GIS in the Surveillance and Management of Invasive Aquatic Plants

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Connecticut Agricultural Experiment Station
Invasive Aquatic Plant Program

Invasive Aquatic Plants in Connecticut

- **Displace native species**
- **Alter native ecosystems**
- **Reduce recreation**
- **Lower property values and tax revenue**
- **Interfere with navigation**

Connecticut's Invasive or Potentially Invasive Aquatic Plants
CT State Statutes (Sec. 22a-381d)

Most common highlighted in red

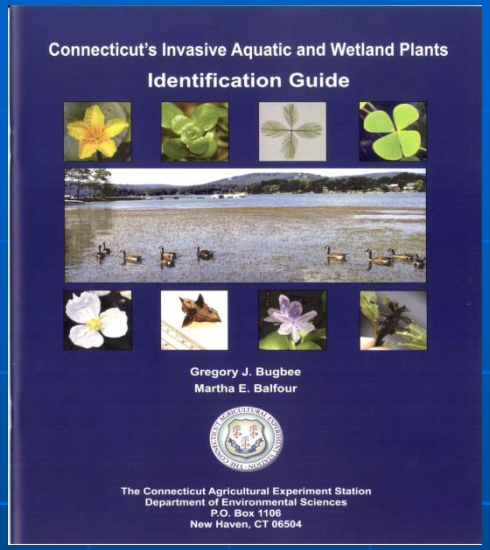
#	COMMON NAME	SCIENTIFIC NAME	DISPERSAL
1	American water lotus	*Nelumbo lutea*	Water Gardening
2	Brazilian water-weed, Anacharis, Egeria	*Egeria densa*	Aquariums, Boats/Trailers, Bait
3	Brittle water-nymph, Minor naiad	*Najas minor*	Boats/Trailers
4	Common water-hyacinth*	*Eichhornia crassipes*	Water Gardening
5	Curly leaf pondweed, Crispy-leaved pondweed	*Potamogeton crispus*	Boats/Trailers
6	Eurasian watermilfoil	*Myriophyllum spicatum*	Aquariums, Boats/Trailers, Bait
7	European waterclover, Water shamrock	*Marsilea quadrifolia*	Water Gardening, Boats/Trailers
8	Fanwort	*Cabomba caroliniana*	Aquariums, Boats/Trailers
9	Flowering rush	*Butomus umbellatus*	Water Gardening
10	Forget-me-not, Water scorpion-grass	*Myosotis scorpioides*	Water Gardening
11	Giant salvinia	*Salvinia molesta*	Water Gardening
12	Hydrilla	*Hydrilla verticillata*	Aquariums, Boats/Trailers, Bait
13	Onerow yellowcress	*Rorippa microphylla*	Water Gardening
14	Parrotfeather	*Myriophyllum aquaticum*	Water Gardening, Boats/Trailers
15	Pond water-starwort	*Callitriche stagnalis*	Water Gardening
16	Purple loosestrife	*Lythrum salicaria*	Nursery Stock, Water Gardening
17	Variable-leaf watermilfoil	*Myriophyllum heterophyllum*	Aquariums, Boats/Trailers
18	Water chestnut	*Trapa natans*	Water Gardening, Boats/Trailers
19	Water lettuce, American water lotus*	*Pistia stratiotes*	Water Gardening
20	Watercress	*Rorippa nasturtium-aquaticum*	Water Gardening
21	Yellow floating heart	*Nymphoides peltata*	Water Gardening
22	Yellow iris, Yellow flag iris	*Iris pseudacorus*	Nursery Stock, Water Gardening

*plants that are not banned

Connecticut's Most Common Invasive Aquatic Plants

Identification guide available at www.ct.gov/caes/iapp

Eurasian watermilfoil
Myriophyllum spicatum



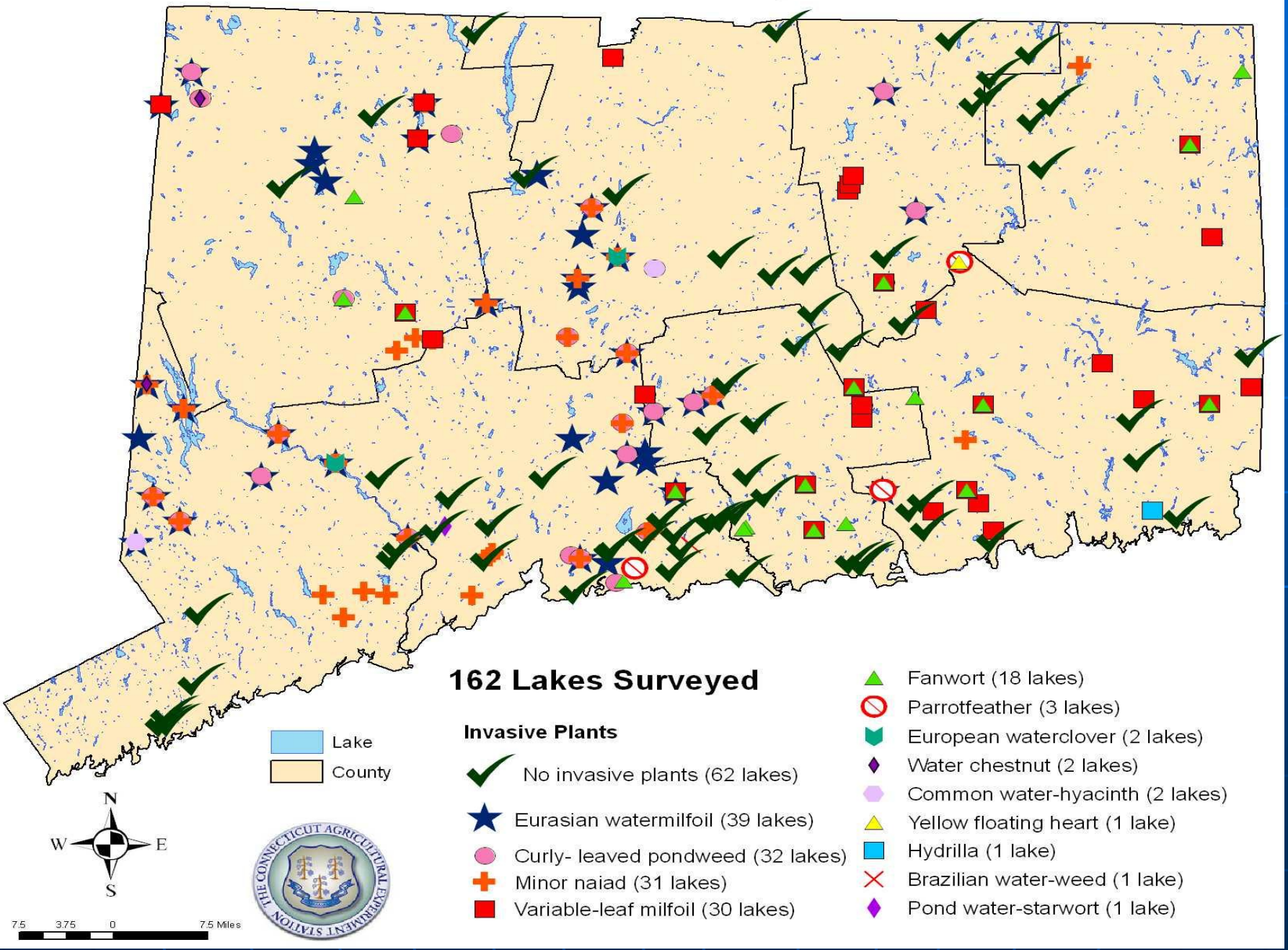
Variable watermilfoil
Myriophyllum heterophyllum

Cabomba (Fanwort)
Cabomba Caroliniana

Curly leaf pondweed
Potamogeton crispus

Minor Naiad
Najas minor

Locations of Invasive Plants Found by CAES IAPP 2004-2009



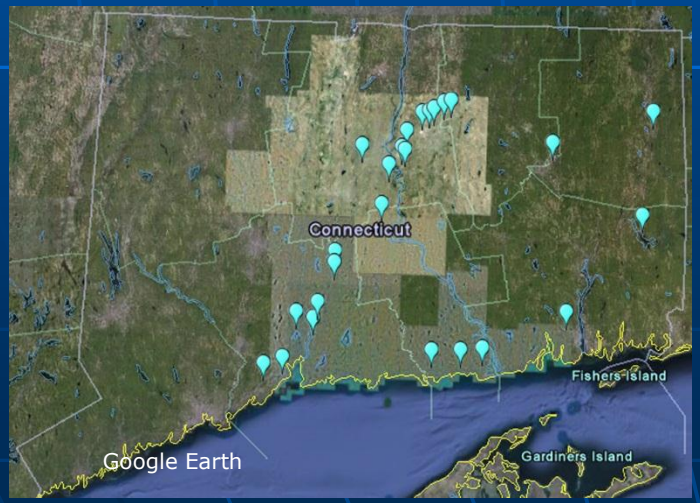
Aquarium Aquatic Plant Survey - 2009

34 stores surveyed

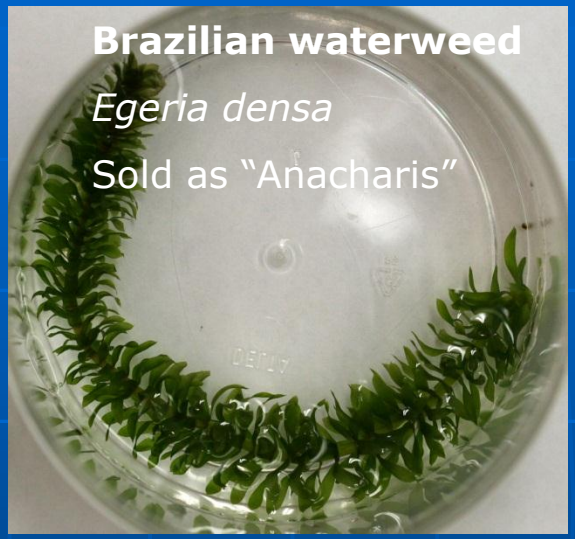
28 stores sold live aquatic plants

8 stores were selling a CT banned invasive

3 stores were selling more than one banned species



CT Banned Aquatic Plants Found:



Brazilian waterweed

Egeria densa

Sold as "Anacharis"

Fanwort

Cabomba caroliniana

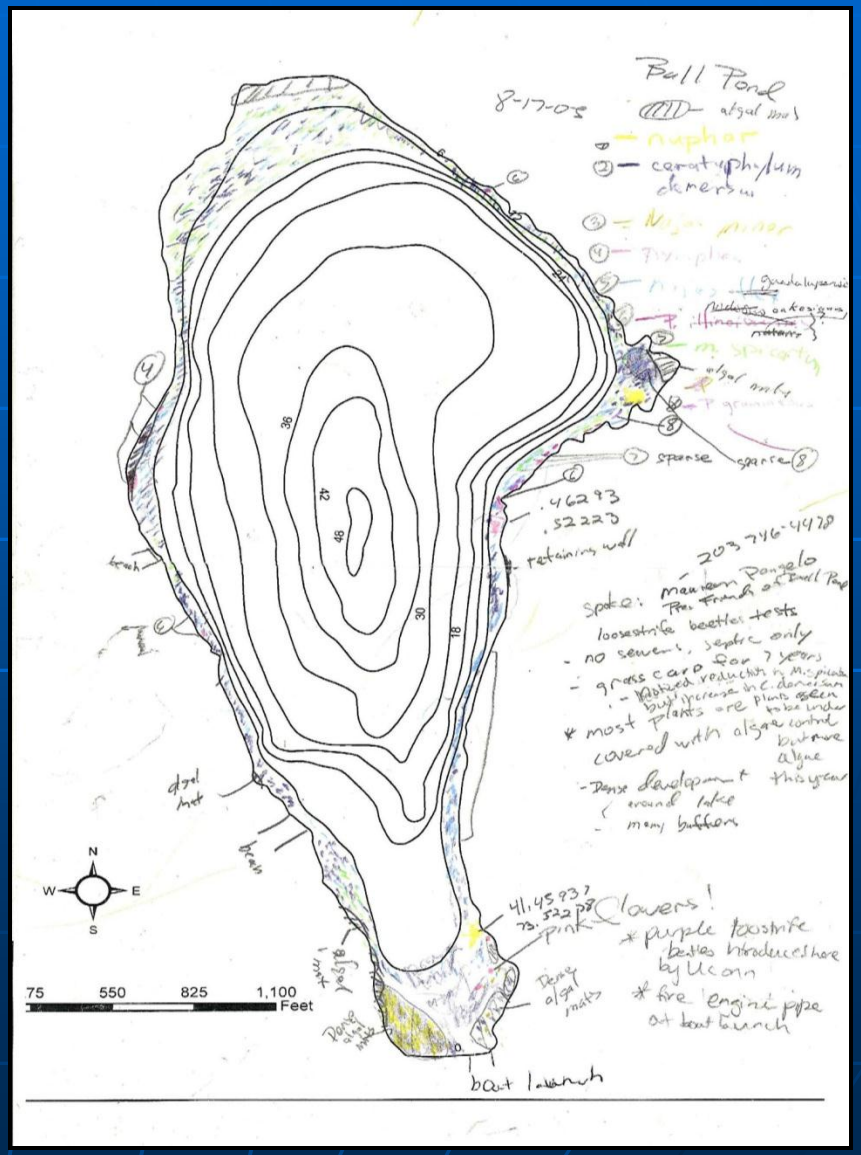
European waterclover

Marsilea quadrifolia

Parrotfeather

Myriophyllum aquaticum

Vegetation Surveys



- General survey
- CT DEP lake maps
- Record locations of plants with colored pencils and written notes

Final Map produced using ArcGIS®

<u>Georeferenced</u>

Water sample sites

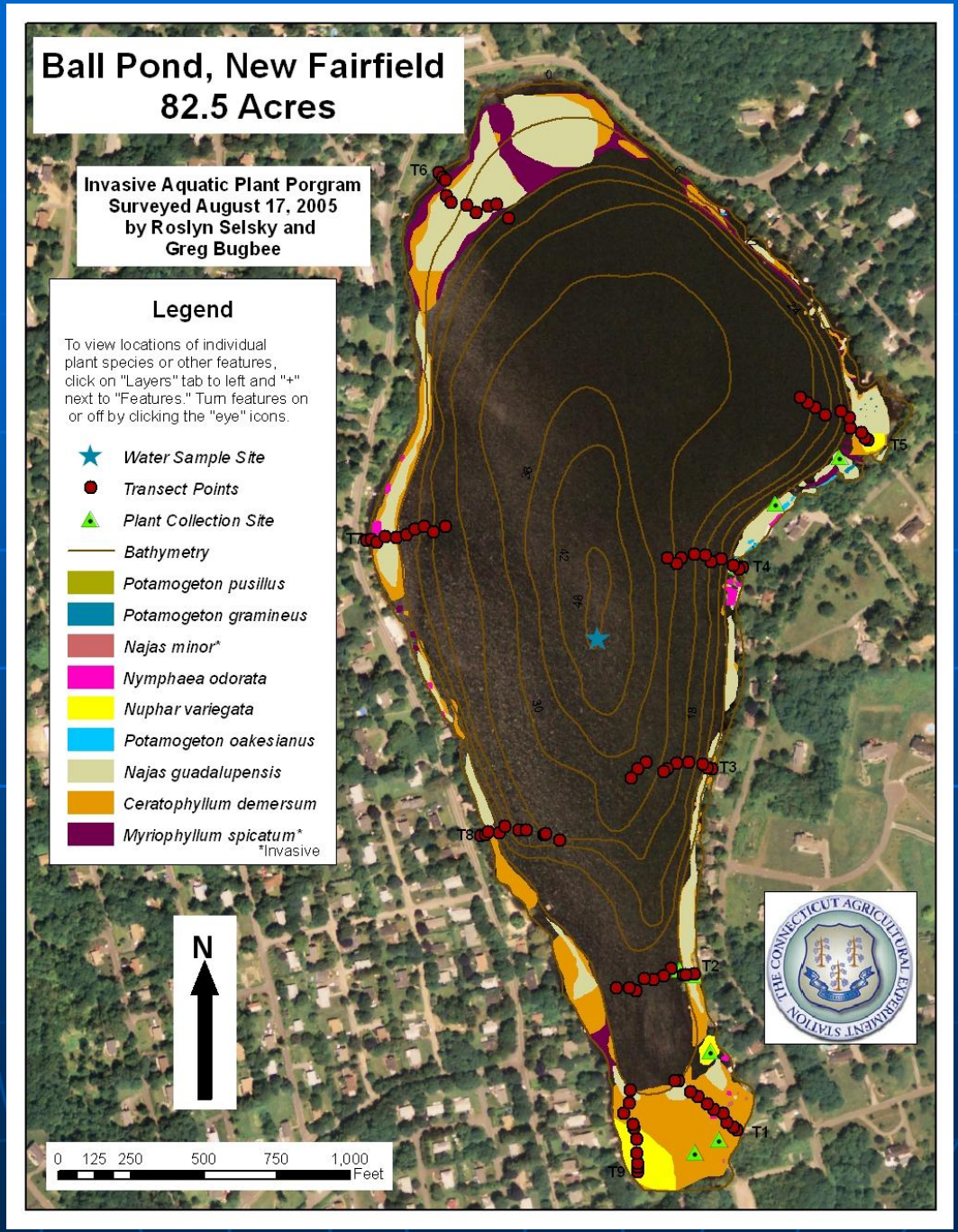
Transect points

Plant collection sites

<u>Base maps</u>

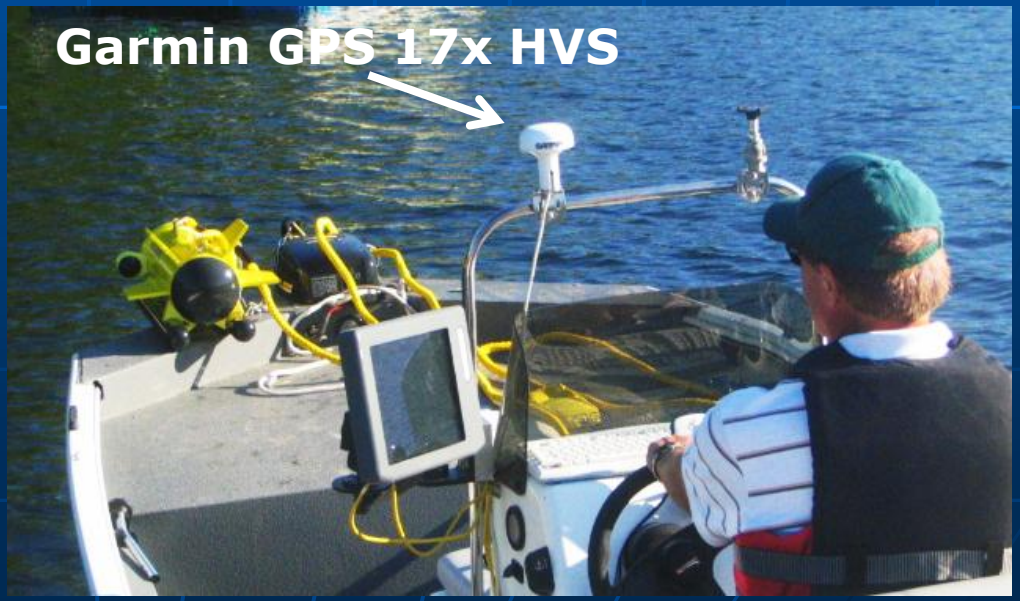
CT DEP lake layer

NAIP aerial imagery

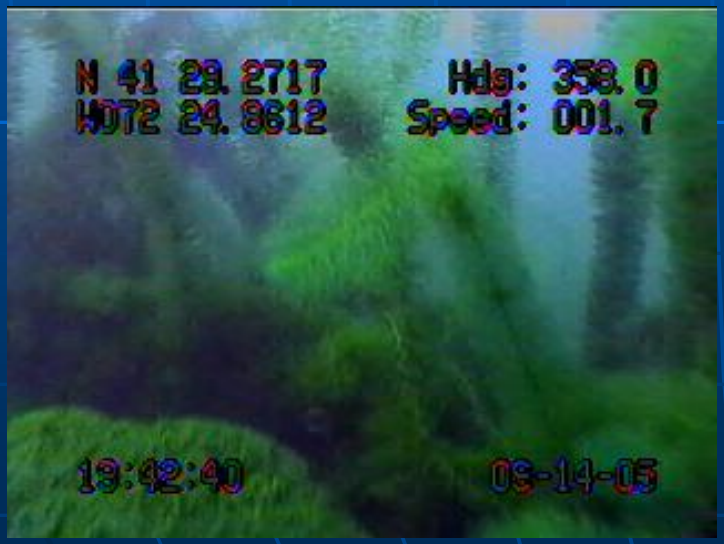


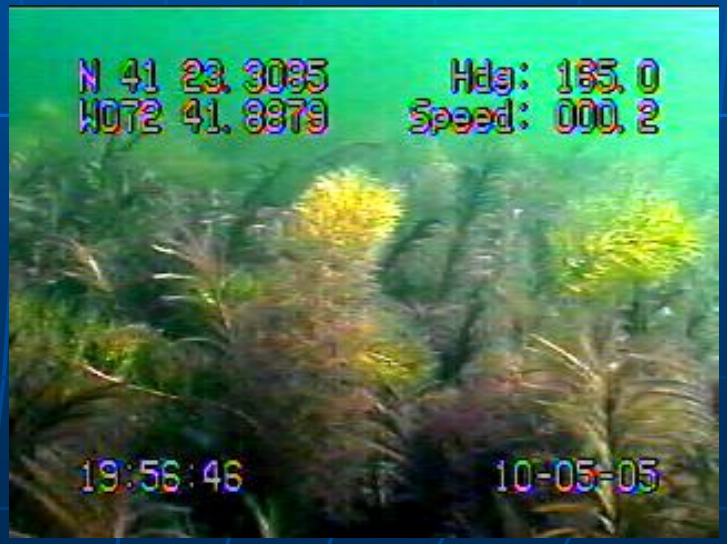
Our Global Positioning Systems

Garmin GPS 76



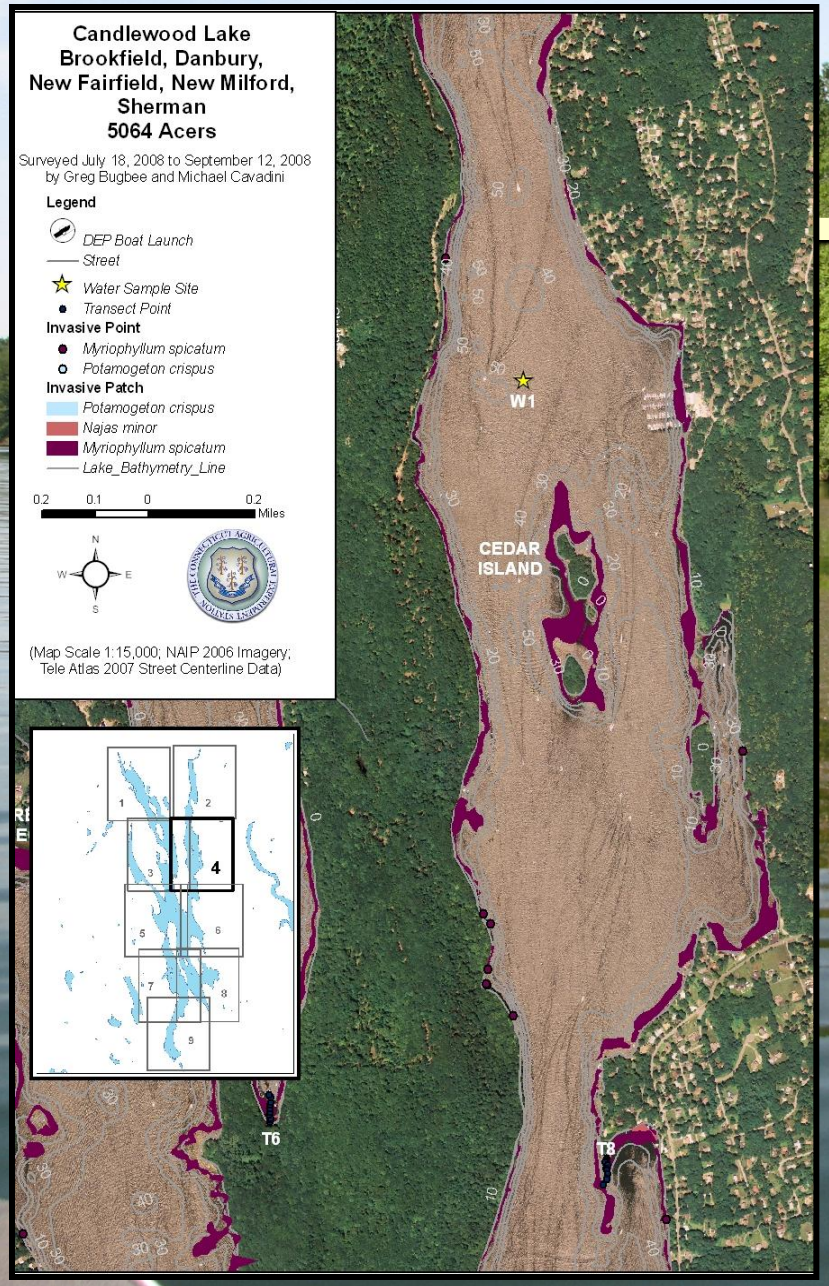
Georeferenced Underwater Pictures





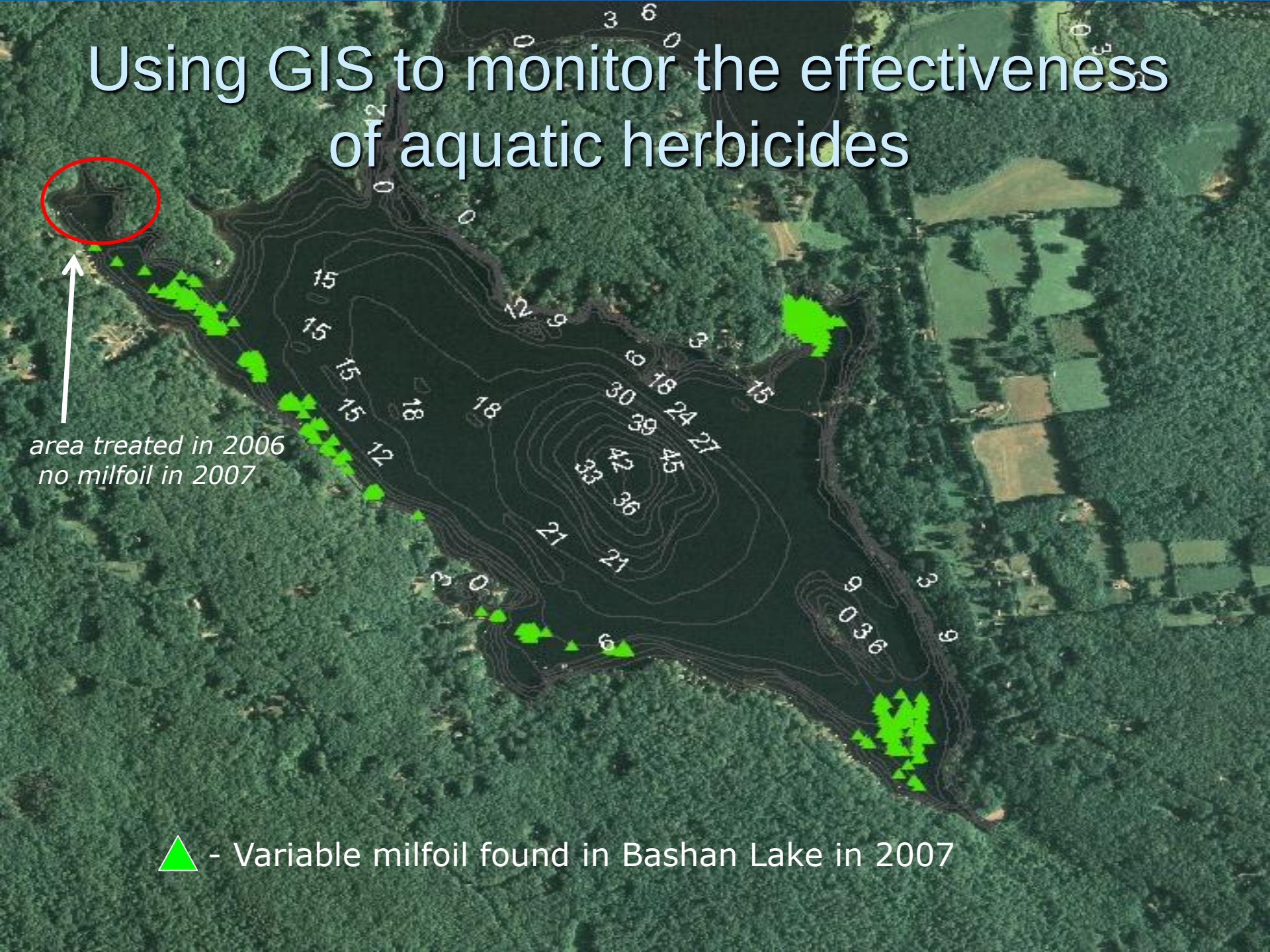
Candlewood Lake

- Connecticut's largest lake
  - **5086 Acres**
  - **200 - 500 acres of Eurasian milfoil depending on depth and duration of winter drawdown**
  - **On-lake mapping and remote sensing utilized**

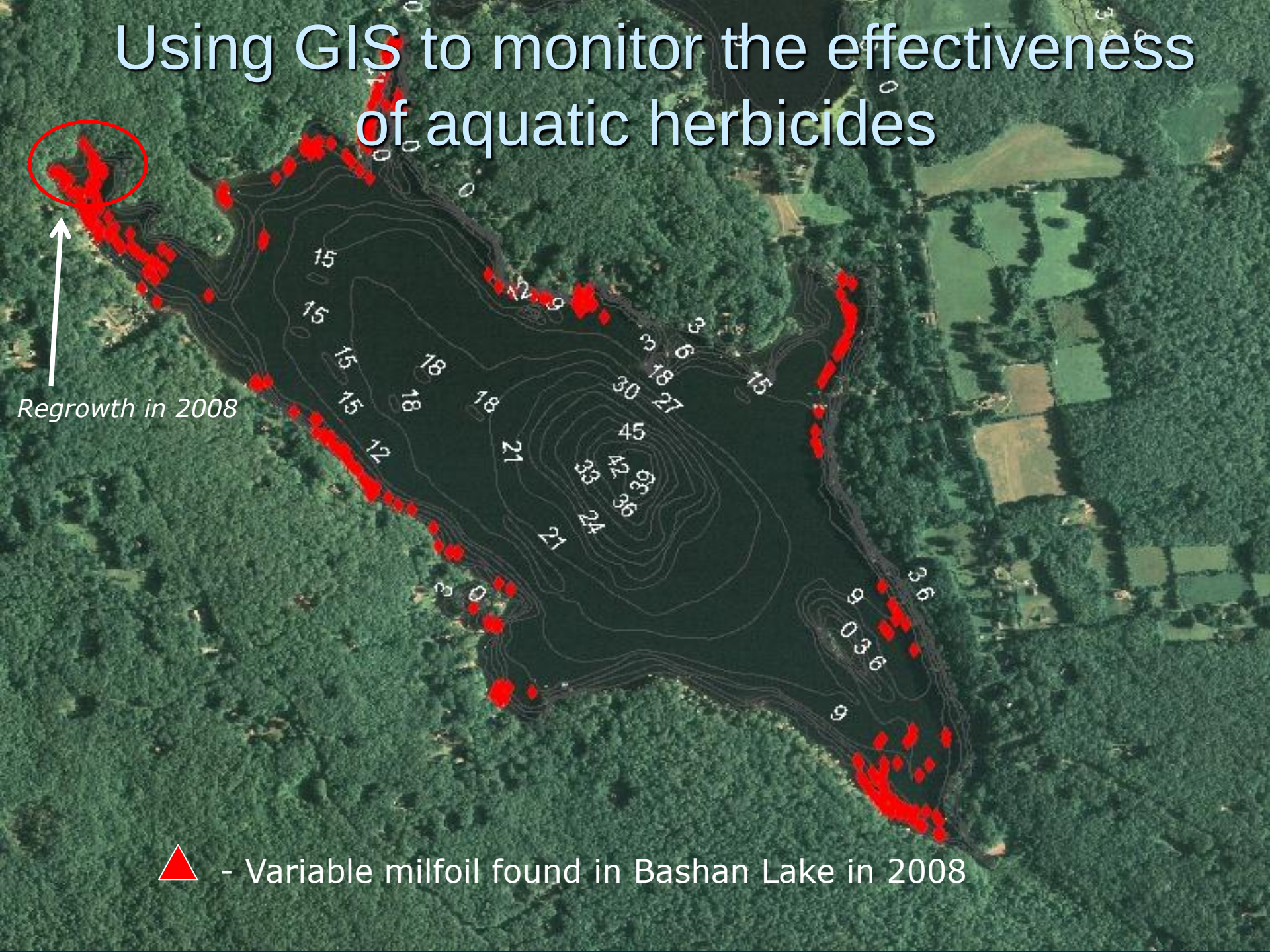


GIS used for tracking boat path when spreading herbicide

Using GIS to monitor the effectiveness of aquatic herbicides

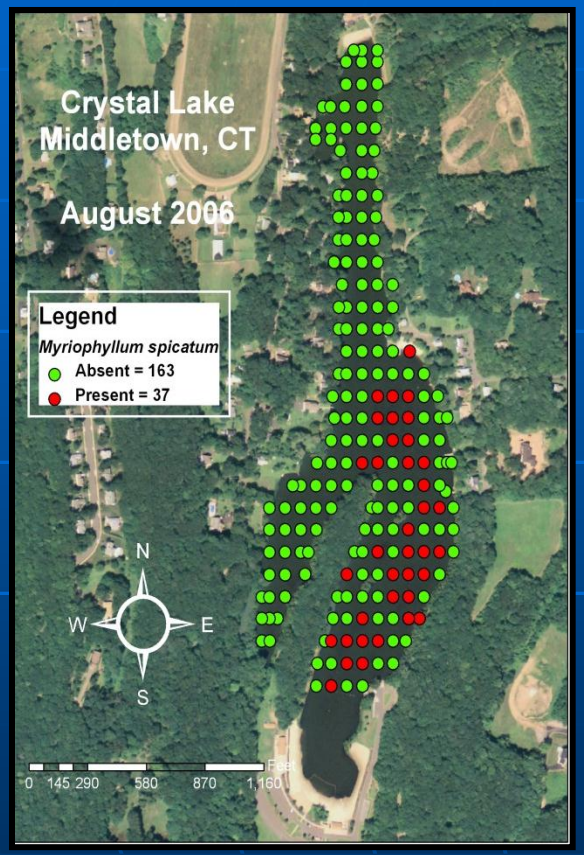


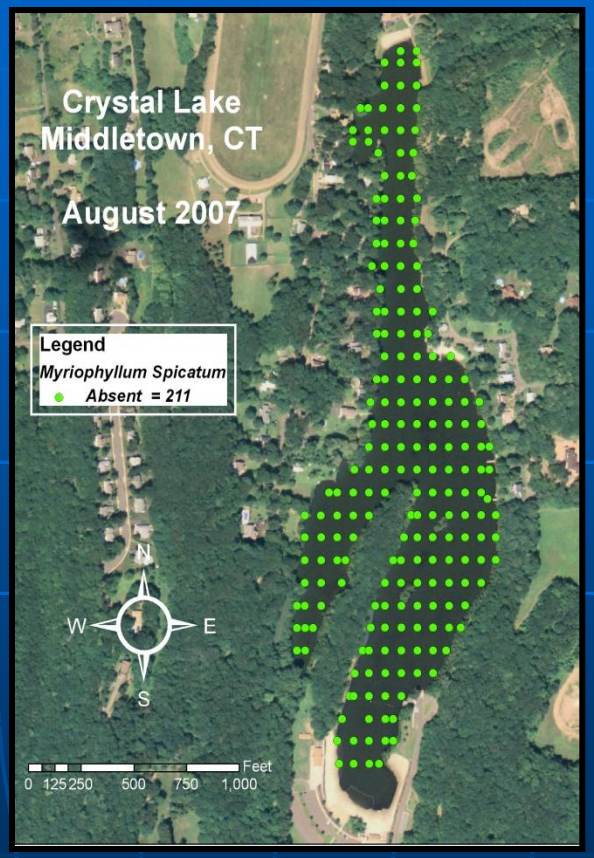
Using GIS to monitor the effectiveness of aquatic herbicides

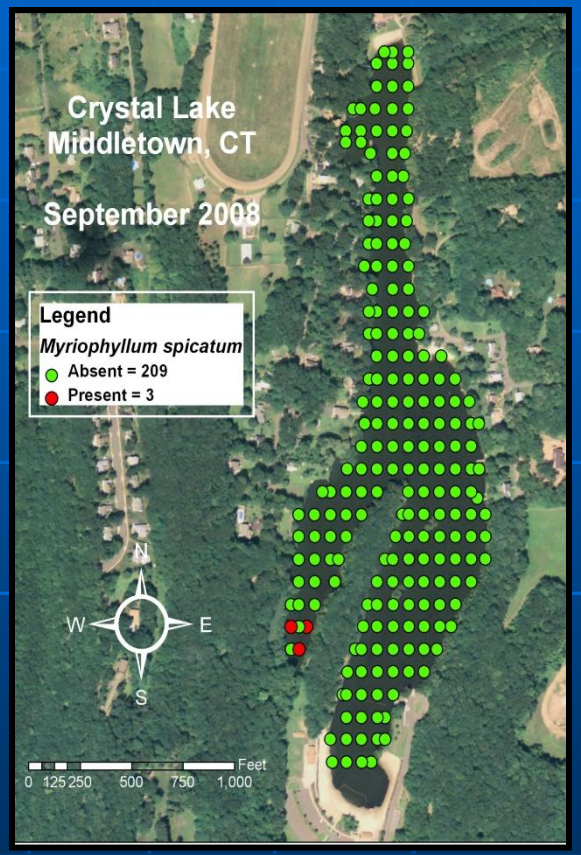


Tracking the Effectiveness of Herbicides in Controlling Invasive Aquatic Plants

Utilize GeoGrid With Points at One Second Latitude and Longitude Intervals







Aerial imagery
2008 United States Department of Agriculture (USDA) National Agriculture Imagery Program (NAIP)
http://www.fsa.usda.gov

- **Data Entered Into MS EXCEL**
- **Converted to .dbf file**
- **ArcMap Shapefile - Add x/y data**

Microsoft Excel - Cyrstal_Veg_June_2008

Crystal Lake Transects- 2008

Transect	Date	Bag	Latitude			Longitude			Lat	Long	Sample	CerDem	PotCri	PotRob	EloCan	EleS
#		#	Deg.	Min.	Sec.	Deg.	Min.	Sec.								
1	6/13/2008	-	41	30	59.0	72	38	20.4	41.51639	-72.63900	-	N	N	N	N	N
	6/13/2008	-	41	30	59.0	72	38	21.0	41.51639	-72.63917	-	N	N	N	N	N
	6/13/2008	B5	41	30	59.0	72	38	22.0	41.51639	-72.63944	cp, ch	N	Y	N	N	N
	6/13/2008	-	41	30	59.0	72	38	22.9	41.51639	-72.63969	-	N	N	N	N	N
2	6/13/2008	-	41	31	0.0	72	38	23.0	41.51667	-72.63972	-	N	N	N	N	N
	6/13/2008	WS24	41	31	0.0	72	38	22.0	41.51667	-72.63944	cp	N	Y	N	N	N
	6/13/2008	I74	41	31	0.0	72	38	21.0	41.51667	-72.63917	cp	N	Y	N	N	N
	6/13/2008	I75	41	31	0.0	72	38	20.0	41.51667	-72.63889	cp, pr	N	Y	Y	N	N
	6/13/2008	-	41	31	0.0	72	38	19.5	41.51667	-72.63875	-	N	N	N	N	N
3	6/13/2008	I52	41	31	1.0	72	38	19.5	41.51694	-72.63875	cp, pr	N	Y	Y	N	N
	6/13/2008	ass Crys	41	31	1.0	72	38	20.0	41.51694	-72.63889	cp, cd	Y	Y	N	N	N
	6/13/2008	WS23	41	31	1.0	72	38	21.0	41.51694	-72.63917	cp	N	Y	N	N	N
	6/13/2008	-	41	31	1.0	72	38	22.7	41.51694	-72.63964	-	N	N	N	N	N
4	6/13/2008	-	41	31	2.0	72	38	22.2	41.51722	-72.63950	-	N	N	N	N	N
	6/13/2008	-	41	31	2.0	72	38	22.0	41.51722	-72.63944	-	N	N	N	N	N
	6/13/2008	WS1	41	31	2.0	72	38	21.0	41.51722	-72.63917	cp, cd	Y	Y	N	N	N
	6/13/2008	B2	41	31	2.0	72	38	20.0	41.51722	-72.63889	cp, cd	Y	Y	N	N	N
	6/13/2008	WS21	41	31	2.0	72	38	19.0	41.51722	-72.63861	cp, cd	Y	Y	N	N	N
5	6/13/2008	30	41	31	3.0	72	38	17.0	41.51750	-72.63806	cp	N	Y	N	N	N
	6/13/2008	42	41	31	3.0	72	38	18.0	41.51750	-72.63833	?	N	Y	N	N	N
	6/13/2008	I41	41	31	3.0	72	38	19.0	41.51750	-72.63861	cp, cd	Y	Y	N	N	N
	6/13/2008	R3	41	31	3.0	72	38	20.0	41.51750	-72.63889	cp, cd	Y	Y	N	N	N
	6/13/2008	P1	41	31	3.0	72	38	21.0	41.51750	-72.63917	cp	N	Y	N	N	N
	6/13/2008	Burr 4	41	31	3.0	72	38	21.9	41.51750	-72.63942	cd	Y	N	N	N	N

Aug2006 - ArcMap - ArcView

Layers
- Crystallakeplantweights2006-5
  - Najas minor
  - Absent = 196
  - Present = 4
- Crystallakeplantweights2006-4
  - Myriophyllum spicatum
  - Absent = 163
  - Present = 37
- Crystallakeplantweights2006-3
  - Potamogeton crispus
  - Absent = 191
  - Present = 9
- Bathymetry (interval = 6 feet)
- State
- Lake
- naip_1-1_1n_s_ct007_2006_1.sid
  - RGB
  - Red: Band_1
  - Green: Band_2
  - Blue: Band_3

Attributes of Crystallakeplantweights2006-4

FID	Shape *	Y	X	MYRSPI
0	Point	41.51722	-72.63944	N
1	Point	41.51722	-72.63917	Y
2	Point	41.51722	-72.63889	N
3	Point	41.51722	-72.63861	N
4	Point	41.5175	-72.63806	N
5	Point	41.5175	-72.63833	N
6	Point	41.5175	-72.63861	Y
7	Point	41.5175	-72.63889	Y
8	Point	41.5175	-72.63917	N
9	Point	41.5175	-72.63942	Y
10	Point	41.51778	-72.63928	N
11	Point	41.51778	-72.63917	Y
12	Point	41.51778	-72.63889	Y
13	Point	41.51778	-72.63861	Y
14	Point	41.51778	-72.63833	Y
15	Point	41.51778	-72.63806	N
16	Point	41.51778	-72.63783	N
17	Point	41.51806	-72.63758	Y
18	Point	41.51806	-72.63778	Y
19	Point	41.51806	-72.63806	N
20	Point	41.51806	-72.63833	N
21	Point	41.51806	-72.63861	Y
22	Point	41.51806	-72.63889	Y
23	Point	41.51806	-72.63914	N
24	Point	41.51833	-72.63906	N
25	Point	41.51833	-72.63889	N
26	Point	41.51833	-72.63861	N
27	Point	41.51833	-72.63833	N
28	Point	41.51833	-72.63806	Y
29	Point	41.51833	-72.63778	Y
30	Point	41.51833	-72.6375	N
31	Point	41.51861	-72.63722	N
32	Point	41.51861	-72.6375	Y
33	Point	41.51861	-72.63778	Y
34	Point	41.51861	-72.63806	Y
35	Point	41.51861	-72.63833	N
36	Point	41.51861	-72.63861	N
37	Point	41.51861	-72.63889	Y

Resources Critical to Our GIS Work

- CT DEP GIS Data
  - www.ct.gov/dep
- National Agriculture Imagery Program (NAIP)
  - http://www.fsa.usda.gov
- ESRI Assist – Service Contract
  - http://support.esri.com
- *Northeast Arc Users Group* (NEARC)
  - *www.northeastarc.org*
- *CT Geospatial Council*
  - *www.ct.gov/gis*
- *Center for Land Use Education and Research (CLEAR)*
  - *http://clear.uconn.edu*

Utilizing the CAES IAPP Website

www.ct.gov/caes/iapp

Questions?

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