NLAE
National Laboratory for Agriculture and the Environment

OPERA DSWx and DIST to map landscape depressions-

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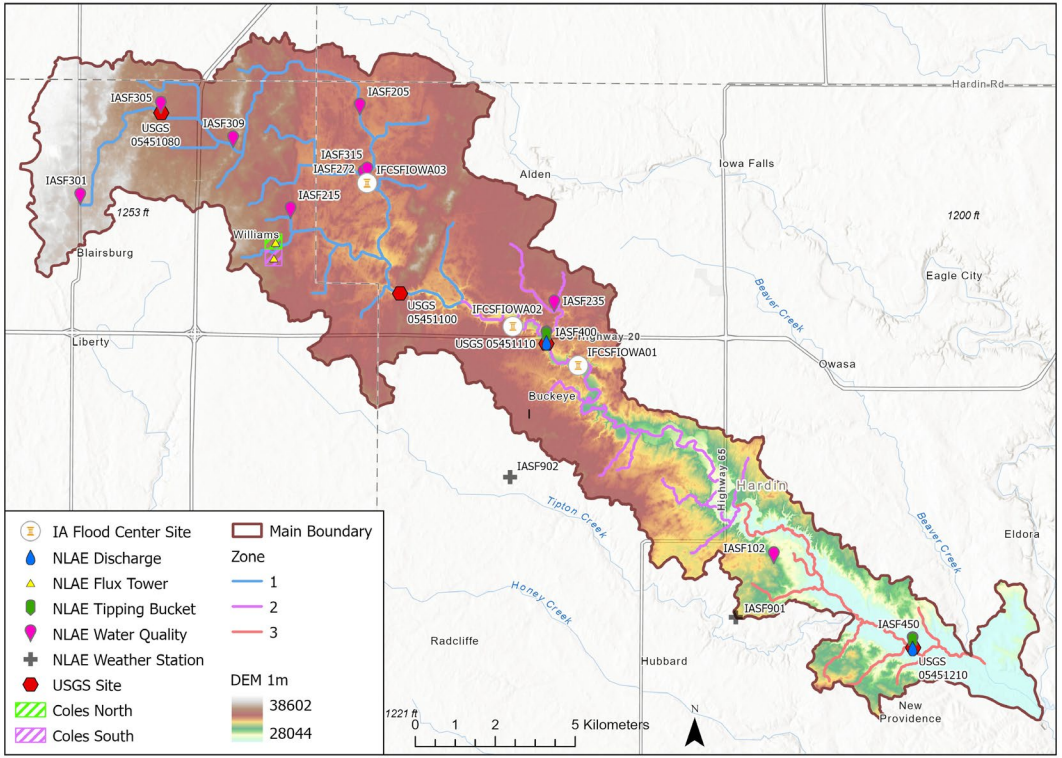
USDA-ARS-MWA-Ames

USDA Agricultural Research Service

South Fork a playground site

South Fork Zones and Sites



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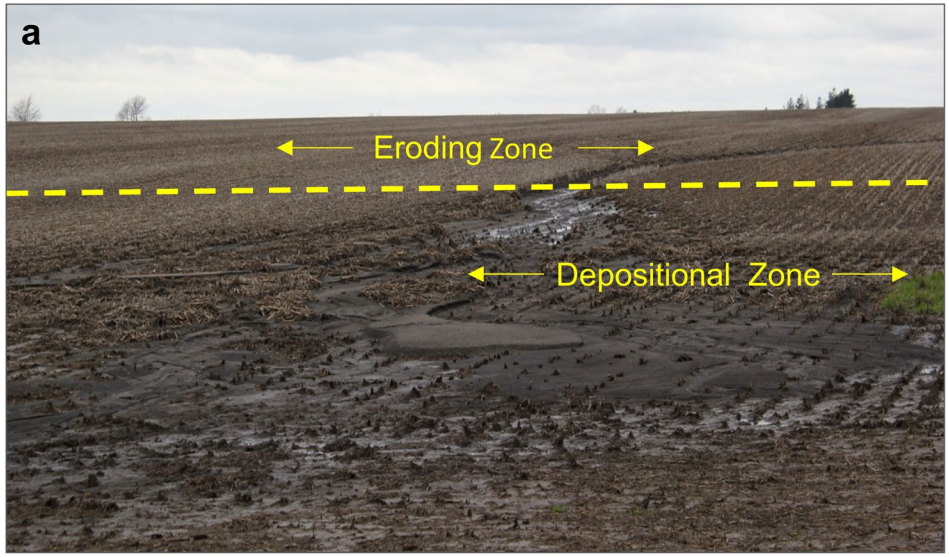
South Fork
a
playground
site for data
and science
sharing

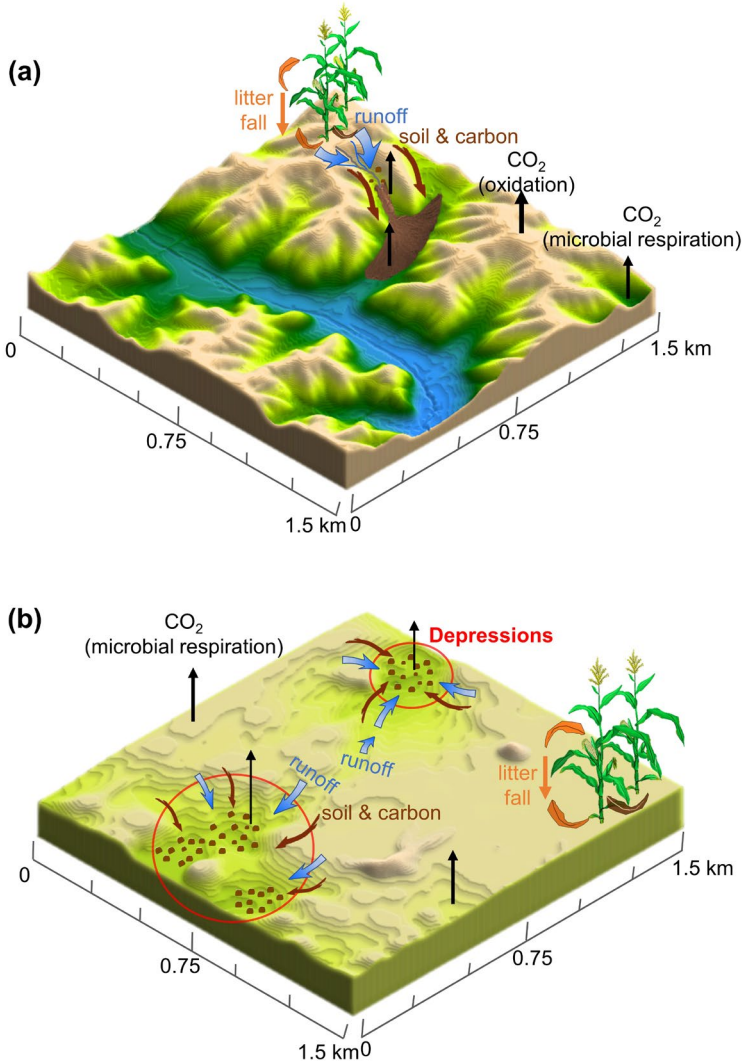
- Circular economy concepts
- More than 100 CAFOs in the upper SF
- 799 certified organic farms in Iowa in 2021; sixth in the nation and number 1 in organic oats
- Sensor testing and playground
- Agroecosystem modeling space for development and validation
- 71 percent of discharge in SF is from tile
- River has lost about15Km of length

- Strong footprint with stakeholders

> *[National Laboratory for Agriculture and The Environment, UMRB-LTAR] NLAE has been a great source of useful information which we have been able to share with farmers across the Middle West, improving soil health, soil conservation, and crop production.*
>
> *- Ag Advisory LTD, President Michael McNeill, PhD and Farmer, Algona, IA*



Papanicolaou, Zhou et al. 2026 Geoderma



Papanicolaou, Zhou et al.
2026 Geoderma

Using Dynamic Surface Water Extent (DSWx) to map landscape depressions

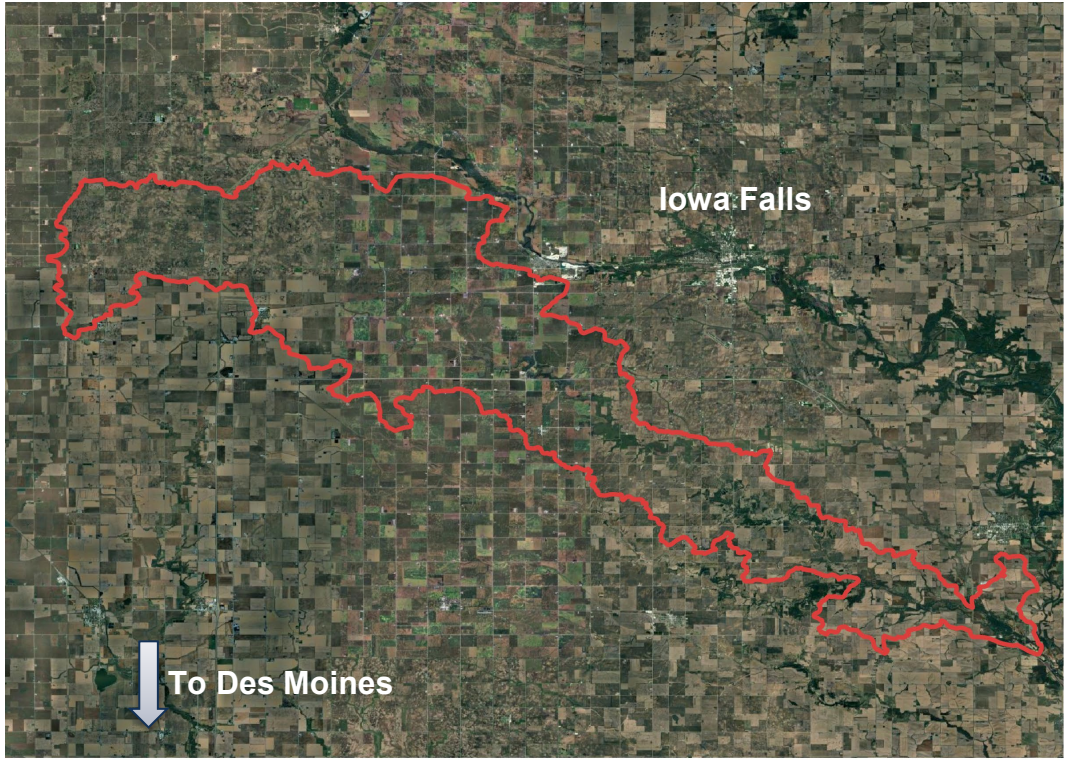
National Aeronautics and Space Administration

DSWx-HLS collected from April 2023 until end of 2024

Area of interest: South Fork basin in Central Iowa

Covered by two tiles: 15TVG and 15TVH

764 total granules used for this study



Temporal aggregation for cloud cover mitigation

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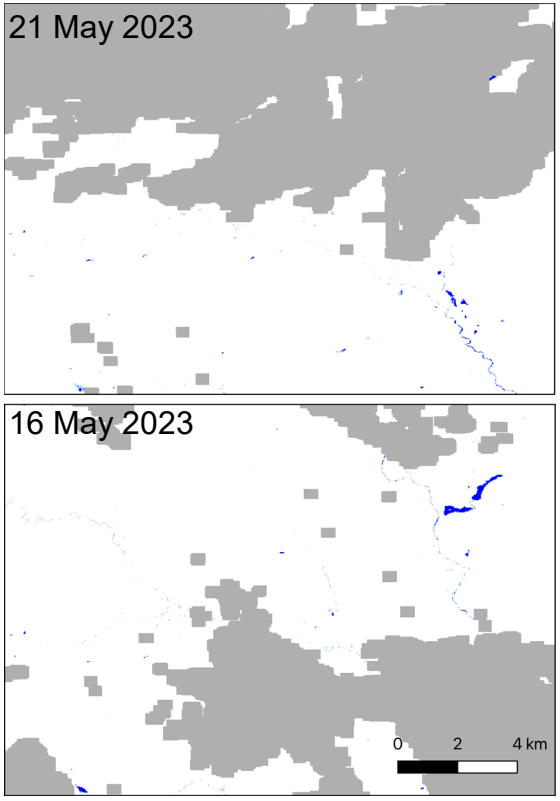
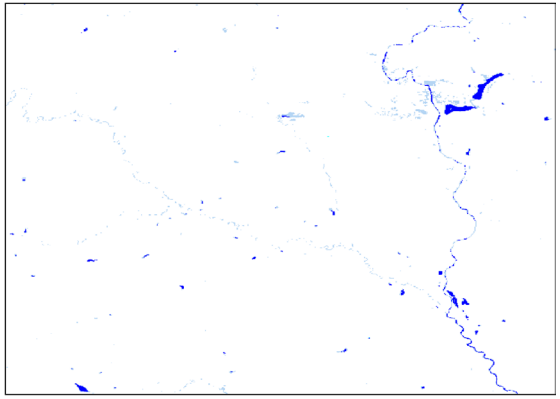
Combine images by stacking individual granules following a pixel class priority to retrieve maximum inundation:

1- Open Water
2- Partial Water
3- Land
4- Cloud
5- No data



Cloud free monthly composites



Open water
Partial water
Clouds

Computation of frequency of inundation

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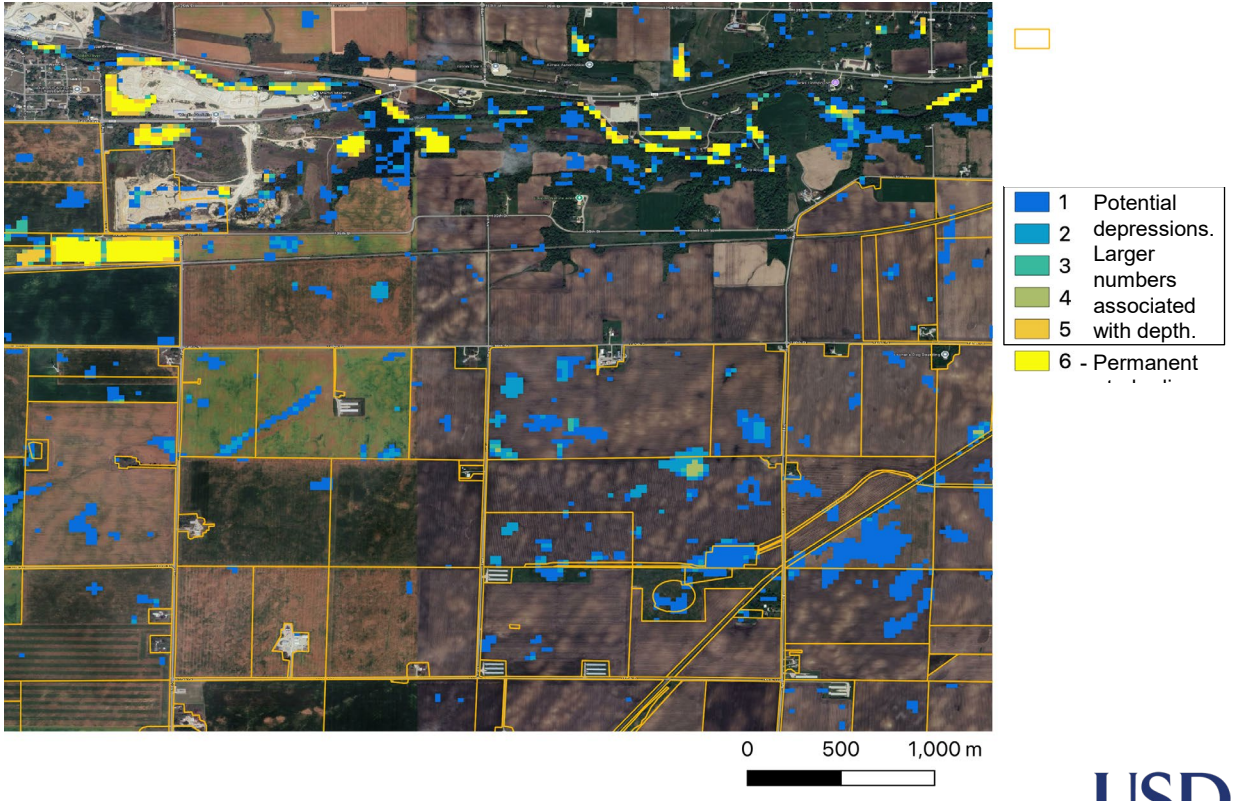
Cycle through monthly mosaics.

Count the number of months each pixel was inundated.

Right image: Number of times each pixel appeared as water from May through October 2024

Larger numbers are associated with deeper depressions.



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Future directions

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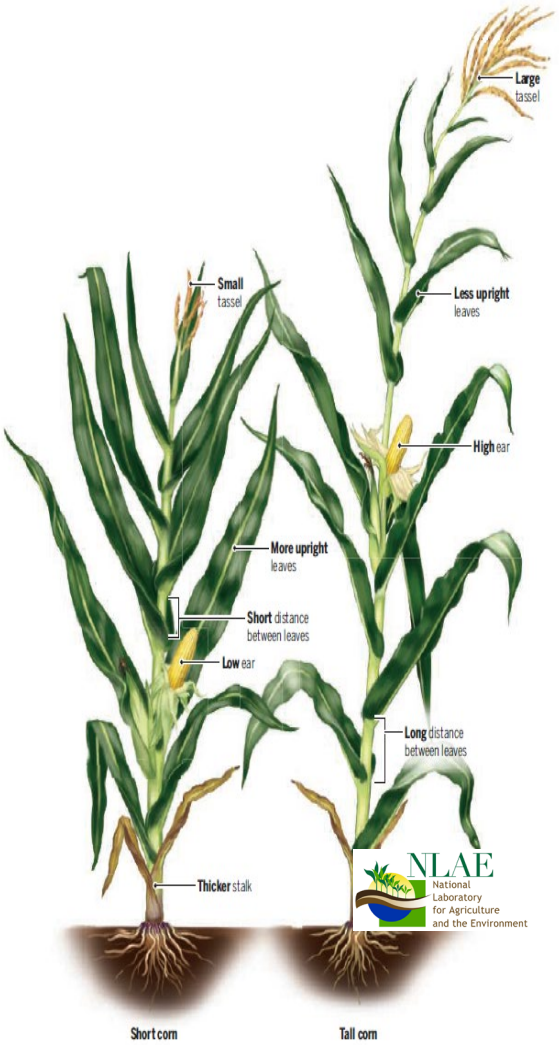
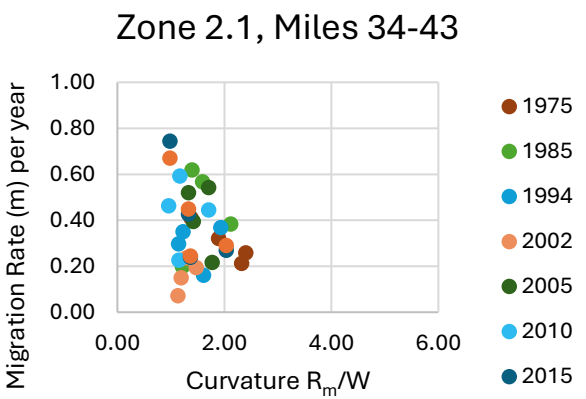
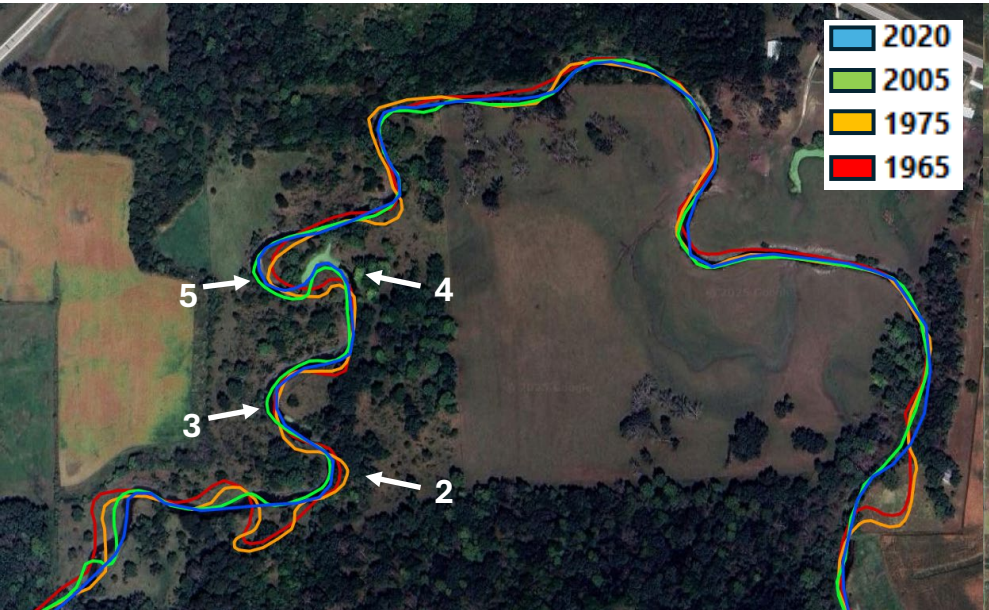
- 2023 and 2024 were very dry years. Depressions could have remained unfilled. Compute frequency of inundation for wetter years will reveal more depressions
- Collection of in situ observations can help fine tune the minimum number of times a location needs to appear as inundated before deeming the location a depression.
- Frequently inundated locations inhibit plant development. Cross-reference potential depressions with the Vegetation Disturbance (DIST) product may eliminate “false positives”
- Use of the OPERA to evaluate crop mortality

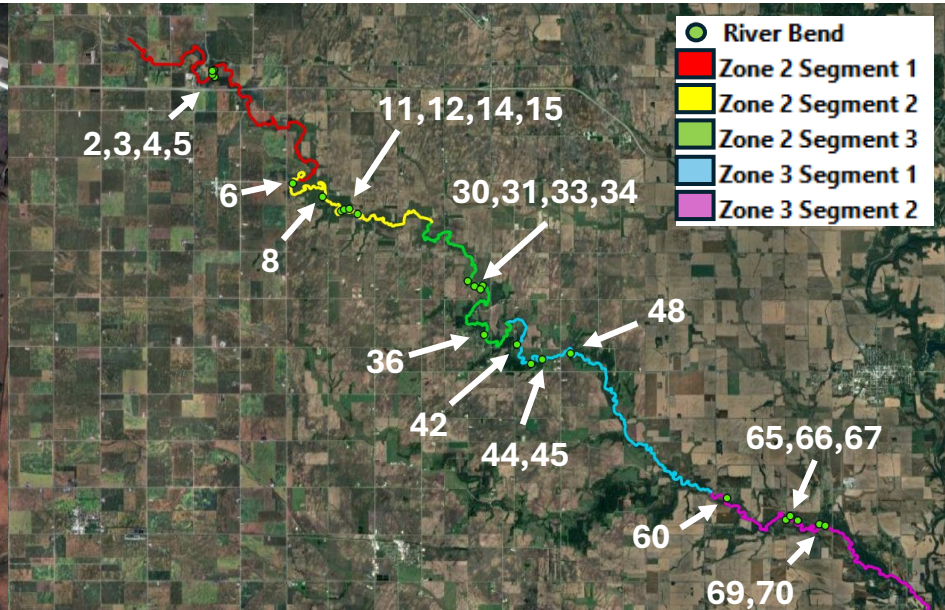
Crop mortality



Zone 2.1 – 1965 to 2020, Miles 34-43



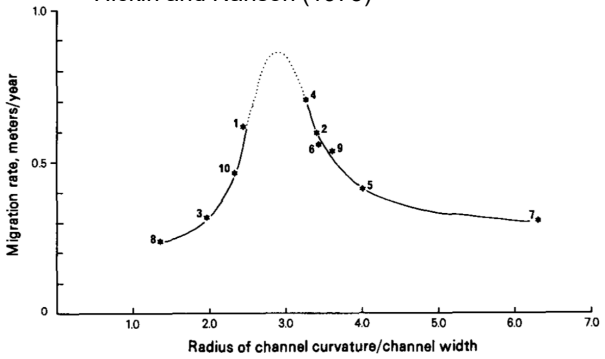




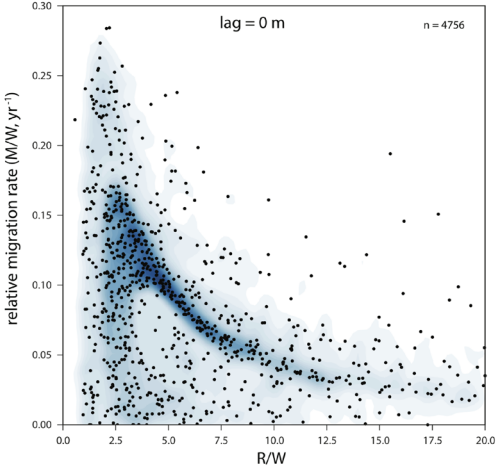
Examples of other applications

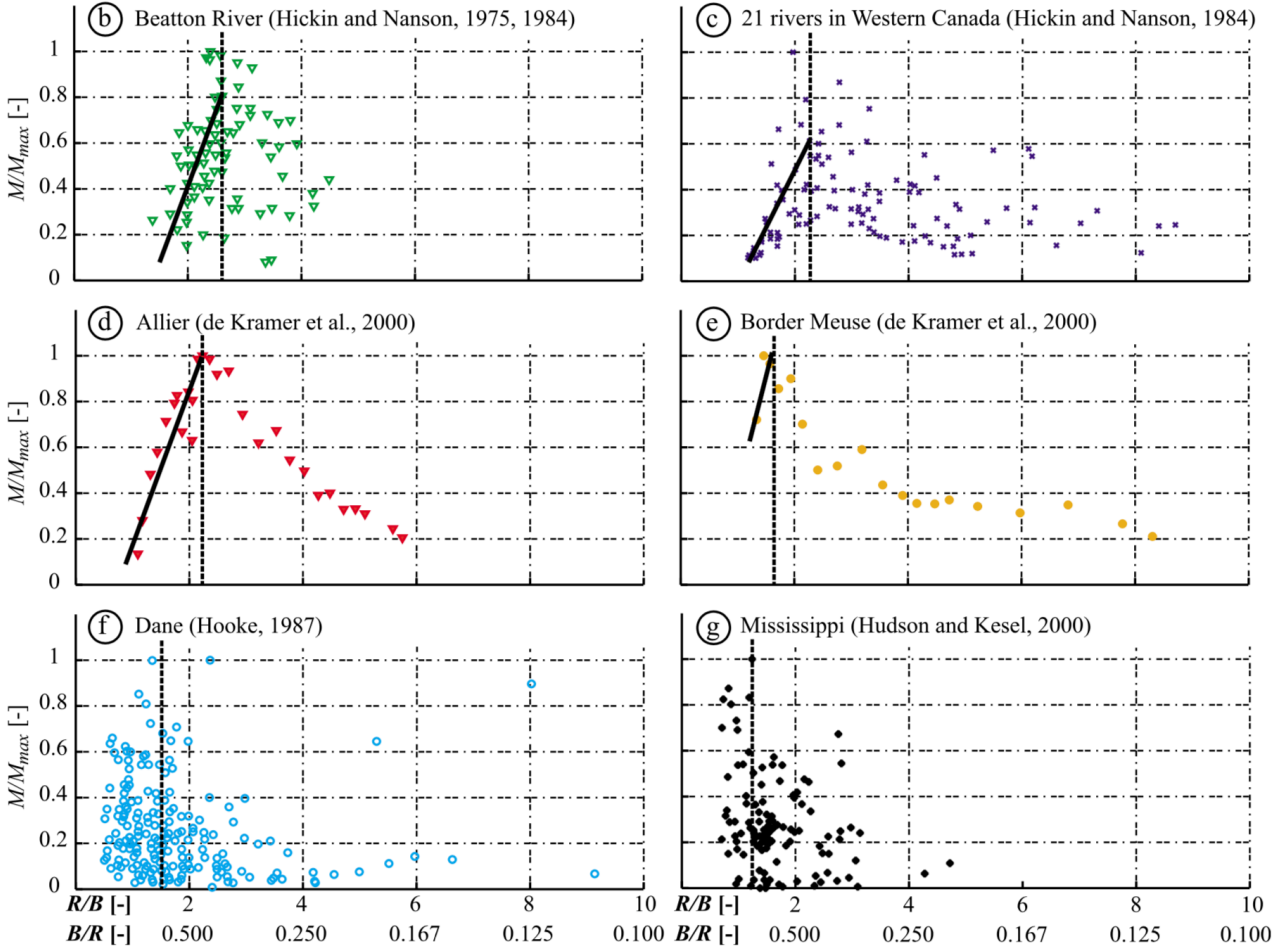
- Zone 2, Mile 11, Segment 2, North of 200th Street.
- In the 2000s the river jumps banks, leading to the bend to dry up.

Hickin and Nanson (1975)



Sylvester et al., (2019)





acknowledgments

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