Impact of Altered Landscapes on Wetlands

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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
Data on the extent of drained agricultural land is from:

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

John Deere

Montreal Times

MNDNR
Increased Connectivity

Pathway for sediment and nutrients

NCSU

Ontario MAFRA
Increased Connectivity

Pathway for invading plants and fish
Altered Hydrology

1997 Watershed Hydrograph

South Branch Buffalo River
Watershed <2% wetlands

Otter Tail River
Watershed (upstream of Orwell Dam)
>25% wetlands

Flow/mi²

USGS
Altered Hydrology

Too little Water
Altered Hydrology

And too much
• Dry can be as important as wet
• Shallow wetlands critical

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