Do freshwater mussel beds associate with lateral channel stability and channel controls?

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Mussel Research Framework in MO

- Identify habitat needs
- Assess risks
- Standardize protocol
- Detect trends in mussel assemblages
  - Habitat suitability model
  - Transference between drainage systems

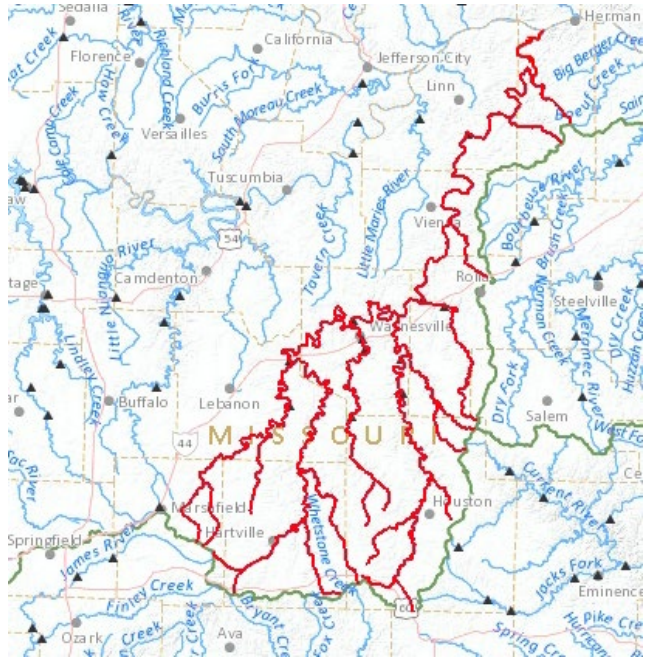
Study Organism: Freshwater Mussels

- Unique life cycle
- Mussel Beds
- Importance
- Mussels in Decline

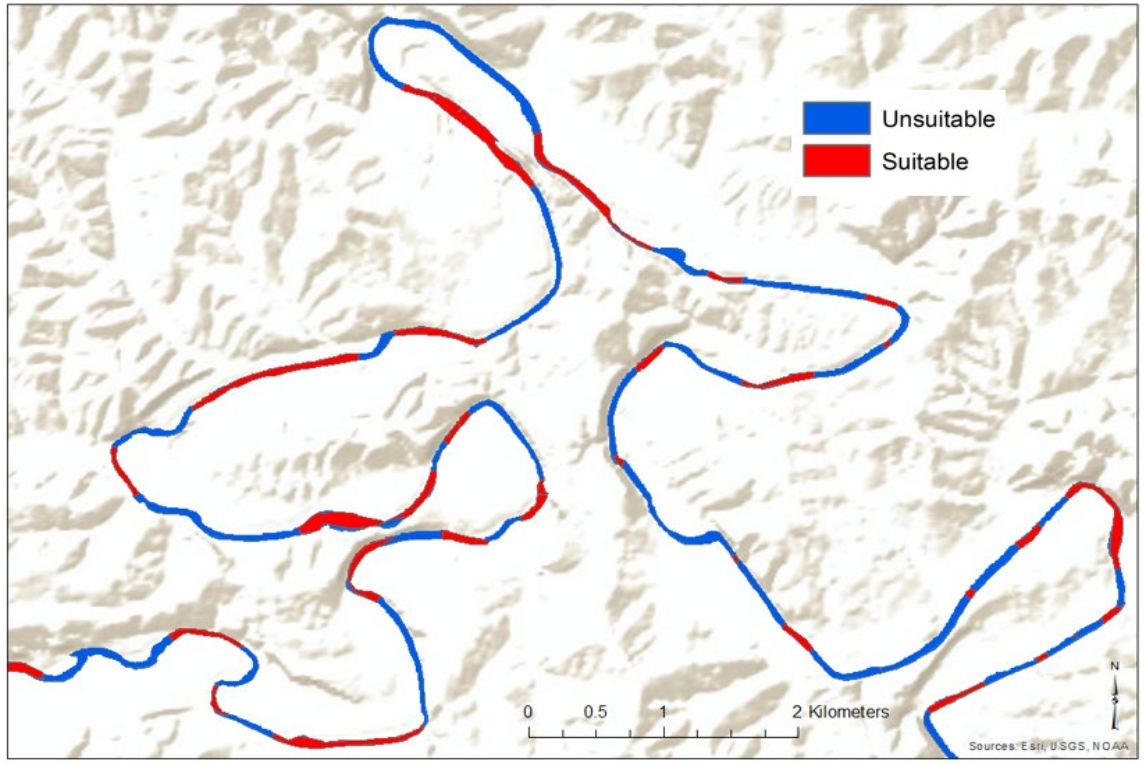
Fundamentally Suitable Habitat

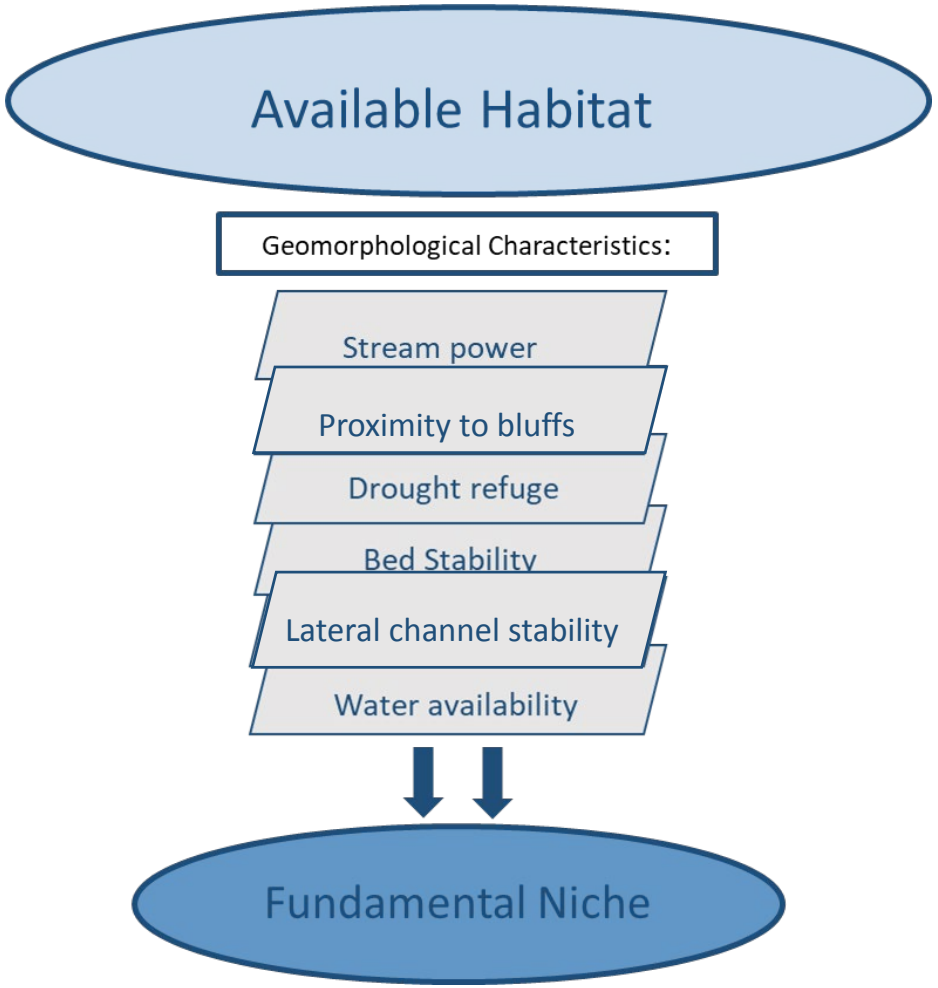
FUNDAMENTAL NICHE:
- Limits to tolerance
- Minimum factors for survival/ positive fitness

REALIZED NICHE
- Actual distribution
- Competitors, Predators, Threats



Fundamentally Suitable Habitat





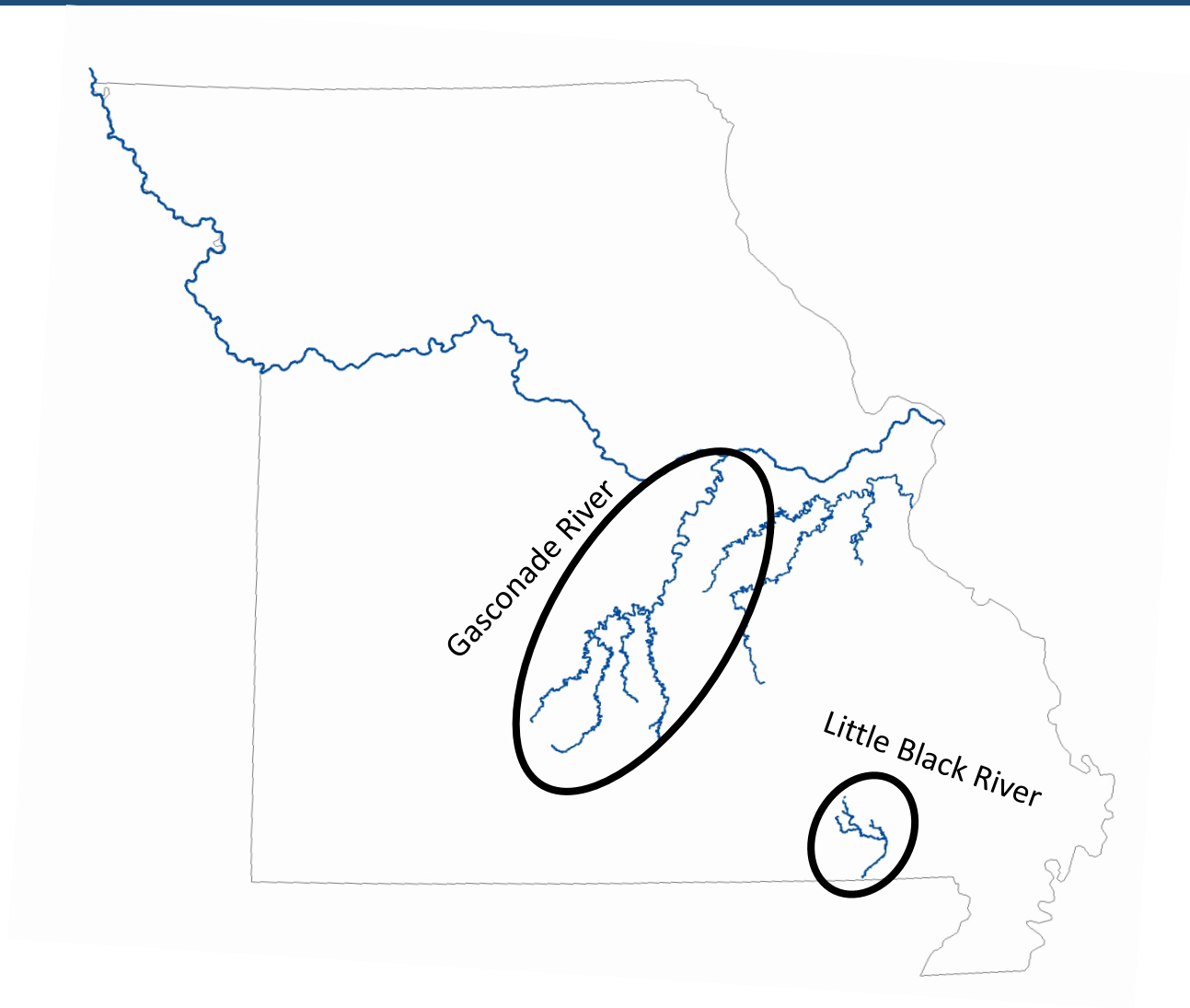
Objectives

- Evaluate relationship between lateral channel stability and the presence of bluffs in Ozark rivers
- Determine if mussel bed occurrences are disproportionately related to channel stability

Hypotheses

- Bluffs will be associated with lateral channel stability
- Mussel beds in both rivers will be found in stable reaches

Study Areas



Methods

- Use remotely- sensed elevation data and aerial imagery to derive hydrogeomorphic variables
- Determine if bluffs lead to lateral channel stability
- Identify species rich beds from the state database
- Determine if mussel beds are disproportionately spread in the systems


1990
2007

Little Black River

Gasconade River

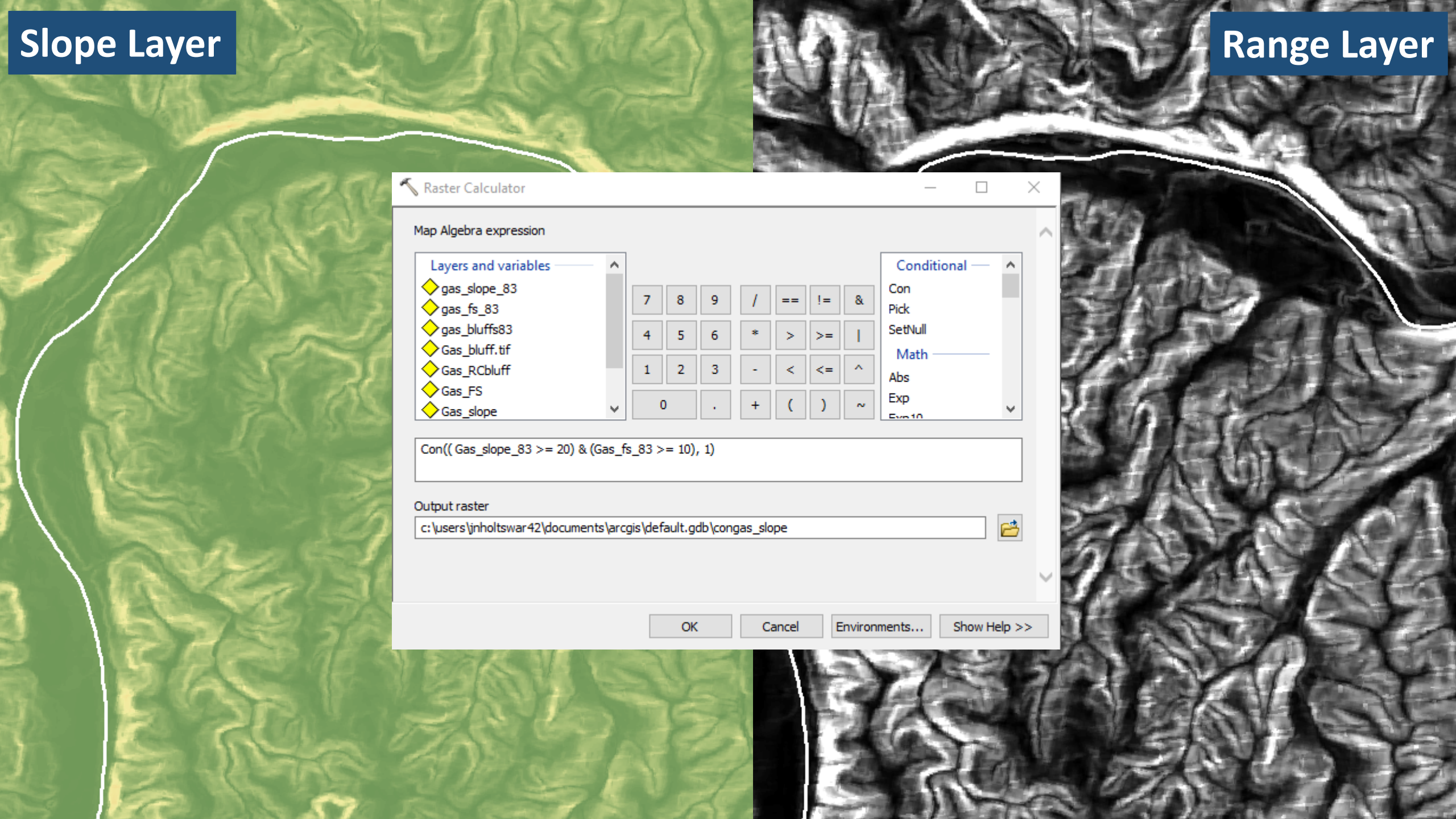
Grandin

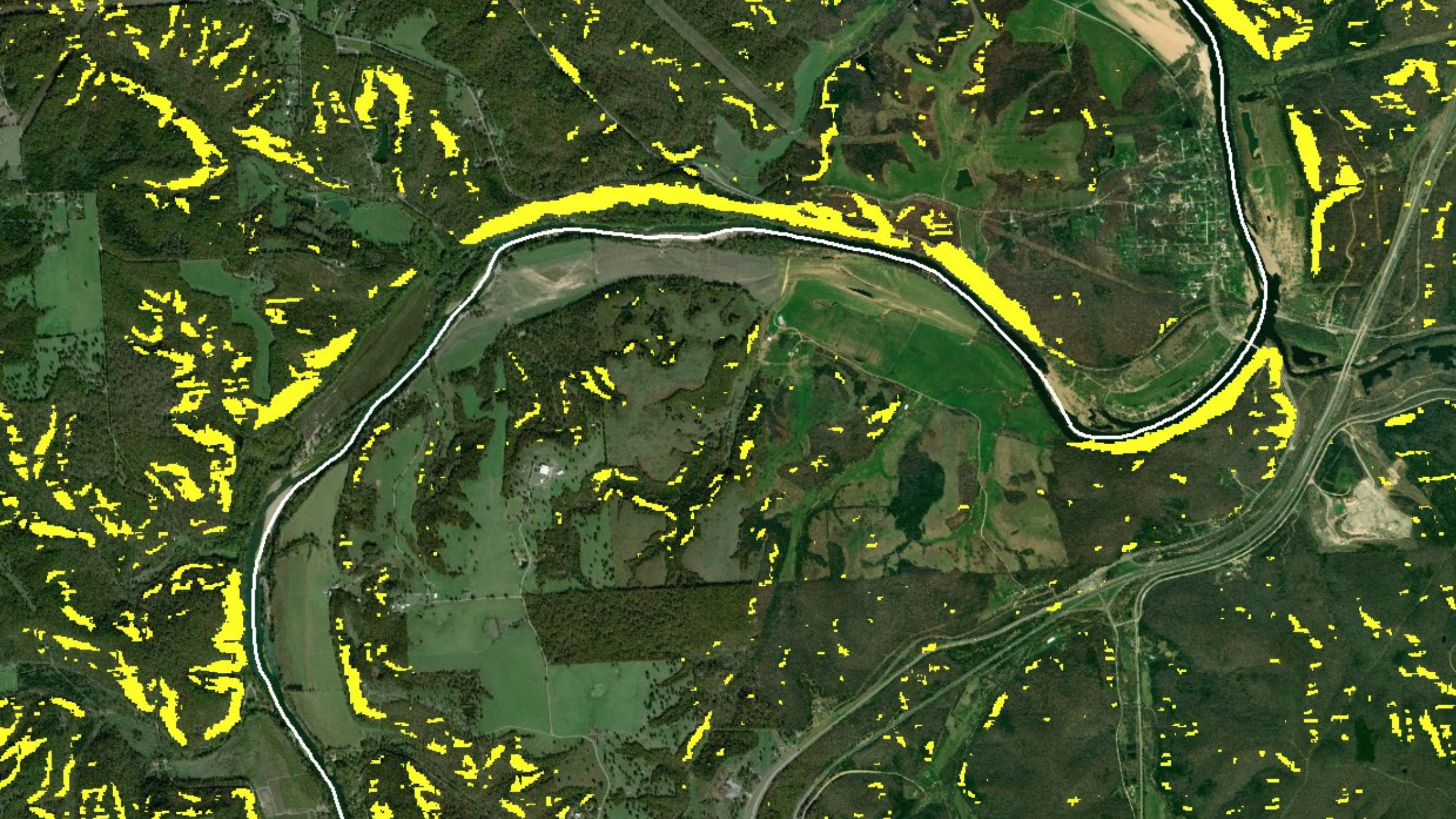
Fairdeal

Rolla

Laterally Stable

Laterally Unstable


Slope Layer
Range Layer
Raster Calculator
Map Algebra expression
Layers and variables
gas_slope_83
gas_fs_83
gas_bluffs83
Gas_bluff.tif
Gas_RCbluff
Gas_FS
Gas_slope
7 8 9 / == != &
4 5 6 * > >= |
1 2 3 - < <= ^
0 . + ( ) ~
Conditional
Con
Pick
SetNull
Math
Abs
Exp
Con((Gas_slope_83 >= 20) & (Gas_fs_83 >= 10), 1)
Output raster
c:\users\jnholtswar42\documents\arcgis\default.gdb\congas_slope
OK
Cancel
Environments...
Show Help >>



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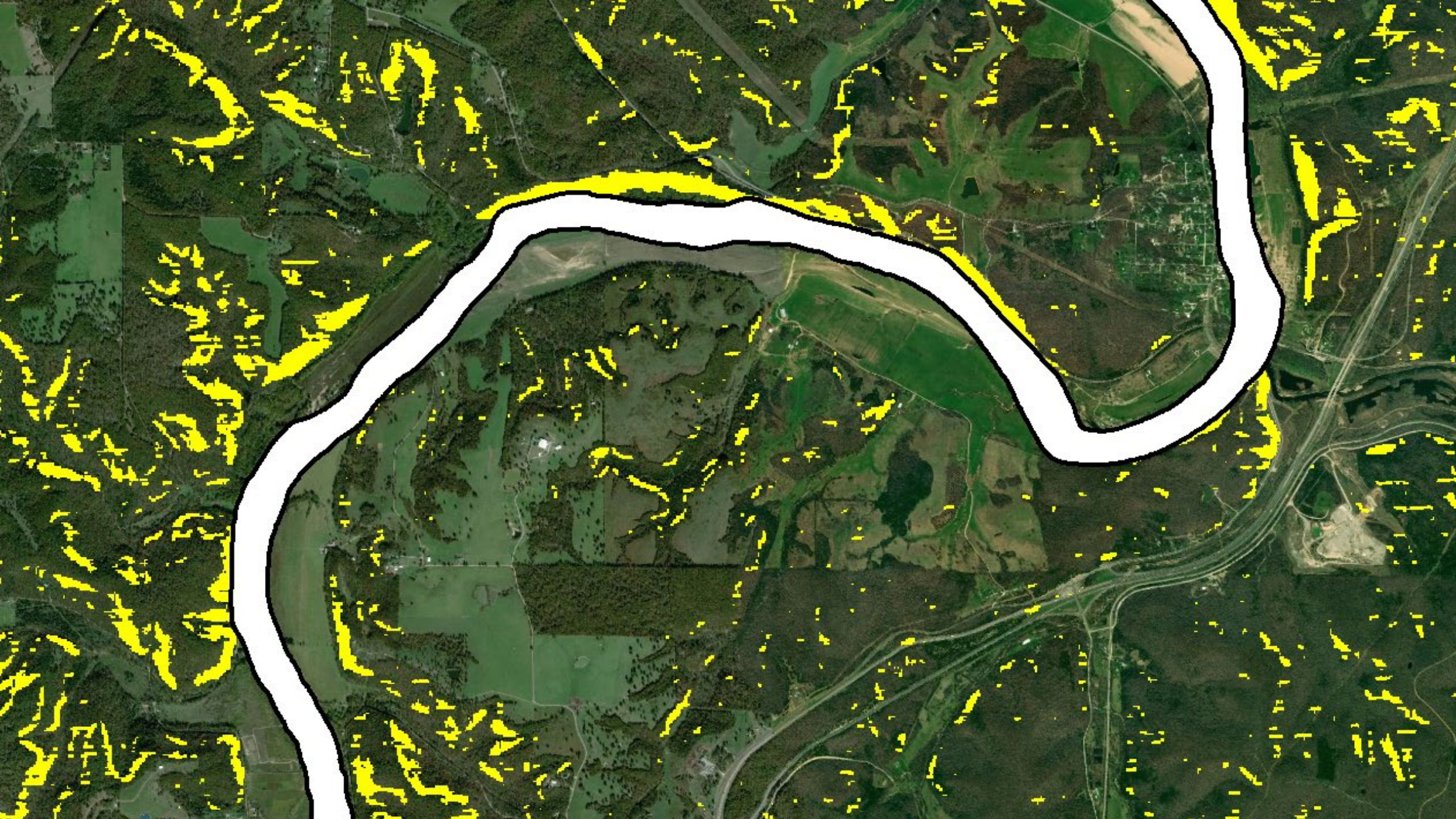

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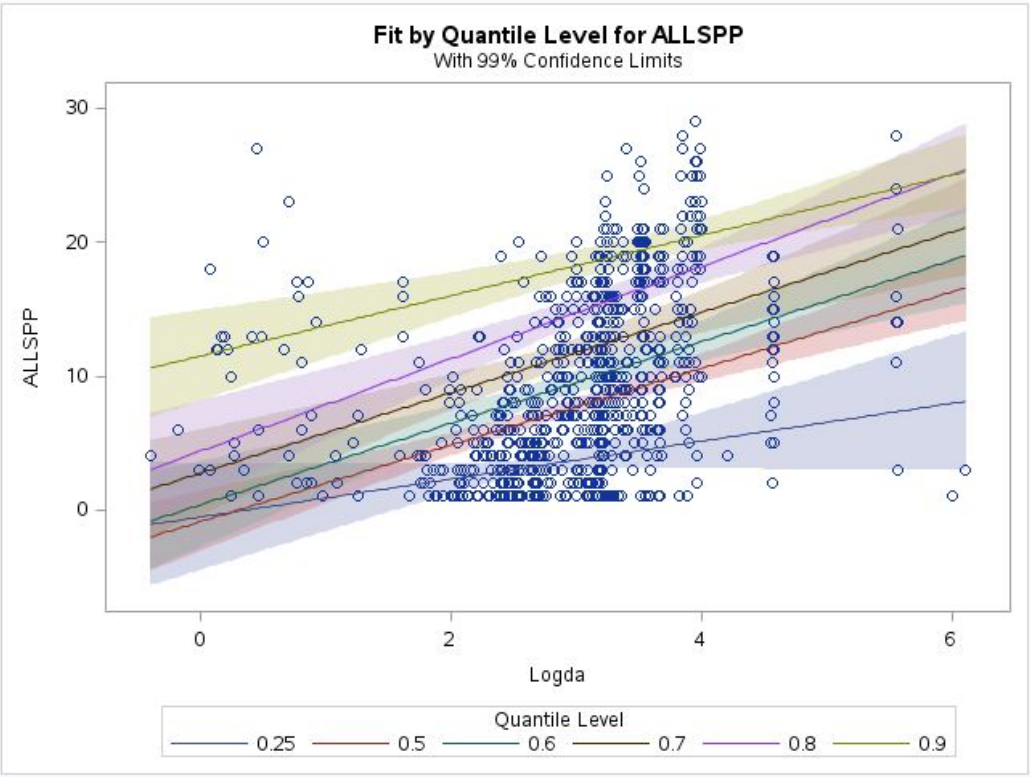
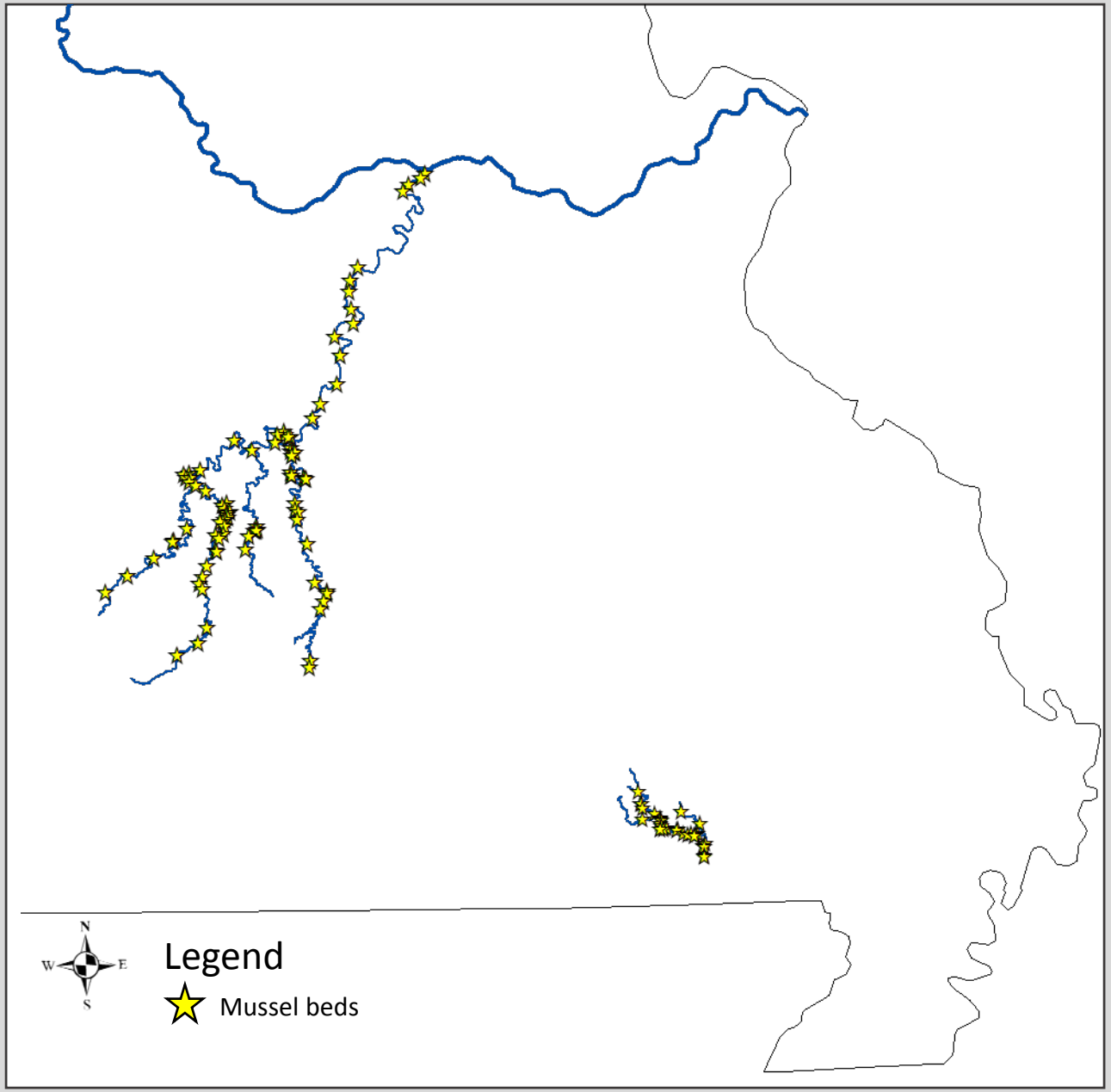


$Quantile\ 0.25$	$Species\ richness = (1.4 * \log_{10} drainage\ area) - 0.51$
$Quantile\ 0.50$	$Species\ richness = (2.9 * \log_{10} drainage\ area) - 0.86$
$Quantile\ 0.60$	$Species\ richness = (3.0 * \log_{10} drainage\ area) + 0.40$
$Quantile\ 0.70$	$Species\ richness = (3.0 * \log_{10} drainage\ area) + 2.80$
$Quantile\ 0.80$	$Species\ richness = (3.4 * \log_{10} drainage\ area) + 4.40$
$Quantile\ 0.90$	$Species\ richness = (2.3 * \log_{10} drainage\ area) + 11.5$



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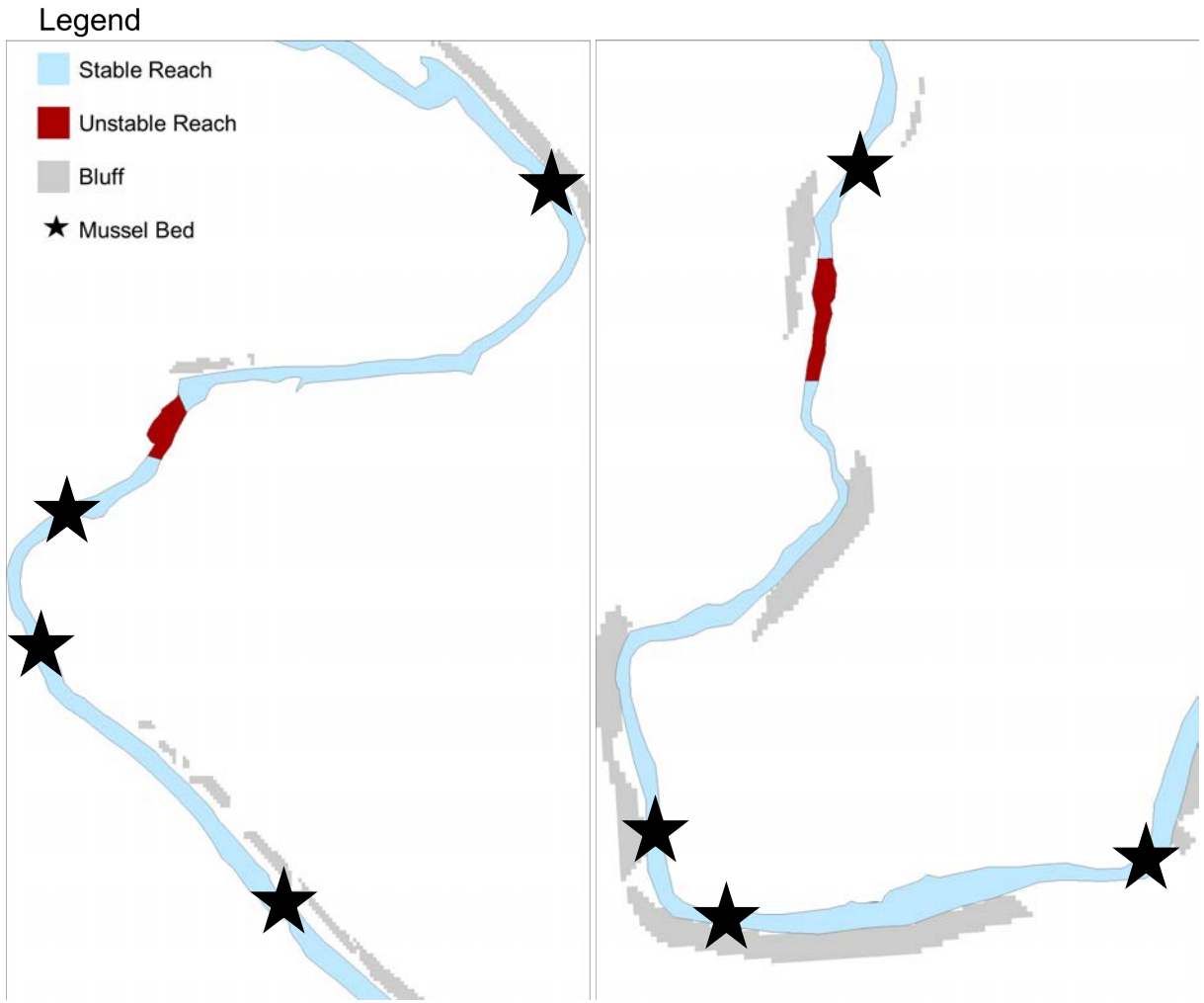
Results



Results

Proximity to Bluffs

- Gasconade River
  - $Chi^2 = 5.45$
  - P-Value= 0.02
- Little Black River
  - $Chi^2 = 0.10$
  - P-Value= 0.92

Freshwater Mussel Beds

- Gasconade River
  - $Chi^2 = 5.45$
  - P-Value= 0.02
- Little Black River
  - $Chi^2 = 0.10$
  - P-Value= 0.74

Why?

=

Conclusions

- Gasconade River VS. Little Black River
  - Bluff proximity
  - Lateral channel stability
- Add other hydrogeomorphological factors = better habitat suitability model

Implications

- Understanding what factors allow freshwater mussel establishment and persistence can help inform successful conservation efforts and save sampling time
- By using remotely sensed data, under-sampled areas can still be examined for fundamental habitat suitability

Acknowledgements

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