



CAPE COASTAL CONFERENCE

*Linking Science with Local
Solutions and Decision-Making*

Trends in Shoreline Change and Hazard Impacts: Hot Spots and Management Challenges

Presented By

Greg Berman

(WHOI Sea Grant & Cape Cod Cooperative Extension)

Outline:

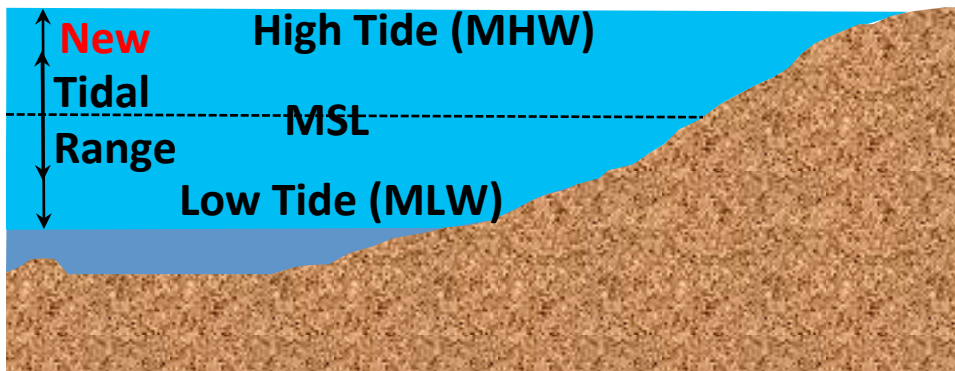
- ~30 min talk & time for questions
- General Glacial/Geologic History and Coastal Processes
- A look at each town on Cape Cod
- Summarize management strategies



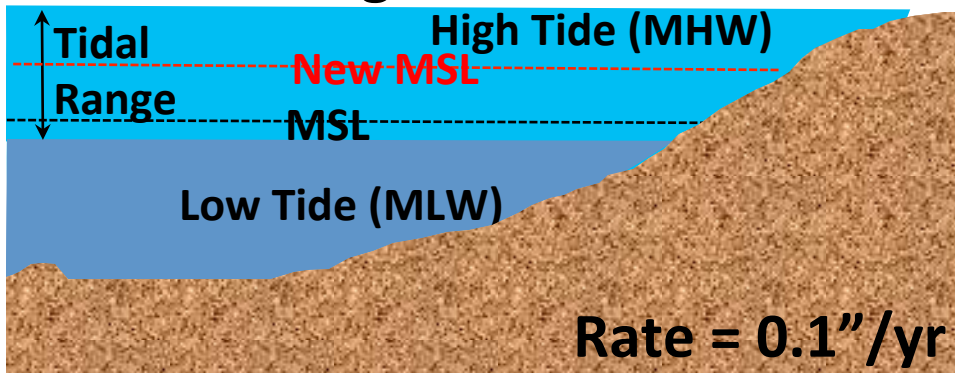
Natural

Change in Wind/Waves/Storms

Change in Tidal Range



Change in Sea Level



Human Induced

Seawall / Revetment



Bulkhead



Gabbion



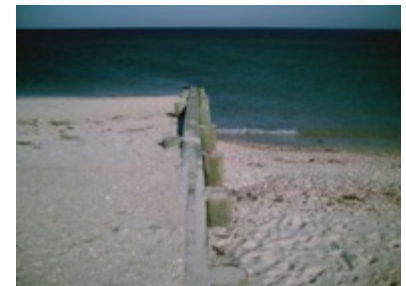
Breakwater



Jetty



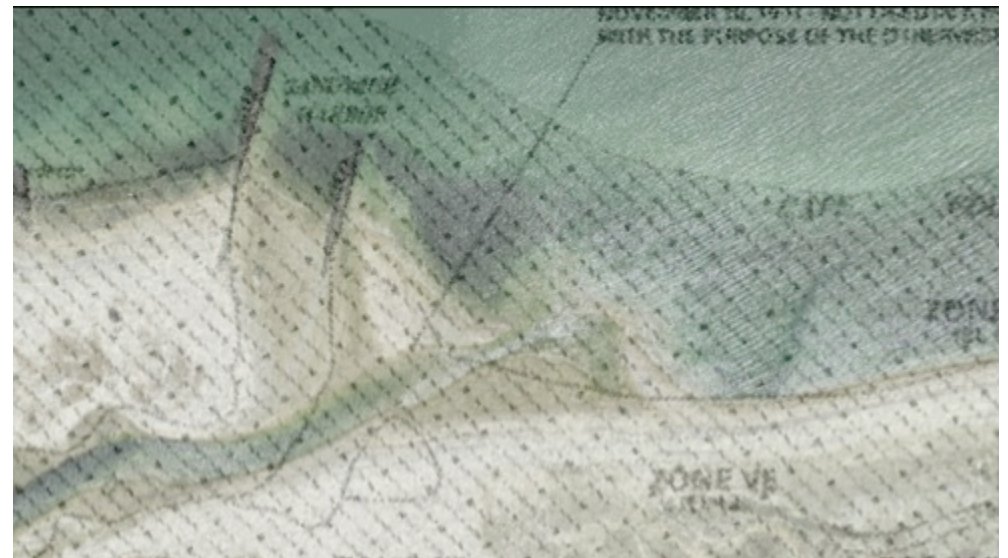
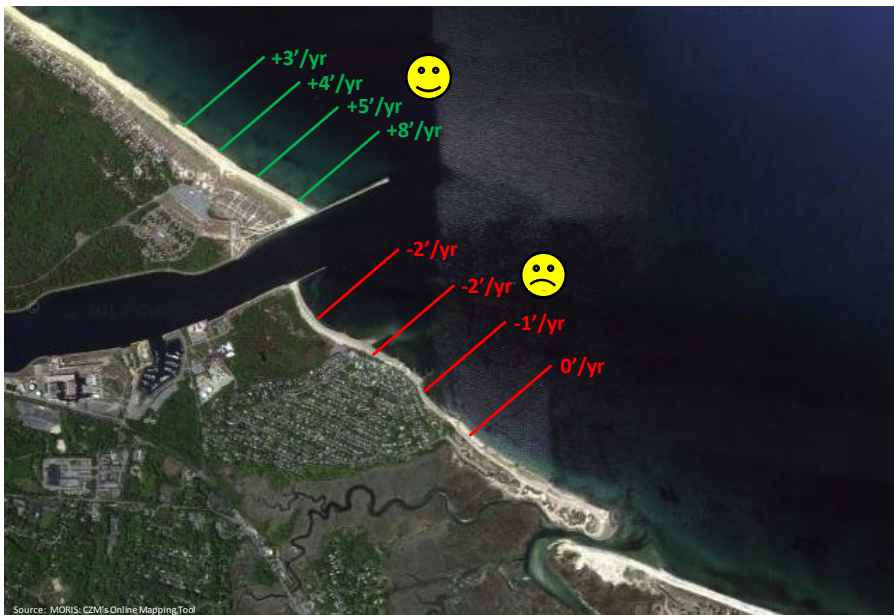
Groin



Sandwich- Town Beach Erosion



**Joint
Draft Environmental Impact Report/
Development of Regional Impact
Beach Management, Inlet Stabilization,
and Maintenance Dredging
Sandwich Harbor, Sandwich, MA**

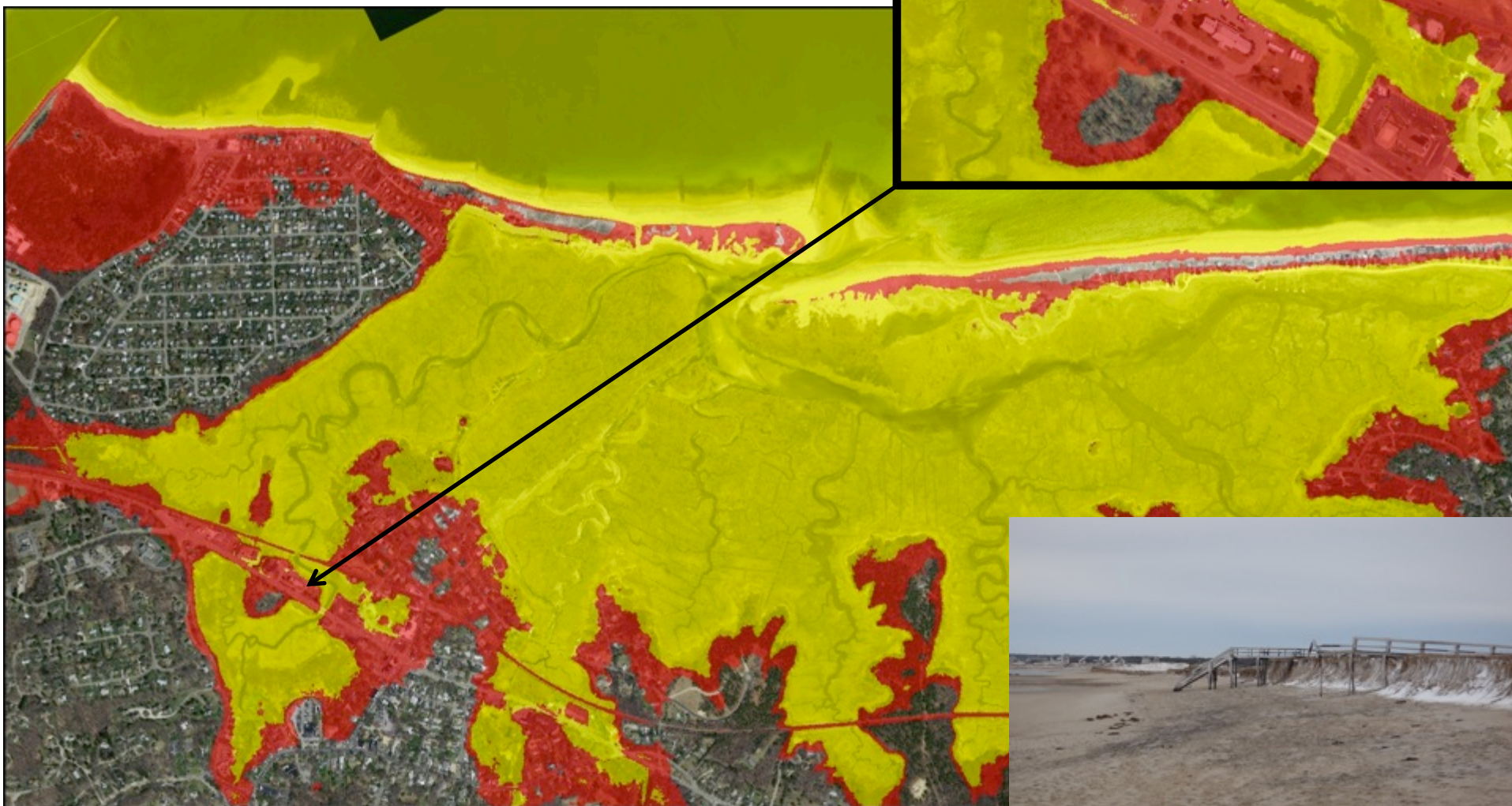


Sandwich- Flooding



Yellow = Current A Zone

Red = Expanded A Zone





Hurricane Bob
NOAA-10
8/19/91
8:30 A.M. EDT
NOAA-NESD-15

Surge is a function of:

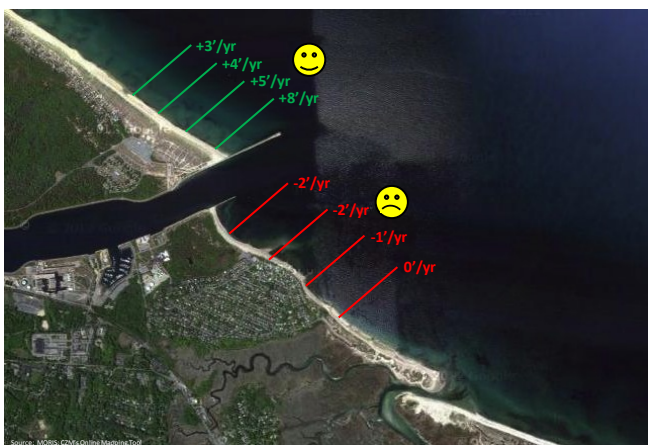
- Storm Intensity
- Storm Track
- Land Geometry/Bathymetry



*Estuaries
can
focus
surge*

1938
12'+
surge

*Will it hit
at:*





**Navigation
Dredging**

**Improvement
Dredging**



Falmouth – The Beaches



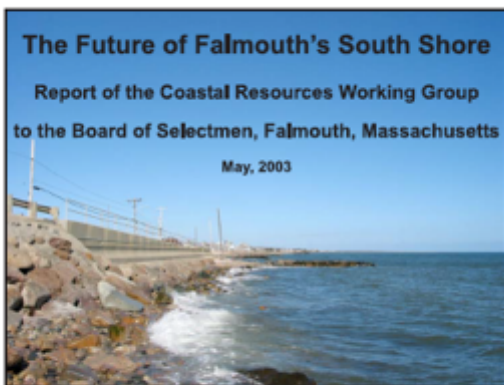
Images from the 10/2010 Report of the CRWG to the Falmouth BOS





Coastal Resources Working Group (CRWG)

May 2003



Coastal Resources Working Group

Rob Thier, Chairman
Dorothy Aspinwall
Bob Barker
Rocky Geyer
Jo Ann Muramoto
Beth Schwarzman
Charles Swain
Jane Tucker
Chris Weidman

George Calise, Town Engineer, ex officio
Jude Wilber, ex officio

October 2010

The Future of Falmouth's Buzzards Bay Shore



Report of the Coastal Resources Working Group
to the Board of Selectmen, Falmouth, Massachusetts

October 2010

Coastal Resources Working Group

Jane Tucker, Chair
Bob Barker
Rocky Geyer
Jo Ann Muramoto
Beth Schwarzman
Doc Taylor
Rob Thier
Chris Weidman

George Calise, Town Engineer (retired), ex officio
Jude Wilber, ex officio

- 1) Coastal Ponds Management Committee for coastal management;
- 2) Harbor Management Plan for Green Pond;
- 3) Beach Management Plan for the town's public beaches;
- 4) Purchase/protection of parcels for open space; and
- 5) Draft hazard mitigation plan with an emphasis on mitigating the effects of SLR.

Mashpee- Sandy (October 29-30, 2012)



South Cape Beach



Before

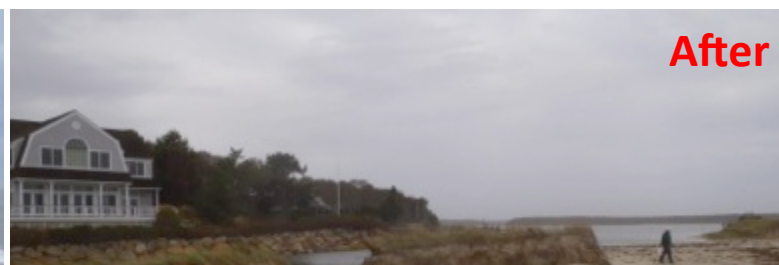


After

Popponesset Beach



Before



After



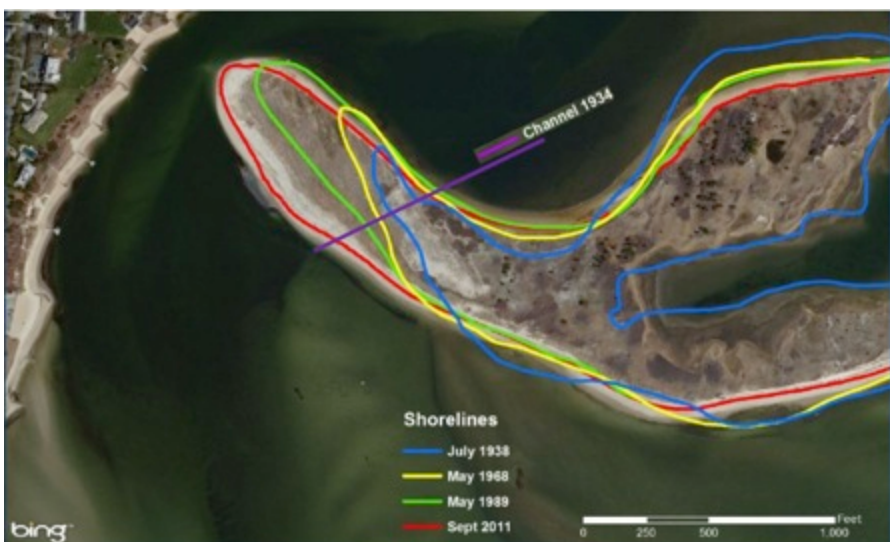
Repair



Accretion affects
navigation & WQ

Erosion affects stability
of barrier island

"Effects of Cotuit Entrance Channel Maintenance on Coastal Processes and Coastal Flooding Potential", 3/8/2013



Dennis – 2/9/2013 Nor'easter



Winter Storm Nemo: Nor'easter Looms

Winter Storm Nemo will deliver heavy snow from the Great Lakes to the Northeast.



Sea Street

Sesuit Harbor



Chapin Beach



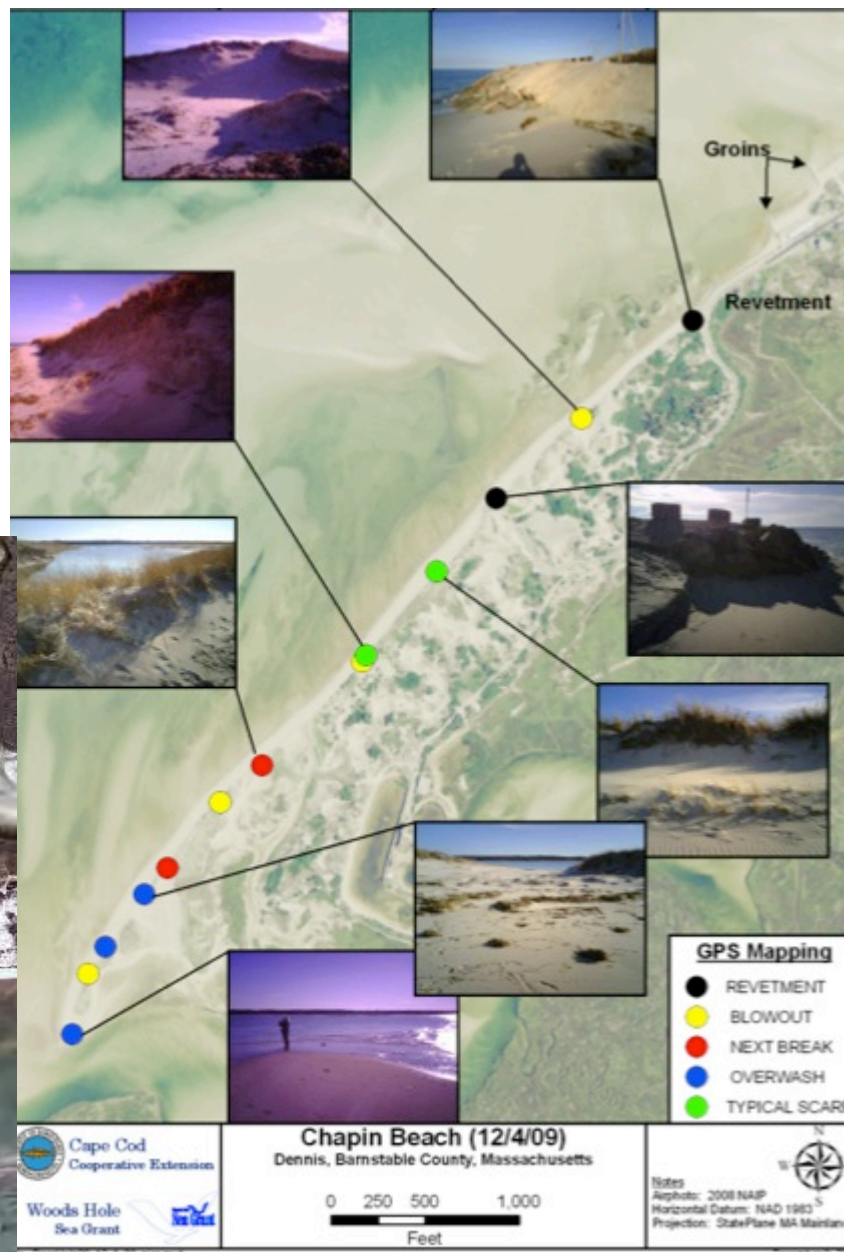
Dennis/Yarmouth – Chapin Beach



Overwash and blow-out areas are concerning.

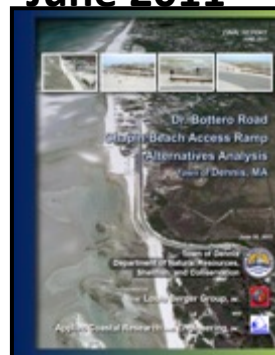
Indicate a beach experiencing relatively rapid erosion.

Point has < 50' of dune width in 2009
(lost ~400' length by 2013)

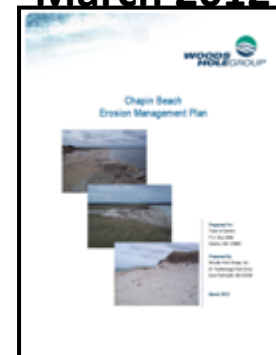




June 2011

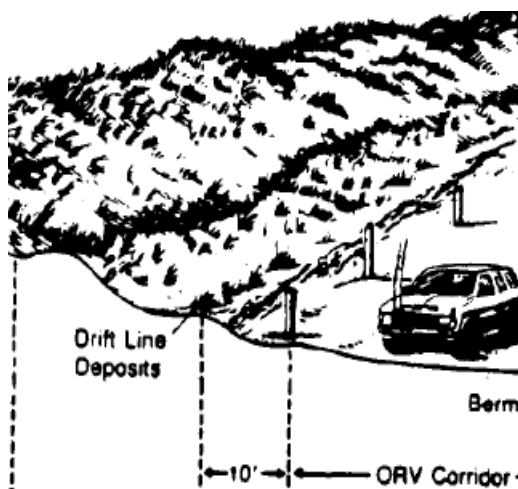


March 2012



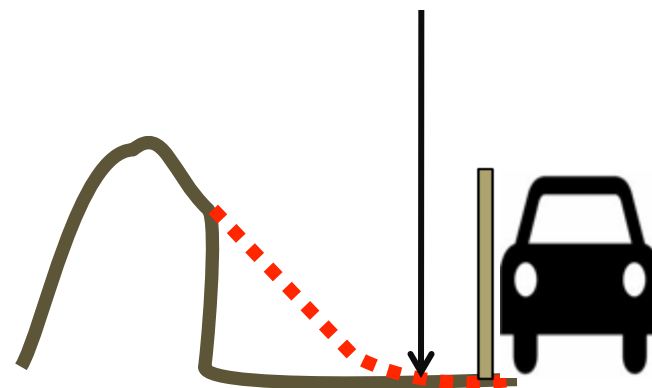
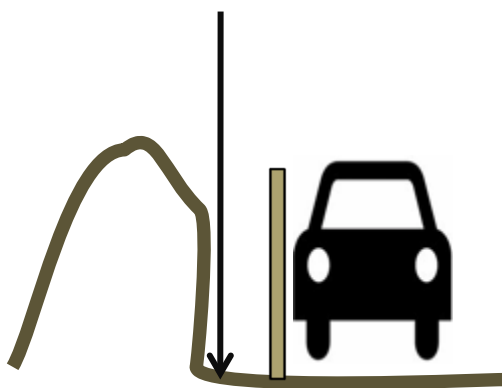
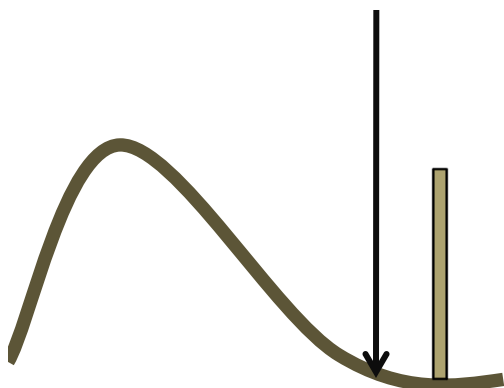
TBA

**Cost
Benefit
Analysis**



Triggers for 10' buffer (posts)

- Spring High Tide / Spring Wrack
- Vegetation
- Toe of dune
- Theoretical toe of dune



Harwich – Red River Beach



Do Nothing - Extend Northern Portion of Jetty
Place sediment - Fiber Rolls - Erosion Control Vegetation
Removal of Jetty - Redesign of Inlet

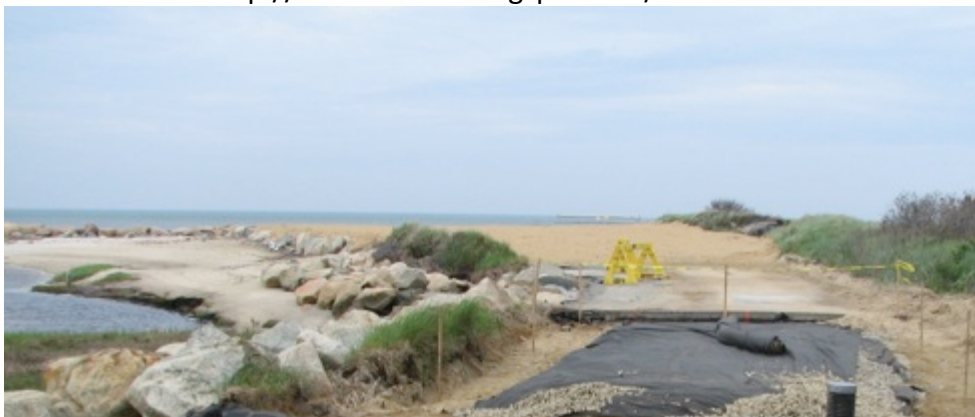




Paine's Creek



Photo Credit: <http://brewsterdnr.blogspot.com/>



Ellis Landing



Chatham - Andrew Harding's Beach

July 2005



Photo Credit: Ted Keon

Chatham - Andrew Harding's Beach

July 2011



Photo Credit: Ted Keon

Chatham - Andrew Harding's Beach



The only constant is change:

2007 inlet = bad for Scatterree,
good for Andrew Harding



April 2011

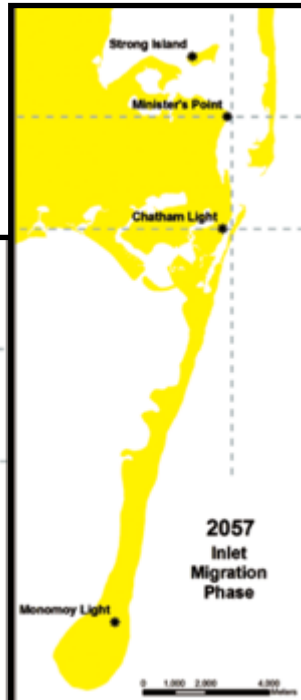
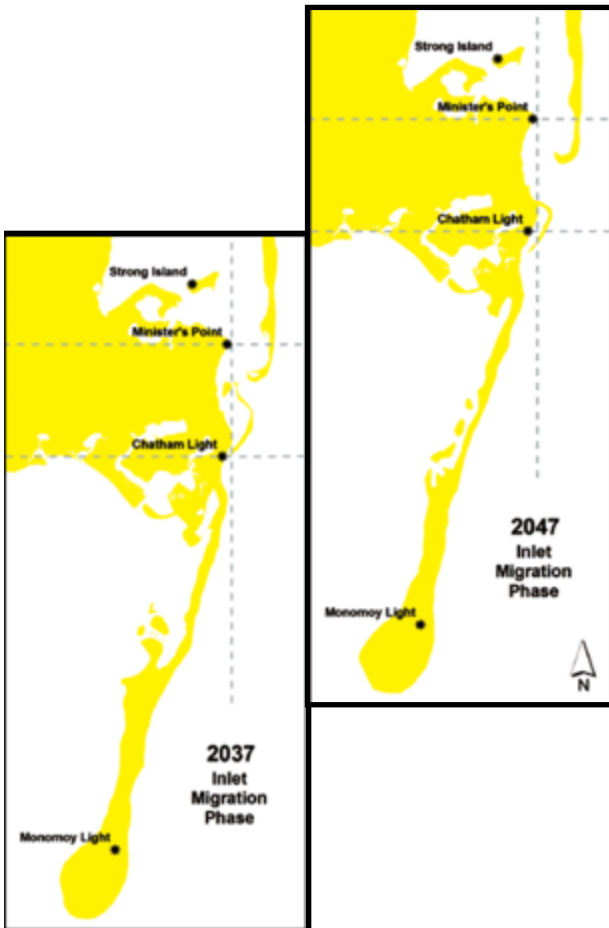


Photo Credit: Ted Keon

2007



Chatham – Future Navigation



(Giese, 2009)



— HISTORICAL MARKED NAVIGATION CHANNELS (NO DREDGE PERMIT EXISTS)
— HISTORICAL MARKED NAVIGATION CHANNELS (DREDGE PERMIT EXISTS)

Orleans - 2007 Inlet

July 2007



Photo Credit: Ted Keon

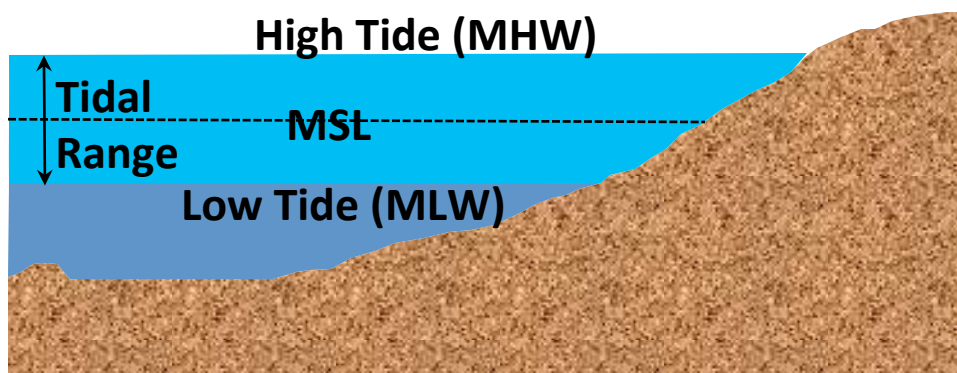
Orleans - 2007 Inlet



Photo Credit: Ted Keon



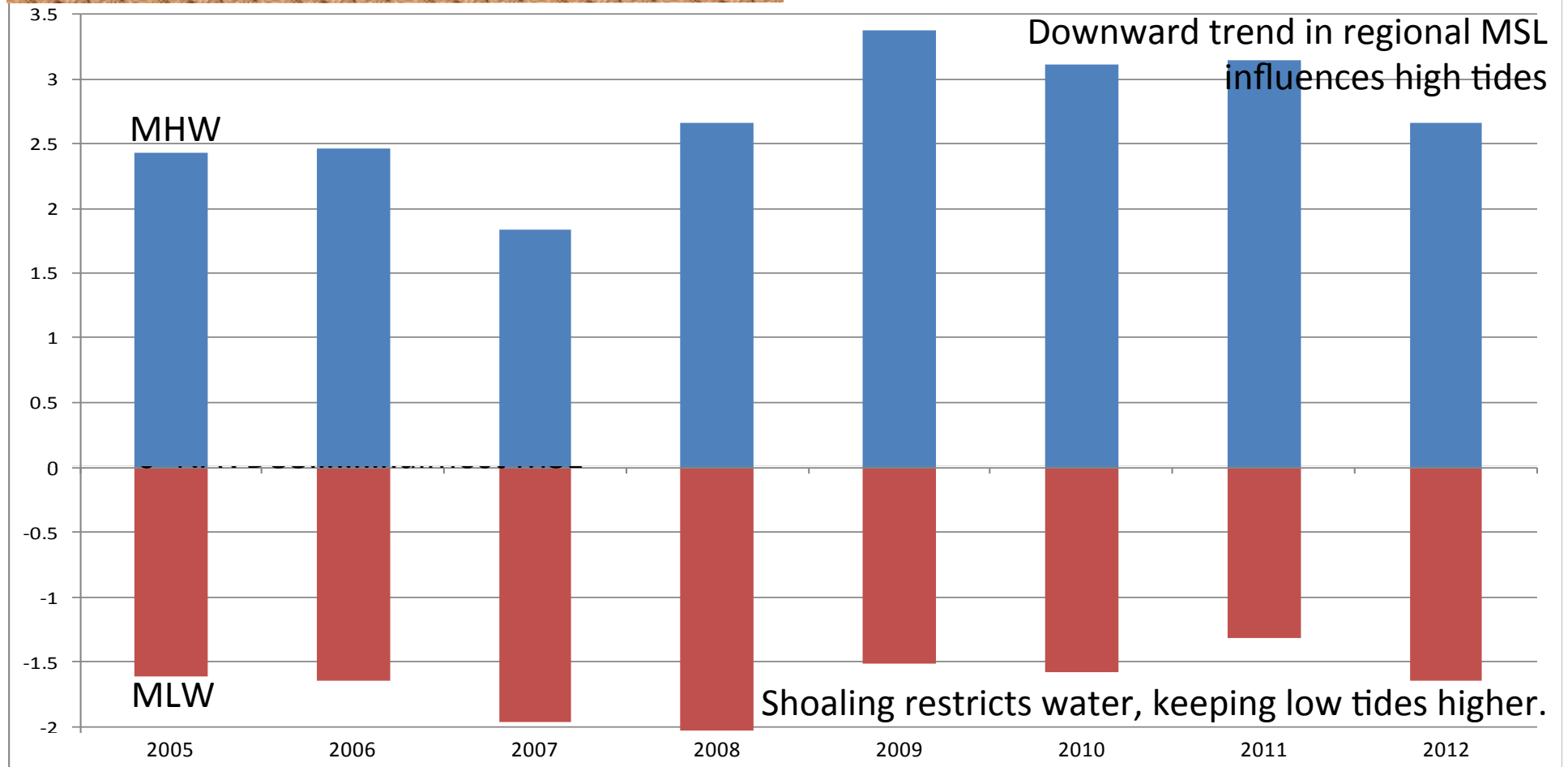
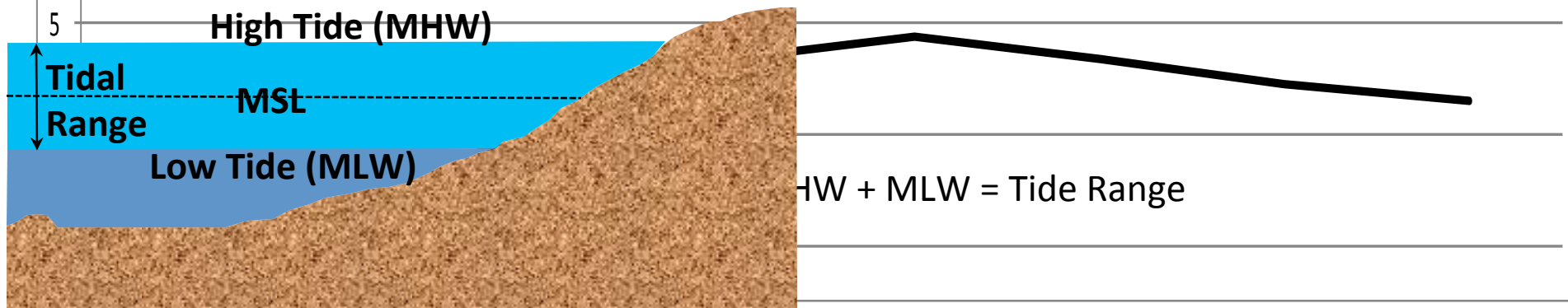
“The formation of the 2007 inlet resulted in bigger tides in Pleasant Bay. However, over the past two years that trend has reversed.”



More “flushing” can improve WQ

Higher tide can erode more

Changing Tides – Meetinghouse Pond





The exposed features are typically short-lived on our shoreline.

over 5' of sand

March 2013

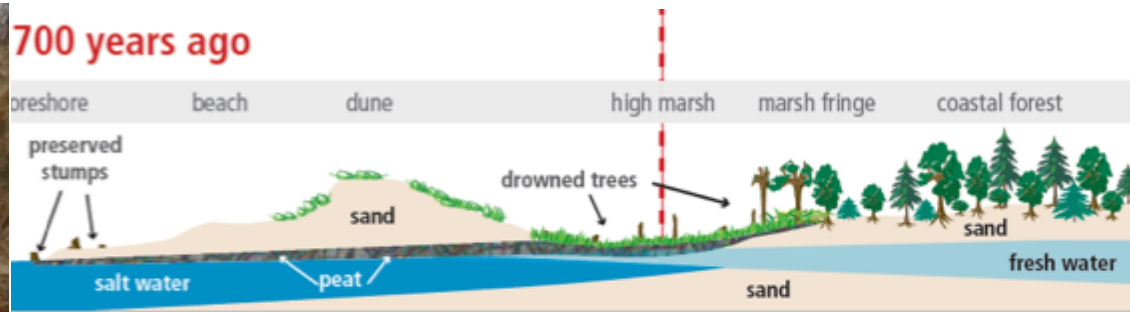
Photo Credit: Ann McNichol



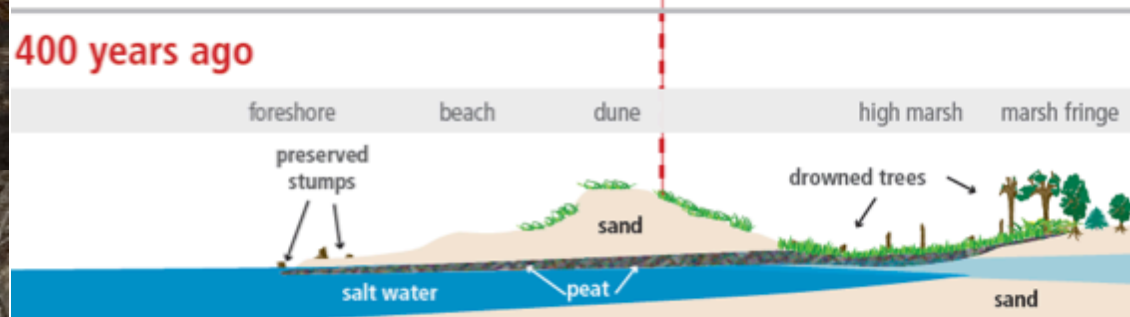
May 2013



700 years ago



400 years ago



Now



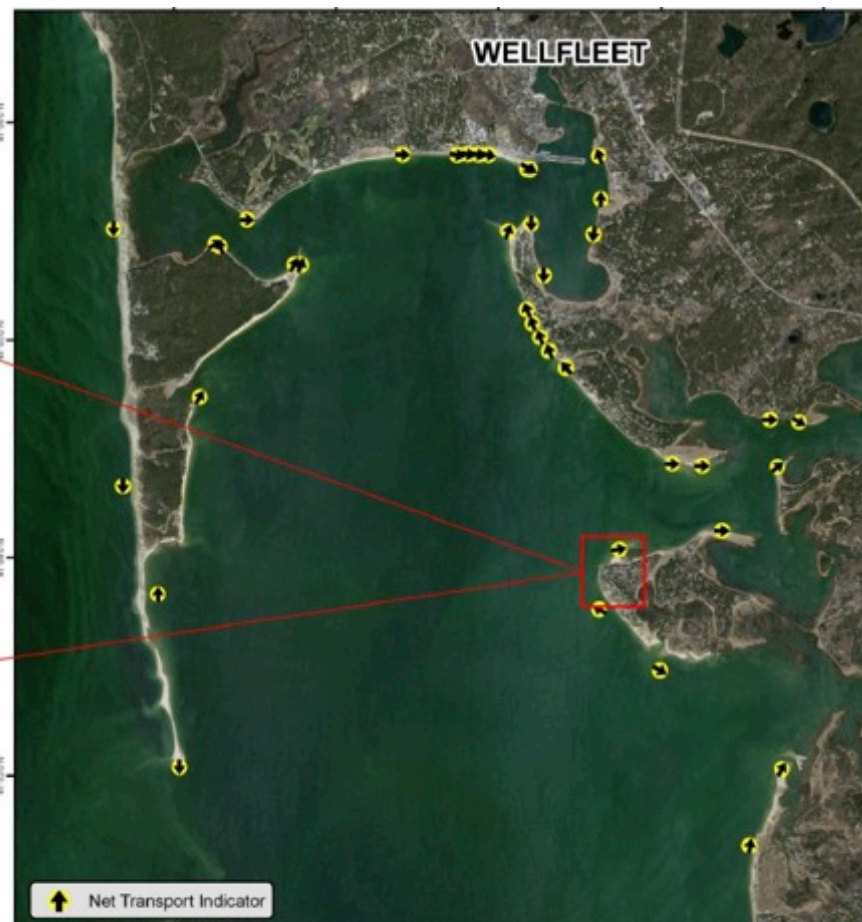
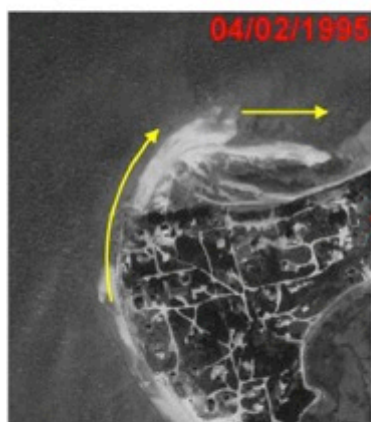
Wellfleet - Lieutenant Island



Not enough to keep the sand spit from migrating
Overall reduction in sediment supply from the coastal bank on western side



➡ Potential Transport Direction



➡ Net Transport Indicator

Longshore Sediment Transport Barnstable County, Massachusetts

Notes:
Sourcing: Right Panel is MapGIS 2009. Images to left from GoogleEarth
Horizontal Datum: NAD 1983
Projection: StatePlane MA Mainland





Impacts to:
Flooding
Wells
Freshwater Vegetation

Dike removed tides and sediment source

Video by Eric Williams, Cape Cod Times



"Seashore Science"

www.nps.gov/caco

***Ballston Beach and the
Upper Pamet River:***
a perspective for long-term management



October 31, 1991 the Atlantic Ocean breaks through at Ballston Beach.

Working towards a
Comprehensive Harbor Management Plan



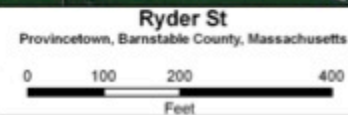
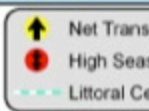
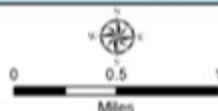
Summer – build up on W of groins
Winter – build up on E of groins

PROVINCETOWN



Longshore Sediment Transport
Barnstable County, Massachusetts

Notes:
Base map: MapGIS 2008
Horizontal Datum: NAD 1983
Projection: StatePlane MA Mainland



Notes:
Aerials: MapGIS
Rotation: -50 degrees
Horizontal Datum: NAD 1983
Projection: StatePlane MA Mainland

Provincetown – Too Much Sand ???





Summary of Management Erosion & Flooding



Do Nothing

Just leave nature alone (NPS)

Or don't have time/\$\$\$

Retreat

Redesign CES (extend, geometry, loosen, removal)

Use hard/soft alternatives during short-lived acceleration of erosion rates/sediment transport

"Soft" Alternatives (fiber rolls, fencing, Erosion Control Vegetation)

More protective of fragile coastal resources (e.g. after a storm)

Place sediment

Engineering sediment transport (DNSI)

Sacrificial sand during storms

Require nourishment with armor

Short-term repair

Opportunistic

Planning

Town Management Committees

To sue or not to sue

Management Plan incorporate erosion and SLR (draft hazard mitigation plan)

Identify sinks and sources of sediment.

Acquire and allow some parcels to erode

Attempt to look forward...what problems are coming?