Identifying and Assessing the Riparian Zones around the Mississippi River

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Research Topic

1. Identify riparian zones around the Mississippi River
2. Identify where potential riparian zone is missing
3. Spatially compare two different segments of the Mississippi River

Defining Riparian Zones

- Transitional zones

- Protect from surface water

- Absorb and breakdown
  chemicals

- Defined by…
  - Vegetation characteristics
  - Elevation/slope
  - Flood plain
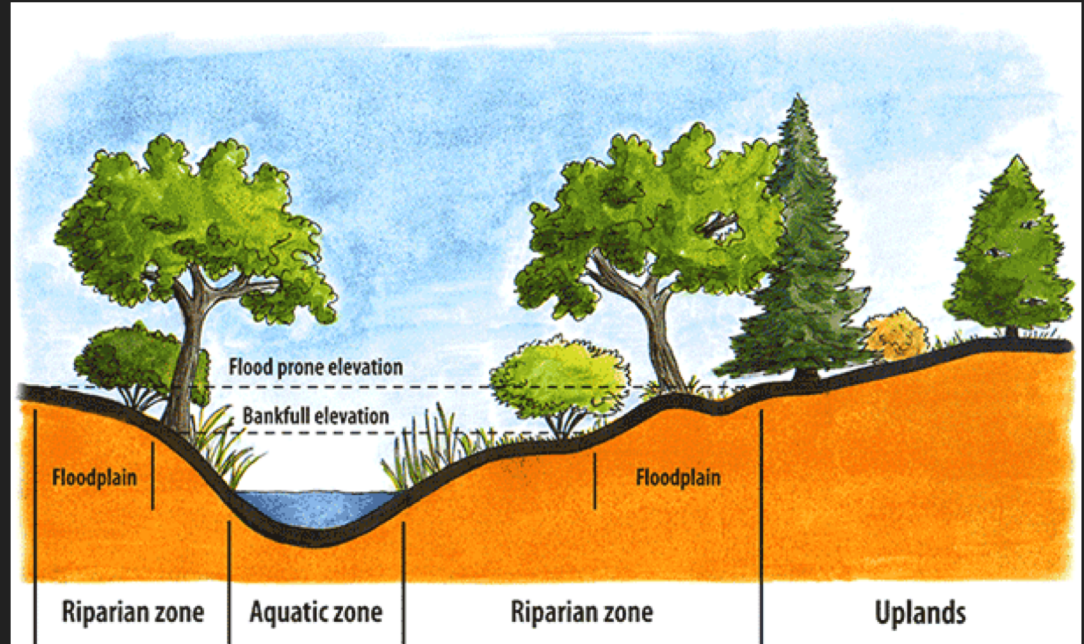
Starting Images

July 9th, 2018, Sentinel-2 Imagery

July 24th, 2018, Sentinel-2 Imagery

Upper Mississippi River Segment:

- Near Atkin, MN
- Rural
- Farming
- Forests
- Northern Minnesota

Lower Mississippi River Segment:

- Near St. Cloud, MN
- More "urban"
- Farming
- Central Minnesota
- Width of river

* Segments were approximately 8 miles of river

Areas of Interest

- Potential riparian zone defined as 50 m from water
- Classified images using unsupervised classification
  - K-Means Method: 15 classes, 20 iterations
- Recoded to create binary
- Created 50 km buffer
- Created subset image
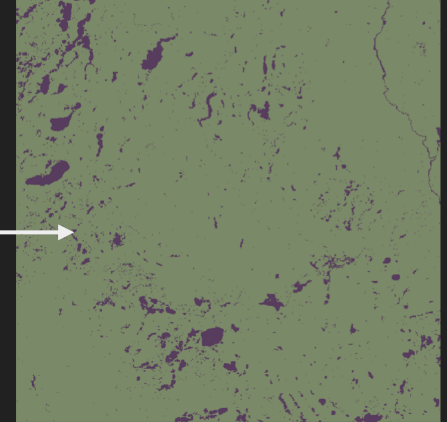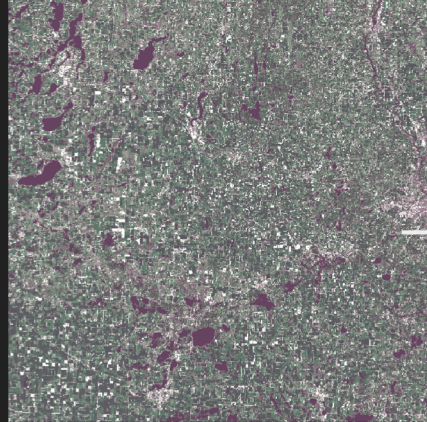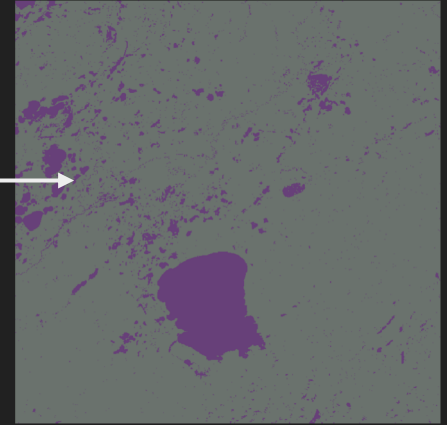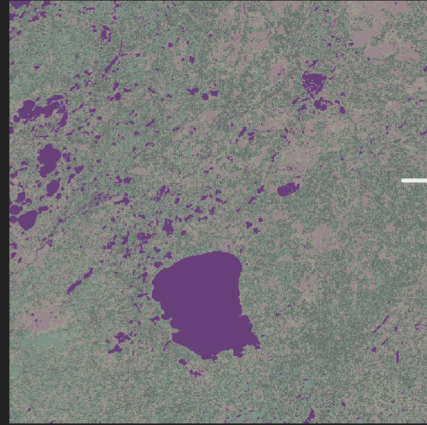
Classifying Land Covers

- Subset from classified images
    - K-Means Method: 15 classes, 20 iterations
- Visually compared classes
- Recoded to condense classes
    - Bare soil/built
    - Grasses or less dense vegetation
    - Forest or more dense vegetation
    - Water
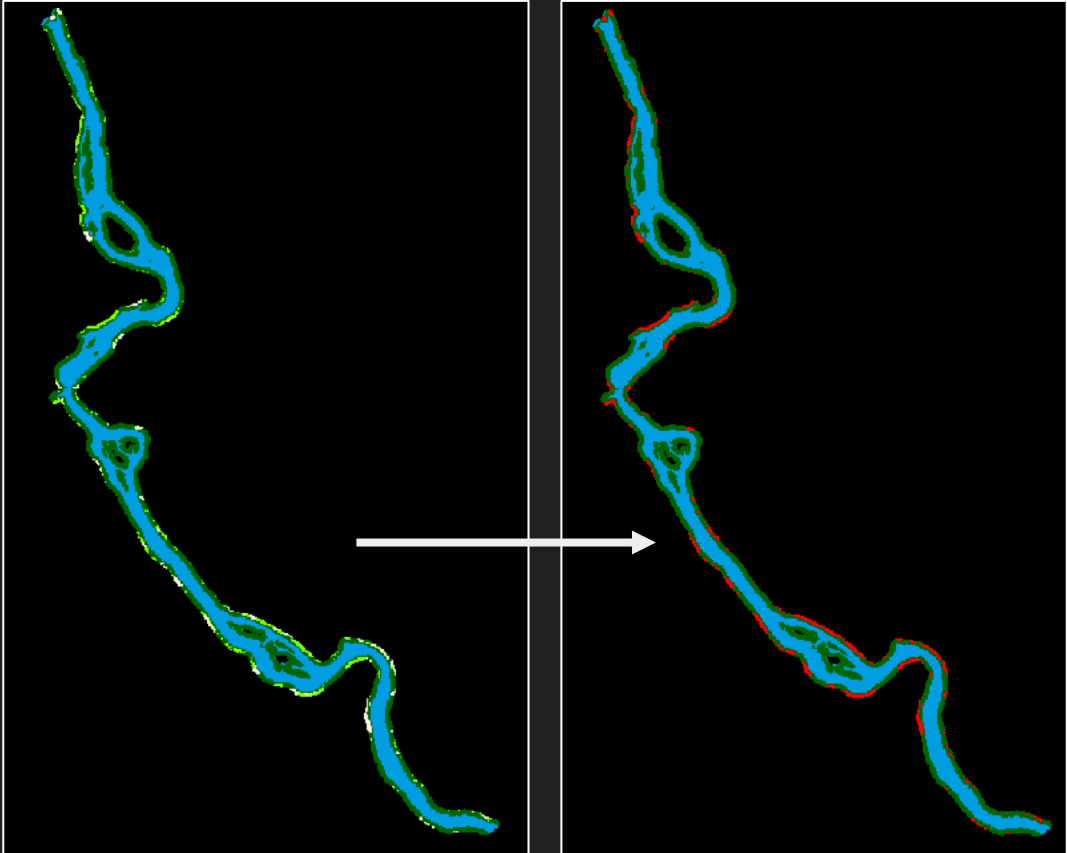- Recoded to create binary
    - More dense vegetation vs everything else
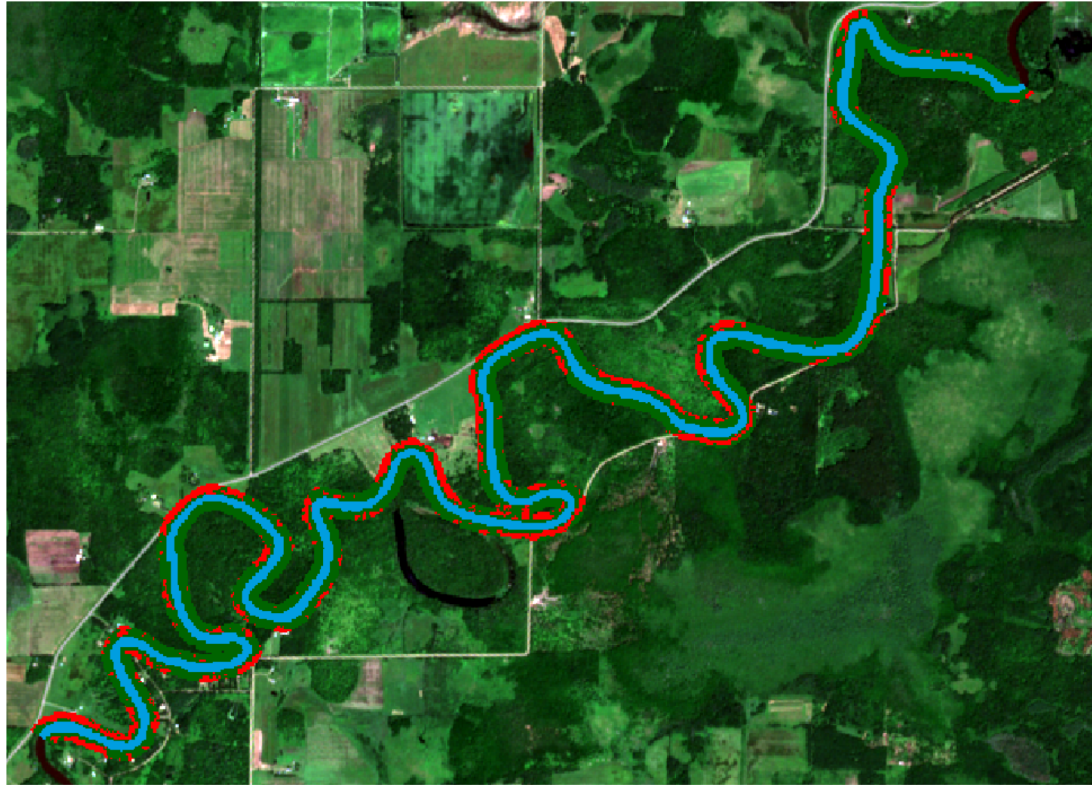   - More dense = proxy
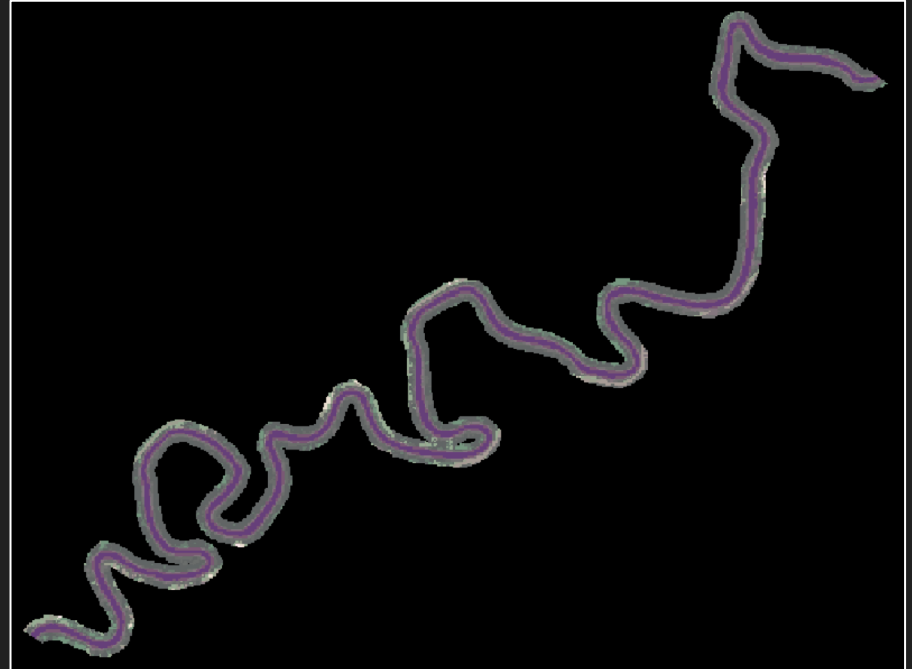
Upper Mississippi Segment:
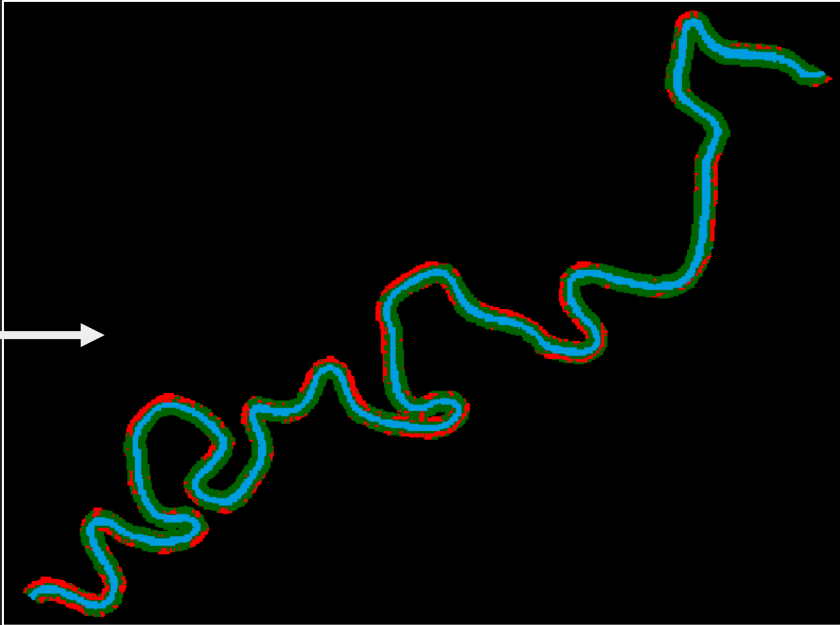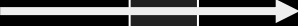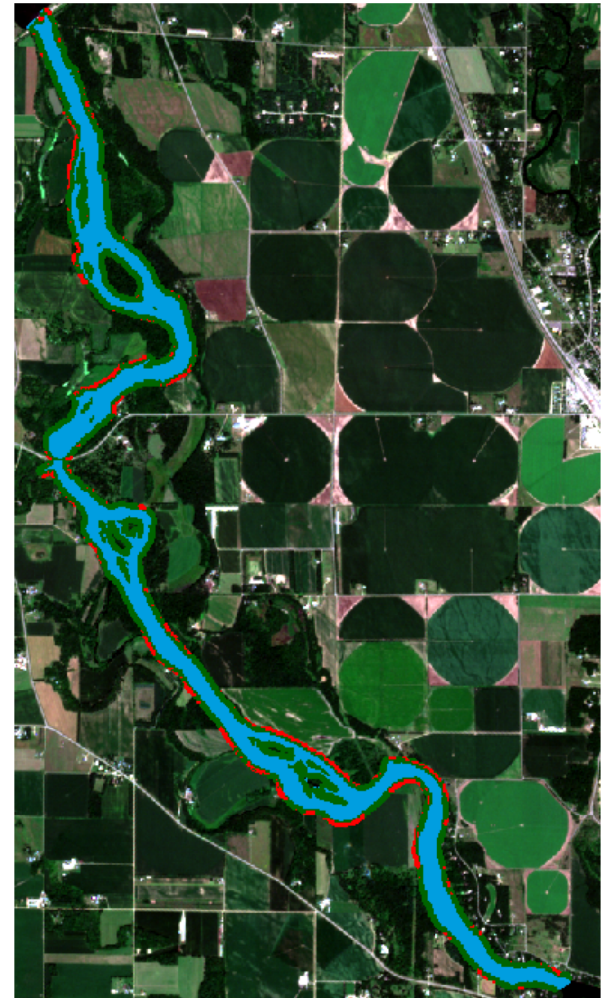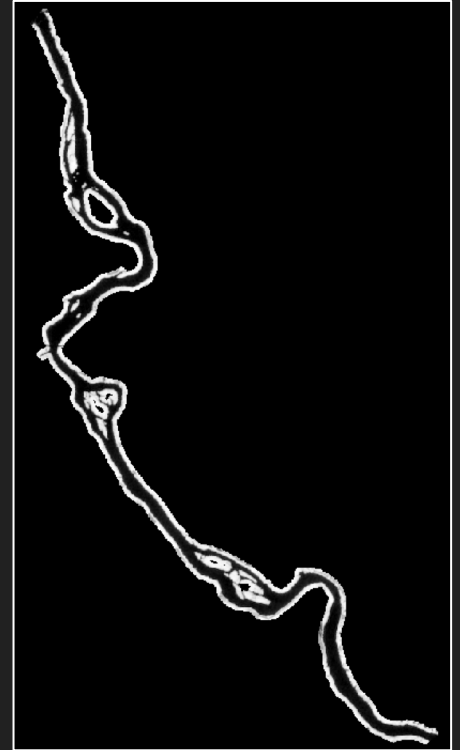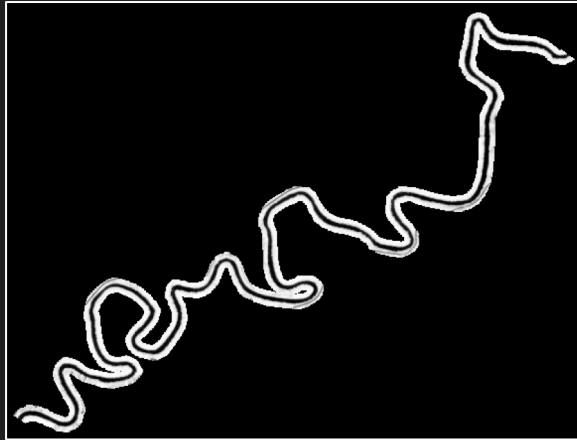
Lower Mississippi Segment:

Spatial Comparison

Water
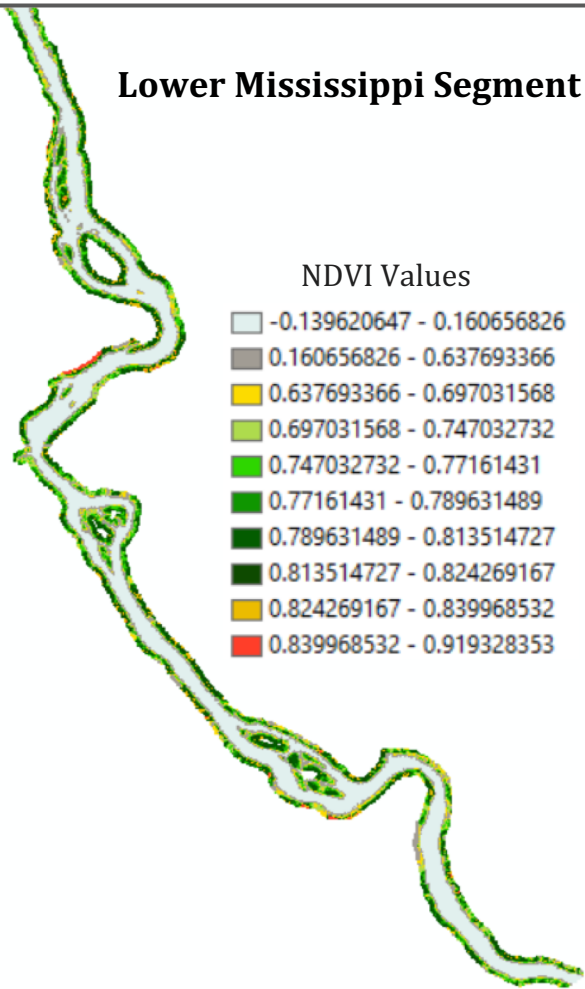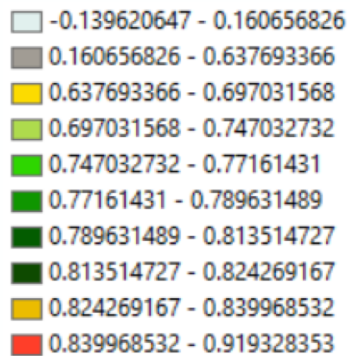Potential Riparian Zone
Lost Riparian Zone

Measuring Riparian Zones with NDVI

- Ran NDVI for the 2 segments

- Uploaded to ArcGIS

- Created new classes and assigned colors

    - 10 classes

    - same color scheme

- Created further nuance

Spatial Comparison

Lower Mississippi Segment

NDVI Values
- [ ] -0.139620647 - 0.160656826
- [ ] 0.160656826 - 0.637693366
- [ ] 0.637693366 - 0.697031568
- [ ] 0.697031568 - 0.747032732
- [ ] 0.747032732 - 0.77161431
- [ ] 0.77161431 - 0.789631489
- [ ] 0.789631489 - 0.813514727
- [ ] 0.813514727 - 0.824269167
- [ ] 0.824269167 - 0.839968532
- [ ] 0.839968532 - 0.919328353

NDVI Values
- [ ] -0.081155434 - 0.162615483
- [ ] 0.162615483 - 0.635841354
- [ ] 0.635841354 - 0.7429531
- [ ] 0.7429531 - 0.78503814
- [ ] 0.78503814 - 0.798711981
- [ ] 0.798711981 - 0.815424451
- [ ] 0.815424451 - 0.835840862
- [ ] 0.835840862 - 0.844443379
- [ ] 0.844443379 - 0.861763576
- [ ] 0.861763576 - 0.939334572

Upper Mississippi Segment

Analysis

- More difficult to see a
  difference than expected

- NDVI picked up on huge
  variation

- Inconclusive

Delineating Land Cover around the Mississippi River

Legend

Custom

- Water
- Forest or Denser Vegetation
- Grass or Sparser Vegetation
- Soil or Built

Scale

Kilometers

Map made by M. Kehew, May 6 2020
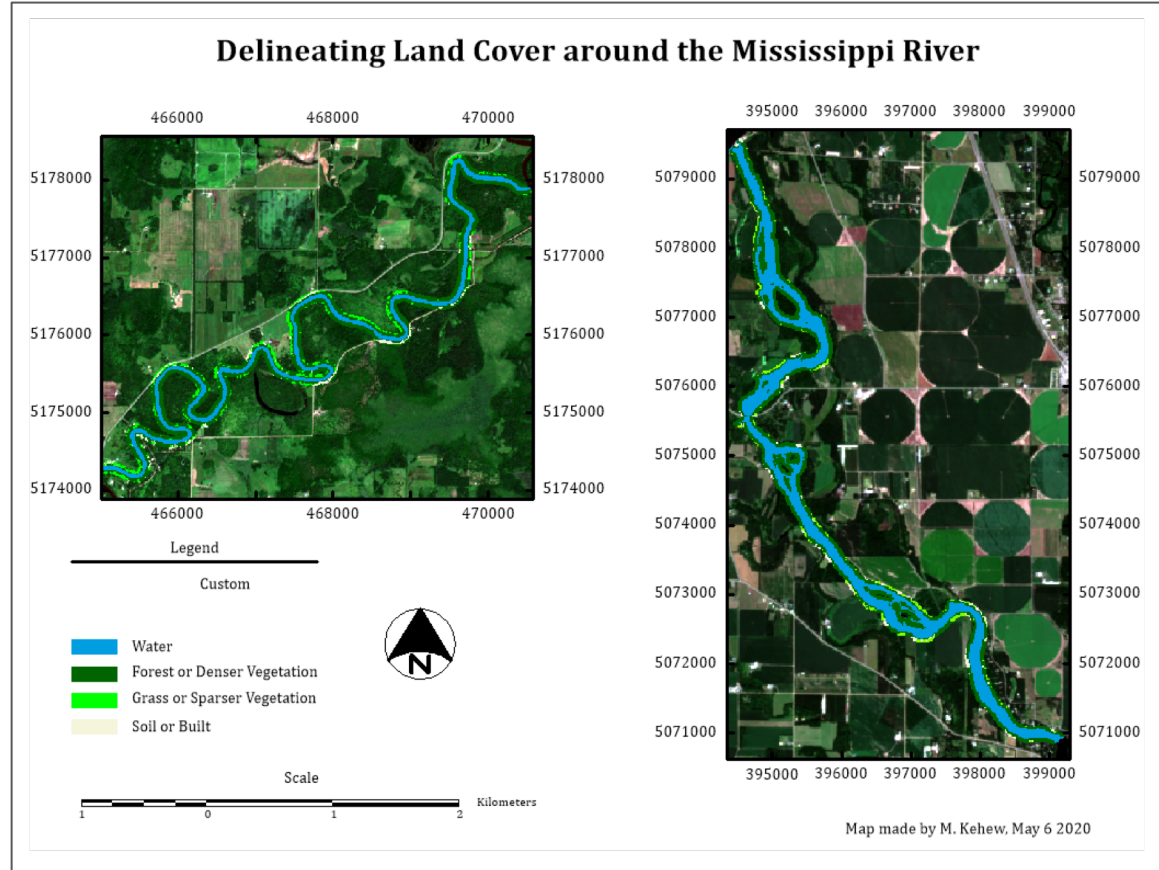
Limitations and Assumptions

- Defining Riparian Ecosystems

    - Need to take into consideration elevation

        and floodplains

    - Different buffer technique

- Smaller area, with greater resolution
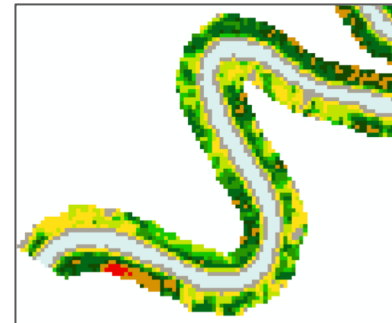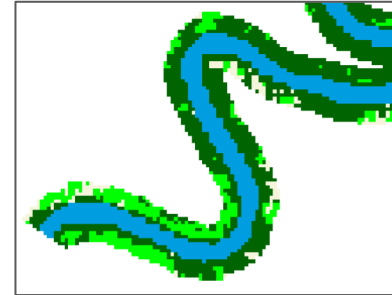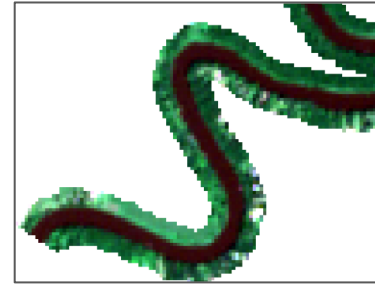
Sources

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Ilhardt, B., Verry, E., & Palik, B. (2000). Defining Riparian Areas. *Forestry and Riparian Areas Conference Proceedings,* 7-10. Klemas, V. (*2014*) Remote Sensing of Riparian and Wetland Buffers: An Overview. *Journal of Coastal Research: Volume 30, Issue 5:* pp. 869 – 880.

Klemas, V. (*2014*) Remote Sensing of Riparian and Wetland Buffers: An Overview. *Journal of Coastal Research: Volume 30, Issue 5:* pp. 869 – 880.

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