

A New Wetland Map for Tompkins County

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Cayuga Lake Watershed Network

Tompkins County Water Resources Council

Tompkins County Soil and Water Conservation District

Finger Lakes – Lake Ontario Watershed

Protection Alliance (FL-LOWPA)

The Park Foundation

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Wetlands

Wetlands exist... *“at the interface between truly terrestrial ecosystems and aquatic systems, making them inherently different from each other, yet highly dependent on both.”*

- Mitsch and Gosselink, 2007



Vernal Pool

Credit: [CT Dept of Energy & Environmental Protection](#)



Emergent marsh/
shrub swamp

Credit: [NH Division of Forests and Lands](#)



Tidal Marsh

Credit: [Maine Natural Areas Program](#)

Wetlands

Wetlands exist... “*at the interface between truly terrestrial ecosystems and aquatic systems, making them inherently different from each other, yet highly dependent on both.*”

- Mitsch and Gosselink, 2007

“*...areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.*”

- U.S. Army Corps of Engineers (Corps) and the U.S. EPA accepted definition for regulatory purposes

Jurisdictional Wetland Criteria

1. Flooding or saturation
2. Hydric Soils
3. Hydrophytic vegetation

Wetlands

Ecological Values

- Support unique plant and animal communities
- High biological diversity
- Critical habitat for many rare and endangered species

Ecosystems goods and services

- Flood abatement
- Groundwater replenishment
- Erosion and sedimentation control
- Water purification
- Nutrient cycling
- Recreation and tourism
- Open spaces

Wetlands

Protection

Federal Law

- [Clean Water Act \(1972\) Section 404](#) established a program to regulate the discharge of dredge and fill material into waters of the United States including wetlands

Solid Waste Agency of Northern Cook County (SWANCC) v. U.S. Army Corps of Engineers,
531 U.S. 159 (2001)

Rapanos v. United States, 547 U.S. 715 (2006)

Recent events

May 27, 2015: EPA and ACOE announce final rule defining waters protected by CWA

October 9, 2015: Federal court blocked the rule's implementation nationwide

State Law

- The [Freshwater Wetlands Act, Article 24](#) of the Environmental Conservation Law, provides DEC and the Adirondack Park Agency with the authority to regulate freshwater wetlands in the state.

Wetlands

Protection – Tompkins County

Wetland Protections in Tompkins County: Existing Status, Gaps, and Future Needs (2008)

- Field Survey
 - 17.4 miles, 45 wetlands encountered, totaling 605 acres
- Results
 - 19% of wetlands (#) in Tompkins have no protection under state or federal law
 - 70-80% of wetlands (#) not on existing wetland maps
 - 20% of wetland area in survey not included in USFWS NWI wetlands database

WRC Wetlands Committee drafted sample local wetland law

“identify and map all wetlands that are not currently regulated by DEC or the federal government and are therefore vulnerable to disturbance and destruction from development.”

- Tompkins County WRC Work Plan

Existing Wetland Maps

National Wetlands Inventory (NWI)

US Fish and Wildlife Service

- Map all wetlands in United States

NYS Article 24 Freshwater Wetland Maps

NYS Department of Environmental Conservation

- Map all NYS jurisdictional wetlands (>12.4 acres) and smaller wetlands of unusual local significance

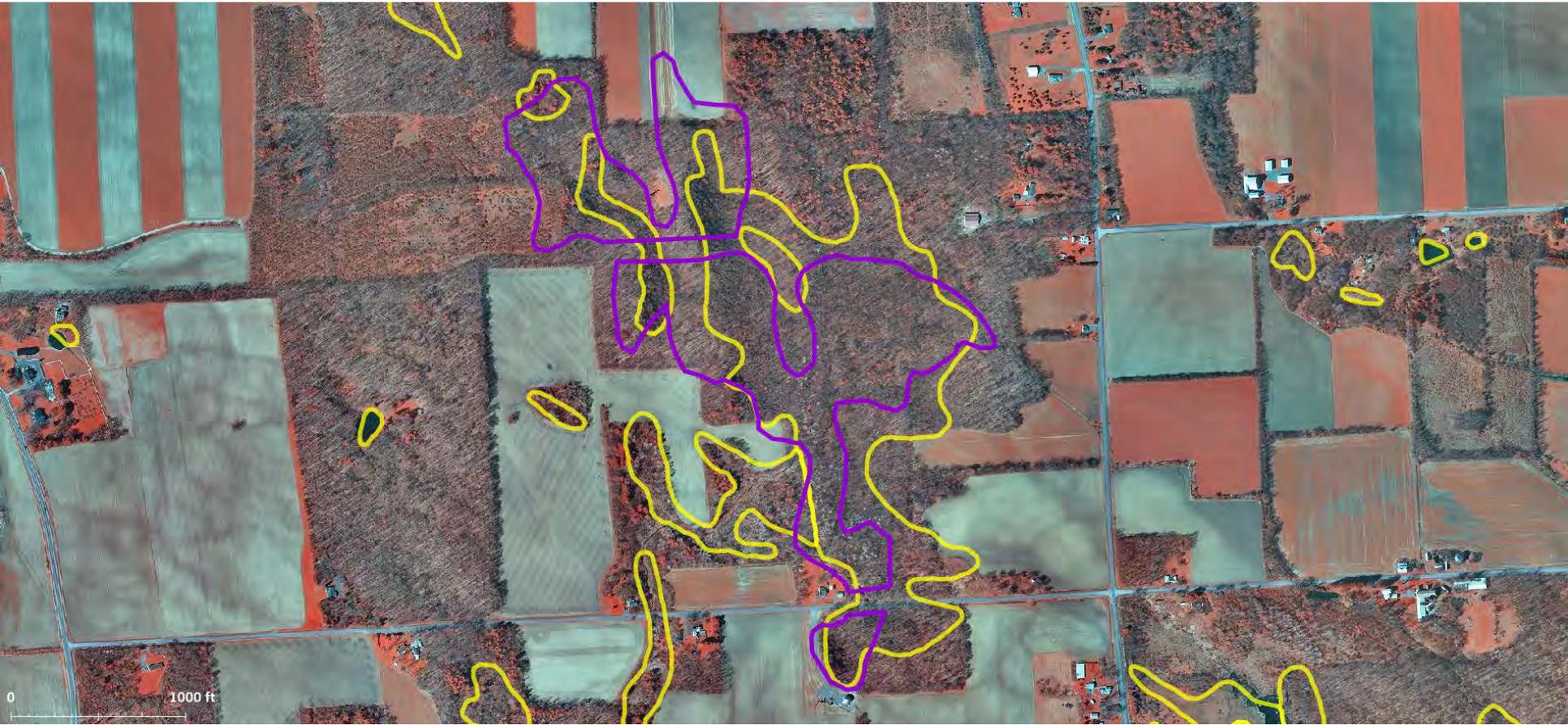
Existing Wetland Maps



USGS NHAP 1980s – Tompkins County

Existing Wetland Maps

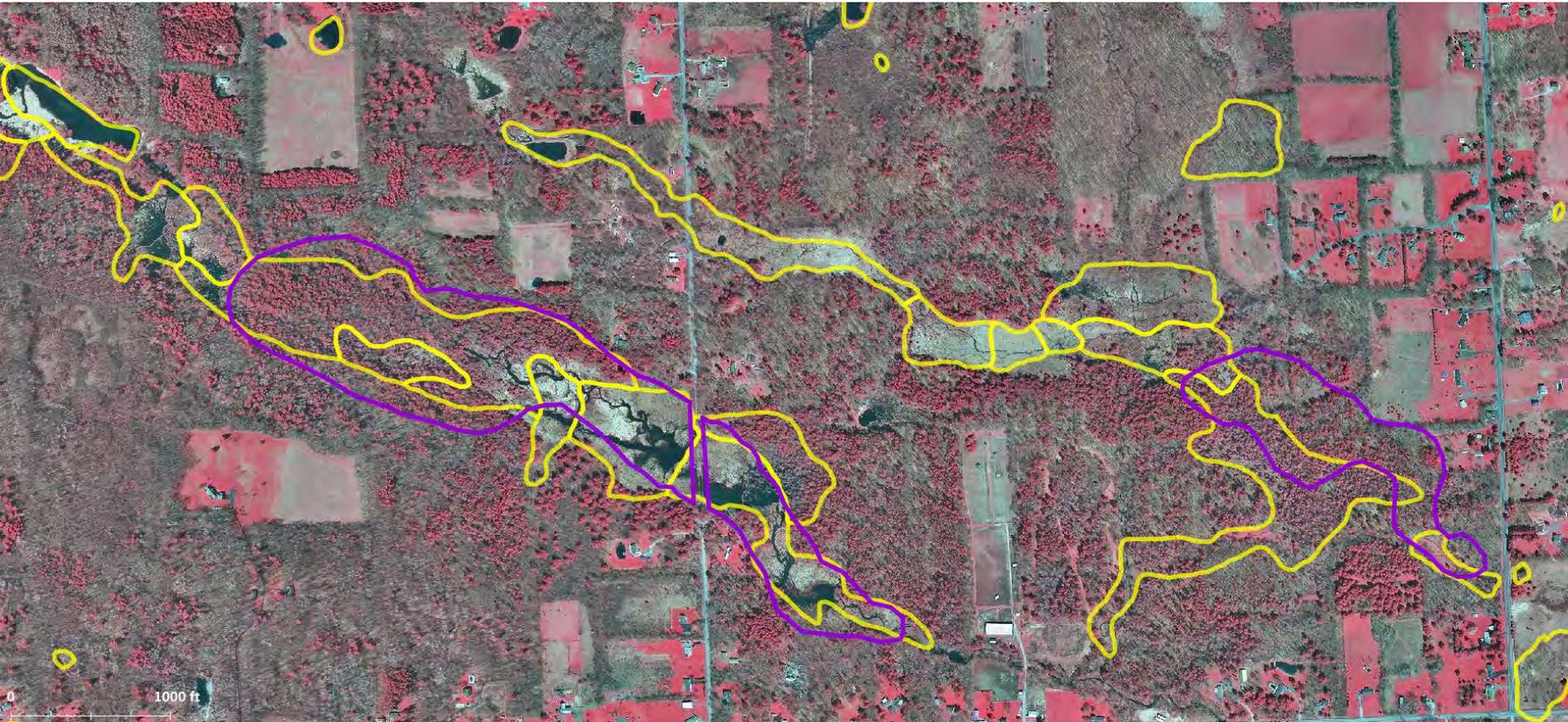
Lansing Example



NYS DOP 2012 – Tompkins County

Existing Wetland Maps

Dryden Example



NYSDOP 2012 – Tompkins County

Existing Wetland Maps

Wetland acreage by category

	DEC	NWI
Freshwater Emergent		2,196.4
Freshwater Forested/Shrub		7,329.9
Freshwater Pond		890.1
Unconsolidated shoreline		11.6
Lake		213.4
Riverine		117.6
Total	5,631.9	10,747.5

Existing Wetland Maps

NWI Wetland Mapping Accuracy Variability

58% of wetlands on NWI maps (CA)

Werner, H. W. Accuracy assessment of National Wetland Inventory maps at Sequoia and Kings Canyon National Parks. Park Sci. 23, 19–23 (2004).

22% of wetlands on NWI; 39% of wetland area not in NWI (VT)

Morrissey, L. A. & Sweeney, W. R. Assessment of the National Wetlands Inventory: Implications for wetlands protection. Geogr. Inf. Syst. water Resour. IV AWRA Spring Spec. Conf. Houston, TX. May 8-10, 2006 1–6 (2006).

90% wetlands > 3ac and 70% of wetlands >1ac and <3ac captured by NWI;
100% of NWI wetlands were wetlands (ME)

Nichols, C. Map Accuracy of National Wetlands Inventory Maps for Areas Subject to Maine Land Use Regulation Commission Jurisdiction. Ecological Services report R5–94/6, 14pp. (1994).

93.7% wetlands on NWI Maps; 97% NWI wetlands were wetlands (MI)

Kudray and Gale, 2000. Evaluation of NWI maps in a heavily forested region in the upper Great Lakes. Wetlands, 20(4), 581-587.

10% of 200ac of wetland captured by NWI (VA)

Stolt, M. H. & Baker, J. C. Evaluation of National Wetland Inventory Maps to inventory wetlands in the Southern Blue Ridge of Virginia. Wetlands 15, 346–353 (1995).

NWI maps underestimated wetland area by 61% (Oswego and Onondaga Counties)

McMullen, J. M. & Meacham, P. A. in Wetl. Environ. Gradients, Boundaries, Buffers (Mulamootil, G., Warner, B. G. & McBean, E. A.) 193–205 (CRC Press LLC, Lewis Publishers, 1996).

New Data Resources

NYS Digital Orthoimagery Program

- 2002 - color-infrared (0.5ft and 1ft pixel resolution)
- 2007 - natural color (0.5ft and 2ft pixel resolution)
- 2012 - 4-band (0.5ft and 2ft pixel resolution)

LiDAR Elevation Data for Tompkins County

- Collected in 2008
- Funded by TCSWCD

Oblique Aerial Imagery

- Pictometry (Rochester, NY)

New Data Resources



Tompkins County 2012 Wetlands Map

Wetland mapping process

Mapping

Visual interpretation

- NYSDOP aerial imagery
 - 2002 CIR and 2012 CIR
- LiDAR derivatives
- Oblique aerial imagery

Scale of delineation = 1:1000 or better

No minimum mapping area

Classification

National Wetland Classification Standard

Additional attributes

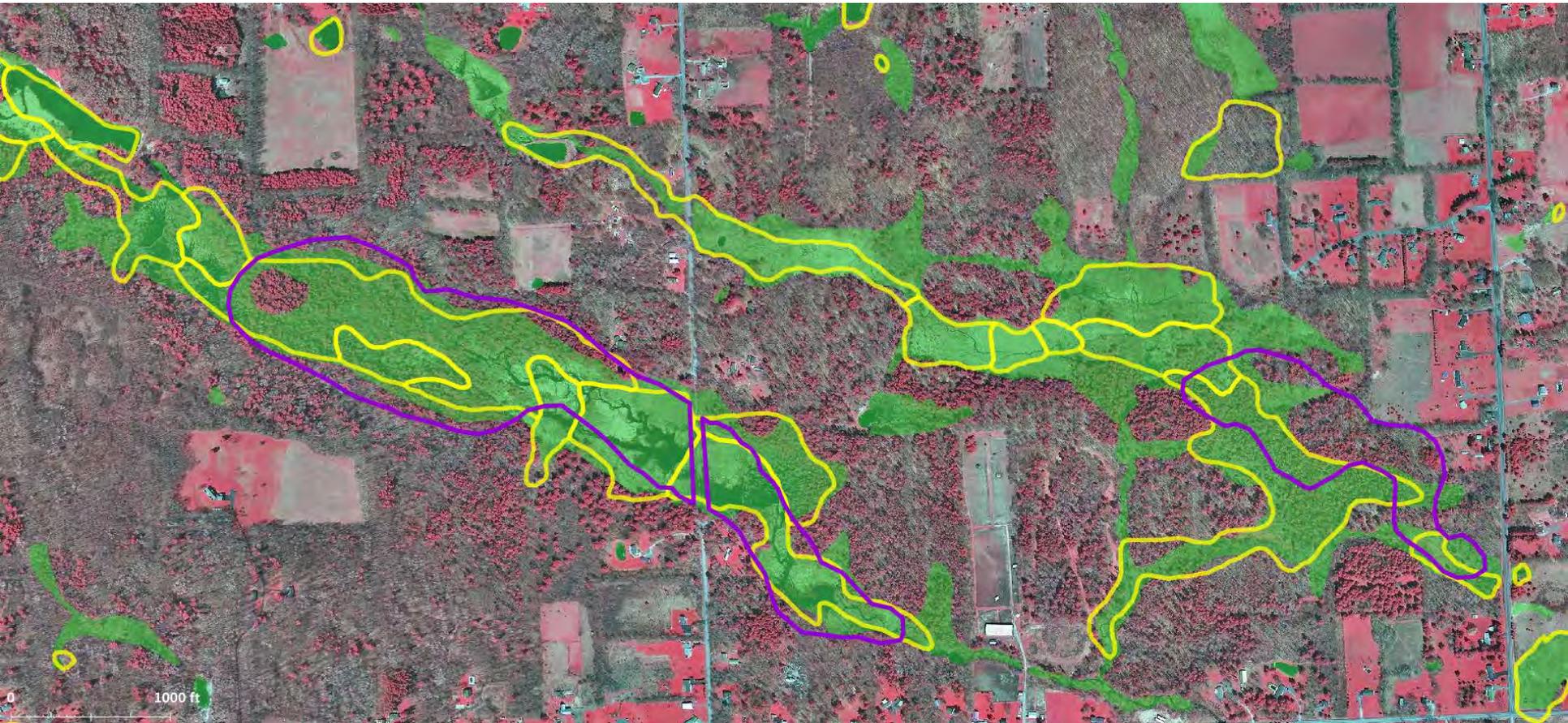
- Artificial vs Natural
- Mapping indicators
- Likelihood of wetland
- Wetland Complex Identification

National Wetland Classification Standard

Systems	Class (vegetation)	Hydrologic Regime	Modifiers
Marine	Pond/Lake Bottom	Temporarily Flooded	Beaver activity
Estuarine	Shore	Saturated	Drained/ditched
Riverine	Emergent (grasses)	Seasonally Flooded	Farmed
Lacustrine	Scrub-Shrub	Permanently Flooded	Impounded
Palustrine	Forested	...	Artificial

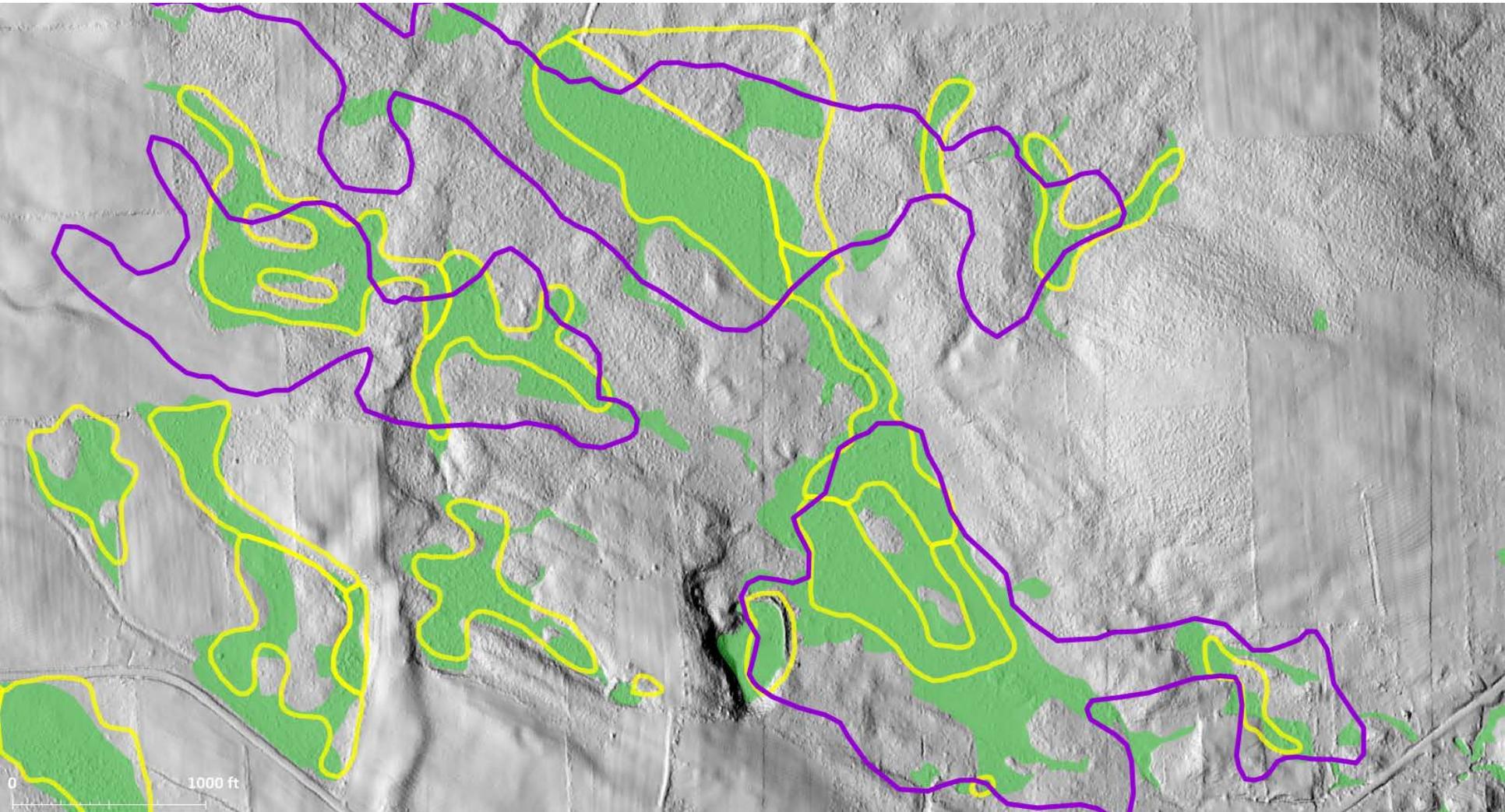
Tompkins County 2012 Wetlands Map

Dryden Example



Tompkins County 2012 Wetlands Map

Groton Example



Tompkins County 2012 Wetlands Map

Result: Wetland acreage by category

	DEC	NWI	Tompkins 2012
Freshwater Emergent		2,196.4	4,002.9
Freshwater Forested/Shrub		7,329.9	9,359.7
Freshwater Pond		890.1	1,618.0
Unconsolidated shoreline		11.6	8.2
Lake		213.4	207.9
Riverine		117.6	115.8
Total	5,631.9	10,747.5	15,312.5

Tompkins County 2012 Wetlands Map

Results: Comparison to existing wetland map

Natural Wetlands Only

Size Class	DEC	Tompkins 2012
< 0.5 ac		1,667
0.5 - 1.0 ac		434
1.0 - 2.0 ac		342
2.0 - 12.4 ac	9	525
> 12.4 ac	81	197
Totals	90	3,164

5,632ac (with red arrows pointing to DEC values 9 and 81)

10,205ac (with red arrow pointing to Tompkins 2012 value 197)

Tompkins County 2012 Wetlands Map

Accuracy Assessment

Measures

1. Omission errors
2. Commission errors
3. Spatial accuracy of wetland boundary
4. NWCS Classification

Field Survey: August – October 2015

- Training and consultation
 - Kerry Thurston
InFocus Environmental Consulting
- 26 sites total
 - 22 Cornell Plantations' Natural Area
 - 4 CLWN Member Landholdings



Site ID/Name: _____ Project Tompkins County Wetland Mapping Assessment 2015

Location/Address: _____ Date: _____ Time: _____

Property Owner: _____ Owner Present: Y N U Met with owner: Y N

Hydrophytic Vegetation Assessment Criteria Met: Yes No Maybe

<p>Dominant Plant Species - Species - Absolute % Cover (Status):</p> <p><u>Canopy/Tree Stratum</u></p> <p>1. _____</p> <p>2. _____</p> <p>3. _____</p> <p><u>Sapling/Shrub Stratum</u></p> <p>1. _____</p> <p>2. _____</p> <p>3. _____</p> <p><u>Understory/Herb Stratum</u></p> <p>1. _____</p> <p>2. _____</p> <p>3. _____</p>	<p>Vegetation Criteria met by:</p> <p>1. Rapid Field Test (primary): The rapid test is met if all dominant species across all strata are OBL or FACW, or a combination of the two, based on a visual assessment. (50/20 rule):</p> <p>a. FACW and wetter species are more than 50% of the total absolute percent coverage for each stratum.</p> <p>b. FACW and wetter species individually account for more than 20% of the total absolute percent coverage for each stratum.</p> <p>2. Morphological Adaptations (secondary): hypertrophied lenticels, multiple trunks adventitious or shallow roots. Observed on > 50% FACU species where indicators of hydric soil and wetland hydrology are present.</p>
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Hydrologic Indicators	Criteria Met: Yes No Maybe											
<table border="0" style="width: 100%;"> <tr> <td colspan="3">Primary Indicators (minimum of one required; check all that apply)</td> <td rowspan="2" style="vertical-align: top;">Secondary Indicators (minimum of two required if no primary)</td> </tr> <tr> <td style="width: 33%;">A. Observation of Surface Water or Saturated Soils</td> <td style="width: 33%;">B. Evidence of Recent Inundation</td> <td style="width: 33%;">C. Evidence of Recent Soil Saturation</td> </tr> <tr> <td> <input type="checkbox"/> Surface water <input type="checkbox"/> High water table (≤12" below surface) <input type="checkbox"/> Saturation (≤12" below surface) </td> <td> <input type="checkbox"/> Water marks <input type="checkbox"/> Sediment deposits <input type="checkbox"/> Drift lines <input type="checkbox"/> Algal mat/crust <input type="checkbox"/> Iron deposits (orange deposit) <input type="checkbox"/> Sparse vegetated concave surface <input type="checkbox"/> Water stained leaves <input type="checkbox"/> Aquatic fauna </td> <td> <input type="checkbox"/> Hydrogen sulfide odor (within upper 12") <input type="checkbox"/> Oxidized root channels <input type="checkbox"/> Presence of reduce iron (upper 12"-24", dry season) </td> <td> <input type="checkbox"/> Surface Soil Cracks <input type="checkbox"/> Drainage patterns <input type="checkbox"/> Moss trim lines <input type="checkbox"/> Crayfish Burrows <input type="checkbox"/> Stunted/Stressed plants <input type="checkbox"/> Water table between 12"-24", dry season </td> </tr> </table>	Primary Indicators (minimum of one required; check all that apply)			Secondary Indicators (minimum of two required if no primary)	A. Observation of Surface Water or Saturated Soils	B. Evidence of Recent Inundation	C. Evidence of Recent Soil Saturation	<input type="checkbox"/> Surface water <input type="checkbox"/> High water table (≤12" below surface) <input type="checkbox"/> Saturation (≤12" below surface)	<input type="checkbox"/> Water marks <input type="checkbox"/> Sediment deposits <input type="checkbox"/> Drift lines <input type="checkbox"/> Algal mat/crust <input type="checkbox"/> Iron deposits (orange deposit) <input type="checkbox"/> Sparse vegetated concave surface <input type="checkbox"/> Water stained leaves <input type="checkbox"/> Aquatic fauna	<input type="checkbox"/> Hydrogen sulfide odor (within upper 12") <input type="checkbox"/> Oxidized root channels <input type="checkbox"/> Presence of reduce iron (upper 12"-24", dry season)	<input type="checkbox"/> Surface Soil Cracks <input type="checkbox"/> Drainage patterns <input type="checkbox"/> Moss trim lines <input type="checkbox"/> Crayfish Burrows <input type="checkbox"/> Stunted/Stressed plants <input type="checkbox"/> Water table between 12"-24", dry season	
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Hydric Soil Indicators (minimum 20")	Criteria Met: Yes No Maybe								
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Notes/Comments

Tompkins County 2012 Wetlands Map

Accuracy Assessment

Results

65 wetland areas found in the field

48 mapped in GIS  74% captured

- Missed wetland median size: 0.2 acres
- 97.5% of wetlands over 0.5 acres successfully mapped

52 wetlands mapped in GIS

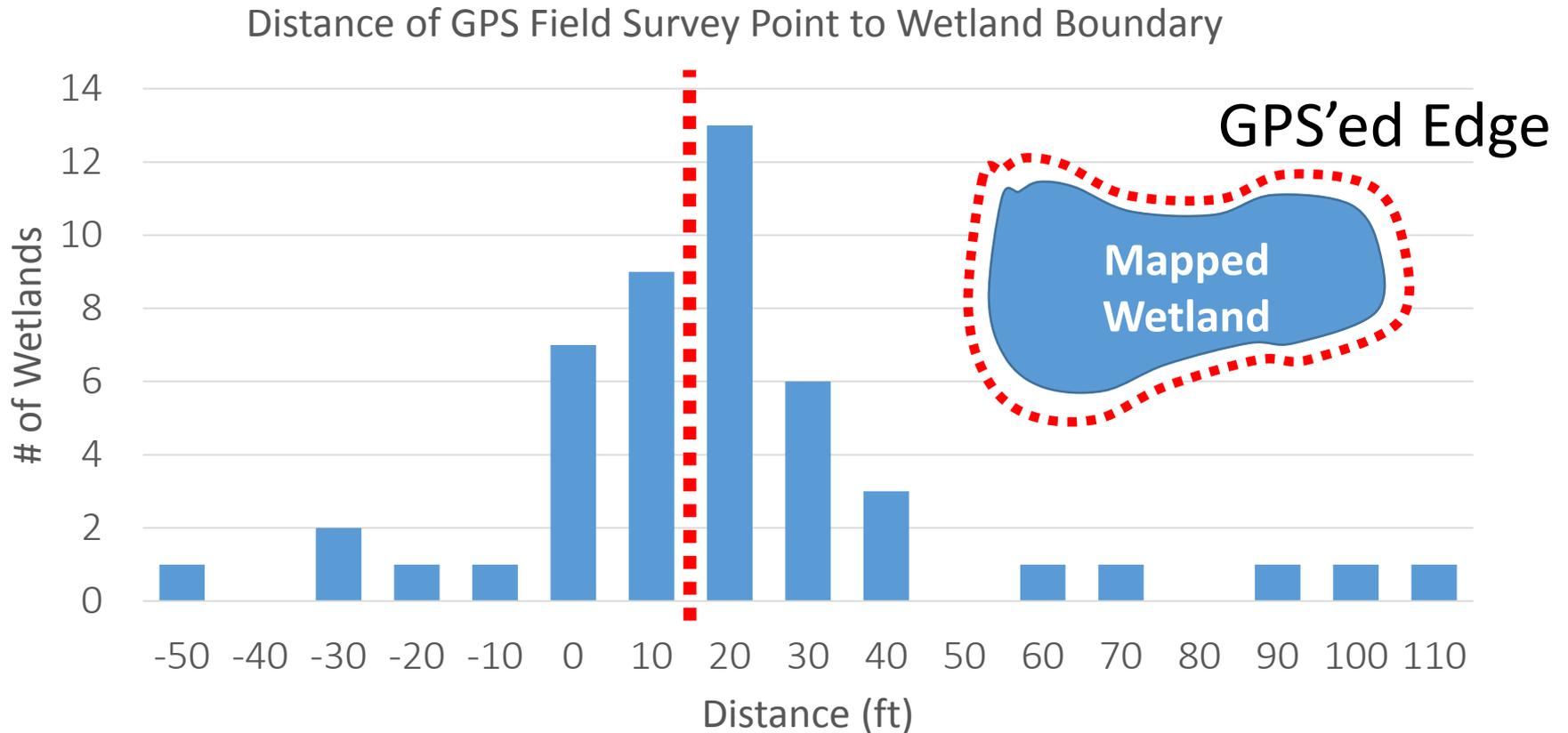
4 NOT found in field  92% of mapped wetlands real

- Falsely mapped wetlands were all floodplain wetlands

Tompkins County 2012 Wetlands Map

Accuracy Assessment

Results



Tompkins County 2012 Wetlands Map

Accuracy Assessment

Concerns

1. Not a random sample
 - Spatial autocorrelation
2. Did not adequately assess NWCS classification
3. Accuracy of areas classified as floodplain wetlands
 - 1,636 acres of palustrine with *temporarily flooded* hydrologic regime
4. Still missing the smallest wetlands

Tompkins County 2012 Wetlands Map

Conclusions

Data Quality

1. New map is not perfect
 - Misses smallest wetlands (<0.5ac)
 - Likely overestimates floodplain wetlands
 - May underestimate wetland size on average
2. New map is more complete and spatially accurate
3. Improve with additional field data

Applications

1. Immediately useful for planning
2. Field delineations to determine whether wetlands are jurisdictional and subject to regulation under state and federal laws
3. Better resource for supporting possible local wetland protection law

Tompkins County 2012 Wetlands Map

Data Availability

Dropbox Folder

- Geospatial data
- Metadata
- Final Report
- PDF Maps
- Presentations

CUGIR (Cornell)

- Geospatial data
- Metadata

Online Map

- Tompkins County Map App
- Cornell Hosted
- [CartoDB](#)

