



Benthic Survey of the Mudflat at Gloucester's Upper Mill River

Barbara Warren

Salem Sound Coastwatch Executive Director

www.salemsound.org



Mass Bays Regional Coordinator

www.mass.gov/envir/massbays



So what is living here since the Pond was released?



Will we find Soft Shell Clams?

– *Mya arenaria*



- ◆ Most important commercial species north of Boston

- ◆ Also called:

long neck clam

steamer

Salinity

- ◆ Soft shell clams have shown in other studies¹ a highly significant correlation between salinity and density
- ◆ Students at O'Maley School tested the waters salinity



¹ Thelan and Theit. Molluscan Community Recovery Following Partial Tidal Restoration of a New England Estuary

Salinity – May 2009

- ◆ Students determined that SALINITY was higher at Washington Street than Dr. Osman Babson Road



Sediment Type and Size

- ◆ Soft shell clams reach their highest densities in muddy sand areas but can be found in muddy, sandy and gravelly bottoms.
- ◆ **Where will we find them?**



Random Sampling of Mudflat

- ◆ Peat – glass – roots - muddy



LOGISTICS

- ◆ Water
- ◆ Mud is HEAVY!
and MUCKY!



Although this Fox had no trouble walking across the mudflat



Walking and Digging in the Muck



VERY CHALLENGING!

The Boat was the way to go!



Benthic Study 2008 thru 2010

Salem Sound Coastwatch – project manager



Funded in part by the Bruce J. Anderson Foundation (2008 –2010)
And MA CZM Wetlands Restoration Program (2008)

Working around the edge



Many hands made the work go



FAST and FUN!

Washers looked for anything alive?



Recorders

- ◆ Identified species and measured clams



Cleaning up

- ◆ Success thanks to so many volunteers



Identification important

- ◆ Soft shell Clams – ovate-elongate shape
 - Front end is rounded and back is slightly pointed



- ◆ Duck Clams – not a filter feeders, but deposit feeders
 - Their long inhalent siphons sweep over the mud, like vacuum cleaners
 - live in muddy bays and quite tolerant of low levels of salinity
 - blackened shells from sulphide-rich sediments

Polychaetes – Clam Worms

- ◆ Predators of the Mudflats



Green Crabs –

- ◆ Predators of the Mudflats



What did we find in 2008?



2008 Transects



- ◆ 13 Randomly selected transects
- ◆ Started 1 meter from high tide mark
- ◆ Then sampled every 5 m
- ◆ Anywhere from 5 to 50 m out into the mudflat
- ◆ 68 samples collected

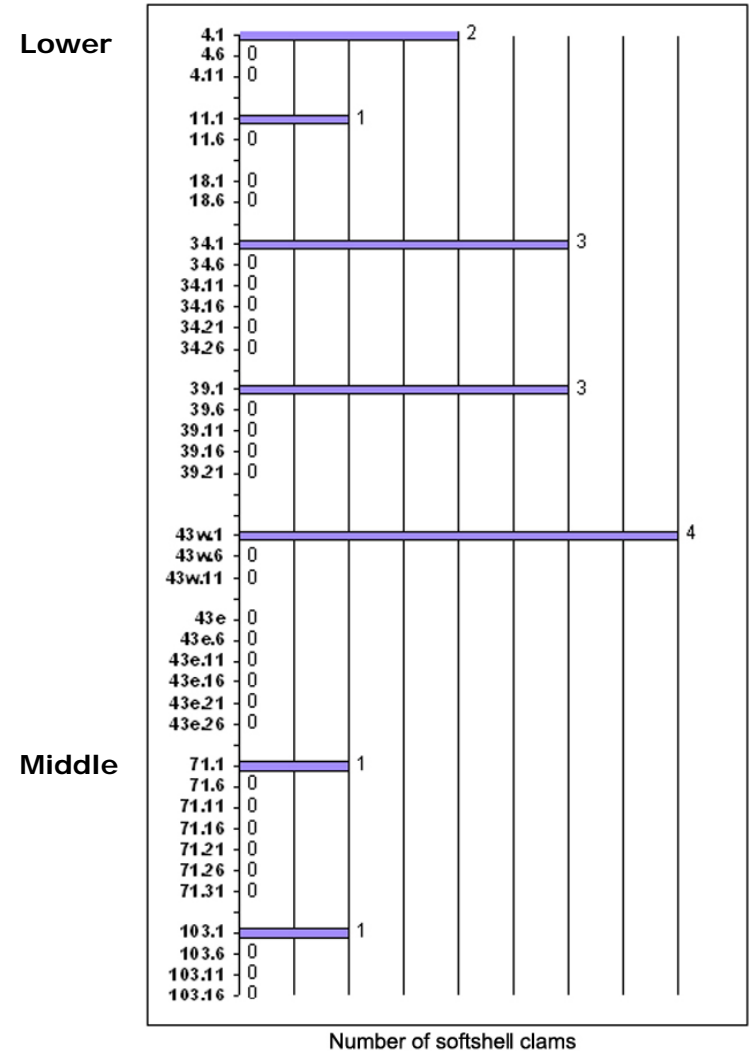
2008 Results

◆ Distribution

13 soft shell clams in LOWER
2 YOY in Middle



Distribution of softshell clams along transects, Mill Pond, Fall 2008



Aging Soft Shell Clams

Life Table of *Mya arenaria* from Brousseau (1978)

- ◆ **Apparent that colonization occurred as soon as the tide gate was opened in 2004.**
- ◆ Upper = 7 clams 3 to 4 years
5 clams two-year class range
1 within the under one-year class
- ◆ Middle = BOTH young of the year and still mobile. Movement is limited to the early stages
- ◆ After clams are over 12 mm in length become permanently fixed in their burrows (Brousseau)



Soft Shell Clams Population

Extrapolating the 2008 data to the whole habitat

Estimated population of 48,626 individuals in the entire upper Mill River study area.

It is important to note large (if not huge) uncertainties as they draw from very low numbers (13 and 2 in the lower and middle areas, respectively).



Duck Clams

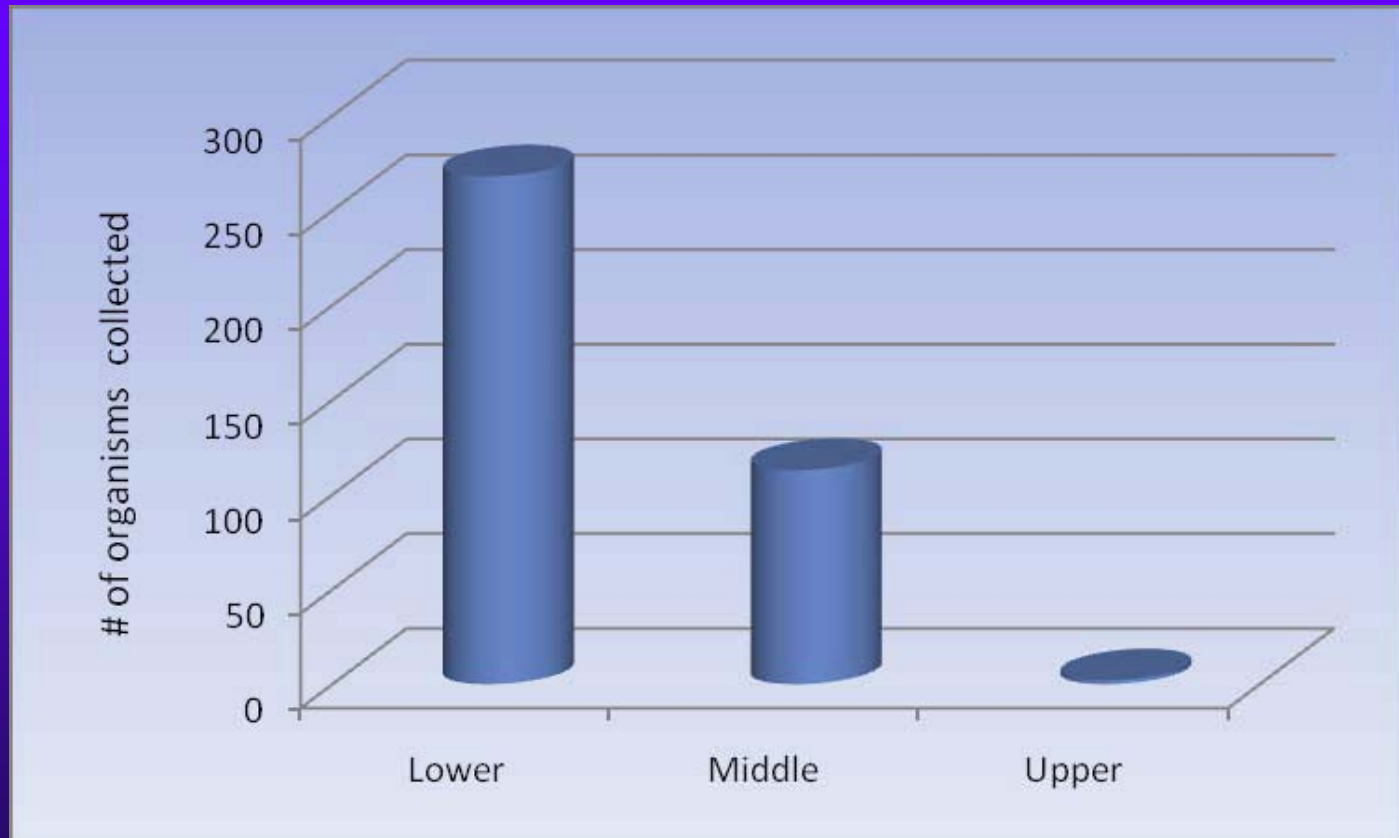


Location	Duck clams	Size Range	Average size
Lower	172	8 to 30 mm	23 mm
Middle	57	10 to 34 mm	27 mm
Upper	2	22 and 32 mm	27 mm
Total	231		

- ◆ 876,840 *duck clams* are estimated to inhabit the study area

2008 Results

- ◆ Majority of organisms found in Lower Study Area



2009 Transects



- ◆ 18 randomly selected transects
- ◆ Sampled only the Lower and Middle; not upper
- ◆ Started 1 meter from high tide mark
- ◆ Randomly selected sites meters 1, 2, 3, 4, 6, 7 into the mudflat
- ◆ 76 samples collected



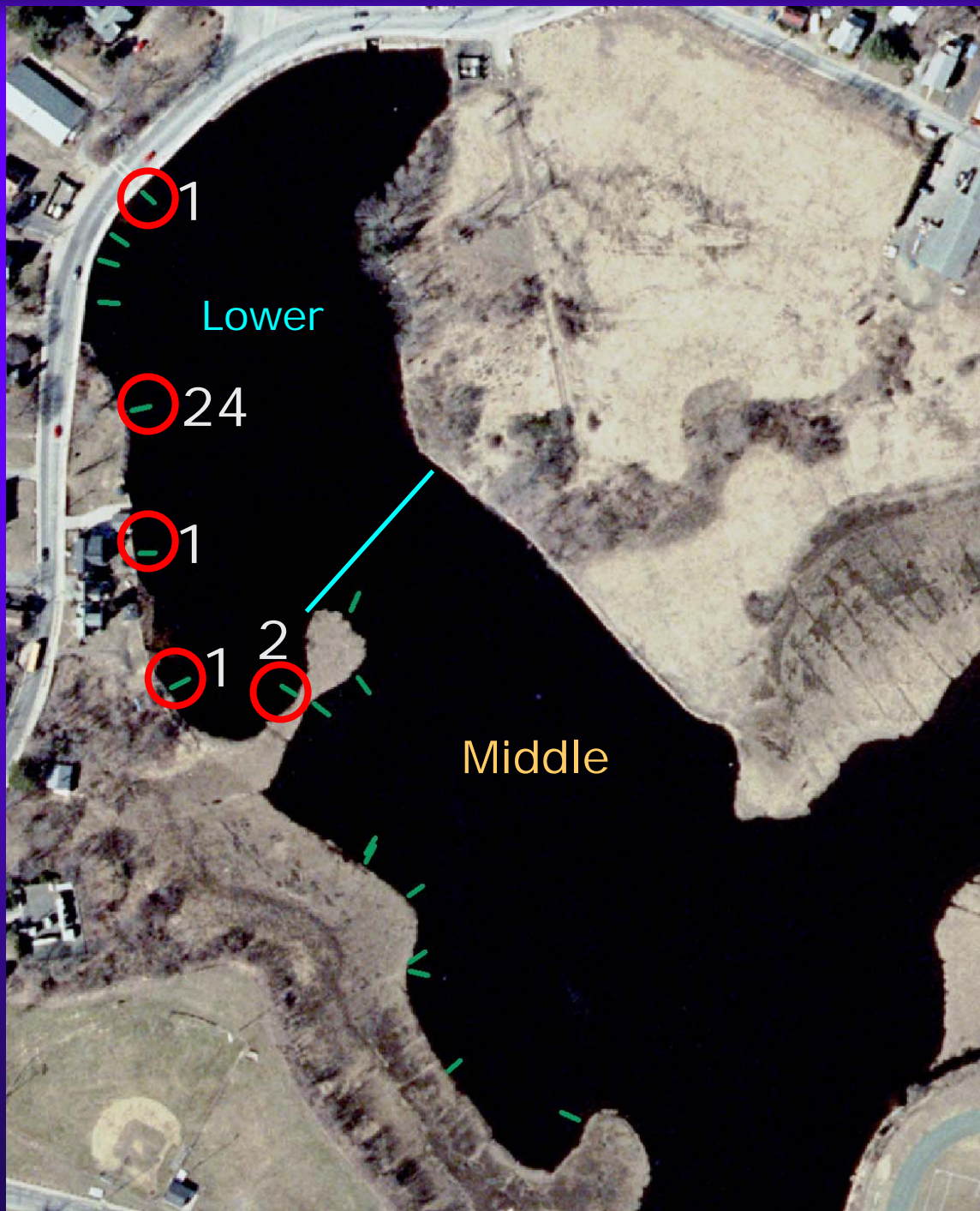
2009 Results

29 Soft Shell Clams

Size Range	Average size
11 - 76 mm	48.8 mm

Age Range:

Years old	Number
7	1
6	2
5	3
4	3
3	7
2	3
1	1
less than 1	9



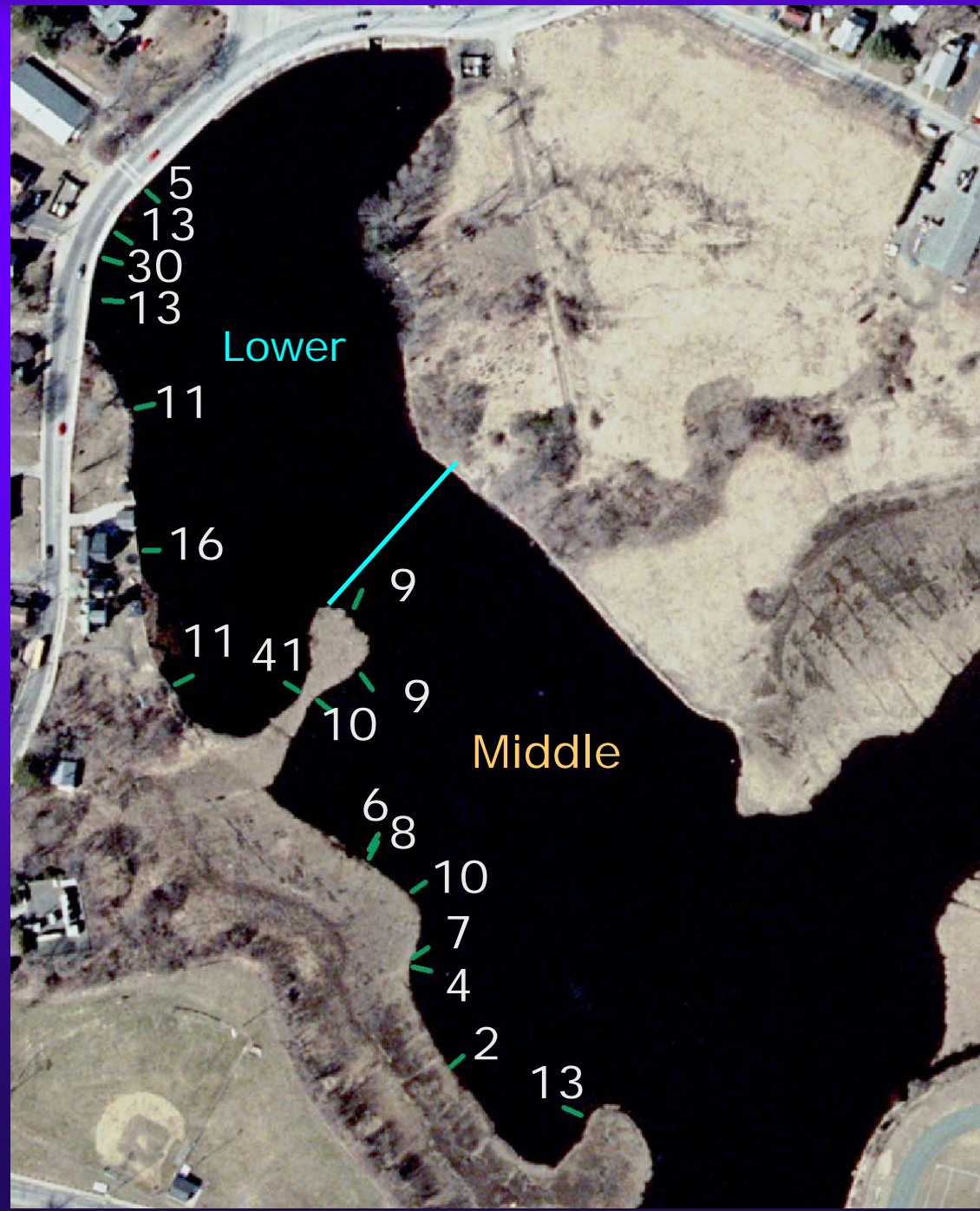


Duck Clams

- ◆ Lower = 140
- ◆ Middle = 78

- ◆ Size Range
8 to 33 mm

- ◆ Average size
19 - 20 mm



Other Species



◆ 2008

	Nereidae Clam Worms	Oligochaetes	<i>Littorina littorea</i>	Tanaids	<i>Ilyanassa obsoletus</i>
Lower	36	17	1	3	26
Middle	45	7	0	0	2
Upper	0	0	0	0	0
Totals	81	24	1	3	28

◆ 2009

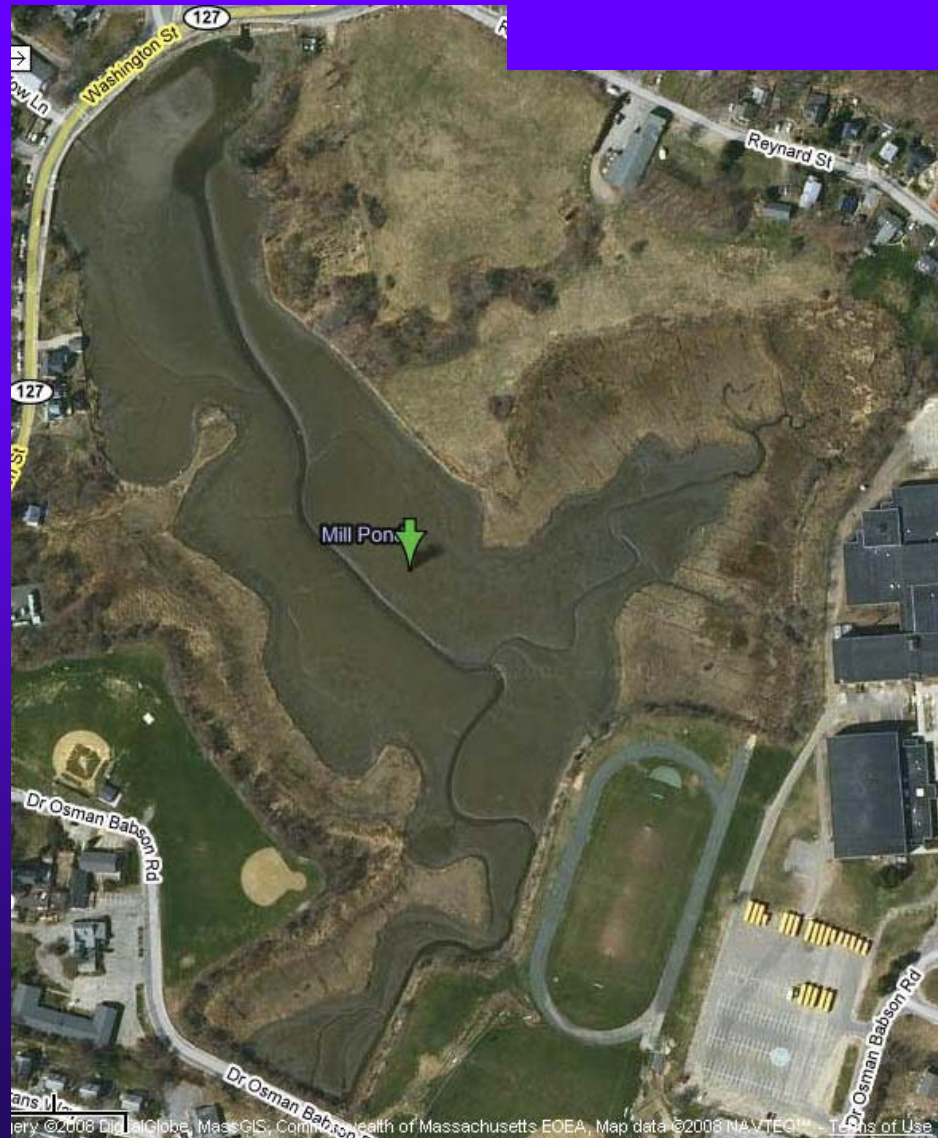
	Nereidae Clam Worms	Oligochaetes	<i>Littorina littorea</i>	Tanaids	<i>Ilyanassa obsoletus</i>	<i>Carcinus maenas</i>
Lower	18	2	3	1	5	3
Middle	22	1	0	3	2	2
Totals	40	3	3	4	7	5

No significant difference – but questions?

Finished until next year - 2010



YES, there is LIFE in the MUDFLAT



Acknowledgements

- ◆ MA Coastal Zone Management Wetlands Restoration Program and staff
- ◆ Bruce J. Anderson Foundation
- ◆ Eric Hutchins and other NOAA staff
- ◆ City of Gloucester – Max Schenk, Dave Sargent and Tammy Cominelli
- ◆ Susan Redlich
- ◆ Mass Bays Program and staff
- ◆ O'Maley Middle School Students and Liz Duff, Mass Audubon
- ◆ Salem Sound Coastwatch Volunteers
- ◆ Volunteers from Gloucester
- ◆ The Bairstow Family

