



# RIVER MAPPING IN REMOTE ALASKA: TOPOBATHYMETRIC LIDAR SOLUTIONS

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# OUTLINE

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AK River Mapping Considerations  
Overcoming Challenges

Repeated Mapping

Case study: Nuyakuk River Project

2020 Collection

2023 Collection

Data Integration

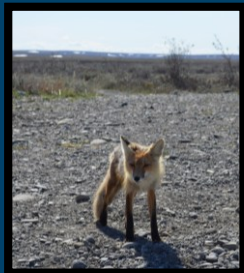
Summary & Closing Thoughts



# ALASKA RIVER MAPPING CONSIDERATIONS

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- Safety and accessibility
  - Remoteness & scale
  - Terrain
  - Weather
- Optimal collection conditions
  - Weather
  - Flow rate & turbidity
  - Snow/vegetation cover

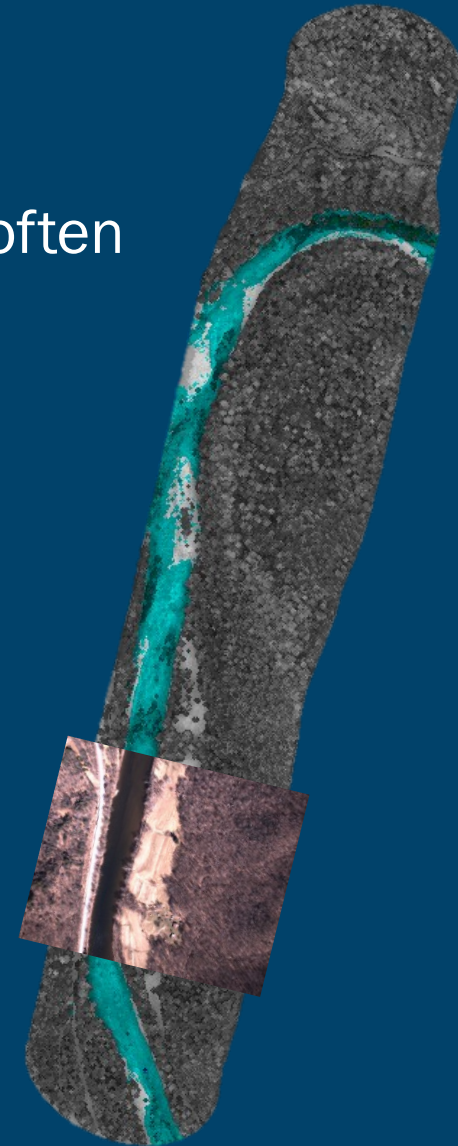




# OVERCOMING CHALLENGES

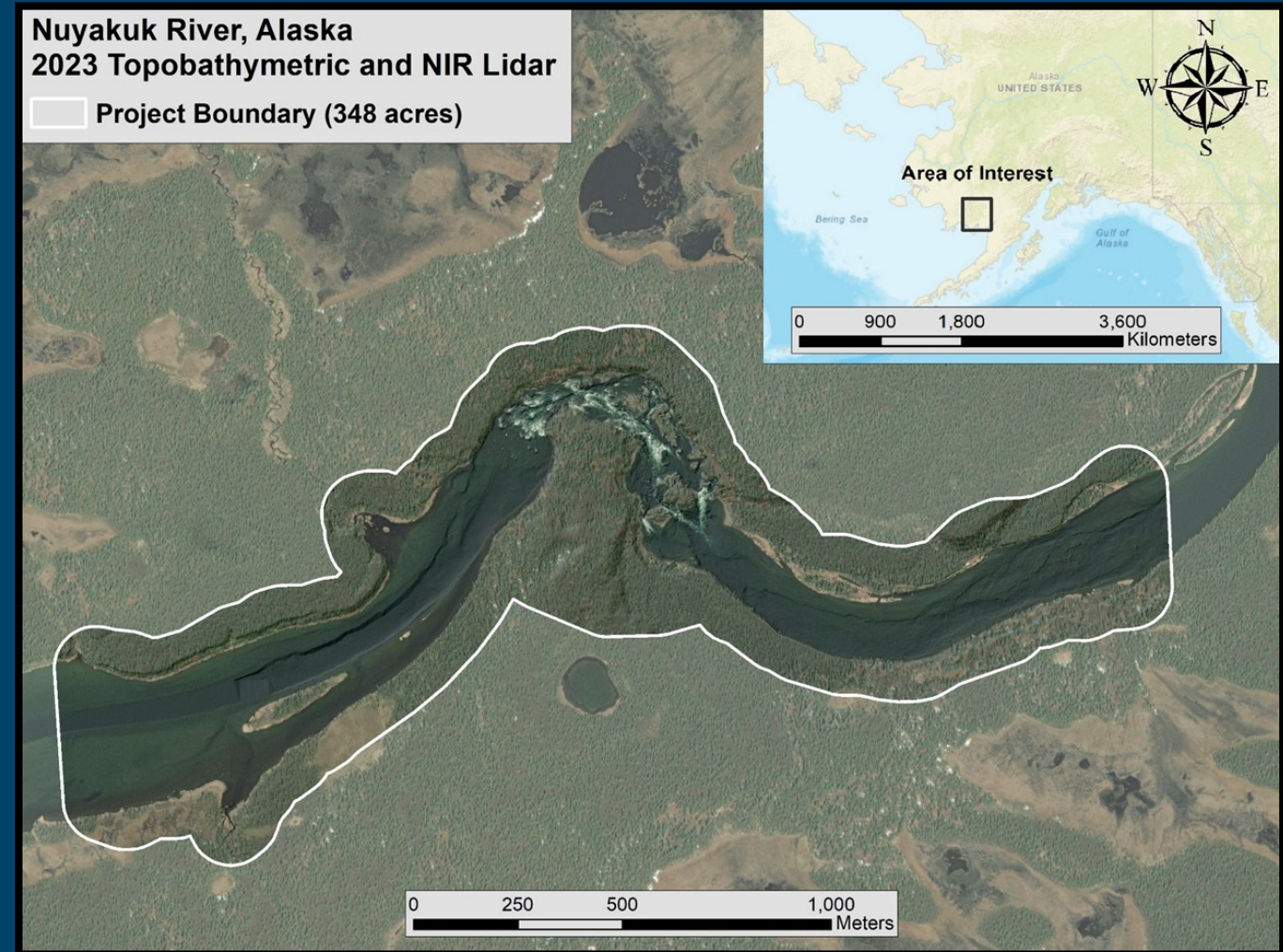
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- Leverage local knowledge & strategic planning
  - Communicate with stakeholders and locals early and often
  - Stage resources accordingly for rapid acquisition
- Select appropriate tools and project timing
  - Topobathymetric lidar and imagery
    - Platform and sensor system
  - Multiple acquisitions
- Data processing must meet the project needs
  - Accuracy
    - Control, trajectory processing
  - Data integration
    - Temporal changes



# CASE STUDY: NUYAKUK RIVER PROJECT

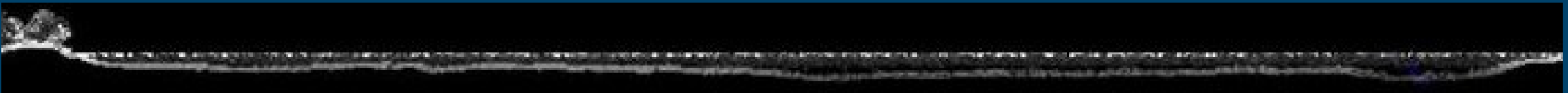
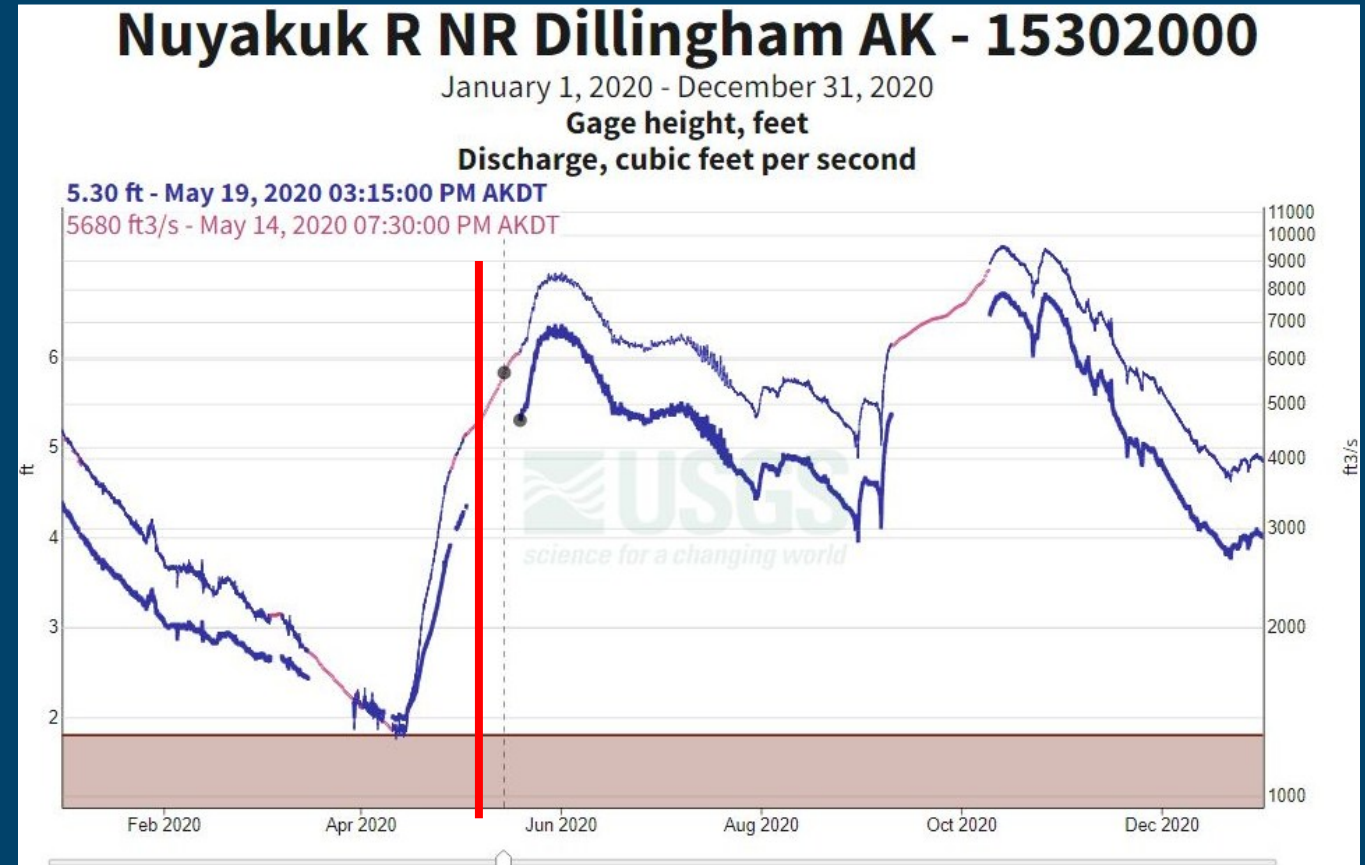
- Remote
  - ~300 miles WSW of Anchorage
- Snow/ice cover - late April/May
- High flow conditions in summer
- Rapids of particular interest



# 2020 TOPOBATHYMETRIC LIDAR ACQUISITION

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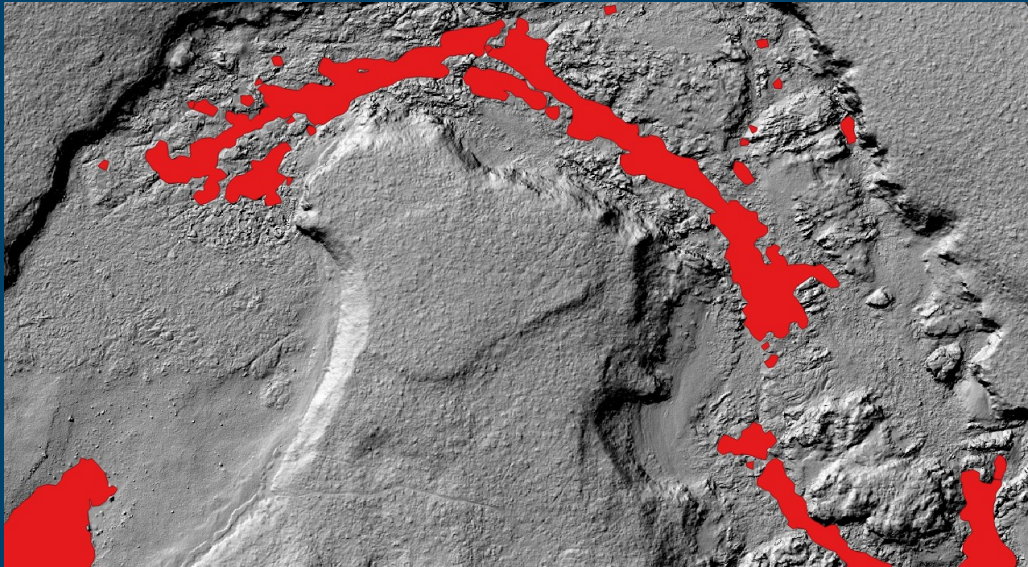
- Goal: target ice/snow-free conditions
- Acquired May 14, 2020
- Riegl VQ-880-G II
- Pandemic!
- 83% bathymetric coverage





# RAPID VOIDS

- Rapids of high interest
- Client still in need of data
- Target earlier collection

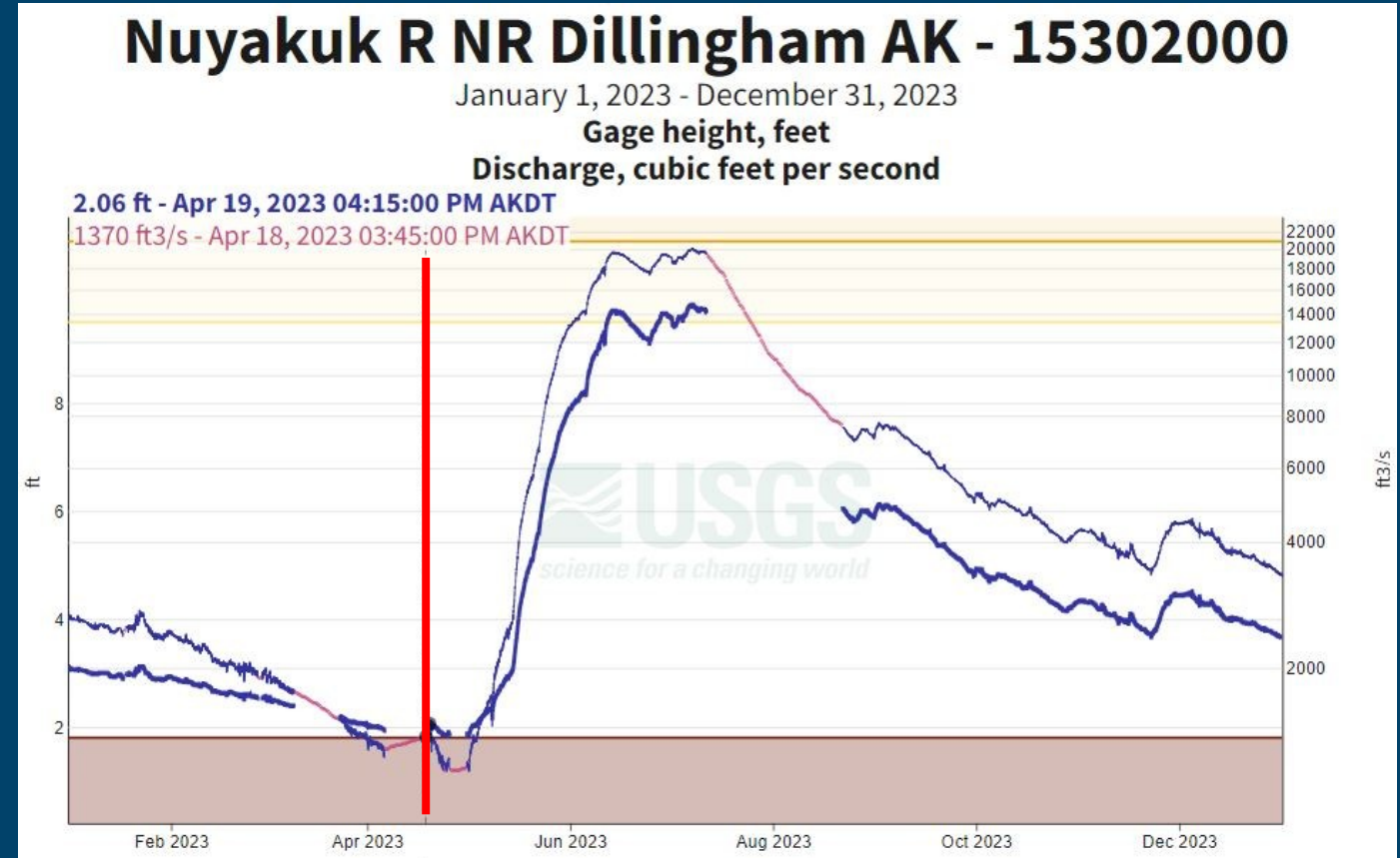
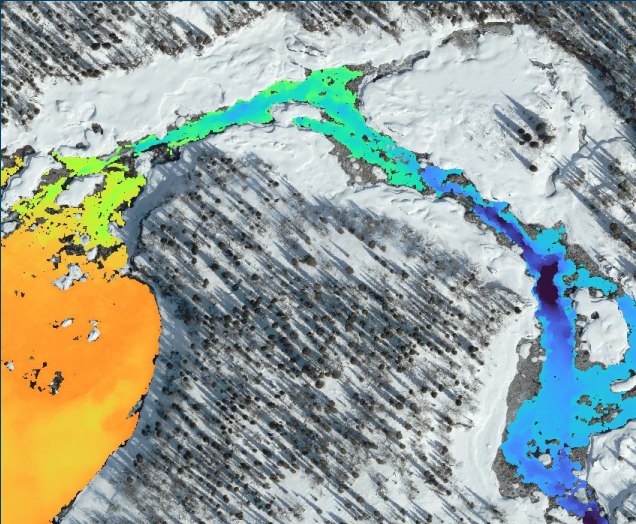




# 2023 TOPOBATHYMETRIC LIDAR ACQUISITION

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- Goal: Capture rapids at low flow
- Acquired April 18, 2023
- Leica Chiroptera 4X
- Snow/ice present
- 85% bathymetric coverage



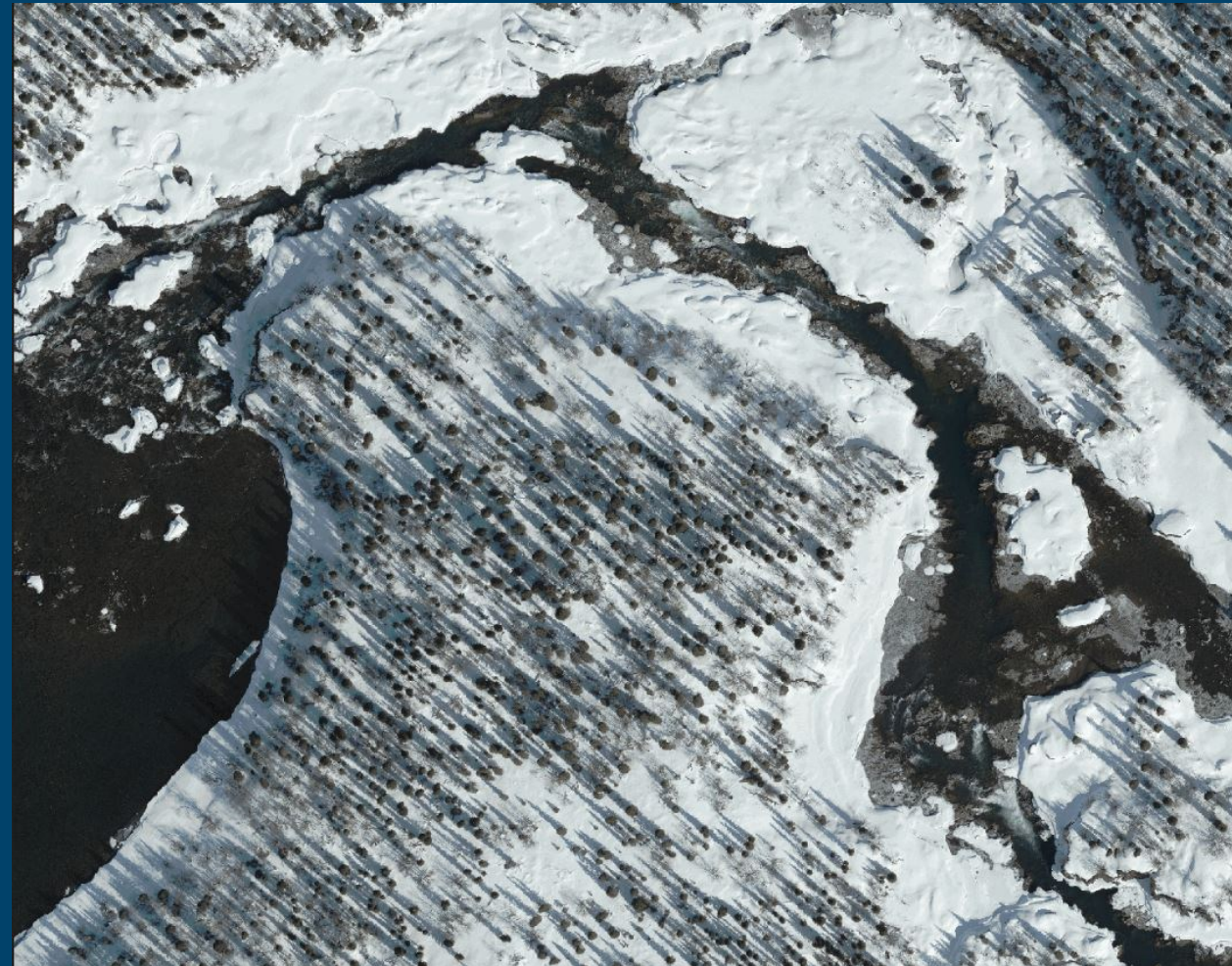


# SITE CONDITIONS

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MAY 2020



APRIL 2023

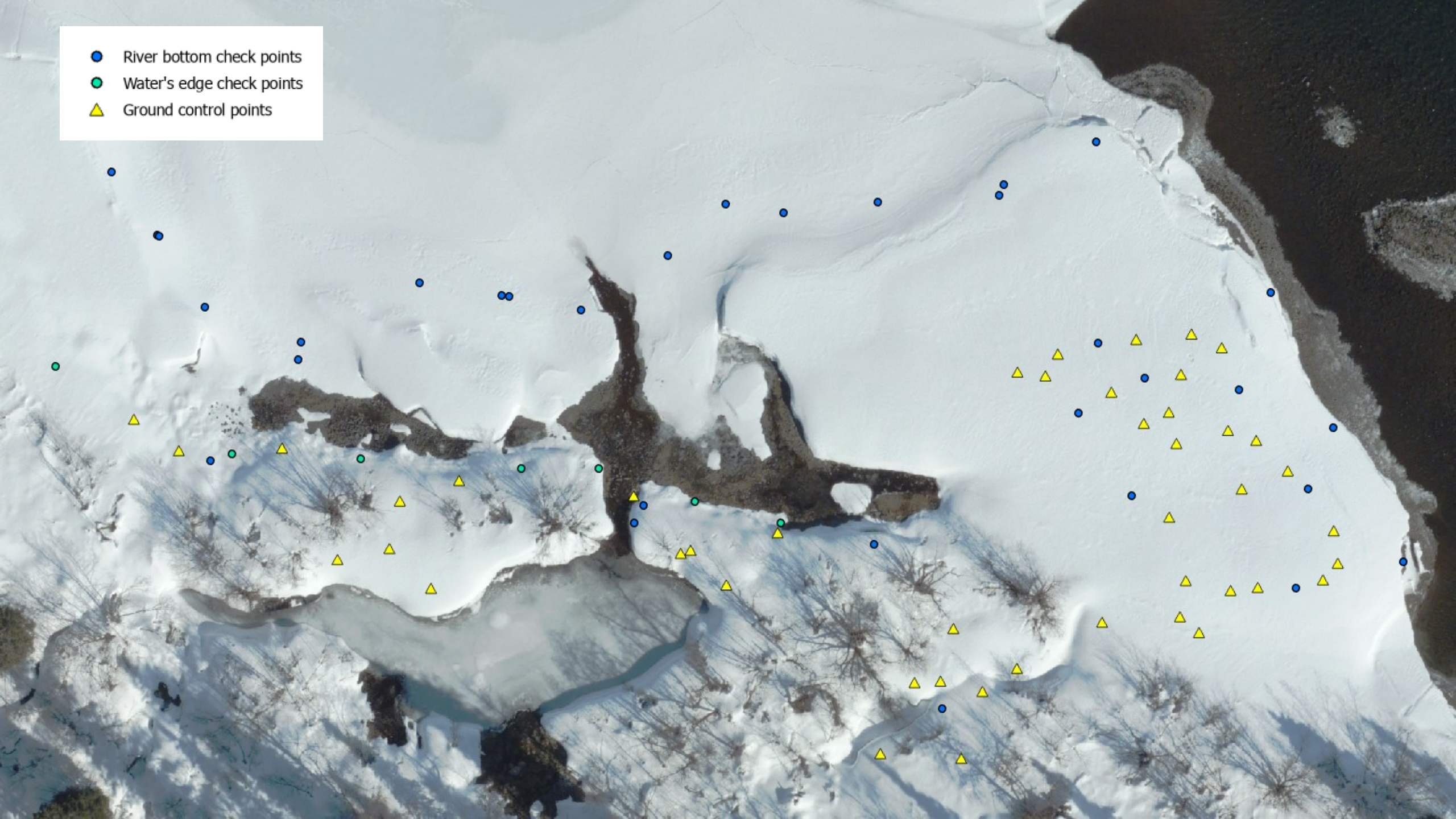


- River bottom check points
- Water's edge check points
- ▲ Ground control points





- River bottom check points
- Water's edge check points
- ▲ Ground control points






- River bottom check points
- Water's edge check points
- ▲ Ground control points





- 
- An aerial photograph of a river winding through a landscape. The river is dark and occupies the central and lower portions of the frame. The banks are covered in snow, with some exposed dark ground and rocks visible. A legend in the top-left corner identifies three types of check points: blue circles for river bottom, green circles for water's edge, and yellow triangles for ground control points. One green circle is located on the upper-left bank. Three yellow triangles are located on the lower-left bank. No blue circles are visible in this section of the image.
- River bottom check points
  - Water's edge check points
  - ▲ Ground control points

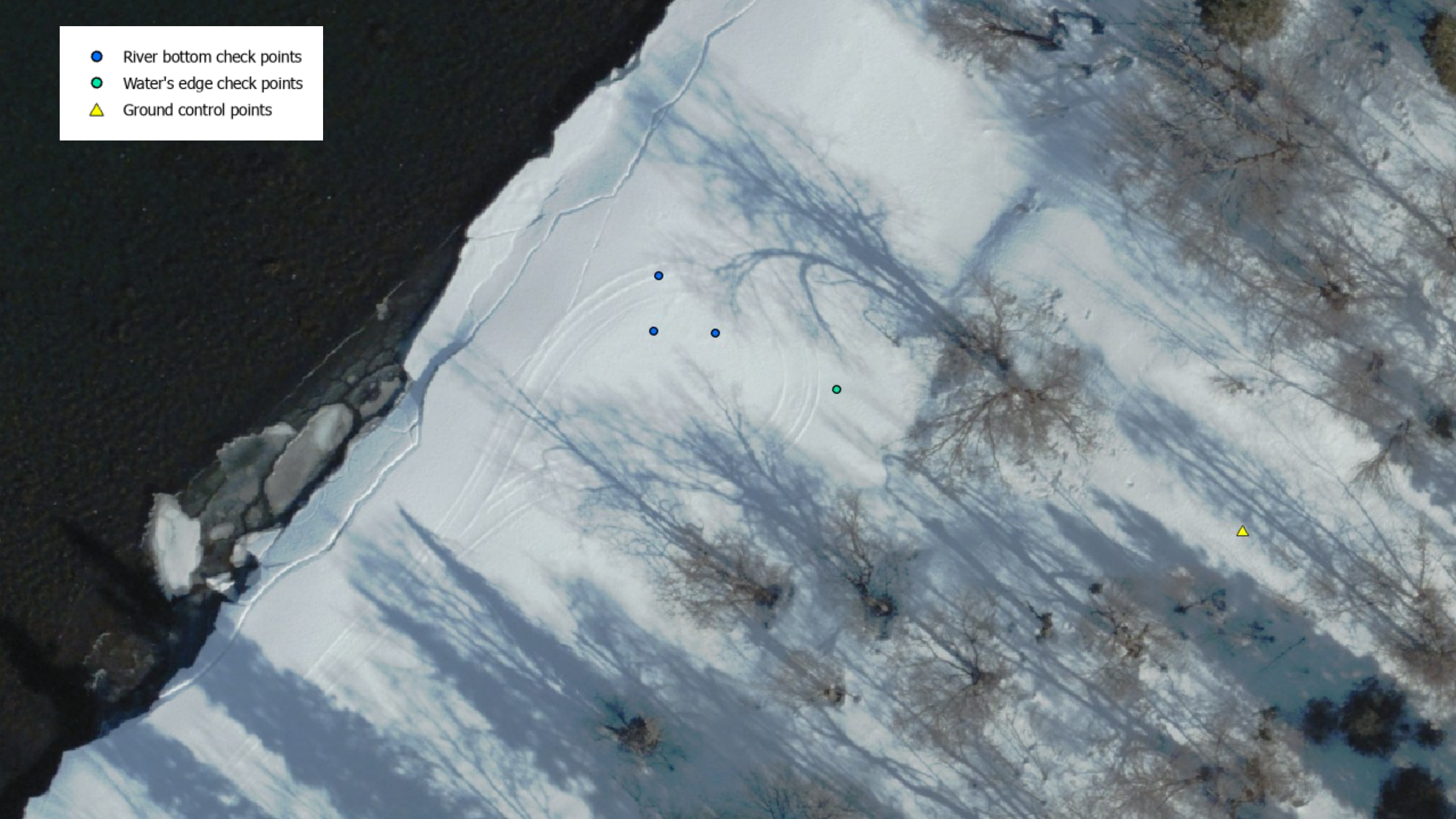


- River bottom check points
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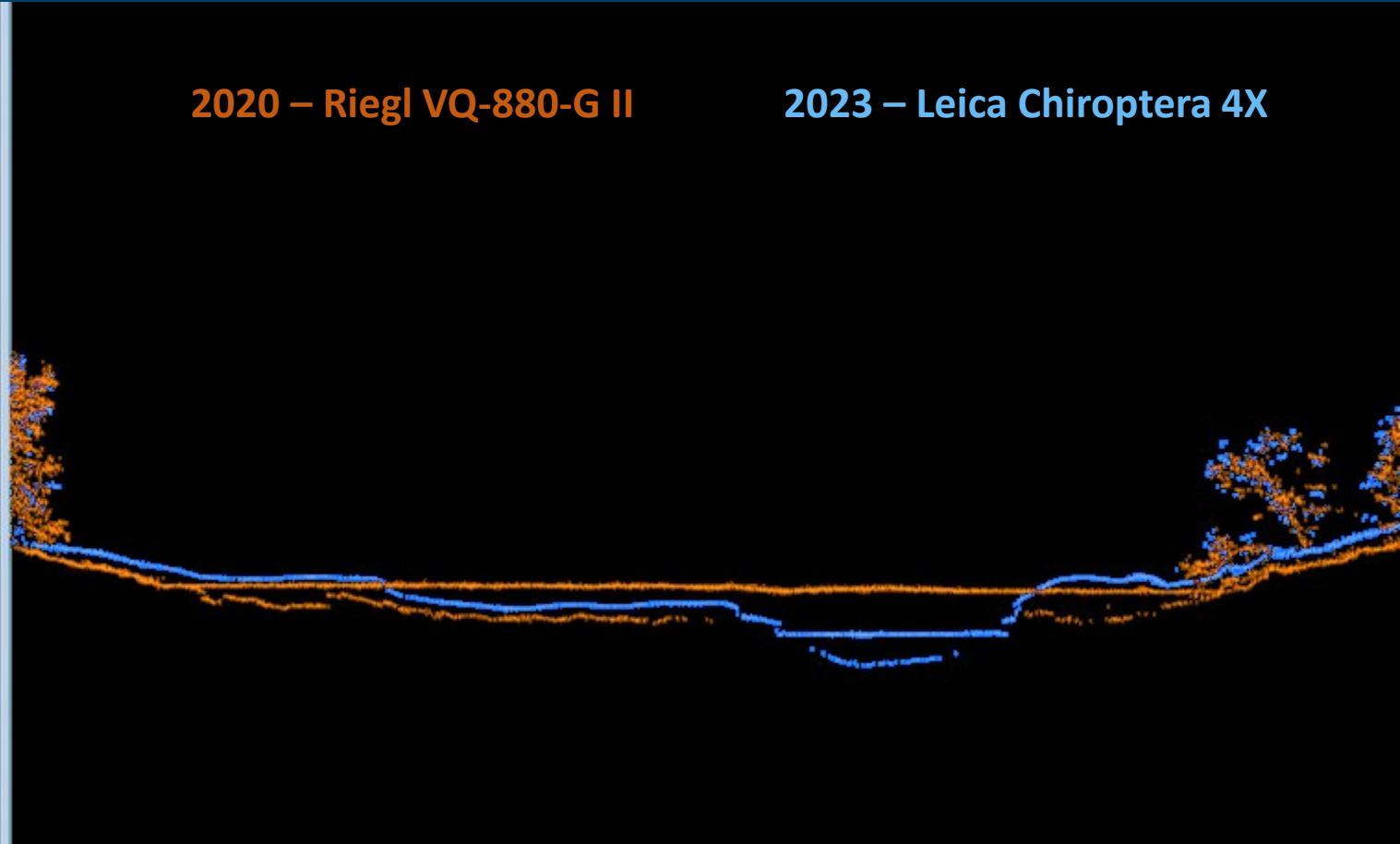
# DATA INTEGRATION

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2020 – Riegl VQ-880-G II

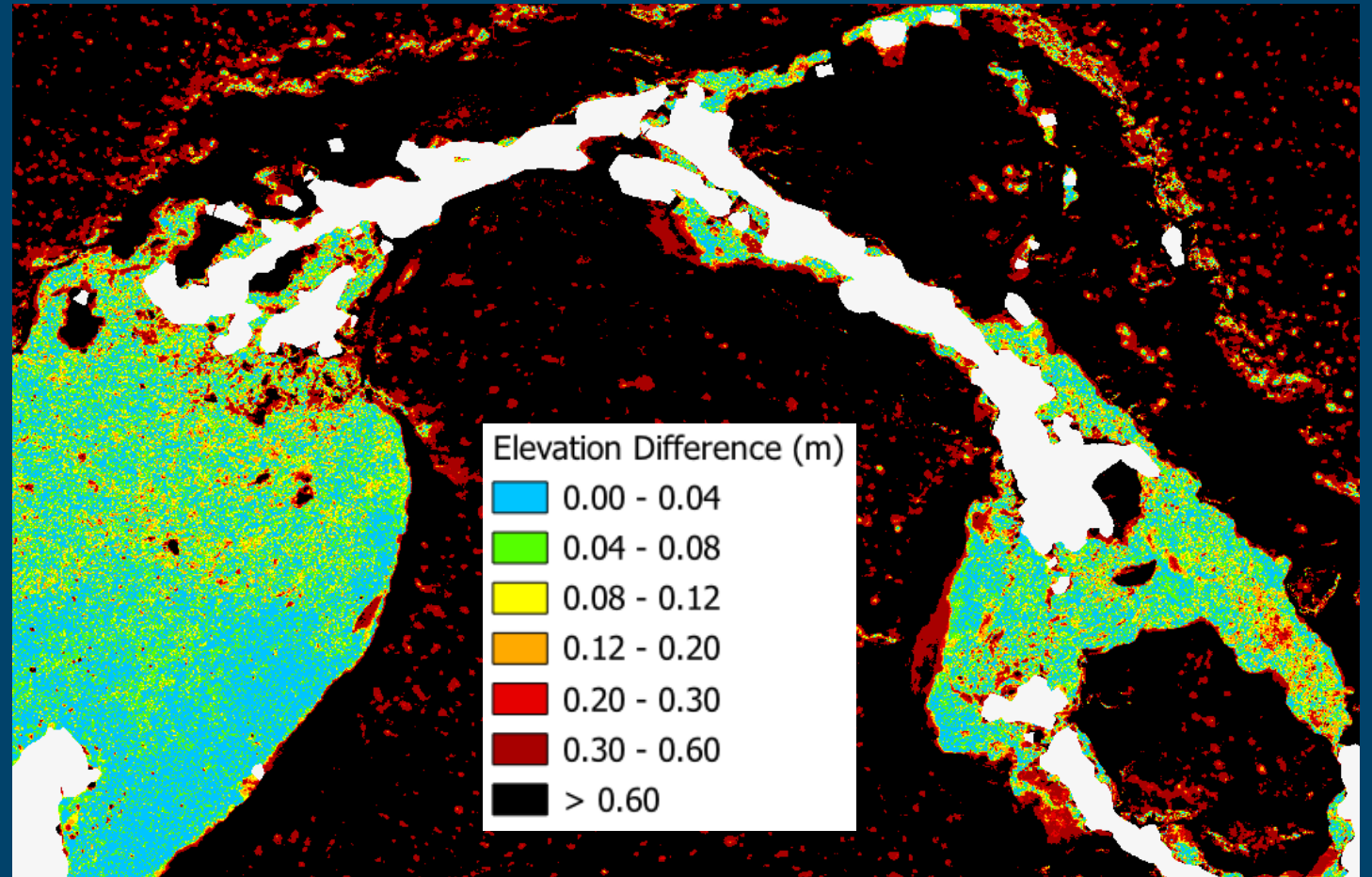
2023 – Leica Chiroptera 4X





# DATA INTEGRATION

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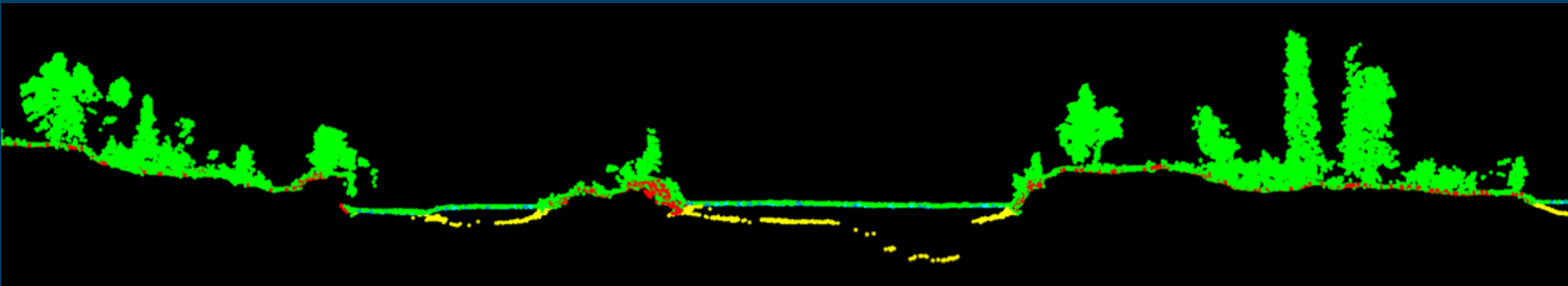
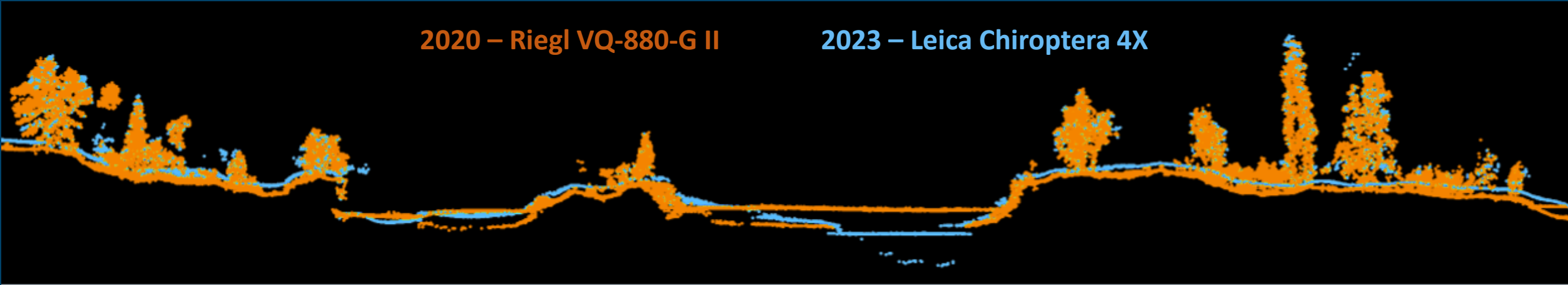


# DATA INTEGRATION

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2020 – Riegl VQ-880-G II

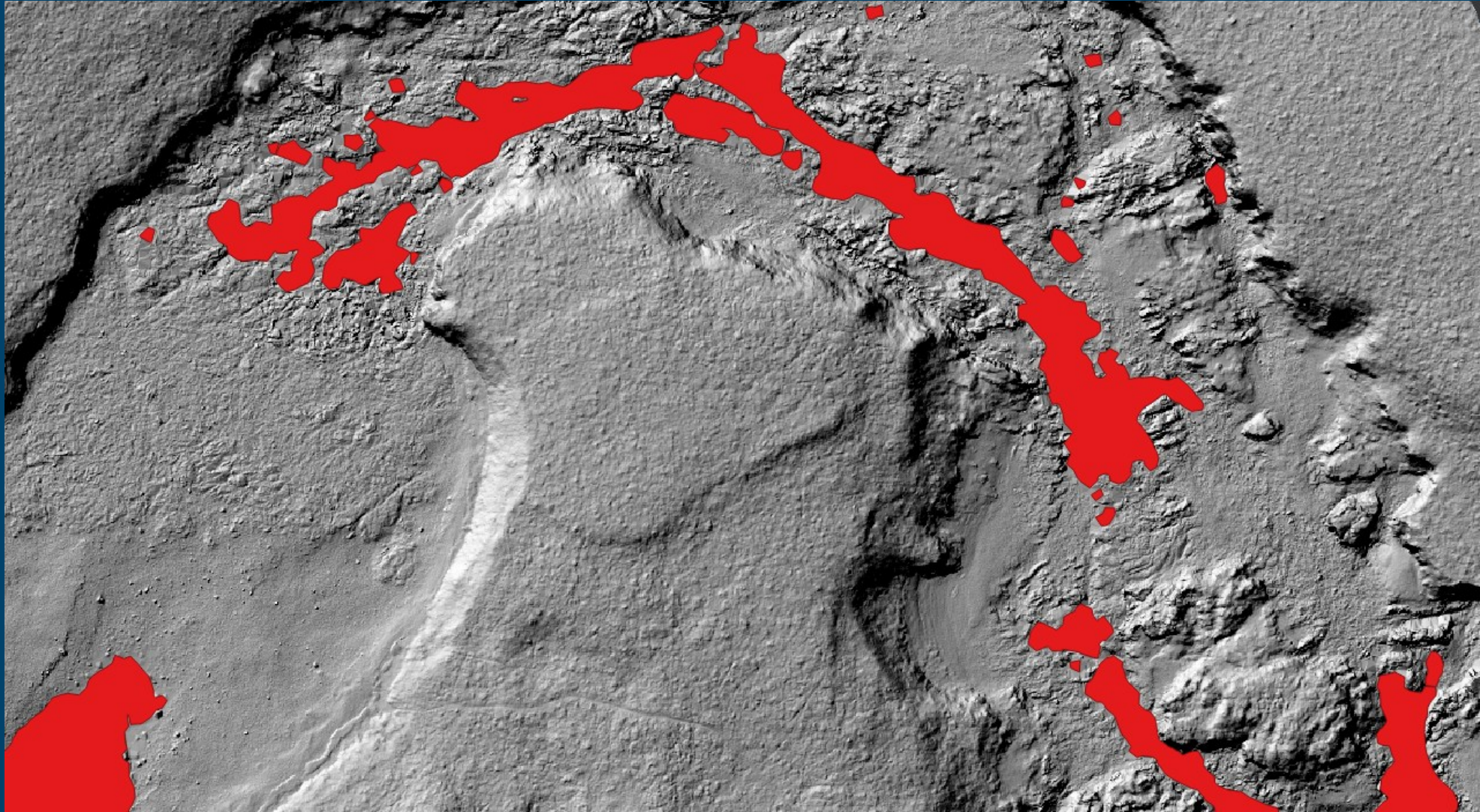
2023 – Leica Chiroptera 4X





# FILLING IN THE VOIDS

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# SUMMARY AND CLOSING THOUGHTS

- Topobathymetric lidar can provide seamless river mapping
  - Ideal condition windows may be rare or at odds with each other
- Planning and communication are key
  - Prioritize areas or features of interest
- Data capture is just the beginning
  - Processing methodologies must support the required product
- Data fusion and change detection
  - Repeat surveys capture changes across varying landscape conditions, seasonal changes, and flow regimes
  - Properly aligning datasets is essential for accurate comparisons, trend analysis, and data fusion





# QUESTIONS?

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Thank you!

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