

LCCMR 2022-163

LAND-USE AND CLIMATE IMPACTS ON MINNESOTA'S WHITEWATER RIVER

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HENRY ENGLAND: MINNESOTA STATE UNIVERSITY, MANKATO
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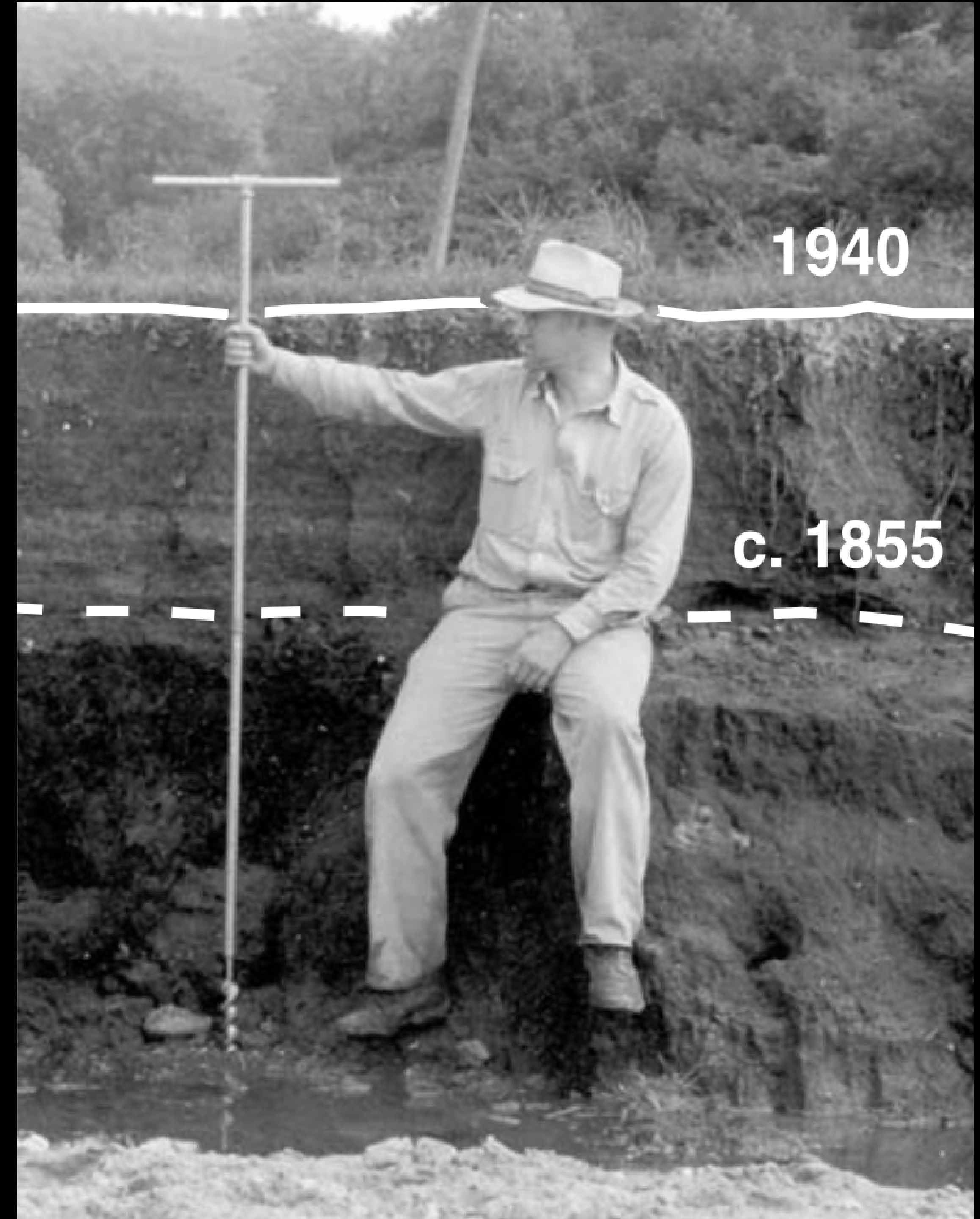
Agenda Item: 05a



**ENVIRONMENT
AND NATURAL RESOURCES
TRUST FUND**

MOTIVATION

- 3–15' of sedimentation on the floor of the Whitewater River valley following Euro-American settlement
 - Reshaped the Whitewater River
 - Buried towns and lead to valley abandonment and the establishment of the Whitewater WMA
- From 1939–1994, scientists established 107 cross sections (94 continued long-term) to map sedimentation. They augered to the pre-settlement soil (ca. 1855).
- Historical airphotos and maps also cover this time period
- Unique chance to understand impacts of (first) land-use and (more recently) climate/precipitation impacts on rivers across Minnesota
 - Specific case of the Whitewater: major recreational stream
 - Guide improved management there and overall
- These data were spread in digital and paper forms in boxes and library archives, so to make them usable for the future, we needed to unify and georeference them.



MOTIVATION

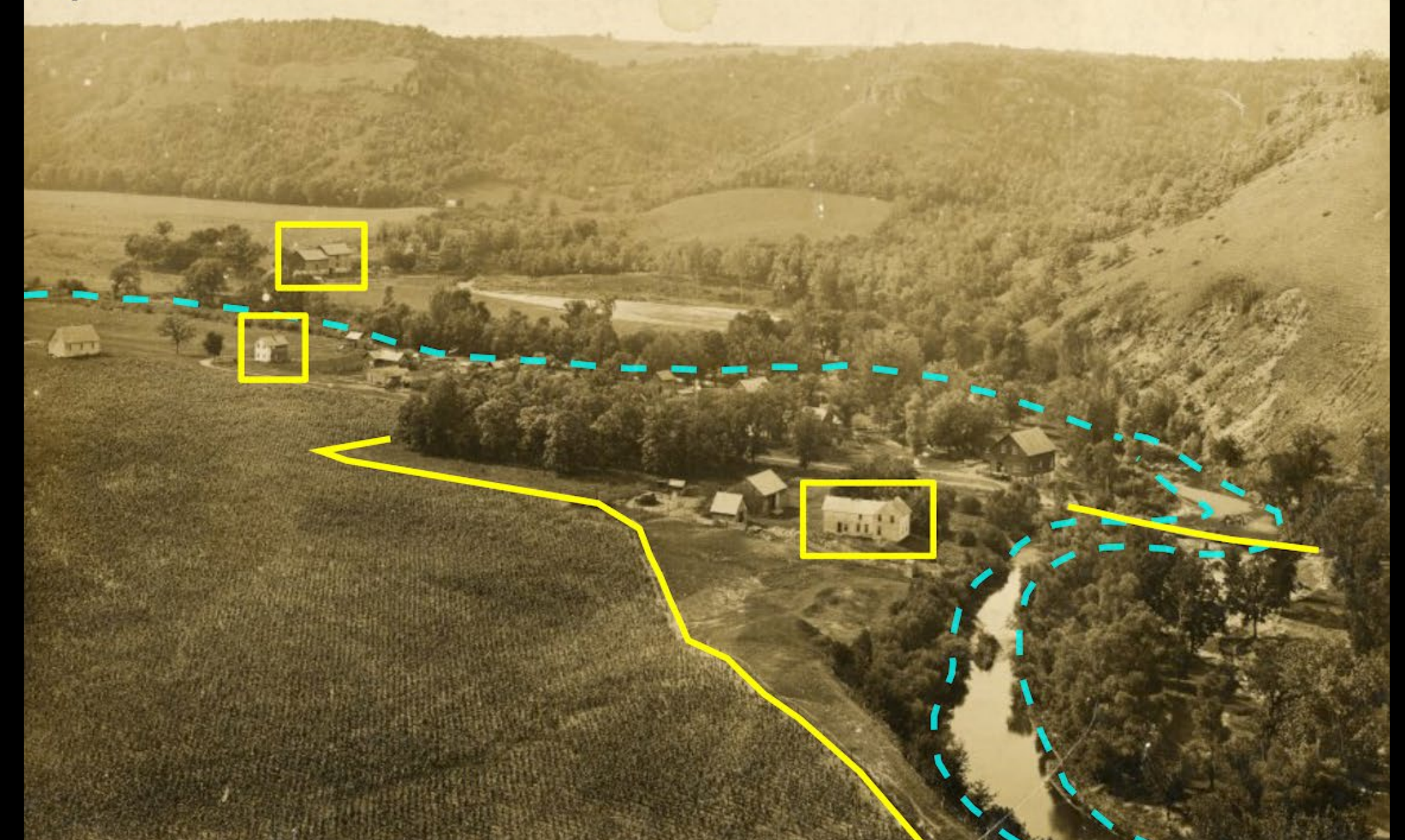
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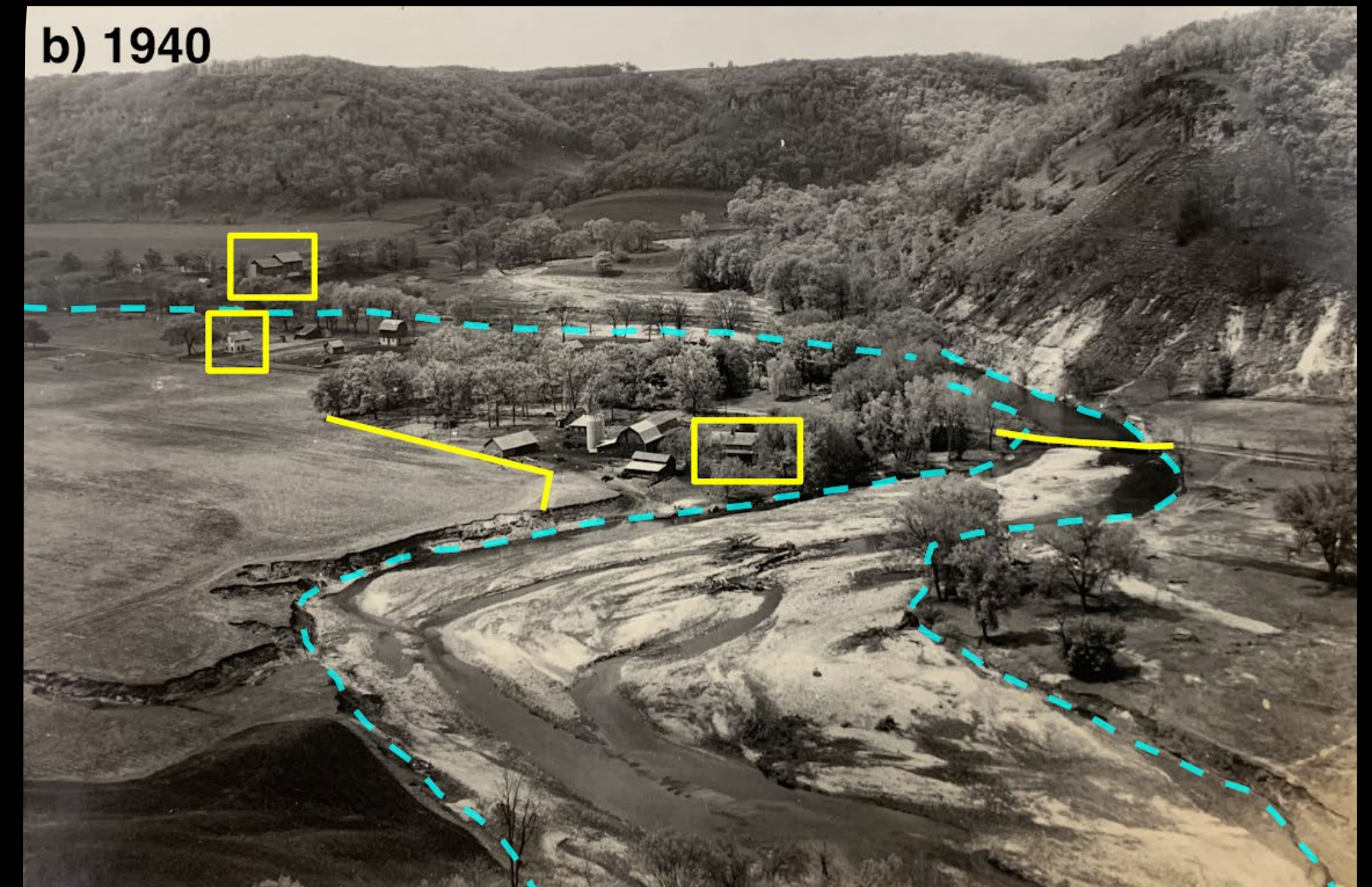
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a) c. 1890–1908



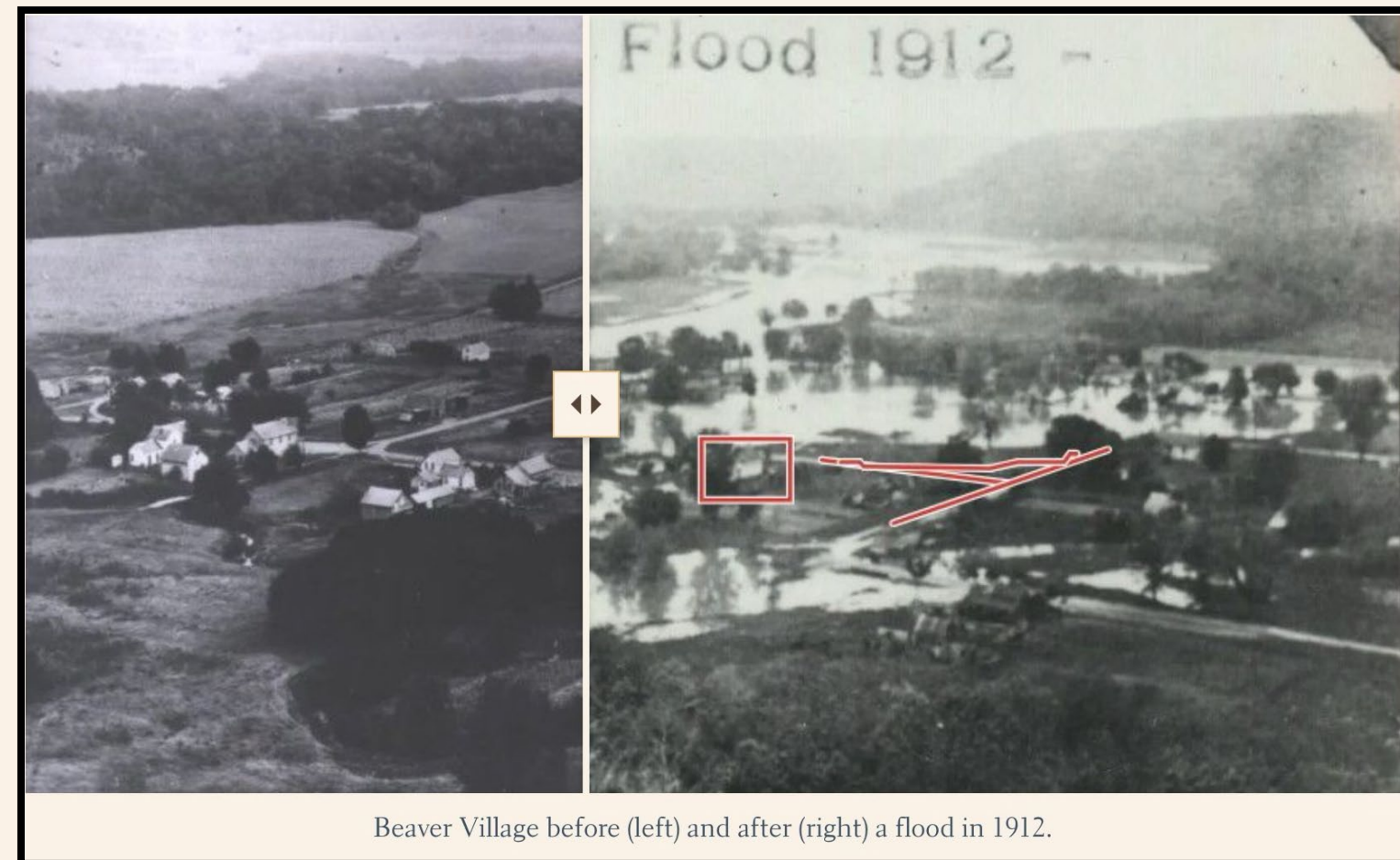
b) 1940



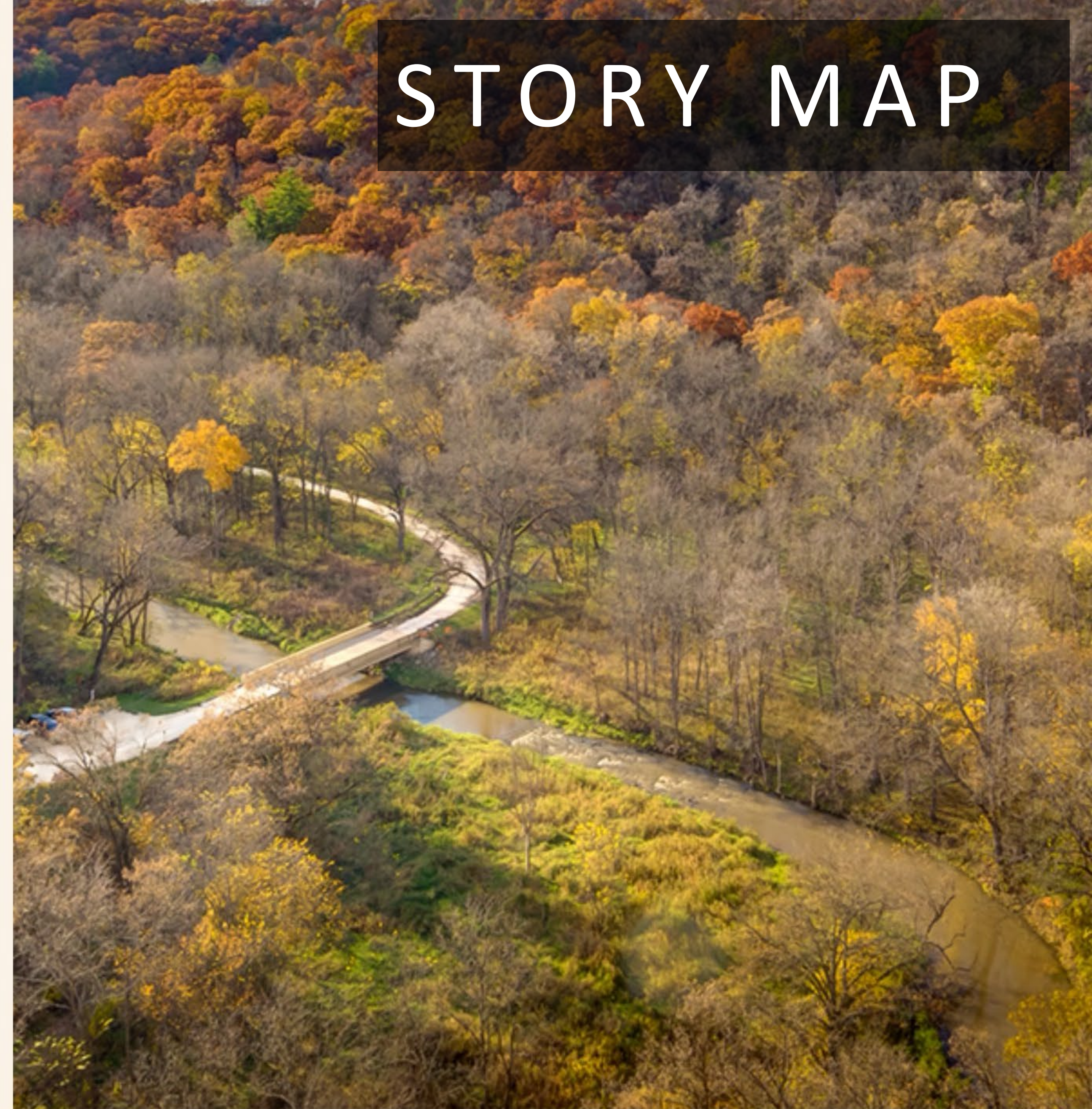
Whitewater Valley, MN

Lesson from environmental catastrophes
- Why is the conservation of land important for sustainable living?

11. April 2024



STORY MAP



LULC Classes



Open Water



Wetlands



Developed



Praire/Grassland



Forest

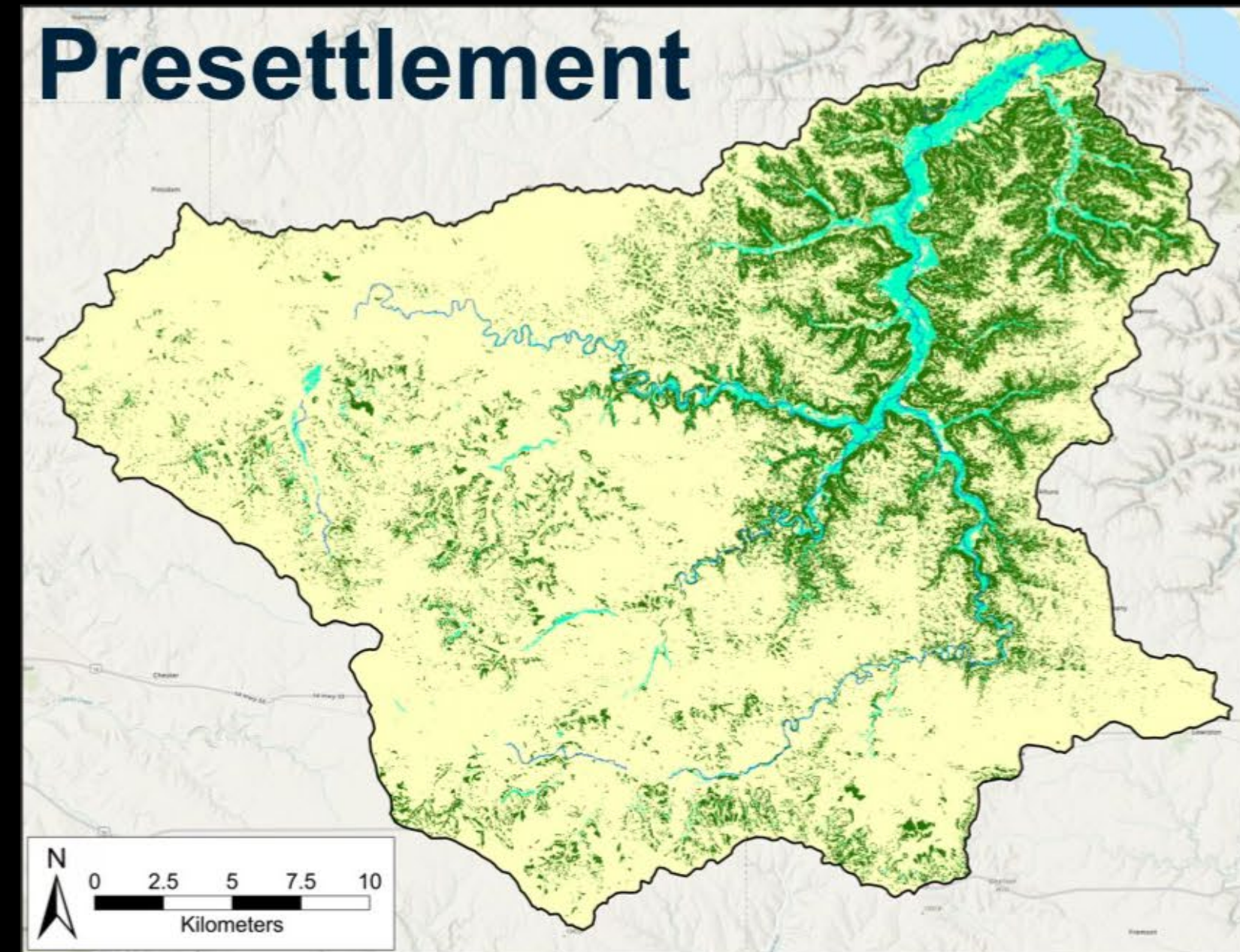


Agriculture

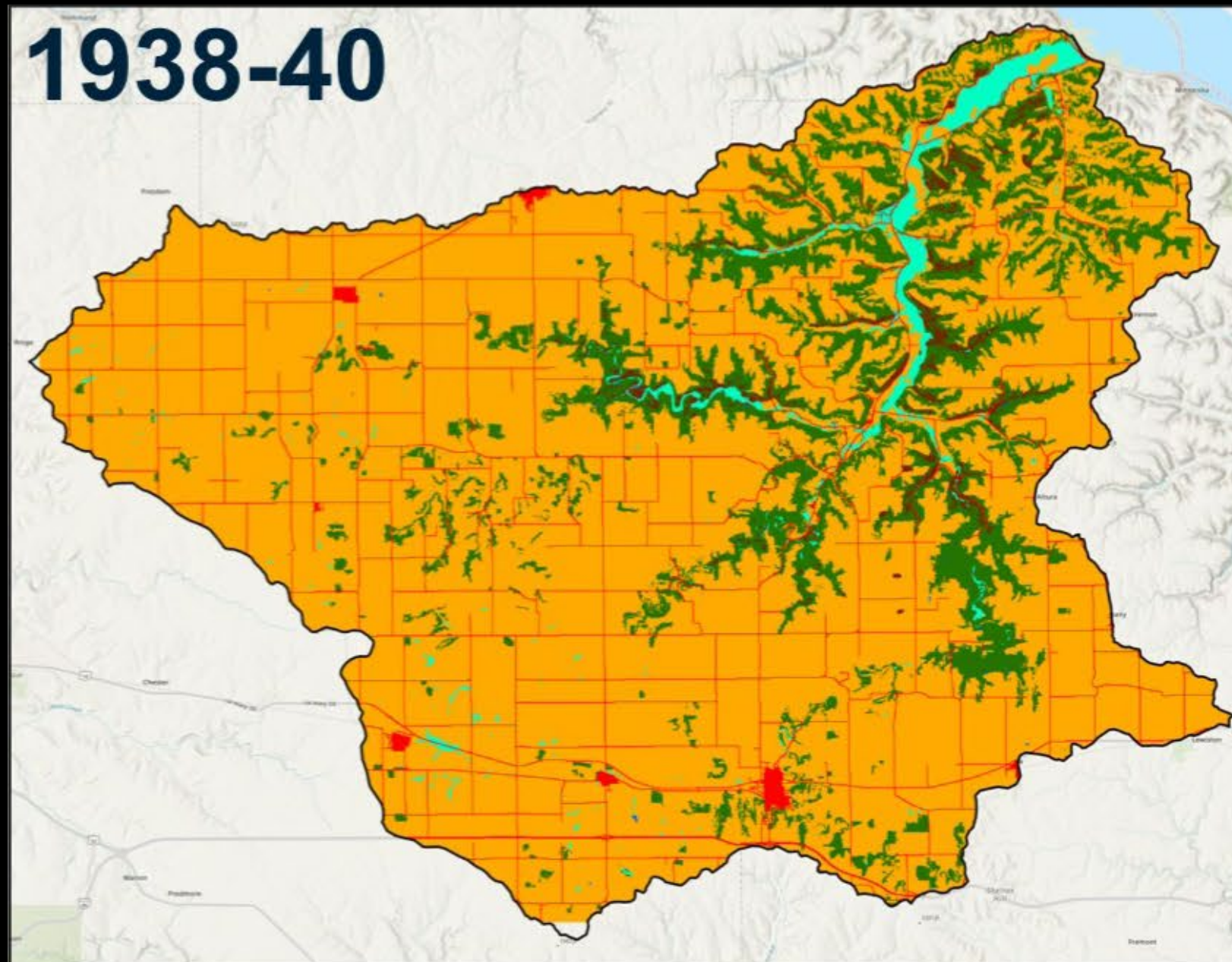


Other

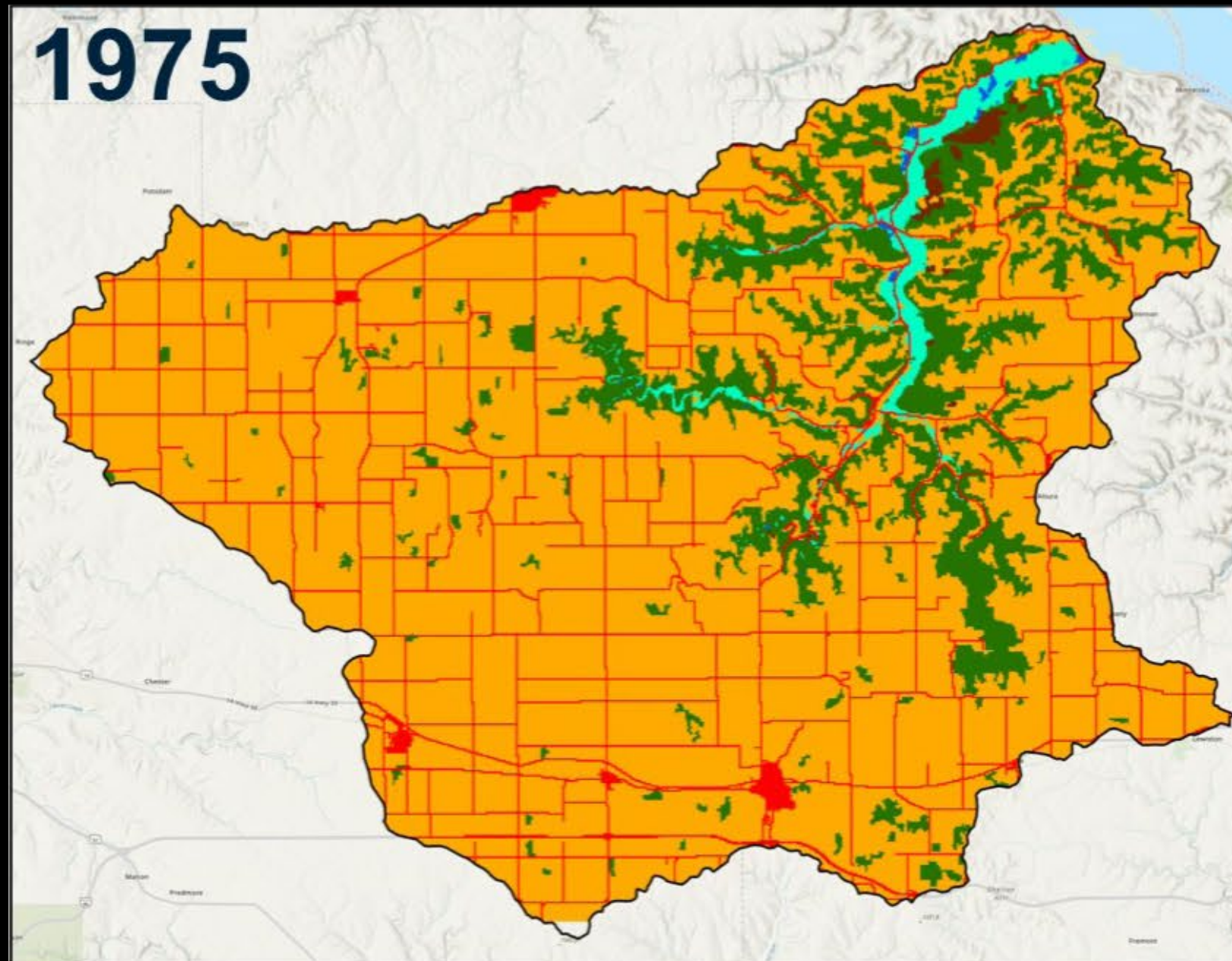
Presettlement



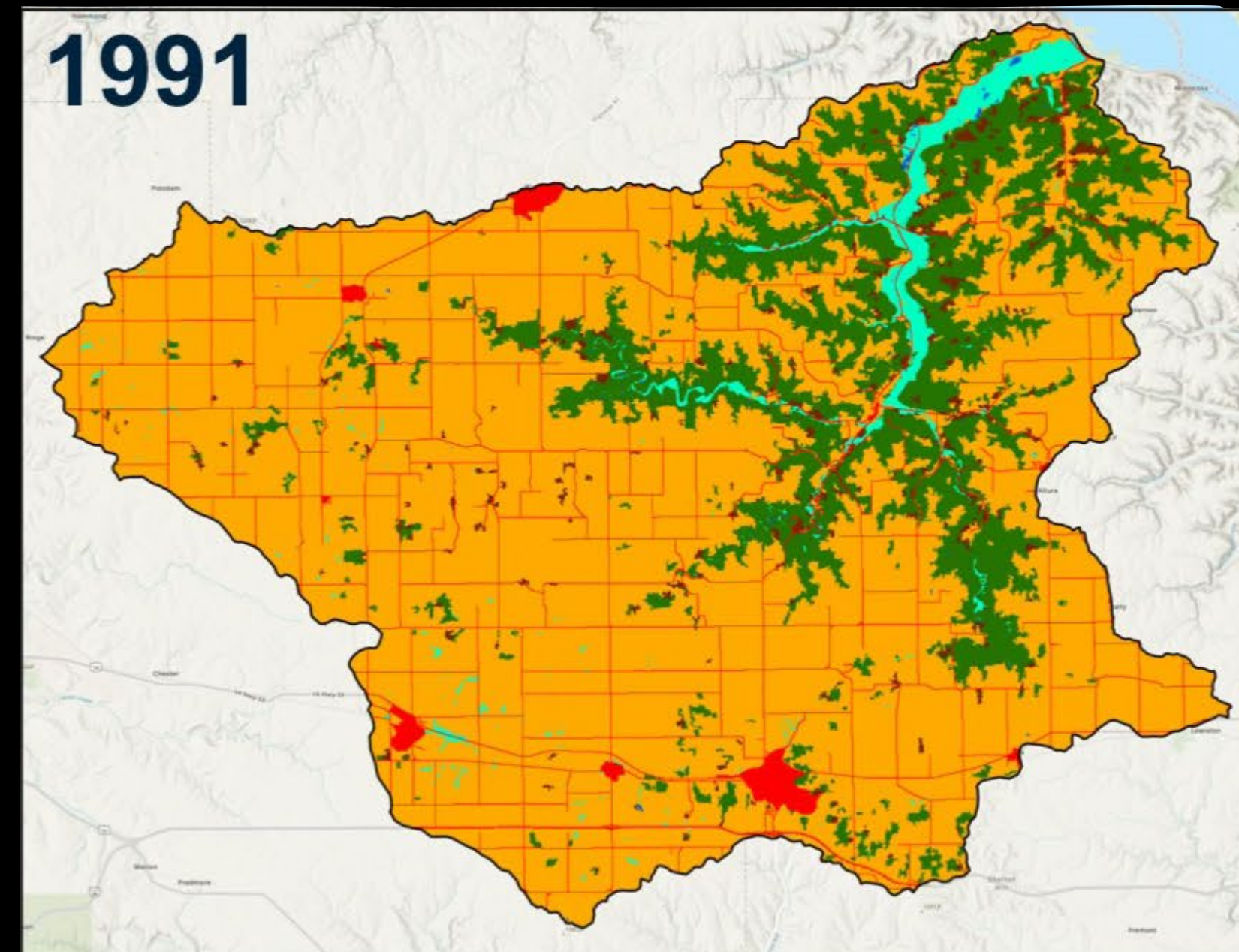
1938-40



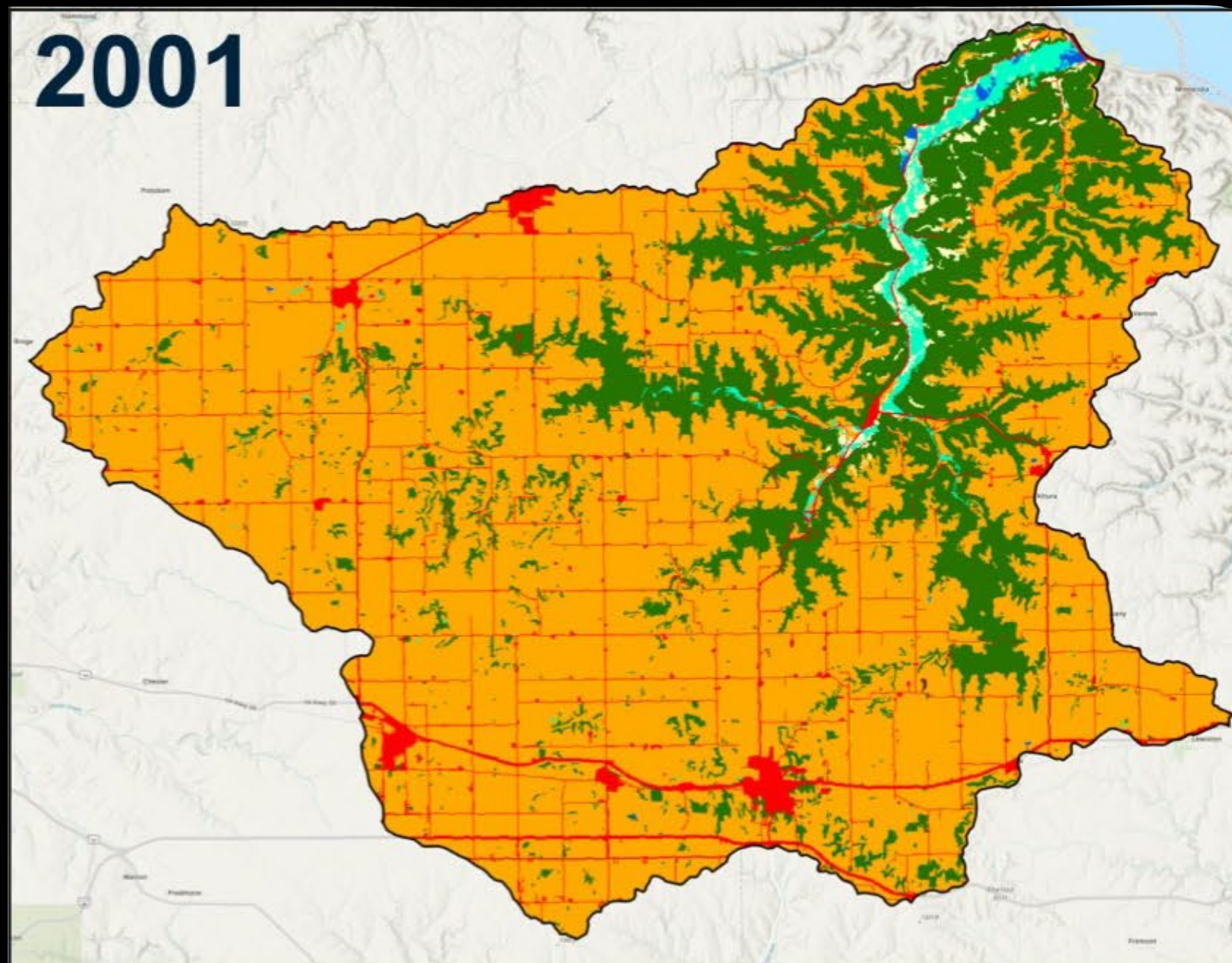
1975



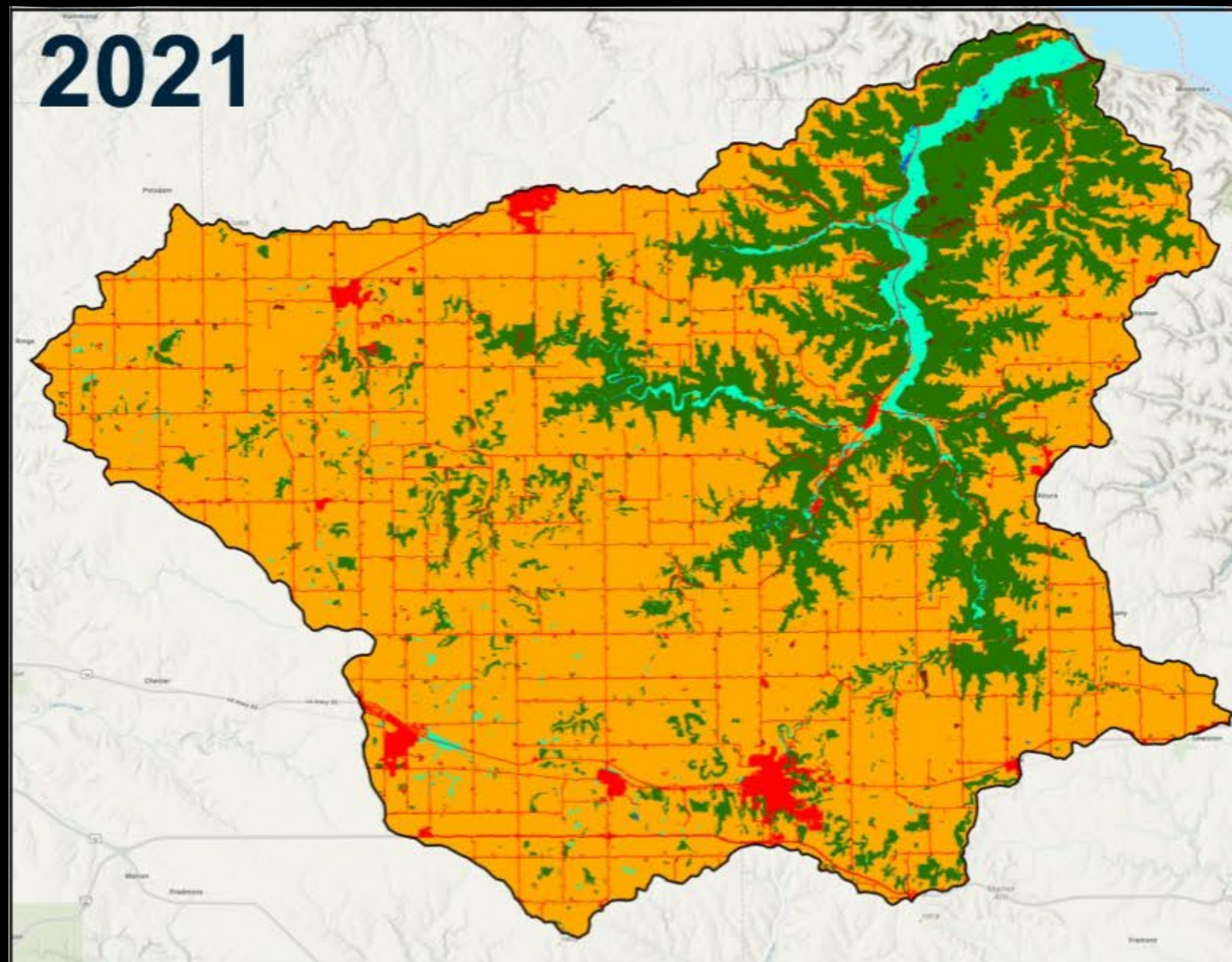
1991



2001



2021

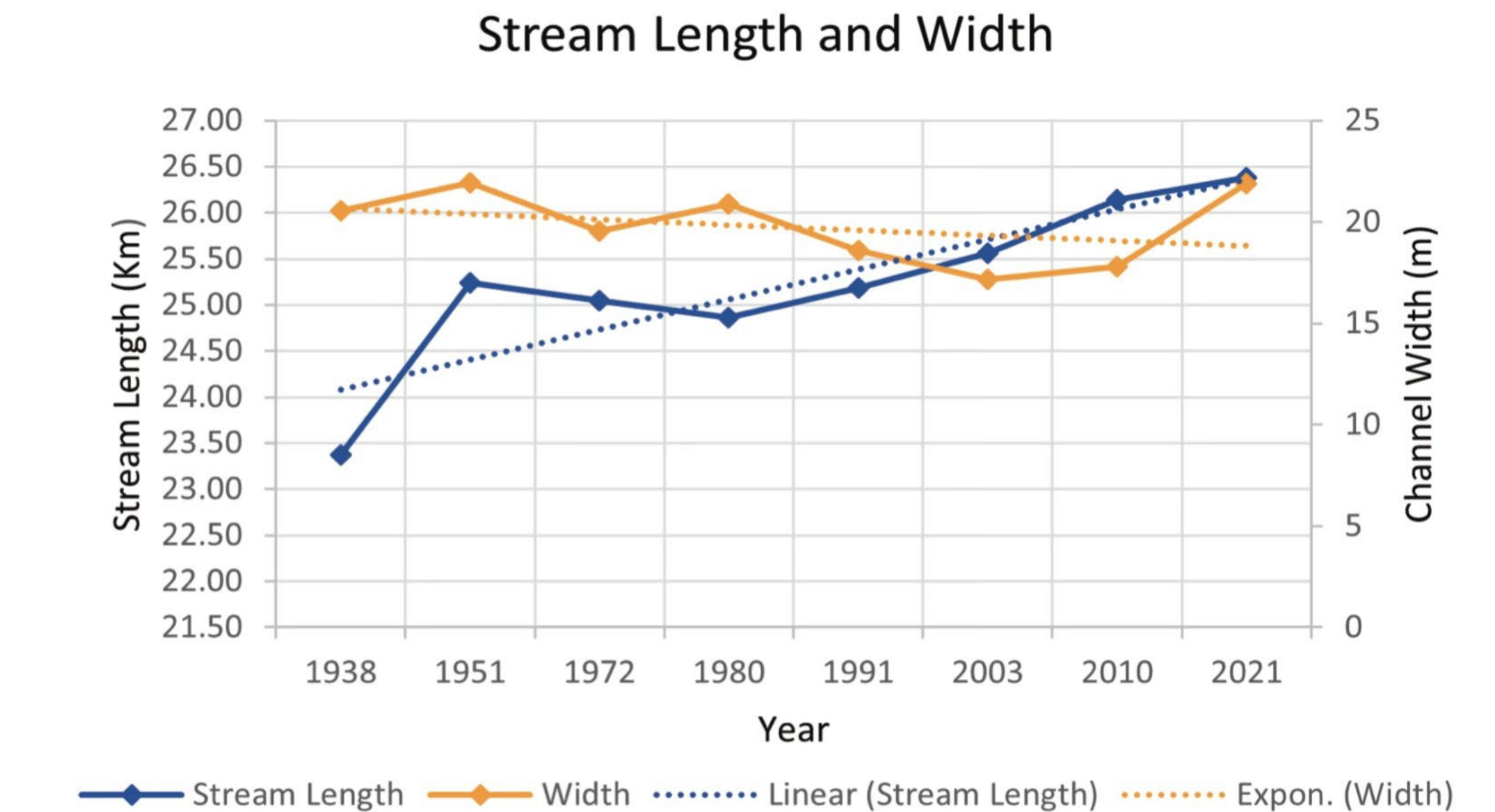


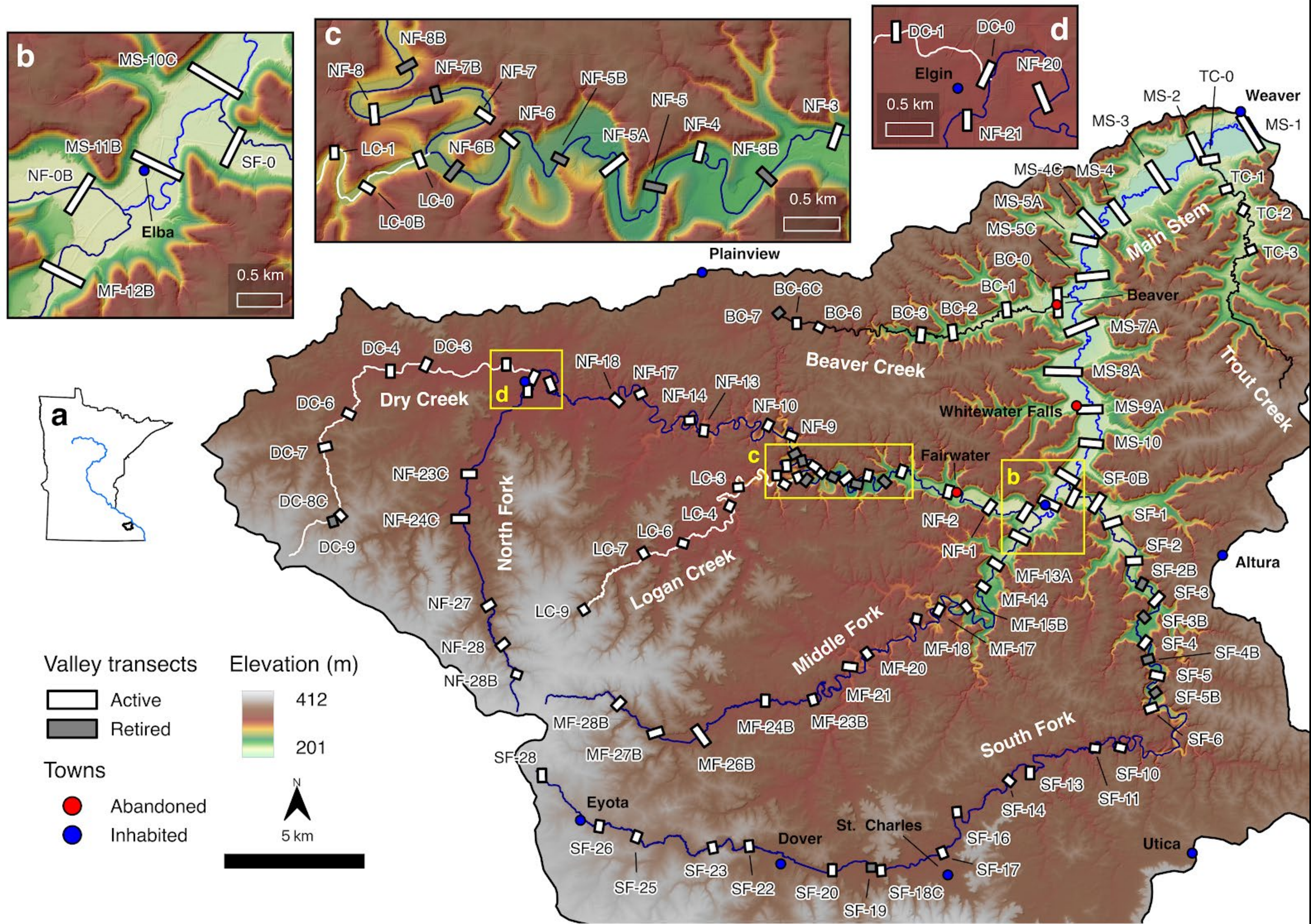
CHANNEL MIGRATION

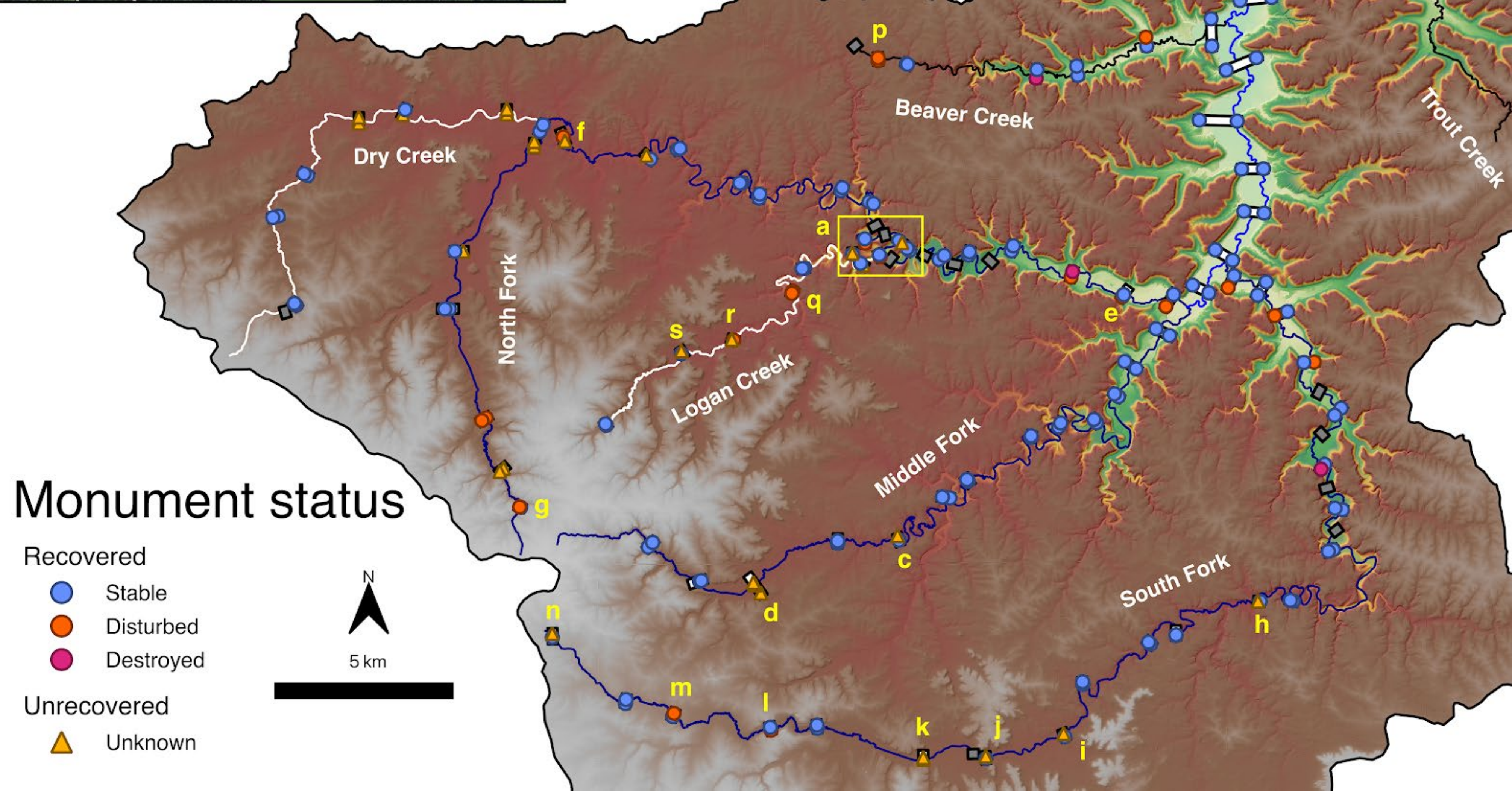
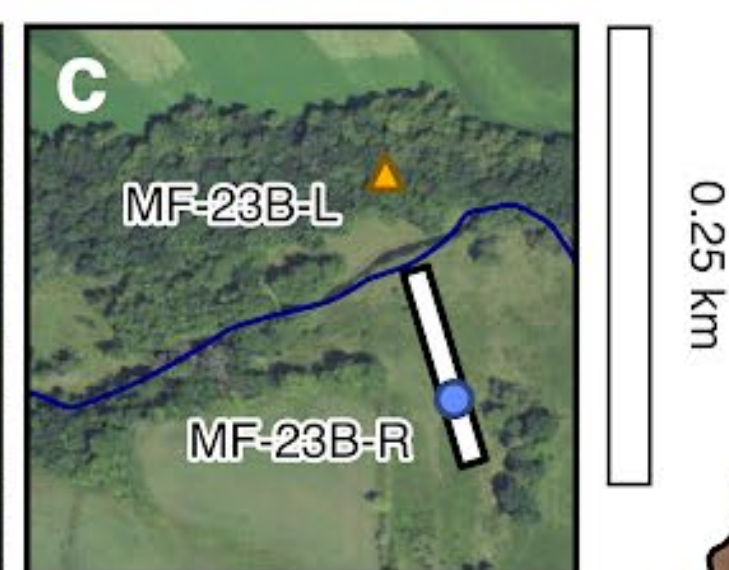
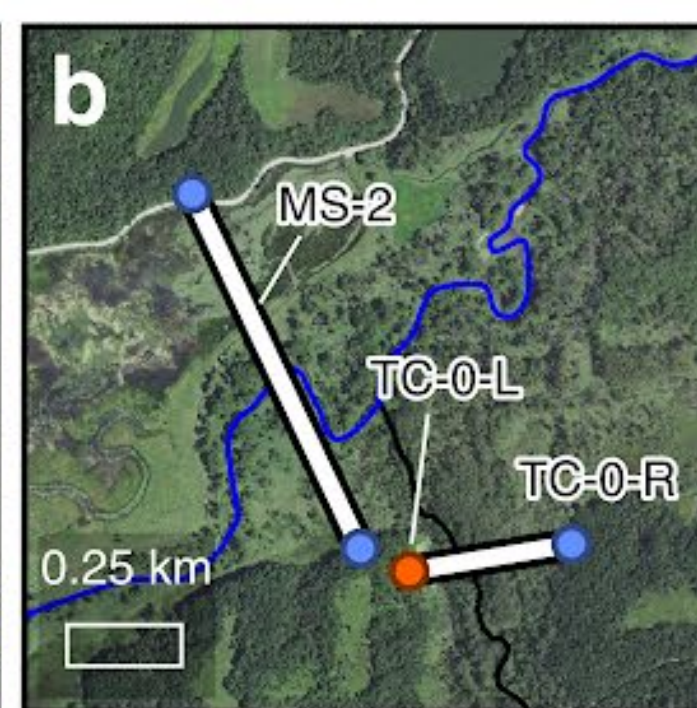
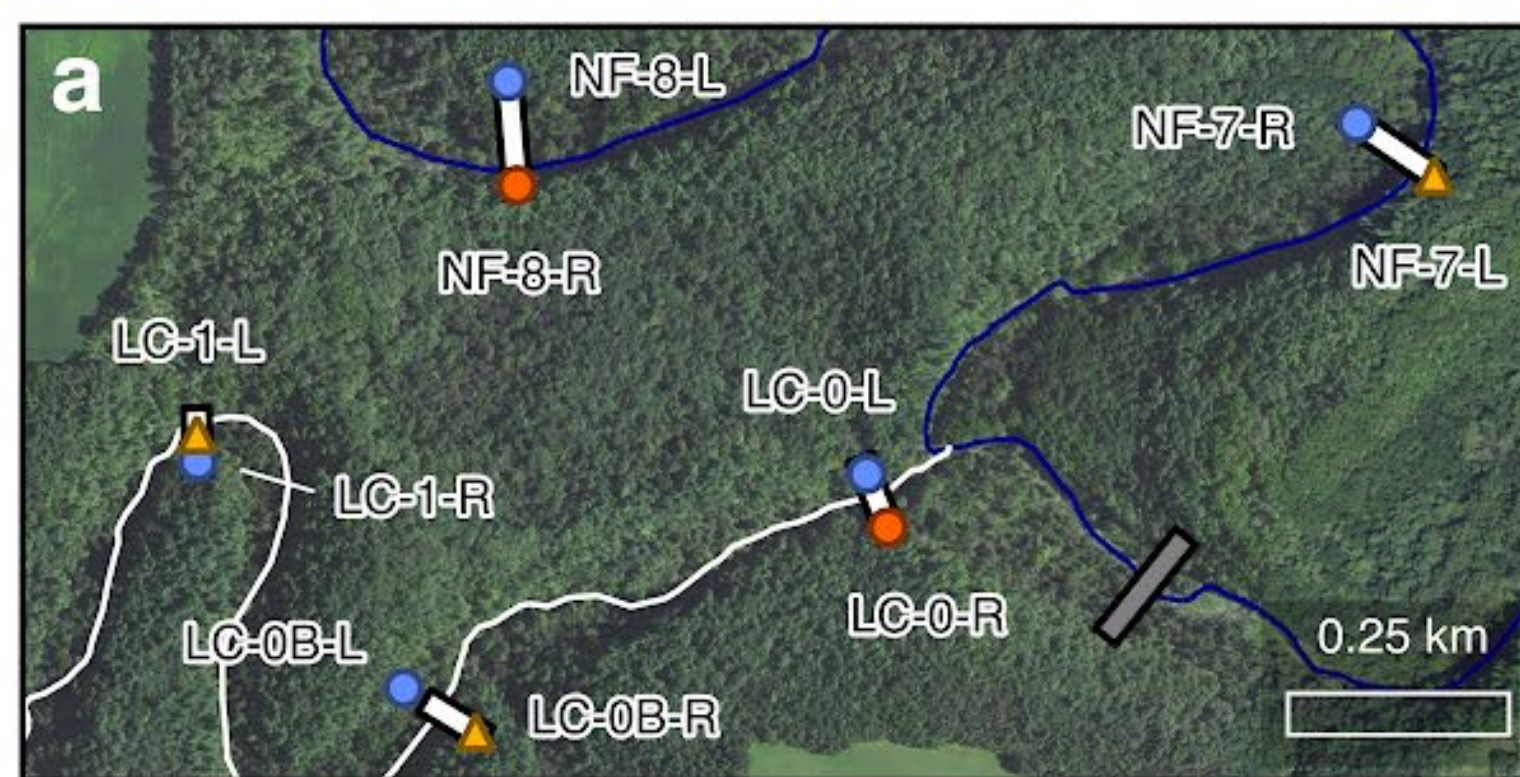
— 1972 Channel

0 0.02 0.04 0.07 0.11 0.14 Kilometers

AIRCRAFT: Airbus DS, USGS, NASA, NOAA, COAR, N. Robinson, NCEAS, NIS, OR
 NOAA, Germany, etc. Rijkswaterstaat, GSA, Geologic, FEMA, etc. and the
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 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025
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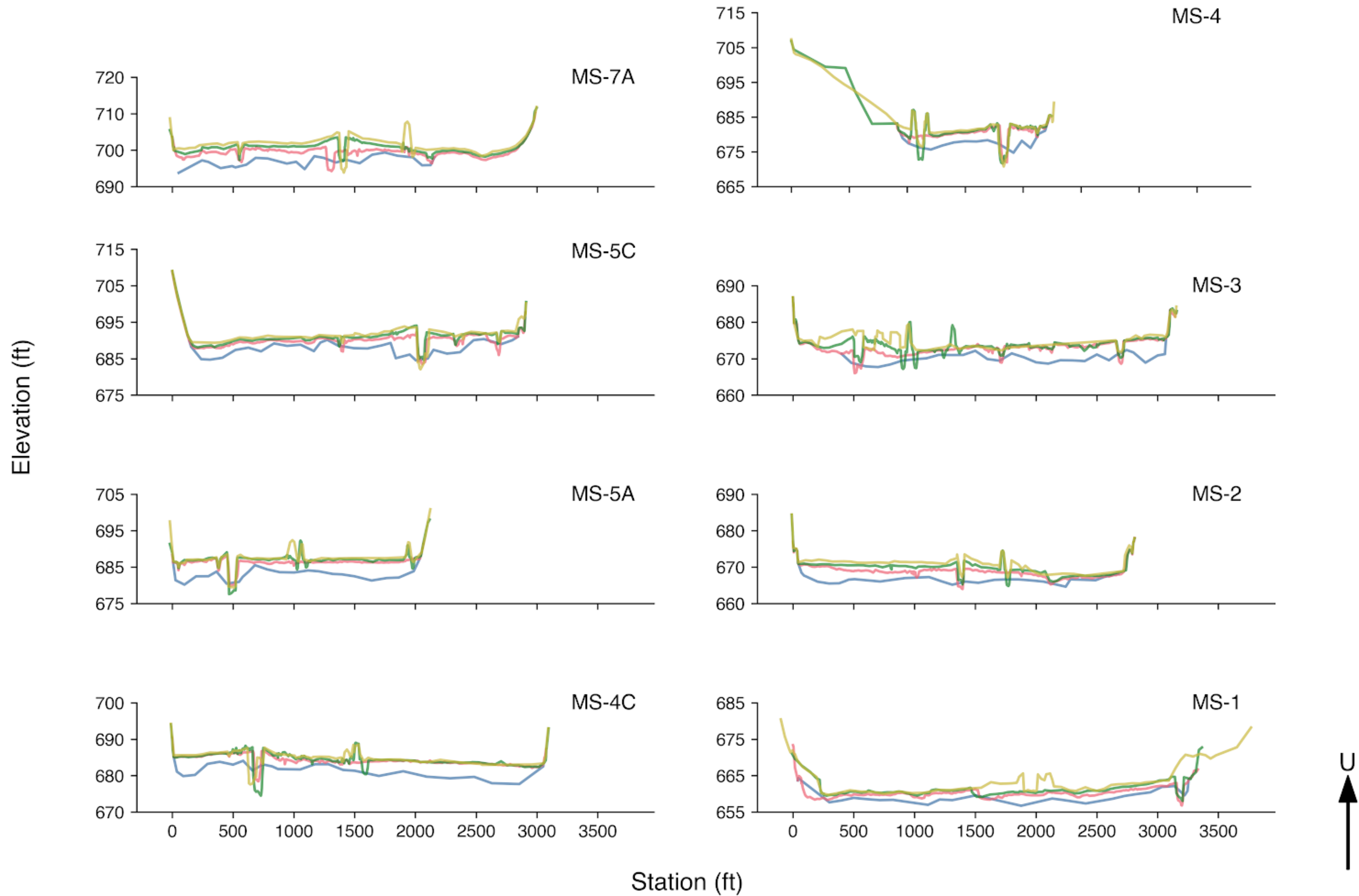




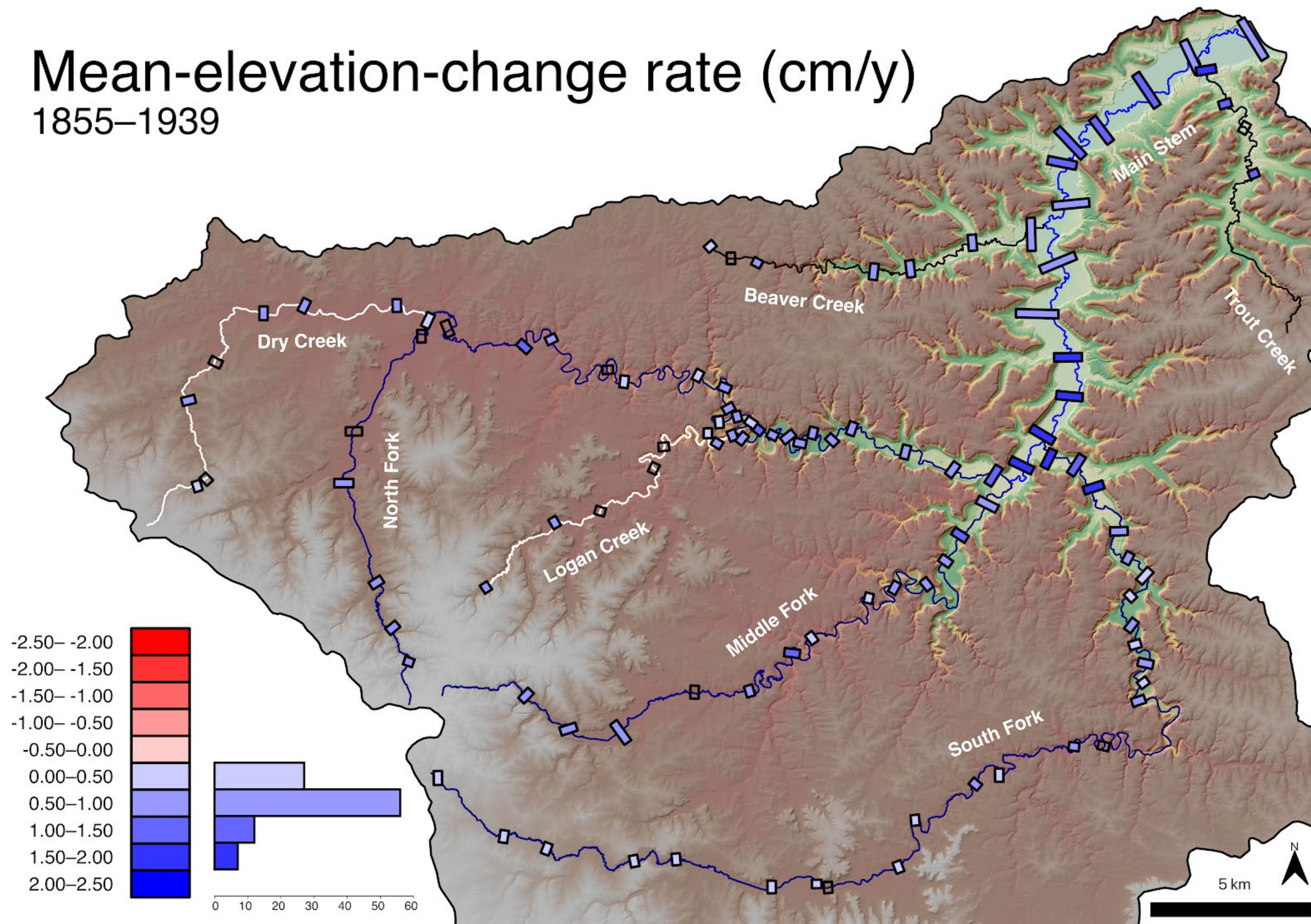


Main Stem Whitewater River

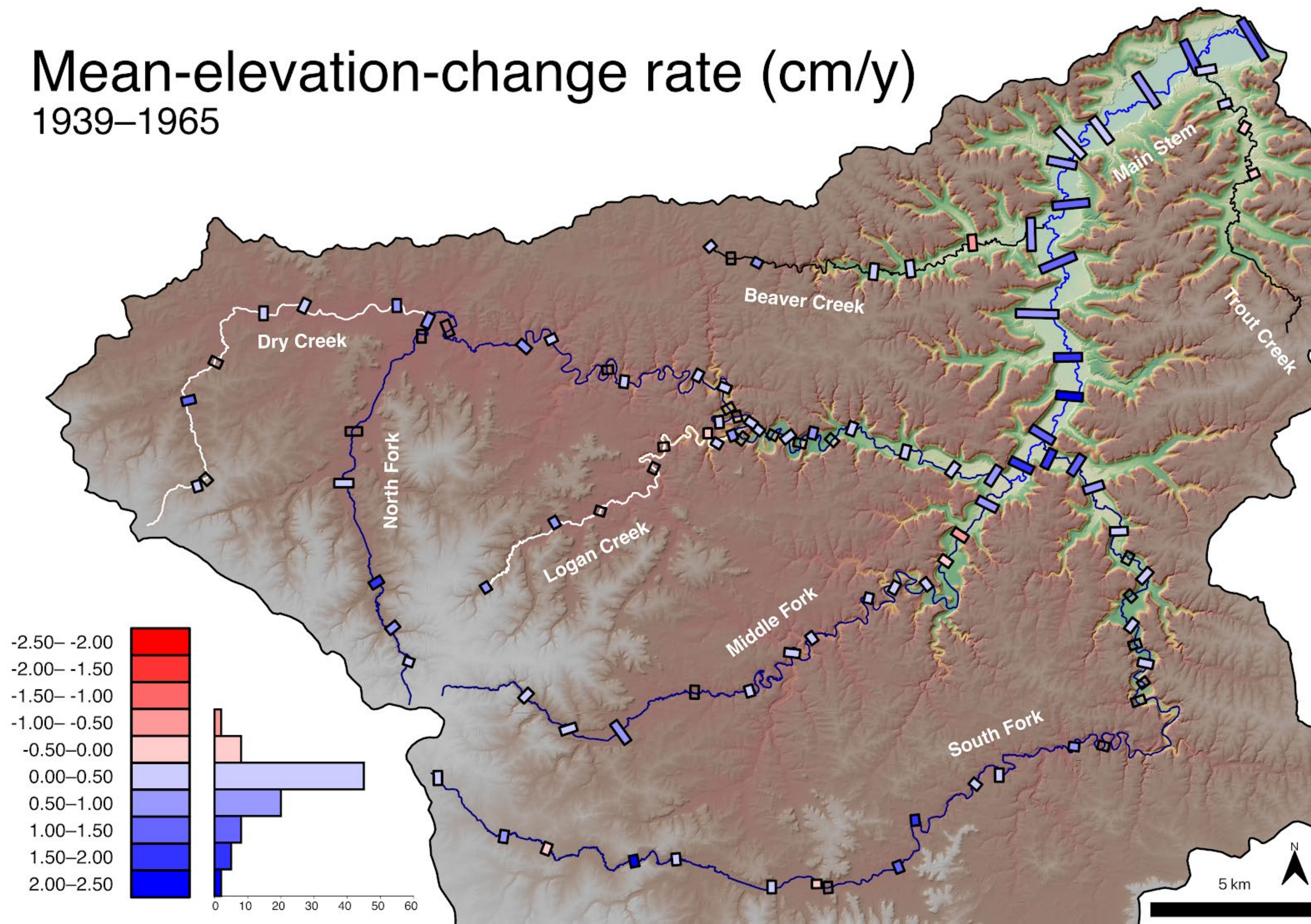
1855 1939 1965 1994



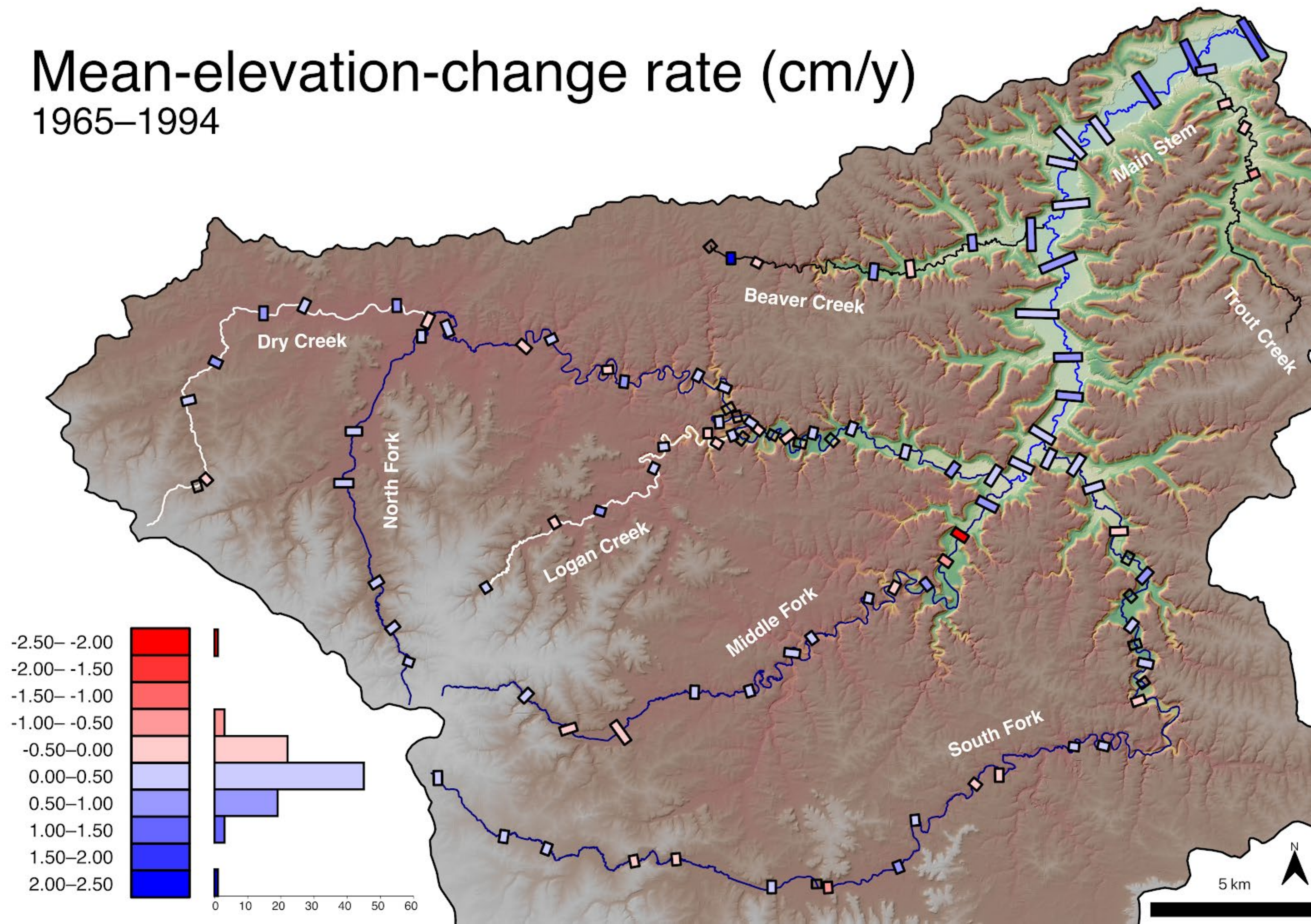
Mean-elevation-change rate (cm/y) 1855–1939



Mean-elevation-change rate (cm/y) 1939–1965



Mean-elevation-change rate (cm/y) 1965–1994



KEY PRODUCTS & PRESS

- Story map
- Georeferenced airphotos: 1938–2021
 - Land-use change
 - River-channel migration
- Fully integrated and geospatially registered cross-sectional data
- Theses from UMN (inventory: complete) and MNSU (flooding impacts: to finish in 2026)
- Journal publications
 - 1 published with media coverage
 - Data publication nearing submission

NEWS | ENVIRONMENT

Modern farming has carved away earth faster than during the ice age

Minnesota study adds to growing evidence of human-accelerated erosion, which could jeopardize agriculture

28 APR 2025 • 1:35 PM ET • BY [EVAN HOWELL](#)

SHARE:



Few forces rival a glacier’s erosive power. Some 20,000 years ago, during the last glacial maximum, the Laurentide Ice Sheet blanketed much of North America, gouging the land and carving the Great Lakes. But a study published this month in *Geology* finds that settlers over the past 150 years have altered the landscape just beyond the Laurentide’s edge far more dramatically, scooping away earth [up to 12 times faster than during the ice age](#) and the quiet millennia that followed. What’s at stake, scientists say, isn’t just the landscape. It’s our food.

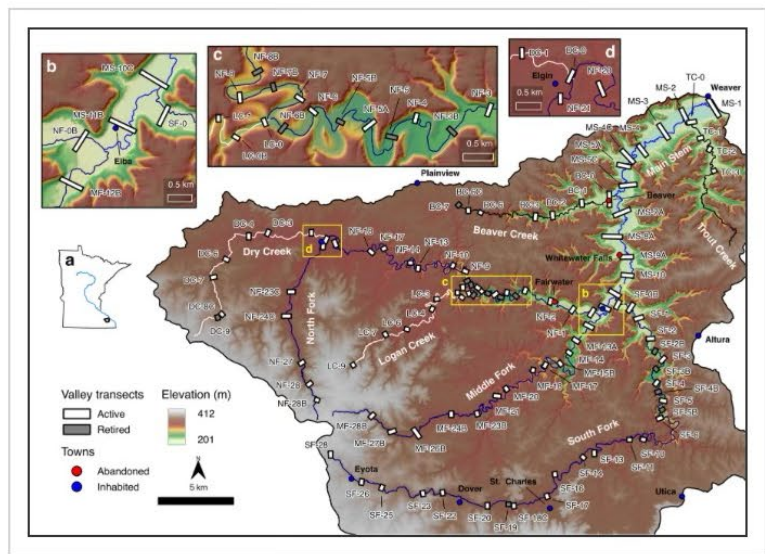
“Agricultural erosion is one of the most overlooked yet profound human impacts on the environment. How long do we let the system run in a deficit before it catches up with us?” says David Montgomery, a geologist at the University of Washington who wasn’t involved with the study. “This is an



Emma Trettin, a master’s student at Minnesota State University, Mankato, stands in Minnesota’s Trout Creek, whose riverbed marks the height of the soil surface during the late 1850s. The creek’s 3-meter-tall banks are formed from eroded sediments, built up from the 19th century onward from land use practices. SHANTI PENPRASE

Historical stream and valley sedimentation survey data for the Whitewater River Valley, Minnesota, United States (1855–1994)

[Wood, Jimmy J](#); [Svien, Lawrence](#); [Christianson, Doug](#); [Claas, Lauren](#) (2025-06-13)



Title

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Datum

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Autor:innen

[Wood, Jimmy J](#)
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Group

[MNI MORPH](#)

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URI

<https://doi.org/10.13020/2ggx-qk28>
<https://hdl.handle.net/11299/273331>

Statistics

[View Statistics](#)

Schlagwörter

LOOKING ONWARD: DATA TO ACTION

- Strengthening connections with Whitewater State Park and Whitewater WMA for land management and river-restoration planning
- Using geospatial data to:
 - Assess the hydrologic (how much water) vs. geomorphic (how big is the channel) causes of flooding
 - Study floodplain sedimentation and long-term flood impact
 - Expand this unique data set to the modern day through collaborations and classes
- Develop physics-based models that can match these data and predict river behavior into the future
 - Prepare for continued changes in precipitation
 - Give informed recommendations for land use and land cover

