# Assessing wildlife habitat preservation and restoration opportunities at a local scale: A planning tool

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2 - Wisconsin Department of Natural Resources

# Milwaukee River Basin Wetlands Assessment Project

- Improve wetland restoration decision making with spatial assessment tools
- Improve water quality and flood control
- Provide a means to assess and maximize wildlife value for wetland and upland habitat restorations

Funding: Wisconsin DNR and U.S. EPA

# Why Address Wildlife Habitat?

- The largest populations and highest diversity of native species tend to occur in the most productive portions of the landscape, where humans also reach their highest densities.
  - Scott et al. 2001; Miller & Hobbs 2002; Huston 2005
- Consequently, urbanization is the leading cause of species imperilment in the United States.
  - Wilcove et al. 1998; Czech et al. 2000; Brown & LaBand 2006; Lerner et al. 2007

# Global Extinction Crisis

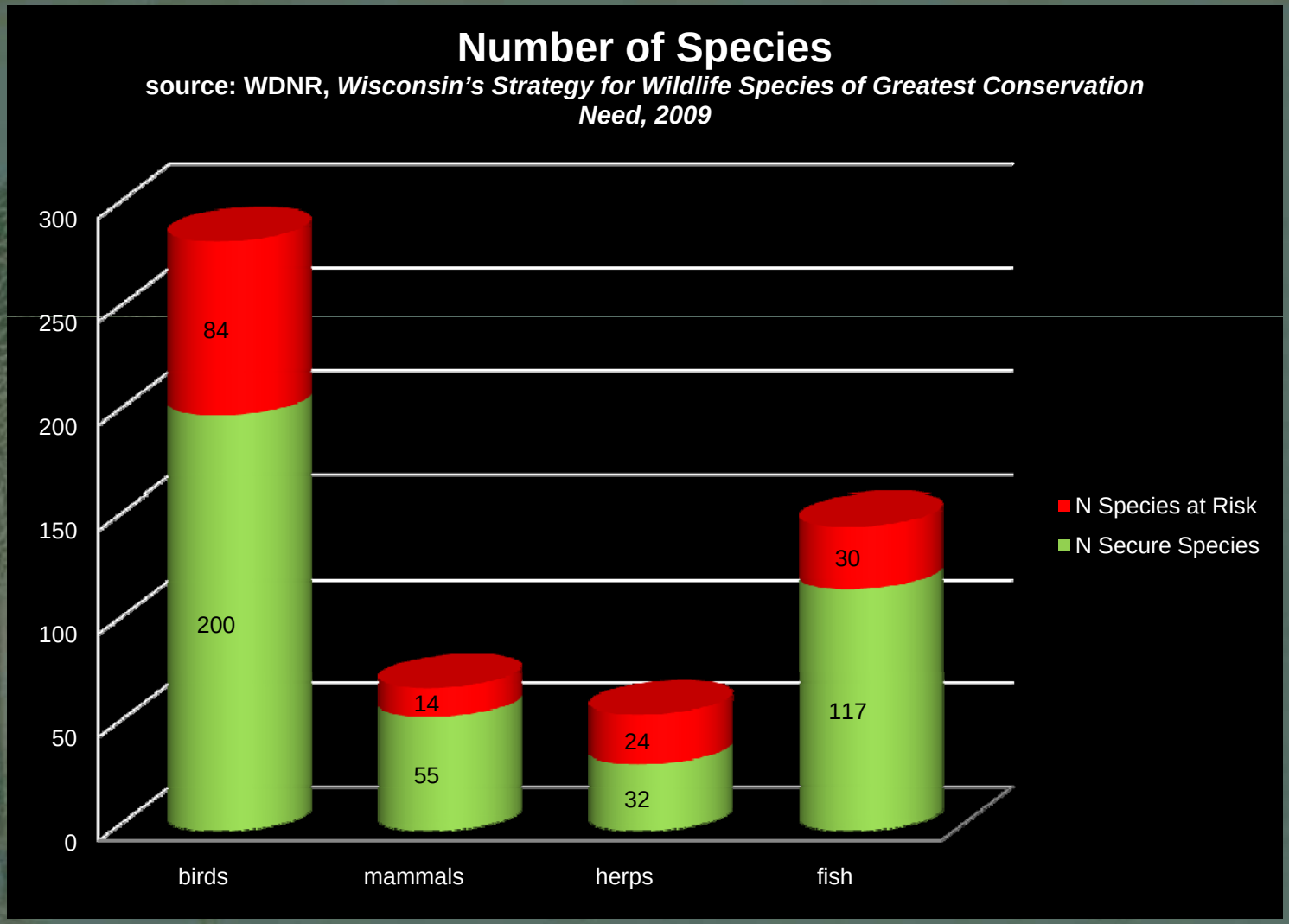
"*Within our lifetime hundreds of species could be lost as a result of our own actions, a frightening sign of what is happening to the ecosystems where they live,*"

Julia Marton-Lefèvre, IUCN Director General, 2008

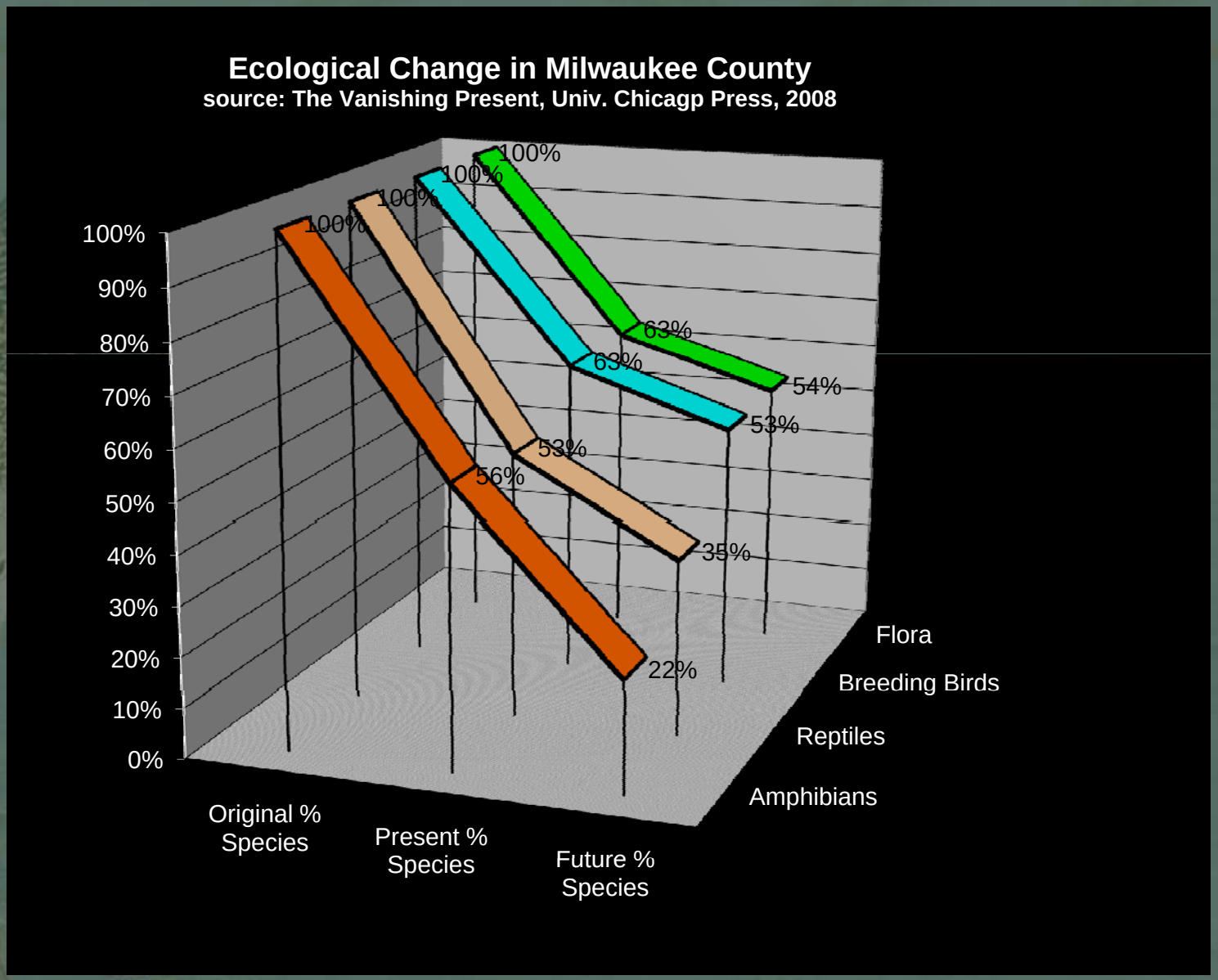
Wilson's Law: *If you save the living environment, you will automatically save the physical environment. But if you only try to save the physical environment, you will lose them both*.

E.O. Wilson, New Scientist, August 2009)

# Wisconsin Wildlife Status

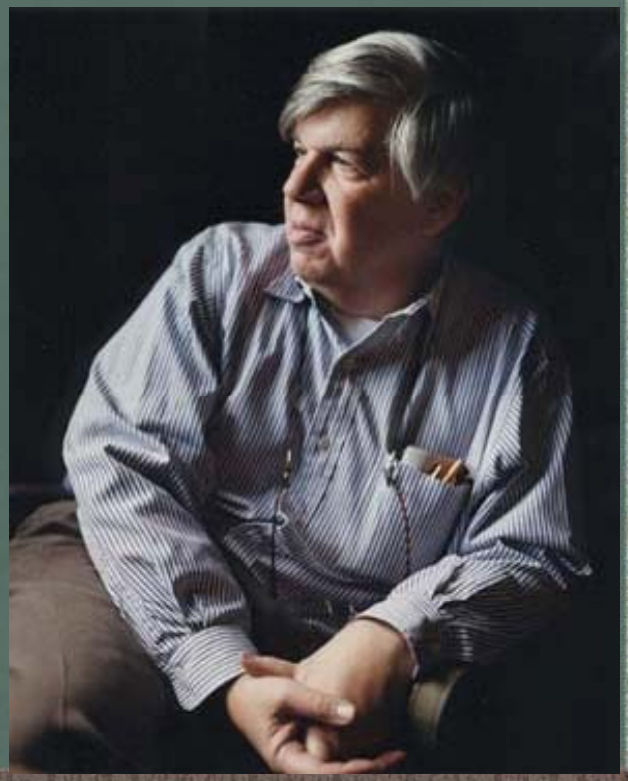


# The Milwaukee Model



*It's always easier to identify problems than to construct solutions*

- Stephen J. Gould



# Solutions

- Decisions regarding development are typically made at relatively low levels of government, such as the county or municipality (Duerksen et al. 1997; Lawrence 2005).
- Consequently, efforts to stem habitat loss and declines have increasingly turned to land-use planning at local scales (Steelman 2002).
    - private land owners
    - local zoning committees

# Disconnect

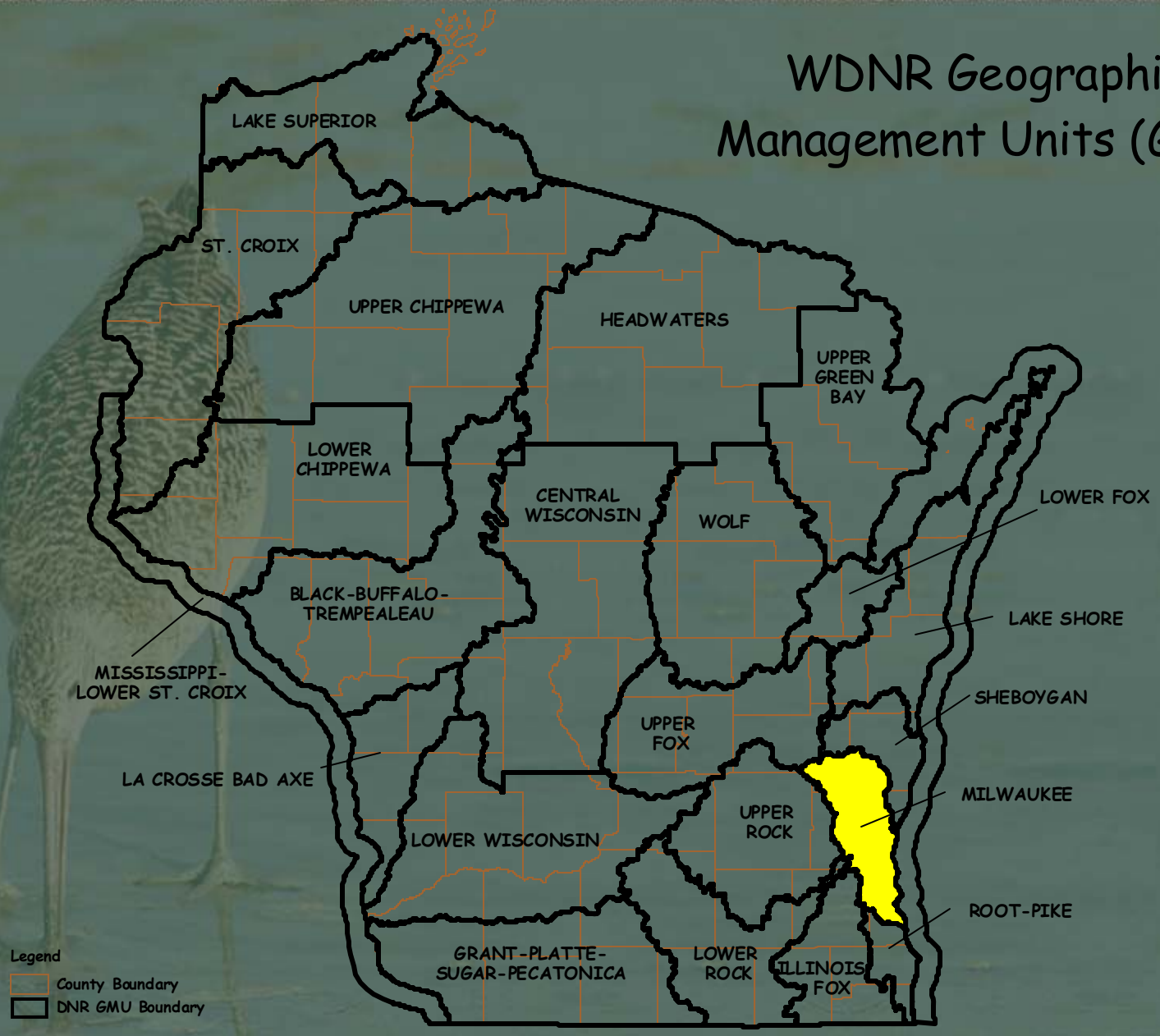
(Miller et al. 2008. Conservation Biology 23:53-63)

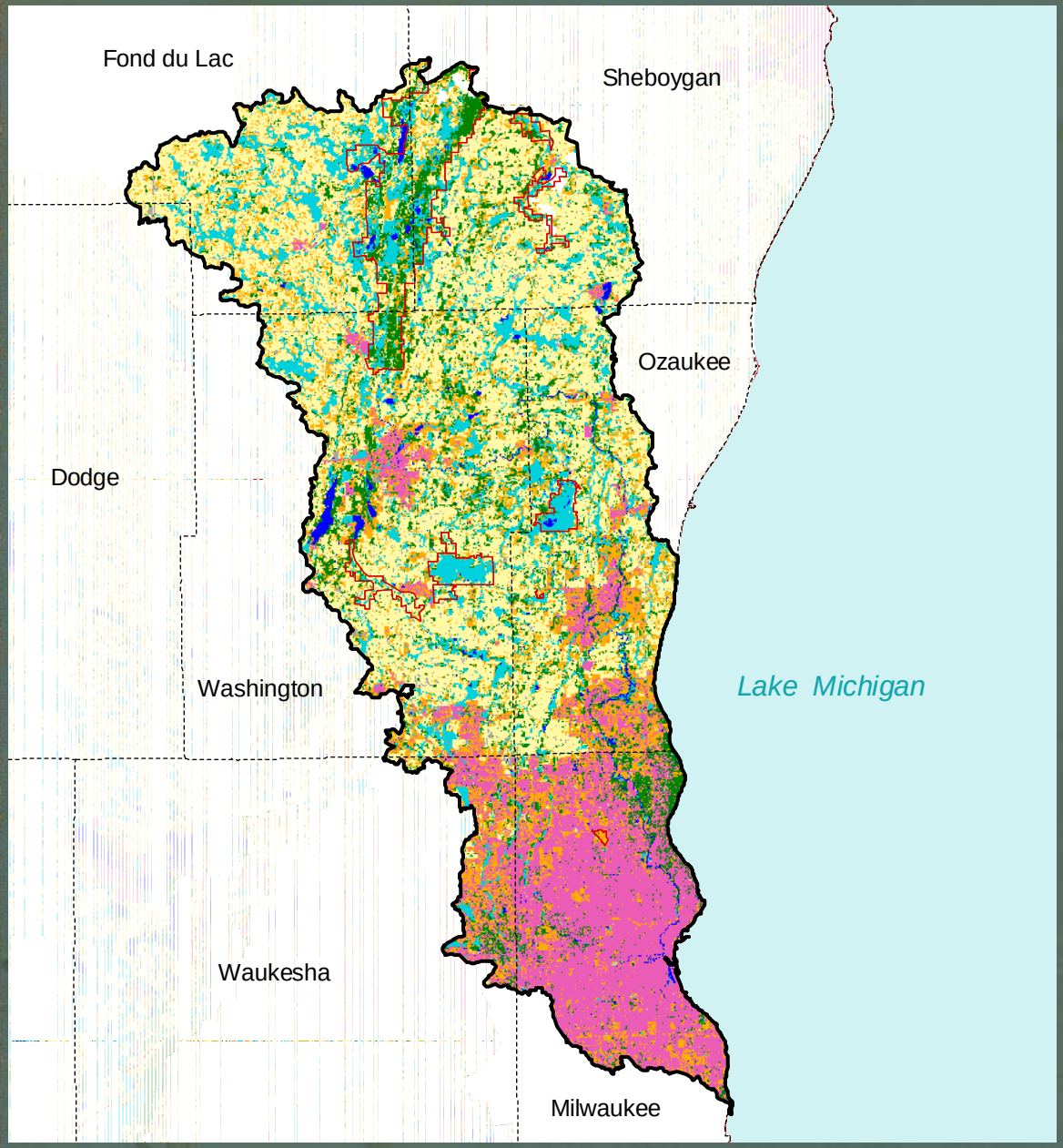
- Biodiversity conservation is seldom a major consideration in these departments.
- Staff time is mainly devoted to development mandates.
- Very few planning agencies employ conservation biologists.

# Connect

- Most planning agencies do employ or contract land use planning specialists, and wetland mapping staff.
- This project targets these staff resources to address wildlife habitat planning.

# WDNR Geographic Management Units (GMU)






# Milwaukee River Basin Landcover

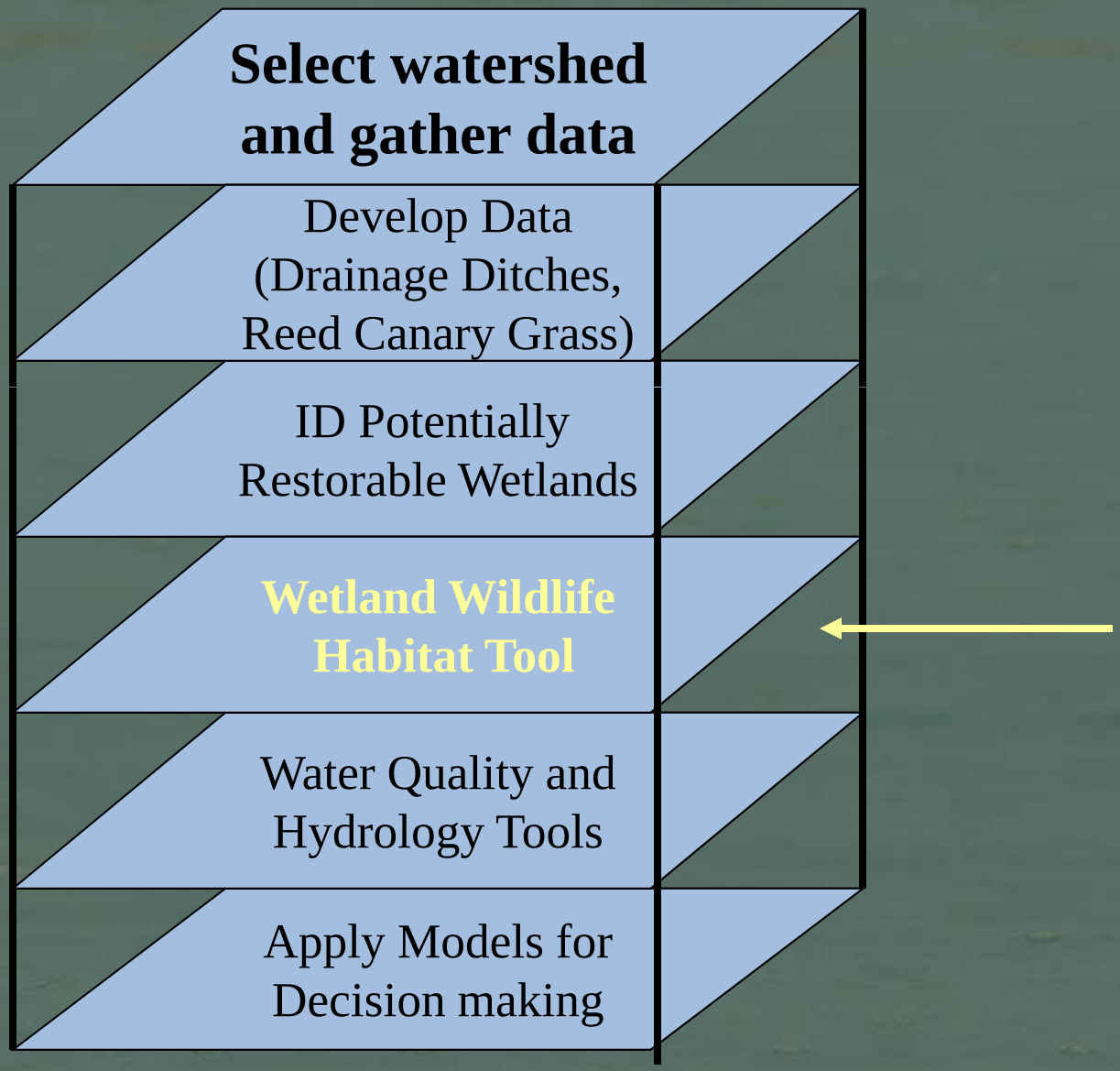
- Glaciated, rolling ground moraine
- "Pristine" Kettle Moraine State Forest - 23,000 acres
- Major suburban growth
- Agricultural north
- Urbanized south: 18% of Basin contains 90% of its population

Milwaukee River Basin
State Properties

Landcover
- Urban
- Agriculture
- Grassland
- Forest
- Open Water
- Wetland
- Barren
- Shrubland
- Cloud Cover

8 0 8 16 Miles

# Overall Process in a Nutshell



# Existing Data Sets

- Topography
- 24K Hydrolayer; Watersheds
- Wisconsin Wetland Inventory
- Reed canary grass dominated wetlands
- NRCS Soils
- WISCLAND Land Cover; NASS
- SEWRPC Land Use Mapping
- Roads
- Biological Inventories

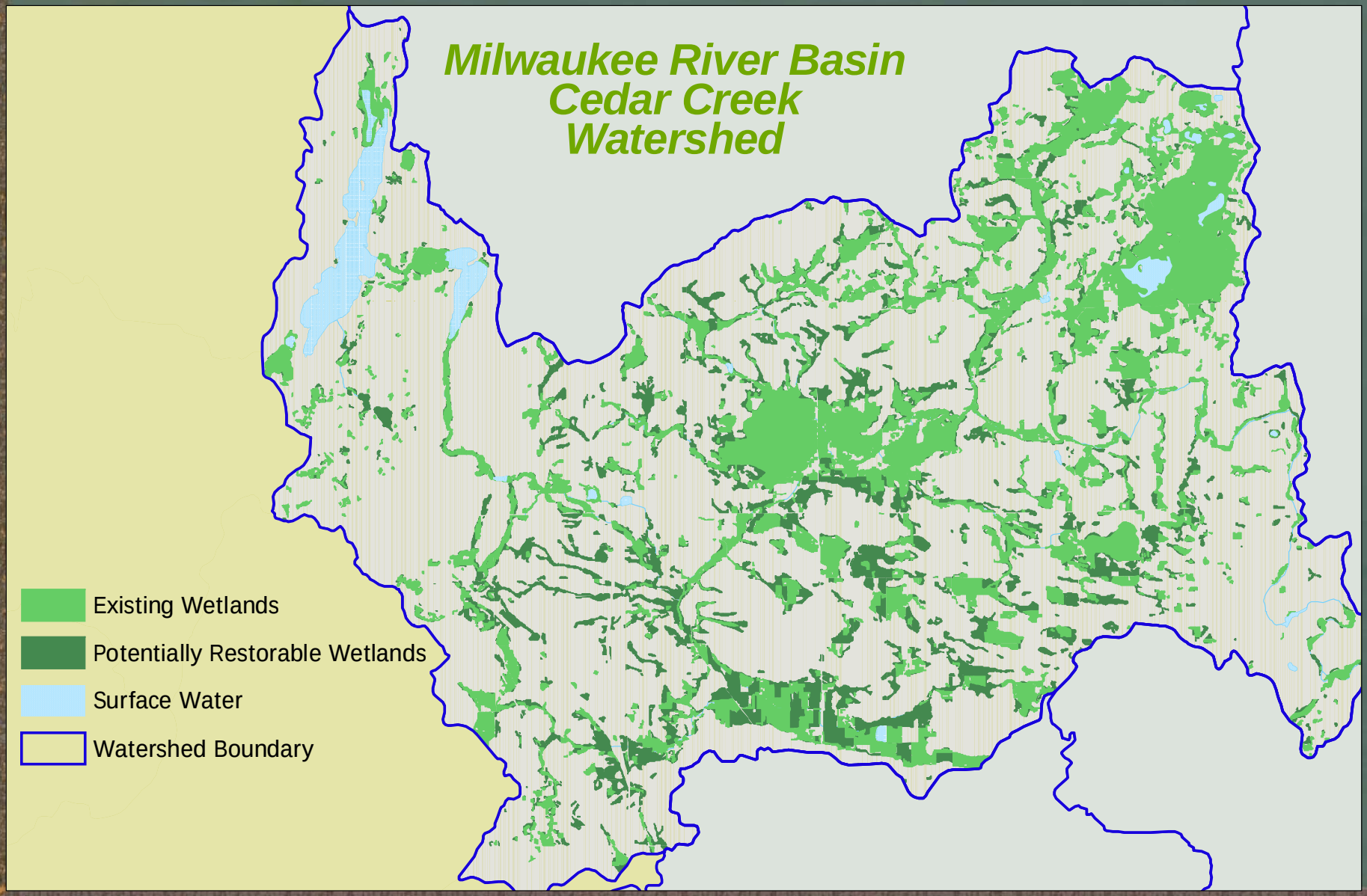
# Identify Potentially Restorable Wetlands (PRWs)

PRWs = Hydric Soils - Existing Wetlands

AND

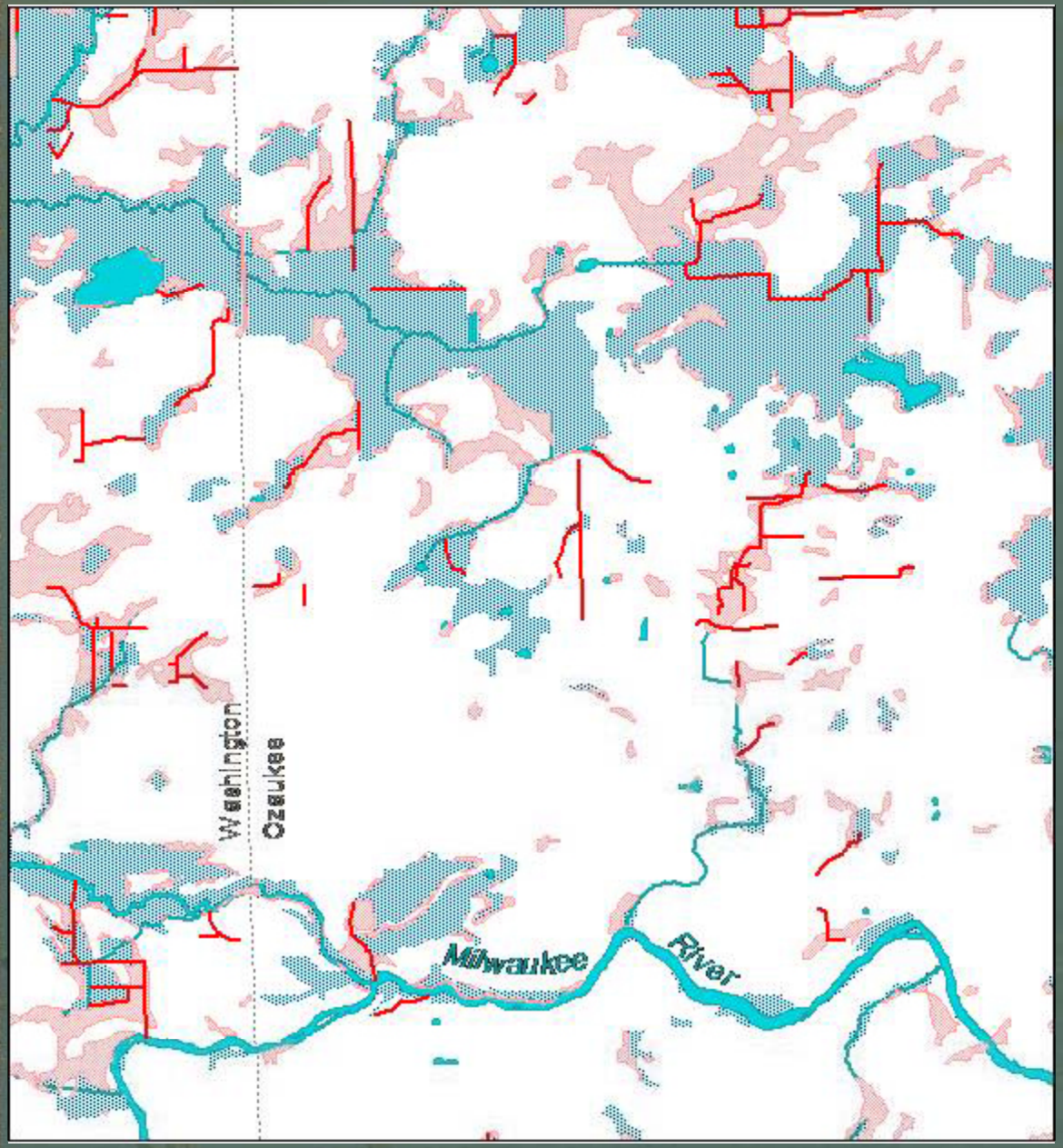
Must be in agricultural or other undeveloped rural land use

# Existing and Potentially Restorable Wetlands



# Other Wetland Restoration Suitability Factors

- Drained Wetlands
  - Drainage ditches evident
- Invasive Species Domination
  - i.e. reed canary grass
- Cropped Wetlands



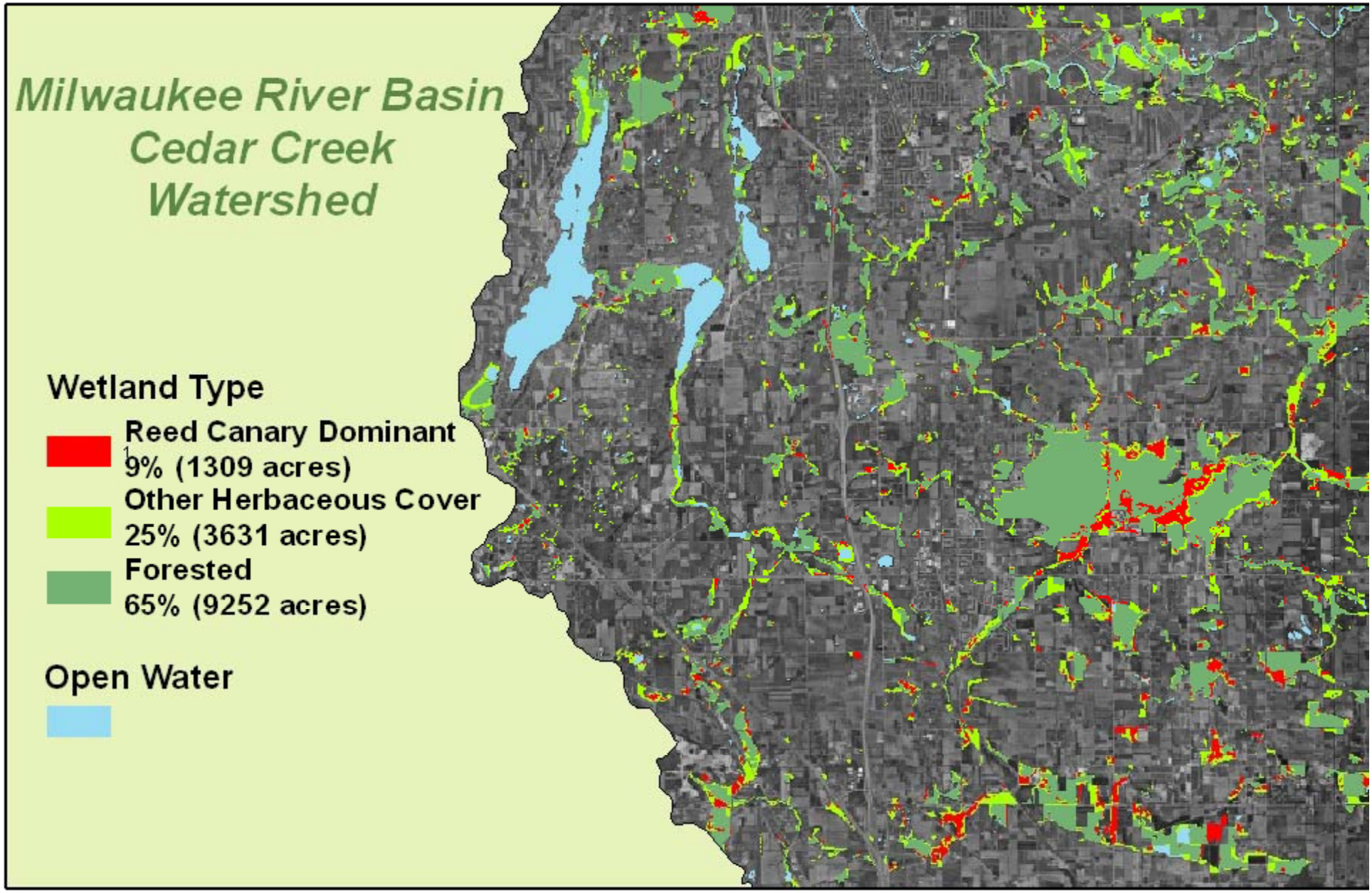

# NW Ozaukee County

## Drainage Ditches with Potentially Restorable Wetlands

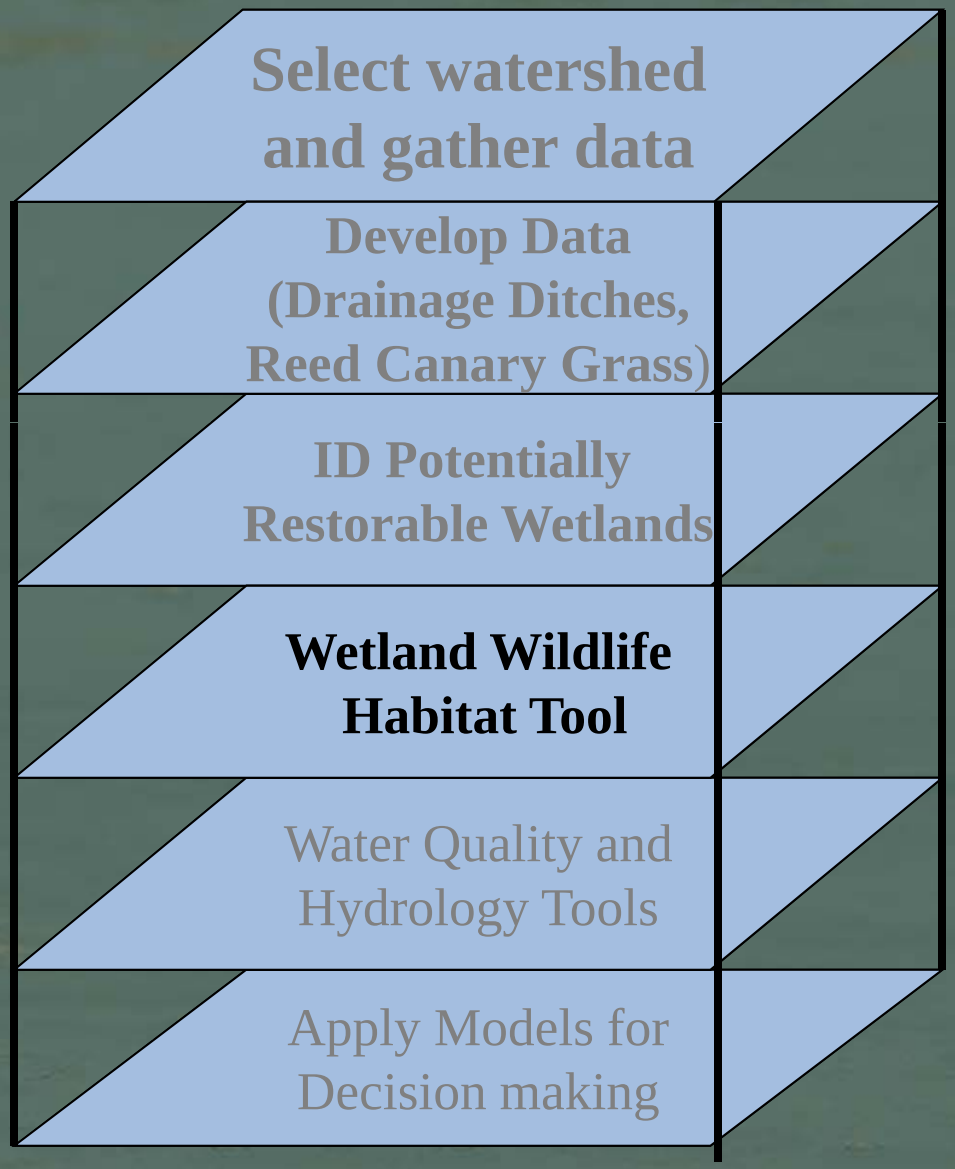
- Rivers / Streams
- Drainage Ditches
- Lakes
- Wetlands
- Potentially Restorable Wetlands

0.6 0 0.6 1.2 Miles

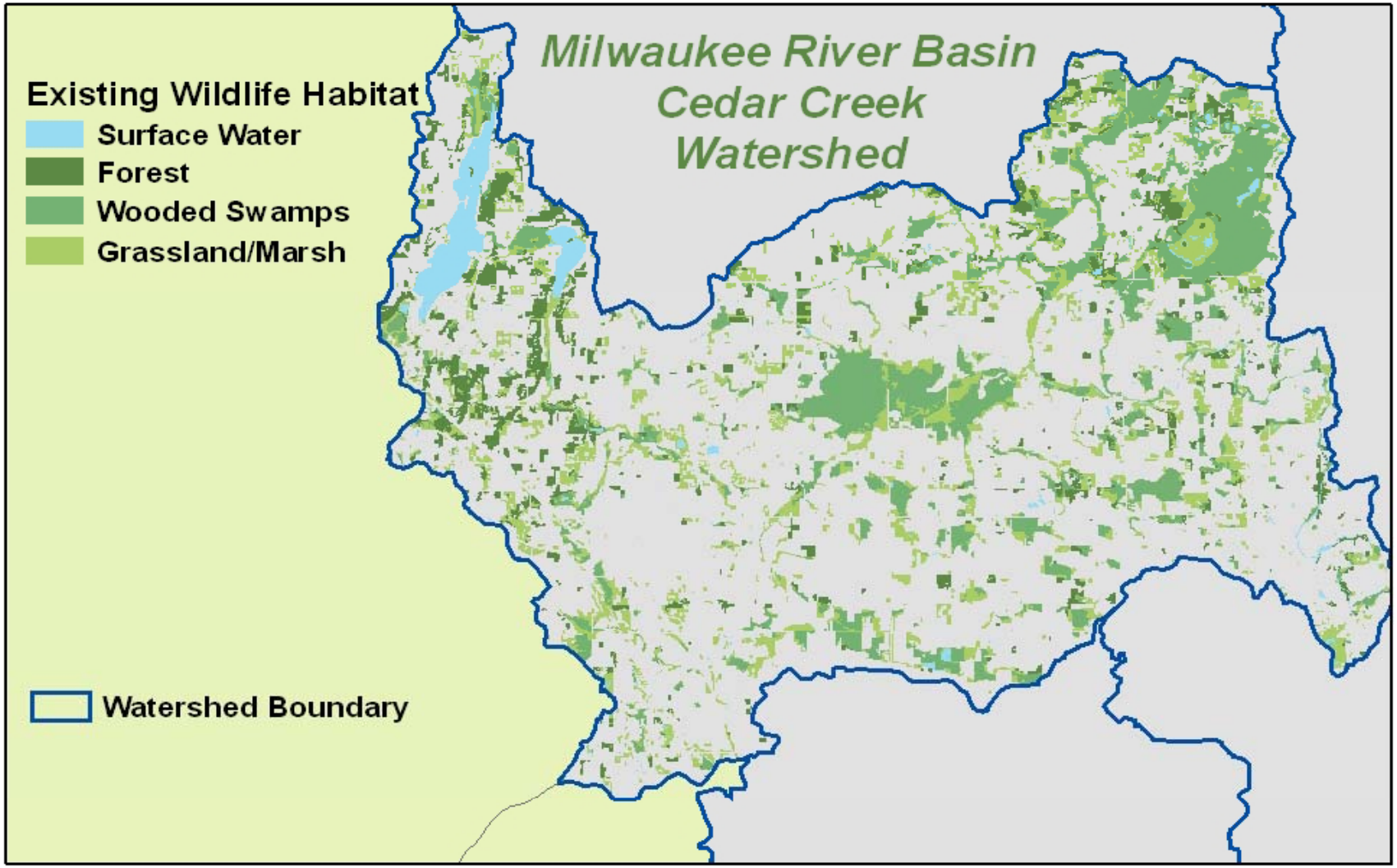
# Reed Canarygrass Mapping from LANDSAT Imagery



# Process in a Nutshell

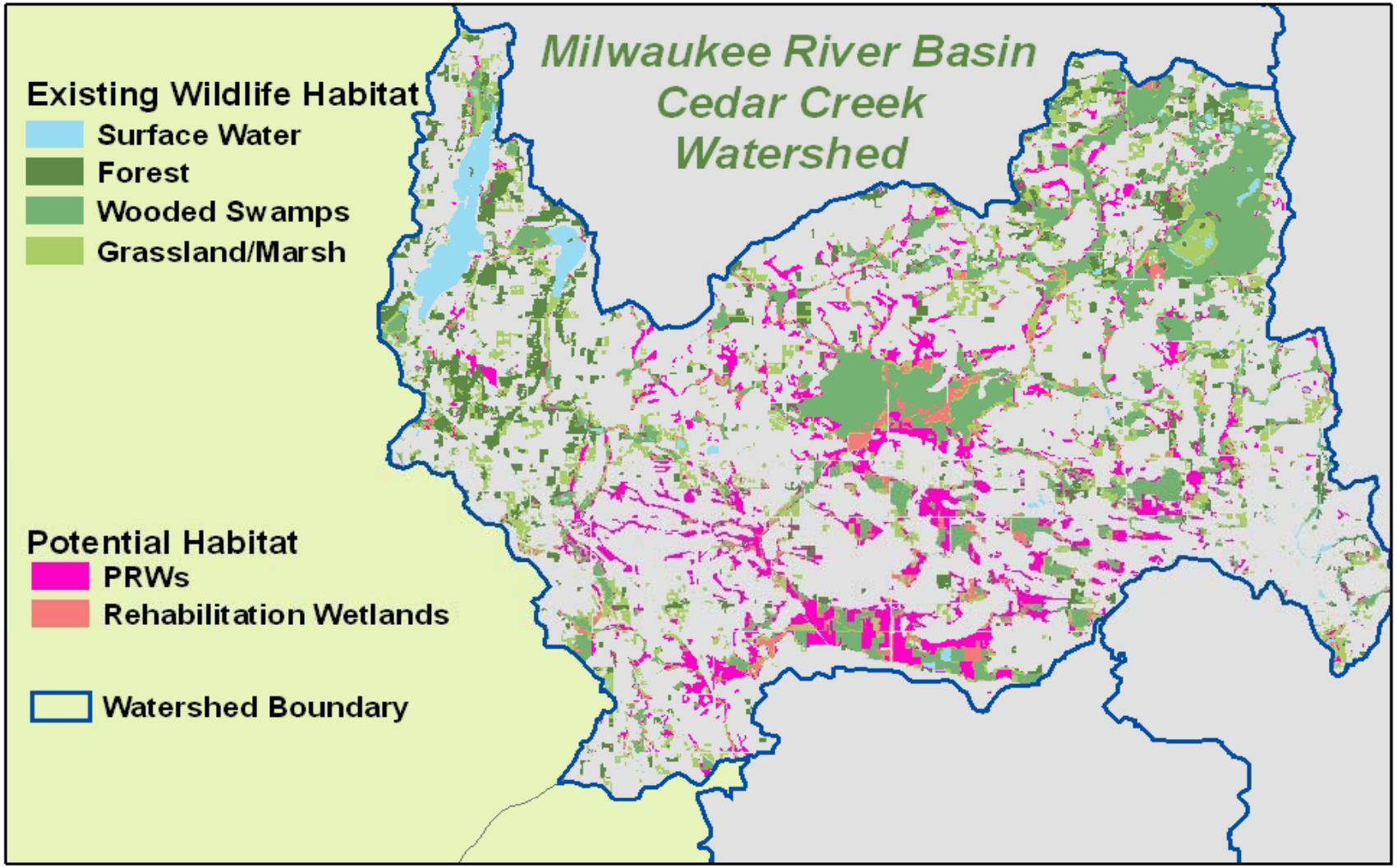


# Existing Wildlife Habitat




*Source WDNR*

# Existing and Potential Wildlife Habitat



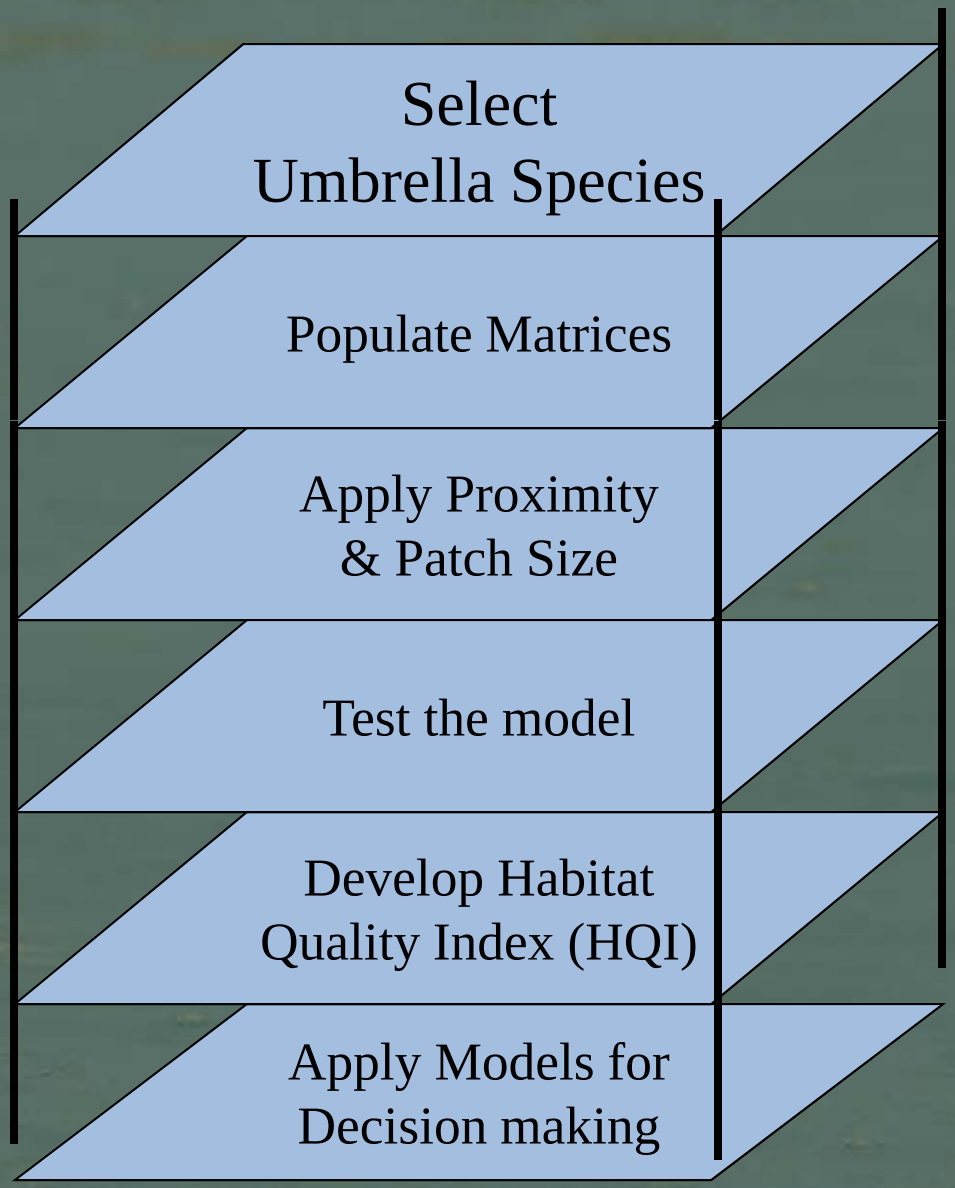

*Source WDNR*

# Are All Restorations Equal From a Wildlife Perspective?

<u>What About</u>

- Habitat Area
- Habitat Patch Size
- Habitat Connectivity
- Habitat Quality

# Wildlife Tool: Maximizing Habitat Quality

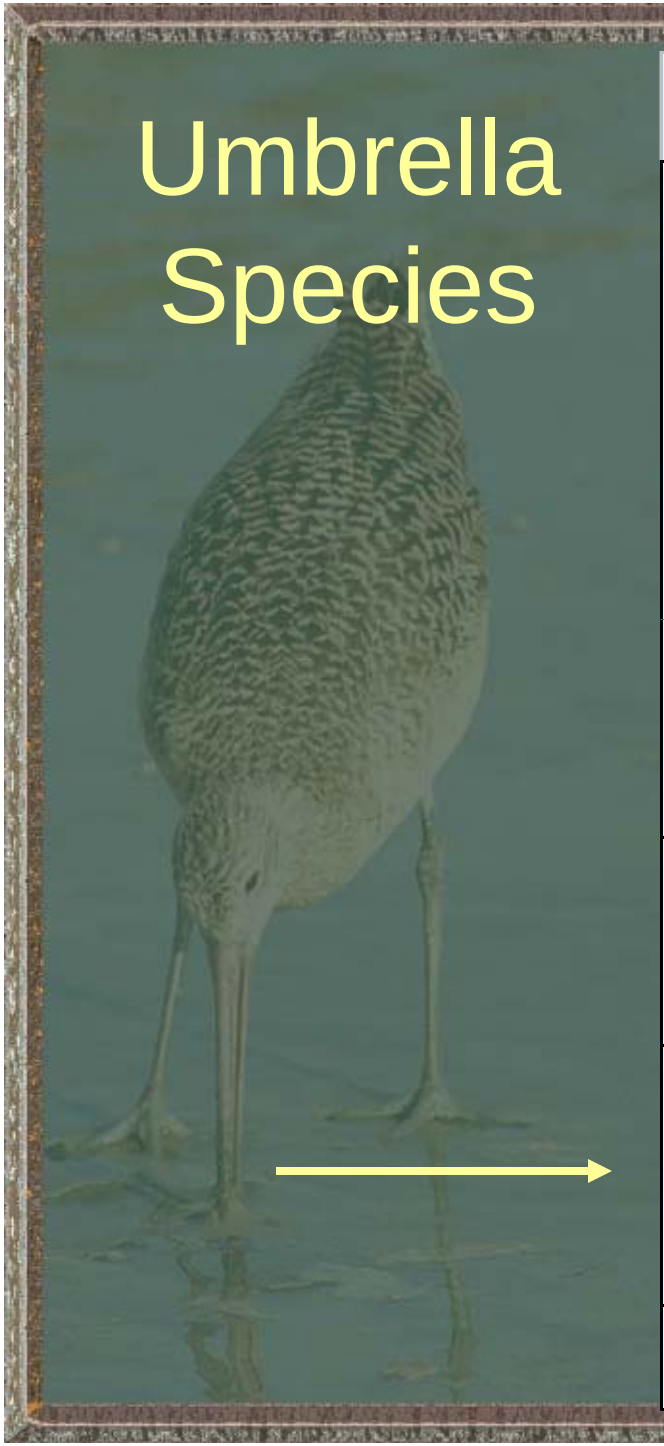



Identify PRWs with the greatest value for increasing suitable wildlife habitat for a diversity of species

# Umbrella Species Concept

- Species whose conservation confers a protective umbrella to co-occurring species due to shared habitat requirements (Lambeck, 1997)
- *Assumption* - if the resource requirements of an umbrella species are met, the requirements of many other species also will be satisfied (Fleishman et al., 2001)

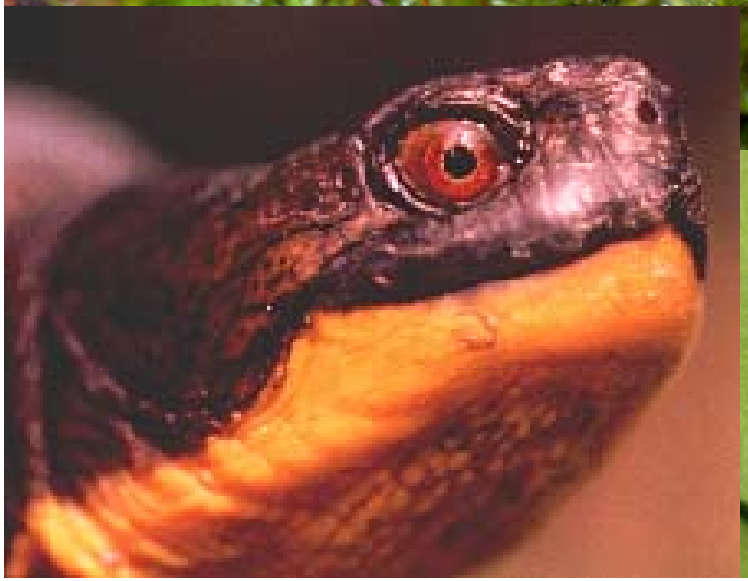
# Umbrella Species



| Species | | Wetland Habitat Context |
|---|---|---|
| BIRDS | Black Tern<br>Pied-billed Grebe | Open Water |
| | American Bittern<br>Sora | Shallow Marsh |
| | Blue-winged Teal | Watery Wetland near Grassland |
| | Sedge Wren | Wet Meadow |
| | Alder Flycatcher<br>Willow Flycatcher | Wet Shrub |
| | Veery<br>Black-and-white Warbler | Wet Forest, Coniferous or Mixed |
| | American Redstart<br>Blue-gray Gnatcatcher | Wet Forest, Deciduous |
| MAMMALS | Muskrat | Deep Marsh and Shallow Marsh |
| | Meadow Vole | Wet Meadow / Grassland |
| | Masked Shrew | Wet Forests |
| HERPS | Chorus Frog | Open Wetlands near Grassland |
| | Wood Frog | Wetlands near Woodlands |
| | Blanding's Turtle | Wetland/Upland Complex |
| FISHES | Northern Pike | Open Wetlands connected to streams |

# Herp Umbrella Species for the Milwaukee River Basin

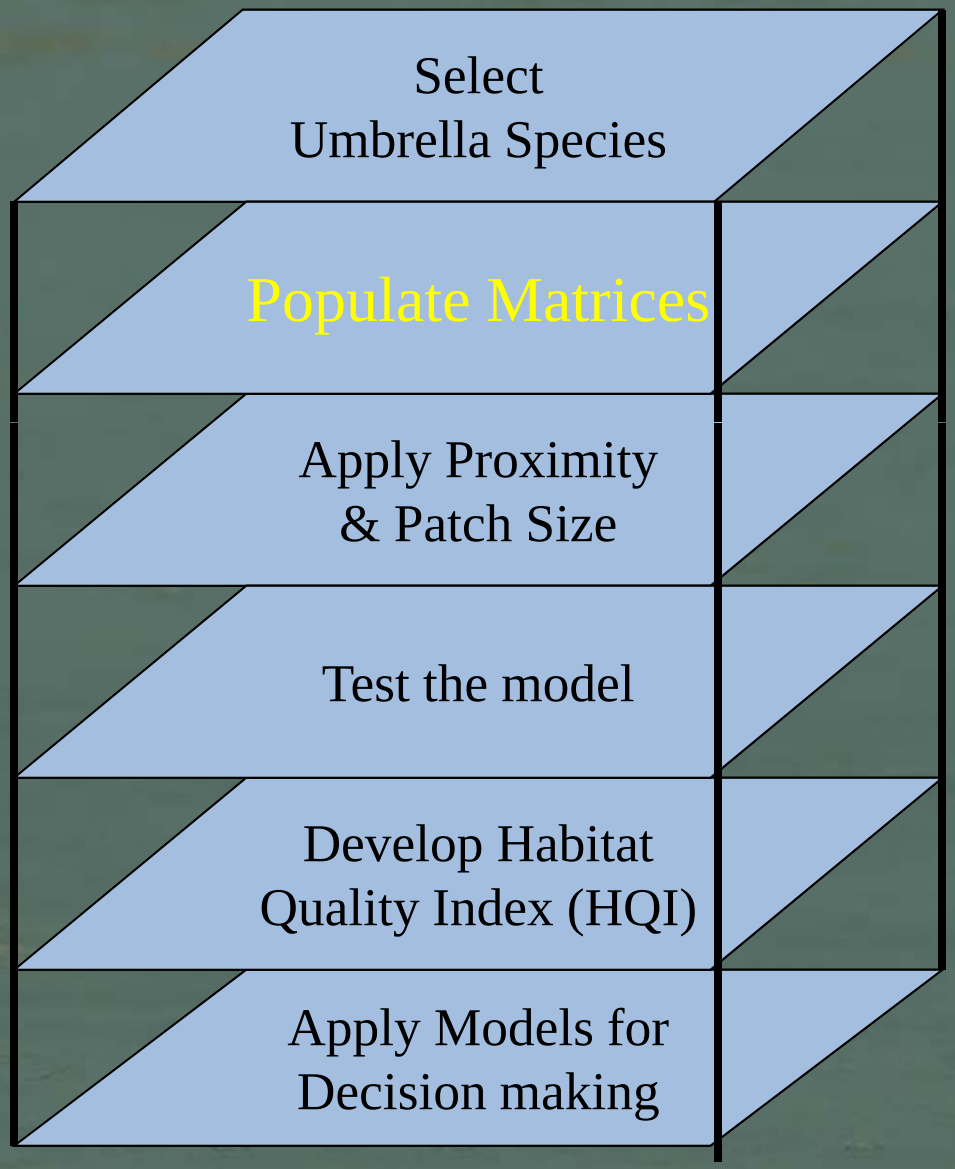
- Wood Frog
- Chorus Frog
- Blanding's Turtle



# Wood Frog Umbrella: wetlands near woodlands support for 11 species

Blue-spotted Salamander, Spotted Salamander, Tiger Salamander, Central Newt, Four-toed Salamander, American Toad, Spring Peeper, Gray Treefrog, Wood Frog, Blanding's Turtle, Common Gartersnake

# Populate Matrices

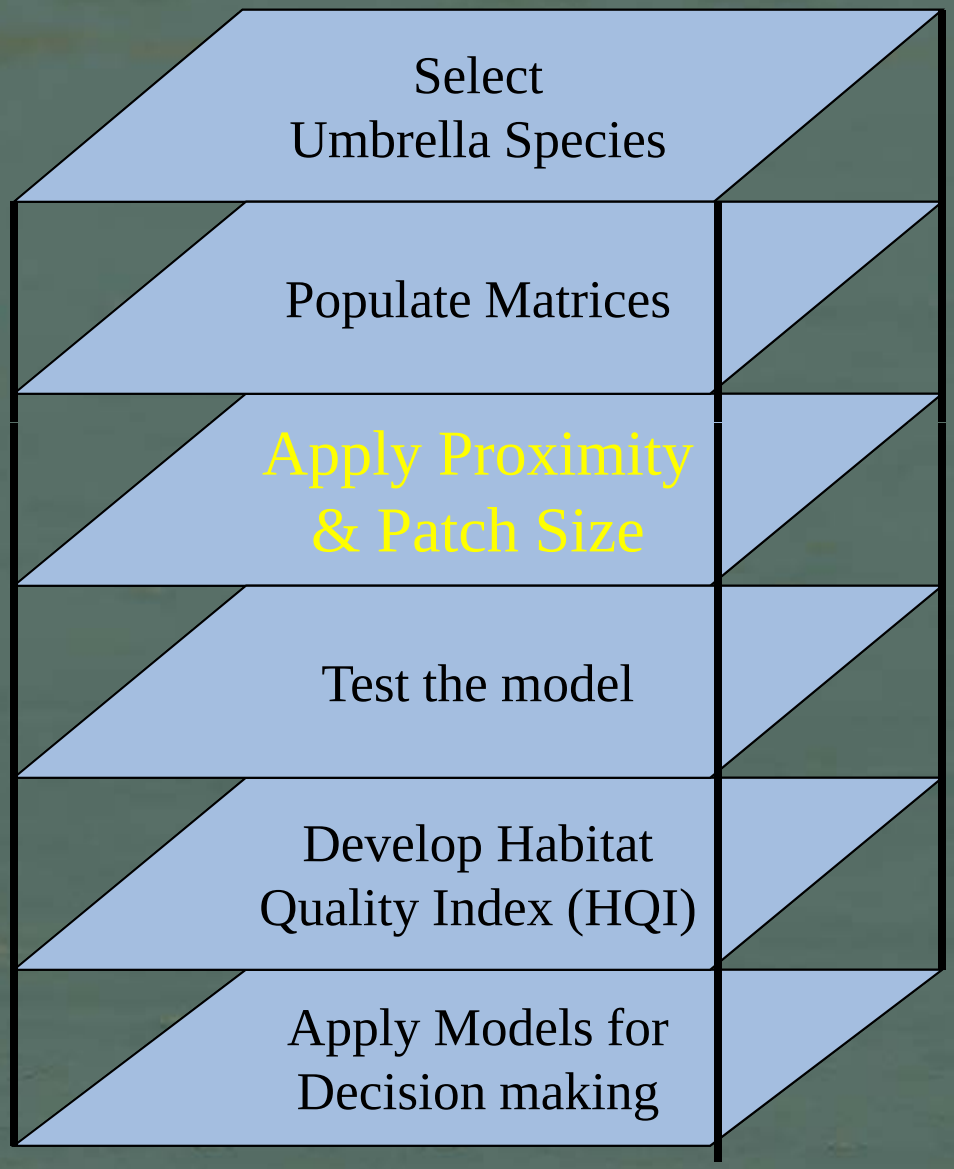


# Assign Habitat Associations based on habitat requirements

## Example Matrix: Herp association scored 0-3

| | | | | | Land CoverType* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Species | Wetland Habitat Context | Forage crops | Grassland | Forest | Shrub | Open Water | Aquatic Bed/Deep Marsh | Shallow Marsh <5 ac | Shallow Marsh 5 ac or larger | Wetland Meadow | Wetland Forest broad lvd deciduous | Wetland Forest coniferous | Wetland Forest mixed | Wetland Shrub | Reed canarygrass monoculture |
| HERPS | Chorus Frog | Open Wetlands near Grassland | 1 | 3 | 1 | 2 | 0 | 2 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 2 |
| | Wood Frog | Wetlands near Woodlands | 0 | 1 | 3 | 1 | 0 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 0 |
| | Blanding's Turtle | Wetland/Upland Complex | 1 | 3 | 3 | 2 | 1 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 1 |

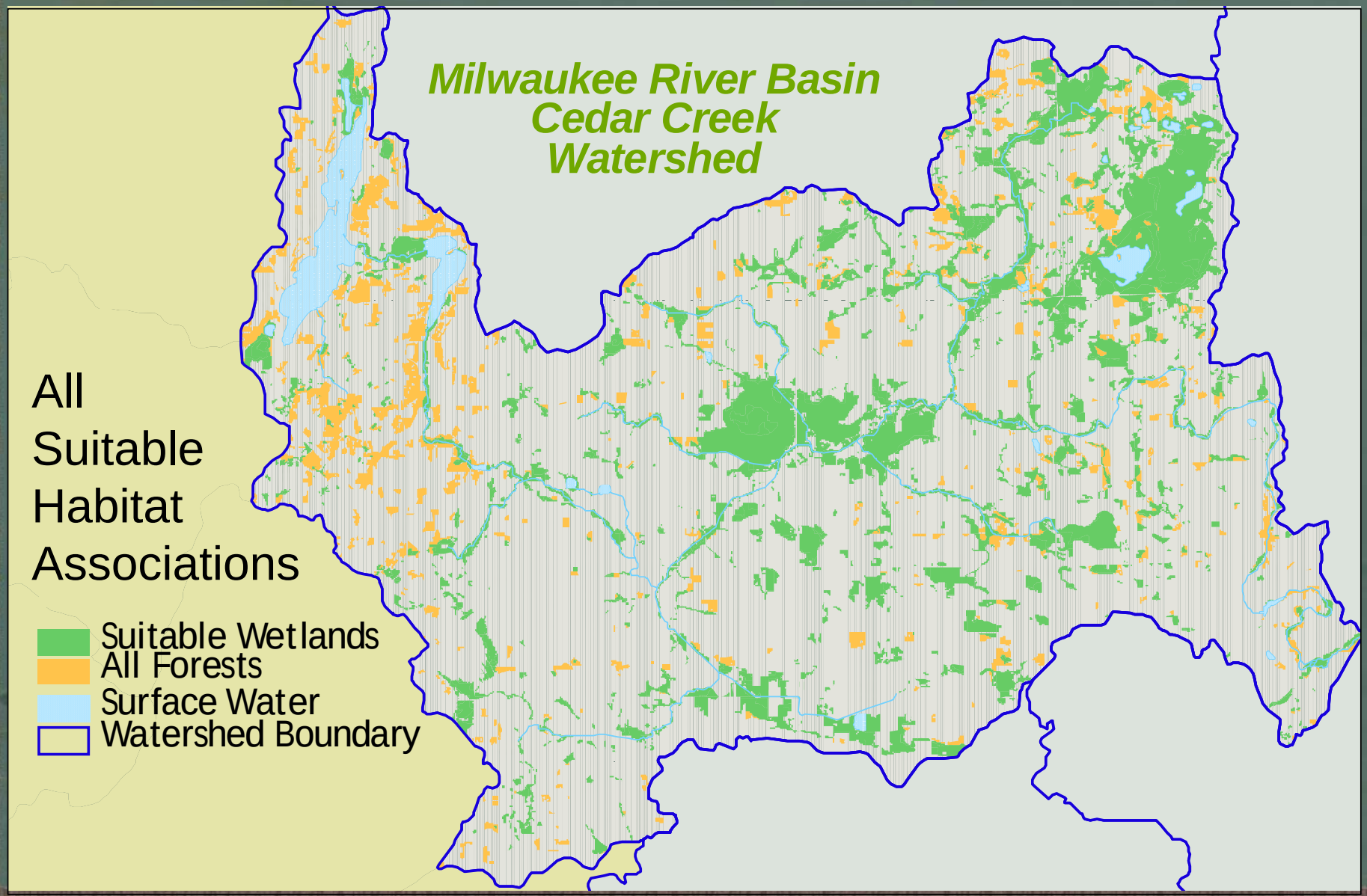
# Proximity & Patch Size Analyses



# Parameters for Forest Herp Umbrella (wood frog) Habitat

- Wetlands >= 0.5 acres size
- Wetlands within 10 m of forests
- Forests within 10 m of the wetlands
- Forests no farther than 300 m from wetland edges

# Wildlife Matrix Habitat



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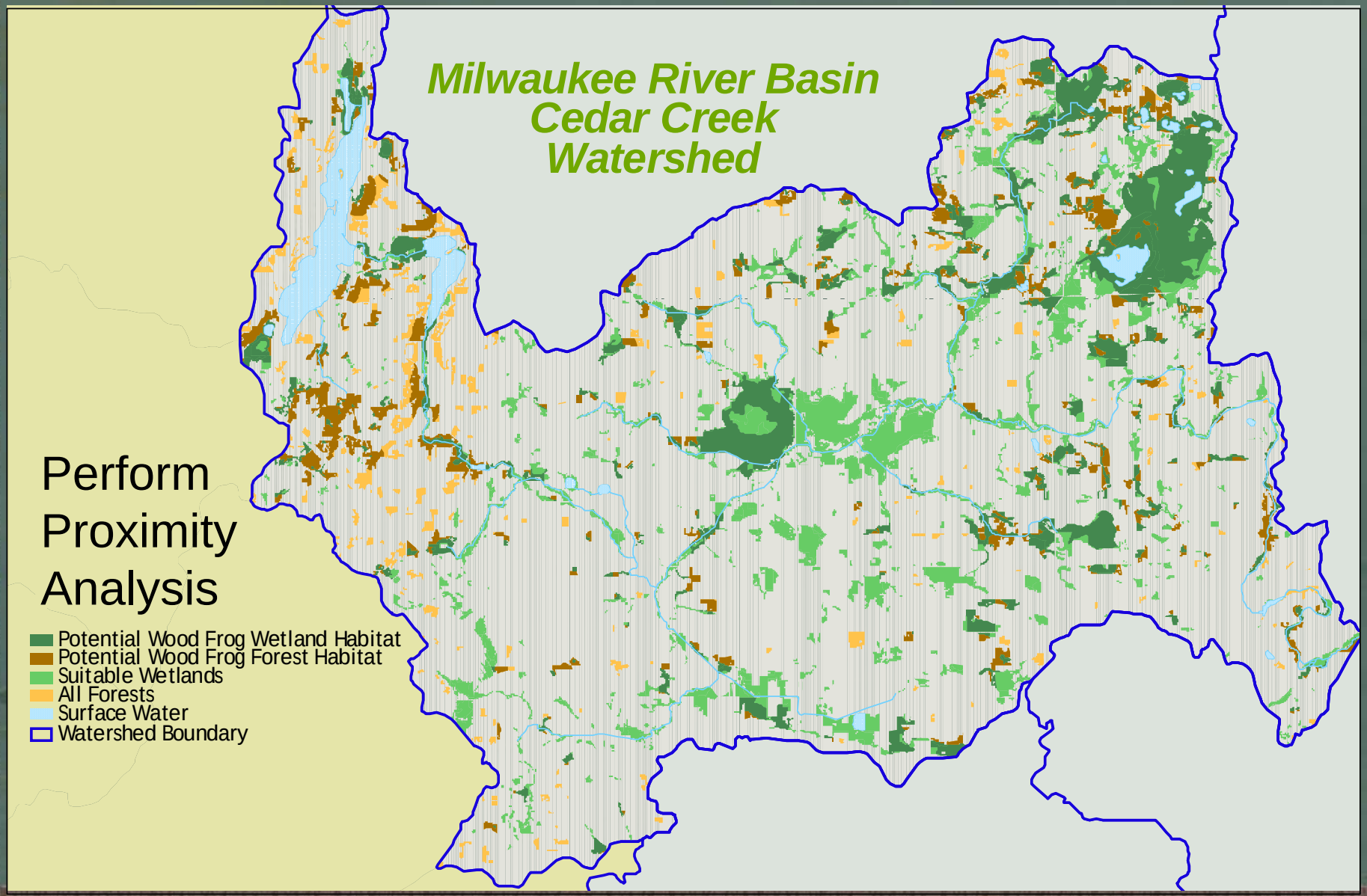


Perform Proximity Analysis

# Wildlife Matrix Habitat

Remove Areas Failing Proximity Criteria

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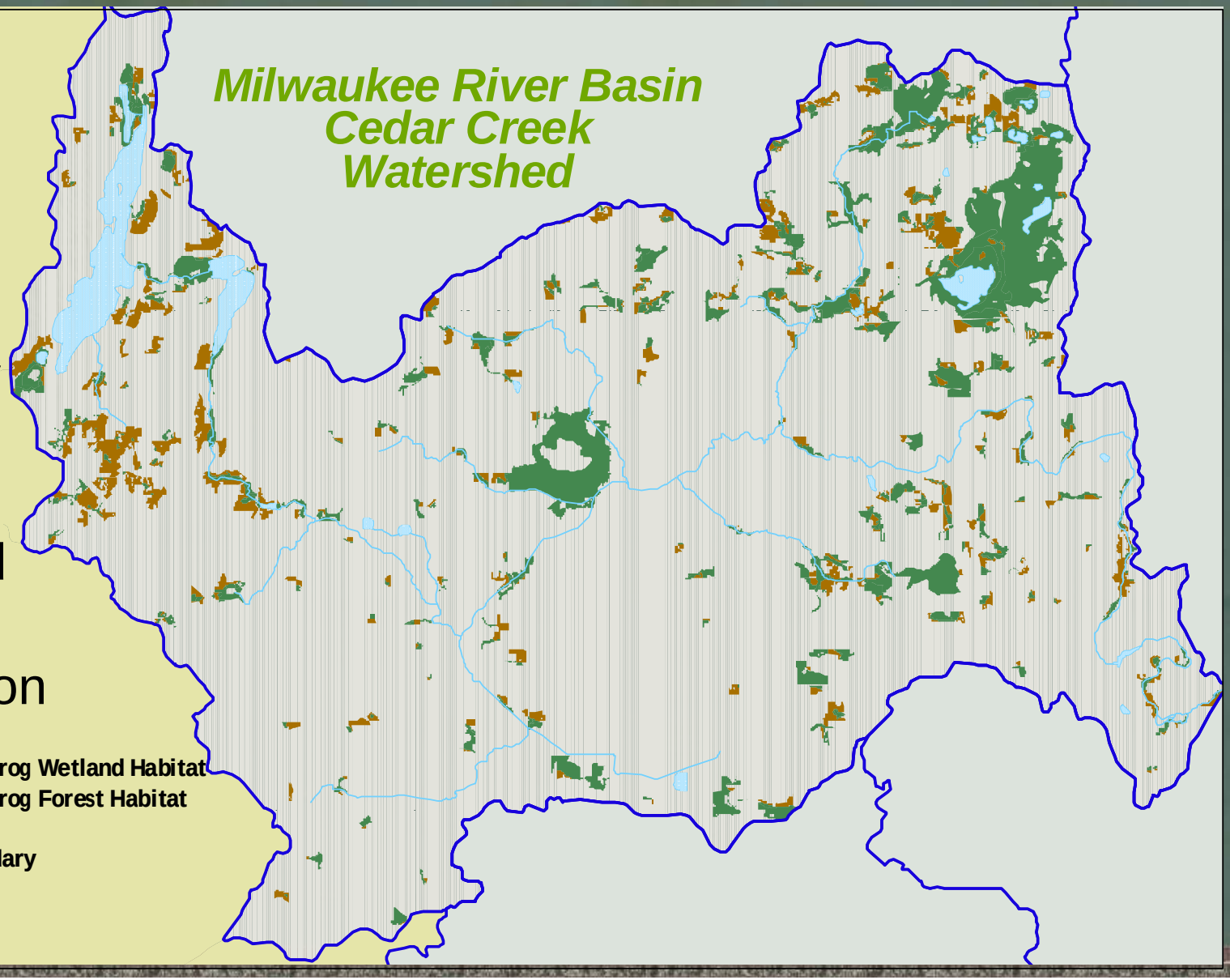
Predicted Species Distribution



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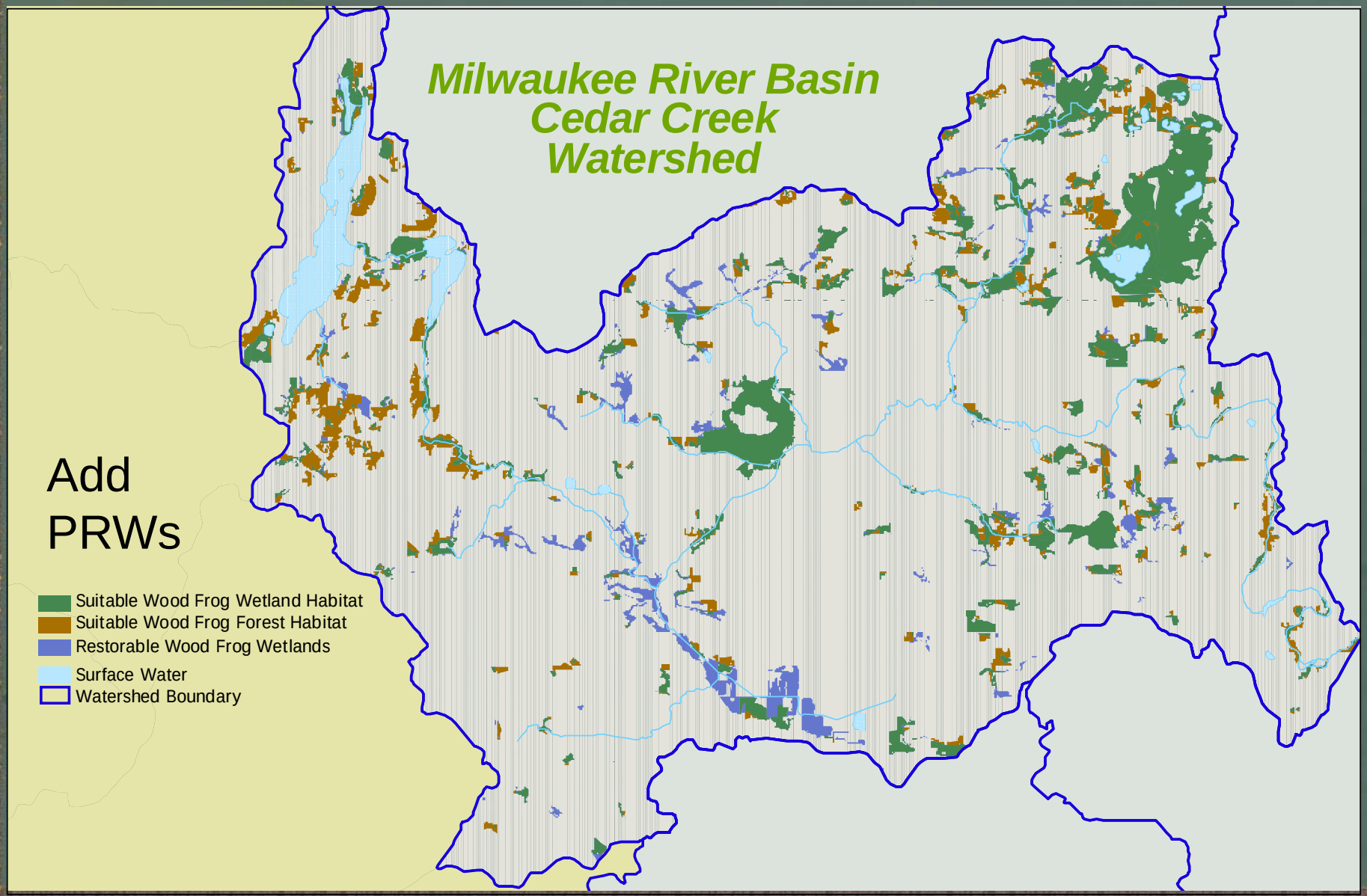


# Validating the Species Models

- Use independent data sets of known occurrences
  - Wisconsin Herp Atlas, WDNR Frog & Toad Survey, personal observations
- Compare known occurrences to the predicted distribution
- Test to see if known occurrences fall within predicted habitat more often than do random localities

# Model Validation Results

- Wood frog predictions were significant (N=67, p=0.0000)
- Blanding's turtle predictions were significant (N=47, p=0.0000)
- Chorus frog predictions were not significant (N=63, p=0.1318)
  - Chorus frogs may be too general in their wetland use for GIS data to capture habitat suitability, especially very small breeding sites

# Next Steps

- Test more species in the models
- Compare to alternative methods such as ecological niche modeling using presence-only data

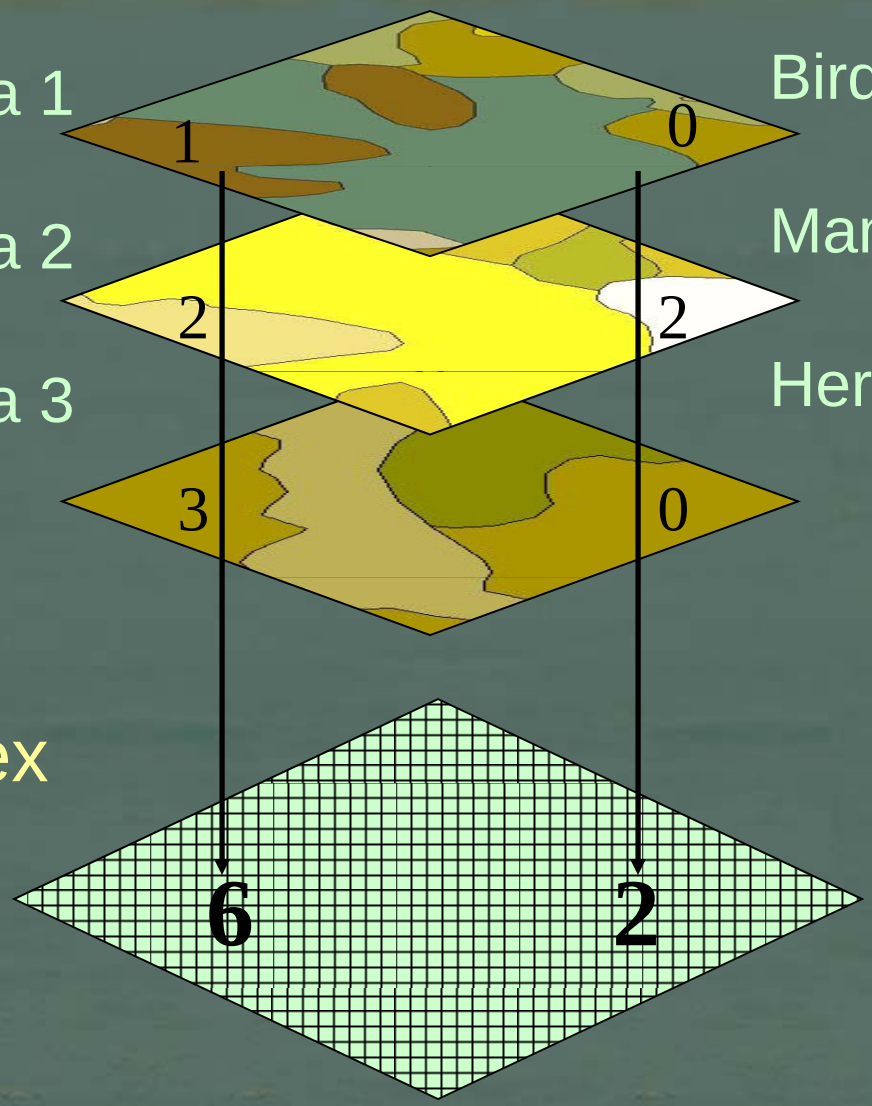
(Phillips et al. 2006. Ecological Modeling 190:231–259)

# Combining Association Results

Marsh Umbrella 1

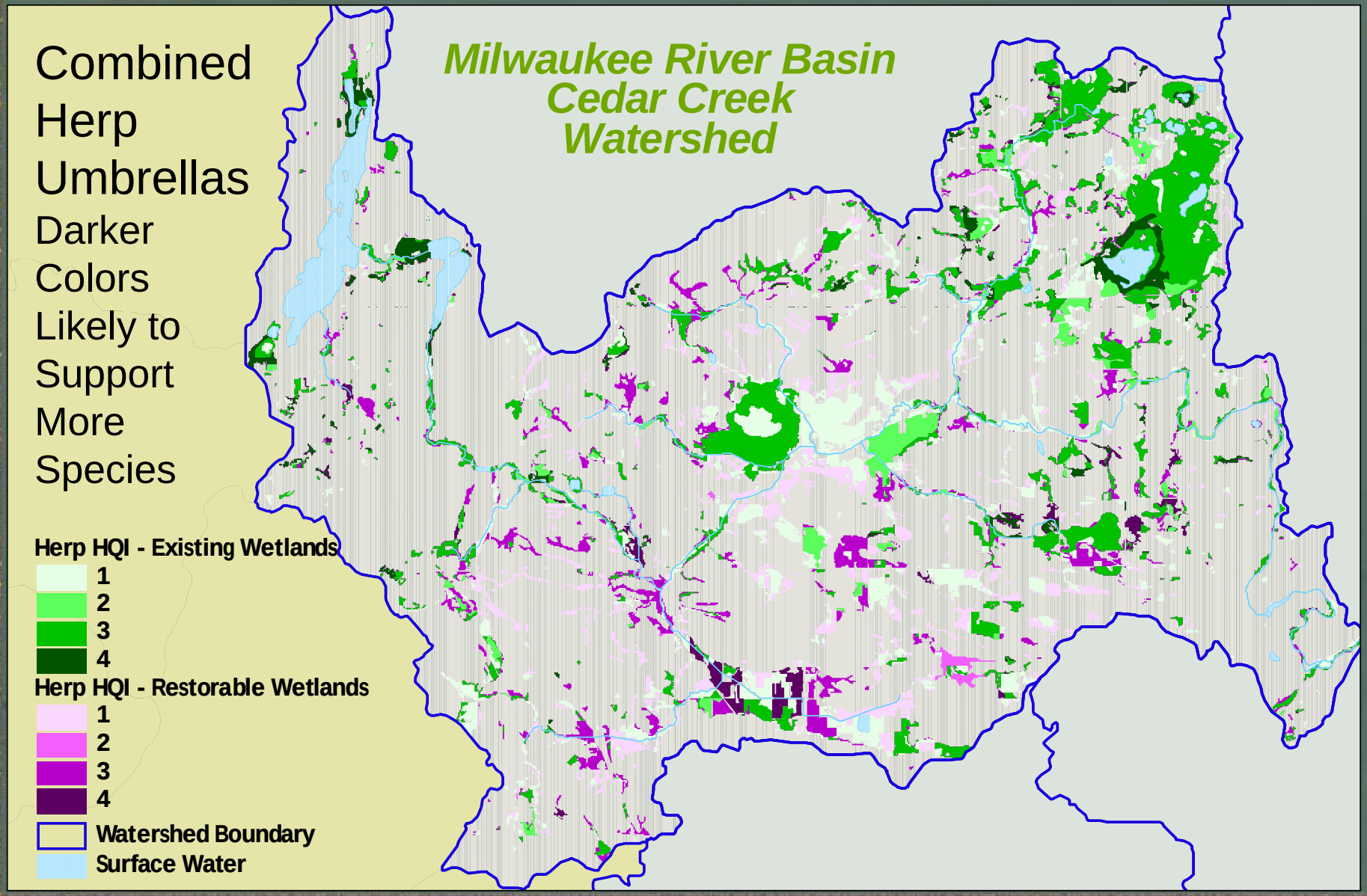
Marsh Umbrella 2

Marsh Umbrella 3

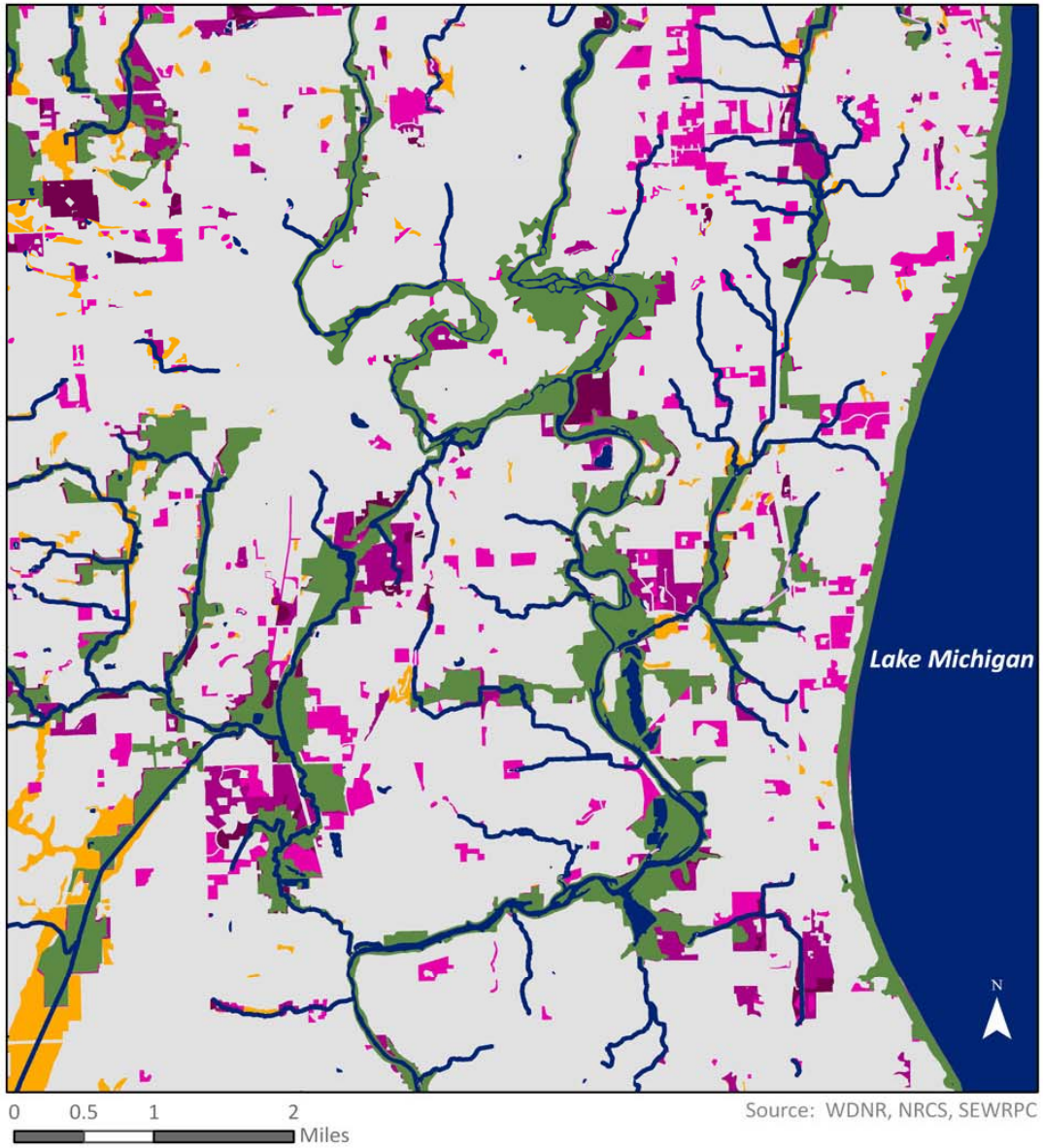



Habitat Quality Index (HQI) = sum of all scores for each grid cell

# Herp Habitat Quality Index



# Wildlife Habitat Quality Index (HQI)
# Milwaukee River Basin, Ozaukee County




## Upland and Wetland Habitat

Environmental Corridors are identified to protect water quality. They also provide valuable wildlife habitat.

The HQI shown here identifies additional significant wildlife habitat important to birds, amphibians, reptiles and small mammals that depend on wetlands.

Restoring former wetlands can expand the wildlife value of existing habitat and grow the environmental corridors.

This information assists planners both to prioritize areas for protection and to guide future development.

**Environmental Corridors**

**Additional Wildlife Habitat Based on HQI**

- **0 - 4**
- **5 - 7**
- **8 - 14**
- **15 - 17**

**Potentially Restorable Wetland**

# SUMMARY

- Spatial tool can have enormous value in identifying existing and potential wildlife habitat.
- Incorporating the biological constraints for species survival into planning is essential to long term success.
- Private landowners are the key to preventing serious losses of biodiversity.
- Simplified tools for modeling are needed that can be implemented by land use planning agencies.

*"When one tugs at a single thing in nature, he finds it attached to the rest of the world."*
- John Muir

# Acknowledgements


- Milwaukee River Basin Project
  - Many WDNR staff,
  - Wildlife Experts: Richard Bautz, Noel Cutright, Robert Hay, Dale Katsma, Steven Price, Missy Sparrow, Gary Casper
- Milwaukee County Ecological Change Project
  - John Idzikowski, Larry Leitner