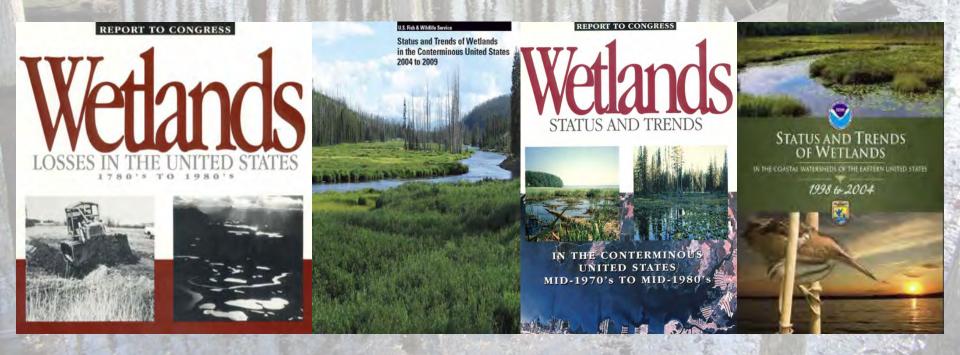


#### Past Efforts at Estimating Wetland Status and Trends in Michigan:

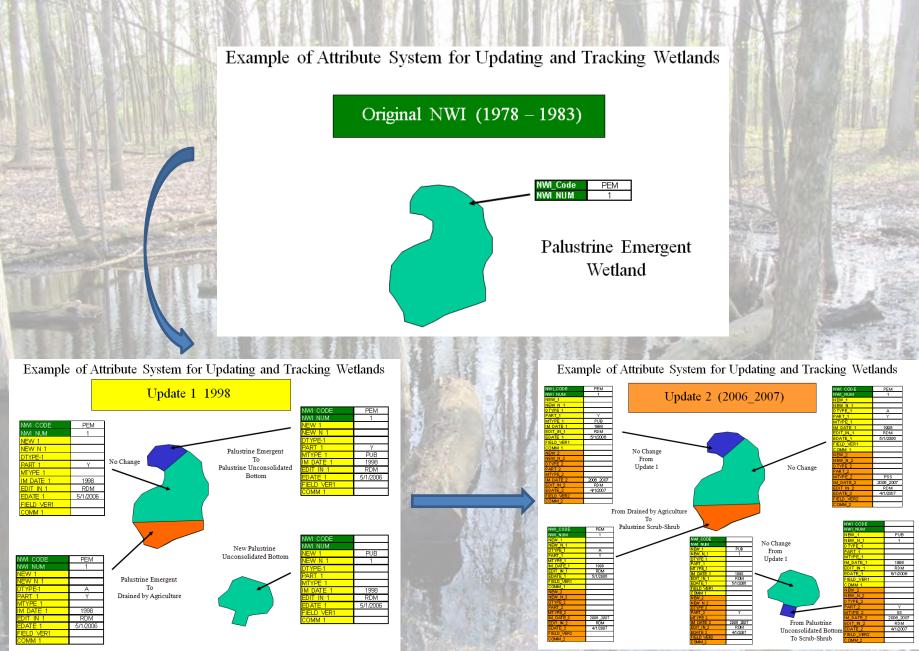
- Based off USFWS Sample Plots
- USFWS has clear guidance that states;

'conducting regional and more intensive analyses in areas with unique and essential resource conditions should be pursued wherever possible. 'The Service will actively pursue intensified wetland trends studies in areas where there is a need for resource information that compliments Service work, resource priorities, or where opportunities exist to establish partnerships at the State or regional level. Intensification studies will be planned to compliment national status and trends updates.' (USFWS, Wetlands Status and Trends-A Step Down Strategic Plan)

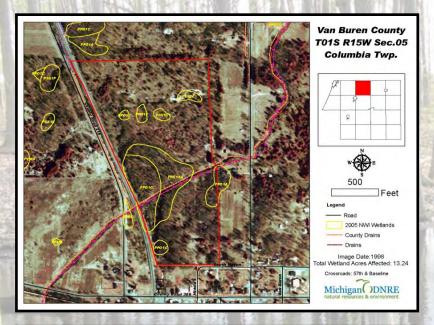


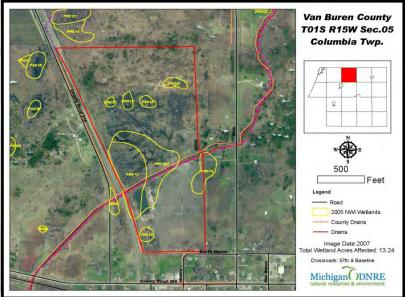


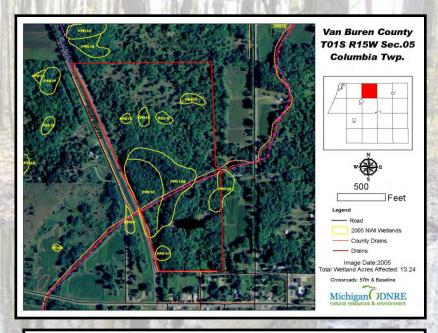
#### **Tracking One Wetland thru Time**

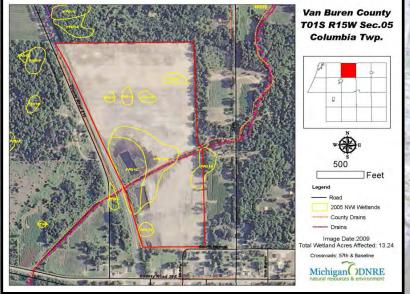


#### **Tracking One Wetland in Time**











#### **Fundamental Issues with NWI:**

Human Fatigue and its Effects on Data Quality



**HOUR 1 OF NWI CODING** 

**HOUR 7 OF NWI CODING** 



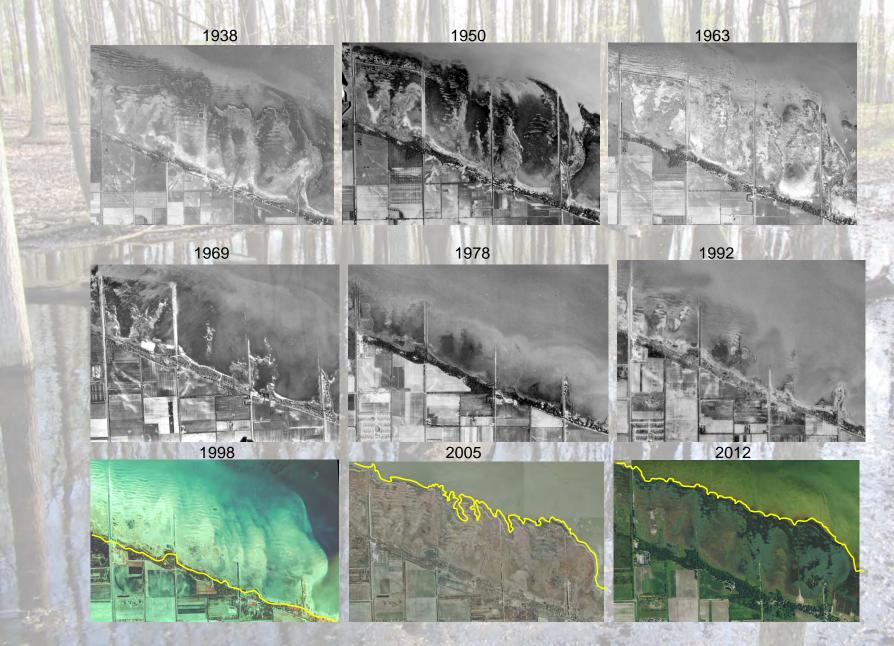
# Fundamental Issues with NWI: Omission of Small, Drier-end, and Forested Wetlands



- LAKEPLAIN PRAIRIE
- VERNAL POOLS
- FORESTED WETLAND

- The wetland types in Michigan most likely to be omitted, represent some of the most diverse and rare ecosystems in the State.
- Vernal Pools are essential to the Michigan's herpetological resources
- Smaller end, isolated wetlands tend to be unregulated

# Fundamental Issues with NWI: Coastal Wetland Change



### Fundamental Issues with NWI: Farmed Wetlands

Figure 5: Stressed crops, inundation and saturation are all easily identified from aerial imagery.



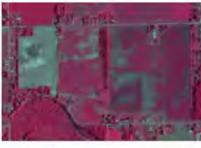




Figure 6: Imagery showing the signature of inundation and saturation of the soil column. Inundated areas have a much darker tone with a clear, unmottled texture as water absorbs all wavelengths of light rendering it black to near black on imagery. Saturated areas appear darker than dry areas, though not as dark as inundated areas, though the texture is more mottled and variable given the presence of soil above the saturated zone.

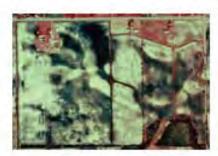






Figure 7: Imagery showing the obvious signature of sub surface drainage lines (tiles) which appear light or white in the soil column above the tile given the artificial and expedited drainage of the soil at that location. The image at right shows a dune/swale complex in Central Eastern MI next to the same habitat being drained and farmed.







#### **RESULTS:**

Hydric Soils on Natural Land Cover not Included in NWI

County	Acres of Potentially Missed Wetland
County	Wedalia
ALCONA	31,504
ALGER	68,526
ALLEGAN	8,224
ALPENA	23,887
ANTRIM	9,477
ARENAC	18,127
BARAGA	21,883
BARRY	1,503
BAY	8,932
BENZIE	3,975
BERRIEN	3,780
BRANCH	5,649
CALHOUN	4,500
CASS	2,012

#### Top Three Counties for Potentially Missed Wetlands:

1.	Chinnowa
1.	Chippewa:

2. Ontonagon:

3. Mackinac:

182,147 acres

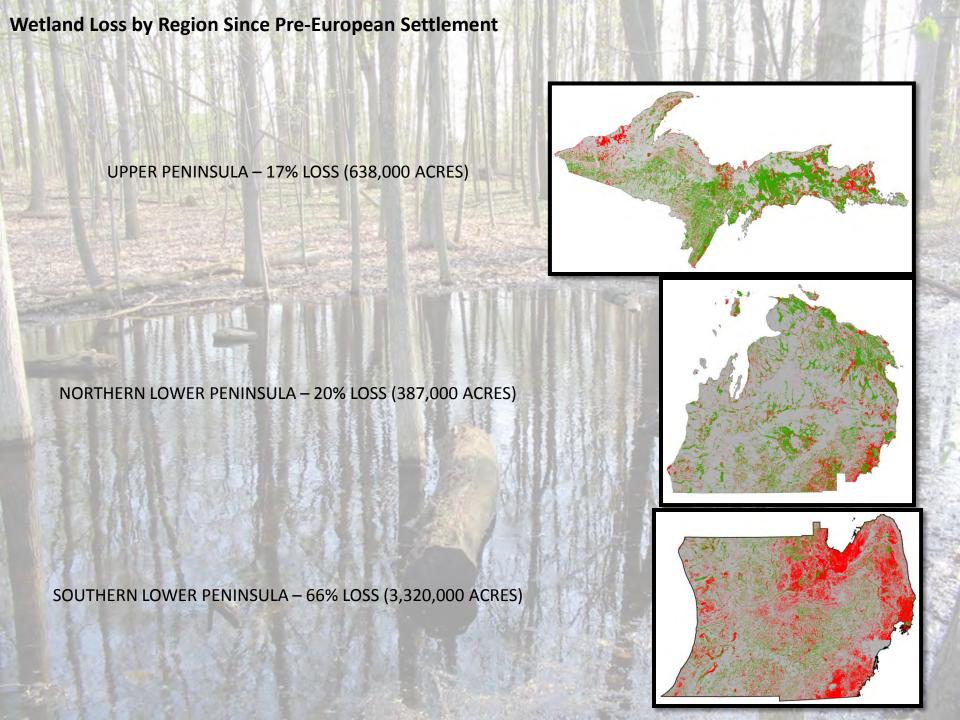
140,830 acres

78,917 acres



# MICHIGAN'S WETLAND LOSSES NOT UNIFORM

- UPPER PENINSULA 17% LOSS (638,000 ACRES)
- NORTHERN LOWER PENINSULA 20% LOSS (387,000 ACRES)
- SOUTHERN LOWER PENINSULA 66% LOSS (3,320,000 ACRES)
- GREAT LAKES COASTAL WETLANDS 71% LOSS



### RESULTS: STATEWIDE COMPARISON

							Total
							Percentage of
	1978 Wetland A	cres & % of	1998 Wetland	d Acres & % of	2005 Wetlan	nd Acres & %	Wetland Loss 78
County	Wetland In (	County	Wetland	In County	of Wetland	d In County	05
ALCONA	76,537	(17.2%)	76,951	(17.3%)	76,894	(17.3%)	0%
ALGER	137,997	(23.0%)	138,103	(23.1%)	138,102	(23.1%)	0%
ALLEGAN	62,021	(11.5%)	61,189	(11.4%)	60,707	(11.3%)	-2%
ALPENA	142,767	(37.5%)	142,147	(37.4%)	142,052	(37.3%)	-1%
ANTRIM	25,294	(7.5%)	25,241	(7.5%)	25,162	(7.5%)	-1%
ARENAC	55 <b>,8</b> 90	(23.7%)	53,713	(22.8%)	53,6 <b>78</b>	(22.8%)	-4%
BARAGA	111,686	(19.0%)	111,691	(19.0%)	111,655	(19.0%)	0%
BARRY	46,199	(12.5%)	46,158	(12.5%)	46,153	(12.5%)	0%
BAY	26,385	(9.2%)	25,318	(8.8%)	25,038	(8.7%)	-5%
BENZIE	24,14 <del>4</del>	(10.9%)	24,126	(10.9%)	24,125	(10.9%)	0%
BERRIEN	31,215	(8.4%)	30,454	(8.2%)	30,289	(8.2%)	-3%
BRANCH	43 <b>,88</b> 3	(13.2%)	42,409	(12.8%)	42,372	(12.7%)	-3%
CALHOUN	77,612	(16.9%)	77,288	(16.8%)	77,231	(16.8%)	0%
CASS	40,486	(12.4%)	40,153	(12.3%)	40,123	(12.3%)	-1%

SIT.						
3	Total	6,506,044	17.4%	6,473,205 (17.3%)	6,465,109 (17.3%)	-1%

Top Three Counties for Wetland Loss: 1978 - 2005:

1. Macomb: 17% loss

2. Huron: 11% loss

3. Sanilac: 7% loss

RESULTS: 1978 NWI Wetland Class

	1978 Wetlands									
			Aquatio	Bed &	Emergen	t & %	Scrub Shr	ub & %		
	Open Wat	er & %	% of C	ounty	of Cou	ntγ	of Cou	ntγ	Forested	& % of
County	of County A	Acreage	Acre	age	Acrea	ge	Acrea	ge	County A	creage
ALCONA	12,769	(2.9%)	548	(0.1%)	2,788	(0.6%)	13,899	(3.1%)	59,302	(13.3%)
ALGER	13,214	(2.2%)	19	(0.0%)	4,818	(0.8%)	16,731	(2.8%)	116,429	(19.4%)
ALLEGAN	12,027	(2.2%)	1,040	(0.2%)	12,591	(2.3%)	7,922	(1.5%)	40,468	(7.5%)
ALPENA	12,102	(3.2%)	825	(0.2%)	5,689	(1.5%)	18,114	(4.8%)	118,139	(31.1%)
ANTRIM	31,359	(9.3%)	291	(0.1%)	1,389	(0.4%)	2,737	(0.8%)	20,877	(6.2%)
ARENAC	1,216	(0.5%)	40	(0.0%)	3,453	(1.5%)	14,162	(6.0%)	38,236	(16.2%)
BARAGA	9,502	(1.6%)	<b>24</b> 0	(0.0%)	3,123	(0.5%)	27,796	(4.7%)	80,538	(13.7%)
BARRY	15,228	(4.1%)	2,256	(0.6%)	15,283	(4.1%)	10,309	(2.8%)	18,351	(5.0%)
BAY	3,239	(1.1%)	1,110	(0.4%)	4,187	(1.5%)	5,096	(1.8%)	15,992	(5.6%)
BENZIE	16,973	(7.6%)	58	(0.0%)	1,374	(0.6%)	3,327	(1.5%)	19,386	(8.7%)
BERRIEN	7,617	(2.1%)	729	(0.2%)	6,620	(1.8%)	3,145	(0.8%)	20,721	(5.6%)
BRANCH	8,486	(2.6%)	264	(0.1%)	8,192	(2.5%)	5,906	(1.8%)	29,522	(8.9%)
CALHOUN	7,336	(1.6%)	578	(0.1%)	22,028	(4.8%)	13,462	(2.9%)	41,545	(9.0%)
CASS	10,007	(3.1%)	1,350	(0.4%)	9,917	(3.0%)	7,868	(2.4%)	21,352	(6.6%)

RESULTS: 1998 NWI Wetland Class

	1998 Wetlands									
County	Open Wa of Cor Acre	unty	Aquatic Book of Cou Acrea	ntγ	Emergen of Cour Acrea	nty	Scrub Shru of Cou Acrea	ntγ	Forested County A	
				-		-		0-		
ALCONA	12,849	(2.9%)	551	(0.1%)	2,887	(0.6%)	14,155	(3.2%)	59,357	(13.4%)
ALGER	13,256	(2.2%)	20	(0.0%)	4,898	(0.8%)	16,760	(2.8%)	116,425	(19.4%)
ALLEGAN	12,318	(2.3%)	1,041	(0.2%)	12,283	(2.3%)	7,873	(1.5%)	39,992	(7.4%)
ALPENA	12,162	(3.2%)	<b>8</b> 30	(0.2%)	5,779	(1.5%)	17,770	(4.7%)	117,768	(31.0%)
ANTRIM	31,242	(9.3%)	296	(0.1%)	1,386	(0.4%)	2,703	(0.8%)	20,856	(6.2%)
ARENAC	1,380	(0.6%)	40	(0.0%)	3,164	(1.3%)	13,474	(5.7%)	37,035	(15.7%)
BARAGA	9,570	(1.6%)	256	(0.0%)	3,223	(0.5%)	27,733	(4.7%)	<b>8</b> 0 <b>,4</b> 90	(13.7%)
BARRY	15,266	(4.1%)	2,256	(0.6%)	15,294	(4.1%)	10,290	(2.8%)	18,318	(5.0%)
BAY	3,336	(1.2%)	1,111	(0.4%)	3,888	(1.4%)	4,652	(1.6%)	15,666	(5.5%)
BENZIE	16,998	(7.6%)	63	(0.0%)	1,385	(0.6%)	3,298	(1.5%)	19,381	(8.7%)
BERRIEN	7,675	(2.1%)	727	(0.2%)	6,257	(1.7%)	3,098	(0.8%)	20,372	(5.5%)
BRANCH	8,553	(2.6%)	264	(0.1%)	7,174	(2.2%)	5,700	(1.7%)	29,271	(8.8%)
CALHOUN	7,385	(1.6%)	5 <b>8</b> 0	(0.1%)	22,008	(4.8%)	13,328	(2.9%)	41,373	(9.0%)
CASS	10,073	(3.1%)	1,352	(0.4%)	9,866	(3.0%)	7,716	(2.4%)	21,219	(6.5%)

# RESULTS: 2005 NWI Wetland Class

#### 2005 Wetlands

	Open Water	· & %	Aquatic Bed	l & % of	Emergent	& % of	Scrub Shrub	& % of	Forested	& % of
County	of County Ac		County Ac		County Ac		County Ac		County A	
ALCONA	12,875 (2	2.9%)	551	(0.1%)	2,889	(0.6%)	14,142	(3.2%)	59,312	(13.3%)
ALGER	13,256 (2	2.2%)	20	(0.0%)	4,909	(0.8%)	16,754	(2.8%)	116,419	(19.4%)
ALLEGAN	12,523 (2	2.3%)	1,042	(0.2%)	12,009	(2.2%)	7,851	(1.5%)	39 <b>,8</b> 05	(7.4%)
ALPENA	12,188 (3	3.2%)	<b>8</b> 30	(0.2%)	5,776	(1.5%)	17,747	(4.7%)	117,700	(30.9%)
ANTRIM	31,256 (9	9.3%)	296	(0.1%)	1,388	(0.4%)	2,692	(0.8%)	20,785	(6.2%)
ARENAC	1,410 (0	0.6%)	41	(0.0%)	3,170	(1.3%)	13,446	(5.7%)	37,021	(15.7%)
BARAGA	9,578 (1	1.6%)	257	(0.0%)	3,223	(0.5%)	27,733	(4.7%)	80,453	(13.7%)
BARRY	15,294 (4	4.1%)	2,258	(0.6%)	15,290	(4.1%)	10,291	(2.8%)	<b>18,</b> 313	(5.0%)
BAY	3,360 (1	1.2%)	1,113	(0.4%)	3,772	(1.3%)	4,592	(1.6%)	15,561	(5.4%)
BENZIE	17,000 (5	7.6%)	63	(0.0%)	1,385	(0.6%)	3,298	(1.5%)	<b>19,38</b> 0	(8.7%)
BERRIEN	7,753 (2	2.1%)	724	(0.2%)	6,221	(1.7%)	3,076	(0.8%)	20,268	(5.5%)
BRANCH	8,568 (2	2.6%)	264	(0.1%)	7,178	(2.2%)	5,700	(1.7%)	29,231	(8.8%)
CALHOUN	7,413 (1	1.6%)	580	(0.1%)	22,012	(4.8%)	13,299	(2.9%)	41,340	(9.0%)
CASS	10,098 (3	3.1%)	1,352	(0.4%)	9,859	(3.0%)	7,707	(2.4%)	21,205	(6.5%)

#### **RESULTS:**

Hydric Soils to 2005 NWI

County	Pre-European Vegetated Wetland Acreages	2005 Vegetated Wetland Acreages	Percentage Vegetated Wetland Loss
ALCONA	104,213	76,894	-26%
ALGER	202,804	138,102	-32%
ALLEGAN	116,499	60,707	-48%
ALPENA	155,165	142,052	-8%
ANTRIM	39 <b>,8</b> 91	25,162	-37%
ARENAC	101,878	53,678	-47%
BARAGA	123,884	111,655	-10%
BARRY	58,621	46,153	-21%
BAY	159,602	25,038	-84%
BENZIE	28,649	24,125	-16%
BERRIEN	65 <b>,88</b> 9	30,289	-54%
BRANCH	87,374	42,372	-52%
CALHOUN	103,566	77,231	-25%
CASS	53,838	40,123	-25%

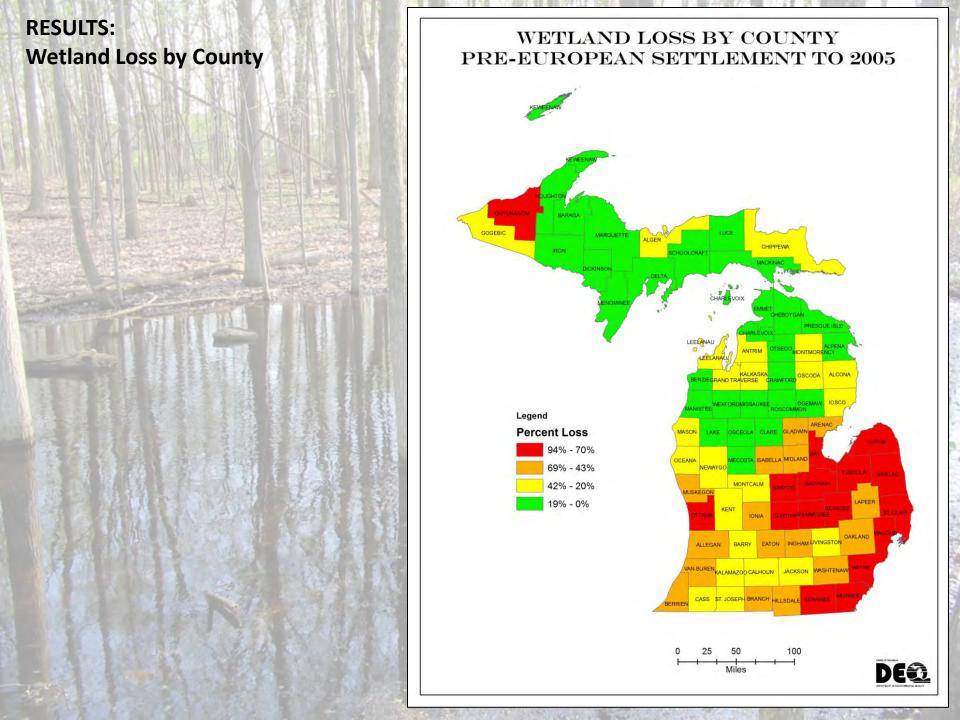
TOTAL	10,743,849	6,465,109	40%

Top Three Counties for Wetland Loss: Presettlement - 2005:

1. Monroe: 94% loss

2. Wayne: 90% loss

3. Saginaw: 88% loss



#### Wetland Loss and the Agents of Change

Agriculture	Development	Recreation	Other
orchards	urban housing	golf courses	logging
crops	rural housing	race tracks	airports
pasture	industry	sports fields	highways
farm houses/	commercial		unknown/unidentified

## When losses from the two temporal time periods are combined;

- Agriculture (47%)
- Development (49%)
- Other Activities such as Logging(2%)
- Recreation (2%)

#### RATE OF CHANGE

- 1978-1998 = Loss of 2,962 acres/year
- 1998-2005 = Loss of 2,048 acres/year



Partially Drained Wetland



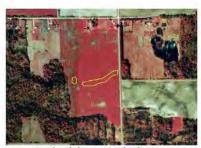
Drained Wetland



Modified Wetland



Unchanged Wetland



Drained due to Agriculture



Drained due to Development



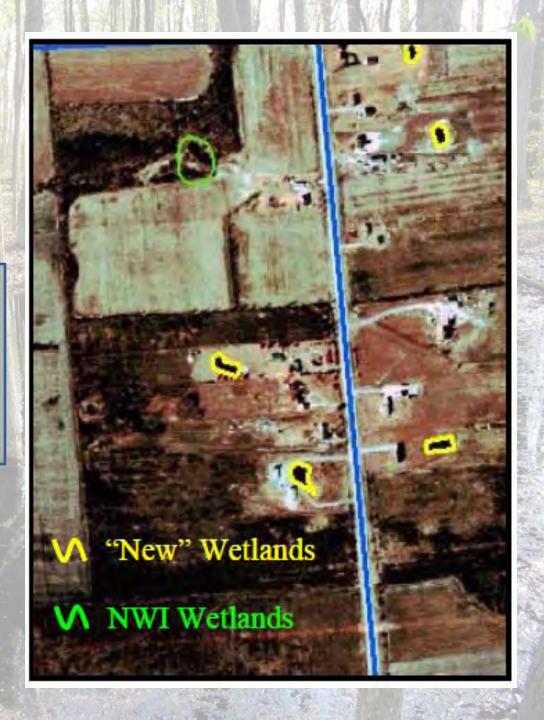
Drained due to Recreation (golf course)



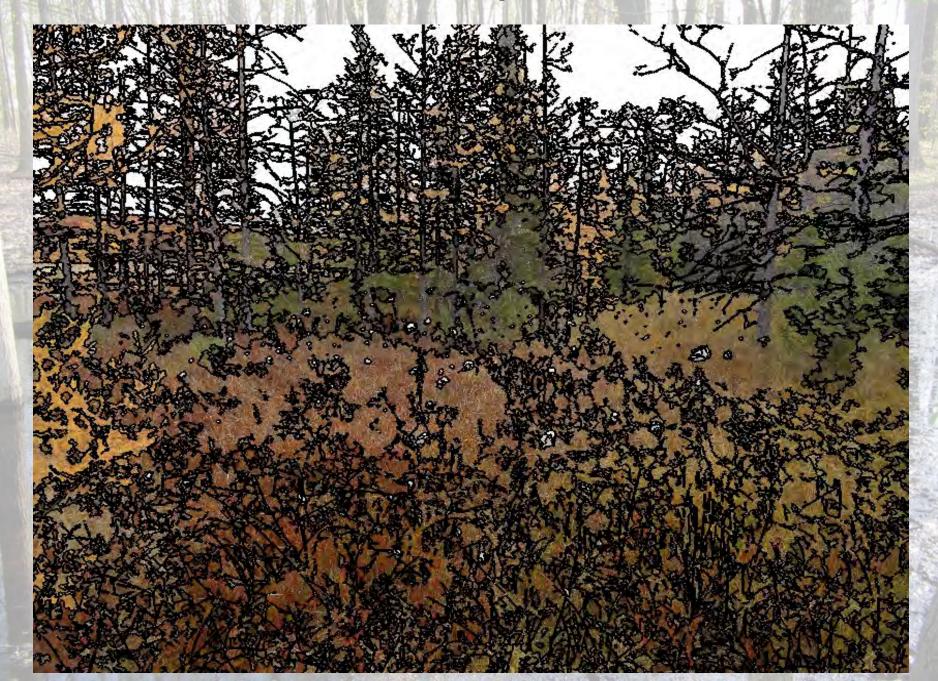
Drained due to Other (logging)

# Wetland Gains: "New" Wetlands?

- Vast majority of 'gains' were in the Open Water class (ie, Ponds)
- Mapping of 'missed' wetlands
- Cowardin coding problems '999'

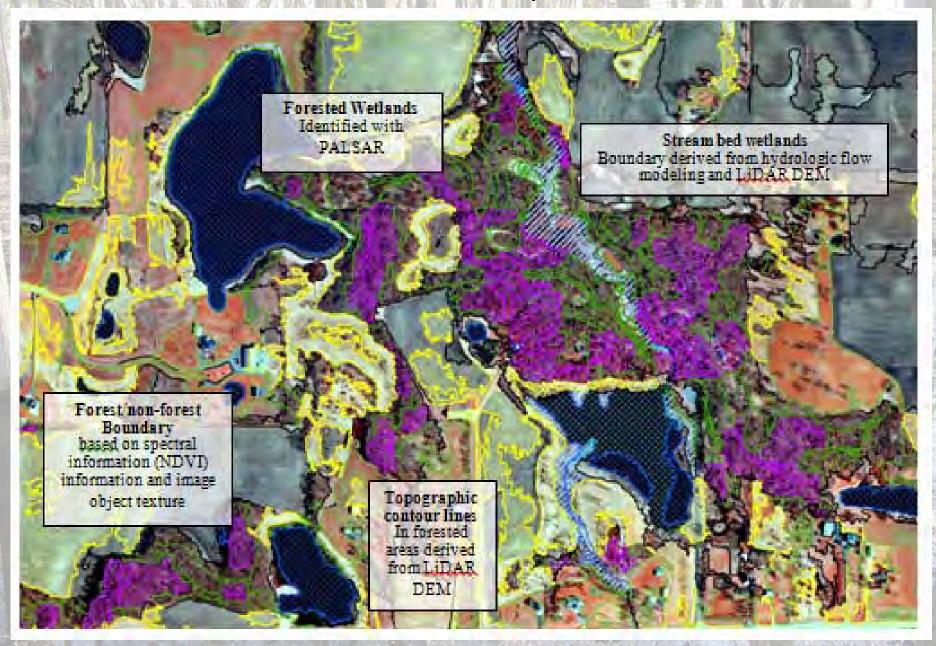


The Future of Wetland Status and Trends in Michigan



# **New High Resolution Imagery** HI-Resolution Imagery Status 9-27-2012 **Aerial Imagery** LIDAR **RADAR** Legend Counties 2008 2009 2010, 2011, 2012 2004, 2005, 2006, 2007

#### The Future of Status and Trends: Minnesota NWI Update



# The Future of Status and Trends: Minnesota NWI Update

#### **AUTOMATED** Image Segmentation

