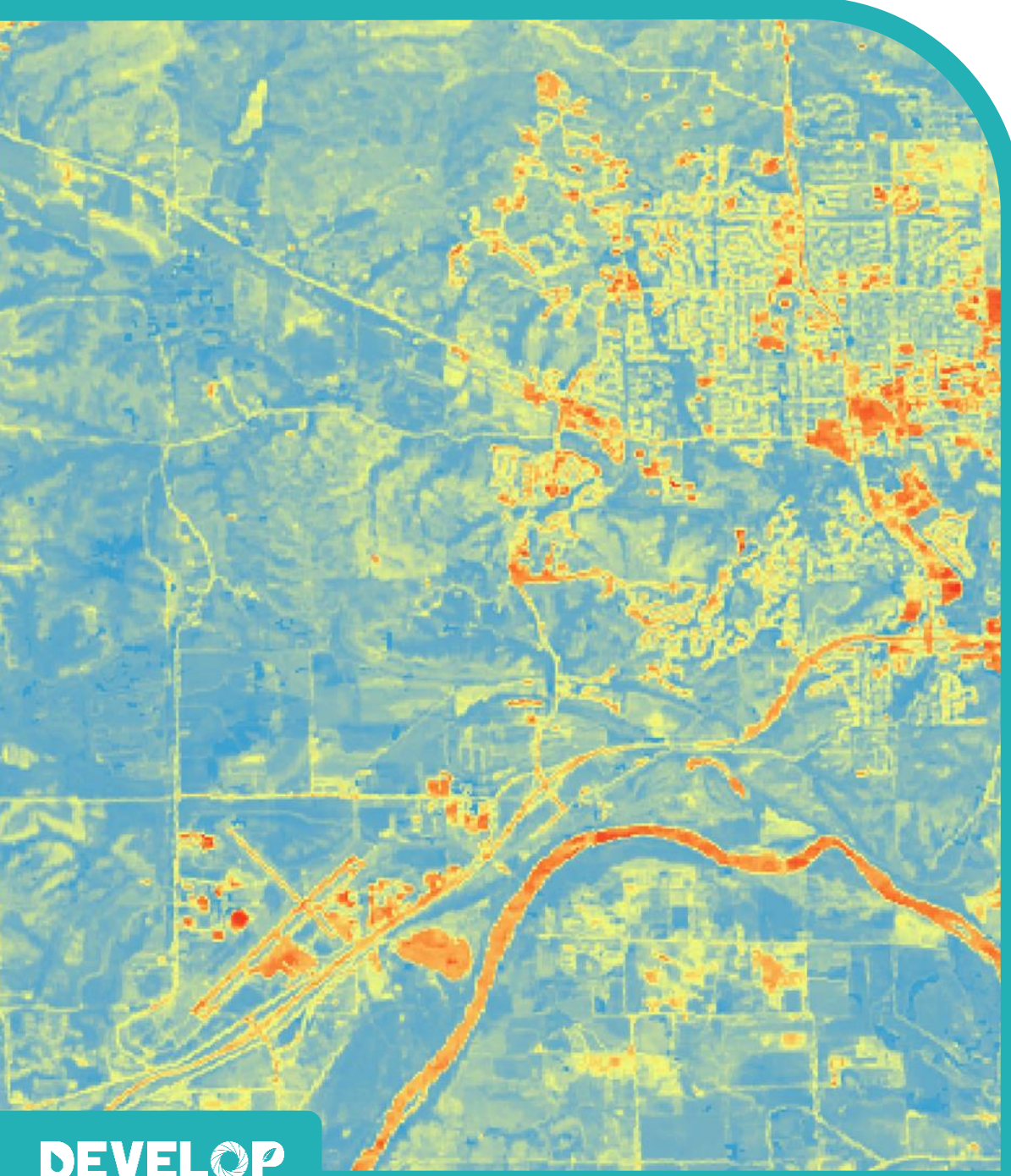

National Aeronautics and Space Administration

Riley County
Water Resources

Comparing Curve Calculation Methods to Inform Local Resiliency Initiatives in Riley County, Kansas

Trista Brophy, Ella Griffith, Elizabeth Nguyen, Adelaide Schmidt

DEVELOP

Virginia – Langley | Summer 2020

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Project Overview

Results & Conclusion

Data Summary

Methodology Tutorials

Scientific Problem

Runoff Curve Number (CN) is an estimate of water runoff over a specific land cover type

CN is a static method that does not account for seasonal variability

Create LULC maps to highlight both detailed urban and agricultural land use

Objectives

- Conduct and compare two methods of curve number calculation: traditional method and a dynamic method
- Provide project partners with updated LULC maps
- Provide project partners with a tutorial on how to calculate a dynamic, NDVI-based curve number

Study Period

Annual Rainy Season	Early Rain Season	Late Rainy Season
March	March	June
September	May	September

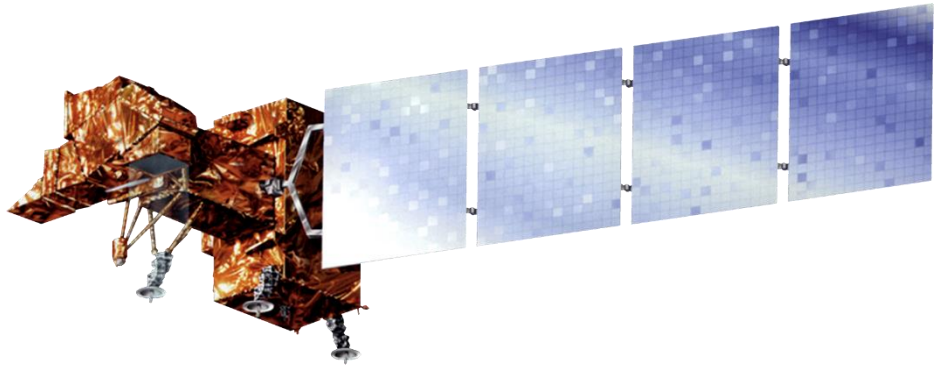
NASA Earth Observations

Landsat 5 TM

- 2006 - 2012

Landsat 7 ETM+

- 2013



Landsat 8 OLI

- 2014 - 2020

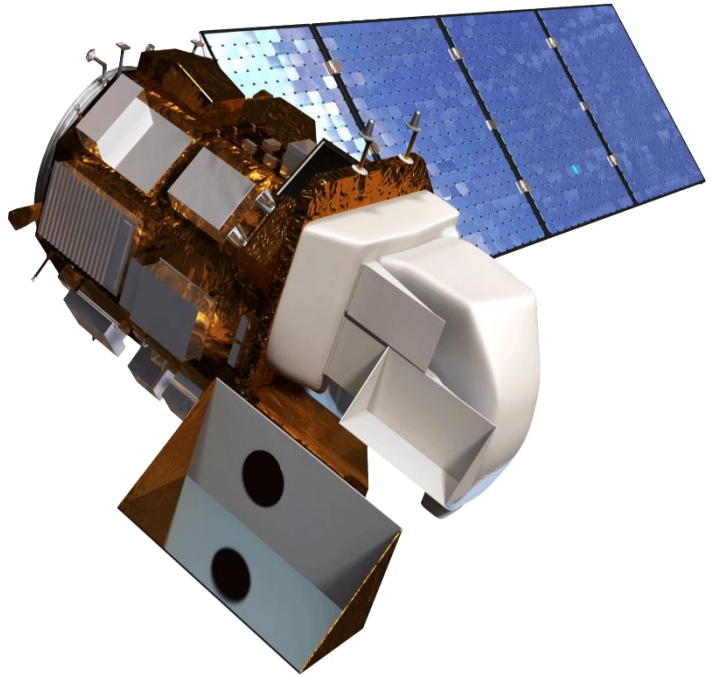
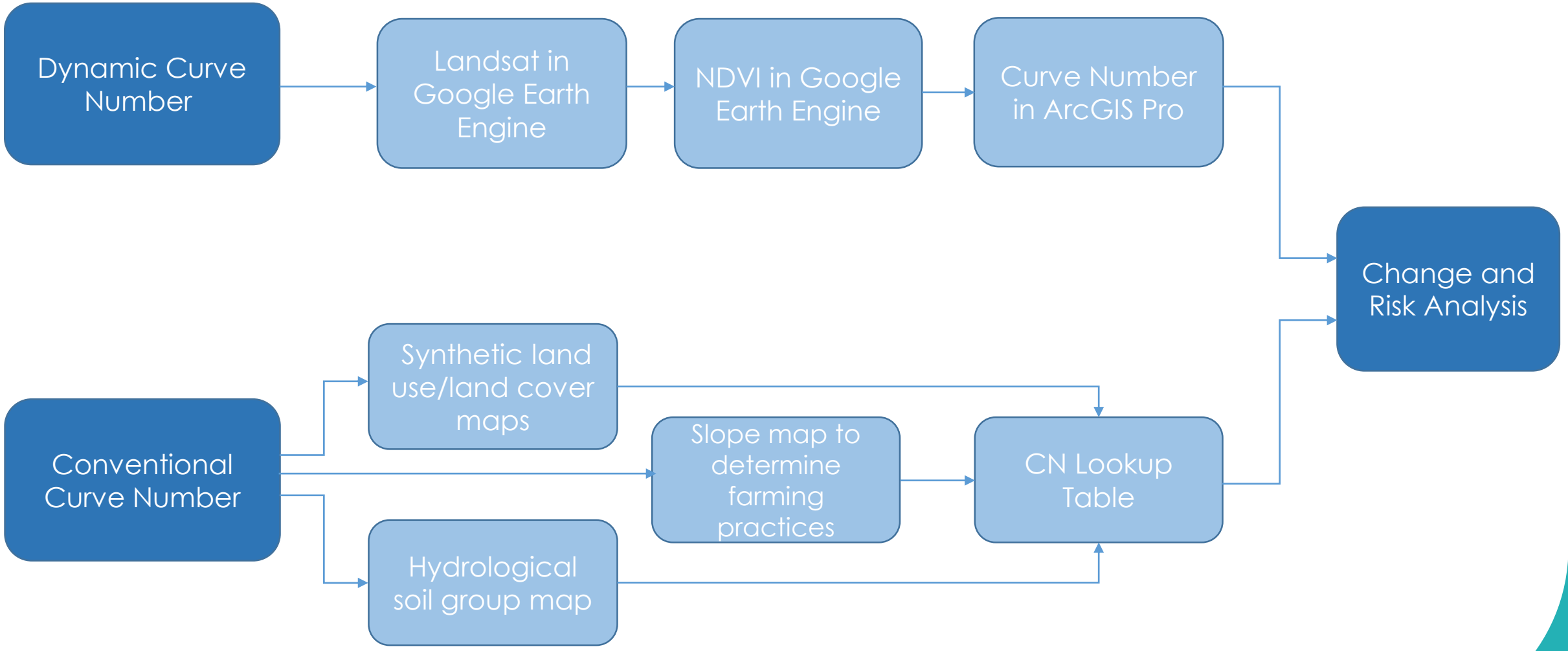


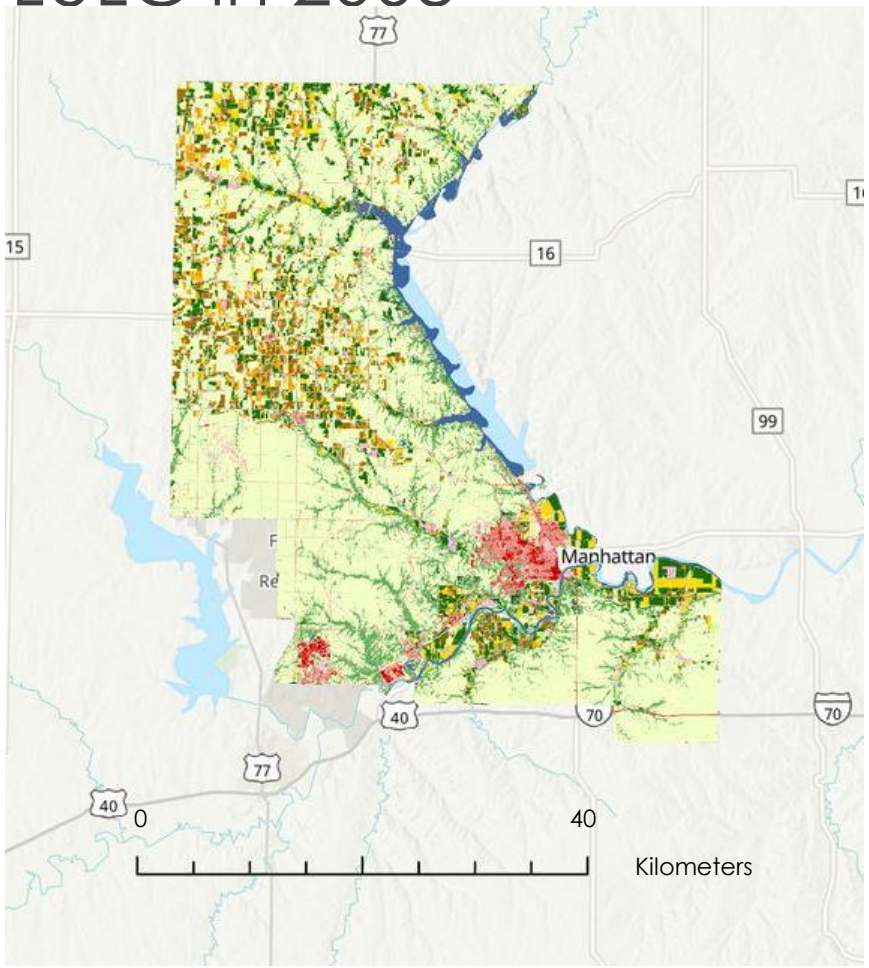
Image credit: NASA

Methodology



Results: Land Use Land Cover Change

LULC in 2008



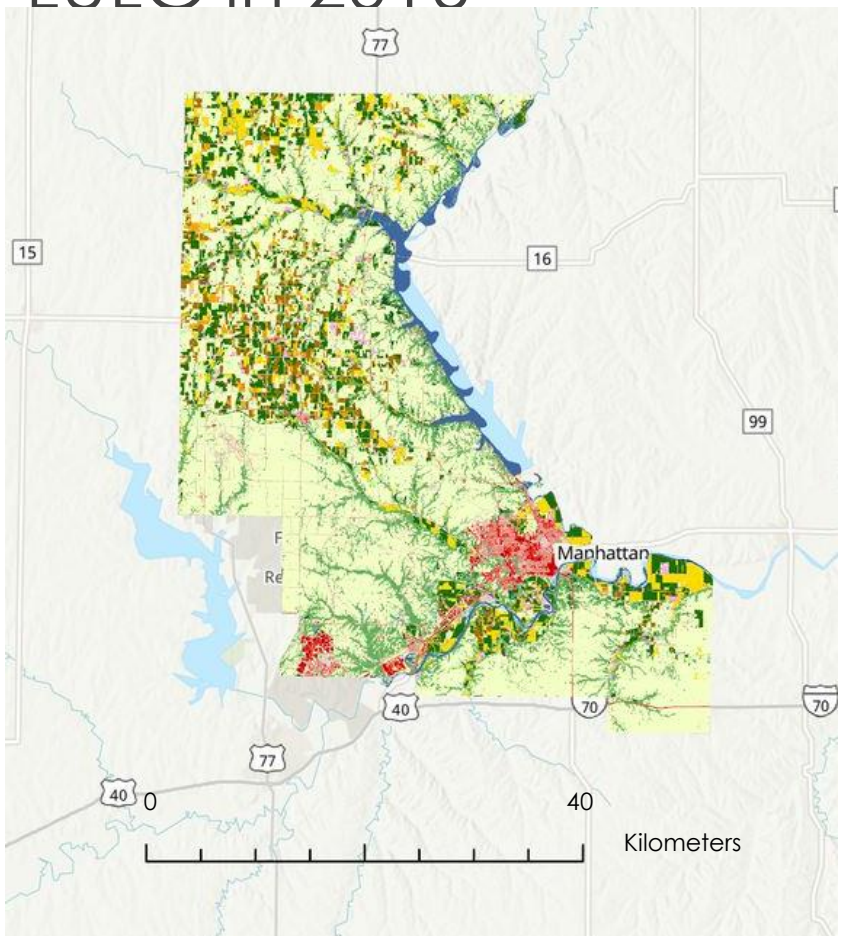
Water

Grass/pasture

Urban/developed

Various agricultural

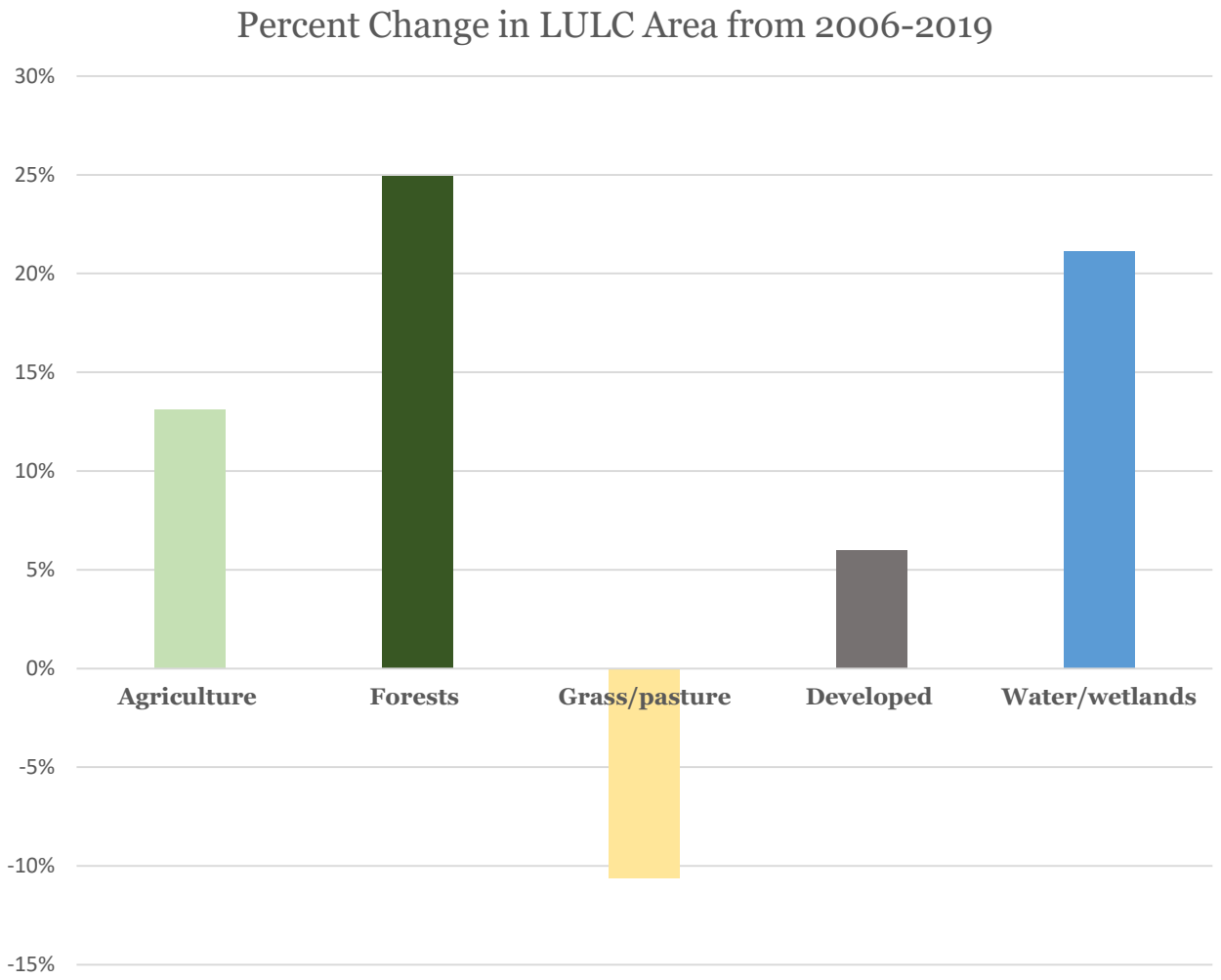
LULC in 2016



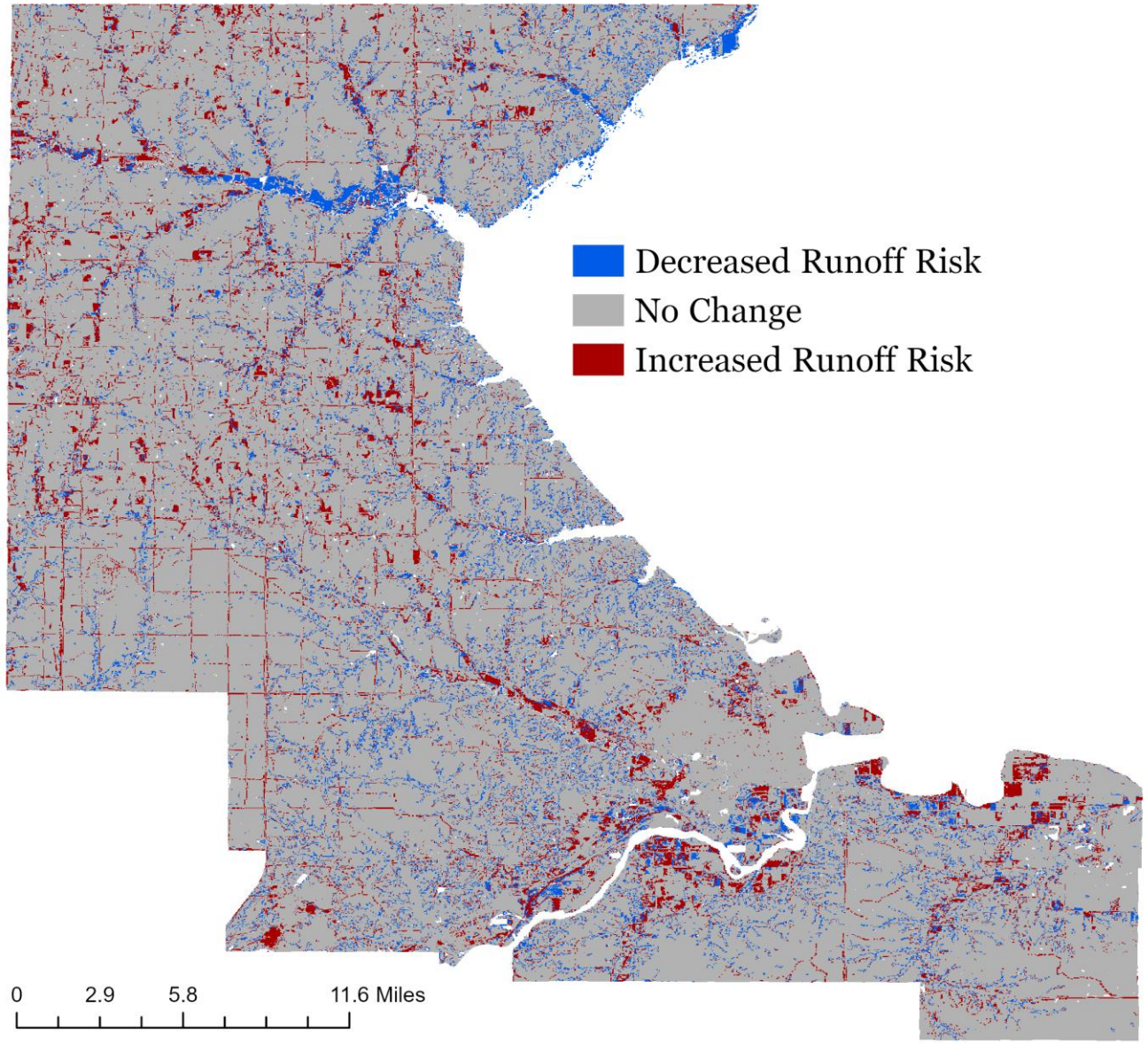
Results: Land Use Land Cover Change

LULC trends from 2006 to 2019:

- Grass/pasture decreased by 11%
- Agriculture increased by 13%
- Urban/developed increased by 6%



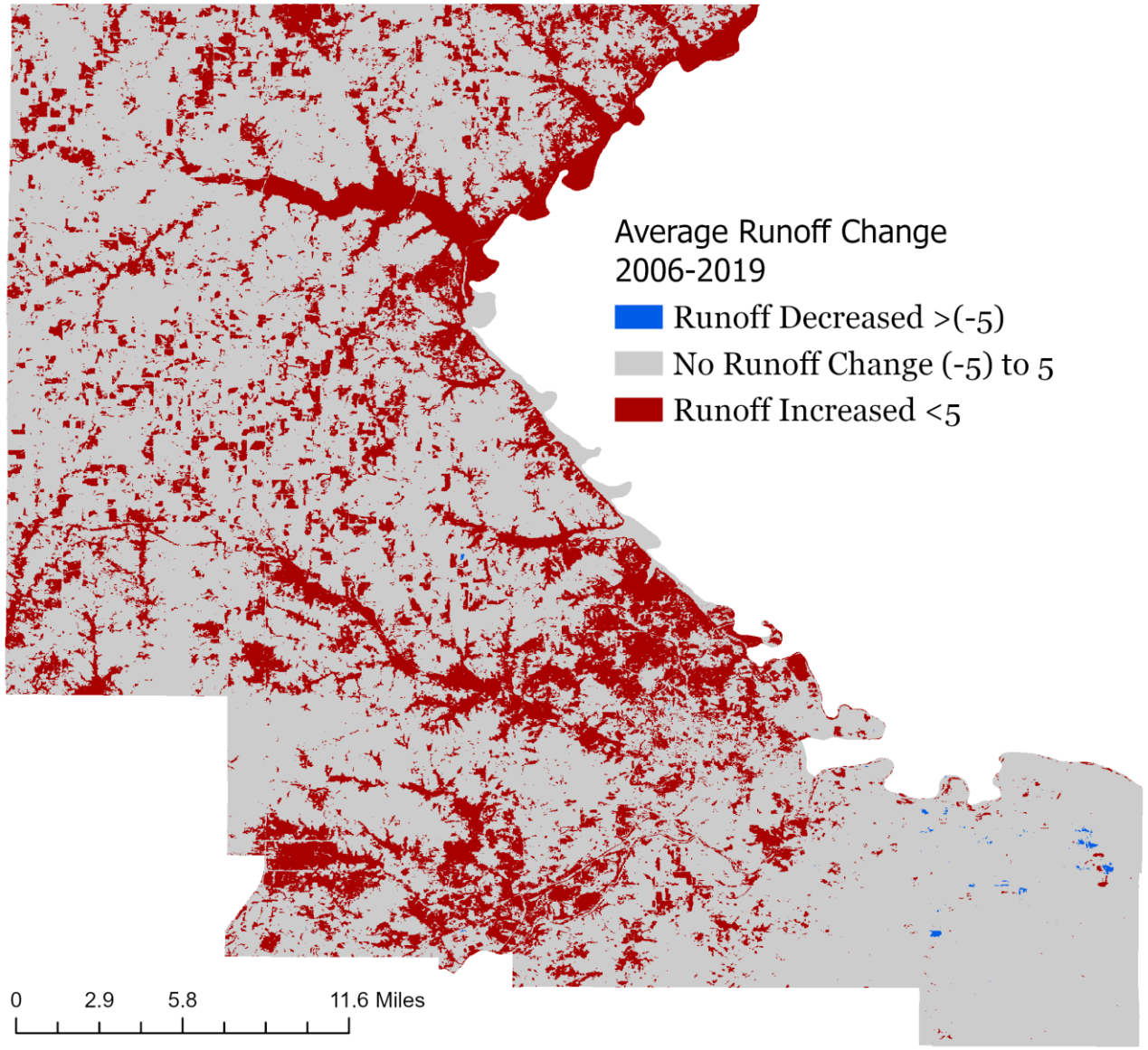
Results: Conventional CN Change



Change in average runoff between 2006 to 2019

- 10,600 acres showed increased runoff risk
- 9,500 acres showed decreased runoff risk
- 117,000 acres showed no change in curve number

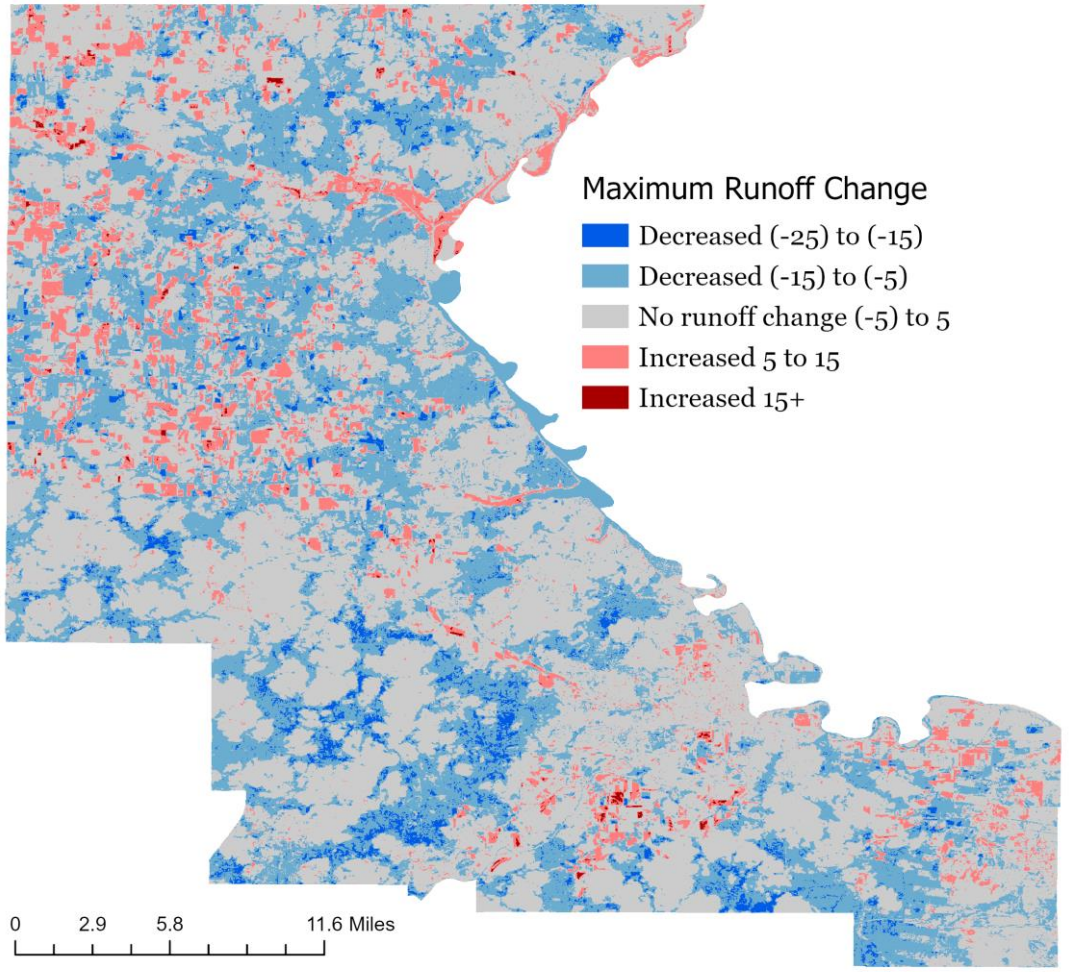
Results: Dynamic Average CN Change



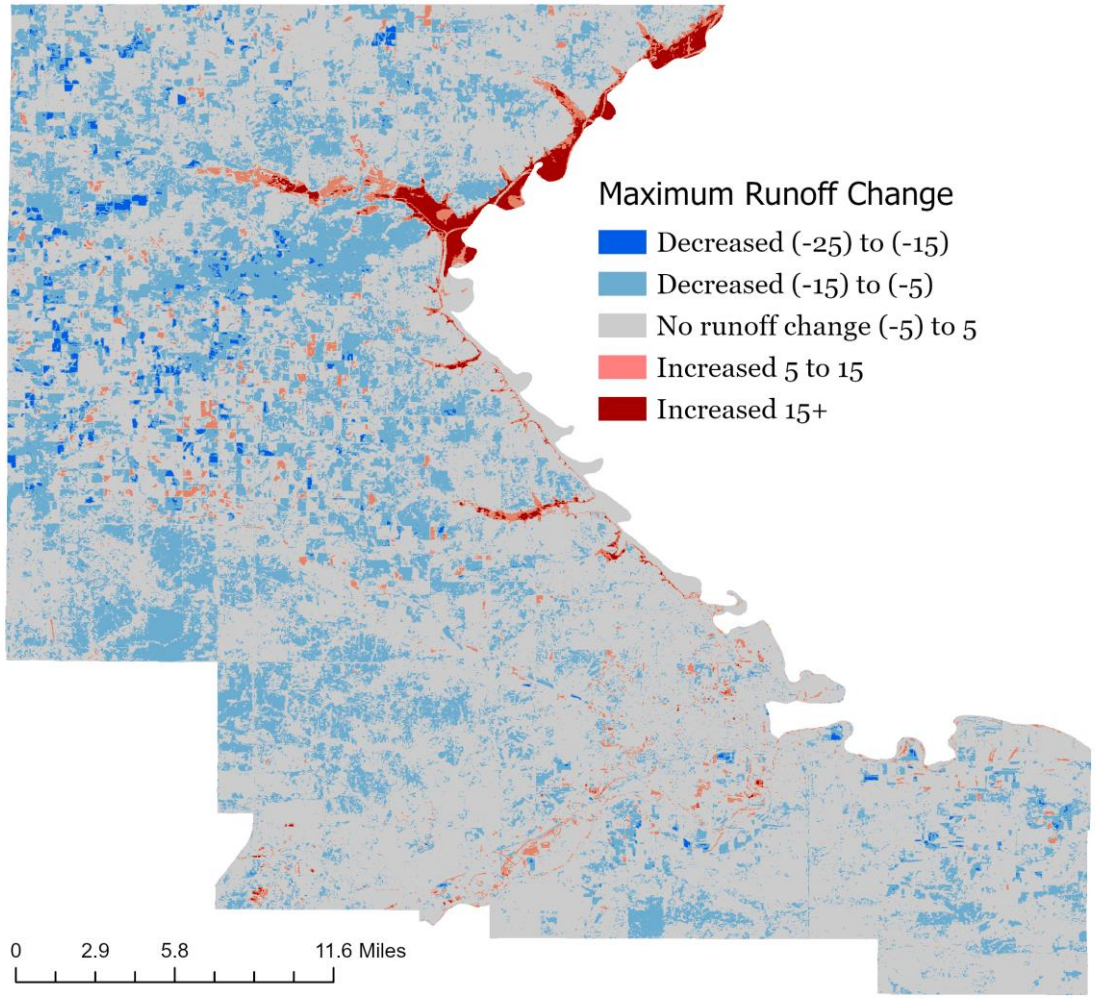
Change in average runoff between 2006 to 2019

- Overall increase in average runoff risk
- Risk is displayed in increments

Results: Early vs. Late Rainy Season
Max CN Change

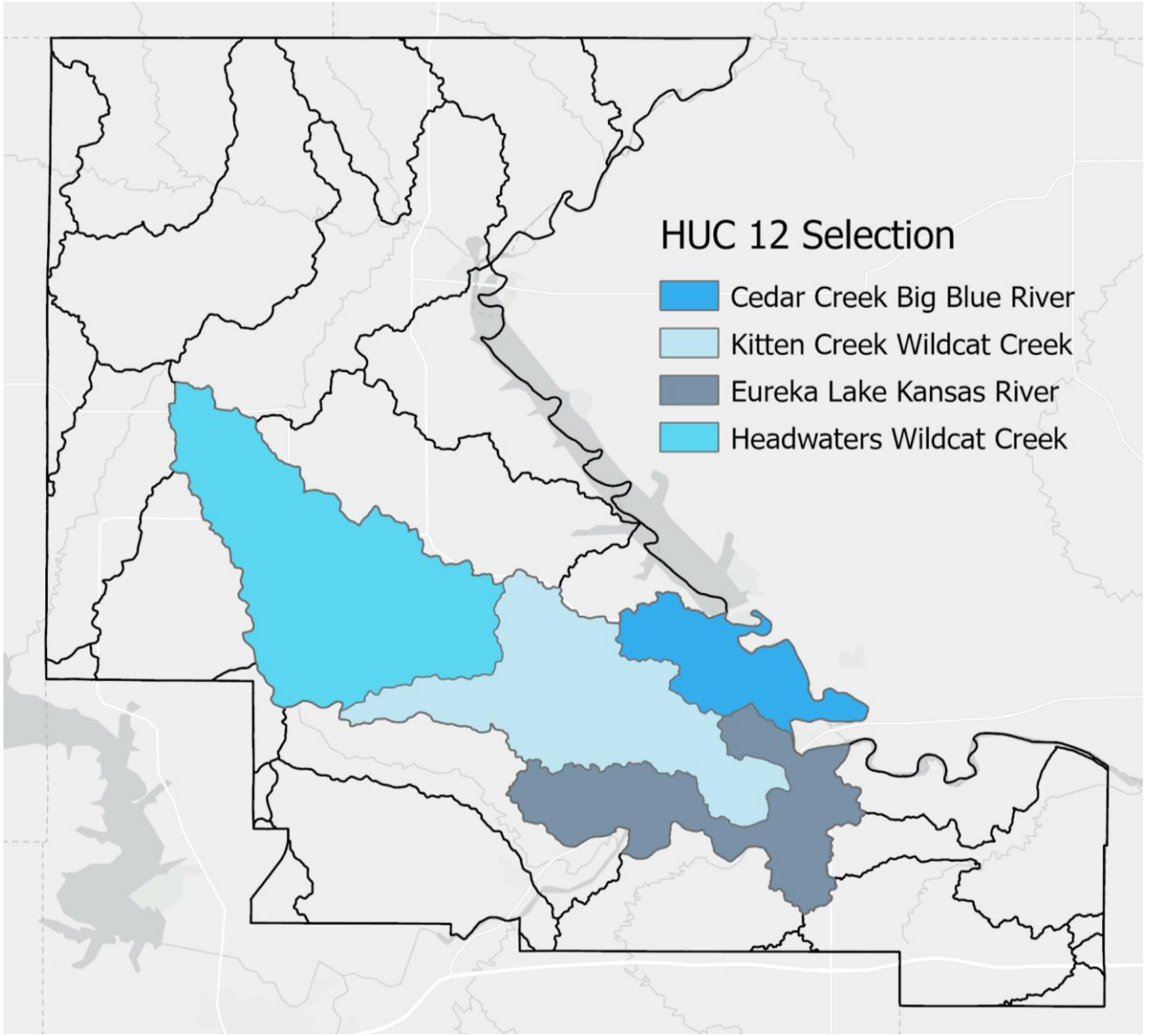


Early rainy season

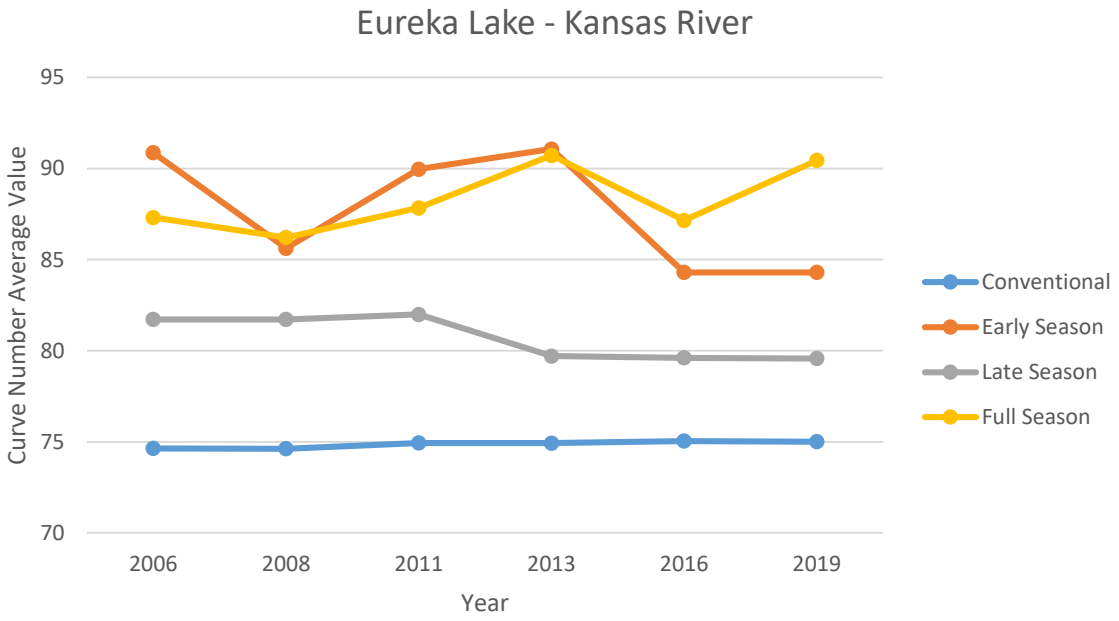


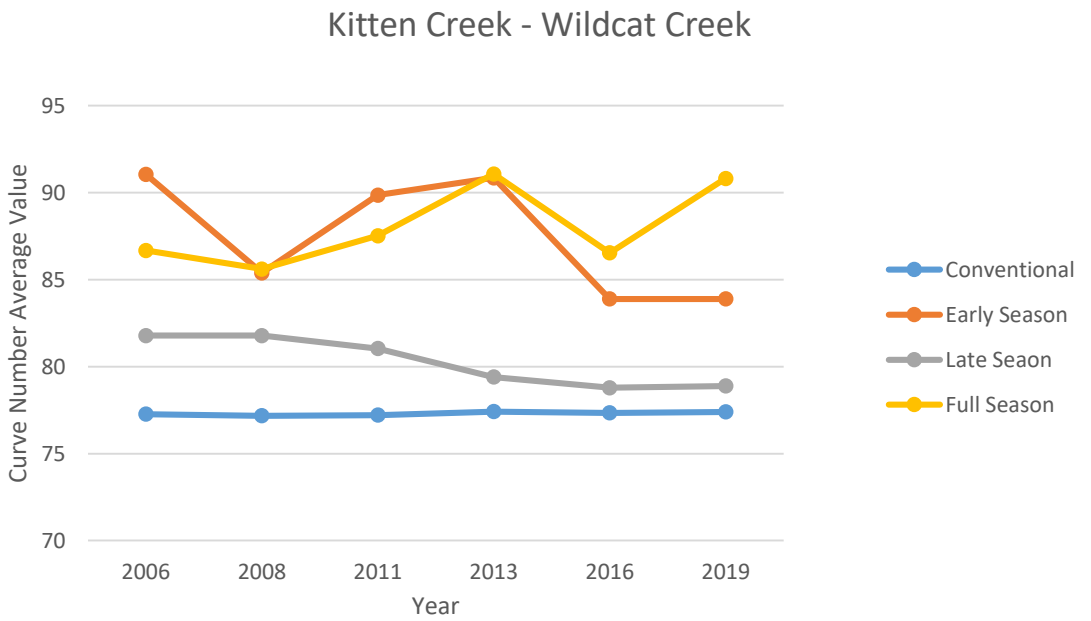
Late rainy season

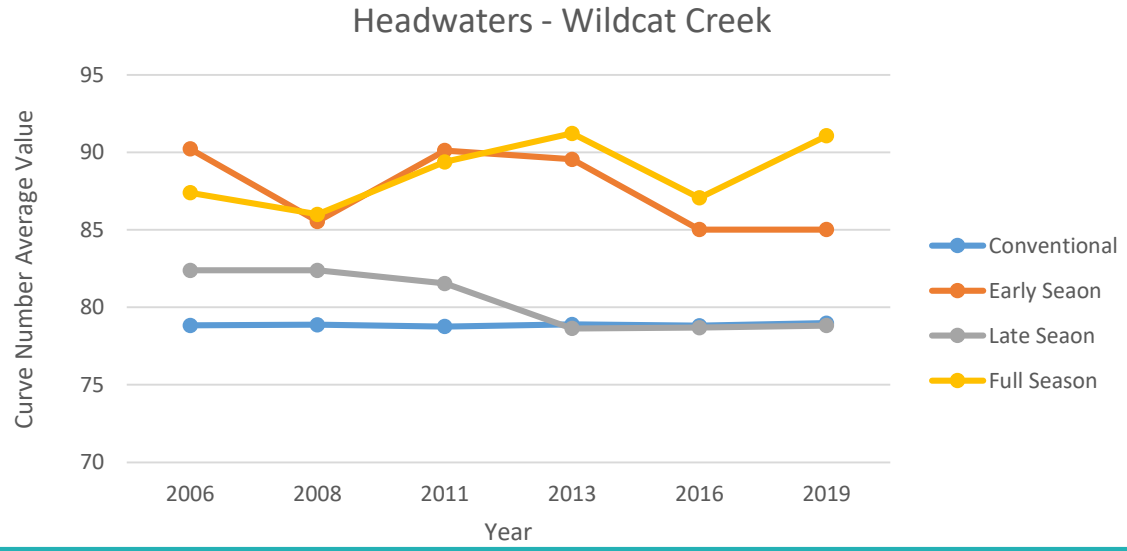
Results: HUC-12 Watershed Level Zonal Statistics

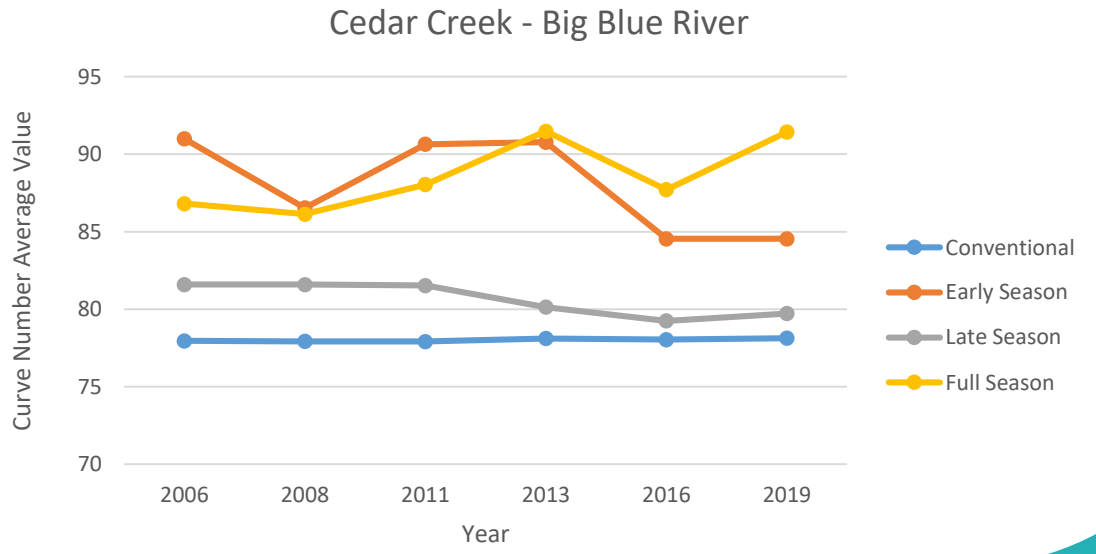


Results: HUC-12 Watershed Level Zonal Statistics









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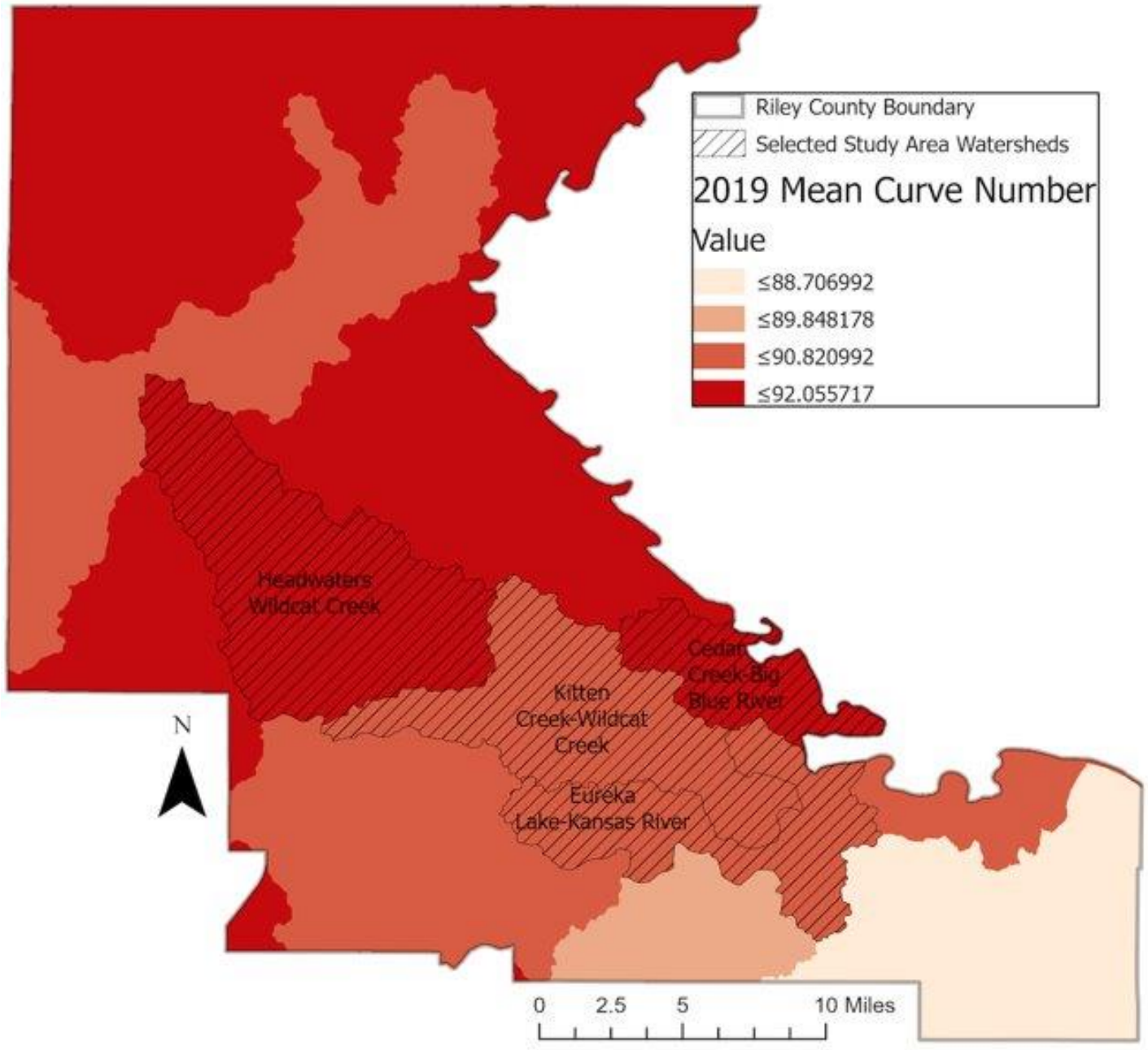
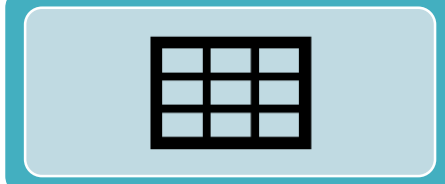


Conclusions

- LULC for developed areas increased by 6%. Increases in impervious surface increase chances for runoff
- Runoff risk increased in 2.67% of the county over 13 years
- Dynamic CN shows more variability
  - Allows for seasonal analysis
  - Overall runoff increased across the county

Data Summary

Dynamic NDVI-based Curve Number Maps



Conventional Curve Number Maps & Tables

Land Use Land Cover Maps

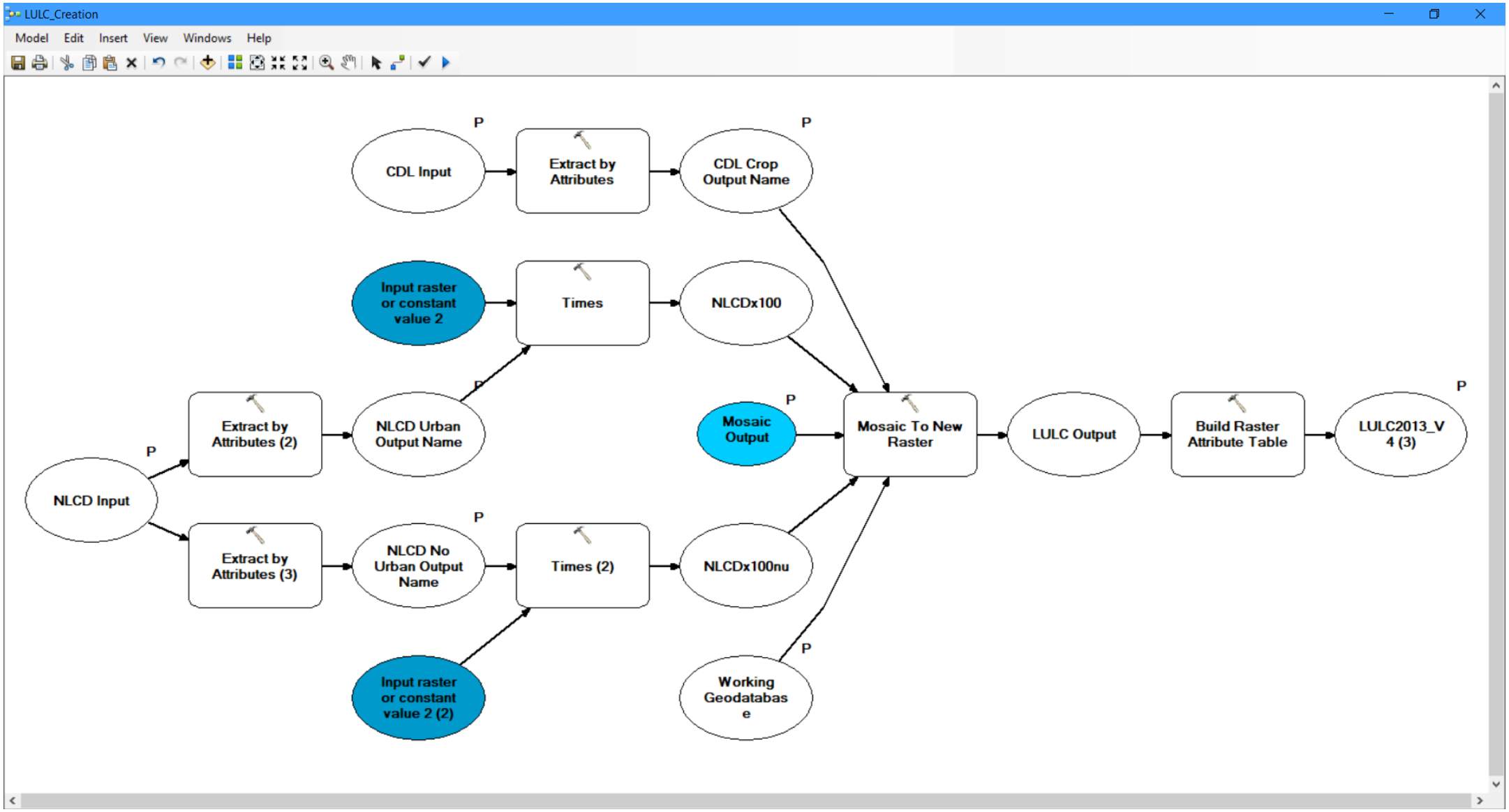
Tutorial of Methods

Story Map

Future Work

- Incorporate precipitation data to understand the role intensity and frequency of rainfall may play in exacerbating runoff
- Include various farming techniques to determine changes in runoff for different tillage methods
- Model the area with the Soil and Water Assessment Tool (SWAT) to better quantify the impacts of land use and land cover practices over watersheds

LULC Tutorial



Conventional CN Tutorial

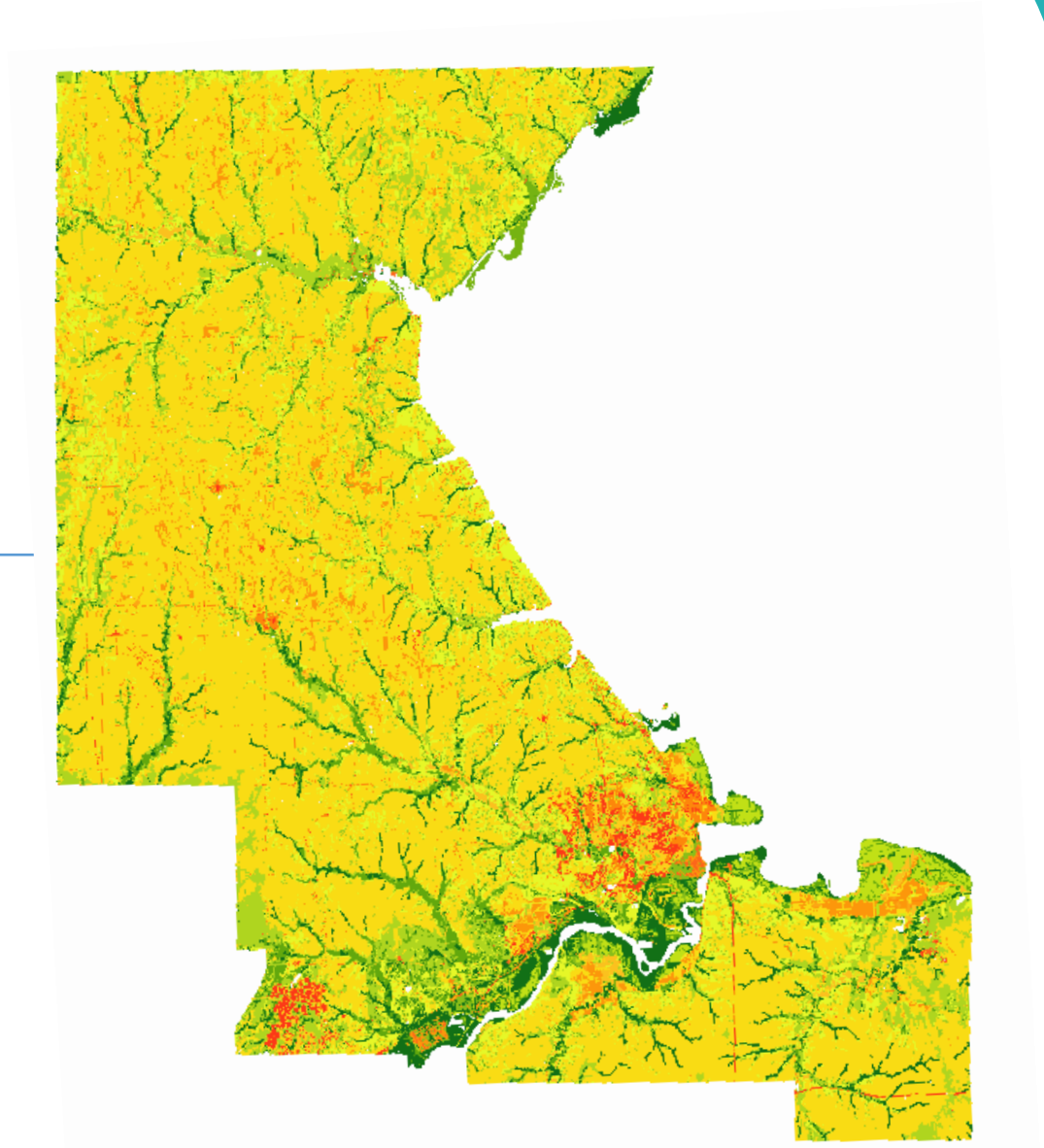
Synthetic land use/land cover maps

Hydrological soil group map

Slope map to determine farming practices

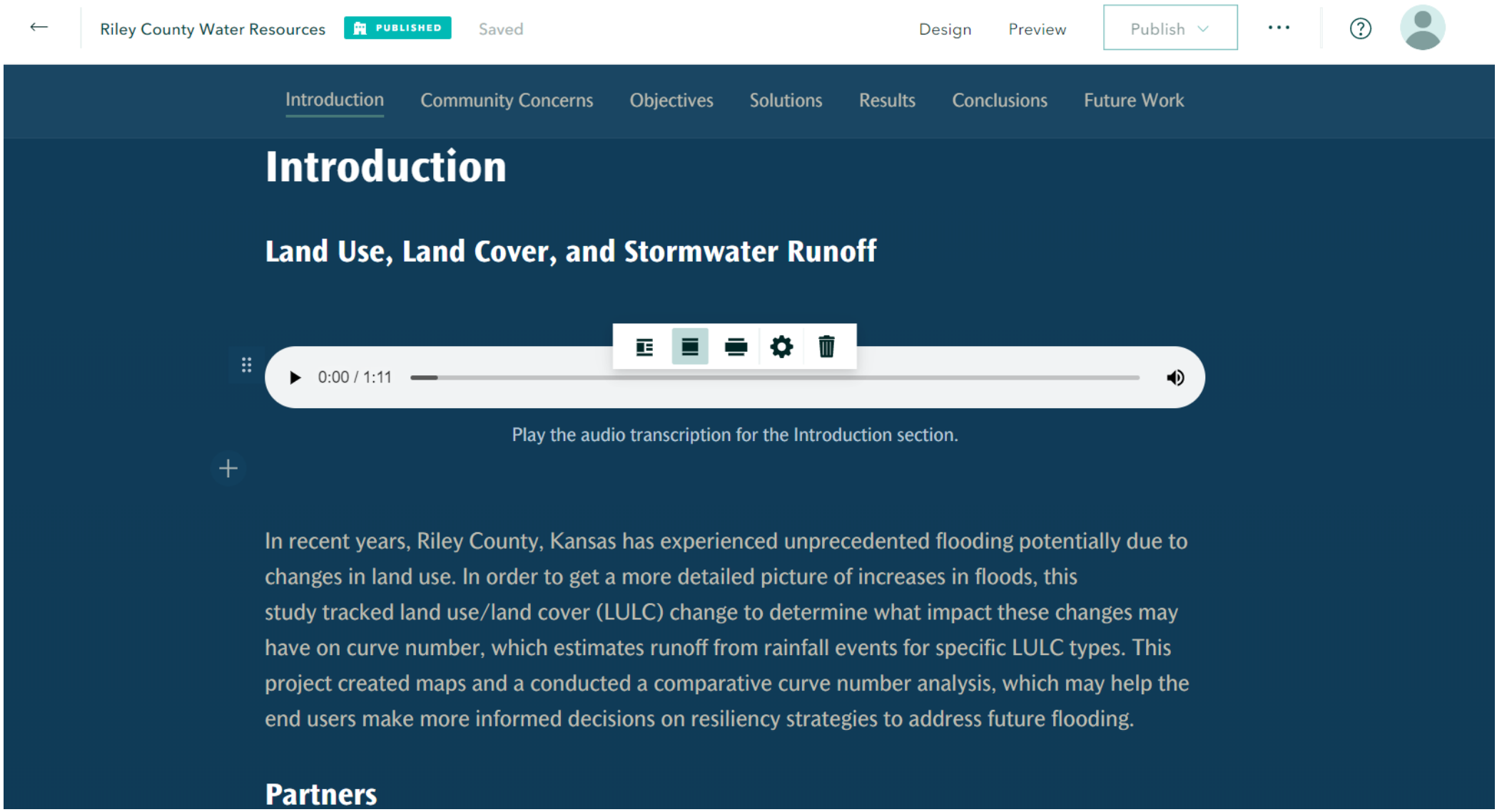
Combine Datasets

Apply CN Lookup Table



Dynamic CN Tutorial

ArcGIS StoryMap



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NASA Science Advisor

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