

# West Virginia Department of Environmental Protection Office of Special Reclamation

## The Evolution



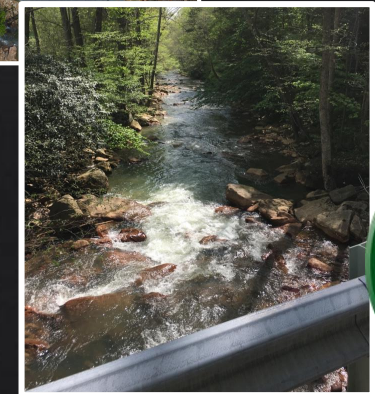
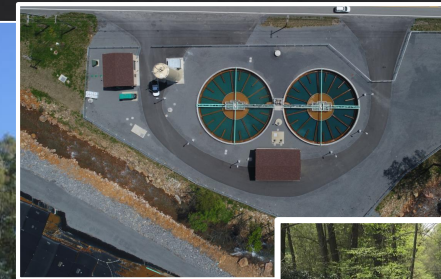
90's Early 2000



2000's Early 2010's



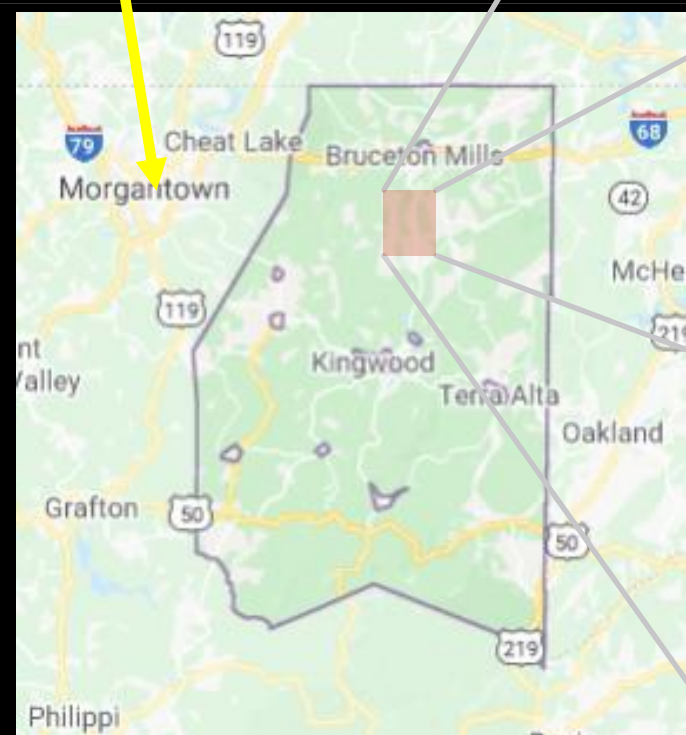
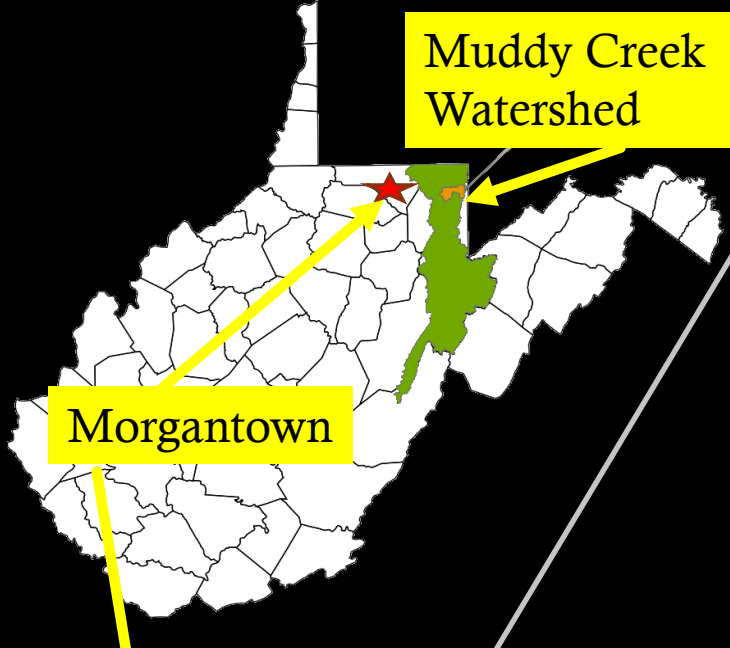
2010 to 2015



2015 to Present




# The Location



Muddy Creek  
Impaired 

Trout Stream  

Fickey Run  
*Impaired* 

Glade Run  
*Impaired* 

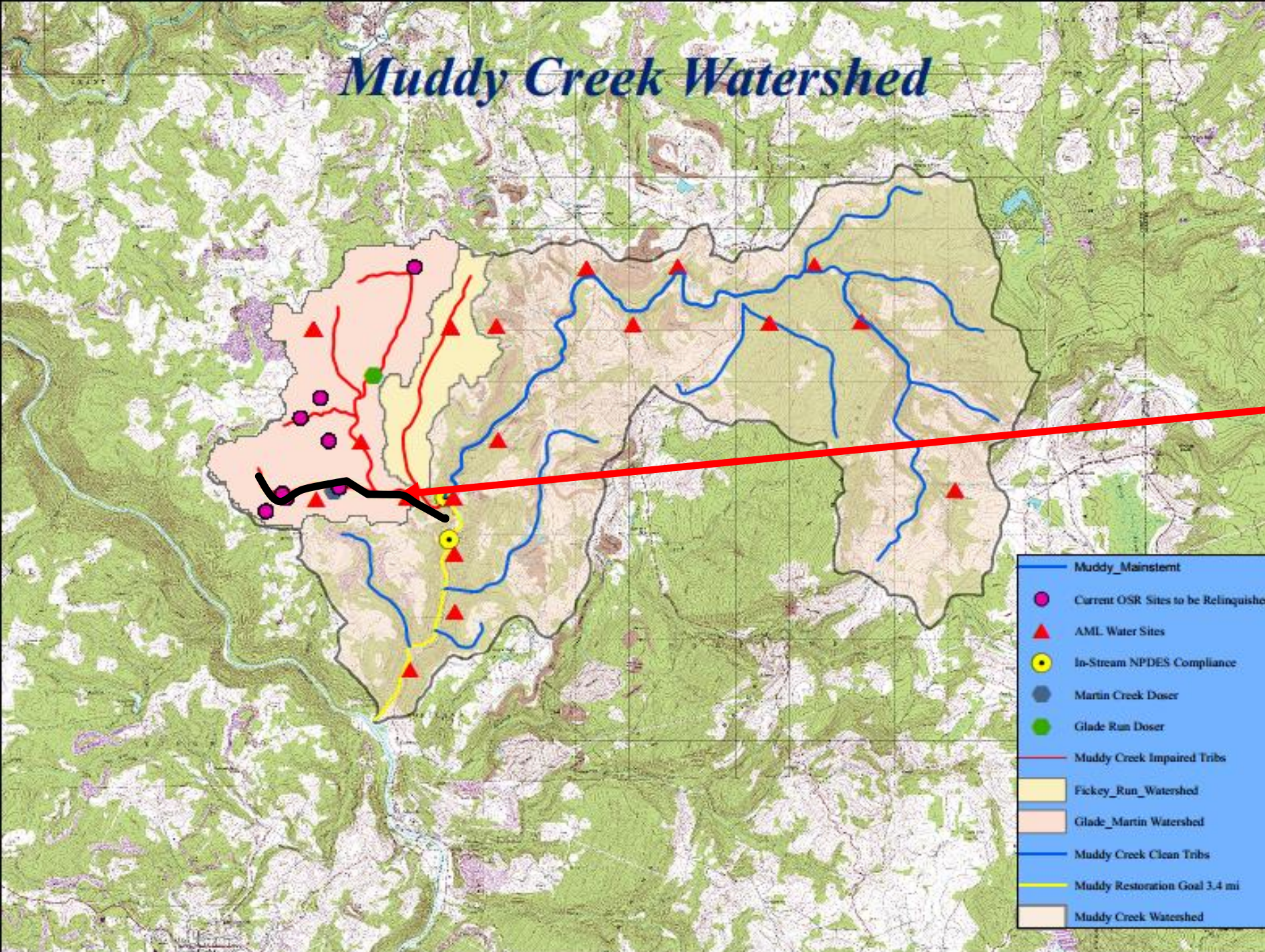
Martin Creek  
*Impaired* 

T & T Mine Portals 



# The Challenge

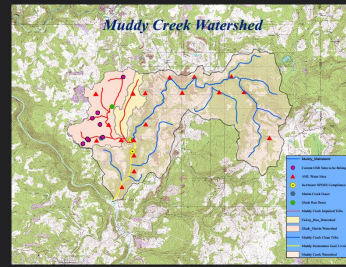
## *Muddy Creek Watershed*



Bond forfeitures are only ~16% of the acid loads of Martin Creek



# The Plan



Install in stream dosing units at Glade Run and Maple Run.

Lift station capable of pumping 1,200 gpm

Engineer, design and construct a plant capable of treating 4,200 gpm.

**68% of the load reductions would come from pre-law mine discharges that would otherwise go untreated according to current, at-source, treatment methods carried out by OSR to date.**



# The Components

This approach will remove approximately 86% of the acid and metal loads from Fickey Run.

68% of the load reductions would come from pre-law mine discharges



Listen AML  
Deep Mine  
Wet Seal



Glade Run In Stream  
Dosing Unit



AMD AML  
Lagoon Drop  
Inlet



Preston OSR  
Energy Seep  
Collector



1200 GPM Lift  
Station to Plant



Viking OSR  
Deep Mine  
Wet Seal



2.5 Miles of  
Pipeline



4,200 GPM AMD Treatment Plant



# Muddy Creek Restoration

## In-Stream Dosing and the Martin Creek Variance

- In order for OSR to implement a watershed-wide treatment approach (with in-stream dosers) that would address pre and post-law AMD the DEP had to apply for a VARIANCE to water quality standards.
- Variance Approved by EPA June 2017



# Legal Stuff

## Based 40 CFR 125.3(f) EPA Reviewed and Approved WV's Variance

- Participated in the development of the permit
- Approved WV's in-stream permit

## 40 CFR 125.3(f)

Identified language within the CWA that set the framework for the in-stream permit where as:

**(f)** Technology-based treatment requirements cannot be satisfied through the use of “non-treatment” techniques such as flow augmentation and in-stream mechanical aerators. **However, these techniques may be considered as a method of achieving water quality standards on a case-by-case basis when**

**(1)** The technology-based treatment requirements applicable to the discharge are not sufficient to achieve the standards;

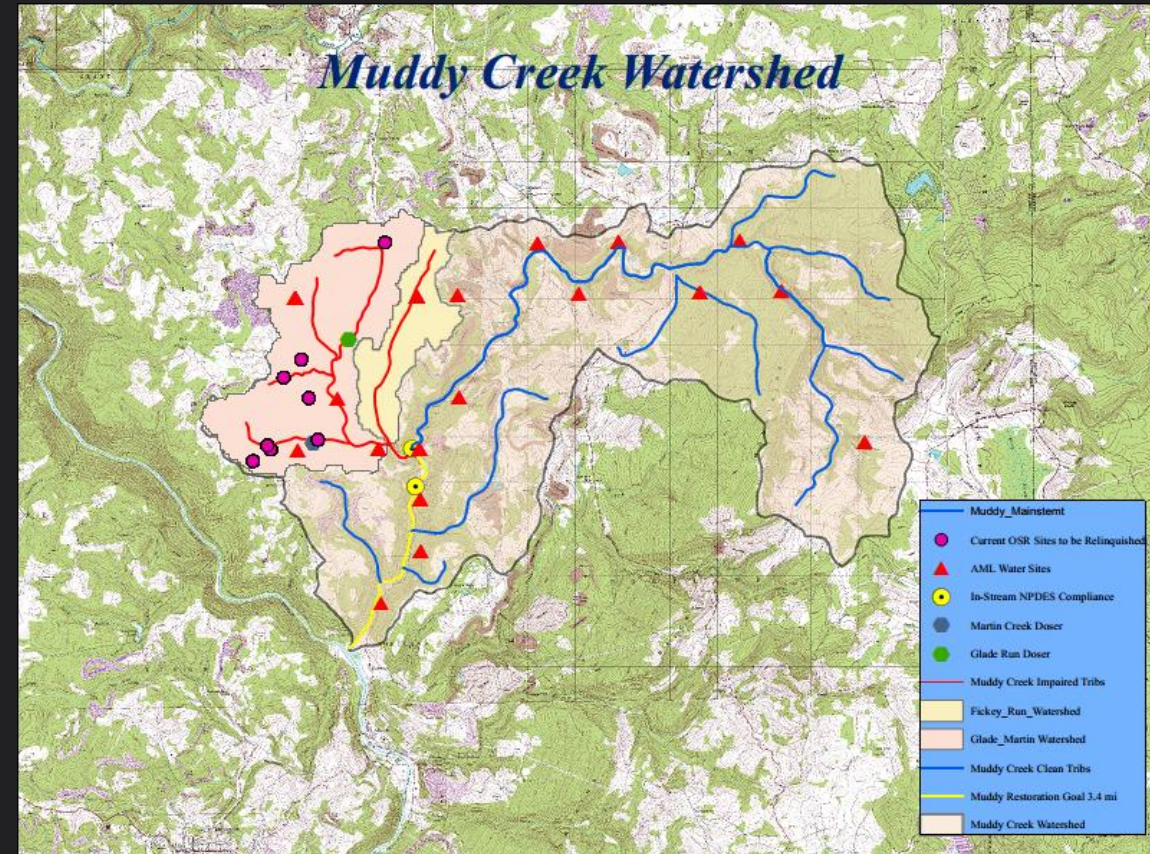
**(2)** The discharger agrees to waive any opportunity to request a variance under section 301 (c), (g) or (h) of the Act; and

**(3)** **The discharge demonstrates that such a technique is the preferred environmental and economic method to achieve the standards after consideration of alternatives such as advanced waste treatment, recycle and reuse, land disposal, changes in operating methods, and other available methods.**

# The Variance



# The Alternative



Point source approach OSR would spend \$1.6 million to enhance 7 existing sites and construct 2 others. Plus operations and maintenance costs ~\$40,000+/year/site.

Despite these efforts and expenses.

**MUDDY CREEK WOULD REMAIN LIFELESS!**





# The Public/Private Partnership



\$8.5 Million

Muddy Creek Restoration



Southwestern Energy Commitment to  
“Freshwater Natural” approach.

\$2.5 mil Initial Capital Contribution

\$350K Annual O&M for 5 years



# The Plant



(2) Polymer Injection  
*Aid Flocculation*



(3) Mix tank  
*pH monitoring and polymer injection*



(4) Two 80' Diameter Clarifiers



(5) Sludge Pumps  
*to Mine or Geotubes*



(1) Lime Slurry  
Injection  
*for pH Adjustment*



(6) Geotube Deep Mine  
Sludge Storage



(7) Discharge



# (1) Confluence of Martin and Muddy Creek

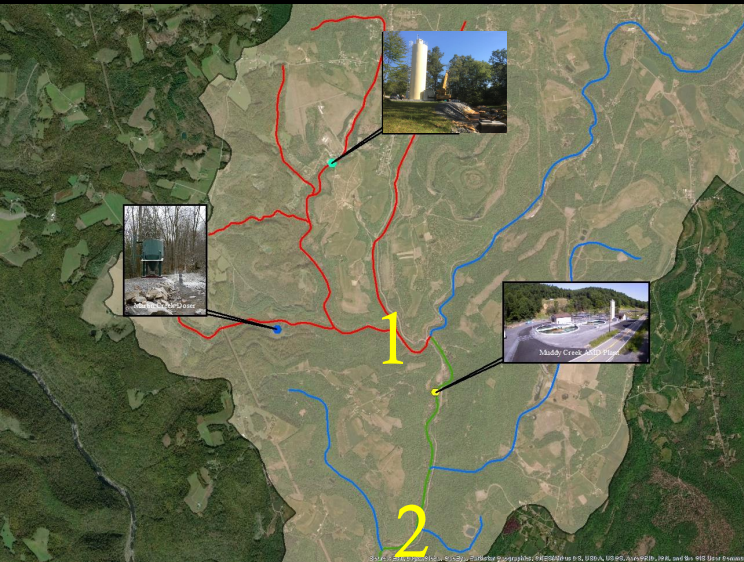
Glade Run Doser Influence



2015



2019



# The Difference



2019



2015

# (2) Downstream From Muddy Creek Plant



# Water Data

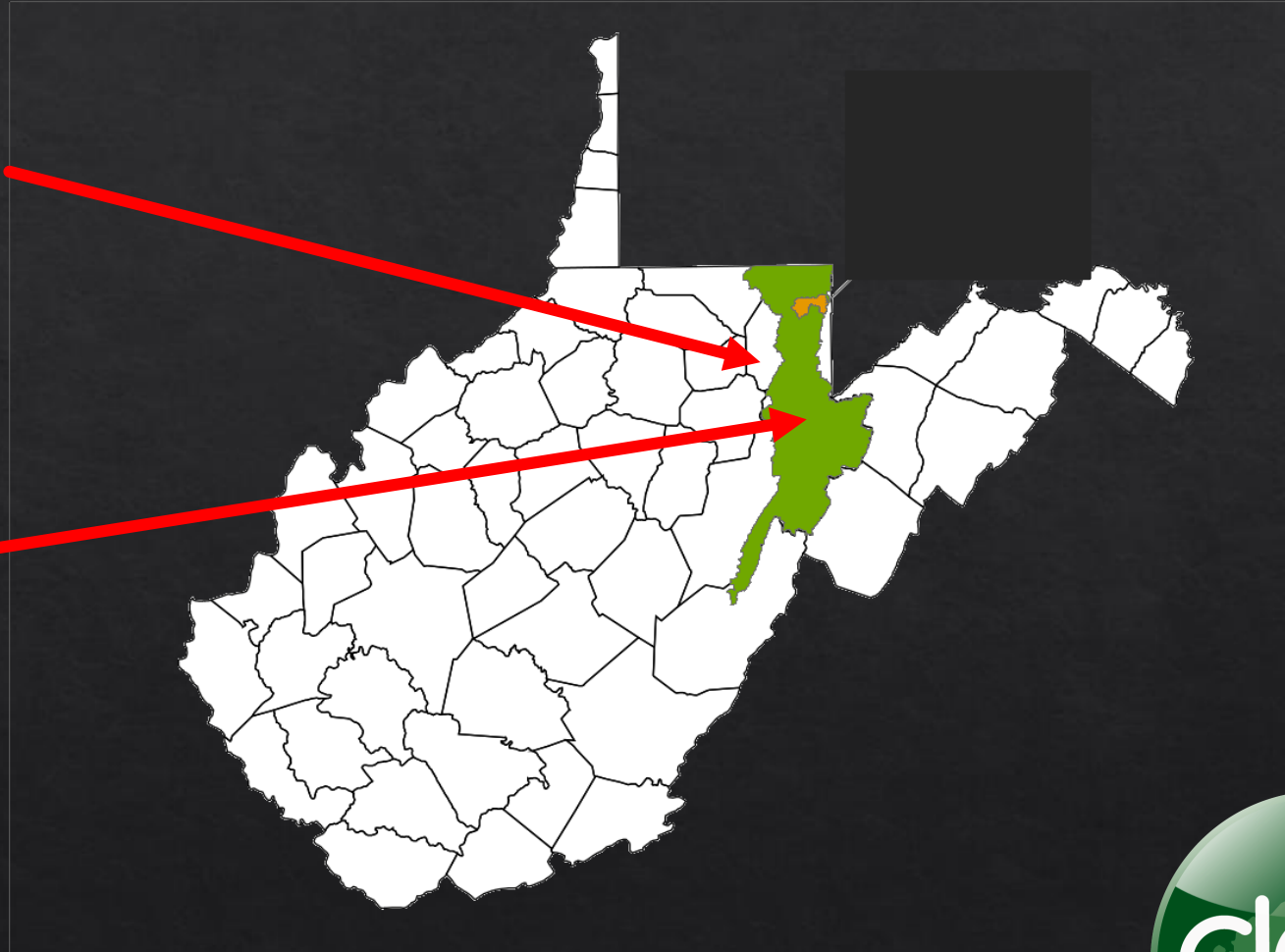
SITE_DESC	SAMPLE_DATE	GPM	FPH	AL	T_FE
Raw Water- Muddy Creek at Mouth (Teter Bridge)	9/7/18 12:30 PM	8211.84	7.38	1.27	0.76
Raw Water - Muddy Creek Below Martin Mouth	8/15/18 9:30 AM	15218.56	6.74	1.58	0.34
Raw Water- Muddy Creek at Mouth (Teter Bridge)	8/15/18 8:30 AM	17924.48	7.67	1.36	0.84
<b>T &amp; T Plant "Turned On" January 2, 2018</b>					
Raw Water- Muddy Creek at Mouth (Teter Bridge)	9/30/15 12:30 PM	13219.14	4.94	6.94	20
Raw Water- Muddy Creek at Mouth (Teter Bridge)	5/12/15 12:00 AM	19781.31	4.61	5.31	5.95



Sandy Creek Watershed Restoration  
Tygart River Watershed.  
Restoration of 14 miles of Sandy Creek



Partnership with WVU  
Rare Earth Extraction Facility  
Buffalo Coal Forfeitures  
Grant County WV



# The Credits

## **Information** (Whom I stole slides from)

Mike Sheehan - Associate Director DLM (RET)

Ladd Williams - Environmental Resource Analysts

## **Engineering** (All engineering done “in house”)

Dave McCoy - Chief Engineer

Larry Riggleman - Regional Engineer

Mark Dickey - Environmental Resource Analyst

Chester Wright - Environmental Resource Analyst

## **Day to Day Operations**

Devin Smith - Environmental Resource Specialist II

Rick Blaney - Environmental Resource Specialist II

Scott McElwayne - Environmental Resource Supervisor

Ben Fancher – Environmental Resource Supervisor

## **Office Administration**

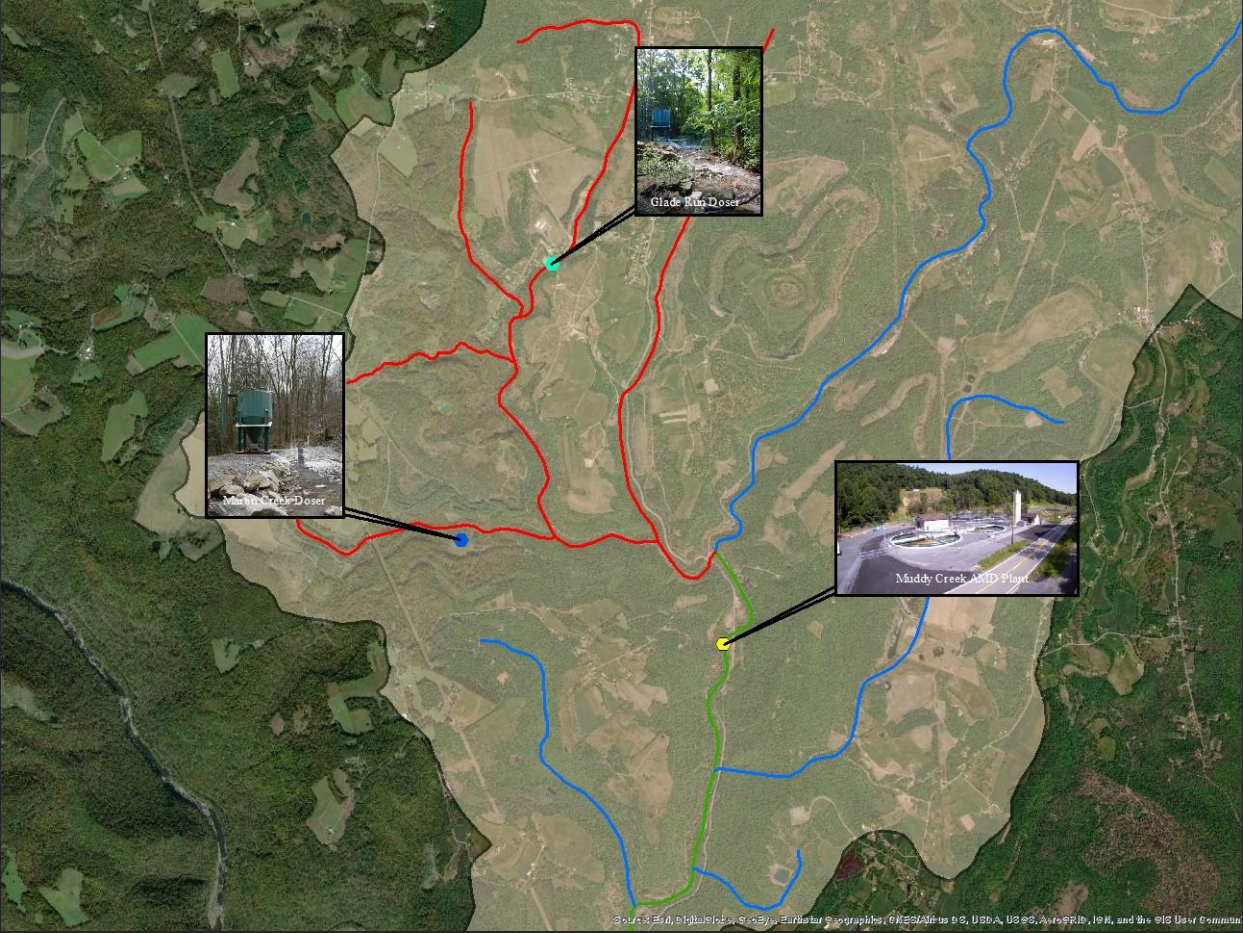
Carla Poling – Administrative Service (RET)

Brittany Spencer – Office Administrator II

Dianna Wright – Secretary I (RET)

# Questions?





## Fickey Mouth Before

SITE_DESC	DATE	Comments	GPM	FPH	ACIDITY	T_FE	T_AL
FICKEY RUN @ MOUTH	29-May-18	Viking/Fickey Pipeline Off	1427.328	2.98	302	41.2	18.80
FICKEY RUN @ MOUTH	7-Jun-18	Viking/Fickey Pipeline On	461.84	3.19	124	4.22	12.90
FICKEY RUN @ MOUTH	3-Jul-18	Viking/Fickey Pipeline On	699.727	3.82	62.5	2.3	5.35
FICKEY RUN @ MOUTH	20-Jul-18	Viking/Fickey Pipeline On	175.04	2.9	179	3.1	13.80
FICKEY RUN @ MOUTH	15-Aug-18	Viking/Fickey Pipeline On	210.05	3.43	116	2.04	10.80
FICKEY RUN @ MOUTH	7-Sep-18	Viking/Fickey Pipeline On	136.44	3.26	177	2.08	8.00

## T & T Average Raw Water

GPM  
1200-1800

FPH  
2.9

Total FE  
106 mg/L

Total AL  
67 mg/L

## Muddy Creek After

SITE_DESC	DATE	Comments	GPM	FPH	ACID mg/L	ALKALINITY	T_FE mg/L	T_AL mg/L
Muddy Creek	8-Jun-18	Muddy Mouth	14943.00	7.17	-6.26	16.6	1.12	2.3
Muddy Creek	29-Jun-18	Muddy Mouth	26381.81	7.49	-7.61	21.9	0.824	0.101
Muddy Creek	24-Jul-18	Muddy Mouth	6198.00	7.23	-2.25	12.1	1.43	2.8
Muddy Creek	15-Aug-18	Muddy Mouth	17957.00	7.67	0	24.4	0.84	1.36
Muddy Creek	16-Aug-18	Muddy Mouth	11163.00	6.33	-8.22	21.6	0.68	1.23
Muddy Creek	21-Aug-18	Muddy Mouth	22101.00	7.09	-7.16	20.2	0.652	1.05
Muddy Creek	7-Sep-18	Muddy Mouth	8227.07	7.38	0	20.9	0.76	1.27





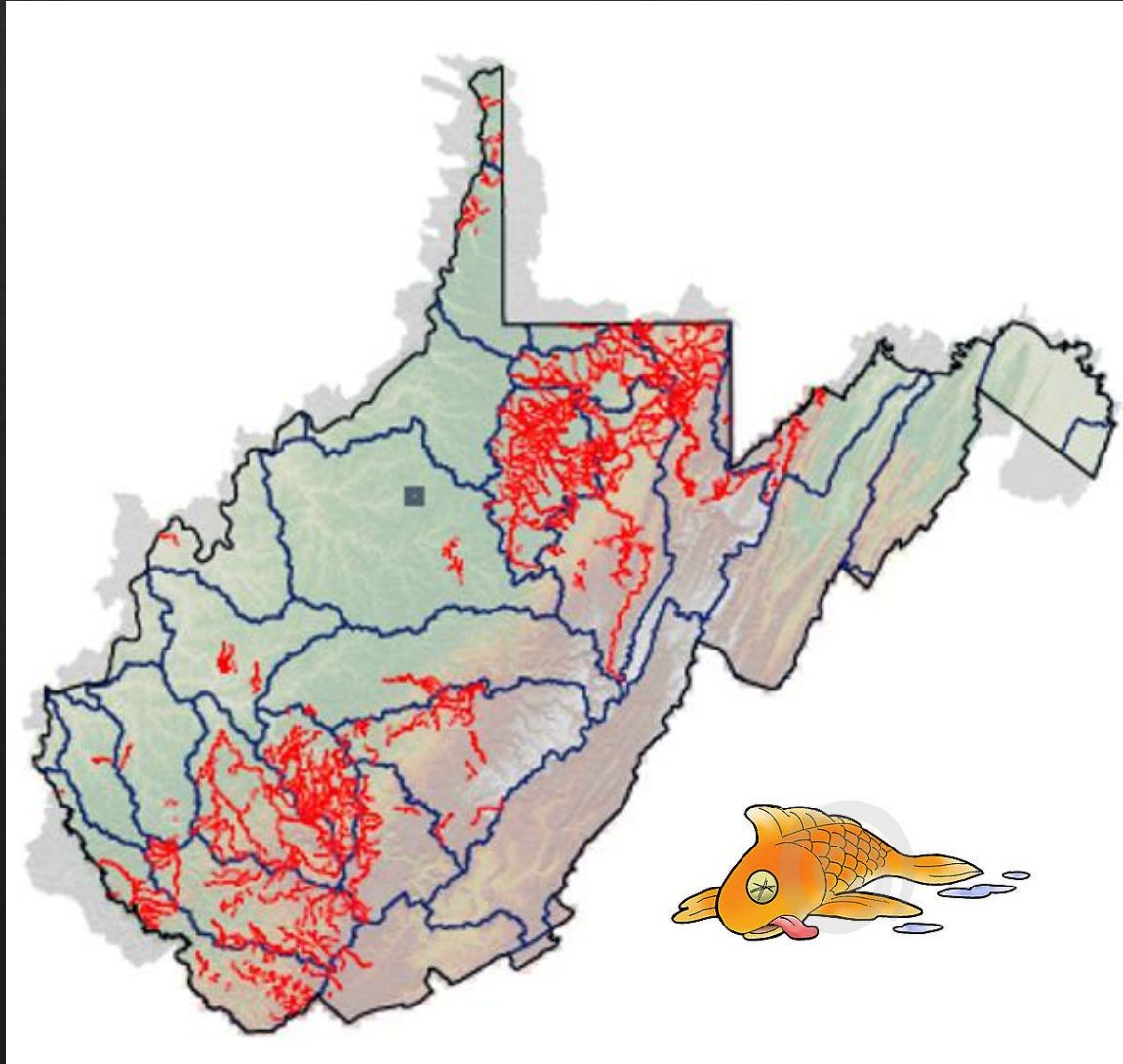
SITE_DESC	DATE	Comments	GPM	FPH	ACID mg/L	ALKALINITY	T_FE mg/L	T_AL mg/L
Muddy Creek	8-Jun-18	Muddy Mouth	14943.00	7.17	-6.26	16.6	1.12	2.3
Muddy Creek	29-Jun-18	Muddy Mouth	26381.81	7.49	-7.61	21.9	0.824	0.101
Muddy Creek	24-Jul-18	Muddy Mouth	6198.00	7.23	-2.25	12.1	1.43	2.8
Muddy Creek	15-Aug-18	Muddy Mouth	17957.00	7.67	0	24.4	0.84	1.36
Muddy Creek	16-Aug-18	Muddy Mouth	11163.00	6.33	-8.22	21.6	0.68	1.23
Muddy Creek	21-Aug-18	Muddy Mouth	22101.00	7.09	-7.16	20.2	0.652	1.05
Muddy Creek	7-Sep-18	Muddy Mouth	8227.07	7.38	0	20.9	0.76	1.27



# Larger Contributors of AMD

T&T EM-113										
			ACIDIT							Al_LD
Sample 3	GPM	PH	Y	Acidity_LD lbs/day	T_FE	Fe_LD lbs/day	MN	Mn_LD lbs/day	AL	lbs/day
Min:	98.56	2.58	286.00	497.57	34.13	52.33	0.95	2.05	1.59	11.39
Max:	851.20	3.02	800.00	5672.62	106.00	1033.16	26.83	192.16	65.90	637.44
Average:	425.02	2.80	397.23	2064.87	53.56	298.63	2.28	13.05	27.68	154.46
T&T EM-113										
			ACIDIT							Al_LD
Sample 1	GPM	PH	Y	Acidity_LD lbs/day	T_FE	Fe_LD lbs/day	MN	Mn_LD lbs/day	AL	lbs/day
Min:	0.00	2.40	5.00	0.00	53.91	0.00	0.67	0.00	21.88	0.00
Max:	551.04	2.87	1000.00	3616.43	133.77	614.66	2.00	0.06	73.64	13.70
Average:	95.09	2.63	567.13	567.34	84.40	95.47	1.29	0.02	42.80	3.74
Viking UO-519										
			ACIDIT							Al_LD
Sample 1	GPM	PH	Y	Acidity_LD lbs/day	T_FE	Fe_LD lbs/day	MN	Mn_LD lbs/day	AL	lbs/day
Min:	0.00	2.75	0.00	0.00	0.48	0.00	0.08	0.00	0.00	0.00
Max:	197.12	6.90	360.00	824.55	23.60	55.92	4.72	11.18	46.00	108.99
Average:	66.20	4.55	169.38	240.25	11.21	16.31	2.26	3.26	21.42	31.19
Preston Energy UO-235										
			ACIDIT							Al_LD
Sample 16	GPM	PH	Y	Acidity_LD lbs/day	T_FE	Fe_LD lbs/day	MN	Mn_LD lbs/day	AL	lbs/day
Min:	119.48	2.77	3.00	12.74	39.60	63.91	1.05	1.58	18.40	29.15
Max:	1102.08	3.08	622.00	8239.63	119.00	1576.39	2.41	31.93	53.00	702.09
Average:	513.88	2.93	314.72	2039.27	61.44	393.69	1.34	8.66	26.28	174.35

# WATERSHED APPROACH



Hundreds of miles of WV streams and rivers are polluted by mine drainage.

The primary sources of polluted mine drainage are the numerous abandoned mine lands throughout the state.

Looking for more effective means of treating AMD and achieving an established goal of full stream restoration to a fishery quality, the WV AML program elected to move in a new direction and utilize in-stream active treatment. Instead of treating one source with passive treatment, WV AML would treat an entire watershed using in-stream dosers placed on tributaries impacted by AMD.

- EPA
  - Reviewed and approved WV's variance
  - Identified language within the CWA that set the framework for the in-stream permit (40 CFR 125.3(f))
  - Participated in the development of the permit
  - Approved WV's in-stream permit

Identified language within the CWA that set the framework for the in-stream permit

(40 CFR 125.3(f))

**(f)** Technology-based treatment requirements cannot be satisfied through the use of “non-treatment” techniques such as flow augmentation and in-stream mechanical aerators. However, these techniques may be considered as a method of achieving water quality standards on a case-by-case basis when:

- (1)** The technology-based treatment requirements applicable to the discharge are not sufficient to achieve the standards;
- (2)** The discharger agrees to waive any opportunity to request a variance under section 301 (c), (g) or (h) of the Act; and
- (3)** The discharger demonstrates that such a technique is the preferred environmental and economic method to achieve the standards after consideration of alternatives such as advanced waste treatment, recycle and reuse, land disposal, changes in operating methods, and other available methods.