

IAFSM 2009 Annual Conference

Benefits of GIS Developed “Enhances Zone A’s” Using
Automated Floodplain Generator (AFG)

With

Mark Everett and Matt Faulkner

AMEC Earth & Environmental

Leading international firm

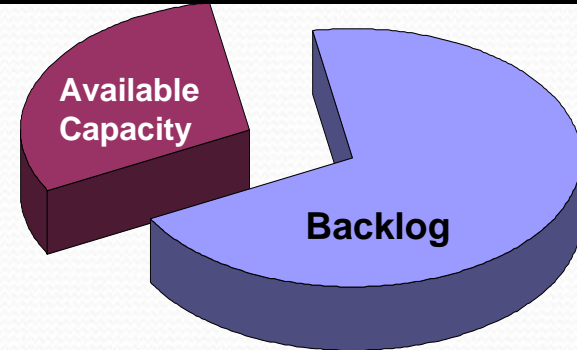
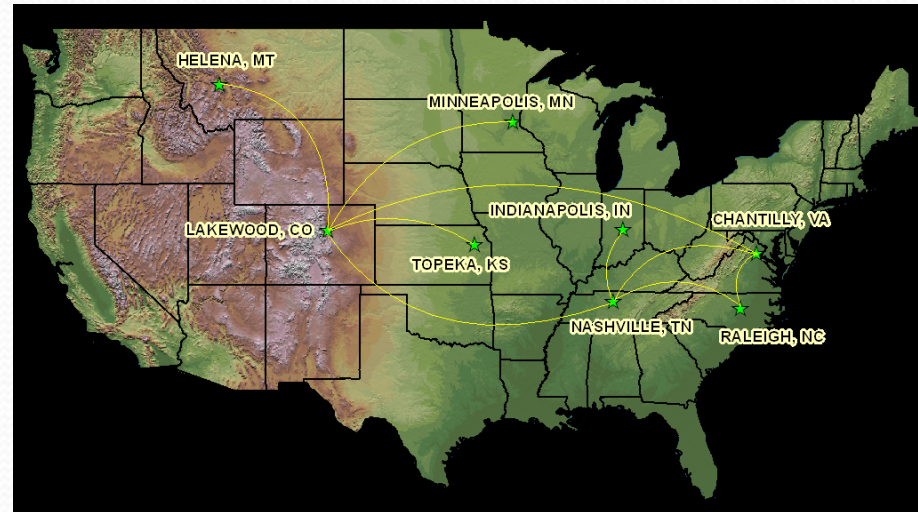
- 22,000 employees, 5th largest International Engineering Services Organization, 300 Offices, 40 Countries, in 6 Continents and annual revenue over 8 billion dollars.
- AMEC has 92 offices in North America employing 2,745 personnel.

US Leader in Water Resources

- Dam Failure Analysis – China, Canada, USACE, States, & Locals
- FEMA Flood Hazard Studies- Regional IDIQ and State CTP Contractor
- State Map Mod Contractors – AL, IN, KS, KY, MO, NC, ND, SD, UT and others pending
- NC DFIRM to support FEMA Multi-hazard Flood Map Modernization
- Watershed Master Planning and Restoration
- Pre and Post Disaster Preparedness Planning/Recovery/Mitigation

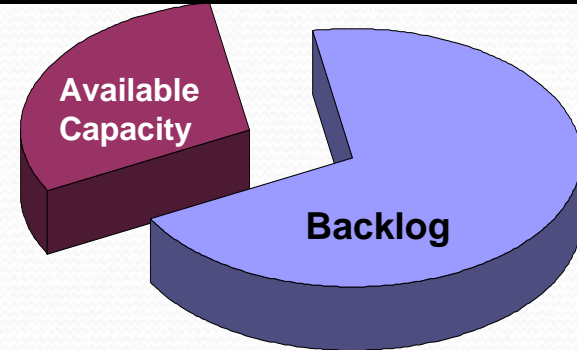
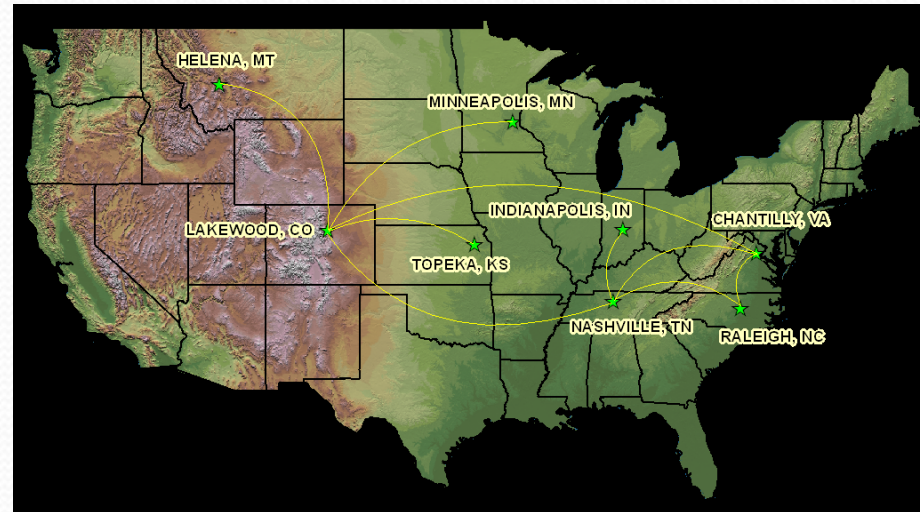
KNOWLEDGE AND FEMA MASTERY

- Three Production Centers Dedicated to DFIRM Production
 - Chantilly, VA
 - Nashville TN
 - Topeka, KS
- Dedicated Staff
 - 50 H&H Engineers
 - 125 GIS Specialist

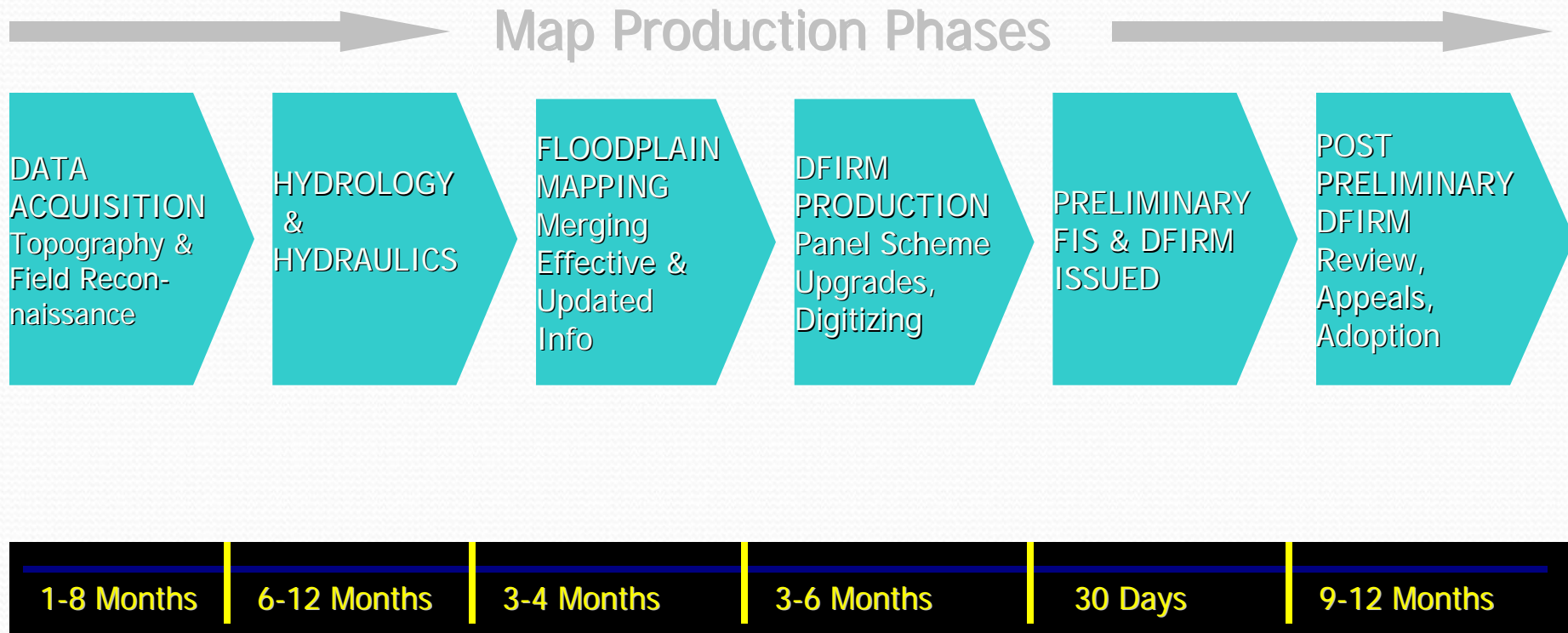


KNOWLEDGE AND FEMA MASTERY

- Annual Production Capacity
 - 4,000 miles detailed H&H
 - Unlimited miles of Enhanced A (40,000 annually)
 - 2,300 panels
- Knowledge of FEMA's New Procedures for Levees (PAL)



Process for Flood Mapping Production



Time frames given are approximate, sometimes concurrent, and may vary from study to study

Components of Zone A Mapping

- Data Setup/ Hydrology
 - Stream Centerline / DEM
 - Regression Equation Input
- AFG Pre RAS
 - Cross Section Layout and Geometry
 - Mannings “n” Selection
- AFG Run HEC RAS
 - Verify Ineffective Flow Areas
 - Bridge Cross Sections
- AFG Post RAS
 - Floodplain Generation

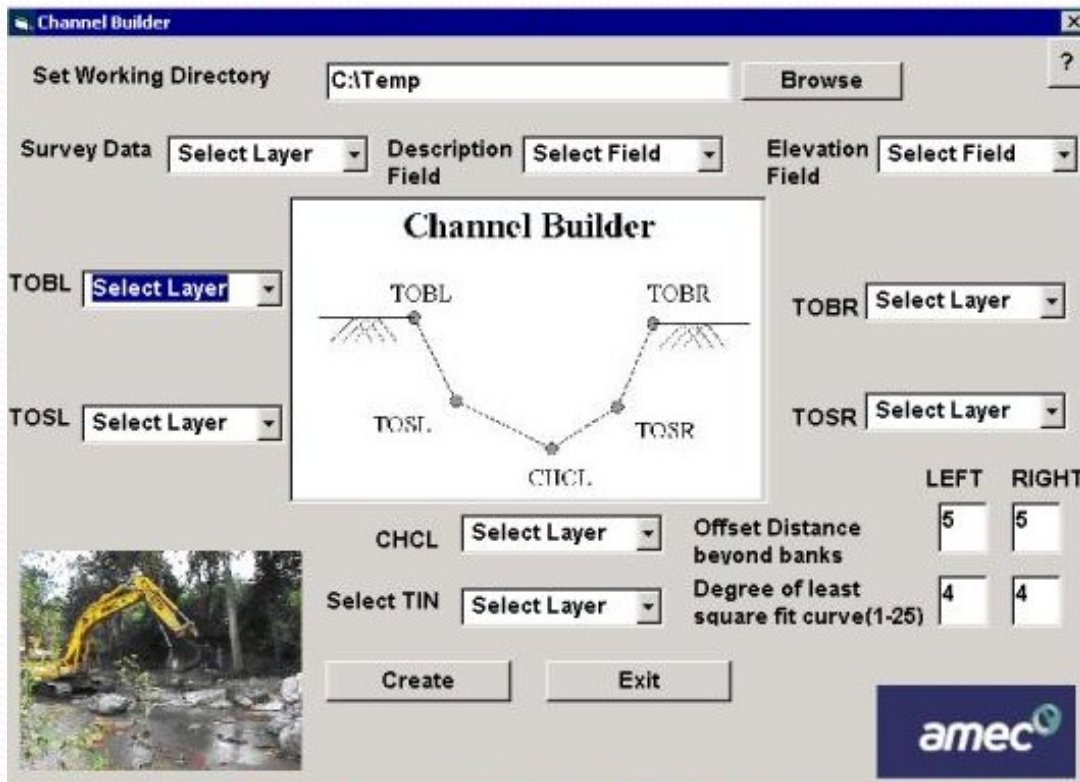
Identifying Topographic Data Needs and Sources

- Topographic data are required to complete stream studies.
- New topographic data is a significant investment by community/county to acquire (up to 50% of map update cost)
- Mapping process will utilize the best available topography data.
- All new DFIRM's will be based on NAVD 1988 datum, which may require adjustment/conversion

REVIEW HYDROLOGY

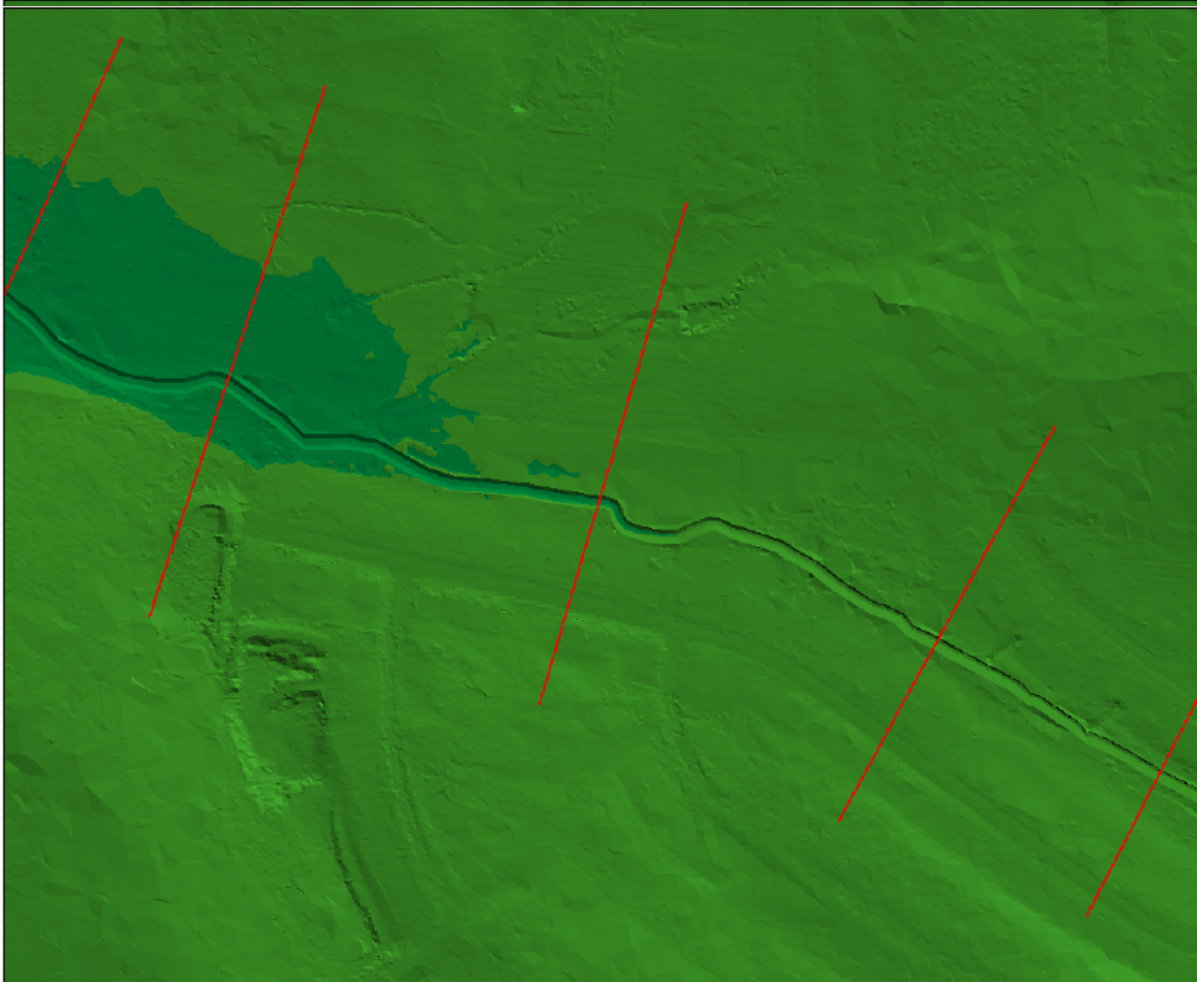
- Check DEM
- Check Stream Names and Stream connectivity.
- Check for Stream Orientation
- Check Catchments
- Check Streams running in and out of the county
- Verify Regression equations used

Digital Channel Builder



- The Digital Channel Builder uses field survey data to 'burn' a channel into a digital ground surface. Makes hydraulic model creation easier and floodplain delineation smoother.

Digital Channel Builder



Hydraulics – PreRAS

PreRAS

Working Directory
C:\Documents and Settings\kevin.heeney\Desktop\ARRvT9_4 Browse

GeoDatabases

- ☒ ARRvT9_4
 - ☒ ARRvT9_4.mdb

Select All Select None

Defaults
XS Spacing XS Width
XS Center Station
Flow Path Buffer

☐ TIN ☒ DEM

☐ DunnLeopold
Width Coefficient
Width Power
Depth Coefficient
Depth Power

☒ Constant
Bank Width
Bank Depth

☐ Breaklines

Channel Shape
☐ Do not force a Channel Shape
☒ Z:
☐
☐

Treat Terrain Elevation at Channel as
☒ Top of Channel ☐ Bottom of Channel

OK

WikiHelp Home \ AFG.NET (Automated Floodplain Generator) \ Hydraulics \ PreRAS - Edit Page

PreRAS

PreRAS - The first Hydraulics component to run in AFG. PreRAS is responsible for generating CrossSections (both 2D & 3D) as well as creating Flowbaths and Banklines. Many options are given for generating these features.

TIN or DEM - You may either choose to create the 3D aspect of the XS by draping the 2D CrossSections over either a TIN or a DEM. The TIN or DEM must be in the same folder as the main Geodatabase and must be named either "tin" or "dem" respectively.

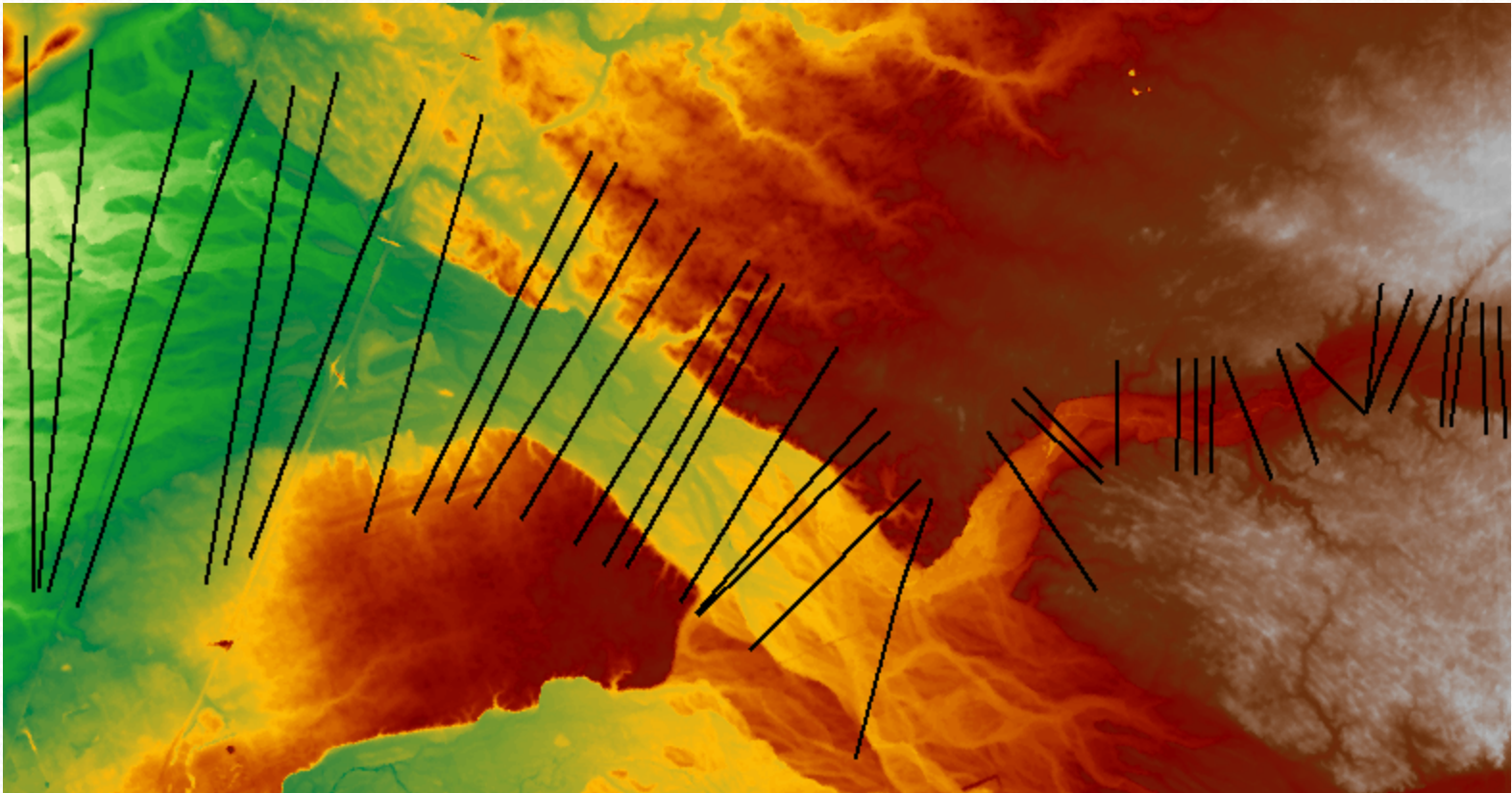
DunnLeopold - Bank Widths and Depths are calculated using the DunnLeopold equation on a per XS basis. The Drainage Area used in the equation is pulled from the DrainagePoints Feature Class from the Hydrology Dataset.

Constant - Bank Widths and Depths are static for all CrossSections.

Channel Shape - You may force the CrossSections to have a specific Channel Shape. If a shape is specified, it will be centered around the centerstation and will use the Calculated or Constant Bank Widths and Depths. If Channel Shaping is chosen then two HEC-RAS geometry files and two plans will be created in RunRAS (the next step); one plan/geometry will have the shaped CrossSections and the other will not.

XS Center Station - Force a Center Station (i.e. 10000)

Cross Section Layout



AFG Hydraulics

RUN RAS

- Imports Cross Section and flow data from Pre-RAS
- Creates a HEC-RAS model
- Runs a HEC-RAS model based on initial Manning's n and contraction/expansion coefficient

AFG Hydraulics

POST-RAS

- WSEL data from HEC-RAS is used to generate a Floodplain.
- Populates Hydraulics feature dataset with the appropriate feature classes

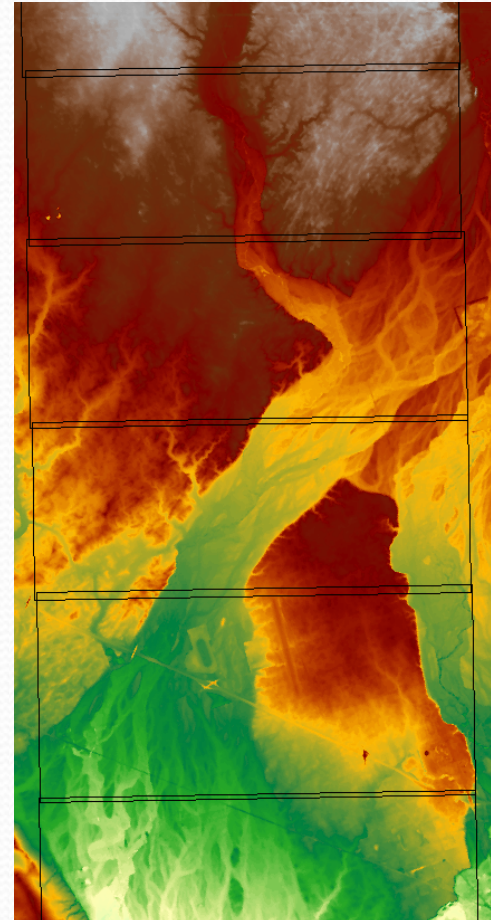
Surface Creation

Create Buffer

Clip Surface DEM or Topo

Resolution of DEM Can Have an Effect on
How The Surface Is Clipped

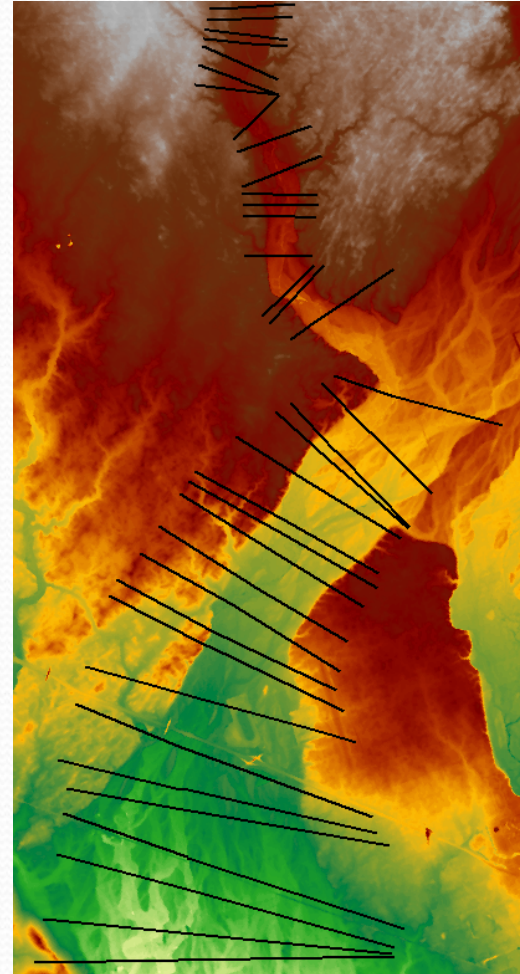
Create Ground Surface TIN



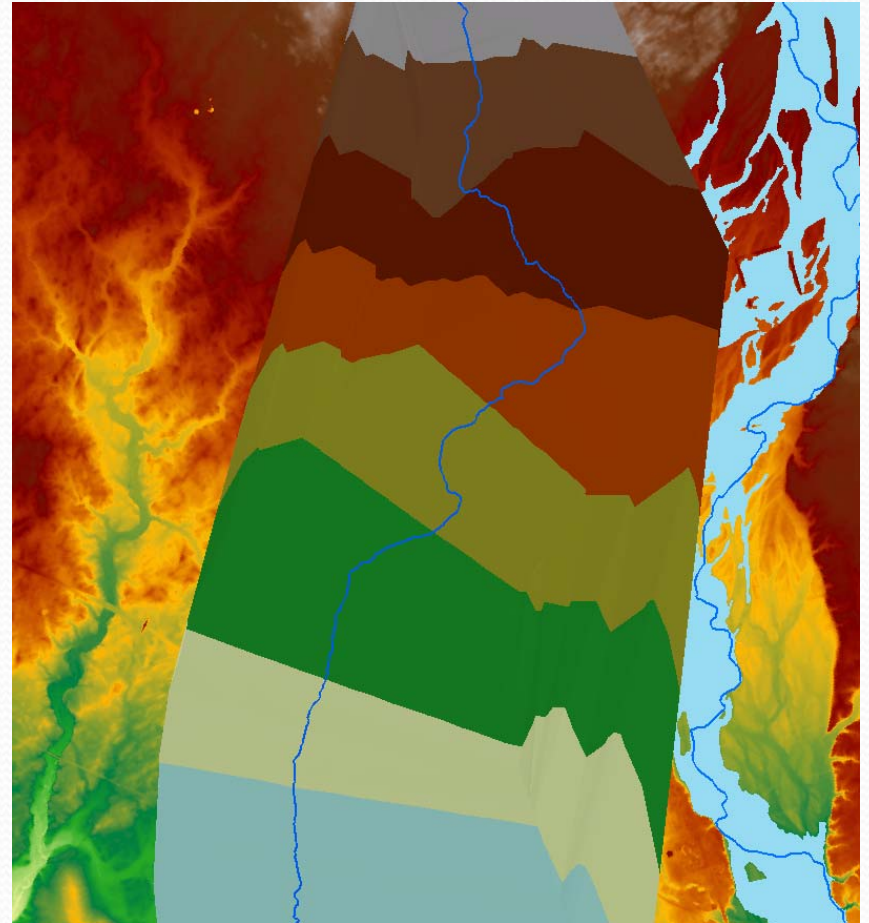
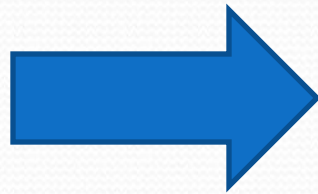
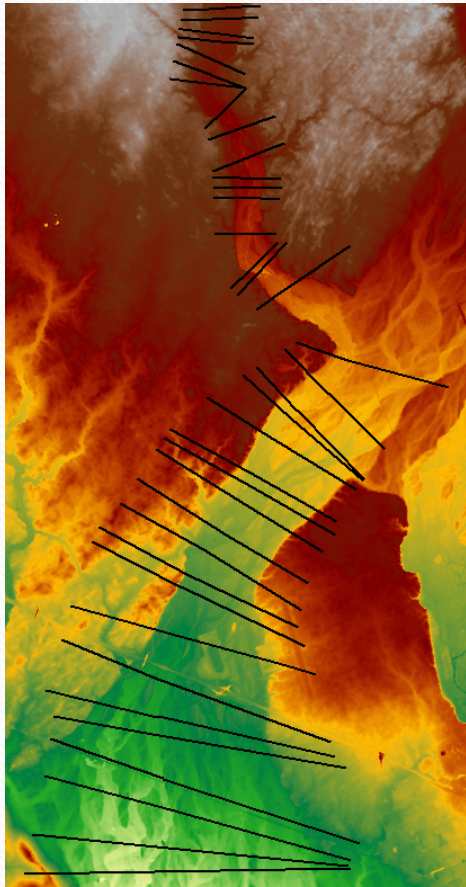
Cross Sections

Import XS

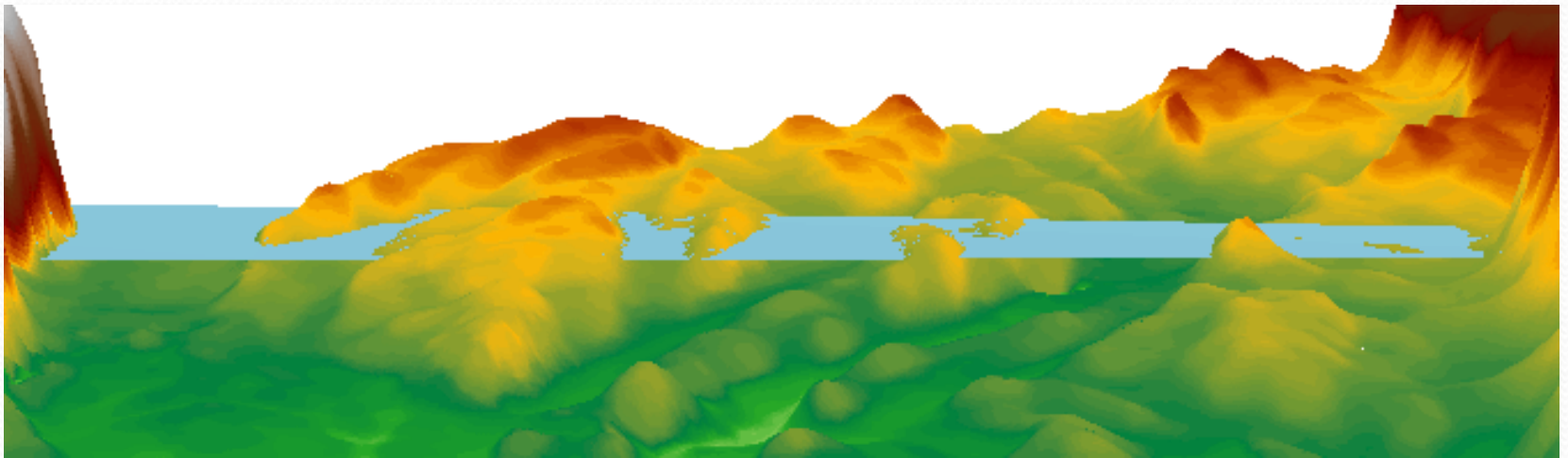
Confirm Cross Section Elevations



Water Surface TIN



Surface TIN Intersection



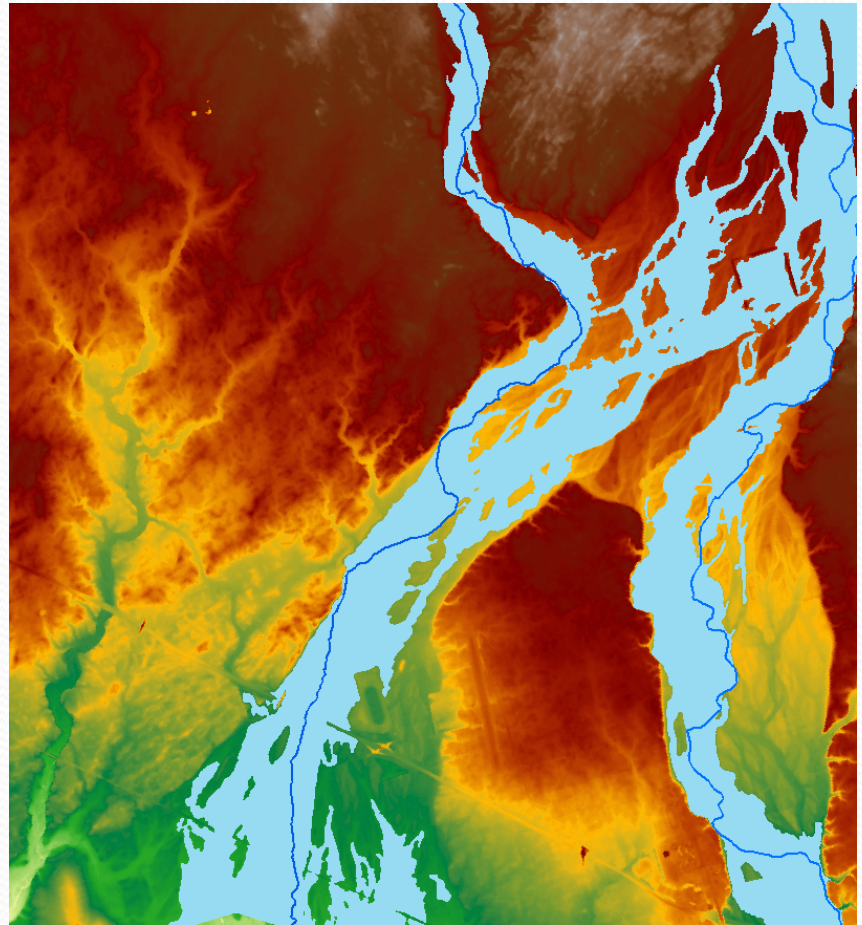
Resulting Floodplain

The Resulting Shapefile from the TIN Difference is the Floodplain Boundary

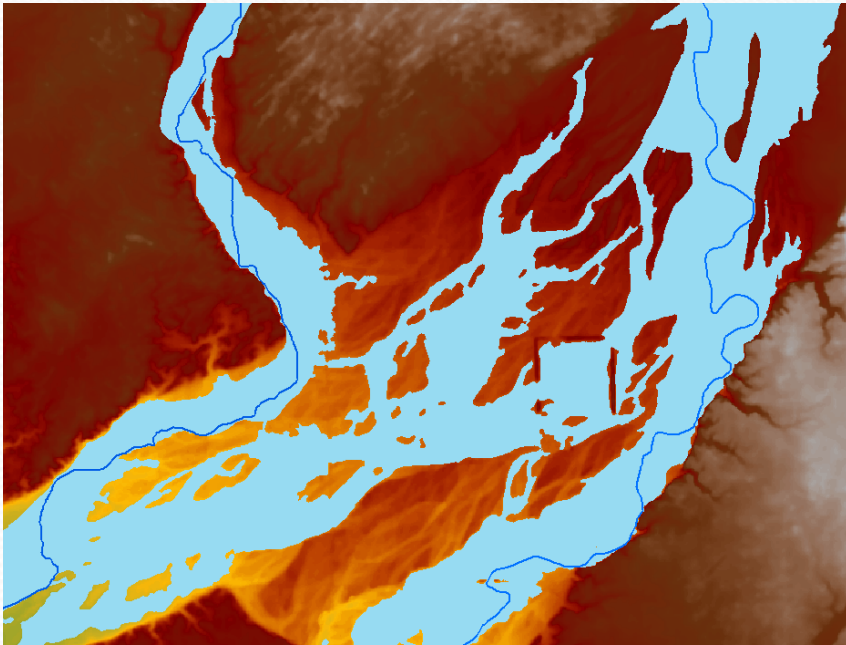
Check Centerline

Verify the Integrity of the Floodplain Boundary

Disconnected or Anomalies



Benefits of AFG



- Mapping Low and High Gradient Systems
- Mapping of Braided or Split Floodplains
- Integrating Zone A's into Detailed Studies or Redelineations
- Efficient County Wide Processing

Questions