period (for example, begin March 2015 and end September 2016). At each sample time, 2 water and 1 periphyton sample will be collected and analyzed for microcystin. Two water and two sediment samples will also be collected at each at the above sample times and analyzed for total and dissolved nitrogen and phosphorus.

Fish will be collected 4 times per year for two years from the 5 sample sites and 1 reference site. Twenty samples of two species (one herbivore and one carnivore) will be collected for a total of 40 samples. Fish liver and intestine will be analyzed for microcystin.

Macroinvertebrate samples will be collected by kick samples 4 times per year (by season) for two years from the 5 sample sites and 1 reference site. Samples will be sorted to the functional feeding level (shredders, predators, etc) and analyzed for microcystin.

Microcystin analysis will be done at the USGS Leetown Science Center (mDL 0.078 ng/mL or ppb). Nitrogen and phosphorus analysis will be done by REIC laboratories, Beckley, WV. The mDL for nitrogen and phosphorus analyzed at REIC are:

- REIC Total P in water - 0.05 mg/L
- REIC Total Dissolved P (in water) - 0.05 mg/L
- REIC Total N in water - 0.5 mg/L
- REIC Total P in sediment - 12.5 mg/Kg
- REIC Total N in sediment - 1.0 mg/Kg

Products

Interim reports will be submitted and presented to the DNR on a yearly basis. Peer-reviewed publications and a MS thesis will also be an outcome.

Budget for 6 sites

	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Total</u>
MS Stipend	18,540	18,540	18,540	55,620
Fringe (9.2%)	1,706	1,706	1,706	5,118
Analysis (microcystin)	27,540	27,540	27,540	82,620

Nitrogen/Phosphorus analysis	9,000	9,000	9,000	27,000
Supplies/equipment	3,214	3,214	3,214	9,642
Totals	60,000	60,000	60,000	180,000

WVU Contributions

Overhead cost (26%)	15,600	15,600	15,600	46,800
Graduate Student Tuition (in state)	11,691	11,691	11,691	35,073
Cost savings using in-House microcystin analysis	87,210	87,210	87,210	261,630
Vehicle use	4,000	4,000	4,000	12,000
Mazik (PI salary) (2 month)	8,668	8,668	8,668	26,004
Technician (3 month) (help with sampling)	4,000	4,000	4,000	12,000
Totals	131,169	131,169	131,189	393,507

USGS Leetown Science Center

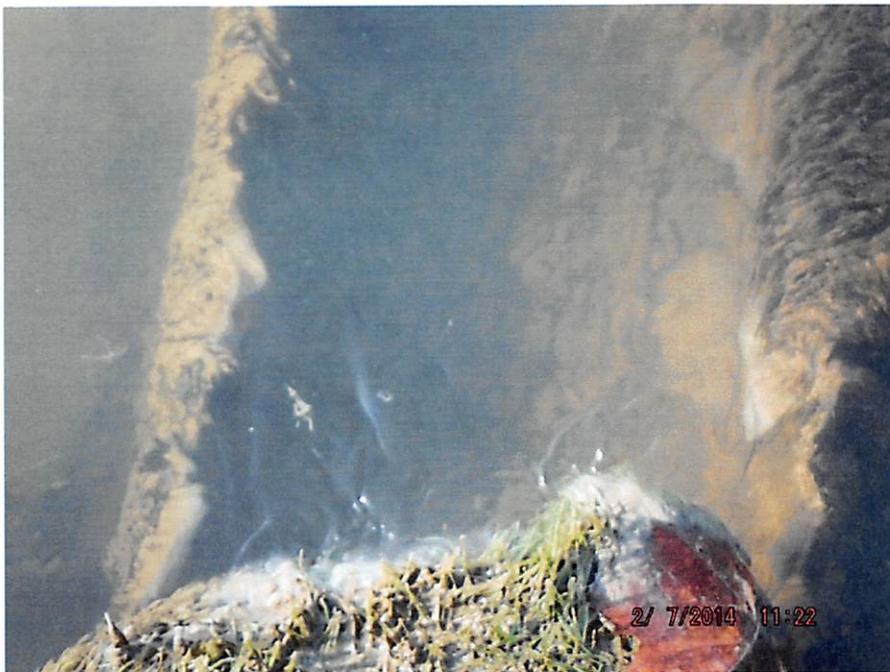
USGS will analyze water and sediment samples taken at all sampling sites for contaminants. This data will be used in this proposal.

Analysis of water and sediment samples	\$20,000	\$20,000	\$20,000	\$80,000
--	----------	----------	----------	----------

Reed's Creek Hatchery Photos
February 7, 2014



Solids in pond at point where they enter outlet pipe.



Floating solids entering outlet pipe.

Reed's Creek Hatchery Photos
February 7, 2014



Solids on rocks as they exit outlet pipe and leave Reed's Creek Hatchery property.



Solids buildup on rocks near stream.

Reed's Creek Hatchery Photos
February 7, 2014



Solids where outlets 001 & 002 meet stream.



Solids buildup at stream.

Base Penalty Calculation

(pursuant to 47CSR1-6.1)

Responsible Party: WV Division of Natural Resources **Receiving Stream:** Reeds Creek/Edray-Unnamed Tributary of Greenbrier River

Treatment System Design Maximum Flow: N/A MGD

Treatment System Actual Average Flow: MGD (if known)

Enter FOF# and rate each finding as to Potential and Extent.

1)	Potential for Harm Factor	Factor Range	FOF#												
			3a	4a	5a	7ai	7aii	7aiii	11						
a)	Amount of Pollutant Released	1 to 3	3	3	3	1	1	1	1						
b)	Toxicity of Pollutant	0 to 3	1	1	1	1	1	1	1						
c)	Sensitivity of the Environment	0 to 3	2	2	2	1	1	1	1						
d)	Length of Time	1 to 3	1	1	1	1	1	1	3						
e)	Actual Exposure and Effects thereon	0 to 3	2	2	2	1	1	1	1						
Average Potential for Harm Factor			1.8	1.8	1.8	1	1	1	1.4	No	No	No	No	No	No
2)	Extent of Deviation Factor	Factor Range													
	Degree of Non-Compliance	1 to 3	3	3	3	1	2	3	3						

Potential for Harm Factors:

- 1)c - Sensitivity of the Environment Potentially Affected (0 for "dead" stream)
- 1)d - Length of Time of Violation
- 1)e - Actual Human/Environmental Exposure and Resulting Effects thereon

Examples/Guidance:

Note: Rate as 1 for Minor, 2 for Moderate and 3 for Major. Rate as 0 if it does not apply.

Minor = exceedance of permit limit by <=40% for Avg. Monthly or <=100% for Daily Max., exceed numeric WQ standard by <= 100%, or report doesn't contain some minor information.

Moderate = exceedance of permit limit by >= 41% and <= 300% for Avg. Monthly , >= 101% and <= 600% for Daily Max., exceed numeric WQ standard by >= 101% and <= of 600% or report doesn't fully address intended subject matter.

Major = exceedance of permit limit by >= 301% for Avg. Monthly, >= 601% for Daily Max., exceed numeric WQ standard by >= 601%, failure to submit a report, failure to obtain a permit, failure to report a spill, etc. Note that a facility in SNC should be rated as major for length of time and degree of non-compliance.

Narrative WQ standard violations - case-by-case.

Penalty Adjustment Factors

(pursuant to 47CSR1-6.2)

Penalty Adjustment Factor

6.2.b.1 - Degree of or absence of willfulness and/or negligence - 0% to 30% increase
 6.2.b.4 - Previous compliance/noncompliance history - 0% to 100% increase - based upon review of last three (3) years - Warning = maximum of 5% each, N.O.V. = maximum of 10% each, previous Order = maximum of 25% each - Consistent DMR violations for <1 year = 10% maximum, for >1 year but <2 years = 20% maximum, for >2 years but <3 years = 30% maximum, for >3 years = 40 % maximum

6.2.b.6 - Economic benefits derived by the responsible party (increase to be determined)

6.2.b.7 - Public Interest (increase to be determined)

6.2.b.8 - Loss of enjoyment of the environment (increase to be determined)

6.2.b.9 - Staff investigative costs (increase to be determined)

6.2.b.10 - Other factors

Size of Violator: 0 - 50% decrease

NOTE: This factor is not available to discharges that are causing a water quality violation. This factor does not apply to a commercial or industrial facility that employees or is part of a corporation that employees more than 100 individuals.

Avg. Daily WW Discharge Flow (gpd)	% Reduction Factor
< 5,000	50
5,000 to 9,999	40
10,000 to 19,999	30
20,000 to 29,999	20
30,000 to 39,999	10
40,000 to 99,999	5
> 100,000	0

Additional Other factors to be determined for increases or decreases on a case-by-case basis.

Public Notice Costs (cost for newspaper advertisement)

6.2.b.2 - Good Faith - 10% decrease to 10% increase

6.2.b.3 - Cooperation with the Secretary - 0% to 10% decrease

6.2.b.5 - Ability to pay a civil penalty - 0% to 100% decrease

Base Penalty Adjustments

(pursuant to 47CSR1-6.2)

Penalty Adjustment Factor	% Increase	% Decrease	Base Penalty Adjustments
6.2.b.1 - Willfulness and/or negligence -	30		\$21,090
6.2.b.4 - Compliance/noncompliance history			\$0
6.2.b.6 - Economic benefits - (flat monetary increase)	\$7,880		\$7,880
6.2.b.7 - Public Interest - (flat monetary increase)			\$0
6.2.b.8 - Loss of enjoyment - (flat monetary increase)			\$0
6.2.b.9 - Investigative costs - (flat monetary increase)			\$0
6.2.b.10 - Other factors (size of violator)			\$0
6.2.b.10 - Additional Other Factors - Increase (flat monetary increase)			\$0
6.2.b.10 - Additional Other Factors - Decrease (flat monetary decrease)			\$0
Public Notice Costs (flat monetary increase)	\$30		\$30
6.2.b.2 - Good Faith - Increase			\$0
6.2.b.2 - Good Faith - Decrease			\$0
6.2.b.3 - Cooperation with the Secretary		10	(\$7,030)
6.2.b.5 - Ability to Pay			\$0
Penalty Adjustments			\$21,970
Penalty =			\$92,270

Estimated Economic Benefit Item	Estimated Benefit (\$)
Monitoring & Reporting	\$5,780
Installation & Maintenance of Pollution Control Equipment	
O&M expenses and cost of equipment/materials needed for compliance	
Permit Application or Modification	\$2,100
Competitive Advantage	
Estimated Economic Benefit	\$7,880
Comments:	Avoided WV/NPDES Permit Fee = \$1,050 x2 years. Avoided DMR analysis and reporting costs = \$2,890 x2 years.