Restoring More Natural and Beneficial Functions of Floodplains

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Founded in 1973, American Rivers protects wild rivers, restores damaged rivers, and conserves clean water for people and nature.

Headquartered in DC, American Rivers has offices across the country and more than 200,000 supporters, members, and volunteers nationwide.
Upper Mississippi River Basin Floodplain Restoration

Presentation Outline:

- Summarize current projects in the basin
  - Nutrient Removal
  - Floodplain Easements
  - Farming in Floodplains
- Describe drivers and barriers
Restoring Functional Floodplains

Connectivity

Variable Flow

Spatial Scale

Habitat and Structural Diversity
Restoring the Multiple Benefits of Floodplains

Recreation

Water storage and groundwater recharge during floods

Photo by Chris Young
Completed a literature review on nutrient removal in floodplains

- **Goal**: direct nutrient removal funds toward floodplain restorations
- **Driver**: states are trying to spend money on the best practices while updating their strategies
- **Barrier**: uncertainty in how much nitrogen and phosphorus floodplains can remove
Nutrient Removal: Sources

Nitrogen Fertilizer

Phosphorus Fertilizer & Erosion
Nutrient Removal: Conservation Practices

Some examples:
- Cover Crops
- Conservation Tillage
- Nutrient Management
- Contour Buffer Strips
- Buffers
- Filter Strips
- Wetlands
- Water and Sediment Control Basins (WASCOBs)
- Bioreactors
- Saturated Buffers
- And others!
# Nutrient Removal: Preliminary Results

## Average Removal in Floodplains

<table>
<thead>
<tr>
<th></th>
<th>Load reduction</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>25(^{th})</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>77.1</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>2.75</td>
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</tbody>
</table>
Nutrient Removal: Preliminary Results

Conservation Practices in the Iowa Nutrient Reduction Strategy

% Nitrogen Reduction

Fertilize with Manure
Nitrification Inhibitor
Fertilizer Rate
Cover Crops
Drain Water Mgt
Extended Rotations
Bioreactors
Saturated Buffer
Wetlands
Floodplains
Land Retirement
Nutrient Removal: Preliminary Results

Conservation Practices in the Iowa Nutrient Reduction Strategy

% Phosphorus Reduction

- Fertilizer Rate
- Floodplains
- Fertilizer Placement
- Conservation Tillage
- Fertilize with Manure
- Buffers
- Land Retirement
- Terraces
- Sediment Control Basins
- No Till (from chisel plow)
What should we restore for better nutrient removal?
What should we restore for better nutrient removal?
Target river & stream reaches with higher concentrations of nitrogen and phosphorus.
Having permanent pools improves nitrate removal.
Having permanent pools improves nitrate removal.
Denitrifying bacteria seem to be more active during fluxes of fresh flood water.
Restore diversity!
Legacy Phosphorus

Phosphorus concentrations in cropped soil could be high and released into water first years after a restoration.
Having vegetation and topography that improve sedimentation and accretion could be best for both nutrients’ particle-bound forms.
Nutrient Removal: Harvesting Nutrients

- Harvesting vegetation could help to remove phosphorus
- Harvesting depends on the goals of the restoration
Design conclusions

- It’s about the Microbes!
- Permanent wetland somewhere on the floodplain
- Diverse geomorphology- maximize transition zones
- Set realistic expectations for first few years
Policy Takeaways

- Two requirements for spending nutrient reduction funds on floodplain restorations:
  - Quantify potential reductions
    - The data are becoming more available
  - Provide good demonstration sites
    - We still need more demonstration projects!!!
Restoration Project: Floodplain Easement Policies

- **Goal**: restore thousands of flood-prone acres to natural floodplain
- **Driver**: many farmers are tired of the repetitive flooding and are open to restoration
- **Barrier**: funding is difficult to access for easements or land purchases
Restoration Project:
Floodplain Easement Policies

- Best easement funds for this project
  - ACEP- Wetland Reserve Easements
  - CREP Wetlands
  - FEMA disaster mitigation
  - EWP Floodplain Easements
Goal: help landowners dealing with flooding and reconnect isolated floodplain easements

Driver: farmers are tired of the flooding

Barriers: it’s difficult deciding whether to restore floodplains and finding the right program
Ground-Level Perspective: Farming in Floodplains

Preliminary Results:

- In 2018, 50% of corn and 16% of soybeans grown in floodplains lost money – assuming farmer ownership.
- ~99% of rented floodplain cropland lost money
The graph shows the number of floods in two different periods:

- **1999-2008**: 4 Floods
- **2009-2018**: 20 Floods

The graph plots river levels in feet (ft) over time. The levels are categorized into:

- **Minor Flood stage**: 22'
- **Moderate Flood stage**: 27'
- **Major Flood stage**: 32'
- **Action stage**: 19'

The data is divided into two periods:

- **1999-2008** shows a relatively stable pattern with minor fluctuations.
- **2009-2018** shows a significant increase in flood events, with peaks reaching up to 32'.
Ground-Level Perspective: Farming in Floodplains

- More research for alternative practices in the floodplain
- Perennial crops for wet areas?
- Hunting leases?
Conclusions

- Solutions for overcoming the barriers
  - More demonstration projects for nutrient removal
  - More emphasis and involvement in EWP Floodplain Easements
  - More options and ideas for farmers
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Floodplain Disconnection

~8,000 miles of levees in the Upper Mississippi River Basin (Galloway Report, 1995)
Rivers Flood

Floods drive natural processes and ecosystem functions that sustain rivers and create floodplains.