

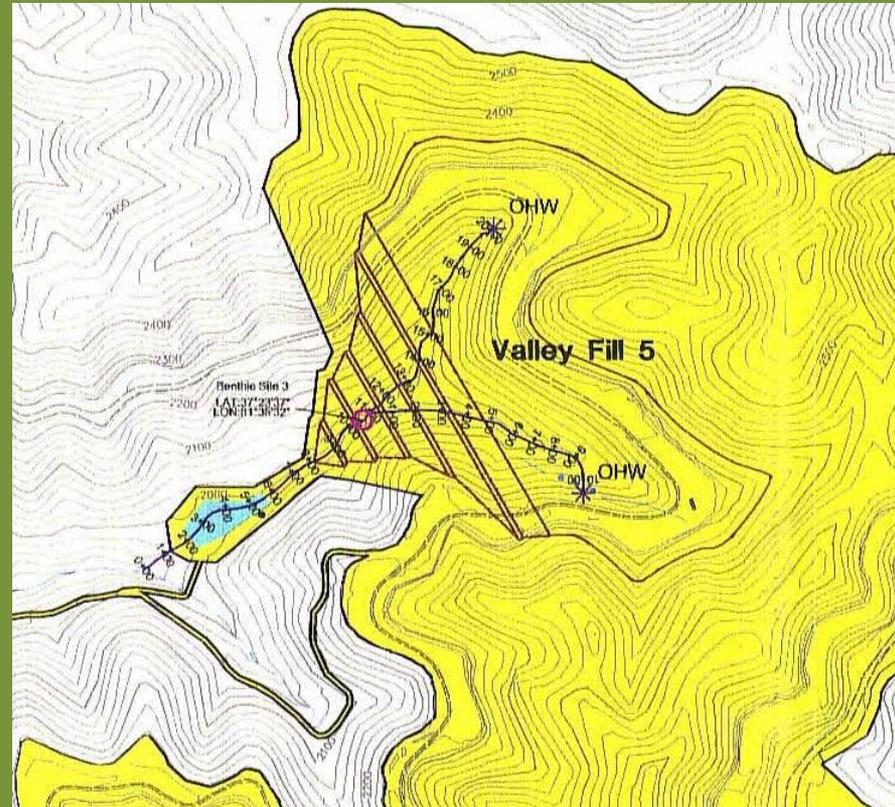


**An interactive spatial  
database of  
compensatory stream  
mitigation projects in  
the southern WV  
coalfields**

**Catherine Artis and J. Todd Petty**

# Legislation

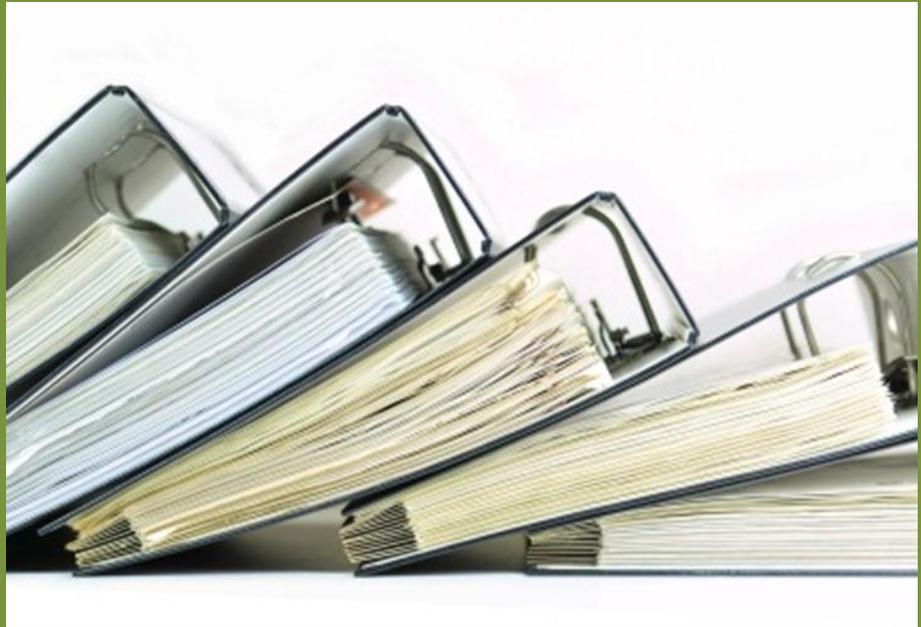
- CWA 404(b)(1): Agencies must consider potential impacts authorized activities could have on stream functions and values
- Compensatory mitigation requirements are then based on expected impacts -Fritz et al. 2010



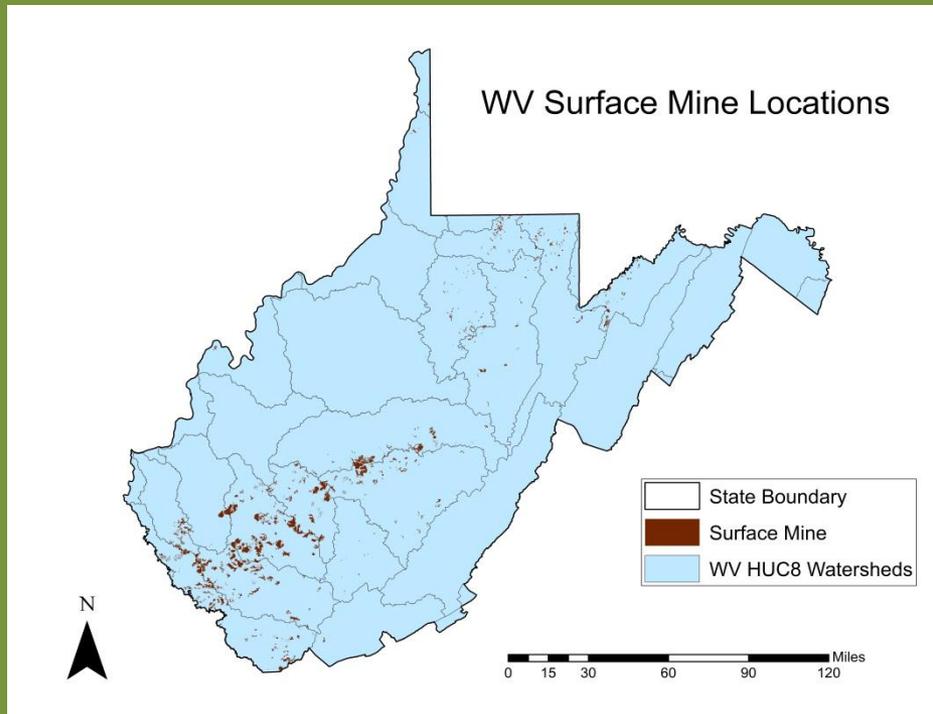
# Permits

- To attain a permit a company must submit a plan showing
  - Impact avoidance
  - Minimize unavoidable impacts
  - Plan to mitigate for unavoidable impacts

*-BenDor et al. 2009*



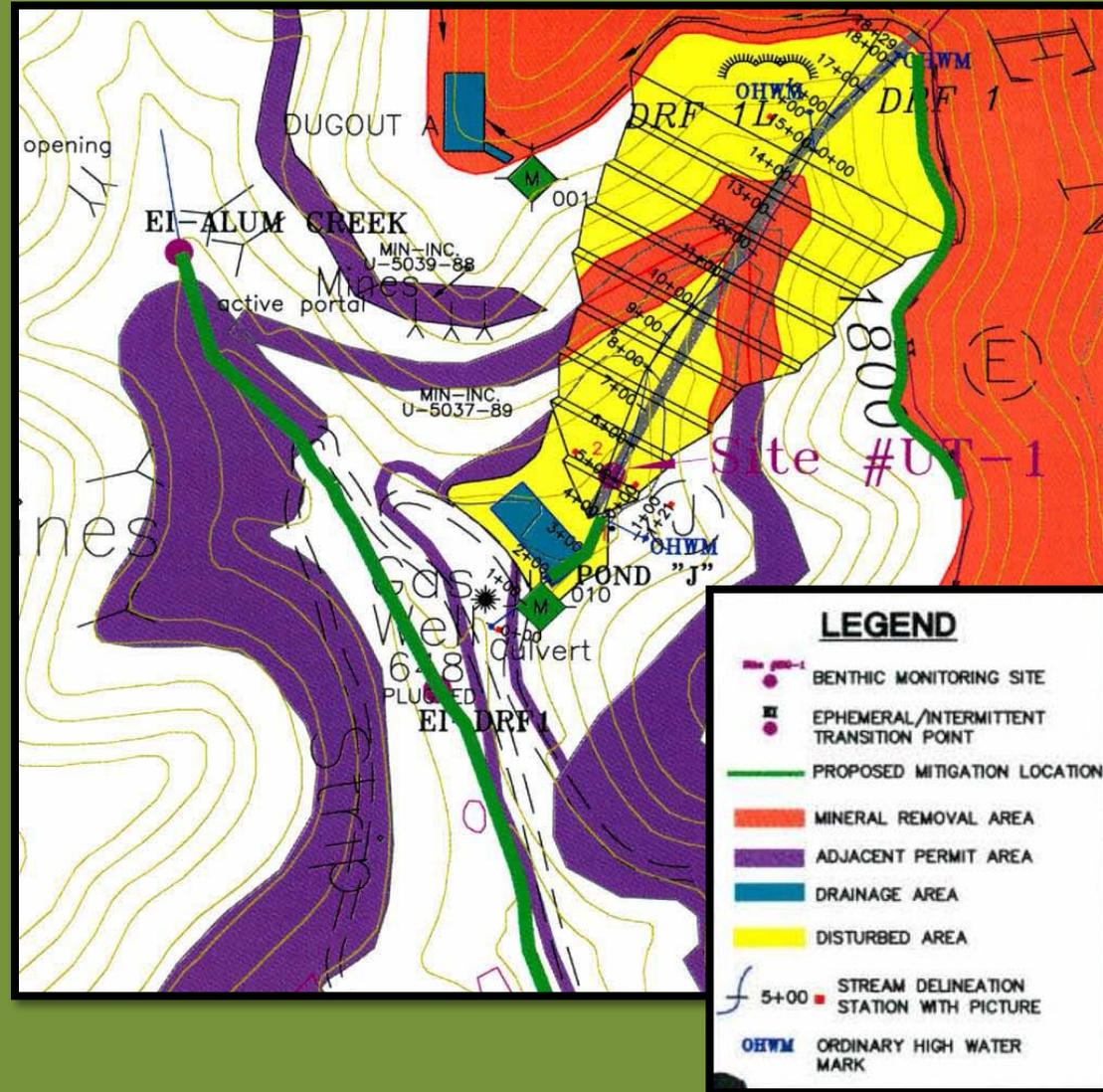
# How did this become a project?



- Many mitigation plans are in hard copy format
- Stream mitigation locations are limited to creators, permitters, and impactors.

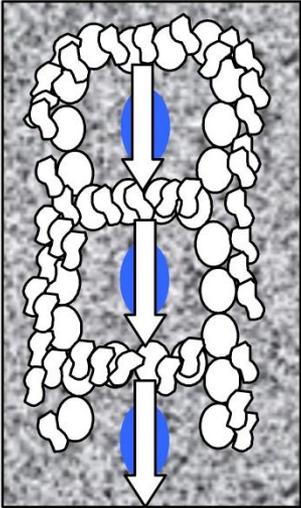
# Compensatory Mitigation Plan

- Expected stream impacts
- Pre-impact stream characteristics
- Pre-mitigation stream characteristics
- Mitigation activities
- Guarantee of mitigation monitoring



# Main Study Objectives

Step-Pool Diagram



Finished A-Type Step-Pools



- Catalog available stream mitigation projects
- Summarize and analyze spatial characteristics
- Examine effectiveness

# Methods

- WV DEP
- Database creation
- Statistical analysis
- ArcGIS



# Findings

## Permanent Impacts

- Valley Fills (76)
- Ponds (6)
- Mine through (12)
- Mine Discharge (1)
- NA (2)

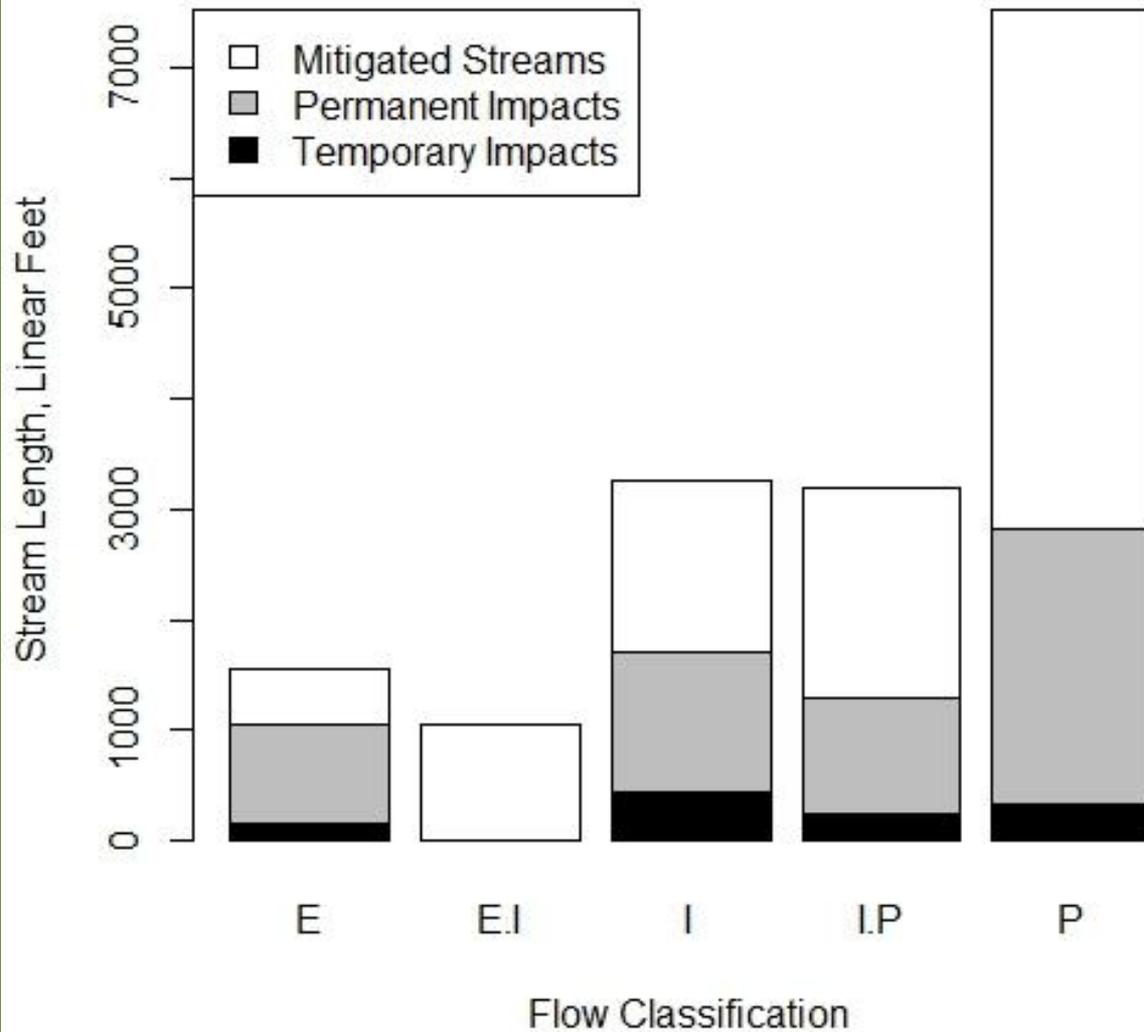
## Temporary Impacts

- Road(4)
- Mine through (14)
- Pond (34)
- Sediment control (2)
- Sediment impact (1)
- Stream Crossing (1)
- NA(5)

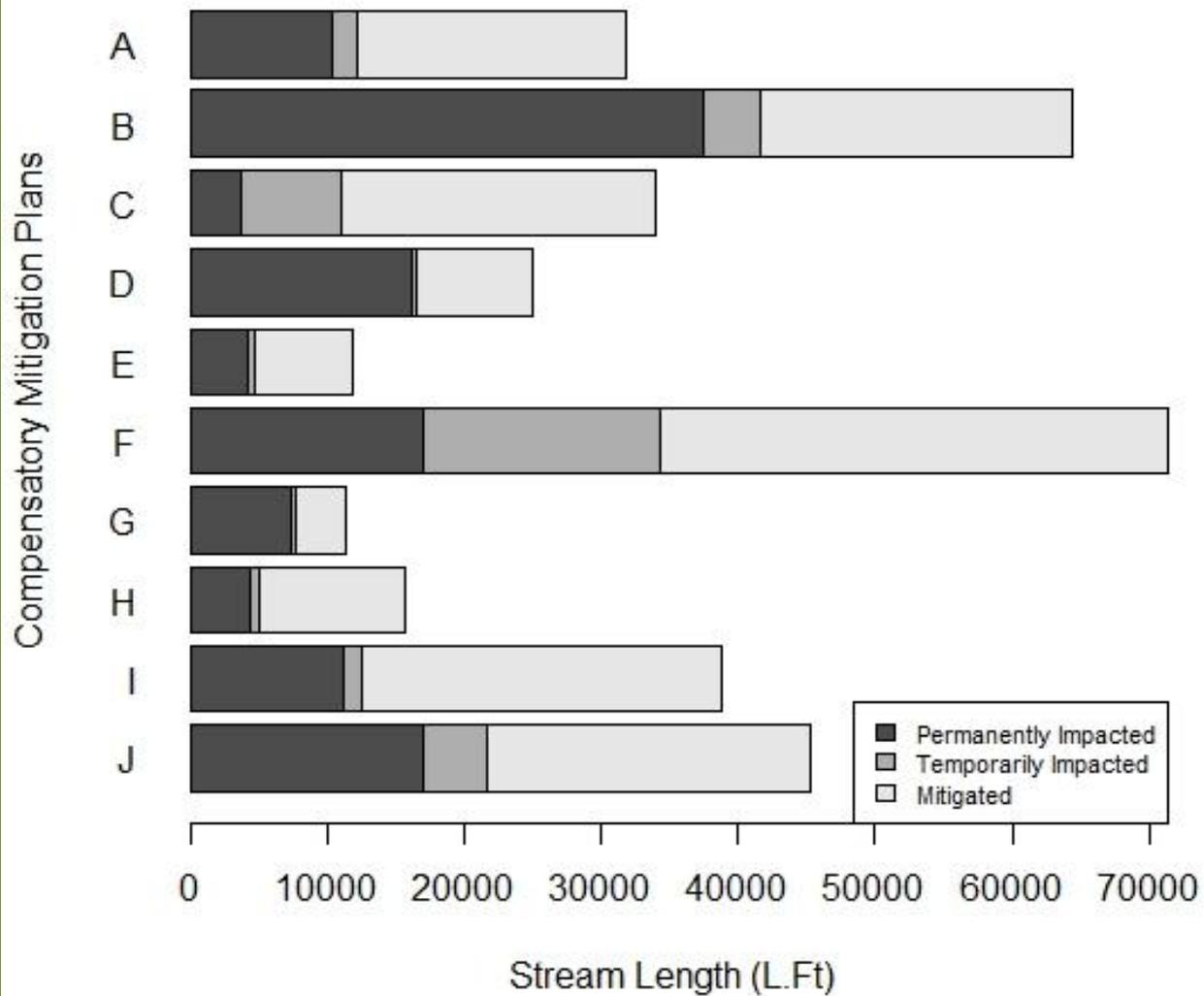
# Mitigation Actions

- Creation
- Enhancement
- pond removal
- Reconnection
- Reconstruction
- Restoration
- restoration/  
enhancement
- restoration/  
reconstruction
- restoration/  
reconstruction or  
enhancement
- restoration/  
rehabilitation
- sediment removal

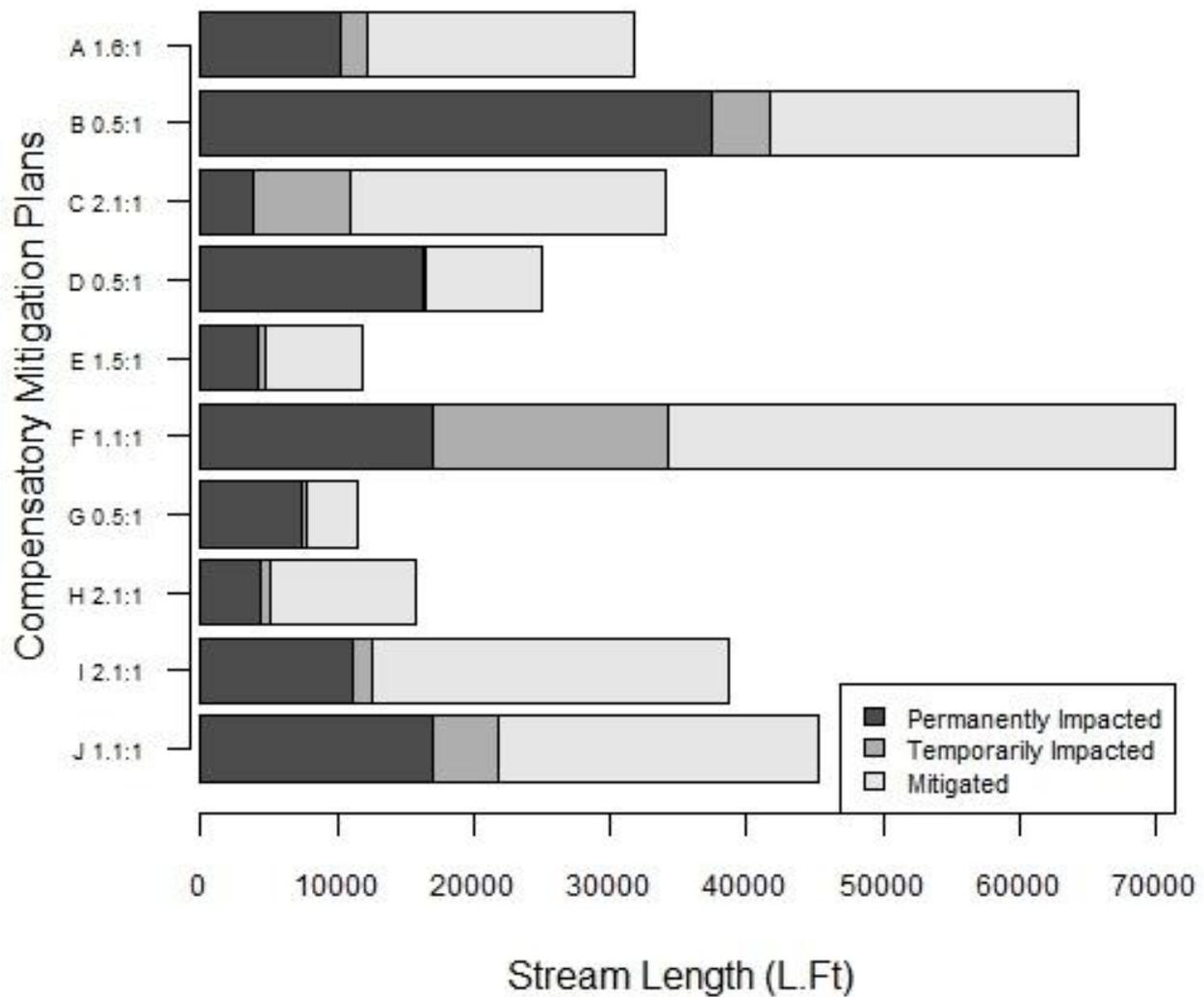
## Mean Stream Length by Classification and Action



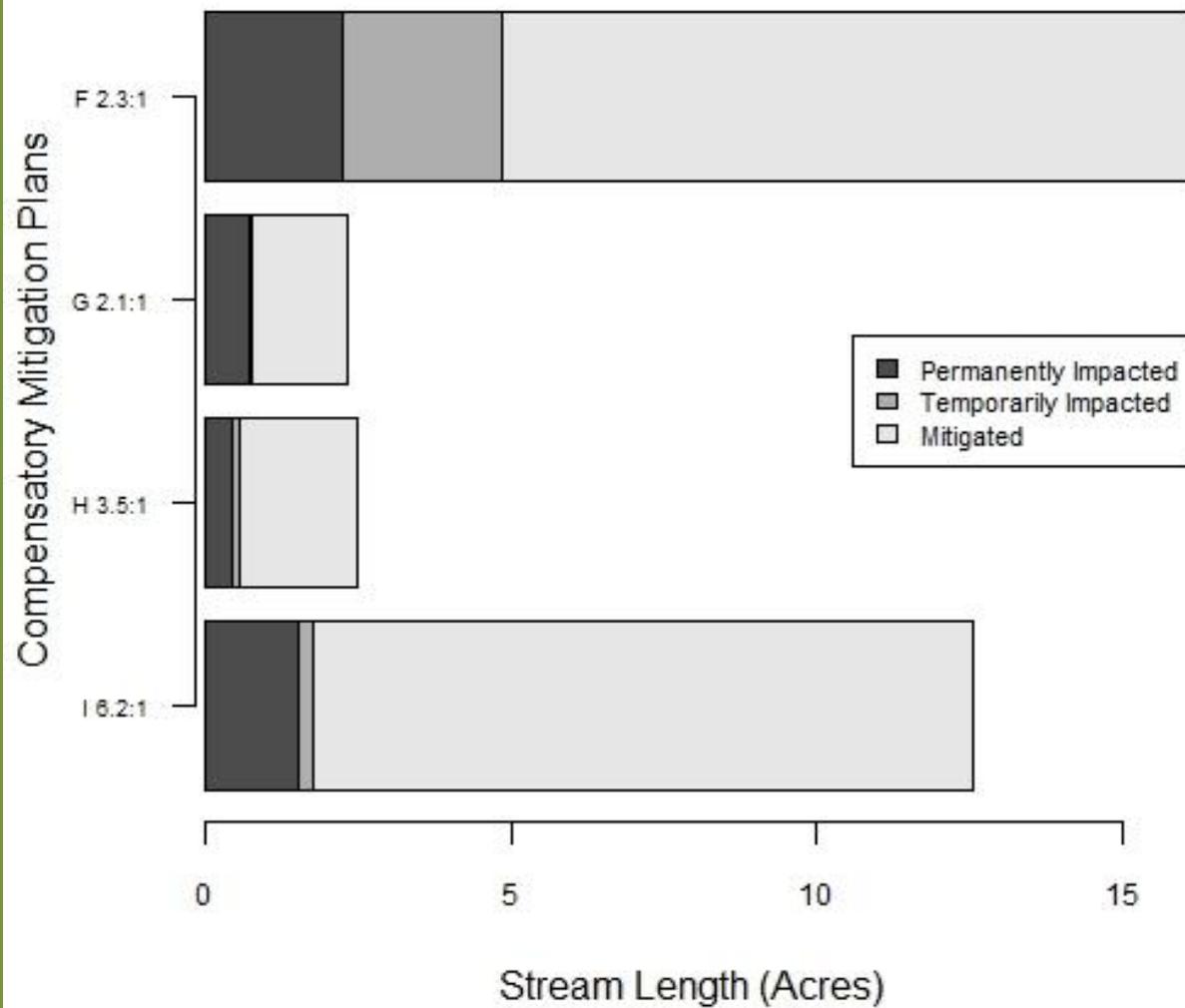
## Total Impacts and Mitigation by CMP

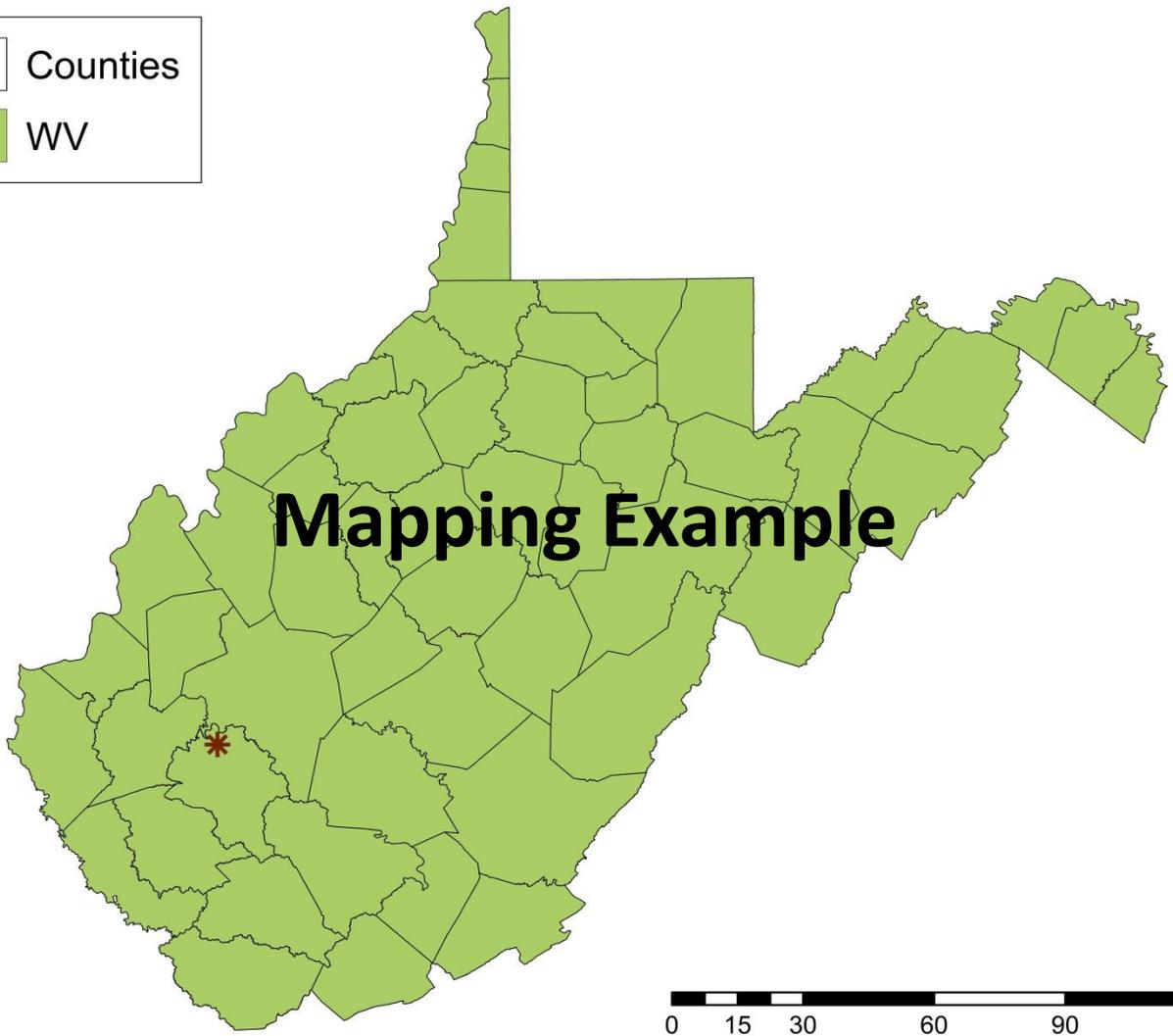
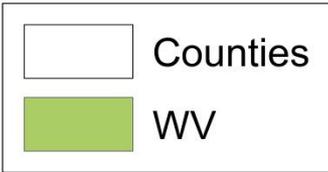


## Total Impacts and Mitigation by CMP



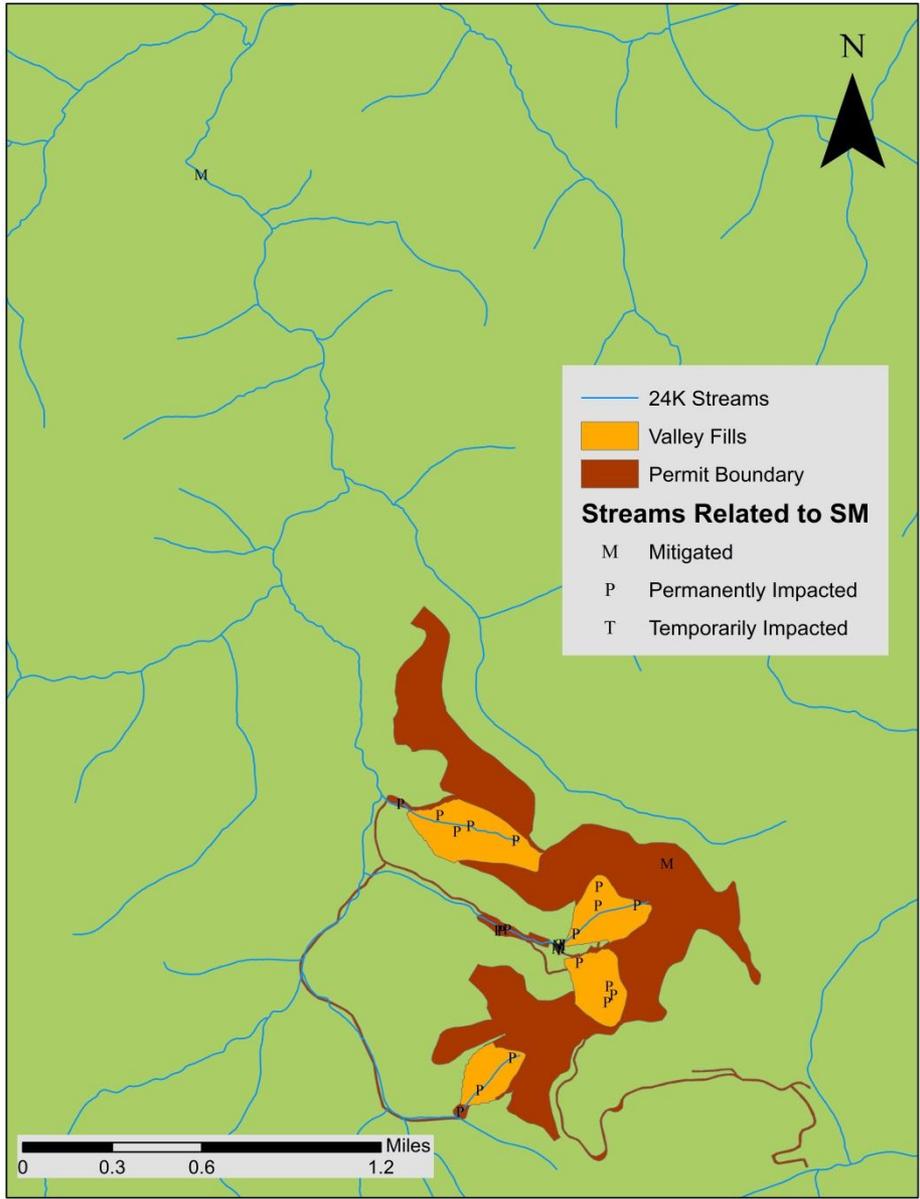
## Total Impacts and Mitigation by CMP

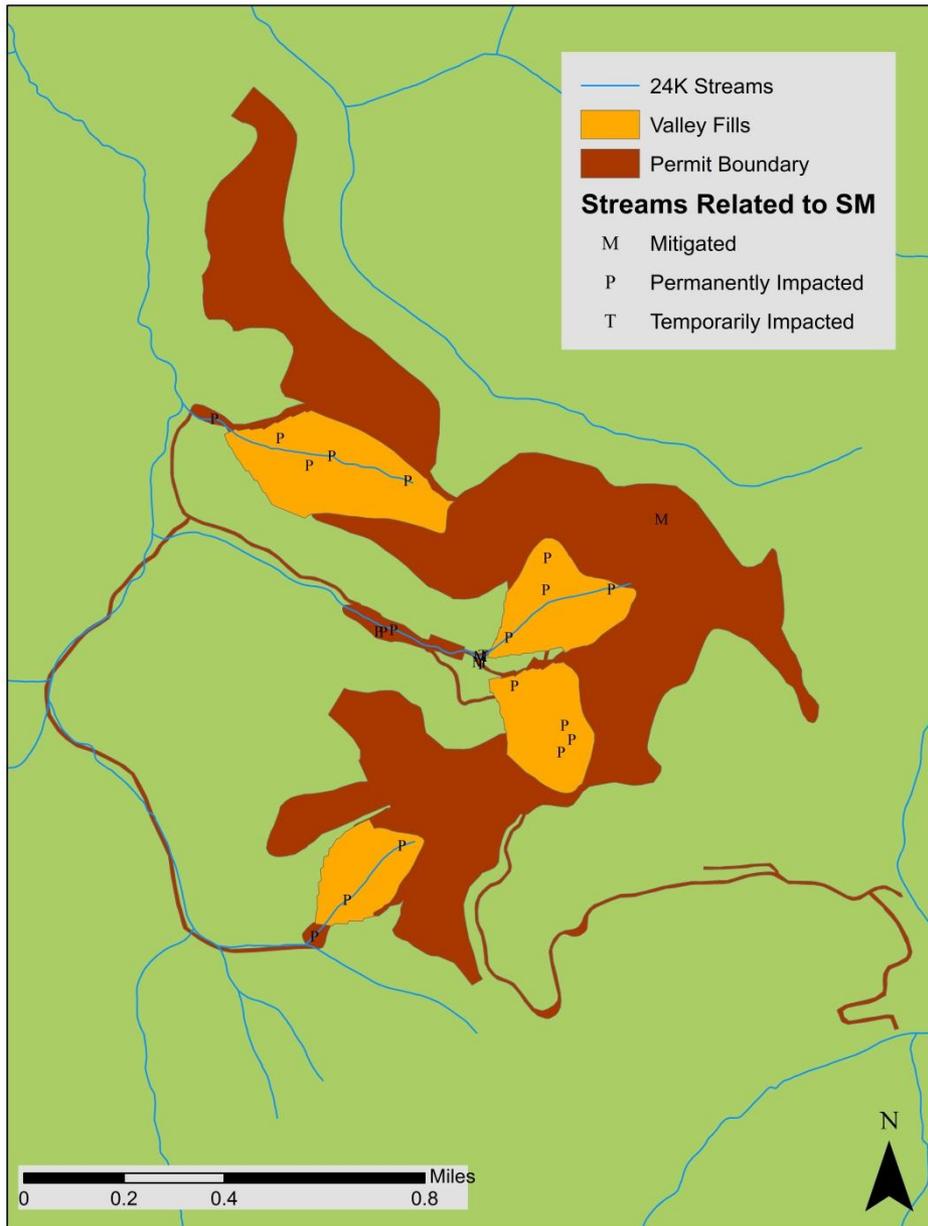


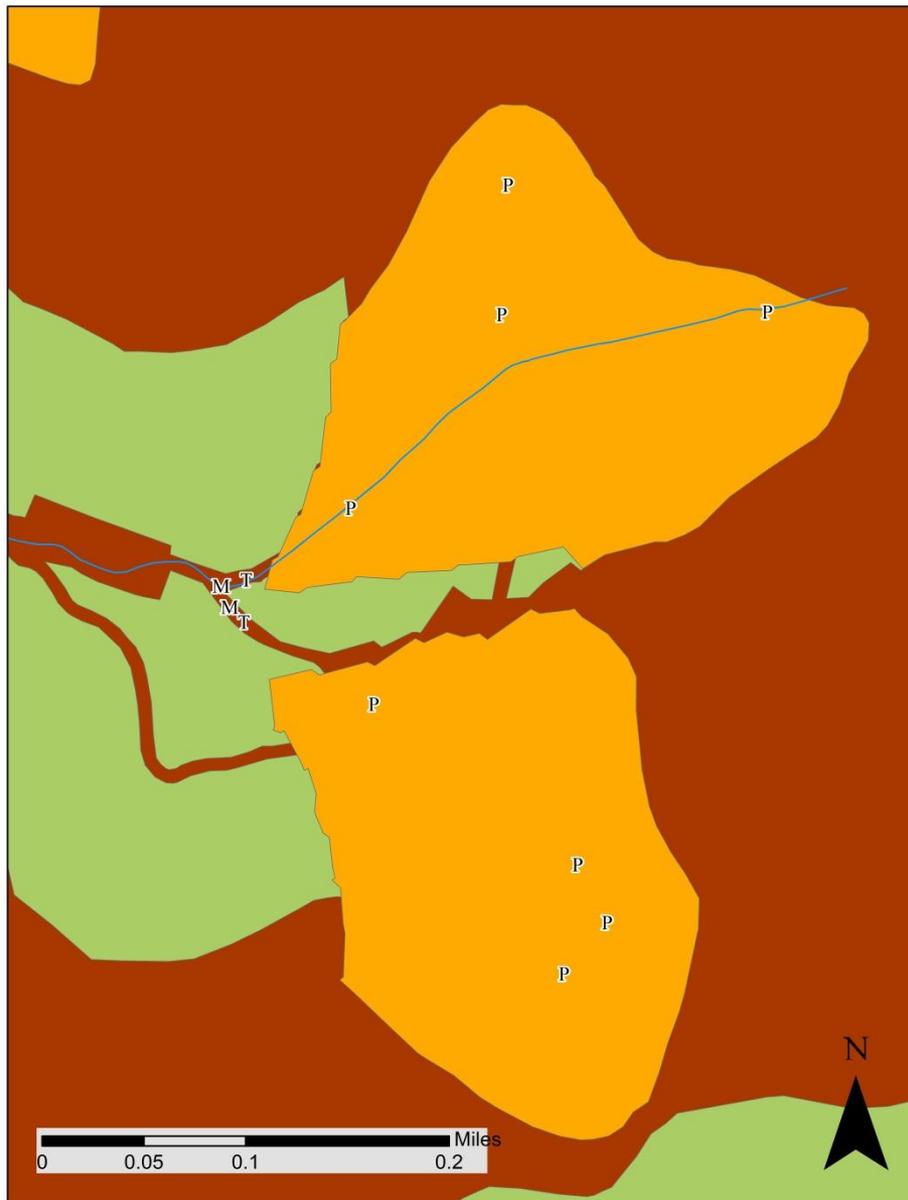


# Mapping Example



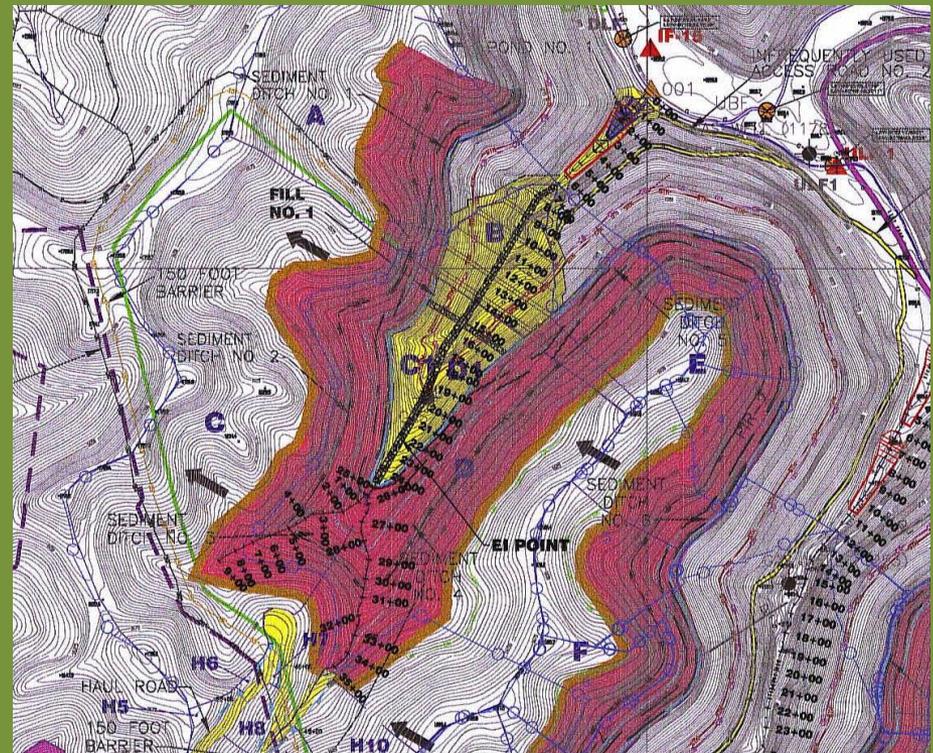






# Conclusions

- Acres/ L. Feet/ Function
- Creation vs reconstruction
- Study application
- Goals as we move forward



# Special Thanks

- J. Todd Petty Ph.D.
- Funding:
  - WV Department of Environmental Protection
  - WV Stream Restoration Fund





**Questions?**