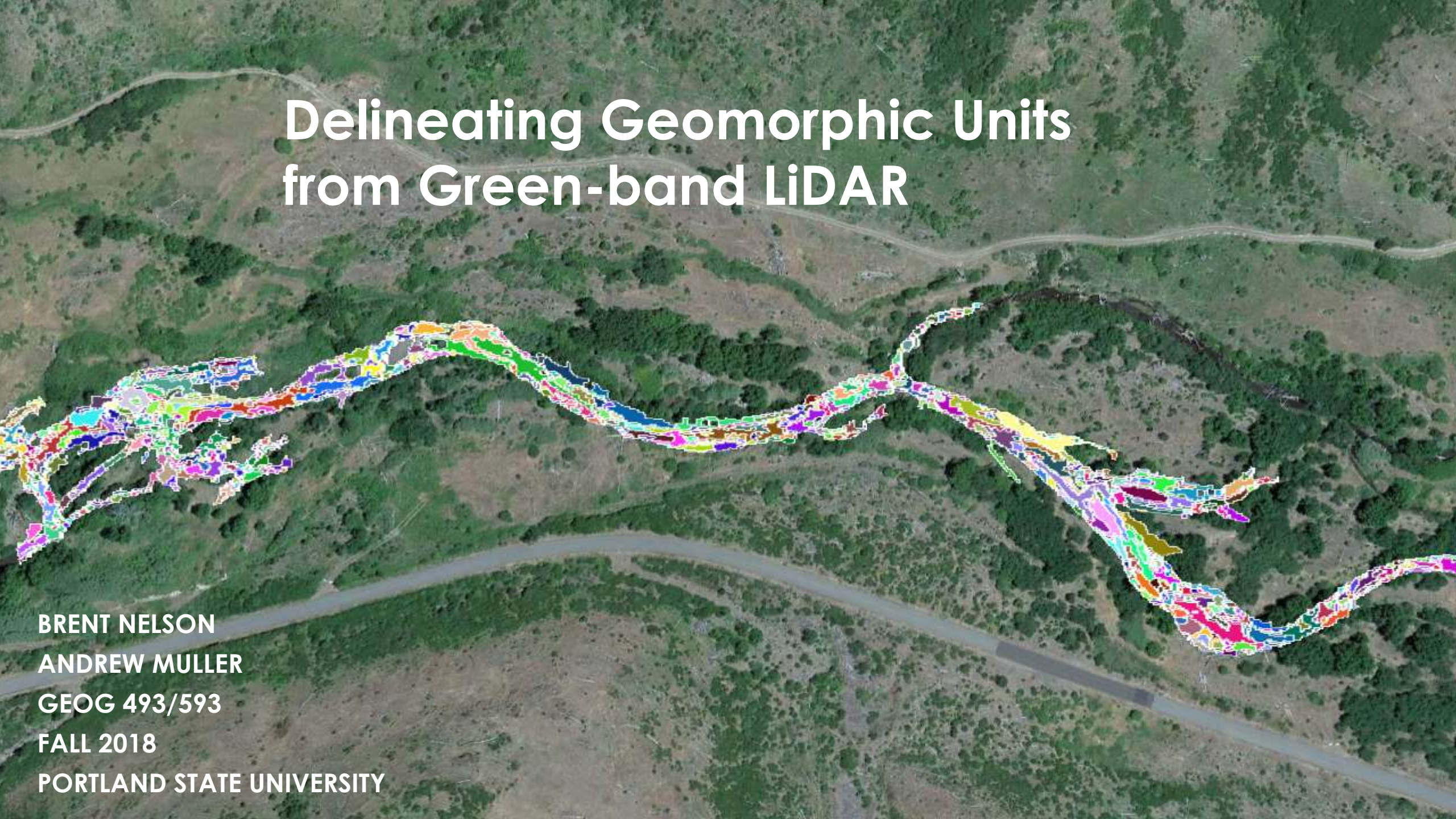
# Delineating Geomorphic Units from Green-band LiDAR



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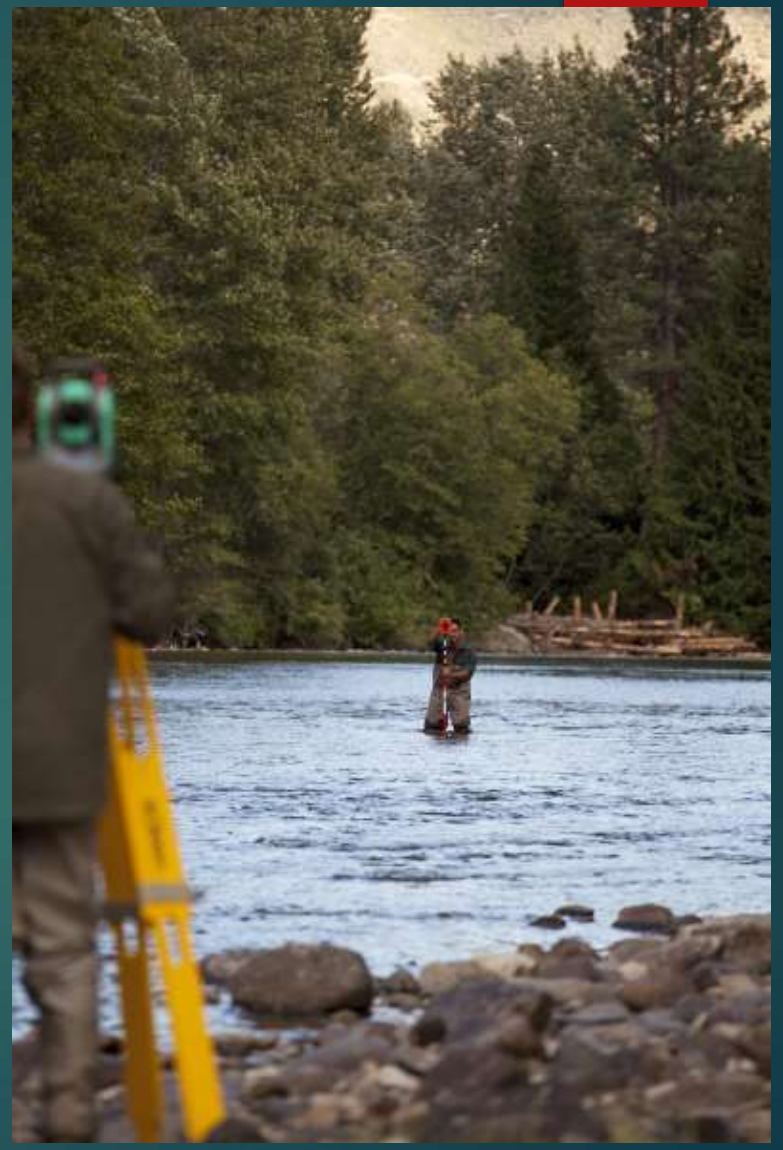
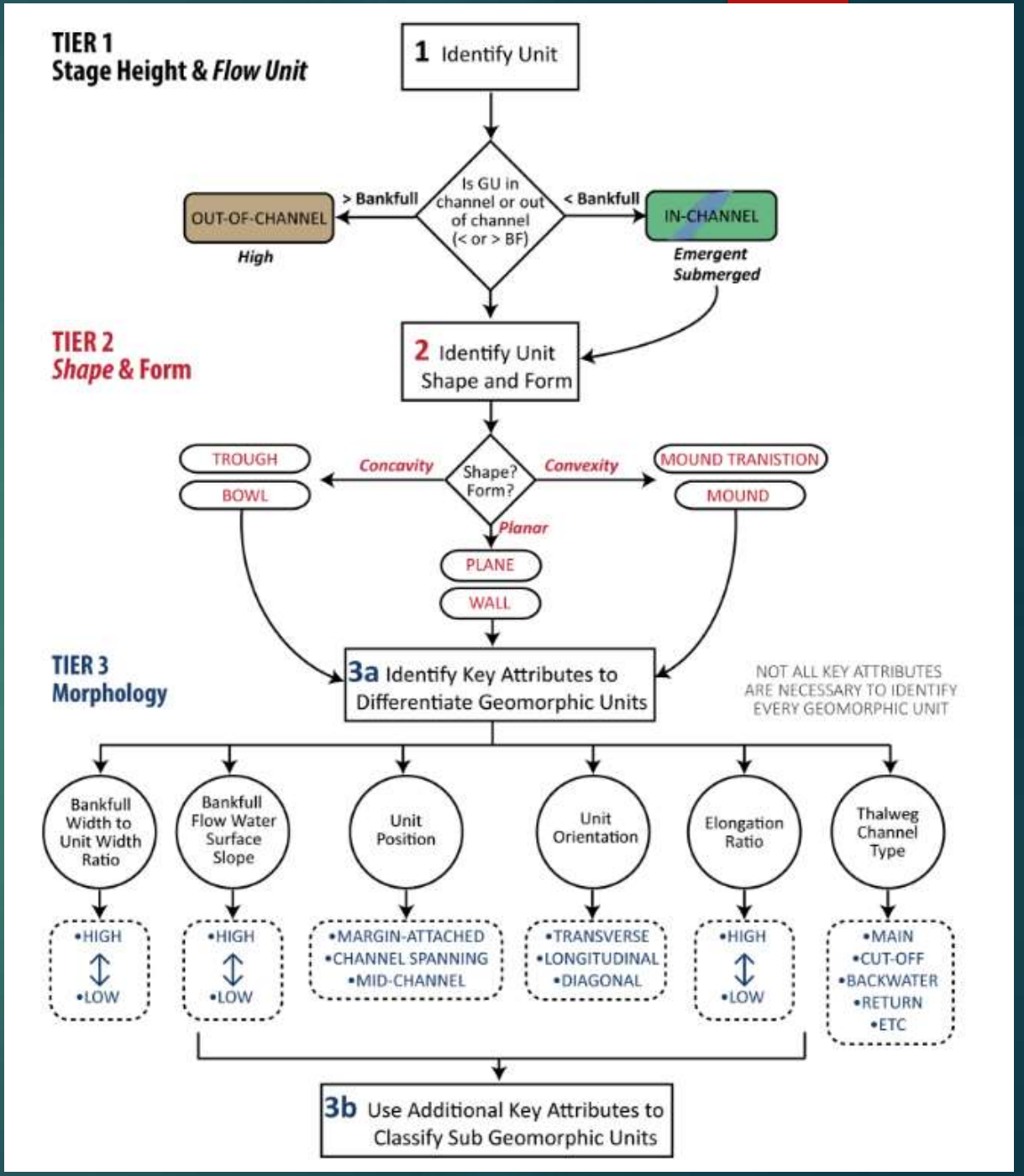
# Background

- Habitat surveys are performed to quantify stream characteristics and changes over time
- Common surveys (CHaMP) use survey equipment to build DEM's of stream channel
  - 600m of stream would require approx. 1000 points
- Geomorphic units are delineated in field, brought into survey data through processing
- $$$, small area covered



# Geomorphic Unit Tool (GUT)

- Automated approach to geomorphic unit classifications
- Removes subjectivity
- Increases classification types
- Increases area surveyed



# Data

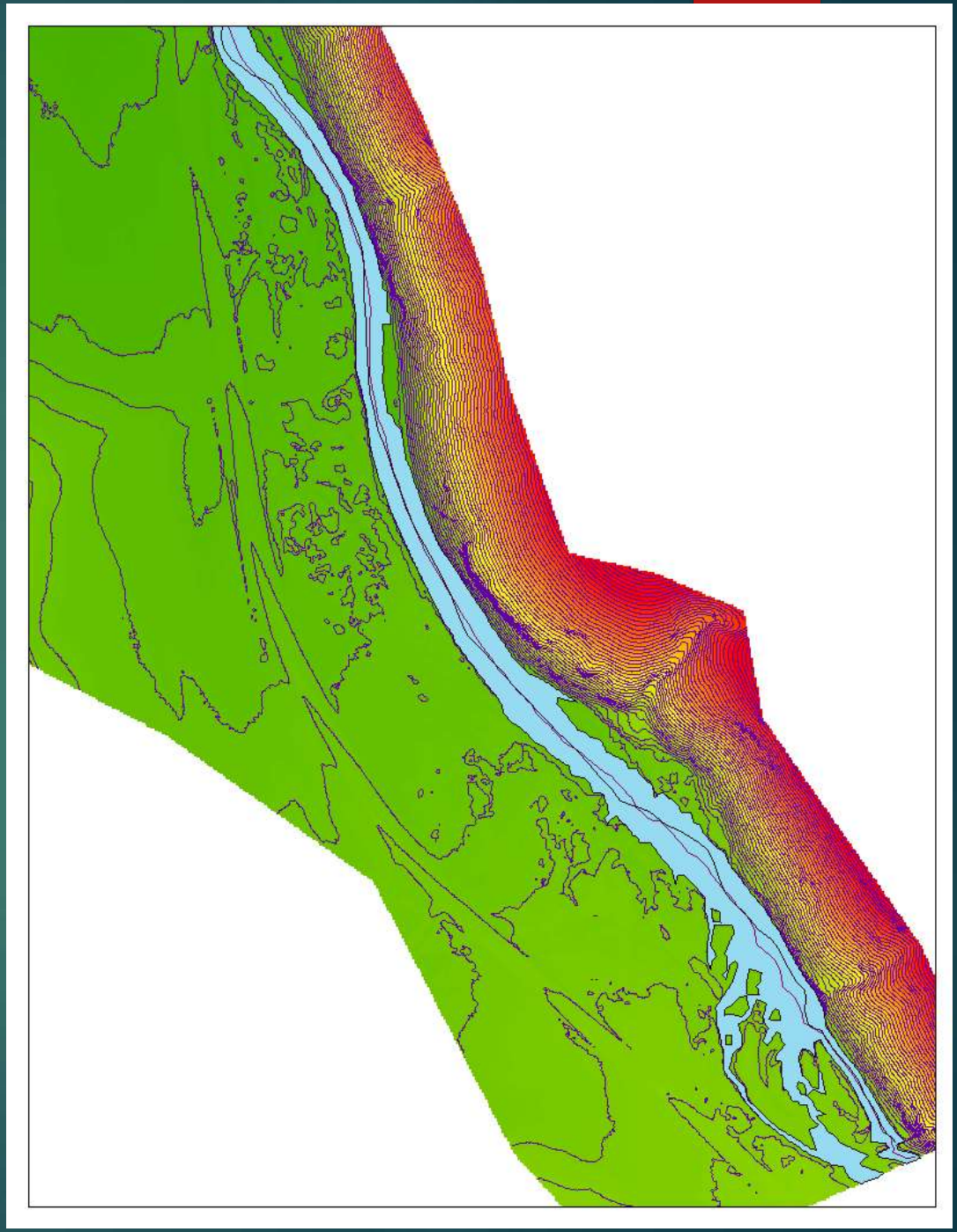
- LiDAR flight in November 2017 on Tucannon River, WA
- DEM and water extent
- Broken into two reaches:
  - 21-control site
  - 11-restoration site

# Tools required

- River Bathymetry Toolkit (RBT)
  - Developed for ArcMap 10.2-not updated
- Geomorphic Unit Tools (pyGUT)
  - Developed for CHaMP data processing-needs associated shapefiles
- Polygon to Centerline
  - Used to create centerline shapefiles

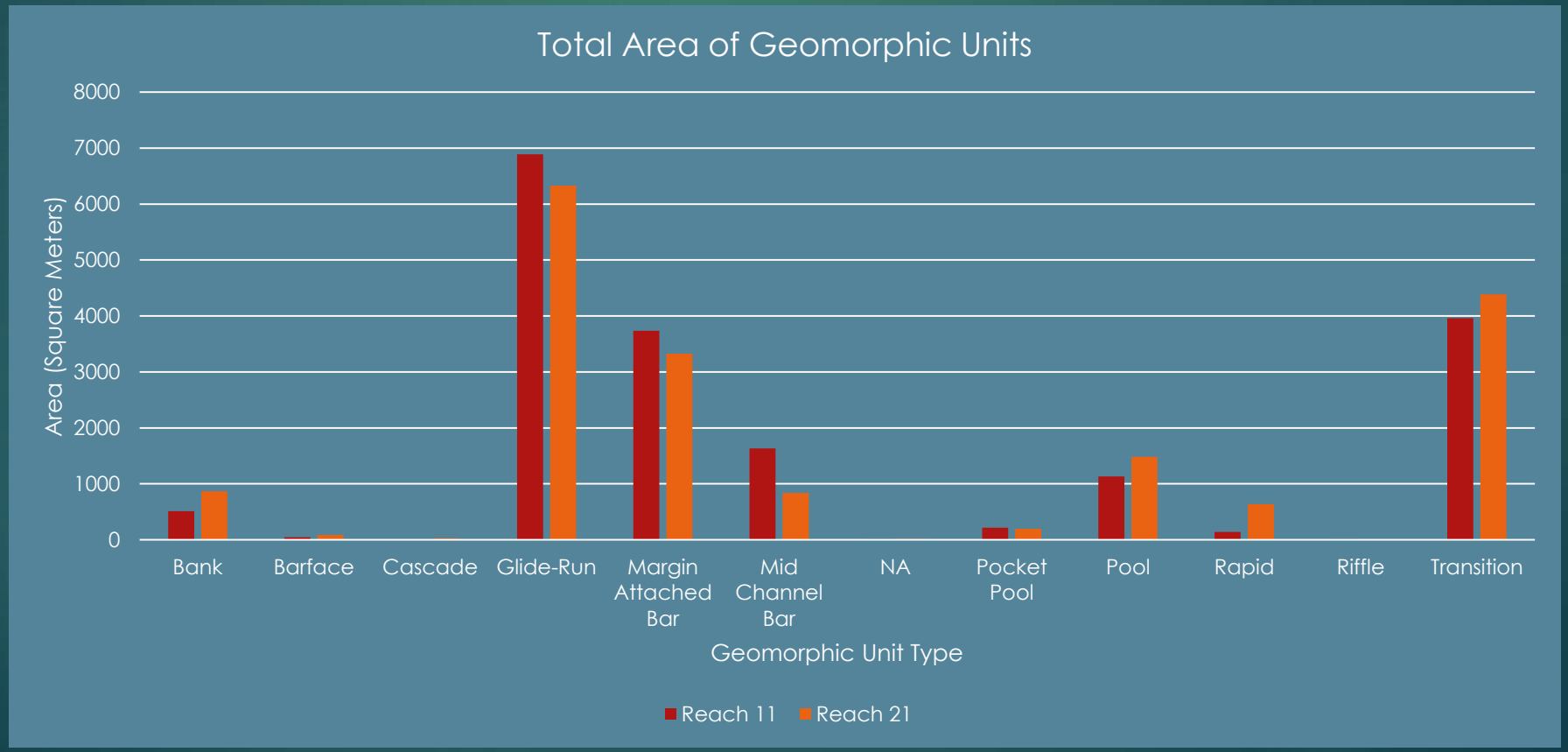
# Processing Steps

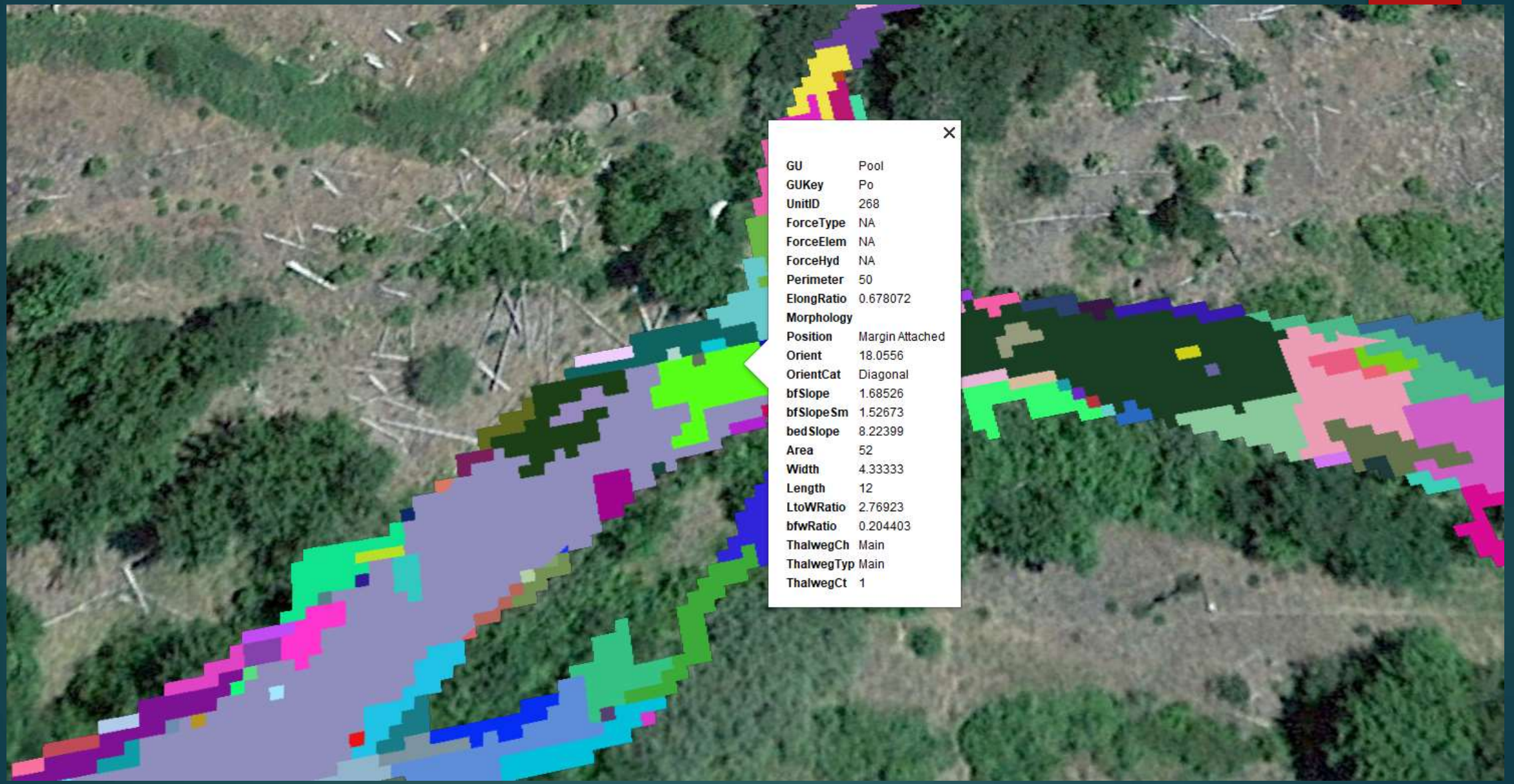
- DEM and Water Extent
- Water extent centerline
- Bankfull and centerline
- Thalweg



# Results

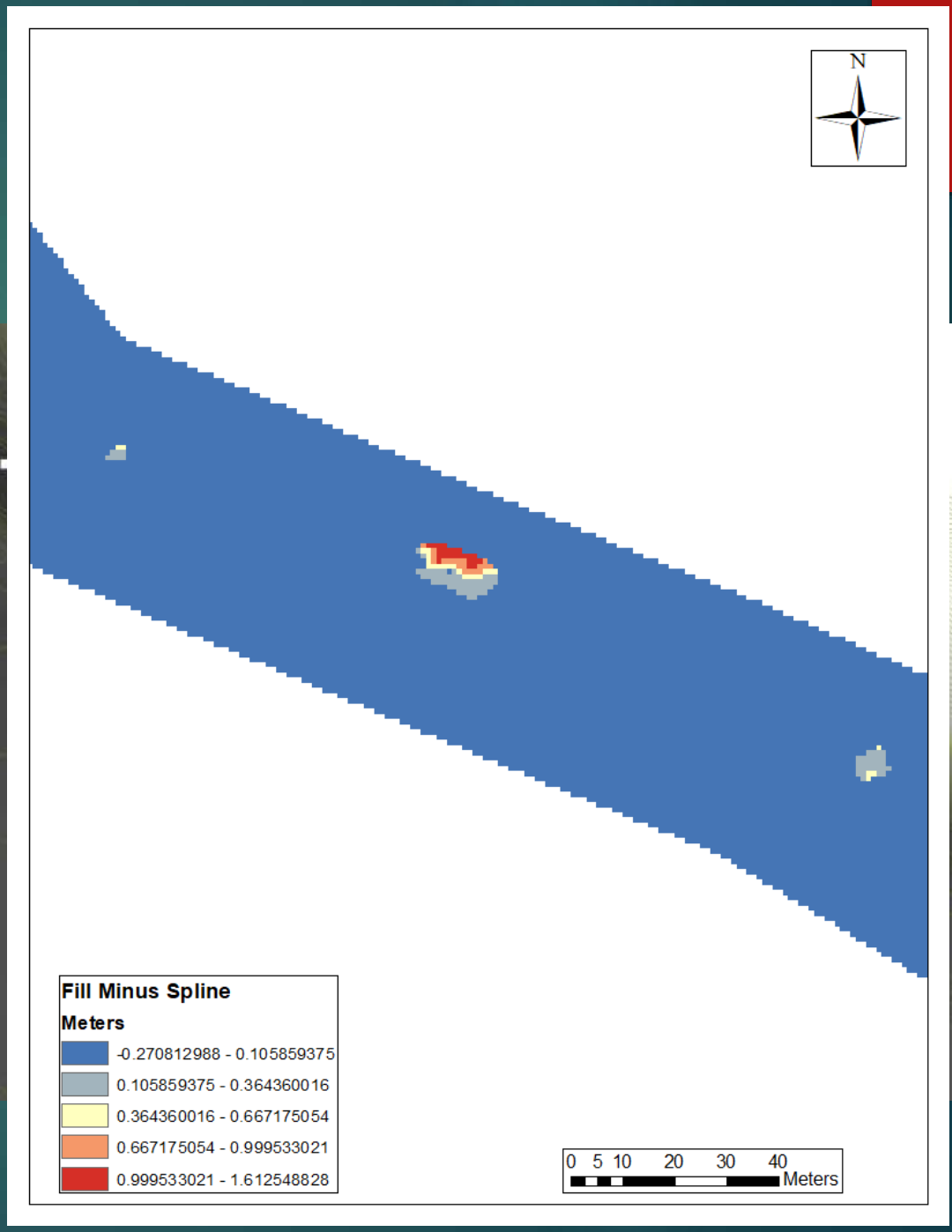
| | Reach 11 | Reach 21 |
|---|---|---|
| Bank | 510.9997489 | 863.9990575 |
| Barface | 43.00000408 | 87.00000827 |
| Cascade | 0 | 24.00000228 |
| Glide-Run | 6890.066253 | 6327.159426 |
| Margin Attached Bar | 3733.002874 | 3326.999333 |
| Mid Channel Bar | 1632.790761 | 834.8026355 |
| NA | 9.00018419 | 14.00000133 |
| Pocket Pool | 216.0000205 | 195.0000185 |
| Pool | 1130.000107 | 1483.000241 |
| Rapid | 141.6932664 | 633.8045275 |
| Riffle | 12.00000114 | 0 |
| Transition | 3959.448322 | 4388.236475 |



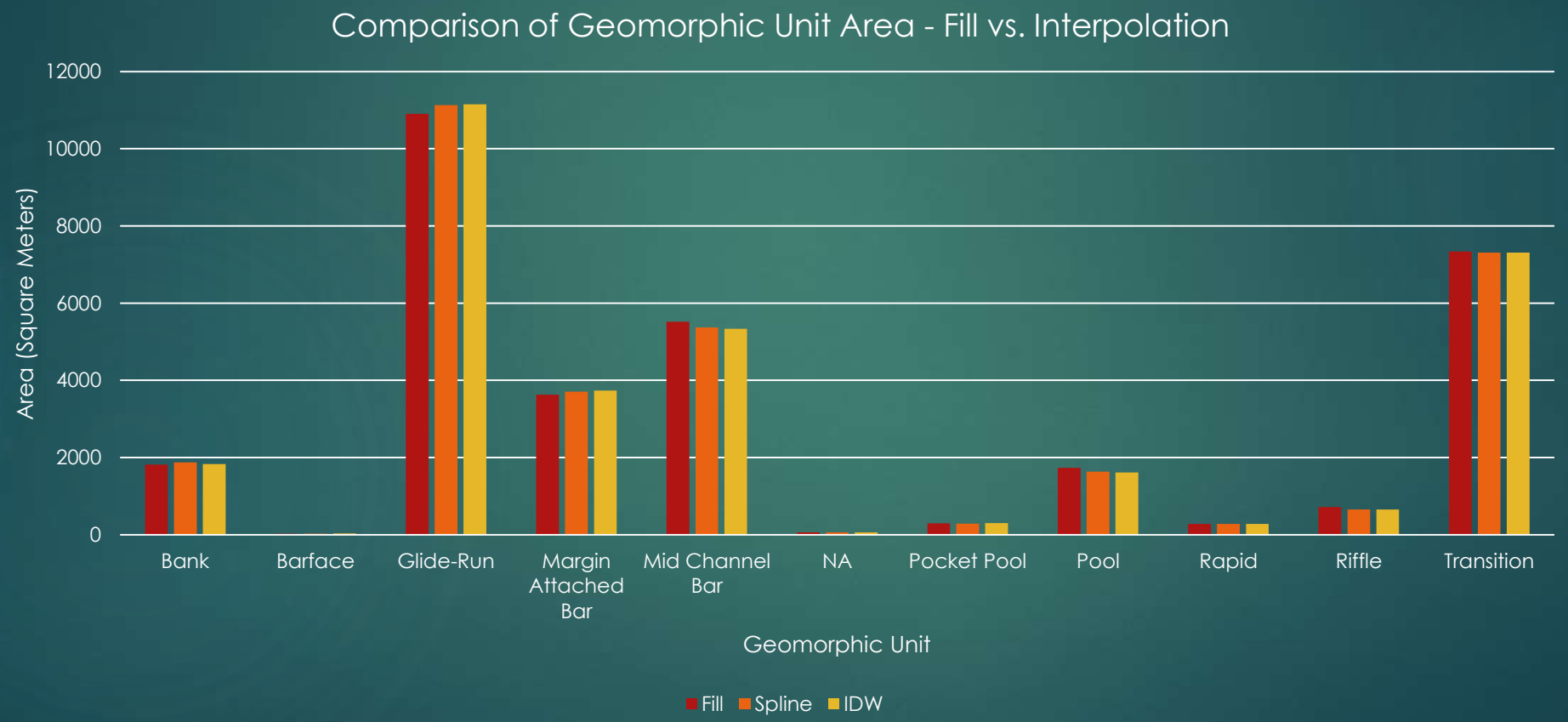

GU Pool
GUKey Po
UnitID 268
ForceType NA
ForceElem NA
ForceHyd NA
Perimeter 50
ElongRatio 0.678072
Morphology
Position Margin Attached
Orient 18.0556
OrientCat Diagonal
bfSlope 1.68526
bfSlopeSm 1.52673
bedSlope 8.22399
Area 52
Width 4.33333
Length 12
LtoWRatio 2.76923
bfwRatio 0.204403
ThalwegCh Main
ThalwegTyp Main
ThalwegCt 1

# Interpolation Comparison

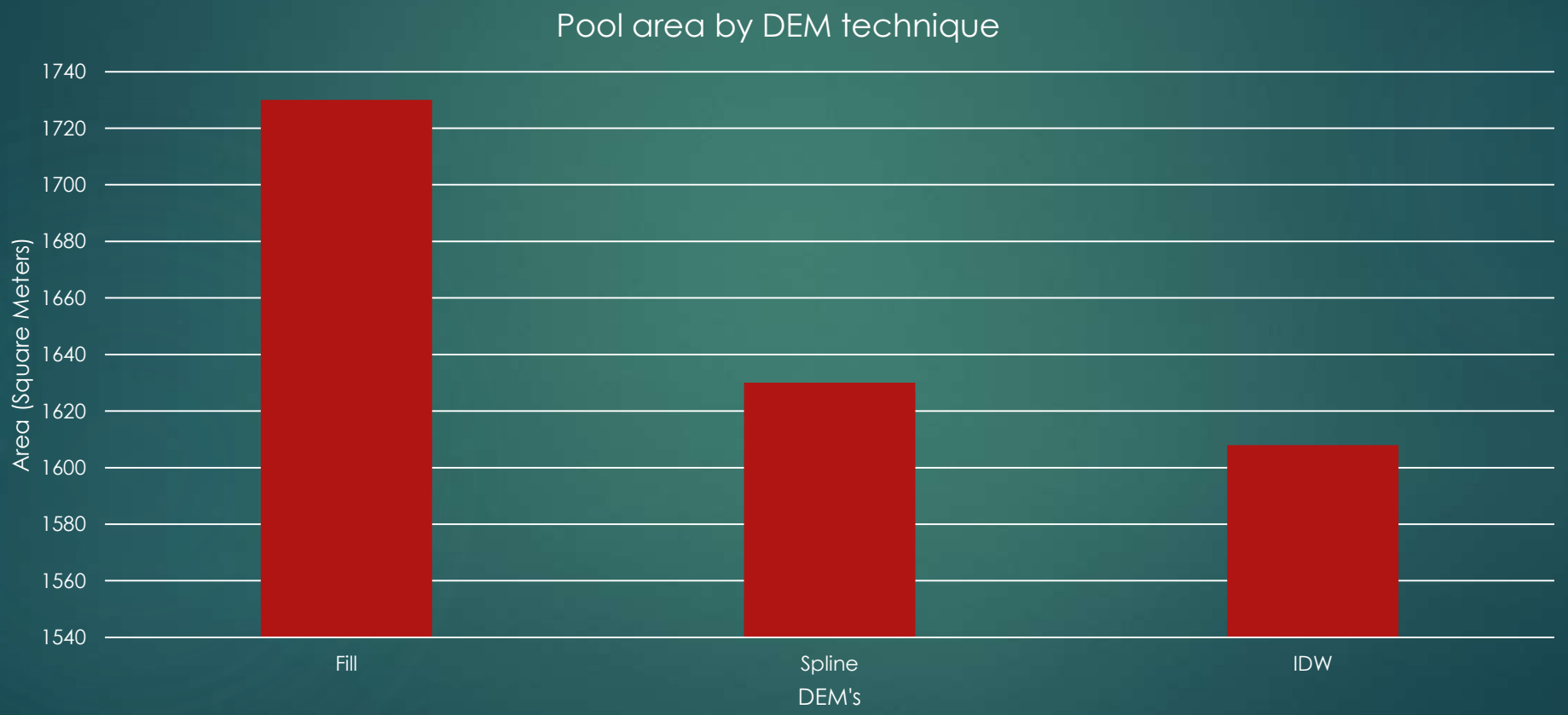
- Original DEM has nodata values in deepest locations (approx. >2m)
- Need to be filled to run GUT
- Fill, Spline and IDW

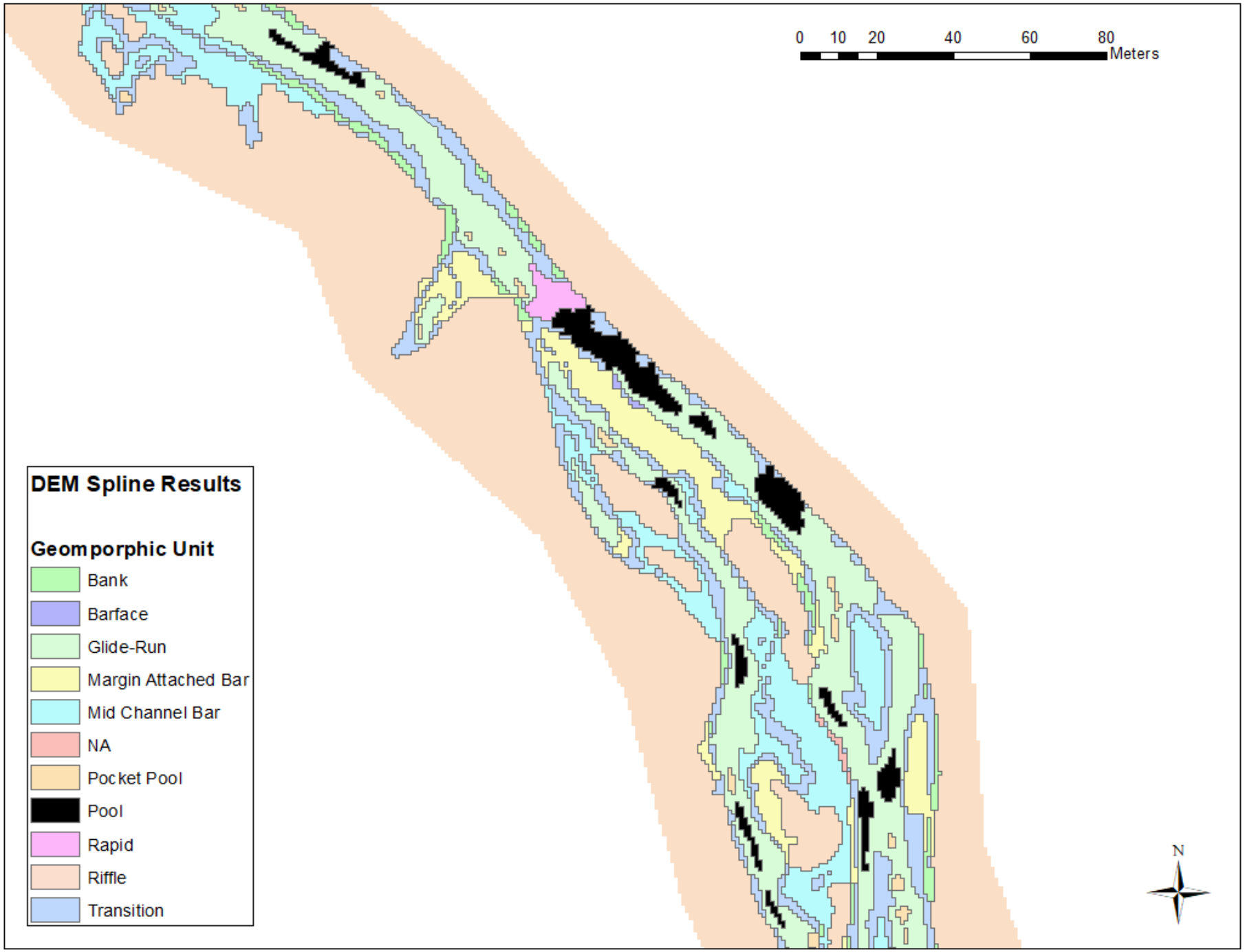


# Interpolation Results



# Interpolation Results




0 10 20 40 60 80
Meters
DEM Spline Results
Geomporphic Unit
Bank
Barface
Glide-Run
Margin Attached Bar
Mid Channel Bar
NA
Pocket Pool
Pool
Rapid
Riffle
Transition
N

# Further Research

- Compare total station DEM results with LiDAR results to see differences
- Compare field-based geomorphic units with GUT units

# References

**Developers of GUT:**

- Sara Bangen, Natalie Kramer, and Joe Wheaton
  - Utah State University
  - Ecogeomorphology & Topographic Analysis Lab
  - Riverscapes Consortium

**Citations:**


Kramer N, Bangen SG, Wheaton JM, Bouwes N, Wall E, Saunders C, and Bennett S.. 2017. Geomorphic Unit Tool (GUT): Applications in Fluvial Mapping. EP11A-1546. AGU. New Orleans, LA, 11-15 Dec. DOI: 10.13140/RG.2.2.30142.18241

Bangen SG, Kramer N, Wheaton, JM, and Bouwes N. 2017. The GUTs of the Geomorphic Unit Tool: What is under the hood. EP31D- 1901. AGU. New Orleans, LA, 11-15 Dec. DOI: 10.13140/RG.2.2.31118.66884

Bangen SG, Kramer N, Wheaton JM, and Bouwes N. In Preparation. Mapping instream geomorphic units from high resolution topography.

https://www.champmonitoring.org/


**Data Source:**

- GeoTerra via Quantum Spatial