5-3-2006

Agawam River Study: Year 5

Welcome To Our Fifth Year Of The

Agawam River Project

Agawam River Watershed

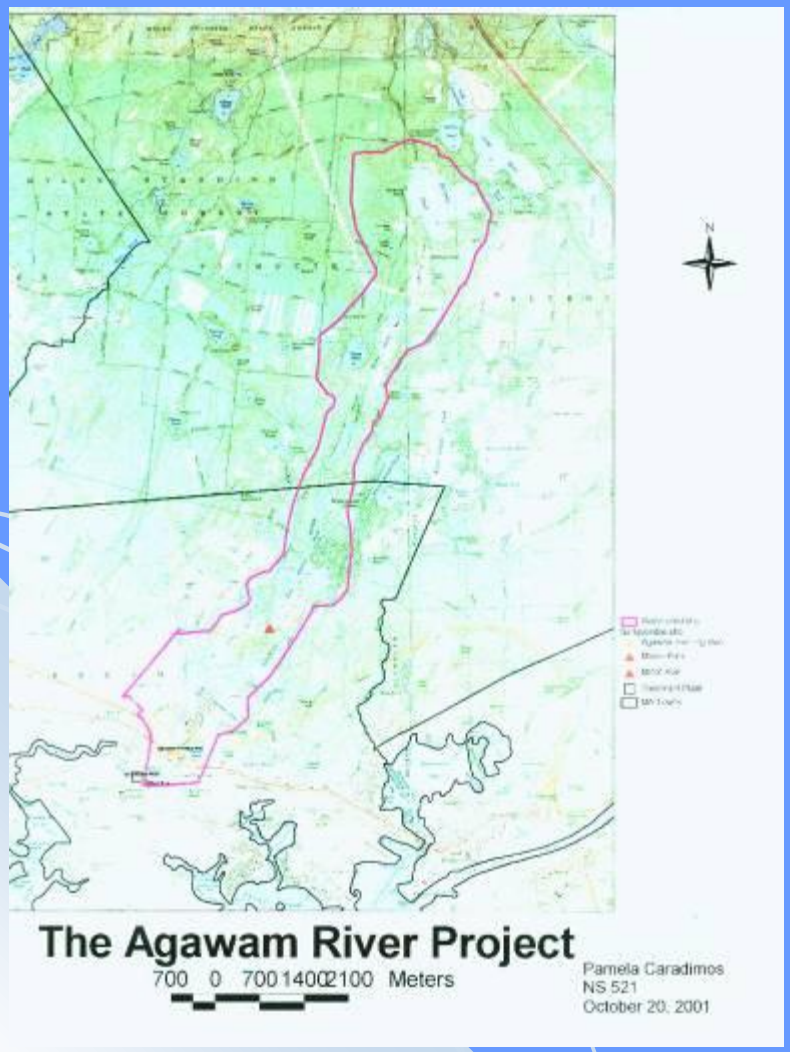
Within Buzzards Bay Watershed

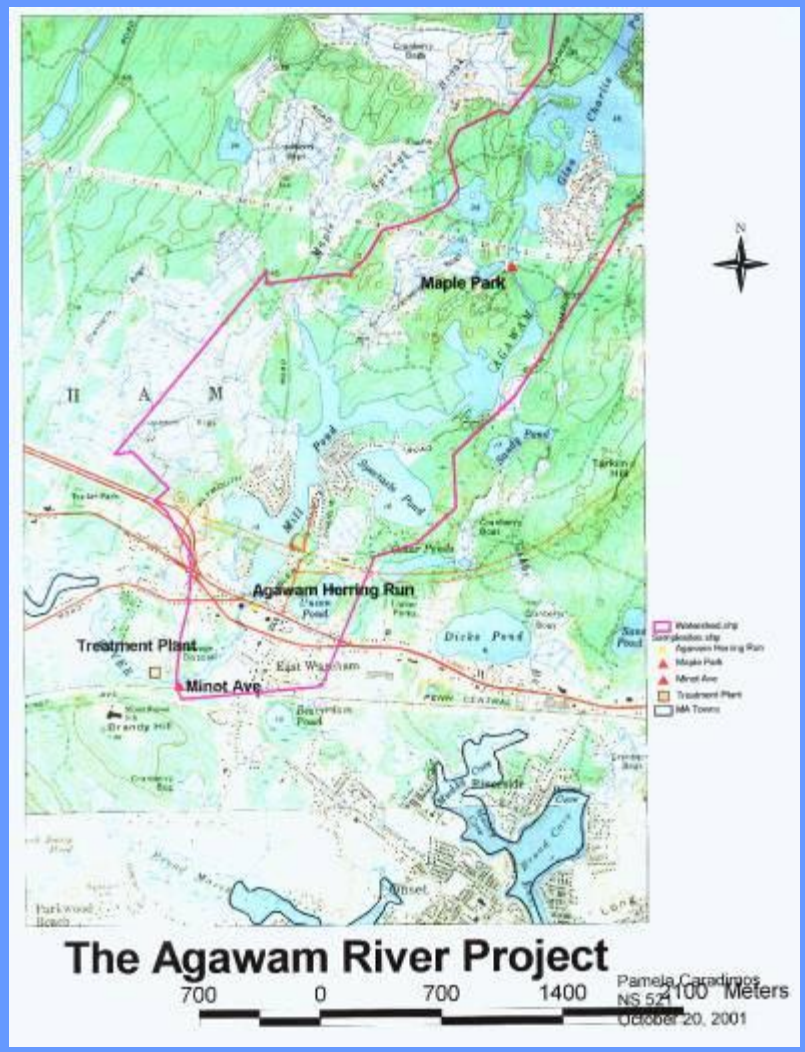
- **The Agawam River merges with the Wankinco River and flows into the Wareham River.**
- **The Wareham Water Pollution Control Facility is along the Agawam River. The WWPCF just completed its three year project of Nitrogen and Phosphorus Removal Upgrade in Fall 2005.**
- **Onset Village just completed Phase 2 of its Storm Remediation Project in April 2006.**
- **The Agawam River has had excess nitrogen over the past years. In years 1 to 3, our project saw slight decline in the health of the river. In years 4 and 5, the health of the river seems to have improvement.**

St. Margaret Regional School
Buzzards Bay

- Nick
- Greg
- Amy
- Aurianna
- Tina
- Kendra
- Caitlin
- Heather
- Morgan
- Meghan
- Katherine
- Mariah

Map of Agawam River – in the Buzzards Bay Watershed





Our 3rd year site - The Agawam Herring Run

- Wampanoag tribes harvested herring at this site for food and fertilizer.
- 1632 - Colonists built a fishway here
- Dam for herring has operated since 1638
- Herring were survival to the colonists
- 160 year old stone embankments from the Agawam Nail Works still exist
- **Much iron was melted into cannon balls near this area at the Agawam Ironworks**
- **1910 – a bleachery mill was operated**

Our 5th year site – Off Glen Charlie Road

ξ A second dam was built upstream from the AHR in the 1800s by the owner of the Nail Works

ξ The site was called the Glen Charlie Mill- we saw some stone of the mill

ξ This was called Maple Springs area

ξ This year we observed a pipe dispensing an orange liquid coagulated sediment.

A stone foundation of the Mill

Our Questions...

- **What is the health of the river at our two sites compared to past years?**
- **Is there a decline in herring in the past five years, and if so, why or why not?**

Agawam Herring Run

- Upstream one mile from Water Pollution Control Facility

Off Glen Charlie

- Upstream three miles from Water Pollution Control Facility

Physical Assessment
Agawam Herring Run / Off Glen Charlie

- **<u>Fall:</u> Not able to go; due to weather conditions**
- **<u>Early Spring</u>: Air 57° F**
- **9:30 A.M.**
- **No rain and dry weather conditions.**
- **Ebb Tide**
- **Sunny and warm, the sun was smiling upon us.**
- **Water was crystal clear, bottom is rocky.**

- **<u>Fall:</u> Not able to go due to weather conditions.**
- **<u>Early Spring:</u> Air 60° F**
- **10:30 A.M.**
- **It was an outgoing spring tide-new moon.**
- **There were buds on the trees.**
- **The herring were running.**
- **Water was clear, bottom is reddish.**

The Vegetation

- Agawam River Herring Run:
- Mosses, fern, grasses, herbataeous or golden rod, low brush, coon tail
- Honey suckle, sumac, bittersweet, caroline, vine, grapes
- Trees: red oak, ash, elm, maple, willow

- Off Glen Charlie:
- Mosses
- Grasses
- Herbataeous
- Low brush
- Pine needles
- Willow, white pine, oak, white oak, white birch

Land Use:

Agawam Herring Run

- **Past:**
- 1632-First dam
- 1720- fish way
- Agawam iron works
- bleachery-1902
- **Current:**
- highway
- parking lot
- herring fish ladder

Off Glen Charlie

- **Past:**
- 1700s-Rolling Mill dam
- spawning grounds for herring
- farms, family picnics
- **Current:**
- cranberry bogs
- power lines
- herring fish ladder
- camp,housing,road

What We Measured

- Turbidity
- Dissolved Oxygen
- Air and Water Temperature
- pH
- Latitude/ Longitude
- Macroinvertebrates
- Physical Assessment

Why Tidal Flow is Important…

- The mouth of the Agawam River is closer to a Bay than inland rivers.
- An incoming tide carries out flow from the Pollution Control Plant upstream.
- An outgoing tide carries debris and surface water downstream into the Bay
- The water at our site is brackish.

Materials

- Hagan pH test kit
- Water thermometer
- Homemade litmus paper
- Data book
- Microscopes
- Waders
- Buckets
- Macroinvertebrate collection net
- Gloves/Brush
- HACH DO Test Kit
- Camera/Computer
- Plastic containers

Methods

- Collect macroinvertebrates
- Classified macroinvertebrates
- Collected water samples
- Measured turbidity, DO, Temperature, pH

AHR Water Quality Data

DO 14g/mL

Water Temperature 11.1°

pH 6.5

Turbidity >117

OGC Dissolved Oxygen and Temperature

DO 22g/mL
Water Temperature 11.1°C
pH 6.0
Turbidity > 118

Nitrogen

Nitrogen is usually too low to detect with current equipment, because of the brackish water.

Salt water testing results are available through The Buzzards Bay Coalition's on line data tables. The BBC reported high Nitrogen levels in the Agawam River in 2004.

pH (potential hydrogen) affects aquatic organisms blood systems and tests for toxic ammonia

Fall: N/A

Spring 2005: AHR - 8.03 OGC – 8.05

Spring 2006: AHR - 6.0* OGC – 6.0 *

*we will retest

Phosphorus

- The excess of phosphorus causes excessive plant growth which depletes the supply of dissolved oxygen, so marine and animal life will not have enough oxygen to breathe, so they die.
- This is called eutrophication.
- In freshwater ecosystems, phosphate is usually a nutrient that is least available for plant growth.
- Phosphates tend to move downstream in a river system by the current. Phosphates bind strongly to soil particles, so phosphorus becomes bound up in sediment at the bottom. Detergents, road salts, fertilizer, human and animal waste contribute to excessive phosphorus.

River Flow and Phosphorus

Minot Ave.	P	Flow	Load
November 2001	0.010 mg P/L	921.88 L/sec	231.13 g/day
November 2002	0.063 mg P/L	3246.31 L/sec	17,670.32 g/day
Herring Run			
October 2003	0.013 mg P/L	1349.11 L/sec	1,515.32 g/day
November 2004	0.017 mg P/L	1654.66 L/sec	2,430.36 g/day
2005-2006 N/A			
Off Glen Charlie			
November 2001	0.008 mg P/L	318.32 L/sec	231.13 g/day
November 2002			
October 2003	0.012 mg P/L	1021.29 L/sec	1,058.87 g/day
November 2004	0.007 mg/L	879.62 L/sec	531.99 g/day

River Flow and Phosphorus

Minot Ave.	P	Flow	Load
March 2002	0.007 mg P/L	792.03 L/sec	511.11 g/day
March 2003	0.005 mg P/L	3071.00 L/sec	1326.67 g/day
Herring Run			
March 2004	0.008 mg P/L	238.42 L/sec	164.80 g/day
March 2005		rain and melt-water too high	
March 2006	not tested		

Off Glen Charlie			
March 2002	0.003 mg P/L	399.82 L/sec	94.58 g/day
March 2003		998.30 L/sec	258.76 g/day
March 2004	0.009 mg P/L	970.02 L/sec	754.28 g/day
March 2005		rain and melt -water too high	

Macroinvertebrates

Caddisflies, mayflies, stoneflies and snail gills are pollution intolerant, therefore they indicate good water quality.

Aquatic worms, midge larva, snail lungs, and leeches are pollution tolerant therefore they indicate poor water quality.

Dragonflies, damselflies, scuds, clams, crayfish, aquatic sowbugs, and beetle larva exist in a range of water quality conditions.

Macroinvertebrates

Macroinvertebrates

Agawam Herring Run

Spring 2004 Spring 2005

Unable to get bugs

Spring 2006 –crustacean, riffle beetle, fingernail clams

Off Glen Charlie

Spring 2004 Spring 2005

18 caddisflies
12 riffle beetles
157 scuds
10 clams

40 scuds

Spring 2006 – caddisfly casing, mayfly, snails

Agawam Herring Run Fall

Fall 2003

Major Group	Density
Caddisflies	805.88
Midges	117.65
Riffle Beetles	5.88
Clams	11.76
Scuds(Amphipods)	64.71
SowBugs	5.88
Leeches	76.47

Fall 2004

Major Group	Density
Caddisflies	511.76
Midges	23.53
Riffle Beetles	11.76
Scuds	76.47
Crayfish	17.65
Sowbug	5.88
Eels	35.29

Off Glen Charlie

Fall 2003

Major Groups	**Density**
Caddisflies	94.12
Craneflies	11.76
Midges	**23.53**
crayfish	5.88
Caddisfly casing	5.88
Damselflies	11.76
Riffle Beetles	11.76
clams	47.06
scuds	211.76
shrimp	11.76
Leeches	11.76

Fall 2004

Major Groups	Density
Caddisflies	105.88
Riffle Beetles	70.59
Clams	58.82
Snails	17.65
Scuds (Amphipods)	**923.53**
Sowbugs (Isopods)	5.88
Leeches	11.76

Results

- We collected pollution sensitive species of macroinvertebrates, compared to many leeches and scuds in the past. The physical appearance of the water was clear and crisp. The turbidity was clear. The pH was too low, and the DO was high, although our equipment may not be accurate. The water temperature was correct , which is the temperature that the herring need to run. We saw many herring. We believe that the herring have decreased running in the Agawam River over the past five years, because this was reported to us by the Herring Agent. Taking herring this year is prohibited. We believe that the netting of herring in larger water systems has contributed to the decline as well as water quality in other water systems. Many fish ladders have been built in Southeastern Massachusetts over the past five years in recognition of the decline. Our river data will given to the Herring Agent and to the town Library.

Discussion

- We believe the health of the Agawam River at our two sites has improved over the past year.

- We chose not to launch the sophisticated equipment this year. We are in brackish water and our results for N have not been accurate with current equipment. We will obtain this data from the Buzzards Bay Coalition when the data is available. Next year's study group will test P Load. The data will be interesting, because the WPCF upgrade will be in its second year. We will be curious to study the results.

- We are concerned about the out flow pipe we found at Off Glen Charlie site. A coagulated, murky, orange substrate had developed along the bank at the water's edge. We reported this last year and we will submit a written statement this year. We will study herring data for 2006.

- Future groups may do soil testing at our sites.


AERO
ABERCROMBIE

What We Learned

Caitlin - I learned that the Agawam River upstream at the Off Glen Charlie site is affected by eutrophication. We walked upstream. There is a lot of green and brown algae there.

Morgan - I learned about the different species of animals and bugs and what they mean about the river. Some bugs mean the water is healthy and others mean it is not as healthy.

Meghan – I learned that runoff from the road at the Herring Run can travel all the way into the Agawam River and add oil, gas, and salt into the river.

Katherine - I learned that everything we do in our environment affects our rivers and waters. We should be more careful not to litter, and to clean up after our dogs and to plant natural plants.

Christina - I learned about the fish ladders and how they help herring run upstream against a strong river current.

Kendra – I learned how to measure turbidity, pH and DO. Also, our turbidity was very healthy this year. We also made our own litmus paper to test pH.

What We Learned

Heather – I learned how to shake dissolved oxygen and how to test pH.

Annamarie – I learned about all the different bugs that live in the river.

Nick – I learned about how runoff from fertilizers may go into the river.

Greg – I learned that there are many different organisms that live in the waters of the Agawam River.

Amy – I learned that soil may change the color of the river water.

Elaine – I learned about how the water travels in the river, at high tide the water level gets higher than at low tide. The water travels to the bay.

Aurianna – I learned a lot about the river. I remember learning about the water and that there is oxygen in the water called dissolved oxygen. Also, that pH is Potential Hydrogen, and it can test for acid from rain.

Thank You

- **Dr. Curry**
- **Kim McCoy**
- **Our Principal, Mrs. Lafleur for supporting this project**
- **Mrs. Young**
- **Mrs. Gilmore**
- **Our Parents**
- **Mike - Wareham Harbormaster**
- **Wareham Public Library**
- **Cape Cod Community Foundation**

Agawam River
“Shall we gather at the river
Where bright angels have trod”