5-6-2004

The Agawam River Study

Buzzards Bay Watershed

- 432 square miles of land
- Lakes, rivers, streams, wetlands and ground water drain into Buzzards Bay

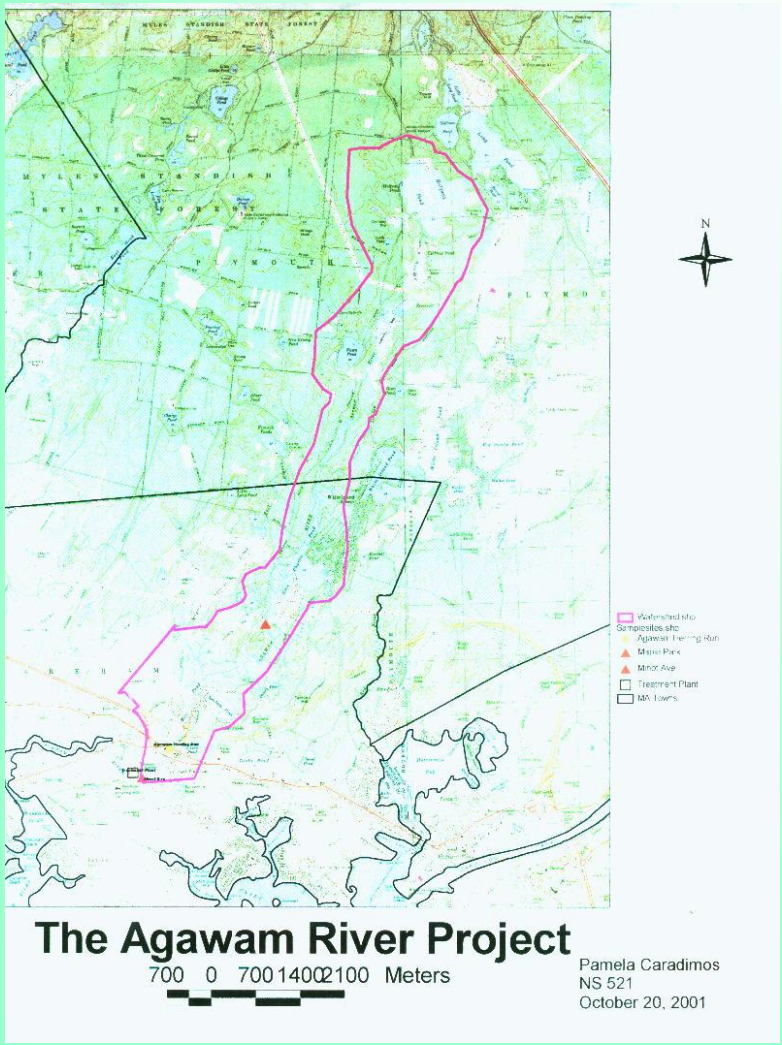
Welcome To Our Third Year Of The Agawam River Project

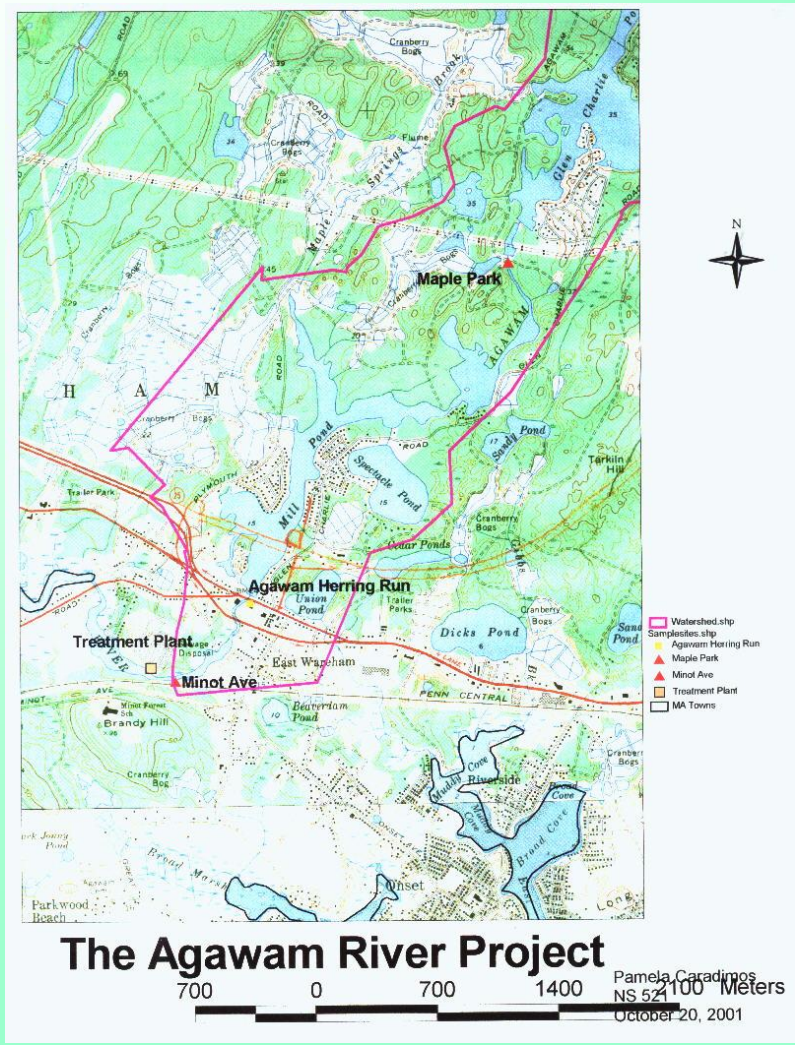
St. Margaret Regional School Buzzards Bay

- Billy
- Holly
- Alexandria
- Carina
- Allysa
- Jaime
- Sam
- Kerri
- Irene

Pictures

Map of Agawam River – in the Buzzards Bay Watershed





Our New Site - The Agawam Herring Run

- Wampanoag tribes harvested herring at this site for food and fertilizer.
- 1632 - colonists built a fishway here
- Herring were caught by hand or spear
- Herring were survival to the colonists
- **Much iron was melted into cannon balls near this area at the Agawam Ironworks**

Our 3rd year Site – Off Glen Charlie Road

- Agawam was named as a place of settlement for dwelling and farming in the 1600s.
- The Agawam River travels 10 miles from Plymouth to where it meets the Wankinco River in Wareham and forms the Wareham River estuary before flowing into Buzzards Bay
- **There were many mills by the Agawam River. We saw ruins of a Grist Mill.**

These are the ruins of the Grist Mill

Our Question...

- **What do the differences of nitrogen, phosphorus, dissolved oxygen, macroinvertebrates, and river velocity between the Agawam Herring Run and Off Glen Charlie tell us about the health of the water and surrounding land in Fall and Spring?**

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> High tide

- 10:00 am
- **Air 68 degrees F**
- Rained night before
- Dark water

<u>Early Spring:</u> Low tide

- 9:30 A.M.
- **Air 39 degrees F**
- Cold and windy
- Saw alewives

<u>Fall:</u> High tide

- 10:45 –11:00
- **Air 68 degrees F**
- Windy, Leaves falling
- Soil was reddish (iron)

<u>Early Spring</u>: Low tide

- 10:15 A.M.
- Air 40 degrees F
- Overcast

The Herring

- backboned animal
- eat small crustaceans
- millions of herring swim close together near the surface
- spend time in deep cold water, then migrate up the Agawam River to Spectacle Pond where they lay their eggs
- they lay 20,000 to 185,000 eggs, but many get eaten by crabs and haddock

Land Use:

Agawam Herring Run

Past:

- 1632-First dam
- 1720- fishway
- Agawam iron works
- Bleachery-1902

Current:

- Highway
- Parking lot
- Fish ladder

Off Glen Charlie

Past:

- 1700s –Grist Mills
- Spawning grounds for herring
- farms

Current:

- Cranberry bogs
- power lines
- herring fish ladder
- camp,housing,road

What We Measured

- River Flow/Velocity
- Dissolved Oxygen
- Temperature
- Nitrogen
- Phosphorus
- Macroinvertebrates

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
- There is brackish water in our sites

Materials

- Flow meter
- Sigma
- Measuring tape
- Depth measure
- Buckets
- Macroinvertebrate Collection nets
- Ethyl alcohol

Hydrolab

Data book

Microscopes

Waders

Small forceps

Gloves/Brush

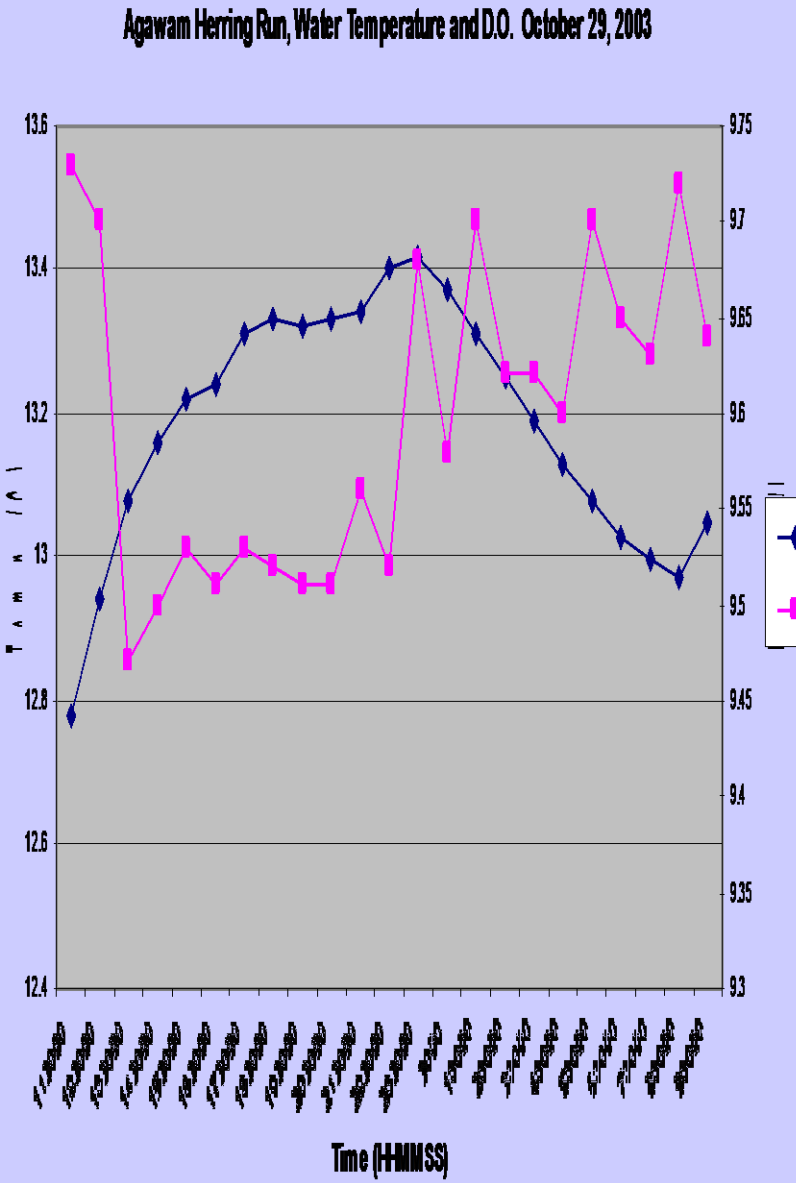
Filters

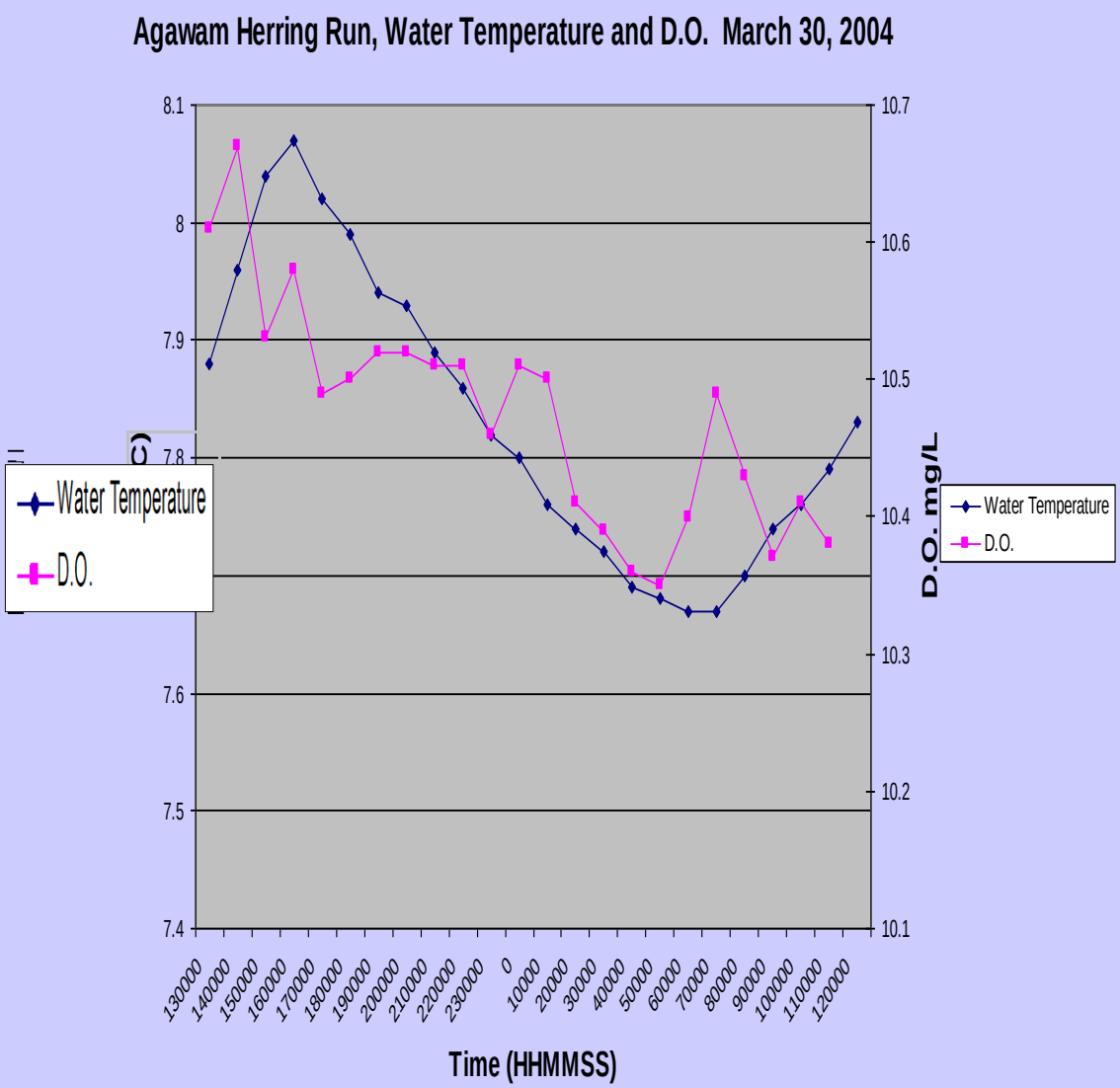
Camera/Computer

Methods

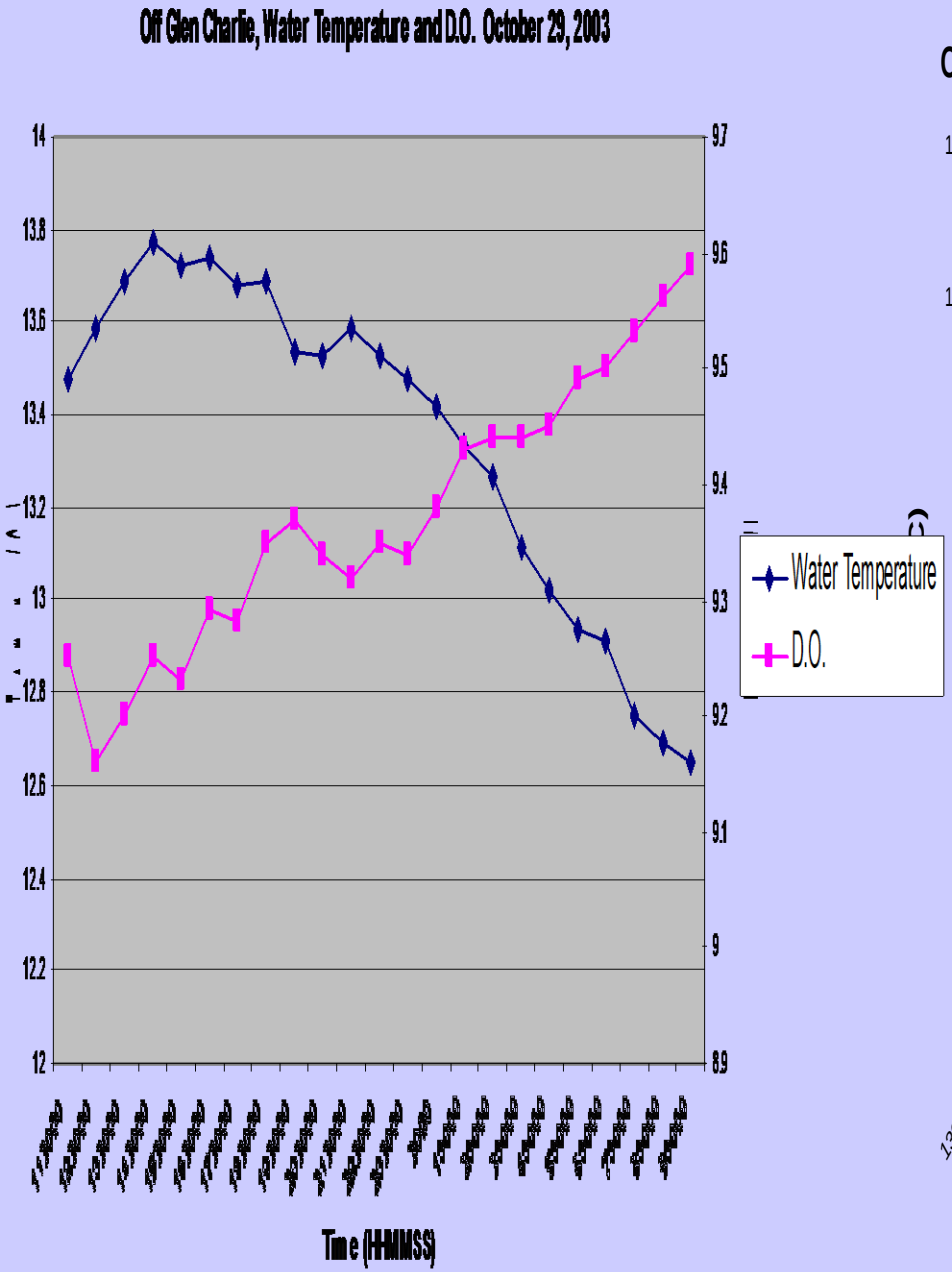
- Measure river width
- Measure river velocity in segments
- Measure river depth in segments
- Collect macroinvertebrates
- Collect water samples
- Filter water samples
- Classify and count macroinvertebrates

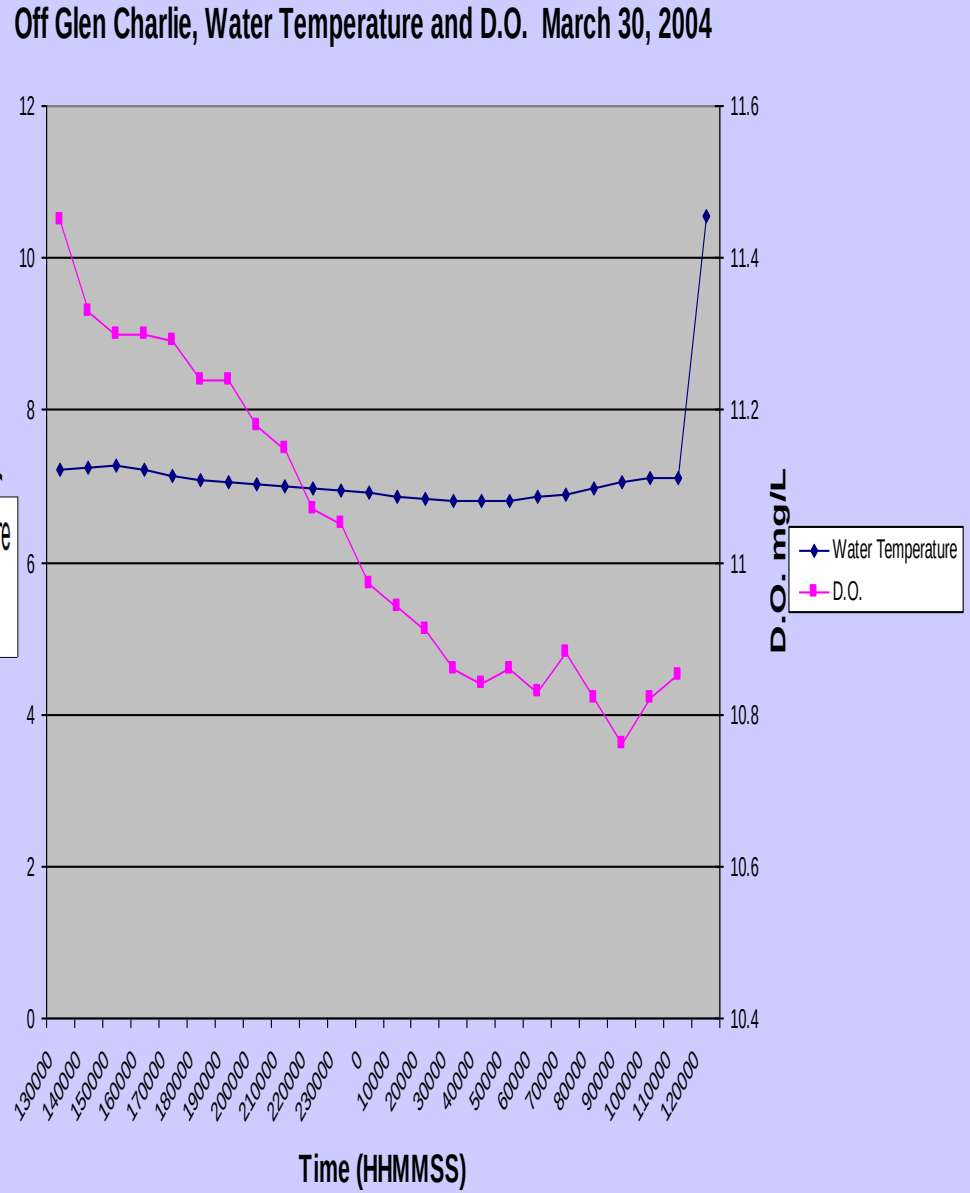
Dissolved Oxygen and Temperature





Dissolved Oxygen and Temperature





Nitrogen

Too low to detect, because of the brackish water.

Need a Lab with salt water testing capabilities

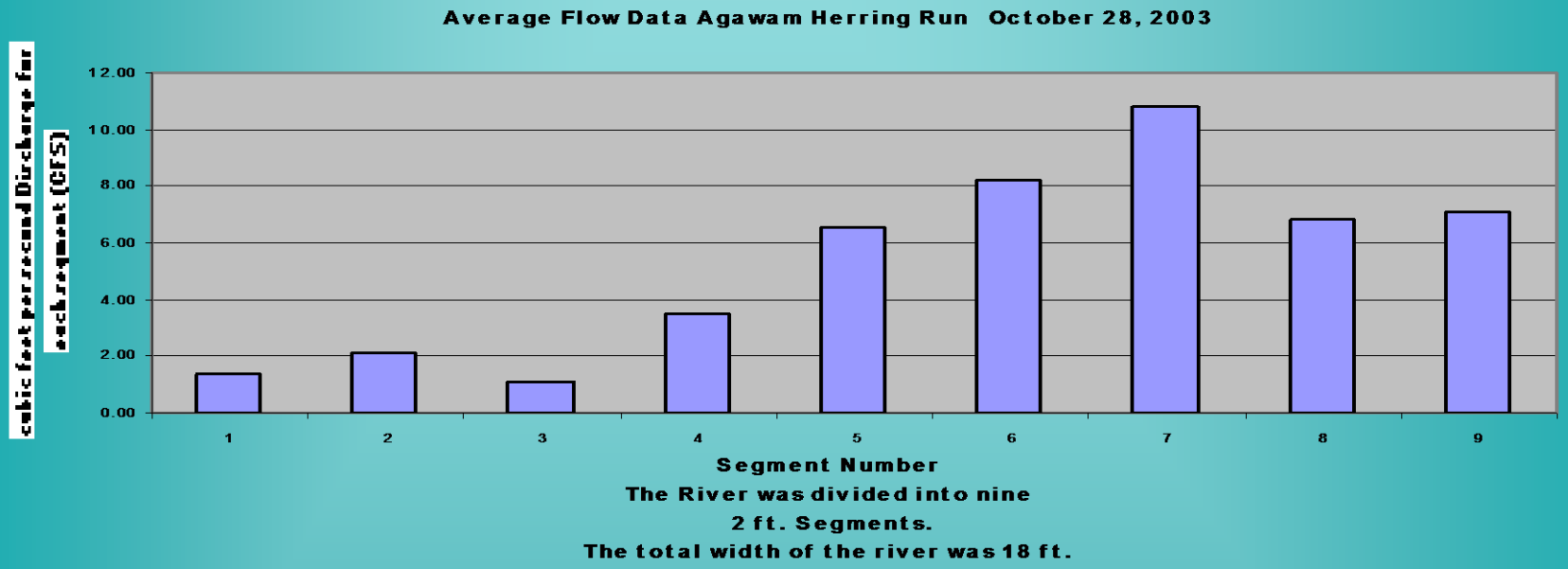
pH

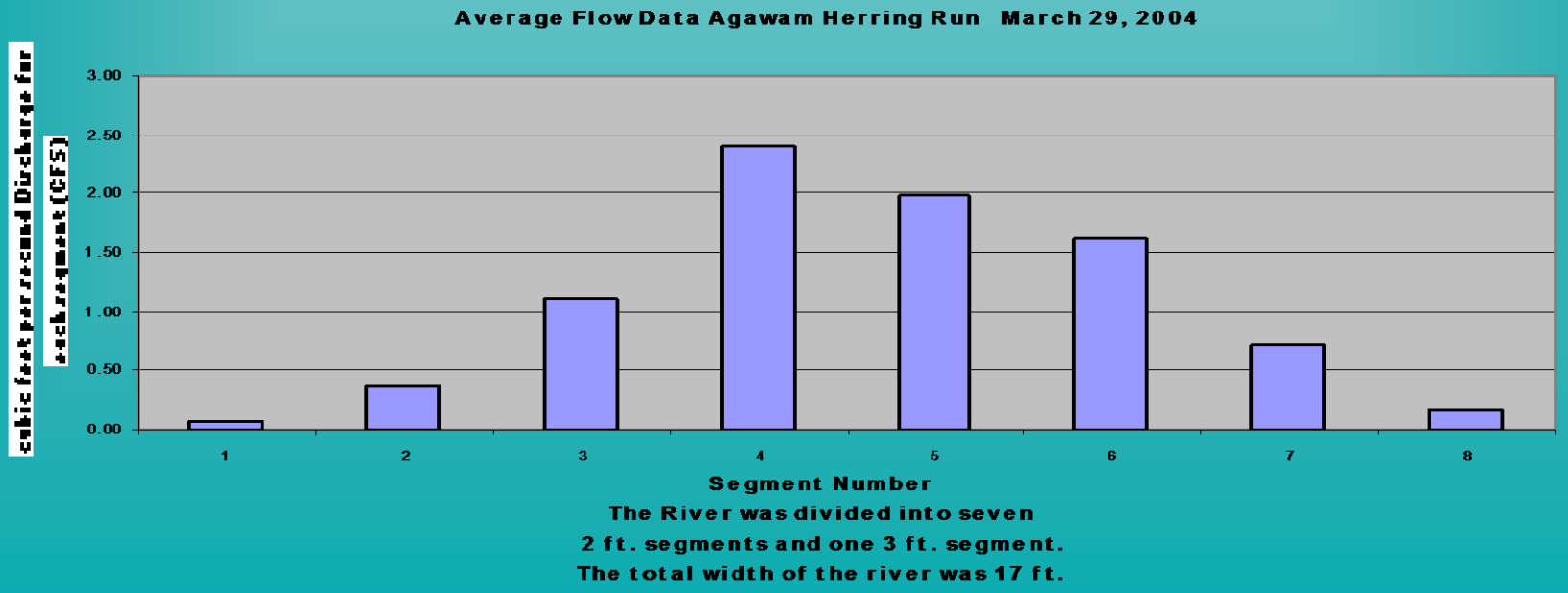
Our pH levels were in normal range

Phosphorus

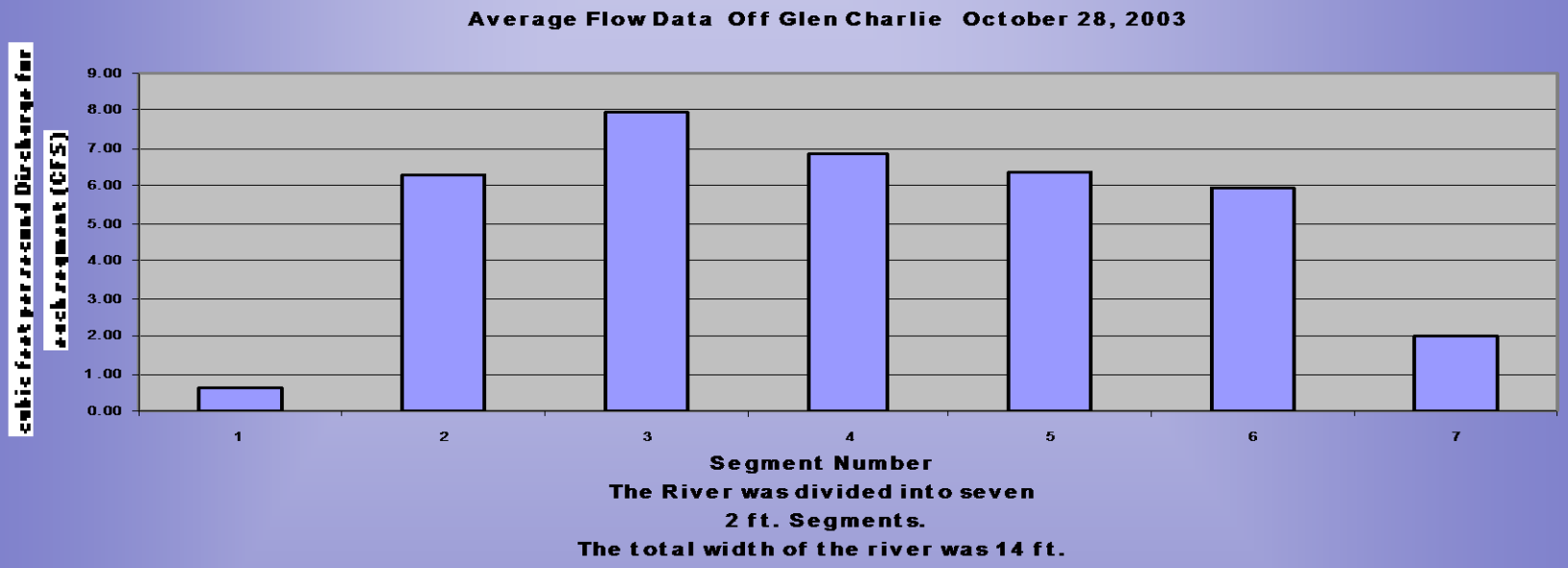
- The excess of phosphorus causes excessive plant growth which depletes the supply of dissolved oxygen, so marine and animal life will not have enough oxygen to breathe, so they die.
- This is called eutrophication.
- In freshwater ecosystems, phosphate is usually a nutrient that is least available for 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. A cycle. We saw this at Minot in November.
- **Detergents, road salts, fertilizer, human and animal waste contribute to excessive phosphorus.**

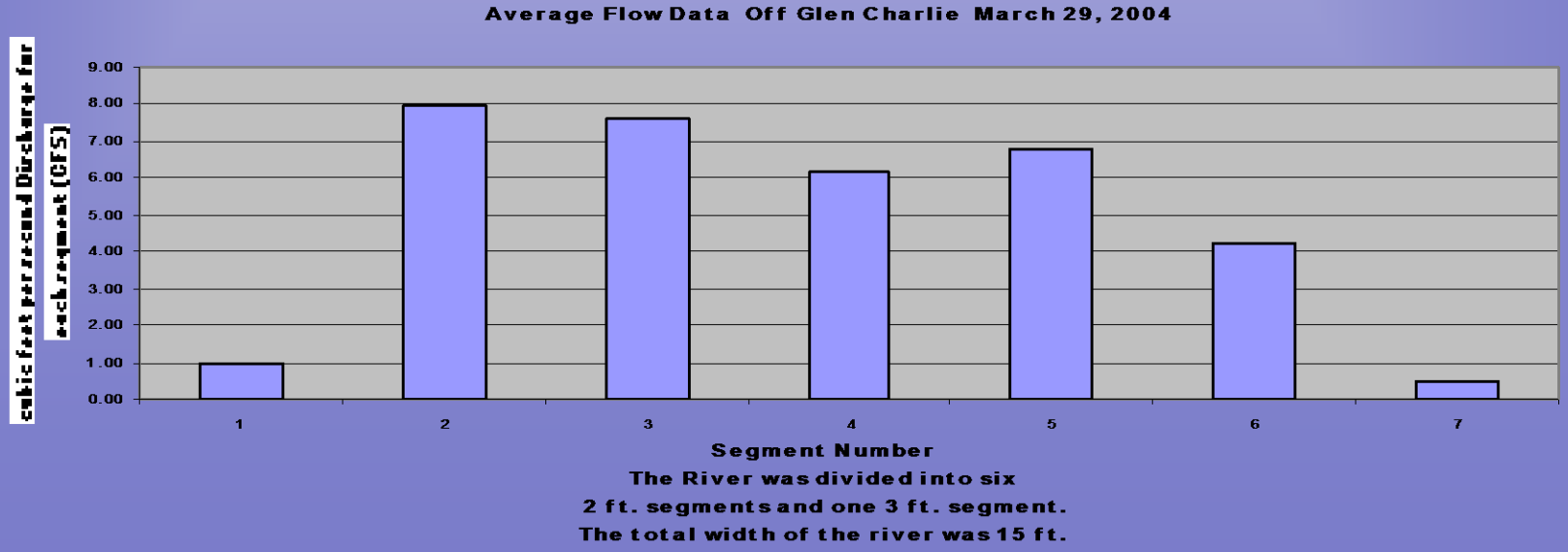
River Flow Agawam Herring Run





River Flow Off Glen Charlie





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**

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**

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**
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**

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

Off Glen Charlie 3-20-04

	Phylum	class	order	Family	Count
caddisflies	Arthropoda	Insecta	Trichoptera	Hydropsychidae	18
scuds		Crustacea	Amphipoda	Gammaridae	157
riffle beetle		Insecta	Coleoptera	Elmidae	12
leech	Annelida	Hirudinea		Erpobdellidae	2
clam	Mollusca	Pelecypoda			10
sowbug	Crustacean	Isopoda		Asselidae (1)	(s
midge (midges)		Insect	Diptera	Chironomidae	
Snails					3

Agawam Herring Run
Fall

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**

Off Glen Charlie

Fall

Major Groups	Density
Caddisflies	1188.24
Craneflies	11.76
Midges	**23.53**
Damselflies	11.76
Riffle Beetles	11.76
Leeches	11.76

Spring

Major Group	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

- In the Fall, in both sites, there was an incoming tide causing more water flow L/sec which may have attributed to more phosphorus g/day than in the Spring. Also, in the Agawam Herring Run during the fall, there was high amount of leeches which may lead to a belief of some detrimental affect to the water and land quality. A higher phosphorus in both sites may be from fertilizer run-off. Our pH levels were in normal range. The water and air temperatures were warm.
- In the spring, in both sites, there was an outgoing tide causing less flow L/sec which meant that the phosphorus g/day was lower than the amount we got in the Fall. Our pH levels were in normal range. At Off Glen Charlie site, there were many scuds. The water and air temperatures were cold. We just had a lot of ice melt from a very cold winter.

Discussion

- Our sites are affected by tidal flow. In comparing the three years of data, we see that an incoming tide creates more flow, relative to stream width. The ratio of flow L/sec and P g/day seems to be comparable over the years, except for Fall 2002 .
- Our new site had a high density of leeches in Fall 2003. We have thought that maybe the water is healthier than the soil at this site. It would be interesting to do soil testing.
- We think that the Off Glen Charlie site in healthier in the Fall and in the Spring than the Agawam Herring Run site. The Agawam Herring Run site may have detrimental affects such as run-off from the highway and adjacent parking lot, and excess iron may be in the soil in both sites.

What We Learned

- I learned that different kinds of bugs determine the health of the water - Ali
- I learned about the rivers and how they work for example the temperature in different seasons- Kerri
- I learned about how high temperatures cause low oxygen in the water- Billy
- I learned about how we need nitrogen in our own air to breathe and live- Carina

What We Learned (cont.)

- I learned about how both plants and humans need nitrogen and phosphorus at an equal level- Jaime
- I learned that when dissolved oxygen is high then water temperature is low - Allysa
- I learned that the changing of tides affects the flow of the river- Holly
- I learned that poorly operated waste water treatment plants, septic systems, and sewage leaks can add nitrogen to streams - Sam
- I learned how to sweep and collect samples - Irene

Thank you

- Dr. Curry
- Kim McCoy
- Our Principal, Mrs. Lafleur for supporting this project
- Mr. Charles Pires of Wareham Treatment
- Mrs. Gilmore
- **Buzzards Bay Project**
- **Mike & Gary-Wareham Harbormasters**
- **Wareham Public Library**
- **Green Grant Youth Council**
- **Wareham Youth Empowerment Council**

Agawam River
“A Place Where Fish are Caught”
Take Time to Listen to a River