

# After the Wallow Fire: A Case Study of One Apache Trout Stream

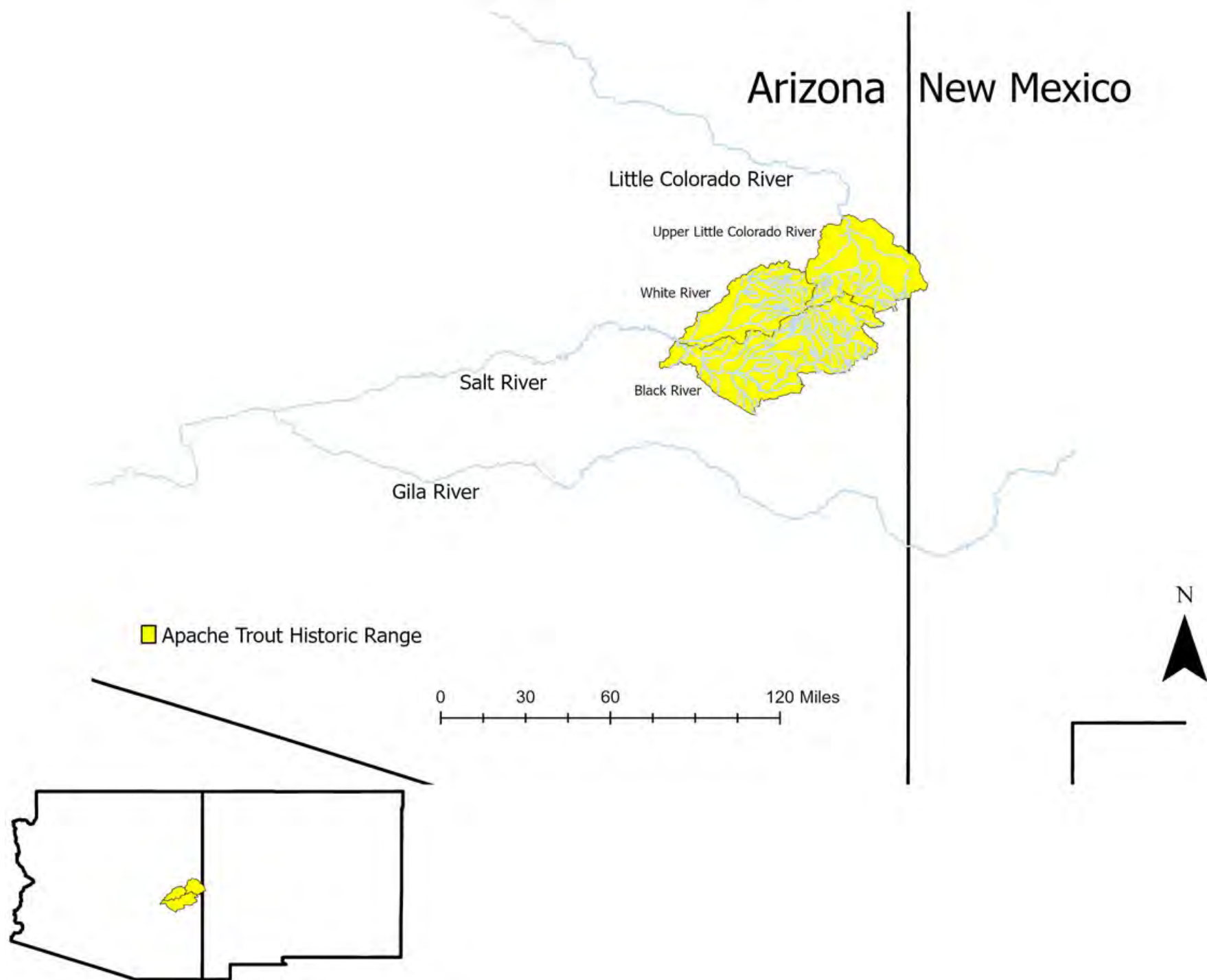


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# Apache Trout

- Historically occupied 965 (600 mi) to 1320 km (820 mi) of stream
- Listed as Endangered in 1967
- Downlisted to Threatened in 1975
- 1983
  - 14 populations
  - occupying 48 km (30 mi) of habitat
- Today
  - 30 genetically pure populations
  - Occupying 281 km (175 mi) of habitat
- Threats
  - Hybridization and(or) competition with nonnative trout, climate change, and catastrophic wildfire



# Wildfire and Arizona's Native Trout

- Arizona's native trout evolved with a natural fire regime
- Natural fire regimes have been altered
- Increases in frequency of large scale, high-severity wildfires
- Creates novel disturbance conditions
- Already affected Arizona's native trout recovery efforts



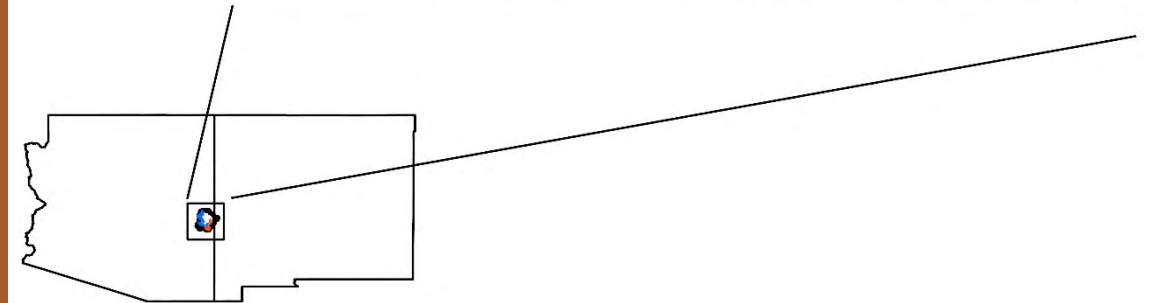
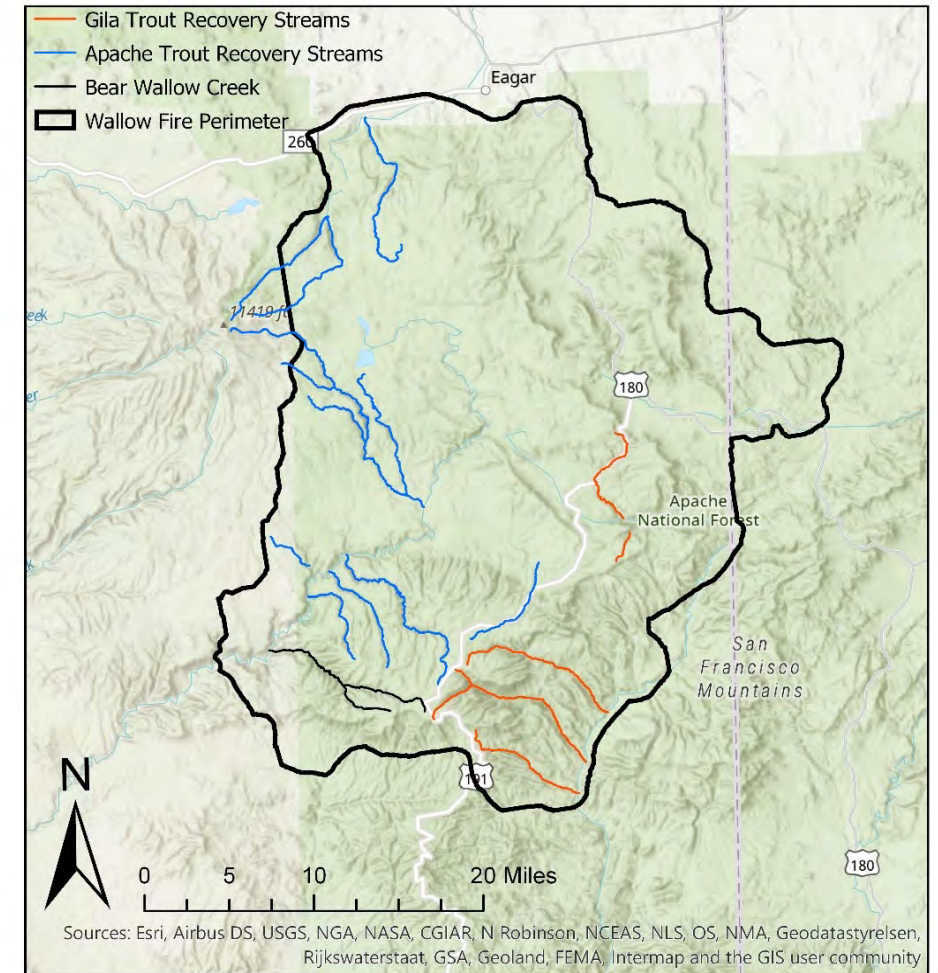


# Wallow Fire- 2011

- Started on May 29, 2011 near Alpine Arizona
- 538,049 acres – largest wildfire in Arizona history
- 12 Apache Trout and 5 Gila Trout recovery or candidate recovery streams in the burn area

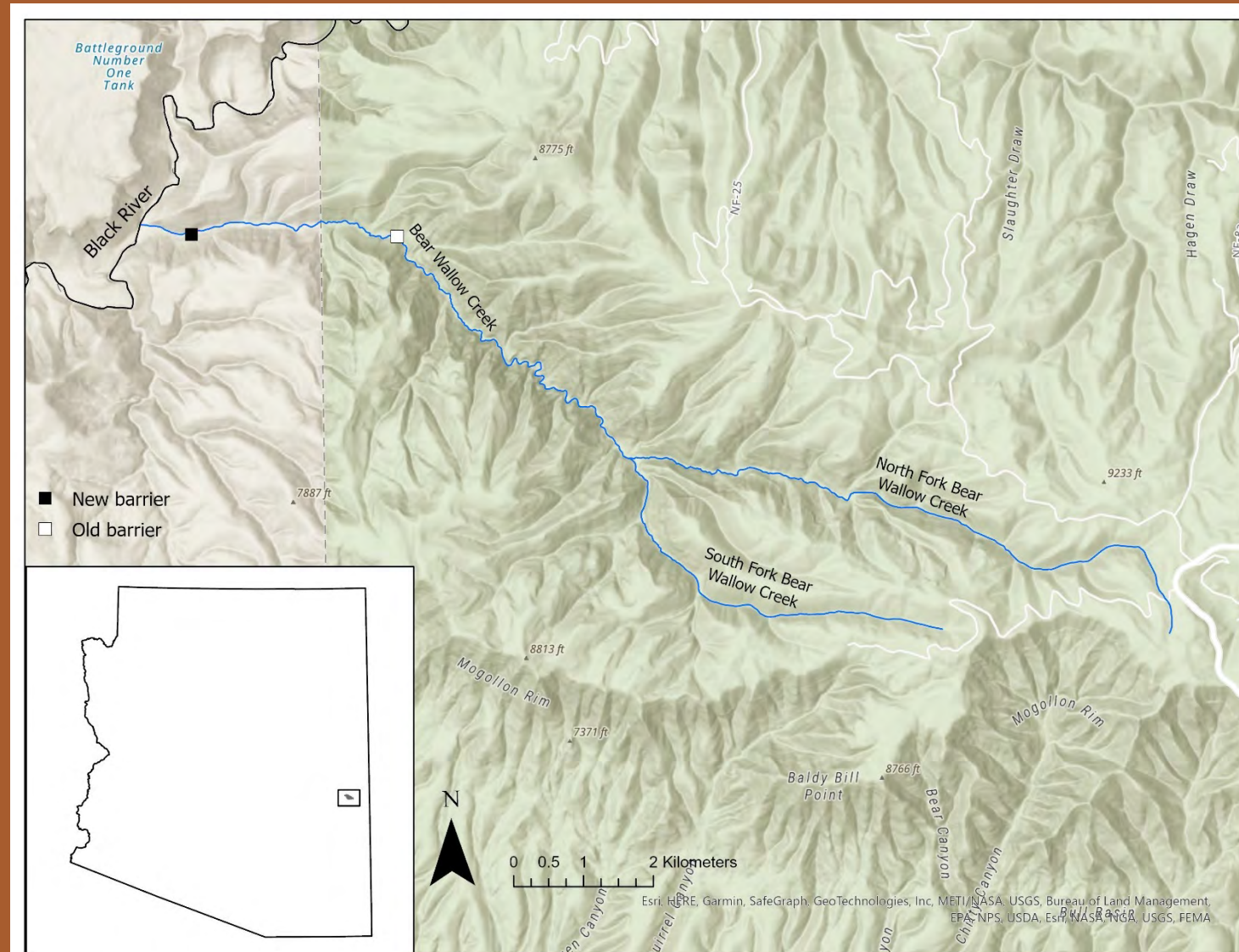


## Wallow Fire 2011



# Bear Wallow Creek – Pre Wallow Fire

- Rock-masonry barrier built in 1979 (old barrier)
  - Repaired in 1984 and 2003-2005
- Treated in 1981
- Apache Trout stocked in 1981, 1983, and 2005
- Additional barrier built in 2007 (new barrier)
  - Adds 3.2 km (2 mi) of habitat



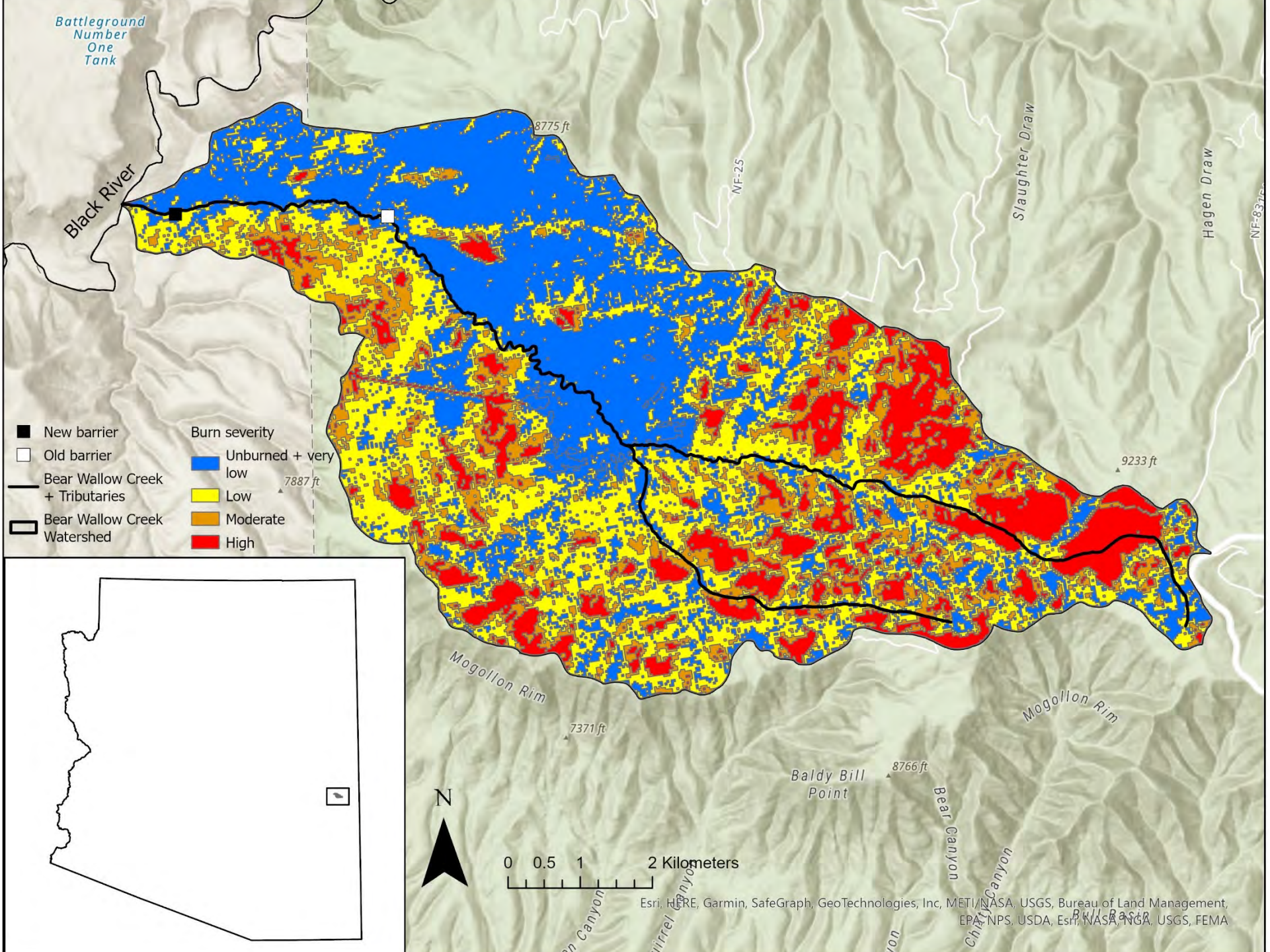


# Bear Wallow Creek – Pre Wallow Fire

- High flows damaged old barrier in 2008
  - Nonnative trout detected upstream
- Genetic testing in 2009 (Carson and Culver 2009)
  - Apache × Rainbow Trout hybrids found
- Wallow Fire 2011









# Bear Wallow Creek – Post Wallow Fire

- Initial assessment – October 2011
  - Fish and habitat surveyed at 5 sites
  - No fish sampled
  - Habitat

Table 1 from Trestik and Lopez (2011)

Bankfull Width (m)	Wetted Width (m)	Substrate Embeddness (%)	Bank Soil Stability (%)	Water Width/ Depth Ratio	Canopy Cover (%)
5.01	2.46	38.10	69.64	30.63	59.31

Embeddness: Excellent: 0-5%, Very Good: 6-25%, Good: 26-50%, Fair: 51-75%, Poor: 76-100%

Bank Soil Stability: Poor: 0-25%, Fair: 26-50%, Good: 51-75%, Excellent: 76-100%

Width/Depth Ratio: Good: <15, Fair: 16-25, Poor: >26

Canopy Density: Poor: 0-25%, Fair: 26-50%, Good: 51-75%, Excellent: 76-100%

# Bear Wallow Creek – Post Wallow Fire

- 2016
  - Discussions about modifying new barrier



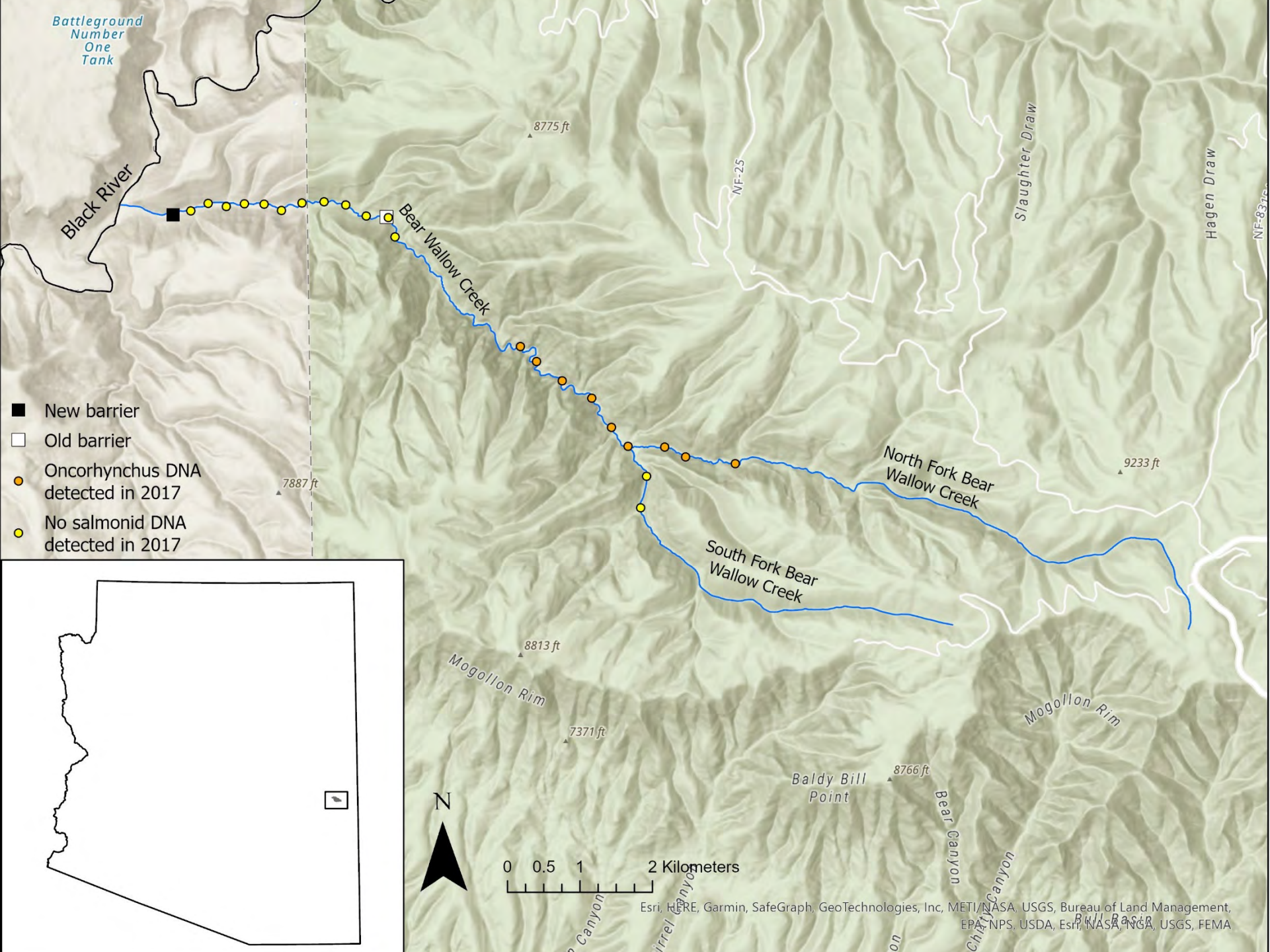


# Bear Wallow Creek – Post Wallow Fire

- 2016
- 2017
  - eDNA









# Bear Wallow Creek – Post Wallow Fire

- 2018



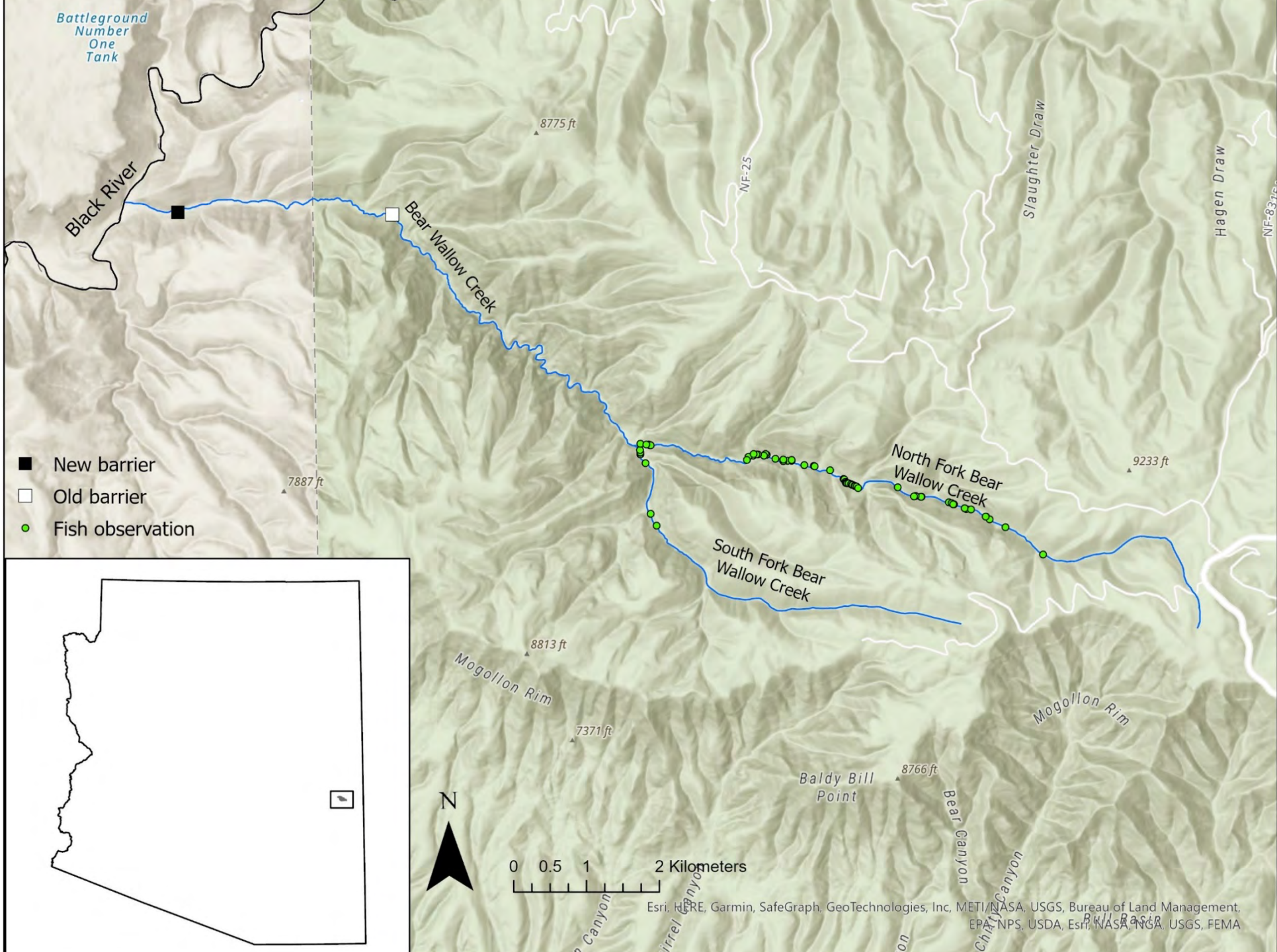


# Bear Wallow Creek – Post Wallow Fire

- 2020
  - Piscicide treatment planning
    - Observed lots of presumed Apache × Rainbow Trout hybrids







Battleground  
Number  
One  
Tank

Black River

Bear Wallow Creek

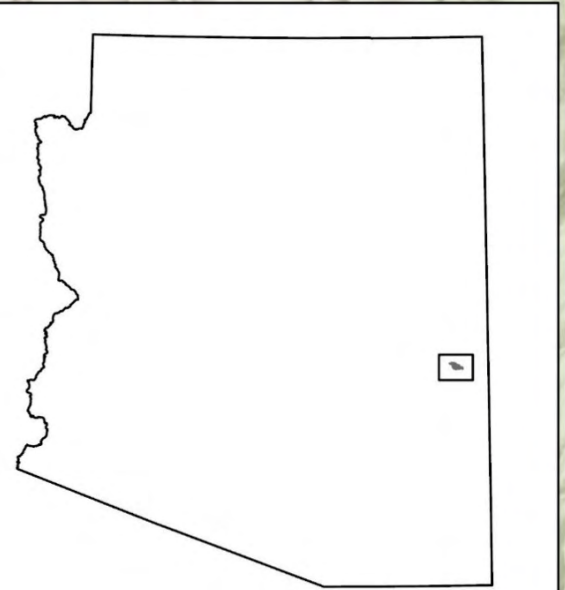
North Fork Bear  
Wallow Creek

South Fork Bear  
Wallow Creek

Slaughter Draw

Hagen Draw

- New barrier
- Old barrier
- Fish observation



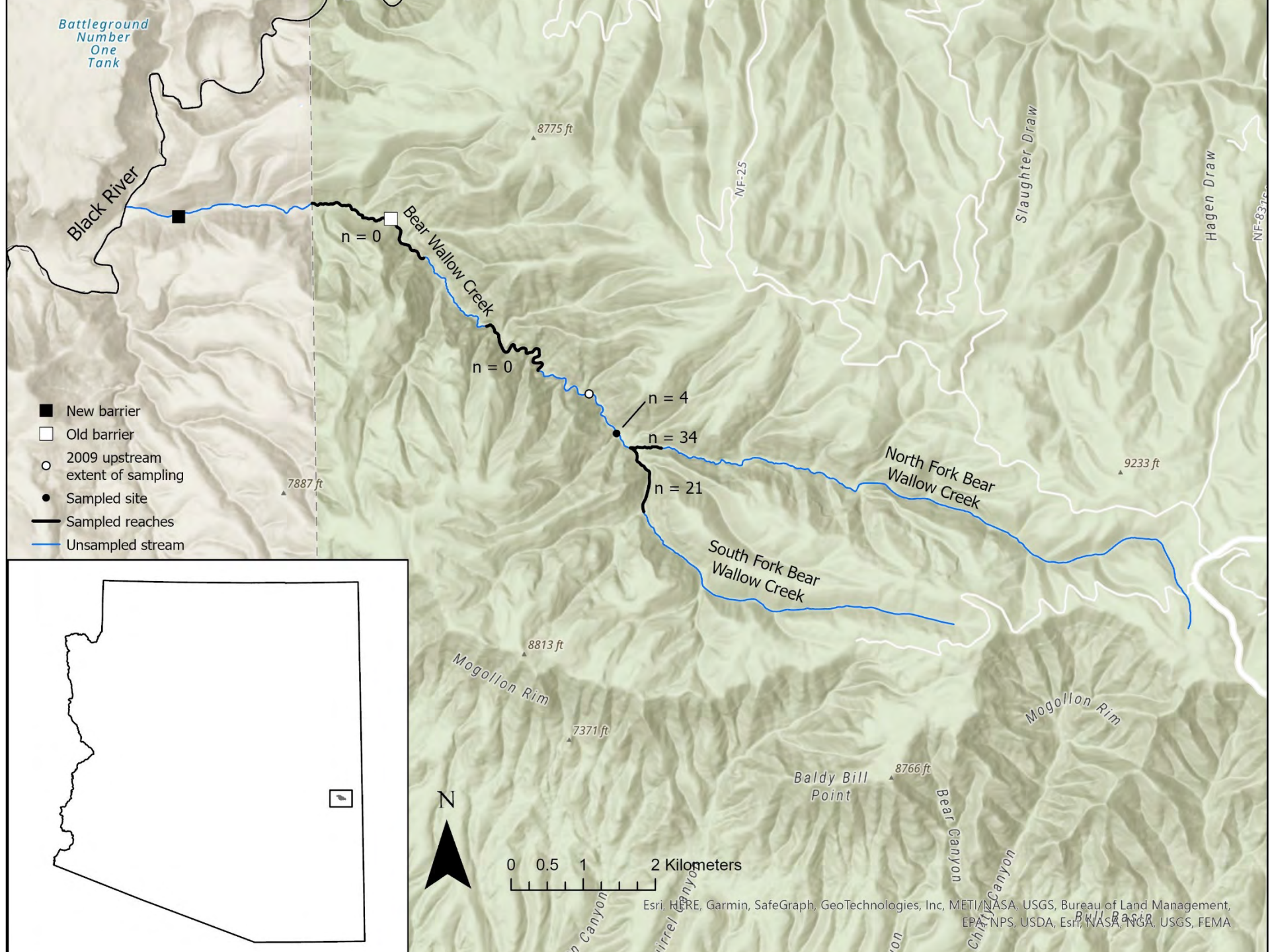
0 0.5 1 2 Kilometers

# Bear Wallow Creek – Post Wallow Fire

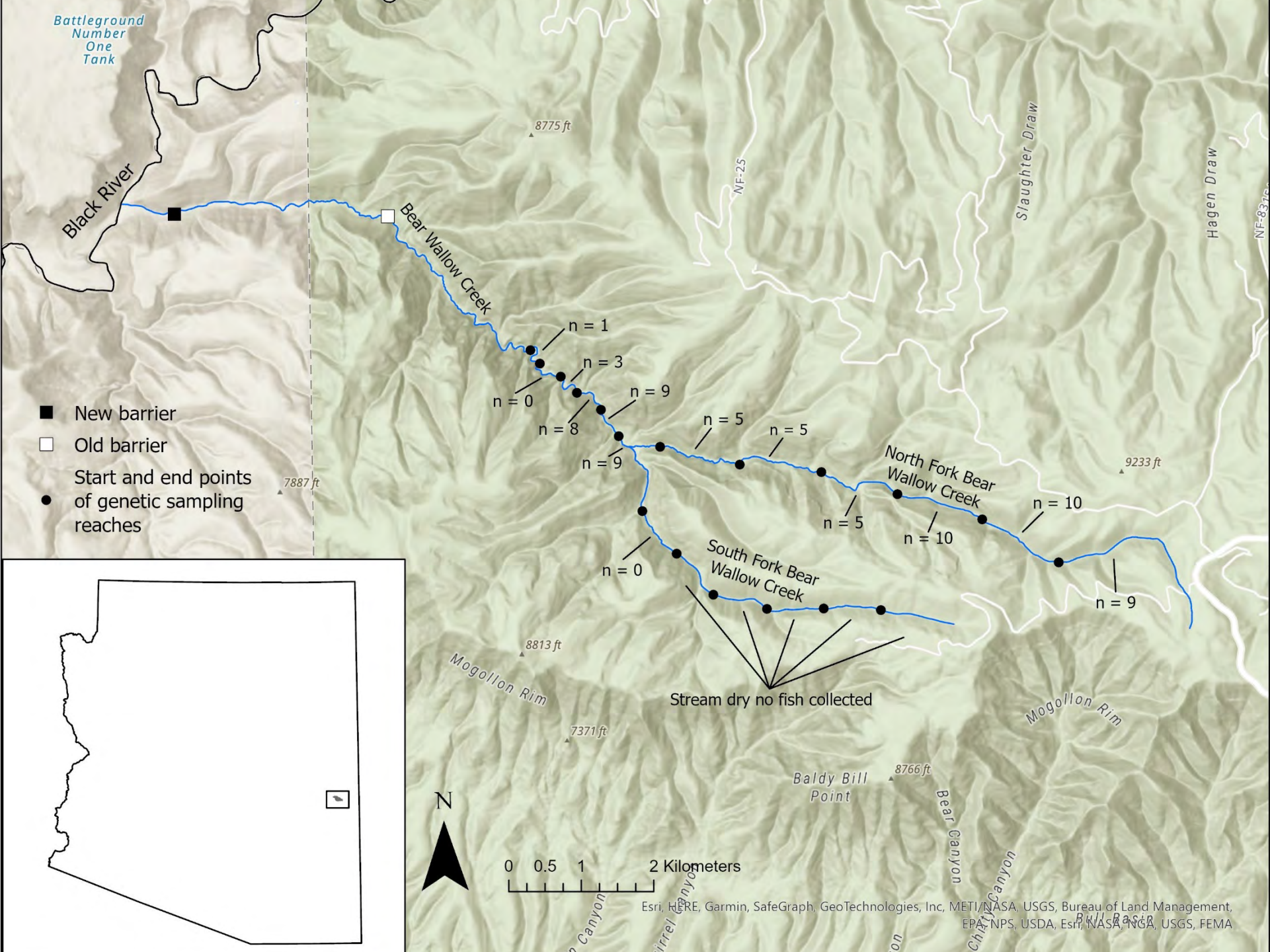
- 2020
  - Piscicide treatment planning
    - Observed lots of Apache Trout
    - No phenotypic expression common in Rainbow Trout x Apache Trout Hybrids observed
- No genetic testing since 2009



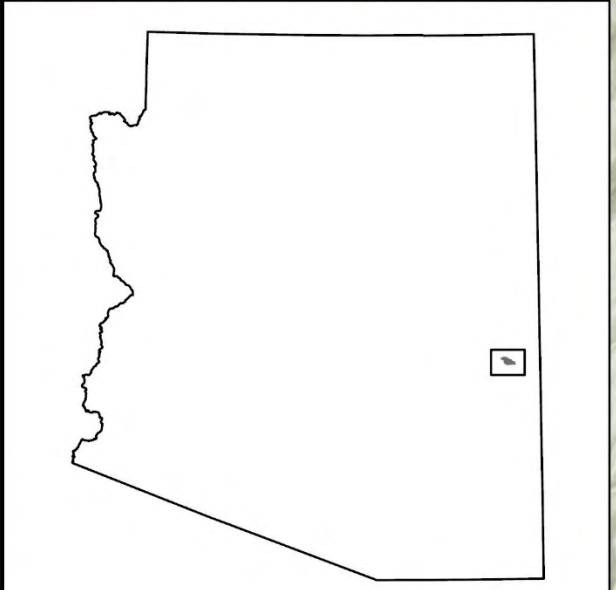
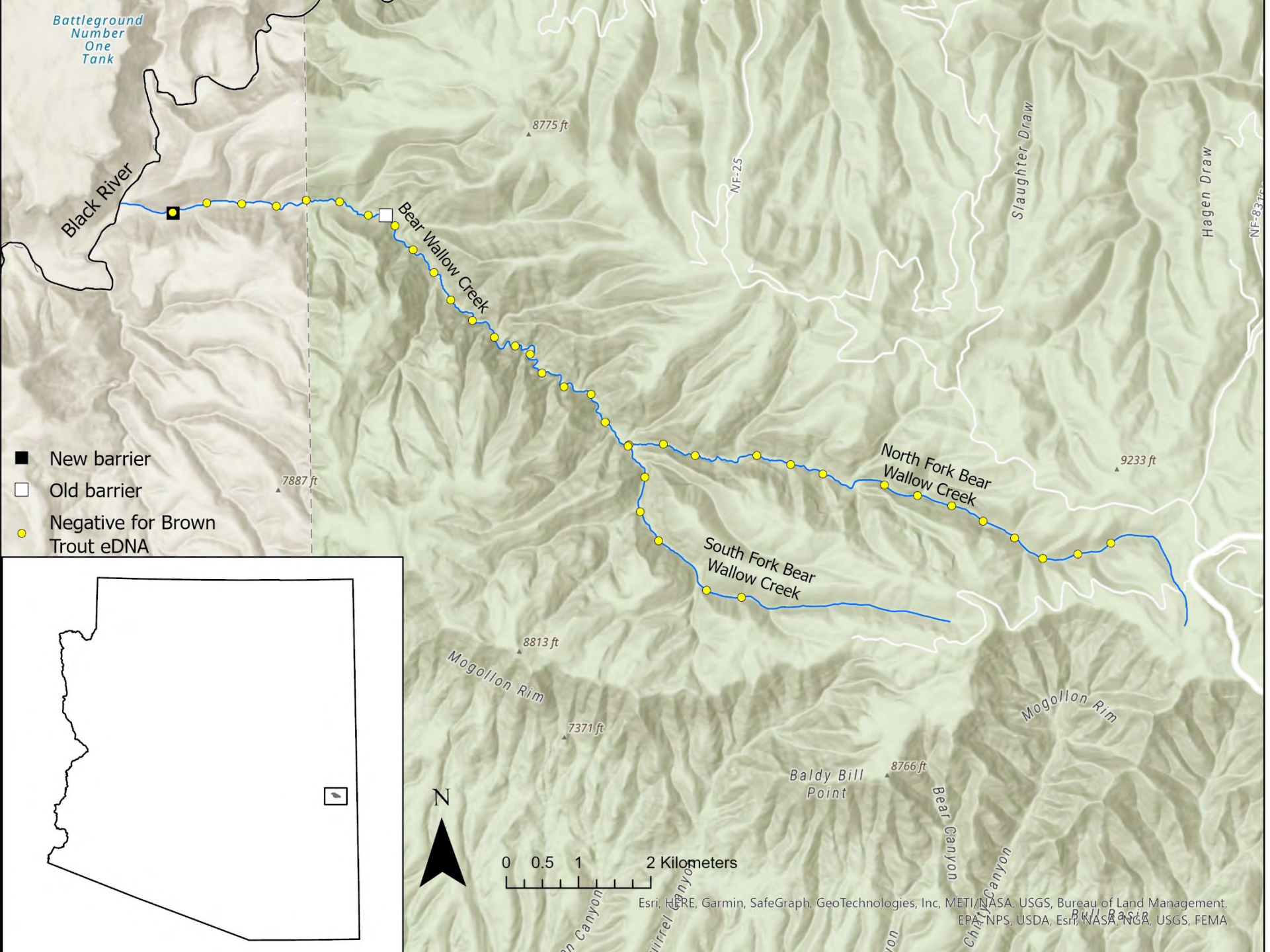












Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA/NPS, USDA, Esri, NASA, INGA, USGS, FEMA

# Conclusions

- Successfully “treated” the stream
- Genetics
  - All Apache Trout were genetically pure
  - No evidence of inbreeding
  - Low genetic diversity
    - Rarified allelic richness ( $A_R$ ) for Bear Wallow Creek = 2.98
    - $A_R$  for other Apache Trout populations = 5.54 (SD±2.33)
- Wildfire can create set backs as well as opportunities in native trout recovery
- Next – population estimate





# Acknowledgements

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