Bayside Shoreline Changes

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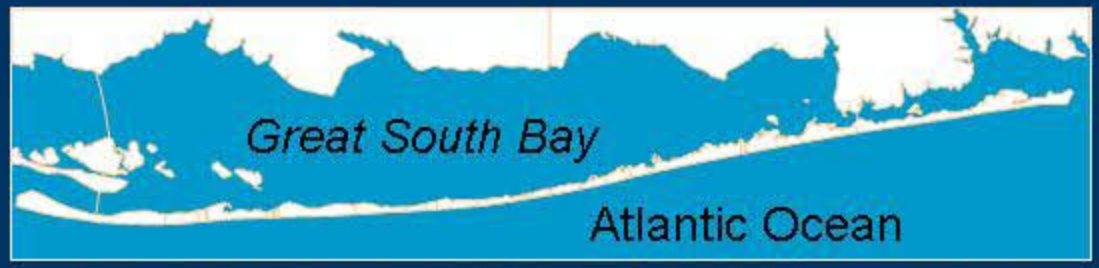
Shared Characteristics of Bay Beaches

Narrow beaches

Local waves dominant
(low heights, short periods)

Persistence of wrack,
micro-topography

Erosion is Widespread But Often Overlooked

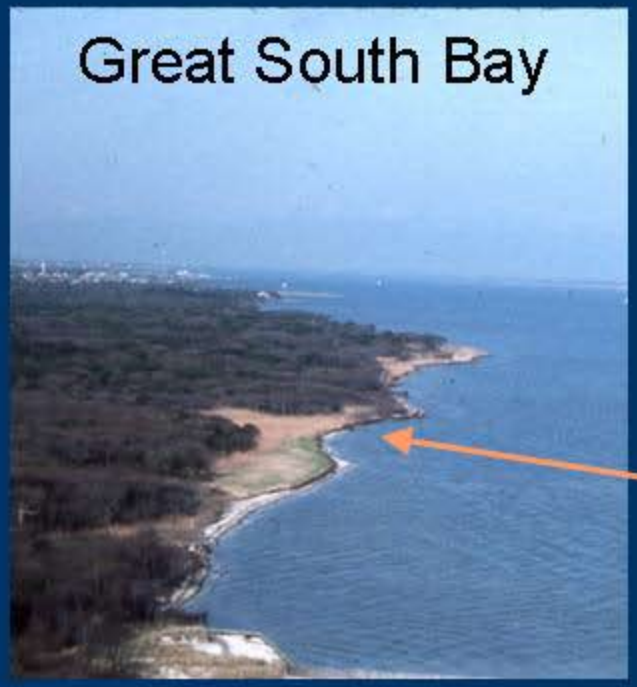


Length of bay shoreline can greatly exceed length of ocean shoreline

Erosion still occurs despite our attempts to ignore it

Hasty, under-designed projects common

Landforms and Shore Evolution



Low wave heights limit size of landforms

Peat and wrack resistant to low energy wave reworking

Irregular shoreline can create isolated drift cells

Low transport rates but even small losses cause erosion

Sand Starvation Problem At Fire Island

Ocean overwash, inlets, dunes, created sand source

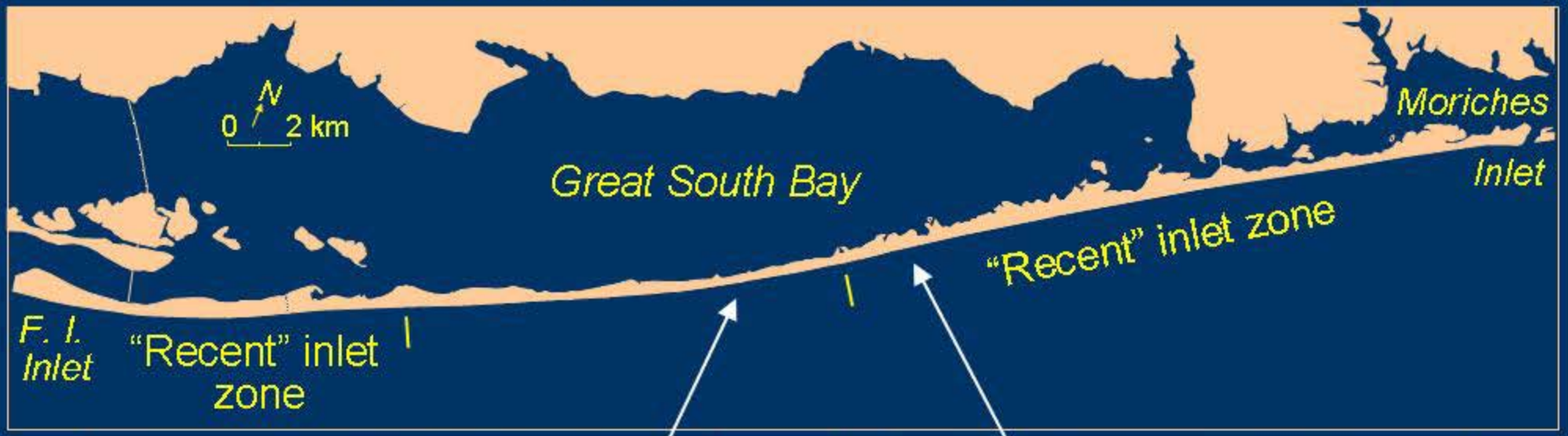
Sediment from ocean sources now restricted by dune building, inlet closures

Oceanside stability incompatible with need for new sand on bayside

Much of bay shore eroding

Annual upland horizontal retreat can be as great as 3.3 m

Inlet legacy at Fire Island



More beaches (eroding upland)
Narrow island, less marsh,
Greater erosion rate

Inlet sediments create marsh substrate
Wider barrier
Greater marsh length and area

Erosion Control: Static Protection

Bulkheads

- Affordable
- Provide protection in limited space
- Replace upland formations
- Decrease sediment inputs
- Eliminate beach habitat
- Do not cause the long term erosion problem

Groins

- Ineffective where little sediment in beaches
- Useful to retain sediment in nourished area

Breakwaters

- More practical than in ocean
- Ineffective if water levels are high
- Highly intrusive
- Introduce exotic habitat

Erosion Control: Augmenting Nature

Subaerial vegetation

- Reduces wave energy
- Resists erosion
- Traps sediment
- Effective only in extremely low energy environments
- Plantings ineffective on sandy beach under wave attack

Beach nourishment

- Adds recreational value
- Little sediment needed (on bayside)
- Increasing use for beach habitat
- But, covers bay bottom habitat

Beach Nourishment: General Design Considerations

Make projects multipurpose (protect human values; add nature)

Match the grain size modes (not just mean size)

Re-establish natural gradients and relationship to upland

- Avoid overly high or wide beaches

Incorporate adaptive management

Placement Adjacent to Development

Considerations

Bulkhead removal impractical; new structures incompatible with NPS mission

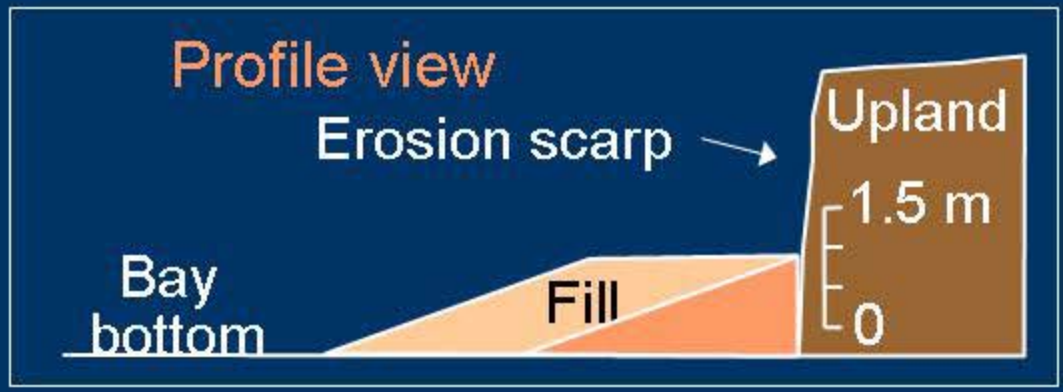
Severe state regulations on altering bay bottom

State requires permanent solution

Must restore sediment budget (compensate for armoring)

Narrow (4 m), frequent (~2 yr), low (1.3 m) fills to retain natural interactions

Sediment available from channel dredging



Next Step: Assessing Fate of Beach Fill

Topographic surveys to determine sediment loss through time

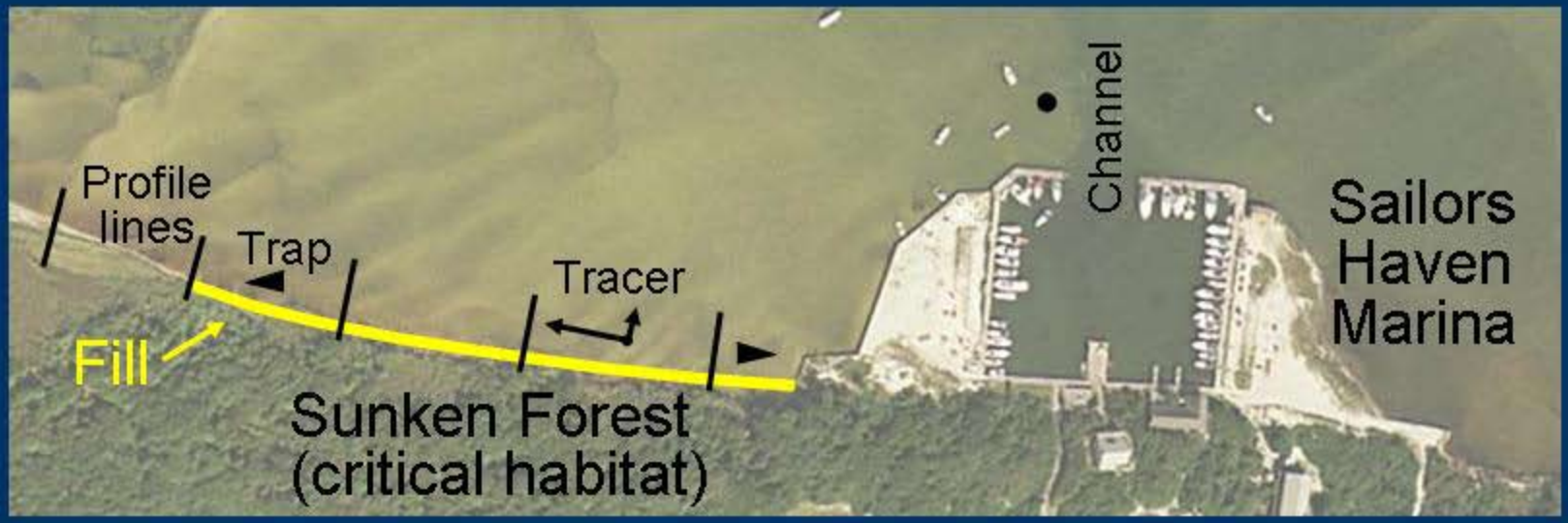
Dyed sand tracer to compare offshore to longshore transport

Sand traps to quantify rates of transport

Current meters and pressure transducers for process data

Instruments offshore to determine sedimentation in navigation channel

Sediment samples from upland, fill, natural beach, bay & channel



Summary of Issues

Relatively high rates of shoreline retreat

Resources and facilities will be lost to erosion

Sediment may not be replaced by natural processes

Nourishment provides new substrate

Restoration of sediment budget is “permanent” solution

New habitats not likely to evolve the same way as previous habitats

If we cannot have what we had, can we have what is needed?