THE TAUNTON BAY STUDY
A pilot project in collaborative bay management

MAPPING REPORT
With 23 MAPS

Steve Perrin
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DMR Mosaic of Taunton Bay, 2005

Greenleaf's Map of the District of Maine, 1815

Friends of Taunton Bay

May 5, 2006

Mapping Report 2005

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Photographs by Steve Perrin

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended.
Administered by the Office of Ocean and Coastal Resource Management,
National Oceanic and Atmospheric Administration.

The Taunton Bay Study
MAPPING REPORT 2005

Steve Perrin, President, Friends of Taunton Bay
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Introduction

The Mapping Working Group was formed to "develop transferable community mapping capabilities to provide products useful to collaborative decision making and bay management in a watershed setting" (Friends of Taunton Bay (FTB) Bay Management Pilot Project Proposal, November 12, 2004). That has translated into an evolving list of maps, of which this report constitutes the ultimate version in containing not only the list but the resulting twenty-three maps themselves. GIS mapping was done primarily by the director and students of The Geographic Information Systems Laboratory at College of the Atlantic (COA) in Bar Harbor. Steve Perrin produced early drafts of several maps using FTB's venerable mapping software. Cartography was done by:

Gordon Longsworth, Director, GIS Laboratory, COA
Lauren Alnwick-Pfund, GIS student, COA
Marianna Bradley. GIS student, COA
Julien Delarue, GIS student, COA
Apoorv Gehlot, GIS student, COA

Clarity and simplicity were adopted as characteristics of maps that would be useful to a wide variety of stakeholders. Uniformity of format was also desirable, but with five different cartographers involved, it proved somewhat elusive, requiring last-minute revisions as the project neared its end. Mapping standards were discussed and, as far as possible, set during a conference call between QLF, DMR, and COA mapping personnel on May 26, 2005. Additional mapping issues were discussed at COA on November 8 by Seth Barker (DMR), Vanessa Levesque (NOAA Fellow), Gordon Longsworth (COA), and Steve Perrin (FTB). To facilitate progress, Gordon and Steve have remained in contact on a weekly basis, usually meeting at the GIS Lab, often with student cartographers.

The maps are intended to provide stakeholders and coastal managers with information about the bay and its watershed. Four of the maps are based on watershed data (relief, hydrology, soils suitability for development, and parcels). The other nineteen are based on data for the bay itself (examples include aquaculture sites, selected fisheries, clam flat closures, primary producers, horseshoe crab habitats, and drifter studies). Several of the maps are based on indicator data gathered during the project year 2005 (lobster and crab buoy locations, harbor seal haulouts, watershed parcels, drifter studies, and bluff stability). The estuary stress gradient map is a graphic presentation of a concept: it shows how water temperature and salinity ranges, species diversity, and water velocity stretch along a gradient from the estuary mouth to the head of the bay. Four of the maps are to be reproduced in the May 2006 Friends of Taunton Bay Newsletter.

Making this information available was seen as one of the primary goals of the project; a quarter of the $20,000 state grant was dedicated to producing the maps. To be effective, ecosystem-based management is dependent on detailed and reliable information about the coastal waters to be managed. Development of a comprehensive management plan for Taunton Bay requires good data about these particular waters. Maps and ecosystems go together in being place-based. ❑

Taunton Bay Locator Map

Caveat.

Where on Earth is Taunton Bay? It is the northernmost arm of Frenchman Bay, which is an arm of the Gulf of Maine, in turn again an arm of the North Atlantic Ocean. But we are more comfortable thinking of locations in terms of places on dry land. Taunton Bay lies ten miles north of Bar Harbor and Acadia National Park. It is situated near Ellsworth in the Hancock County towns of Franklin, Hancock, and Sullivan in the state of Maine, U.S.A., North American Continent, Western Hemisphere, Earth, Solar System, Milky Way Galaxy, etc. Here is where it is, right where it should be. Except that 18,000 years ago it was under a mountain of ice sweeping out of the Laurentian Plateau, a vast dome of granite in what we now call Canada, and only gradually emerged after the ice mountain receded, the land depressed by ice lifted from the sea, and lo, there it is, Taunton Bay, as it is now if not as it always has been, or will be tomorrow.

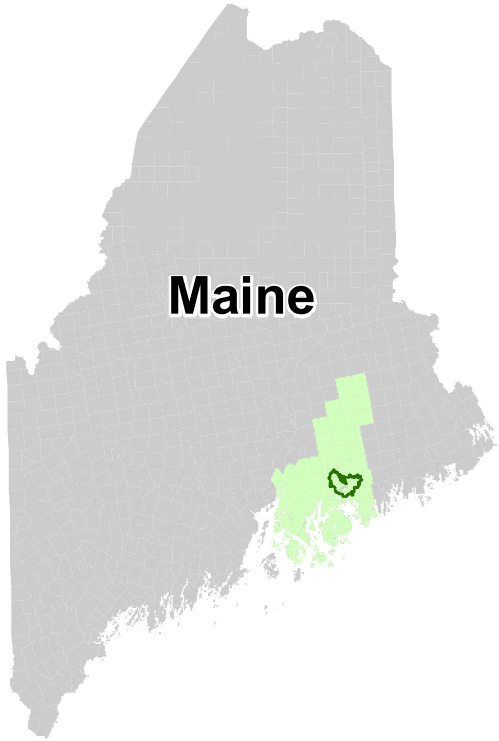
The bay is always changing. You can't exactly put a finger on it and claim, "Here it is, Taunton Bay." What it is is time dependent. Just wait a few minutes. The tide will be higher or lower, and those tidal waters are what Taunton Bay is. It is not a place on a map, it is an estuary on the ever-lively coast of Maine, growing, changing, receding every minute, every hour, every day, every season, every year. That water was here just a minute ago, where did it go? That seagull, that floating branch, that wave—where are they now?

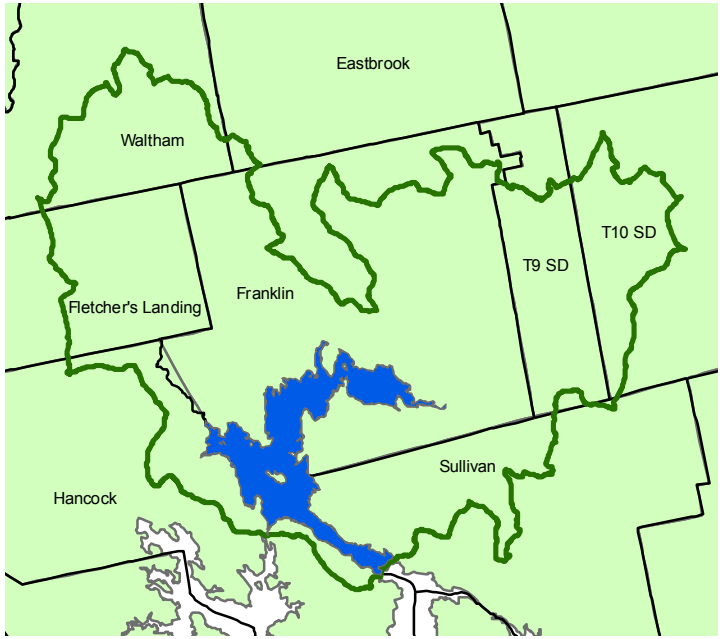
Taunton Bay leads a double life as a concept in the human mind and as a facet of the universe. The two are not the same. Yet we act as if they were. Be cautious with maps, they are conceptual, artifacts of our thinking, not aspects of the world. Map reader, beware. Maps lie because they are chock full of assumptions, conventions, and distortions, none of them true. If we cannot distinguish between a map and the territory it represents, then we live a symbolic life. Maps leave all the good stuff out, the details, the energy, the life. Maps are dead while the places they depict are alive. The living waters of Taunton Bay will never be captured on paper.

Beware of this report. Do not believe any of it. Doubt, probe, ask, and ask again. Can this be true? How can we tell? Who says? By what authority? And so on. Don't be sucked into the myth that people can know or understand events on this rock we call our home planet. We know nothing, understand nothing, but act all the while as if we did. To prove it, get your boots and walk out on a mudflat at low tide. That will put you in a different universe than you are accustomed to. You can't map a mudflat any more than you can a cup of tea. Things are never what we think they are, say they are, want them to be.

So, where is Taunton Bay? In our heads, along with everything else we know, feel, believe, and do. Which as far as we are concerned is the only place anything can be. Our physical apparatus has a hand in all our activities. When we speak, we can only speak about ourselves and the way things seem to us. Which we learned over the course of our lifetime up till this instant. The truth is only our personal truth. We are wholly unable to get beyond ourselves to see what's really going on. Who can say where Taunton Bay is, when it is, what it is, why it is?

Maps are conventions. This report is a series of conventions. It is meant to prompt you to grapple with the reality of Taunton Bay on your own. Don't be gulled by the maps or the words. ❑





Legend

- Taunton Bay Watershed
- Taunton Bay
- Towns

Taunton Bay Locator Map

Map Prepared By
College of the Atlantic
May 2006

Friends of Taunton Bay
Contact: steveperrin@verizon.net

N

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended.
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National Oceanic and Atmospheric Administration.

The Frenchman Bay Region

Looking from Taunton Bay across Skillings River to Frenchman Bay and Mount Desert Island.

Taunton Bay is the northernmost estuary at the head of Frenchman Bay. Other estuaries in the area include Jordan River, Raccoon Cove, Skillings River, and Flanders Bay. Of them all, Taunton Bay is the largest (3,772 acres), and has the most extensive mudflats. Twice a day these estuaries exchange tidal waters with Frenchman Bay, influencing and being influenced by that greater marine system. To avoid the notion that each of these bays is ecologically independent of the others, it is essential to remember the common setting within which each of them functions. This regional map is meant to remind us of that fact.

Frenchman Bay is linked to the Gulf of Maine by the Eastern Maine Coastal Current which flows in a southwesterly direction parallel to the coast. It is also influenced by tidal currents varying with the season and phase of the moon. Surface currents are influenced by prevailing winds, generally from the southwest in summer, northwest in winter. Tidal waters flow between Taunton Bay and Sullivan Harbor, the two bodies constituting a single tidal exchange system. Free-floating objects such as a log or a plank will sometimes ride back and forth between the two bays, carried on the tide for a number of days.

Frenchman Bay is sometimes mistakenly called Frenchmen Bay, but it more accurately honors one particular man, not Samuel Champlain as is sometimes claimed, but Antoine Launay, who took the name of Cadillac. “Frenchman Bay east of Mount Desert Island was named for Antoine Launay de la Mothe Cadillac, who later founded Detroit and became governor of Louisiana. He lived briefly on the bay in 1687–1688 and laid claim to its islands, including Mount Desert. Land titles in the area are based on Cadillac’s grant from the governor of New France”(Steve Perrin, *Acadia’s Trails and Terrain,* Eastern National, 2002). Some sources say that Cadillac’s grant in the region known as Donaquec was on the Union River, but others allow it could have been centered on Taunton River, stretching along the shore of Frenchman Bay in both directions, embracing the islands, including Mount Desert. Bar Harbor, gateway to the eastern division of Acadia National Park, is ten miles south of Taunton Bay. ❑

THE TAUNTON BAY STUDY

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Frenchman Bay Region

Legend

- Taunton Bay
- Taunton Bay Watershed

Friends of Taunton Bay
Contact: steveperrin@verizon.net

Sources:
Maine Office of GIS
College of the Atlantic

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended.
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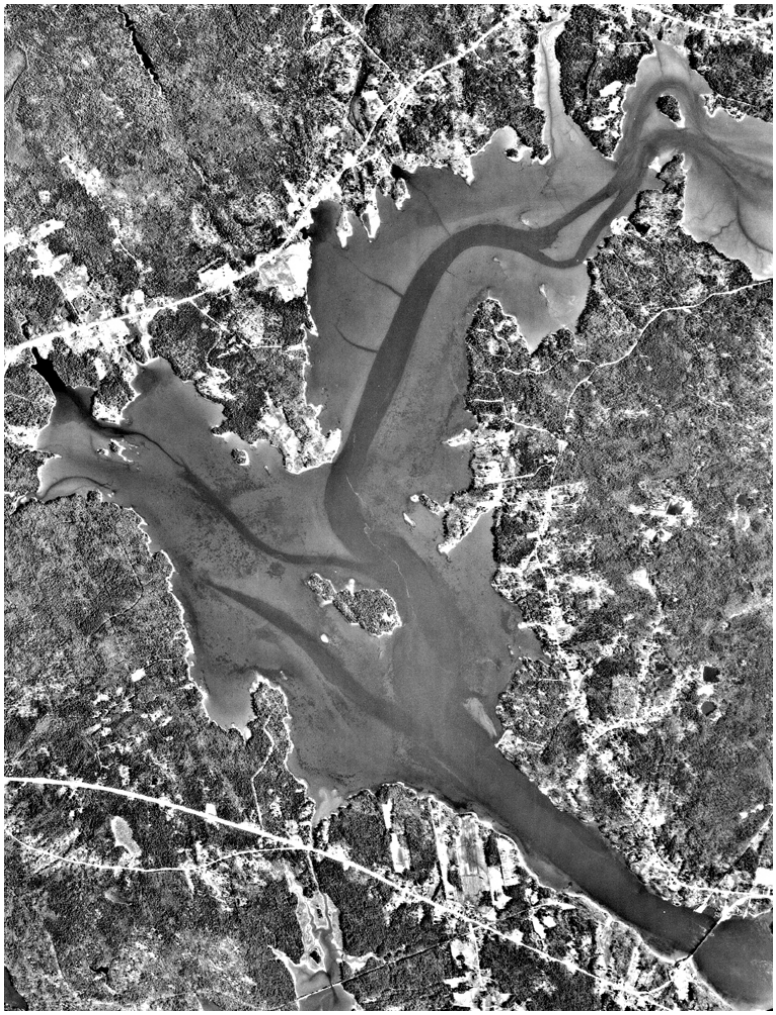
Map Prepared By
College of the Atlantic
May 2006

Taunton Bay at a Glance



Taunton Bay, May 14, 1996.

Maps give us the vision of angels, astronauts, parachutists, hawks, or alien beings from other worlds. We are not ourselves when we gaze at a map because we are sitting in a chair in a room contemplating a view we could never have if we tried. On the map on the opposite page, features are labeled, which in the everyday world they are not. Symbols are keyed to explanations of what they stand for, while in nature things simply are what they are without being keyed to words, things they are not.

Taunton Bay at a Glance is the name of the map, but it takes a lifetime at least to acquaint such a place. What does a lifetime reveal about Taunton Bay that this map is attempting to convey all at once?

Taunton Bay stretches between Tidal Falls at its mouth and extensive mudflats at its head. Falls Point extends well into Taunton River, constricting the flow so that water races to get past. The bay is hospitable to eagles, horseshoe crabs, eelgrass, migrating shorebirds, harbor seals, among a wide variety of other species. It hosts an oyster aquaculture farm, and two land-based aquaculture operations. Granite quarries and mines dot the landscape. The western shore rests on bedrock composed of Ellsworth schist, much of the eastern shore on granite. Place names are given to streams, points, bays, and islands.

What the map doesn't say is that mussels, clams, and baitworms are harvested from these flats and waters, along with lobsters and crabs, alewives, elvers, scallops, and urchins. It is also silent about shipbuilding in former years, agriculture, logging, and what life was like in the booming era of underground mines (1870s–1880s) and granite quarries (1830s–1930s). The map says little about the people who now live and have lived around the bay. It doesn't say the old "Singing Bridge" was replaced by a voiceless bridge in 2000, or that the mellow note of the last train was heard in 1965. No mention is made of the Red Paint People who were here 7,000 years ago, or the ceramic culture that was here when the French settled the area, and then the English. There is no wind on this map, and no tide. It is good to remember that a map is a map and not a place. ❑

THE TAUNTON BAY STUDY

Taunton Bay at a Glance

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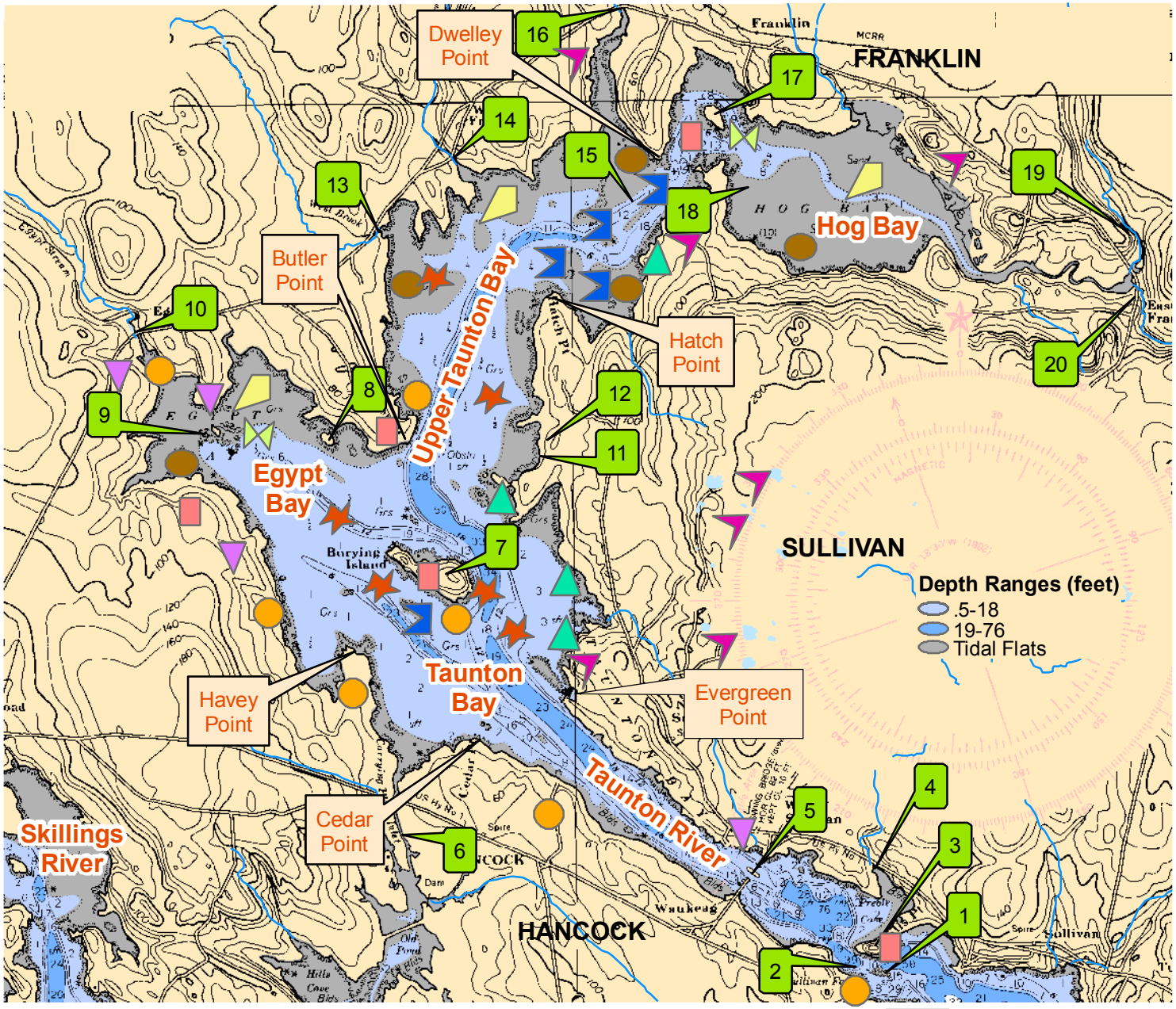

Legend

- American bald eagle habitat
- Bedrock: Ellsworth Schist
- Bedrock: Granite
- Eelgrass decline
- Horseshoe Crab habitat
- Mudflats
- Selected Silver and Copper mines
- Granite quarries
- Migrating Shorebirds (mid-Jul to mid-Sep)
- Harbor seal haulouts

1 Falls Island
2 Hancock-Sullivan Tidal Falls
3 Falls Point
4 Clapham Brook
5 U.S. Route 1 Bridge
6 Carrying Place Inlet (canal dug in 1852)
7 Burying Island
8 Butler Island
9 Twin Islands
10 Egypt Stream
11 UMaine Center for Cooperative Aquaculture Research
12 USDA National Cold Water Marine Aquaculture Research Ctr.
13 West Brook
14 Mill Brook
15 Oyster Farm
16 Springer Creek
17 Round Island
18 Oyster Nursery
19 Card Mill Stream
20 Johnnys Brook

Map Prepared By
College of the Atlantic
May 2006

Friends of Taunton Bay
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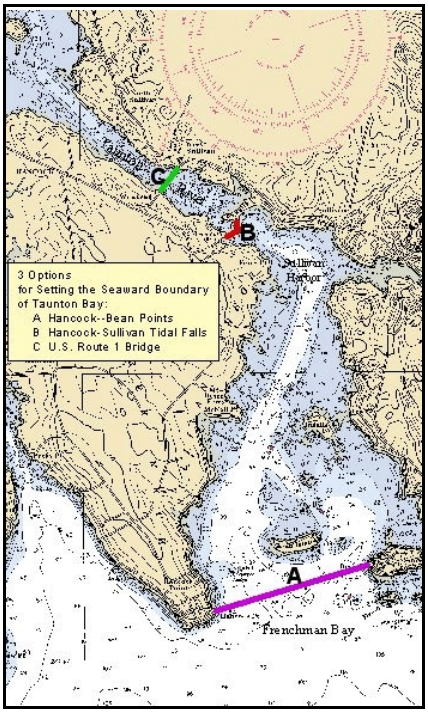
Cartography By: Apoorv Gehlot
GIS Lab, College of the Atlantic

Sources:
NOAA: Chart 13318_1
Maine Office of GIS
Maine DMR
College of the Atlantic

0 0.5 1 Miles

Project Base Map

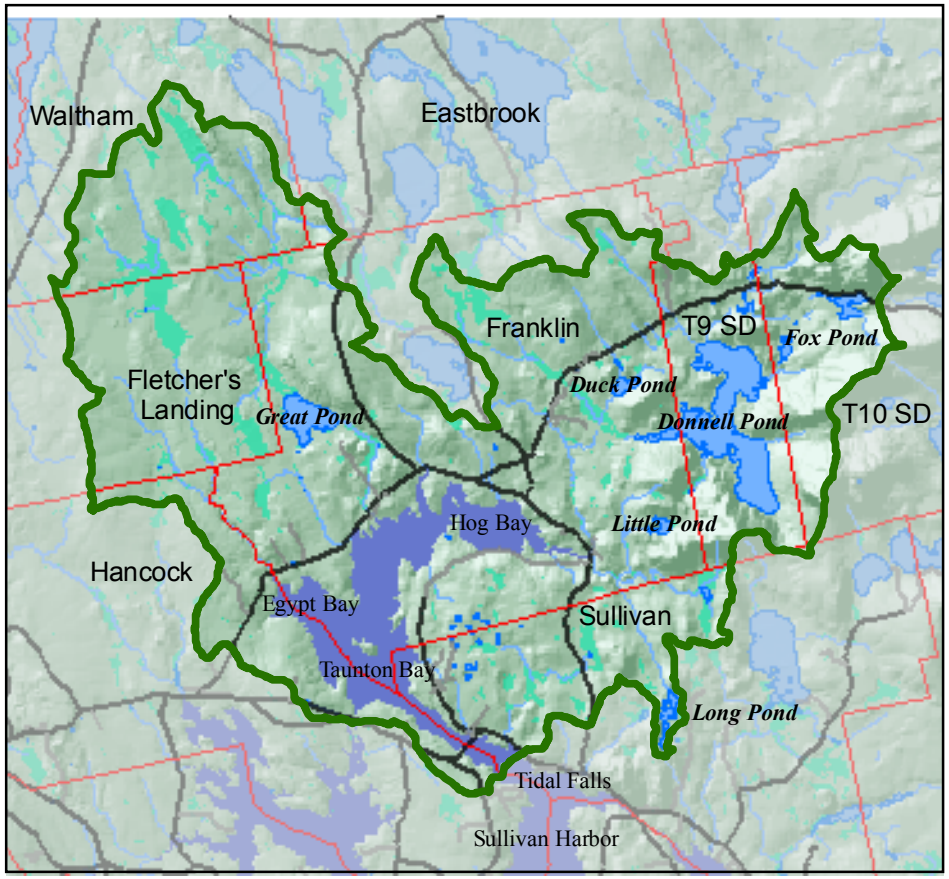
The first map done for The Taunton Bay Study was this base map consisting of two views, one of the estuary itself (right), the other of the estuary's watershed (left). The watershed map delineates that portion of Earth's surface that drains to Taunton Bay through fresh water runoff, seepage, and small streams. The green border follows the ridgeline marking the divide between the watershed of Taunton Bay and neighboring watersheds (Skillings River, Union River, Narraguagus River, Sullivan Harbor). The watershed map shows main roads, town boundaries, streams, ponds, wetlands, and topography in shaded relief. The estuary map is a portion of NOAA Nautical Chart 13318, Frenchman Bay and Mount Desert Island. Soundings are given in feet. The chart is said to be periodically corrected, but contains a number of inaccuracies nonetheless, such as the swing span on the old "Singing Bridge," bottom types, eelgrass coverage, depths at mean low water, secondary roads, among others.

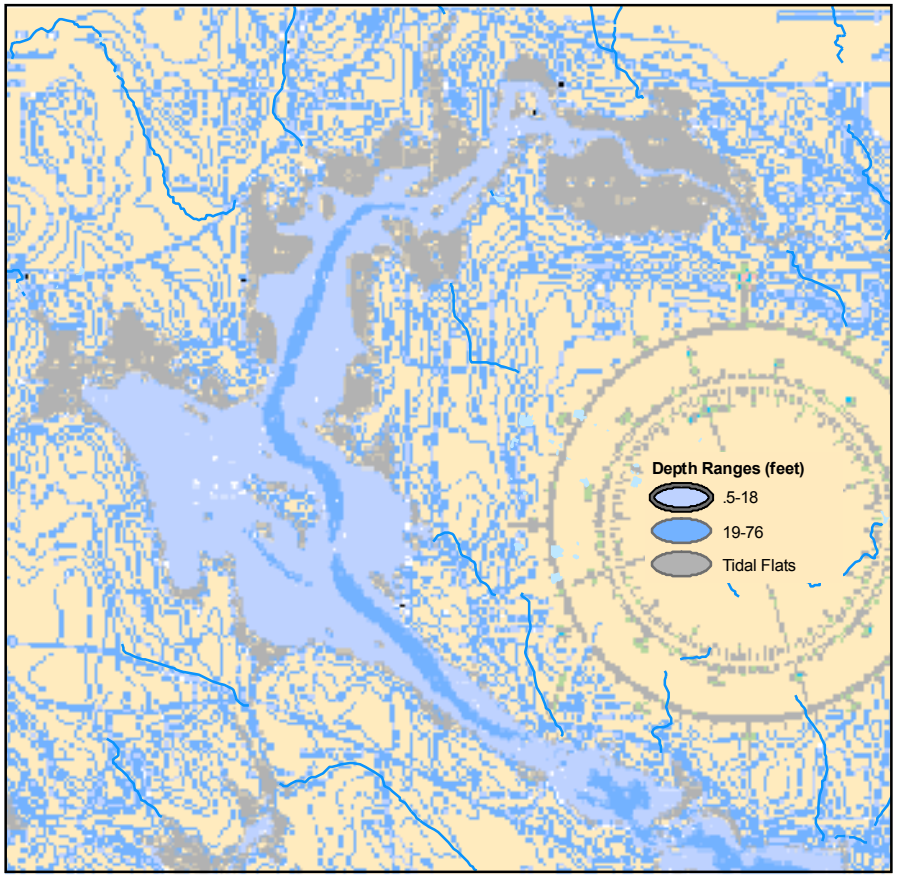


Alternative limits to Taunton Bay.

In these two views, the seaward limit of Taunton Bay is taken to be Falls Island at the eastern end of Tidal Falls in Hancock and Sullivan. This was decided on ecological grounds based on the height-of-tide differential across the falls (due to the constricted entrance and ten-foot sill), and the consequent tidal delay of approximately an hour-and-a-half behind tides in Bar Harbor. Cases can be made for setting the limit of the bay at the U.S. Route 1 bridge over Taunton River (a cultural boundary), or at a line between Hancock Point and Bean Point in Sorrento, which would include Sullivan Harbor and Long Cove. Madame de Leval's map from the early 1790s (*see page 10*) shows Taunton Bay starting between these two points. Watershed bounds are set according to the interests of those who define them from a particular geographic point of concern ("Everywhere upslope from *here* is in the watershed"). Boaters agree that Taunton River begins at the falls (you have to adopt a certain mindset to navigate that passage), and all water passing through the river drains from or flows into Taunton Bay, so ecologically and practically Taunton Bay can be said to begin at Falls Island.

Traditionally, land uses and marine water uses have been managed separately by towns and different state agencies. The point of showing these two views side-by-side is to encourage stakeholders (those with an interest in Taunton Bay) to see land uses and water uses as parts of the same picture. Since a watershed is defined by its receiving waters, all human uses of land within the watershed influence those receiving waters every bit as much as any direct uses of those receiving waters themselves. All human uses, whether in the watershed or on the bay, can affect the Taunton Bay ecosystem, which in turn affects land users and water users alike. It is in the best interests of all users to maintain water quality in the bay at as high a level as possible. Closed clam flats—there are eight of them in Taunton Bay as of 2005 (*see pages 18–19*)—are a sure sign that stakeholders have taken the health of the bay for granted. As development increases, acceptance of stewardship roles by all stakeholders would be appropriate. ❑





Sources:
NOAA: Chart 13318_1
Maine Office of GIS
Maine DMR
College of the Atlantic

Legend

- Taunton Bay Watershed
- Estuary
- Lakes and Ponds
- Fresh Water Wetlands
- Streams
- Town Lines
- Protected Land

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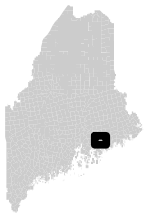

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Watershed and Estuary Base Map

Map Prepared By
College of the Atlantic

May 2006

Friends of Taunton Bay
Contact: steveperrin@verizon.net

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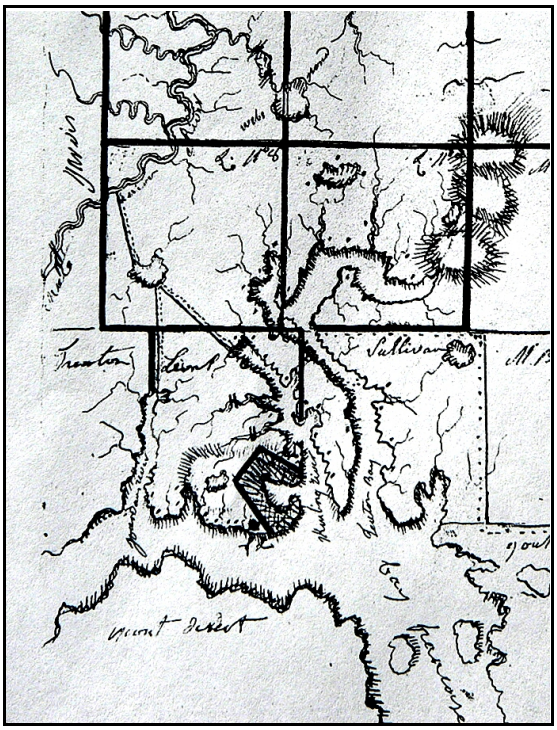
2005 DMR Mosaic of Taunton Bay



Madame de Leval's map, c. 1791. F.S. Allis Jr., *William Bingham's Maine Lands 1790-1820*. The Colonial Society of Massachusetts, 1954.

An early, hand-drawn map of Taunton Bay is shown on this page at left; a color mosaic comprising multiple digital images is shown on the opposite page. It is hard to believe they show the same part of Earth's surface. Cartography has come a long way in 214 years.

What is perhaps most striking about the 2005 mosaic is the amount of detail it reveals about the bottom of the bay at low tide. The defining feature of Taunton Bay is shown to be its extensive subtidal and intertidal flats. Kelp beds in the fast flowing Taunton River are an exception to the general character of the bay. Even peninsulas and islands rise from mudflats and not the deep, navigable waters so featured in real estate ads.

Another striking detail is how wooded the shoreline appears from above. In the 1840s, much of the surrounding land was cleared for agricultural use. With few exceptions, those fields have grown back. Roads (such as U.S. Route 1, Maine Routes 182 and 200, and South Shore Road) stand out as pale lines through largely wooded terrain, in places bordered by lots and development.

And then there are those conspicuous channels snaking through the flats, the larger ones showing where tidal waters run (the smaller where streams drain into the bay). These are the arteries that share the nutrients, detritus, phytoplankton, and oxygen they bear with life on the flats and in the mud. Looking closely, along the upper edges of channel slopes, thin, dark lines can be seen where water from the channel floods onto the flats, or, when the flow goes the other way, water from the flats drain into the channel. Those thin, dark lines are mussel reefs, levee-like structures that armor (stabilize) the borders between channels and flats where currents are apt to be strong on incoming and outgoing tides, borders highly susceptible to damage from ice in winter and waves the rest of the year. Mussel reefs slow channel waters flowing onto the flats, causing sediments to settle out, thereby building the reefs themselves while cleaning the water.

Taunton Bay is an estuary where fresh water flows into salt water, lowering the salinity below that of Frenchman Bay. No major river flows into the bay; instead, small streams (Egypt Stream, West Brook, Mill Brook, Springer Creek, Card Mill Stream, Johnnys Brook, Clapham Brook, among others) flow into the bay from surrounding ponds, streams, and wetlands. The courses of several of these streams appear on the mosaic where they drain across the flats. These streams are the routes followed by juvenile eels (elvers), alewives, smelt, shad, and other fish species that spend part of their life cycles in fresh, part in salt water. Alewives and elvers are netted in spring on several streams in Franklin. ❑

THE TAUNTON BAY STUDY

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Aerial Photo Mosaic
Low Tide July 23, 2005

1 0.5 0 1 Miles

Sources:
Maine DMR
College of the Atlantic

Friends of Taunton Bay
Contact: steveperrin@verizon.net

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Map Prepared By
College of the Atlantic

May 2006

Taunton Bay Watershed Hydrology

In this instance, hydrology refers to the distribution of fresh water as it flows through the watershed of Taunton Bay from ridgeline to tideline. This distribution begins with precipitation falling or condensing from above the watershed as rain, snow, sleet, hail, or fog. It soaks into the soil or runs off directly into small channels and streams, which feed wetlands, larger streams, ponds, and ultimately the bay itself. Water that soaks into the soil moves downhill as well, some being taken up by plant roots, much of it seeping into streams, wetlands, and ponds lower down the watershed. It is often thought that streams rise in hillside springs, but most of them are fed by seepage along their banks in an almost unnoticeable flow through damp soil. Soil is made up of grains of organic and mineral matter, so is porous, providing a network of minute but extensive underground channels through which water can flow from grain to grain, until it reaches the water table, where it collects as an underground reservoir that feeds more evident surface waters in wetlands, streams, and ponds.

Aquifers are underground water storage areas in porous soils composed of gravel and sand deposited by the last glacier. The largest aquifer in the watershed runs from East Franklin to Georges Pond. Maine Route 200 runs along its spine for a ways. Gravel pits mark the course of the aquifer to the northwest. This aquifer serves as water supply for the Town of Franklin. Aquifers release water slowly into surrounding wetlands, which in turn feed into streams—in this case Card Mill Stream east of the aquifer, and on the west seeps directly into tidal waters. Wells dug in aquifers generally produce a reliable source of fresh water. It is ironic that the largest aquifer in the region, located beneath Hancock Heights and Washington Junction, was long ago designated an industrial site, making it unsuitable for use as Ellsworth's water supply because of the danger of pollution.

The main streams feeding into Taunton Bay are Egypt Stream, West Brook, Mill Brook, Card Mill Stream, Johnnys Brook, and Clapham Brook by Falls Point. Mill Brook drains Great Pond; Card Mill Stream drains Fox, Duck, and Donnell Ponds; Johnnys Brook drains Schoodic Bog and Long Pond. Other streams bear local names not listed on the hydrology map. Many of these streams connect to extensive freshwater wetlands, which can spread snowmelt or intermittent precipitation into a reduced but steady streamflow even in drier seasons. Egypt Stream drains extensive wetlands in Fletcher's Landing; West Brook drains wetlands as far north as Waltham. The outlet of the largest lake in the watershed, Donnell Pond, joins Alder Brook to form Card Mill Stream, which drains to the bay in East Franklin.

Estuaries (S-tuaries) are sunny, shallow, sheltered, saltwater bays that serve as receiving waters for streams flowing from surrounding high ground. Most major rivers flow into estuaries, but Taunton Bay doesn't have any such rivers, yet is an estuary nonetheless because of the cumulative effect of its several small streams. This freshwater flow cuts the salt content of the bay's waters, lowering salinity on a variable basis, making it difficult for marine species to survive here, and easier for species that can tolerate a range of salinities. During rainstorms at low tide, salinity on the flats can plunge for a time to that of fresh water. The hardy species that make a living in the mud can endure such conditions for a time, which moderate when the tide brings its flood of saltier water from farther down the estuary. ❑

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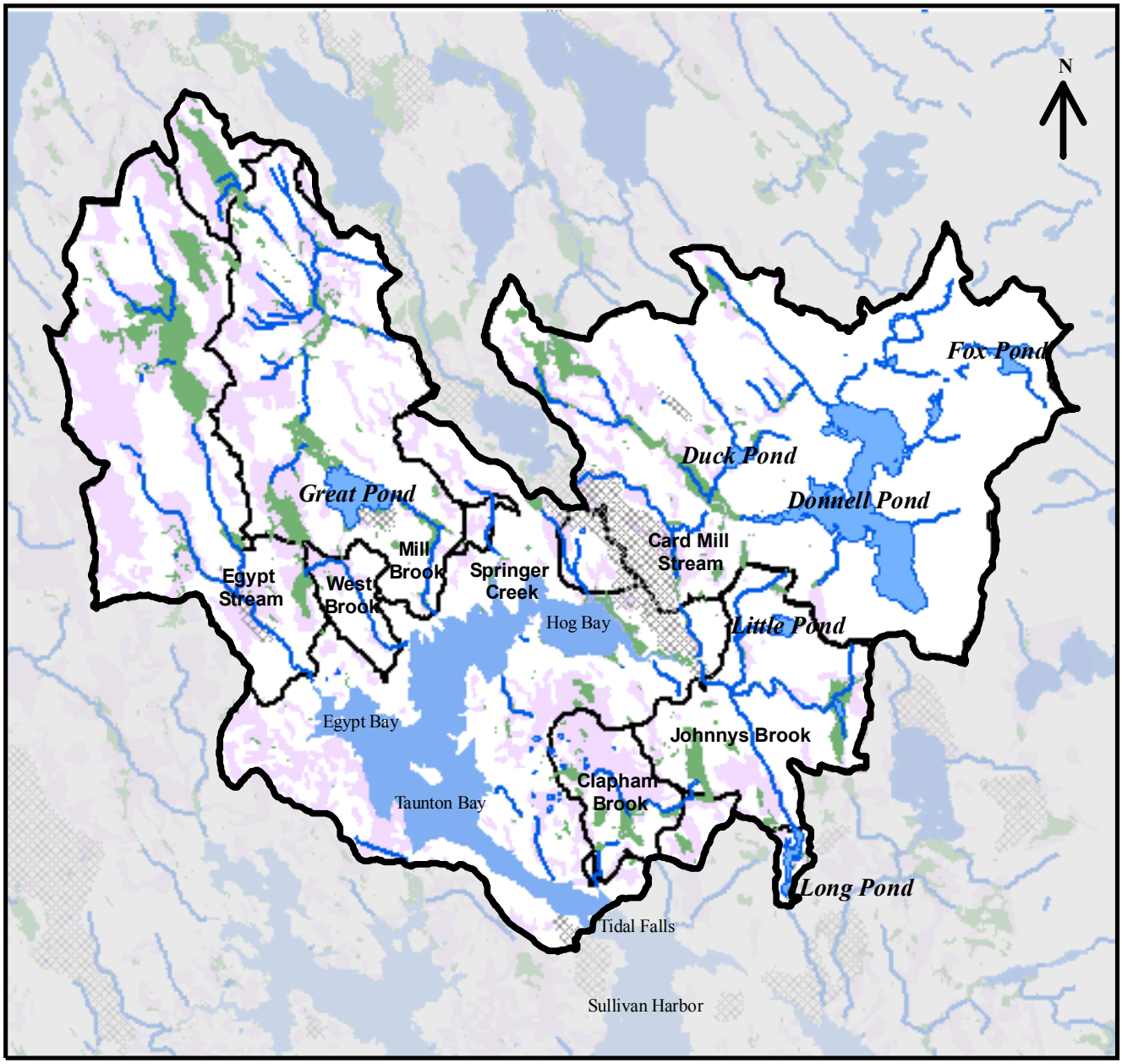
Hydrology



2 1 0 2 Miles

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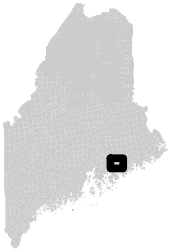
Legend

- Watershed
- Sub-Watersheds
- Estuary
- Lakes and Ponds
- Fresh Water Wetlands
- Hydric Soils
- Aquifers
- Streams



Sources:
Hancock Soils Conservation Service
Maine Office of GIS
Maine Geologic Survey
College of the Atlantic

Friends of Taunton Bay
Contact: steveperrin@verizon.net

Map Prepared By
College of the Atlantic
May 2006

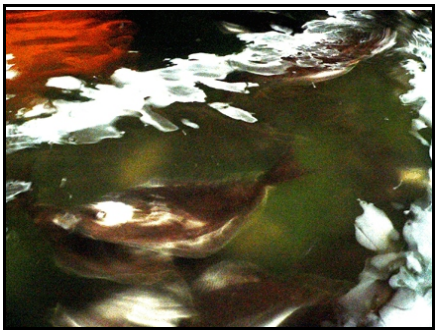
Aquaculture Sites in Taunton Bay 2005

Mike Briggs at oyster nursery, Hog Bay.

USDA Atlantic salmon nursery.

USDA Atlantic salmon tank.

Halibut tank room, UMCCAR.


Halibut in tank at UMCCAR.

The map opposite is already out-of-date by the time this report is released because Mike Briggs plans to move his oyster grow-out lease site from the upper bay to a new site south of Burying Island. But the number of aquaculture leases will remain the same for the time being. Mike maintains two lease sites, an oyster nursery on the surface of Hog Bay (small red rectangle on the map) and a bottom grow-out site (larger red rectangle) soon to be relocated.

Selecting appropriate sites for such leases is not that simple. A great many factors affect the sites in varying degrees through the seasons. In different amounts and combinations, wind, temperature, salinity, nutrients, phytoplankton, currents, predators, sedimentation, and pollution all bear on aquaculture operations. The impacts cannot all be told in advance. In Mike's case, sediment settled out of the current at its farthest reach into the bay, which happened to be right on top of his grow-out site, smothering the oysters he had planted there.

The University of Maine bought what started out in 1990 as the Penobscot Salmon Company facility in Franklin, converting it to an experimental operation where innovations in land-based aquaculture could be tried out. The facility, now the University of Maine Center for Collaborative Aquaculture Research, or UMCCAR, conducts or makes possible research growing species as varied as halibut, salmon, cod, bait worms, sea urchins, and seaweed in tanks fed by a single water circulation system on dry land. The water comes from two sources, the channel off Butler Point, and fresh water wells.

The U.S. Department of Agriculture is developing another land-based aquaculture site abutting the UM facility to the north. The National Cold Water Marine Aquaculture Center will focus on breeding disease-resistant Atlantic salmon in support of the U.S. aquaculture industry. Salmon research has already begun on sites leased from the University of Maine.

Land-based aquaculture operations require a lot of plumbing, filtering, pumping, and settling. Water drawn from the bay, for instance, contains a high amount of sediment, which has to be removed before it can enter the circulation system. This is accomplished by three large settling tanks in the pump house near the shore. Whether on land or water, sediment exerts a strong influence on aquaculture operations in Taunton Bay. ❑

THE TAUNTON BAY STUDY

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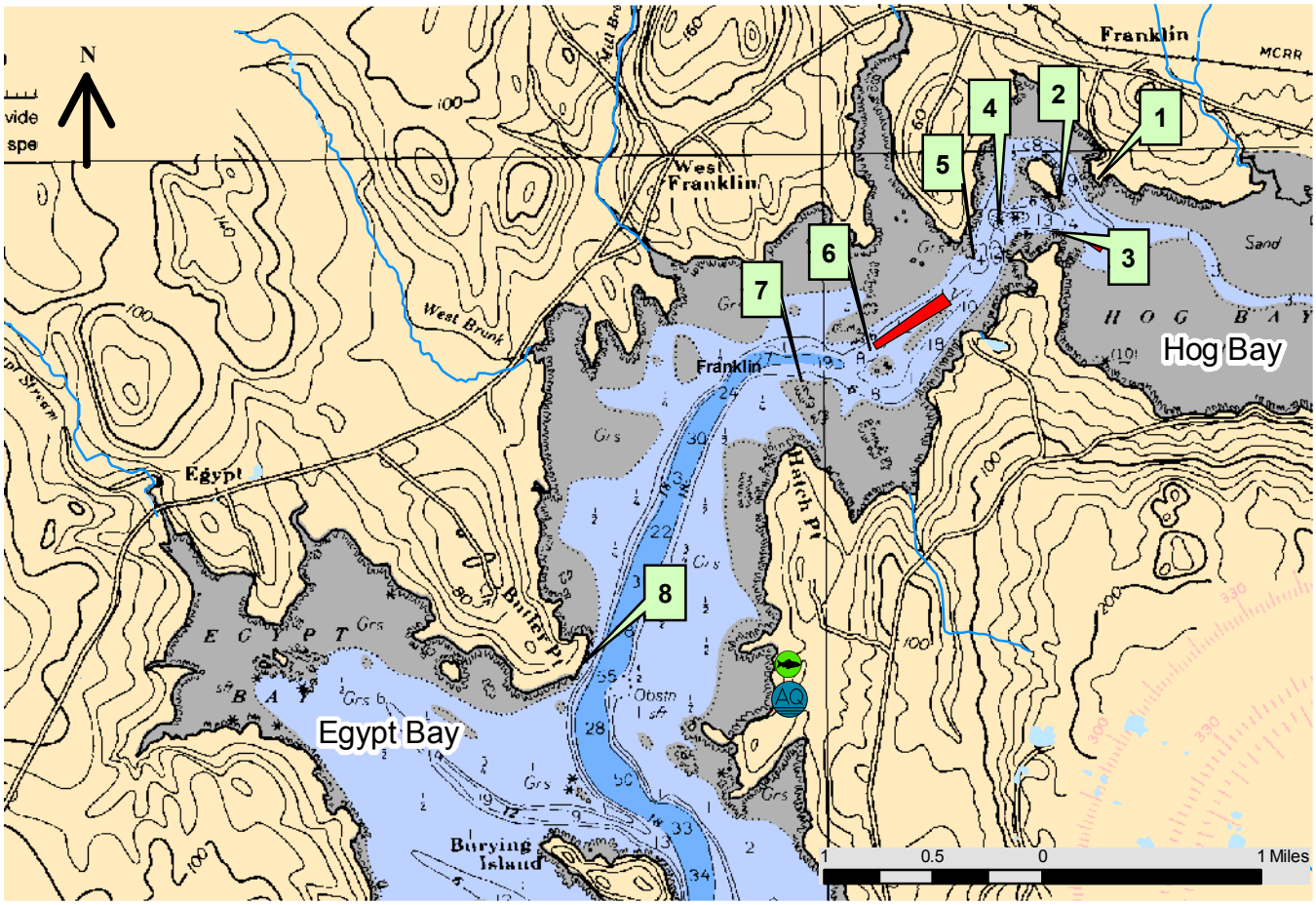
Oyster Monitoring Sites 2005



Legend

Oyster Monitoring Locations

ID	LOCATION	GEOLOGY
1	Dorsey	schist
2	Round Island	granite, schist
3	DeBeck Pt.	schist
4	NW Channel	granite
5	Outer Dwelley	granite
6	Stand Alone	granite
7	Hatch Pt. N	granite
8	Butler Pt.	granite

Oyster Lease Sites

AQ *UMCCAR Site

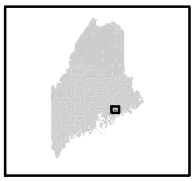
*USDA Cold Water Marine Aquaculture Ctr.

*UMCCAR (University of Maine Center for Collaborative Aquaculture Research)
*USDA National Cold Water Marine Aquaculture Center

Oyster farmer Mike Briggs examining an intertidal boulder in station 4 for an oyster set.

Sources:
NOAA: Chart 13318_1
Maine DMR
Steve Perrin (Friends of Taunton Bay)
College of the Atlantic

Cartography By: Marianna Bradley
GIS Lab, College of the Atlantic



Friends of Taunton Bay
Contact: steveperrin@verizon.net

Map Prepared By
College of the Atlantic
April 2006

Selected Fisheries in Taunton Bay 2005

Fyke nets, Mill Brook, Franklin, 2006.

Alewife trap, Mill Brook, Franklin, 2006.

Worm-harvested flat, Creasy Cove.

Raking mussels by hand.

In preparing an Economic Assessment of the Fisheries and Marine Resources of Taunton Bay for The Taunton Bay Study, Barbara S. Arter found the following species were actively being harvested: soft shelled clams, bloodworms (native and cultured), blue mussels, elvers, alewives, kelp, rockweed, oysters (aquaculture), lobsters, crabs, sea urchins, halibut (aquaculture), and scallops. The total estimated annual gross revenue for bay fisheries falls between 4 and 10 million dollars

Clams are dug or pulled by hand from flats around the bay. Flats closed to clam harvesting are shown by diagonal bars on the map. *Bloodworms* are dug for sport-fishery bait on intertidal flats, and are not affected by flat closures. Sea Bait Maine also raises farmed bloodworms in its facility at UMCCAR.

Blue mussels are hand raked in the bay where dragging is prohibited according to the 2005 moratorium, and dragged in the basin between the U.S. Route 1 bridge and Tidal Falls. Experimental mussel dragging may be done in the bay if grant proposals are funded, and the DMR Commissioner gives his approval. *Sea urchins* and *scallops* are dive harvested in Taunton River.

Elvers are taken during their spring upstream run in fyke nets at the entrance to Egypt Stream, Mill Brook, and Card Mill Stream. *Alewives* are netted in facilities installed by the Town of Franklin on Mill Brook and Card Mill Stream.

Kelp is harvested in Taunton River, and *rockweed* (with landowner permission) from shores around the bay. *Nori* is raised experimentally at UMCCAR.

Lobsters and *crabs* are caught primarily by traps placed in the channel from Falls Point to Round Island at the entrance to Hog Bay, a distance of about seven miles.

Oysters grown in a nursery in Hog Bay are farmed in the upper bay (soon to be moved to the lower bay), and *halibut* are farmed in tanks at UMCCAR.

Not all of these fisheries are indicated on the map. ❑

THE TAUNTON BAY STUDY

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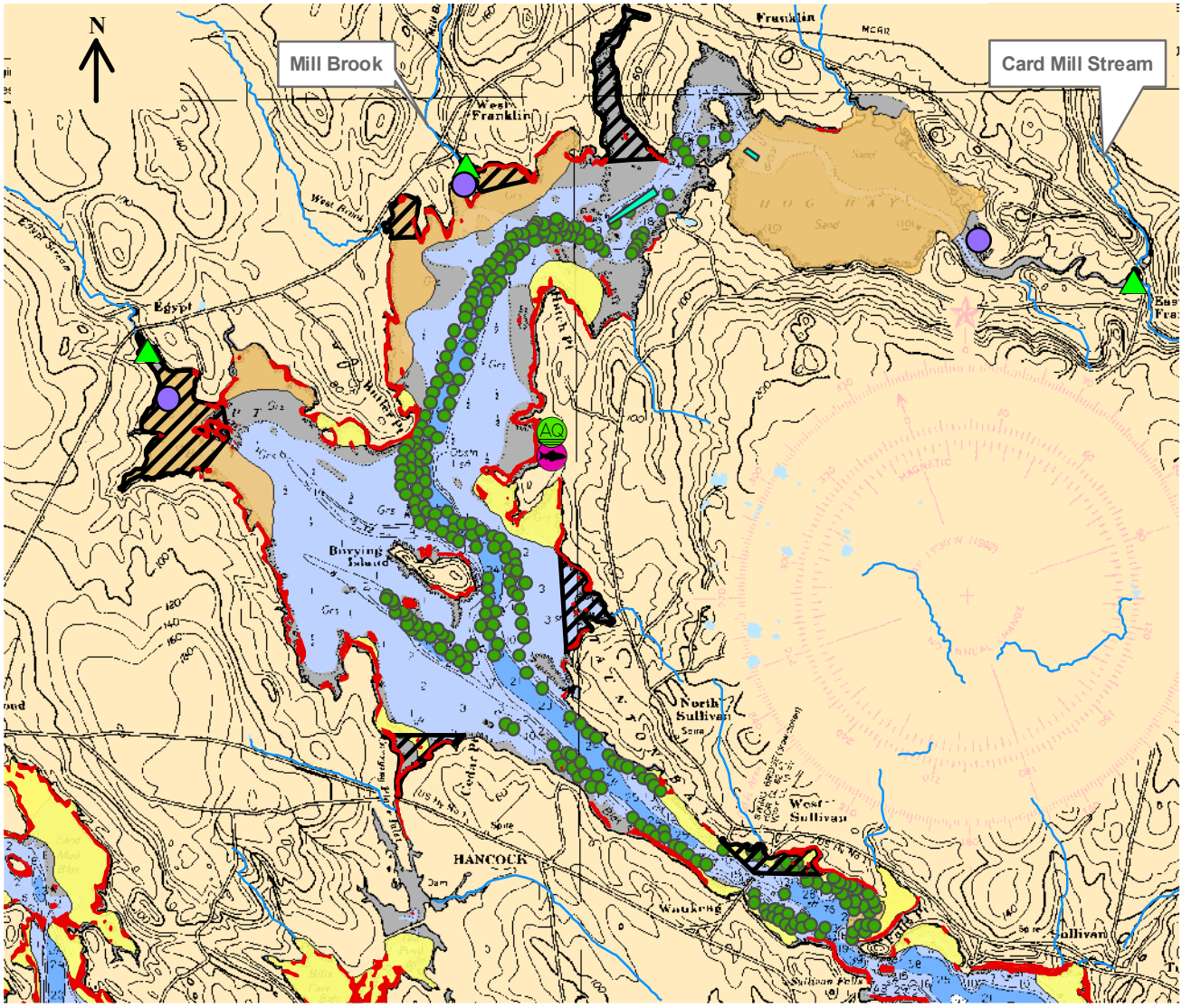
Selected Fisheries 2005



1 0.5 0 1 Miles

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended.
Administered by the Office of Ocean and Coastal Resource Management,
National Oceanic and Atmospheric Administration.

Legend

- USDA Aq Site
- UMCCAR Site
- Elvers
- anadromous fish runs
- Lobster/Crab Buoy 6/21/05
- Rockweed
- Clam Flat Closures
- Aquaculture Sites
- Shellfish
- Worms

Depth Ranges (feet)

- .5-18
- 19-76
- Tidal Flats

Sources:
NOAA: Chart 13318_1
Maine DMR
College of the Atlantic

Friends of Taunton Bay
Contact: steveperrin@verizon.net

Map Prepared By
College of the Atlantic
May 2006

Clam Flat Closures 2005

Setting out clam pots on flats in Franklin.

Twelve clams in a pot.

Brian Beal covers seed clams with mud.

Clam flats can be closed for a number of reasons, one of them being pollution resulting from septic system failure. The solution is to replace the failed system(s), an expensive proposition, but one for which the town or state may make funds available if the landowner qualifies for such aid. In 2005, a septic system was replaced in Hancock in an effort to clean up flats near Carrying Place Inlet. In that case the landowner would not reveal his financial status, so he paid the full price of the new installation. A preventive solution would be to have septic systems checked on a regular basis, so they can be pumped out or repaired before failure occurs.

Septic pollution may be due to other causes, such as an active beaver lodge upstream of the flat, or a rotting animal carcass spreading bacteria through flowing water. In such cases the solution would be to move the beavers or remove the carcass.

The Department of Marine Resources laboratory in Lamoine takes water samples at 18 to 20 stations around Taunton Bay every year, usually on a monthly basis from April into November. Pollution events are often episodic, depending on rainfall, streamflow, tide height, and other variables. It is likely that some such events are not recorded because they fall between DMR visits. The safest procedure would be to close a flat on the basis of one sample showing a high coliform count. In practice, one high count may not suffice to trigger that result.

The flat closure map for 2005 illustrates how widespread septic pollution is in Taunton Bay. With approximately half the bay's clam flats closed, the challenge would seem to lie in avoiding additional closures while trying to trace and repair the sources responsible for flats already shut down. It is sometimes claimed that flats aren't really polluted, it's just that DMR lacks adequate personnel to do the testing necessary to have them reopened. This isn't true, and having additional testing might well show up in more flats being closed, not fewer.

The photos above show a good use of closed flats, which is to conduct research in clam growth and predation on flats unlikely to be disturbed. In 2006, Brian Beal from UMM has planted some 1,440 seed clams in mud-filled clam pots set on two different closed flats in Franklin. Some pots are open to predation, others sealed with plastic mesh. The pots will be taken up in November, growth of individual clams measured, and the extent of predation by worms, birds, crabs, and raccoons determined. This makes productive use of flats that are closed for bad reasons. ❑

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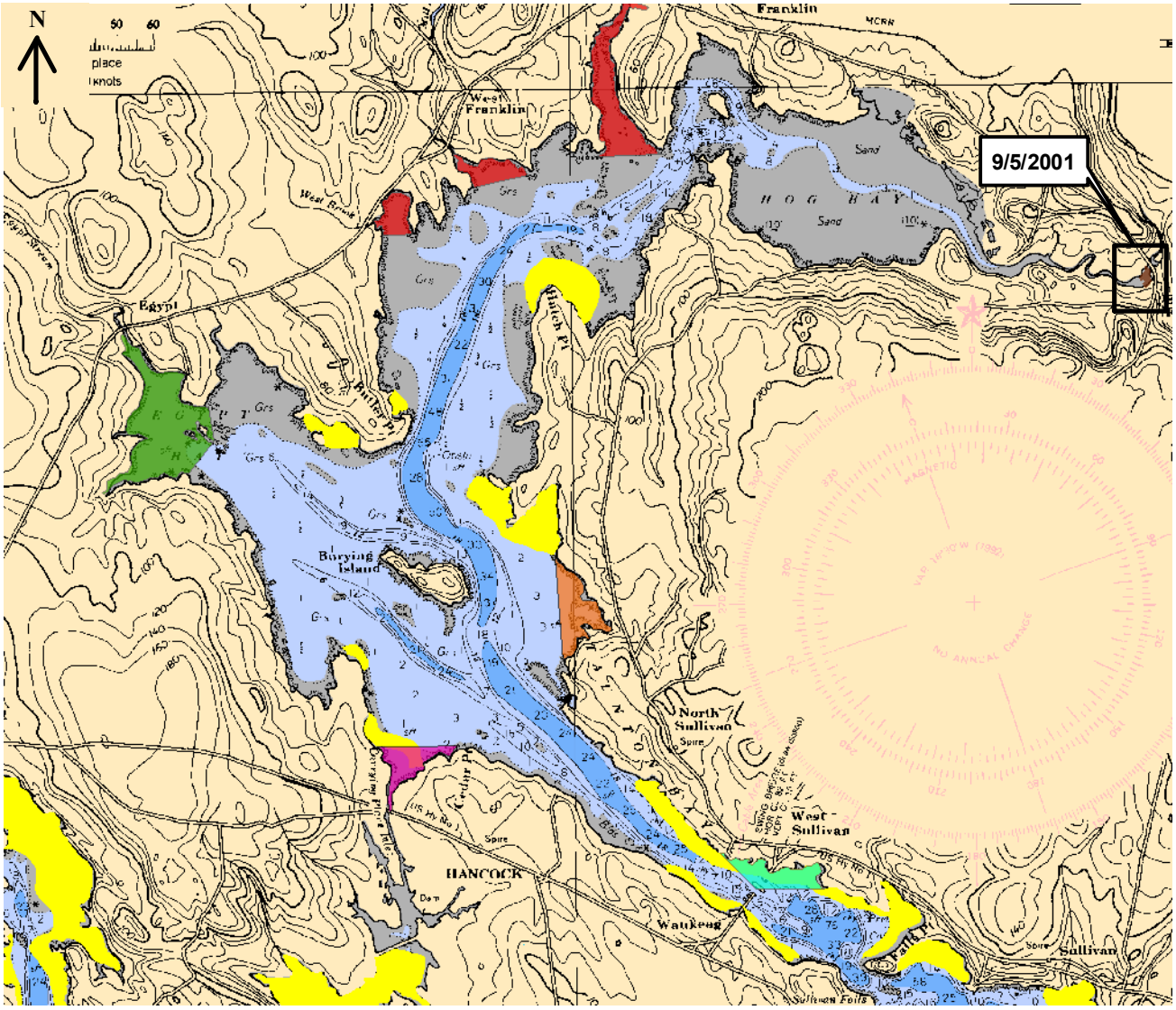
Clam Flat Closures 2005



1 0.5 0 1 Miles

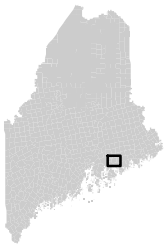
Financial assistance provided by the Coastal Zone Management Act of 1972, as amended.
Administered by the Office of Ocean and Coastal Resource Management,
National Oceanic and Atmospheric Administration.

Legend

Clam Flat Closure Areas and Type

Date Closed and Type

- 5/30/2002 Type 1 *
- 9/5/2001 Type 1 *
- 8/15/2001 Type 1 *
- 6/5/2000 Type 1 *
- 1/23/1995 Type 1 *
- 4/27/2005 Type 3 **
- Clam Flats



Friends of Taunton Bay
Contact: steveperrin@verizon.net

Map Prepared By
College of the Atlantic
May 2006

* Type 1 = Prohibited, no shellfish harvesting of any kind
** Type 3 = Restricted, shellfish may be harvested but sent only to a depuration plant

Lobster/Crab Buoys, June 21, 2005

As Barbara S. Arter has shown in her 2005 economic assessment, landings data are not available for any species taken in Taunton Bay. Without such data, it would be difficult to undertake an ecosystem-based management plan. Not knowing how much of a species is taken precludes gauging the impact on those that remain, or on populations of other species in the natural community.

In the case of lobsters, there is a way to get at the effort spent to catch them, which does not produce the desired landings data, but does provide the basis for an estimate of how much bait is being put out, and how intensively lobsters and crabs are being sought in the bay on a particular date. Local lobstermen do not set traps out in strings as they do elsewhere. By counting buoys on the surface, the number of traps can be told (though not whether they are intended for lobsters or crabs), which can provide a basis for comparison of fishing effort with other seasons and other years.

On June 21, Steve Perrin and Project Assistant Lauren Alnwick-Pfund counted buoys between Falls Point and the entrance to Hog Bay, coming up with an approximate total of 283 buoys marking traps set for both crabs and lobsters. Of that total, 33% were in Taunton River, 7% west of Burying Island, 55% in the main channel north of Taunton River, and 5% in the twin channels as far as Round Island.

What does that tell us? Adult lobsters are not creatures of the flats like clams and worms. Juvenile lobsters may have a wider range, but not adults. Which we already knew, but there it is. A third of all buoys were in Taunton River, the remaining two-thirds in channels north of there. As already stated, 7% of all buoys were in the channel heading for Egypt Bay, and 5% of all buoys were in the twin channels or above. Over half (55% of all buoys) the effort on that day was in the main channel above Taunton River. This numbers game doesn't shed any light at all on where lobsters or crabs were actually caught on that day, or in what numbers.

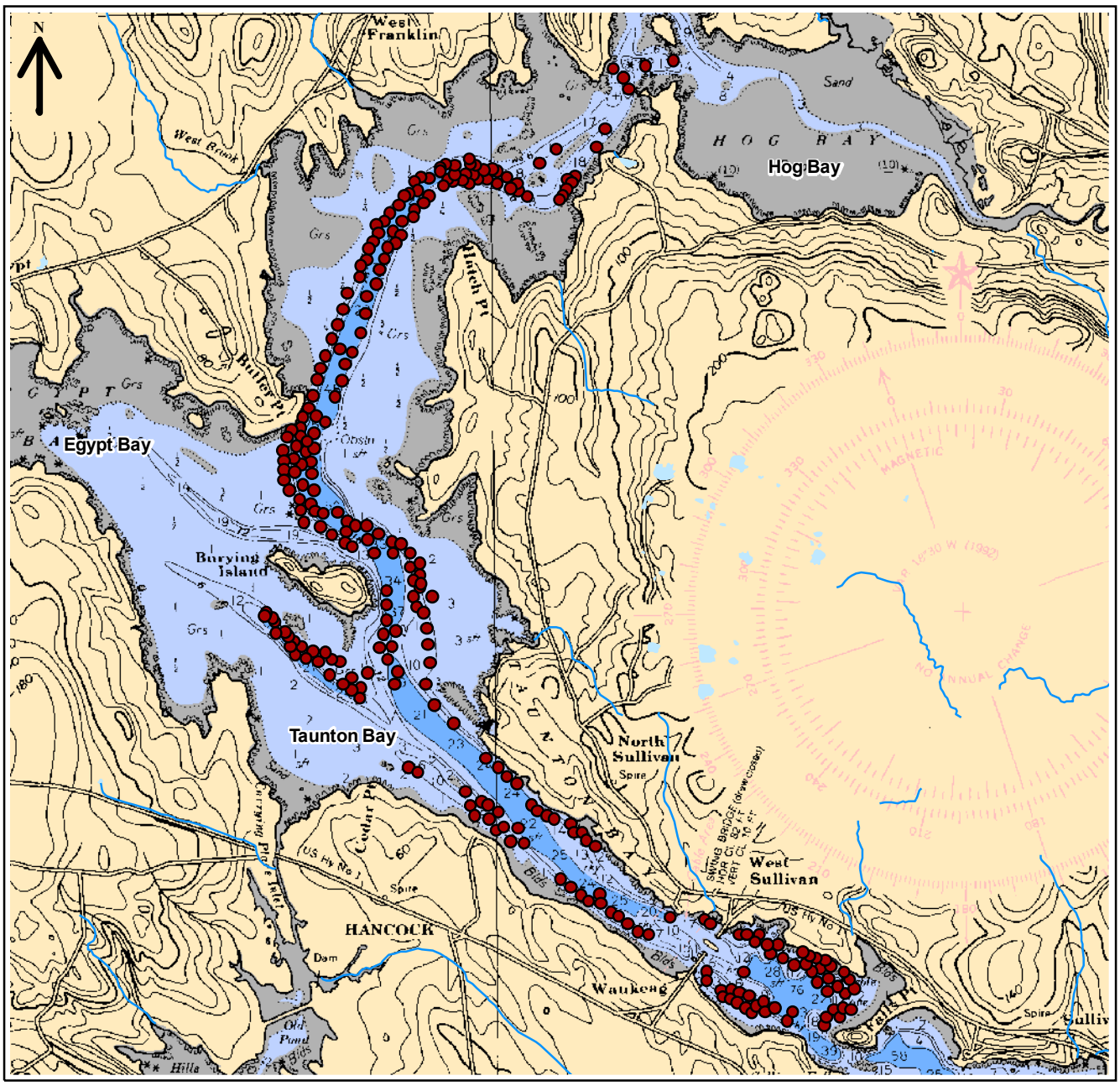
What has been achieved is a baseline against which buoy counts on other days in other seasons and years can be held for the sake of comparison. By talking with lobstermen, some idea of the daily catch per trap might be gained, which would allow estimates of actual lobster landings at different times of year to be made. What remains to be shown is whether taking a stab at such estimates is better than not bothering to make them at all. *(See the next map for further developments.*)

All of which underscores the predicament we are placed in by not having meaningful landings data available for Taunton Bay. ❑

THE TAUNTON BAY STUDY

A pilot project in collaborative bay management

Approximate Locations of 283 Lobster & Crab Buoys
June 21, 2005

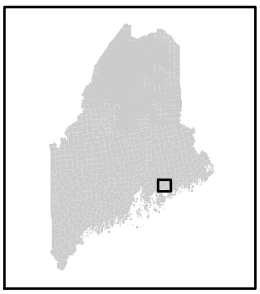


1 0.5 0 1 Miles

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended.
Administered by the Office of Ocean and Coastal Resource Management,
National Oceanic and Atmospheric Administration.

Legend

- Lobster or Crab Buoy
- .5-18
- 19-76
- Tidal Flats



Sources:
NOAA: Chart 13318_1
Maine DMR
Steve Perrin (Friends of Taunton Bay)
College of the Atlantic

Friends of Taunton Bay
Contact: steveperrin@verizon.net

Map Prepared By
College of the Atlantic
November 2005

Lobster/Crab Buoys, July 29, 2005

The total lobster or crab buoy count on July 29, 2005 came to 485. Of this total, 45% were in Taunton River, 44% in the main channel above the river, with 10% west of Burying Island, and 1% in the twin channels approaching the entrance to Hog Bay. How do these figures compare to those obtained on June 21? In the following table, percentages have been rounded off.

Buoy Count on→	June 21		July 29	
Location↓	No.	%	No.	%
Taunton River	91	33%	220	45%
Main Channel	146	55%	215	44%
W. Burying I.	24	7%	45	9%
Twin Channels	15	5%	5	1%
Total	283	100%	485	99%

Not only have 202 more buoys been put in the bay (an increase of 71%), but the fishing effort has shifted southward toward the mouth of the bay. The number of buoys north of Taunton River has grown from 185 to 265, but the percentage of the total number of buoys in that area has fallen from 65% to 55%, at the same time the number of buoys in Taunton River has risen from 91 to 220, with the percentage of the total number of buoys in the river rising from 32% to 45%.

The shift in fishing effort toward the southern end of the bay tells us that fishermen are either following or anticipating a southern shift in the lobster population. From past experience, we might predict that such a trend would continue as the season progresses. Suddenly we are not merely playing a numbers game, but are seeing a dim reflection of events taking place in the real world. To test the hypothesis that lobsters in Taunton Bay move southward with the coming of fall, we could have made a third buoy count in September, and a fourth in November. Which we didn't do, so the hypothesis remains a guess prompting us to extend our observations later into the year.

As for estimating the number of lobsters and crabs actually brought up, we can be pretty sure that fishermen wouldn't be intensifying their effort if there was nothing to be caught. The counter hypothesis would be that there are so few lobsters on the bottom that fishermen have to work harder to cover expenses. Here again it would be appropriate to check with those who know, the fishermen themselves. ❑

THE TAUNTON BAY STUDY

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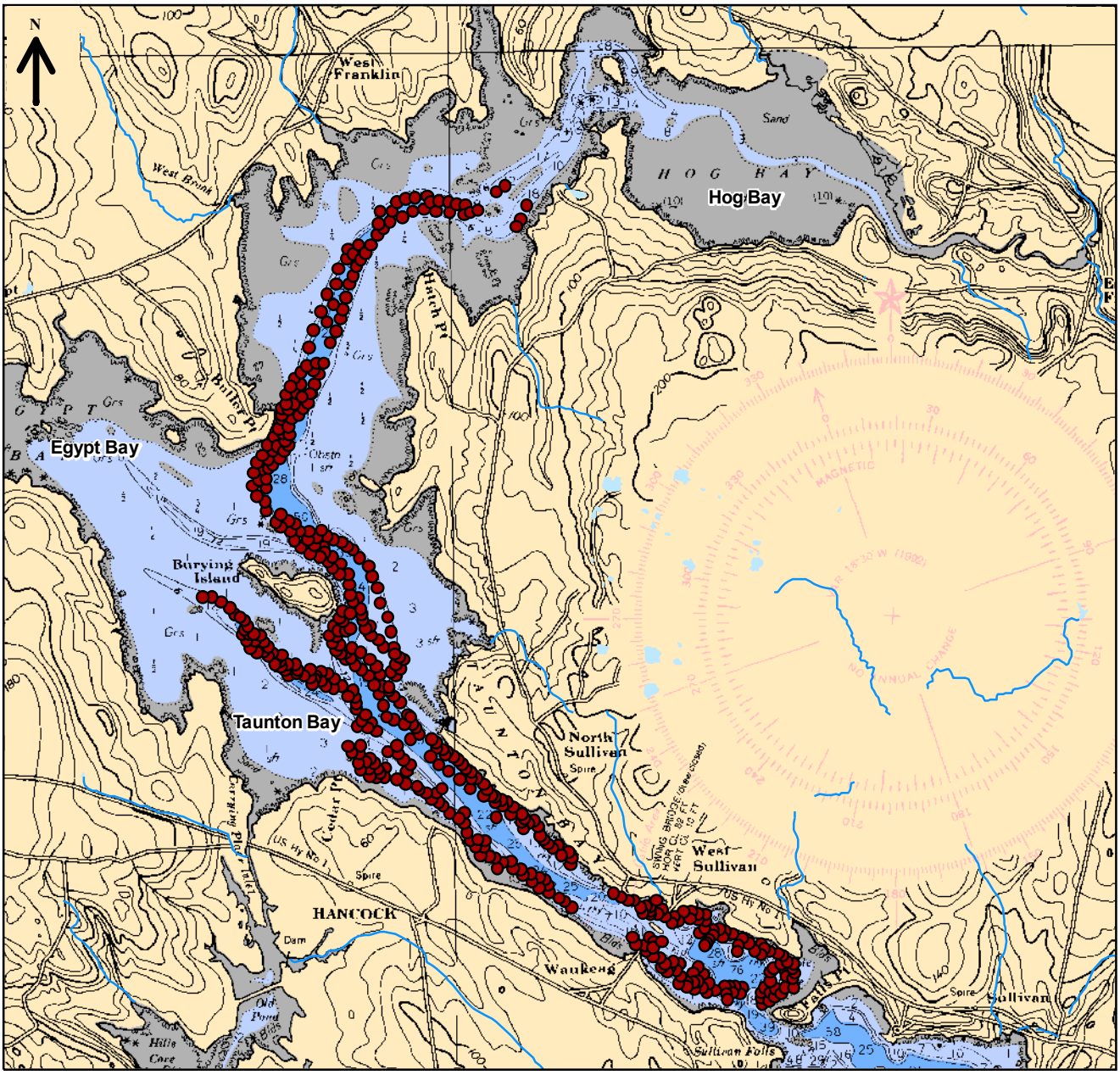
Approximate Locations of 485 Lobster & Crab Buoys
July 29, 2005

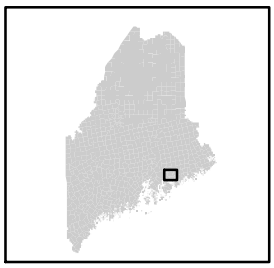


1 0.5 0 1 Miles

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended.
Administered by the Office of Ocean and Coastal Resource Management,
National Oceanic and Atmospheric Administration.

Legend

- Lobster or Crab Buoy
- .5-18
- 19-76
- Tidal Flats



Sources:
NOAA: Chart 13318_1
Maine DMR
Steve Perrin (Friends of Taunton Bay)
College of the Atlantic

Friends of Taunton Bay
Contact: steveperrin@verizon.net

Map Prepared By
College of the Atlantic
May 2006

Primary Producers and Habitats

Primary producers support life in the bay.

Eelgrass and rockweed at low tide.

Rock crab finds shelter beneath rockweed.

Salt marsh in Hog Bay from the air.

Primary producers not only fix carbon in edible form by using solar energy to rearrange the atoms in carbon dioxide and water to form nutritious carbohydrates, they also provide protective habitats for the living communities that thrive in their midst. Taunton Bay is fortunate in having productive and protective habitats provided by six different producers in six different parts of the bay:

- kelp beds in the high energy waters of Taunton River
- eelgrass on subtidal flats and upper channel slopes
- rockweed on rocks and ledges in the intertidal zone
- salt marsh flooded by the highest tides
- algal flats on both shallow subtidal and intertidal flats
- phytoplankton throughout the water column.

When they break off and start to decay, particles of these primary producers attract microbes rich in protein to create a seventh producer called detritus. Detritus is distributed by waves and currents throughout the estuary, where it is gleaned by a wide variety of organisms because of its protein content—which can be as high as 25 percent.

These seven different food producers are distributed throughout the bay in many different habitats to provide the basic sustenance that the estuary's native species require for health and survival. Given sunlight enough and time, food is produced, grazers arrive to eat that food, animal eaters arrive to eat the grazers, predators arrive to eat the eaters of grazers, and decomposing microbes stand ever-ready to recycle crumbs and remains of the dead.

It is a beautiful, self-propagating, self-regulating system that supports not only life in the water and mud, but also visitors from shorelands and the sky above. Crows, sparrows, gulls, cormorants, kingfishers, ospreys, eagles, geese, ducks, raccoons, coyotes, foxes, humans, and many others derive immediate benefit from the food web based on primary production.

These few producers support the entire structure of the estuary. Beyond the trophic (nutritional) levels and the protective habitats, entire communities of life forms interact with one another and such habitats, adapting to a wide range of conditions imposed by climate, weather, seasonal changes, currents, salinity, erosion, nutrients, pollution, and other natural factors. ❑

THE TAUNTON BAY STUDY

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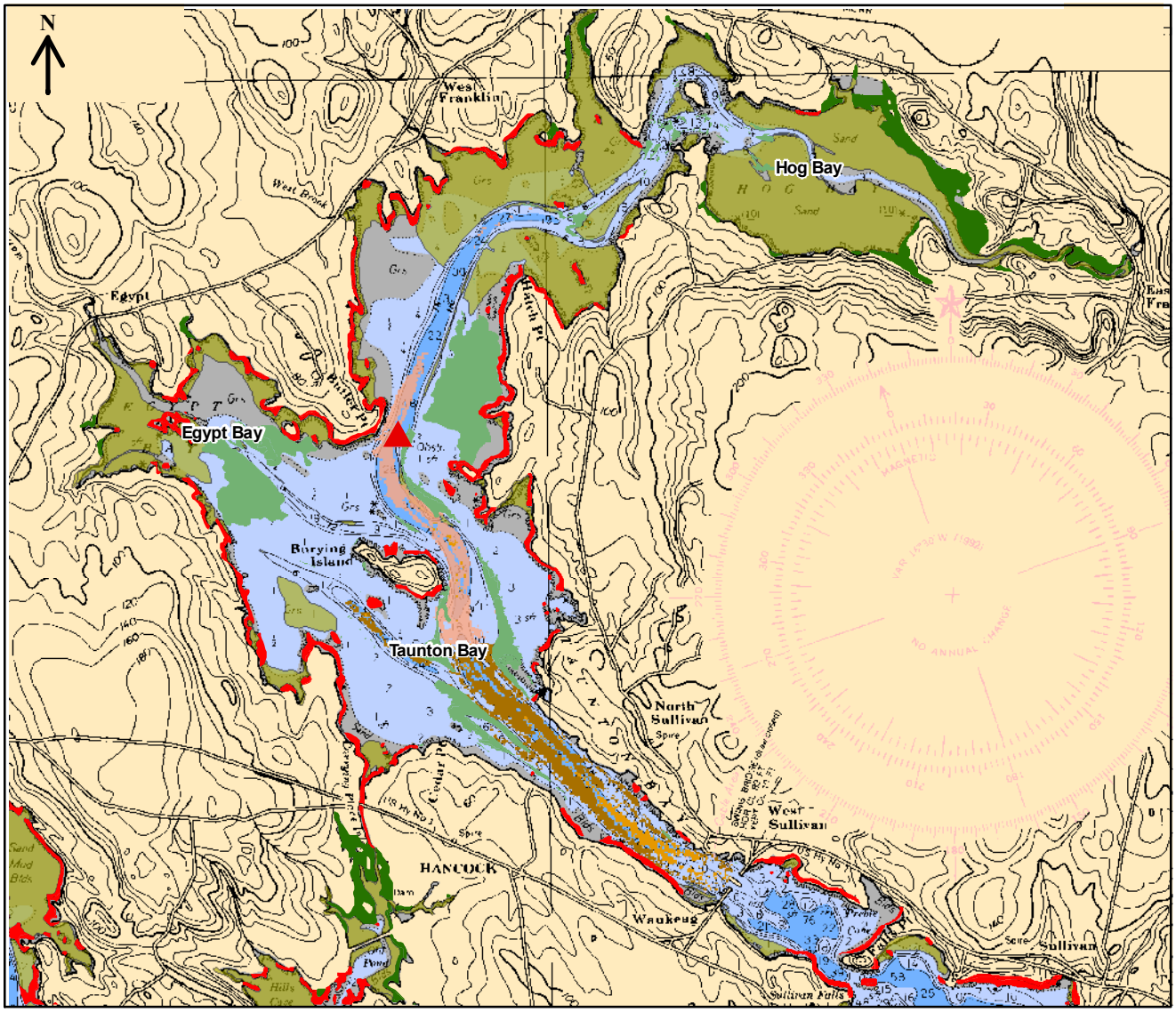
Primary Producers and Habitats



2 1 0 2 Miles

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended.
Administered by the Office of Ocean and Coastal Resource Management,
National Oceanic and Atmospheric Administration.

Legend

- Phytoplankton monitoring site
- Eelgrass (2005)
- Kelp (dense) on pebbly gravel
- Kelp (moderate to sparse)
- Gravely (pebbly) sand
- Rockweed
- Saltmarsh
- Mudflats

Depth Ranges (feet)

- .5-18
- 19-76
- Tidal Flats

* Phytoplankton are found throughout the water column

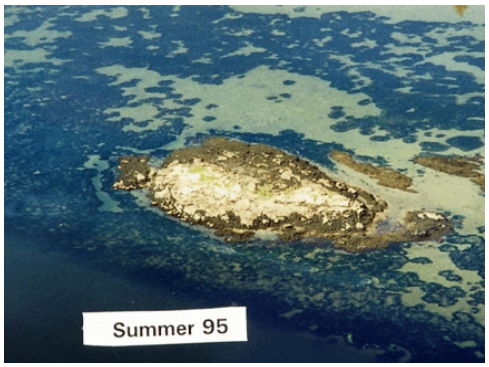
Sources:
NOAA: Chart 13318_1
Maine Office of GIS
Maine DMR
College of the Atlantic

Friends of Taunton Bay
Contact: steveperrin@verizon.net

Map Prepared By
College of the Atlantic
May 2006

Eelgrass 1955–2005

Eelgrass (now gone) east of Burying Island.



Eelgrass (now gone) around ledge.

Eelgrass meadow (now gone).

In this map, two black-and-white photographs of eelgrass in earlier years are offered for comparison with five eelgrass areas shown on the DMR color mosaic taken June 23, 2005. The borders of the comparison photographs are color-coded to match empty frames on the mosaic. The earlier photographs were not necessarily taken at low tide, but the tide is low enough to give a sense of the spread and density of eelgrass.

Yellow borders show roughly the same area east of Butler Point and south of West Brook Cove. The greatest spread of eelgrass shows up in the photograph take August 10, 1955, fifty years ago. The spread had dwindled noticeably thirty years later on April 24, 1985, and all but disappeared by 2005.

White borders show the flats west of Hatch Point. On August 10, 1955, eelgrass reached generally from the shore to the edge of the channel. By August 19, 1996 it had been reduced to two parallel streaks, and in 2005 it was largely gone.

Red borders show part or all of Egypt Bay. On April 15, 1973, eelgrass formed thick beds north and west of Burying Island, and well into Egypt Bay. On August 20, 1996, that spread had thinned considerably, and by 2005 was almost gone.

Purple borders show the subtidal flats off Evergreen Point in Sullivan. On April 15, 1973, a band of eelgrass lined the shore, and perhaps a part of the channel as well. By August 19, 1996 the band had largely disappeared, but the bed along the channel looks to have spread. By 2005 the flats were free of eelgrass except for the bed along the channel, which appears somewhat reduced. A fringe of dense eelgrass east of Burying Island was no longer evident.

Blue borders show flats between Burying Island and Havey Point. On April 15, 1973, eelgrass beds surrounded Burying Island Ledge, spread along the western shore of the island itself, and on the western edge of the channel. On August 20, 1996, much of that eelgrass remained except near the island. By 2005 the flats appeared to be free of all eelgrass.

No one is sure why eelgrass displays such variability. It died back to a great extent in the 1930s, probably due to a wasting disease that emerges during periods of high salinity (this was a time of little rain). The year 2001 when the recent dieback occurred was also a year of drought. ❑

THE TAUNTON BAY STUDY

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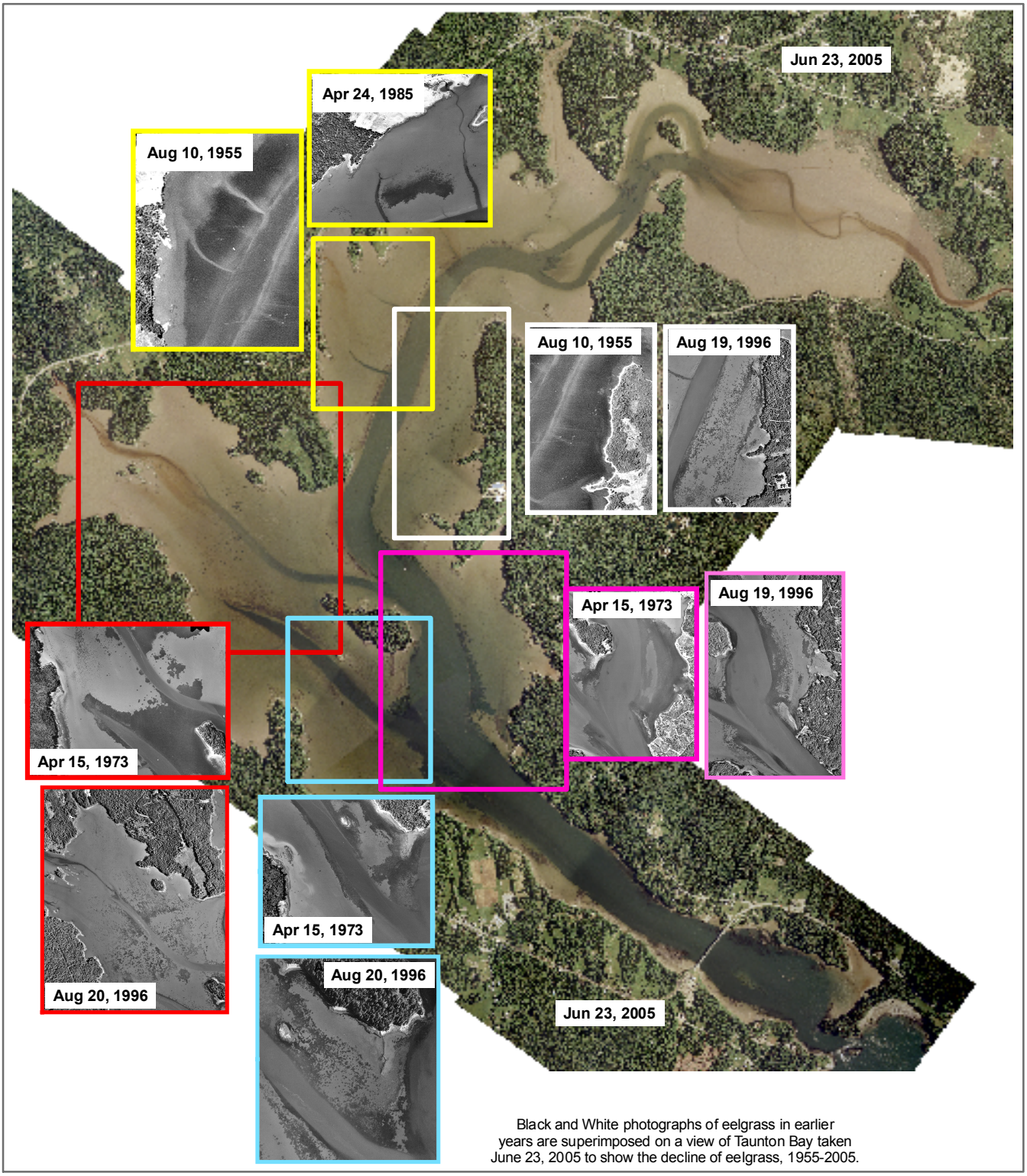
Friends of Taunton Bay
Contact: steveperrin@verizon.net

Eelgrass 1955-2005



Black and White photographs of eelgrass in earlier years are superimposed on a view of Taunton Bay taken June 23, 2005 to show the decline of eelgrass, 1955-2005.

Sources:
Maine DMR, Color Mosaic, 2005
Friends of Taunton Bay, Black and White Photography
College of the Atlantic

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended.
Administered by the Office of Ocean and Coastal Resource Management,
National Oceanic and Atmospheric Administration.

N

Map Prepared By
College of the Atlantic
May 2006

Harbor Seal Haulouts 2005

Seal with two ducks, February.

From Tidal Falls to Hog Bay, at one time or another harbor seals can be seen swimming almost anywhere in Taunton Bay. And when air temperature is warmer than water temperature, they can haul out on ledges or boulders almost anywhere as well. In winter, they even haul out on ice floes drifting on the tide. But over the years, they do favor some haulout locations over others. These are shown on the map, Harbor Seal Haulouts 2005.

Harbor seal pup.

Unlike many haulout sites, Burying Island Ledge has gradual slopes covered with rockweed. Adjacent to a small channel leading into Egypt Bay, it has a rapid escape route, should it be needed. This is where seals show up about April 1st after wintering elsewhere in the Gulf of Maine. In May and June, this is where the local population of harbor seals births many of its pups. The nearby ledge off Havey Point has served as a haulout in the past, but it is unusual to see seals there now that the land has been developed.

Mother and nursing pup.

The other favored haulout sites are in the shallower, warmer waters of the upper bay. Here, almost any glacial erratic boulder will do, but the most seals will haul out on the biggest ledges and groups of boulders off Hatch and Dwelley Points. Many will stay into December, when they exit the bay for warmer waters with more abundant fish. When the bay freezes over in January, as it has often done in the past, only one or a few seals remain, perhaps defending their territory.

Breaching harbor seal.

For the Indicators Report, the harbor seal population of Taunton Bay was estimated to be 75–80 in 2005. That was based on sightings of 57 seals hauled out on boulders north of Hatch Point, 10 in the water, and another 10 elsewhere in the bay. That figure holds for the one day the sightings were made. No one knows if the bay harbor seal population remains steady from April through December. Chances are it may not, supposing seals swim freely back and forth through the falls.

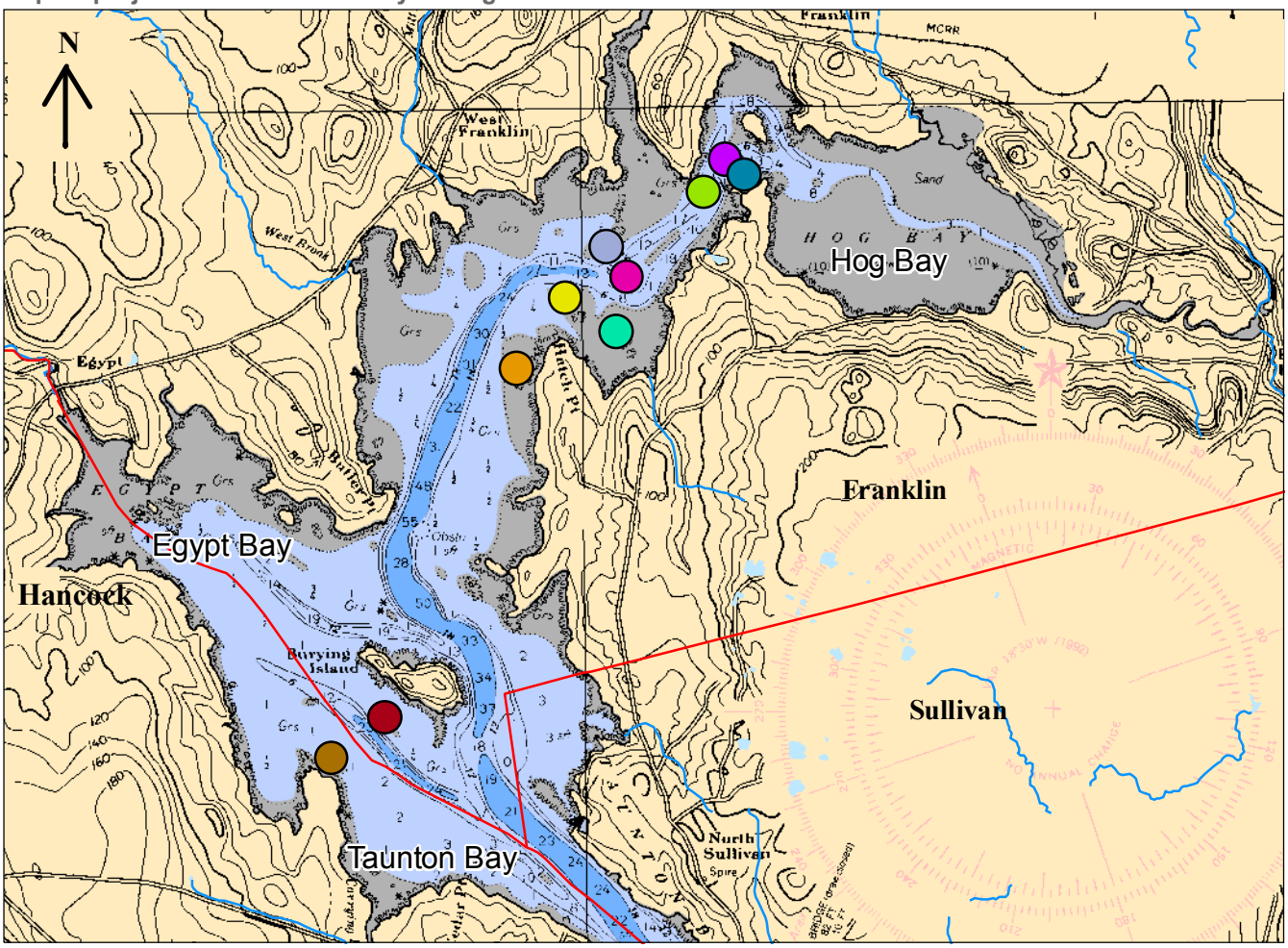
Seals hauled out on boulders, Franklin.

What do seals eat? Herring, alewives, smelts, and other free-swimming fish. Pups are known to eat mussels, and some have been known to eat clams, digging them out of the bottom by directing a downward stream of air out of their nostrils. There is scant evidence that they eat a significant number of crustaceans. Recreational boating is a potential threat to seals in sending them into cold water where they are forced to burn hard-won calories. ❑

THE TAUNTON BAY STUDY

A pilot project in collaborative bay management

Harbor Seal Haulouts 2005



1 0.5 0 1 Miles

Legend

Harbor Seal Locations

Location

- Round Island West
- Seal Rocks
- Seal Rocks South
- Burying Island Ledge
- Dwelley Point South
- Round Island South
- Hatch Point East
- Hatch Point North
- Hatch Point West
- Havey Point Rocks
- Town Lines

Burying Island Ledge April 26

Hatch Point North August 18

Dwelley Point South September 28

Friends of Taunton Bay
Contact:
steveperrin@verizon.net

Sources: NOAA: Chart 13318_1,
Maine DMR,
Steve Perrin (Friends of Taunton Bay),
College of the Atlantic

Map Prepared By
College of the Atlantic
April 2006

Horseshoe Crab Habitats 1991–2005

Horseshoe crab habitat, Egypt Bay.

Horseshoe crab country, entrance to Hog Bay.

Gravel: ideal horseshoe crab breeding habitat.

The smaller map shows locations where horseshoe crabs are currently found in Maine in sufficient numbers to be noticed. Two breeding sites are in Casco Bay, four in the Midcoast Region, and four east of the Penobscot River in Hancock County. Taunton Bay is not only thought to be the northernmost site where they are found in Maine, it is the northernmost site where they are found anywhere on Earth. More importantly, it is one of the rare sites where horseshoe crabs are not taken as wildlife specimens, or used for bait, fertilizer, or medicinal purposes. For that reason, the highest and best use of the two sub-populations in Taunton Bay is for research to better understand how these genetically distinct groups survive at the extreme edge of their global range.

The larger map shows locations where breeding horseshoe crabs have been sighted from 1991 to 2005, and in the black circles, the primary habitats used by the Egypt Bay and Hog Bay sub-populations respectively. The cooperative FTB-DMR horseshoe tracking project followed thirteen horseshoe crabs in each bay during the years 2003, 2004, and 2005. This project expanded our knowledge of where horseshoe crabs breed in Taunton Bay during June to where they are the rest of the year when they don't come ashore. As it turns out, from November through April, they dig into the mud along upper channel slopes and essentially hibernate for half of the year.

Local horseshoe crabs do not breed until the water temperature rises above 12º to 13º C (54º to 56º F), which generally occurs in late May or early June. This temperature threshold is reached when incoming tides are warmed by heat-storing subtidal and intertidal flats at the time of full or new moon when high tides occur midday or in early afternoon. Taunton Bay horseshoe crabs become active when temperatures most resemble the range experienced by other populations farther south such as on Cape Cod or in Delaware Bay. They tend to avoid colder waters in Taunton River and the channel farther into the bay.

Sue Schaller and a volunteer crew have been tagging individual crabs in Hog Bay for five years. The average sex ratio for that period is two male crabs for every female. None of the tagged crabs has yet shown up to be counted at the Egypt Bay monitoring site. As far as is known, the two sub-populations do not interbreed, perhaps isolated by cold waters off Butler Point. ❑

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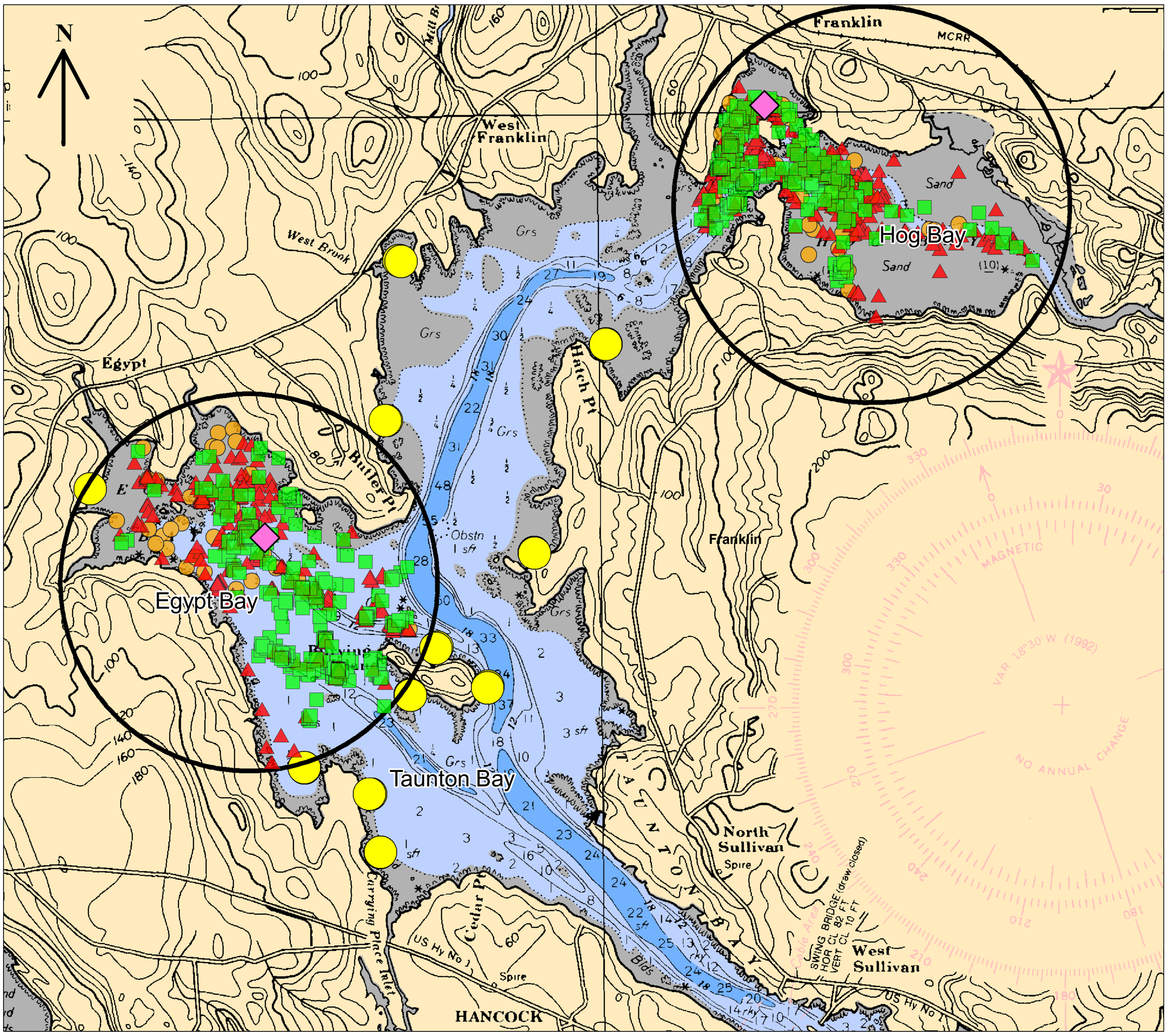
Horseshoe Crabs (1991-2005)



1 0.5 0 1 Miles

Legend

- Benthic Thermometers

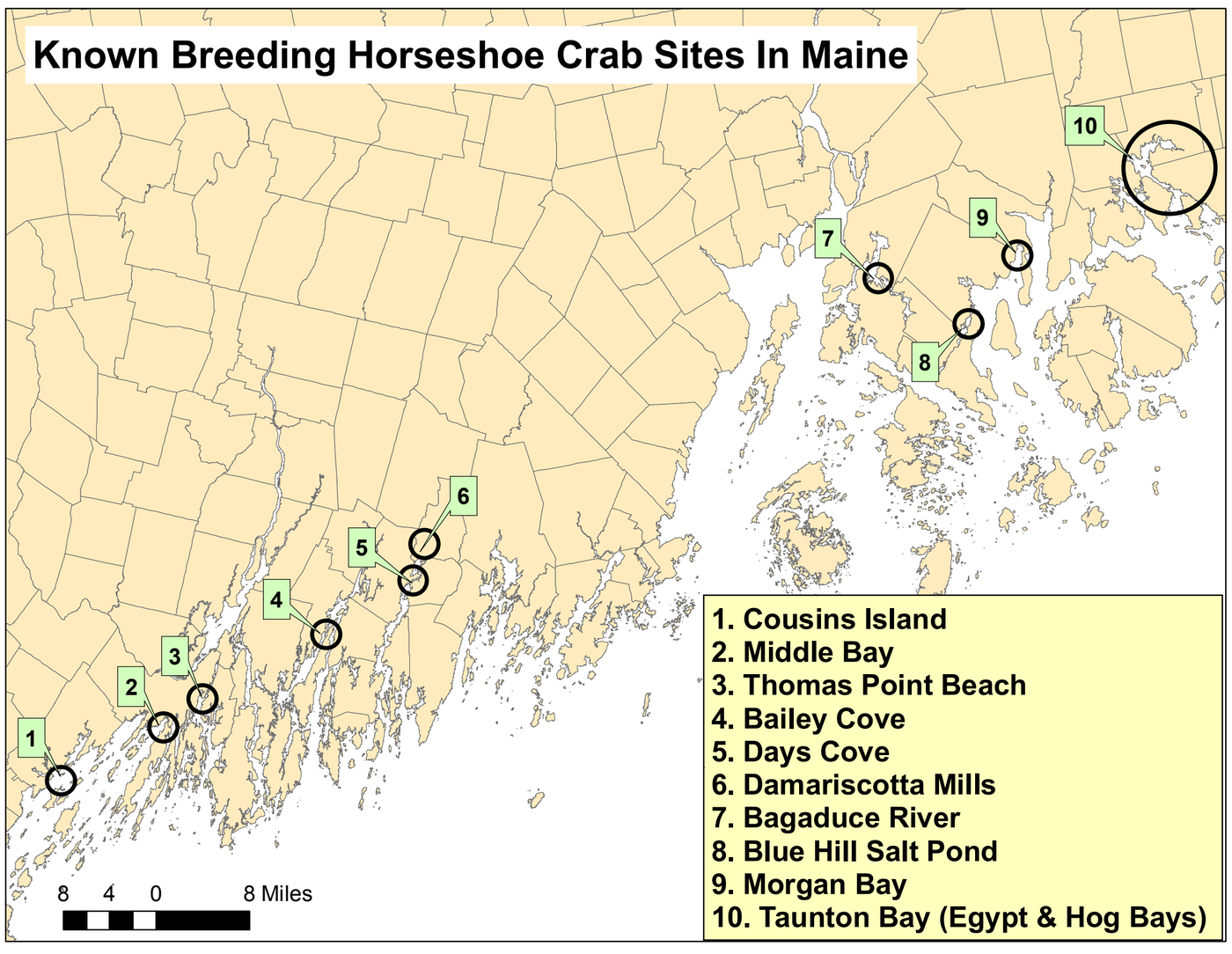
Location of 13 Tracked Crabs

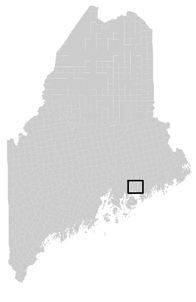
- 2003
- 2004
- 2005

- Visual Sightings
- 13-Crab Tracking Study Area

Depth Ranges (feet)

- .5-18
- 19-76
- Tidal Flats





Sources:
NOAA: Chart 13318_1
Maine DMR
Steve Perrin (Friends of Taunton Bay)
College of the Atlantic

Friends of Taunton Bay
Contact: steveperrin@verizon.net

Map Prepared By
College of the Atlantic
May 2006

American Bald Eagle Nesting Sites 2005

Four out of five nesting attempts by American bald eagles in Taunton Bay failed in 2005, largely as a result of an unusually cold, wet, and windy spring, the trying conditions perhaps augmented by weakened resistance due to residual burdens of toxic chemicals. Of the five active nests on the bay, only the one on Burying Island fledged a young eagle. In 2004, the five nests produced four immature eagles.

The map shows not only nests that were active in 2005, with their quarter-mile-radius buffers, but also locations that have served as active eagle breeding sites in the past. It is clear that the wooded shores of Taunton Bay, featuring large white pines to serve as nesting trees, provide ideal breeding habitat from an eagle's point of view. It is also clear that the bay produces enough food to sustain five active nests, each of which may contain two, three, four, or even five eagles (that is, a breeding pair and three eaglets). Long years of local observation suggest that these eagles utilize about one square mile of the bay in supporting a nest. With 3,772 acres (5.9 square miles), Taunton Bay might then provide for five or six nests at one time. With five active nests in recent years, that conjectural capacity has nearly been filled.

Two of the current nesting sites are located on properties protected as open space by conservation easements. The other three sites are on largely undeveloped lands that remain undisturbed through the year. A few pairs may be somewhat tolerant of activity near the nest, but most are highly sensitive, particularly during the breeding season (roughly January through September). Former eagle nesting habitats that have been subsequently developed (such as Dwelley Point and Havey Point), are not likely to host eagles in the future, particularly when occupied by year-round residents.

American bald eagles are included among the so-called fish eagles, but on Taunton Bay they survive on a diet that includes almost anything but fish. In winter, diving ducks are a mainstay, often caught when short of air and just about to surface in an open pool surrounded by ice. The hunter rides on the wind downwind from the pool, then glides in with talons extended and plucks the duck from the water just before it breaks the surface. It takes a young eagle a winter of trial and error to learn that particular survival skill. If it doesn't learn to hide on the wind, it won't last till spring. At other seasons, eagles will scavenge almost anything from snakes and eels to rotting seal or deer carcases. During the forty years that herons were common on the bay, young herons in the nest became a staple of the eagle diet, one pair of eagles even nesting in the heronry to be close to their food supply.

As the shoreline becomes more densely developed, open space will become increasingly scarce, and eagles will have fewer options in selecting sites with suitable nesting trees apt to be free from disturbance. Recreational boating will also make it easy for curious wildlife watchers to venture within the unmarked quarter-mile "do not disturb" zone surrounding each active or potentially active nest. This scenario has a sequel featuring the rise of citizen stewardship. The map on the opposite page is meant to sensitize local residents and visitors to the presence of eagles on Taunton Bay as a means of encouraging them to guide their behavior accordingly. The map is decidedly not an invitation to say to your guests, "Let's go see the eagles." It is one thing if the eagles come to you, another entirely for you go to the eagles. ❑

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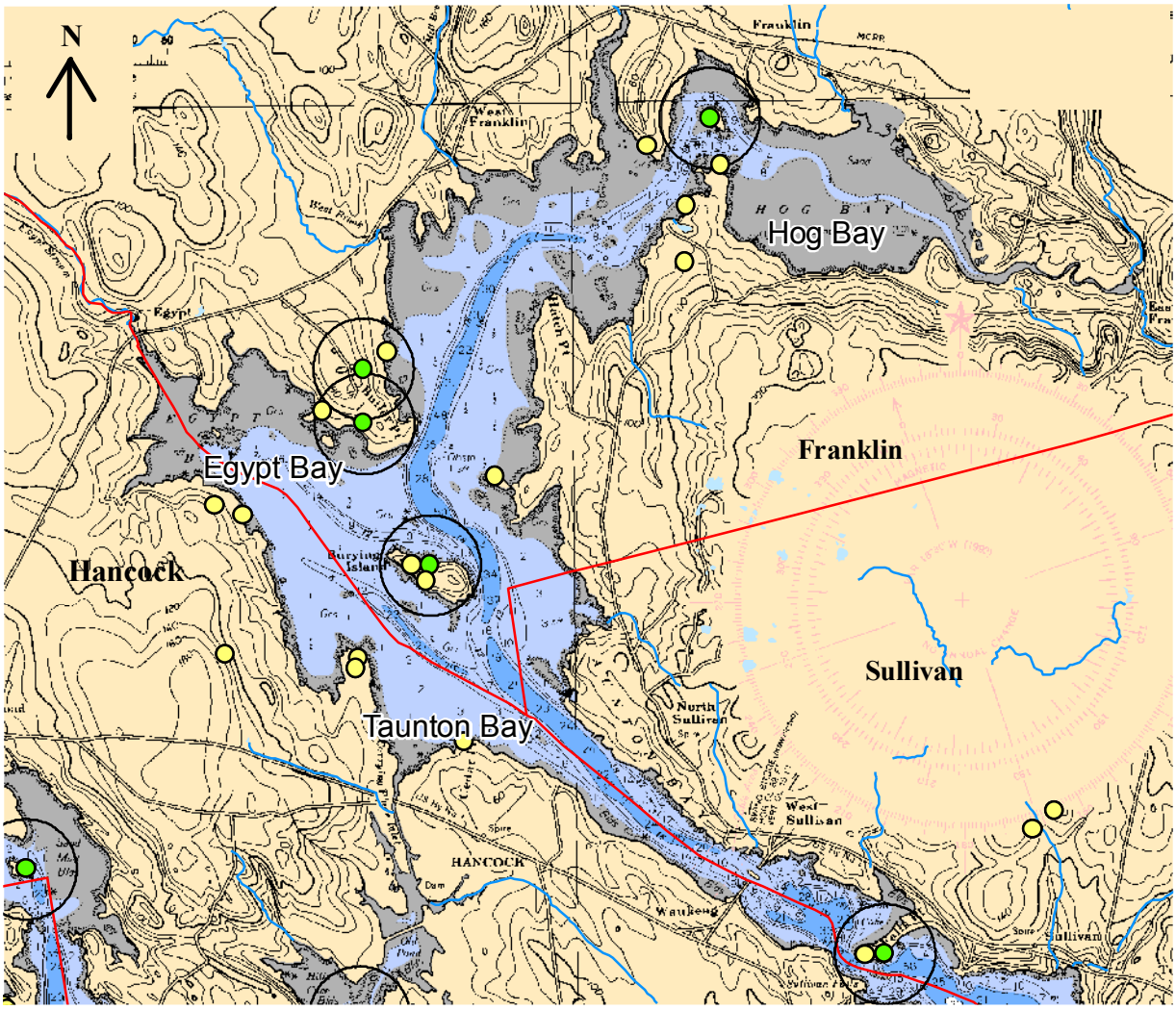
Eagle Nesting Sites 2005

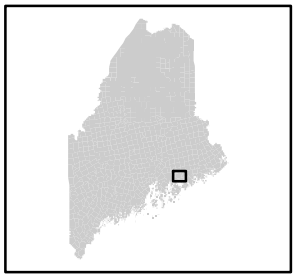


Legend

Eagle Nesting Sites 2005

- Occupied
- Unoccupied
- Town Lines

1 0.5 0 1 Miles



Friends of Taunton Bay
Contact: steveperrin@verizon.net

Sources: NOAA: Chart 13318_1,
Maine DMR,
Steve Perrin (Friends of Taunton Bay),
College of the Atlantic

Map Prepared By
College of the Atlantic
May 2006

Estuary Wildlife

White-tailed deer.

Snowshoe hare.

Great blue heron.

Osprey.

Kingfisher.

Estuaries are great places to see wildlife. Taunton Bay is no exception. Usually it is off in the distance minding its own business. If you want to see it in more detail, the best investment you can make is in a pair of 7x or 8x binoculars with 40–50 mm lenses.

On a trip up the bay, you are apt to see loons, ospreys, herons, kingfishers, eagles, a variety of gulls, terns, harbor seals, and an assortment of other species. Low tide would be a good time to head up the channel, but getting there may be a problem because of the wide margin of mud on either side. In late summer and fall, migrating warblers, shorebirds, and hawks visit the bay, and in winter, a variety of geese and ducks including buffleheads, common goldeneyes, greater scaups, eiders, red-breasted mergansers, and oldsquaws.

If you peer into the trees at dawn or dusk, you might see a white-tailed deer or snowshoe hare. Other mammals in, on, or around the bay include red squirrel, flying squirrel, ermine, mink, otter, fox, coyote, bobcat, raccoon, along with an assortment of shrews, voles, and mice. Bats used to be common, but not anymore.

Insects abound in the area, though in reduced numbers compared to earlier years. Bees and wasps are in notable decline. Aside from pesky carpenter ants, black flies, and mosquitoes, there are springtails, luna moths, northern pine sawyers, dragonflies, butterflies, and beetles not far away, depending on the season. Bay shores are a great place to become acquainted with local Maine spiders, which, it is good to remember, consume hordes of insect pests.

The map on the opposite page can only suggest the richness of the bay's native wildlife. Horseshoe crabs are notable because here they are at the northern extreme of their global range. Few people even know they can survive this far north of Delaware Bay or Cape Cod. Eagles have recovered from humanity's brief but deadly romance with DDT in the years after World War II. Harbor seals were once killed by fishermen because it was believed they ate lobsters, and a bounty could be had for their noses when presented at town offices. They seem to be holding their own in Taunton Bay. Shorebirds (such as sandpipers and plovers), however, are in marked decline from their numbers only fifteen to twenty years ago. ❑

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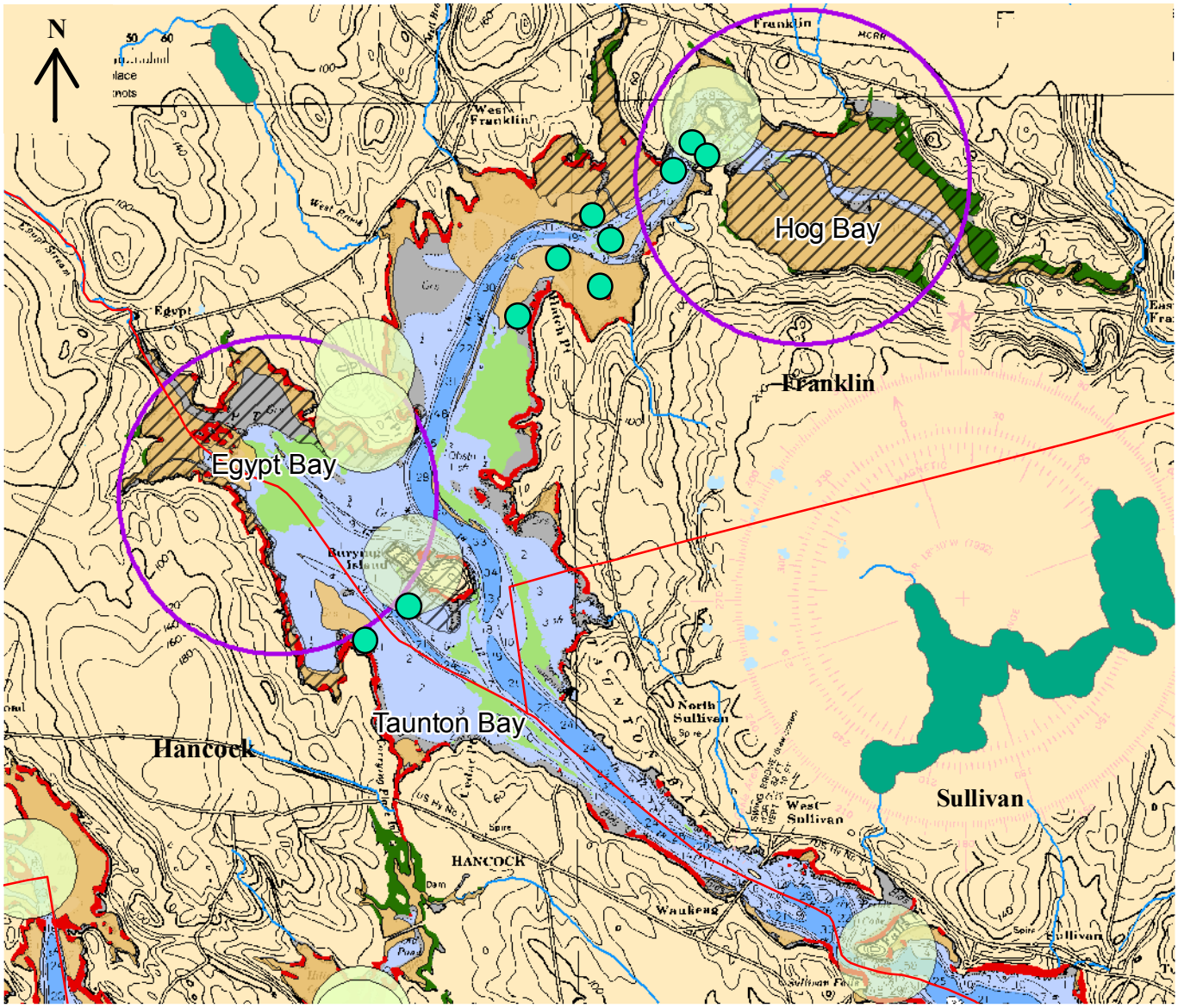
Estuary Wildlife 2005



1 0.5 0 1 Miles

Legend

- Harbor Seal Haulout
- Town Lines
- Migratory shorebird coastal staging areas
- Inland waterfowl & wading bird habitat
- Eelgrass (2005)
- Saltmarsh
- Mudflats
- Rockweed
- Eagle nests
- Horseshoe Crab Subpopulations

Sources: NOAA: Chart 13318_1,
Maine DMR,
Steve Perrin (Friends of Taunton Bay),
College of the Atlantic

Friends of Taunton Bay
Contact: steveperrin@verizon.net

Map Prepared By
College of the Atlantic
April 2006

Biodiversity Hotspots

Maps produced by Geographic Information Systems (GIS) are built up in layers of information that can be graphically displayed. Not only can the layers be overlaid to produce maps, the data on which they are based can also be assigned a numerical value allowing the layers to be added up, the total score indicating the value of all layers contributing data at a particular location. Habitat areas, for example, can be assigned a value representing the rarity, vulnerability, or value in ecological services particular species represent. When different habitats overlap, their respective values would add together for a higher score than habitats that stand apart from others.

The Biodiversity Hotspots map on the opposite page is based on assigning a value to each of a number of species' habitats, and then plotting the results of the additive character of the total stack of habitat data at each point on the map. This analysis was done by Marianna Bradley, a Class of 2006 graduate at College of the Atlantic in Bar Harbor. In this case, the habitat layers for Taunton Bay included:

- shellfish
- worms
- crabs
- lobsters
- anadromous fish
- elvers
- eelgrass
- kelp
- bald eagles
- horseshoe crabs
- harbor seals
- algal flats
- mudflats.
- rockweed

The total habitat scores were sorted into three value ranges representing moderate, high, and very high overlapping habitat (biodiversity) values. According to the map, Taunton river and the estuary channel received moderate biodiversity scores, Hog Bay and areas with other prominent flats received high biodiversity scores, and a few sites near eagle nests around the bay were awarded very high scores.

The art in applying this tool comes in selecting GIS data layers that are truly additive in an ecological sense. In many cases, the underlying habitat data are not available, or are available only in a very general sense (on a county or town scale rather than an ecosystem scale), resulting in poor resolution. It is a judgment call whether or not eagles and clams can be included in a single measure of biodiversity. Is this adding apples and oranges to produce a more general category of fruit, or does it tell us something about places that include both kinds of fruit, i.e., clams and eagles?

Beyond being an exercise in the application of GIS technology, this may well prove to be a useful tool for evaluating the cumulative benefit of overlapping habitats in estuaries such as Taunton Bay. Eagles may not eat clams, but they certainly do eat eaters of clams, and eaters of eaters of clams. ❑

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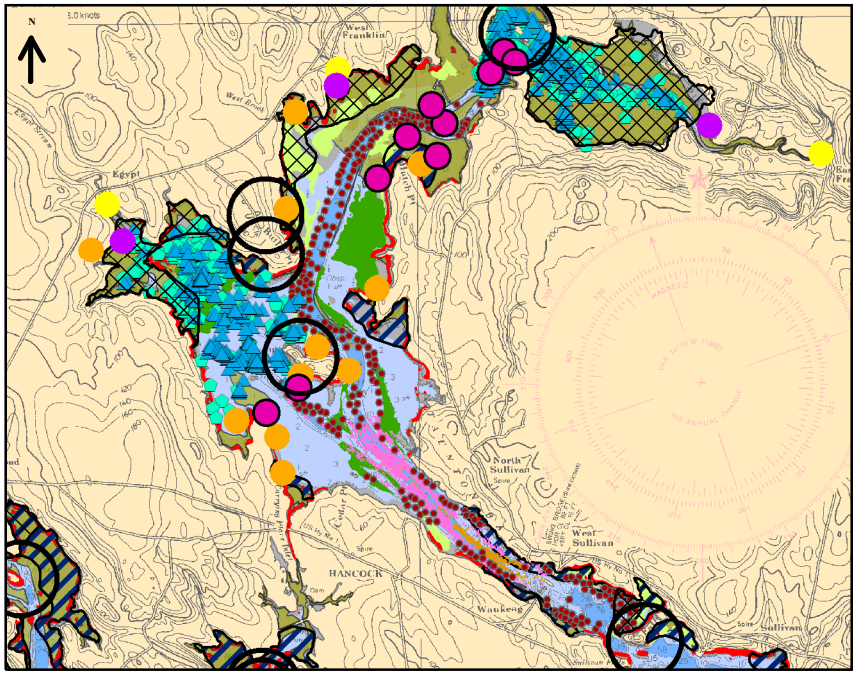
Marine Species and Wildlife



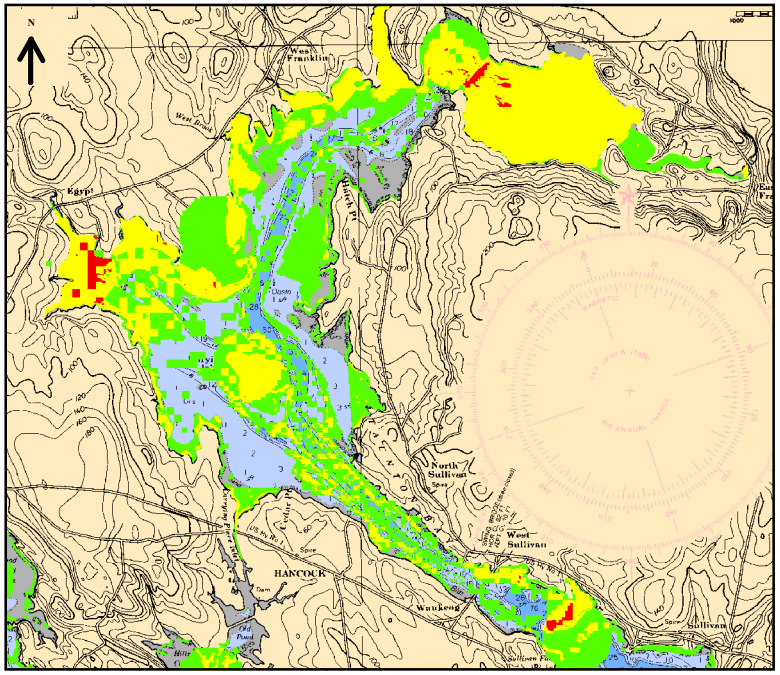
1 0.5 0 1 Miles

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended.
Administered by the Office of Ocean and Coastal Resource Management,
National Oceanic and Atmospheric Administration.

Legend

- Anadromous Fish Run
- Elvers
- Eagle Nests
- Seal Haulouts
- Breeding Horeshoe Crab Sightings
- hsc_2003_DMR
- hsc_2004_DMR
- Lobster/Crab Buoy
- shellfish
- worms
- Kelp (dense) on pebbly gravel
- Kelp (moderate to sparse)
- Eelgrass (2005)
- Algal flats
- Rockweed
- Mudflats

Biodiversity Hotspots Analysis



1 0.5 0 1 Miles

Legend

Value

- Moderate
- High
- Very High

The ratings are based on the number of overlapping layers.

Very High = 4-5
High = 2-3
Moderate = 1

Sources:
NOAA: Chart 13318_1
Maine Office of GIS
Maine DMR
College of the Atlantic

Analysis By: Marianna Bradley
College of the Atlantic, GIS Lab

Friends of Taunton Bay
Contact: steveperrin@verizon.net

Map Prepared By
College of the Atlantic
April 2006

Soils' Suitability for Development

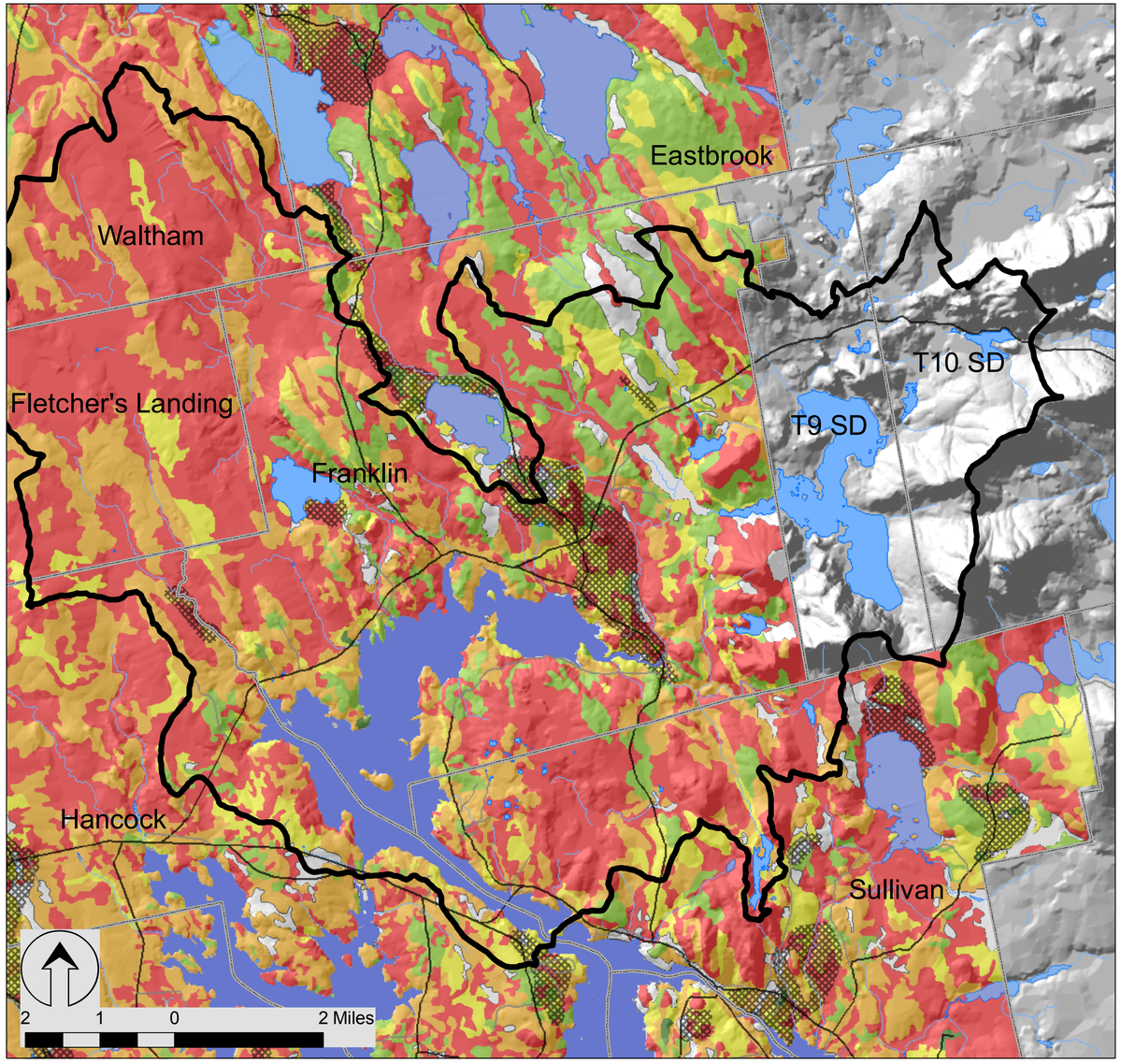
Whether a site is suitable for development or not depends on the characteristics of the specific soils found on that site. Different soils can be highly variable in their susceptibility to erosion, permeability or retention, depth to bedrock, and depth to watertable at different times of year. Soils can be more-or-less suitable for such land uses as forestry, agriculture, water storage, industrial sites, or residential development. Before such activities are undertaken, towns, planners, and builders want to know whether a site is appropriate for the specific project being proposed. To make that determination, soil scientists conduct a soil survey looking at such properties as slope severity, depth to bedrock, limitation for septic tank drain fields, wildlife suitability, and flood or wetland conditions. Other considerations are moisture content, clay content, and rates that air and water move through the soil.

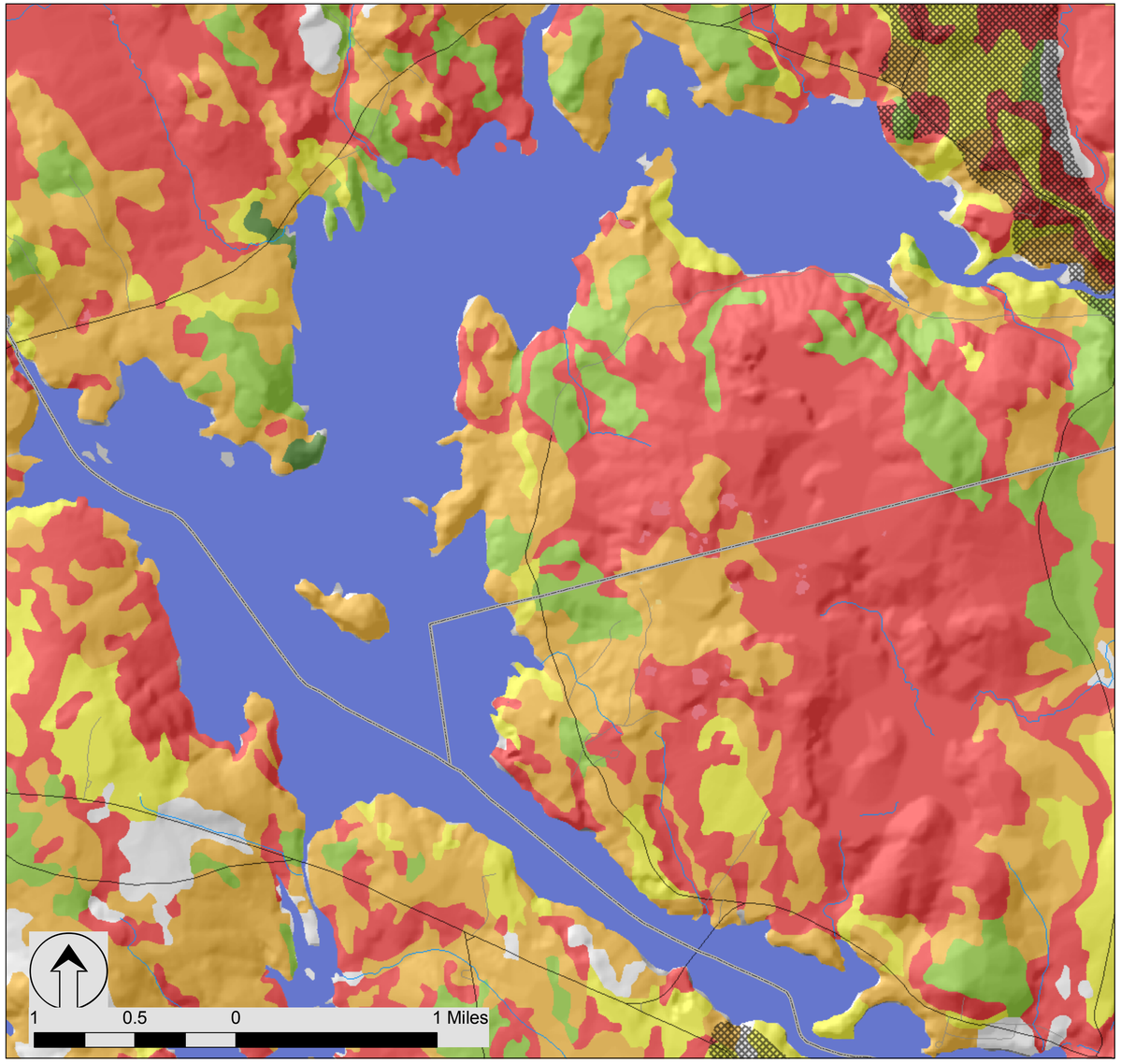
Erosion is always an issue in land use alteration and development. The natural rate of erosion can be accelerated by human activity, particularly if it increases runoff from a site. The greater the length and gradient of a slope, the greater the potential for increased erosion if the site is disturbed. Properties affecting erodibility are soil texture, structure, permeability, and amount of organic matter. Removing vegetation promotes topsoil erosion. Soils are a non-renewable resource: it can take a thousand years to lay down one inch of topsoil.

The maps on the opposite page are based on a soils classification scheme resulting in six levels of soils suitability for development. Dark green represents very high suitability, bright red very low suitability, with in-between levels indicated in order of decreasing suitability by light green, yellow, and tan. Lack of color, as in unorganized territories, indicates soils data has not been included for those areas. Aquifers are shown in transparent crosshatching that reveals the suitability ratings for soils in the area.

What leaps from these maps is the amount of bright red and tan they contain, and the slight amount of light and dark green. Patches of yellow are small, few, and far between. With the exception of local aquifers, soils in the region are generally thin, often sloping, poorly drained, and subject to erosion if disturbed. Many people want to build here, but sometimes here may not be a suitable place to build. The map is reproduced at a very small scale, so soil properties at a particular site need to be determined by a qualified soil scientist. It is always wise to visit a site in the spring when runoff and snowmelt are apt to be high, resulting in local ponding and erosion.

Another development issue is sprawl, which results from developing sites that can only be reached by automobile. Communities in the Taunton Bay area, instead of being self-sufficient as they formerly were, are residential extensions largely dependent on businesses, services, and jobs in Bangor, Ellsworth, or Bar Harbor. With little regional public transportation available, local communities are made possible by the private car, pickup, van, or SUV. Though rising gasoline prices are causing people to question this dependence, clustering development in towns and villages is an idea whose time has not yet arrived. It seems easier to look for alternative fuels than alternative lifestyles, though perhaps not for long. ❑





Sources:
Hancock Soils Conservation Service
Maine Office of GIS
Maine Geologic Survey
College of the Atlantic

Map Prepared By
College of the Atlantic
April 2006

Legend

- Taunton Bay Watershed
- Estuary
- Lakes and Ponds
- Streams
- Town Lines
- Aquifers

Soils Potential for Development

- No Data
- Very High
- High
- Medium
- Low
- Very Low

Friends of Taunton Bay
Contact: steveperrin@verizon.net

THE TAUNTON BAY STUDY

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Watershed and Estuary Soils Development Potential and Aquifers

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended.
Administered by the Office of Ocean and Coastal Resource Management,
National Oceanic and Atmospheric Administration.

Watershed Parcels

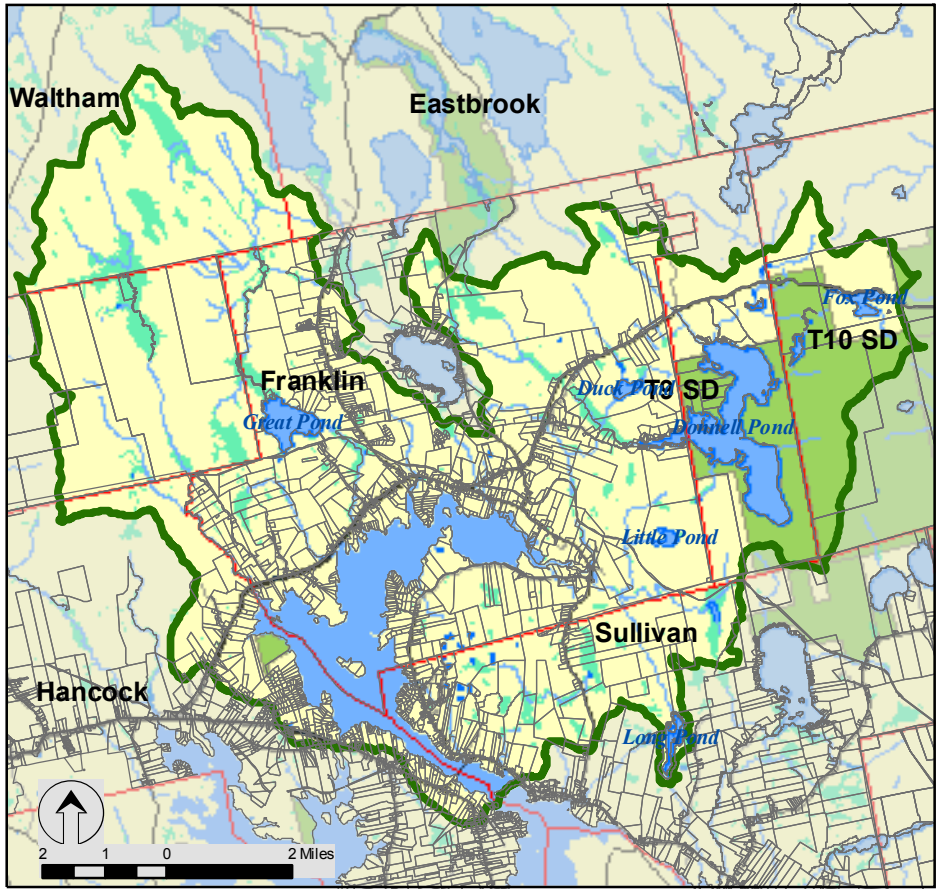
The Watershed Parcels Map is a basic tool that can help keep track of development, land use, and potential pollution around the bay. It is more of a rough indicator than a precise tool. But subdivision of land within the watershed does at least provide a sense of the granularity of development if not detailed information about land use in particular locations. As a rule of thumb, more intensive subdivision is suggestive of more roads, buildings, impervious surfaces, and septic fields in the area. All of these translate into an increased possibility for pollution reaching the bay. With eight clam flats closed in 2005, finer grained development would pose an even greater threat to water quality in Taunton Bay.

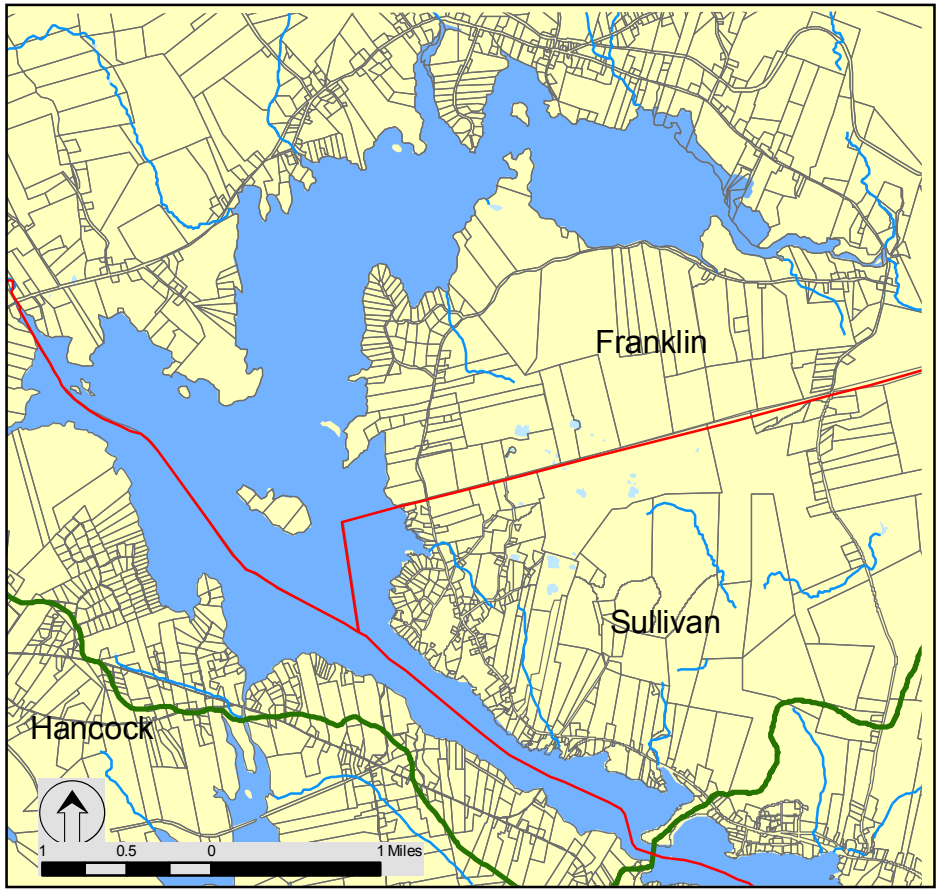
Digitization of the Franklin parcel map was completed in spring 2006. This is the first time a GIS map such as this could be produced for the entire watershed. Now that the work has been done, the challenge is to update the map as new records become available from each town. Note that records have been obtained from LURC for unincorporated townships in the watershed, but not yet from the incorporated towns of Waltham and Eastbrook.

Larger parcels may be used more for forestry or agriculture than homebuilding, but siltation and pesticide/herbicide runoff from these areas potentially affect water quality in Taunton Bay. Although most parcels in the watershed are shown, not all lots are developed, so it is not possible to use this map as an accurate gauge of the potential for pollution. But to quote from page 47 of The Taunton Bay Study Indicators Report, "assuming each parcel contains 0.8 septic system (not all parcels are developed while some parcels have more than one septic system), an estimate of the potential for septic pollution can be gauged from the subdivision of the entire watershed into discrete parcels. The number of parcels and estimated number of septic systems in (or partially in) each watershed town is as follows:

Town	Parcels	Septic Systems	% Watershed Total
Eastbrook	2 (estimate)	2	0.2%
Fletcher's Landing	6	5	0.5%
Franklin	641	513	49.7%
Hancock	339	271	26.2%
Sullivan	262	210	20.3%
T 9 SD	21	17	1.6%
T 10 SD	9	7	0.7%
Waltham	10 (estimate)	8	0.8%
Totals	1290	1033	100.0%

By this very rough model, the Town of Franklin stands to contribute as much pollution to the bay as all other towns combined. Hancock's potential share is half that amount, Sullivan's somewhat less. Entering the shallow end of the bay which is normally under high ecological stress, pollution from Franklin could pose a potential threat to local mudflats and the life they support. Now that a baseline has been established, a more accurate estimate of the watershed's impact on the bay can be made and refined in coming years. ❑





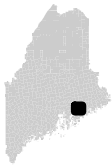
Sources:
NOAA: Chart 13318_1
Maine Office of GIS
Maine DMR
Hancock County Planning Commission
Frenchman Bay Conservancy
College of the Atlantic

Map Prepared By
College of the Atlantic
March 2006

Friends of Taunton Bay
Contact: steveperrin@verizon.net

Legend

- Parcels
- Protected Land
- Taunton Bay Watershed
- Estuary
- Lakes and Ponds
- Fresh Water Wetlands
- Streams
- Towns_TBW
- Town Lines



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Watershed and Estuary Parcels Map

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended.
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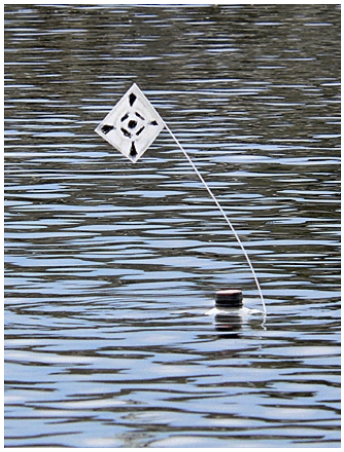
National Oceanic and Atmospheric Administration.

Drifter Studies


Drifter with flag.

Drifters are tools for studying currents in bodies of fresh or salt water. They are generally designed to maximize the influence of flowing water while minimizing that of the wind. Some have a drogue suspended from them to maximize the effect of currents at a set water depth. They can include transmitters with satellite links to relay data to distant stations, or they can be a simple juice bottle filled with a mixture of fresh water and sand, with a flag attached for visibility. The drifter used in Taunton Bay for the three studies shown on the Drifter Studies map is of the juice-bottle variety. To tell us anything about tidal currents, it can only be used on days with slight winds. In these studies, the transmitter was replaced by a human observer with a clipboard who tracked the drifter by boat, periodically recording its position with a GPS unit. Another requirement is a time commitment of some six to seven hours.

Drifter in Taunton River.

On June 21, 2003, the drifter was placed at the head of Hog Bay at high tide, and tracked as it moved on the outgoing tide across the bay, past Round Island, and through the southeasterly of the two channels until it came to rest north of Creasy Cove at low tide. That short journey suggests that water in the shallow upper bay on windless days might not mix very well with water coming in from Frenchman Bay. In a sense, on such days the flow in Hog Bay is like a wave in a bathtub, riding back and forth, back and forth.

The two drifter studies conducted in 2005 both began at low tide midway between Falls Island and Falls Point. The drifter followed similar courses along the main channel through Taunton River and the middle bay, diverging off Hatch Point, on May 14th ending up on Julius Darling Point at high tide, the other drifter on July 21st coming to rest at the western end of the northwesterly channel in five hours, remaining in that location until the water was high, rising with the tide, but not changing position. The end point of these two drifters was close to that of the 2003 drifter which, coming the other way on an outgoing tide, came to rest in a nearby location.

Drifter along Sullivan shore.

More drifter studies will have to be done to augment our understanding of tidal currents in Taunton Bay. So far it looks as though, on days with little or no wind, water from Sullivan Harbor reaches as far as a line from Julius Darling Point through the middle of Creasy Cove, where it slows and comes to a halt before heading the other direction. As it slows, the current drops its load of sediment, in 2005 reaching as far as Mike Briggs' oyster grow-out lease, where that load of sediment settled, smothering the oysters on the bottom. Mike is relocating his lease site to the channel south of Burying Island. This event illustrates the utility of drifter studies such as this. ❑

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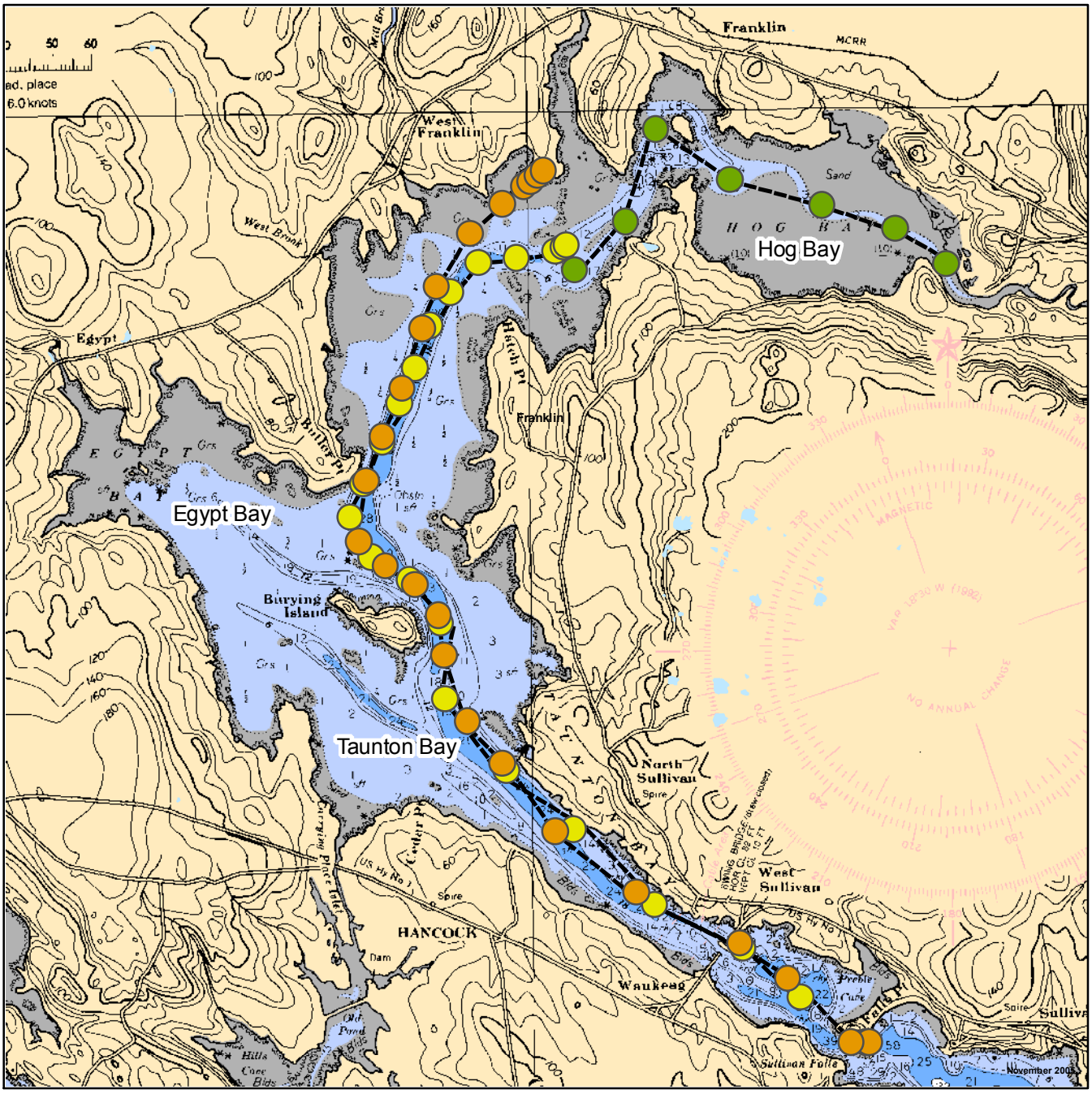
Drifter Studies



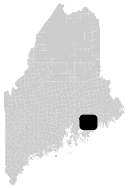
1 0.5 0 1 Miles

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended.
Administered by the Office of Ocean and Coastal Resource Management,
National Oceanic and Atmospheric Administration.

Legend

	Tide	Date	Height	Time Interval	Depth Ranges (feet)
	Incoming	05/14/05	7'	15-minute intervals	.5-18
	Incoming	07/21/05	9'	15-minute intervals	19-76
	Outgoing	06/21/2003		Hourly intervals	Tidal Flats

Drift_Tracks



Sources:
NOAA: Chart 13318_1
Maine DMR
Steve Perrin (Friends of Taunton Bay)
College of the Atlantic

Friends of Taunton Bay
Contact: steveperrin@verizon.net

Map Prepared By
College of the Atlantic
April 2006

Bluff Stability Survey 2005

A highly unstable bluff on the shore of Taunton River in Hancock.

Chris Miller conducting bluff survey.

As the rate of glacial melting increases around the Earth due to global warming, ice sheets in Greenland and Antarctica now have the potential of raising sea level by 20 feet apiece for a total anticipated rise of forty feet. Meltwater and increasing ocean temperatures are even now causing the tide level in Taunton Bay to rise at a faster rate than it did in all the twentieth century, resulting in a rise of multiple feet per hundred years as opposed to the previous rate of four inches in the same period.

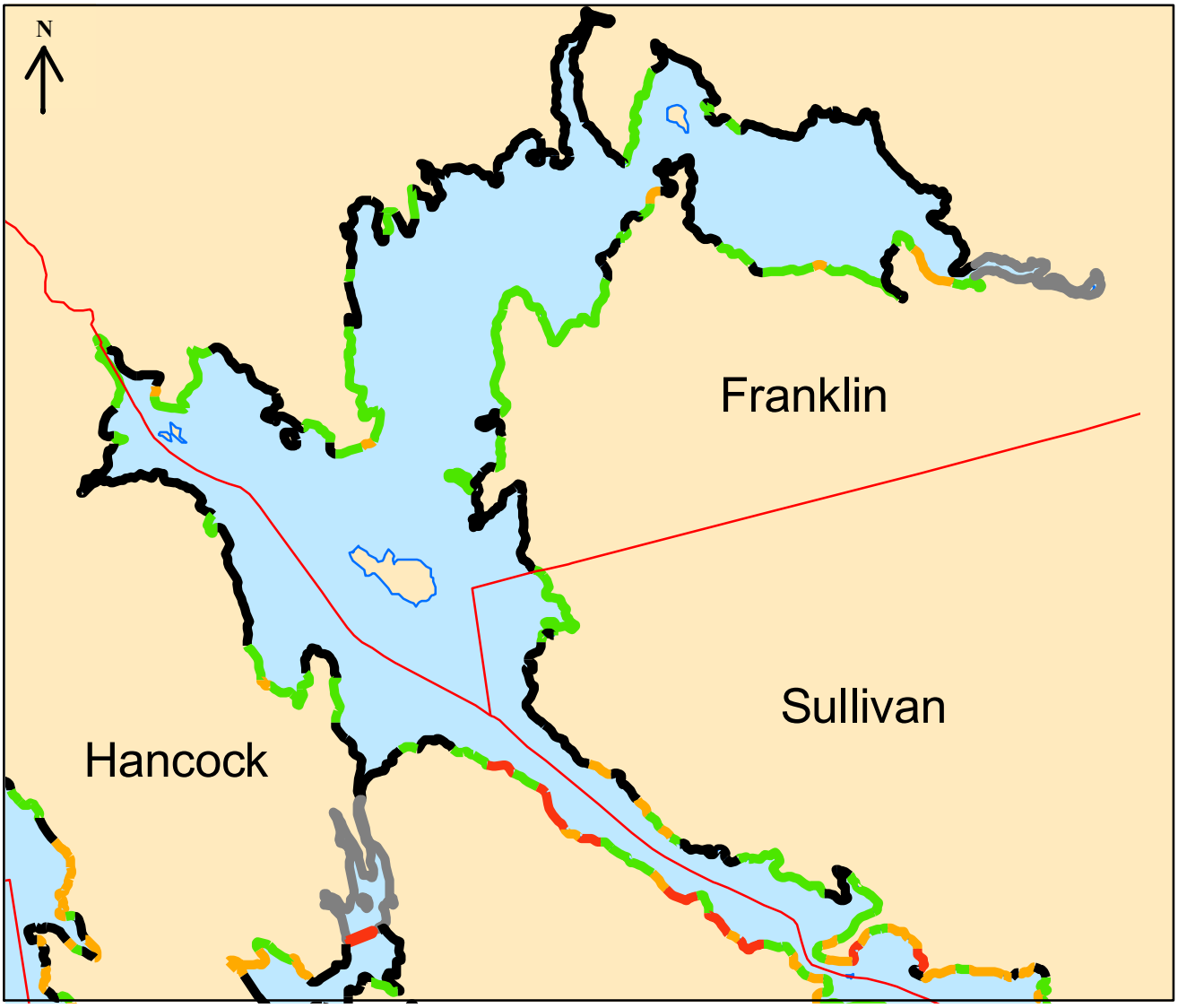
The bluff stability map on the opposite page suggests the vulnerability of the Taunton Bay shoreline to a sea level rise of even a few inches, much less 20 or 40 feet. Granite and schist bedrock will not be much affected, but banks of unconsolidated soils such as sand and glacial till, when they rest on the high tide line, will be undercut, slump or erode, and wash as sediment into the bay. If this happens on a grand enough scale, turbidity will increase, and both light transmission and productivity decrease, generally triggering ecological havoc throughout the estuary. This grim scenario may not happen all at once, but, given our national reluctance to face into global warming as a fact, it now appears to be inevitable.

We may joke that the smart money is now investing in properties at or above the present 40-foot contour, but cynicism is no solution to events now unfolding as we move into the twenty-first century. We may prefer lighthearted entertainment, but escapism and denial will not reveal the current warming trend as a hoax staged by the environmental community. When it comes to survival, the fittest are those who can deal with the facts. The bluff stability survey presents a few of those facts. The photo at left above presents a few of those facts. Every tree fallen into the tide, every grain of soil washing out of a bank, every new retaining wall—presents more and more facts. Taunton Bay and the entire coast of Maine are brimming with similar facts, if we will only look to them as a foundation on which to base effective action in days ahead. ❑

THE TAUNTON BAY STUDY

A pilot project in collaborative bay management

Bluff Survey



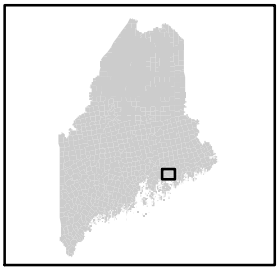
1 0.5 0 1 Miles

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended.
Administered by the Office of Ocean and Coastal Resource Management,
National Oceanic and Atmospheric Administration.

Legend

Bluff Stability Rating

- Highly Unstable
- Unstable
- Stable
- No Bluff
- Not Mapped
- Estuary
- Town Lines



Data Sources:
Maine Geological Survey

Friends of Taunton Bay
Contact: steveperrin@verizon.net

Map Prepared By
College of the Atlantic
May 2006

Estuary Stress Gradient

Tidal falls at the mouth of the estuary.

Hog Bay at the head of the estuary, low tide.

Conditions vary widely from the mouth of Taunton Bay at Tidal Falls to the head of the estuary in Egypt and Hog Bays. At the falls, conditions are largely influenced by the marine conditions in Frenchman Bay: salinity is high, water temperature low, water velocity high because of the ten-foot sill and constricted entrance due to Falls Point, nutrients are well mixed at all depths, and oxygen levels are high. As a result of these conditions, the diversity of species at the falls and in Taunton River is relatively high.

At the head of the estuary, the bay grades from shallow subtidal to intertidal flats; the range of salinities can be high depending on precipitation, streamflow, and runoff; the daily and tidal range of air and water temperatures can also be high; water velocity (depending on wind) is relatively low; producing an ecological environment characterized by extremes to which few species are adapted, resulting in relatively low species diversity.

The concept of ecological stress level combines these different factors into one index of species diversity. That index is low at the estuary mouth where conditions favor diversity, high at the head where conditions are harsher, providing habitats that favor fewer species. The Estuary Stress Gradient map illustrates the change in stress from one end of the estuary to the other, suggesting intermediate levels of stress where conditions are more-or-less moderated. The map is conceptual in nature and not based on actual observations or measurements.

Species diversity should not be confused with species abundance. Many marine invertebrates adapt to extreme conditions by burrowing into bottom substrates where moderate conditions prevail despite exstreme variations on the surface of the flats only a fraction of an inch overhead. The diversity of species in mudflat communities may be comparatively low, but the total abundance of organic life (much of it microscopic) can be surprisingly high. The map of the estuary stress gradient in Taunton Bay can be used to predict general levels of biotic diversity, but not the abundance of life forms actually present.

Fefer and Schettig* cite season of the year, substrate, water column stability, pollution, salinity, and productivity as factors governing the number of species found at a given location. High densities of individual organisms are found where species diversity is lowest (the upper estuary). These are areas of low competition with rival species, and few predators, allowing the few species tolerant of high stress due to variable conditions to proliferate. ❑

* Fefer, Stewart. and Patricia A. Schettig, *An Ecological Characterization of Coastal Maine,* Vol. 2, Ch. 5, page 5-85.

THE TAUNTON BAY STUDY

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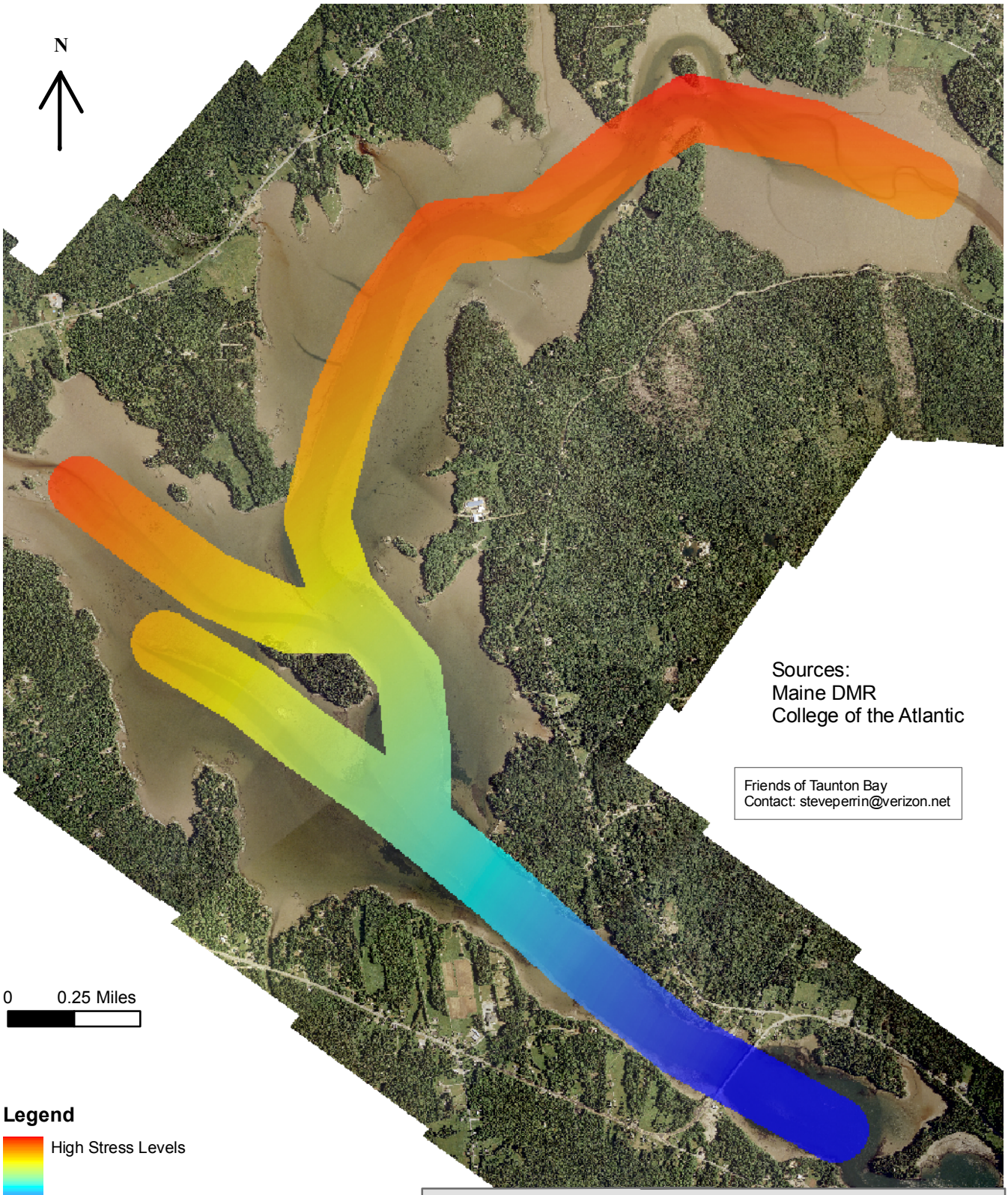
Estuary Stress Gradient



Legend

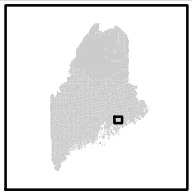
High Stress Levels

Low Stress Levels

High temperature & salinity ranges; low species diversity

Low temperature & salinity ranges; high species diversity

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended.
Administered by the Office of Ocean and Coastal Resource Management,
National Oceanic and Atmospheric Administration.



Map Prepared By
College of the Atlantic
March 2006

Discussion

The Mapping Report 2005 is meant to serve as an integral part of The Taunton Bay Study. It is a companion piece to the Indicators Monitoring Report 2005, both of which were conceived as means of presenting information relevant to the Taunton Bay ecosystem in a form that stakeholders (those sharing an interest in the bay) would find both informative and useful. The goal toward which these reports are directed is widespread local stewardship of the bay's natural resources, and beyond that, promotion of ecosystem-based management as a means of improving the governance of Maine's public trust resources throughout Taunton Bay and its watershed. The Governance Report offers nineteen recommendations regarding how such improved management might be undertaken on a regional basis. These three reports, augmented by Barbara Arter's Economic Assessment of the Fisheries and Marine Resources of Taunton Bay, issued in November 2005, were intended to provide the foundation for an outreach program that would engage stakeholders in working with state, regional, and local officials to assure the sustainability of the Taunton Bay ecosystem, and the benefits it provides to local communities.

The fundamental flaw in this ambitious design arose from underestimating how much time and effort it would take to produce the products on which the crucial outreach portion of the study would depend. That is, we were in the awkward position of wanting stakeholders to share their hopes, values, and concerns with us before having anything to give them in exchange to help focus the discussion. The Taunton Bay Study commenced April 1, 2005, when Friends of Taunton Bay signed a contract with the State of Maine to deliver certain products. It was thought at that time that maps and indicators would emerge during the course of the pilot project, in time to share with stakeholders at public meetings designed to raise particular issues and work out the details of ecosystem-based management. That didn't happen. Monitoring of indicators took from May through November; gathering data from other sources (weather, water quality, eagle breeding success, town parcel maps, etc.) took two months of intermittent activity. Working the data into presentable form took three months of full-time effort beyond that. The Indicators Monitoring Report wasn't completed until late April 2006. A second draft Governance Report was distributed to the Governance Working Group on April 27, 2006. The Mapping Report was finished on May 5, 2006, when, after a dedicated effort, all maps were received and approved.

With these four reports in hand, the outreach program can now begin in earnest. Except that the project has run out of time. The deadline for submitting reports is May 9, 2006. If the outreach phase of the project is to be accomplished, Friends of Taunton Bay will have to undertake it on its own initiative. Which is pretty much how the project has gone since its inception in September 2004 before the project proposal was submitted to the State Planning Office. Local bay management depends absolutely on local citizens taking initiative to formalize their stewardship responsibilities. Some come to this realization sooner than others. For these early comers, the learning curve is extremely steep —and expensive. Gathering and presenting good local information requires motivation, training, know-how, and dedication. Detailed information about local ecosystems is not generally available, but it is essential to effective ecosystem based management on the local level. There is no escaping the fact: local organizations have to find ways of producing that information. And of sharing that information with a broad range of stakeholders in order to generate the necessary discussions that must take place if coastal management in Maine is going to improve. ❑ (S.P., May 5, 2006)