

US EPA ARCHIVE DOCUMENT

Influence of coastal streams on beach water quality

New England Association of Environmental Biologists

Westbrook, CT March 20, 2009



Beach Act funds monitoring assessment and notification



Pipes lead to closures but it's challenging to actually track down the sources – from where in the pipe is the bacteria originating?



But, quite often, it's not just pipes, it's coastal streams that have been integrated into the stormwater system



Top communities with chronic closures in New England 2004 to 2006

Town	State	Days	Number of beaches
Salem	MA	324	14
Boston	MA	319	9
Marion	MA	252	6
Chatham	MA	250	5
Quincy	MA	174	12
Warwick	RI	147	4
Marblehead	MA	138	7
Stamford	CT	123	4
Norwalk	CT	118	6
Provincetown	MA	110	17
Dartmouth	MA	92	3



We've assisted many communities in tracking sources of pollutants that cause beach closures

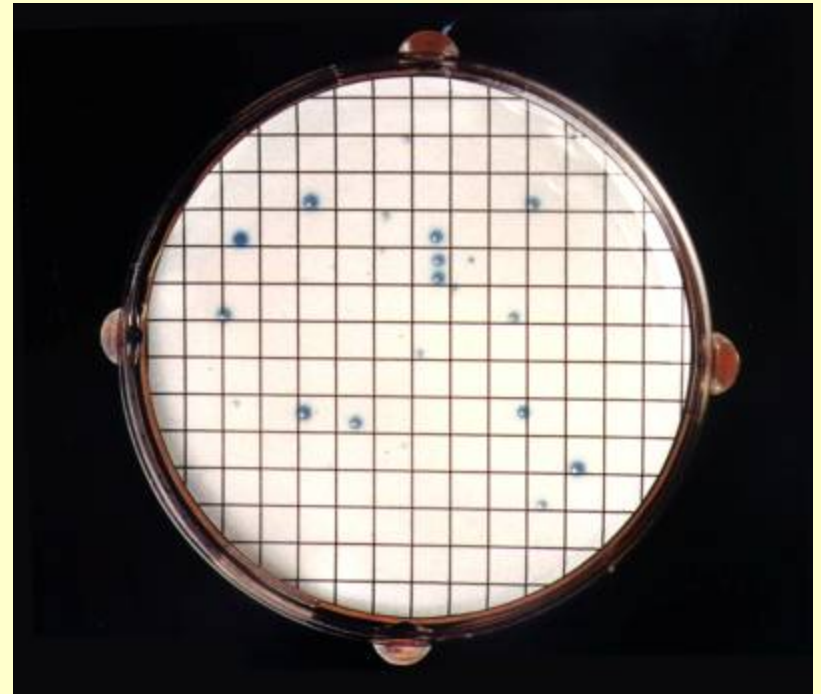


Conceptual model of source, transport and fate of indicator bacteria to coastal beaches

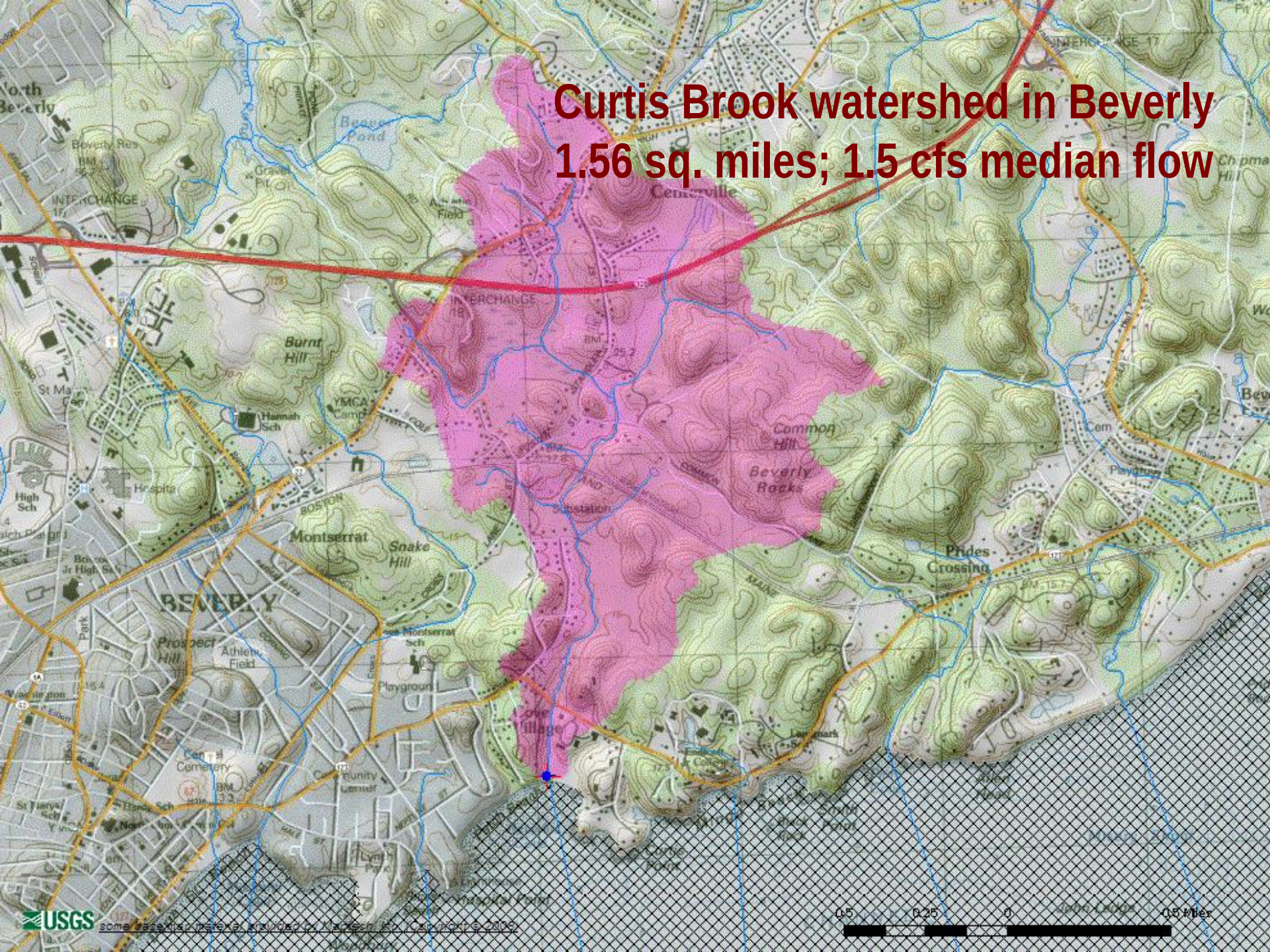
- ✂ Proximate source
- ✂ Transport via storm water pipe or conveyance into coastal stream
- ✂ Coastal stream is channelized, little attenuation of bacteria
- ✂ Community ecology – predation, light are not present to attenuate bacteria
- ✂ Modification of wetland
- ✂ Discharge to the beach through an undersized culvert

Sources of bacteria to coastal beaches

- ✂ Leaking sewers
- ✂ Illicit connections
- ✂ Failing septic systems
- ✂ Waterfowl
- ✂ Dog waste
- ✂ Beach wrack



**Curtis Brook watershed in Beverly
1.56 sq. miles; 1.5 cfs median flow**



Mar 18, 2009 3:03 pm

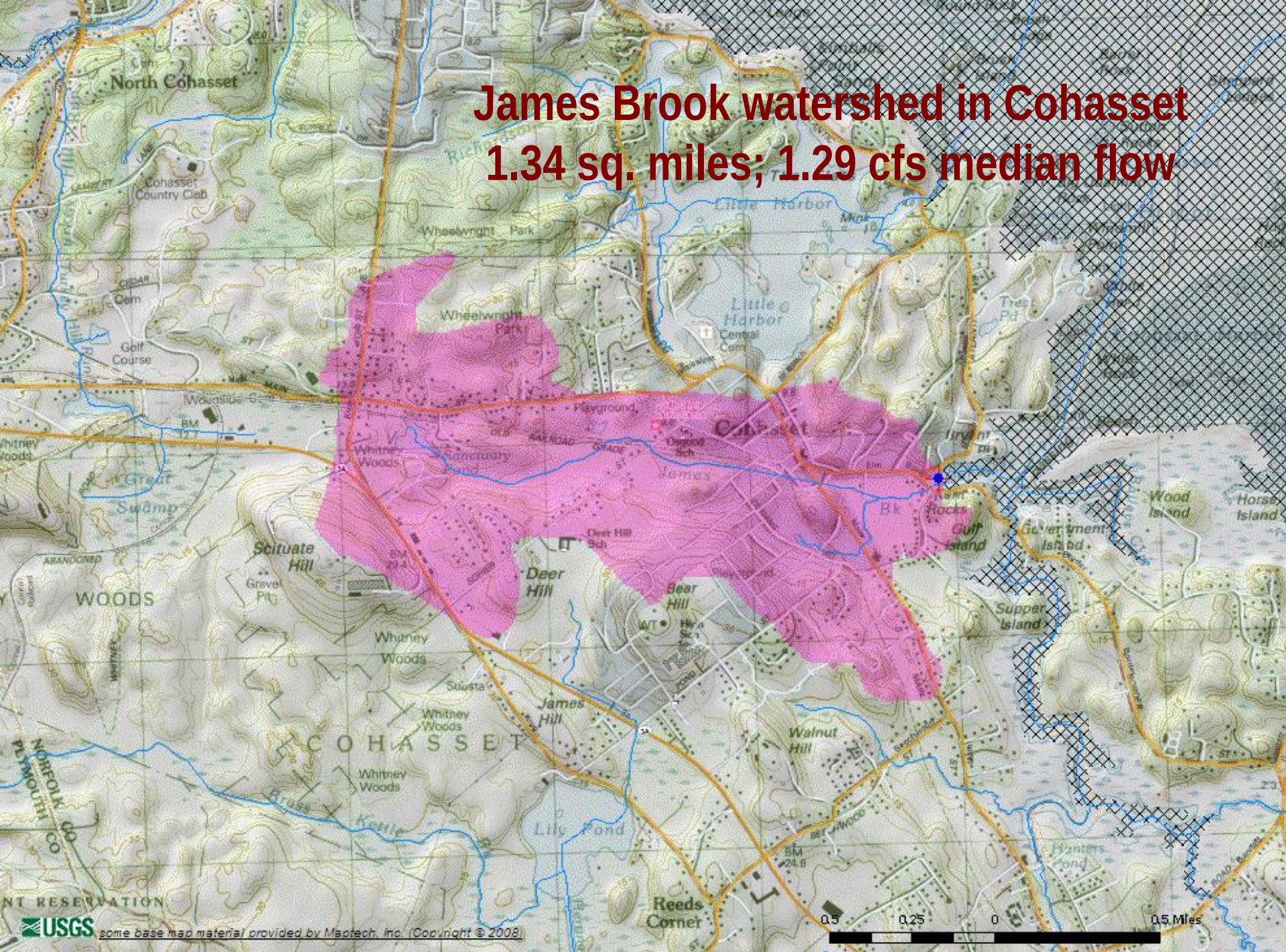
4 days

© 2009 Europa Technologies
© 2009 Tele Atlas

©2009 Google™

James Brook watershed in Cohasset

1.34 sq. miles; 1.29 cfs median flow



63 days

White Rock

Cohasset Cohasset, Massachusetts

Wood Island

Hors

© 2009 Europa Technologies
© 2009 Tele Atlas

©2009 Google

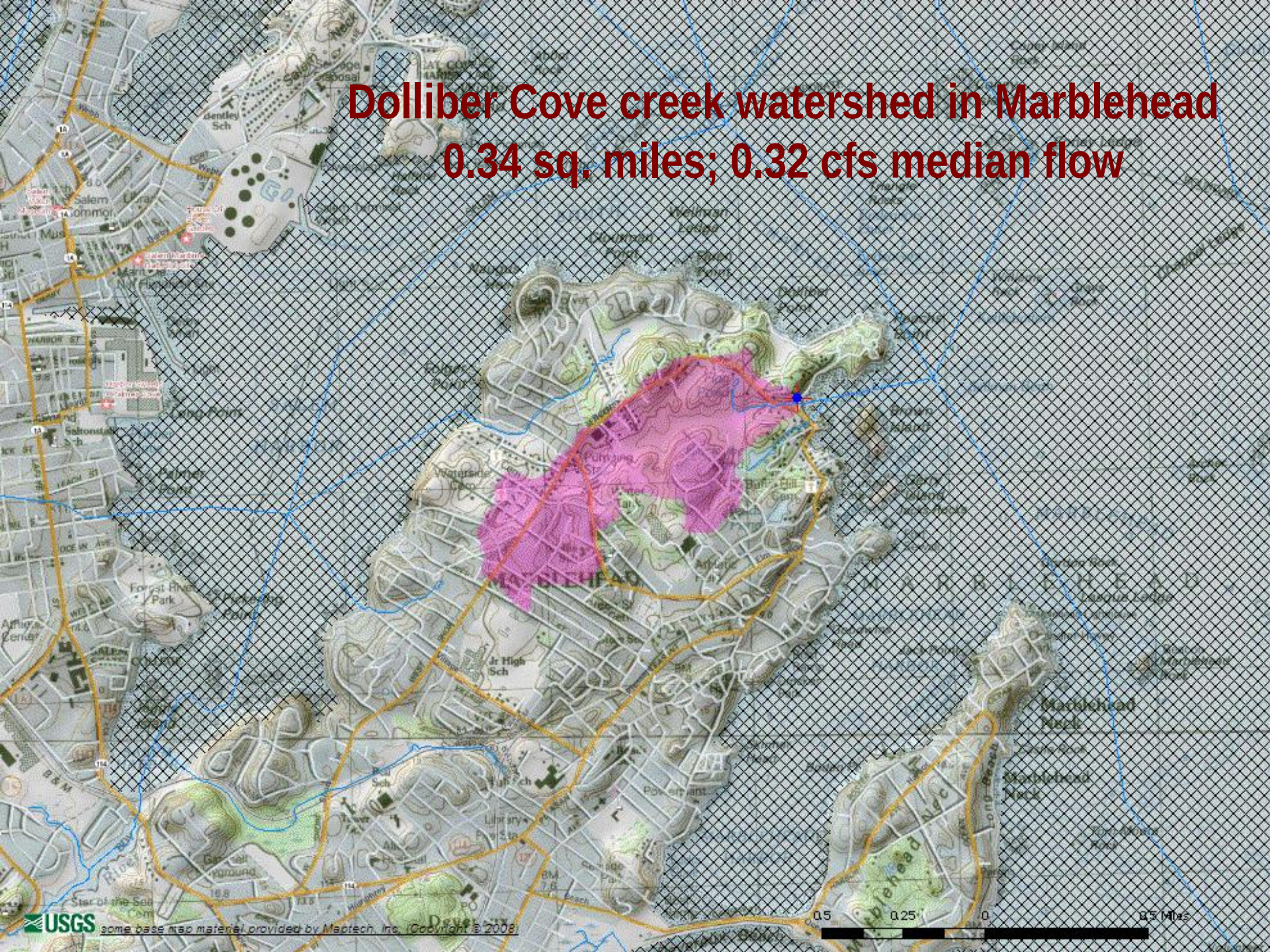
Imagery Date: Jul 29, 2007

42°14'23.95"N 70°47'29.26"W elev 2 ft

Eye alt 7423 ft

Dolliber Cove creek watershed in Marblehead

0.34 sq. miles; 0.32 cfs median flow



Mar 18, 2009 3:03 pm

Pitman Rock

29 days

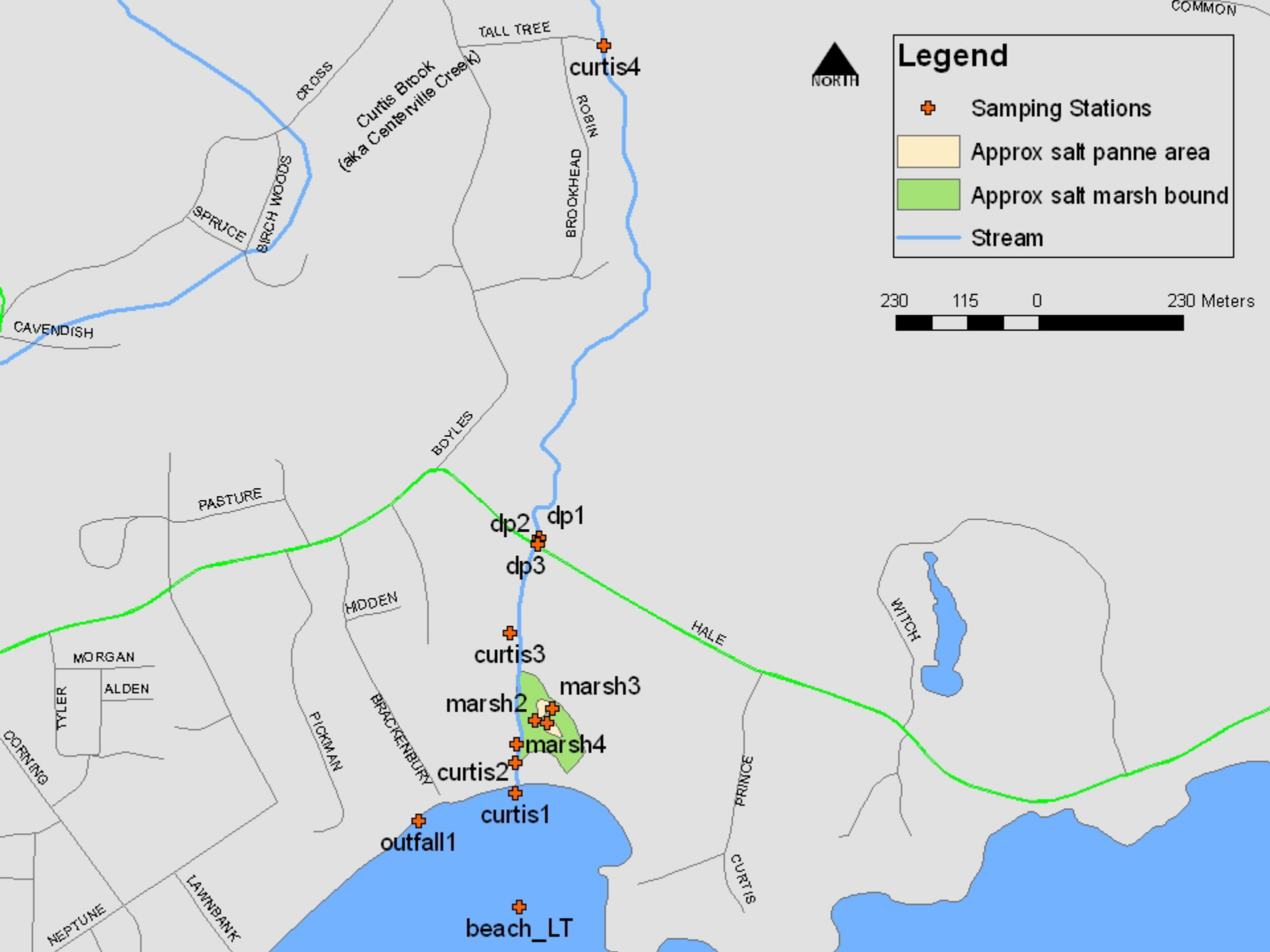
Brown Island

Gerry Is
Jack Rock

© 2009 Europa Technologies
© 2009 Tele Atlas

Google













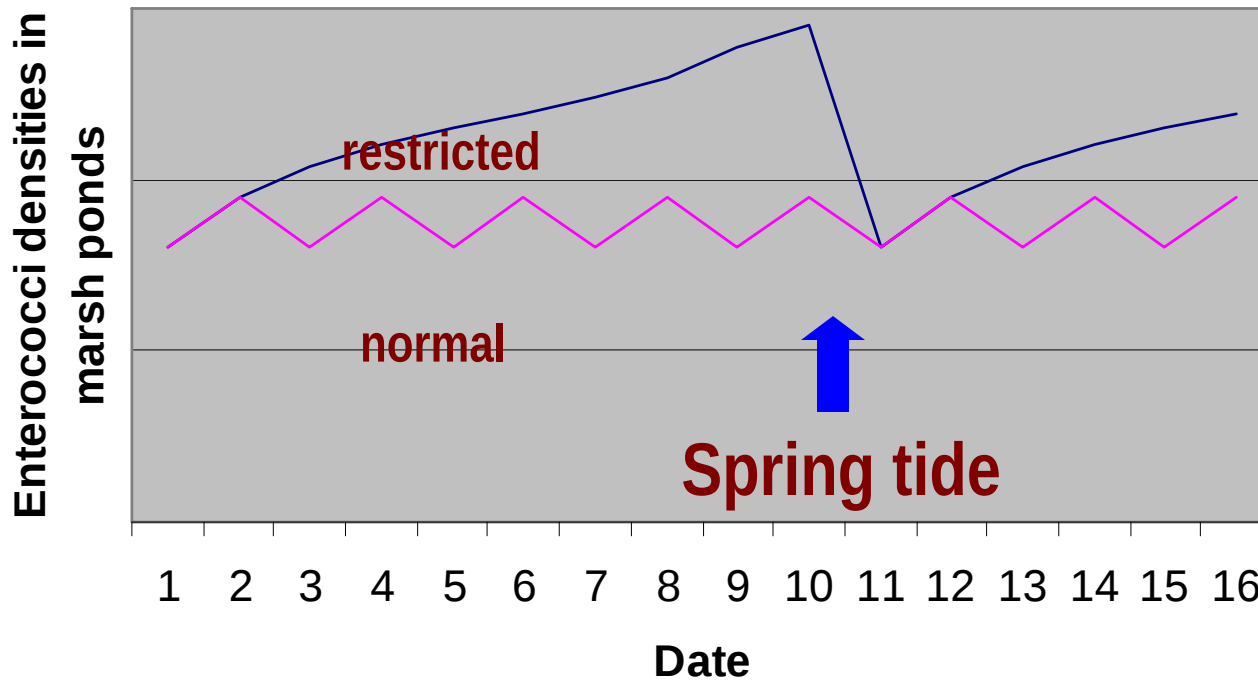


Factors influencing water quality at the beach

- ✂ In wet weather, bacteria levels influenced by upstream sources, in Curtis/Centerville/Thistle Brook
- ✂ During dry weather, bacteria levels strongly influenced by marsh
- ✂ More bacteria are discharged from marsh during ebbing spring (extreme) tides than during normal tides
- ✂ Tidal restriction is present in the marsh, suggesting that the marsh does not flush sufficiently on a regular basis
- ✂ Bacteria grow during warm conditions within the pannes, and then on spring tides (2 to 4 times per month), high levels are flushed out, resulting in possible beach closures

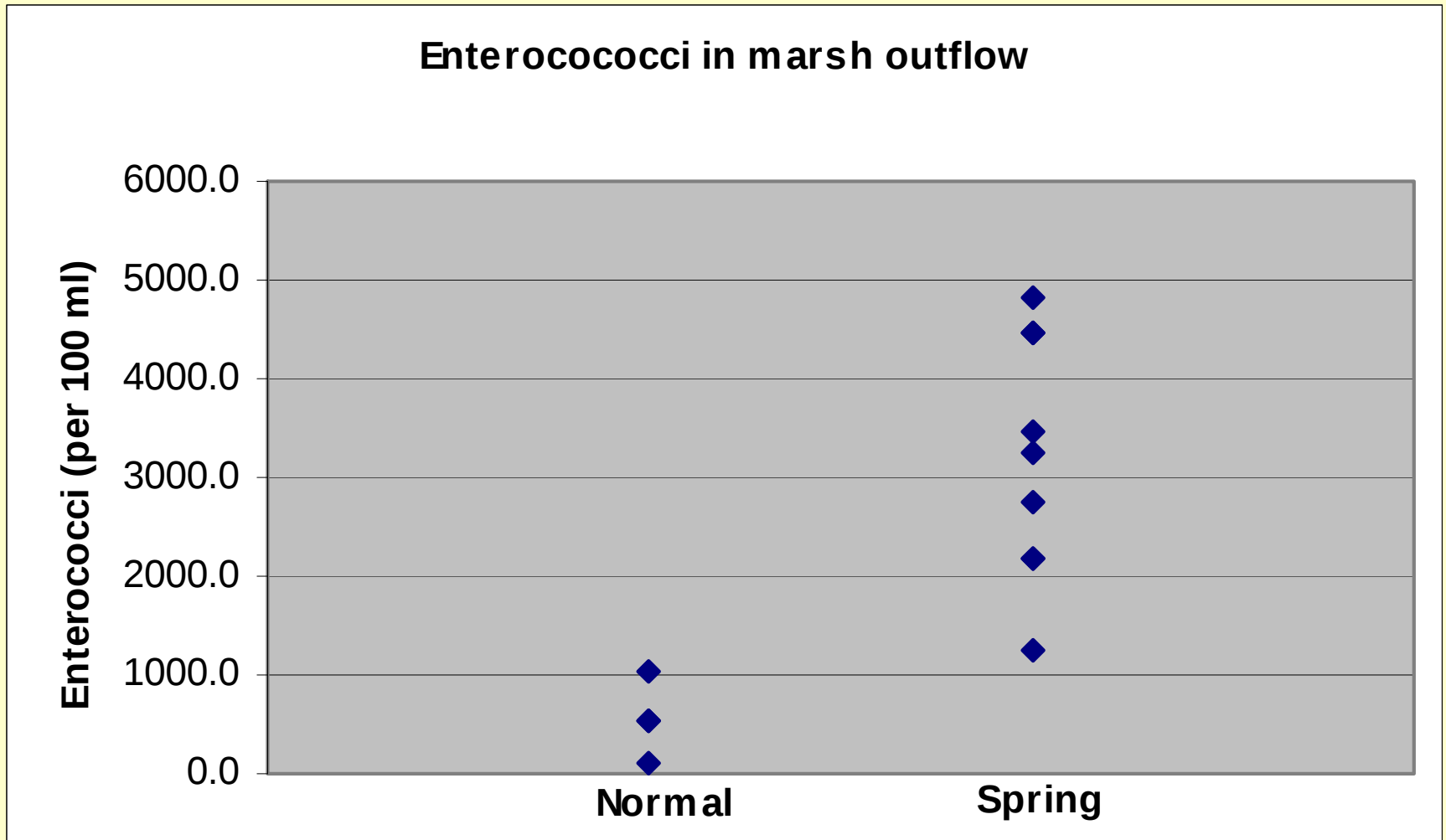
Conceptual model of influence of spring tides on bacteria in marsh outflow

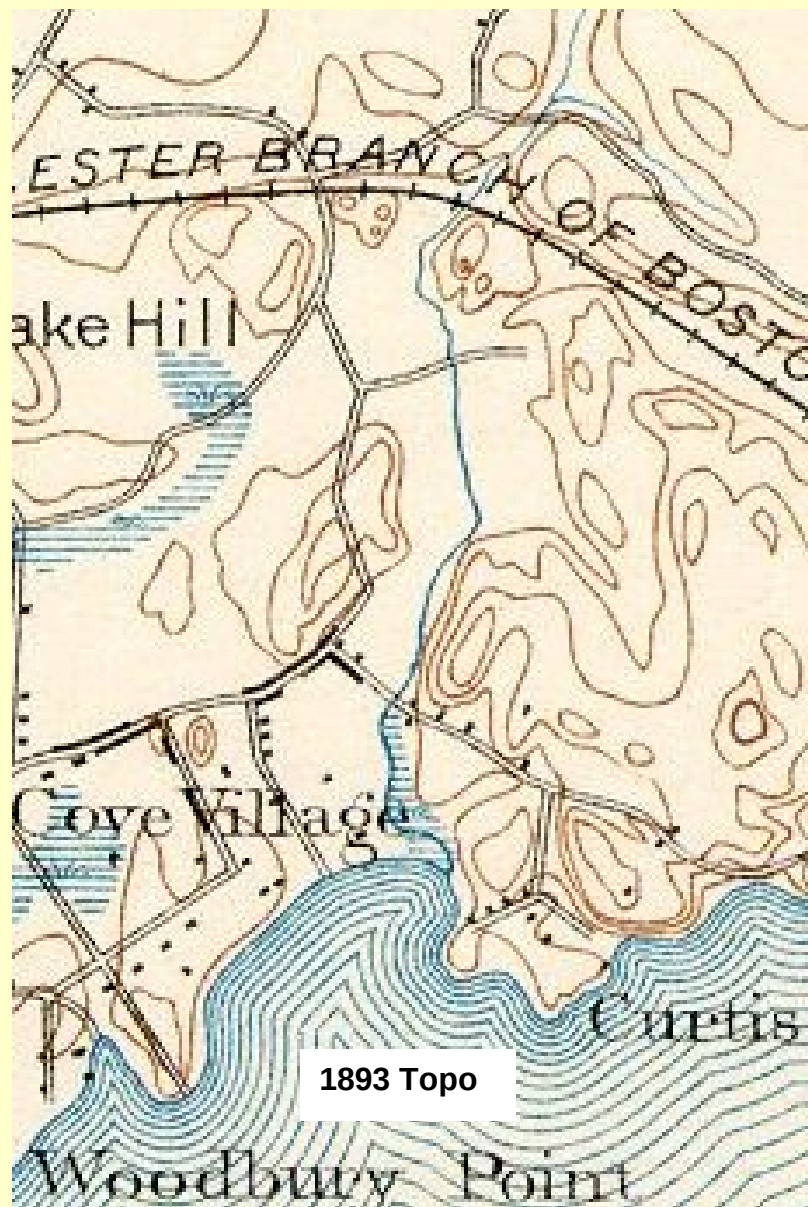
Environmental growth of enterococci in marsh pools affected by spring tides



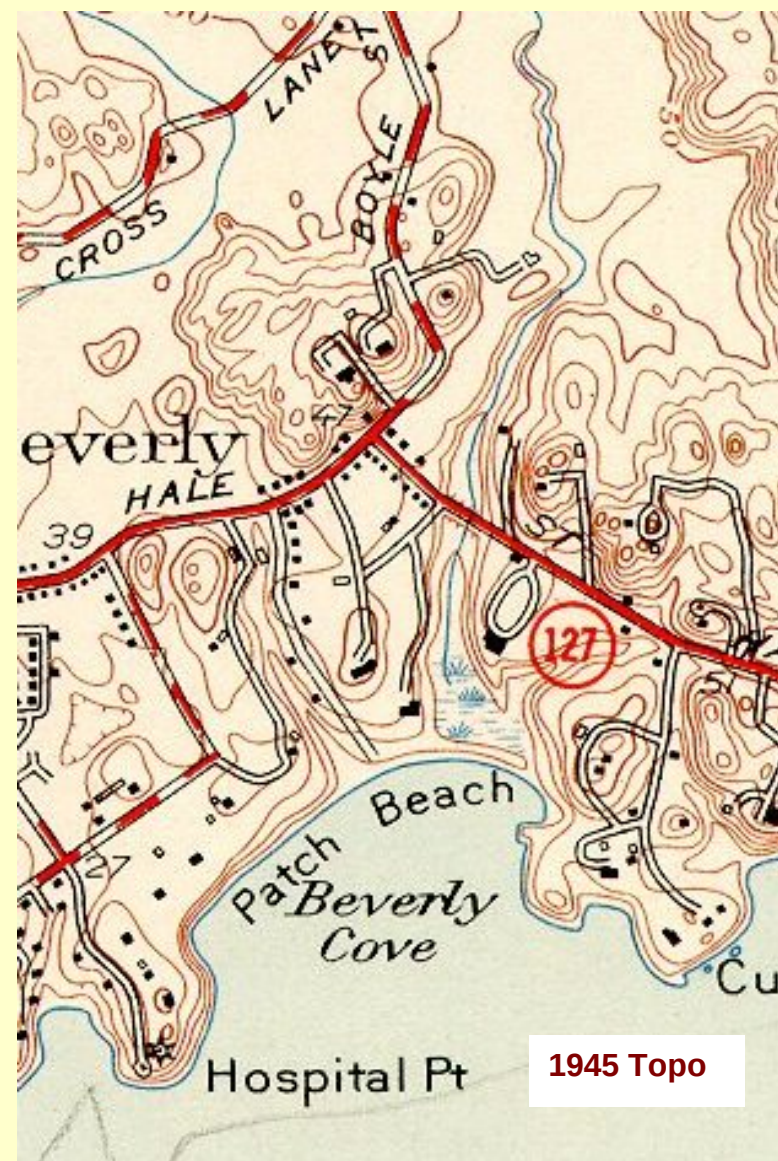


Spring (extreme) tides appear to extract more indicator bacteria out of marsh ponds

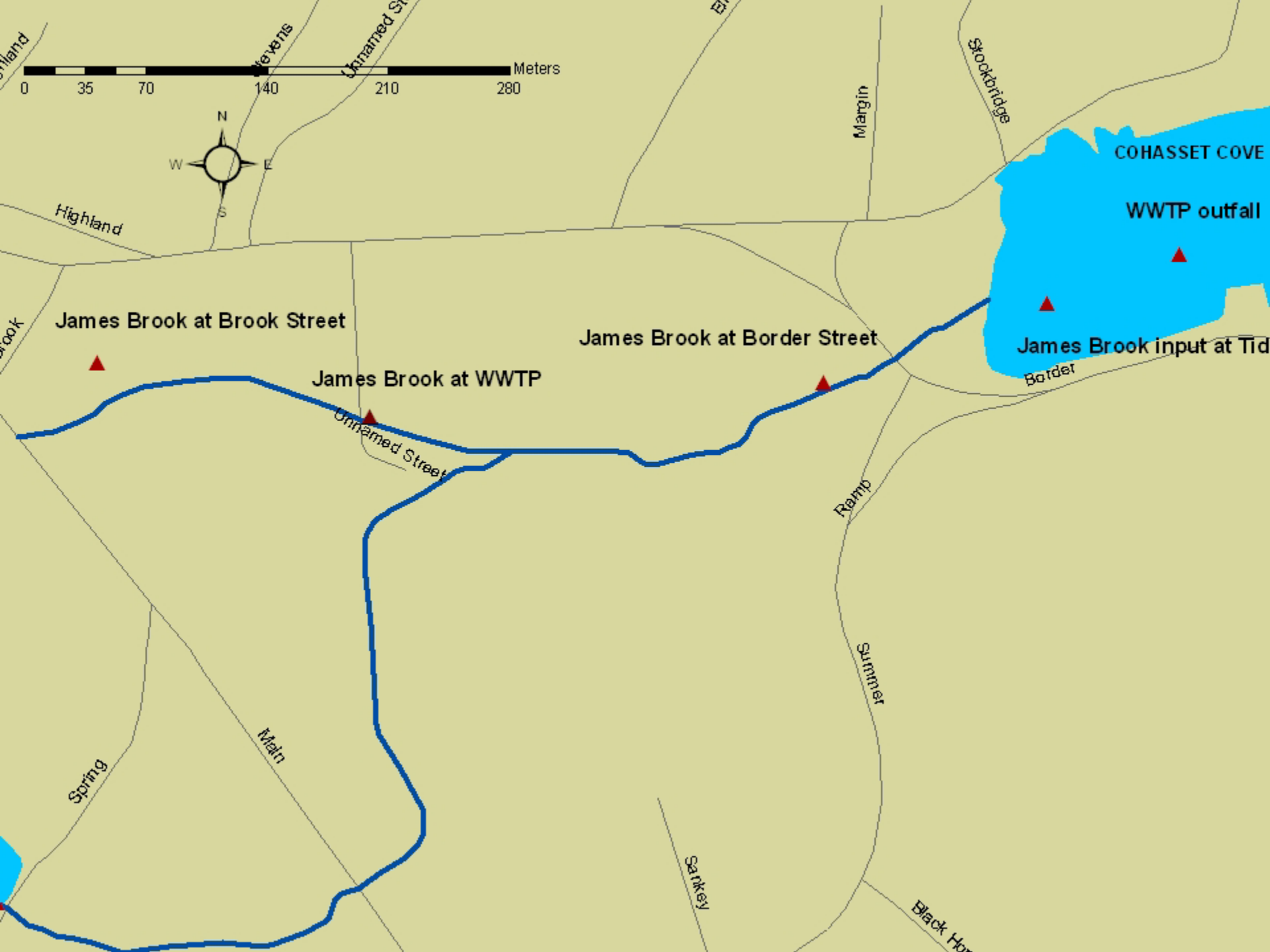




1893 Topo



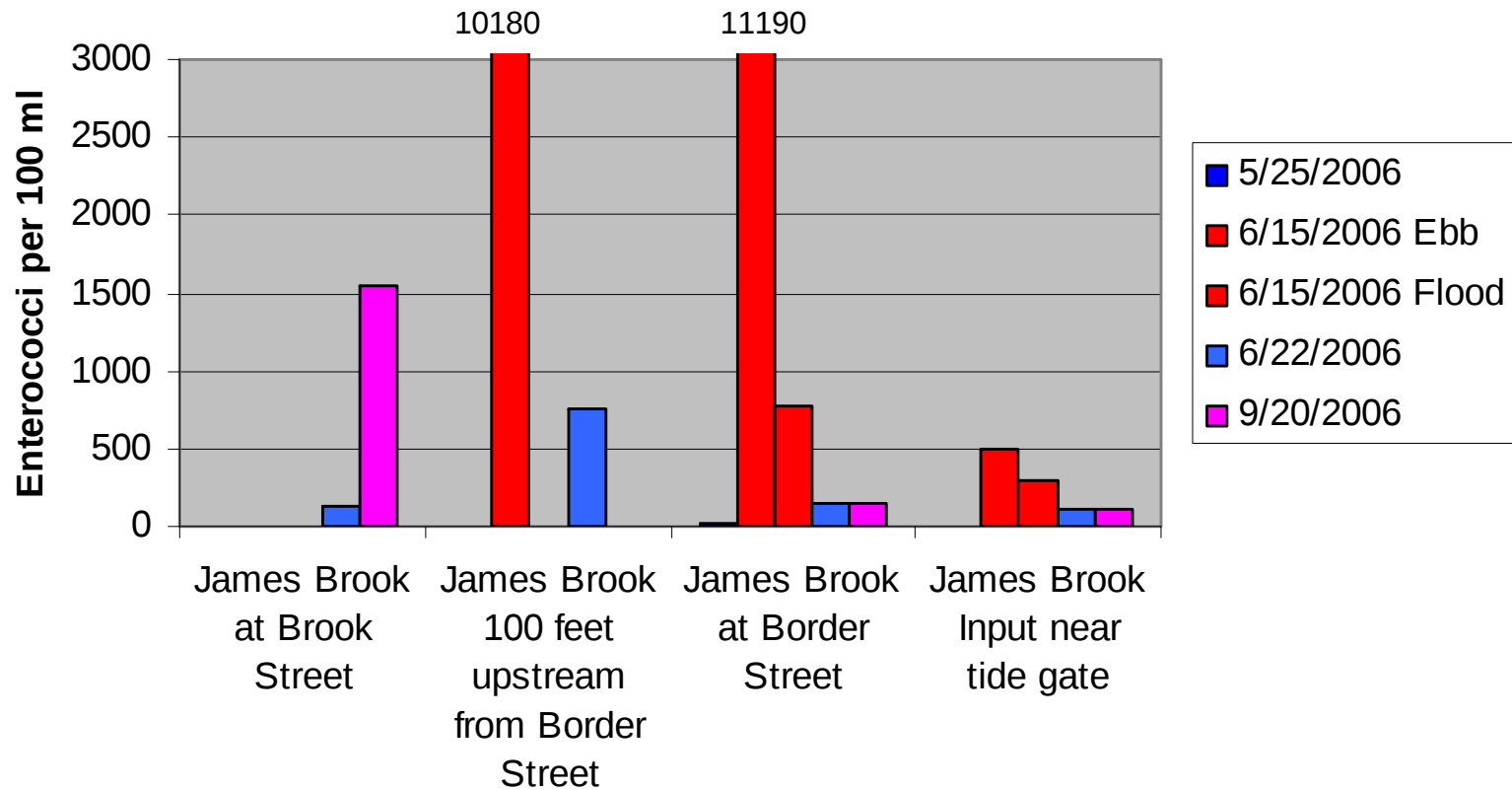
1945 Topo



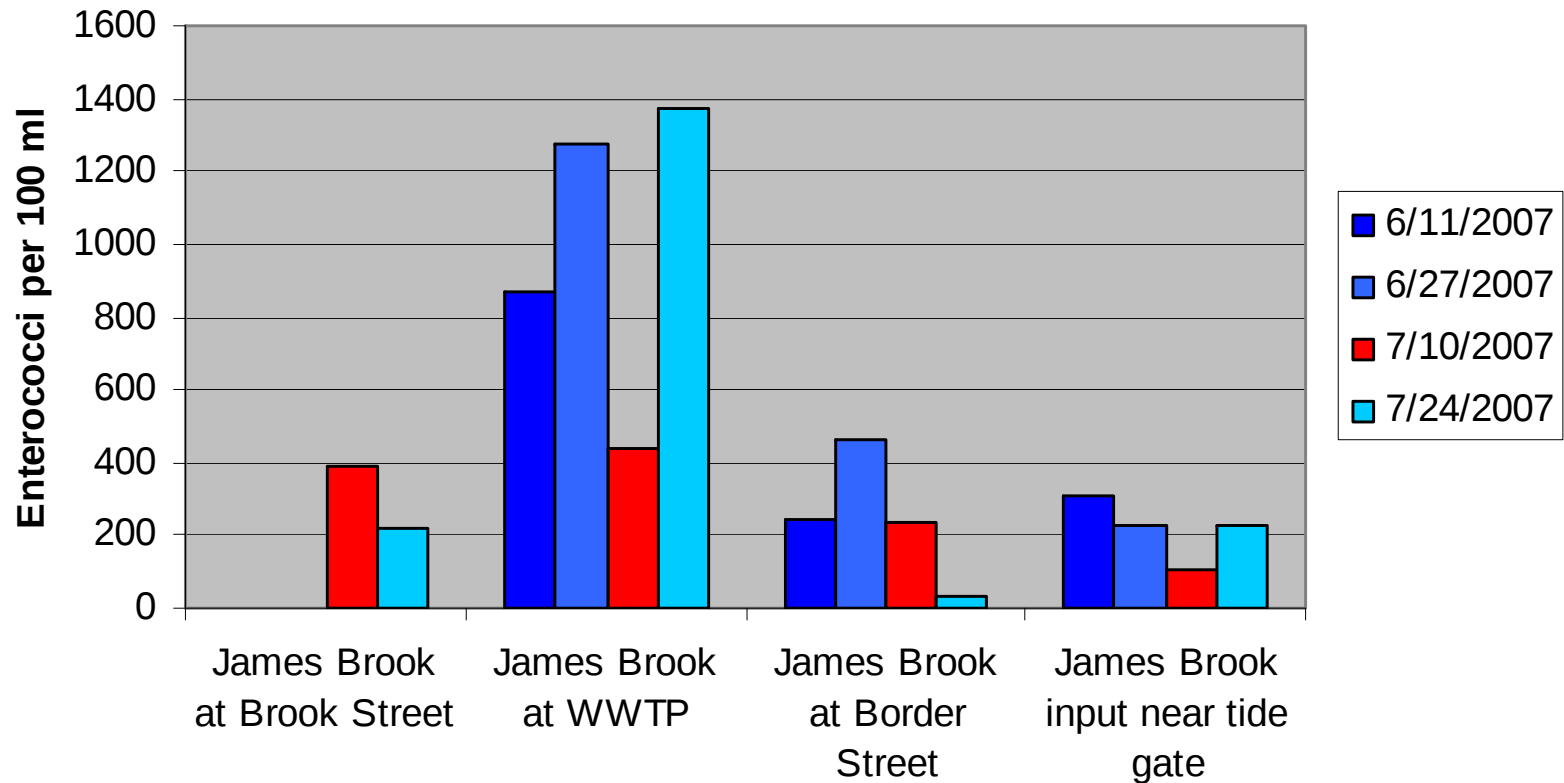




Wet weather often associated with high bacteria densities



WWTP appears to be a major source; little mixing in the cove





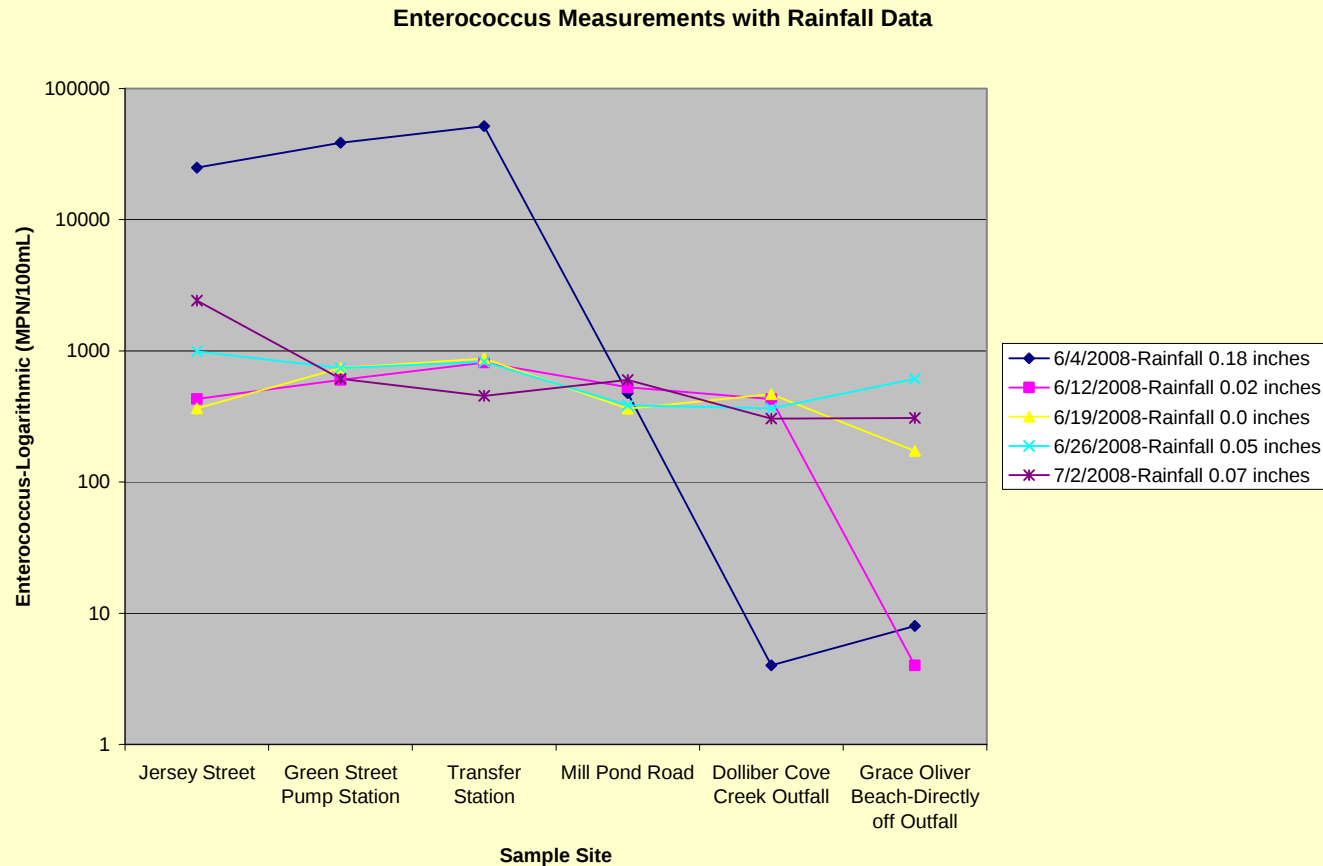






Is their attenuation in the swamp?

Most attenuation is in the open creek



Conclusions

- ✖ Small neighborhood beaches often influenced by stormwater from coastal streams that have become integrated into the stormwater system
- ✖ Ultimate sources of bacteria can often be controlled
- ✖ Poorly functioning wetlands or riparian habitat do not provide the community ecology to attenuate the bacteria
- ✖ Restoring coastal habitat may also result in improvements in water quality



epa.gov/ne/eco/beaches

