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MVM, Geomorphic Analysis of St. Francis River
Holly Enlow

BLUF:

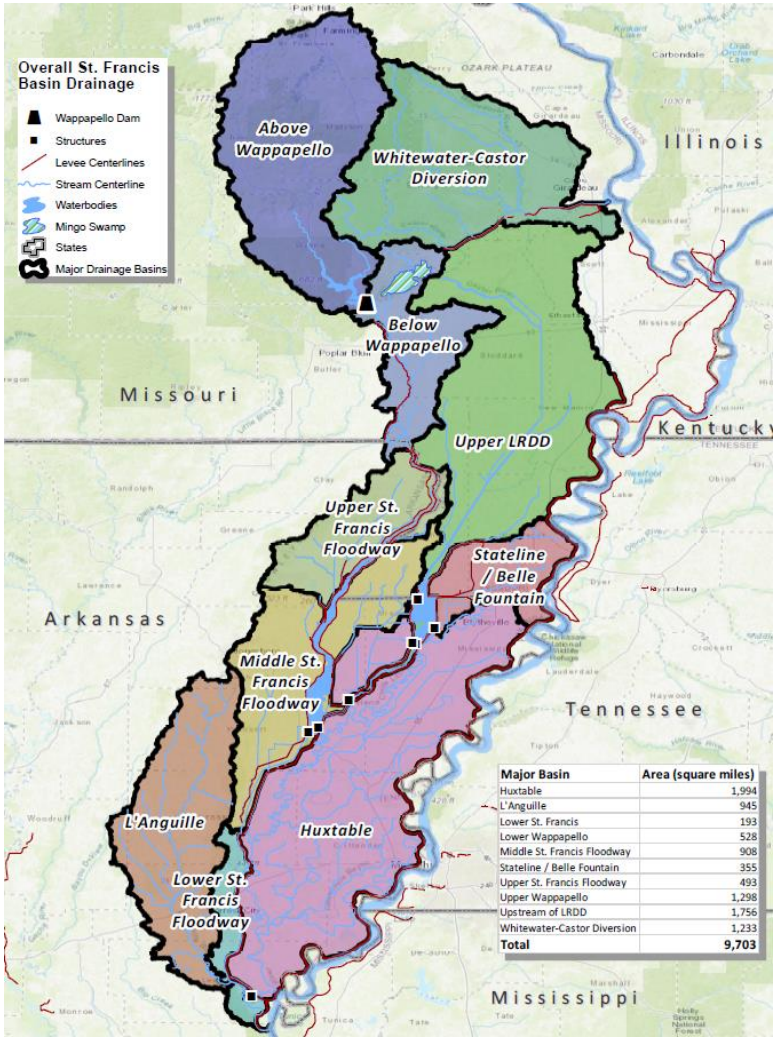
A portion of the St. Francis River below Arkansas Highway 90 continually fills with sediment and requires significant maintenance by the Memphis District. A geomorphic analysis of the St. Francis River is being conducted help to understand the channel response and sediment sources to the below Highway 90 reach to help inform a basin wide sediment management plan. The geomorphic analysis focuses on the Below Wappapello and Upper St. Francis Floodway basins.

Challenge/Objectives

- Construct history of major river engineering activities within the study reach and channel response
- Identify sediment sources and aggradational/degradational reaches.

Approach

- Originally planned a low water trip for field investigation
- ~90 mile reach was identified for analysis
- Remote sensing techniques and gage analysis
  - Specific gage, low stage plots, stage duration
  - Aerial imagery, slope analysis, stream power
- FluvialGeomorph toolkit for Rapid Geomorphic Assessment
- Geomorphic Analysis Package



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MVM PDT Members:

Holly Enlow
Sarah Girdner
Nate Wetzel
Michael Lamport
Kyle Raburn

ERDC PDT Members:

Chris Haring
David Biedenharn

Stakeholders/Partners

- St. Francis Drainage District of Clay and Greene Counties, AR
- Eight Mile Drainage District of Greene County, AR
- Drainage District No. 48, Dunklin County, MO
- Varney River Drainage District
- Levee District No. 7 of Dunklin Co. MO
- Mingo Drainage District
- Drainage District No. 12 of Stoddard Co., MO
- Drainage District No. 12 of Dunklin Co., MO
- Drainage District No. 5

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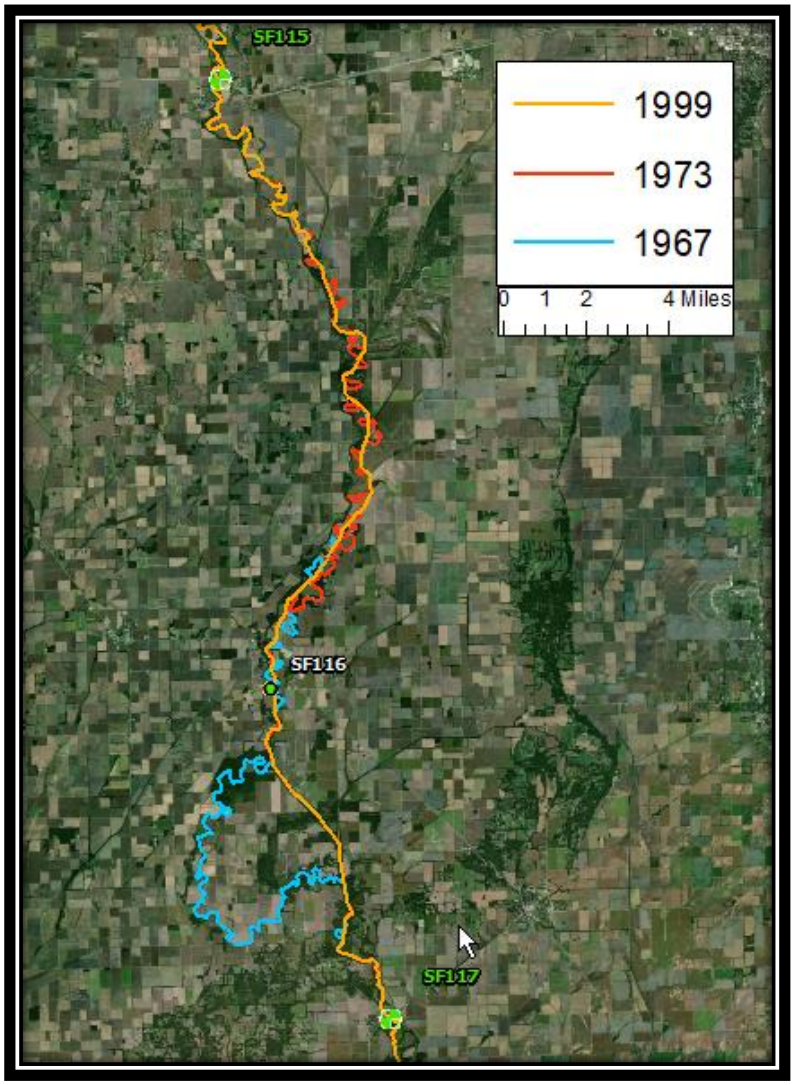
Year	Channel Length (mi)*
1956	109
1961	108
1967	107
1973	91
1999	79
2009	80
2011	80

*Wappapello Dam to Hwy 90



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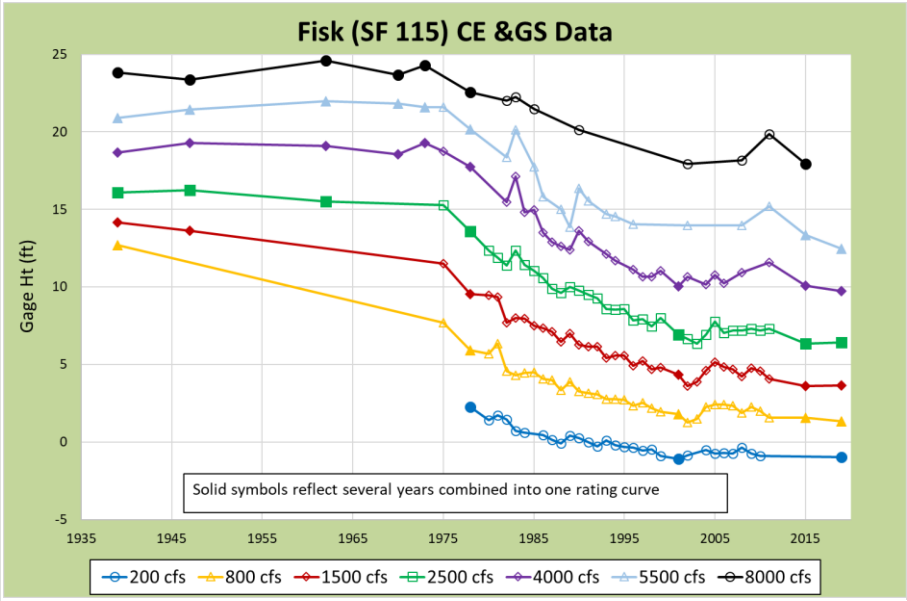
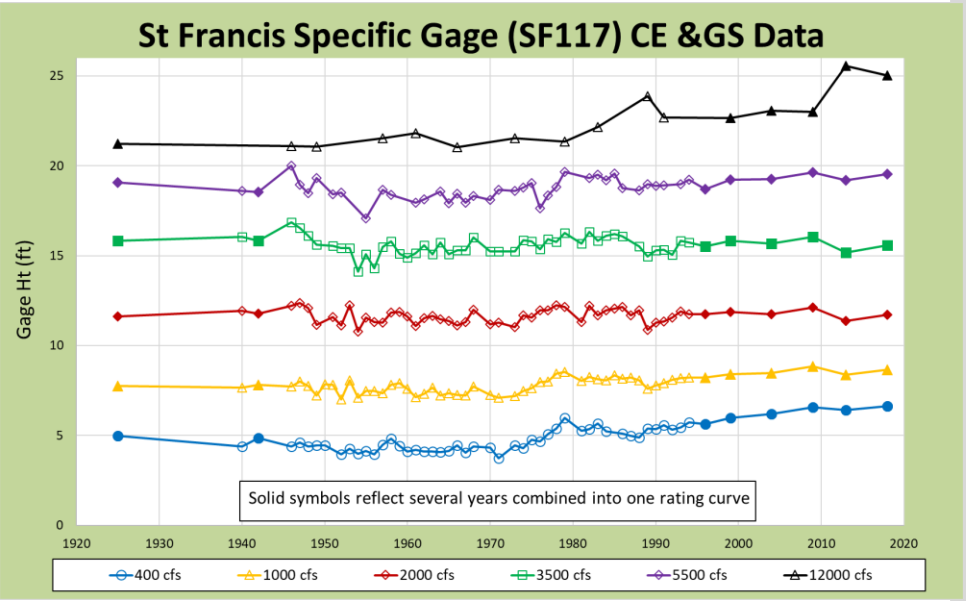
Upstream of Cutoffs



Downstream of Cutoffs



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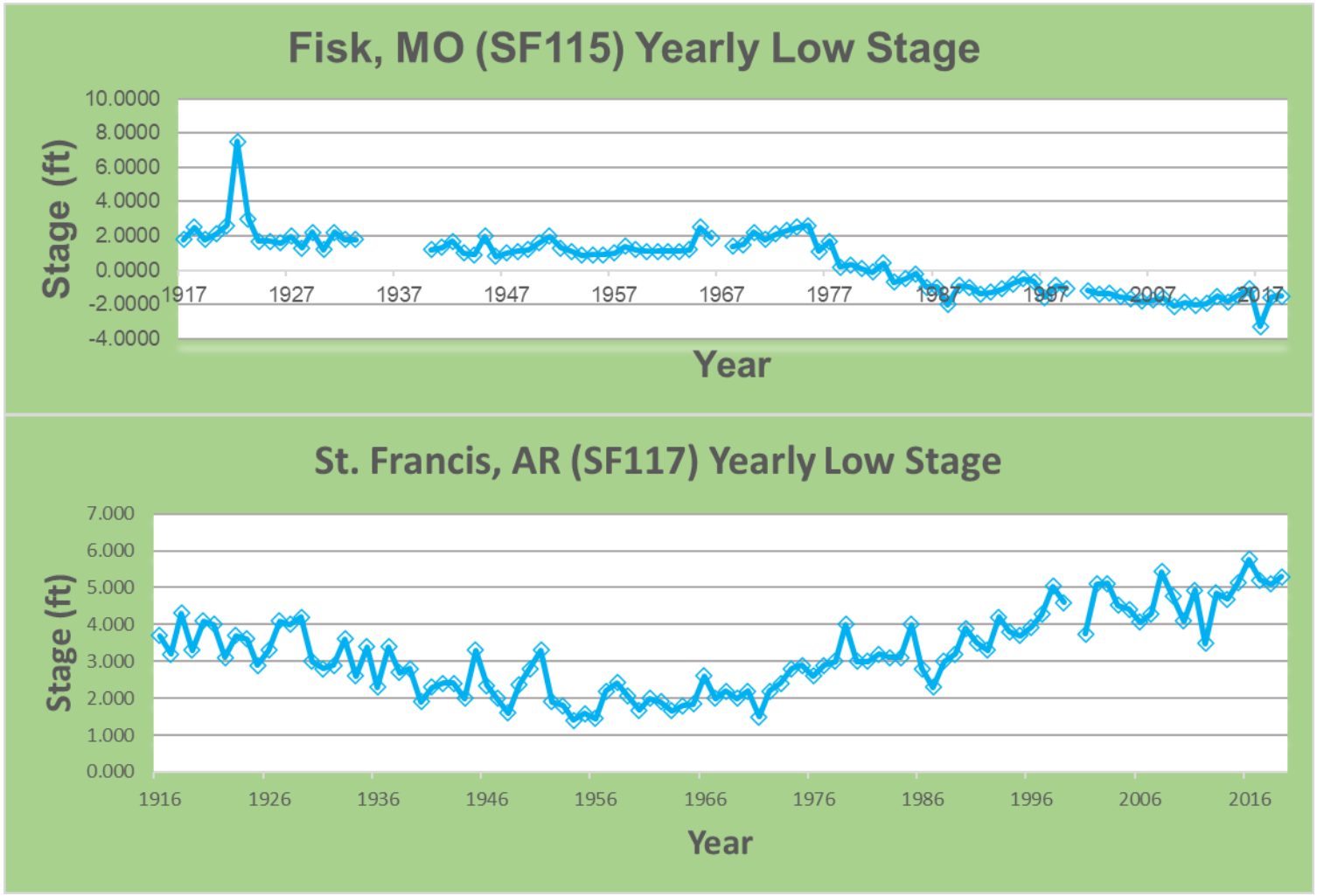

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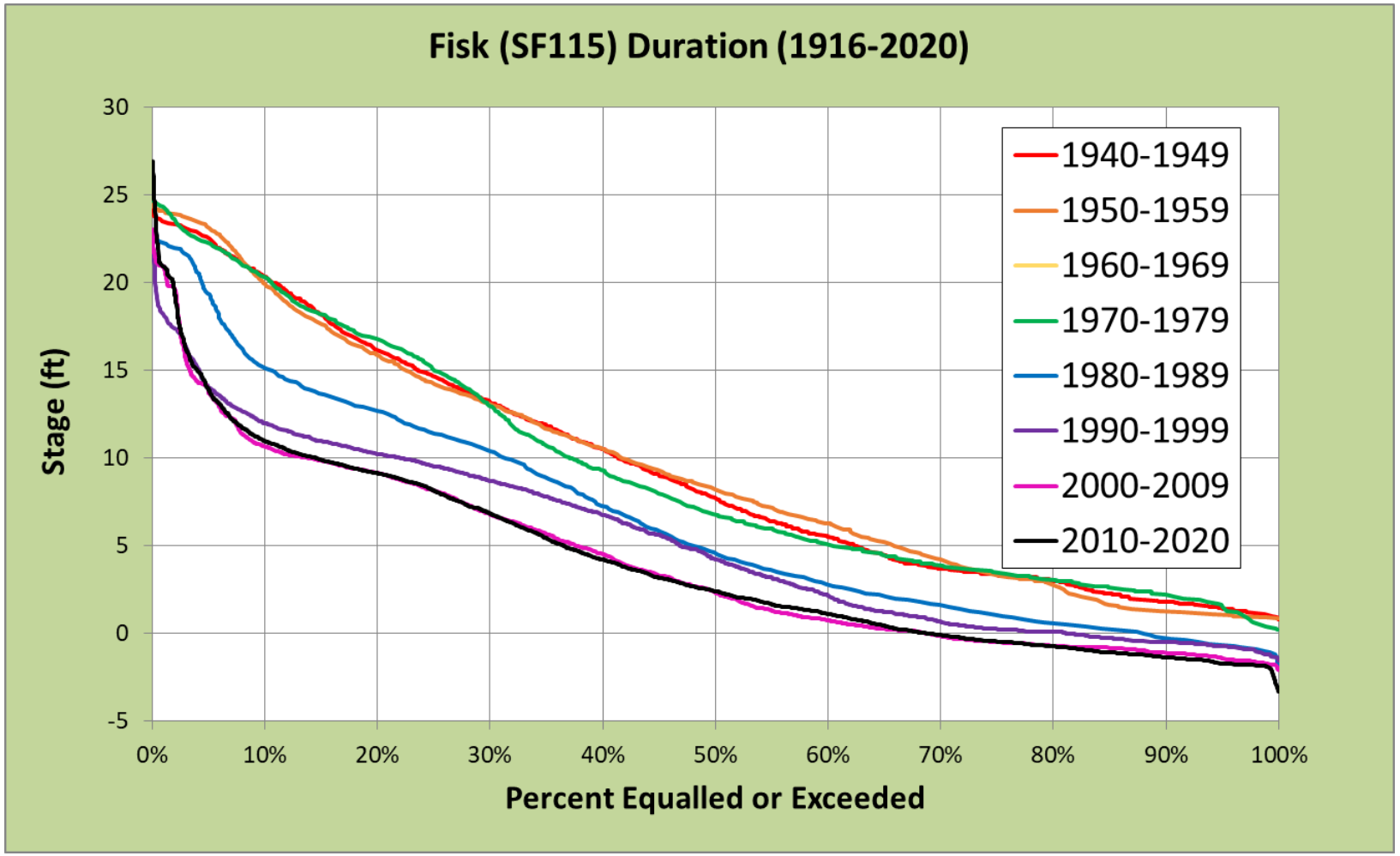

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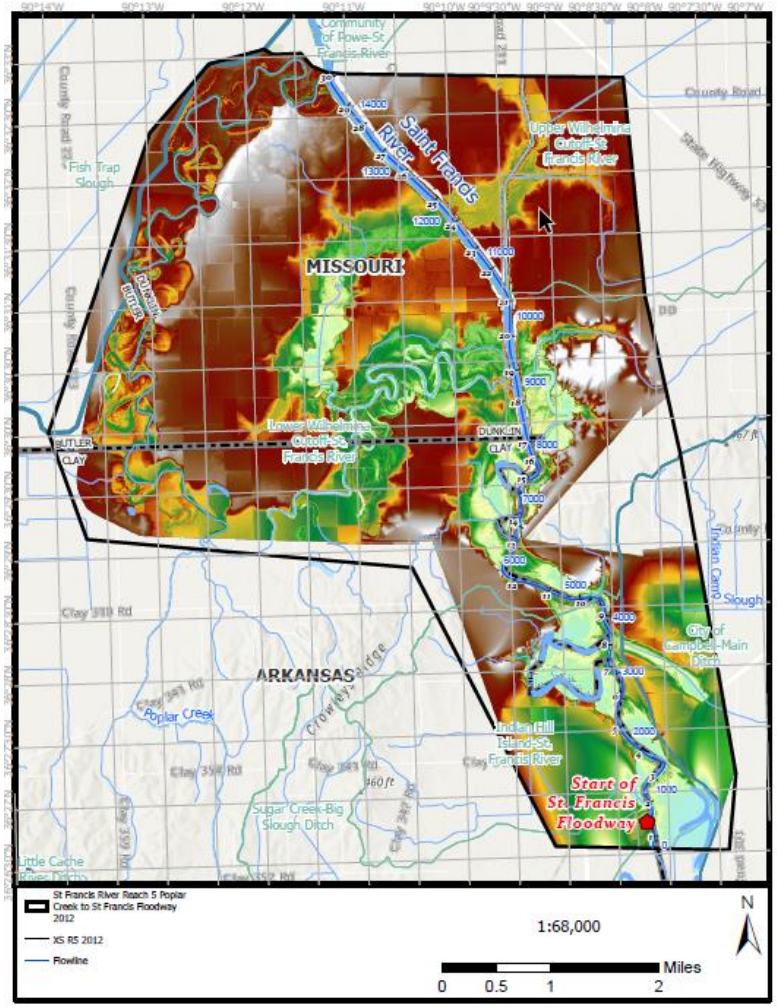
- Rapid Geomorphic Assessments (RGA) using the FluvialGeomorph (FG) Toolkit are being completed on 12 reaches of the St. Francis River and tributaries.
- Existing high-resolution terrain data (LiDAR) used to assess geomorphic metrics and channel stability.
- Level I Channel Change Analysis is being completed on all 12 reaches and Level II-Channel Dimension Analysis will be completed on reaches identified from Level I based on the need for further assessment.
- The purpose of the FG analysis is to identify unstable reaches for further data collection and detailed study.



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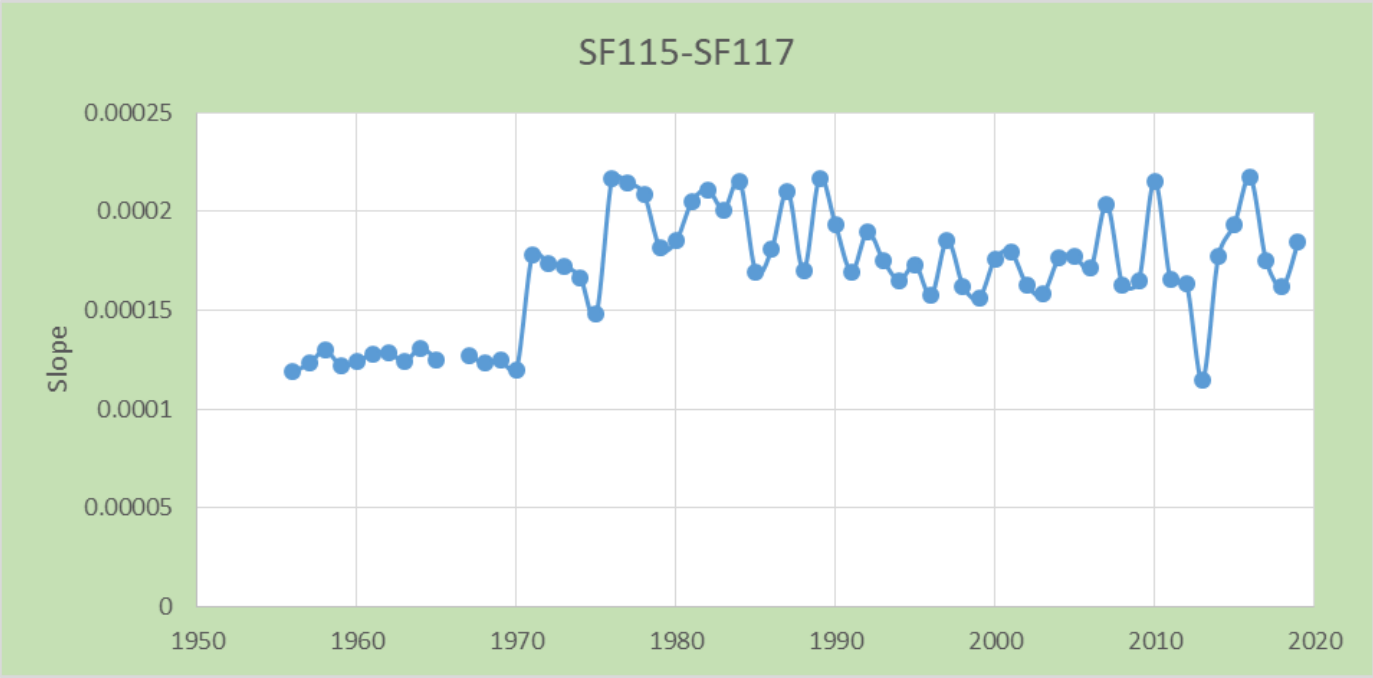
Ongoing analysis:

- FluvialGeomorph
- Slope and stream power changes pre- and post-cutoff
- Synthesize results from all analyses



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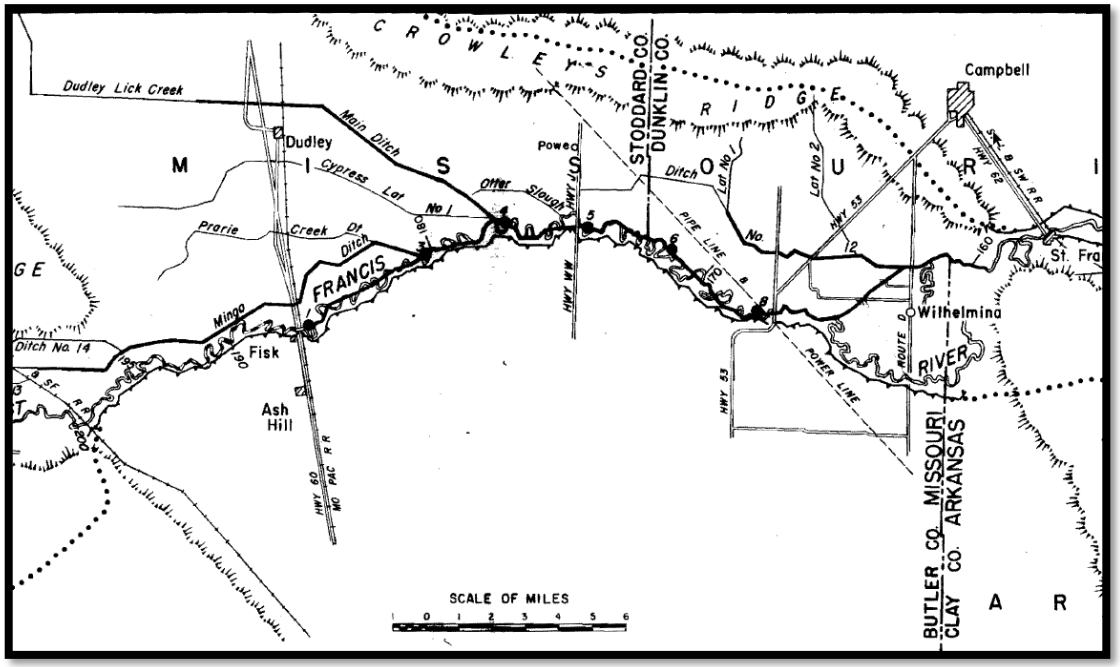
What challenges did you face to get your project to implementation and how did you move past them?

- Locating historical documents and consolidating data (construction plans, authorities, previous studies, stage, discharge, rating curves, aerial photographs, LiDAR, etc.)
- Recent turnovers in personnel has resulted in loss of institutional knowledge of the basin



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How is this project benefiting the USACE and Nation?

- Federal government is responsible for 100% of maintenance and construction costs for the St. Francis Basin
- Below Hwy 90 Channel cleanout has a recurring cost $5-$10 million ~every 5 years
- St. Francis Basin Future Management Plan PDT was recently created to determine more sustainable ways to reduce recurrence of cleanout projects and to perform project maintenance
- The results from this study will lay the groundwork for the future basin management plan and provide valuable data for future sedimentation studies