DEPARTMENT OF NATURAL RESOURCES

Impact of Altered Landscapes on Wetlands

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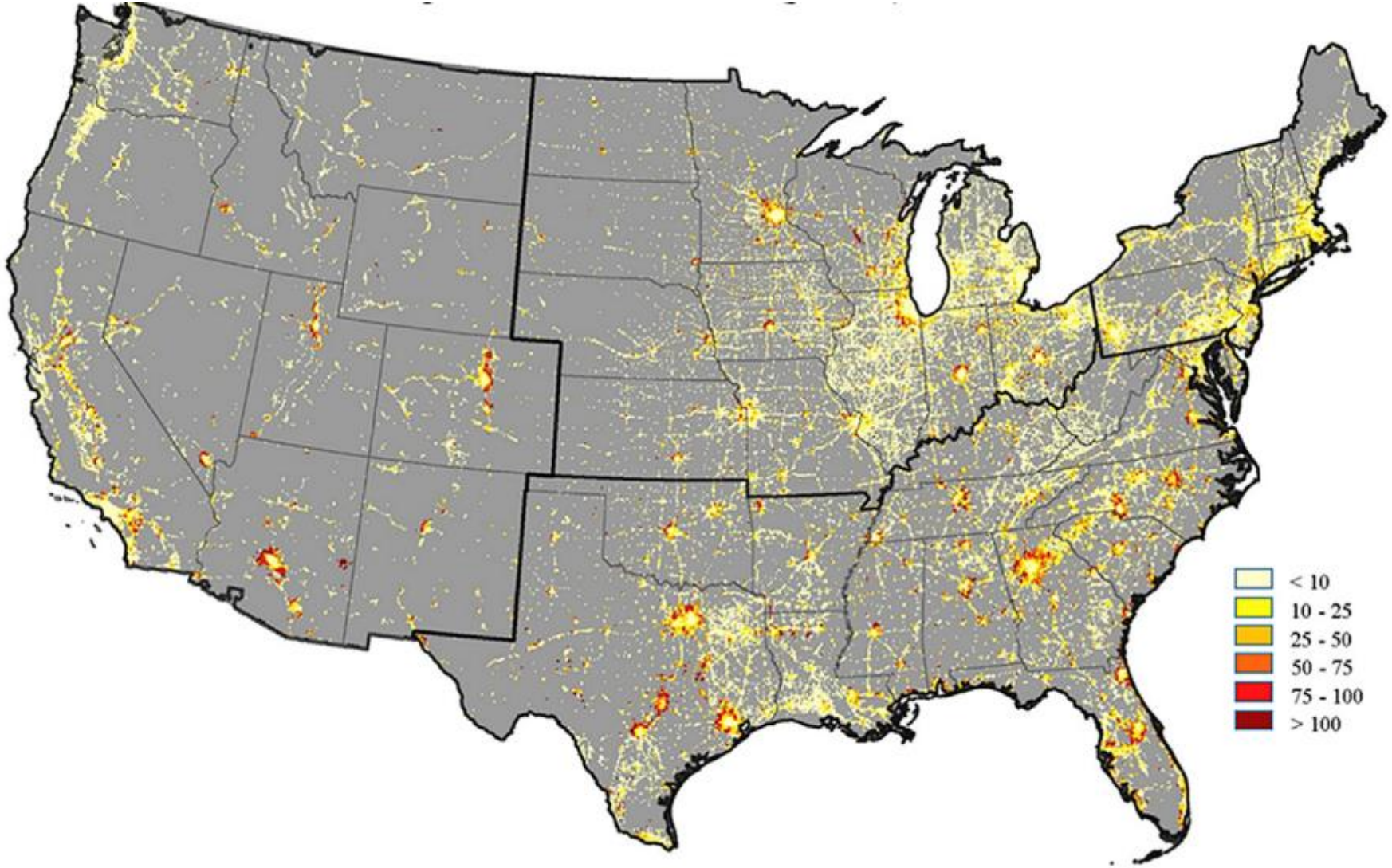
Division of Fish and Wildlife

Human Infrastructure Influence

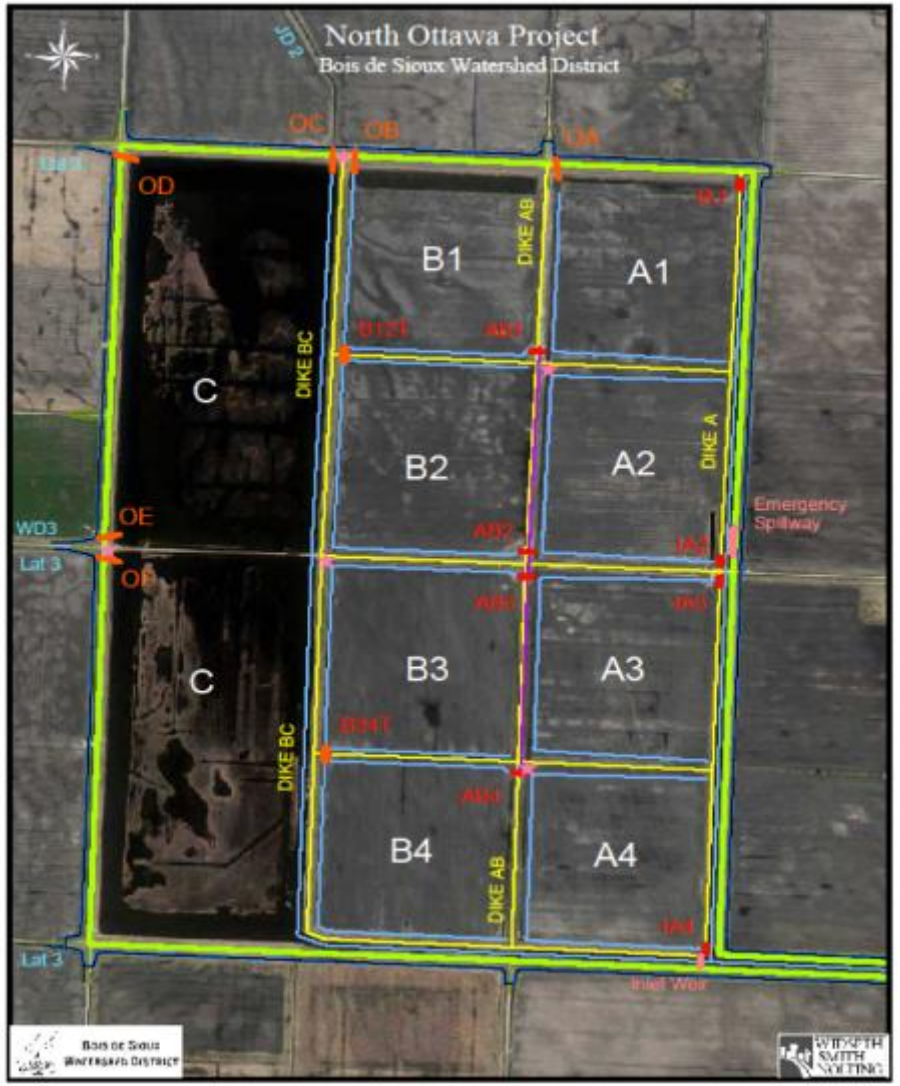


Urban Stormwater Management

- Impervious Structure
- Buildings
- Roads
- Rerouting Water
- Storm Sewers
- Storage Ponds

Flood Damage Reduction

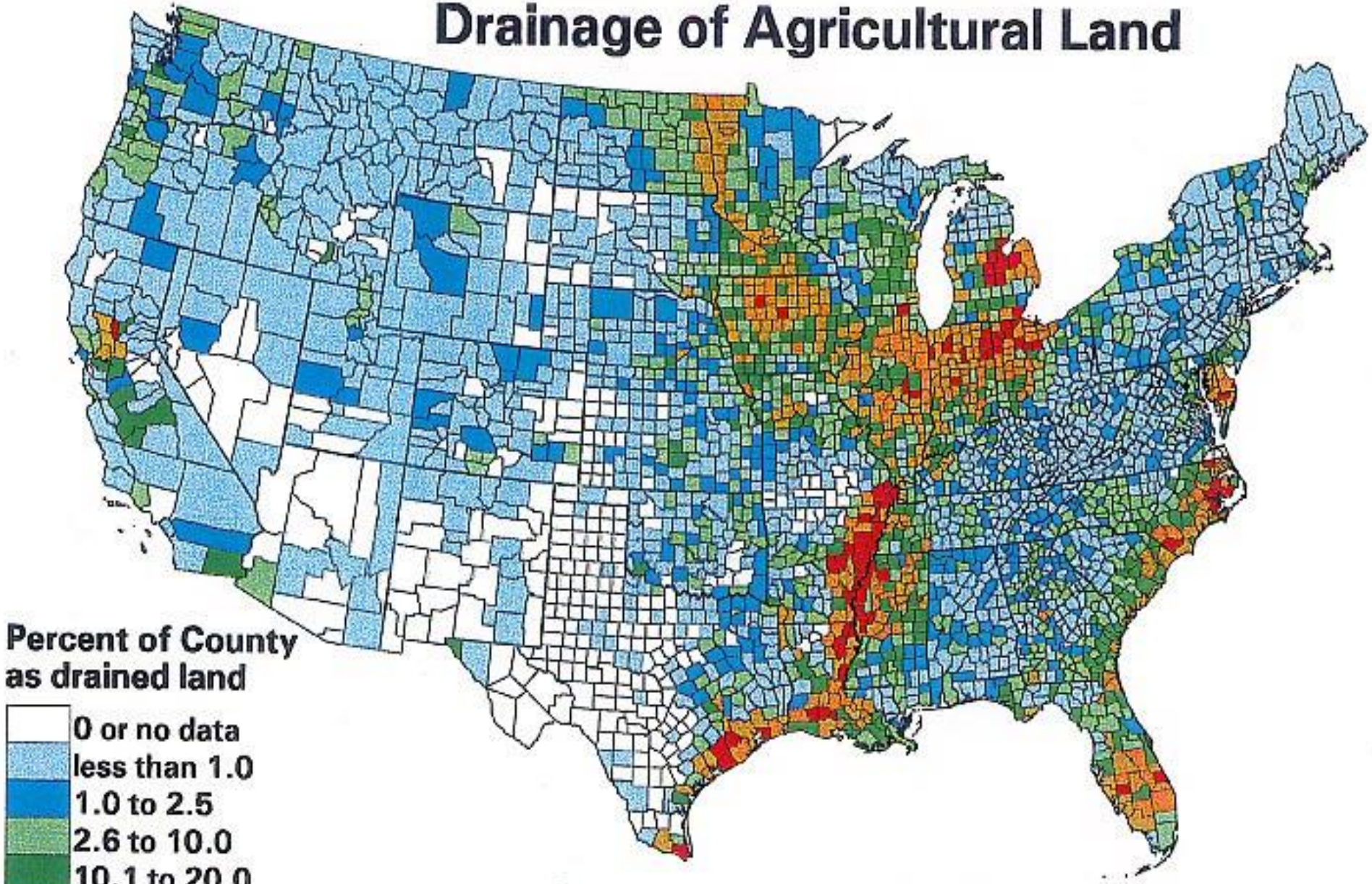
- Channelization
- Dams
- Topography



Roadways

- Channelized streams
- Ditch conveyance
- Dams

Drainage of Agricultural Land



Data on the extent of drained agricultural land is from:

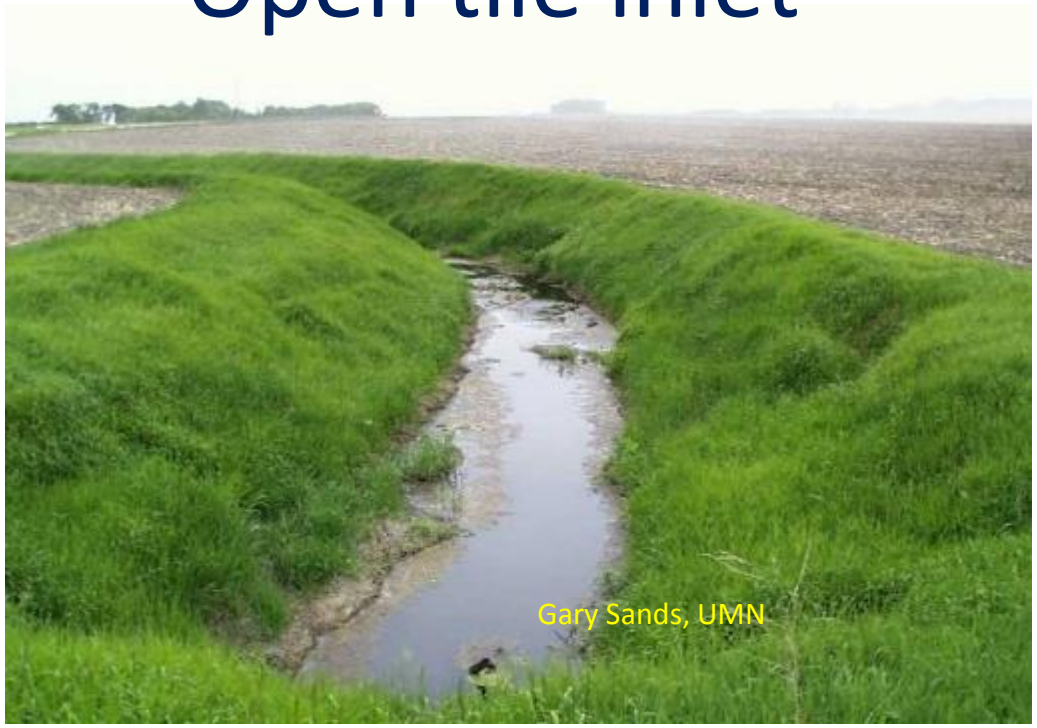
U.S. Department of Commerce, Bureau of the Census, 1978 Census of Agriculture. 1981. Volume 5, Special Reports, Part 5, Drainage of Agricultural Lands, AC78 – SR – 5.

Graphic by William Battaglin, USGS

Types of Drainage

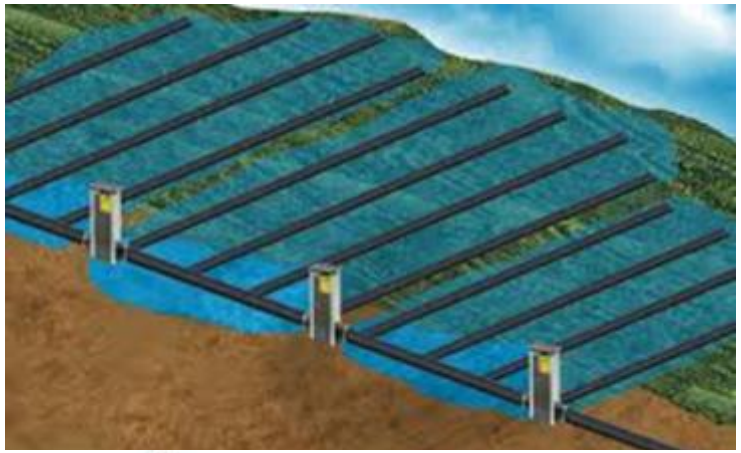
Open ditches

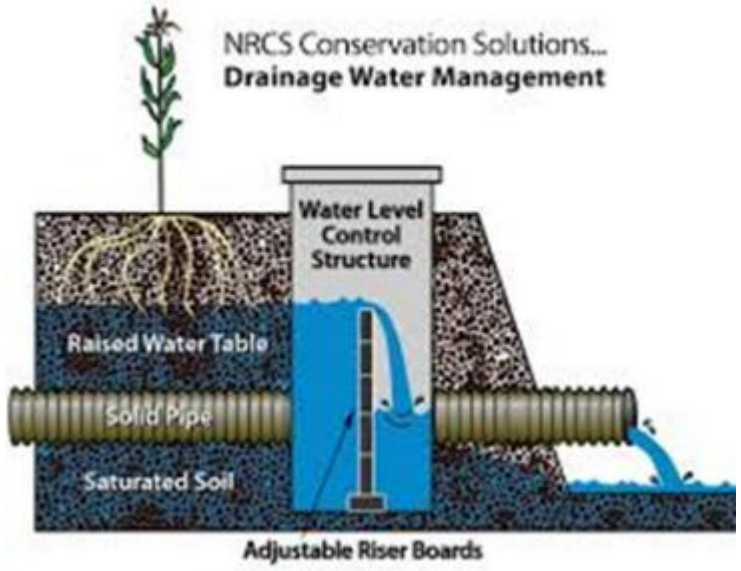
Open tile inlet



Types of Drainage

- Pattern tiling
- Controlled drainage



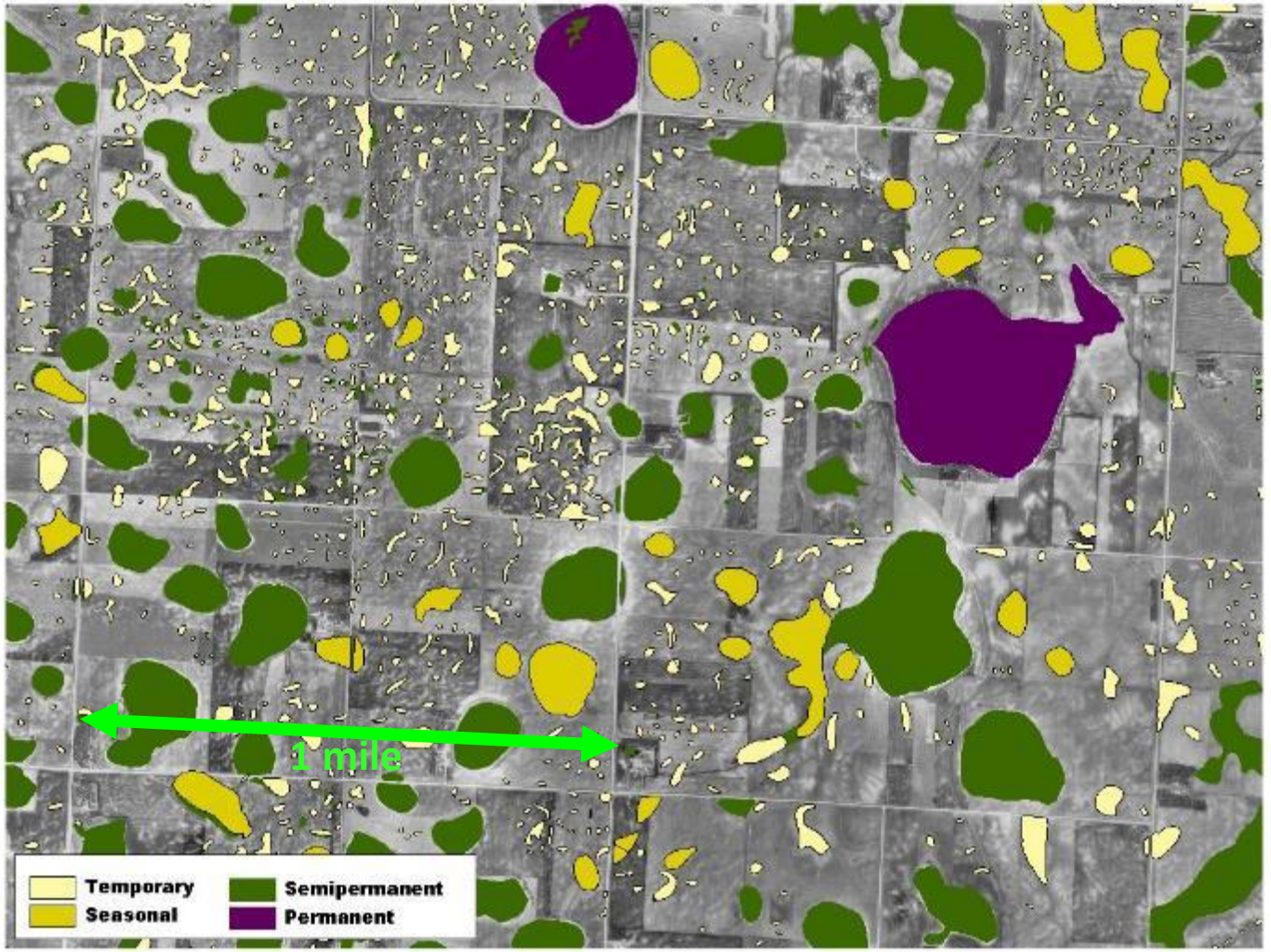


What has been the Impact?

- Fragmentation
- Direct Loss
- Increased Connectivity
- Altered Hydrology

Fragmenting Wetland Habitat Complexes

- Variety Wetland Types
  - Size
  - Depth
  - Permanence
- Spatial Relationship
- Patch Size
  - Acres to Watersheds



Forest Wetland Complexes

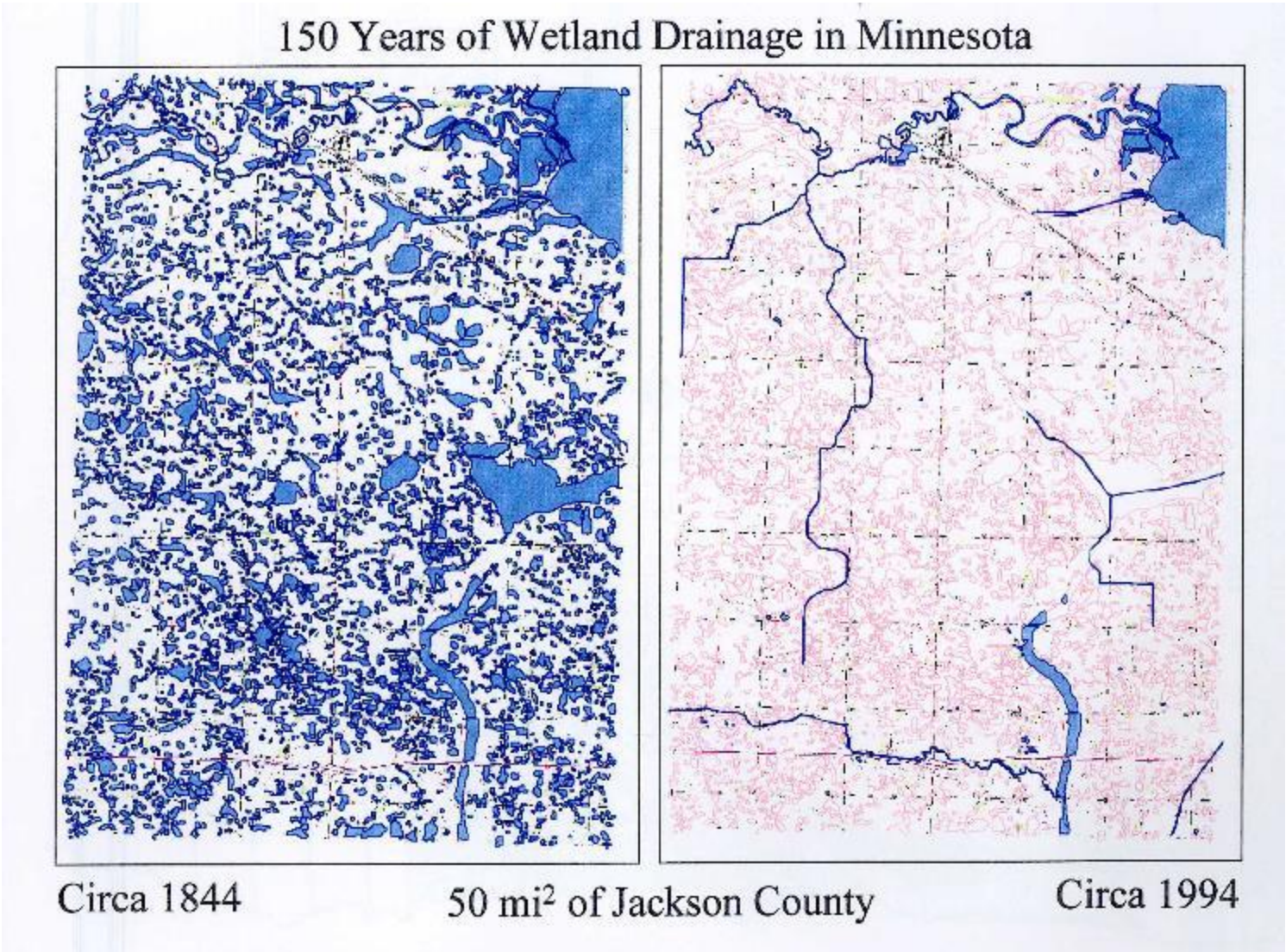
- Lakes
- Ponds
- Vernal Pools
- Fens

River Wetland Complexes

- Main channel
- Backwaters
- Oxbows
- Floodplains
- Depressions

Direct loss through Drainage

- Initial loss focused on temporary and seasonal basins
- 50% loss of acres = 90% loss of basins



Direct Loss by Topographical Change

- Loss through filling
- Loss of microtopography through tillage

Increased Connectivity

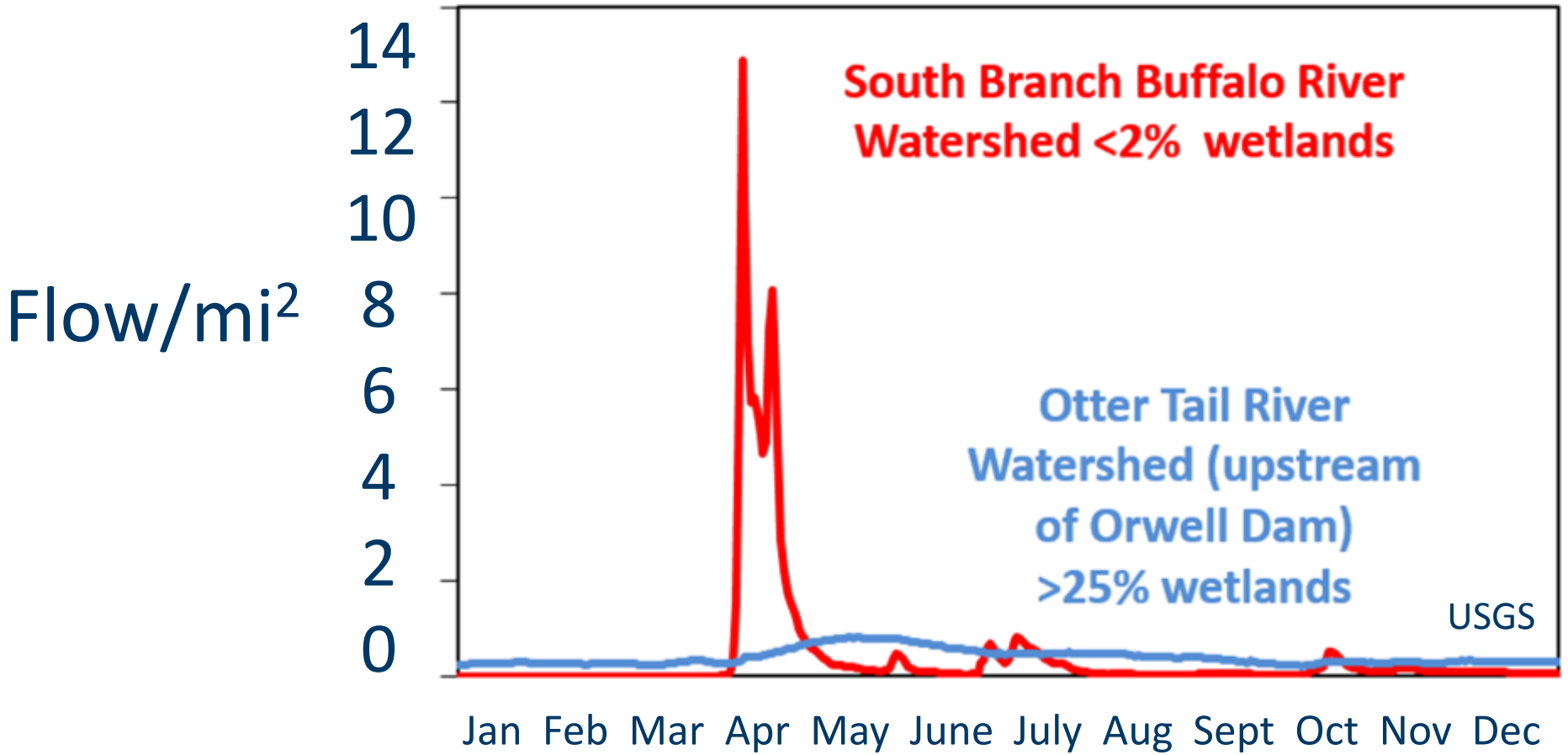
Pathway for sediment and nutrients

Increased Connectivity

Pathway for invading plants and fish

Altered Hydrology

1997 Watershed Hydrograph



Altered Hydrology

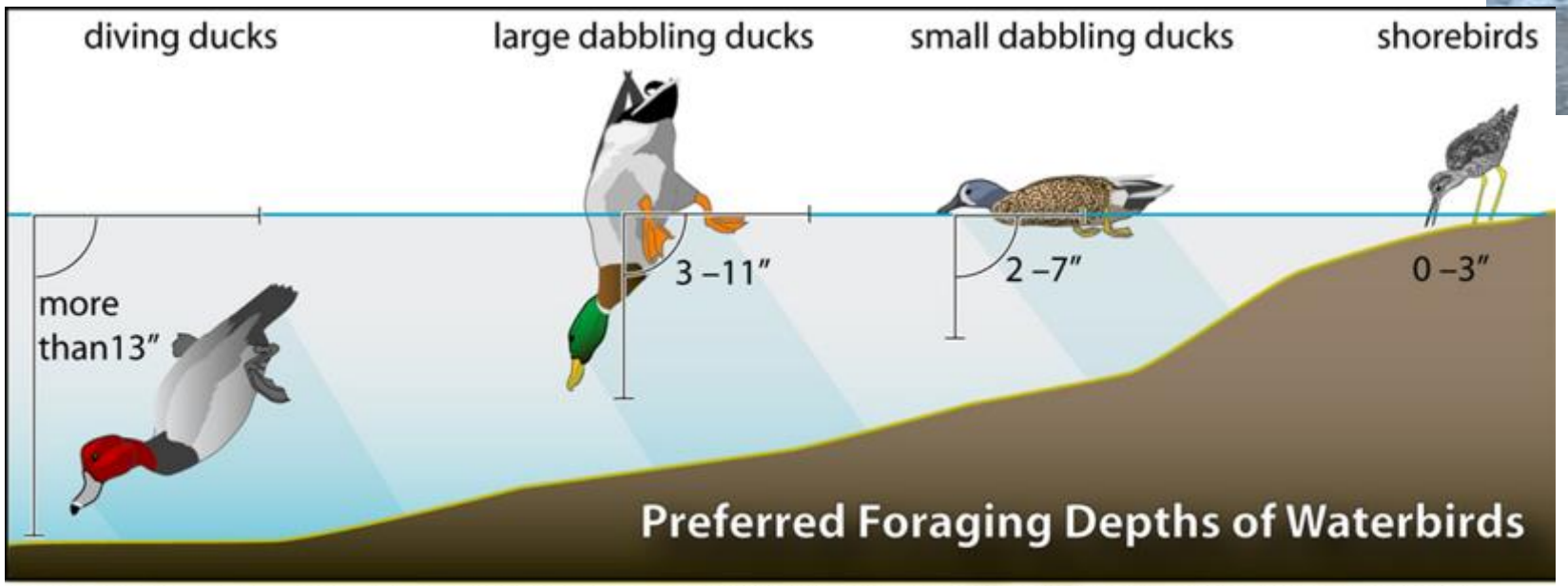
Too little Water

Altered Hydrology

And too much

- Dry can be as important as wet
- Shallow wetlands critical

Ellingson Inc.



Fredrickson, L.H., &. Dugger, B.D. 1993. Management of Wetlands at high altitudes in the Southwest. U.S. Department of Agriculture, Forest Service, Southwest Region, Washington, D.C.

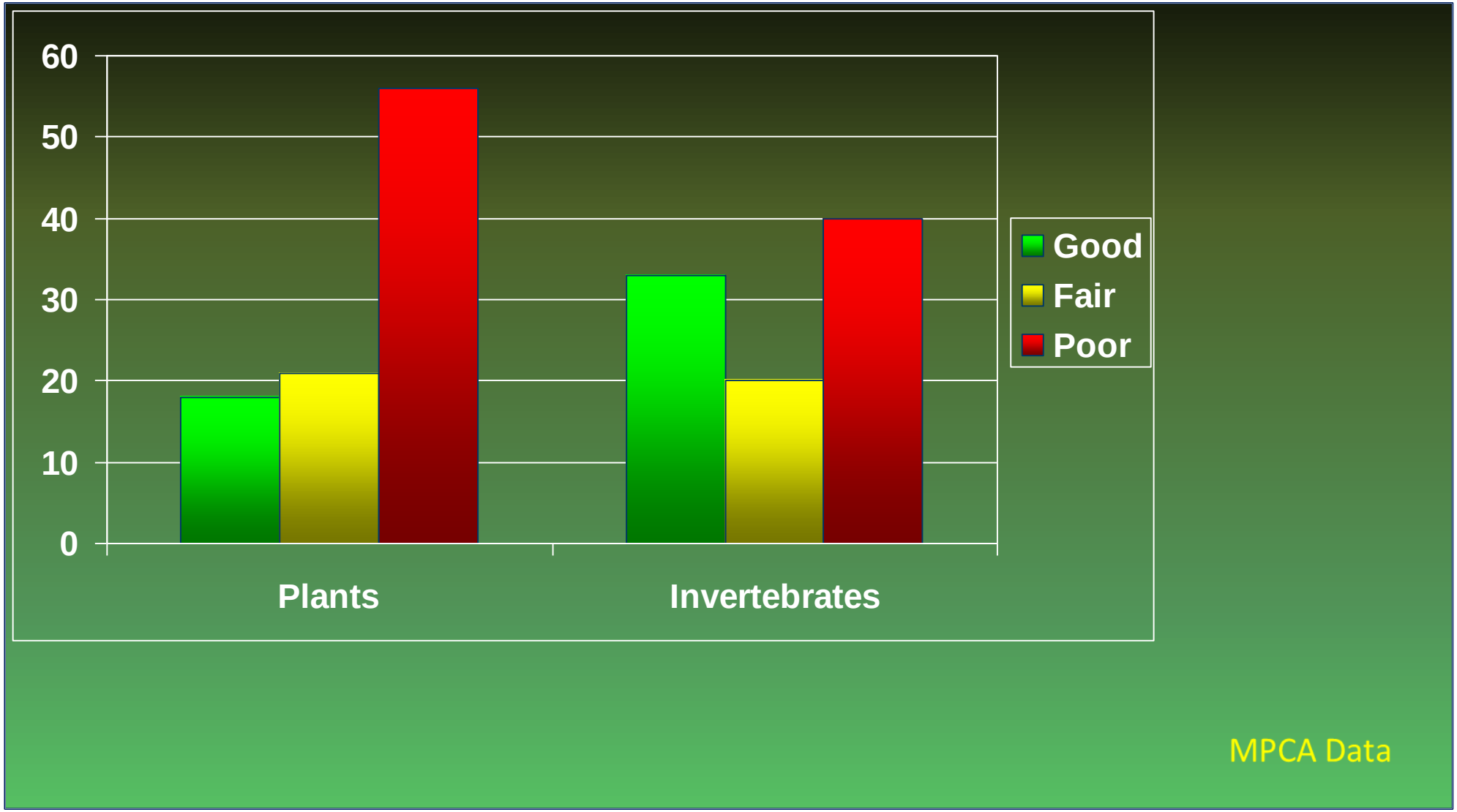
Impairment Synergy

- Pathway reduces residence time = ↑Nitrates/Flooding
- Pathway + Sediment = ↑Phosphorus/Algae

Impairment Synergy

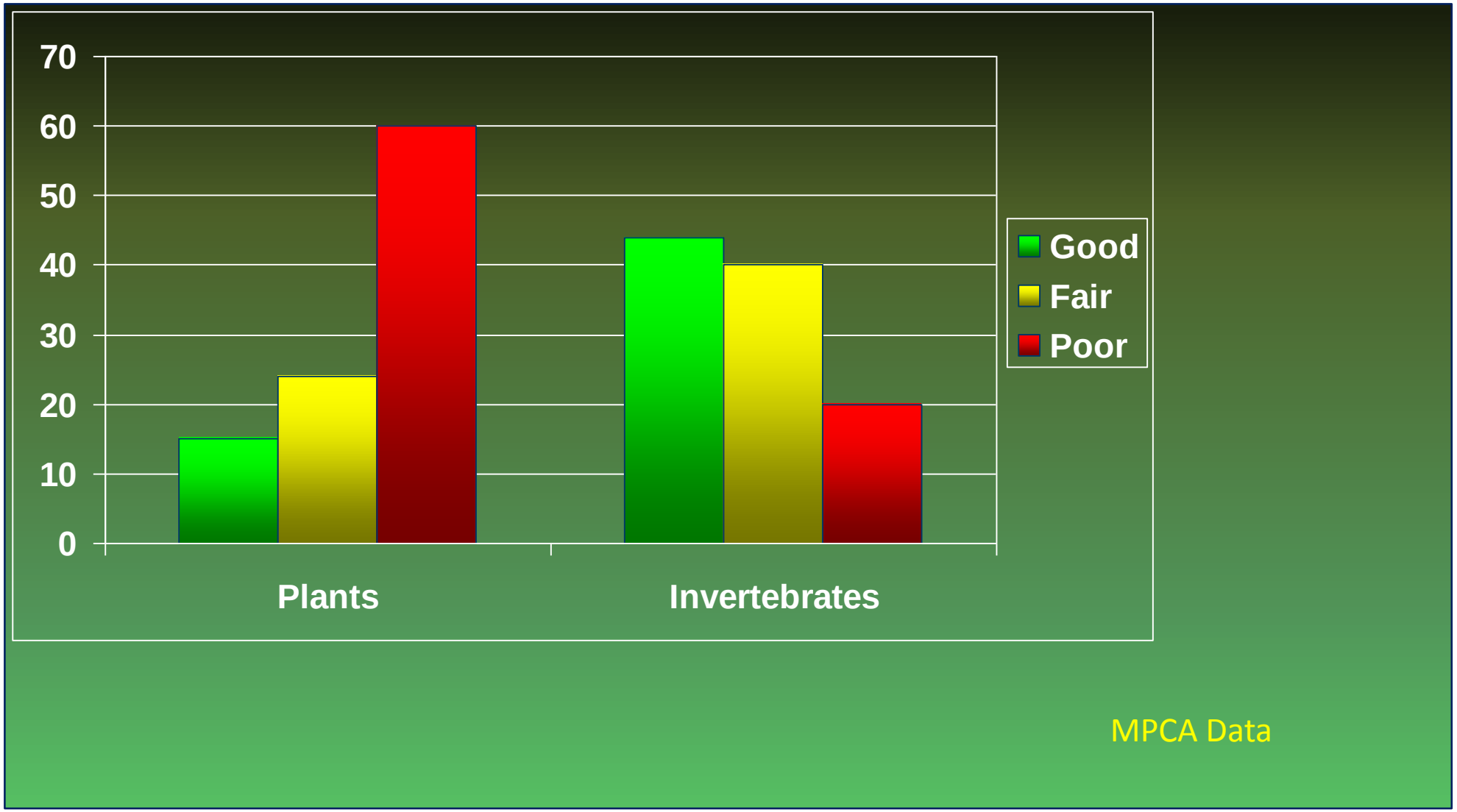
- Pathway + Nutrients = Undesirable Plants
- Pathway + Greater Depth = More Fish

Prairie Wetland Quality



MPCA Data

Hardwood Transition Wetland Quality



MPCA Data

Summary of Impacts

- Outright Loss of Wetlands
- Fragmentation of Wetland Complexes
- Increased Connectivity/Altered Hydrology affecting:
    - Residence Time
    - Water Regime/Depths
    - Invading Plants and Fish
    - Pathway for Contaminants
    - Nutrient Enrichment