

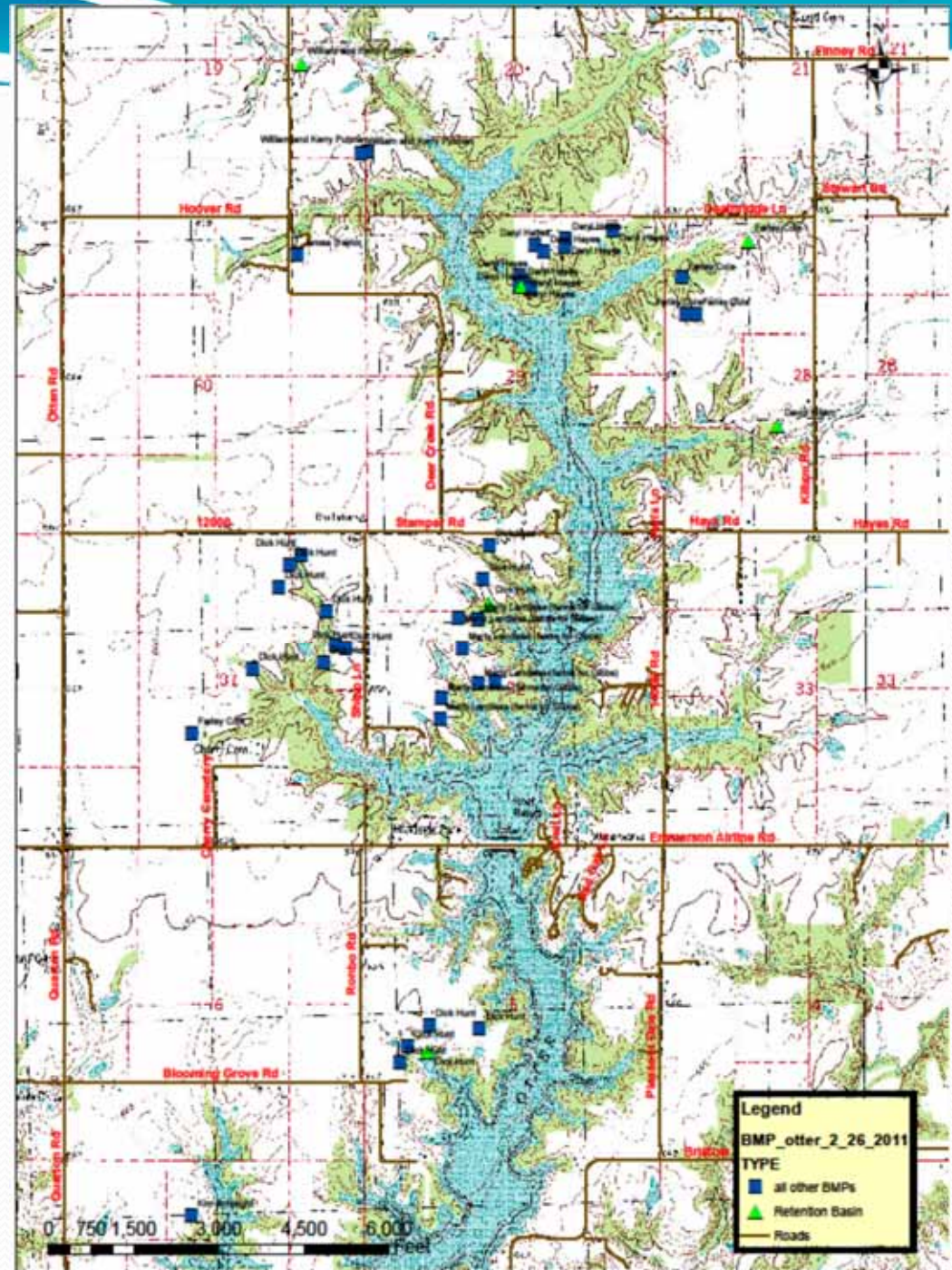
Otter Lake Nutrient Reduction Initiative

Jeff Boeckler & Derrick Martin



Otter Lake

- Owned and managed by the Otter Lake Water Commission
- Macoupin County, IL
- 770 surface acres, 13,000 ac watershed
- Public water supply & recreation resource
- Water quality issues
 - sediment
 - nutrients
 - pesticides



Otter Lake Nutrient Reduction Initiative; Background

- Enhances work completed in the early 90's
- TMDL plan in place
- EPA Section 319 implementation grant
 - Grant funded in 2010 for \$350,000+ (total Project Cost = \$540,000)
 - Upland BMPs and shoreline stabilization
 - Compliments additional work in the watershed
 - Past shoreline stabilization
 - TSI and prairie restoration

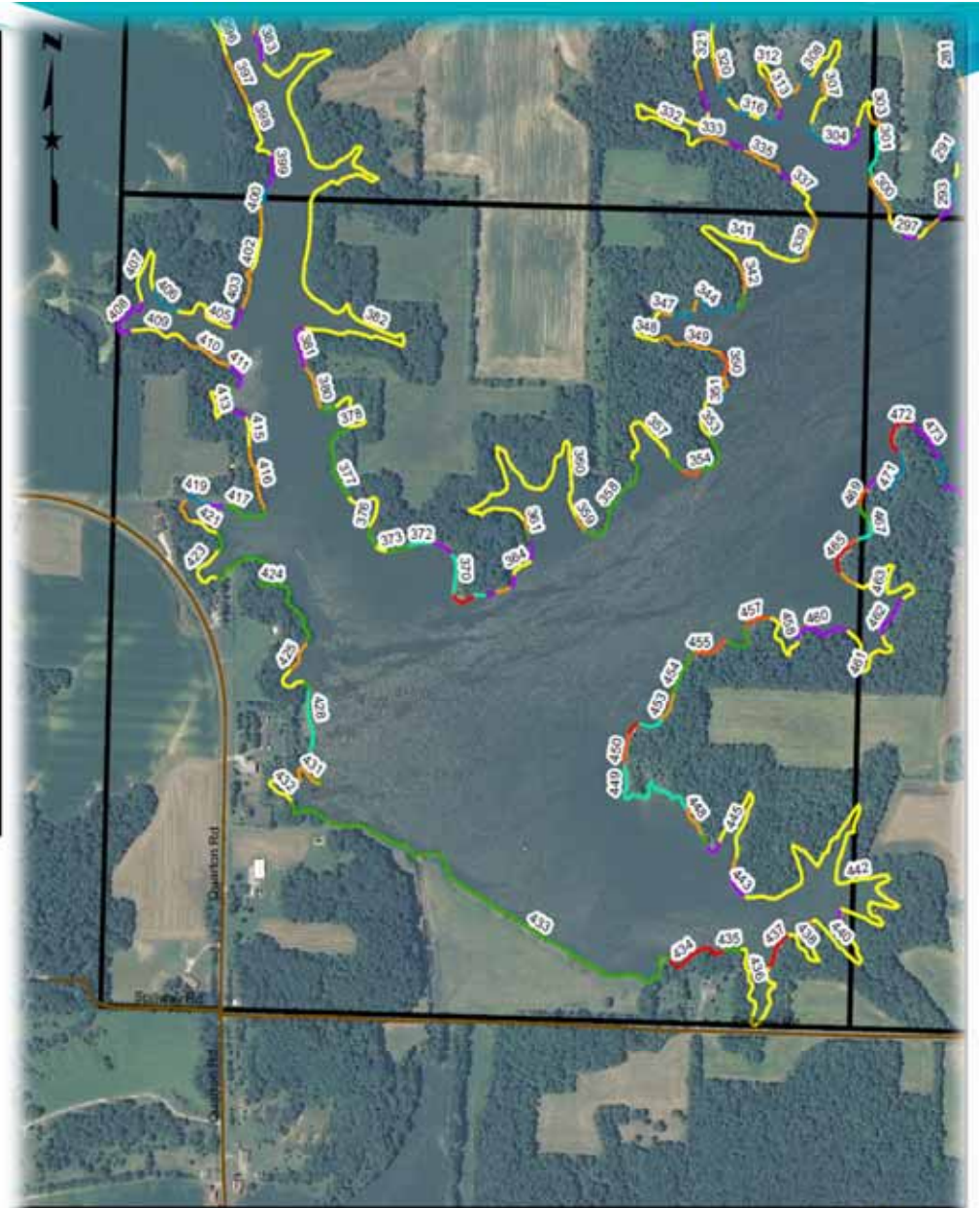
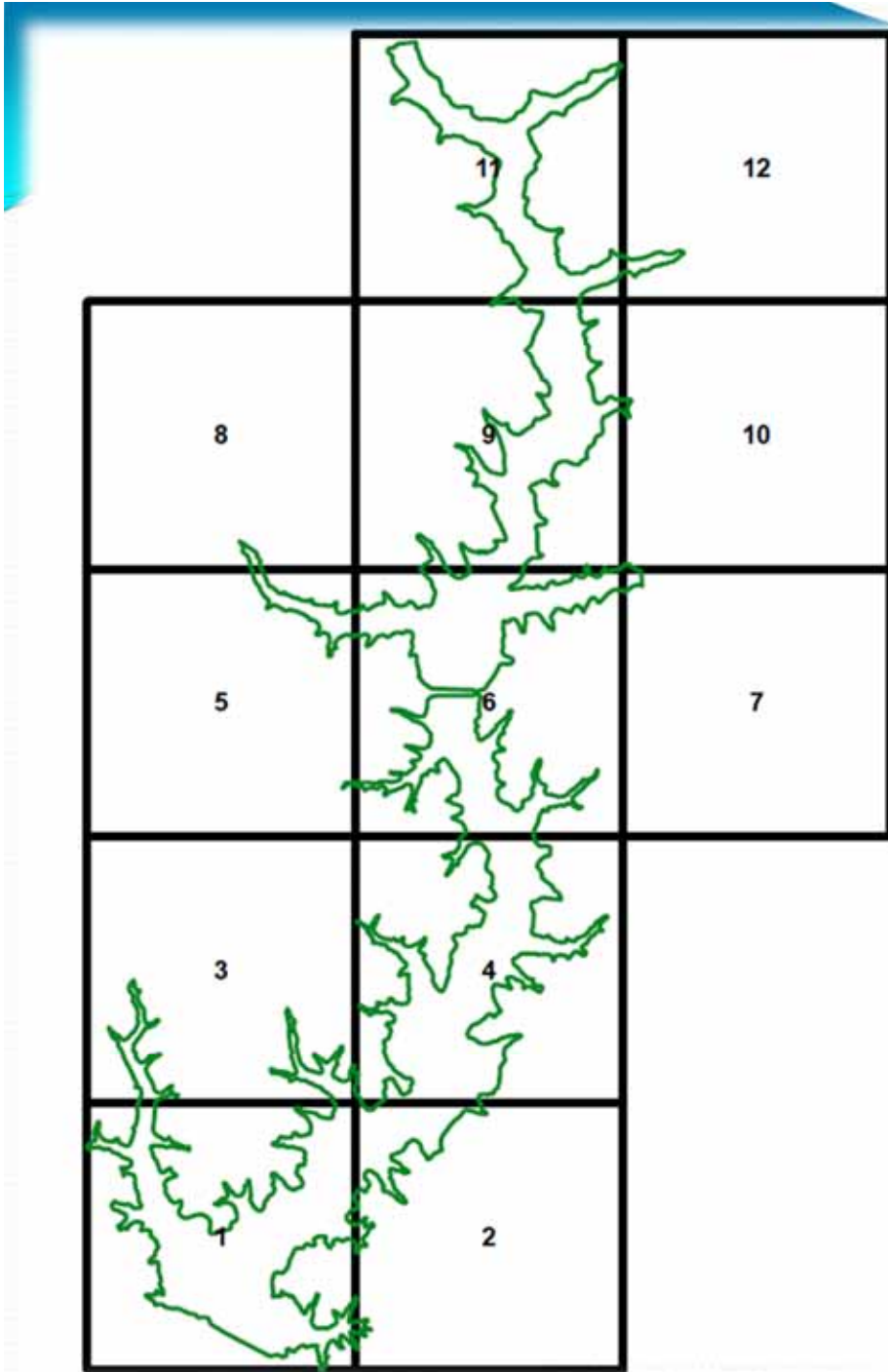
Otter Lake Nutrient Reduction Initiative

- Enhances work done in the 90's to address pesticides and recent work to control sediment
 - In-lake sediment dam
 - Shoreline stabilization
 - BMPs
- Current work (2010 - Present) includes:
 - Aggressive shoreline stabilization
 - Shoreline stability mapping
 - Upland sediment and nutrient control BMPs on adjacent crop ground
 - Invasive species removal and Timber Stand Improvement (TSI)
 - Prairie restoration

Shoreline Stability Mapping

- GPS to record and rank shoreline erosion
- Processed field data into spatial map files and created a “map atlas”
 - bank length, height and nutrient and sediment loading quantities
- Used to target stabilization efforts and quantify water quality benefits





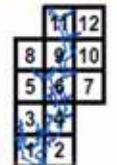
Map Legend

Road	Shoreline Erosion
Old Shore Line	Bank Rank
Substrate Point	

Northwater

Otter Lake Shoreline Erosion
Map 1 of 12

0 250 500 1,000 1,500 2,000 Feet



Shoreline Stabilization

- 9,000ft bank stabilization
 - Rip-Rap
 - Hardwood tree planting
- Sediment reduction – 1,000tons/yr
- P reduction – 900lbs/yr
- N reduction – 1,900lbs/yr

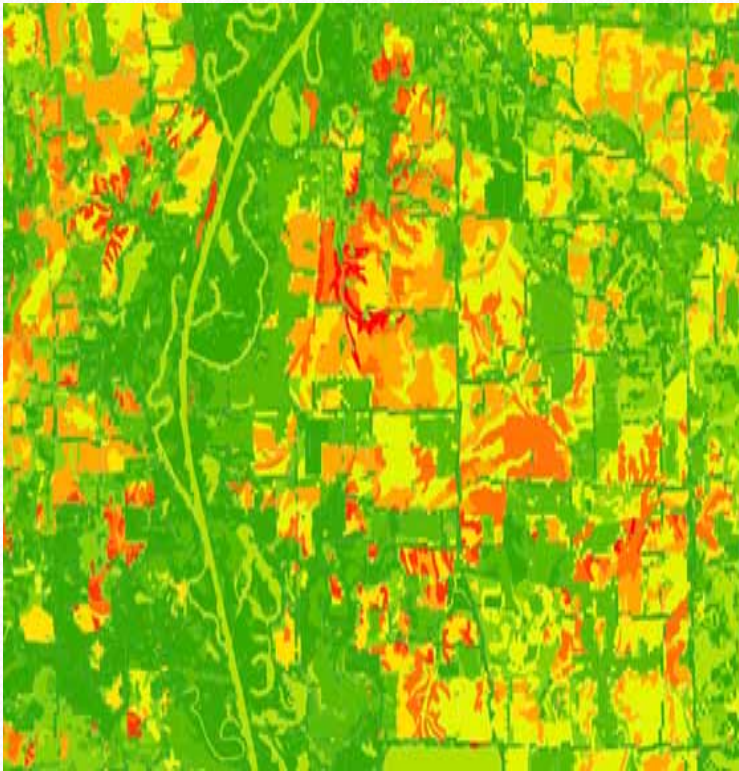




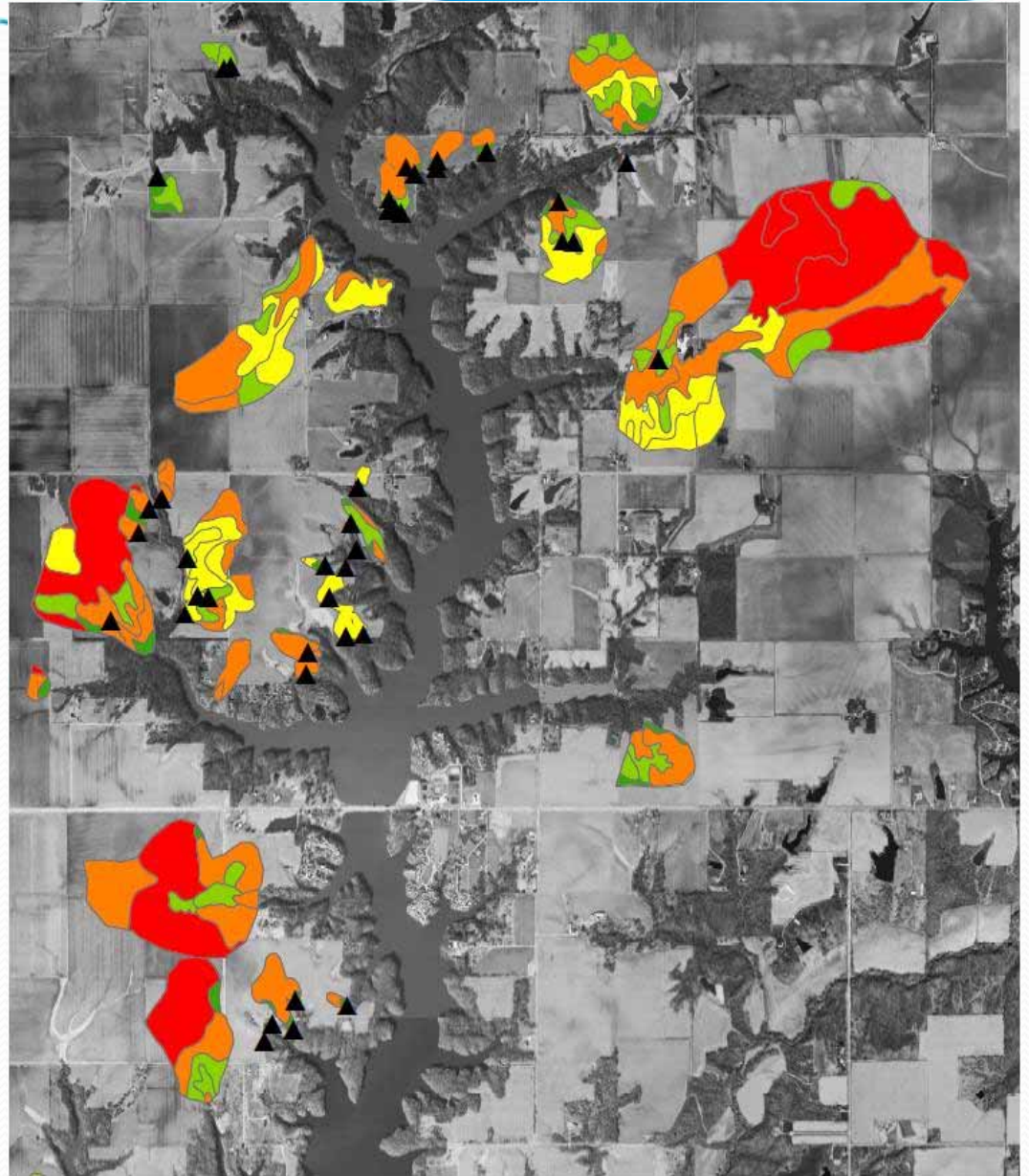


Upland Sediment and Nutrient Control

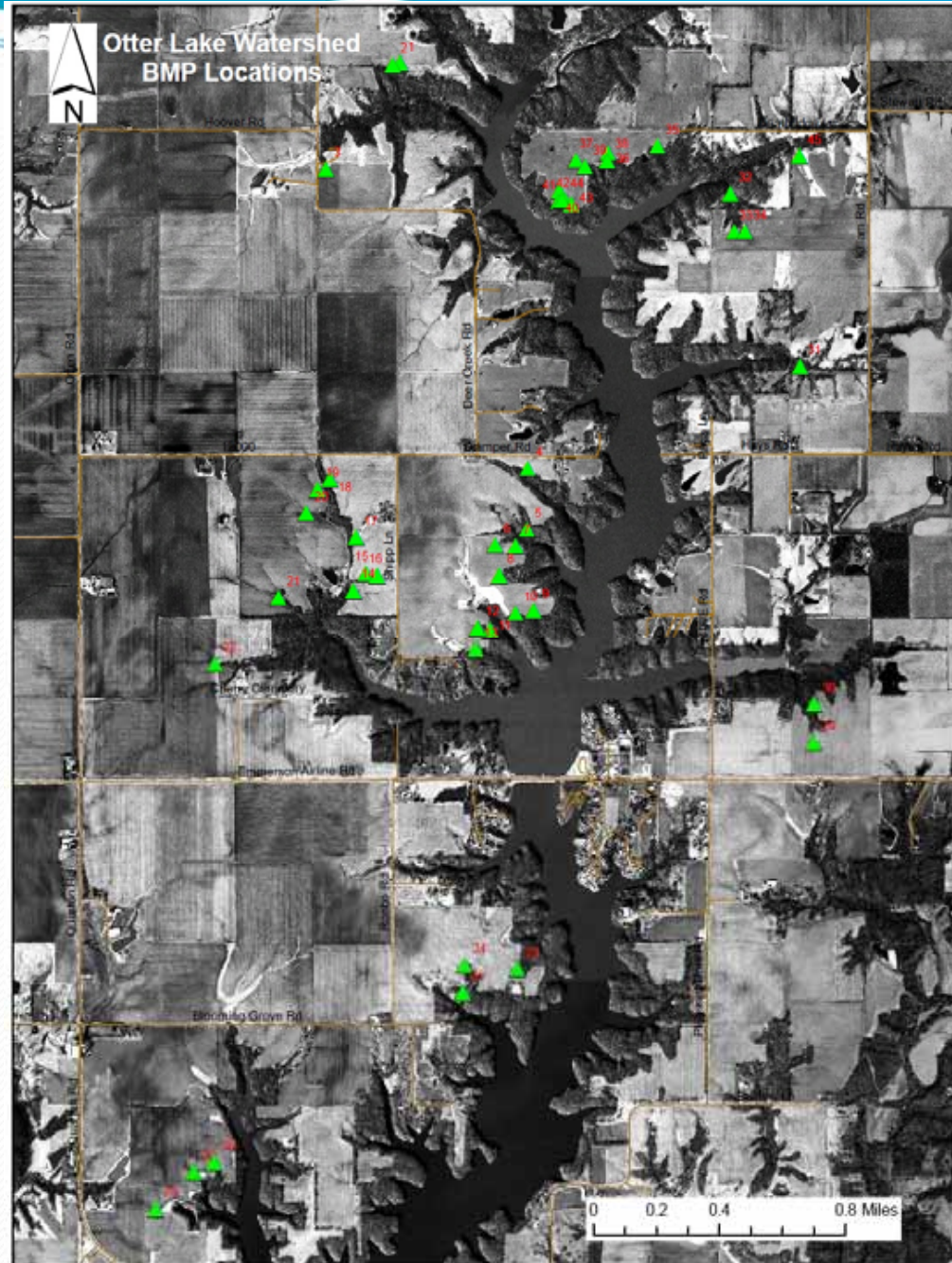
- Evaluated adjacent crop ground
 - Using GPS, identified areas of erosion and Best Management Practices (BMPs)
 - Developed nutrient and sediment loading models using GIS to quantify pollution
 - Contacted landowners and negotiated BMPs
 - Applied for Section 319 funding to install needed BMPs
 - All survey, design and construction completed in less than a year and a half



GIS Based
Pollution Load
Model Output



Best Management Practice Locations





Practices Receiving Funding & Completed

- **45+ Water and Sediment Control Basins**
- **2 Terraces (1,000ft)**
- **6 Retention Basins**
- **2 Rock riffle/grade control structures**
- **Maintenance of 3 existing structures**

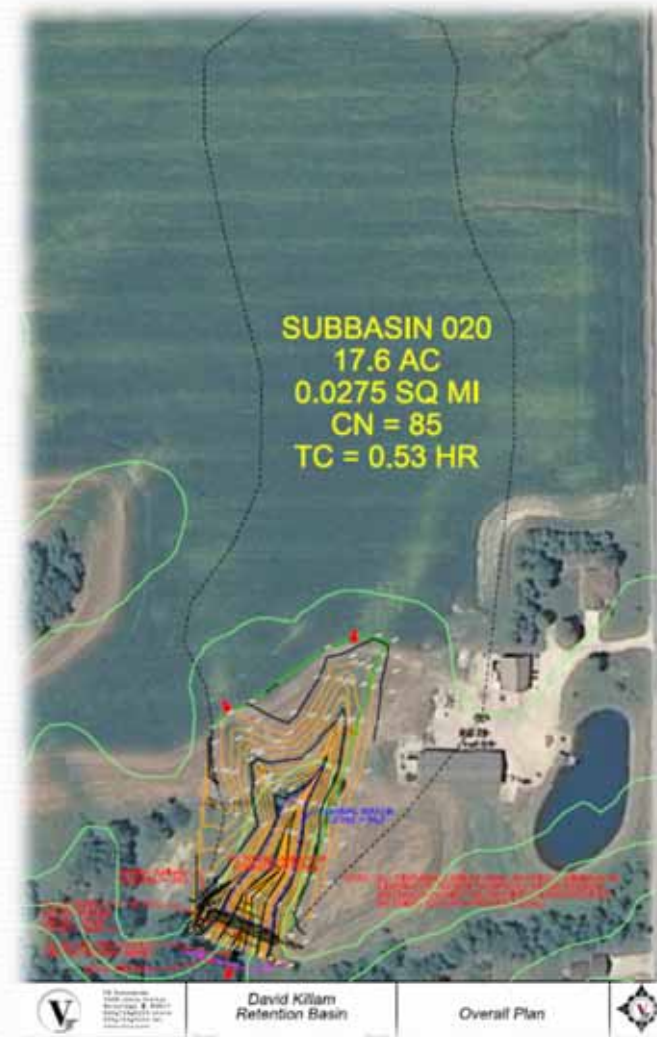
- 
- **Upland BMP implementation resulted in the following annual pollutant load reductions:**
 - **2,035 tons sediment**
 - **7,246 lbs nitrogen**
 - **2,532 lbs phosphorus**
 - **11 Cooperating and “happy” landowners**

Retention Basin Locations



Retention Basin Design Considerations

- National Resources Conservation Service (NRCS) conservation practice standard (Code 378 - Pond)
- Dam height 6-25 Feet; no dam permit required
- Site soils, drainage area, & reservoir area



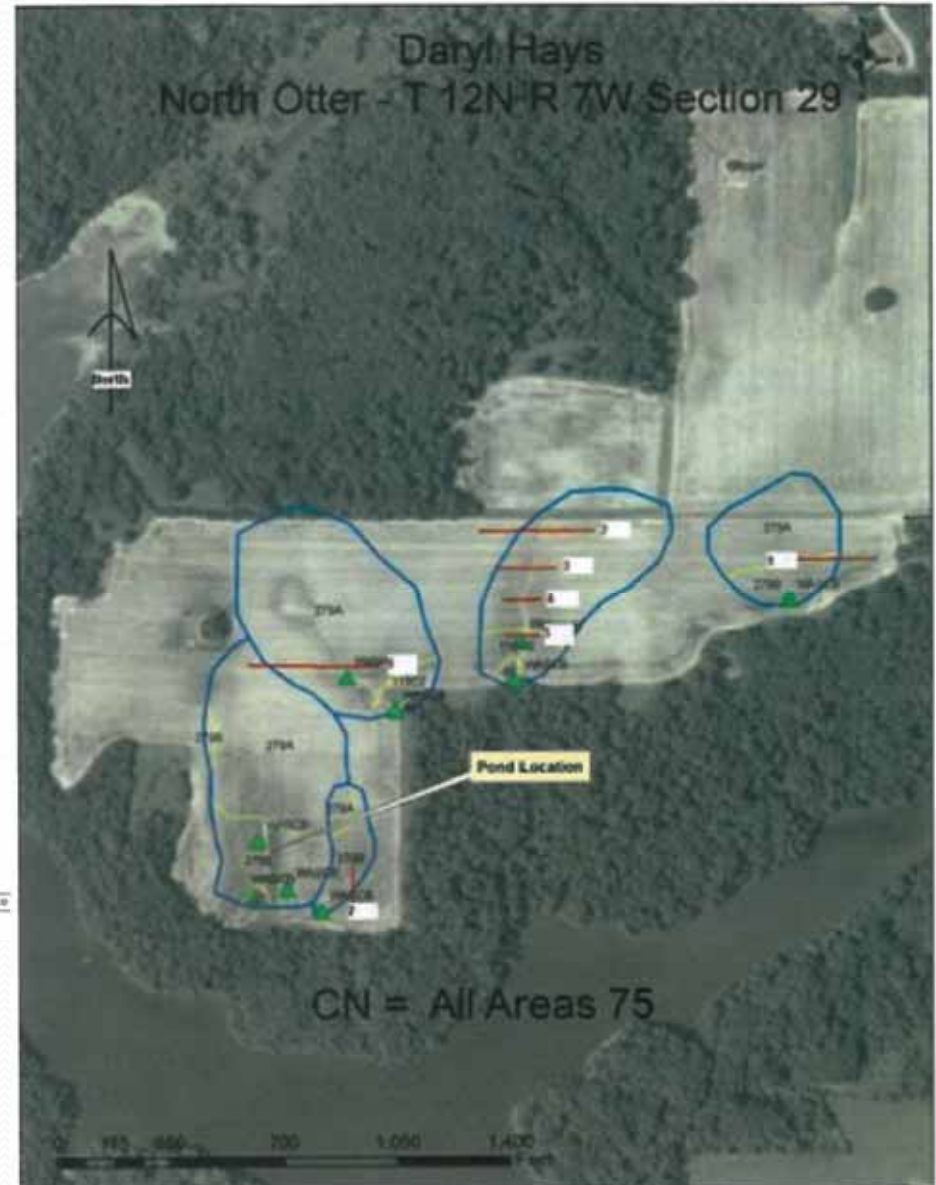
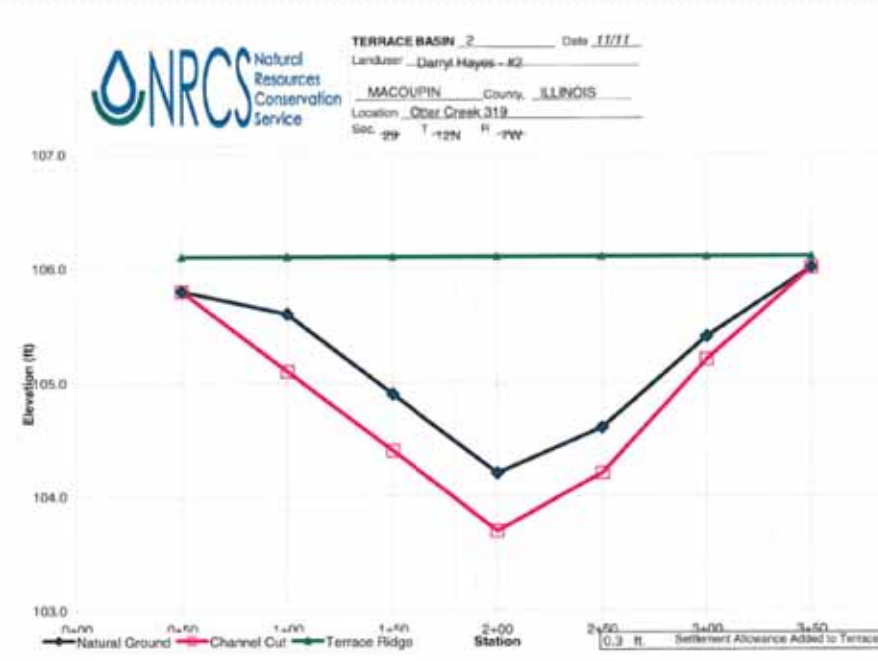




Dry Dam Design Considerations

- NRCS conservation practice standard (Code 638 – Water & Sediment Control Basin)
- Located in minor flows paths
 - Can be a single dry dam or used in a series
- Location
 - Fit topography
 - Maximize storage
 - Accommodate farm operations (If Applicable)
- Embankment design criteria
 - Capacity
 - 10-yr, 24-hr event
 - 10-yr sediment accumulation

Dry Dam Plans



Dry Dam Details & Worksheets

INLET FOR UNDERGROUND OUTLET

DIRECT METHOD INLET CONNECTION

DETAIL B
Office Hole

DESIGN DIMEN			
Inlet Number	Orifice Dia. (A)	Inlet Dia. (B)	Offset Dia. (C)
2	2.5	6	4 min

DESIGN DIMEN

Terrace Design

Woods APDS - version 2.08 (7/04) - R.Bloch

Date: 11/08/11
 Landuser: Darryl Hayes - #2
 Location: Cheat Creek 319
 Basin ID: 2
 State: ILLINOIS
 County: MACOUPIN
 Runoff CN: 75.0
 Soil Loss (T/ac): 5.0
 Dewater time (hr): 12

Sec: 29
 Twp: T12N
 Range: 7W

Designed by: Rob Meats
 Checked by: DLM
 Approved by:

Design Storm: 10-year

Design Rainfall (in.)	4.65
Direct Runoff (in.)	2.17
Sediment Storage (in.)	0.34
Water Storage (in.)	0.91
Total Storage (in.)	1.28
Reqd. Volume (cu.ft.)	9407
Release Rate (cfs)	0.209

Watershed Entry: Length & Spacing

Length (ft)	500.0
Spacing (ft)	160.0
Acres	2.1

Est. Ground Slope (%): 0.2

Terrace Front Slope Length (ft): 6
 Channel Bottom Width (ft): 3
 Terrace Type:

Ridge Outside Storage Area: none
 Instrument Height (ft): 108.40

SURVEY DATA:

STA	Grade Rod	Optional Offset	Channel Cut (ft)	Constructed Ridge (ft)
0+50	2.6		0.0	2.3
1+00	2.8		0.5	2.3
1+50	3.5		0.5	2.3
2+00	4.2		0.5	2.3
2+50	3.8		0.4	2.3
3+00	3.0		0.2	2.3
3+50	2.4		0.0	2.3

Interactive Volume Calculation:

Trial Ridge Rod: 2.6
 *Select Trial Ridge Rod so that the Storage meets or exceeds Target

Storage (cu.ft.)	Target
53,754	9,407

67%

Terrace Height (ft): 2.1
 without settlement allowance or feedback

Cut/Fill Ratio Est.	0.29
	29 cu.yd. CUT
	100 cu.yd. FILL

Interactive Tile/Orifice Sizing:

Orifice Depth (ft.)	2.6
Min. Orifice Diameter (in.)	2.25
Corrected Orifice Dia. (in.)	2.5
Corrected Flow (this basin)(cfs)	0.331
+Q flow from other terraces (if any)	
Total Tile Flow (cfs)	0.331

Tile Dia. (in.)	Min. Slope %	Velocity (ft/s)
4	4.03	3.79
5	1.23	2.43
6	0.46	1.69
8	0.16	0.95

seeding across (if applicable) Job Sheet 000-1 (2)

Select riser type: Offset Inline

Min. Riser Dia	5 in.
Use Riser Dia	6 in.

E:\1963-197
 drawing
 Sheet 1 of 1

Landowner: Darryl Hayes - #2 Location: Sec. 29 T12N R7W MACOUPIN County

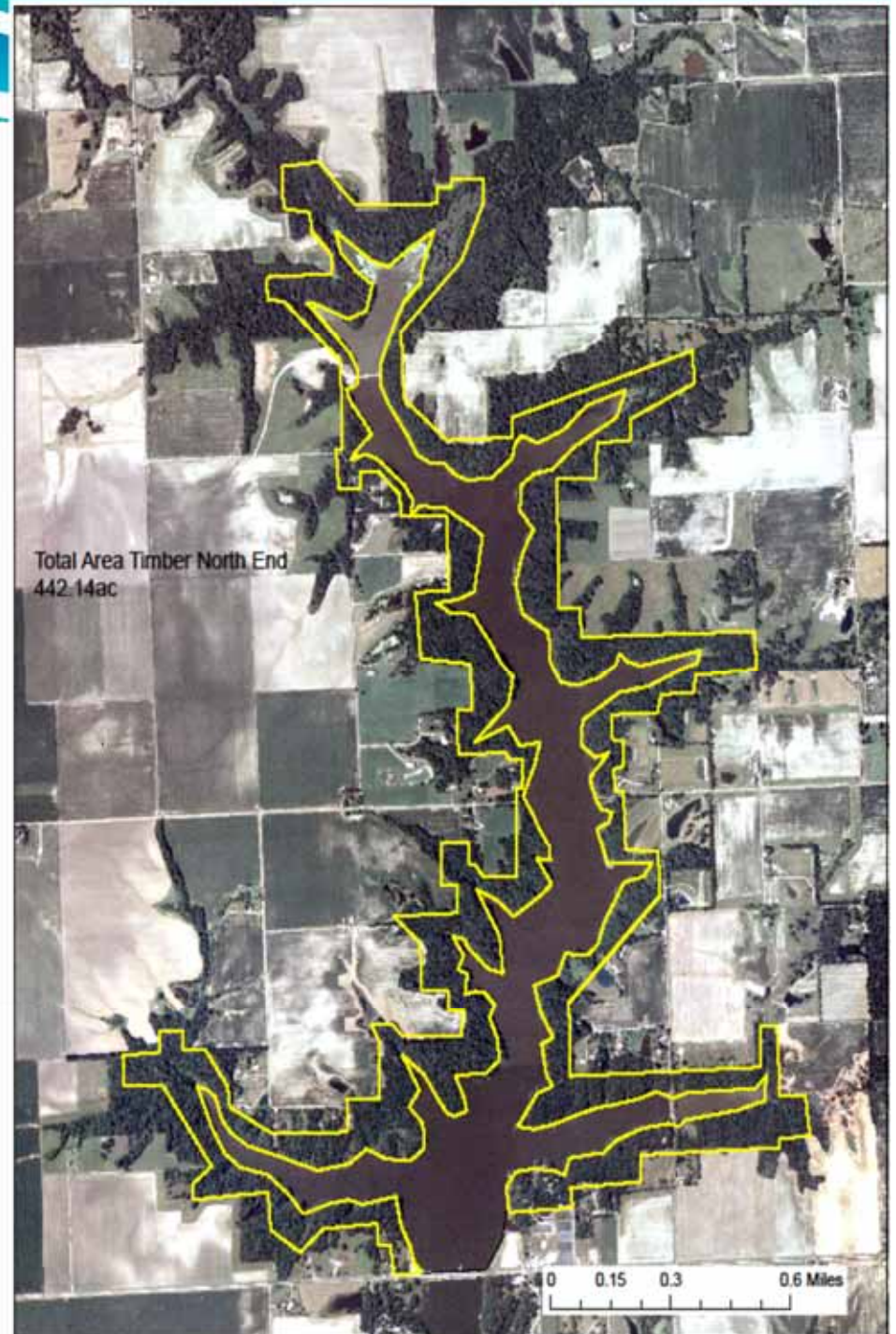






TSI and Invasive Species Removal

- 175 acres of invasive species removal; NE section of the lake
- Enhance forest understory, reduce and filter runoff to the lake
- Bush Honeysuckle, Black Locust, and Hedge removal





Before

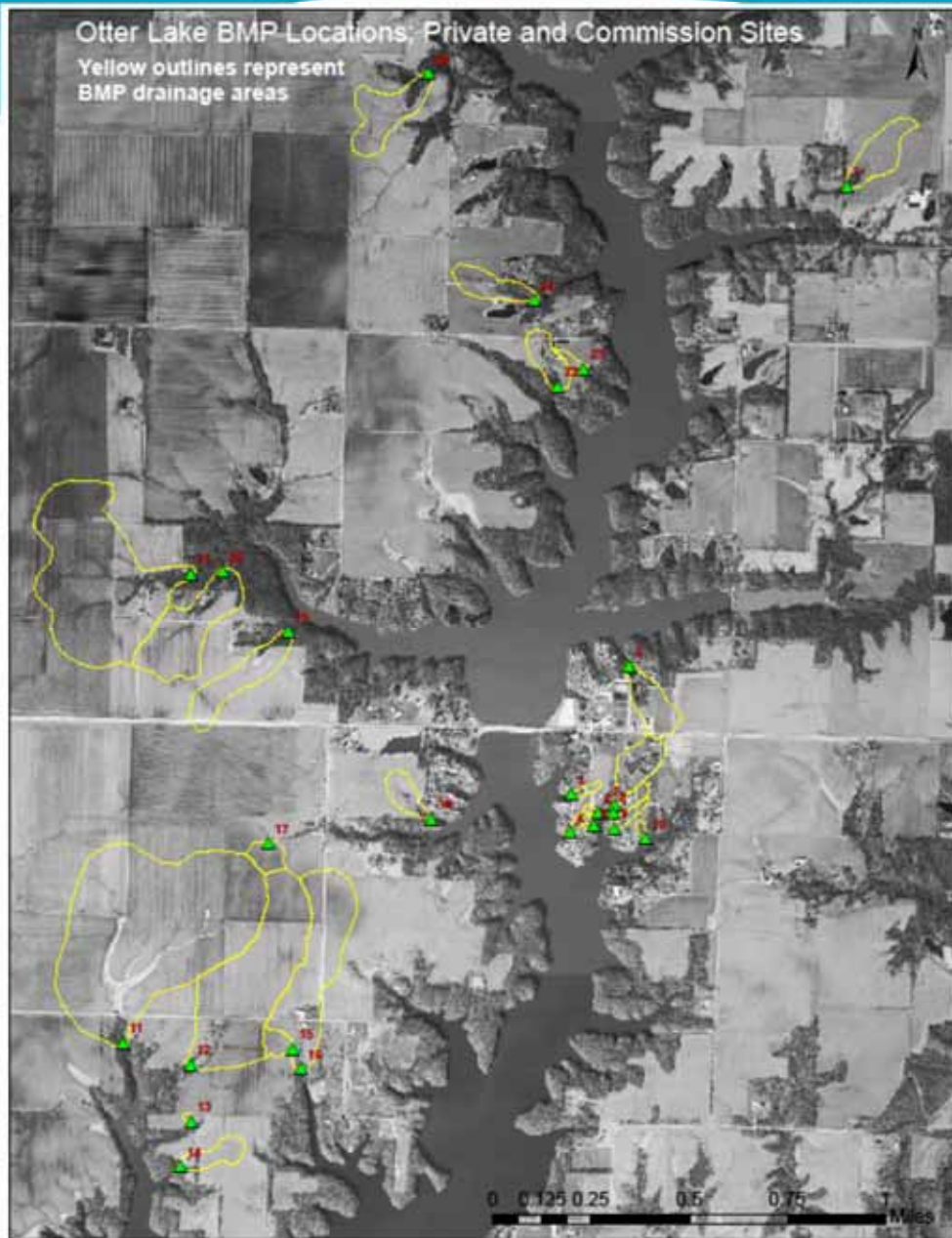


After

Prairie Conversion

- Approximately 400ac of prairie restoration
 - Converted cool season grasses on ground within the watershed





Next Steps

- 2012 Section 319 grant submitted for additional BMP implementation
- Implement additional components of a Forest Management Plan



Questions??