Very High-Resolution Mapping of Anadromous Streams and Salmon Habitat in the Chignik Watershed

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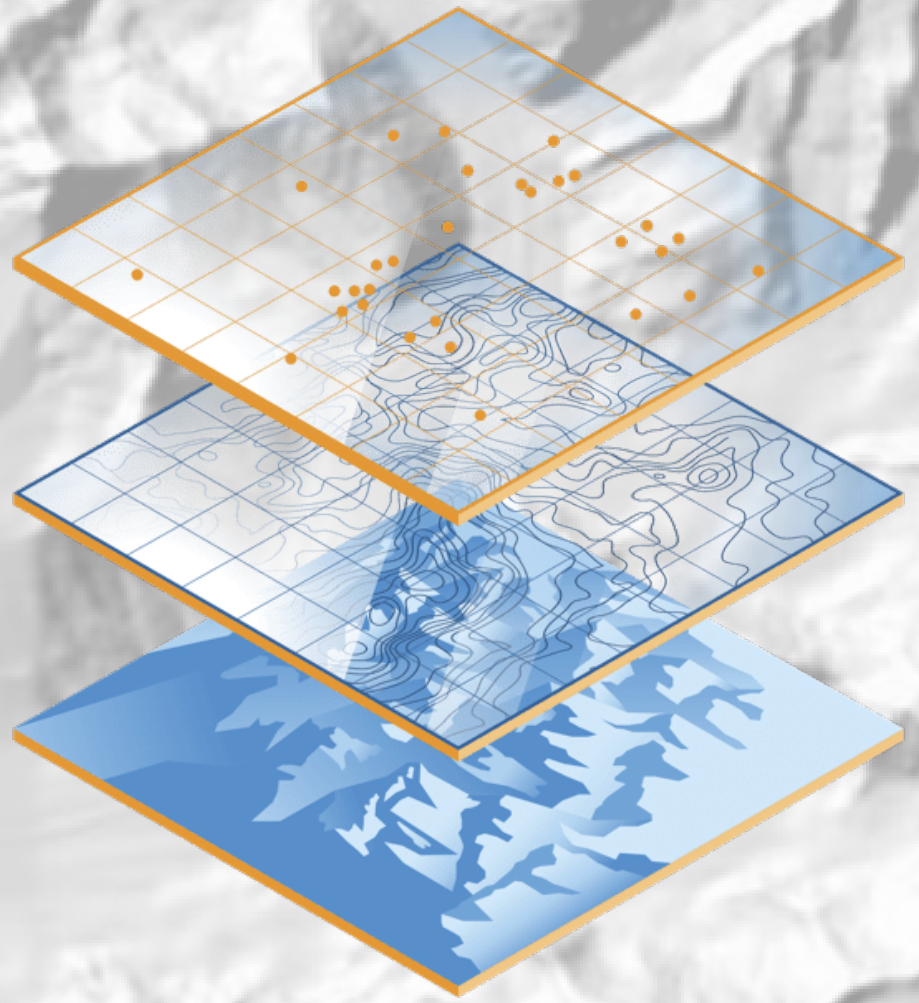
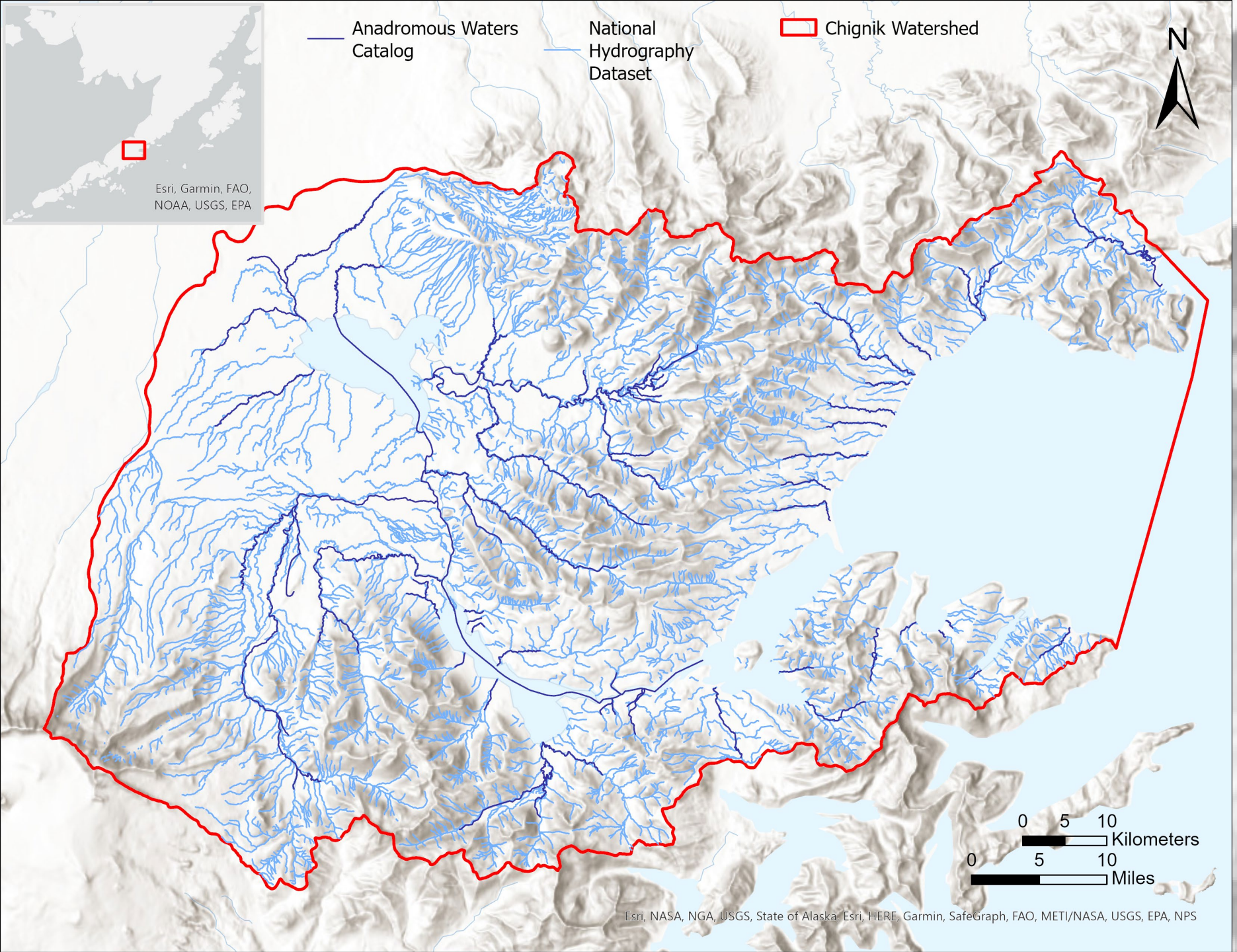
2023 Western Alaska Interdisciplinary Science Conference and Forum

BACKGROUND

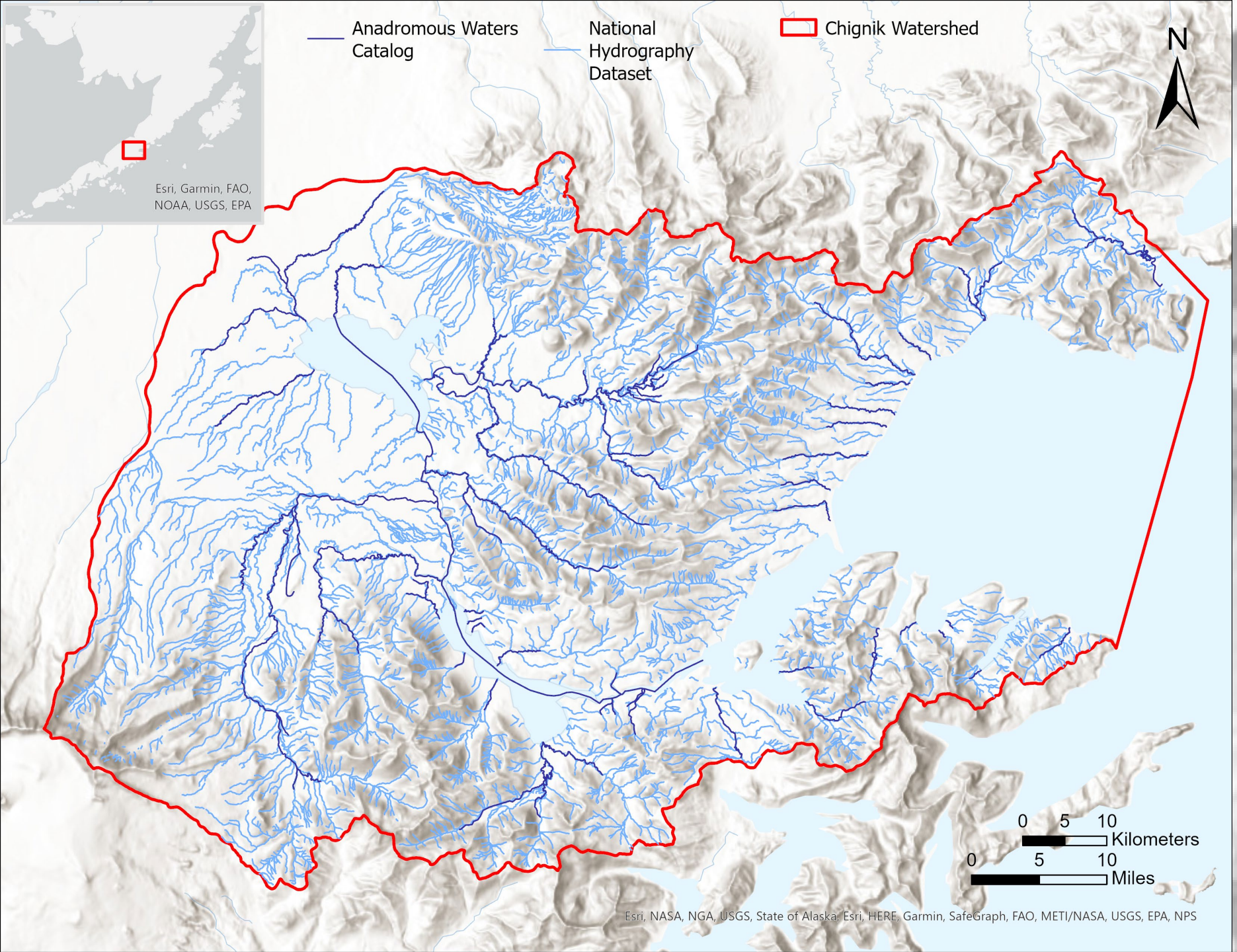
- Alaska needs high-resolution data
- Alaska communities rely on salmon for traditional food/resource-gathering
- Climate change has outsized effects at high latitudes and for Alaska





CHIGNIK WATERSHED

- **~1100 km "known" salmon streams**
- **small area; BIG productivity**
- **Dynamic - habitat variability**



CHIGNIK WATERSHED

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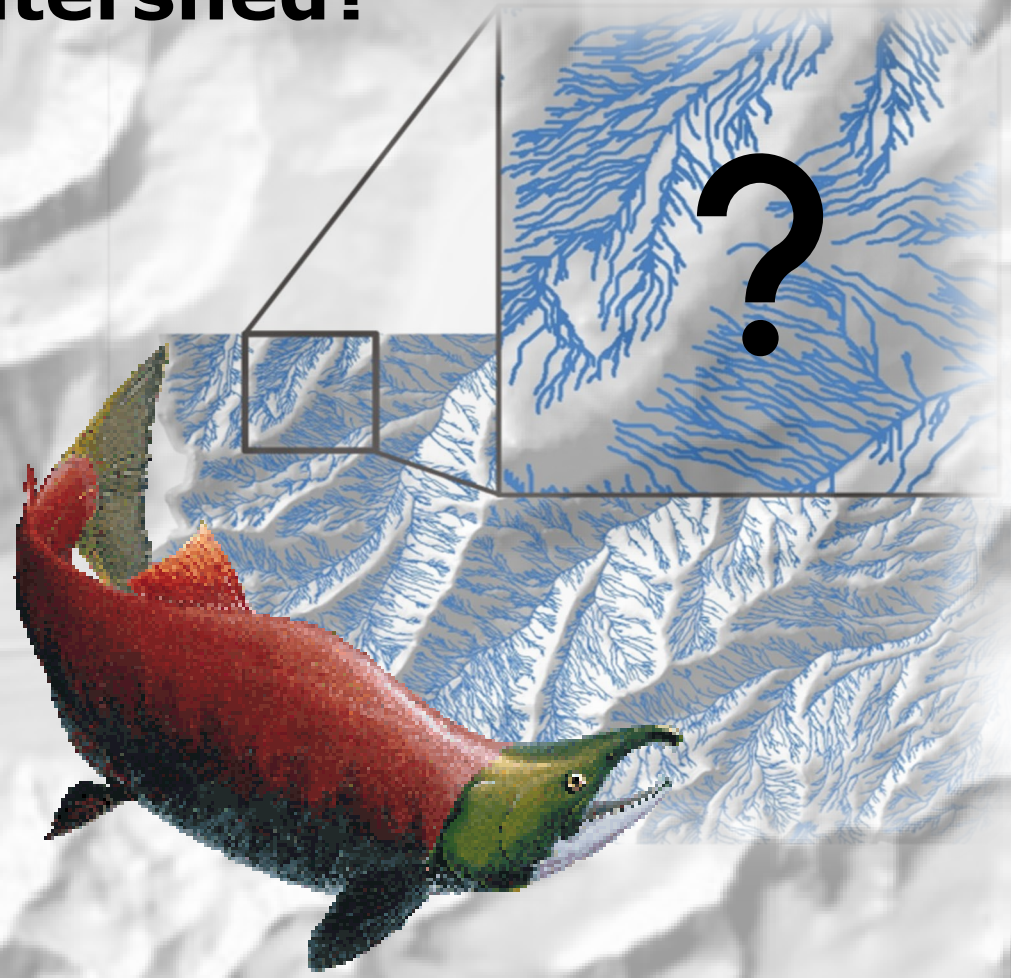
RESEARCH QUESTION

What is the spatial distribution and extent of "known" salmon streams in the Chignik watershed?

- Where are the important spawning/rearing sites?
- How can we assess & monitor change if we don't know all the streams that salmon use?

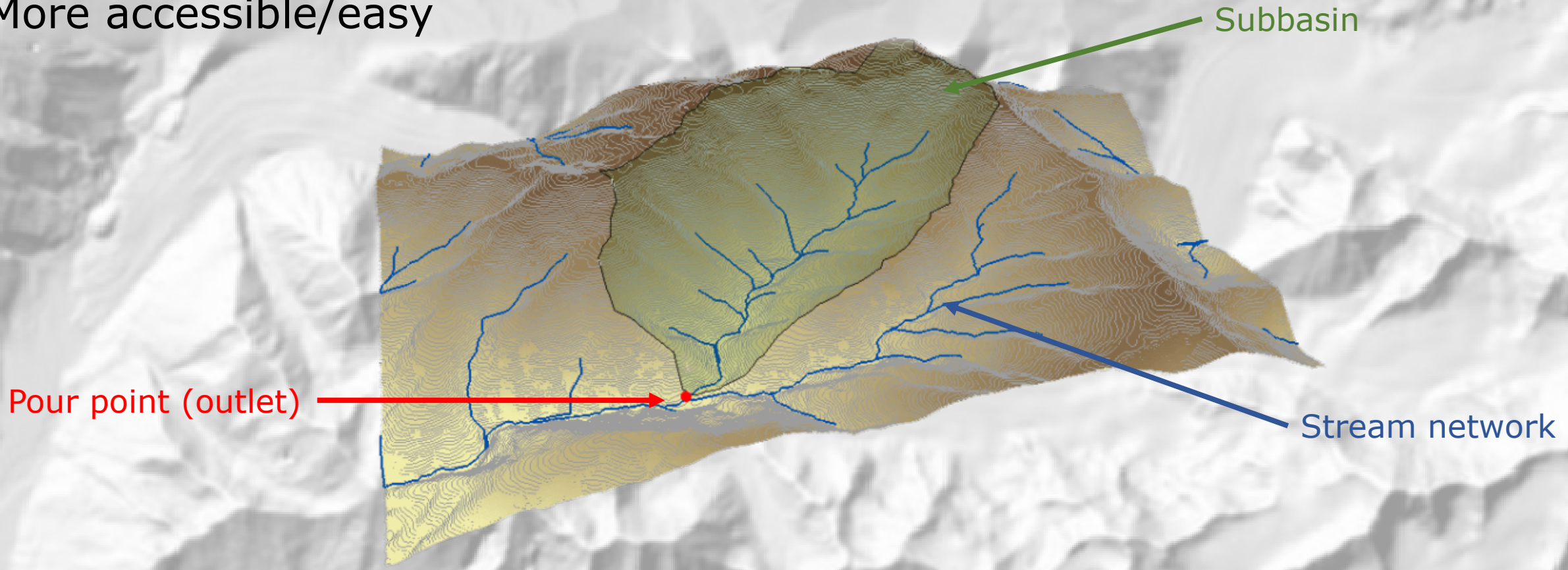


This situation is not unique…

…plenty of examples throughout the state

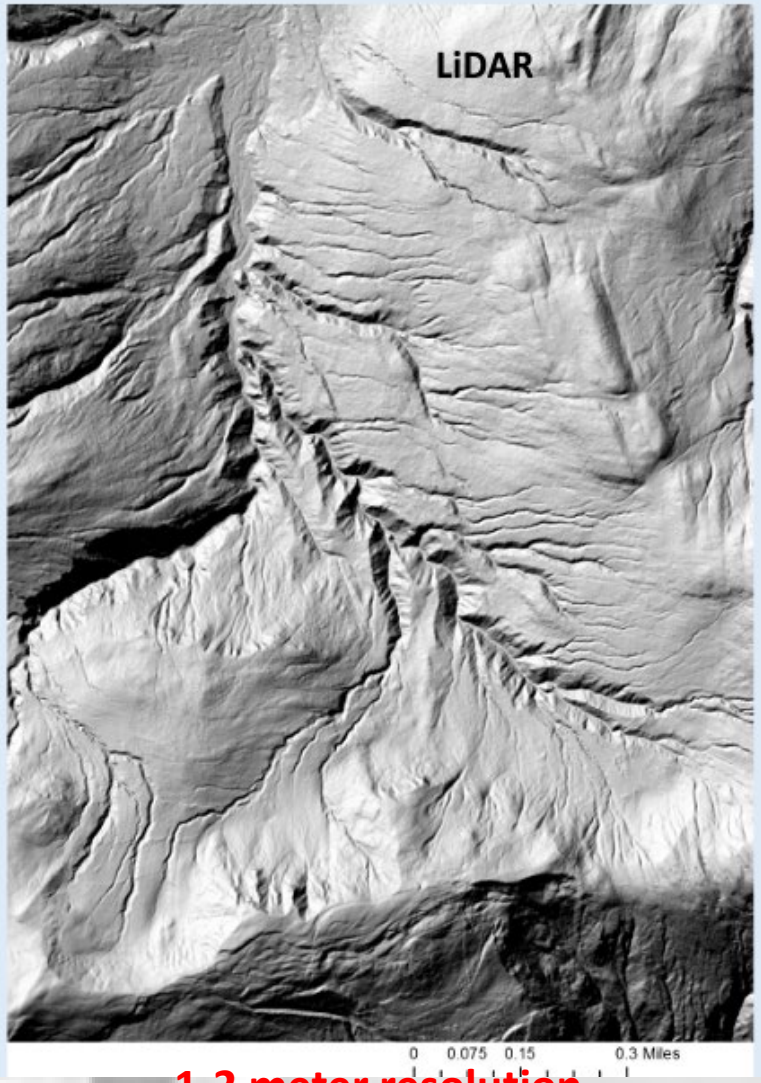
VIRTUAL WATERSHEDS

- Digital geospatial model of riverine environment
- Scalable: basin > subbasin > reach > micro…
- More accessible/easy

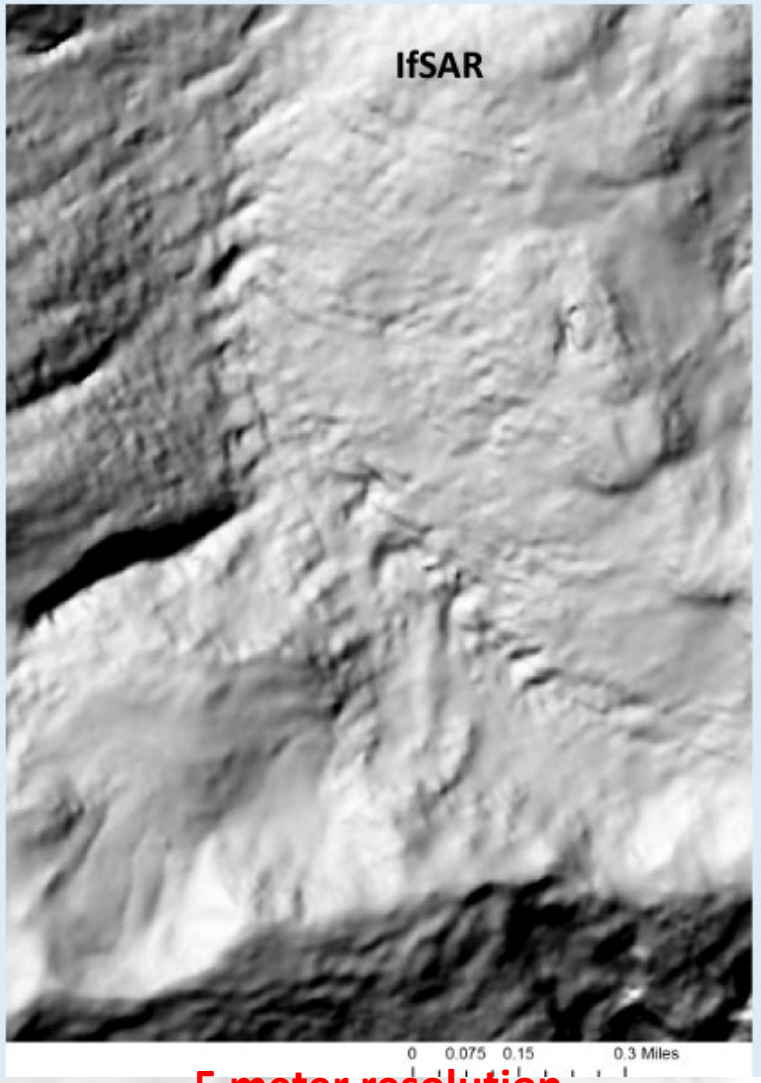


DEMs

- Base topographic data used for watershed delineation
- Gridded data containing x,y,z information
- Delineation accuracy increases w/ DEM resolution



1-2 meter resolution

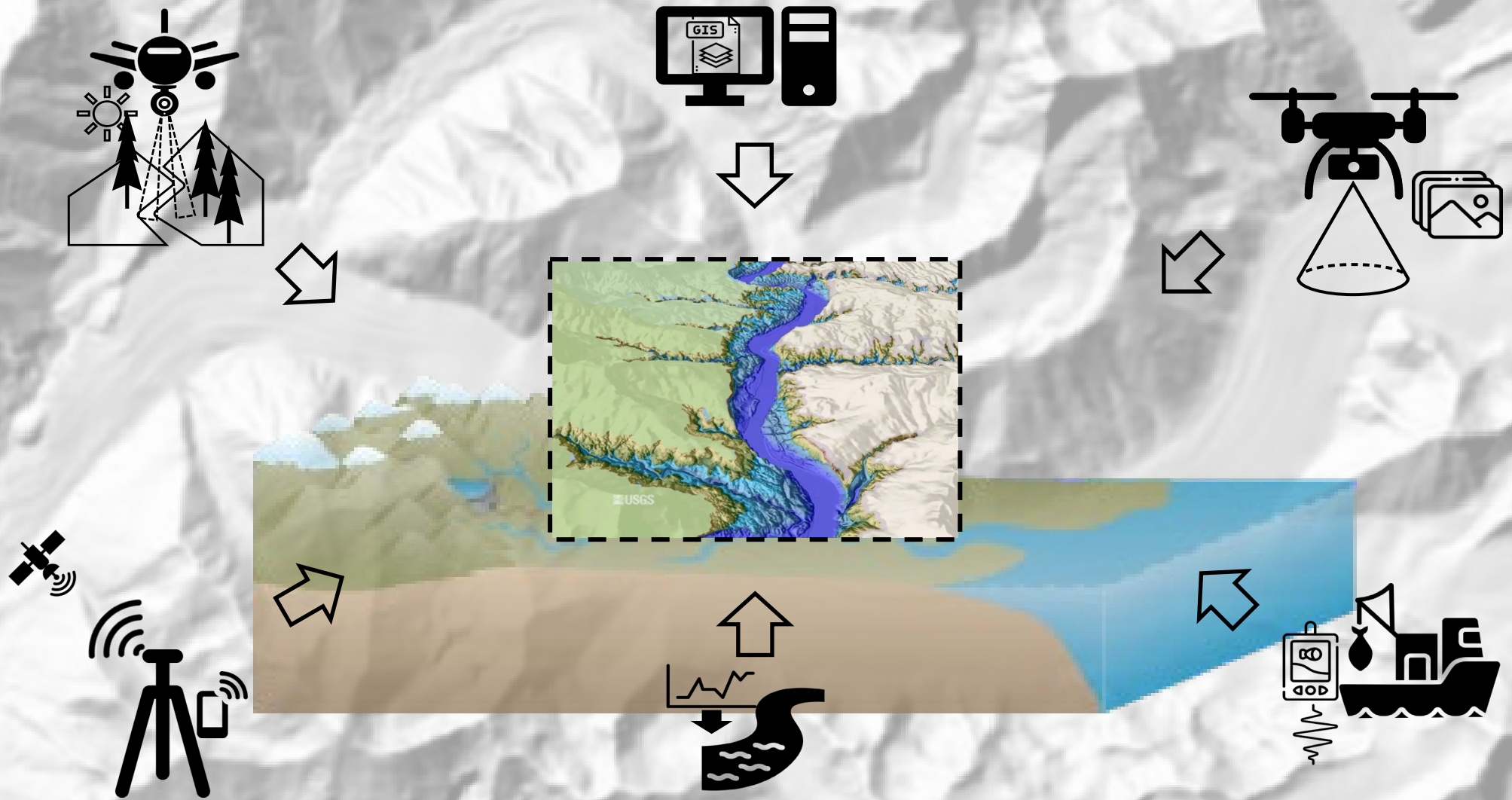


5 meter resolution

Source: TerrainWorks *Benda et al.*

Preliminary delineation relies on Alaska Statewide Mapping Initiative's 5-m IfSAR DTM (digital terrain model) *in progress*

METHODS



LiDAR

- **Li**ght **D**etection **A**nd **R**anging
- Sub-meter resolution, vertical accuracy

LiDAR acquisition flight survey (USGS 3DEP) scheduled spring 2023, ROI: ~125 square miles

HYDROGRAPHIC DATA

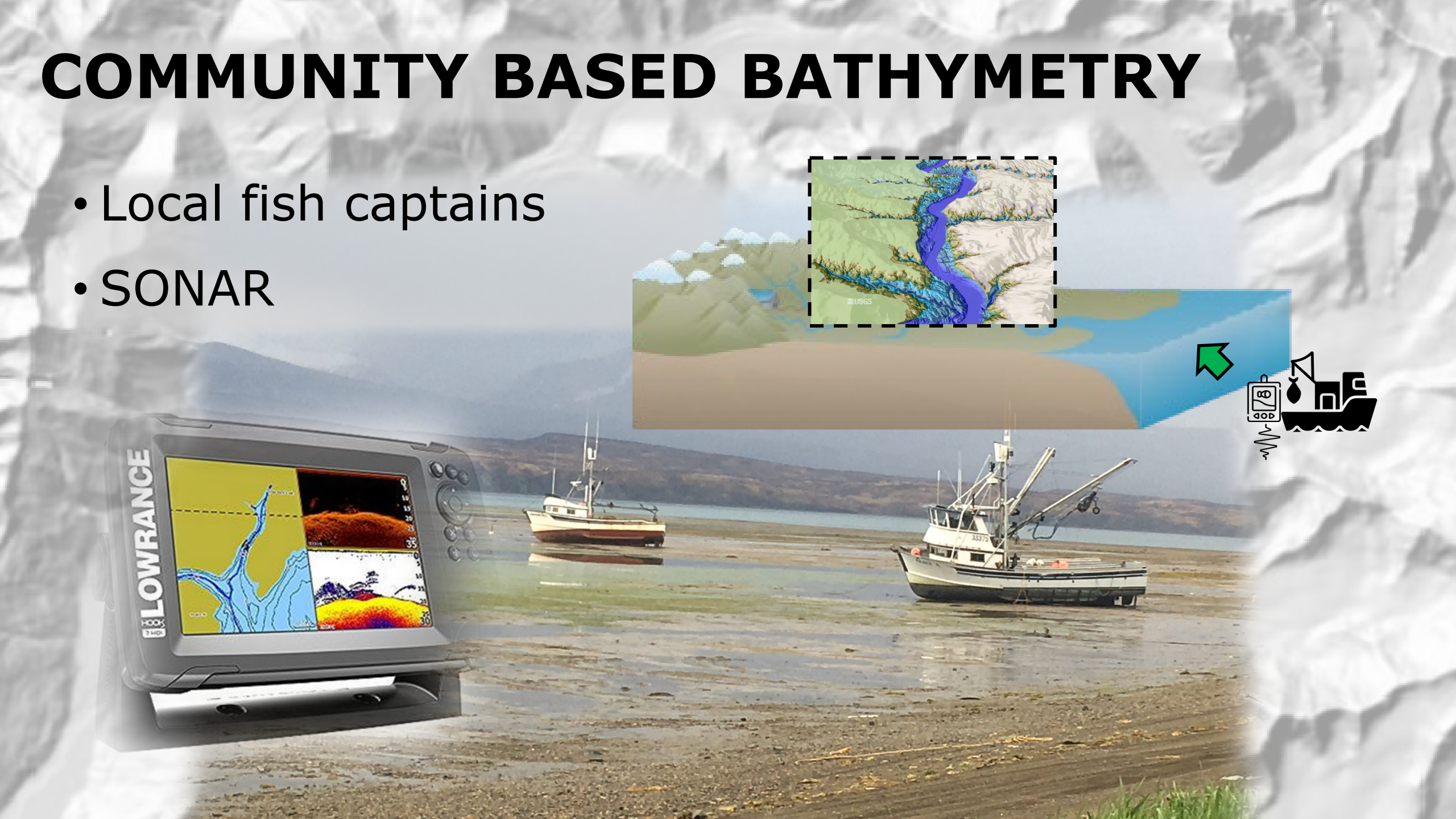
- Measuring flow

DIFFERENTIAL GPS

- RTK for GCPs
- Shallow water bathymetry

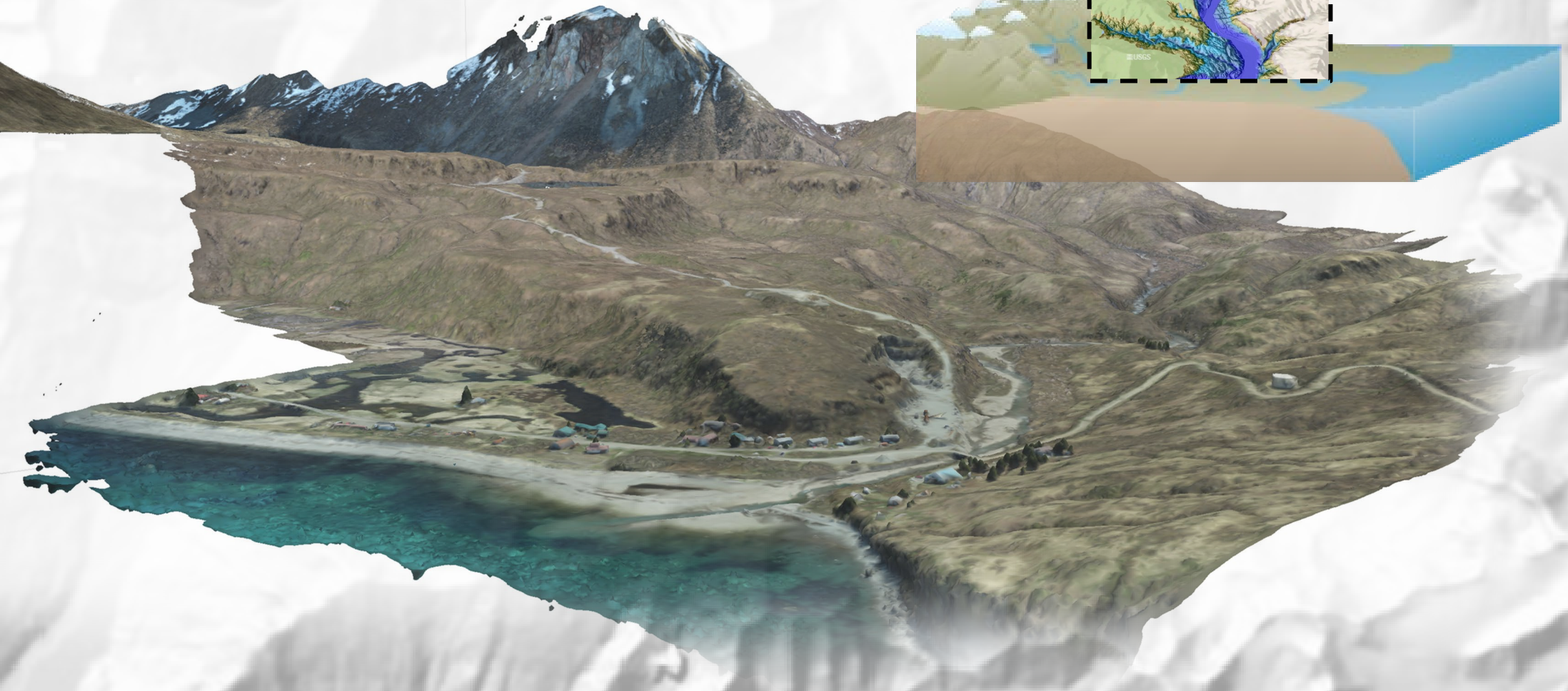
COMMUNITY BASED BATHYMETRY

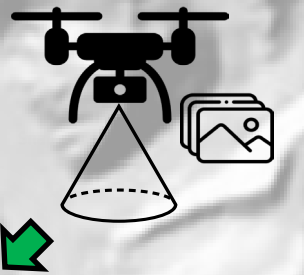
- Local fish captains
- SONAR



UAS SURVEYS

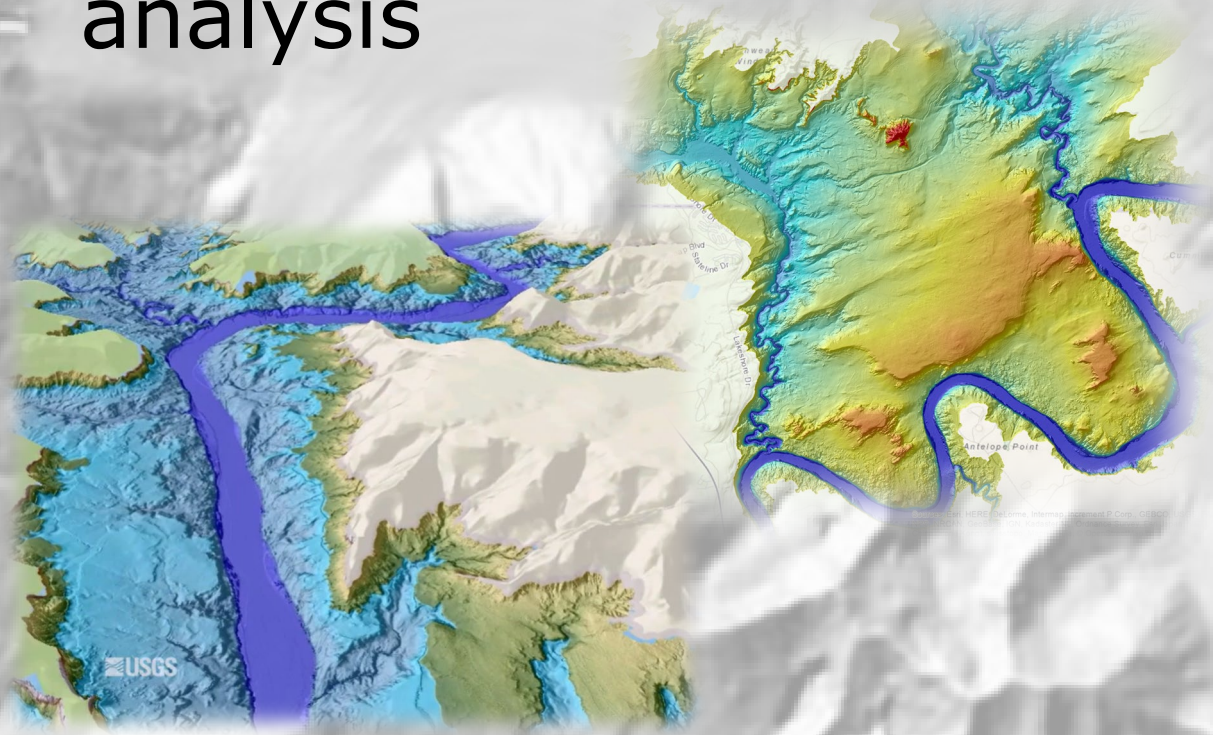
- 3D model

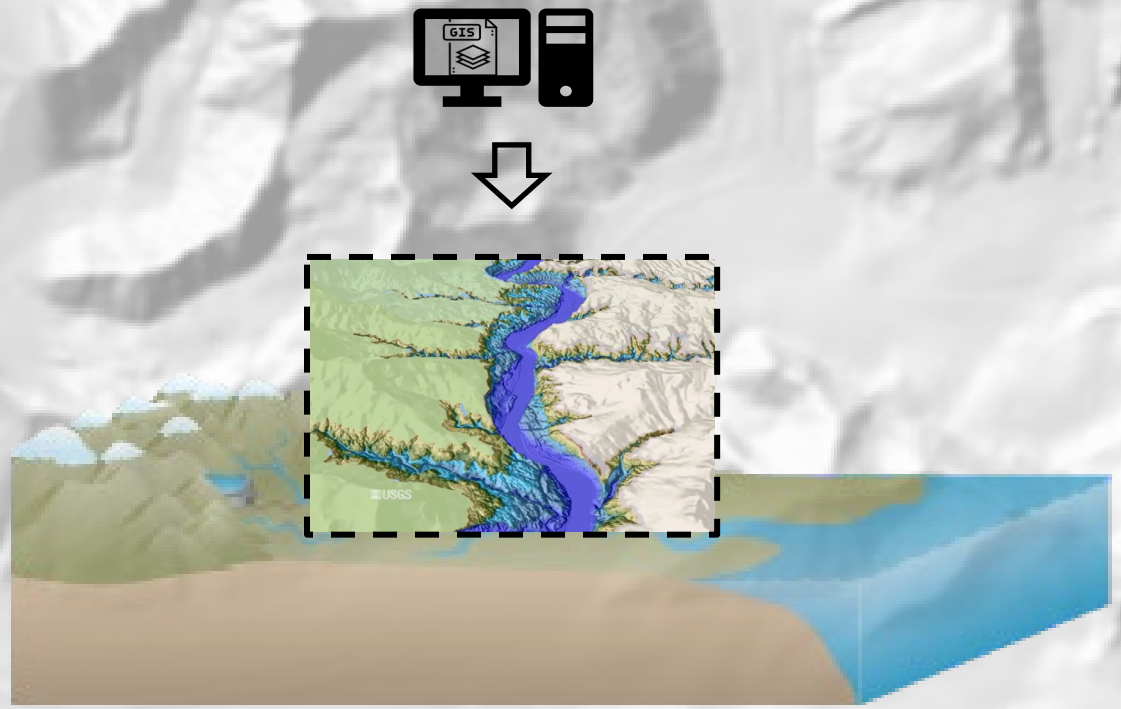




GIS

- Put it all together!
- Processing, fusion, visualization, modeling, analysis

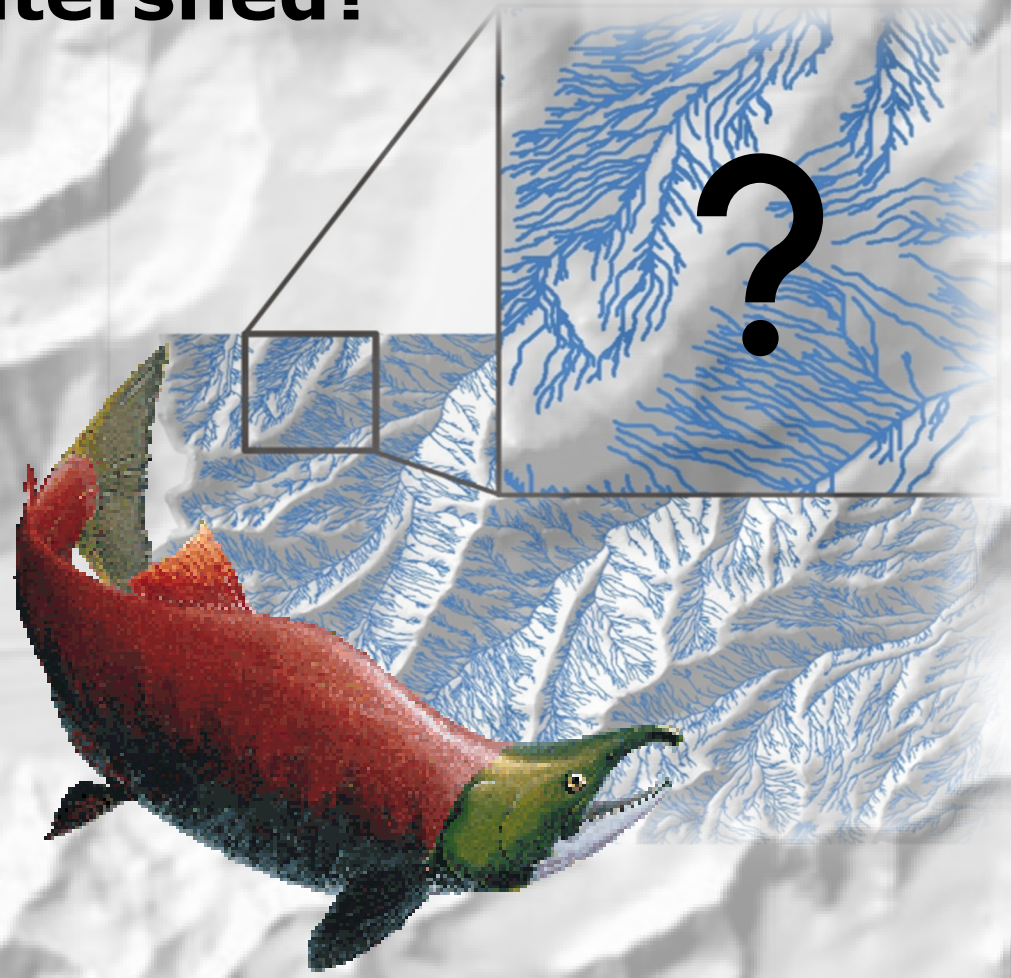


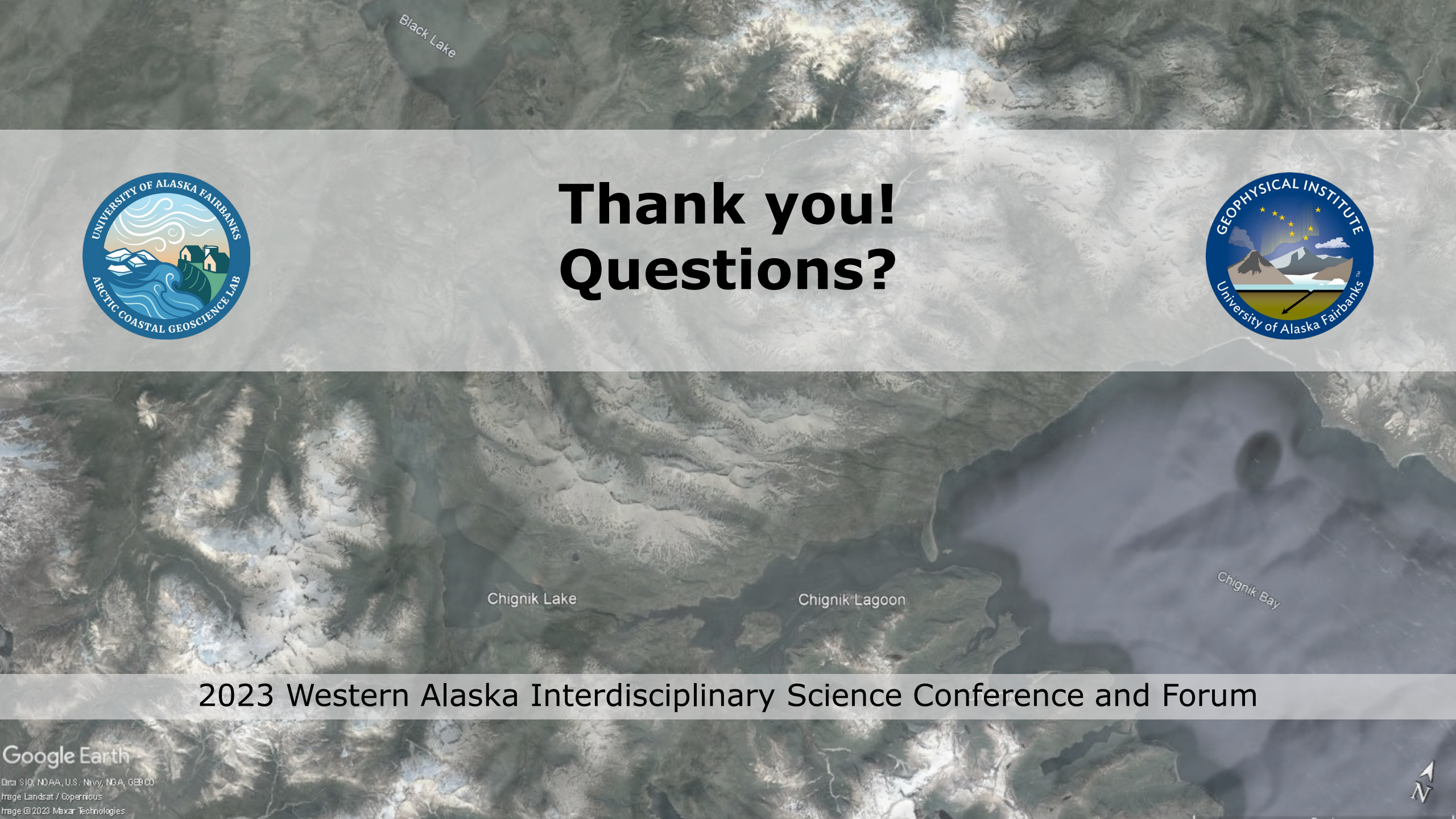


EXPECTED OUTCOMES

What is the spatial distribution and extent of "known" salmon streams in the Chignik watershed?

- Apply salmon habitat models and other inputs to watershed delineation & topobathy products





Thank you!
Questions?

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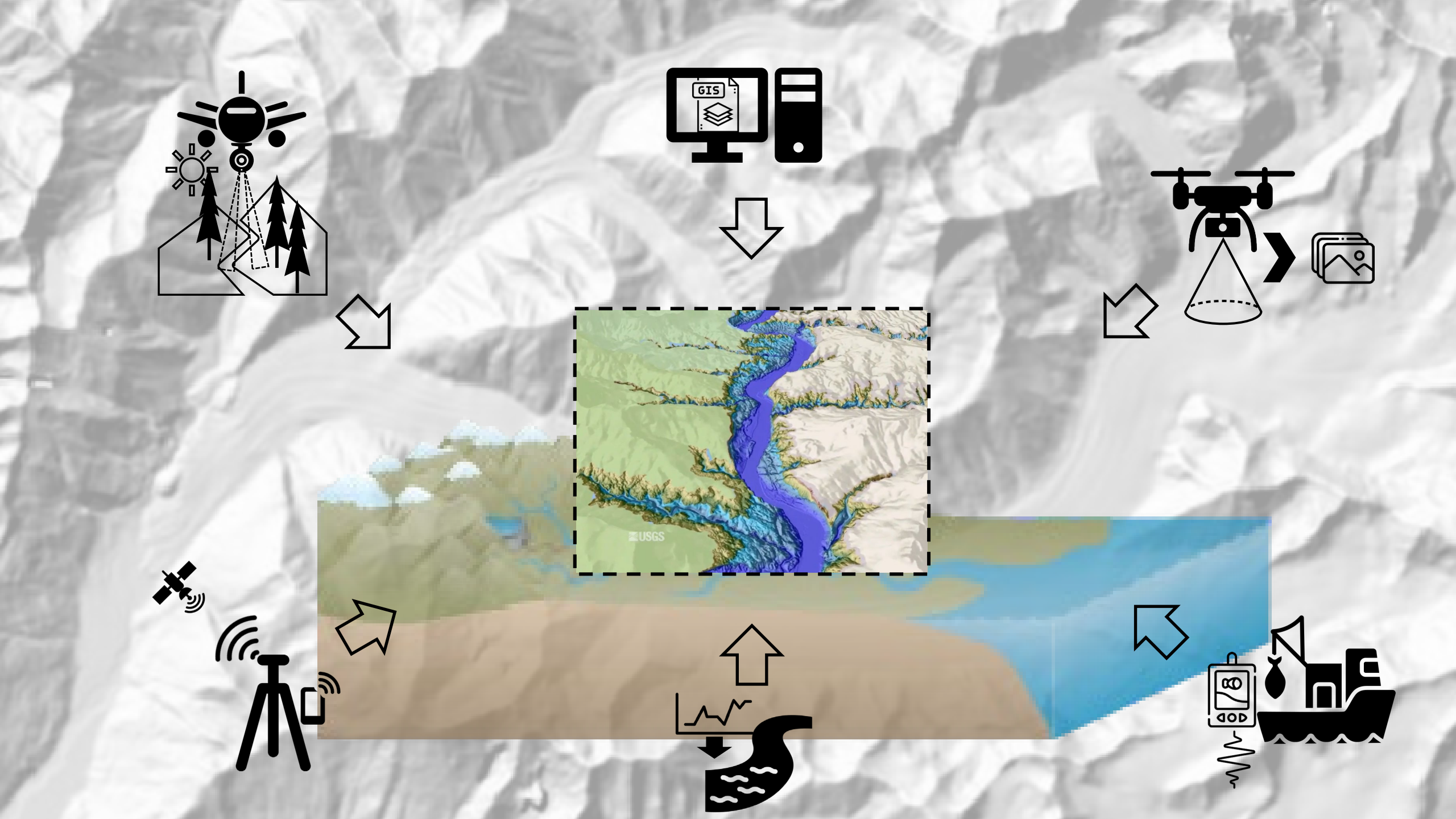
PROJECT OBJECTIVES PT. 1:

- Develop baseline topographic & bathymetric datasets
- Update watershed delineation & stream networks
- Identify salmon streams & any not currently registered in the AWC

PROJECT OBJECTIVES PT. II:

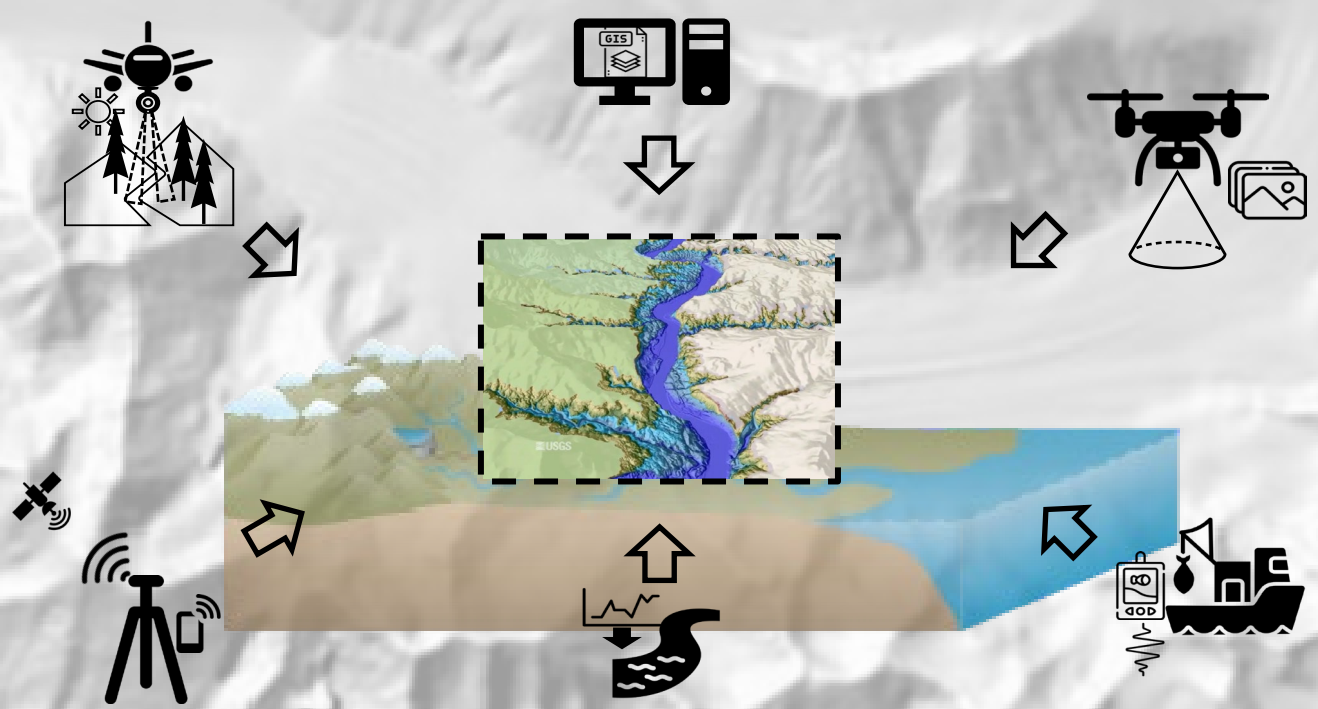
- ❑ Incorporate LiDAR survey data into watershed delineation
- ❑ Fusion of datasets
- ❑ Salmon habitat modeling
- ❑ Ground truthing of salmon streams


GIS
USGS

2023 FIELDWORK:

May - June 2023

- Identify salmon sites with local knowledge
- Conduct UAS surveys to collect supplemental high-res imagery
- Conduct differential GPS surveys for bathymetric data in shallow areas
- Citizen-science hydrographic data collection training



PROJECTED OUTCOMES:

CHIGNIK WATERSHED

- Datasets for and by local community members
- Updated and improved virtual watershed delineation
- Salmon habitat suitability model
- Topobathymetric model @ specific sites
- Future work