



The Floodplain Explorer

**An Online GIS Tool
for Guiding Floodplain
Protection & Restoration in the
Mississippi River Basin**

Oct. 31, 2023



Floodplain Prioritization Essentials

- Precision about *where* to work
- Transparency about *why* to work there
- Clarity about *how* to work there
- Key features:
 - Comprehensive *floodplain data*
 - Dynamic footprint of sites based on *multiple criteria*
 - Multiple spatial *scales*: basin-wide, regional, local
 - Framework for building *locally relevant spinoffs*



A Comprehensive U.S. Flood Model

- Based on high-precision terrain model
- Models flows based on thousands of USGS gaging stations + NOAA rainfall data
- Multiple return periods (1-in-5-year, -100-yr., -500-yr.)
- Explicit representation of Army Corps National Levee Database
- High validation rate against FEMA and USGS data
- No gaps!



Identify Floodplain Units

1-in-5-year

1-in-100-year

1-in-500-year

Zoom in to Activate

HUC-8

HUC-12

Catchment

Protection

Restoration

✓ Available Floodplain Area

0 to > 50,000 acres

☐ Local Nutrient Loading

Identify Floodplain Units

Select Flood Frequency

1-in-5-year

1-in-100-year

1-in-500-year

View Floodplains By Watershed

HUC-8

HUC-12

Catchment

Select Management Action

Protection

Restoration

Available Floodplain Area

☒ Area of floodplain in agriculture or pasture land

500 to 2,500 acres

Nutrients

☒ Local nutrient impact

50 to 100 %

☒ Nutrient contribution to the Gulf of Mexico

50 to 100 %

☐ Growing degree days

50 to 100 %

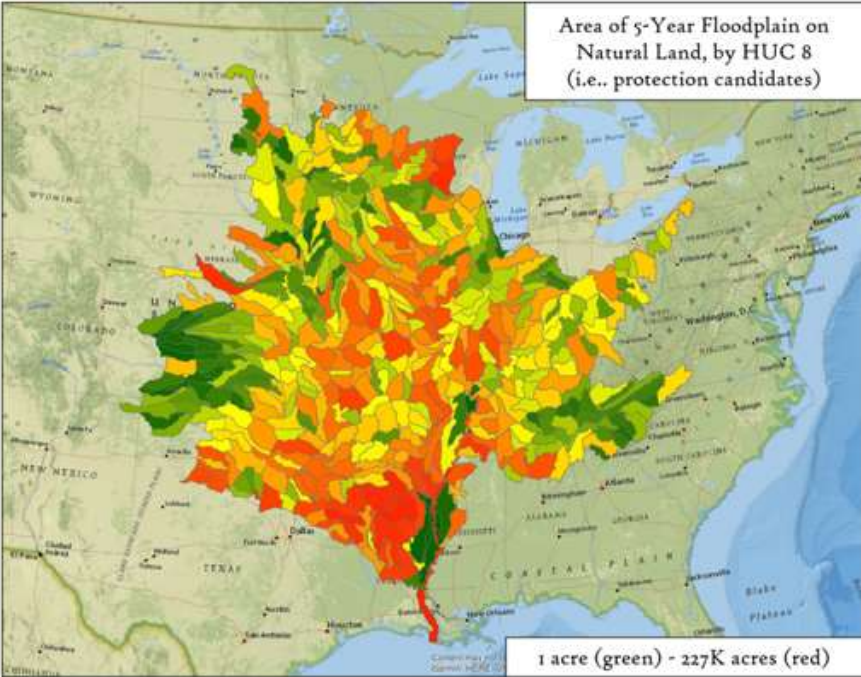
Land Conversion

☒ Agricultural productivity potential of soils

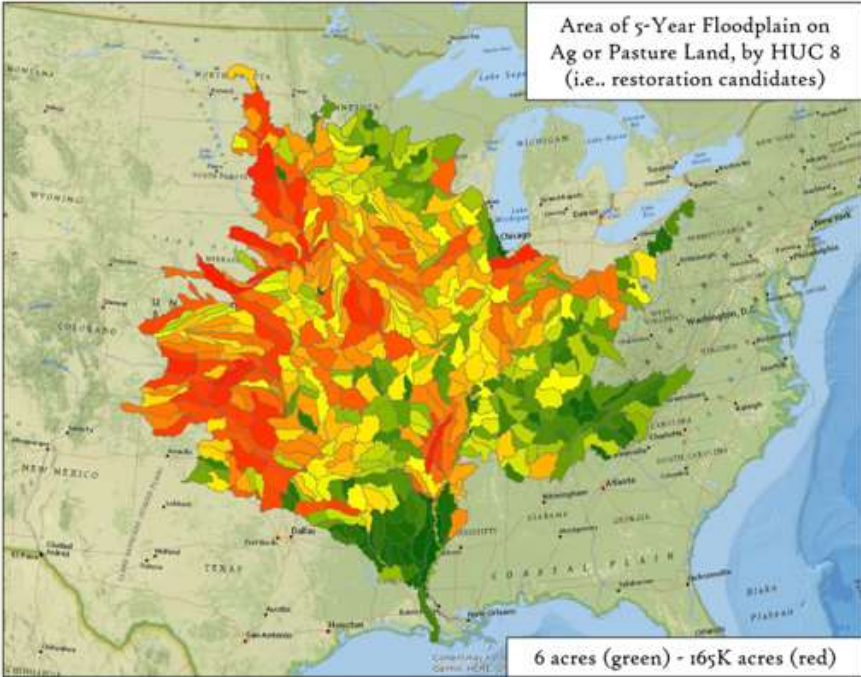
0 to 0.6

How much floodplain is available for:

Protection – In *forest*,
wetland, or *grassland*



Restoration – In *ag* or
pasture



Water Quality

Identify Floodplain Units

Select Flood Frequency

1-in-5-year

1-in-100-year

1-in-500-year

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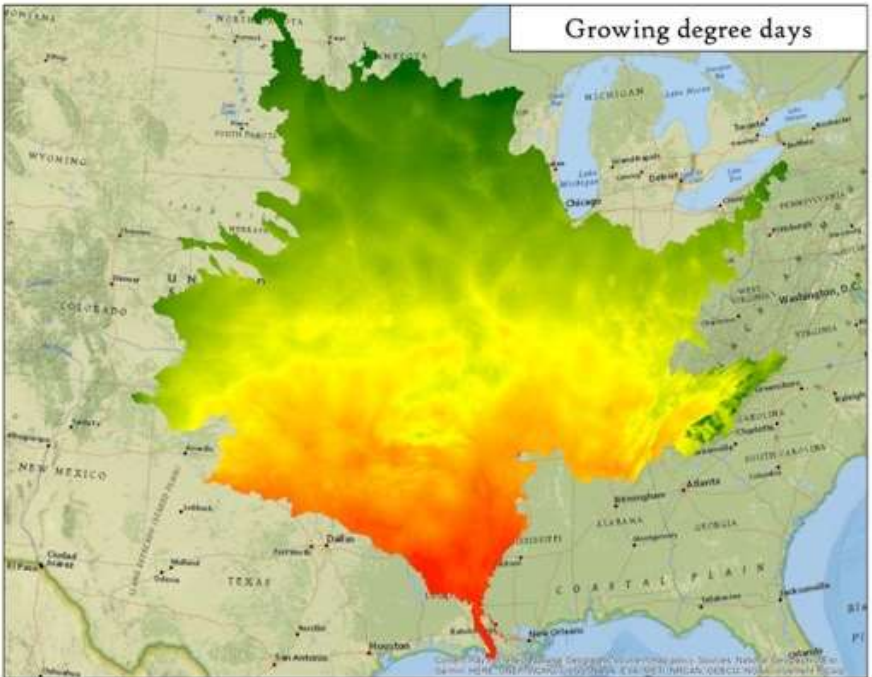
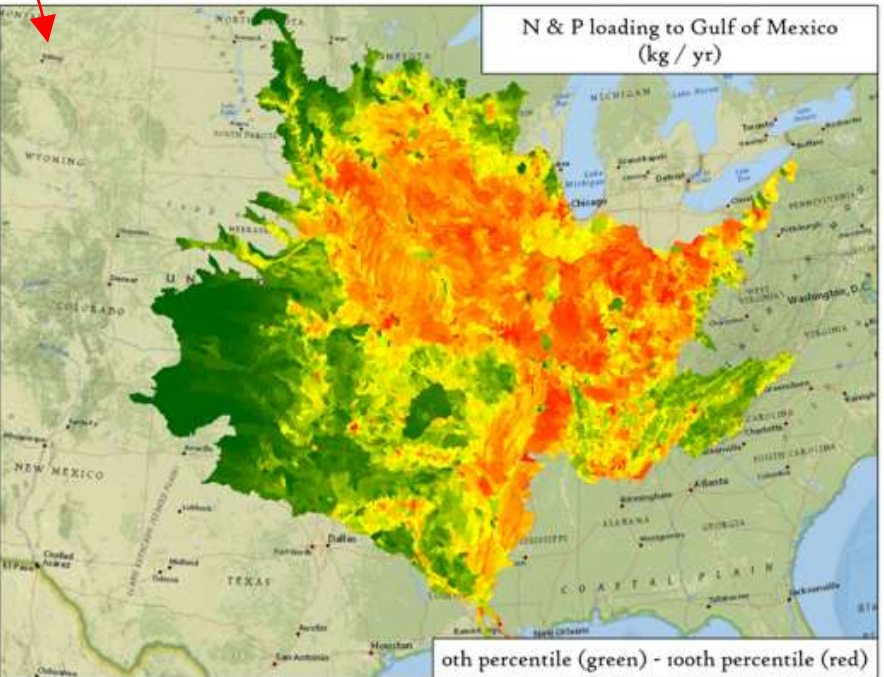
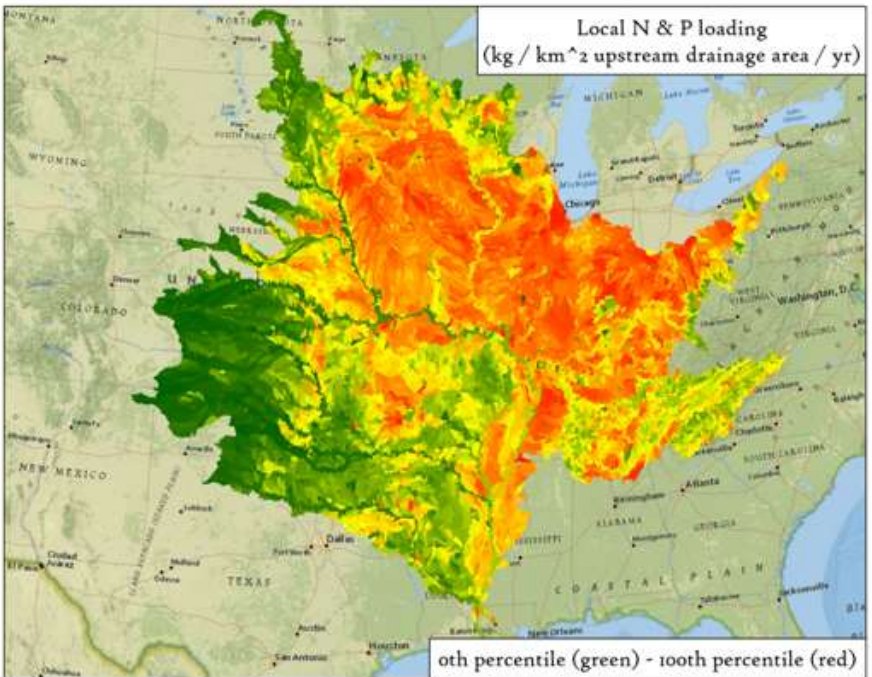
50 to 100 %

Land Conversion

☒ Agricultural productivity potential of soils

0 to 0.6

- Nutrient loading to *local waters*
- Nutrient loading to *Gulf of Mexico*
- Growing degree days – In conjunction with higher loading, facilitates *denitrification*



Identify Floodplain Units

Select Flood Frequency

1-in-5-year 1-in-100-year 1-in-500-year

View Floodplains By Watershed

HUC-8 HUC-12 Catchment

Select Management Action

Protection Restoration

Available Floodplain Area

Area of floodplain in agriculture or pasture land 500 to 2,500 acres

Nutrients

Local nutrient impact 50 to 100 %

Nutrient contribution to the Gulf of Mexico 50 to 100 %

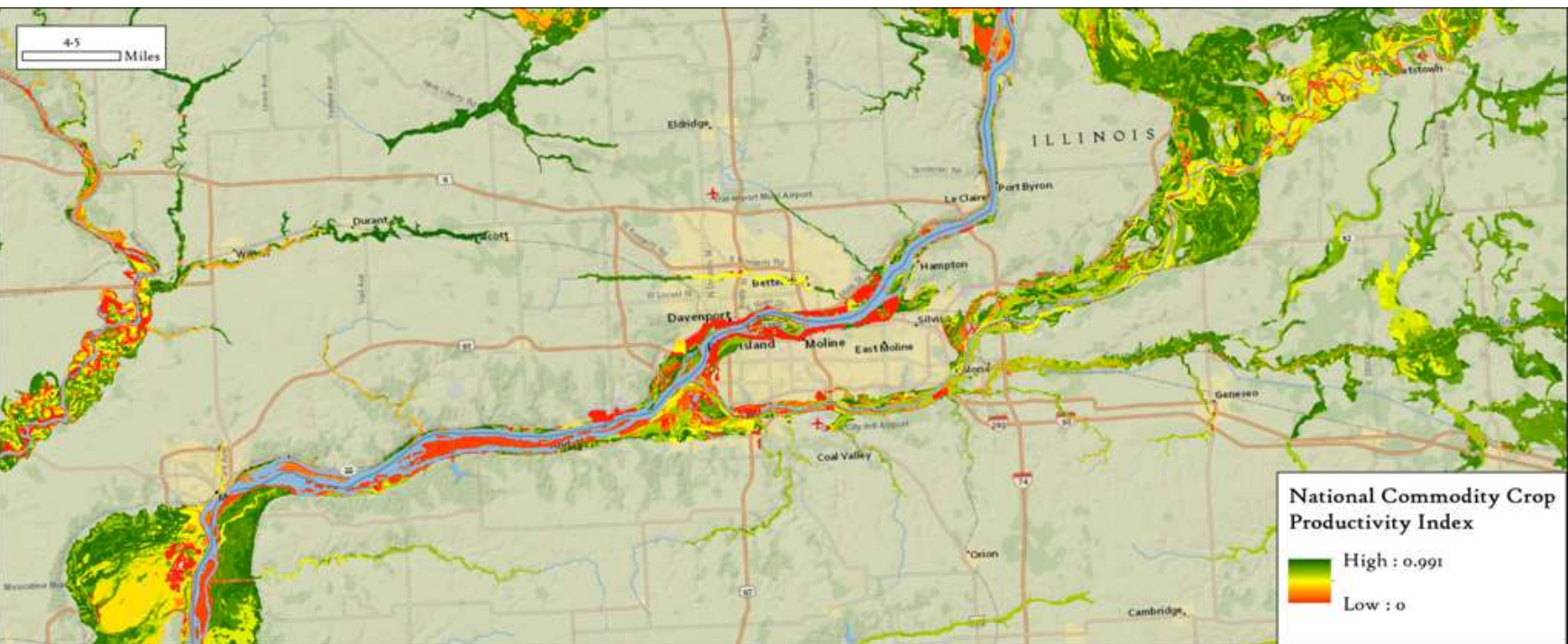
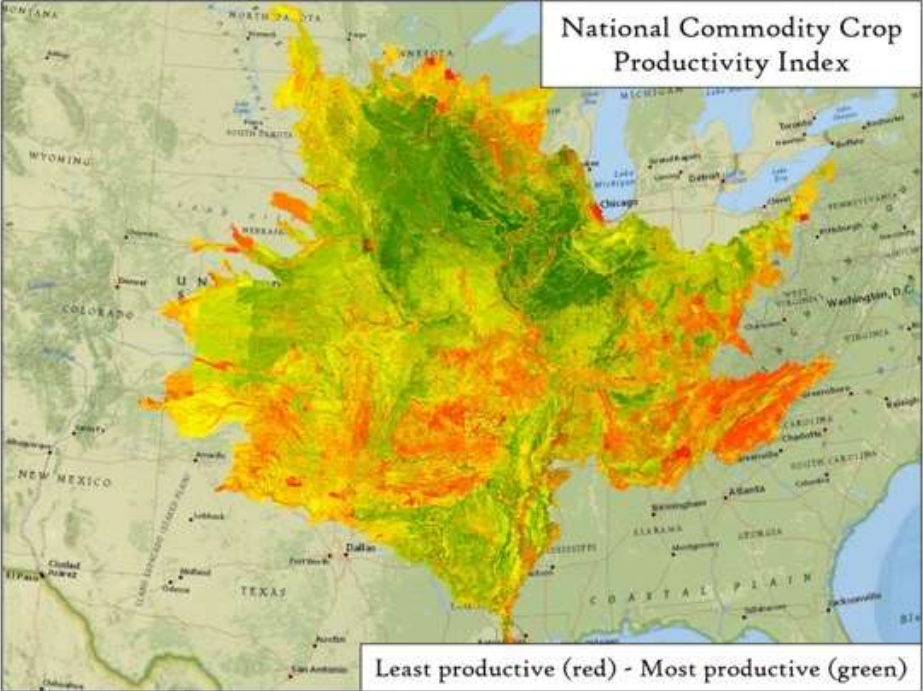
Growing degree days 50 to 100 %

Land Conversion

Agricultural productivity potential of soils 0 to 0.6

Soil Quality

- National Commodity Crop Productivity Index – A measure of *soils' inherent capacity to produce commodity crops*
- Draw restoration efforts to relatively less desirable soils



Habitat

☐ Important Bird Areas

Present

Absent

☐ TNC Ecoregional Assessment Units

Present

Absent

☐ At-Risk Wetland Species

0 to 8

☐ USFWS Threatened & Endangered Species Active Critical Habitat

Present

Absent

☐ American Bird Conservancy Corridors & Key Habitat Bird Areas

Present

Absent

☐ National Fish Habitat Partnership Cumulative Habitat Condition Index

0 to 5

Population Exposure

☐ Current population

0 to 700

☐ Projected population (2050)

121 to 400

Future Economic Asset Exposure

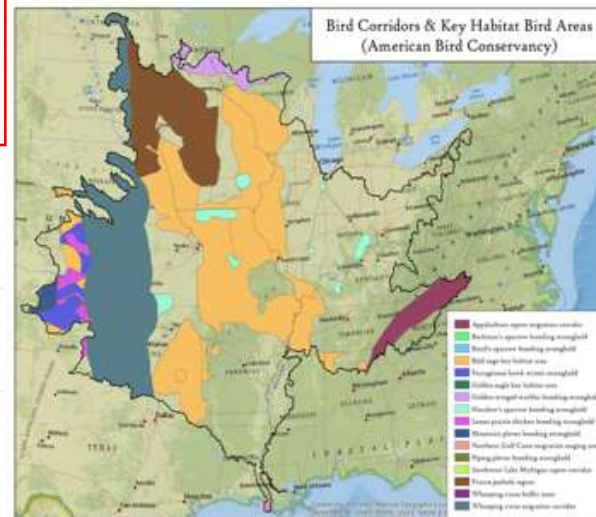
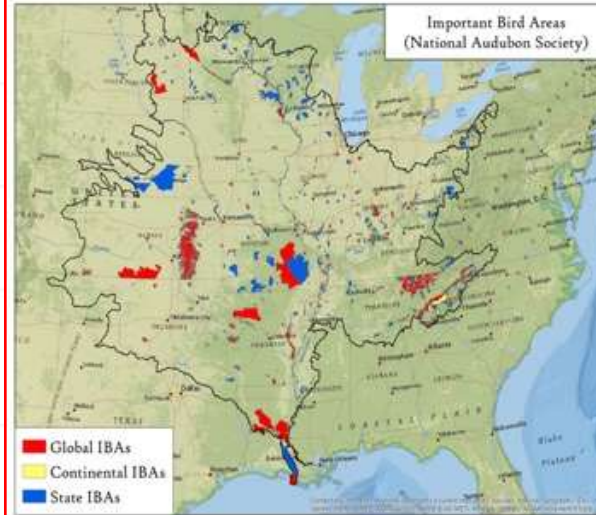
☐ Economic asset exposure (2050) (SSP2)

6 to 400

☐ Economic asset exposure (2050) (SSP5)

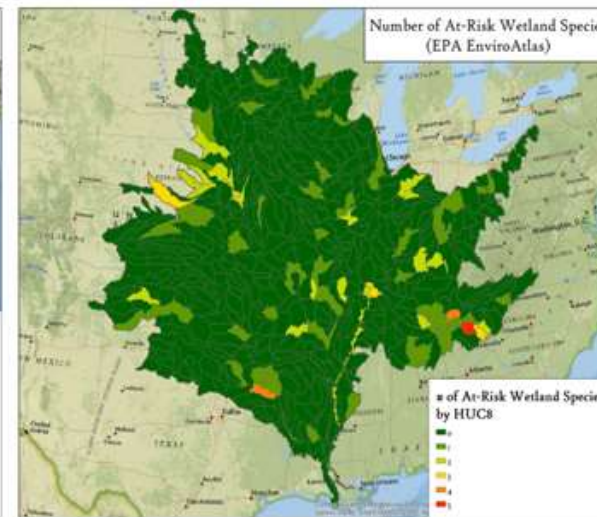
0 to 400

Important Bird Areas (Audubon)



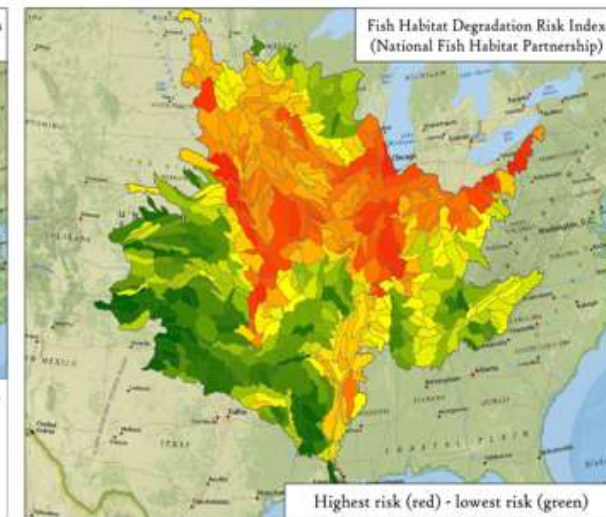
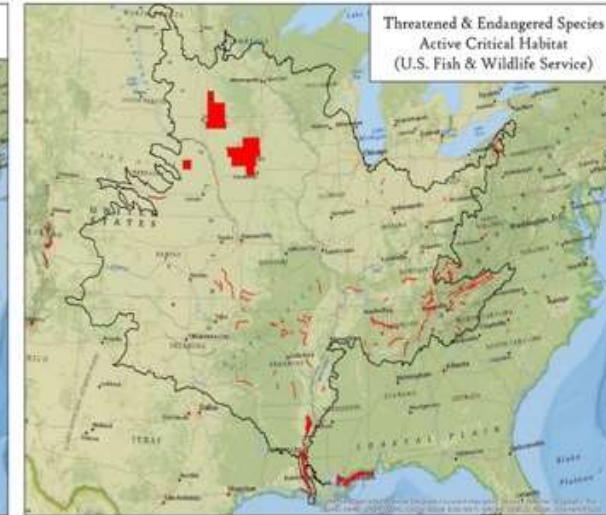
Bird Corridors & Key Habitat Areas (American Bird Conservancy)

TNC Ecoregional Rollup Units



Number of At-Risk Wetland Species (EPA)

USFWS Threatened & Endangered Species



Fish Habitat Degradation Risk Index (NFHP)

Human Exposure to Flooding

Habitat

☐ Important Bird Areas ☒ Present ☐ Absent

☐ TNC Ecoregional Assessment Units ☒ Present ☐ Absent

☐ At-Risk Wetland Species ☐ 0 to 8

☐ USFWS Threatened & Endangered Species Active Critical Habitat ☒ Present ☐ Absent

☐ American Bird Conservancy Corridors & Key Habitat Bird Areas ☒ Present ☐ Absent

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Population Exposure

☐ Current population ☐ 0 to 700

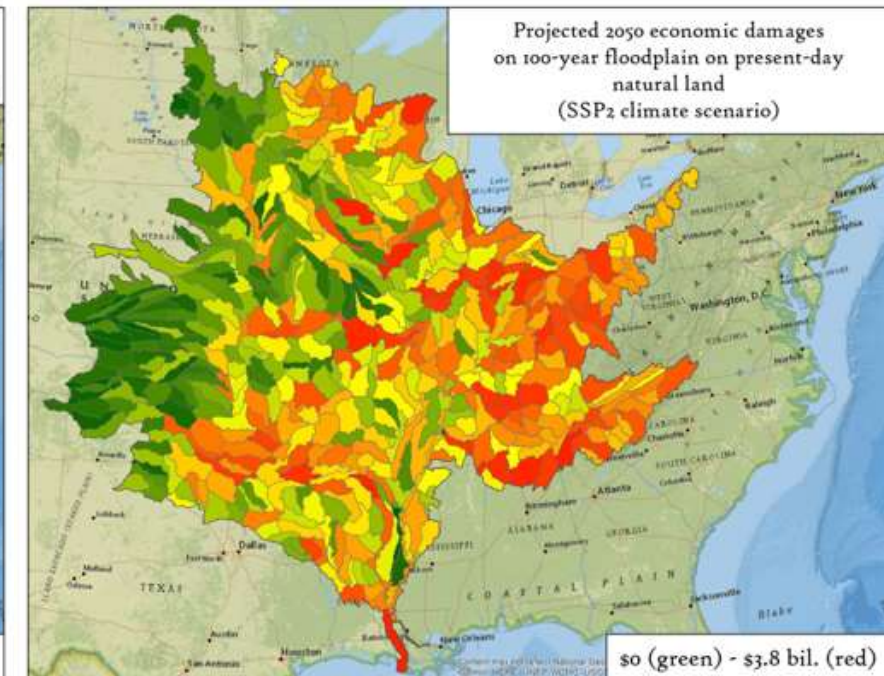
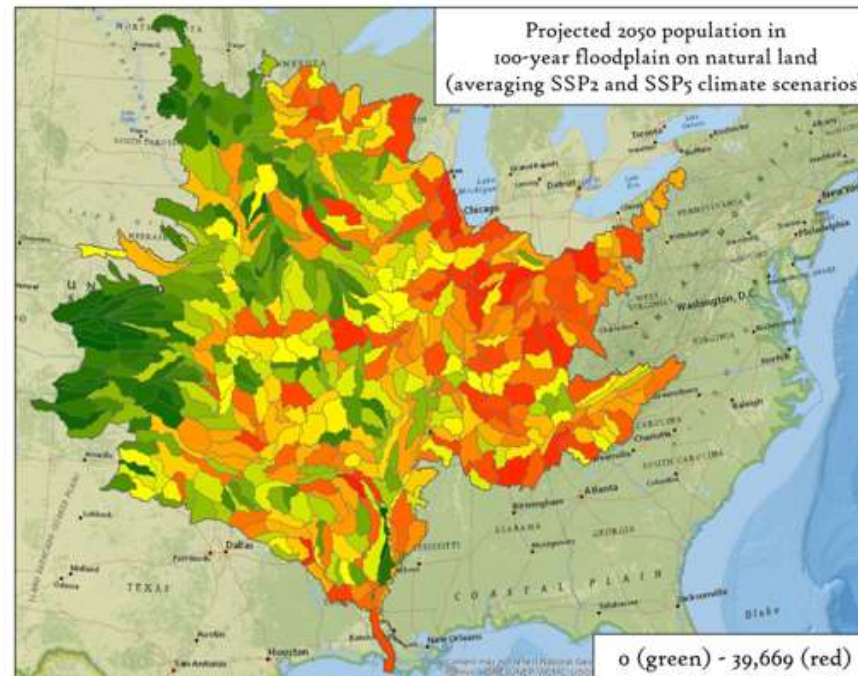
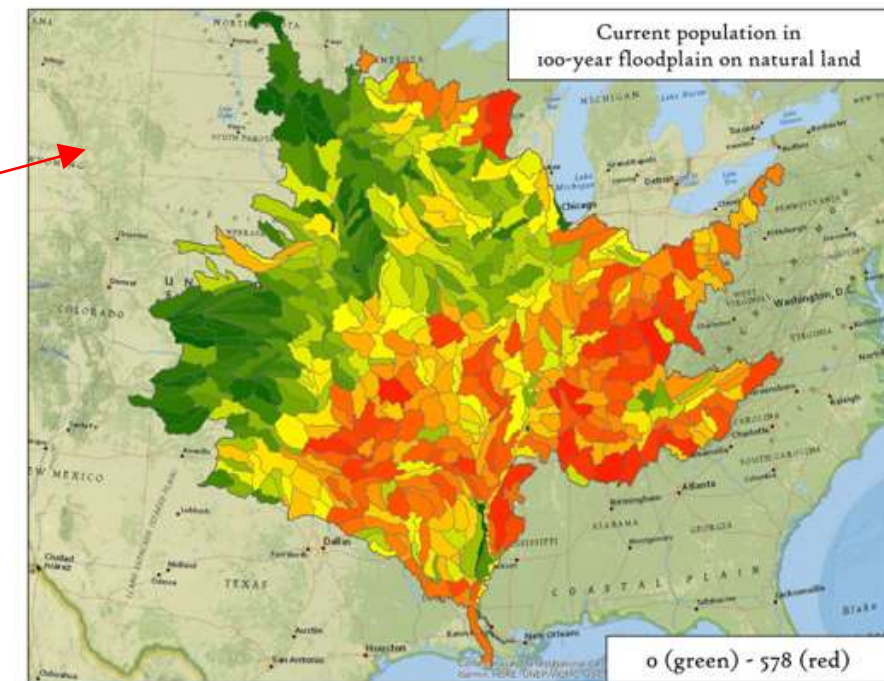
☐ Projected population (2050) ☐ 121 to 400

Future Economic Asset Exposure

☐ Economic asset exposure (2050) (SSP2) ☐ 6 to 400

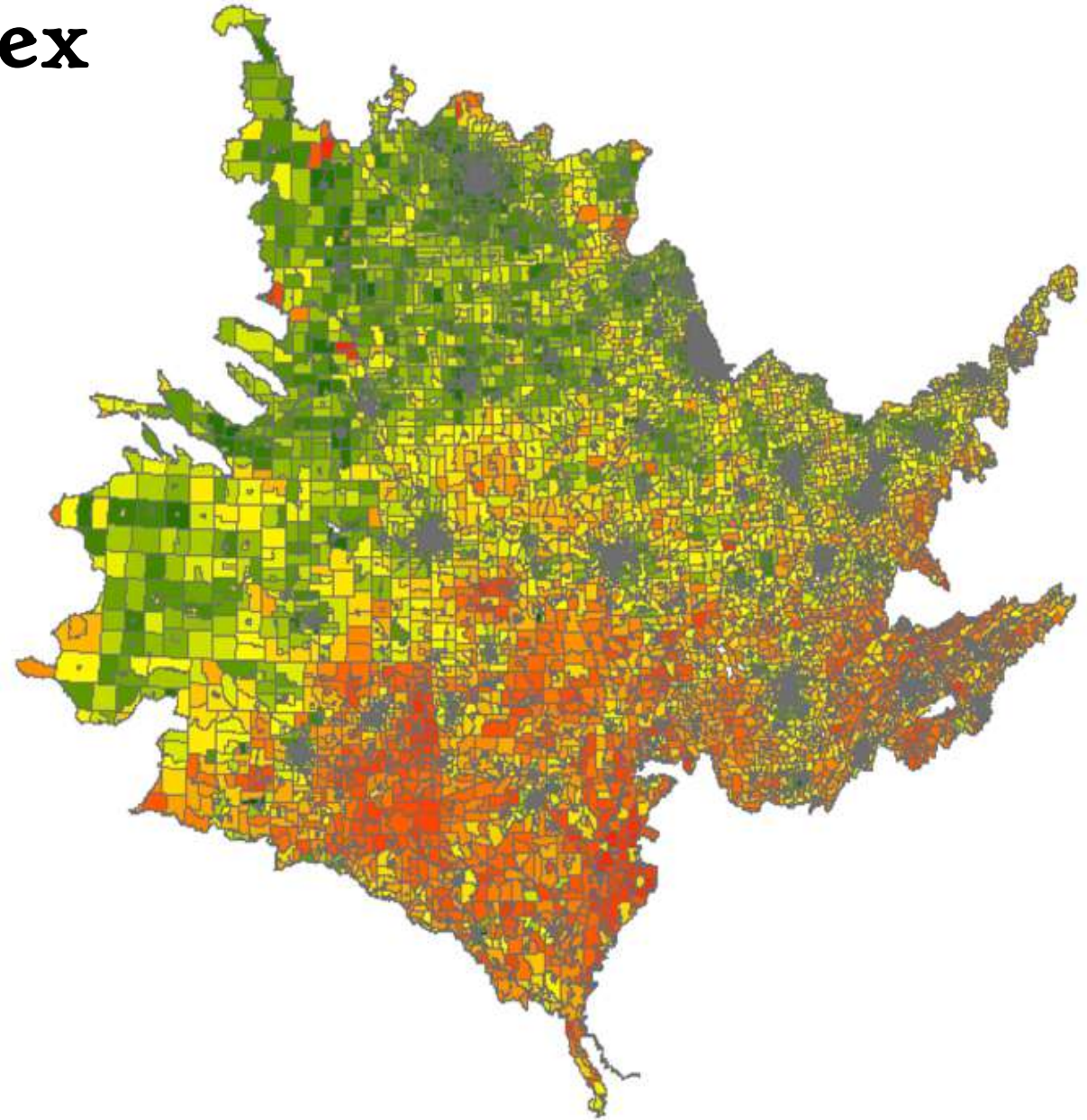
☐ Economic asset exposure (2050) (SSP5) ☐ 0 to 400

- *Current population* in the floodplain
- *Future population (2050)* in the floodplain
- *Future property damage (2050)* from flooding



Social Vulnerability Index

- Census tract scale
- Index of social vulnerability to disaster based on 22 variables from American Community Survey
- E.g. *per-capita income*, % pop. *<20 and >64 yrs. old*, *education level*, *racial demographics*, *local rents*, etc.



Strategies for Use (1/2)

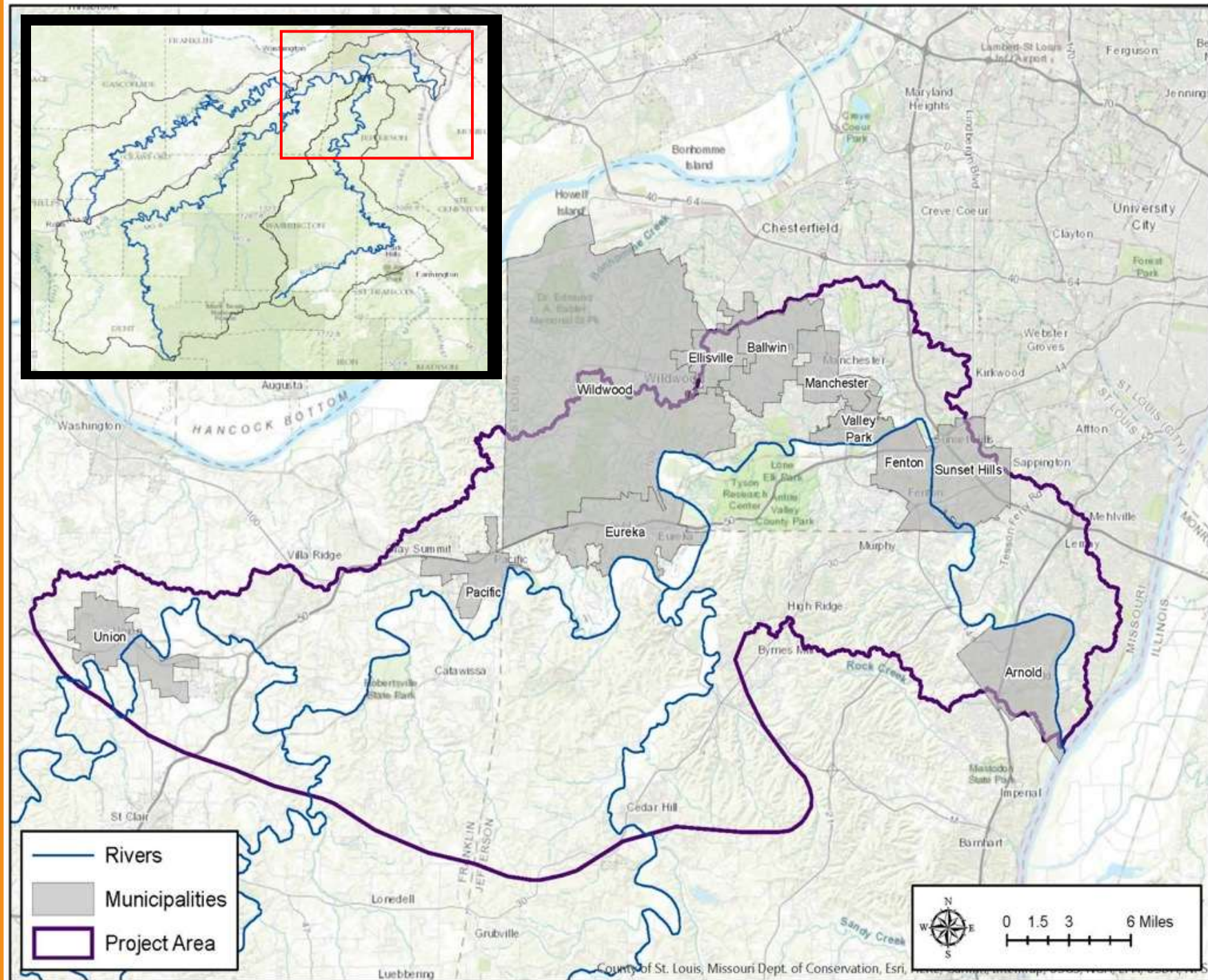
- The tool is not just for **decision support** – but to **facilitate broader conversations**
- Multiple floodplain benefits = multiple ways to reconcile them
 - Laser-focus on **one issue** of concern
 - Balance **across benefits**
 - Generate **alternative footprints** / maps + see where they overlap

Strategies for Use (2/2)

- This is **not a site-scale** tool – it provides a **first cut** to ID watersheds that:
 1. Contain significant opportunity for conservation
 2. Conservation could be especially impactful
- **Highly customizable** to local geographies

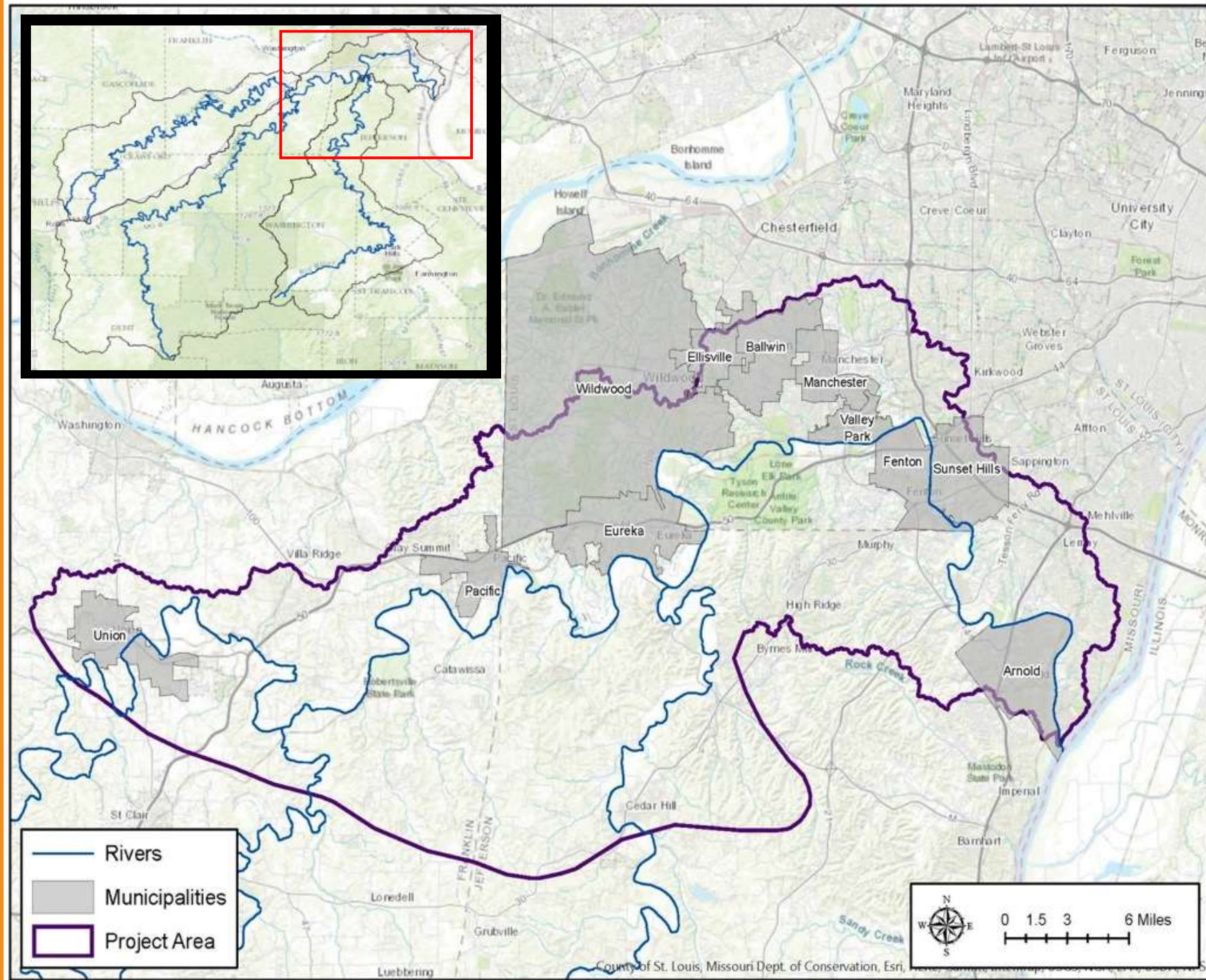
The Lower Meramec River Multi-Jurisdictional Flood Management Plan

- 115 river miles on Meramec R. + 2 tributaries
- 3 counties
- 8 municipalities



Lessons Learned

- Plug into a formal planning process / cycle
- Customization is critical – based on stakeholders / potential users



Potential FP Tool Users	Potential Applications
Federal, State and Local Governments	Development of watershed plans for water quality, e.g. 9 Key Element Plans; siting of natural infrastructure projects
Land Trusts	Strategic conservation planning; prioritizing projects; grant proposals; wetland education & outreach
Compensatory Mitigation Project Sponsors/Wetland Regulators	Identify and analyze potential restoration sites; guide project selection; support mitigation goals and improve outcomes
County Planners/Regional Planning Commissions	Aid in developing local and regional comprehensive plans; parks and open space plans; flood control and water quality improvements
Private Businesses	Wetland restoration as one component of meeting regulatory requirements, e.g. water quality trading and Adaptive Management programs
Wetland Consultants	Wetland restoration planning and design
Watershed Planners	Watershed assessments, water quality planning
Wildlife/Other Resources Managers	Prioritize projects; identify and analyze sites; wetland restoration planning and design
Universities/University Extensions	Wetland research; education and outreach; economic valuation of wetland ecosystem services