# **DEVELOPING STATE 'WETLAND RESTORATION POTENTIAL' MAPPING THAT REFLECTS VARIATION IN WATERSHED CHARACTERISTICS**

# Introduction

Illinois does not have statewide 'wetland restoration' potential' mapping to aid in discerning suitable sites for wetland restoration. Topographic Wetness Index (TWI) analyses paired with existing datasets from state and federal agencies provide the foundation for typical mapping efforts. TWI can utilize different algorithms for determining flow direction and accumulation modeled in a landscape. Three different algorithms were investigated in TWI along with field determined wetland data. Selected characteristics (see Table 1) were investigated in three watersheds.

# Methods

ArcGIS Pro Topographic Wetness Index: Preprocessing 1/3 arc-second DEM (10m) for watersheds; ArcHydro Fill, Flow Direction, Flow Accumulation functions with test algorithms. Calculate slope raster to radians.

- Test algorithms = D8, MFD, and DINF (ESRI 2023)
  - ✤ D8 flow direction to one of eight steepest downslope neighbor
  - ✤ MFD flow partition exponent created from an adaptive approach partitions flow to all downslope cells
  - DINF flow direction is steepest downward slope on eight triangular facets
- TWI=Ln(("Flow\_Accum.tif"+0.001)/Tan("Slope\_Rad") .tif"+0.001)). TWI threshold 1SD from TWI mean
- Spatial Analyst Tool < 'Extract Multivalues to</p> Points' for TWI and INHS wetland points
- Other ArcGIS tools e.g. "Raster reclassification", 'Select by attributes' and 'Intersect'

Topographic	Water Table	Very Poorly
Wetness	<b>30cm or Less</b>	Drained and
Index		Poorly
Threshold		Drained
Very Poorly	Hydric	NLCD –
Drained	Classification	Agriculture
	– 75% or	and
	greater	Herbaceous

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The MFD algorithm had the best fit to field verified wetland data in Topographic Wetness Index analyses.

Mean TWI values (MFD algorithms) of respective watersheds ranged from 6.5 – 10.2. TWI threshold ranged from 3.12 – 7.28.

Selection factors related to soil characteristics were found to have varying prominence between watersheds. 'Water Table 30cm or Less' severely limited suitability acreage in one watershed'. 'Very Poorly Drained' limited for all watersheds and thus was excluded.

Since TWI threshold values are used to eliminate large areas of landscape from site suitability and are often set at a state or regional level, finer scale investigations (e.g. watersheds) may be important in not over- or underestimating this metric.

### Discussion

The next steps will be developing appropriate coding that captures variation in watershed TWI analyses for statewide map production. Protocols for selecting and ranking other factors (e.g. hydric classification) need further refinement.

These TWI thresholds are lower (drier) than other regions. This could be due to smaller (<0.5 acre) wetlands delineated in this dataset. Enhanced DEM resolution and better algorithms developed for landscape analyses will eventually pick up on microtopography.

Once suitable areas for wetland restoration potential are mapped, nutrient reduction, flood abatement and social benefits can be calculated for communities and state agencies.

## Acknowledgments

Thank you to the Illinois Department of Transportation and Illinois Natural History Survey Wetland Science Program for funding and supporting this research, and Dr. Sam Stickley for GIS advice.