Science to Guide Floodplain Protection & Restoration in the Mississippi River Basin

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Charting a New Course for the Mississippi River Watershed
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Multiple Benefits of Floodplains
Successful Floodplain Projects
Floodplain Prioritization

How do we scale up?

Where to invest?
US Floodplain Analysis

NEW US model

• LISFLOOD-FP routes flows through channels delineated by HydroSHEDS
• Regionalized flood frequency analysis
• 10 return periods from 5 to 1000 yrs
• Explicit representation of USACE NLD
• Validated with FEMA and USGS data (Wing et al. 2017)
US Floodplain Analysis
US Floodplain Analysis

41 million people at risk

$5 TRILLION exposed

Wing et al 2018
US Floodplain Analysis
US Floodplain Analysis

$675,919 \text{ km}^2$ natural area in 100-year floodplain

$306 \text{ B}$ to acquire

avoıds $593 \text{ Billion}$ future damages by 2070

Johnson et al in press
FLOODPLAIN PRIORITIZATION TOOL

Identify places in the Mississippi River Basin where restoration or conservation would have the greatest impact on the overall health of this river system.

Photo credit: Byron/frijjorjim

LEARN MORE

FPTool.org
Water Quality

• Nutrient loading to *local waters*

• Nutrient loading to *Gulf of Mexico*

• Growing degree days – In conjunction with higher loading, facilitates *denitrification*
Important Bird Areas (Audubon)

TNC Ecorregional Rollup Units

USFWS Threatened & Endangered Species

Bird Corridors & Key Habitat Areas (American Bird Conservancy)

Number of At-Risk Wetland Species (EPA)

Fish Habitat Degradation Risk Index (NFHP)
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
Flood Risk

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

- 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, % *Native American*, % with *less than 12th-grade education*, % *Hispanic*, etc.

Social Vulnerability Index

- Census block group scale
- *$ value of row-crop losses* assuming 100-year flood of 24 hrs. duration on June 1, modeled with HEC-FIA

Ag Losses from Flooding
The Floodplains Prioritization Tool (FP Tool) is designed to identify critical opportunities for floodplain protection and restoration in the Mississippi River Basin. Use the selector widgets below to specify criteria related to water quality, wildlife habitat, and human exposure to flood risk. The map on the right will change in response to your selections to identify sites meeting these criteria and identify those geographies where floodplain restoration or conservation is likely to have the greatest positive impact on the health of this river system.

**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
- Zoom in to Activate Catchment

**Select Management Action**
- Protection
- Restoration

**Filter Floodplain Units**
- Available Floodplain Area
- Nutrients
Growing degree days
Nutrient loading
Restorable area
Flood frequency
Spatial scale
Action type

Restoration priorities: Nutrient focus
Restoration priorities: **Nutrient** focus
Eliminate areas with highly productive soils

In TNC Ecoregional Assessment priority area

More severe stresses to fish habitat
Future population

Future flood damages

Restoration priorities:
- Has 500+ restorable acres
- ≥33/100 for nutrient loading
- In a TNC ecoregional assessment priority
- Relatively greater fish habitat stressors
- Relatively less productive soil
- At least ~30 ppl. in floodplain by 2050
- At least $500K in damages by 2050
At-risk wetland species

More severe stresses to fish habitat

Future population
At-risk wetland species

More severe stresses to fish habitat

Future population

Future flood damages

Restoration priorities:
- Has nonzero restorable acres
- $\geq 50/100$ for nutrient loading
- In a TNC ecoregional assessment priority
- Has at-risk wetland species
- Relatively greater fish habitat stressors
- At least $\approx 10$ ppl. in floodplain by 2050
- At least $\$10K$ in damages by 2050
Lower Meramec River Multi-Jurisdictional Flood Management Plan

- 70 river miles on the Meramec
- 25 river miles on the Bourbeuse
- 20 river miles on the Big River
Silver Jacket’s Lower Meramec Floodplain Management Plan Partners
Criteria for PROTECTION:
• At least 1,000 acres of floodplain in forest or wetland
• Bottom 50% for nutrient loading
• Nonzero current pop. & projected 2050 pop. >100 ppl.
• Projected 2050 flood damage >=$10,000,000
Upcoming Data & Development

• Updated data from **USGS SPARROW model**
• Places **resilient to climate change**
• Improved mapping of **levee locations**
• Estimate of **Carbon sequestration** in floodplain
• **Future floodplain maps** based on climate change
• Development of **customized tools** for local geographies – e.g. lower Meramec River in Missouri
Upcoming Data & Development
Upcoming Data & Development
Thank You!

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