Evaluating 20 years of passive AMD treatment projects in WV

Rachel Spirnak
Water Research Project Manager
West Virginia Water Research Institute

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WEST VIRGINIA WATER RESEARCH INSTITUTE

About WVWRI

- Serves as a statewide vehicle for performing research related to water issues since 1967
- The USGS-supported Water Resources Research Institute for West Virginia
- Housed at West Virginia University in Morgantown, WV
- Programs include the National Mine Land Reclamation Center, Three Rivers QUEST (3RQ), and more

National Mine Land Reclamation Center (NMLRC)

- Program within WVWRI
- Partner with local watershed groups to complete AMD remediation projects
- Early development and testing of AMD treatment methods
  - Alkaline amendment, passive treatment, coal ash and steel slag applications
- Other research has included biofuel production on reclaimed lands, AMD waste products as soil amendments, and more

Agenda

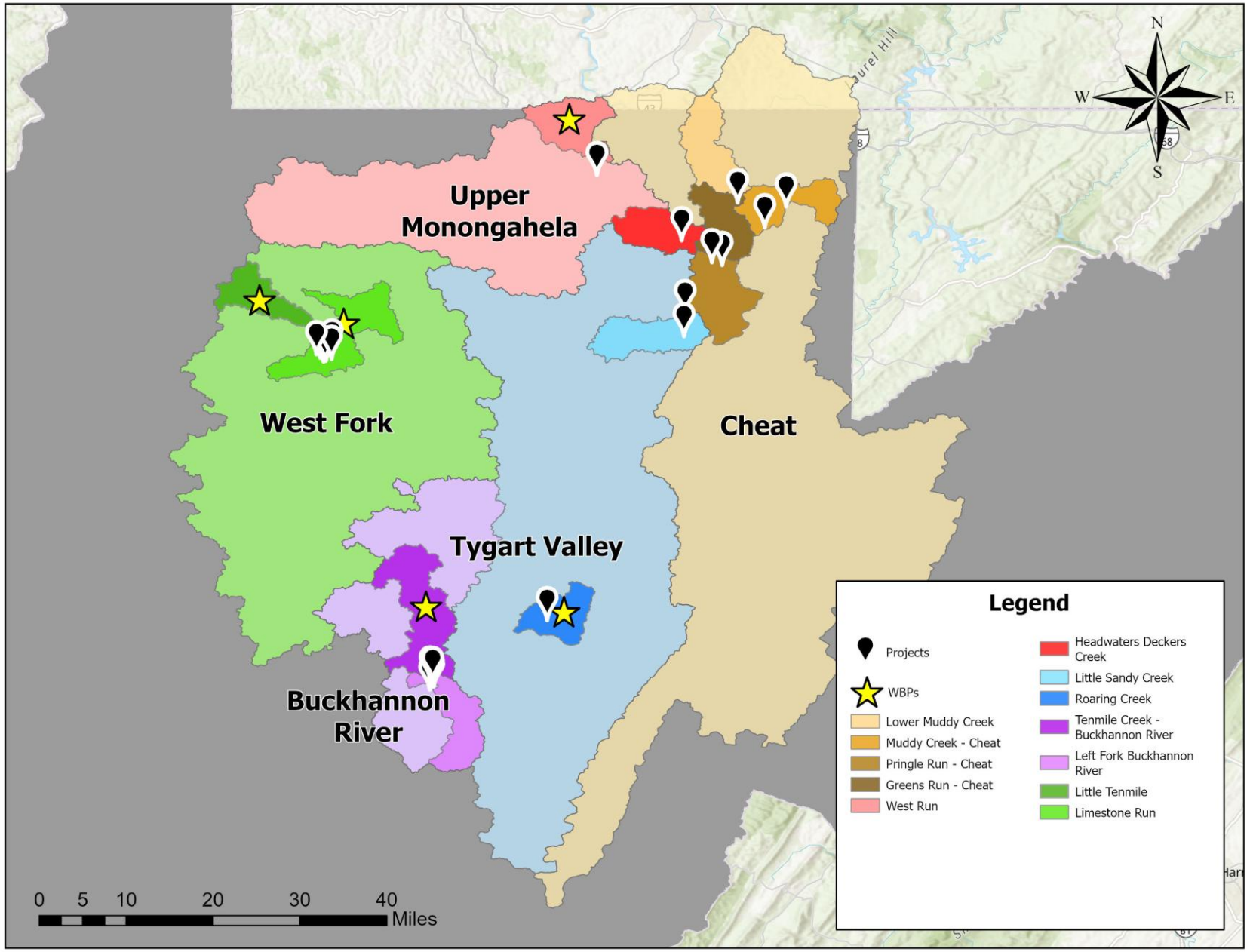

AMD Projects Portfolio
Successes
Challenges
Recommendations

AMD Remediation Projects at a Glance

- **44** completed projects since **2003**
  - **33** construction projects
  - **3** engineering projects
  - **5** Watershed Based Plans
  - **3** 'other' (biological assessments, etc)
- In partnership with **6** watershed groups

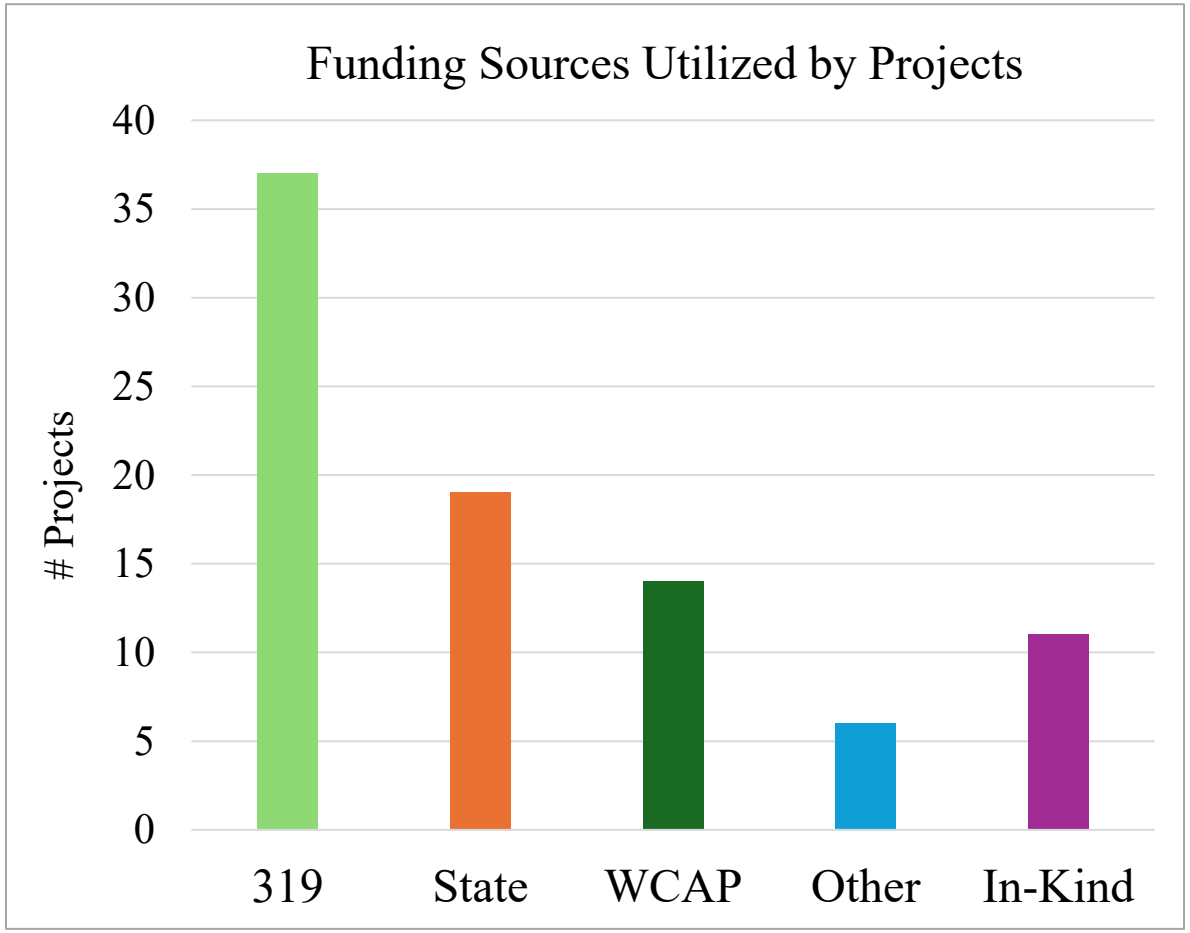
Geographic Reach

- **24** total treatment systems constructed
  - Of those, 11 required multiple phases
- **5** Watershed Based Plans developed



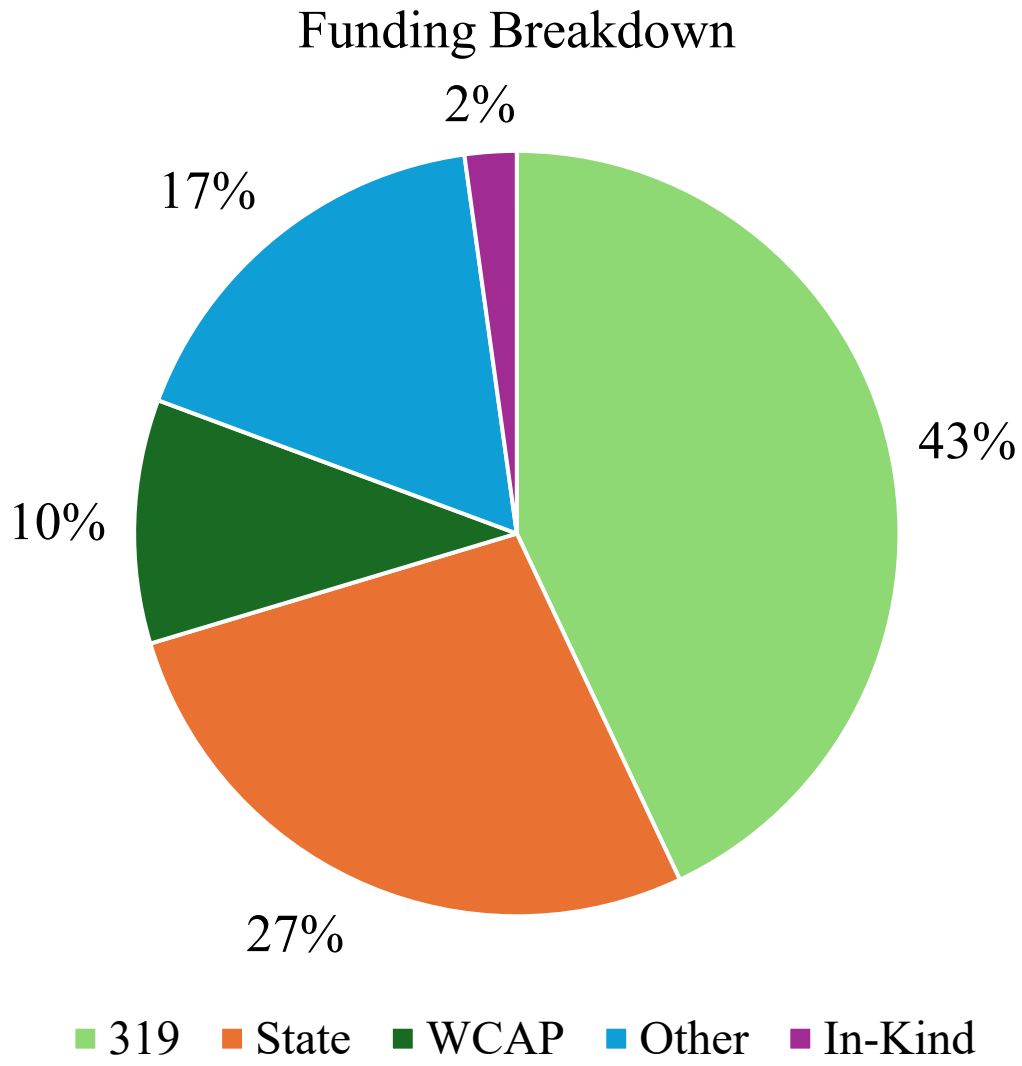
Project Funding

- Most used a combination
  - §319 program requires 40% match
- State funding included:
  - Stream Restoration Fund
  - Division of Water and Waste Management
  - Department of Land Reclamation
  - Water Quality Management Fund
  - Abandoned Mine Lands
- OSM Watershed Cooperative Agreement Program (WCAP) – only watershed groups are eligible to apply
- Other sources:
  - Appalachian Stewardship Foundation
  - Industry contributions



Project Funding

Funding Source	Funding Received
319	$ 6,176,697
State	$ 3,931,320
WCAP	$ 1,480,109
Other	$ 2,463,885
In-Kind	$ 314,618
Total	**$ 14,366,628**



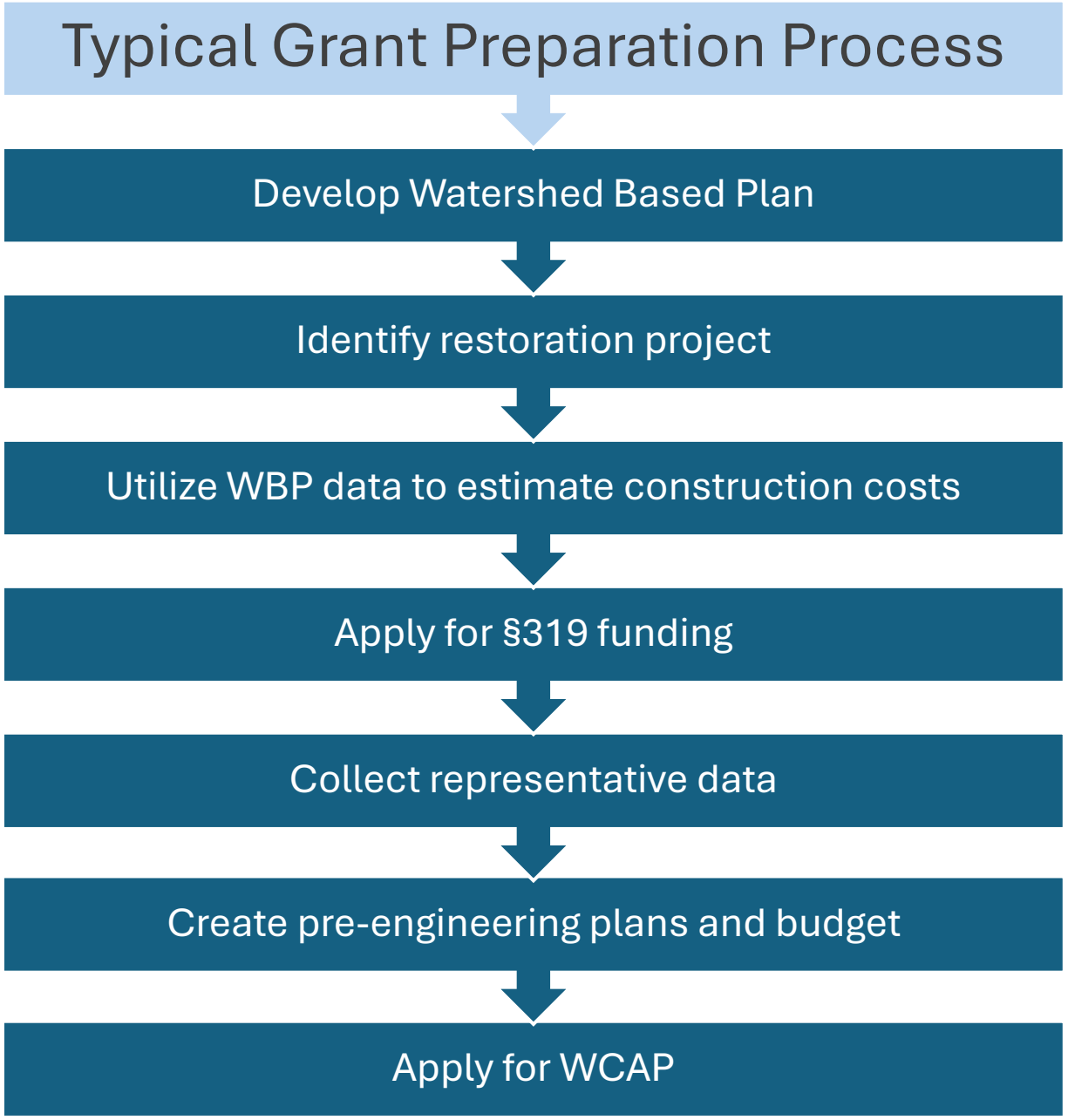
Project Funding: Construction Costs

- Nearly half (42%) of overall funds were used to pay construction contracts
- Average construction cost: approx. $248,000
- Other costs include:
  - Administration & project management
  - Pre- and post- construction monitoring
  - Surveying
  - Engineering
  - Permitting

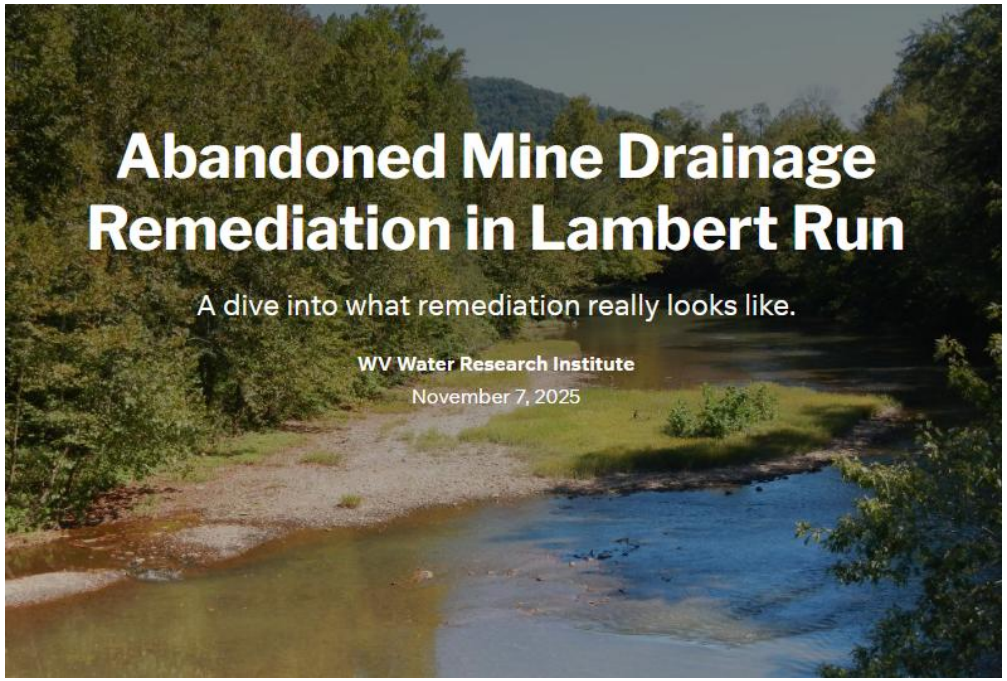

Lambert Run Site 4

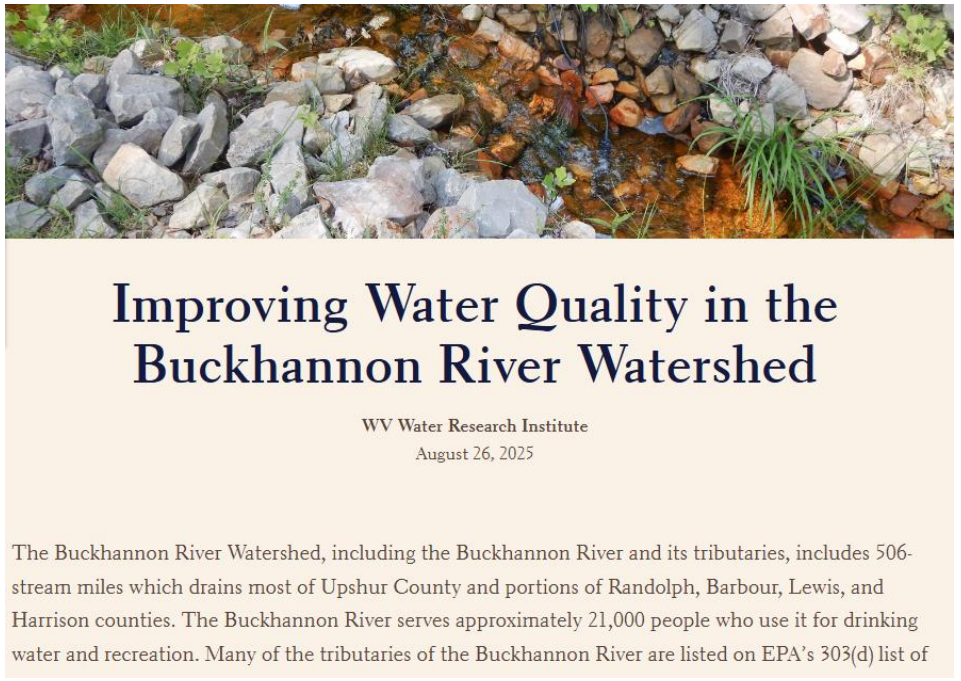
Approach

- Most projects follow at-source approach to watershed restoration:
  - Tackle 1 source at a time
  - Remediation ongoing for 20+ years



Watershed Efforts





Check out our StoryMaps: wwri-wvu.hub.arcgis.com

Lambert Run StoryMap

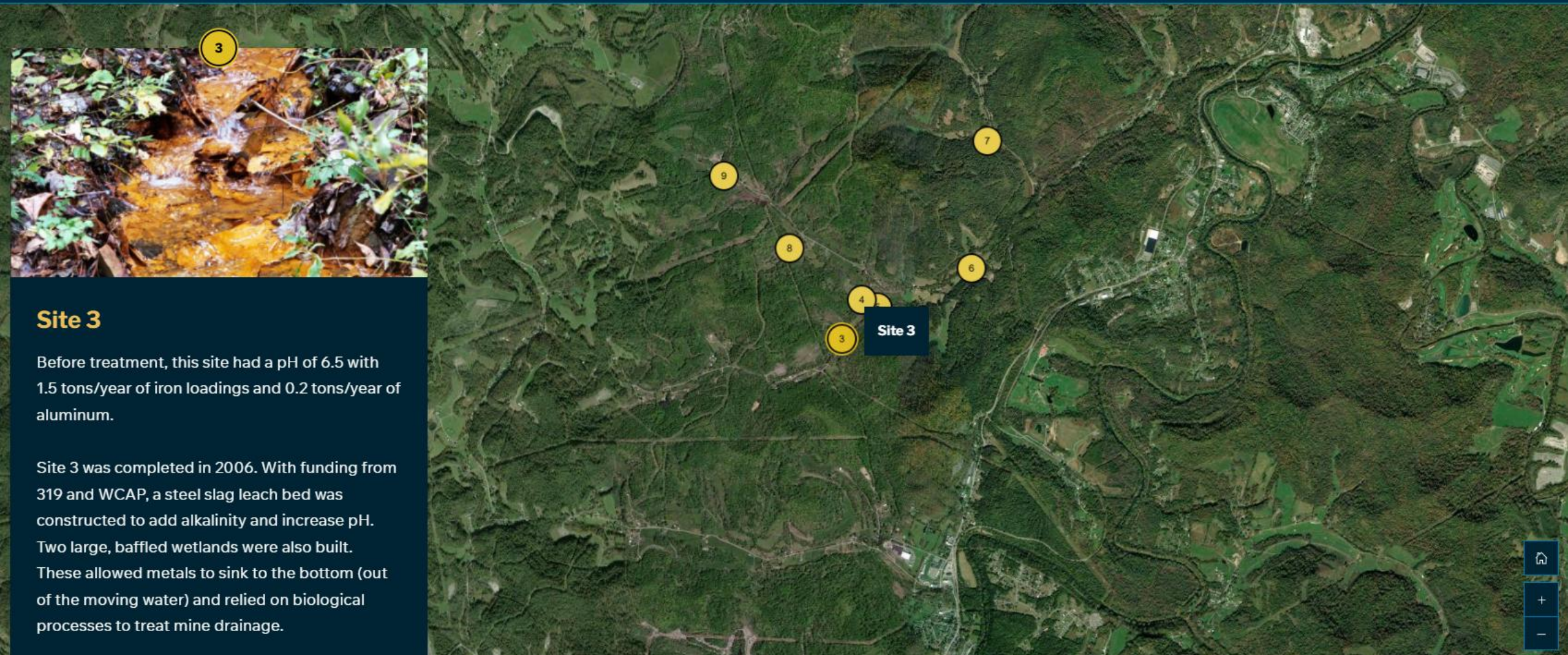
https://storymaps.arcgis.com/stories/8b7c577b35ec440cb3f61f85b8785ece

The Bigger Picture: Abandoned ... | How does AMD Form? | The Impact on Lambert Run | Remediation Efforts in Lambert... | Where we are now and what we p... | What you can do to help | Works Cited

Site 3

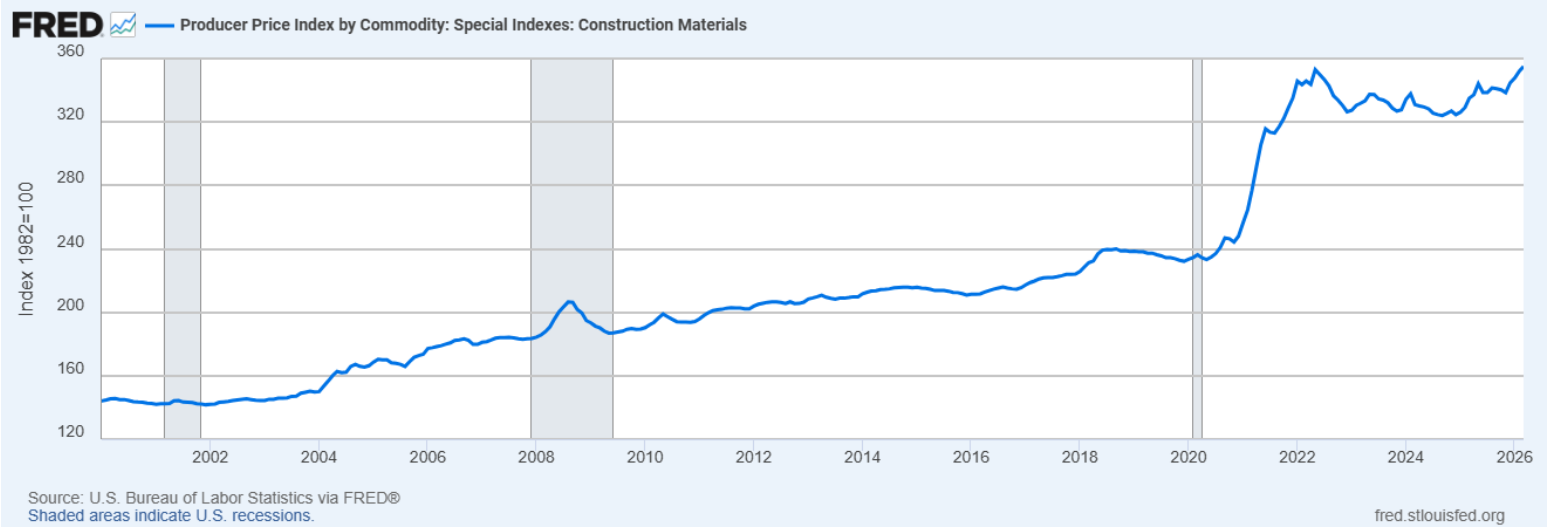
Before treatment, this site had a pH of 6.5 with 1.5 tons/year of iron loadings and 0.2 tons/year of aluminum.

Site 3 was completed in 2006. With funding from 319 and WCAP, a steel slag leach bed was constructed to add alkalinity and increase pH. Two large, baffled wetlands were also built. These allowed metals to sink to the bottom (out of the moving water) and relied on biological processes to treat mine drainage.



Challenges

- Increasing construction costs + Match requirements -> Projects often broken up into phases
- Administrative burden for volunteer-run watershed groups
- Landowner agreements



Challenges: At-source approach

- Takes longer to recover streams
- Some systems need rehabilitation before all sources addressed
- AMD source chemistry, flow, and locations may change after WBP development
- Watershed recovery can be difficult to assess

Recommendations

- Bring engineering in early
- Collect comprehensive data
  - Routine water quality and flow measurements
  - Ferric and ferrous iron tests
  - Settling tests
  - Piezometer may be needed
- Establish landowner incentives and tax breaks
- Utilize watershed-scale approach when possible

Challenges: Operations & Maintenance

- Watershed groups responsible for long-term operations and maintenance
  - Must seek grants for routine monitoring of systems & maintenance
  - Lack of equipment or contractors easily deployed
  - Sludge disposal


Lambert Run Site 8

Recommendations

- Plan ahead for Operations & Maintenance
  - Design for as little maintenance as possible
  - Avoid underground conveyance when possible
  - Utilize practical solutions rather than latest and newest tech
  - Design system with sludge retention ponds


Lambert Run Site 4

Other Initiatives

- Watershed-scale remediation
- Assessing habitats and biological recovery in AMD-remediation streams
- Improving in-stream and riparian habitats post-AMD restoration

Coir logs being installed in Upper Deckers Creek

Acknowledgements

- Buckhannon River Watershed Association
- Guardians of the West Fork
- Friends of the Cheat
- Friends of Deckers Creek
- Save the Tygart Watershed Association
- West Run Watershed Association
- West Virginia Department of Environmental Protection

Questions?

Contact: Rachel.Spirnak@mail.wvu.edu