



# PLATTE RIVER BASIN WATER RESOURCES II

Predicting Land Cover Change in the  
Platte River Basin to Select Wetland  
Protection Sites Vulnerable to Urban  
Encroachment

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# Background

- ▶ **Platte River Basin (PRB)** – Most prominent waterway system in the US Northern Great Plains; a major river in Nebraska (563 km)  
Tributaries:
  - ▶ North Platte (1 690 km) flows into Wyoming
  - ▶ South Platte (706 km) flows into Colorado
- ▶ **PRB** wetlands are crucial for wildlife biodiversity and provide essential ecosystem services
- ▶ **Major challenges:**
  - ▶ Climate change that causes extreme weather events
  - ▶ Pressure from urban development encroachment



Image Credit: Napa

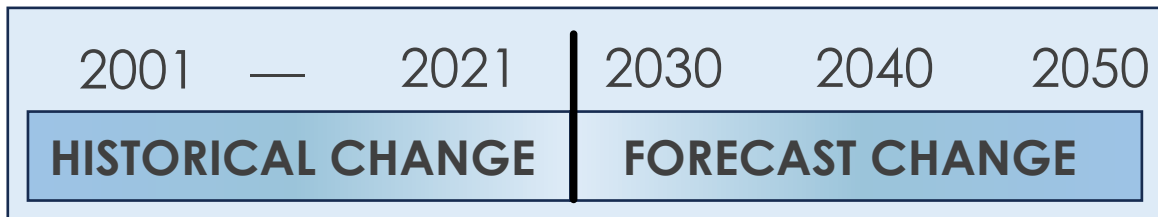


# Study Area & Period

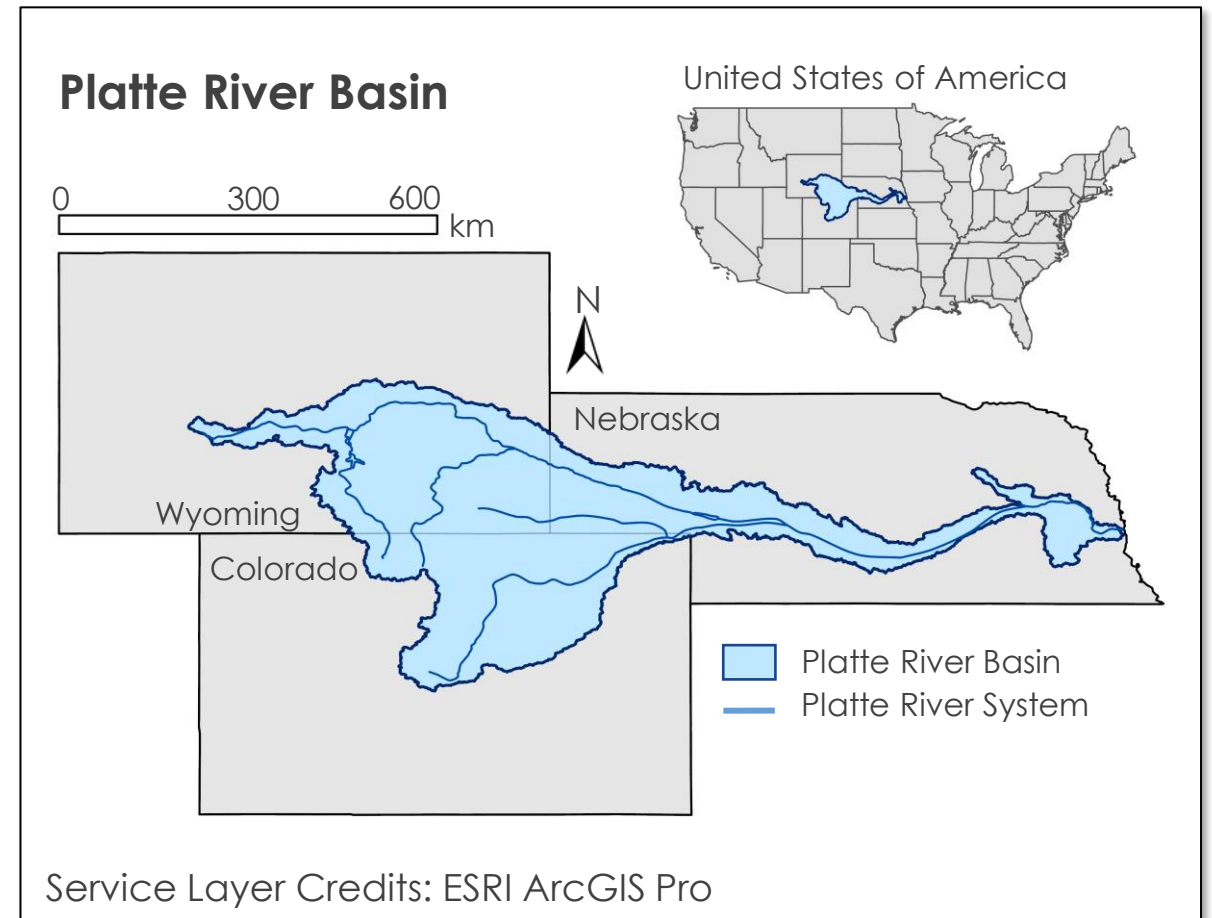
## ► Study Area

- Platte River Basin in Nebraska, Colorado, and Wyoming
- Nearly **223,000** square kilometers

## ► Study Period



- **50 years total**



# Partner Organization

## Audubon Great Plains

The National Audubon Society regional office for Nebraska, North Dakota, and South Dakota.

***"Where birds thrive, people prosper"***

**Goal:** Using science, habitat restoration, outreach, and education to address the core threats faced by birds in the region.

**Mission:** Protect birds and the places they need, today and tomorrow.



Image Credit: Larry Crist



# Community Concerns

```
graph TD; A[Urbanization] --> B[Wetland Degradation]; A --> C[Habitat Fragmentation]; B --> D[Flooding]; B --> E[Bird Habitat Loss]; C --> F[Community Green Space Loss];
```

## Urbanization

Image Credit: Ryan Renner

## Wetland Degradation

Image Credit: USDA

## Habitat Fragmentation

Image Credit: Andrew Filer

## Flooding

Image Credit: Diana Fredlund

## Bird Habitat Loss

Image Credit: Larry Crist

## Community Green Space Loss

Image Credit: Chuck Haacker

# Project Objectives



**Model** future urban growth in the Platte River Basin



**Produce** Land Use Land Cover (LULC) Change maps  
for 2030, 2040, and 2050

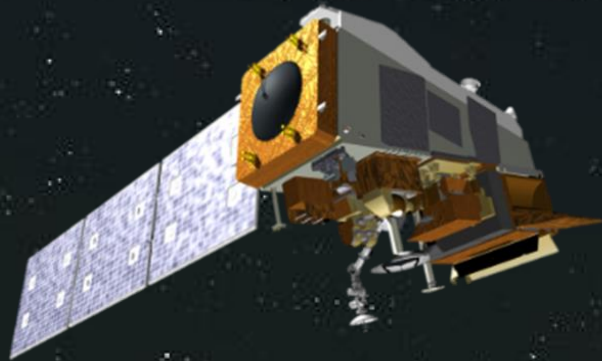


**Identify** wetland areas vulnerable to urban expansion



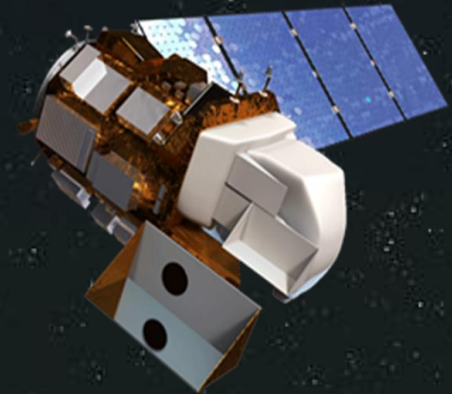
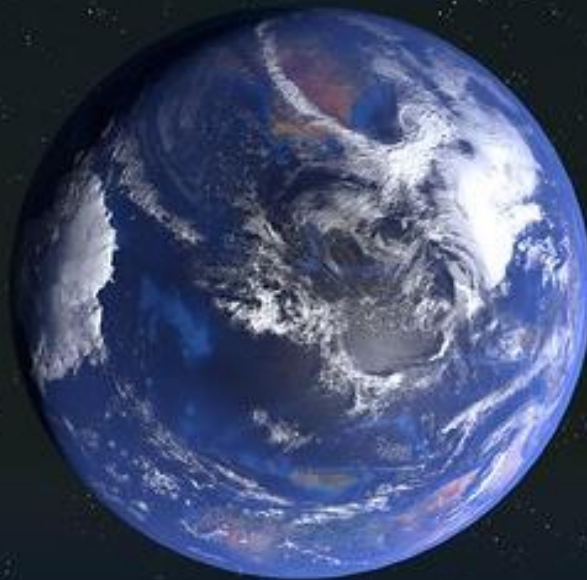
**Create** Protected Wetlands Vulnerability maps

# Earth Observation



**Suomi-NPP VIIRS**

Image Credit: NASA



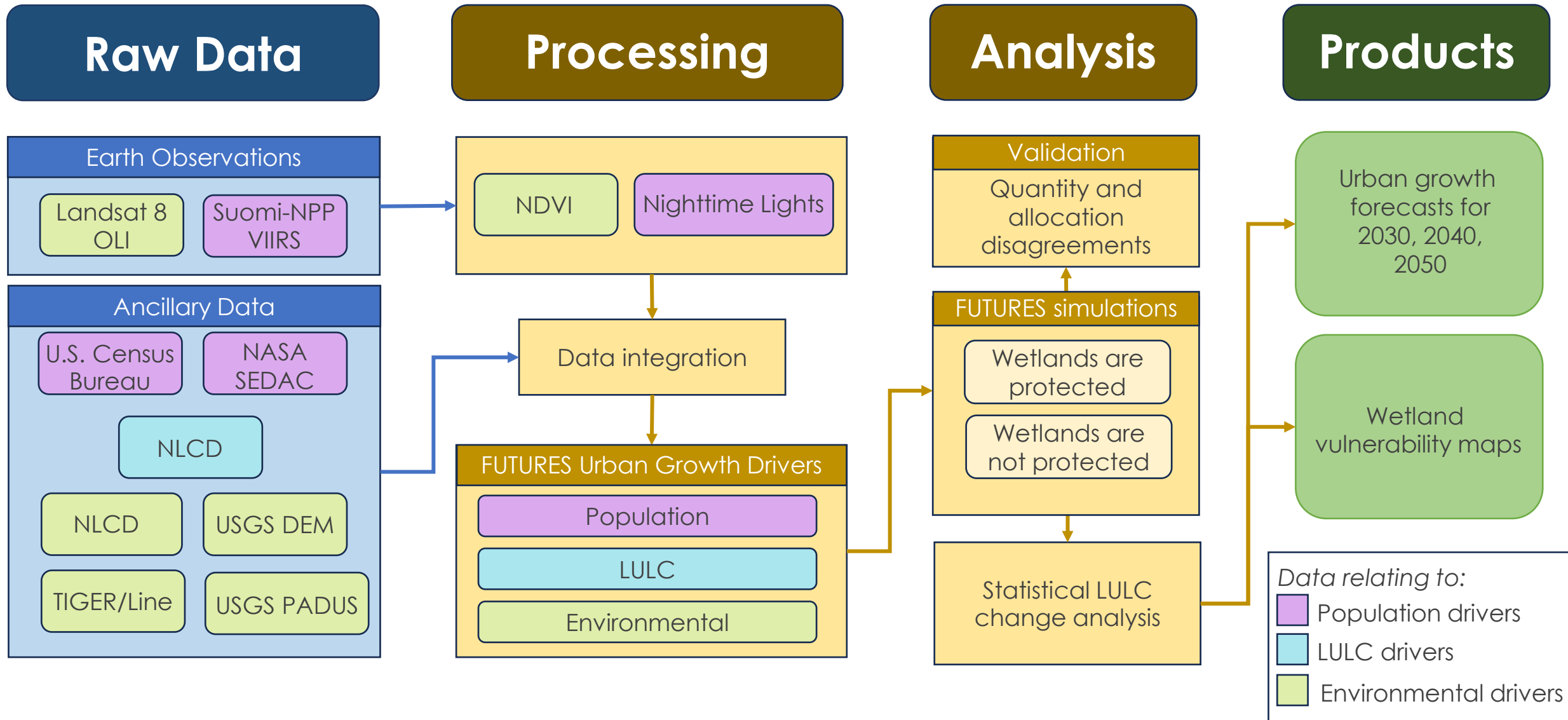
**Landsat 8 OLI**

Image Credit: NASA

Image Credit: Kristian Fagerström

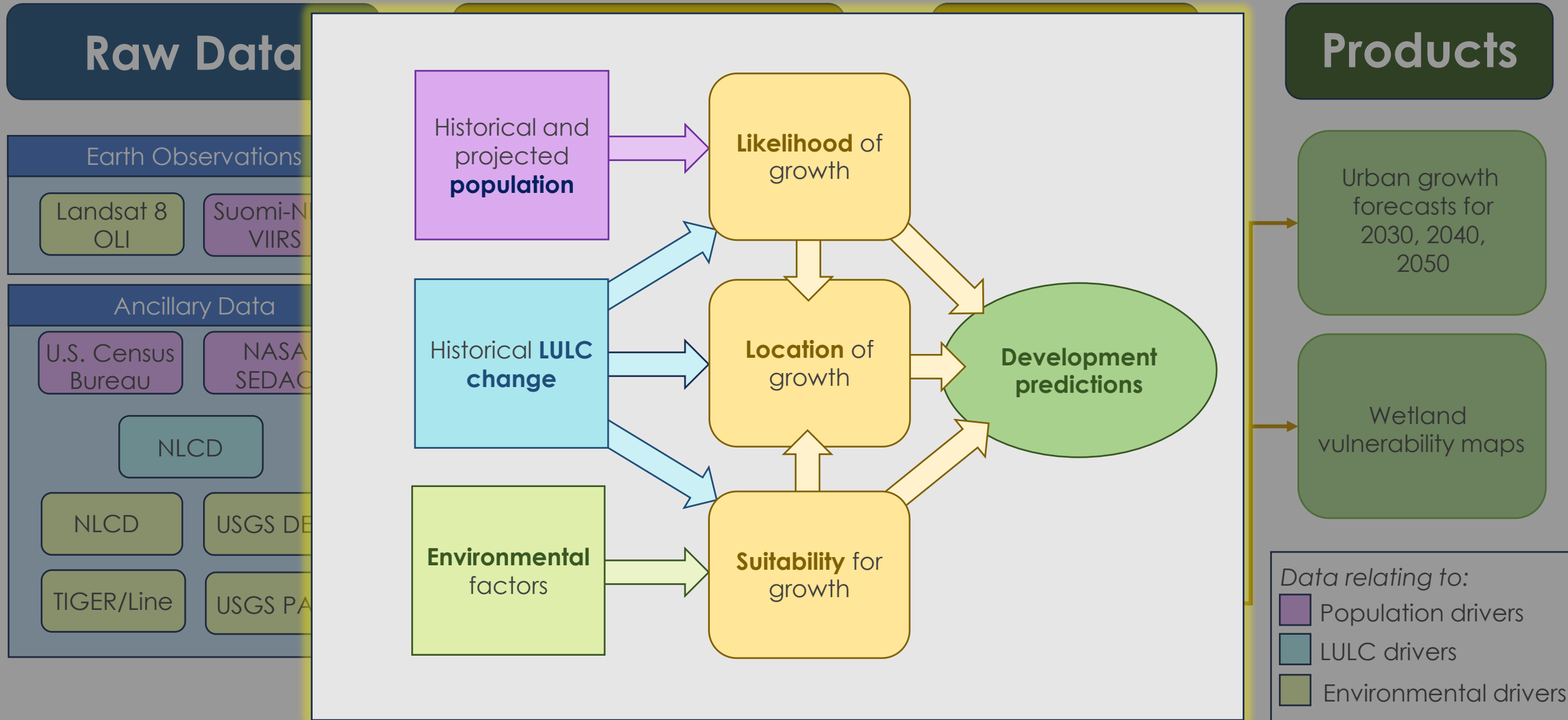


# Methods

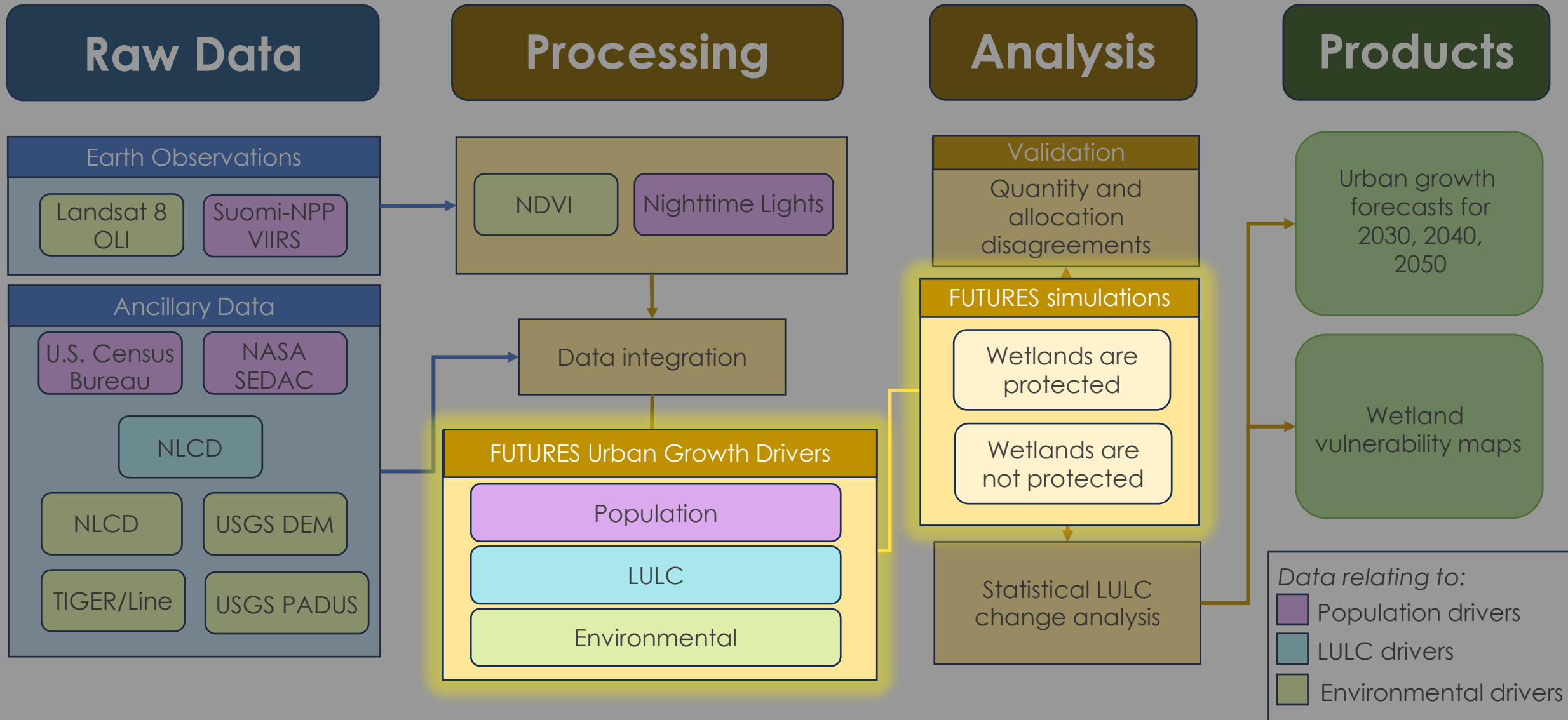




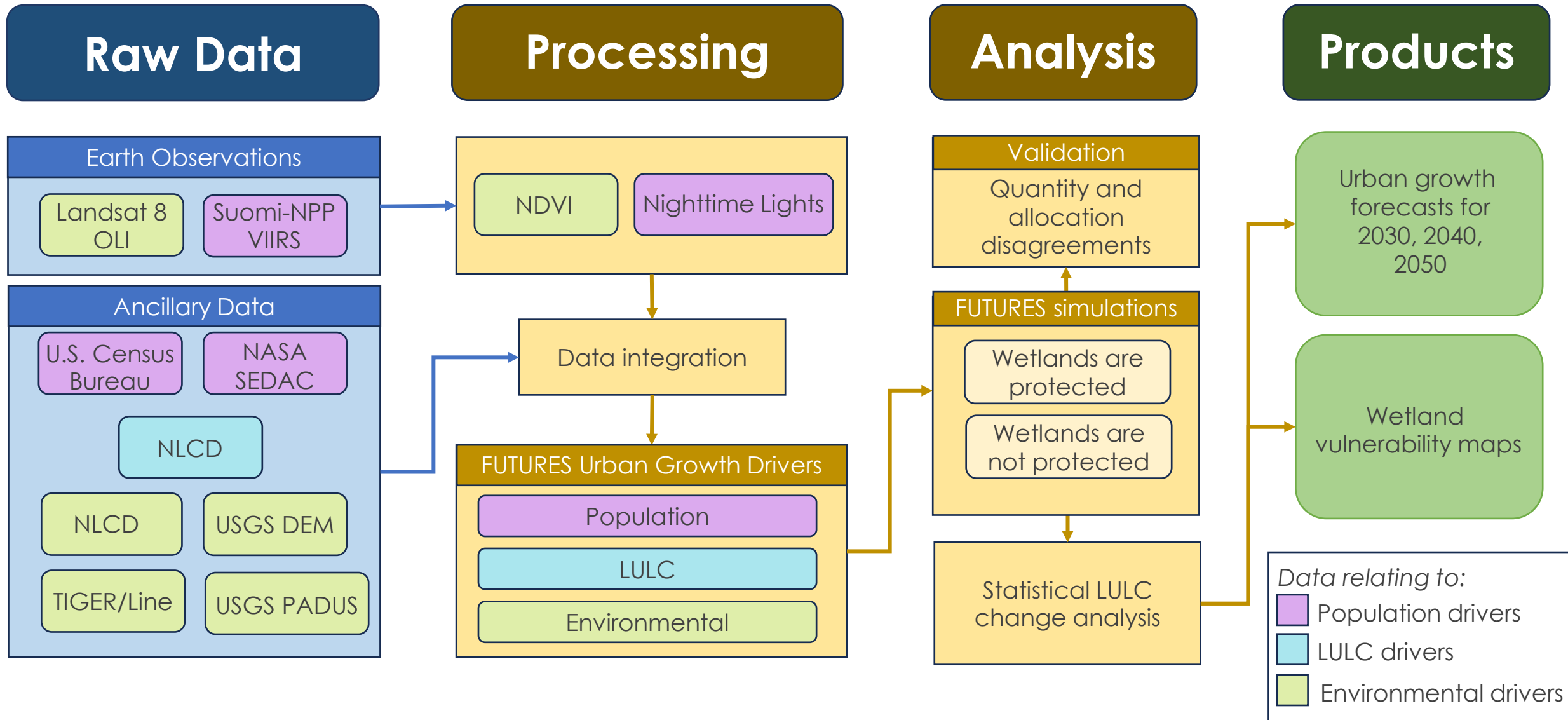
# Methods: FUTURES Explanation



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# Methods



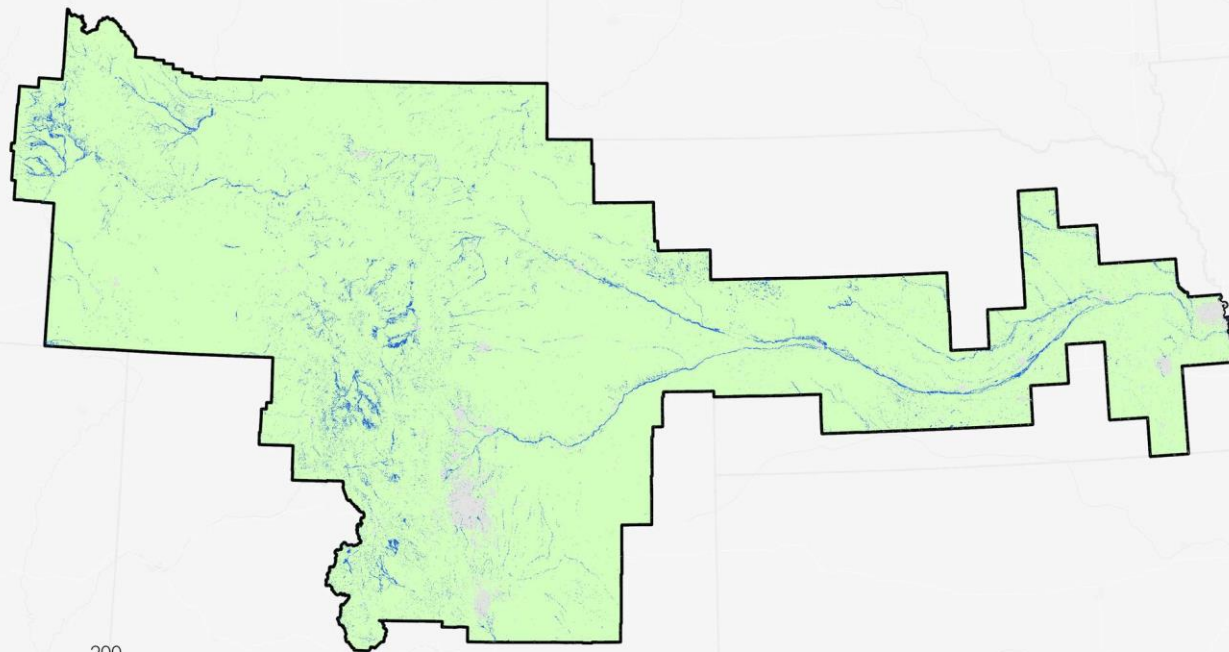


# Results: Platte River Basin Forecasts

## Projected urban growth in the Platte River Basin

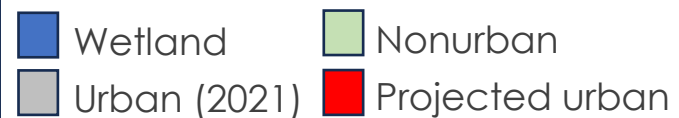
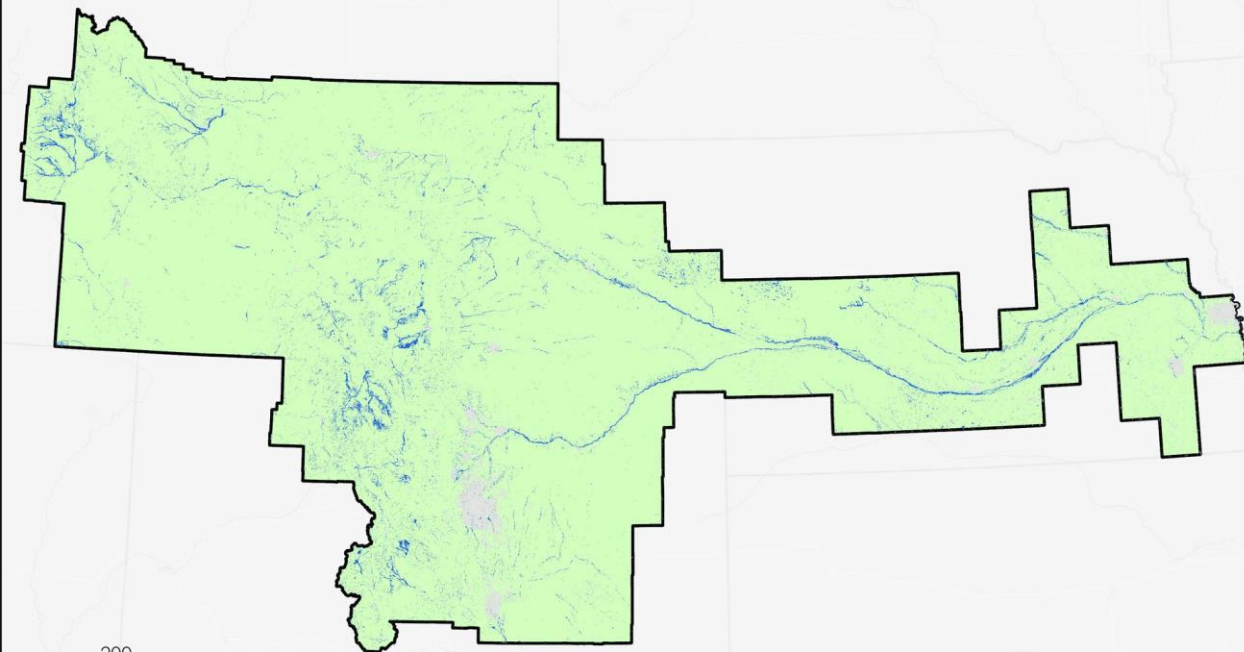
Scenario 1: Wetlands are protected

2021



Scenario 2: Wetlands are unprotected

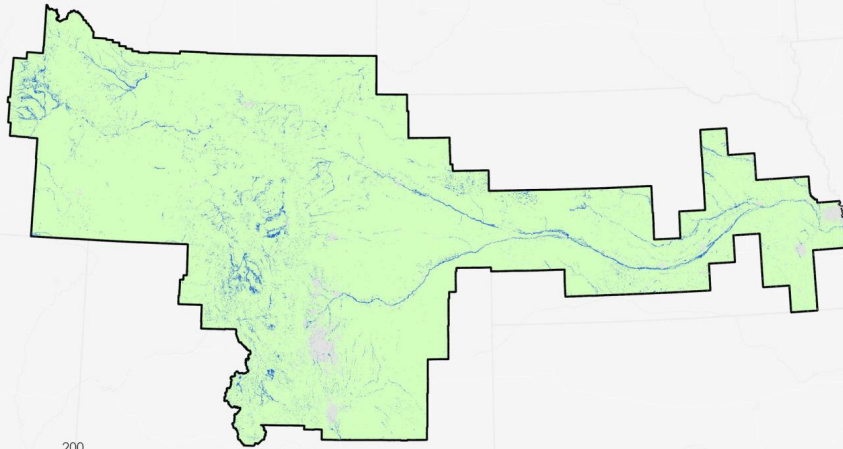
2021



# Results: Platte River Basin Forecasts

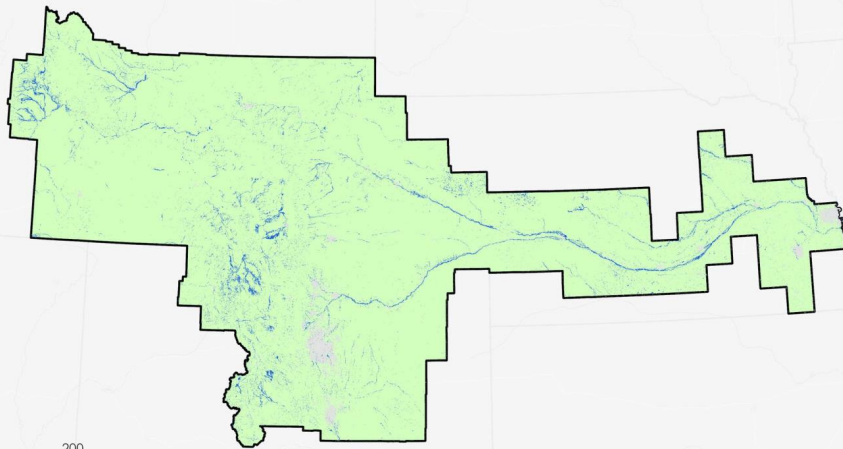
Scenario 1: Wetlands are protected

2021

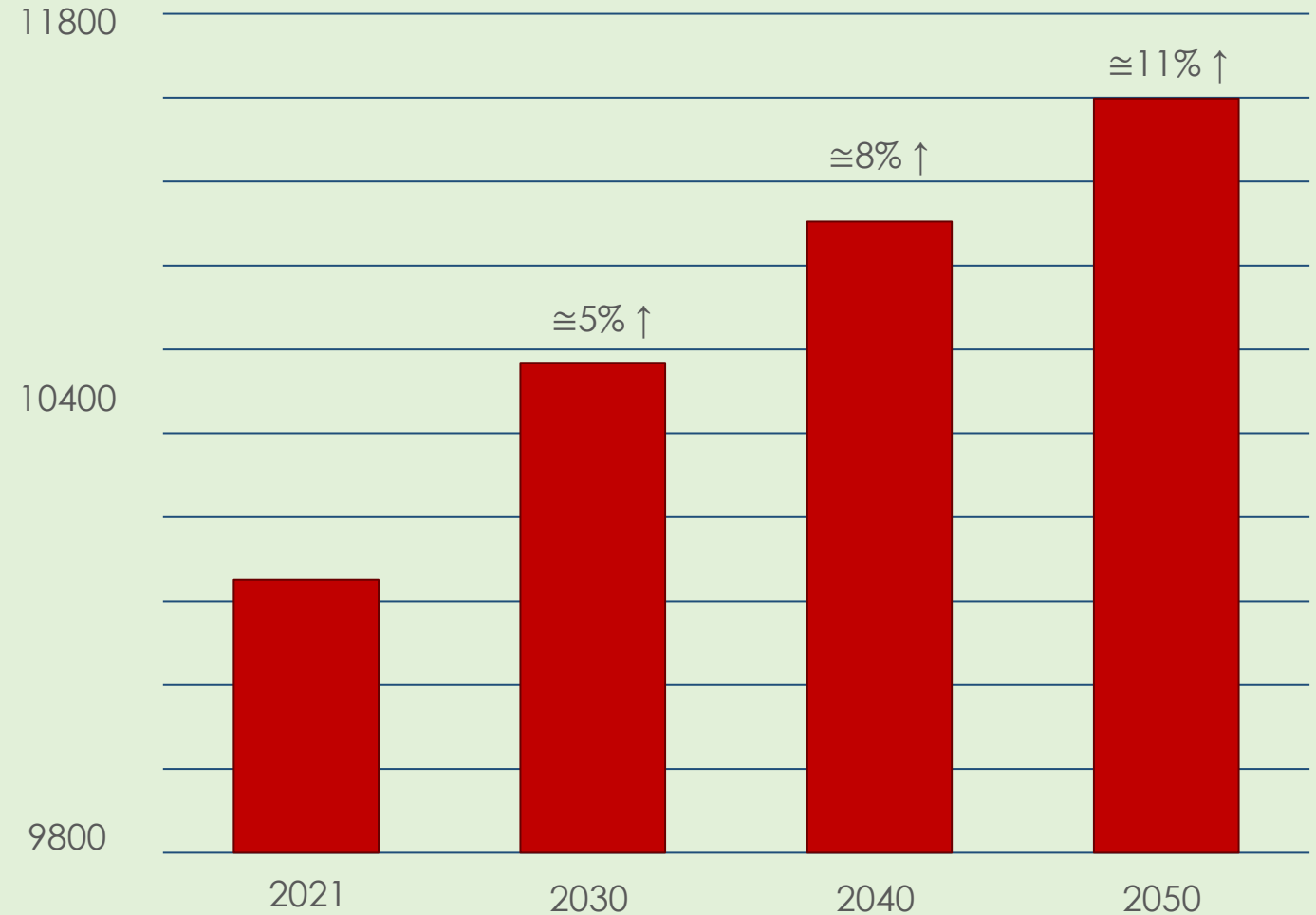


Scenario 2: Wetlands are unprotected

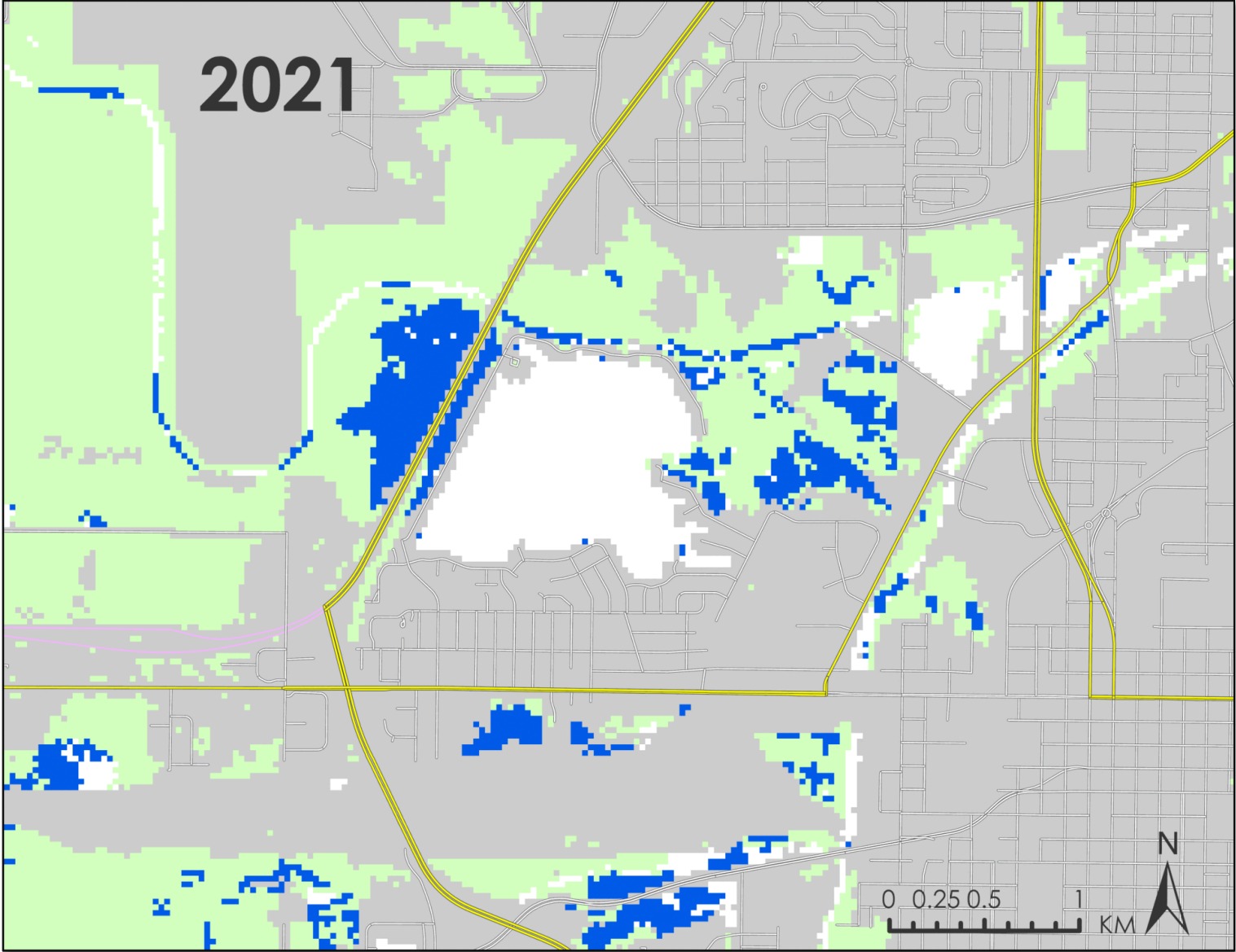
2021



Projected urban areas in the PRB (km<sup>2</sup>)



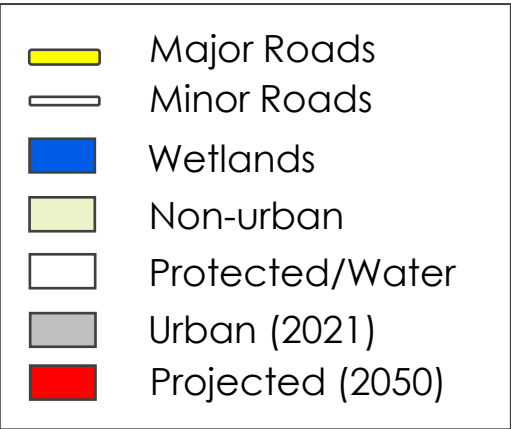
# Results: Fragment of Urban Change



This animation map shows three different scenarios 2021, Scenario 1 (all wetlands are protected) for 2050, and Scenario 2 (all wetlands are unprotected) for 2050 of fragment of urban area in Lincoln, NE.

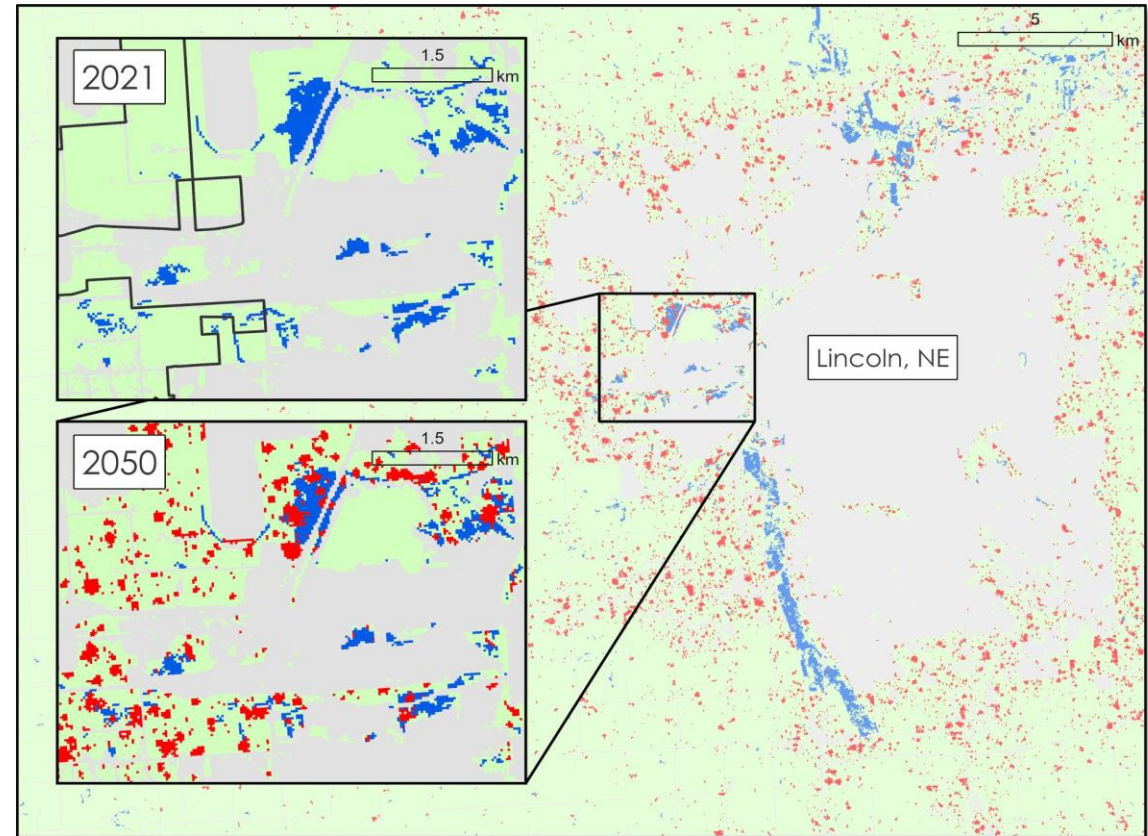
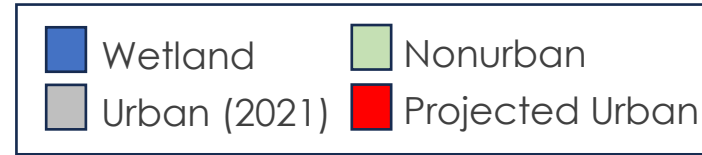
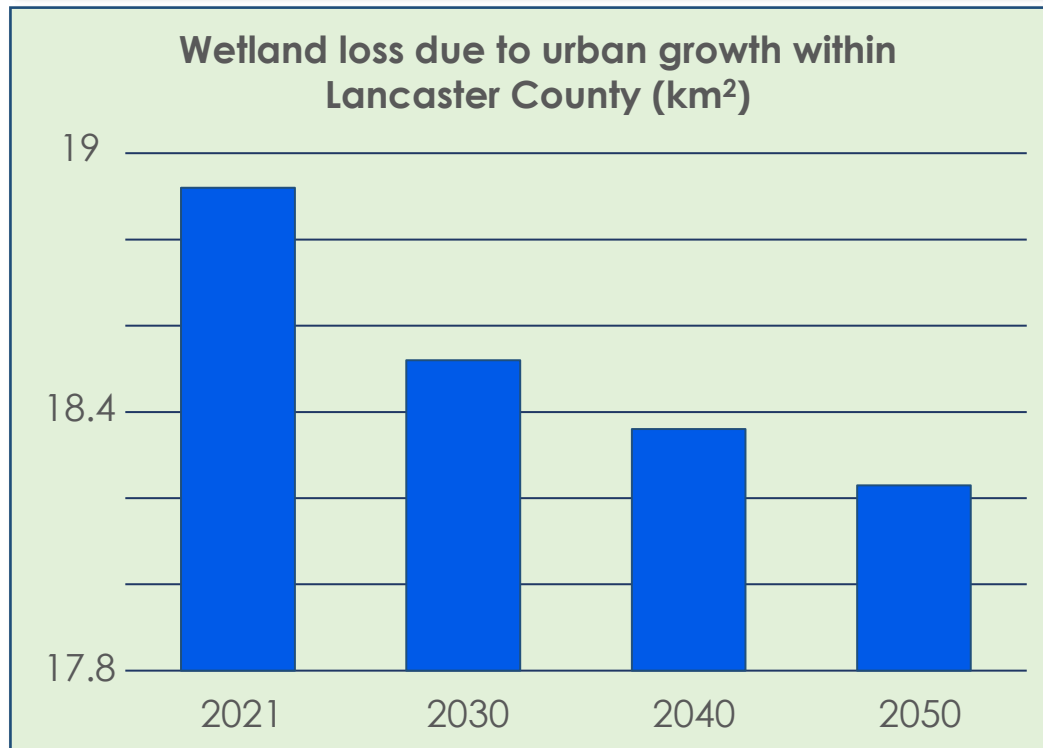
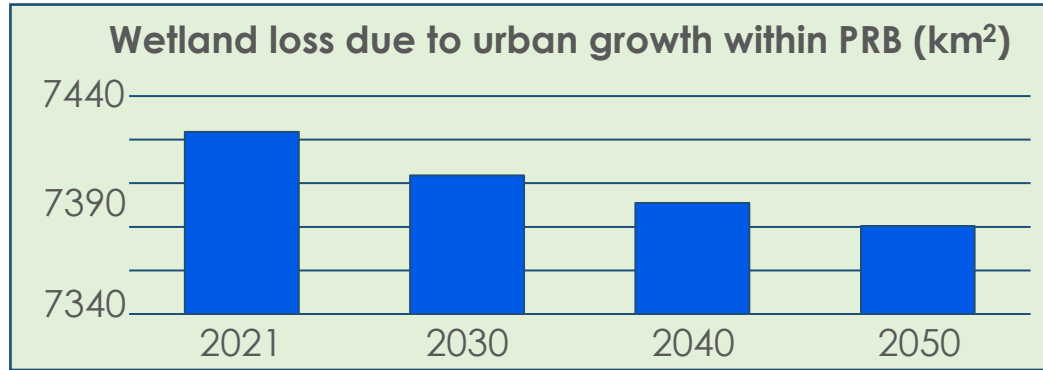
While the growth happens in both scenarios, the impact on wetlands is significantly more extensive for Scenario 2.

Scenario 2	Area Loss	% Loss
2050	0.65 Sq KM	24.3 %



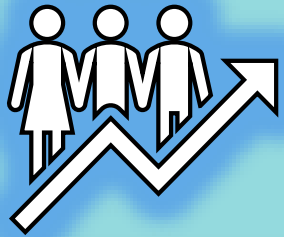


# Results: Wetland Vulnerability



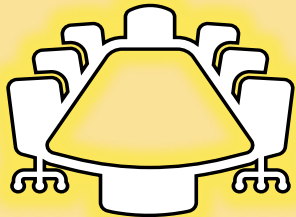
Service Layer Credits: City of Lincoln/Lancaster County, Nebraska Game & Parks Commission, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, USFWS

# Errors and Uncertainties



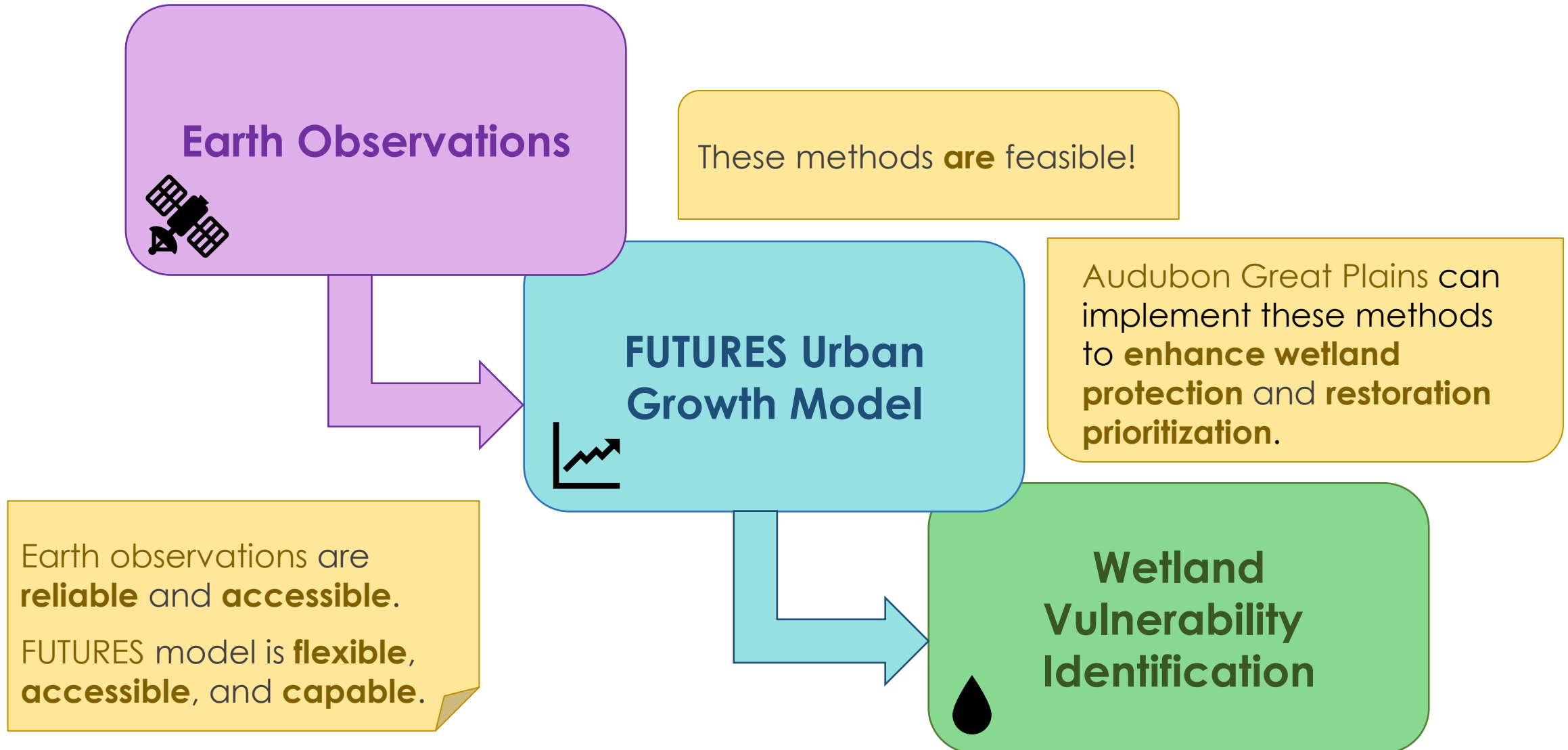
**Lack** of precision in population distribution

**Urban growth** forecasting



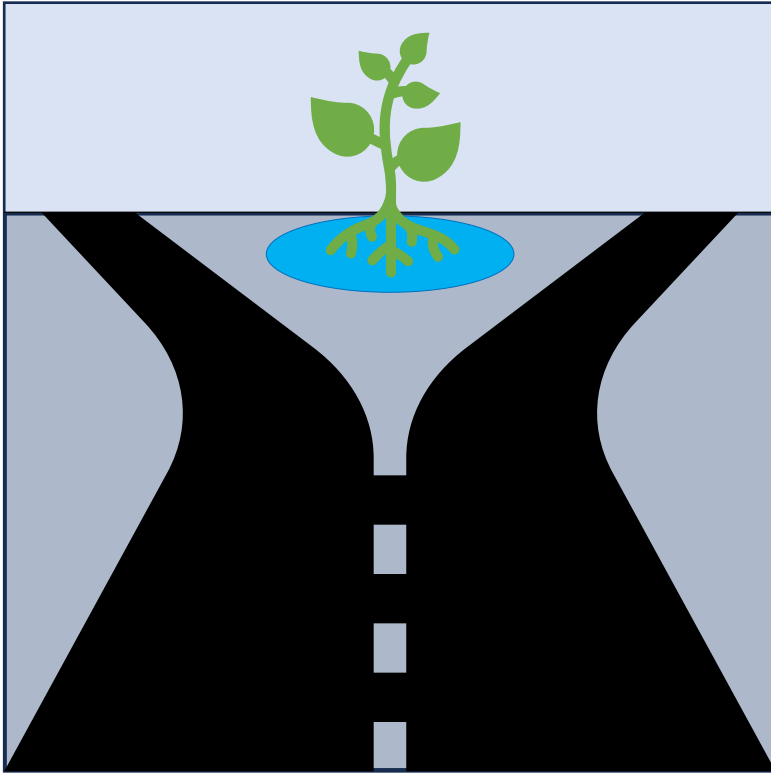
Did not consider **agents** that drive change

# Feasibility & Partner Implementation



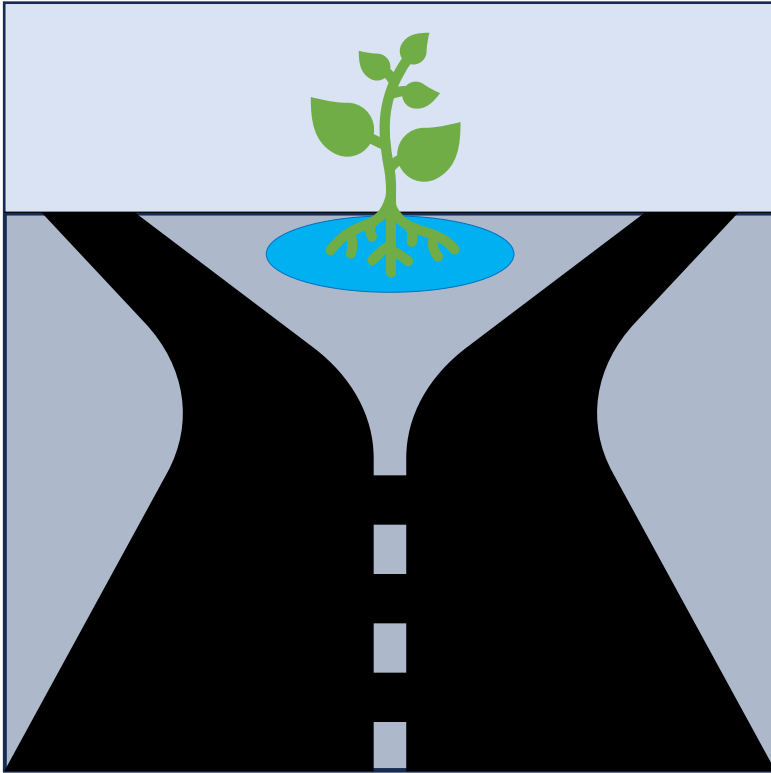


# Conclusions

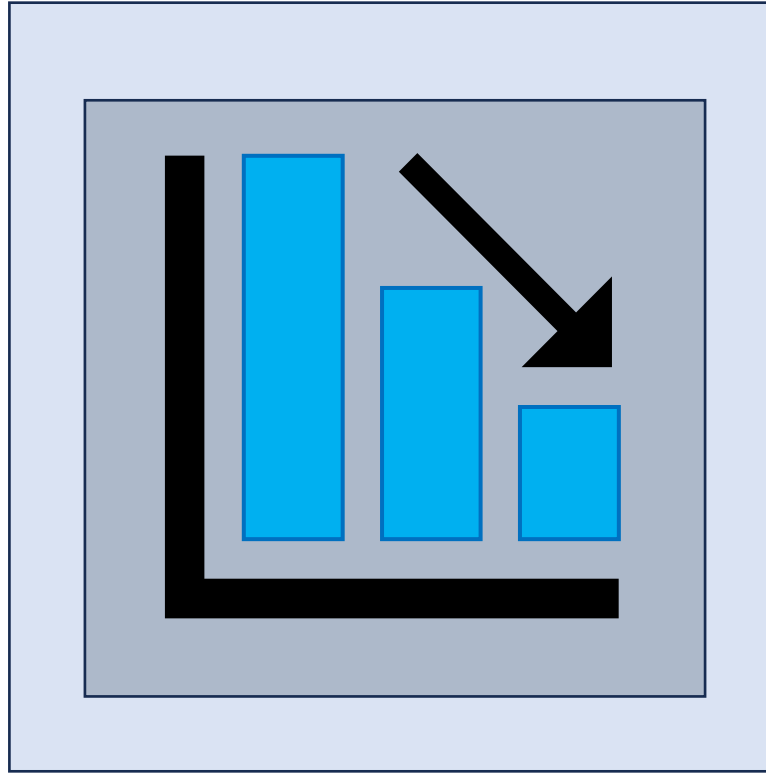


Wetland protection status  
**influences** urban growth  
patterns

# Conclusions

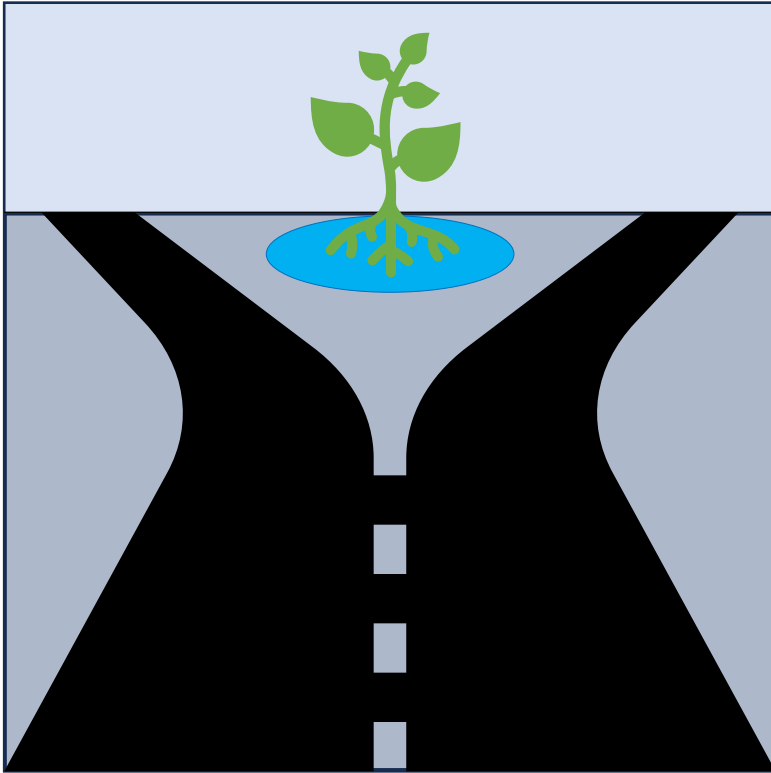


Wetland protection status  
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**Wetland loss** is projected to  
occur across the basin and  
within cities

# Conclusions



Wetland protection status  
**influences** urban growth  
patterns



**Wetland loss** is projected to  
occur across the basin and  
within cities



Audubon Great Plains can use  
this information to **inform**  
**restoration/protection work**



# Acknowledgments

- ▶ **Previous Team:** Platte River Basin Water Resources I team
  - ▶ Jennifer Mathis
  - ▶ Jackie Encinas
  - ▶ Emma Vail
  - ▶ Olivia Kirkland
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