



**West Virginia
Mine Drainage
Task Force**



Civil & Environmental Consultants, Inc.

"A 30,000 Foot-High View of 30 Years of AMD Watershed Improvement in Several Appalachian States"

Presented at the

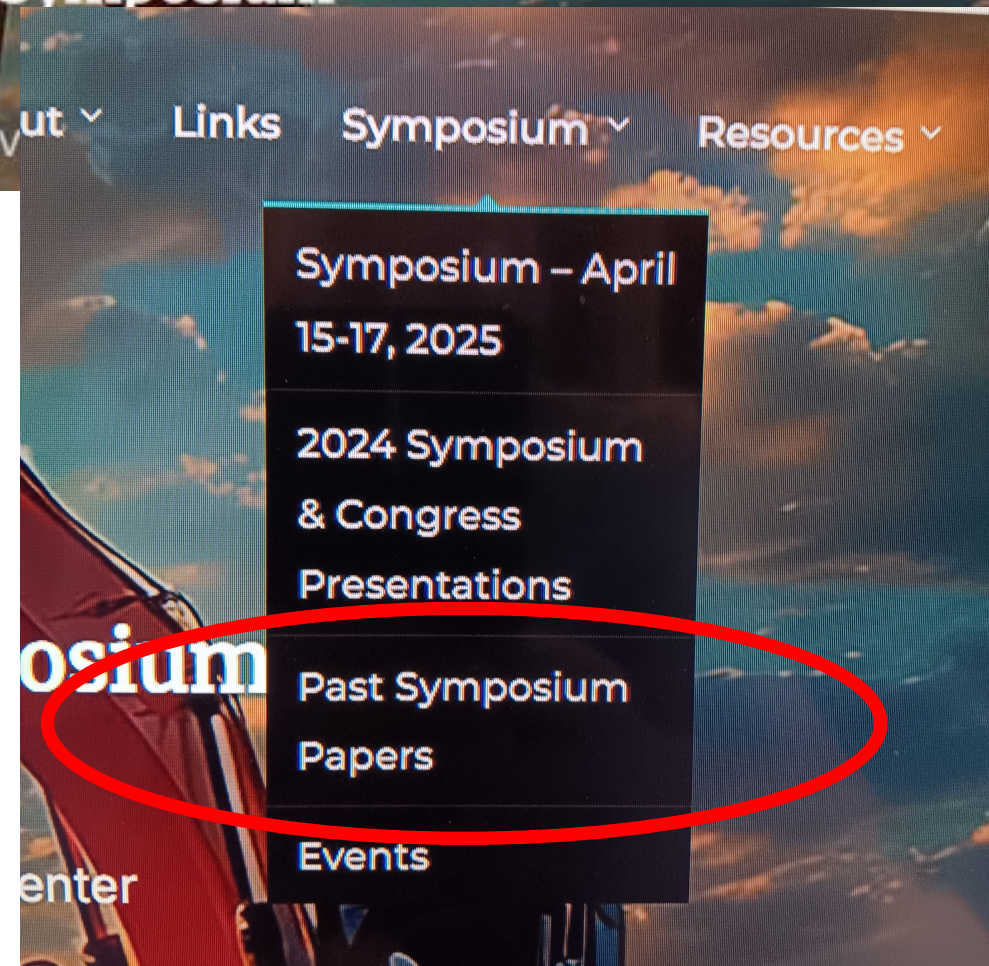
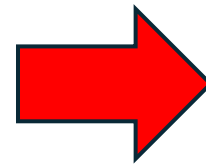
43rd Annual WV Mine Drainage Task Force Symposium

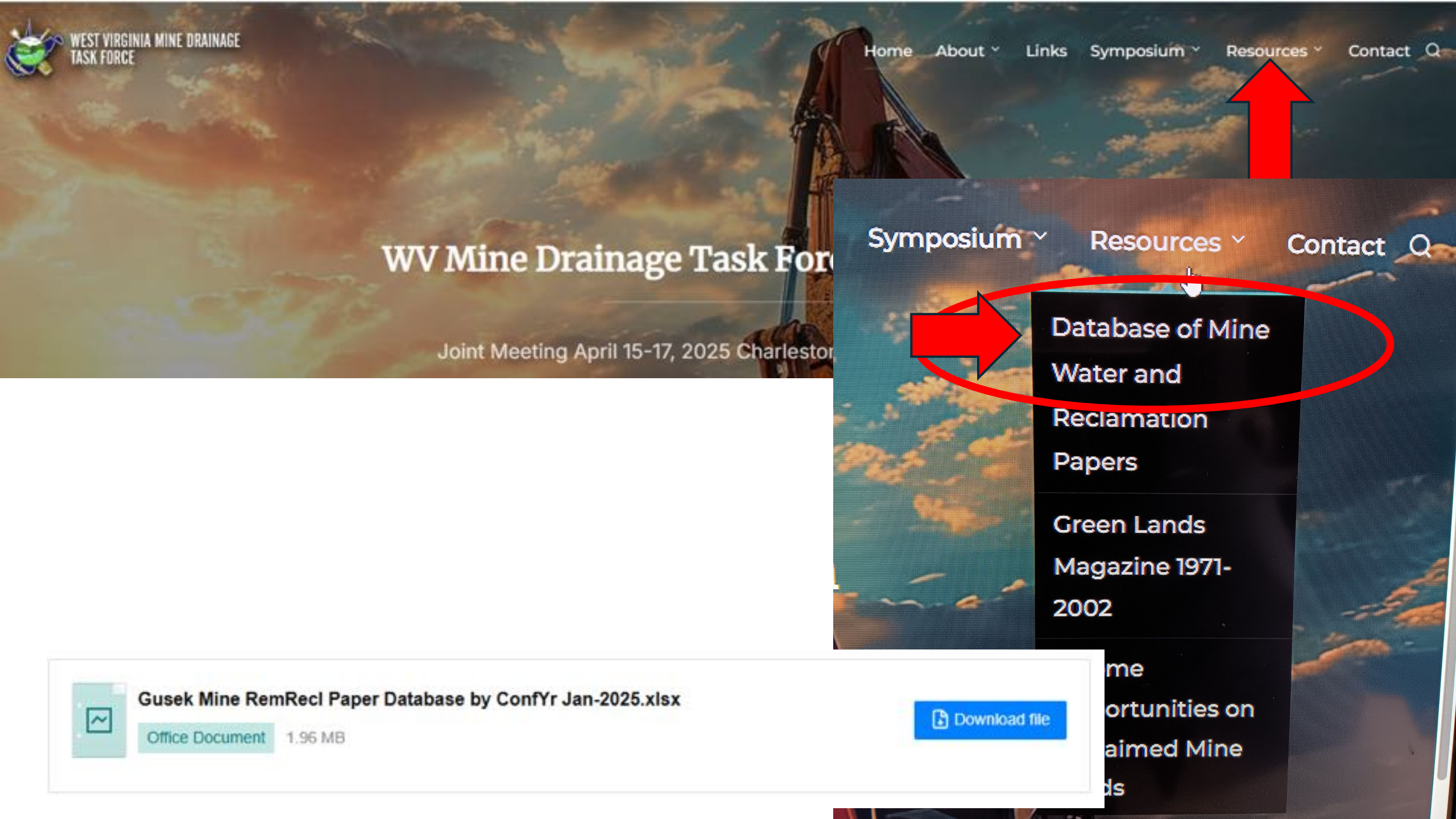
Charleston, WV Coliseum & Convention Center April 16-17, 2025

Ben B. Faulkner, Senior Consultant, WVMDTF Chairman



The Task Force wishes to document the improvement of Appalachian AMD-Influenced Streams in the last 30 years





WV Mine Drainage Task Force

Joint Meeting April 15-17, 2025 Charleston

Database of Mine
Water and
Reclamation
Papers

Green Lands
Magazine 1971-
2002

me
ortunities on
aimed Mine
ds



Gusek Mine RemRecl Paper Database by ConfYr Jan-2025.xlsx

Office Document 1.96 MB

[Download file](#)

In EXCEL, use Control F to search for “long-term” of “dosing”

87593 2024

Item #	Year	Form/Media	Conf.	Authors	Title (no guarantees that links	ISSN	AAAI Paper
7575	2024	Website download	Tailings & Mine Waste 2024	Juan Carlos Ayer-Zamudio, Akher Hossain and Tony Freeman	Tailings Characterization for Flow Li Evaluation at a Large Tailings Storage Advanced Laboratories Testing		
7576	2024	Website download	Tailings & Mine Waste 2024	John Thuybaert, Joe Piccolo-Laurance, Joseph Quinn and Romain Grand	Improving Tailings Deposition: A D Survey Validation Framework for En Management		
7577	2024	Website download	Tailings & Mine Waste 2024	Virginie Queiroz Rezende Pinto, Daniel Bernardes Raposo, Milena Fernandes Xavier Matos, Elias Silva de Sousa and Alexandre Cristiano Correa dos Santos	Risk Management for Access to Dam Level Control: Control Levels (CMS) Plan		
7578	2024	Website download	Tailings & Mine Waste 2024	Camilla Rodriguez, Marc Lambert and Ben Witten	Passive Seismic and Interferometry Techniques in Dam Decharacterization Monitoring	2345	Monitor & Risk Mgr
7579	2024	Website download	Tailings & Mine Waste 2024	Leonardo Prober Simoes, Bráulio Rodriguez, Sean Allen, Jake Lloyd, Vitor Almeida, Jhonimar Santos and Denis Rafael Valentin	New Wireless Technology for Tailings Monitoring	2357	Monitor & Risk Mgr
7580	2024	Website download	Tailings & Mine Waste 2024	Anjan Kundu	UPLOAD - ANALYSE - ACT: Artificial Intelligence-assisted Faster, Seamless, and Almost Real-time Tailings Dam Construction Quality Assurance is Knocking at our Doorstep	2367	Monitor & Risk Mgr
7581	2024	Website download	Tailings & Mine Waste 2024	Wing-Keat (Wayne) Wong, Greg Puts and Lucas Lobato Ribeiro	Vale Base Metals Modernization of Instrumentation Monitoring System for Dam Safety at Canada Tailings Storage Facilities	2373	Monitor & Risk Mgr
7582	2024	Website download	Tailings & Mine Waste 2024	Élyse Gaudreau, Ajinkya Koleshrar, Kenny Yue, Pablo Blanco, Riccardo Tortini and Giacomo Faloni	Assessing SAR, InSAR and Multispectral Optical Data for Mapping Supernatant Pond Evolution	2383	Monitor & Risk Mgr
7583	2024	Website download	Tailings & Mine Waste 2024	Zhen Ran Yung, Qing Zhan, Stephen Darnawan and Rudy Montaña	The Application of a 3D Inclinometer in Monitoring the Performance of a TSF near an Active Mine Pit	2397	Monitor & Risk Mgr
7584	2024	Website download	Tailings & Mine Waste 2024	Vincent Le Borgne, Adam Oulmagne, Josh Sun, Evan Davison, Divya Sekha Vaka and Skye Pandey	Integration of Multi-Sensing Technologies for the Monitoring of Tailing Storage Facilities	2407	Monitor & Risk Mgr
7585	2024	Website download	Tailings & Mine Waste 2024	Felipe Bolívar Domingos, Alessandra Mazon and Jefferson Barbosa	Integrated Analysis of Dam Surface Displacement Monitoring	2419	Monitor & Risk Mgr
7586	2024	Website download	Tailings & Mine Waste 2024	David Slack, Roque Obusan, Yamin Byrne, Dora de Melo and Jason DeJong	Enhancing Safety and Reducing Environmental Impact through Development of a Robotic Hybrid CPT Rig	2433	Site Investigation
7587	2024	Website download	Tailings & Mine Waste 2024	Veronique Nell and Andrea Krupa	Tailings Facility Surveying Leveraging Complementary Technologies	2447	Site Investigation
7588	2024	Website download	Tailings & Mine Waste 2024	Ghama Vijevickose and Ana Valverde	Potential of X-ray Micro-CT Imaging for Mine Tailings Deposit Characterization	2457	Site Investigation
7589	2024	Website download	Tailings & Mine Waste 2024	Ganet M. Martin, Christopher A. Bareither and Joseph Scala IV	Influence of Density on Predicting Saturation in Filtered Tailings using an Electromagnetic Sensor	2467	Site Investigation
7590	2024	Website download	Tailings & Mine Waste 2024	Arno Talmon, Welbe Boomma, Bas Nieuwboer, Sara Rustamov, Merino Jaspers, Sven van Asperen and Miguel de Lucas Pardo	Testing of an Autonomous Rheometer for Optimized Tailings Thickener Operation	2485	Site Investigation

Find and Replace

Find Replace


Find what: long-term No Format Set Format...

Within: Sheet ☐ Match case

Search: By Rows ☐ Match entire cell contents

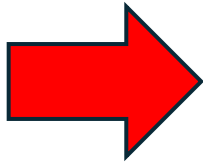
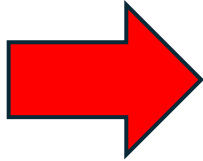
Look in: Formulas Options <<

Find All Find Next Close



Gusek’s Database of >7500 Mine Drainage Presentations Sorted by Year, by Organization/Publisher

1996



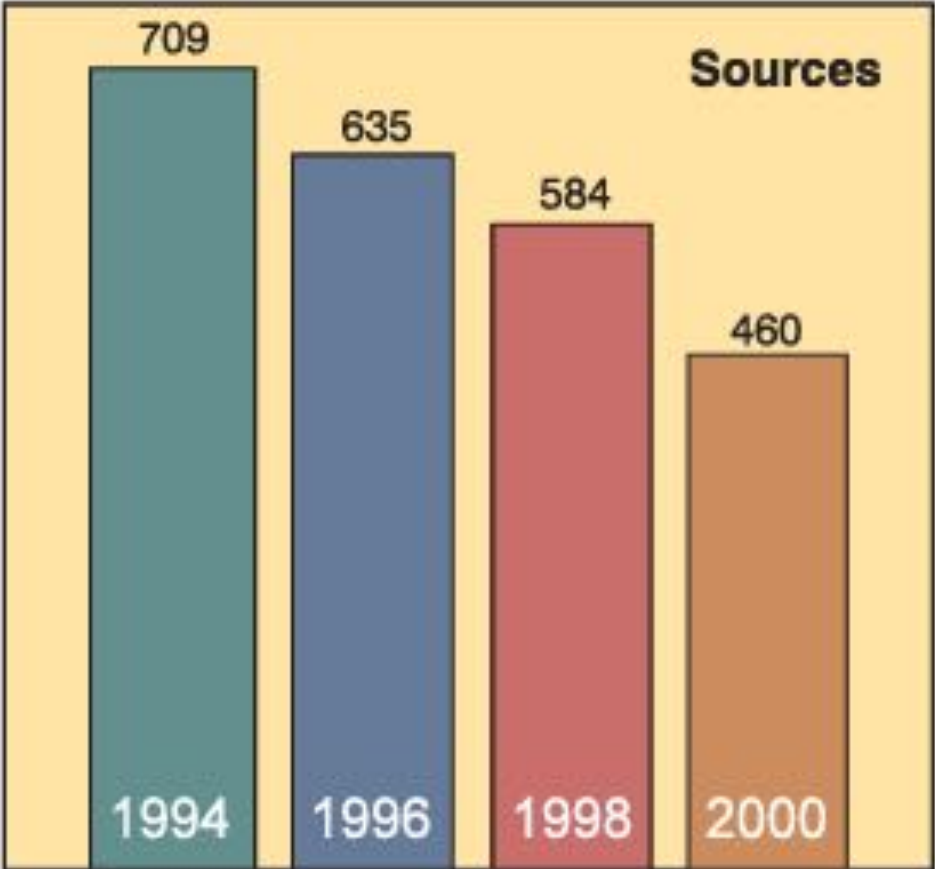
a.m.	REGISTRATION
8:25 – 8:30 a.m.	WELCOME AND OPENING REMARKS Morning Moderator Ben Faulkner Environmental Consultant Stratton Farm Princeton, WV
8:30 – 9:00 a.m.	"ACID MINE DRAINAGE TREATMENT IN GREENS RUN BY AN ANOXIC LIMESTONE DRAIN" Troy Titchenell Anker Energy Morgantown, WV
9:00 – 9:30 a.m.	"CARBON DIOXIDE PRETREATMENT OF AMD FOR LIMESTONE DIVERSION WELLS" Barnaby Watten National Biological Survey Wellsboro, PA
9:30 – 10:00 a.m.	"THE NORTH BRANCH OF THE POTOMAC RIVER: RESULTS OF TWO YEARS OF LIME DOSING" Joseph Mills Maryland Department of Environment Frostburg, MD
10:00 – 10:30 a.m.	BREAK
10:30 – 11:00 a.m.	"EARLY RESULTS FROM CALCIUM CARBONATE NEUTRALIZATION OF TWO WEST VIRGINIA RIVERS ACIDIFIED BY MINE DRAINAGE" Peter Zurbuch WV Division of Natural Resources Elkins, WV
11:00 – 11:30 a.m.	"ACID MINE DRAINAGE TREATMENT WITH OPEN LIMESTONE CHANNELS" Paul Ziemkiewicz, Director National Mine Land Reclamation Center Morgantown, WV
11:30 a.m. – 12:00 noon	"TREATMENT OF ACID MINE DRAINAGE WITH A COMBINED WETLAND/ANOXIC LIMESTONE DRAIN: COMPARISON OF LABORATORY VERSUS FIELD RESULTS" Alan Sexstone, Associate Professor West Virginia University Morgantown, WV
12:00 noon	ADJOURN

1997

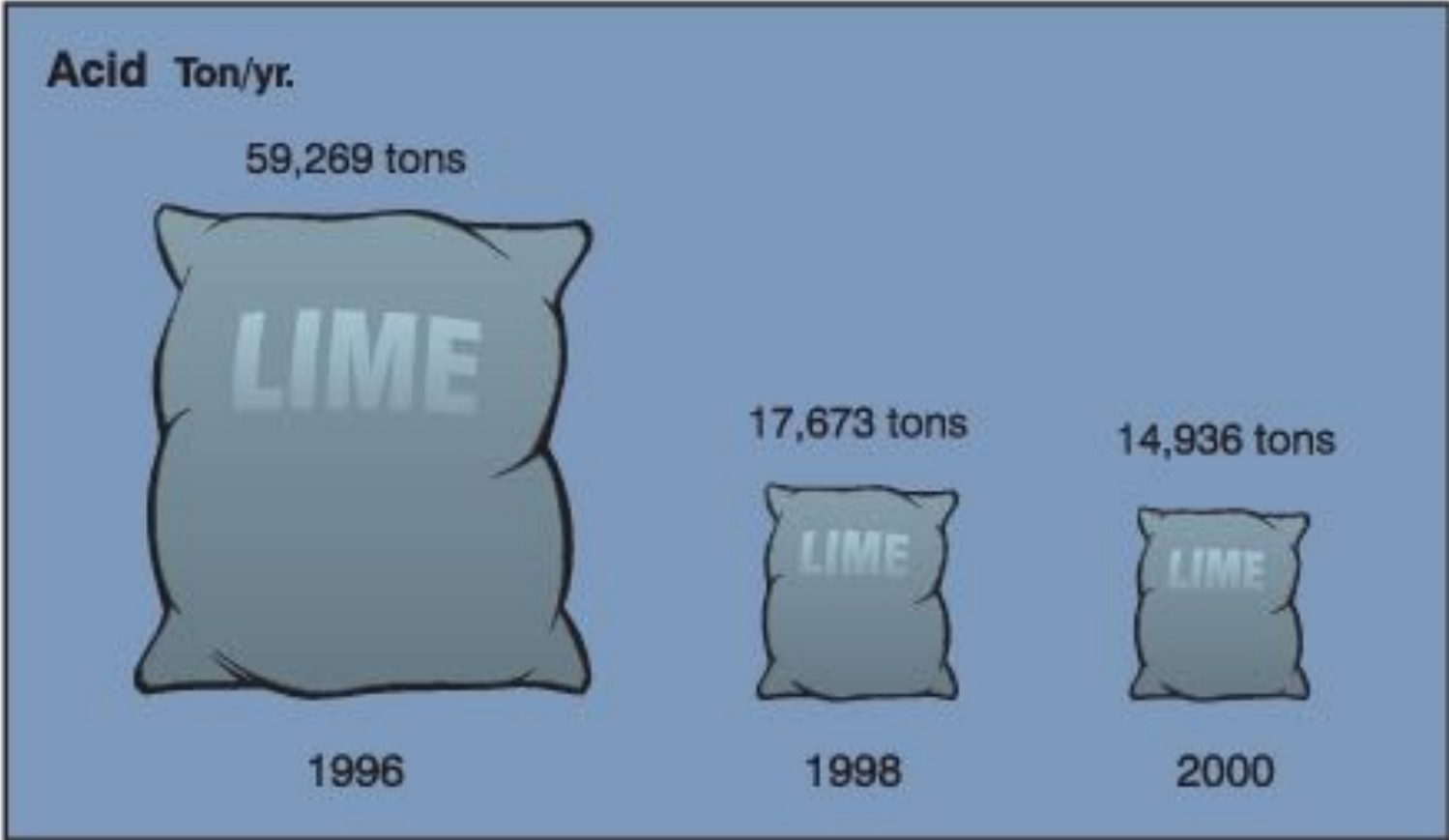
		Home About ▾ Links Symp
8:00 – 8:15 a.m.	"AMD REGULATORY AND POLICY IMPACTS ON CURRENT MINING ACTIVITIES IN WEST VIRGINIA" John Allen, Chief Office of Mining and Reclamation West Virginia Division of Environmental Protection Nitro, WV	
9:15 – 9:40 a.m.	"OSM'S INITIATIVES, DIRECTIONS, AND APPROACHES TO ACID MINE DRAINAGE CONTROL AND TREATMENT" Kathrine Henry, Acting Director Office of Surface Mining Washington, DC	
9:40 – 10:00 a.m.	"OSM POLICIES IN WEST VIRGINIA" Roger Calhoun Office of Surface Mining Charleston, WV	
10:00 – 10:30 a.m.	BREAK	
10:30 – 11:00 a.m.	"ACID MINE DRAINAGE INVENTORY IN WEST VIRGINIA" Ben Faulkner Bratton Farms Princeton, WV	
11:00 – 11:30 a.m.	"AMD INVENTORY IN CHEAT RIVER WATERSHED" Sheila Vukovich and Greg Adolfson West Virginia Division of Environmental Protection Nitro, WV	
11:30 – 12:00 noon	"MANGANESE TOXICITY TO AQUATIC ORGANISMS" Tiff Hilton and Rob Norman WOPEC, Inc. Lewisburg, WV	
12:00 – 1:20 p.m.	LUNCH	
1:20 – 1:30 p.m.	REGROUP Afternoon Moderator: Bruce Leavitt CONSOL, Inc. Pittsburgh, PA	
1:30 – 2:00 p.m.	"1997 Legislative ISSUES RELATED TO MINING AND RECLAMATION" Ben Greene, President West Virginia Mining & Reclamation Association Charleston, WV	
2:00 – 2:30 p.m.	"AMD IN THE MONONGAHELA BASIN" Bruce Leavitt CONSOL, Inc. Pittsburgh, PA	
2:30 – 3:00 p.m.	"WATER QUALITY CHANGES AND COSTS OF REMINING IN WEST VIRGINIA AND PENNSYLVANIA" Bob Hedin, Ben Faulkner, and Jeff Skousen Hedin Environmental Pittsburgh, PA	

Exhibit J:

Sources which would prevent release



Acid Load which would (if untreated) impact streams



It is good to look back...

2000

2000 West Virginia Surface Mine Drainage Task Force Symposium Papers

- 
- 
- 
- 
- [The Acid Drainage Technology Initiative \(ADTI\) — Coal Mining Sector](#) – R. Hornberger, G. Krueger, P. Ziemkiewicz, and B. Leavitt – 12pp (326k)
 - [An Evaluation of Remote Sensing Technologies for Watershed Assessment](#) – T. Ackman, G.A. Veloski, R.A. Dotson, and R. Hammack – 14pp (46k)
 - [Antidegradation Issues and Regulations](#) – T. Moran and D. Burns – 3pp (36k)
 - [Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania](#) – K. Brady, T. Kania, M.W. Smith, and R. Hornberger – 3pp (16k)
 - [Effects of Armoring on Limestone Neutralization of Acid Mine Drainage](#) – Q. Sun, L. McDonald, and J. Skousen – 10pp (49k)
 - [Experimental Injection of Alkaline Lime Slurry for In-Situ Remediation of an Acidic Surface-Mine Aquifer](#) – P. Ziemkiewicz, J. Donovan, J. Frazier, M. Daly, C. Black, and E. Werner – 26 pp (845k)
 - [Long-term Hydrogeological and Geochemical Response to Flooding of an Abandoned Below-Drainage Pittsburgh Coal Mine](#) – J. Donovan, B. Leavitt, E. Werner, E. Perry, and K. McCoy – 21pp (630k)
 - [Technical Issues for Water Quality in the 21st Century](#) – P. Ziemkiewicz – 3pp (16k)
 - [Water Quality Changes Over 30 Years from Underground Mine Discharges](#) – J. Demchak, J. Skousen, and G. Bryant – 10pp (94k)
 - [Advanced Planning Tools for Optimization of Acid Mine Drainage Treatment](#) – J. Fripp, J. Stiles, and P. Ziemkiewicz – 10pp (72k)
 - [The Recovery of the North Branch: 1940 to 2000 and Beyond](#) – J. Mills and T. Davis – 11pp (357k)
 - [Reduction in Acid Loads from the Alton Project](#) – B. Faulkner, M. Reese, W. Snider, R. Phillips, A. McCartney, D. Gillum, and R. Green – 7pp (1,847k)
 - [Evaluation of Natural Amelioration of Acidic Deep Mine Discharges in the Uniontown Syncline, PA](#) – D. Lambert, D. Dzombak, and W. Aljoe – 10pp (402k)
 - [Improving the Acid-Base Account By Use Of Programmed-Temperature Oxidation and Evolved Gas Analysis](#) – D. Kern, R.B. LaCount, and R. Hammack
 - [Coal and Energy in the 21st Century](#) – Dan Gerkin – 18pp (494k)



Official Obituary of

Donald Paul Phares

August 5, 1941 - May 6, 2017



Official Obituary of

Peter Emig "Pete" Zurbuch

April 28, 1931 - September 2, 2006



Many of the benefits we enjoy today are the result of sacrifices and work of those who have gone before, many of whom we will never know.

It is good to look back...

Statement of Mutual Intent Strategic Plan

for the

Restoration and Protection of Streams
and Watersheds Polluted by Acid Mine
Drainage from Abandoned Coal Mines

1995 Progress Report



SIGNATORIES/SUPPORTERS OF THE STATEMENT OF MUTUAL INTENT

USDI, Office of Surface Mining
U.S. Environmental Protection Agency -
West Virginia Division of Environmental Protection
Pennsylvania Department of Environmental Protection
Pennsylvania Fish and Boat Commission
Headwaters RC&D Council and Headwaters
Maryland Department of Environmental Protection
Ohio Department of Natural Resources
International Association of Fish & Wildlife Managers
Stoneycreek & Conemaugh Rivers Improvement
Southern Allegheny Conservancy
Southern Allegheny R C & D
Western Pennsylvania Coalition for Abandoned Mine Lands
USDI, Bureau of Land Management
USDI Assistant Secretary for Land & Minerals Management
USDI, National Biological Service
USDA, Natural Resources Conservation Service
Trout Unlimited
National Fish & Wildlife Foundation
National Mined Land Reclamation Center
Heinz Endowments
Blacklick Creek Watershed Association
Citizens' Coal Council
USDI, Bureau of Mines
USDI, Fish & Wildlife Service
Ohio River Valley Water Sanitation Commission
Sierra Club
Pennsylvania Environmental Defense Fund
Pennsylvania Organization for Watersheds and Rivers
The Conemaugh Valley Conservancy
The Casselman River Task Force
The Loyalhanna Creek Watershed Association
The Loyalhanna Abandoned Mine Drainage Coalition
The Office of Congressman John P. Murtha, 12th. Distr. PA
The Office of Congressman Frank Mascara, 20th. Distr. PA

1995

	NO FISH	SOME FISH	TOTAL
OH	258	349	607
PA	1714	1525	3239
WV	592	548	1140
VA	17	0	17
MD	42	110	152

1996 Progress Report
promised data from:

KENTUCKY
TENNESSEE
ALABAMA
ILLINOIS
INDIANA

Objectives of the Statement of Mutual Intent and Strategic Plan

Build a clearinghouse
to share data &
information, identify
AMD sites, and
abatement techniques
to restore water quality

Objectives of the Statement of Mutual Intent and Strategic Plan

Support an effective
remining program.

Provide forums to
transfer
technologies...

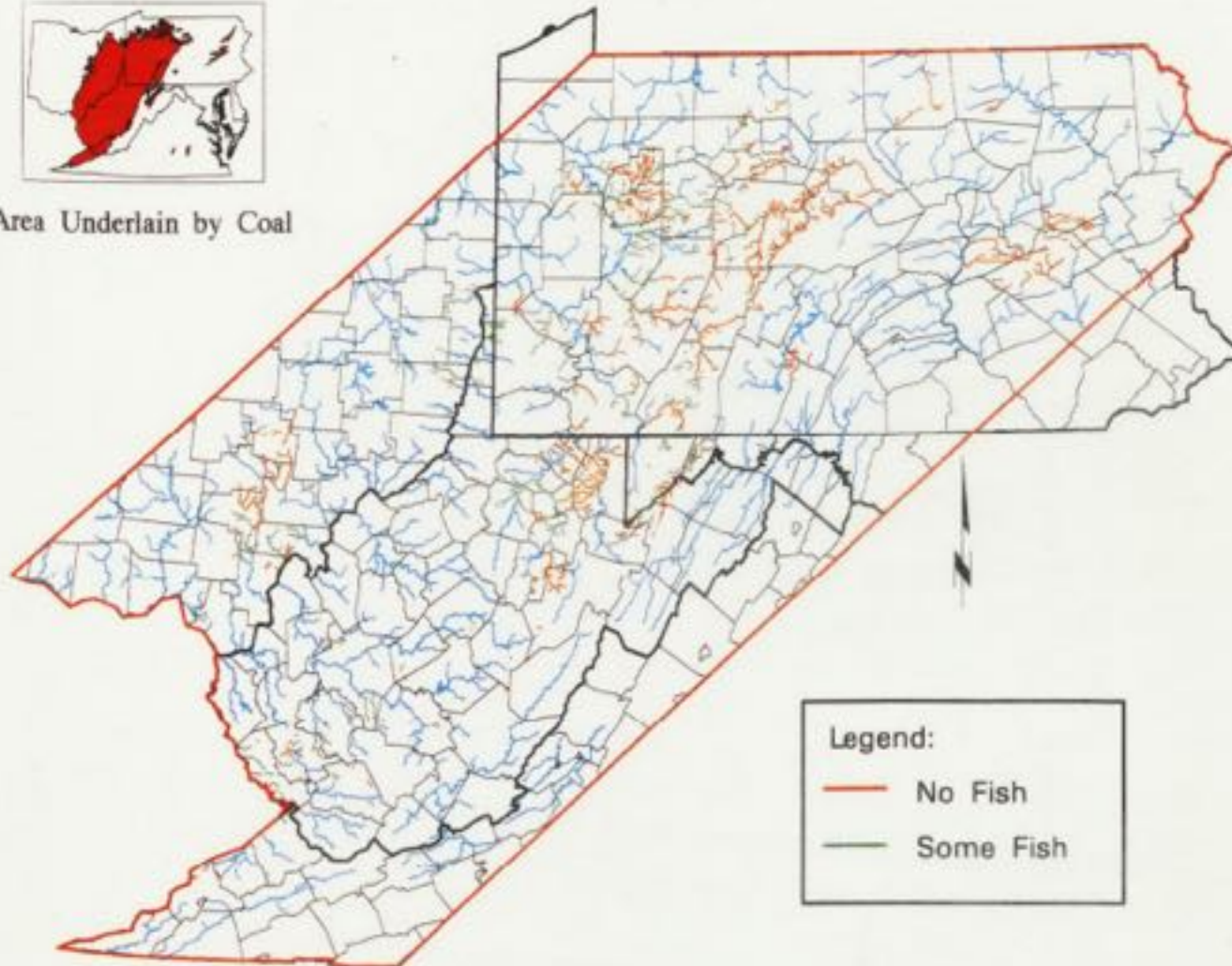
Objectives of the Statement of Mutual Intent and Strategic Plan

Prepare periodic reports describing the extent and severity of the mine drainage problem and the current status of ongoing efforts to improve and restore degraded watersheds

Streams with Fisheries Impacted by Acid Mine Drainage in MD, OH, PA, VA, WV (Based on EPA Fisheries Survey - 1995)



Area Underlain by Coal



	1995		
	NO FISH	SOME FISH	TOTAL
OH	258	349	607
PA	1714	1525	3239
WV	592	548	1140
VA	17	0	17
MD	42	110	152

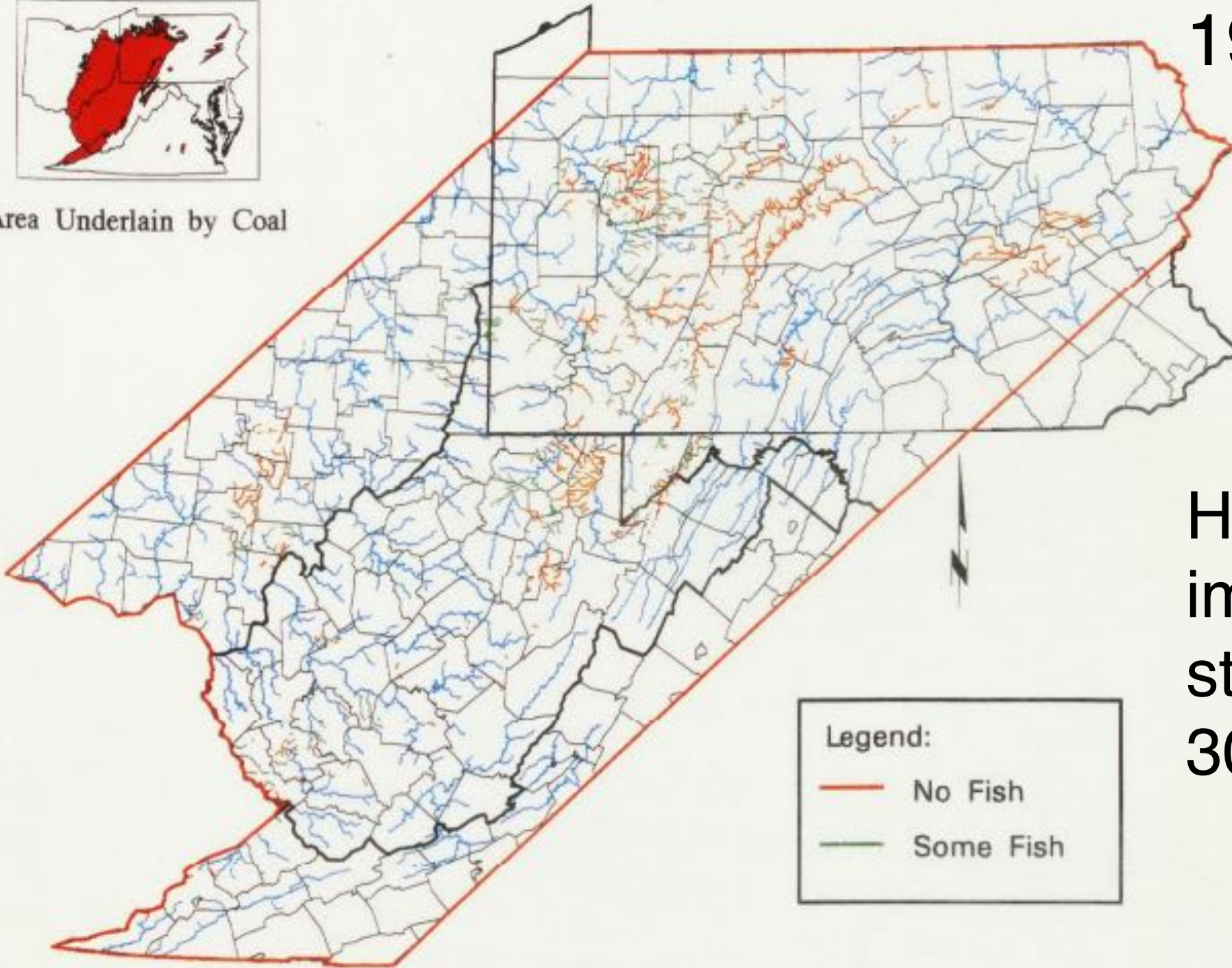
Characterization of AMD-Impacted Streams (Metals and pH Only) based on State Fisheries Biologists BPJ:

No Fish 
(except at springs or trib mouths)

Some Fish 
(reduced species and/or populations)



Area Underlain by Coal



1995 “a baseline”

How have we improved these streams in the last 30 years?

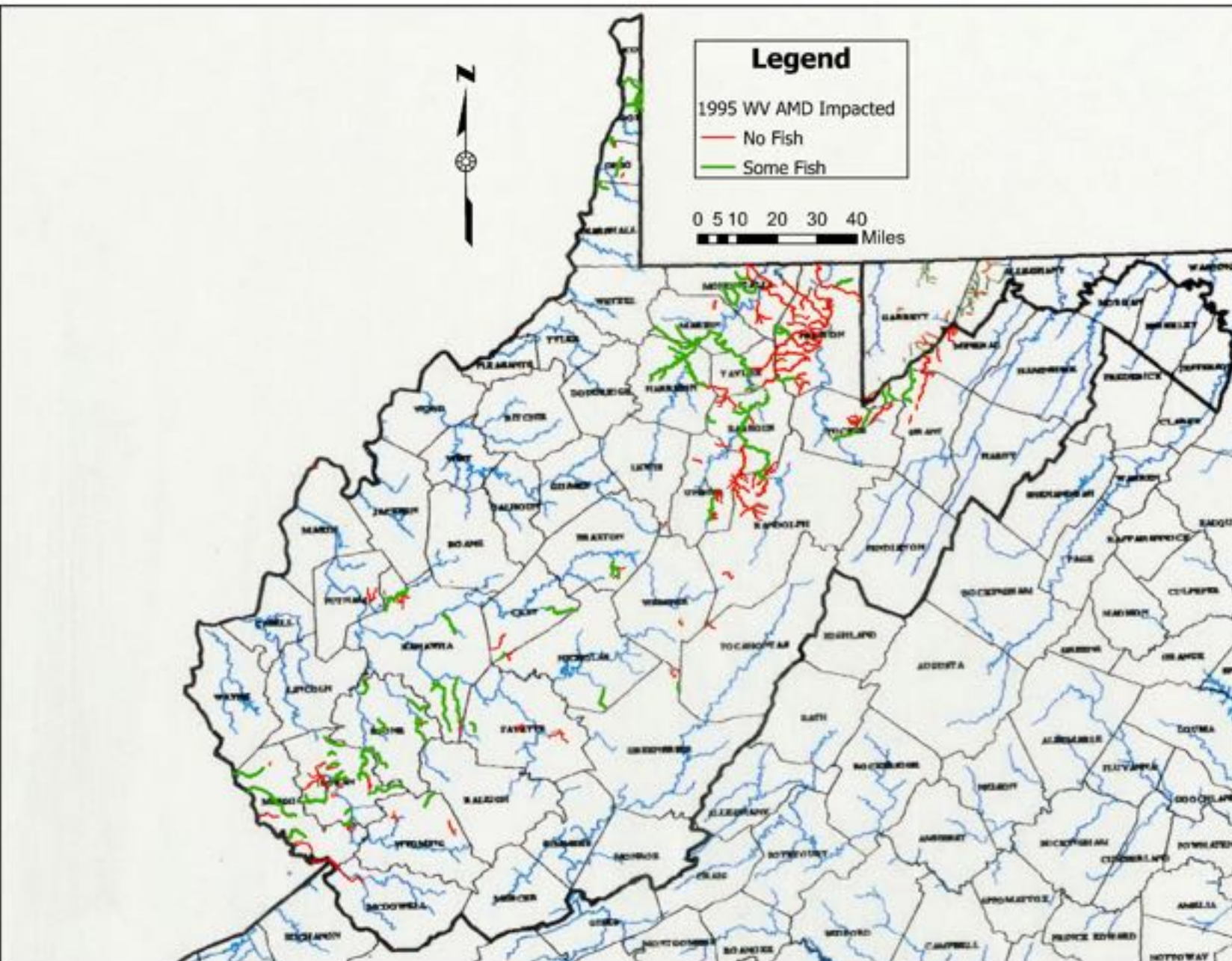
Stream Miles Impacted									
	1995				2025				IMPROVED
	NO FISH	SOME FISH	TOTAL		NO FISH	SOME FISH	GOOD AQL	TOTAL	NO FISH
CH	258	349	607		130	477		607	-50%
PA	1714	1525	3239						
WV	592	548	1140		239	626	275	1140	-60%
VA	17	0	17		indicated 2 of their 9 streams now had fish, mileage				not calculated
MD	42	110	152						
KY	?	?	?						
TN	?	?	?						
AL	?	?	?						
L	?	?	?						
IN	?	?	?						
TOTAL	2519	2596	5115						


Note: the WV Stream miles was adjusted from 1100 to align with 2025 mapping

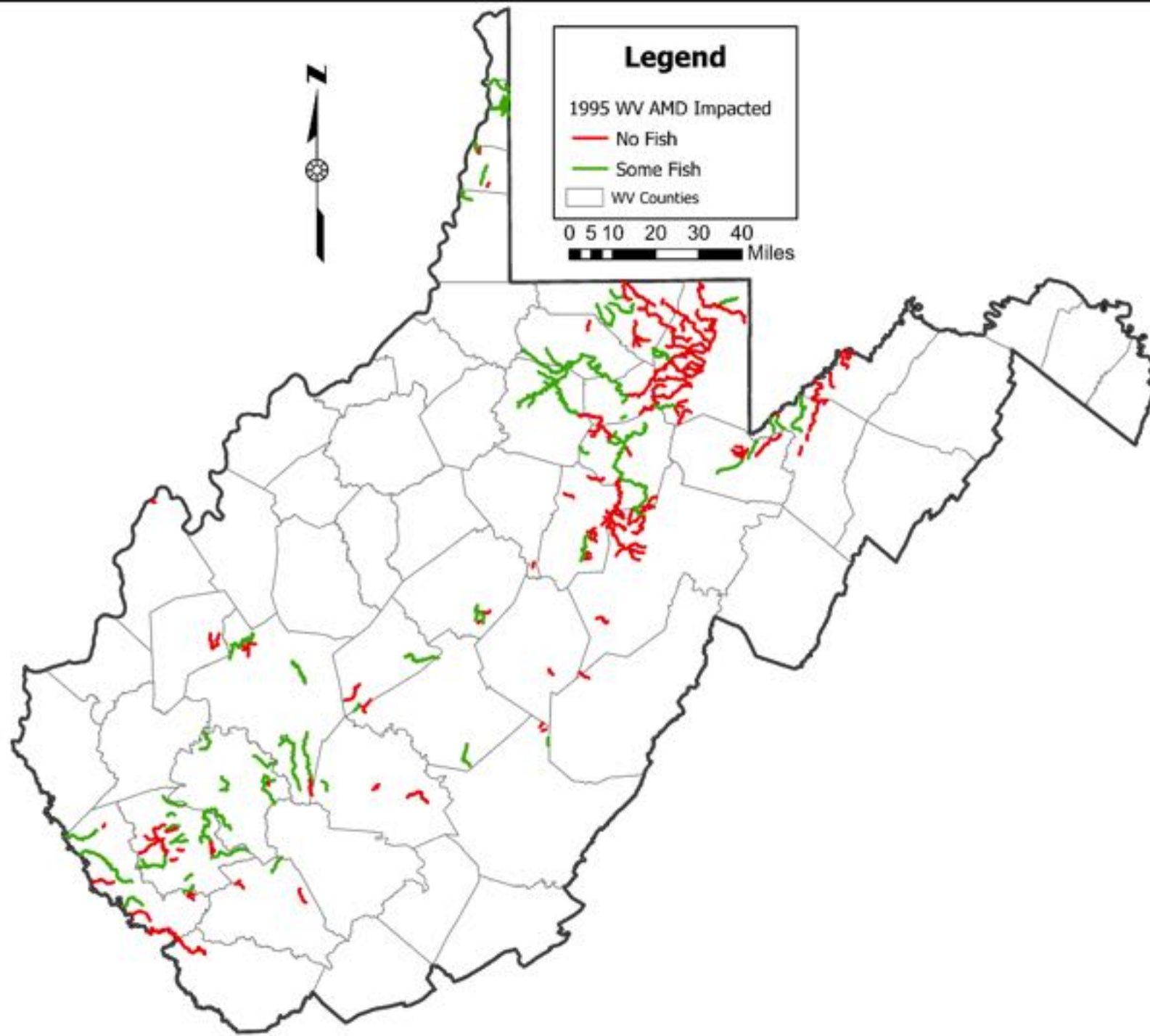
29% of WV Some Fish improved in 2025

What Has Been The Most (Cost) Effective Technology?

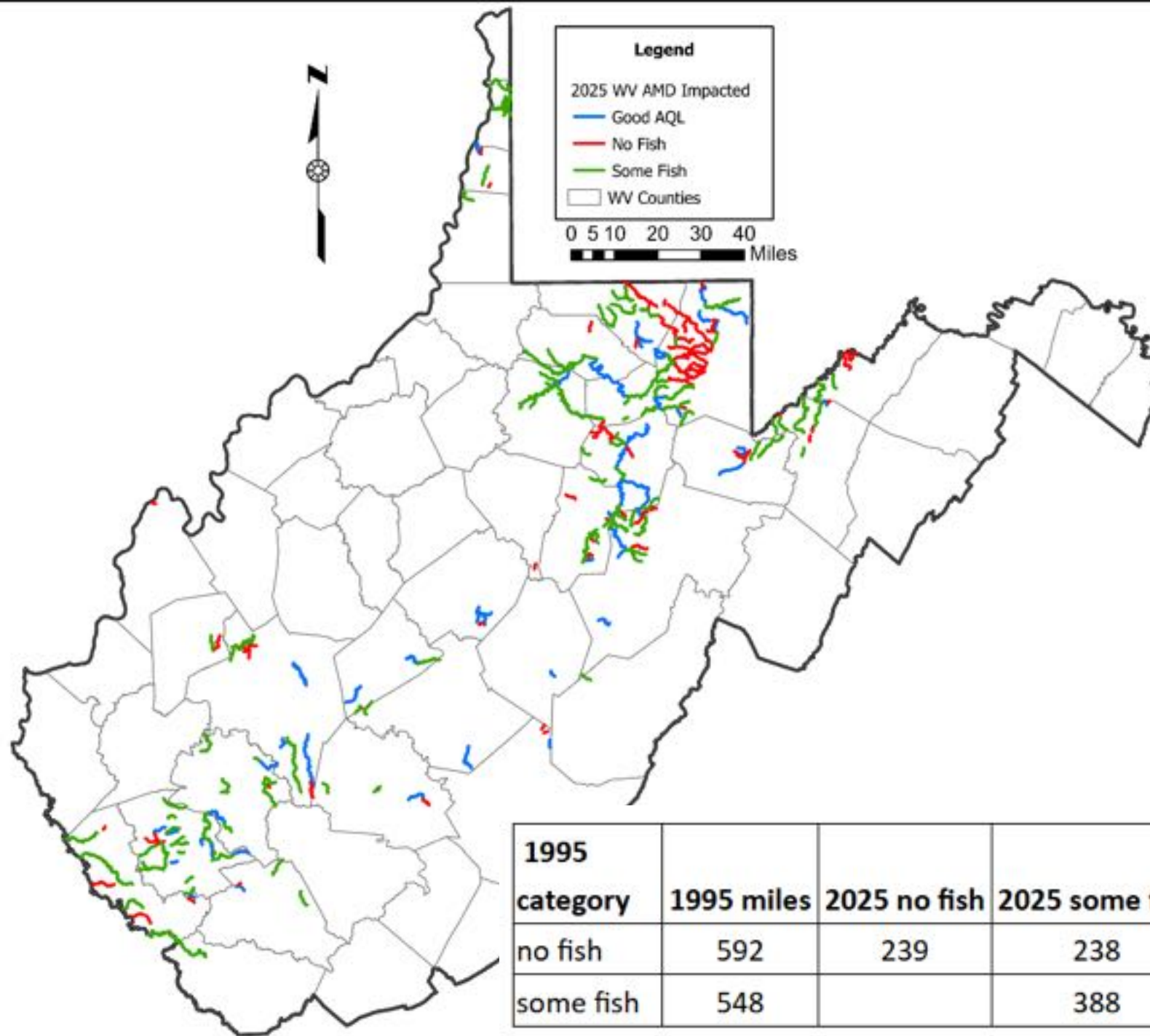
		WV	MD	OH	PA	VA	KY	TN
Monitored Natural Attenuation (Wait and Watch)								
Point Source Mitigation								
	REMINING OR REMOVE							
	SEQUESTER TOXICS							
	WATER MANAGEMENT							
Add Alkalinity To Stream								
	ROTATING DRUM DOSER							
	DEPOSIT IN NEAR STREAM							



1995 Regional
AMD-Impacted
No Fish 
Some Fish 

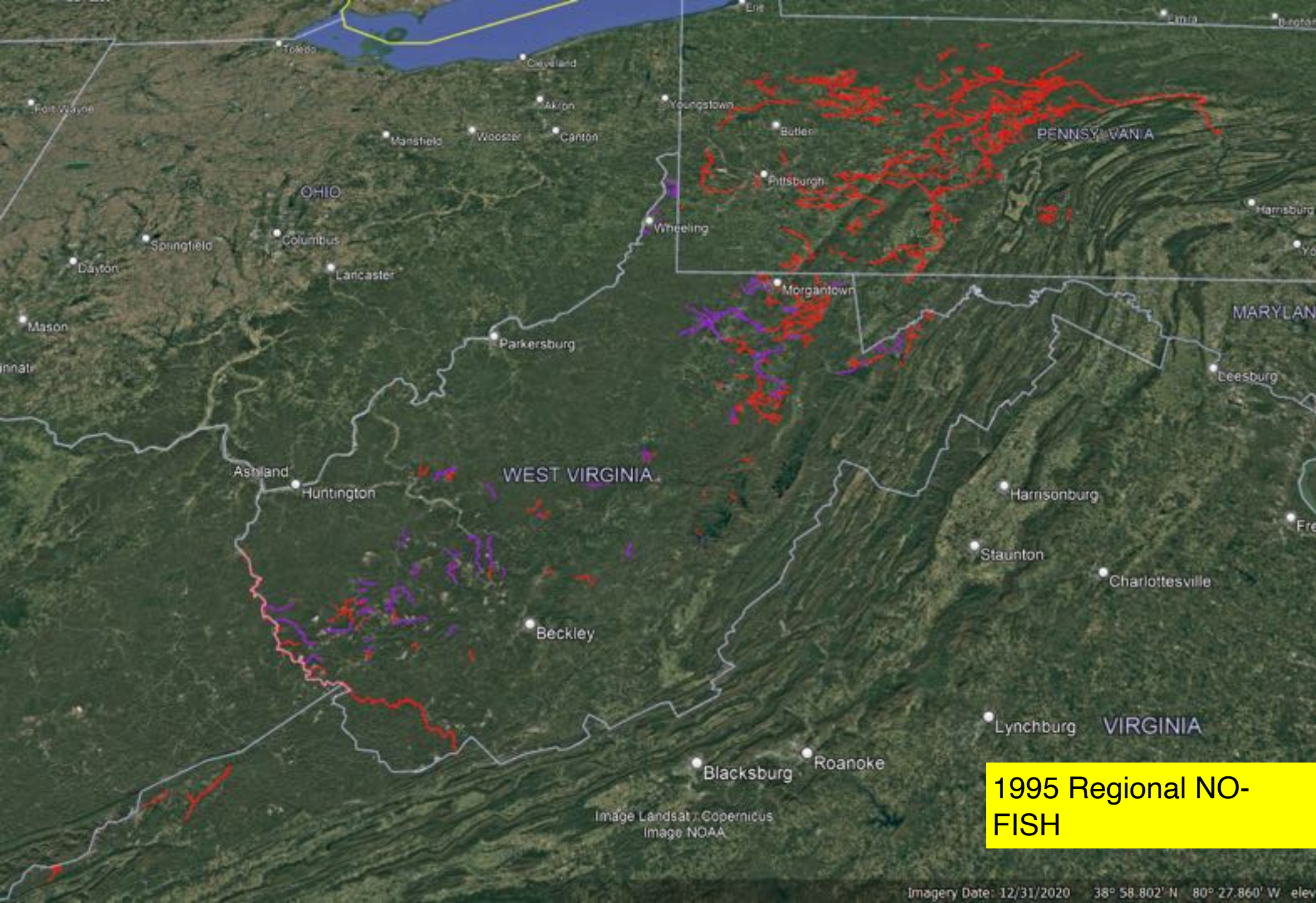


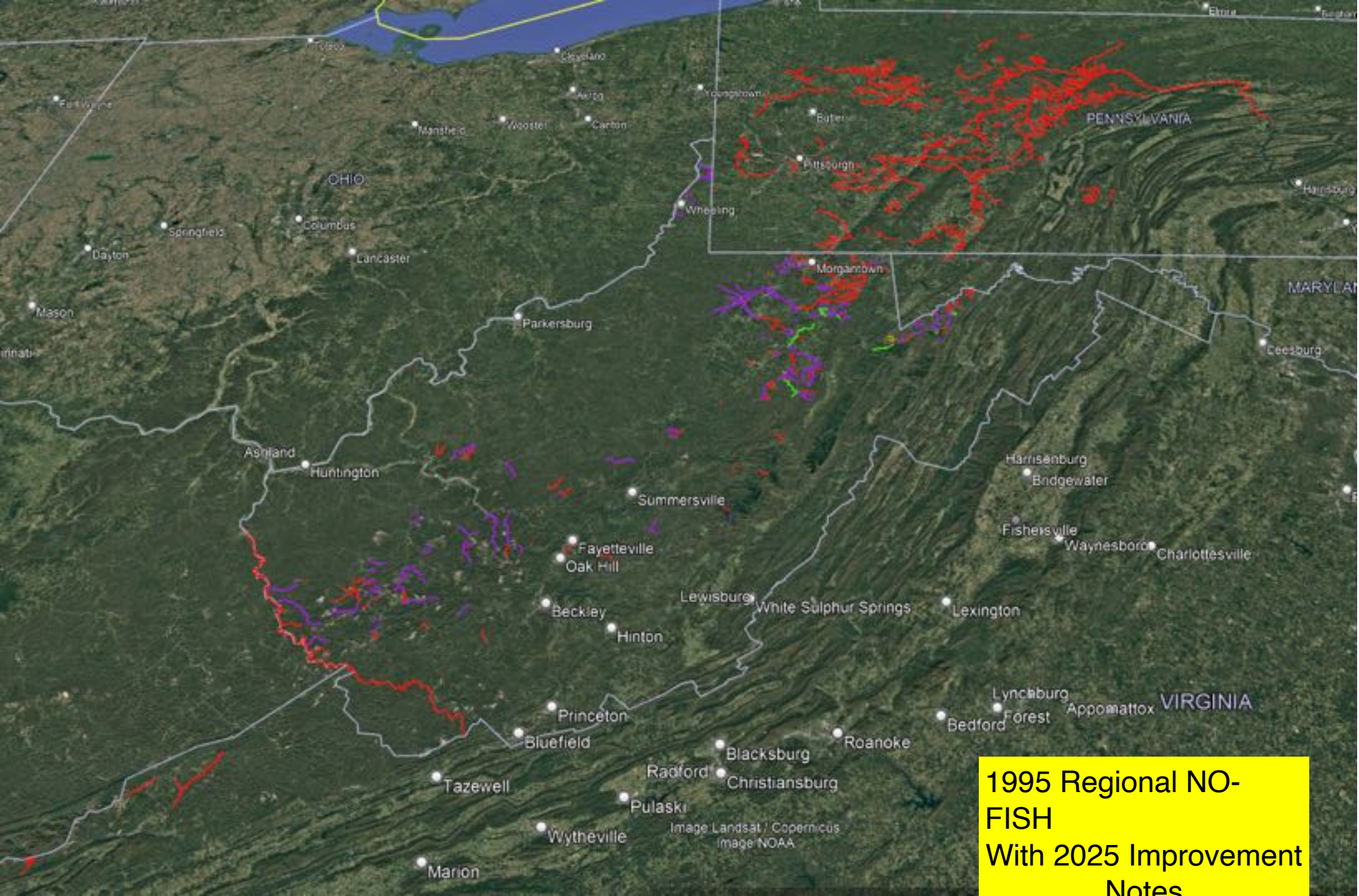
1995 WV
AMD-Impacted
No Fish 
Some Fish 



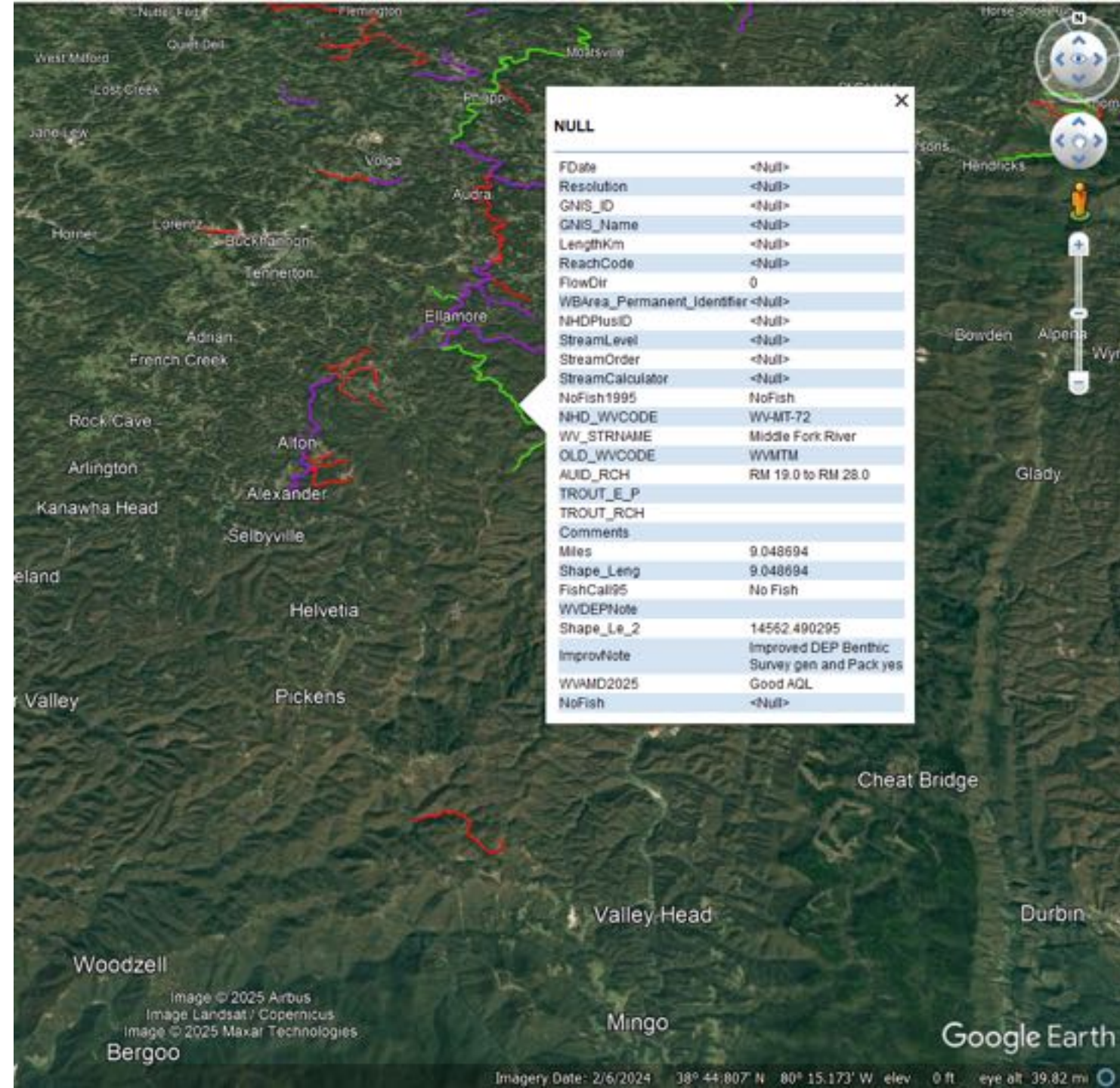
2025. WV
AMD-Impacted
Good AQL
No Fish
Some Fish

1995 category	1995 miles	2025 no fish	2025 some fish	2025 Good AQL	% improved
no fish	592	239	238	115	60
some fish	548		388	159	29





1995 Regional NO-FISH
With 2025 Improvement
Notes



Middle Fork River of
the Tygart Valley
Watershed RM 19.0 to
28.0 (9 miles) that had
NO FISH in 1995 and
GOOD AQL in 2025
(Improved DEP
Benthic Survey)

Benefit/Cost Ratios

The WVDNR estimates that, in total, the Middle Fork limestone sand project has restored 119 miles of the Middle Fork River and its tributaries. The unit cost of that restoration is thus approximately about \$756 per mile per year. This is extremely cost-effective. The WVDNR uses an economic benefit figure of approximately \$40,000 per mile per year for restored coldwater streams. At that rate, the benefits of restoring sport fisheries in the Middle Fork watershed exceed \$4.75 million annually to the West Virginia economy. The resulting benefit/cost ratio of the Middle Fork project would be about 53 to 1.

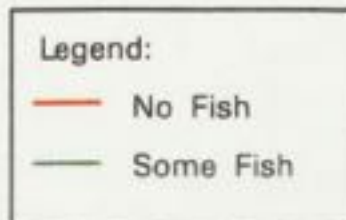
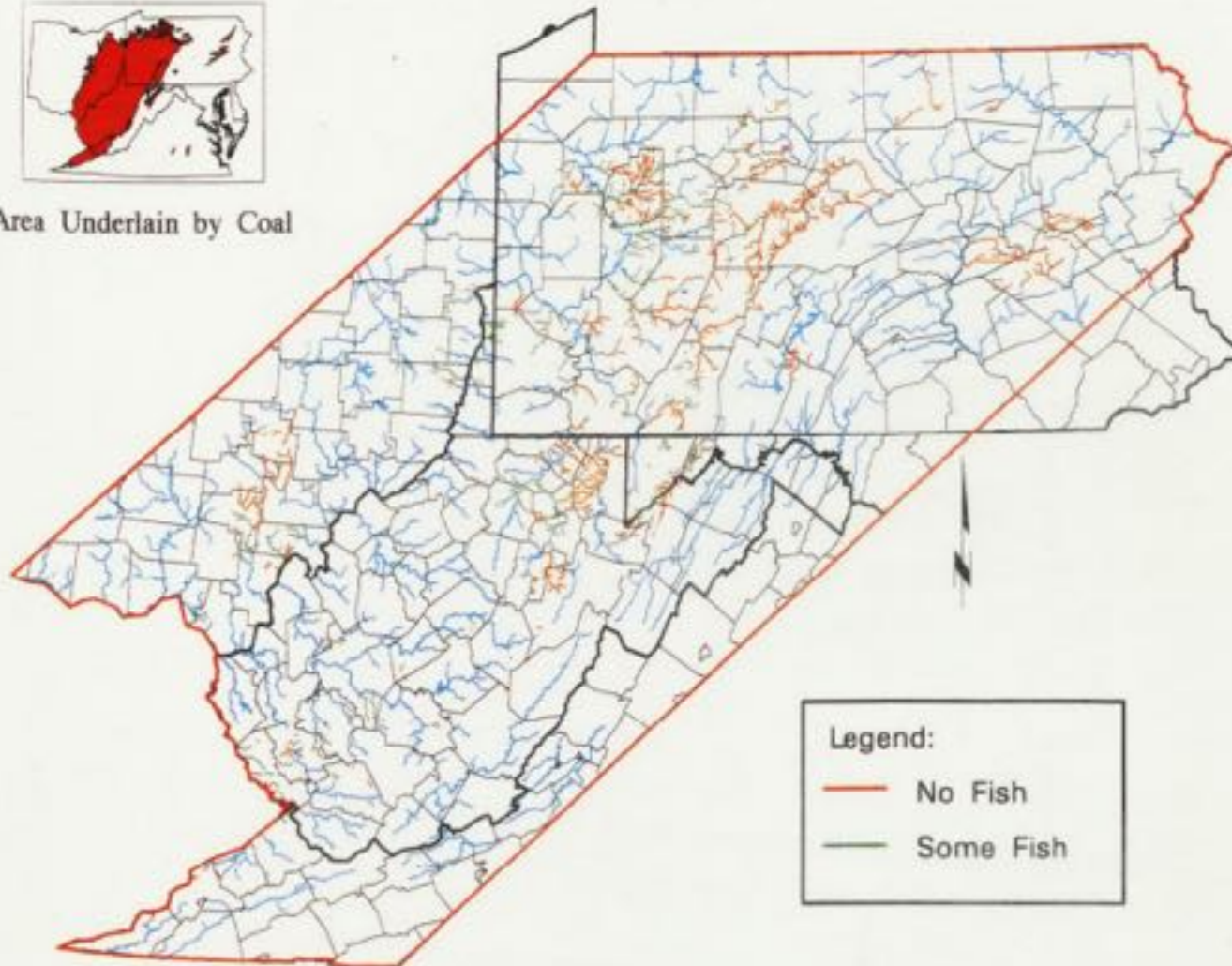
[Presentation](#) - Ed J. Kirk, Randall Maggard, and Christy M. Mower

- [2005 Legislative Issues Related to Mining, Reclamation, and AMD](#) - Jason Bostic
- [The Success of Remining in Pennsylvania](#) - [Presentation](#) - Thomas Kovalchuk
- [Antidegradation and TMDL Issues](#) - Ken Ellison
- [State Perspective on Mine Placement of Coal Combustion Wastes](#) - Greg Conrad
- [The Largest Acid Mine Drainage Treatment Plant in the World?](#) - [Presentation](#) - Ben B. Faulkner, E.G. Wyatt, J.A. Chermak, and F.R. Miller
- [Abandoned Mined Land Reclamation Projects and Passive Treatment in Ohio](#) - [Presentation](#) - Mitch Farley and Paul Ziemkiewicz
- [In-stream Limestone Sand Treatment of the Middle Fork Watershed](#) - Walter S. Brown
- [Water Treatment at Bond Forfeiture Sites](#) - Charlie Miller

Streams with Fisheries Impacted by Acid Mine Drainage in MD, OH, PA, VA, WV (Based on EPA Fisheries Survey - 1995)



Area Underlain by Coal



	1995		
	NO FISH	SOME FISH	TOTAL
OH	258	349	607
PA	1714	1525	3239
WV	592	548	1140
VA	17	0	17
MD	42	110	152

Characterization of AMD-Impacted Streams (Metals and pH Only) based on State Fisheries Biologists BPJ:

No Fish 
(except at springs or trib mouths)

Some Fish 
(reduced species and/or populations)

Streams and Fisheries Impacted by Acid Mine Drainage in Ohio

(Based on EPA Fisheries Survey - 1995)

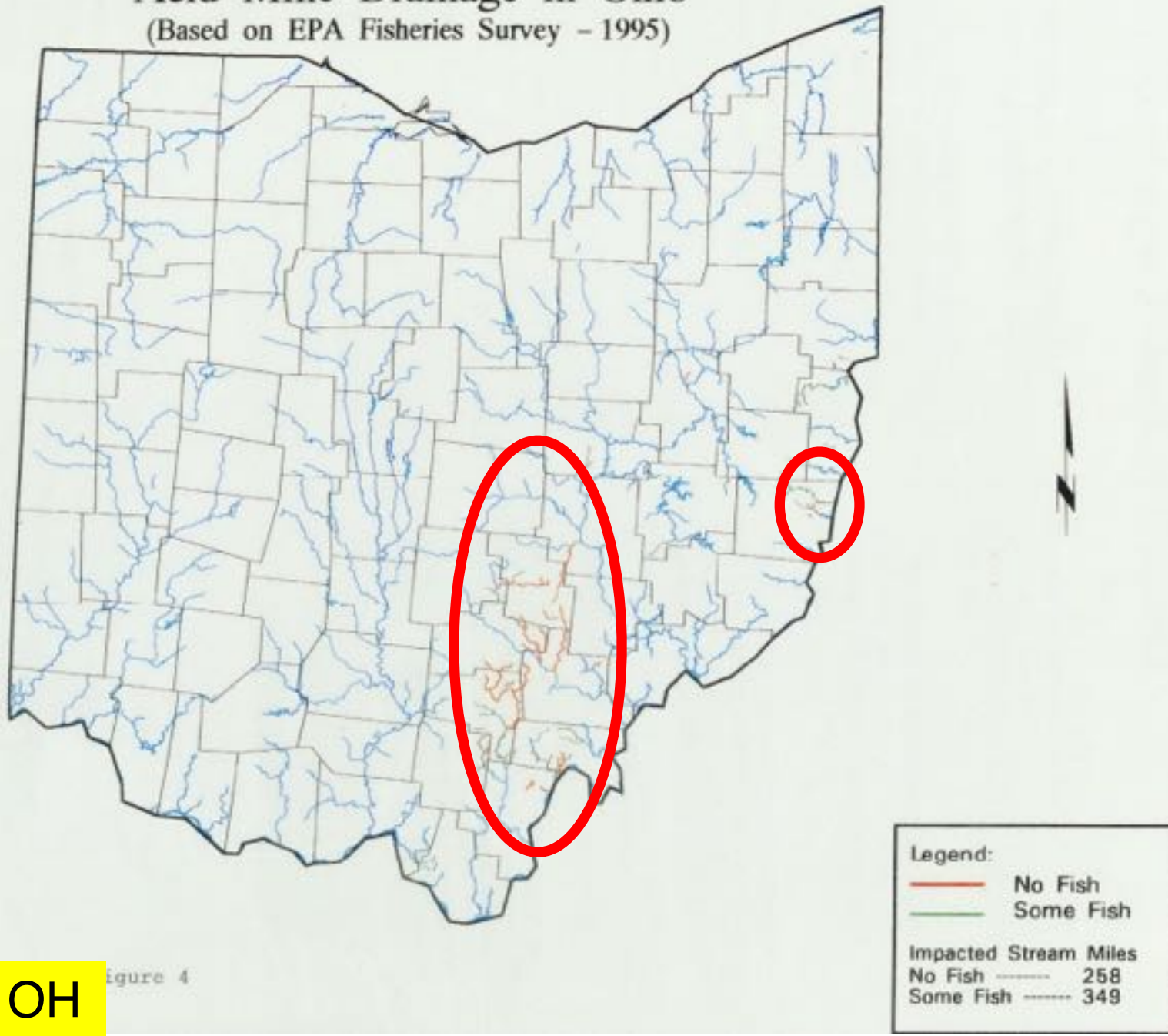
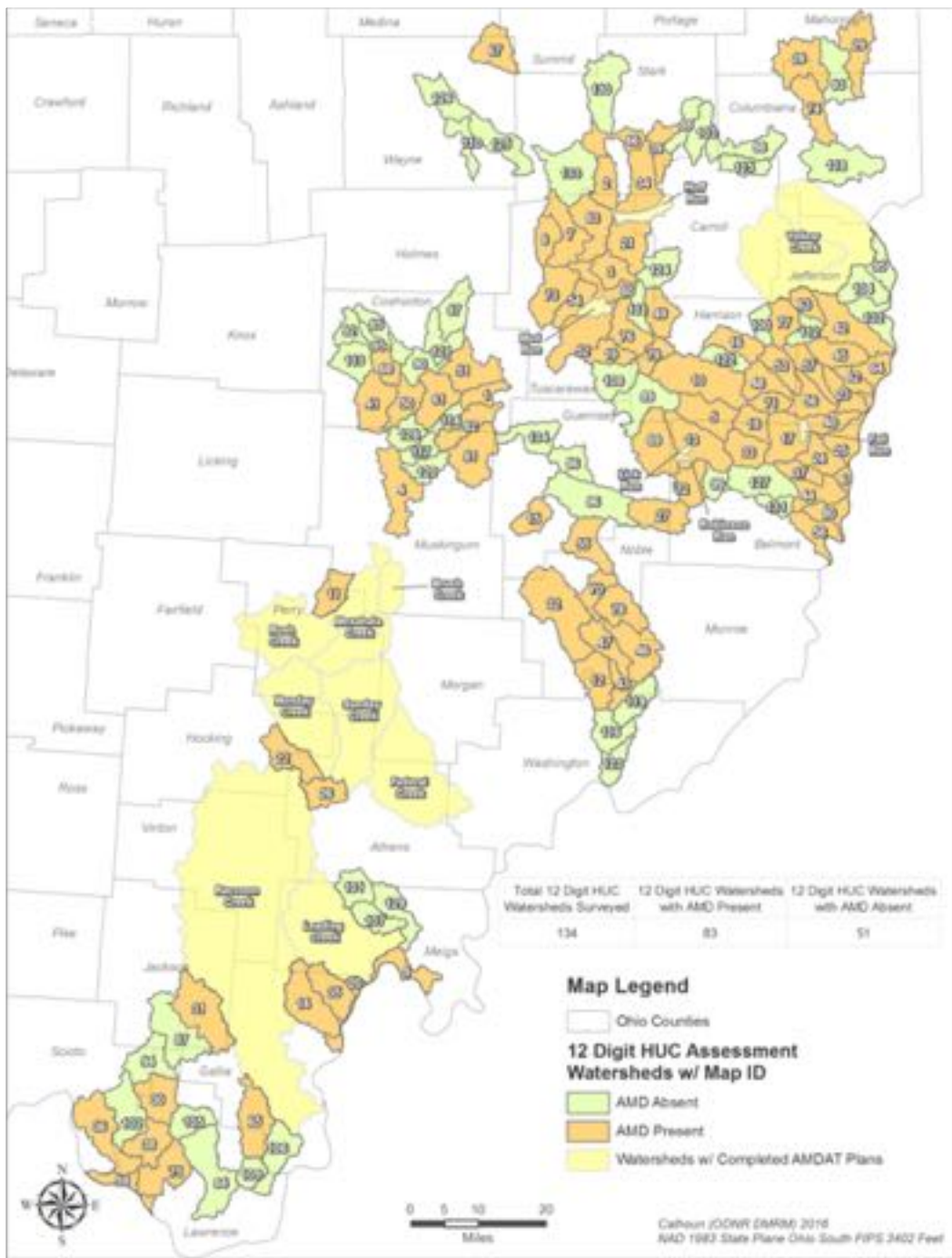


Figure 4

Ohio Acid Mine Drainage Program

Much work has been done to abate AMD in Ohio since 1995:

- 14 watersheds with AMD abatement plans (yellow)
- 6 watersheds have completed AMD projects
- 83 watersheds determined to have “AMD present” and are currently being prioritized for potential projects (orange)

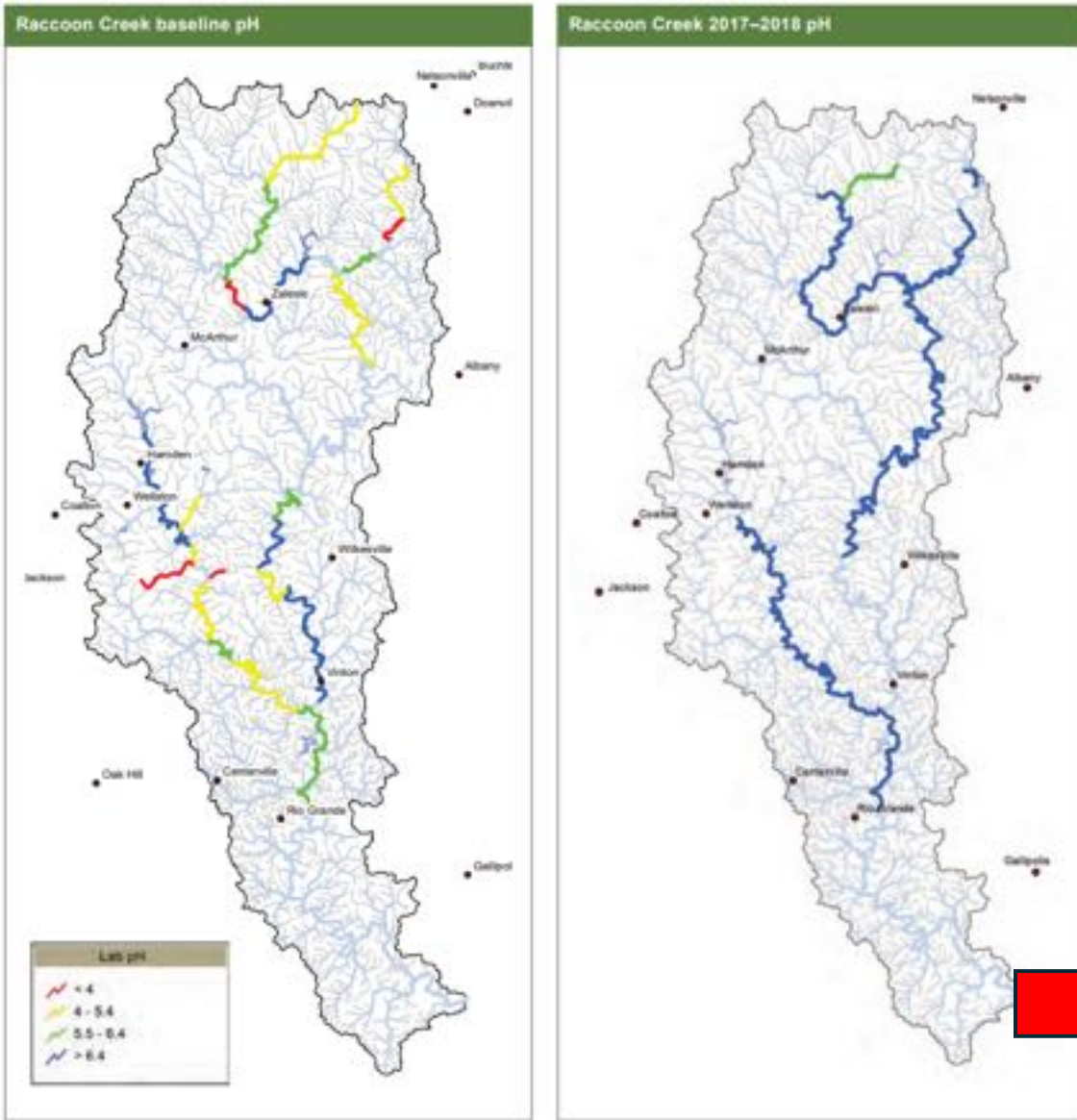


Ohio Acid Mine Drainage Program

Watershed	Number of AMD Projects	Project Costs to Date	Miles Meeting pH targets/Miles Monitored
Leading Creek	2	\$720,280	8/8
Middle Tuscarawas	15	\$6,058,794	16/16
Monday Creek	17	\$10,006,139	26/26
Raccoon Creek	20	\$15,554,265	158/158
Sunday Creek	11	\$2,581,433	42/42
Yellow Creek	1	\$577,422	
Total	66	\$35,498,333	250/250

250 miles of stream now meeting pH targets

Ohio Acid Mine Drainage Program



Raccoon Creek success story:

- Baseline: 158 miles severe biological impairment
- 20 projects, \$16 million over 19 years
- Fish
 - 1984: 21 species
 - 2018: 78 species
- Upper 71 miles now meet state water biological quality standards (warm water habitat)
- Lower 40 miles now meet exceptional state water biological quality standards (exceptional warm water habitat)
- Designated as a State Scenic River in 2024

Streams and Fisheries Impacted by Acid Mine Drainage in Ohio

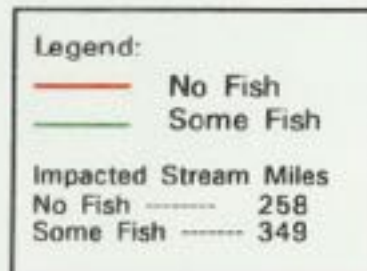
(Based on EPA Fisheries Survey - 1995)



Stream Miles Impacted						
1995			2025			
	No Fish	Some Fish	Total	No Fish	Some Fish	Total
Ohio	258	349	607	130	477	607

The Ohio AMD program uses state biological water quality standards to assess baseline conditions and document improvements or recovery of AMD impacted streams. It is unknown what data was used to determine the number of stream miles with "no fish" and "some fish" in the 1995 report, and it likely did not represent all the impaired stream miles. The estimated stream miles for 2025 are mainly based on 6 AWCAT watersheds, a lack of understanding of how the 1995 stream miles were estimated, and did not use the typical methodology used in the Ohio AMD program to assesses biological recovery. Therefore, the 2025 should be considered a "rough guess" and should not be used as a comprehensive assessment of biological recovery in Ohio AMD impacted streams or the overall success of the Ohio AMD program.

NOW HALF THOSE
MILES WITH NO
FISH IN 1995 HAVE
FISH!

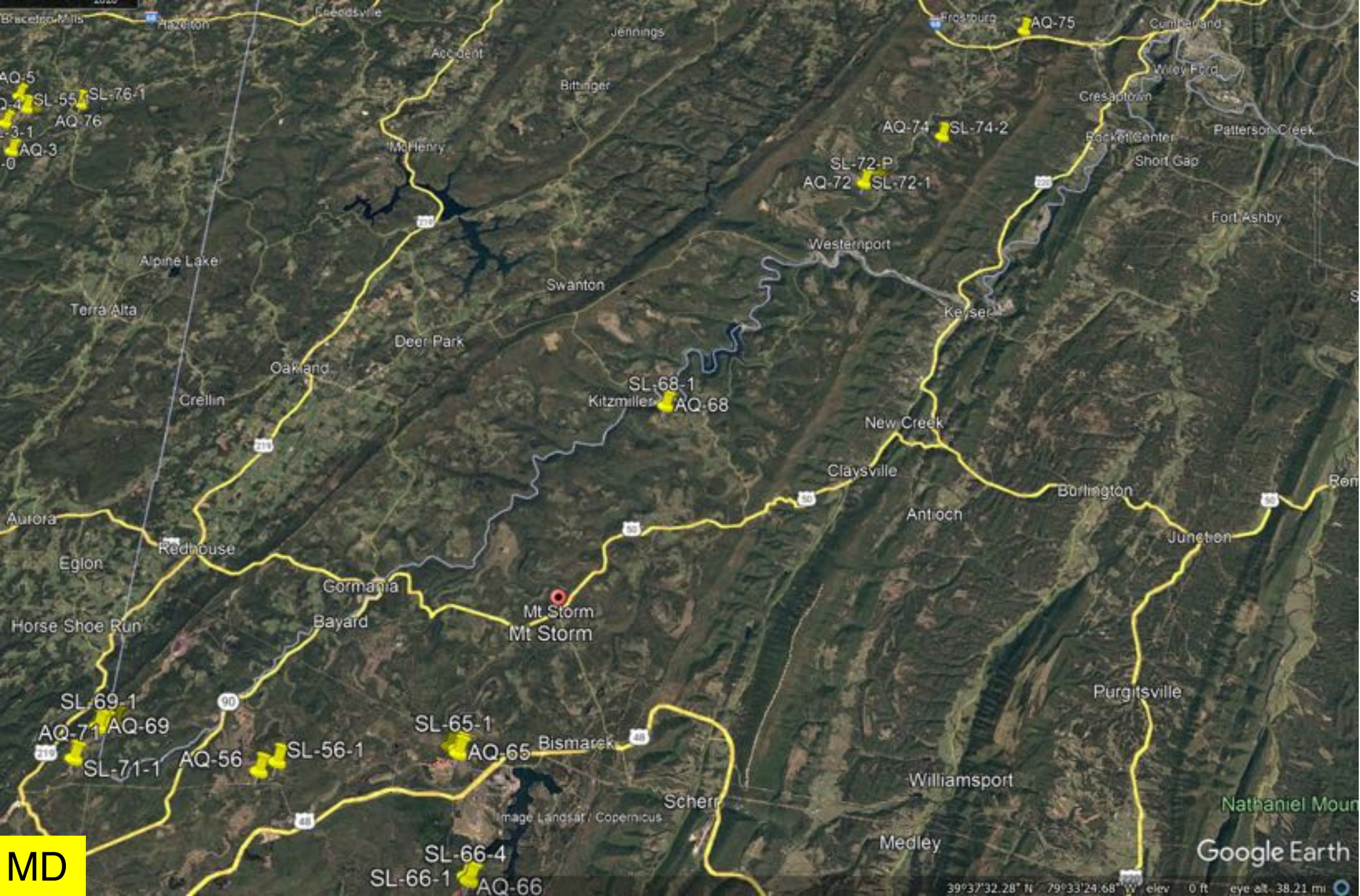


Stream Miles Impacted							
	1995				2025		
	NO FISH	SOME FISH	TOTAL		NO FISH	SOME FISH	TOTAL
OH	258	349	607		130	477	607
PA	1714	1525	3239				
WV	488	612	1100				
VA	17	0	17				
MD	42	110	152				
KY	?	?	?				
TN	?	?	?				
AL	?	?	?				
IL	?	?	?				
IN	?	?	?				
TOTAL	2519	2596	5115				

Streams and Fisheries Impacted by Acid Mine Drainage in [REDACTED] Maryland

(Based on EPA Fisheries Survey – 1995)





MD

Abandoned Mine Land Division

Department of the Environment
Land and Materials Administration
Mining Program

Treating Mine Drainage

- The Abandoned Mine Land Division operates 64 Mine Drainage Treatment Systems in Allegany and Garrett Counties.
- Types of Treatment used by AMLD:
 - *Active Treatment* - The addition of alkaline chemicals directly to the mine discharge or stream.
 - *Passive Treatment* - *The use of ponds, wetlands, ditches, and limestone to treat the mine drainage through biological and geochemical processes.*
- The method we use to treat the Mine Drainage is determined by the water quality characteristics and the flow. Passive treatment can require 2 to 10 acres of ground to construct a system to properly treat the mine drainage. Passive treatment is limited to relatively low flows (<100 gpm) and pH >3.5. Active treatment requires less space and can treat any water quality and greater flows.

Active Treatment

Types of Passive Treatment

Anoxic Limestone Drains (ALD)

Vertical Flow Ponds (VFP)

Successive Alkalinity Producing Systems (SAPS)

Limestone Leach Beds

Limestone Channels

Constructed Wetlands

Steel Slag Beds

Settling Basins

Sand Application Areas or Sand Dumps (semi-passive)



Limestone Sand Dump Examples



Past and Present Accomplishments

- Aaron's Run - Installed Doser and multiple passive treatment systems in the watershed. The stream was de-listed in 2015 from the EPA 303D list for pH impaired streams.
- North Branch Potomac River - Virtually lifeless prior to 1994 due to AMD from pre-law mining. Several dosers(9) and passive treatment systems were installed in the watershed. Today the river is a high-quality stocked trout stream and a popular destination for anglers, kayakers, rafters, and nature enthusiasts. In 2010, a report was completed by "Downstream Strategies" stating that boaters and anglers spend roughly \$3 million annually. Economic impacts of the North Branch alone were 10 times the cost of treatment using the dosers at that time.
- Casselman River - Sand Dumps and multiple passive treatment systems have greatly improved brook trout populations in the watershed.
- It is estimated that approximately 120 miles of AMD impaired streams have been improved.

Stream Miles Impacted							
	1995				2025		
	NO FISH	SOME FISH	TOTAL		NO FISH	SOME FISH	TOTAL
OH	258	349	607		130	477	607
PA	1714	1525	3239				
WV	488	612	1100				
VA	17	0	17				
MD	42	110	152		Minus 120		

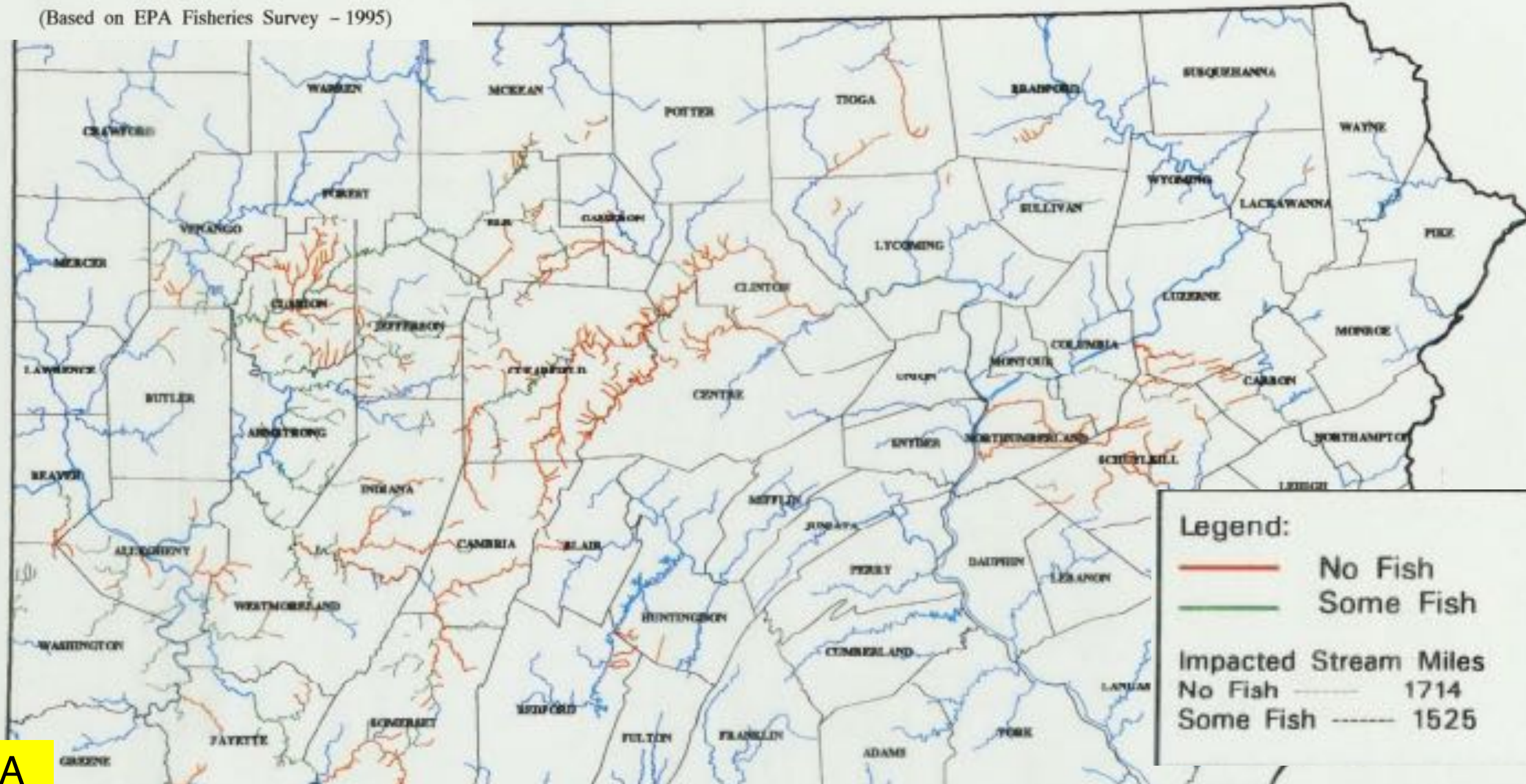
It is estimated that approximately 120 miles of AMD impaired streams have been improved.

AL	?	?	?				
IL	?	?	?				
IN	?	?	?				
TOTAL	2519	2596	5115				

Streams and Fisheries Impacted by Acid Mine Drainage in Pennsylvania

(Based on EPA Fisheries Survey - 1995)

PA



PENNSYLVANIA stream names

Many areas in western PA but highest line densities are:

Clarion County

Clearfield/Center/Clinton

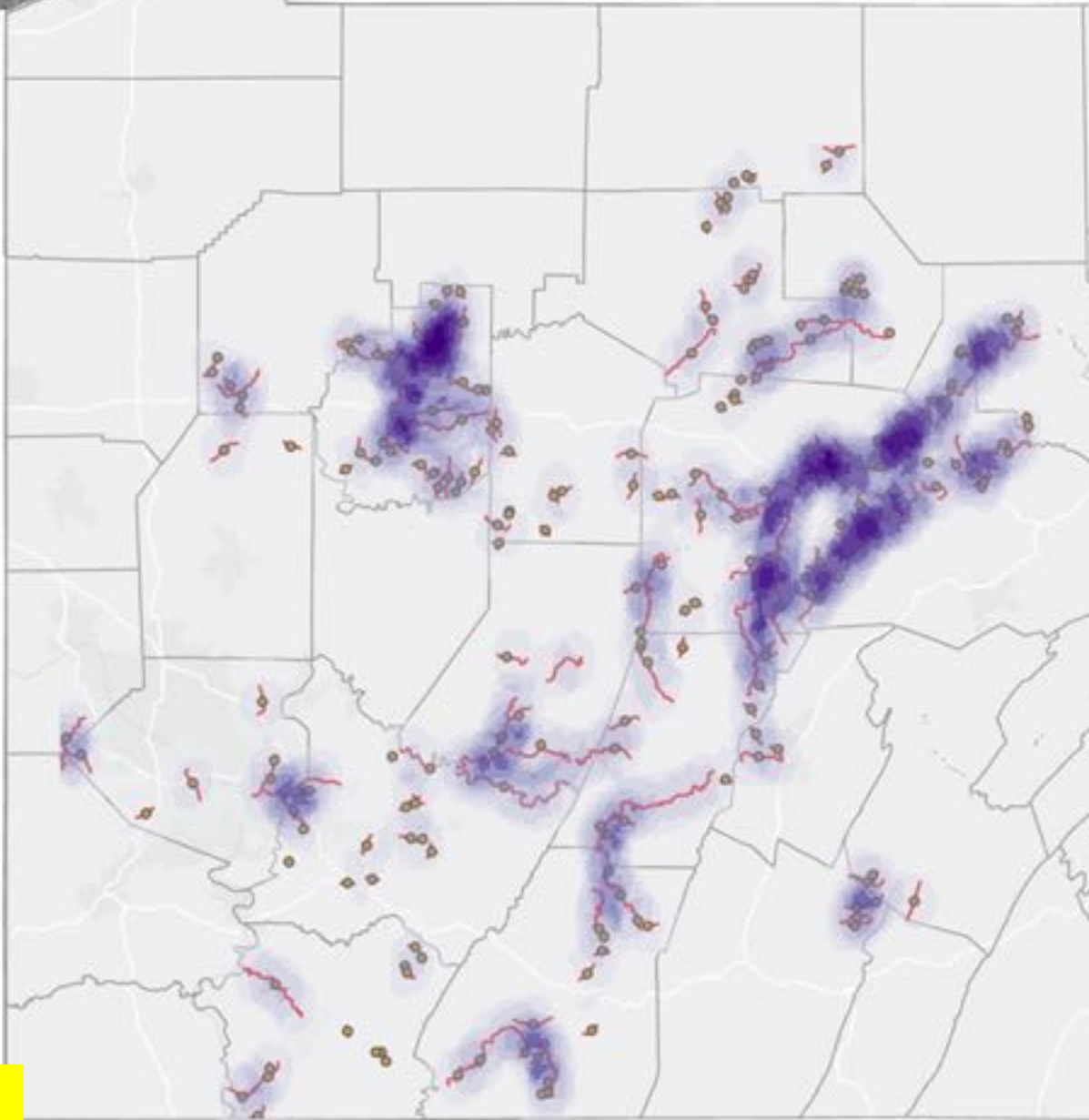
Cambria County

Indiana County

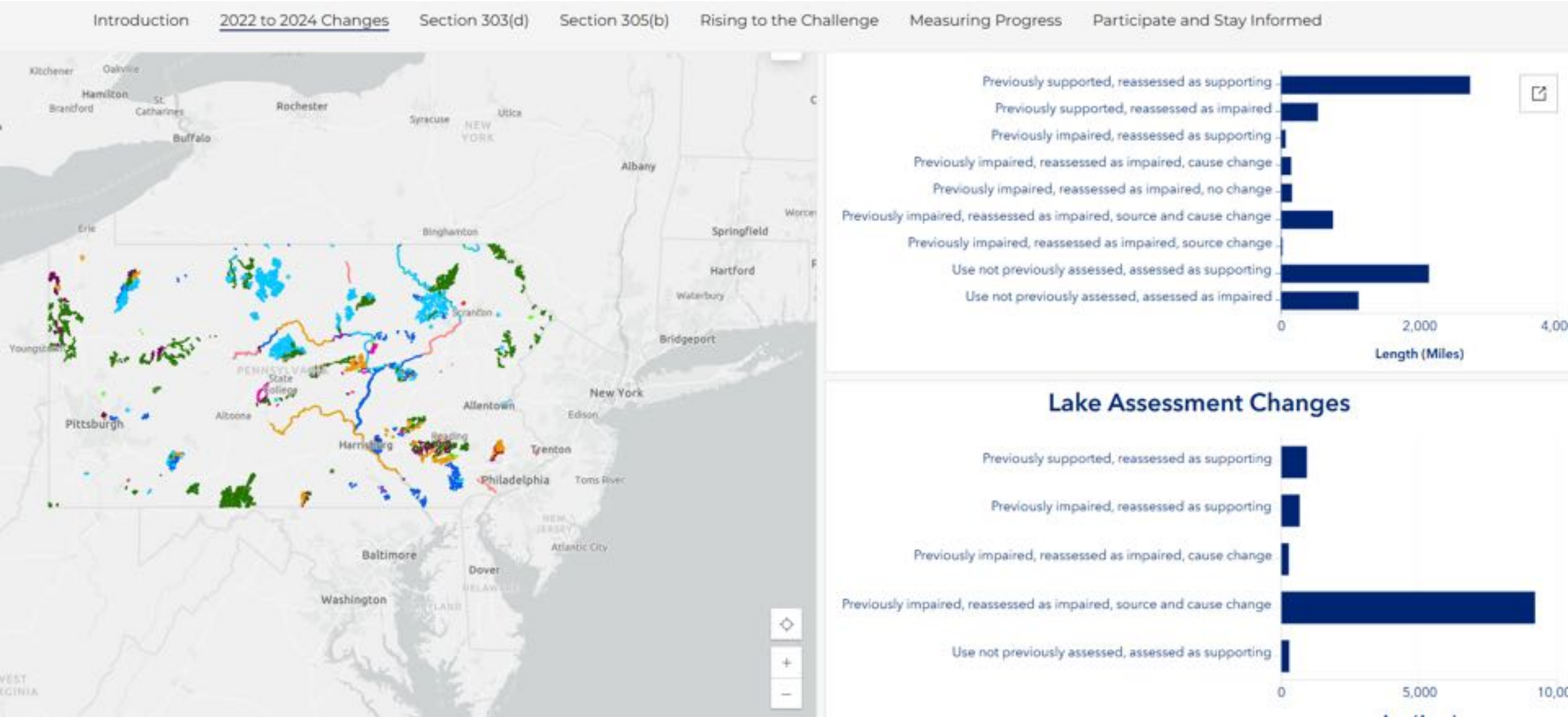
Somerset County

Westmoreland/Allegheny

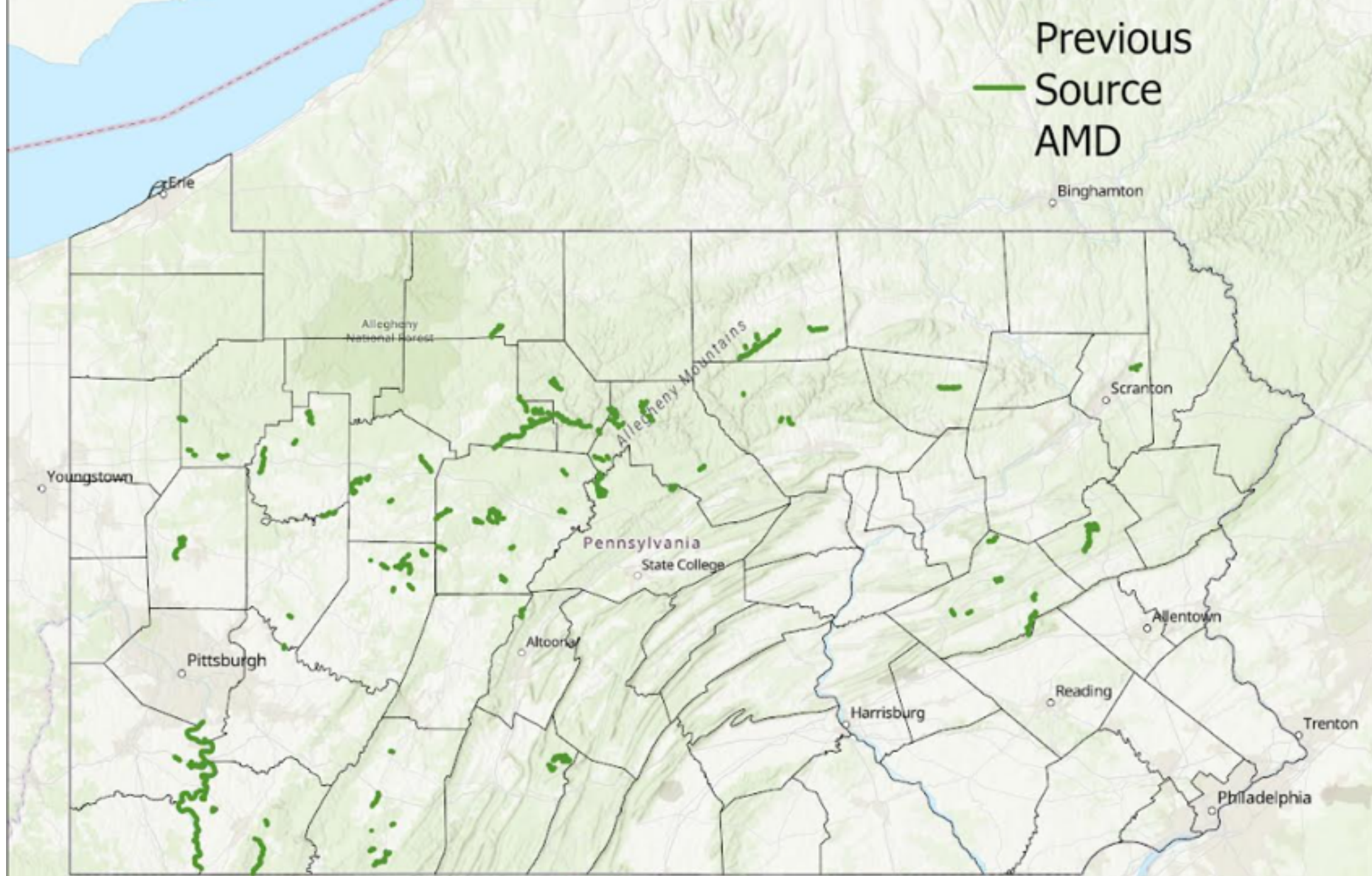
Bedford/Huntingdon



Stream Miles Impacted							
	1995				2025		
	NO FISH	SOME FISH	TOTAL		NO FISH	SOME FISH	TOTAL
OH	258	349	607		130	477	607
PA	1714	1525	3239				
WV	488	612	1100				
VA	17	0	17				
MD	42	110	152		Minus 120		
KY	?	?	?				
TN	?	?	?				
AL	?	?	?				
IL	?	?	?				
IN	?	?	?				
TOTAL	2519	2596	5115				



Previous
Source
AMD



Bennett Branch Sinnemahoning Creek

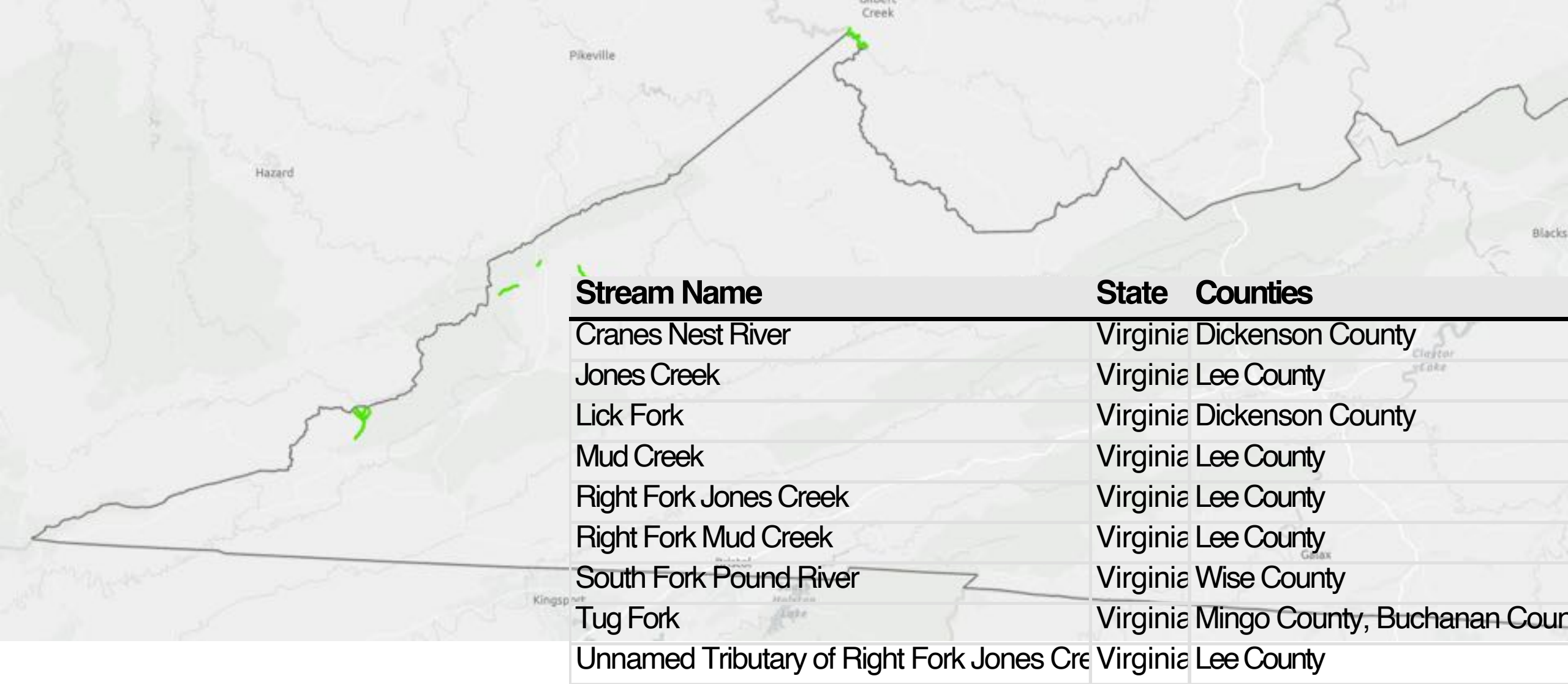
padep-1.maps.arcgis.com/apps/dashboards/f8b463be59dd43548572fc60010b0008

WVDEP Dropbox - Files - Si... Bible Monarch WATER AND MINI... Birds CEC YouTube TV OXY SHAREPOINT -... MIDTOWNE Sign I

Bennett Branch Sinnemahoning Creek

Zoom to Pan

NHD Flowline Comid	61430238
Assessed Use	Aquatic Life
Restoration Date	2022
Previous Sources	ACID MINE DRAINAGE
Previous Causes	METALS
ATTAINS ID	PA-SCR-61430238
ATTAINS Name	Bennett Branch Sinnemahoning Creek-61430238
Length (Miles)	0.28
County	Cameron
Municipality	GIBSON
Municipality Type	TWP
Zip Code	15832

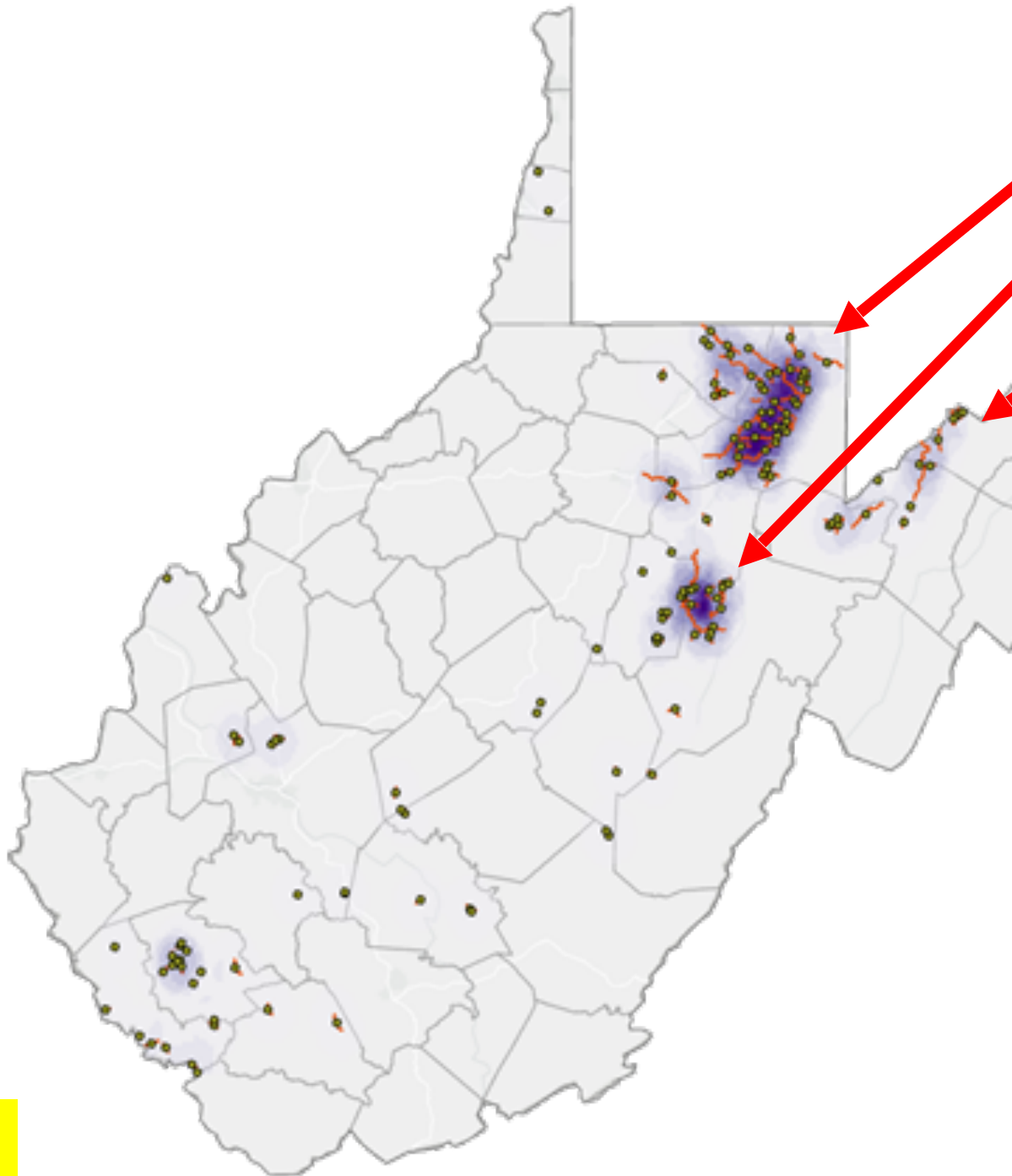


Fish Data from only 2 streams in 2025:
Cranes Nest River, South Fork Pound
River

Stream Miles Impacted									
	1995				2025				IMPROVED
	NO FISH	SOME FISH	TOTAL		NO FISH	SOME FISH	GOOD AQL	TOTAL	NO FISH
OH	258	349	607		130	477		607	-50%
PA	1714	1525	3239						
WV	592	548	1140		239	626	275	1140	-60%
VA	17	0	17		2 of 9 streams NOW have fish. Miles not calculated				
MD	42	110	152		Minus 120				

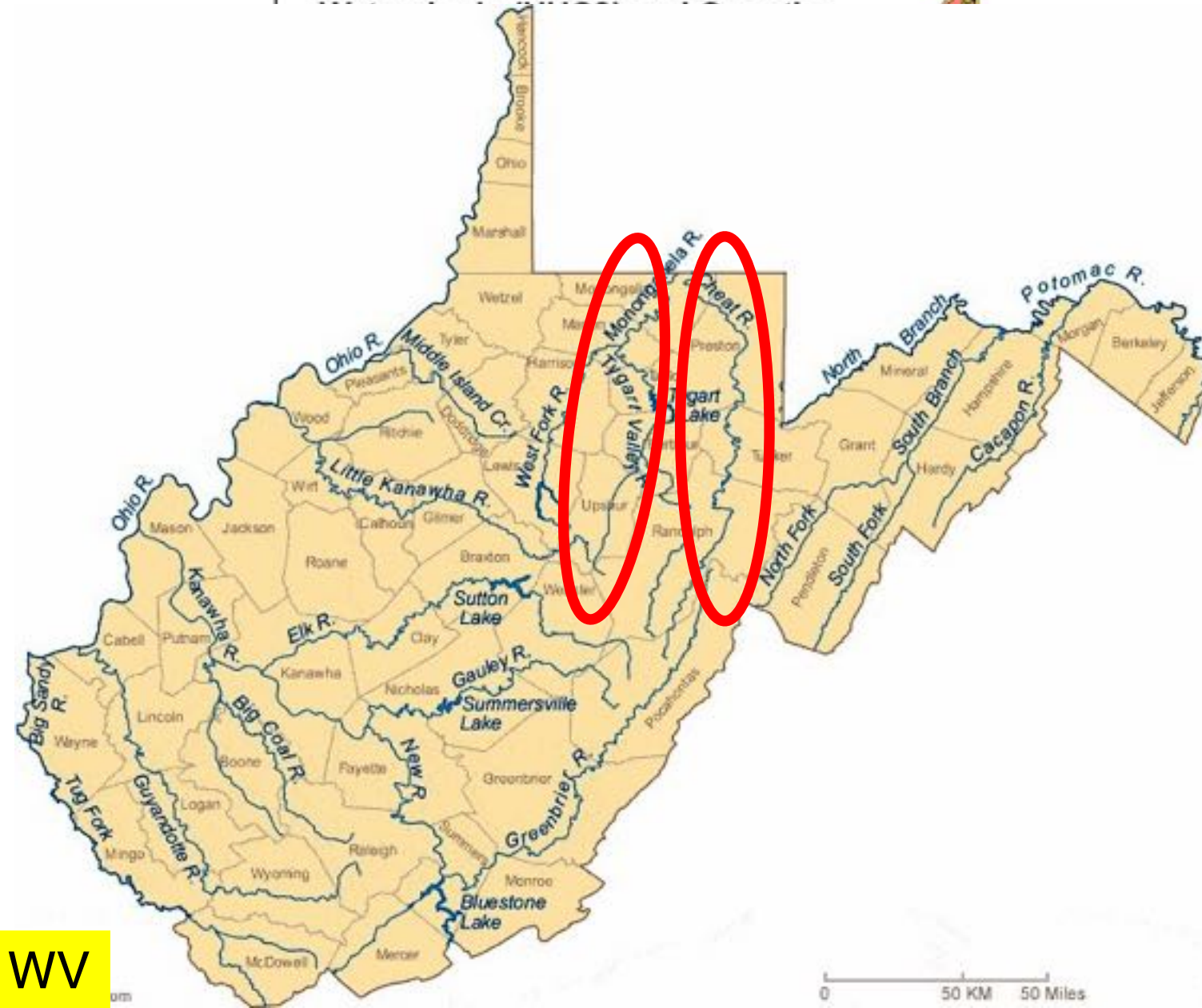
need BPJ of
 MD
 PA
 VA
 Fish Biologists

Monongahela River Cheat River Tygart River Tlibs of South. Fk. Potomac

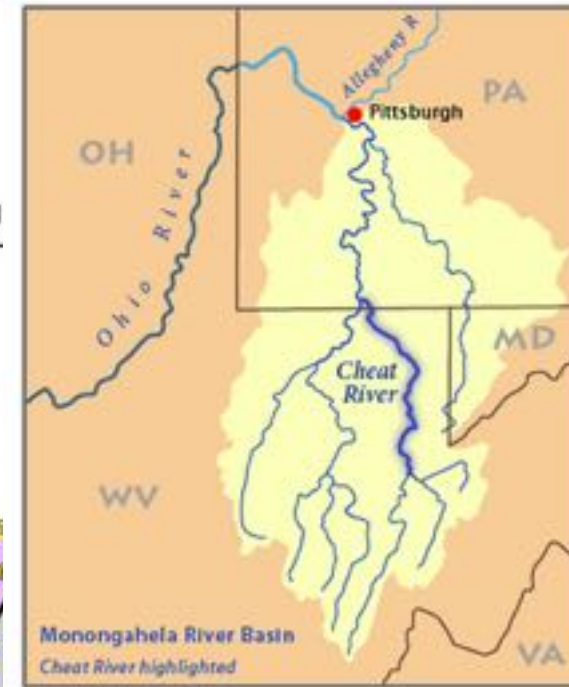


113	Trace Fork	West Virgini Logan County	37.81409001	-82.06782569
114	Tug Fork	West Virgini Mingo County, Buchanan County	37.51463108	-81.93943515
115	Tupper Creek	West Virgini Kanawha County	38.50182133	-81.64495017
116	Turkey Creek	West Virgini Webster County	38.41002686	-80.35558828
117	Unnamed Beaver Creek Tributary	West Virgini Randolph County	38.96204144	-79.93079229
118	Unnamed Buckhannon River Tributary	West Virgini Upshur County	38.80800941	-80.1996893
119	Unnamed Left Fork Sandy Creek Tributary	West Virgini Preston County	39.28328516	-79.80127162
120	Unnamed Little Birch River Tributary	West Virgini Braxton County	38.5826557	-80.65624341
121	Unnamed Middle Fork River Tributary	West Virgini Barbour County, Randolph County	38.94359773	-80.07090921
122	Unnamed Panther Run Tributary	West Virgini Randolph County	38.8186199	-79.99959097
123	Unnamed Right Fork Tenmile Creek Tributary	West Virgini Upshur County	38.85923094	-80.17970893
124	Unnamed Squires Creek Tributary	West Virgini Preston County	39.46522092	-79.77049182
125	Unnamed Tributary of Glade Run	West Virgini Preston County	39.58230893	-79.64002104
126	Unnamed Tributary of Gum Run	West Virgini Upshur County	38.92716563	-80.1106718
127	Unnamed Tributary of Left Fork Little Sandy C	West Virgini Preston County	39.37663881	-79.74860993
128	Unnamed Tributary of Left Fork Sandy Creek	West Virgini Preston County	39.30060131	-79.78437565
129	Unnamed Tributary of Lick Run	West Virgini Preston County	39.42357635	-79.7501548
130	Unnamed Tributary of Manns Creek	West Virgini Fayette County	37.99252301	-80.90331268
131	Unnamed Tributary of Middle Wheeling Cree	West Virgini Ohio County	40.05037828	-80.61039402
132	Unnamed Tributary of Pringle Run	West Virgini Preston County	39.39750099	-79.74813588
133	Unnamed Tygart Valley River Tributary	West Virgini Randolph County	38.95192428	-79.95209424
134	Unnamed West Fork Twelvepole Creek Tribut	West Virgini Mingo County	37.8893324	-82.2506152
135	Waddles Run	West Virgini Ohio County	40.16298786	-80.64844086
136	Wades Run	West Virgini Monongalia County	39.67446608	-80.02090286
137	Webster Run	West Virgini Preston County	39.63314848	-79.66402635
138	West Branch Simpson Creek	West Virgini Barbour County	39.21966007	-80.14854218
139	West Run	West Virgini Monongalia County	39.66051783	-79.93500483
140	White Oak Run	West Virgini Randolph County, Upshur County	38.94044649	-80.10197391
141	Wolf Creek	West Virgini Fayette County	38.02916187	-81.09276508
142				
143				

WEST VIRGINIA



0 1



Watershed Groupings

USGS Hydrologic Unit Code (HUC8)
and DEP Watershed Name

County

A 5020004 Cheat
2070007 Shenandoah Jefferson
2070006 Shenandoah Hardy
2070001 S. Br. Potomac
5050006 Upper Kanawha
5030101 Upper Ohio North
5020006 Youghiogheny

B 5050009 Coal
5050007 Elk
5050008 Lower Kanawha
2070002 N. Br. Potomac
5020001 Tygart Valley

C 5050005 Gauley
5070102 Lower Guyandotte
5030201 Middle Ohio North
5030202 Middle Ohio South
2070004 Potomac Drains
5070201 Tug Fork

D 5050003 Greenbrier
2080201 James
5030203 Little Kanawha
5050004 Lower New
5020003 Monongahela
5050002 Upper New

E 5070204 Big Sandy
2070003 Cacapon
5020005 Dunkard
5090101 Lower Ohio
5090102 Twelvepole
5070101 Upper Guyandotte
5030106 Upper Ohio South
5020002 West Fork

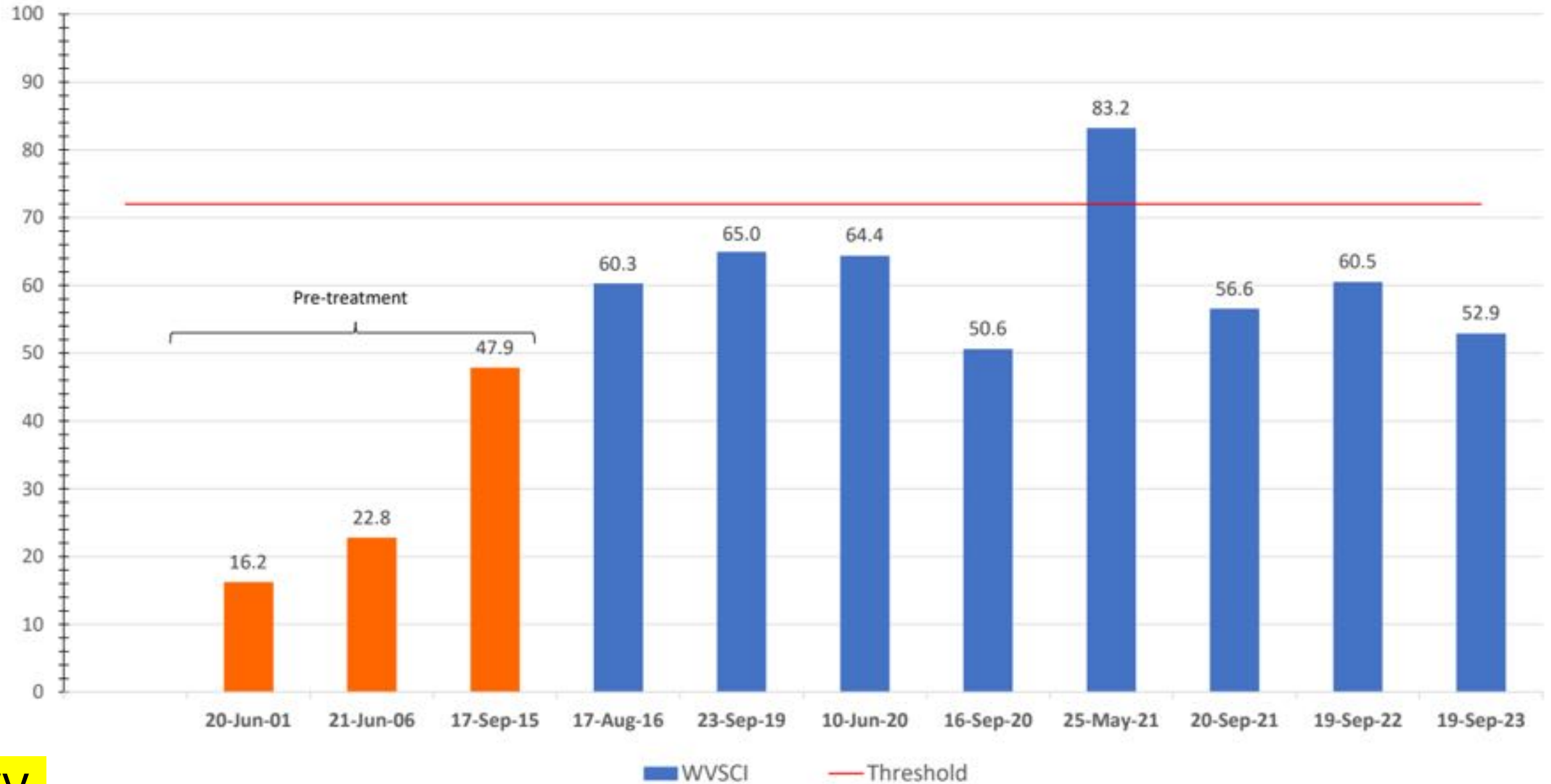
WVDEP – Water Quality Standards and Assessment – Monitoring Unit

Muddy Creek (WVMC-17) Biological Restoration Updates - April 3, 2024

- The WV Stream Condition Index (WVSCI) is an Index of Biotic Integrity (IBI) that summarizes the health of the aquatic life community using samples of benthic macroinvertebrates from riffle/run habitats in streams.
- WVSCI scoring ranges from 0 – 100 with an attainment threshold established at 72.0 based on the 5th percentile of reference samples.
- WVSCI scores have demonstrated significant improvement in biological health when comparing pre- and post-treatment data at stations downstream of the treatment facility (mile point 0.0 and 2.1) on Muddy Creek (WVMC-17).
- At MP 0.0 in May of 2021, the WVSCI score (83.2) exceeded the attainment threshold of 72.0, however three subsequent samples in September 2021, 2022, and 2023 have produced scores below the attainment threshold.
- At MP 2.1 in May of 2021, the WVSCI score (71.2) nearly attained the threshold of 72.0, however three subsequent samples in 2021, 2022, and 2023 have produced scores below the attainment threshold.
- All WVSCI scores from the upstream control station at mile point 4.4 have exceeded the attainment threshold of 72.0, including most recently in the fall of 2023 when two samples were collected.
- New benthic samples from these three stations on Muddy Creek will be collected in September of 2024 by WVDEP Water Quality Standards and Assessment's Monitoring Unit.

WVSCI - Muddy Creek MP 0.0 – Near Mouth Approx 2.8 Miles Downstream of Treatment Facility

WVDEP WQSAS Data

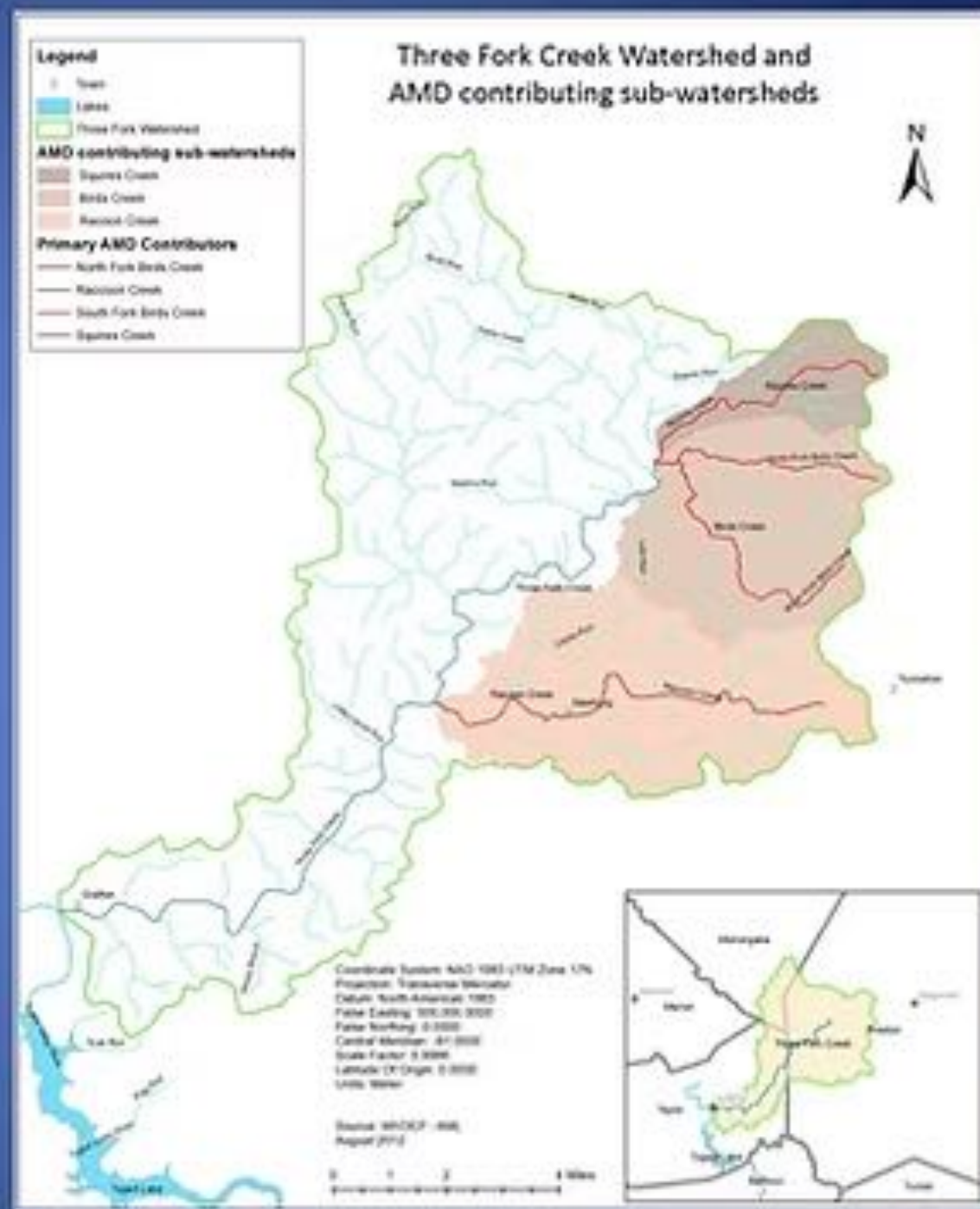


- Significant fish community improvements have been demonstrated downstream of the treatment facility at MP 0.0 when comparing pre- and post-treatment samples – in fact, no fish were observed in 2015 after electrofishing a 300-meter reach.
- Post-treatment surveys at MP 0.0 have produced fifteen species collectively from 2019, 2021, 2023 surveys.
- Although low in abundance, the collection of Mottled Sculpin from MP 0.0 and 2.1 is notable in terms of biological recovery
- Cheat River will also provide recruitment opportunities for species adapted to live in smaller, cooler streams like lower Muddy Creek.

Muddy Creek Fish Community Comparison										
Pre-treatment (2015) vs Post-treatment (2019, 2021, 2023)										
WVDEP – WQSAS Data										
Point	MP 0.0 (d.s. treatment)				MP 2.1 (d.s. treatment)			MP 4.4 (u.s. treatment)		
Sample Year	2015	2019	2021	2023	2019	2021	2023	2015	2019	2023
Brook Trout			1			2				
Brook Trout								6	1	3
Rock Chub					10	4	15	301	191	133
Green Sunfish		3	12	4	12	11	7			
Greenside Darter				1						
Longnose Dace				3				26	27	3
Mottled Sculpin	No	1	1		3		1	225	653	340
Rainbow Trout	Fish				1	1	1		2	12
River Chub	Observed	111	77	83						
Rock Bass	in 300 Meter	2		4						
Rosyface Shiner	Sample	10	38	19						
Rosyside Dace	Reach	1	1							
Smallmouth Bass		12	9	12						
White Shiner		1								
Brook Cat		2		8						
Brook Trout			6							
Western Blacknose Dace			4			2		461	485	310
White Sucker								22	82	37
Yellow Bullhead			1							
Total Species	0	9	10	8	4	5	4	6	7	7
Total Collected	0	143	150	134	26	20	24	1041	1441	838
Fish per meter	0.00	0.18	0.50	0.45	0.09	0.07	0.08	3.47	4.80	2.79

Three Fork Creek Watershed

- Located in Preston, Taylor and Monongalia Counties
- Headwaters predominantly in Preston county
- Drains 103 square miles
- ~20 miles from confluence to mouth
- Flows into the Tygart Valley River of the Monongahela River Basin
- Second Highest Contributor of AMD in the Monongahela River Basin



Three Fork Creek Near Mouth

Prior to Dosing



Since Dosing



W E S T · V I R G I N I A

WILD



LIFE

SEPTEMBER, 1929

The Pollution of Cheat River



DEAD FISH TAKEN FROM CHEAT RIVER
AT ROWLESBURG, W. VA.
AUGUST 27, 1929

Fish Taken from Cheat River at Rowlesburg on August 27th: Second Large Killing by Pollution of the Stream at Up-River Points.

1929 Magazine Cover shows the truckload of fish taken from Cheat River at Rowlesburg – There WERE fish prior to AMD impacts. The Cheat was “RED and DEAD” by the 1950’s

Some highlights for Cheat Lake:

- 1952 to 1977 only 15 fish species, most collected in sheltered embayments with higher pH
- During this time period bullhead catfish and white suckers made up 82% of the collected fish and almost all of the collected fish in the main lake where pH was lower
- Since 2011, we have documented 44 species in Cheat Lake including: 15 species of gamefish, 5 species of native suckers, 10 species of minnows, 6 species of darters, and several other types of fish.
- From 2011-2015 the average annual abundance of fish was 4 times greater than the average annual abundance from 1990-2001
- Since 2005, the average annual abundance of smallmouth bass has been 13 times greater than the average annual abundance from 1990-2001
- Channel Catfish are now the most dominant catfish species in Cheat Lake instead of the acid tolerant bullhead
- Walleye were extirpated from the lake by the late 1940's but have since been reintroduced and are naturally reproducing in the lake and in the river upstream
- No pH depressions less than 6.0 have been detected at the head of the lake since 2011

Tygart and Mon River similar stories to Cheat watershed. Improved water quality, specifically pH. Used to be dominated by bullhead catfish. Now support multiple species of naturally reproducing game fish and non-game fish, including good populations of Walleye and Smallmouth Bass. Both Cheat and Tygart rivers are high density smallmouth bass rivers which would not be possible without the improved water quality.

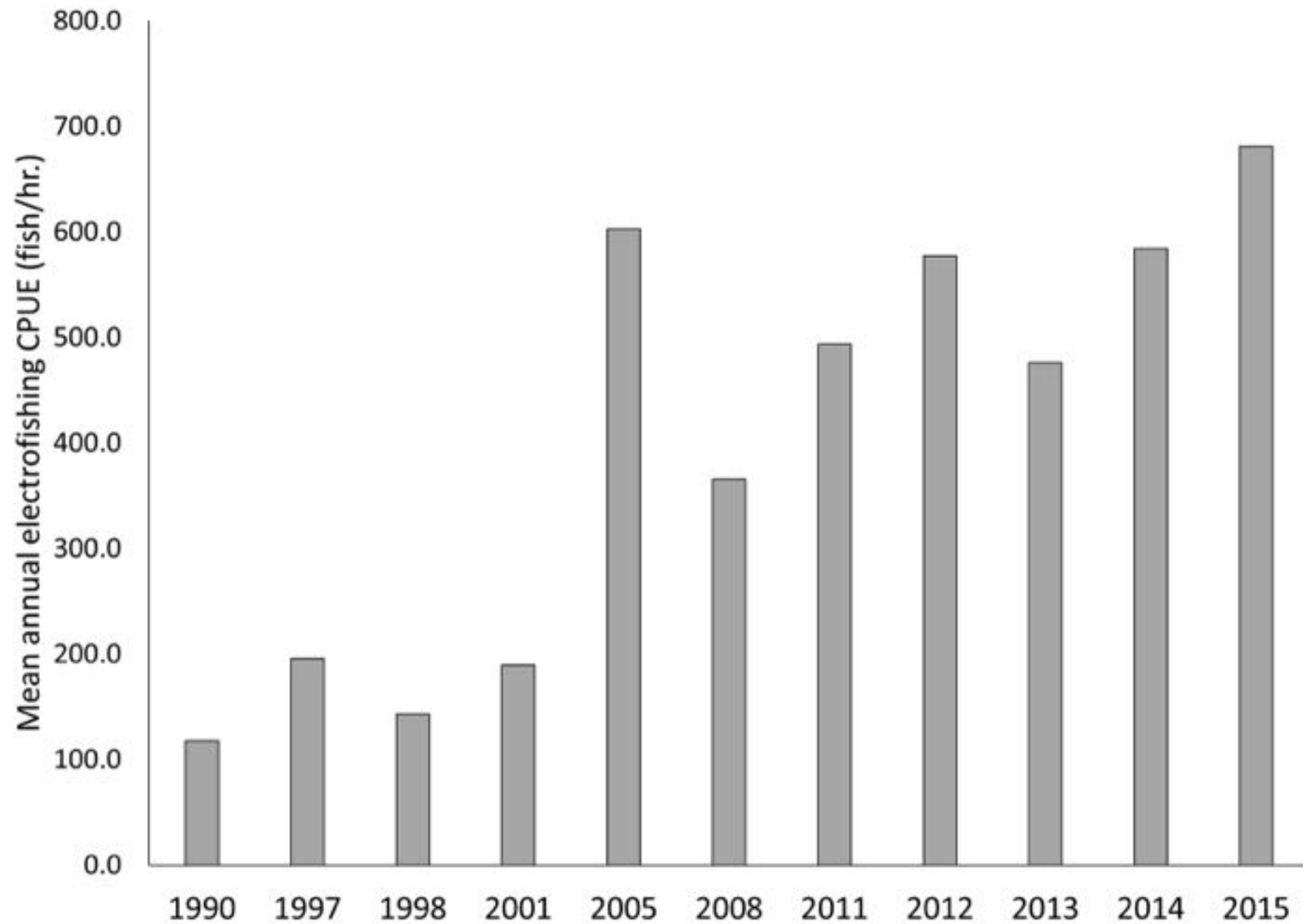


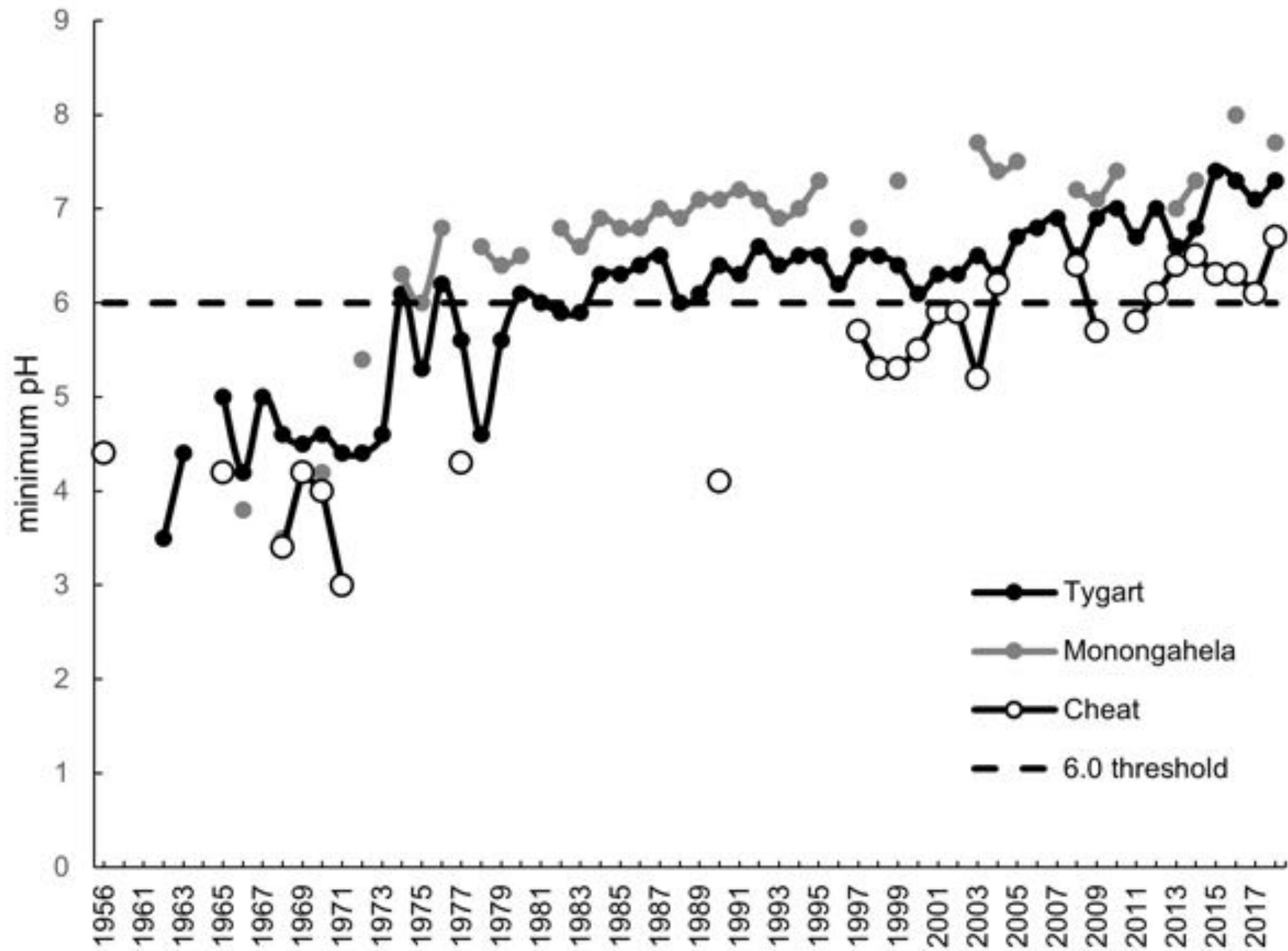
Recent
capture of
Smallmouth in
Cheat by WV
DNR's Dave
Wellman and
Dustin Smith

Recent Cheat
Lake 32"
Walleye
By WV DNR's
Dustin Smith

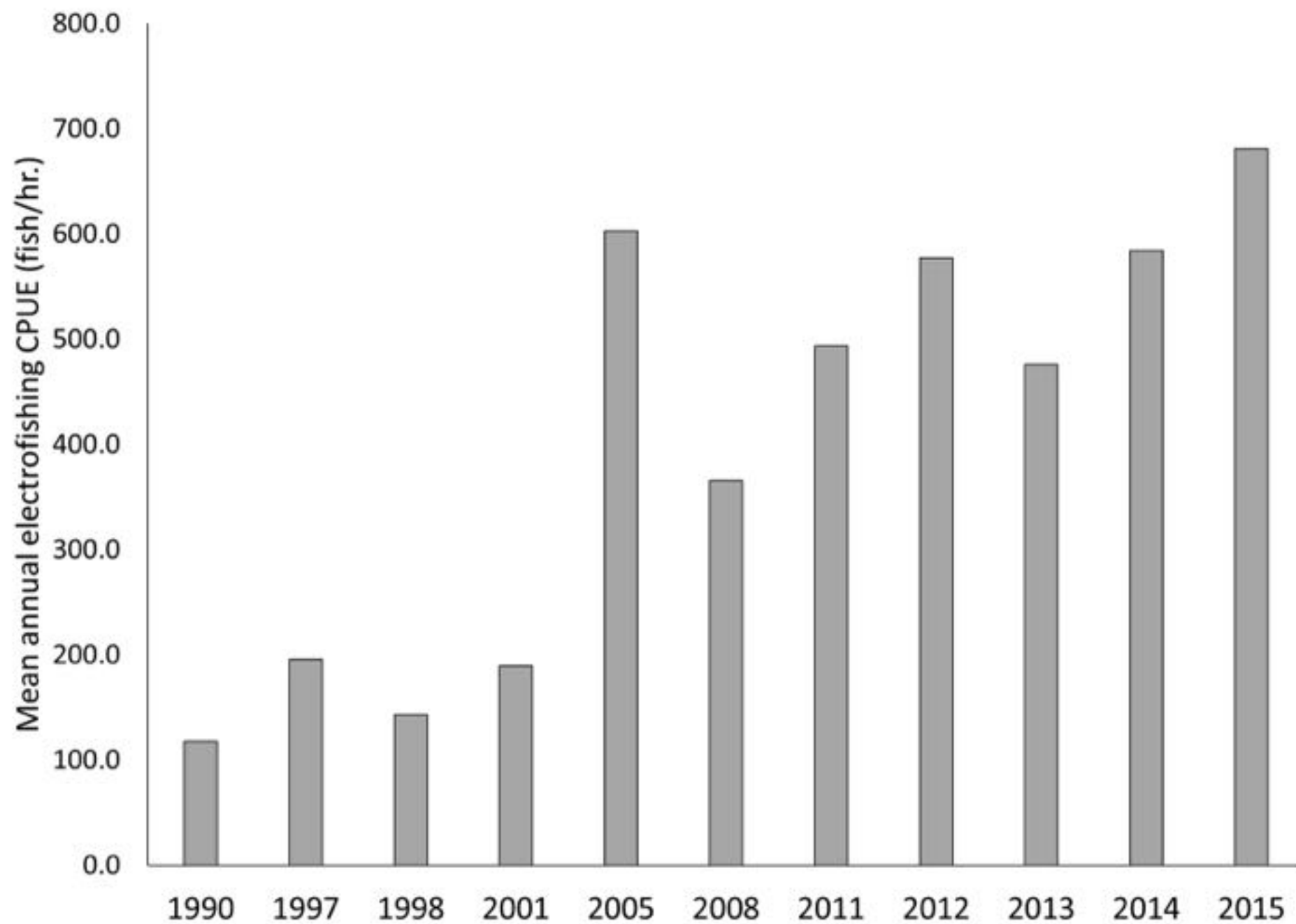


Total Fish Relative Abundance





Total Fish Relative Abundance



Elsewhere in TN
AMD-impacted streams:
SF Cumberland,
Obey,
Caney Fork,
Collins,
Upper Clinch,
Emory,
Lower TN
watersheds.

Ocoee River at
Copperhill, Tennessee
1950 photo by TVA
2007 by Ben Faulkner



Georgia, agencies join battle against E. coli in Ocoee

Multiple agencies and two states are joining forces to attack the E. coli problem on the Ocoee River. At a meeting last week, two officials from the Georgia Department of Natural Resources joined officials from Tennessee, Polk County, TVA and the Forest Service to develop a strategy to identify and put a stop to the source of the spikes of E. coli that have been found in the river and tributaries this year.

Richard Urban with the Tennessee Department of Environment & Conservation. He said he was pleased with the spirit of cooperation at the meeting.

Urban said last week's meeting was a good start, with all participants realizing the significance of the problem and the fact they all need to be as proactive as possible. A number of efforts will be made.

Sheriff Bill Davis said his office

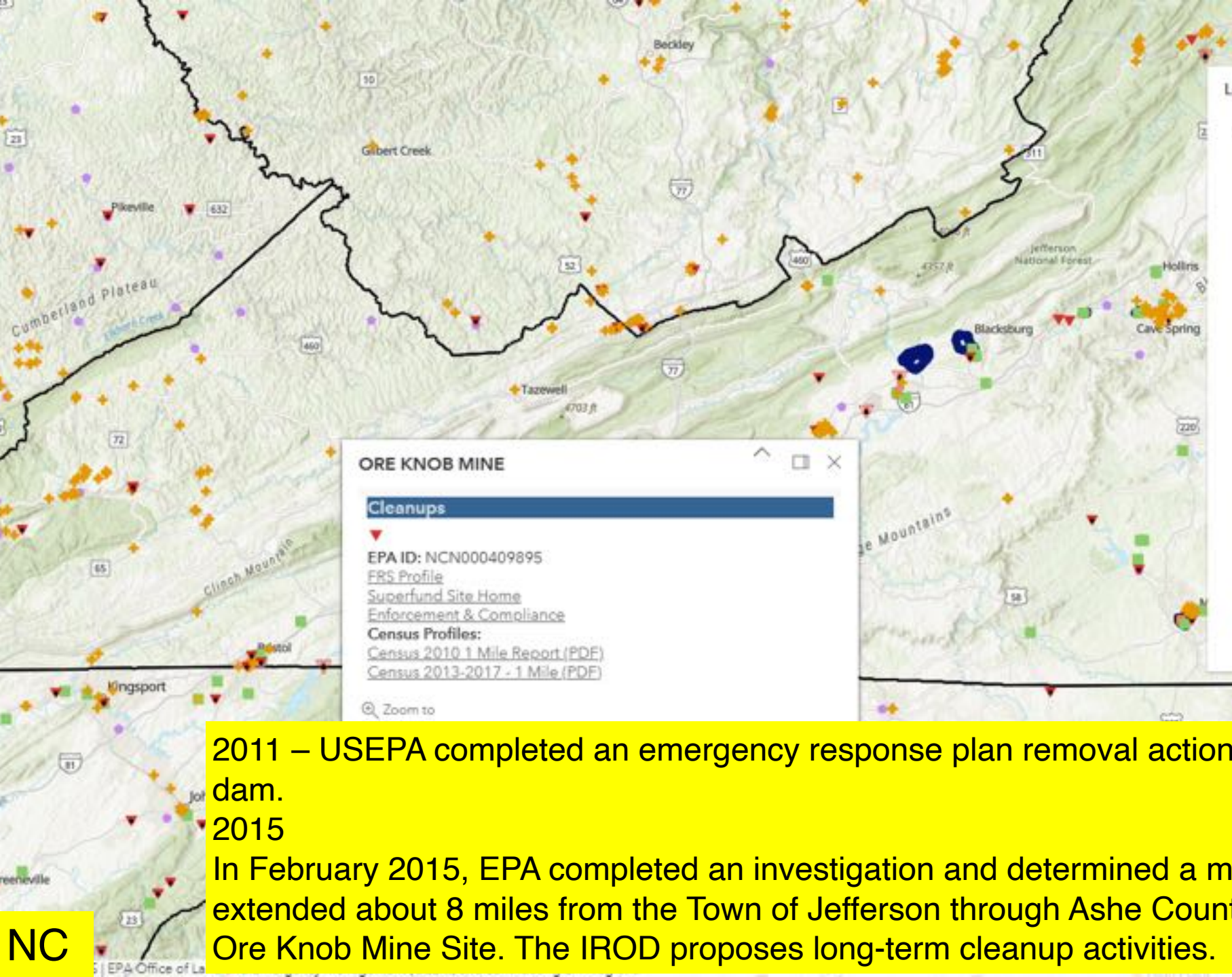
will move forward with a complete assessment of locations where they have sanitary facilities to be sure there are no leaks. While no problems are suspected here, they plan to do testing to confirm that.

Georgia officials agreed to be cooperative in providing information they have available and will be looking at facilities upstream of McCaysville.

E. coli - (Continued from page 1)

share anything they find so there be no misconceptions that nothing is being done.

W.R. (Rusty) Kestle with the Georgia DNR said his office is checking out for possible sources on the Georgia side of the river. He added they have just b



The Ore Knob Mine Superfund site is located approximately 12 miles south of the Virginia state line, 45 miles southeast of Bristol, Tennessee, and eight miles east of Jefferson, North Carolina. The area hosted intermittent mining of copper ore from the 1850s through 1962, with most mining occurring from 1873 to 1883 and from 1957 to 1962. The site includes three principal areas and several downstream areas. National Priorities List

2011 – USEPA completed an emergency response plan removal action to stabilize the impoundment dam.

2015

In February 2015, EPA completed an investigation and determined a municipal water line will be extended about 8 miles from the Town of Jefferson through Ashe County to affected residents near the Ore Knob Mine Site. The IROD proposes long-term cleanup activities.

Stream Miles Impacted									
	1995				2025				IMPROVED
	NO FISH	SOME FISH	TOTAL		NO FISH	SOME FISH	GOOD AQL	TOTAL	NO FISH
OH	258	349	607		130	477		607	-50%
PA	1714	1525	3239						
VW	592	548	1140		239	626	275	1140	-60%
VA	17	0	17		2 of 9 streams NOW have fish. Miles not calculated				
MD	42	110	152		Minus 120				
KY	?	?	?						
TN	?	?	?						
AL	?	?	?						
L	?	?	?						
IN	?	?	?						
TOTAL	2519	2596	5115						

For the Fish...

I thank these good folks:

Authors	Position	form
Frank Borsuk	USEPA Wheeling Office	Personal Communication
Jeff Calhoun	Ohio Department of Natural Resources, Division of Mineral Resources Management	Personal Communication
Martin Christ	WVDEP Environmental Resources Specialist 2, Division of Water and Waste Management, - Watershed Improvement Branch Fairmont	Personal Communication
Joseph Cocco	Pennsylvania Department of Environmental Protection I Bureau of Abandoned Mine Reclamation	Personal Communication
Jacob Culp	Environmental Biologist Supervisor, Kentucky Division of Water, Water Quality Branch, Monitoring Section	Personal Communication
James Gusek	WVMDTaskForce.com Resources - ResearchGate accessed 2025-04	web access
Jason Hill	Virginia Department of Environmental Quality. Water Monitoring and Assessment Manager	Personal Communication
Michael Lookenbill	Pennsylvania Department of Environmental Protection, Bureau of Clean Water, Env. Program Manager, Water Quality Division	Personal Communication
Megan Maggard	WVDEP Technical Analyst Associate, Division of Water and Waste Management DWWM-WQSAS Mon. Unit	Personal Communication
Maria Morresi	USEPA GIS Analyst US EPA Mid-Atlantic Region Applied Science & Quality Assurance Branch (3LS10)	Personal Communication
Dan Murray	Tennessee Department of Environment and Conservation, Division Of Mineral and Geologic Resources	Personal Communication
Mindy Neil	Assistant Director, WVDEP-DWWM, Water Quality Standards and Assessment Section	Personal Communication
Ryan Pack	WVDEP Environmental Resources Program Manager 2, Division of Water and Waste Management DWWM-WQSAS Mon. Unit	Personal Communication
Rob Rice	WVDEP Deputy Cabinet Secretary, DLR & HSER	Personal Communication
Erik Schafer	Natural Resource Planner IV, Maryland Dept. of the Environment, Land & Minerals AML Division	Personal Communication
Terry Schmidt	EarthRes, a Division of RESPEC	Personal Communication
Mel Shafer	Water Research Scientist, West Virginia Water Research Institute, West Virginia University	Personal Communication
Kaabe Shaw	Ohio Department of Natural Resources, Division of Mineral Resources Management	Personal Communication
Dustin Smith	WV DNR Distct 1 Fish Biologist	Personal Communication
Dustin Smith	Evaluation of a Re-established Walley Population within a Hydropower Reservoir Recovering from Acidification - 2018	WVU Ph.D Dissertation
Dustin Smith	North American Journal of Fisheries Management. 2022 American Fisheries Society. ISSN:1548-8675 online	Journal Article
David Thome	WV DNR Elkins Fish Biologist	Personal Communication
Dave Turner	Tennessee Department of Environment and Conservation, retired	Personal Communication
Dave Wellman	WV DNR Distct 1 Fish Biologist	Personal Communication
Authors	WVMDTaskForce.com Symposium - Past Symposium Proceedings accessed 2025-04	web access