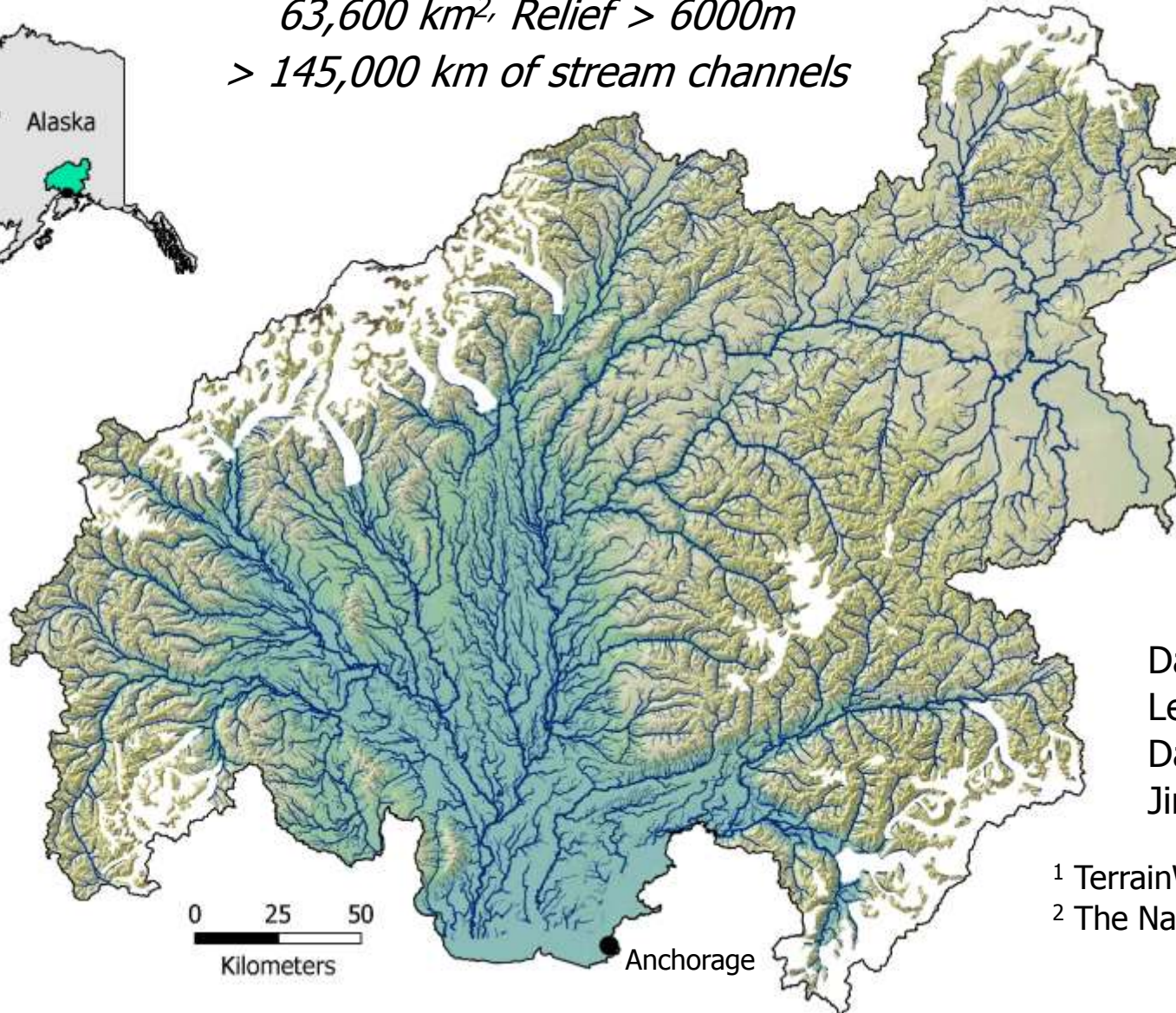


Creation of a complete, accurate, and versatile GIS-based stream layer and Hydroscape for the Matanuska-Susitna Basins

*63,600 km², Relief > 6000m
> 145,000 km of stream channels*

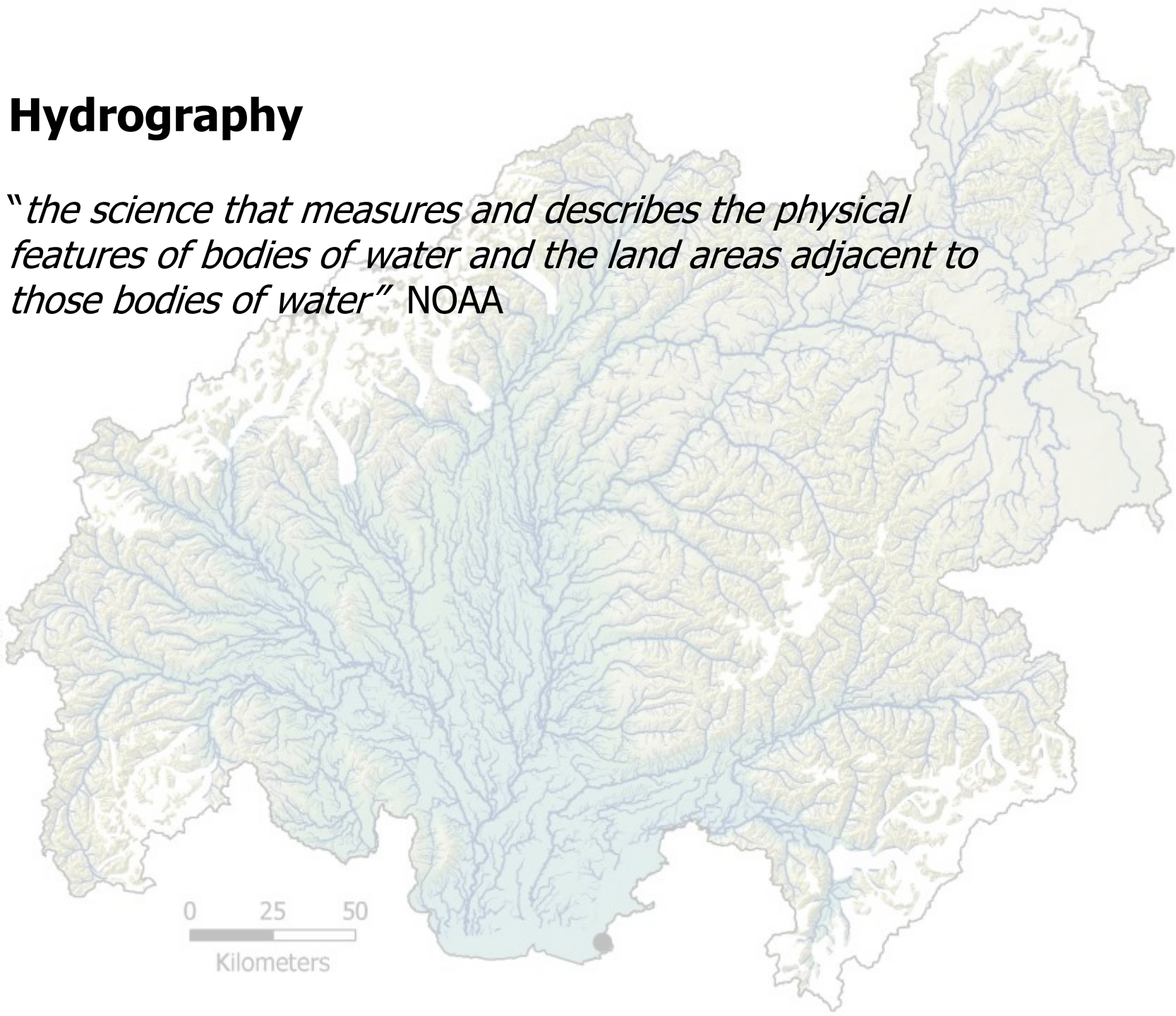


Dan Miller¹
Lee Benda¹
Dave Albert²
Jim DePasquale²

¹ TerrainWorks, Inc.
² The Nature Conservancy

Hydrography

“the science that measures and describes the physical features of bodies of water and the land areas adjacent to those bodies of water” NOAA



Hydrography

“the science that measures and describes the physical features of bodies of water and the land areas adjacent to those bodies of water” NOAA

Landscape

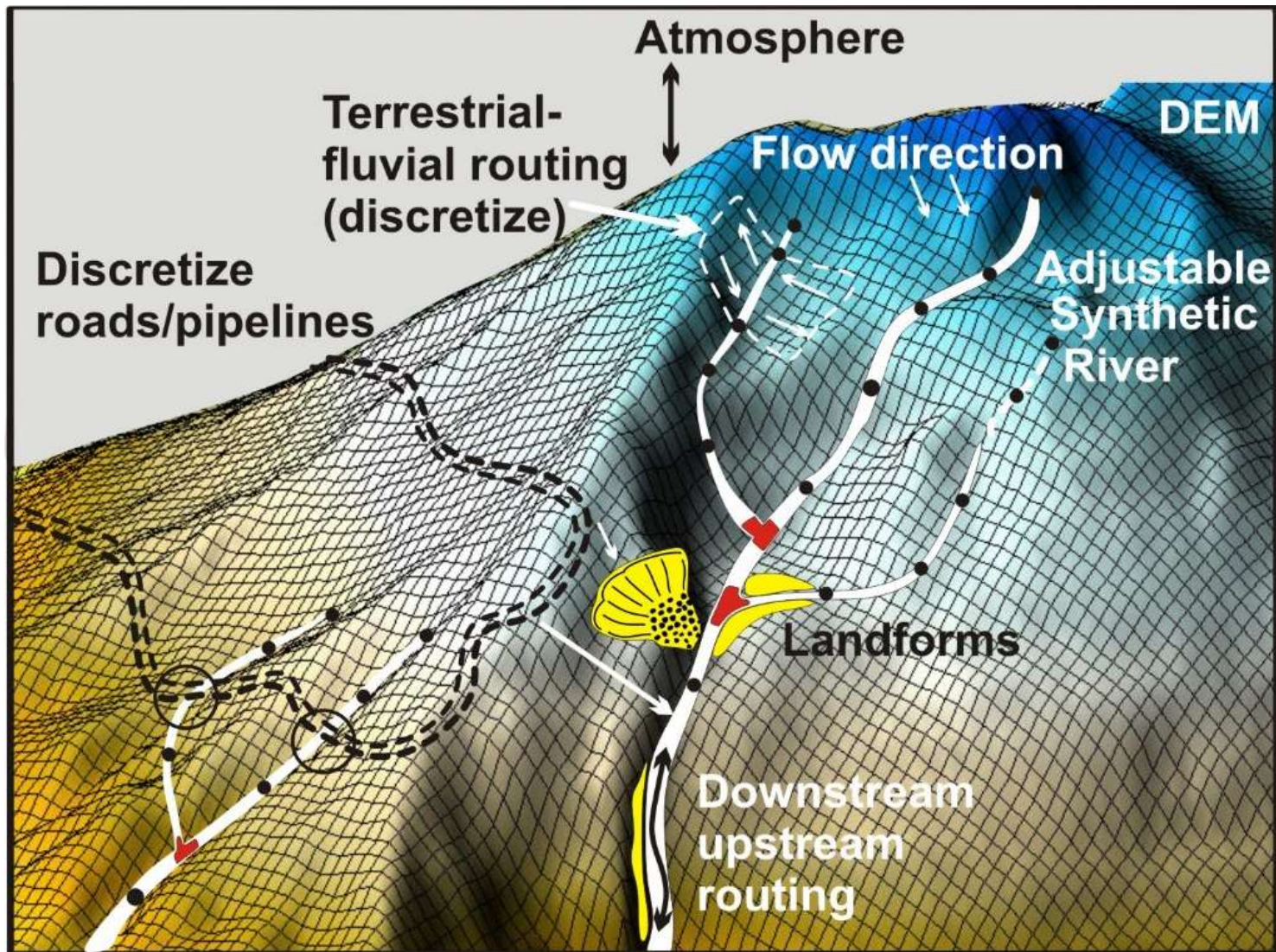
“features of an area of land, including the physical elements of landforms such as mountains, hills, water bodies such as rivers, lakes, ponds and the sea, living elements of land cover including indigenous vegetation, human elements including land use, buildings and structures, and transitory elements such as lighting and weather conditions”

Wikipedia

Hydrography in a Landscape context: Hydroscape

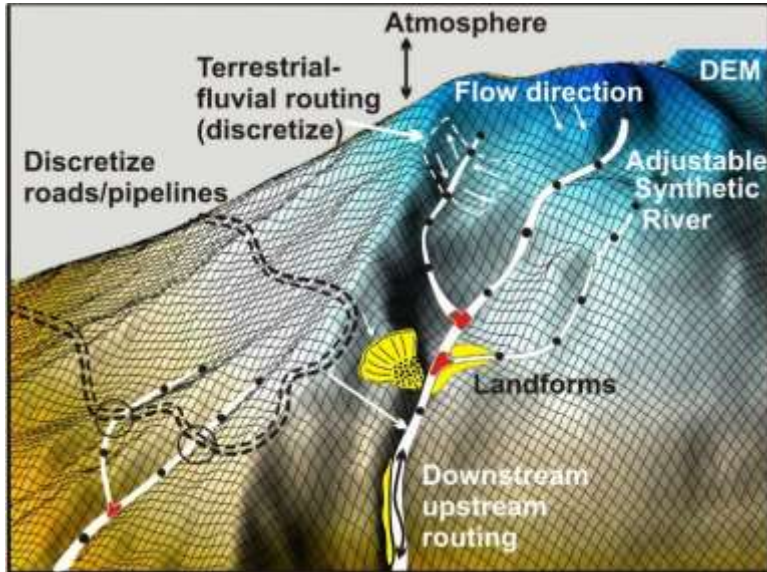


Digital Hydroscape: Data structures, Computer programs Spatial Template, Interactions, Linkages



Digital Hydroscape

Data structures, computer programs

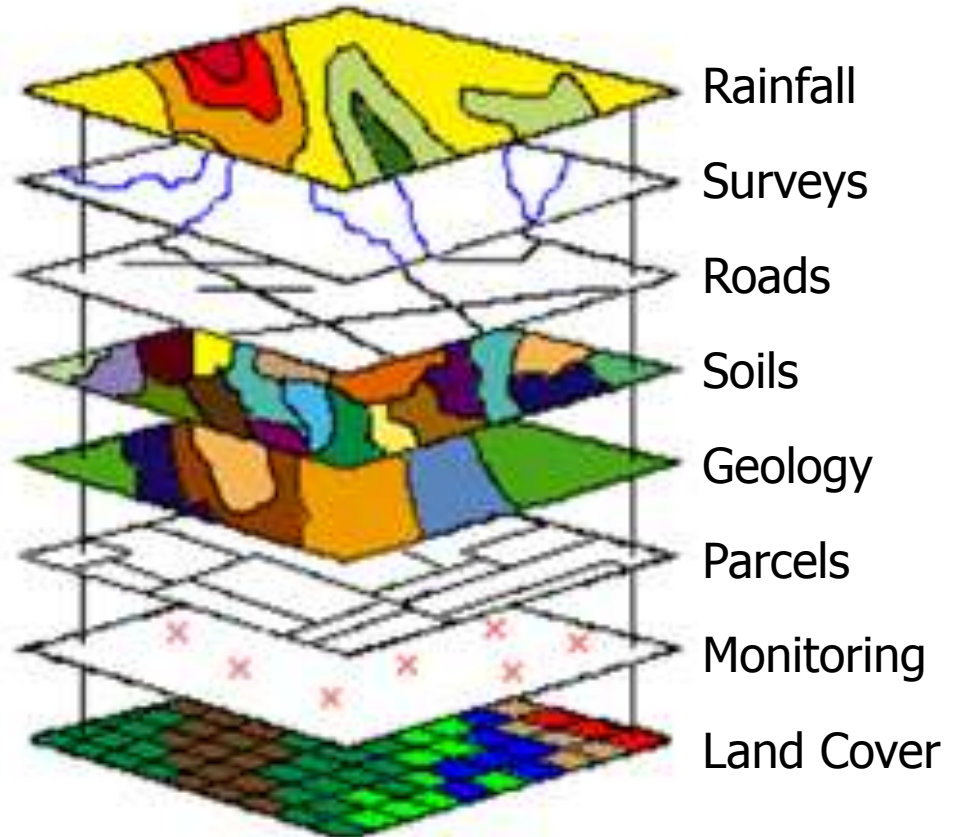


NetMap

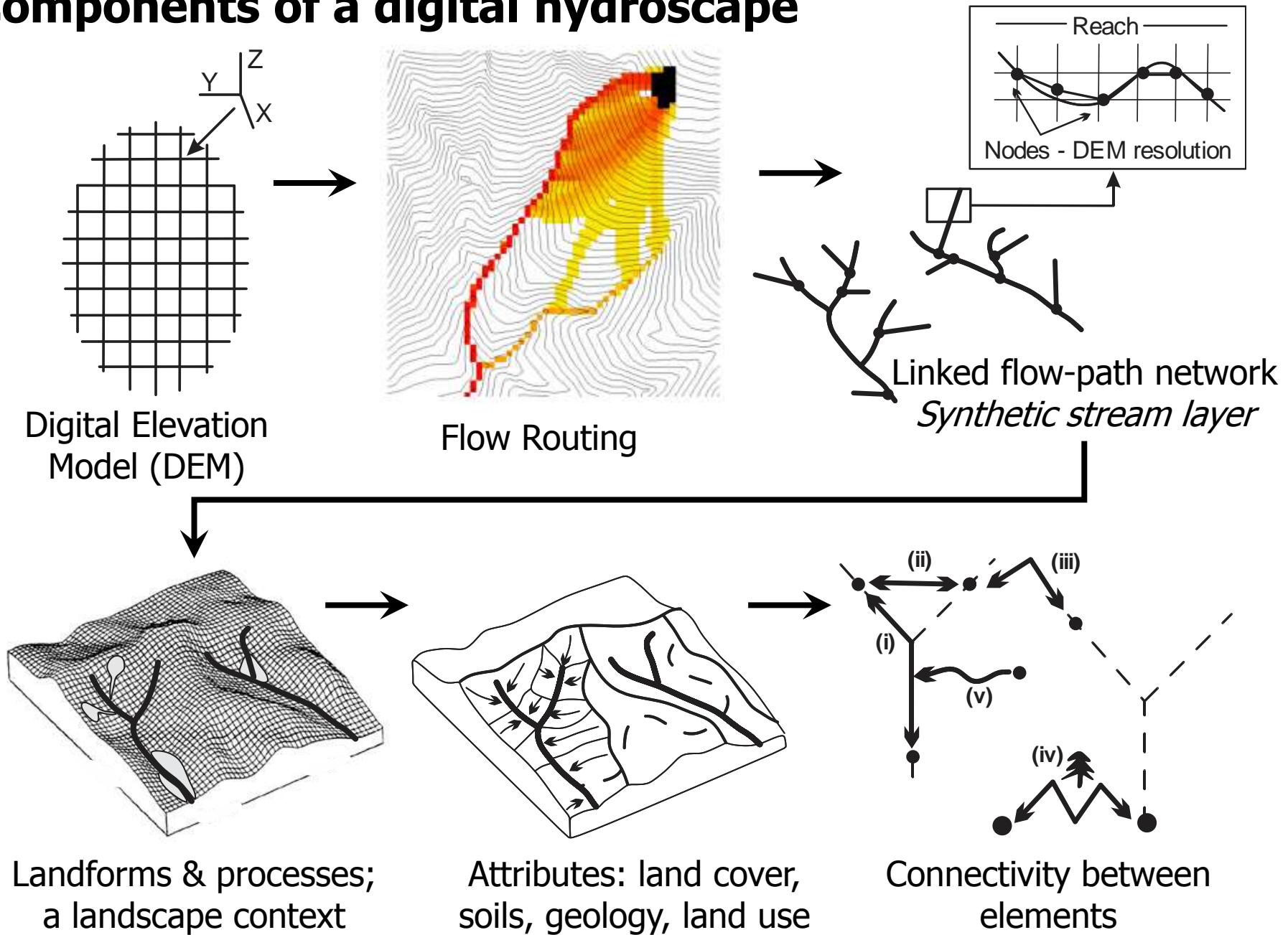
↔ User Interface

ArcGIS

Data, Maps, Documentation

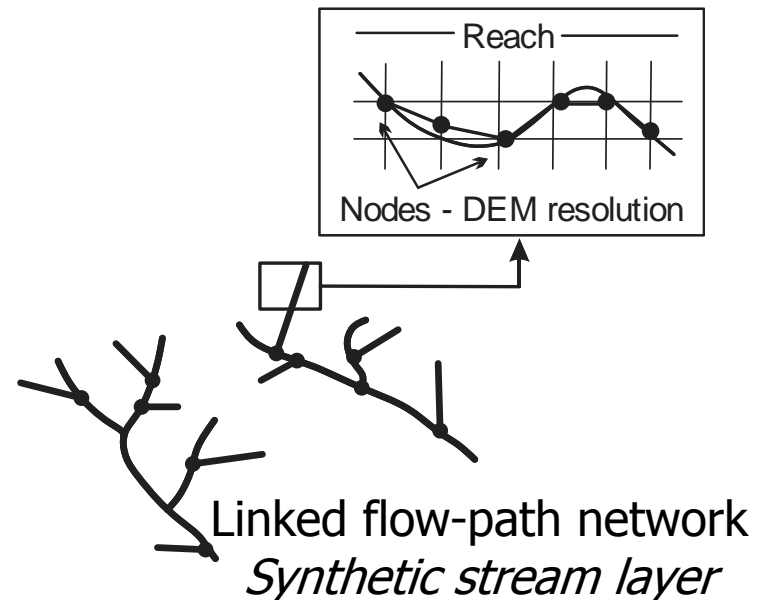


Components of a digital hydroscape



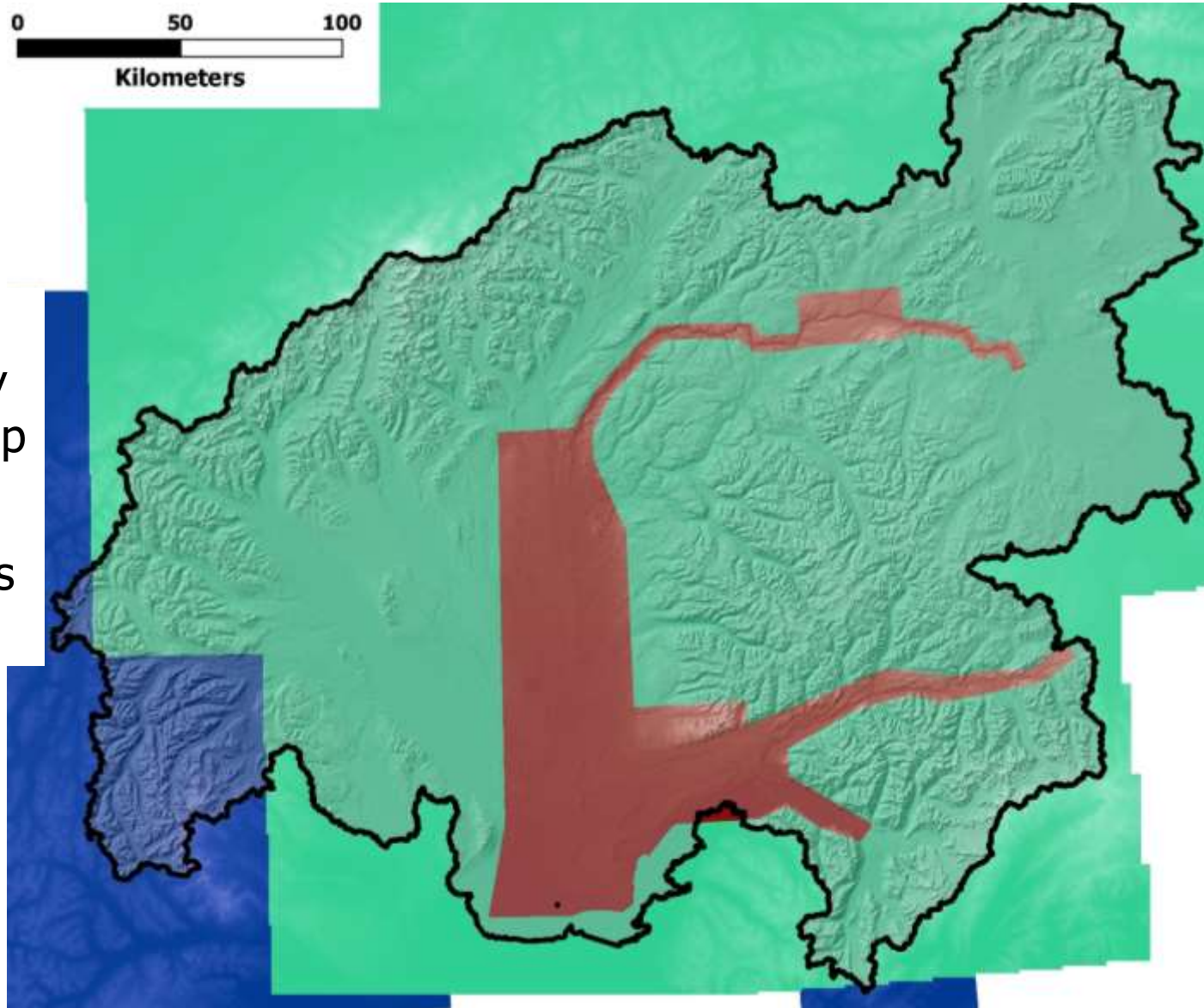
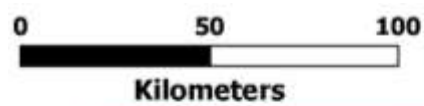
To build a flow-path network.

1. Contiguous DEM over entire watershed
2. Calibrate channel extent
3. Hydrologic conditioning
4. Build linked channel-node dataset
5. Build GIS output files
6. Verify, fix, repeat



Elevation data sources

- 1-m LiDAR
- 5-m IfSAR
- ~90m NED



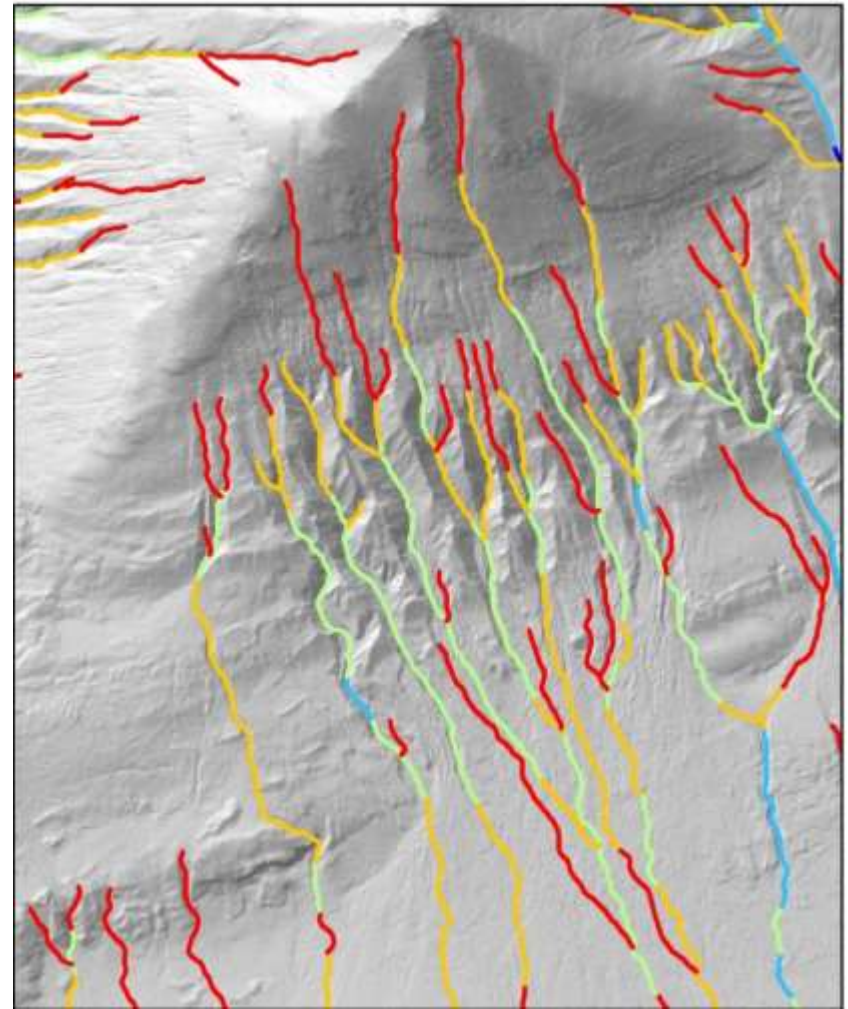
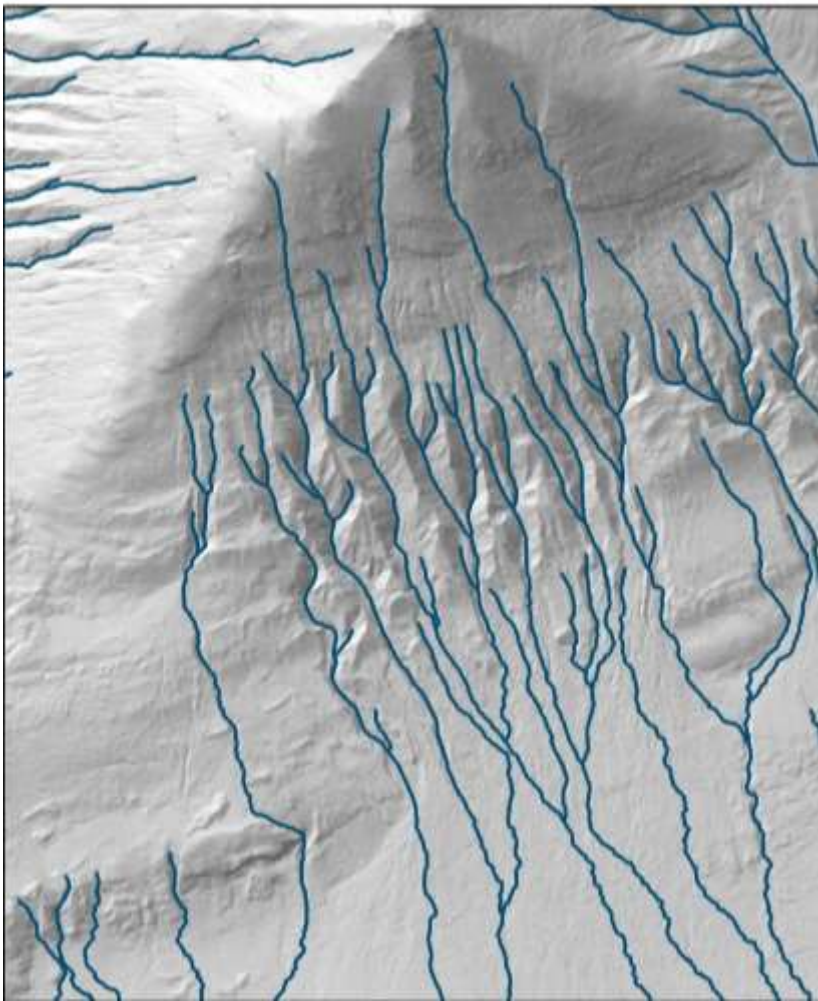
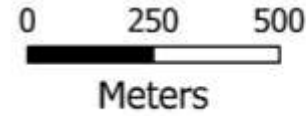
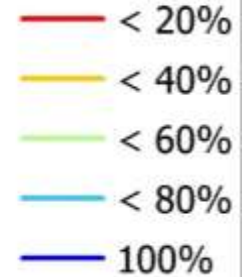
1. Warp - to match elevations exactly in areas of overlap
2. Sample to a single, contiguous DEM

Calibration – flow-path extent.

We want to include all potential channels.

You can delete channel segments, but you cannot subsequently add channels.

Probability of Perennial Flow

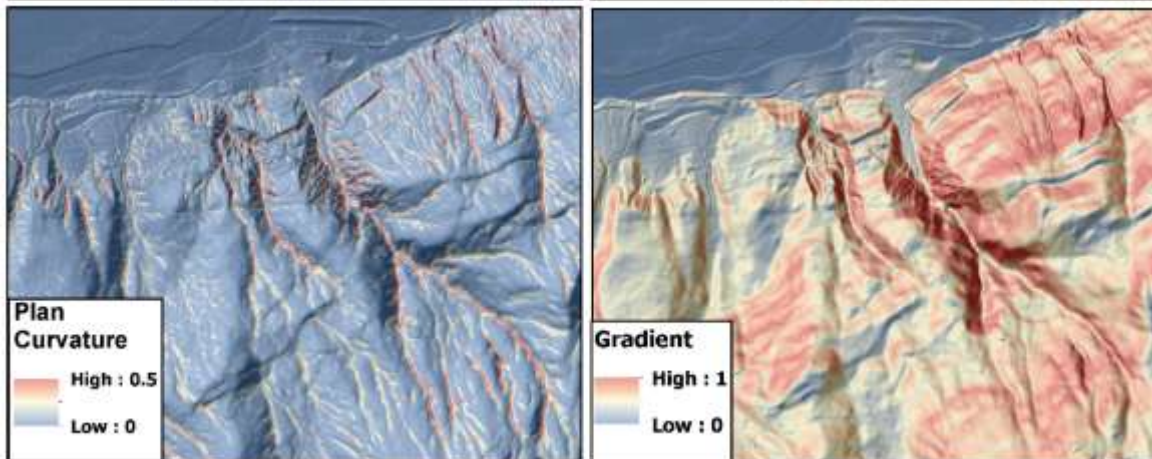
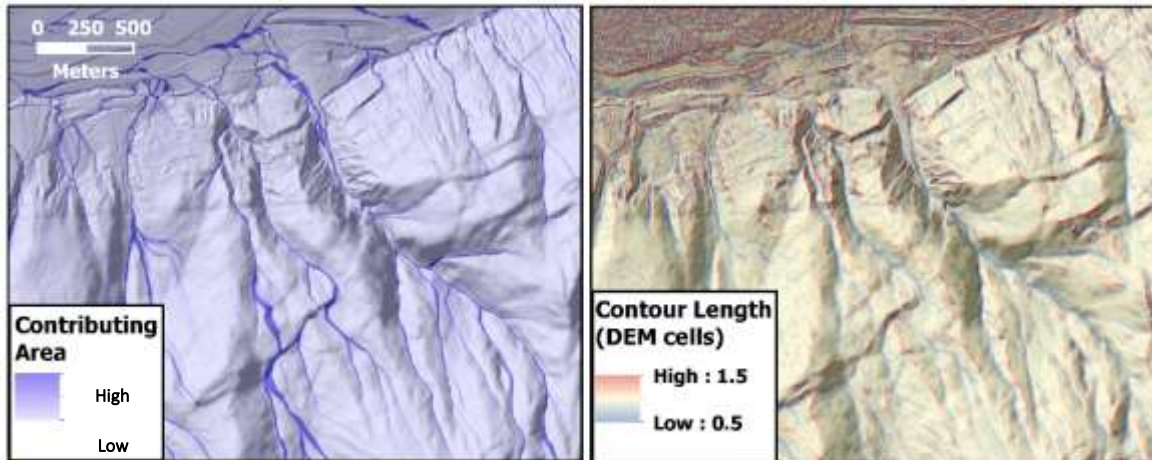


Calibrate channel-network extent.

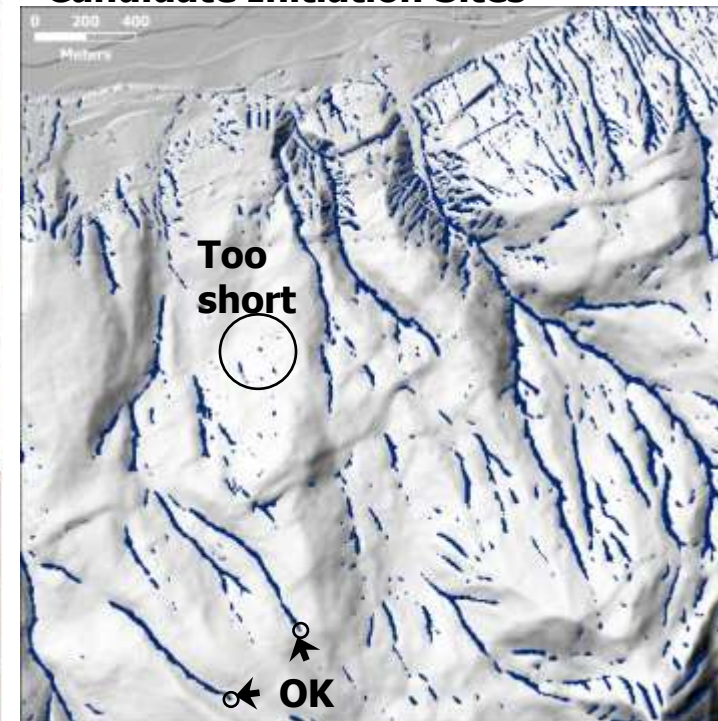
Channel-initiation threshold calibrated to DEM.

Three thresholds:

- 1) Specific contributing area * slope squared; measure of erosive potential.
- 2) Plan curvature; measure of flow convergence.
- 3) Minimum flow length over which above two threshold must be met.



Candidate Initiation Sites



Enforcement by:

- Point (identified channel initiation points)
- Line (surveyed channels)
- Polygon (water mask)

● Enforced Initiation Points

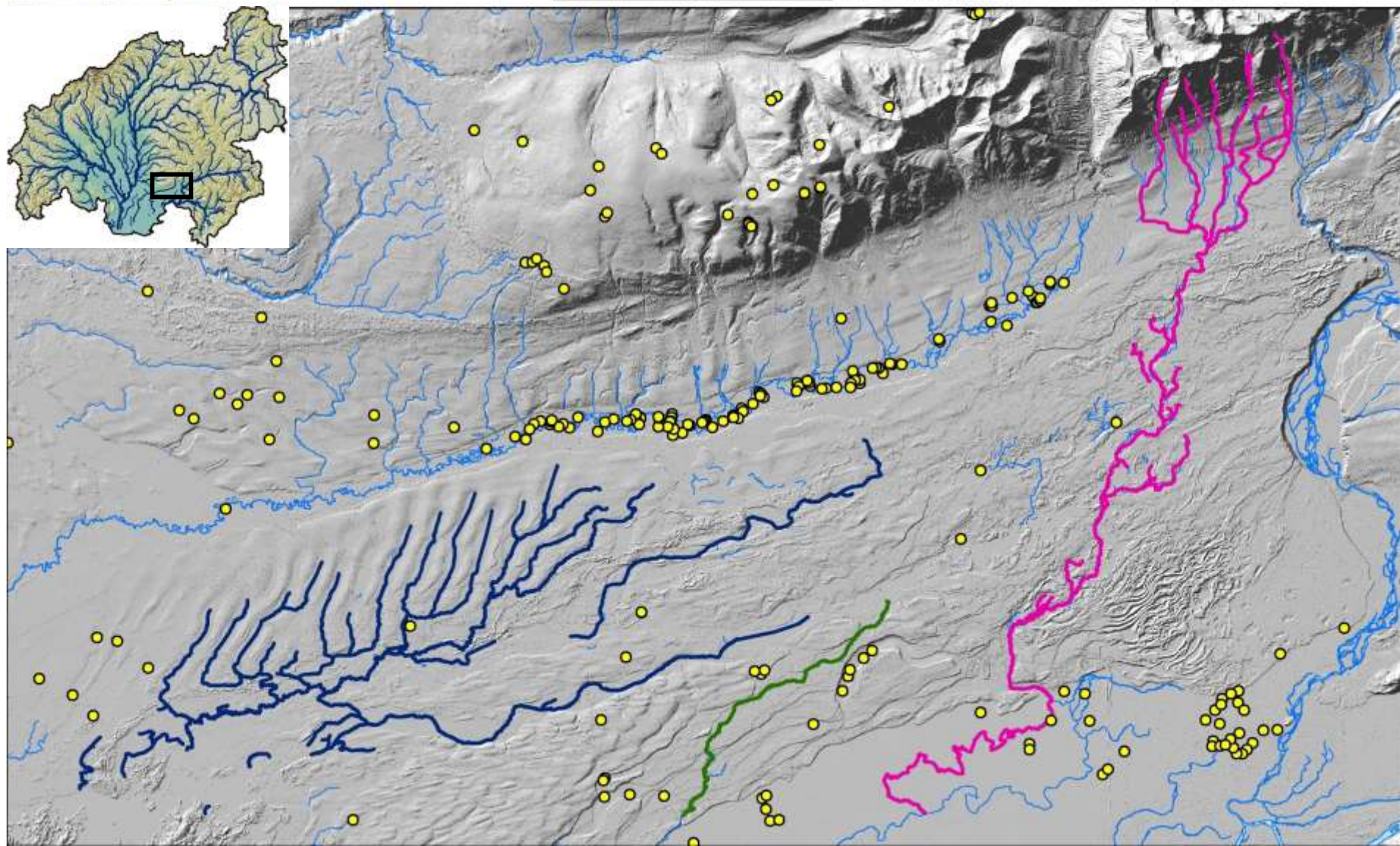
— Big Lake Streams

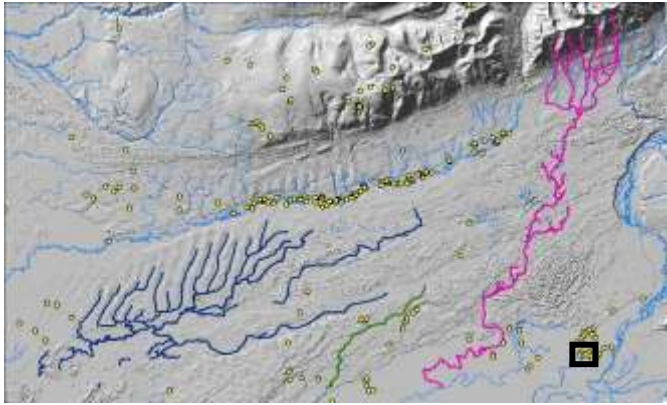
— Lower Cottonwood

— Wassilla Creek

□ Water Mask

0 5 10 Kilometers





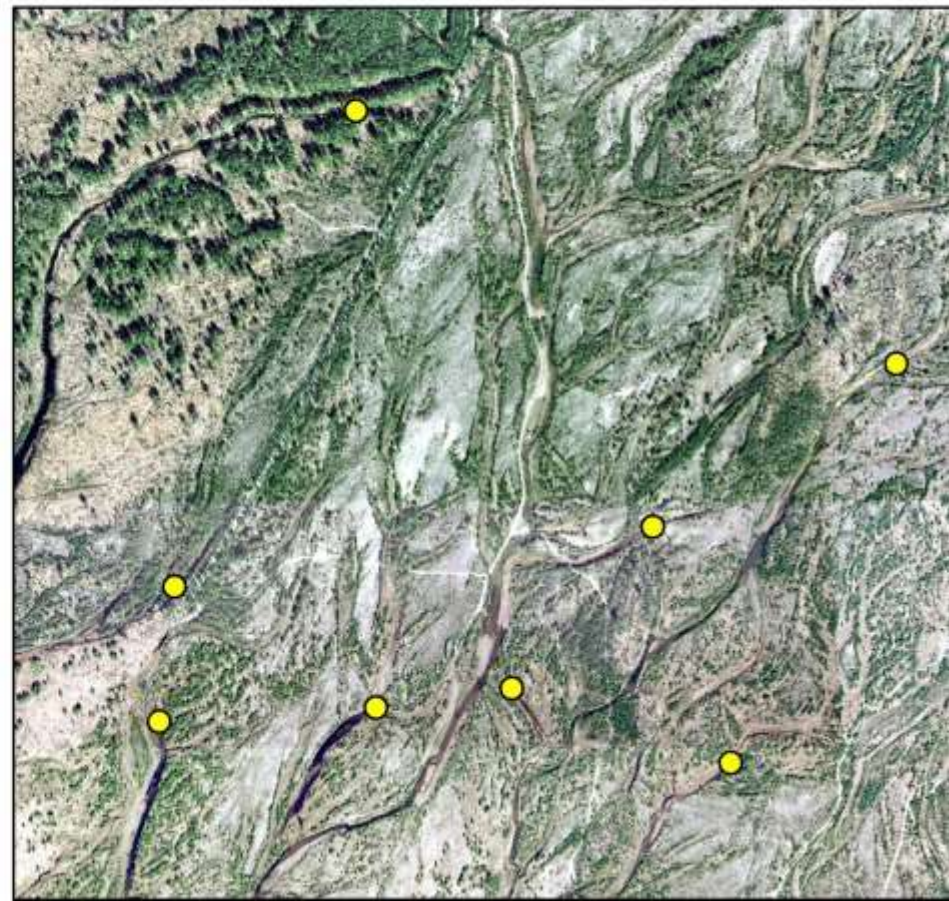
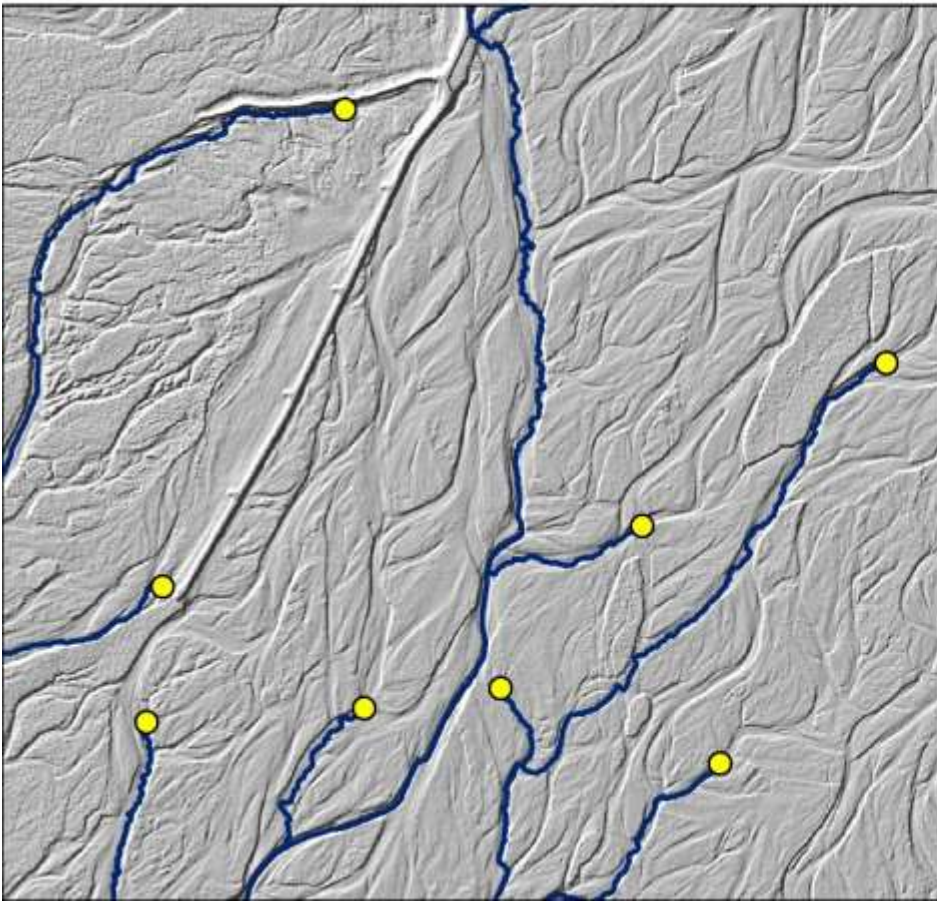
Enforced channel initiation

Initiation points identified from high-resolution aerial photographs or ground-surveyed GPS points

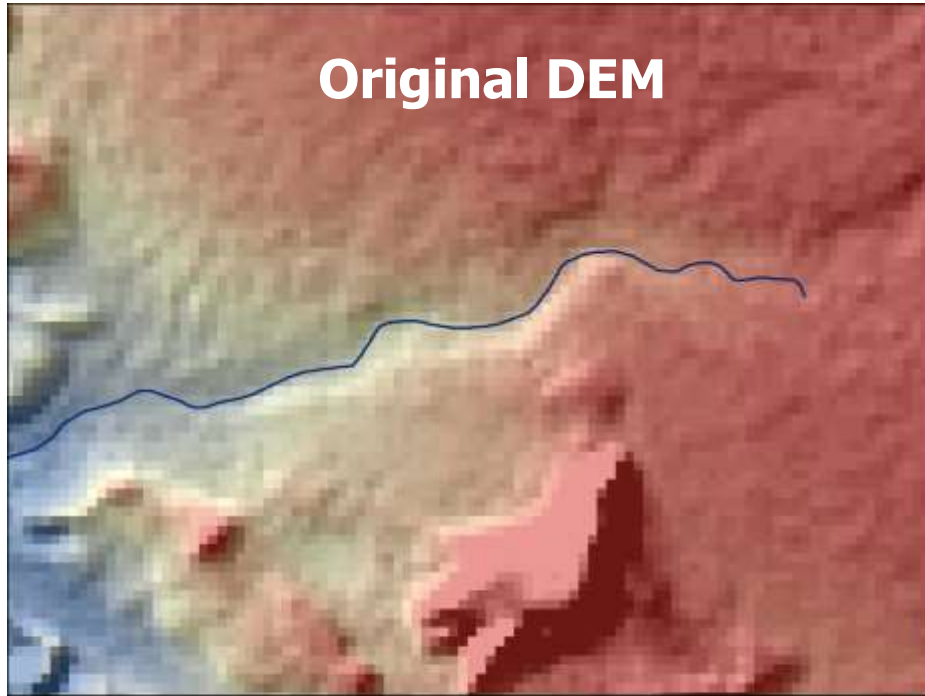
● Enforced Initiation Points

— DEM-traced channels

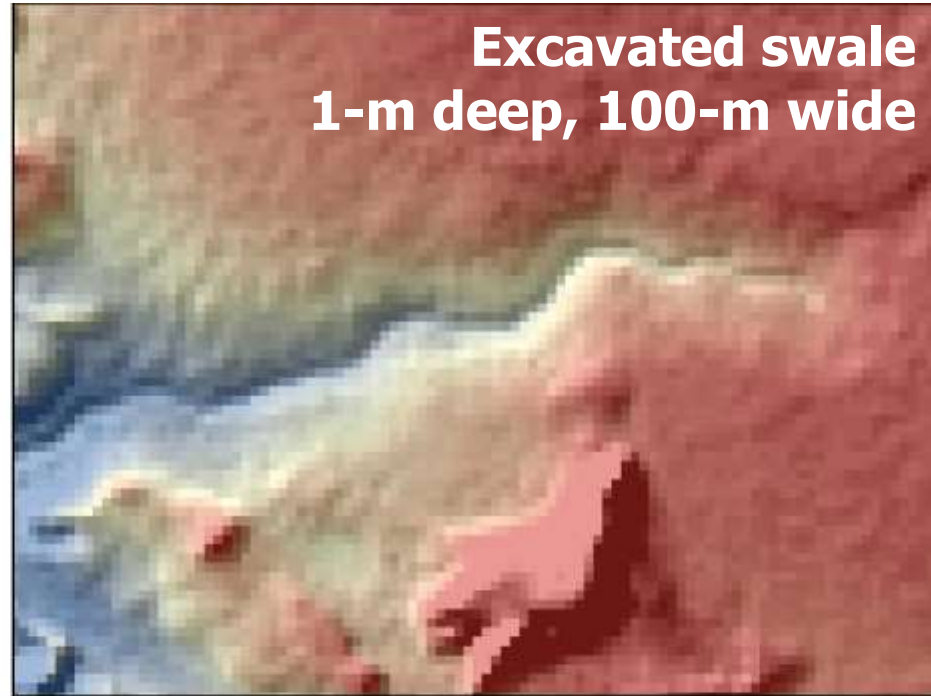
0 250 500 Meters



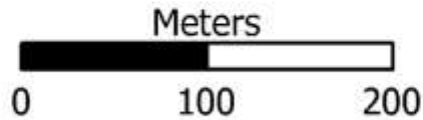
Original DEM



**Excavated swale
1-m deep, 100-m wide**



Elevation (m)

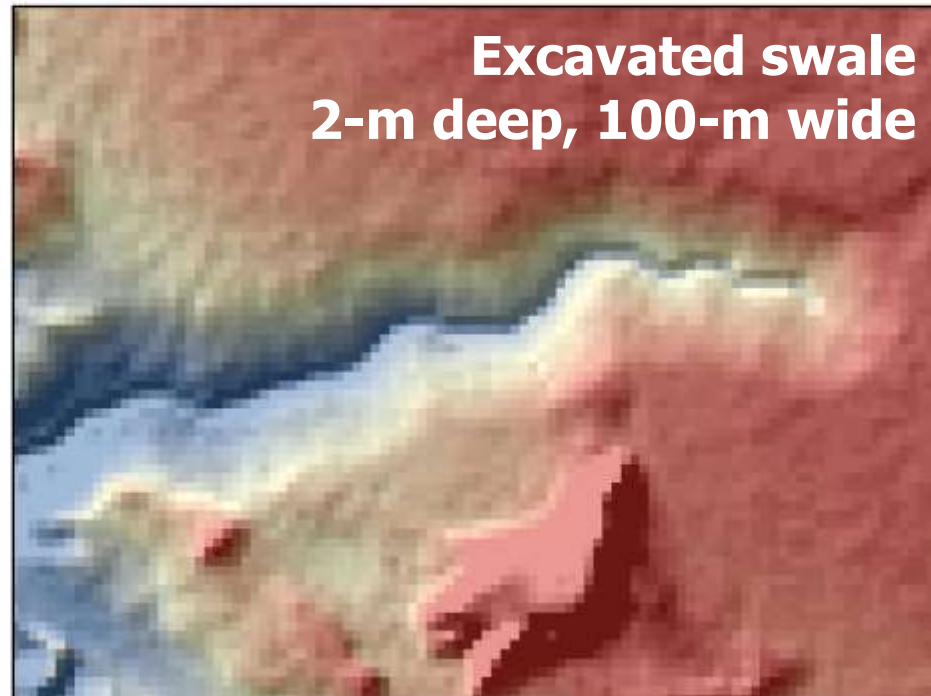


— Single-line hydrography

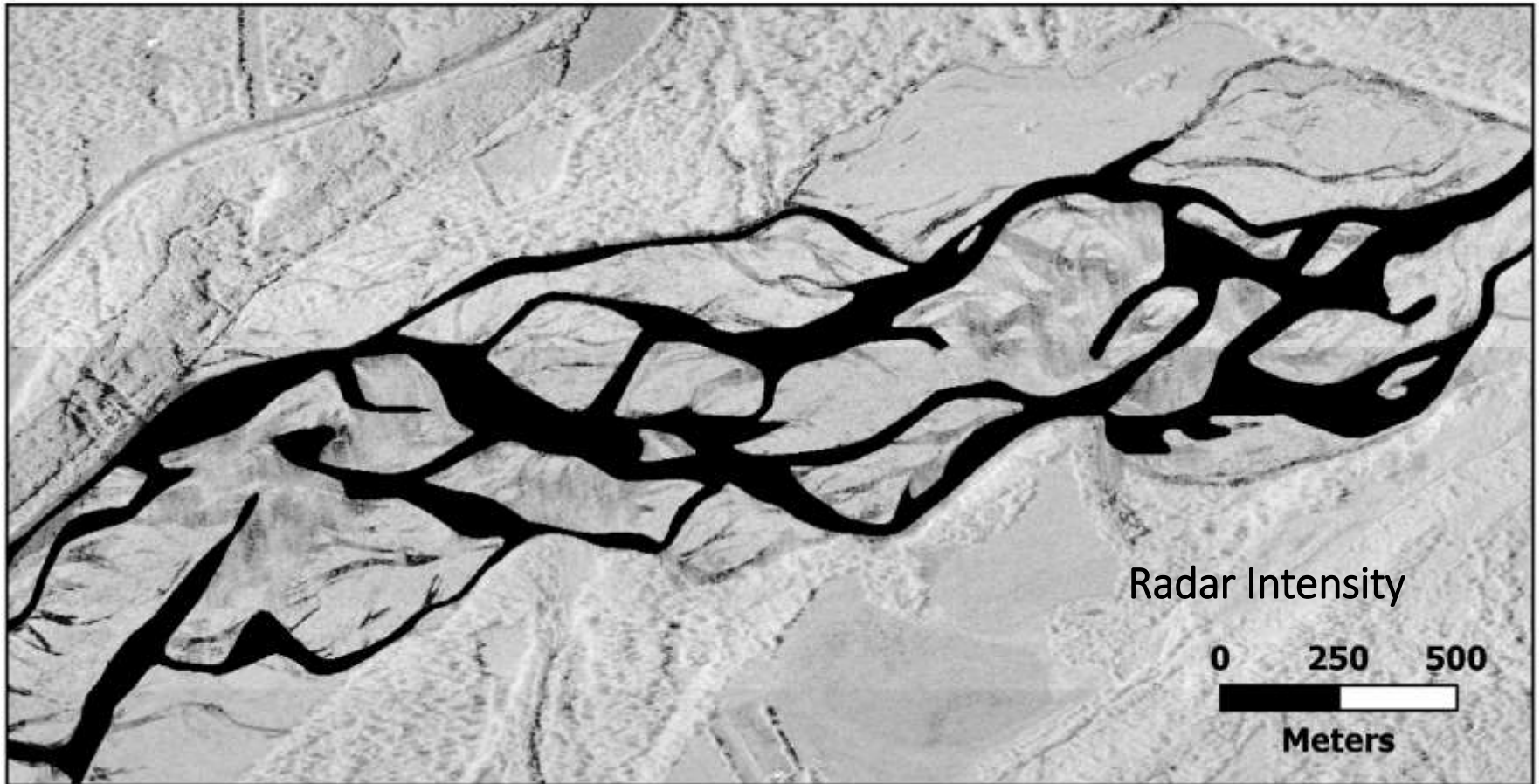
Drainage enforcement:

- Encourage flow toward preferred courses
- Degree of encouragement determined by depth and width of excavated swale
- Once flow directions set, swale is removed and all analyses done on original DEM

**Excavated swale
2-m deep, 100-m wide**



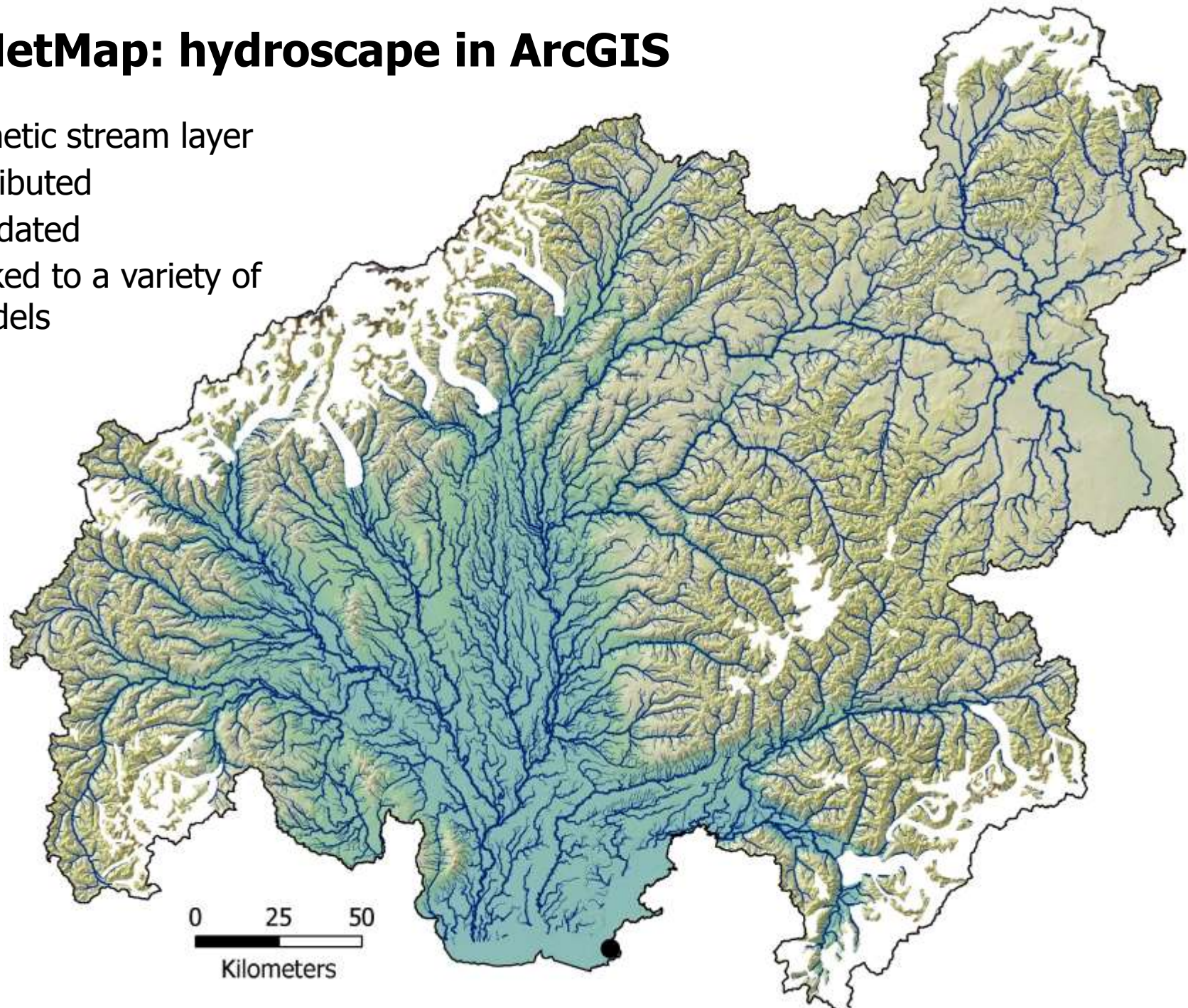
- Water mask:** Delineates surface water
Derived from remotely sensed imagery
- Hydrologic enforcement – guides flow lines
 - Provides channel and habitat attributes



NetMap: hydroscape in ArcGIS

Synthetic stream layer

- Attributed
- Validated
- Linked to a variety of models



An Introduction to Integrated Hydrography with NetMap Digital Hydroscape

A mapping and analysis platform for stream and watershed assessment

1:30 – 4:30 Thursday, Nov. 20, Alaska Pacific University GIS Lab.

Agenda

1:30 – 2:00pm, Introduction:

What is NetMap?

Under the hood: how does NetMap work?

How is NetMap used?

2 – 2:30pm Demonstration exercise in the Goose Bay / Big Lake watershed

Culverts and Habitat Connectivity

2:30 - 4:00pm Hands-on exercises for the Goose Bay / Big Lake watershed.

Impervious surfaces and water quality

Proximity of parcels to active river flood plain

Parcels near spawning streams

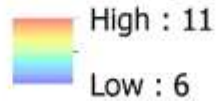
4:00 – 4:30pm Open Discussion

Road Crossings

LiDAR reflections don't see pipes and culverts, so drainage through road prisms and other areas drained by pipes need to be enforced.



Elevation (m)



— Culverts

