

Geomorphology of the Nechako River



NWR Spring Technical Meeting

June 3rd, 2025

Presented by:

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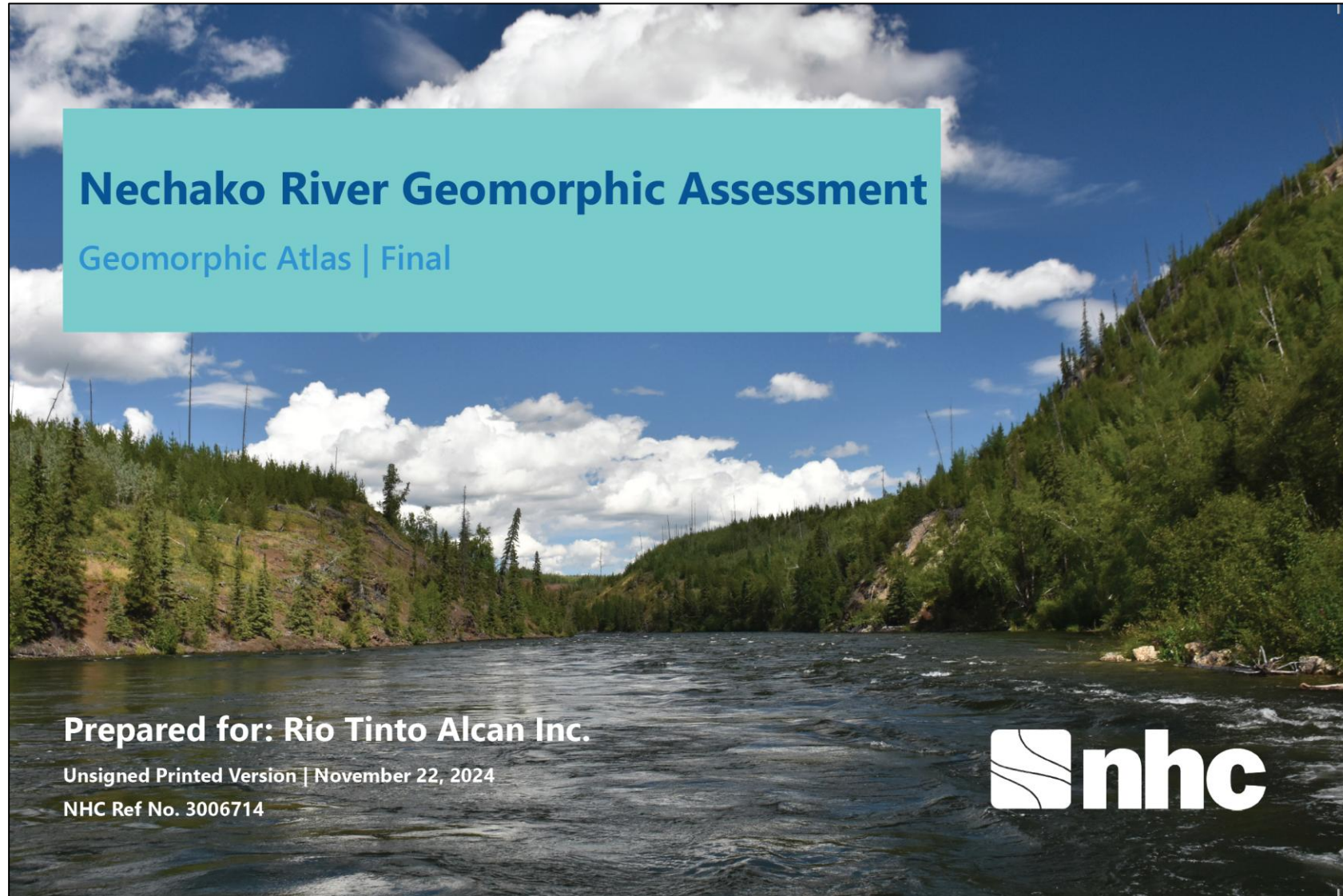
Introduction



What is '*geomorphology*'?



Nechako River Geomorphology Atlas



Nechako River Geomorphic Assessment

Geomorphic Atlas | Final

Prepared for: Rio Tinto Alcan Inc.

Unsigned Printed Version | November 22, 2024

NHC Ref No. 3006714



Nechako River Geomorphology Atlas



Vanderhoof: Ice Jams

On January 12, 2021, an ice jam formed in the Nechako River west of downtown Vanderhoof (RKM 150) causing water levels to overtop the river bank and flood homes along the river. The properties of a number of additional landowners were also impacted.

Ice jams can form both due to cold weather resulting in ice formation as well as warm weather releasing ice that has formed upstream. The magnitude of flooding will depend upon a combination of factors such as temperature (water and air), discharge, ice supply, ice properties, and existing snow and ice conditions.

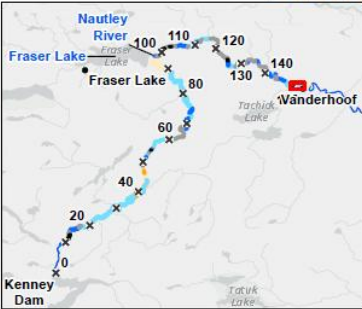
The ice jam flood levels observed in 2021 met or exceeded the 200-year open water flood levels (NHC, 2009). The effects that ice jams have on water levels in this reach is particularly strong because of the steeper gradient relative to downstream reaches.

Flow regulation has resulted in the extensive establishment of vegetation along the Vanderhoof reach especially at the island complex where ice jams form today. The establishment of vegetation has likely occurred due to both smaller peak flows but also much less frequent ice jams. The effects of established vegetation may in turn alter the ice regime somewhat, particularly where the extensive establishment of vegetation has resulted in a change in river plan and section geometry.

Ice jam flooding is expected to continue in the future. The 2021 winter saw flows similar or below the average pre-regulation winter flow and flood levels associated with the 2021 ice jam conditions would not be considered unique prior to regulation.



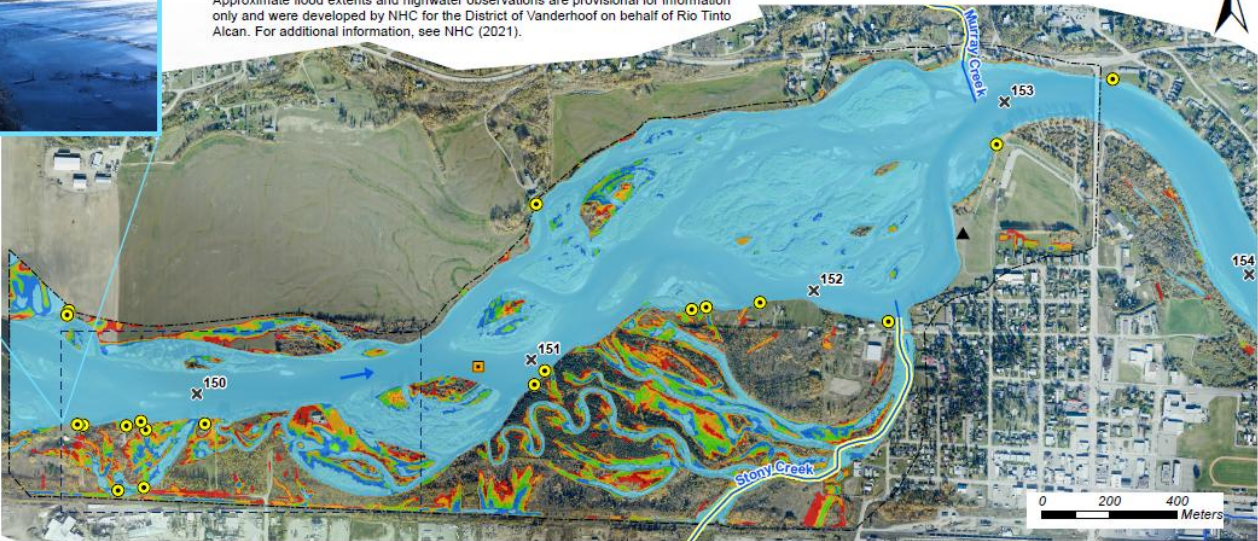
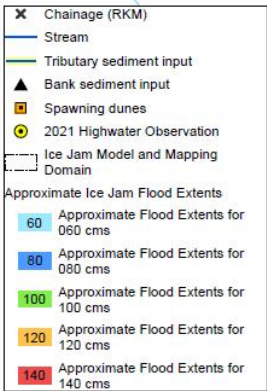
▲ Photo from January 12, 2021 collected by MFLNRD at RKM 150.5 showing ice buildup and flooding along Campbell Rd properties. The dashed navy blue box in the map below shows the approximate area covered in this photo.



► Photo taken looking upstream at a side channel freeze-up from January 15, 2021.



▼ Nechako River Provisional Ice Jam Hazard Areas Map modified from NHC (2021). Approximate flood extents and highwater observations are provisional for information only and were developed by NHC for the District of Vanderhoof on behalf of Rio Tinto Alcan. For additional information, see NHC (2021).

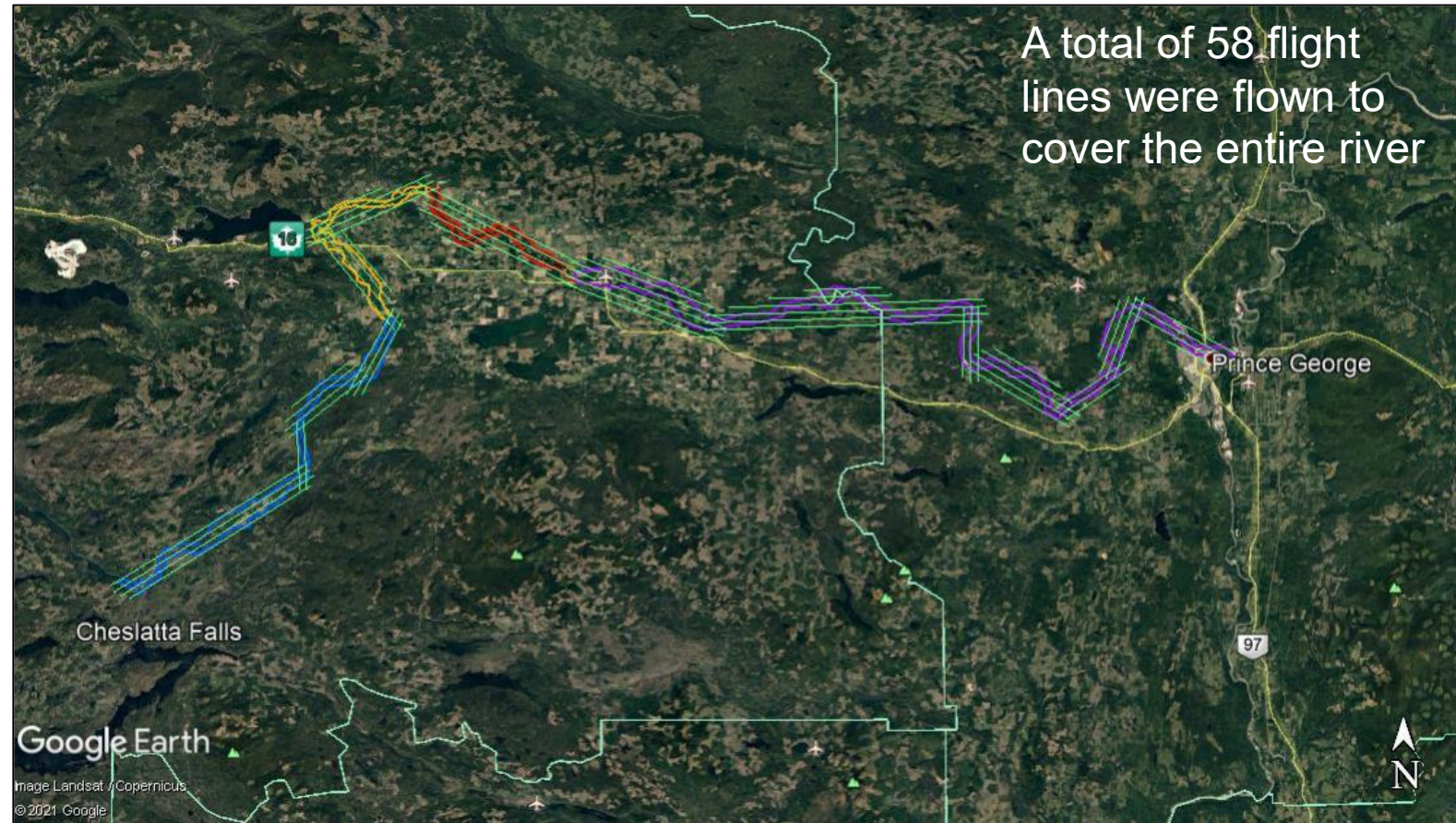


Nechako River Geomorphology Atlas

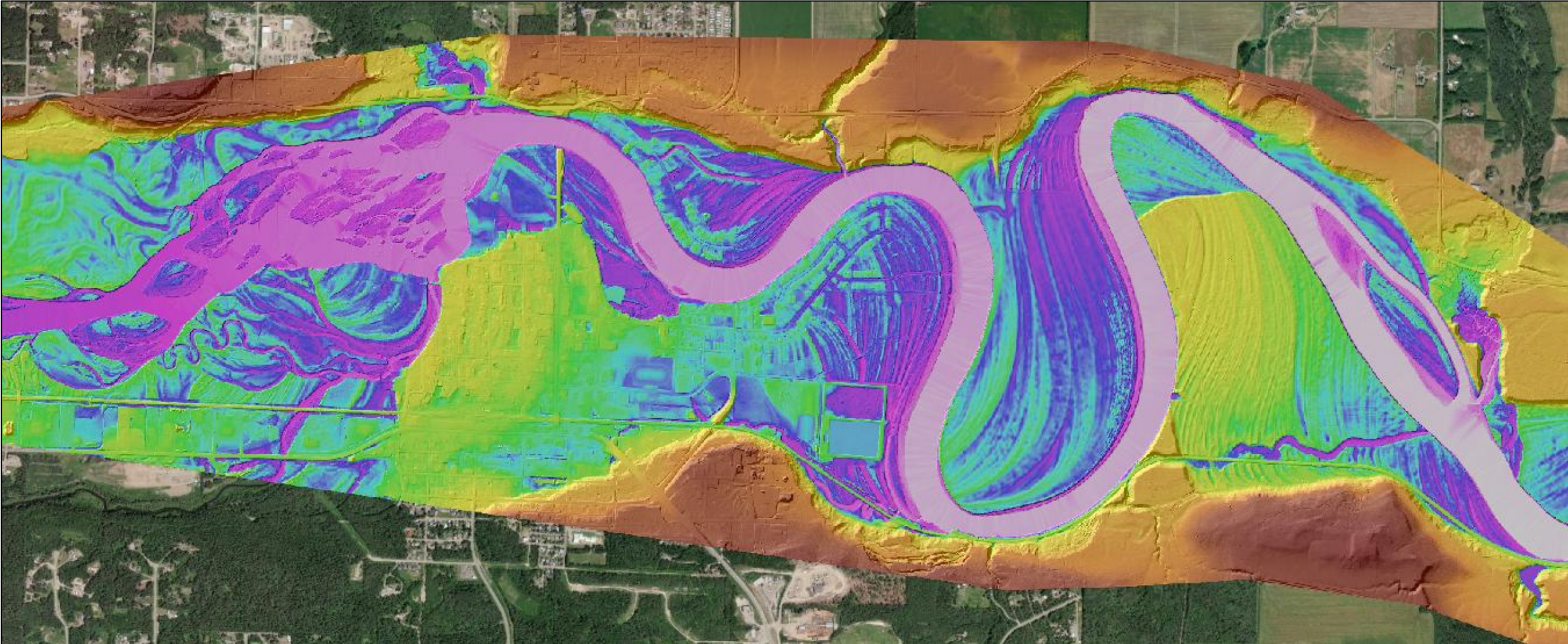


Data collection (2021):

- Lidar (floodplain topography)
- High-resolution aerial imagery
- Bathymetry survey
- Velocity measurements
- Bankline photos
- Underwater photos

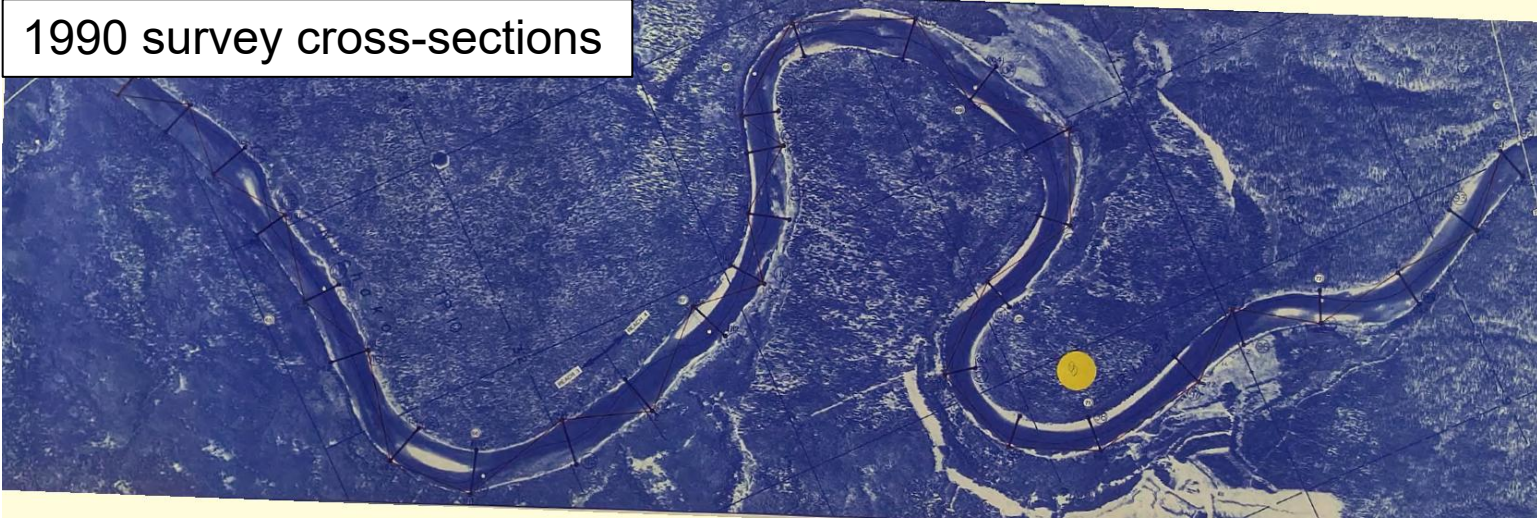


Nechako River Geomorphology Atlas

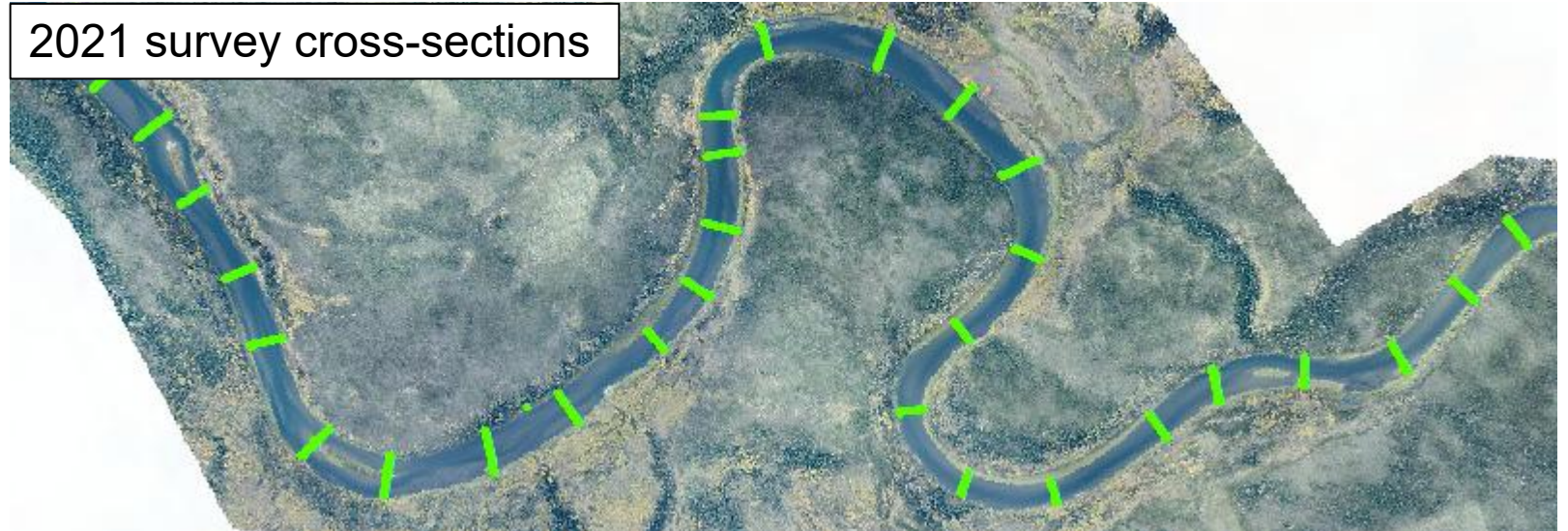


Nechako River Geomorphology Atlas

1990 survey cross-sections



2021 survey cross-sections



So, what did we find out?

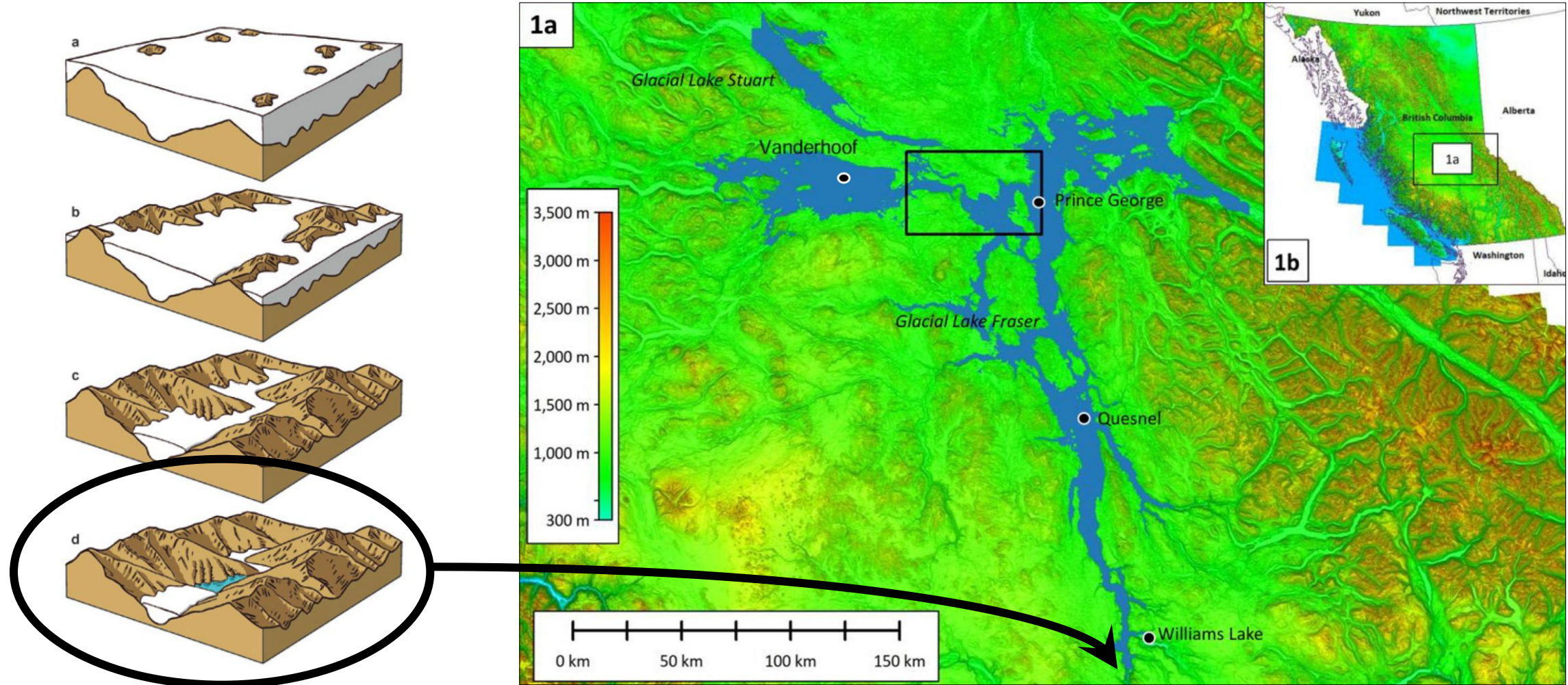
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Nechako River Geomorphic Assessment
Final Geomorphic Atlas

Glacial history of the Nechako River



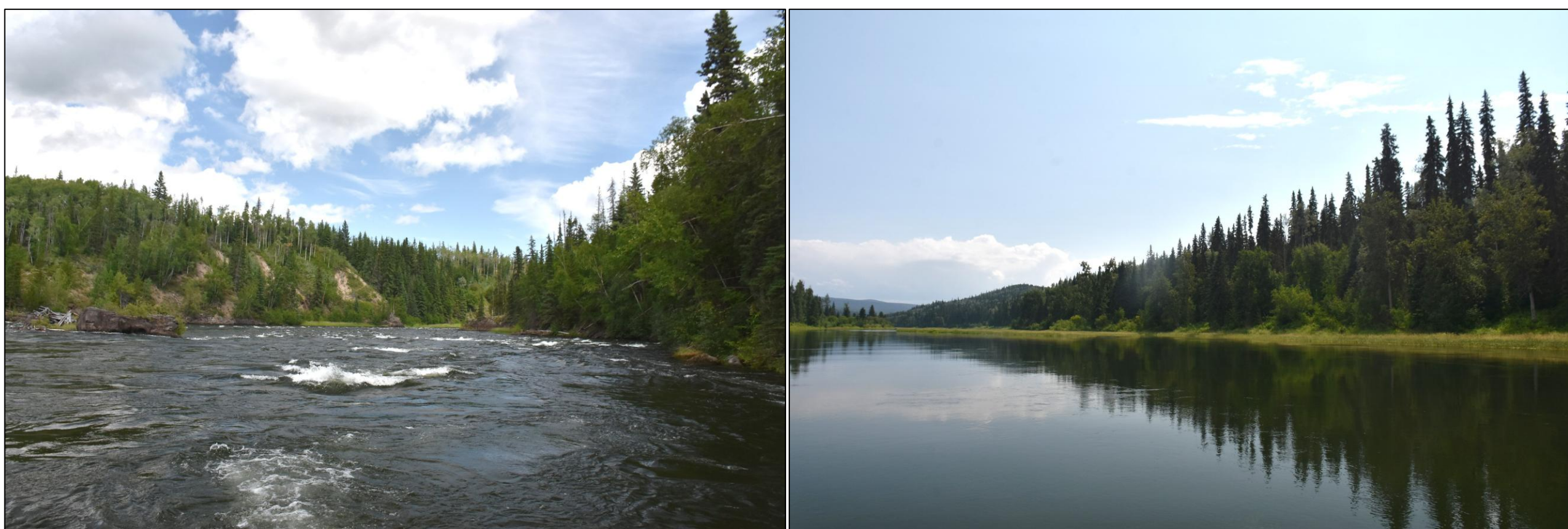
Clague and Miller. 2025. Rapid and Large-Scale Landscape Modification Caused by the Draining of a Glacier-Dammed Lake in British Columbia, Canada. *Geomorphology*, 475. <https://doi.org/10.1016/j.geomorph.2025.109669>

Clague. (2017). Deglaciation of the Cordillera of Western Canada at the end of the Pleistocene. *Cuadernos de Investigación Geográfica*, 43(2), 449-466.

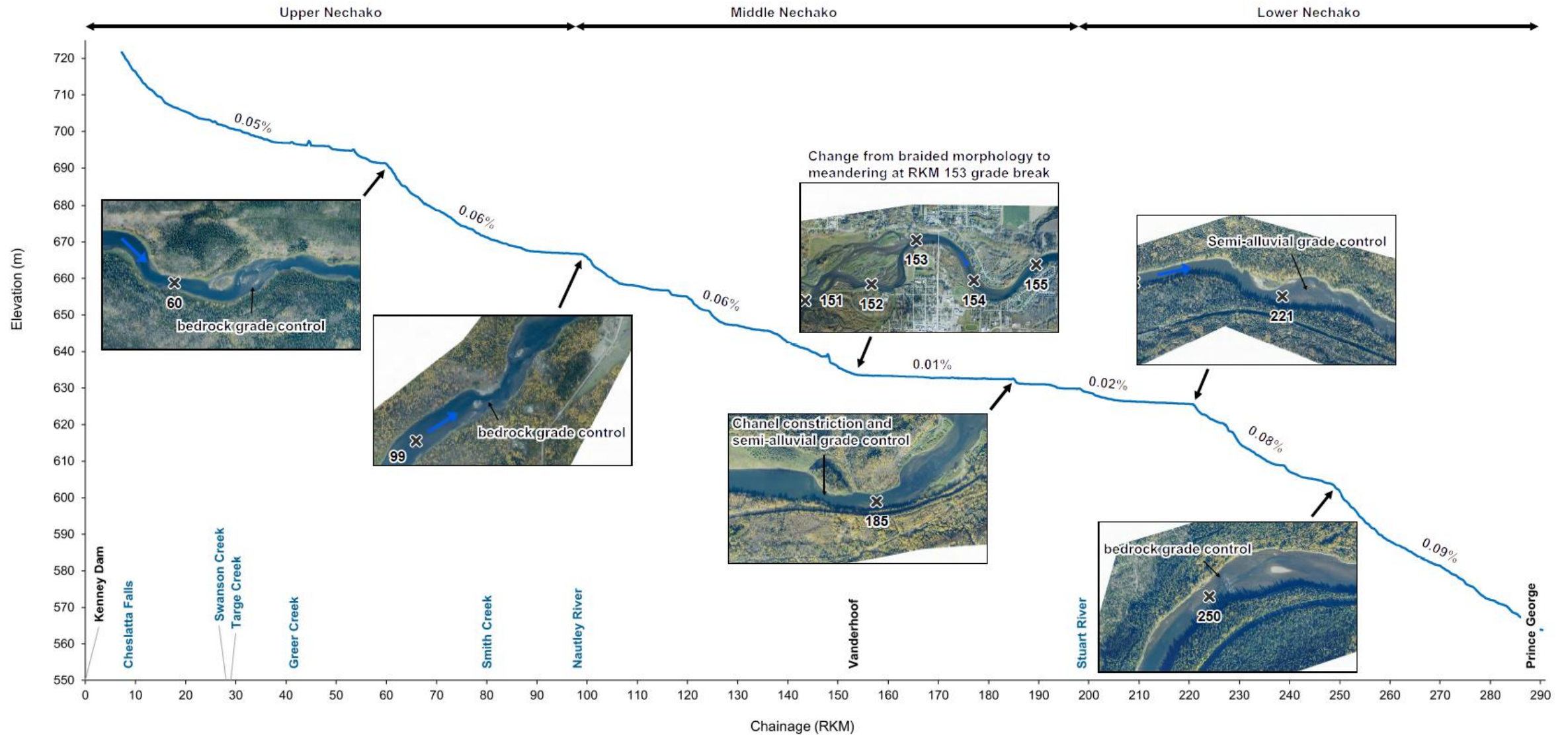
Glacial history of the Nechako River



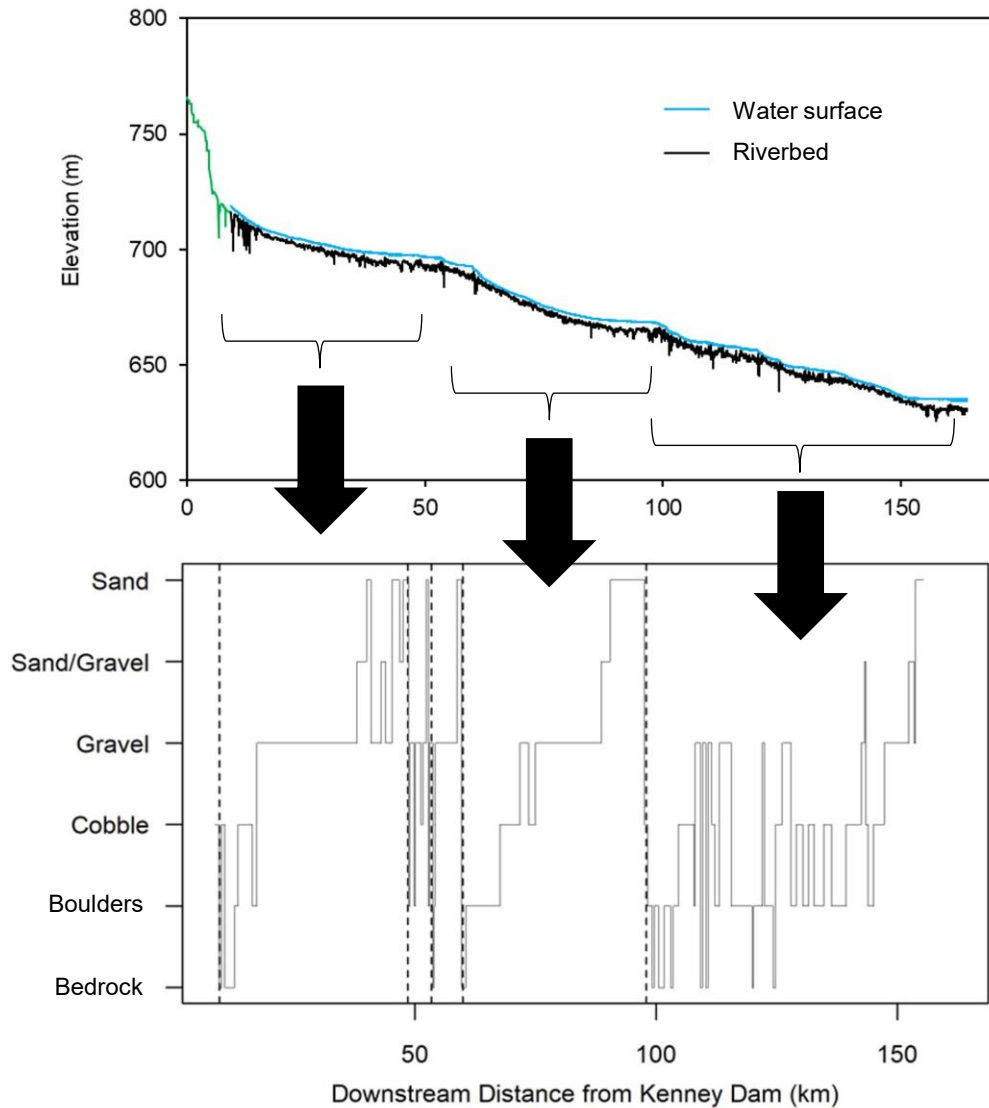
What controls how the river looks?



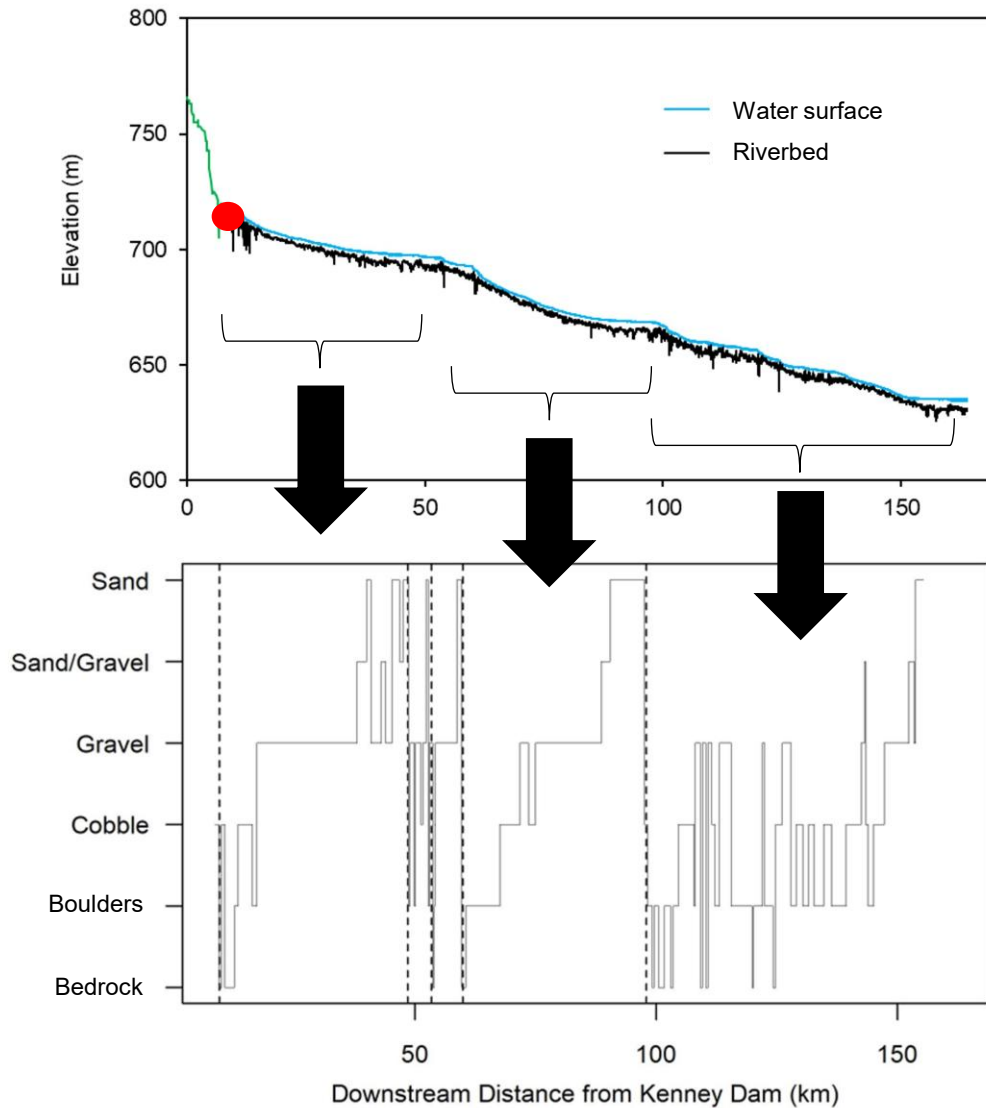
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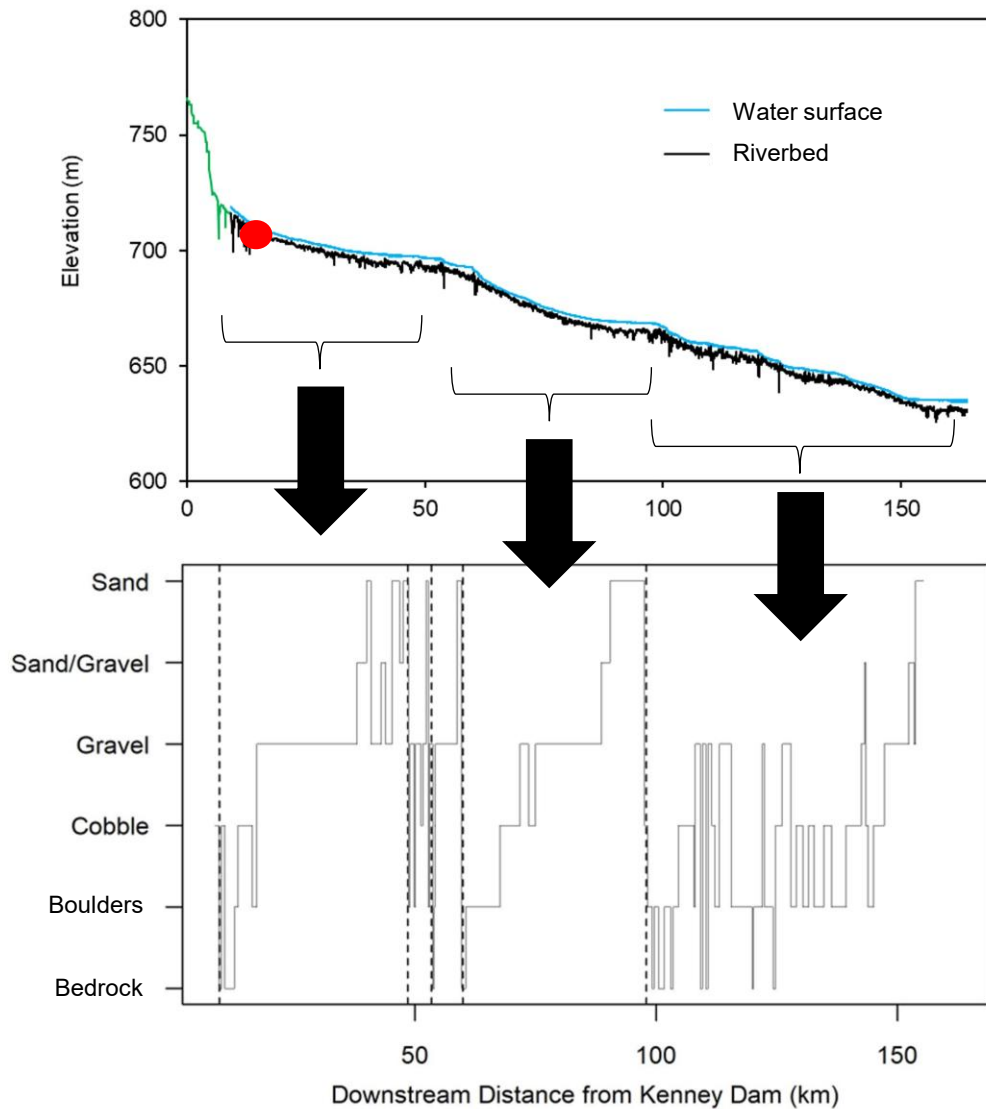
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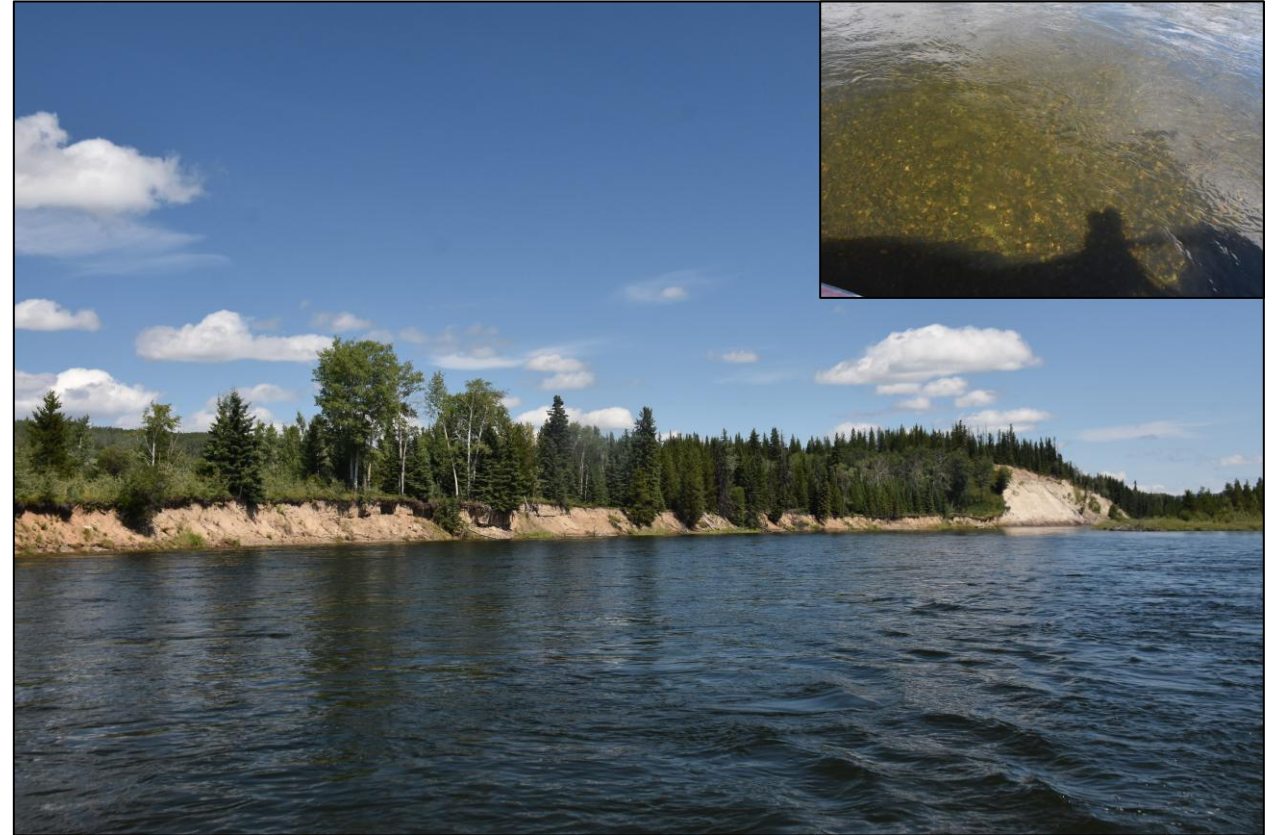
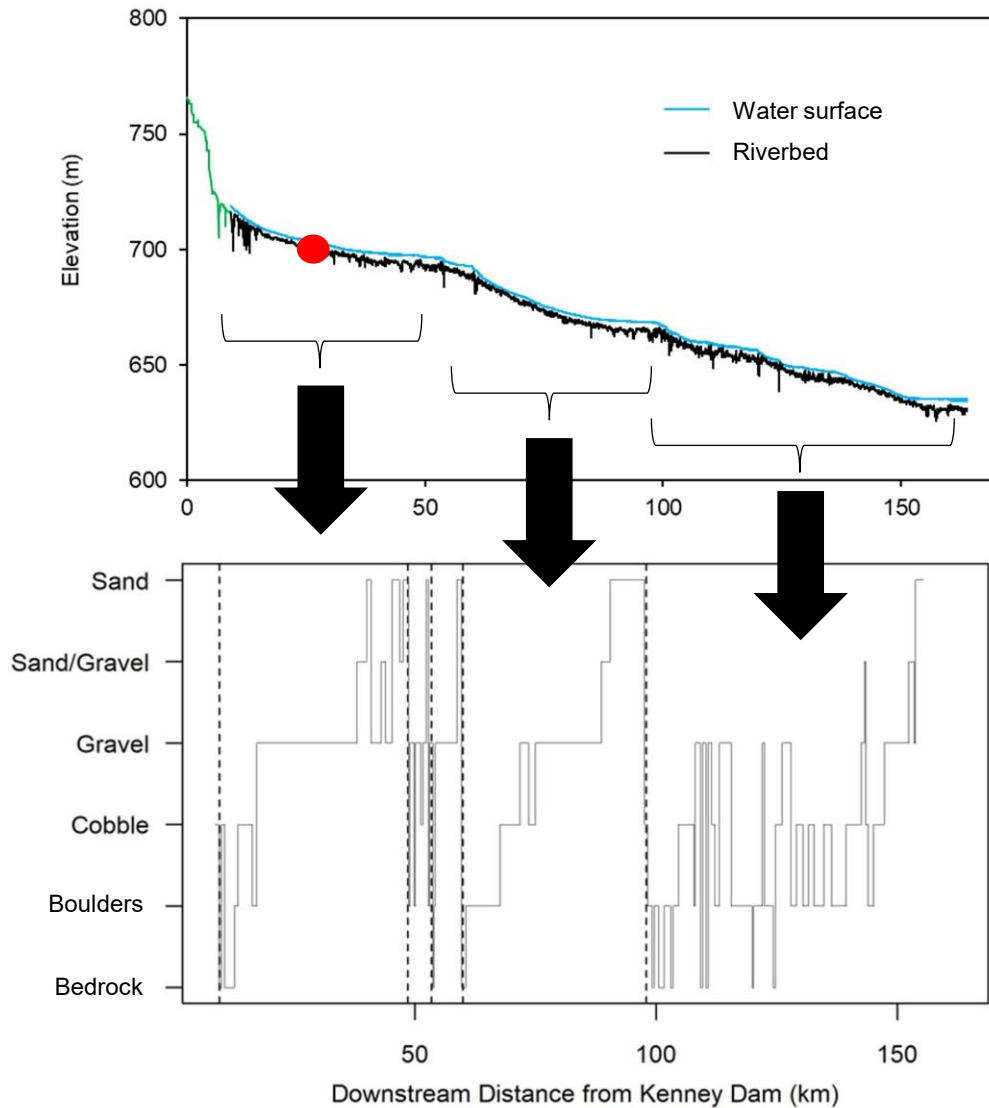
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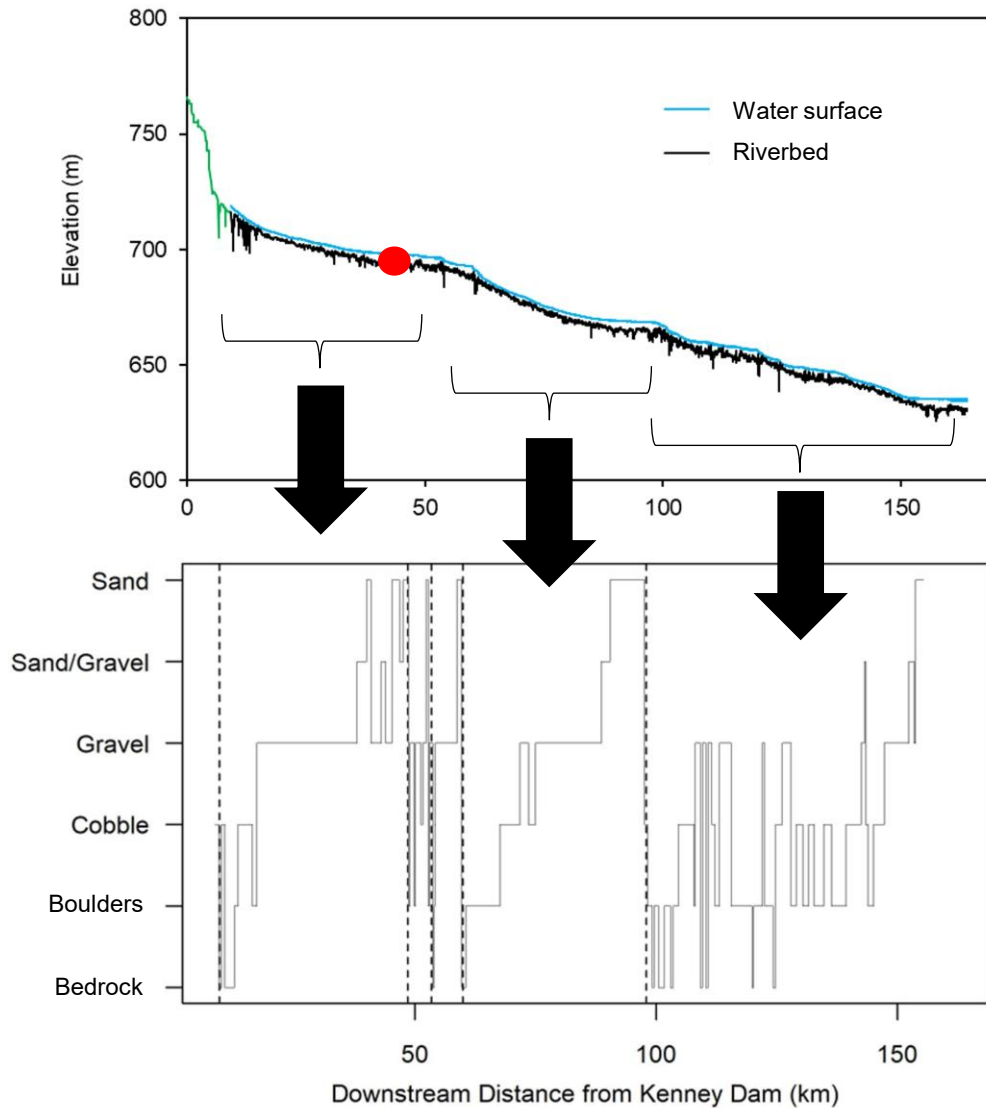
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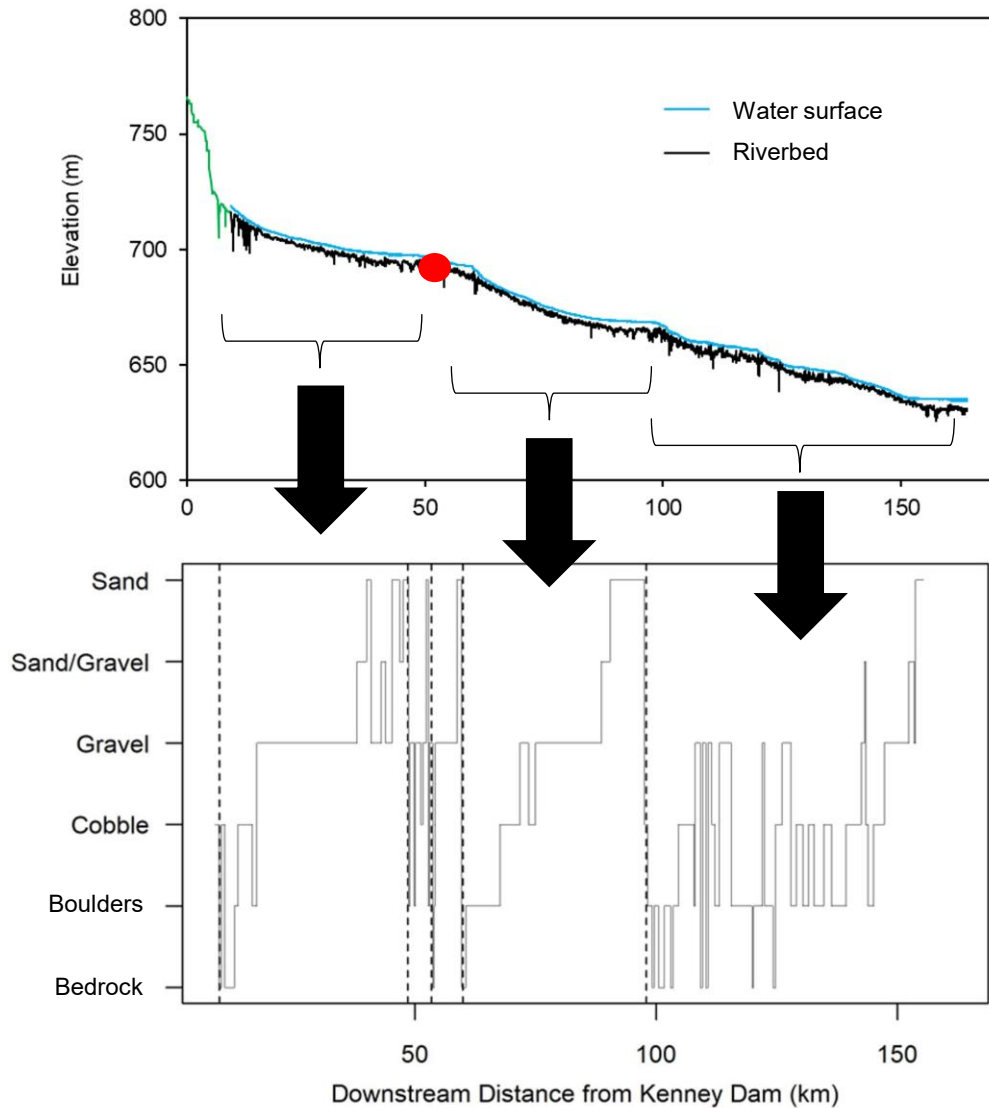
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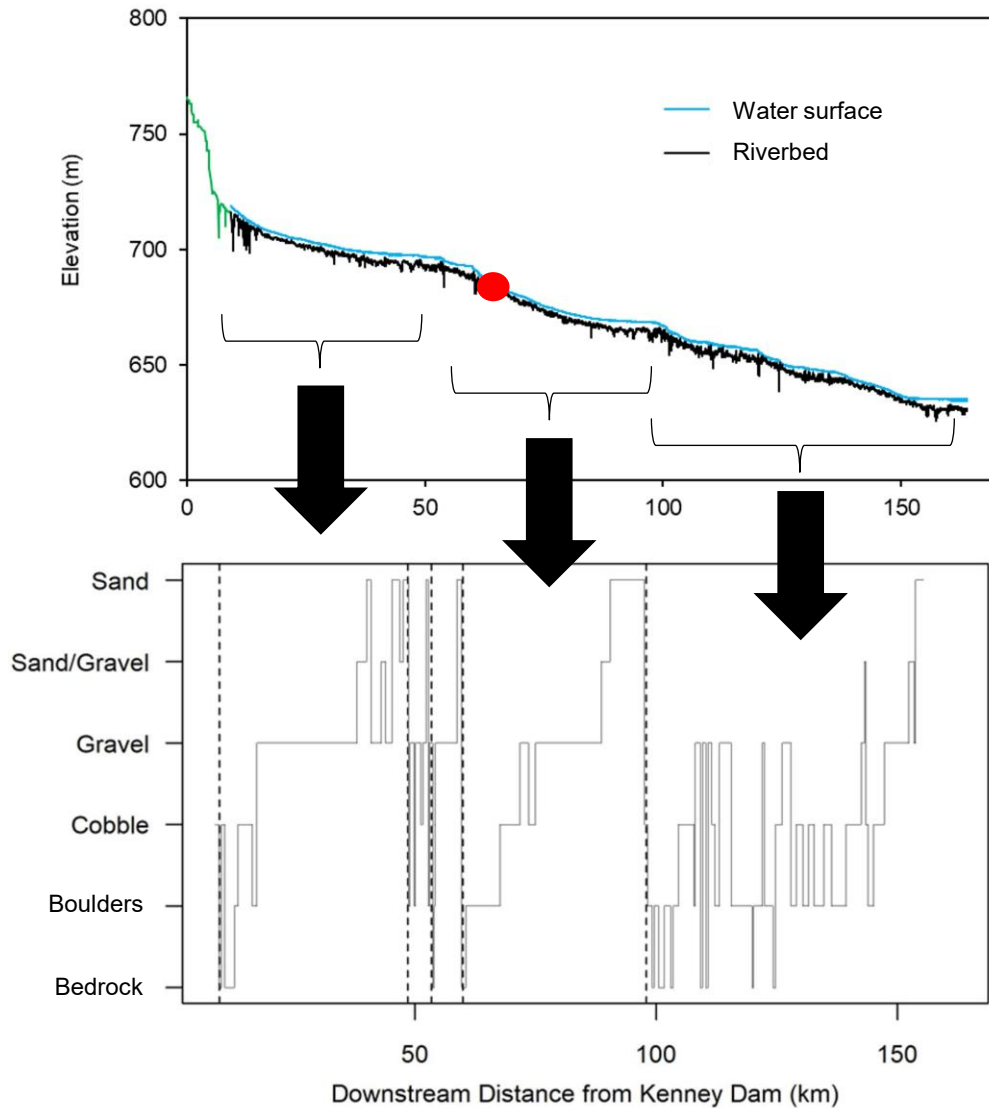
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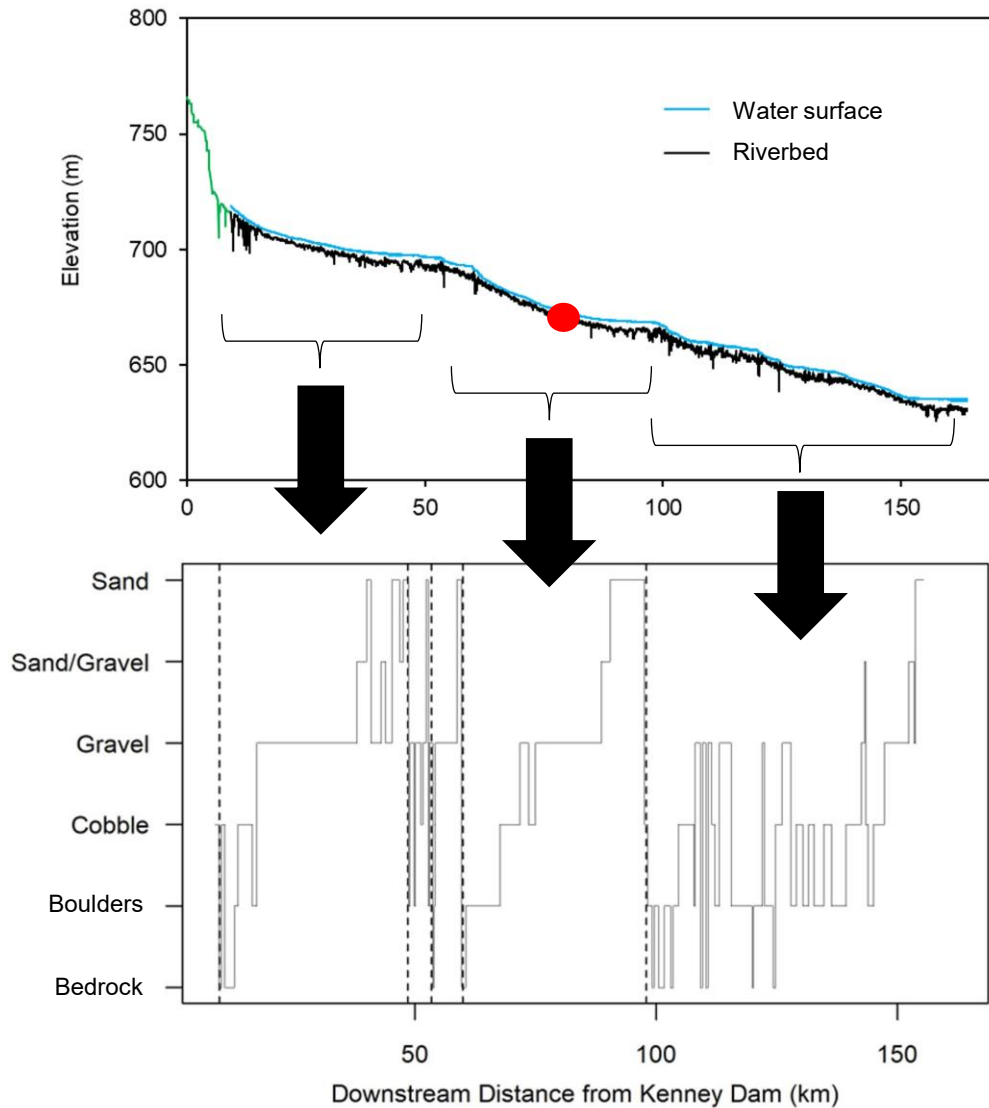
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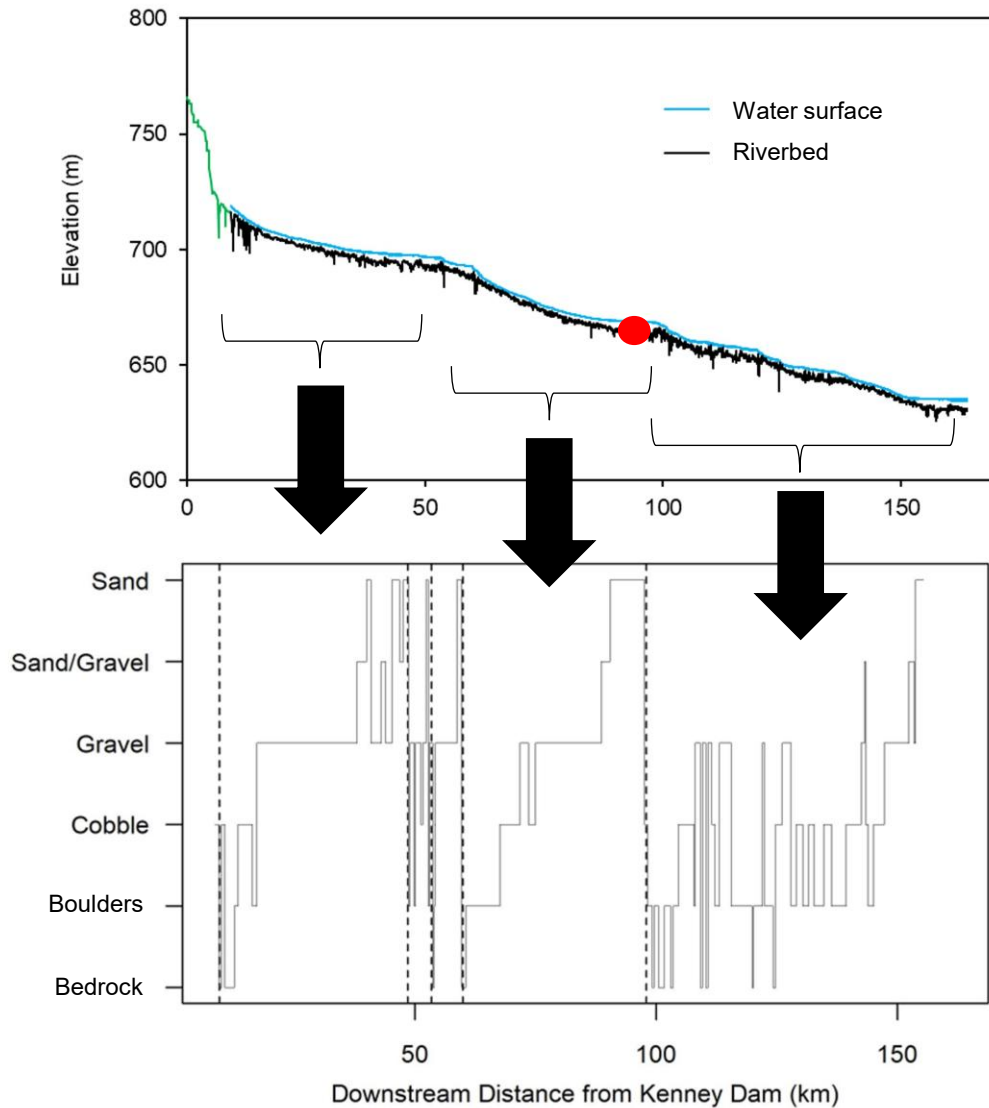
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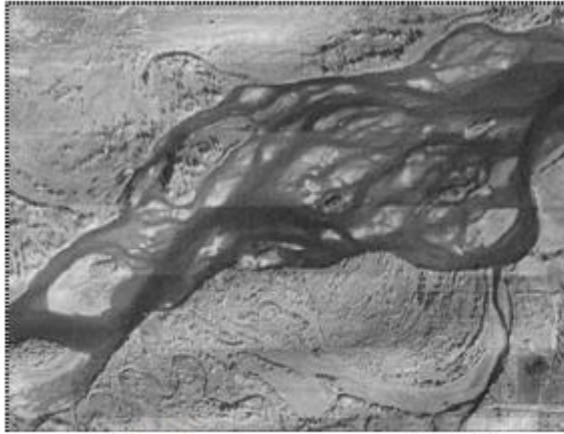
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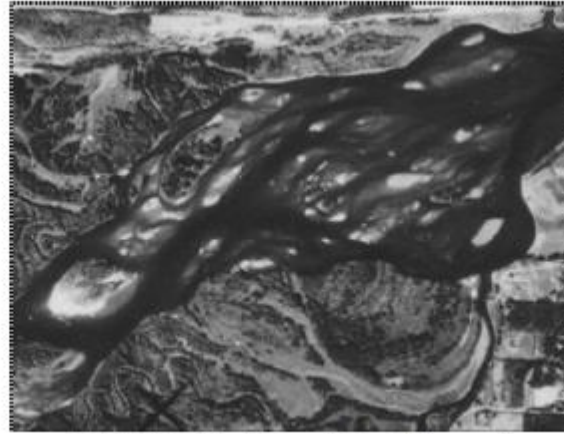
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How is the river evolving?



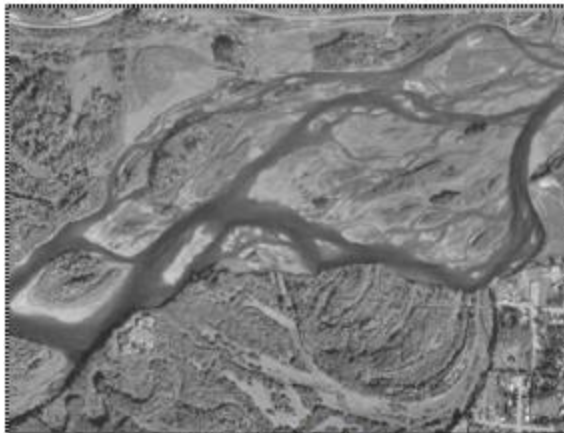
1928 (discharge unavailable)



1946 ($198 \text{ m}^3/\text{s}$ at Fort Fraser)



1966 ($96 \text{ m}^3/\text{s}$)



1973 ($57 \text{ m}^3/\text{s}$)

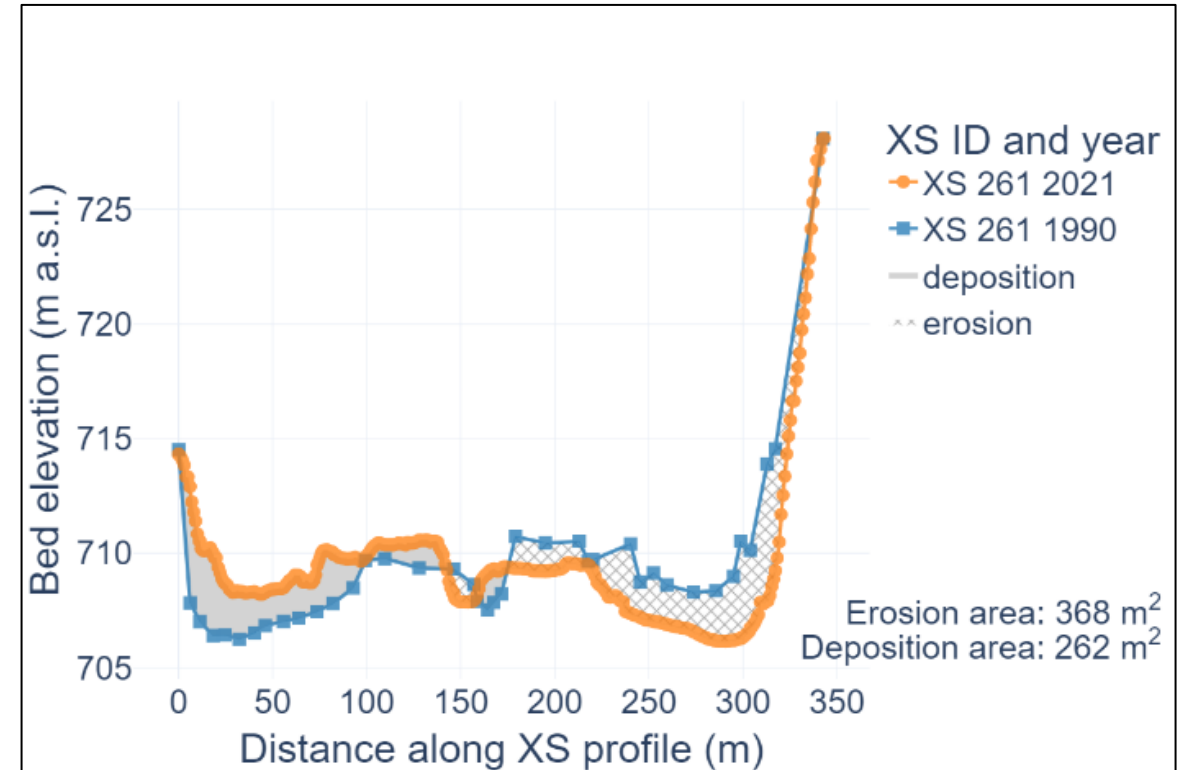


1985 ($175 \text{ m}^3/\text{s}$)

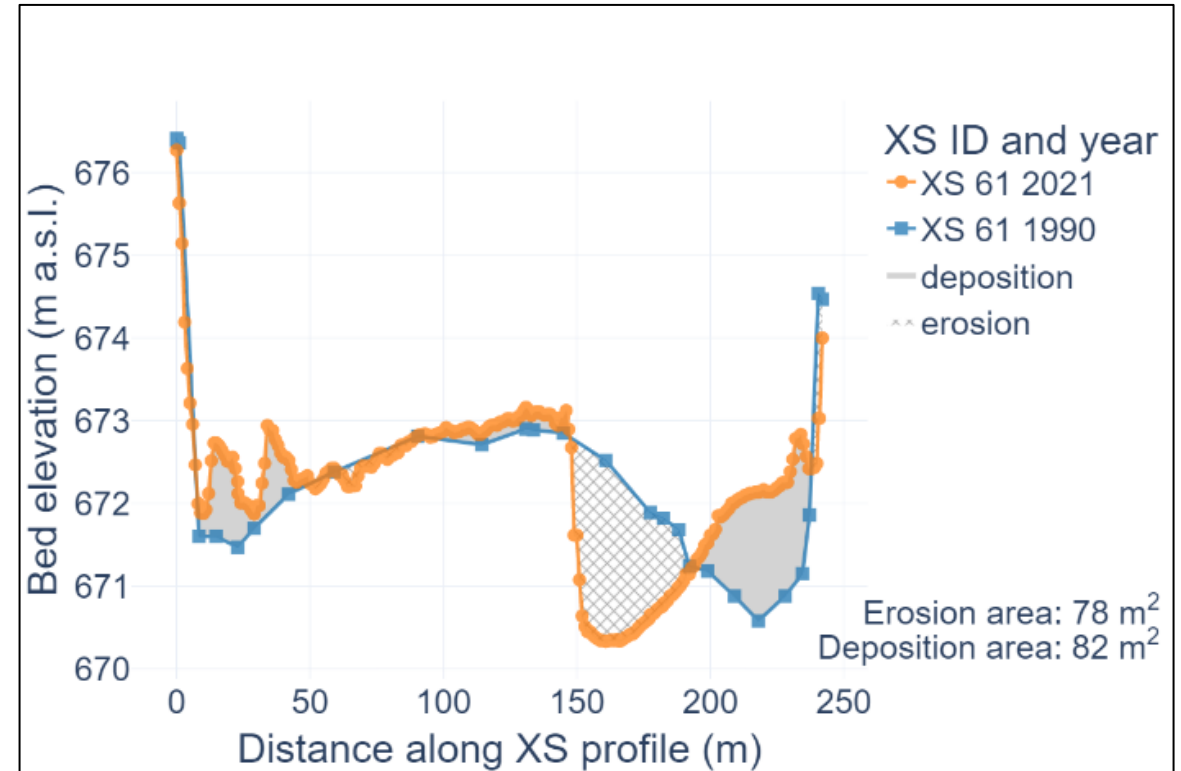
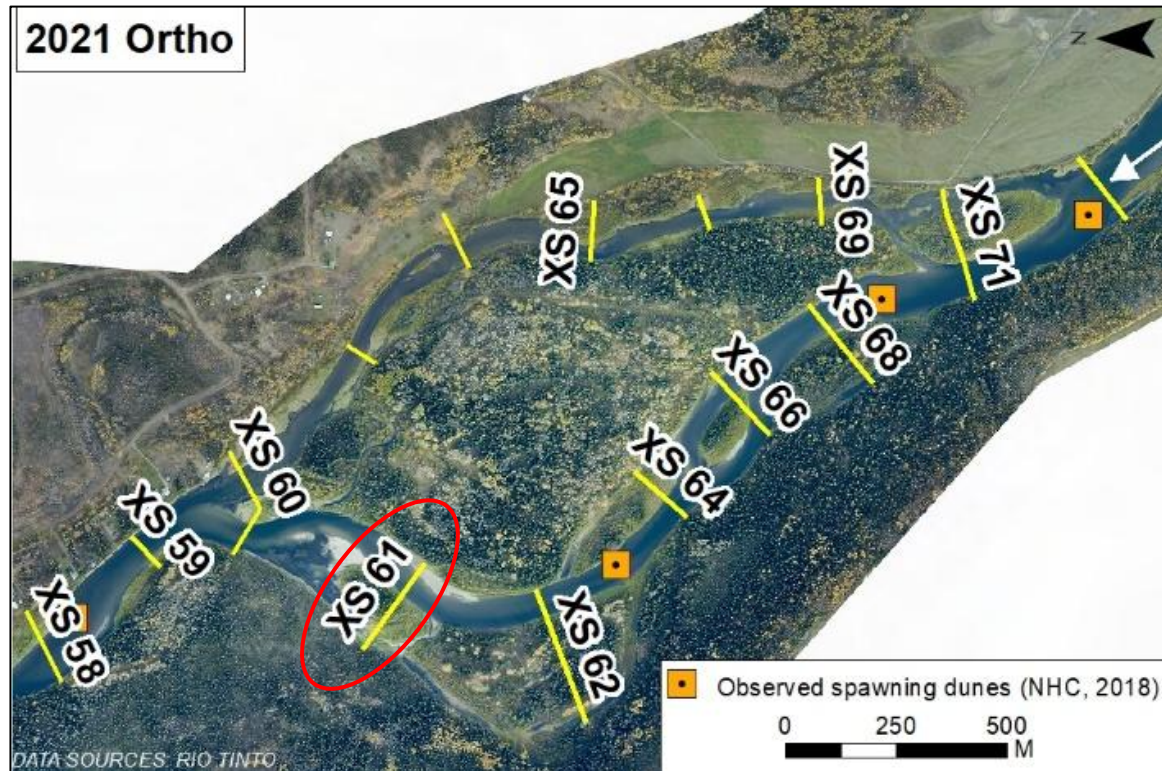


2021 ($92 \text{ m}^3/\text{s}$)

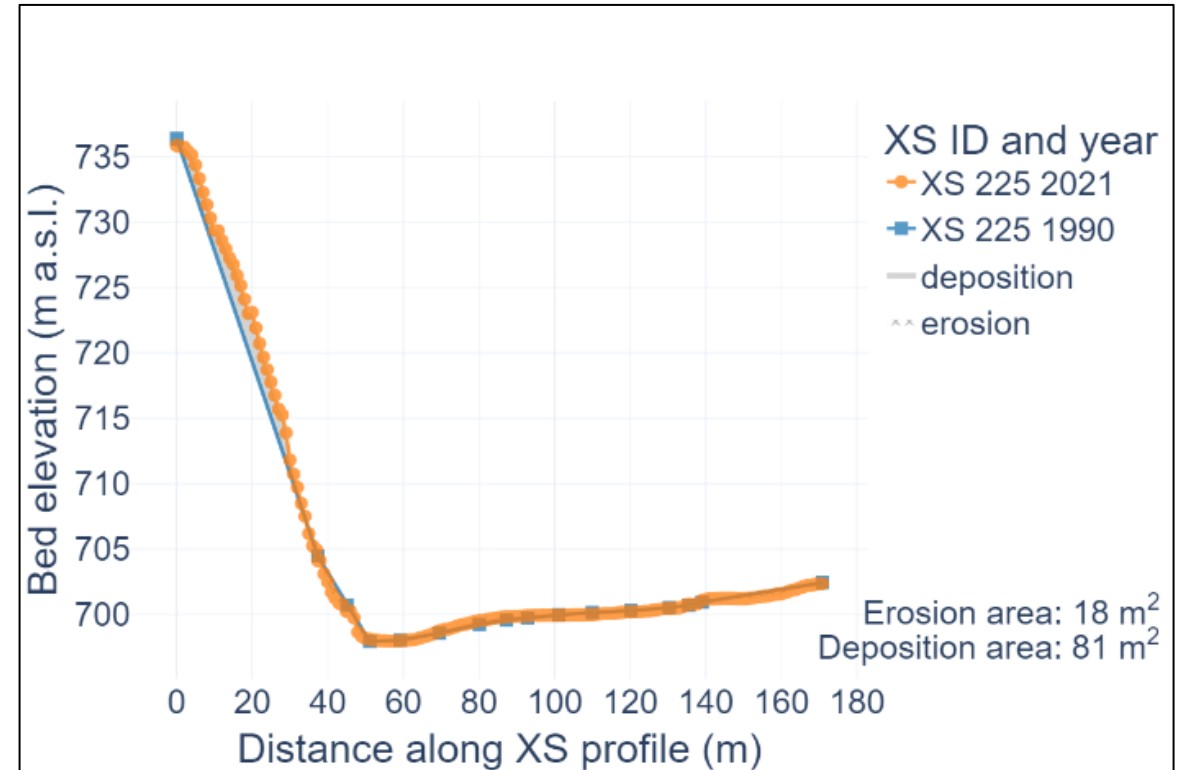
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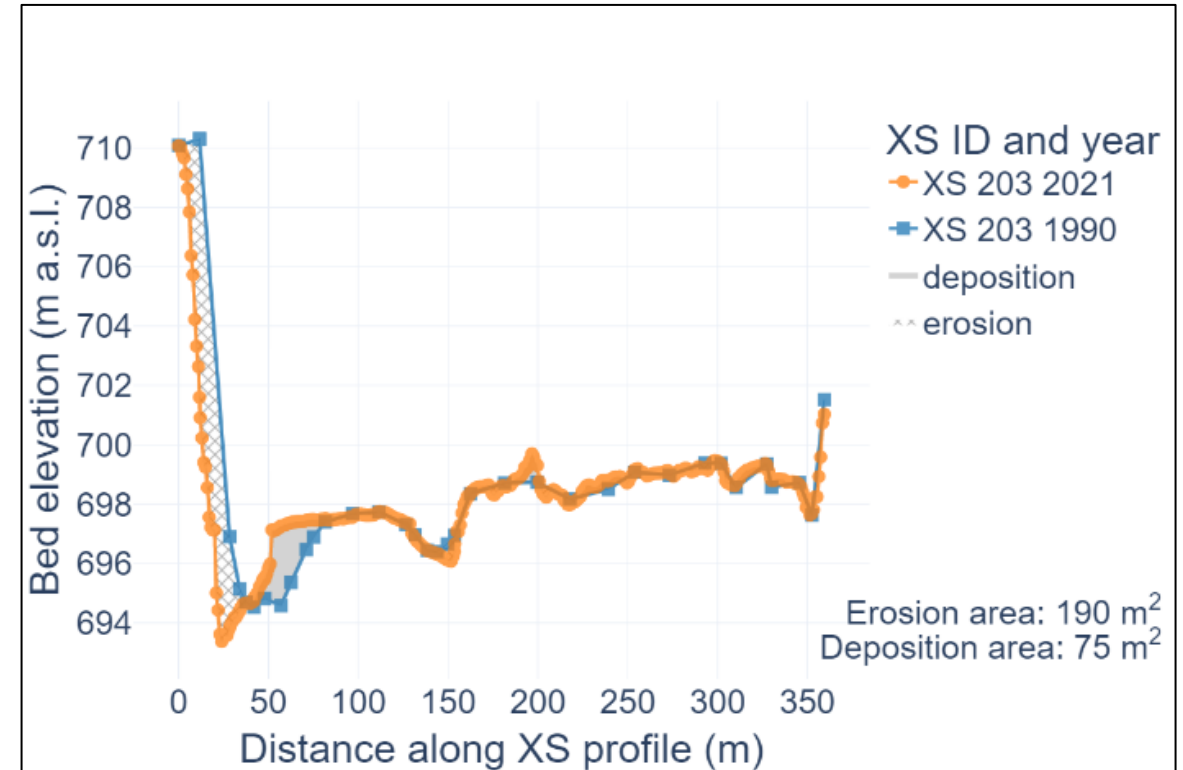
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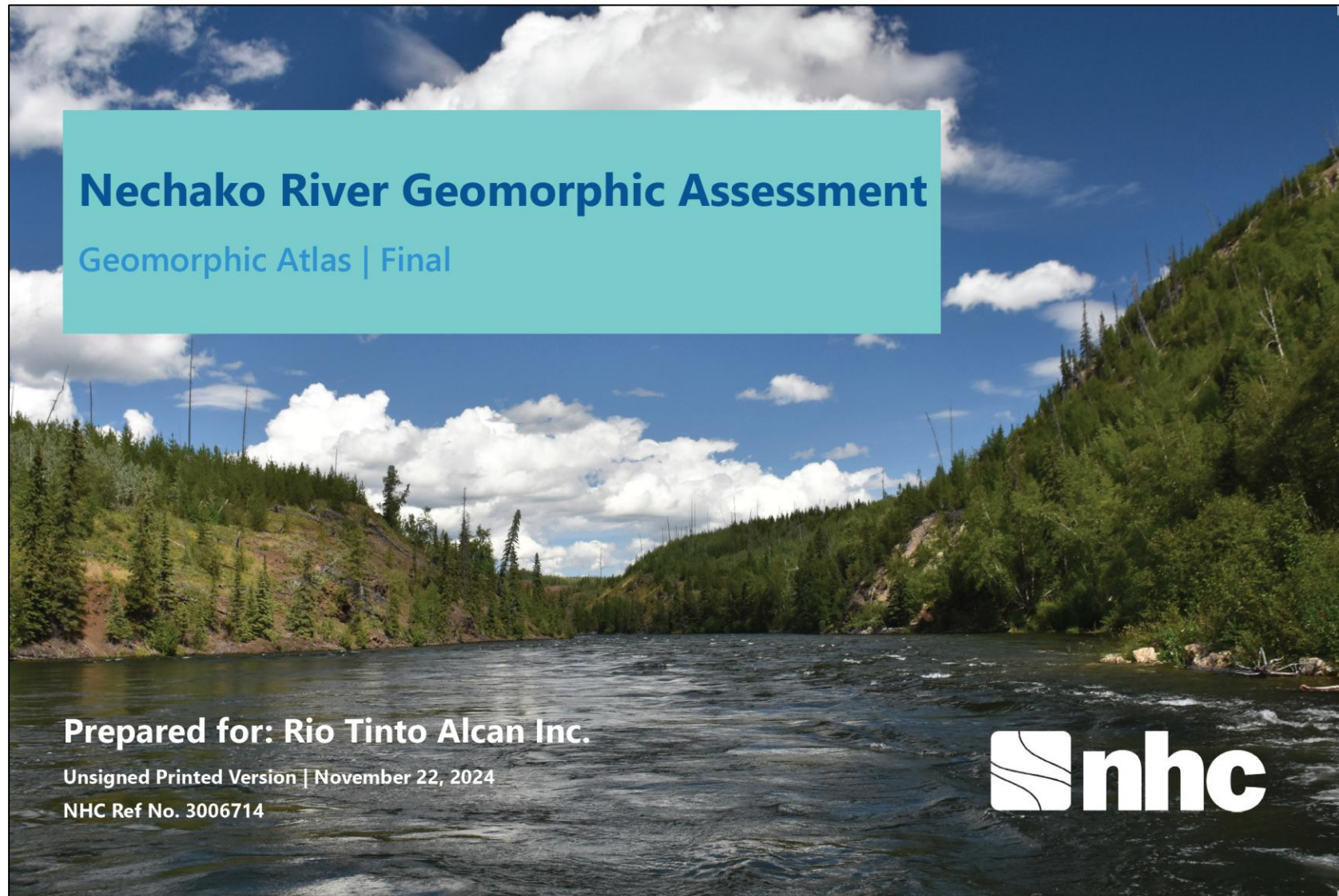
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For more information:



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Thank you!

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