

Mapping Massachusetts Wetlands



NEBAWWG-MAWWG MEETING, NOVEMBER 13-15, 2018

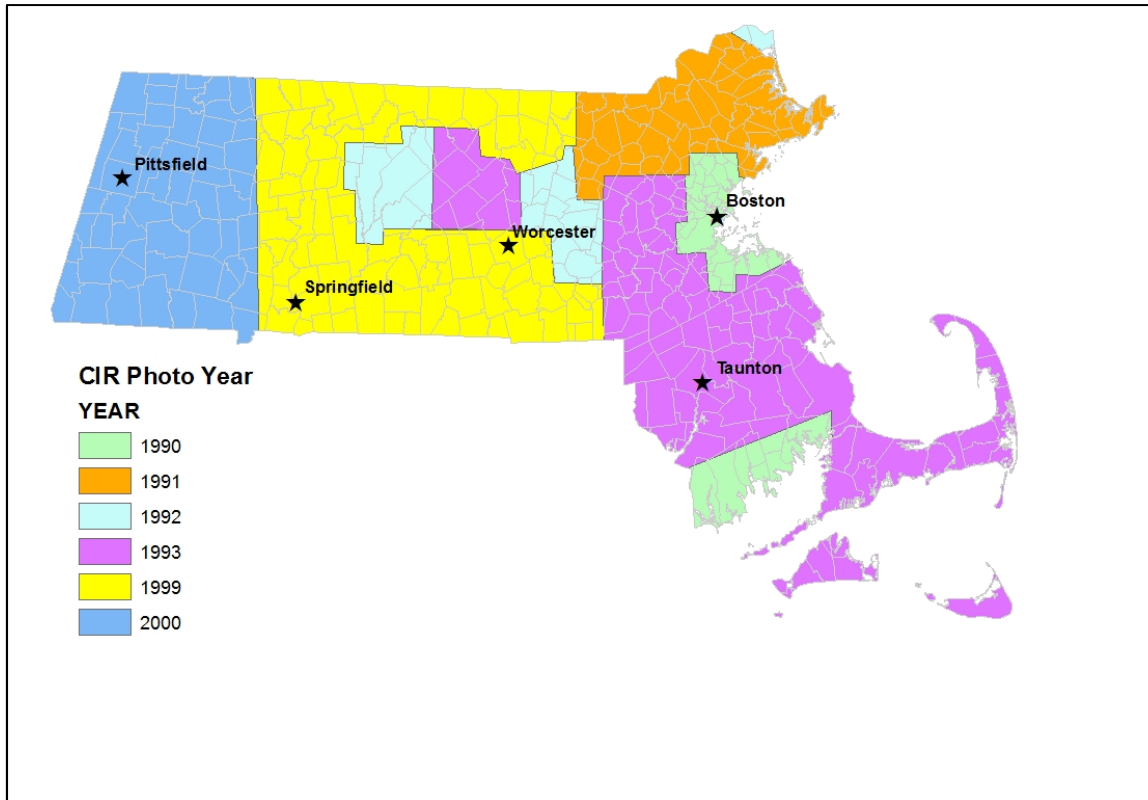
COOPERSTOWN NY

Presented by Michael McHugh and Lisa Rhodes, MassDEP



Original Wetland Data Layer

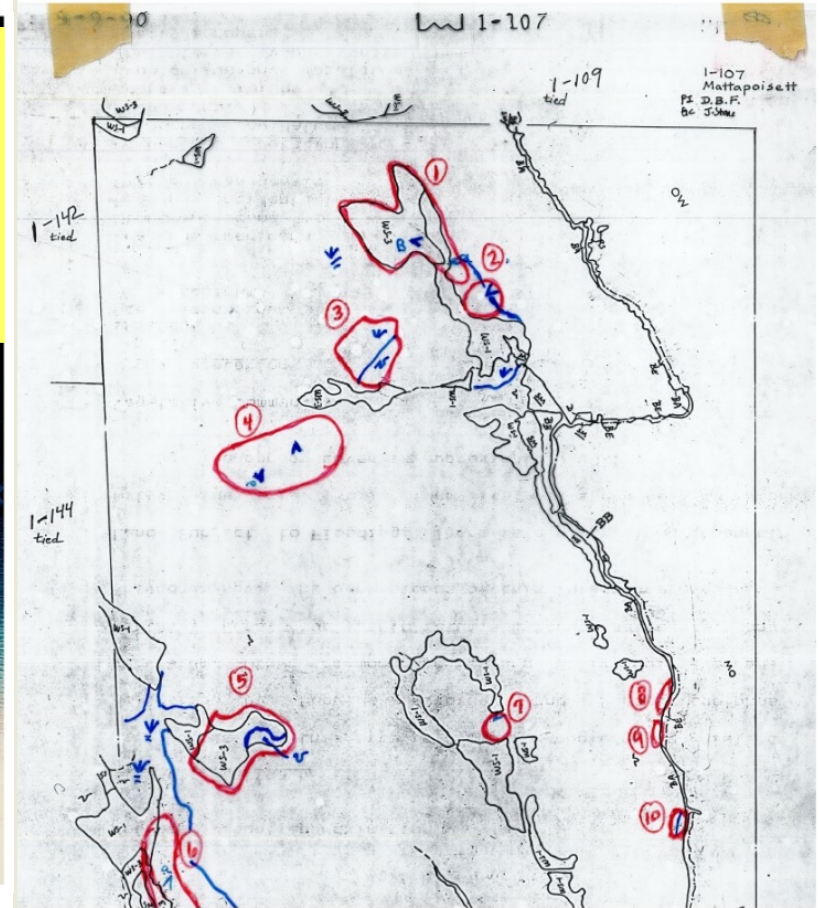
STEP 1: Aerial Imagery Acquisition



- Color infrared
- Analog
- Stereoscopic
- 1:12,000 Scale
- Leaf off
- Early Spring

Original Wetland Data Layer

STEP 2: Analogue Interpreted Wetlands Overlay



Original Wetland Data Layer

STEP 3: Major Field Verification Effort

Confirm areas of confidence, Confirm classification, Resolve difficult to discern areas

Project Area NS

WETLANDS CONSERVANCY PROGRAM
FIELD DATA FORM

Date 5/4/73 Personnel MM Town Nashua

CIR no. 2-153 Field ID no. WMA3 Field Classification W3.1

Are normal environmental conditions present? If no, explain Yes

Location: South of Byfield

PLANT COMMUNITY

Dominant Plants
Acer rubrum Toxicodendron radicans

Common Plants
Prinos racemosa Prinos serotina Parthenocleis quinquefolia
Viburnum coccineum Dryopteris sp. Athyrium filix-femina

Less Common Plants
Ulmus americana Oxalis sensibilis Rubus fruticosus
Fraxinus pennsylvanica Mitchella repens

Is the hydrophytic plant criterion met? Yes

SOILS Profile:

Is the soil a Histisol? No

Histic Epipedon present? No

Is the soil: Mottled? Yes Gleyed? No

Matrix Color: 2.5 y 5/6 Mottle colors: 50% yellow to 10% y/y

Texture: Silty clay loam

Other hydric soil indicators

Is the hydric soil criterion met? No

WETLAND HYDROLOGY

Observations: Water in hole at 18"
Silted at surface
drainage channels present on ground
Soil returned to the surface

OTHER OBSERVATIONS/COMMENTS

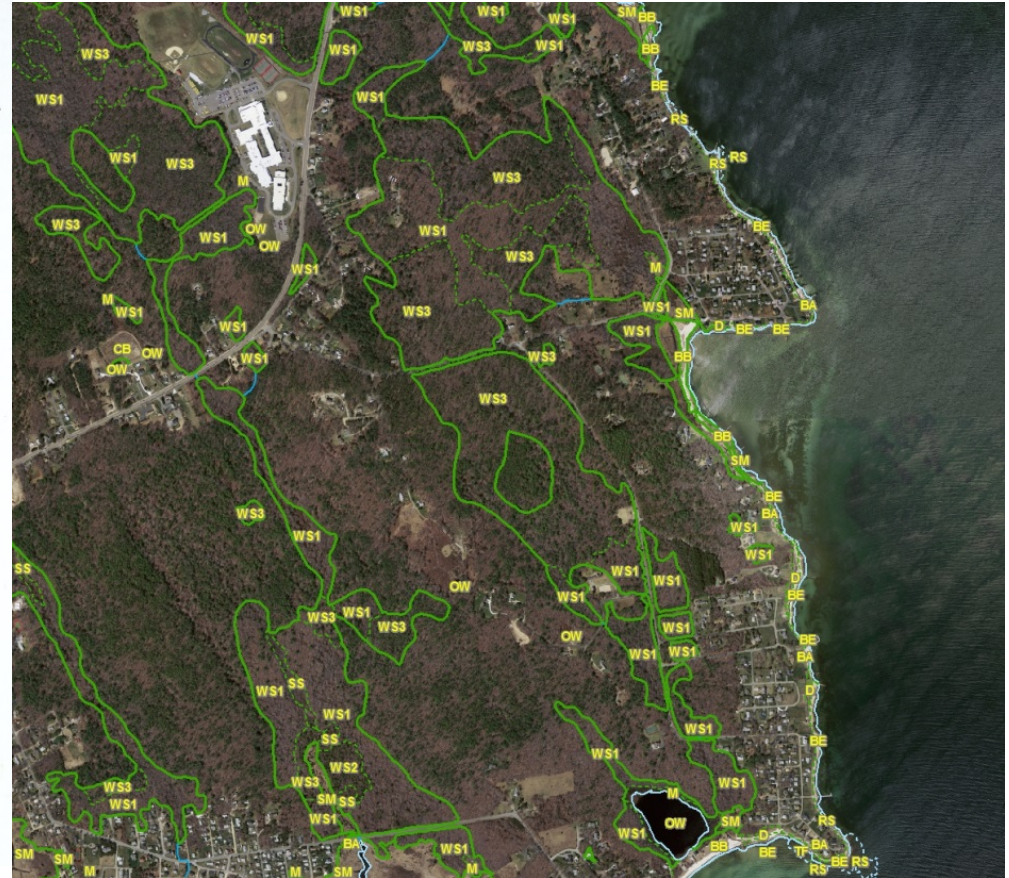
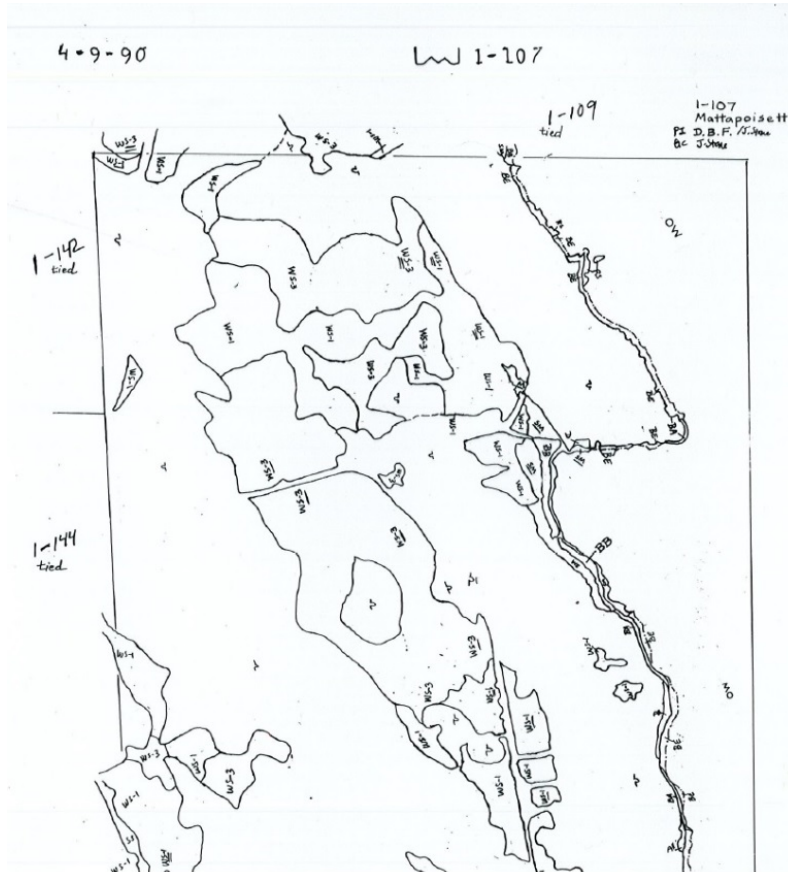
Soil just not quite hydric, but plant list ok, and wetland hydrology good. The main body of this upper area can be called wet, however the area to south-east is up. Still Acer rubrum, but also Rubus peduncularis and Prinos serotina.



- 1990-2005 1-2 Field Staff
 - 5-10 site verifications/day
 - 4 days/week
 - 10 months /year
 - 15 years
- Approximately 30,000 site visits to verify boundaries!

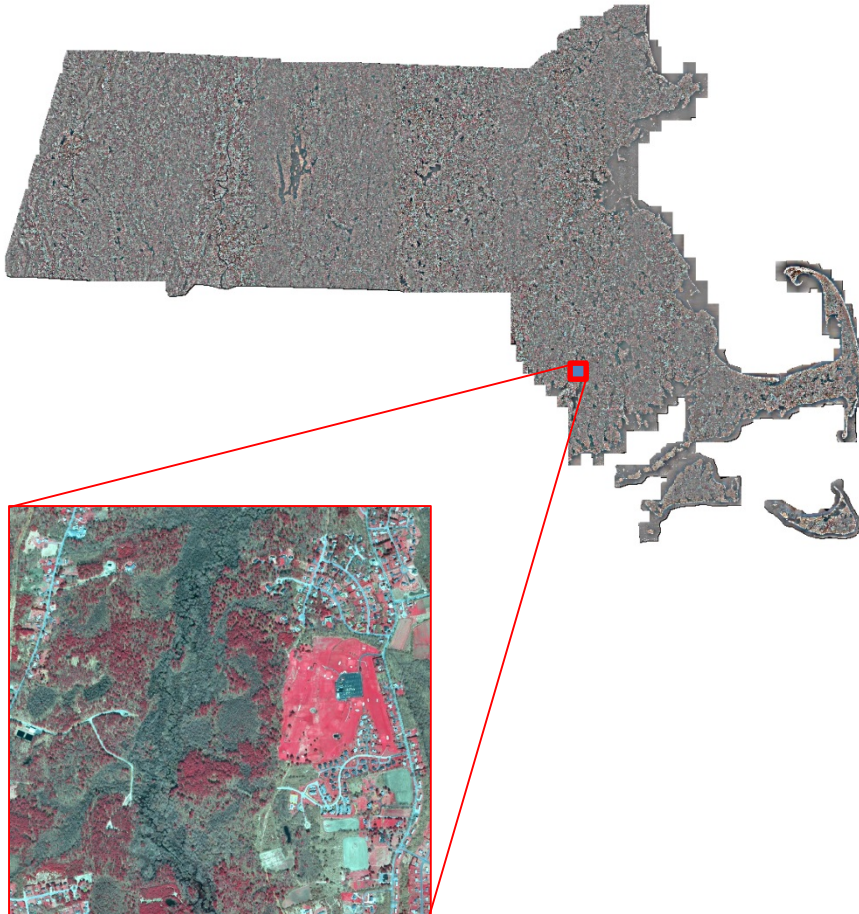
Original Wetland Data Layer

STEP 4: Final Wetland Data Layer Developed



First Wetland Data Layer **Update**

STEP 1: New Statewide Aerial Imagery Acquisition in 2005



- Color infrared
- **Digital**
- Stereoscopic
- **0.5 meter resolution**
- Leaf off
- Early Spring
- **No field work conducted (photointerpretation only)**

First Wetland Data Layer **Update**

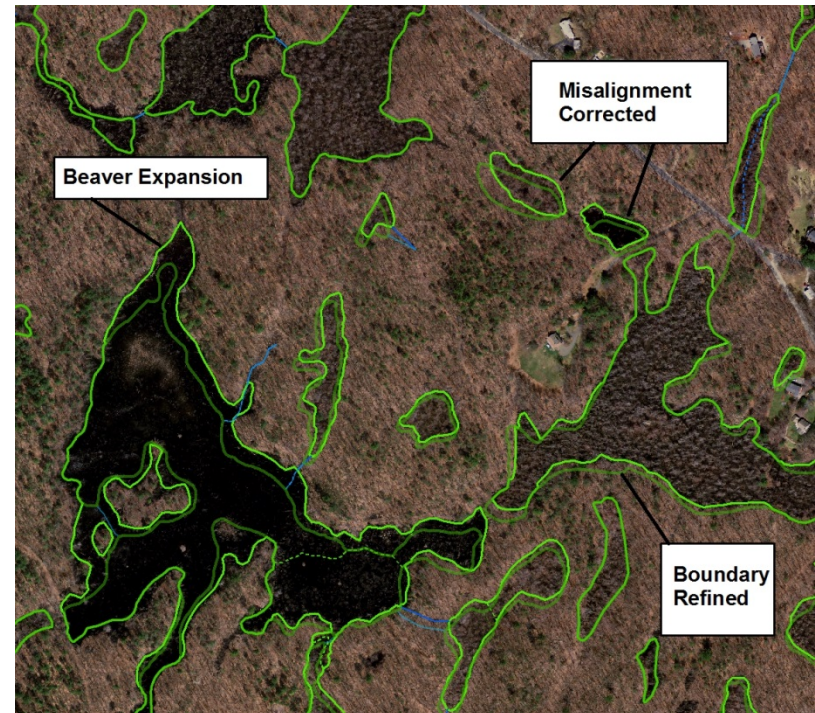
STEP 2: Photointerpretation

Changes made:

- New wetland areas added
- Former wetland areas deleted
- Existing areas reconfigured (larger or smaller)
- Classifications changed (WS to SS)

Categories Tracked:

- Natural Change
- Beaver Activity
- Human Change
- Improvements in Technology
- Undetermined



First Wetland Data Layer **Update**

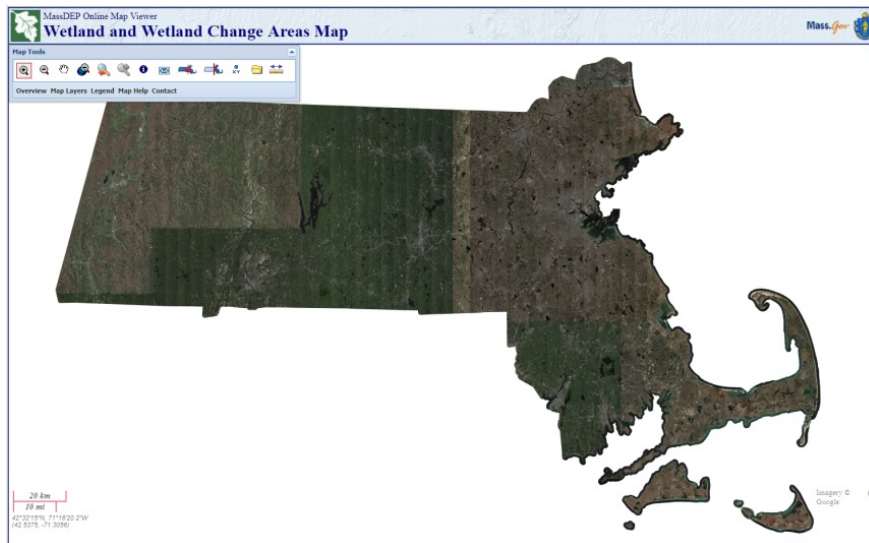
STEP 3: Public Use

Regulatory Issues

Concern about changes in boundaries for ongoing cases, especially those under enforcement

Disclaimer

The wetland map layers provide a medium-scale representation of the wetlands in the state and are for planning purposes only. The wetland boundaries shown on this map have been determined by photographic interpretation. They do not represent, and should not be used as, wetlands delineations under the Massachusetts Wetlands Protection Act and its regulations.



MassDEP Provides its wetlands data on-line through a web based Map Viewer. It is the most utilized map viewer maintained by our Office of Geographic Information.

First Wetland Data Layer **Update** Comparison to Original

Data	Comparison	
	<u>Original</u>	<u>Update</u>
Time	16 years	10 years
Staff	6 FTE plus consultant	1.5 staff (no consultant)
Approximate Cost	\$3,159,000	\$1,180,000

First Wetland Data Layer **Update**

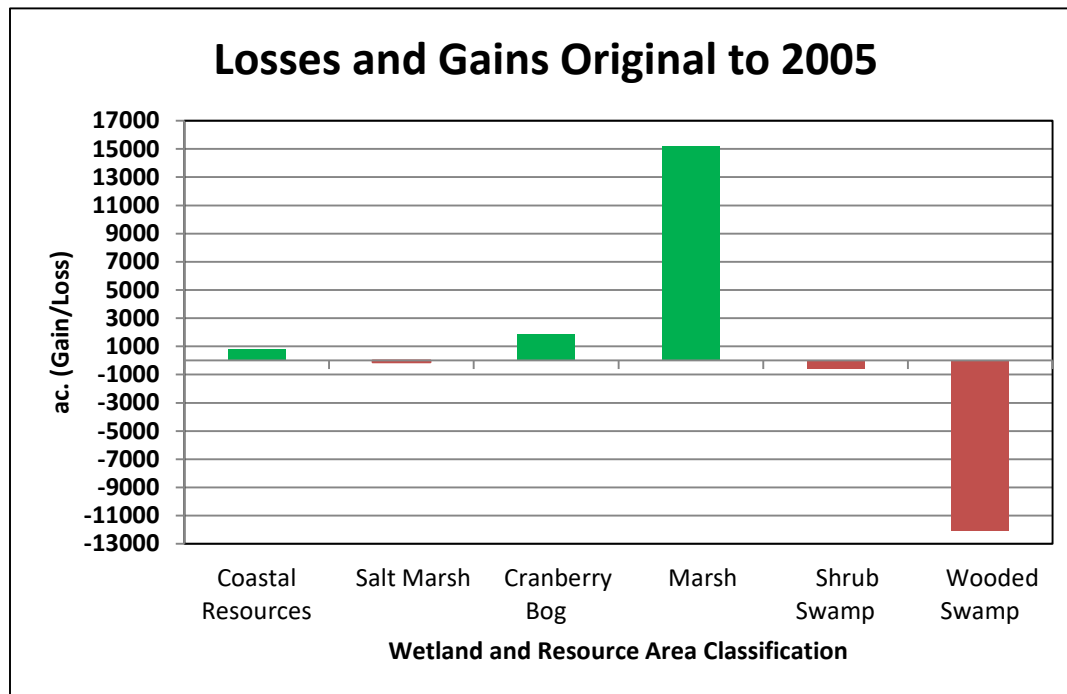
Comparison to Original

Wetlands Type	Original Mapped Acres	2005 Mapped Acres	Acres		Actual Change percent
			Map changes attributed to Advancements in Technology	Mapped Actual Changes 2005 (Natural/Human/Undetermined)	
Coastal	96,520	108,077	10,819	737 (234 / 22 / 481)	0.76
Coastal Bank	2,117	2,072	-42	-3 (-3 / 4 / -4)	-0.14
Barrier Beach	5,062	6,384	1,347	-26 (-13 / -1 / -12)	-0.51
Beach	11,615	14,043	1,801	625 (368 / -11 / 268)	5.38
Dune	11,733	10,879	-656	-197 (-196 / -1 / 0)	-1.68
Rocky Shore	1,192	1,583	385	6 (0 / 4 / 2)	0.50
Salt Marsh	45,344	45,055	-199	-89 (-89 / 19 / -19)	-0.20
Tidal Flat	19,458	28,061	8,183	421 (167 / 8 / 246)	2.16
Freshwater	466,480	482,379	11,710	4,188 (2,664 / 1,207 / 497)	0.90
Bog	5,407	5,364	70	-114 (-70 / -32 / -12)	-2.11
Cranberry Bog	13,764	15,651	50	1,837 (4 / 1,828 / 5)	13.35
Marsh	82,811	100,418	2,395	15,212 (11,871 / 1,308 / 2,032)	18.37
Shrub Swamp	77,143	79,337	2,828	-635 (-55 / -256 / -324)	-0.82
Wooded Swamp	287,355	281,610	6,366	-12,111 (-9,086 / -1,821 / -1,204)	-4.21
Grand Total	563,000	590,457	22,529	4,926 (2,899 / 1,049 / 978)	0.95

First Wetland Data Layer Update

Comparison to Original

- **4,926** ac. of Net Wetlands Gain
- Freshwater Wetlands Net Gain = **4,188** ac. ~ **9%**
- Coastal Wetlands Net Gain = **737** ac. ~ **8%**



Wetland Change Project

Identification of Anthropogenic Changes

- Used Feature Extraction Software (Feature Analyst) on Original/Updated Wetland Data layers

2005 Wetlands Data Layer Update

- Natural Change
- Beaver Activity
- Human Change
- Improvements in Technology
- Undetermined

WetChange (1995-2012)

- Agriculture
- Clearing Unknown Reason
- Commercial Development
- Cranberry Bog Activity
- Dock or Pier
- Driveway
- Filling Unknown Reason
- Flooding
- Gravel Operation
- Logging/Clearing
- New Road
- Other

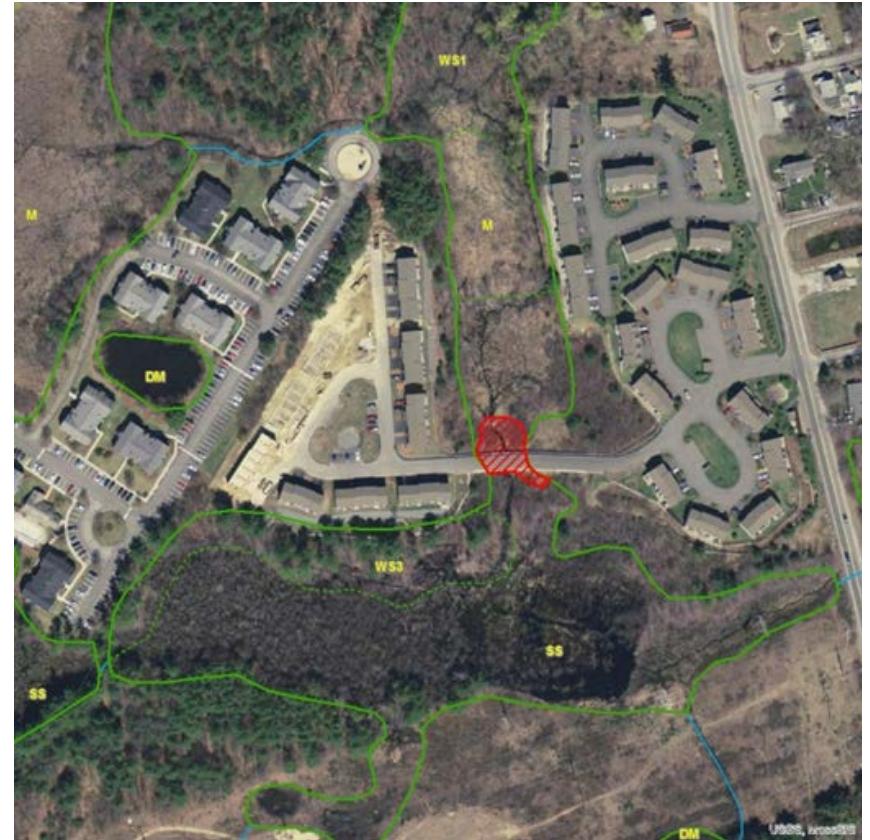
Wetland Change Project

Identification of Anthropogenic Changes

2001



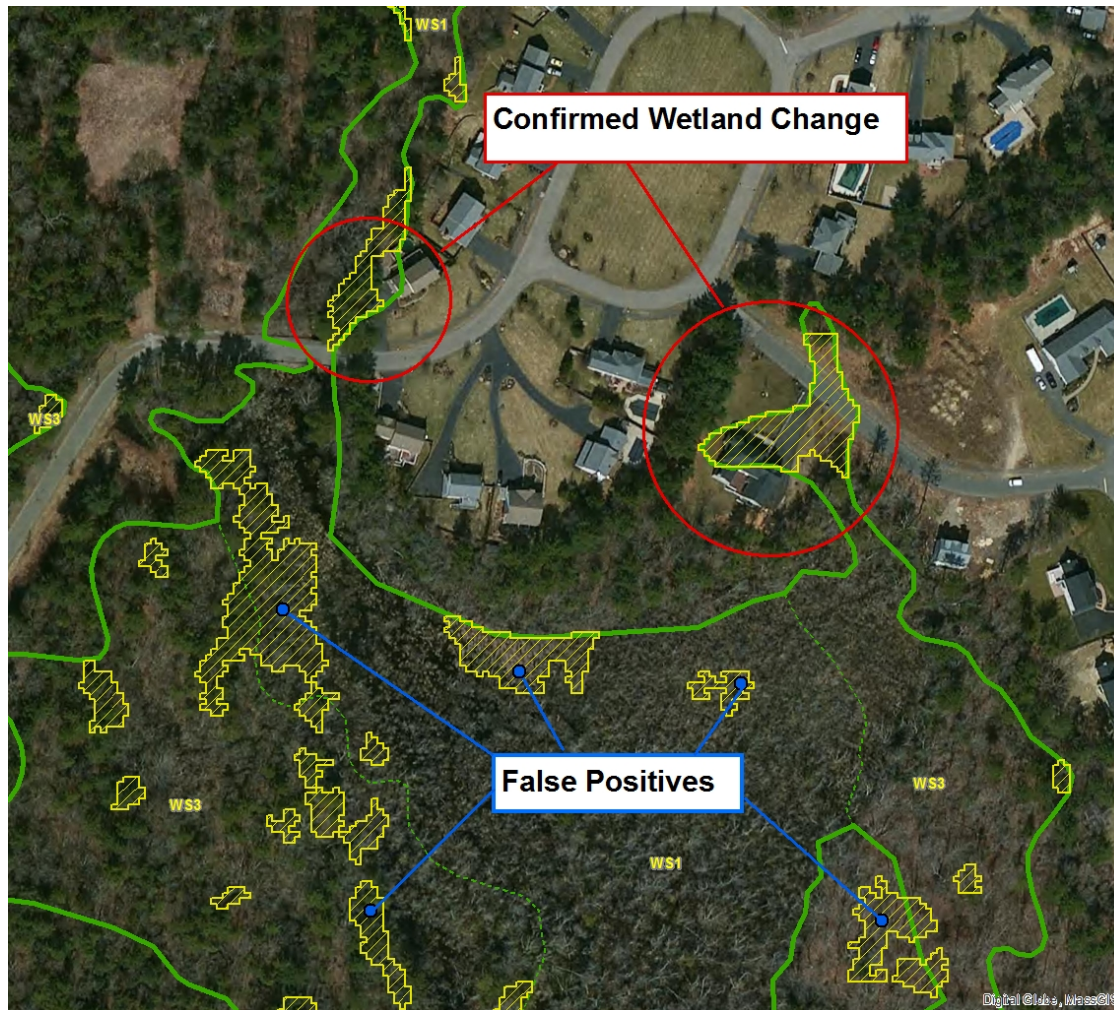
2005



Wetland Change Project

Identification of Anthropogenic Changes

Automated Change Detection Needs Human QC !



- Wetlands are often mosaics of different plant communities, each with their own signature
- Natural changes such as storm damage or beaver activity appears as “change”.
- Water levels can naturally fluctuate over different years.

Wetland Change Project

Identification of Anthropogenic Changes

Greatest cause of loss due to humans = residential and commercial

Years Compared	% of State w/ Wetlands Loss Data	Acres Lost
1990-2001	70	988
2001-2005	100	618
2005-2009	100	116
2010-2012	100	42

77 enforcement actions

\$3,311,337 in combined penalties

68.2 acres of wetlands ordered restored



DEP NEWS

Massachusetts Department of Environmental Protection

FOR IMMEDIATE RELEASE:

June 1, 2005

CONTACT:

Ed Coletta 617-292-5737

DEPARTMENT OF ENVIRONMENTAL PROTECTION CRACKS DOWN ON ELEVEN MORE CASES OF ILLEGAL DESTRUCTION OF WETLANDS

*Enforcement cases target 15 acres of altered wetlands,
resulting in assessed penalties totaling more than \$984,000*

The Department of Environmental Protection (DEP) continued its crackdown on illegal wetlands destruction by targeting 11 sites across the state for enforcement action, which involved the filling and alteration of 15 acres of wetlands without permits.

DEP Commissioner Robert W. Gollidge Jr. announced the enforcement actions, with assessed penalties totaling \$984,100, as part of the agency effort that uses aerial reconnaissance and innovative computer technology to identify wetlands that have been filled illegally.

"DEP's wetlands enforcement program continues to produce tangible results – requiring acres and acres of destroyed wetlands to be restored to their natural condition," Gollidge said. "Our state-of-the-art program continues to find illegal filling, and we will continue to aggressively pursue violators. Having completed another aerial flyover of the state this spring, if anyone has destroyed more wetlands out there, we will find them."

Many of the cases announced today were the result of DEP's high tech wetlands enforcement program that uses before-and-after aerial photographs, which are analyzed by a computer program to show where wetlands have been altered. Other cases resulted from staff surveillance during airplane flyovers and tips from local officials and the general public about illegal alterations in their neighborhoods.

These cases involve illegal wetlands filling in Belchertown, Brookfield, Framingham, Hadley, Middleboro, Millis, Newburyport, Rochester, Templeton, West Bridgewater and Westminster. The penalties range from \$410,450 assessed against three parties for wetland alterations uncovered in Hadley to an \$11,150 penalty assessed for alteration of approximately 3,000 square feet in Templeton. Two other cases carried no financial penalty, but required restoration of approximately an acre of filled wetlands.

The cases outlined today are the latest in the enhanced wetlands enforcement effort, which was announced 18 months ago using the high tech tools to help track wetlands change. During this time period, 83 higher-level enforcement actions for wetlands violations have been taken, more than 35 acres of wetlands ordered restored and \$1.9 million in fines assessed.

(more)

Commonwealth of Massachusetts • Mitt Romney, Governor • Kerry Healey, Lieutenant Governor
Executive Office of Environmental Affairs • Ellen Roy Herzfelder, Secretary
Department of Environmental Protection • Robert W. Gollidge Jr., Commissioner
One Winter Street • Boston 02108 • (617) 292-5500 • <http://www.mass.gov/dep>

Eelgrass Mapping Project

STEP 1: Obtain Aerial Imagery and Delineate Approximate Polygons

5 rounds of mapping since 1995
(available on web)

Aerial Image Specifications:

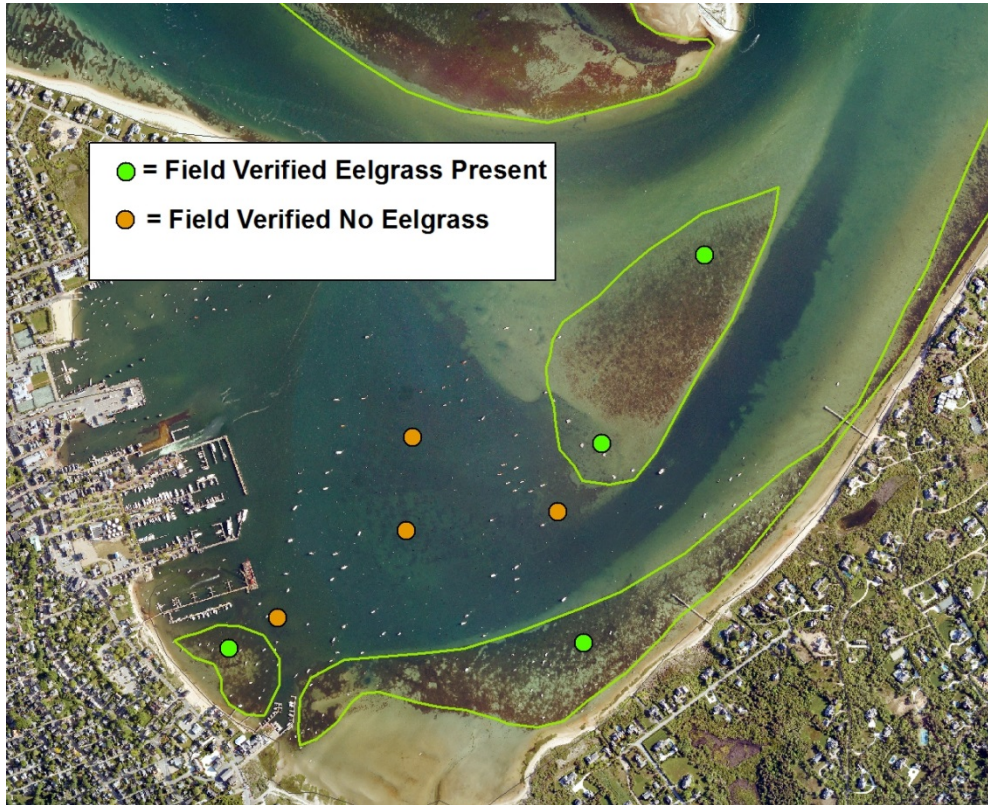
- Low tide
- Low sun angle
- Late spring/summer
- True Color
- No recent rain or storm events
- No wind
- No cloud cover, haze or fog



Eelgrass Mapping Project

STEP 2: Boat Based Field Verification and Data Collection

STEP 3: Finalize Polygons and Field QC



MassDEP working with Mass. Maritime Academy

- Goals of Field Data Collection
- Confirm Signature/Locate Boundary
- Resolve Difficult Areas

Field Data Attributes

- Eelgrass Presence/Absence
- Percent Cover
- Point type (edge or middle)
- Algae Presence/Absence
- Percent Cover
- Algae Type
- Epiphyte Presence/absence
- Water Depth
- Substrate Type

Eelgrass Mapping Project

Use of “Collector” to Transfer Data from DEP to/from MMA

Editable Eel Grass Web Map-Copy [Edit](#)

Overview

Usage

Settings

[Edit Thumbnail](#)



★ Add to Favorites

Development towards collector

Web Map by [Michael.McHugh_Mass_EOEEA](#)

Created: Jul 2, 2018 Updated: Aug 6, 2018 View Count: 39

Description

[Add an in-depth description of the item.](#)

Layers

[SamplePointsTest](#)

[TestPoly](#)

[Eel_Grass_Collector_Prep2](#)

[NOAA Raster Nautical Charts \(RNC\)](#)

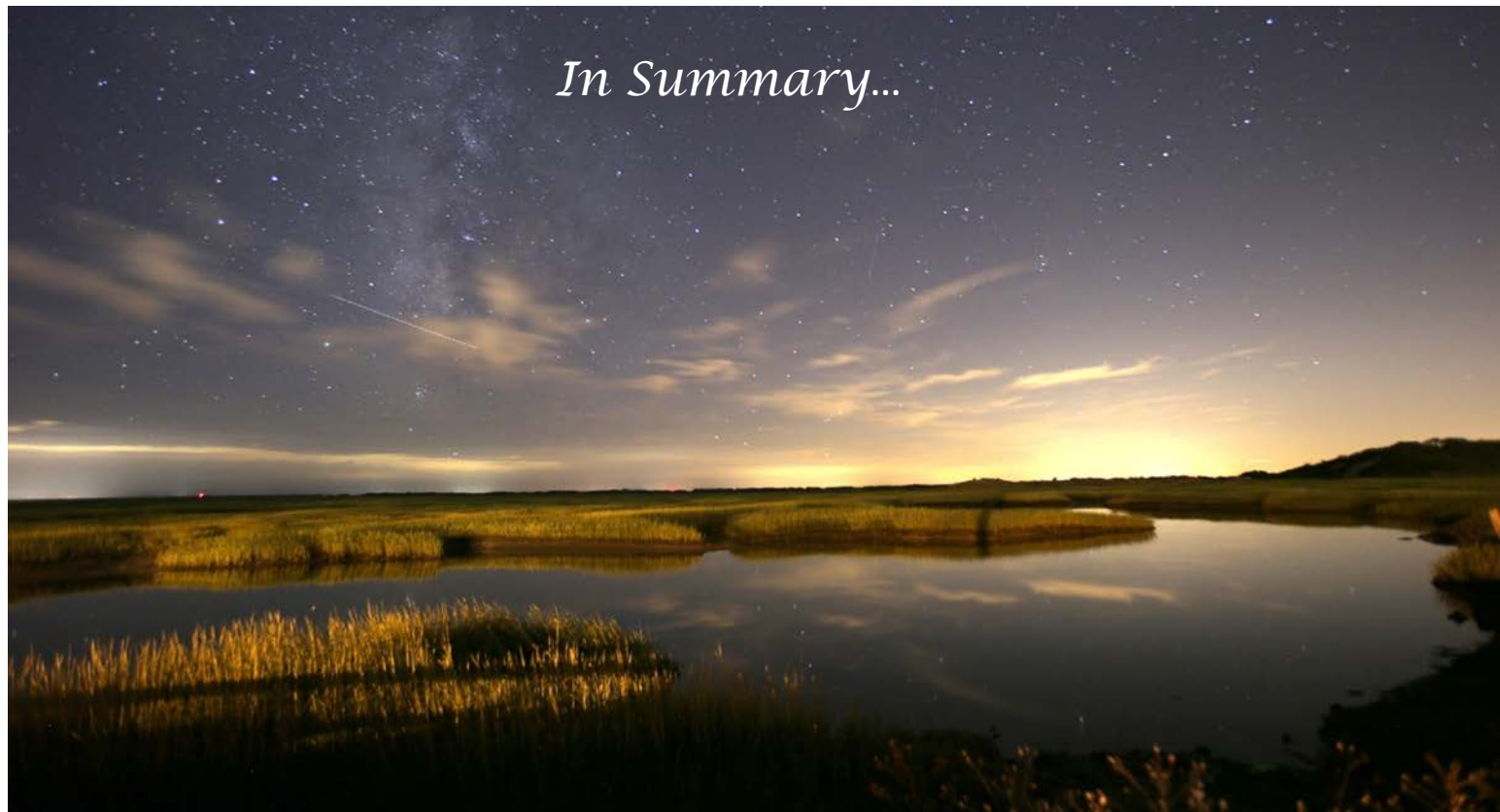
[USGS_Orthos_2013_2014](#)

[USGS_Orthos_2013_2014](#)

Data Collection using ArcGIS On-line Collector

Same Boat Based Field Data Collection





In Summary...

LOOKING BACK

Accurate maps have enabled us to:

- Understand wetland status and trends
- Protect wetlands through regulations
- Inform the public about wetlands
- Enforce against illegal alterations

LOOKING FORWARD

Improve mapping tools & technology:

- Explore object oriented feature extraction
- Incorporate LIDAR data
- Deploy online mapping tools
- Partner with other mapping experts

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