

Opportunities for Ecological Restoration Along  
Forested Headwater Streams in Kentucky's  
Appalachian Mountains

*Jennifer Shelby, PE, CPESC*

*August 22, 2023*



Proud sponsor & exhibitor  
**Find us at booth #A25**

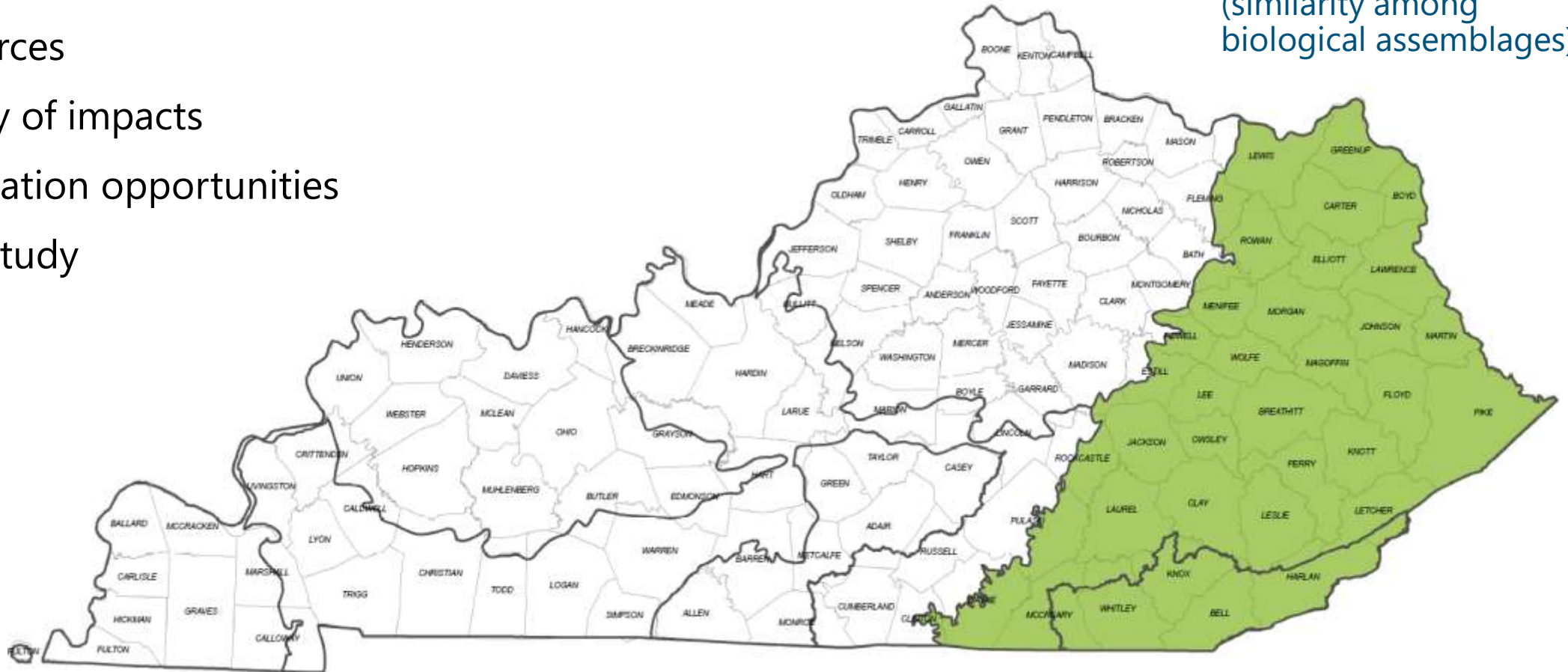


# Presentation Outline

- Eastern Kentucky's Appalachian Mountain Region
  - Resources
  - Legacy of impacts
  - Restoration opportunities
  - Case study

## Mountain Bioregion

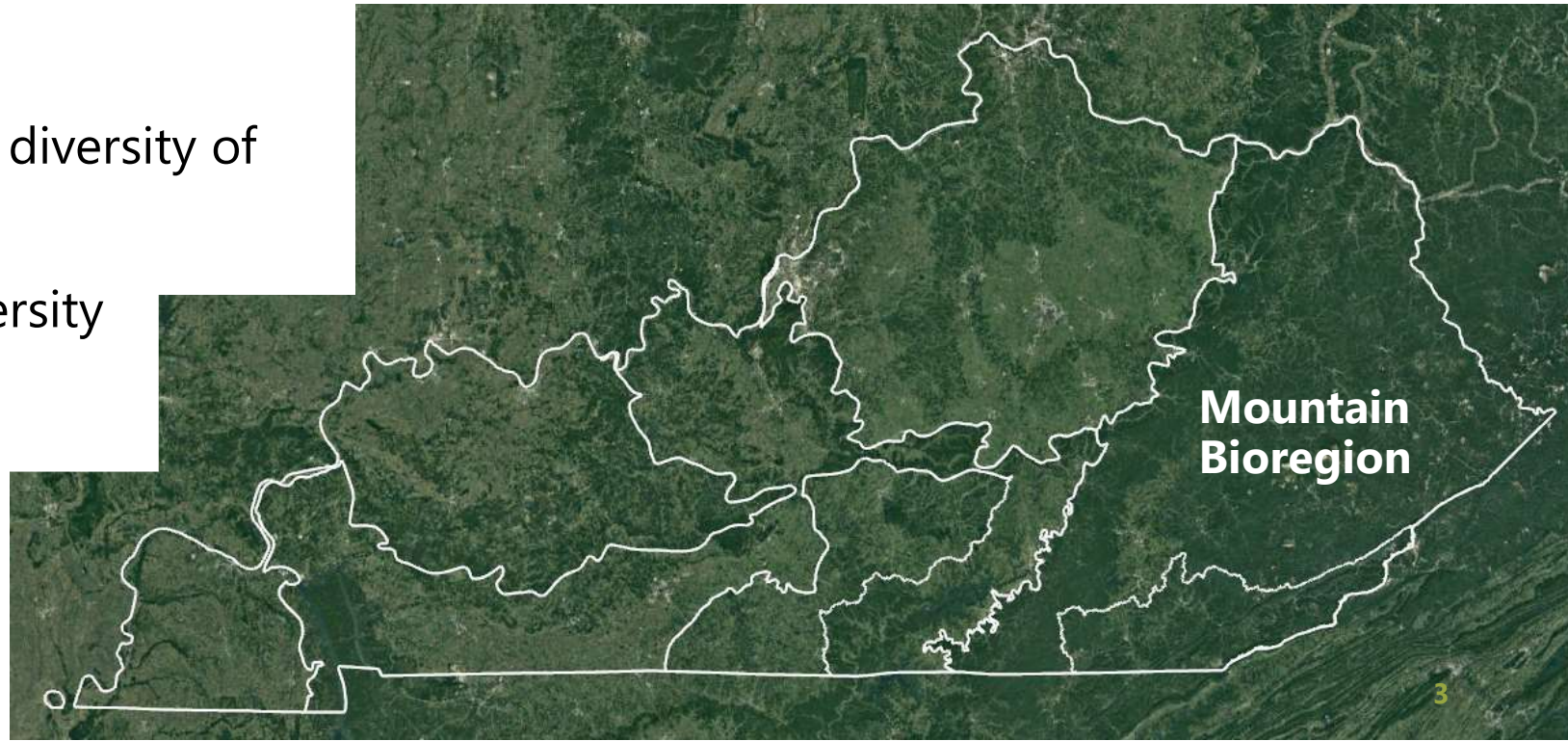
(similarity among biological assemblages)



# Resources

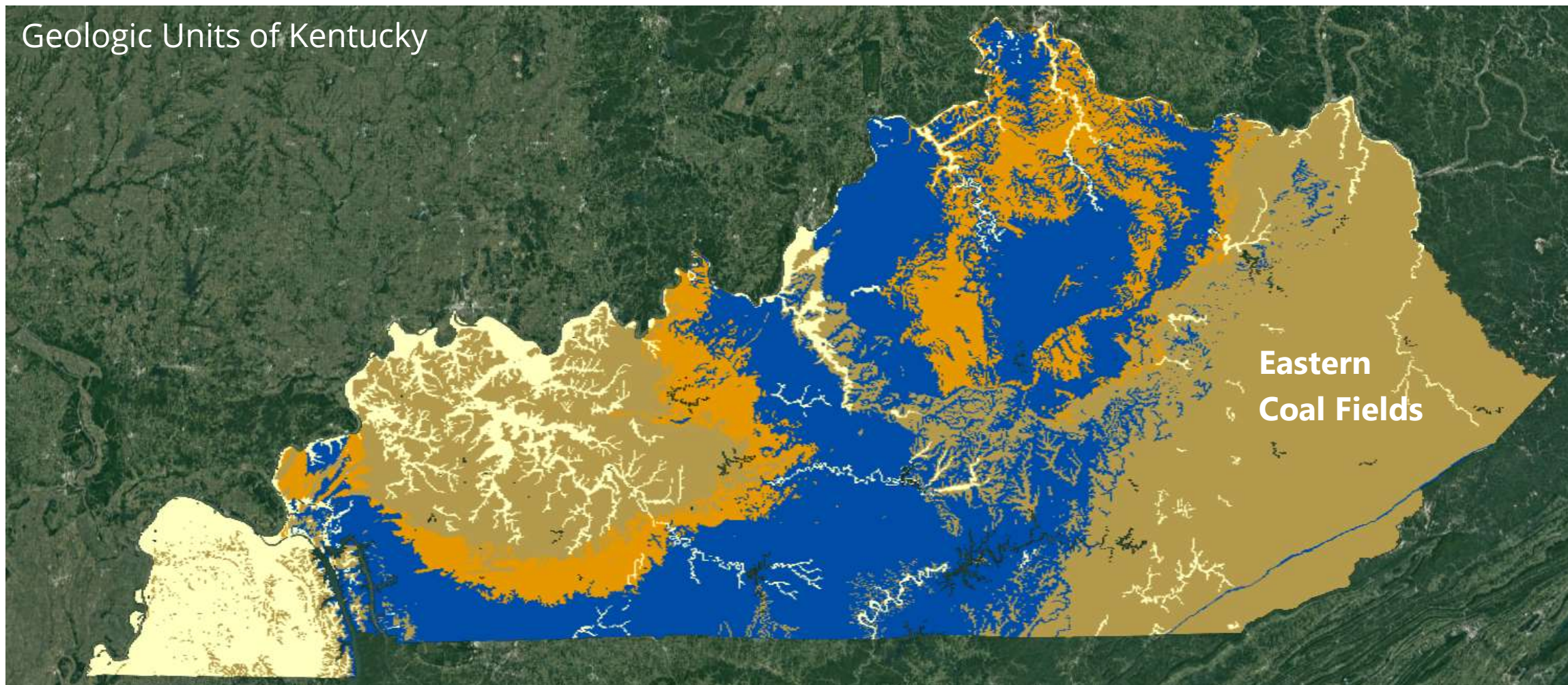
---

- Diverse topography
  - Highest point in Kentucky, Big Black Mountain, 4,145 feet above sea level, is in Harlan county
- Abundant forests
  - Mixed mesophytic forest, one of the most diverse temperate forests on the planet
  - Includes rare plant species
- Kentucky nationally recognized for diversity of fish, mussel, and crayfish species
- Global hotspot for salamander diversity
- Habitat for numerous bat species



# Resources

- Eastern Mountain Coal Fields = part of Appalachian Coal Basin, extending from Pennsylvania to Alabama



# Legacy of Impacts

---

- Kentucky has a nearly 12,000-year history of human activity
- The last ~200 years have been severely impactful
  - Economy based on natural resource extraction
  - Habitat loss and degradation
  - Pollution

Let's review some history behind this legacy of impacts and how it still affects this region and our ability to perform restoration today.



Image from Kentucky's Natural Heritage: An interactive guide to biodiversity

# Land & Title History of Kentucky

---

- The **Kentucky** region was inhabited by indigenous agricultural and hunting peoples, including more than 20 known tribes of Native Americans
- European explorers came to Kentucky via the rivers of the Mississippi basin in the 1600s
- Traders from the eastern colonies entered the region during the early 1700s



Black Mountain, highest point in Kentucky; Image from Kentucky's Natural Heritage: An interactive guide to biodiversity

# Land & Title History of Kentucky

---

- In 1769 **Daniel Boone** and a hunting party penetrated to the central plateau region, or Bluegrass country
- He later blazed a trail, the Wilderness Road, into the rich area from **Cumberland Gap** through which hundreds of thousands of settlers passed
- Settlement was rapid during the 1770s



Image: George Caleb Bingham's Daniel Boone Escorting Settlers through the Cumberland Gap (1851-52)

# Land & Title History of Kentucky

- Following the American Revolution (1775-1783), immigrants also poured down the **rivers into KY from the north**
- Kentucky remained part of Virginia until **June 1, 1792, when Kentucky became the 15th state of the union**
- There was a land boom and property speculation during the early 1800s

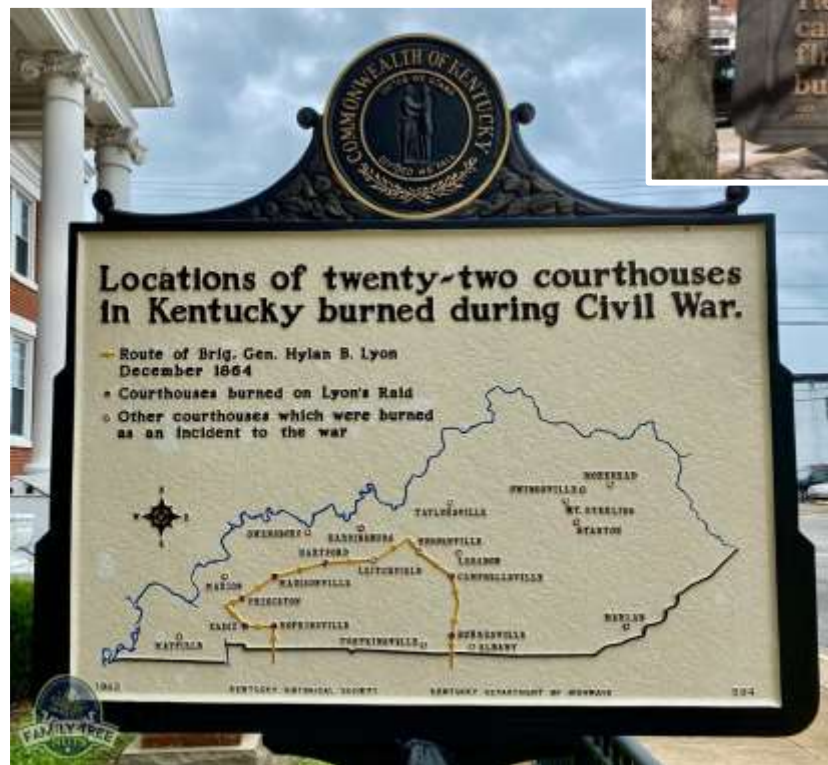


Map of Kentucke published in 1784 along with The Discovery, Settlement and Present State of Kentucke by John Filson



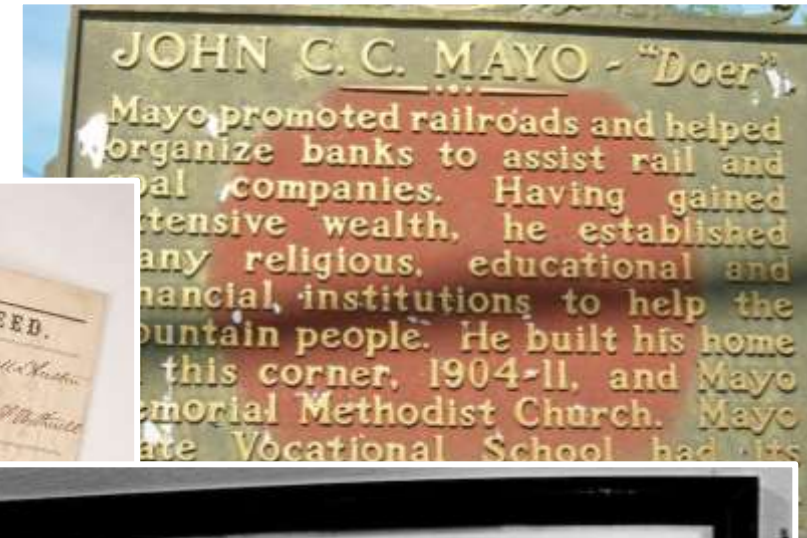
# Land & Title History of Kentucky

- Although officially neutral, Kentucky was **invaded by both Union and Confederate forces** during the Civil War (1861-65). Many courthouses were burned and **property records destroyed** as a result
- At the close of the Civil War most of Kentucky's virgin timber was still standing, and only a small portion of its vast mineral resources had been tapped
  - Eastern Kentucky was still largely **agrarian** and **isolated**



# Land & Title History

- Post-Civil War, the value of the region's vast coal reserves was recognized
- **Mineral speculators**, driven and financed by industrialization in the northeastern US, **purchased rights to minerals and timber across eastern Kentucky**
- Mineral rights were **severed from surface rights** (and often not along the same boundaries/descriptions)
  - Large blocks of reserves were owned by a small number of companies and continues today



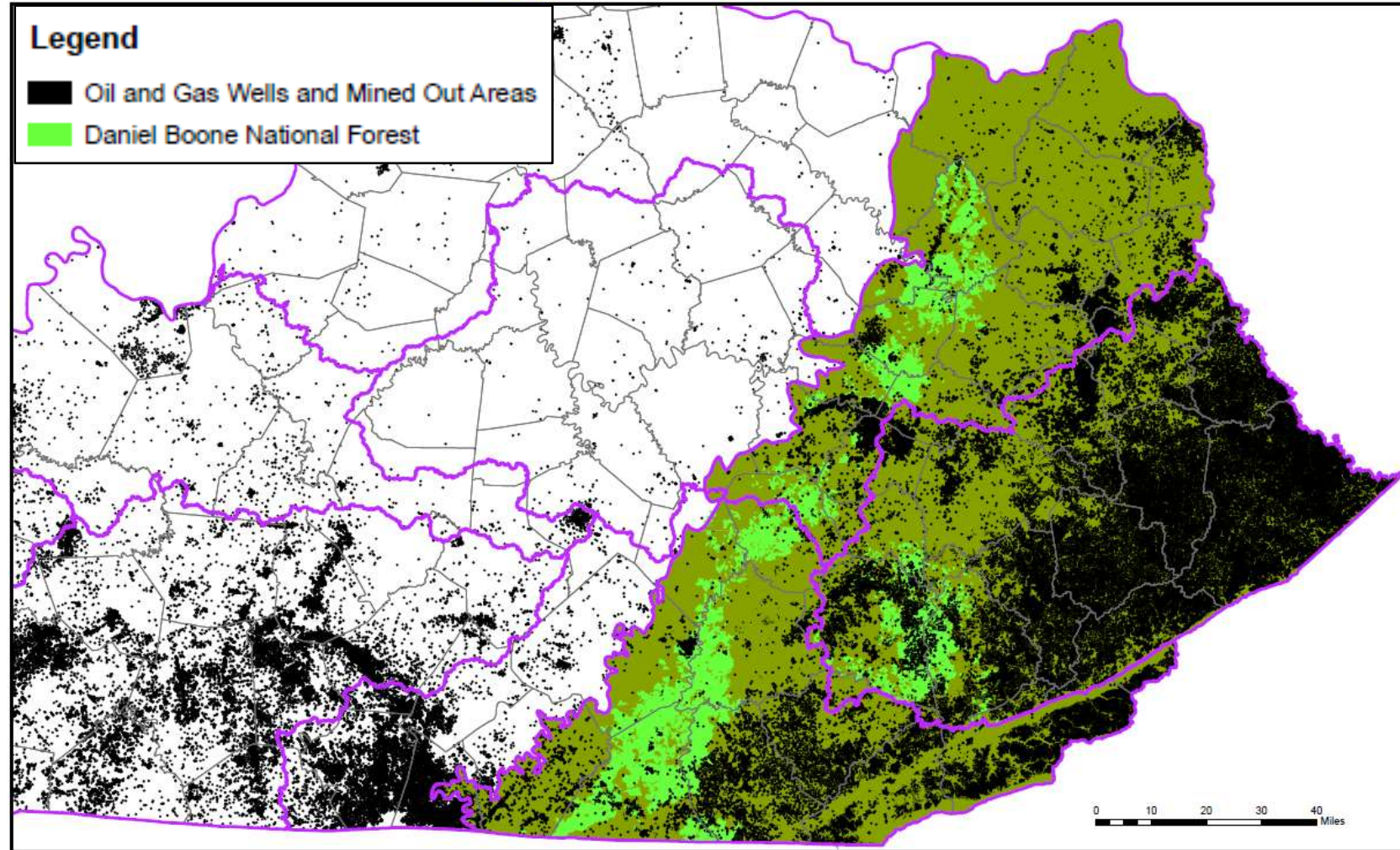
# Legacy of Impacts

- Large-scale mining (deep/underground) began in eastern Kentucky in the early 1900s and continues
- Eventually coal companies reduced deep mining and increased strip-mining and mountain top removal techniques
- In addition to **coal severances**, **timber rights** and **oil & gas rights** are **extensively severed** in most of the state today



# Legacy of Impacts

- Natural resources extraction and timber harvest has left behind degraded ecosystems, including water quality
- The history of the extraction has left a legacy of divisions in property and mineral ownership
- Terrain is rugged and often lacks accessibility



# Restoration Opportunities

- Improve physical stream conditions / habitat
- Improve previously mined land / low fertility soils
- Remove / re-align streams around relic sediment ponds
- Restore streams impacted by roads / culverts / access for timber and mineral extraction
- Restore channelized / moved streams
- Restore riparian zones
- **Restoration is critical!**

## But with Additional Constraints

- Stream Mitigation Requires
  - Baseline level of water quality
  - Fee simple ownership (own surface and minerals!)
  - No existing easements
  - Ability to protect with permanent conservation easement or deed restriction



# CASE STUDY: Straight Creek Mitigation Project

## Morgan County, Kentucky

---

- Opportunity to restore an impacted system and provide mitigation for a parkway widening / relocation project



# CASE STUDY: Approach



**Site Identification**



**Project Validation – Water Quality,  
Ecology, Geomorphology, Credit  
Generation**



**Project Validation – Boundary,  
Mineral Title, Ability to Provide  
Long-term Protections**



**Permitting and  
Design**

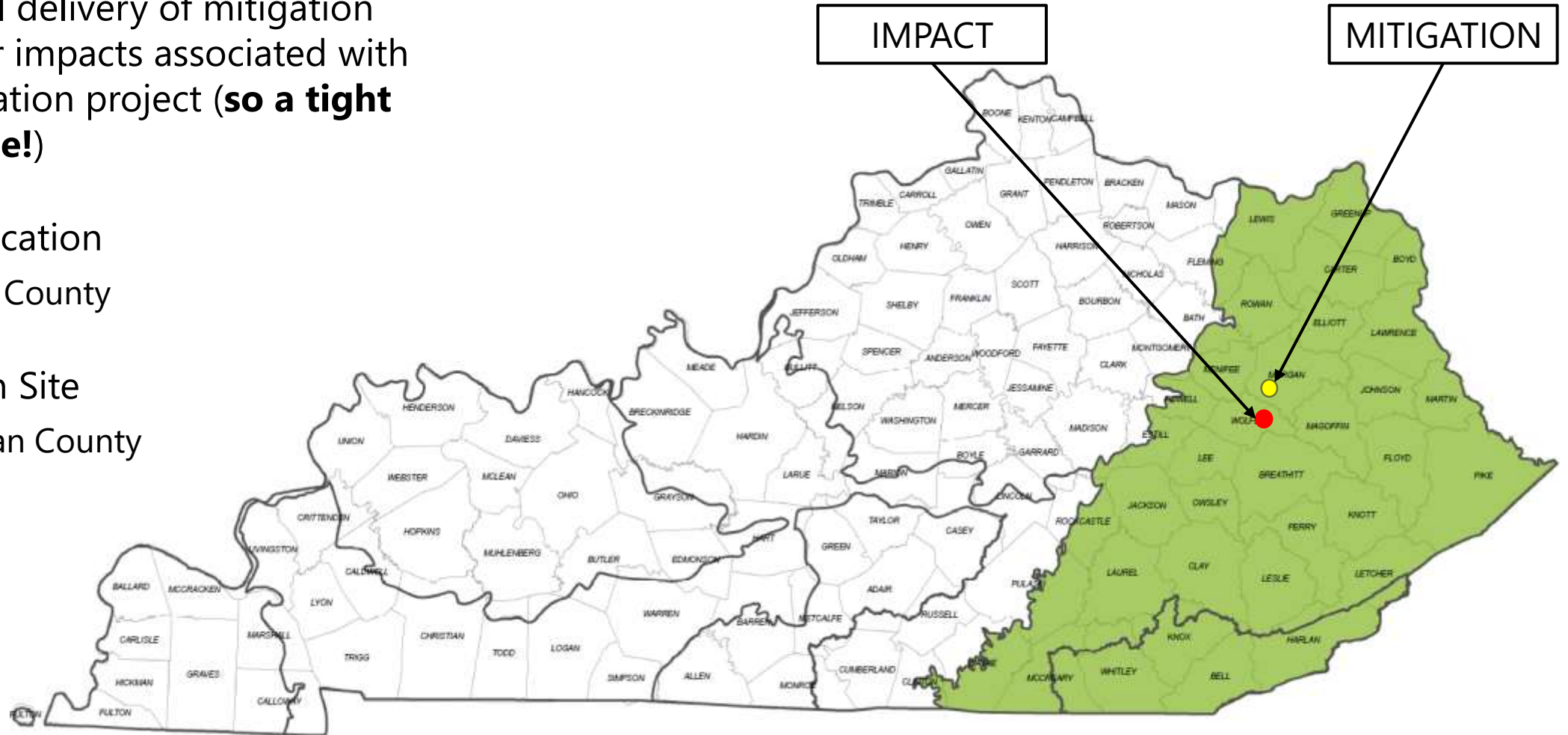


**Construction and  
Monitoring**

# CASE STUDY: Straight Creek Mitigation Project

## Morgan County, Kentucky

- **Goal:** Full delivery of mitigation credits for impacts associated with transportation project (**so a tight timeframe!**)
- Impact Location
  - Wolfe County
- Mitigation Site
  - Morgan County





# CASE STUDY: Approach



Site Identification



Project Validation – Water Quality,  
Ecology, Geomorphology, Credit  
Generation



Project Validation – Boundary,  
Mineral Title, Ability to Provide  
Long-term Protections



Permitting and  
Design



Construction and  
Monitoring

# CASE STUDY: Straight Creek Mitigation Project

## Morgan County, Kentucky

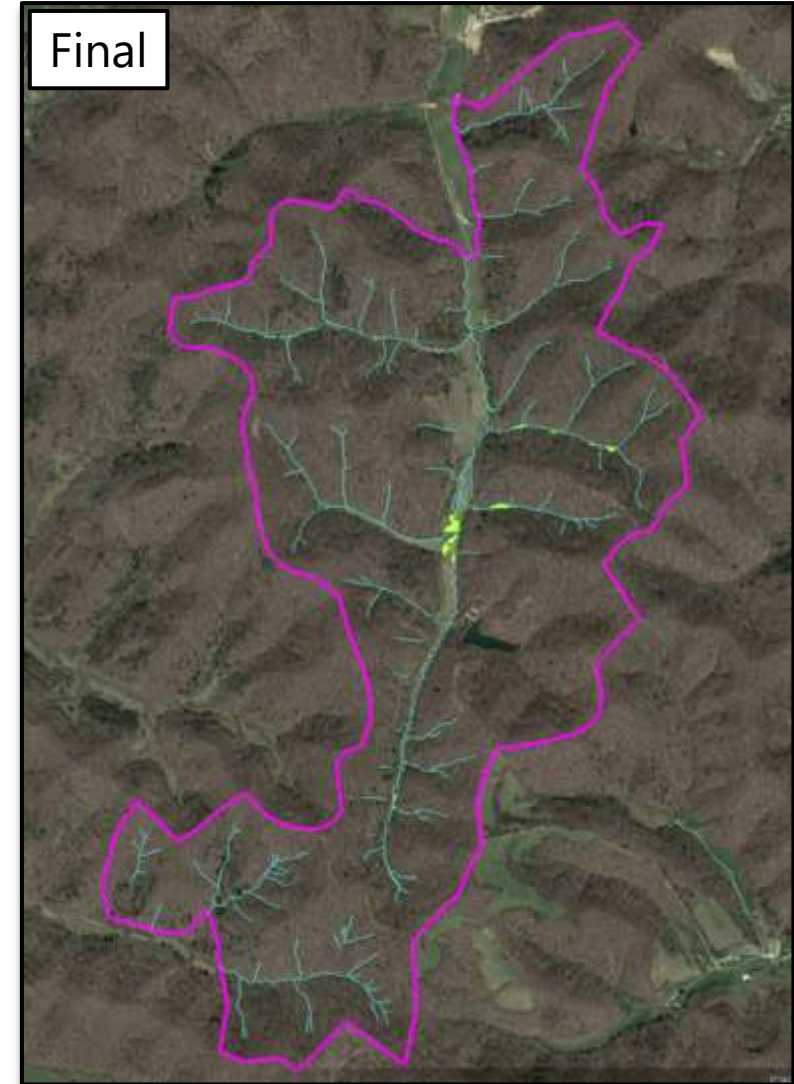
- **Land and Property Title Issue Encountered:**

Vague Metes & Bounds Boundary Descriptions in Source Deeds and Bad PVA Tax Maps:

*"BEGINNING at a corner to Noah Adkins tract, running up the creek to the point where Noah's cow used to stand and drink, thence up the field to a hickory tree, thence down the ridge past the old spring that dried up and back to BEGINNING..."*

- **Resolutions:**

Expensive but extensive Boundary Survey obtained based on abstracted titles of subject tracts and adjoining.



# CASE STUDY: Straight Creek Mitigation Project

## Morgan County, Kentucky

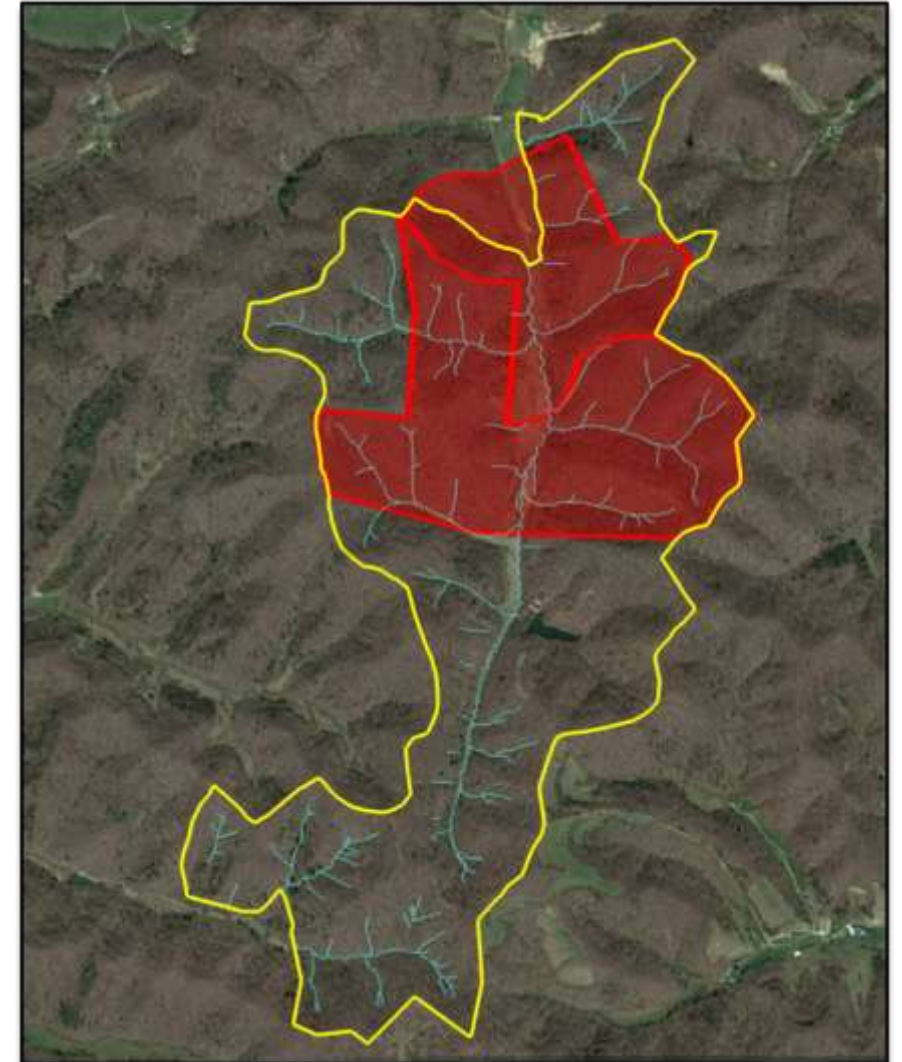
- **Land and Property Title Issues Encountered:**

- **Oil & Gas Mineral Severance** Identified in Title Abstract

- Oil & Gas only on portions = severed between 1919-1926
- Affecting ~300 Acres of Subject Area
- Owners disappear from records and heirs prove unknown
- Several prior Oil & Gas Leases were found but presumed expired since no production was confirmed at KY Division of Oil & Gas

- **Curative Title Resolutions:**

- In conjunction with and on behalf of the surface owners, a **Quiet Title Action** was filed in Morgan Circuit Court.
- When no claimants came forward to contest after (90) days, a Default Judgment was issued in the matter thereby re-joining the severed Oil & Gas estates to the fee simple owners.



# CASE STUDY: Straight Creek Mitigation Project

## Morgan County, Kentucky

### Land / Title Takeaways

- Do **Mineral Title Research** at start of project (ASAP)
- Identify Mineral Rights concurrent/before Surface Rights (especially before purchase of surface rights)
- **Don't believe the PVA tax map boundaries** in Kentucky counties
- It never hurts to have a **great Mineral Abstractor & experienced Attorney**

—MS—

LODGED FOR RECORD  
MORGAN COUNTY CLERK

JUL 13 2022

TIME: 12:00 PM  
RANDY WILLIAMS CLERK

DECLARATION OF RESTRICTIVE COVENANTS FOR CONSERVATION

THIS DECLARATION OF RESTRICTIVE COVENANTS FOR CONSERVATION is made this 30 day of June, 2022, by Liberty Hunt Club, LLC, an Ohio limited liability company, whose mailing address is 7580 Angel Road NW, Dundee, Ohio 44624 ("Declarant").

RECITALS

WHEREAS, Declarant is the sole owner in fee simple of certain real property located in Morgan County, Kentucky, as described in Deed Book 233, Page 659, in the Office of the Morgan County Clerk, and as more particularly described in the legal description attached hereto as Exhibit A and shown on the Site Plan attached hereto as Exhibit B, both of which are incorporated herein by reference ("Property");

WHEREAS, the discharge of dredged and/or fill material into jurisdictional waters of the United States, including wetlands and streams, pursuant to Sections 401 and 404 of the Clean Water Act, requires compensatory mitigation; and

WHEREAS, as compensatory mitigation under Federal and State law for and in consideration of Department of the Army Permit No. LRL-2021-00071 ("Permit") issued by the U.S. Army Corps of Engineers, Louisville District ("Corps") pursuant to Section 404 of the Clean Water Act (33 U.S.C. §1344) and/or Section 10 of the Rivers and Harbors Act (33 U.S.C. §403), and Water Quality Certification No. WQCLOP2022-012-7 ("Certification") issued by the Kentucky Energy and Environment Cabinet, Department of Environmental Protection, Division of Water ("Cabinet"), in accordance with Section 401 of the Clean Water Act (33 U.S.C. §1341) and Section 224.16-050 of the Kentucky Revised Statutes and in recognition of the continuing benefit to the permitted property, and for the protection of waters of the United States and scenic, resource, environmental, and other conservation values, Declarant has agreed to rehabilitate, re-establish, enhance, and preserve aquatic habitat, riparian areas, and buffers and place certain restrictive covenants on the portion of the Property depicted on the Site Plan (Exhibit B) and described in the legal description attached hereto as Exhibit C and incorporated herein by reference ("Mitigation Property"), in order that the Mitigation Property shall remain substantially in its natural condition forever, and to grant the Corps and Cabinet a right of access and entry to the Property;

NOW THEREFORE, in consideration of the benefits to be derived by the Declarant and each and every subsequent owner and occupant of the Mitigation Property, and as required mitigation for the discharge of dredged and/or fill material into waters of the United States, as authorized by the Permit and Certification, Declarant hereby makes this Declaration on the terms and conditions stated below.

1. **Purpose.** The purpose of this Declaration of Restrictive Covenants is to restrict the current and future use of the Mitigation Property in perpetuity in order to protect aquatic resource functions and values, scenic, resource, environmental, and other conservation values, and conservation functions and ecological services; to establish the Mitigation Property as an

3000 PD

# CASE STUDY: Approach



Site Identification



Project Validation – Water Quality,  
Ecology, Geomorphology, Credit  
Generation



Project Validation – Boundary,  
Mineral Title, Ability to Provide  
Long-term Protections



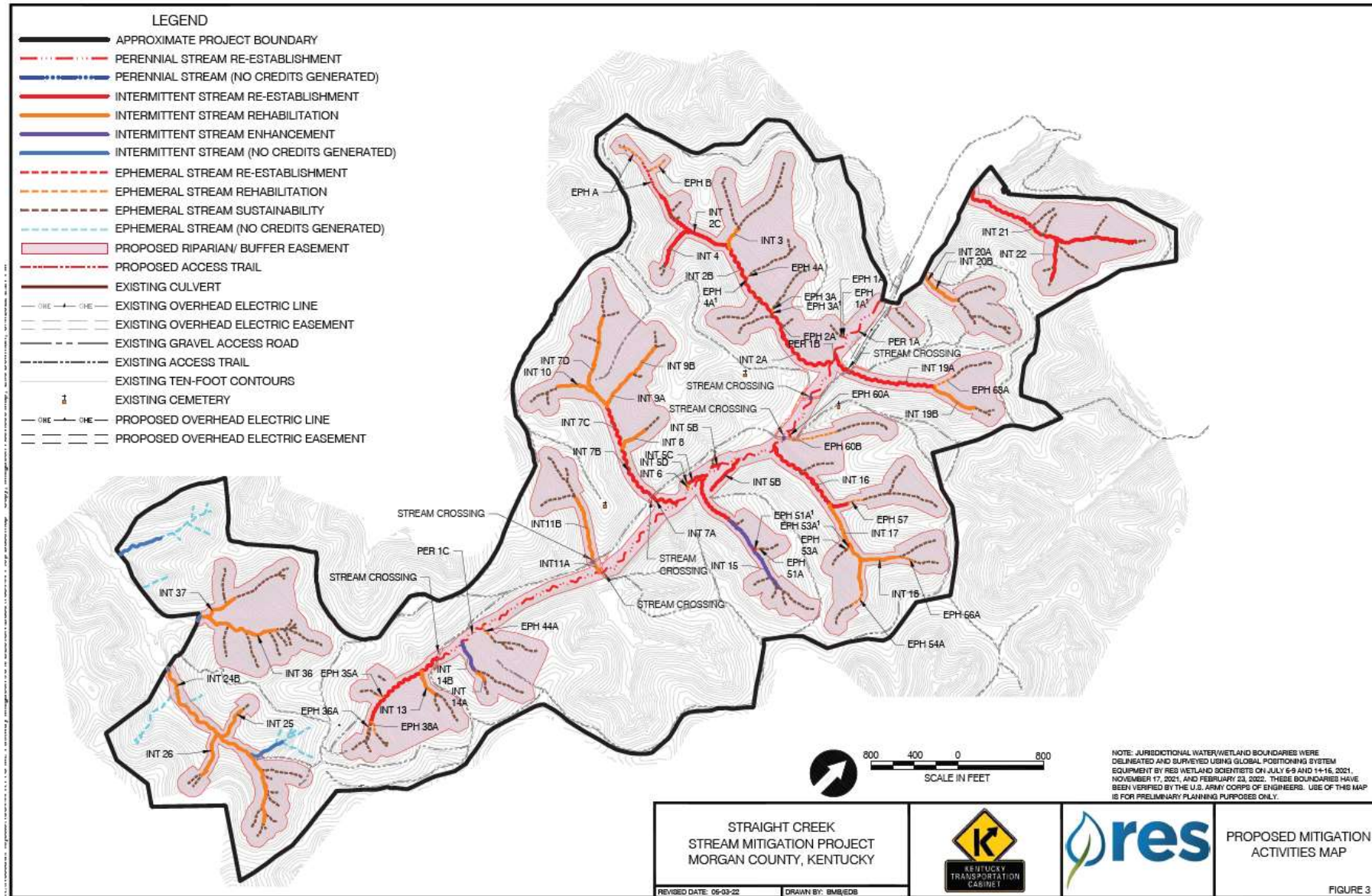
Permitting and  
Design



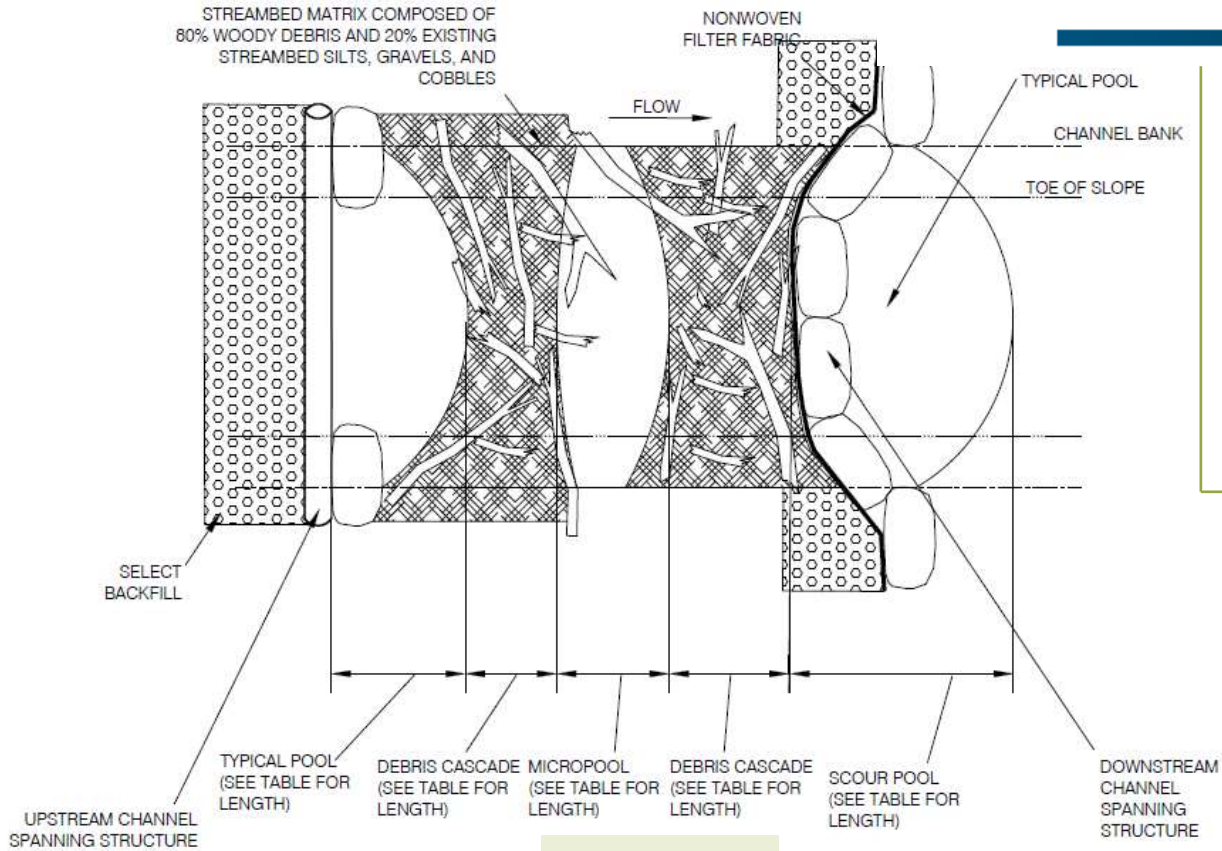
Construction and  
Monitoring

# CASE STUDY: Straight Creek Mitigation Project

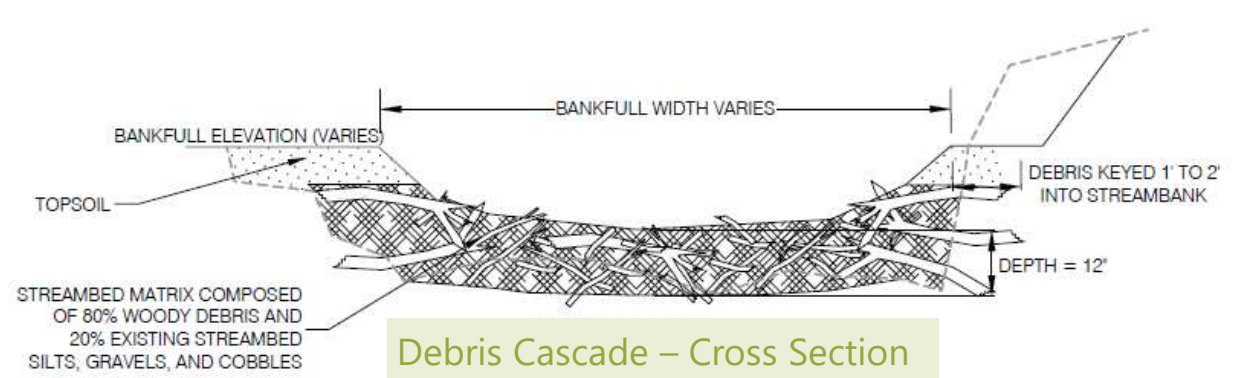
## Morgan County, Kentucky



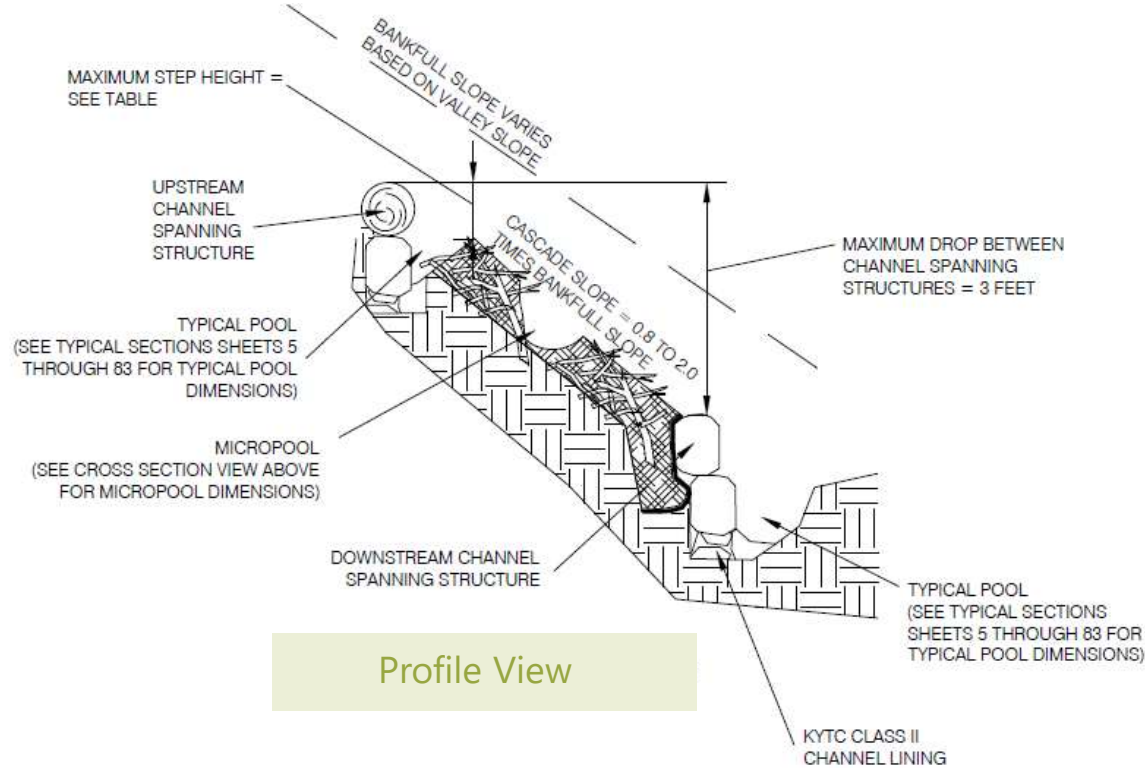
# Headwater Treatment



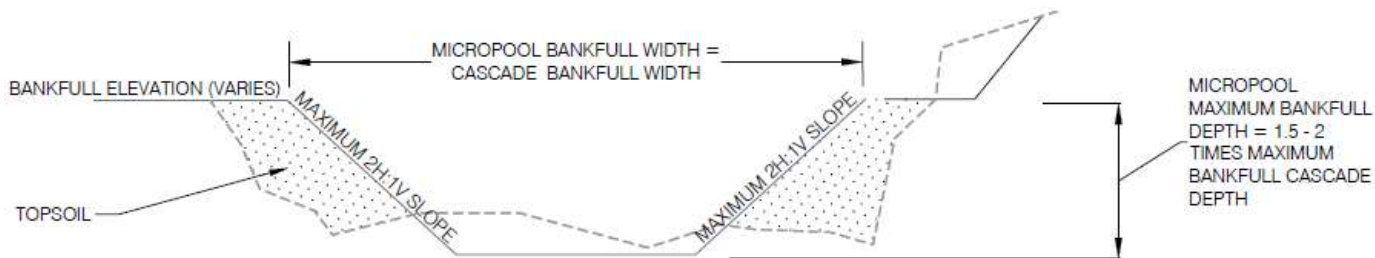
Plan View



Debris Cascade - Cross Section



Profile View



Micro Pool - Cross Section

7-16-2021



12-12-2022



Int 8  
Headwater  
Treatment  
14% bkf slope

1-24-2023



2-23-2023





7-16-2021



11-2-2022



Int 13  
Headwater  
Treatment  
9.8% bkf slope

11-15-2022



1-24-2023



5-23-23

Downstream  
extent of  
Headwater  
Treatment

Headwater Treatment  
followed by more  
traditional step-pool  
system in intermittent  
tributaries



- Minimized impact on adjacent forested hillslopes
- Utilized wood removed from corridor
- Continuing to trap leaves and woody debris
- Temporary riparian vegetation establishing
- Trees will be planted in the fall



# Summary

---

- Eastern Kentucky's Appalachian Mountain Region
  - Rich in resources
  - Legacy of impacts
    - Physical degradation
    - Land/title issues
  - Restoration opportunities
    - Headwater systems can be restored!
  - Case study
    - Results so far indicate successful restoration



# Contact Us

Jennifer Shelby, PE, CPSC

[jshelby@res.us](mailto:jshelby@res.us)



Proud sponsor & exhibitor  
**Find us at booth #A25**

