Development of a Beach Scoring System for Management of Maine's Sandy Beaches

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Goal: Utilize historic shoreline change data, in addition to various physical beach characteristics, to develop a scoring system that identifies the need for beach management, and helps determine subsequent applicable beach management actions.

Scoring System Protocol

System follows general protocol established by Taylor Engineering Jacksonville, FL (*Trudnak et. al., 2002*) for several beaches in the FL panhandle. System adapted to take into account some different criteria of the Maine coast (and different available data) and a different rating system (4 point scale).

Step 1: Database Development

1. Determine shoreline characteristics for different criteria (@100-ft intervals):

- *Historic Shoreline Change* (Saco Bay1962-1995)
- *Shoreline Type* (dune, dune/seawall, seawall/dune, wall)
- *Dry Beach Width* (HWL to seaward edge of dune)
- *Total Width* (distance, HWL to first habitable structure)
- *Beach and Dune Profiles*
  - *Difference from Base Flood Elevation* (maximum profile elevation compared with BFE from FIRMs)
  - *Beach Volume Change* (subaerial-intertidal beach)

Step 2: Scoring System Development

2. Ranking score development and data scoring

Based on overall population variability for each shoreline characteristic, developed range of physical scores where 1 is excellent, 2 is good, 3 is fair, and 4 is poor

Criteria	1 (Excellent)	2 (Good)	3 (Fair)	4 (Poor)
Δ Shoreline (ft/yr)	x>2	1<x<2	-1<x<1	x<-1
Δ Volume (cuft/yr)	x>2	1<x<2	-1<x<1	x<-1
Diff from BFE (ft)	x>2	0<x<2	-1<x<1	x<-1
Dry Beach Width (ft)	x>125	75<x<125	25<x<75	x<25
Total Width (ft)	x>200	100<x<200	50<x<100	x<50
Shoreline Type	Dune only	Dune/Wall	Wall/Dune	Wall only

Step 2: Scoring System Development

3. Determine Overall Management Need

Use rankings (1-4) to determine a normalized score illustrating overall management need for shoreline.

- Six shoreline characteristics (total score = 24)
- Worst score = 24 (normalized score = 24/24 = 1)
- Best score = 6 (normalized score = 6/24 = 0.25)
- ***The higher the score, the higher the need for management***

The results of this system was developed for viewing in ArcView GIS.

Step 2: Scoring System Development

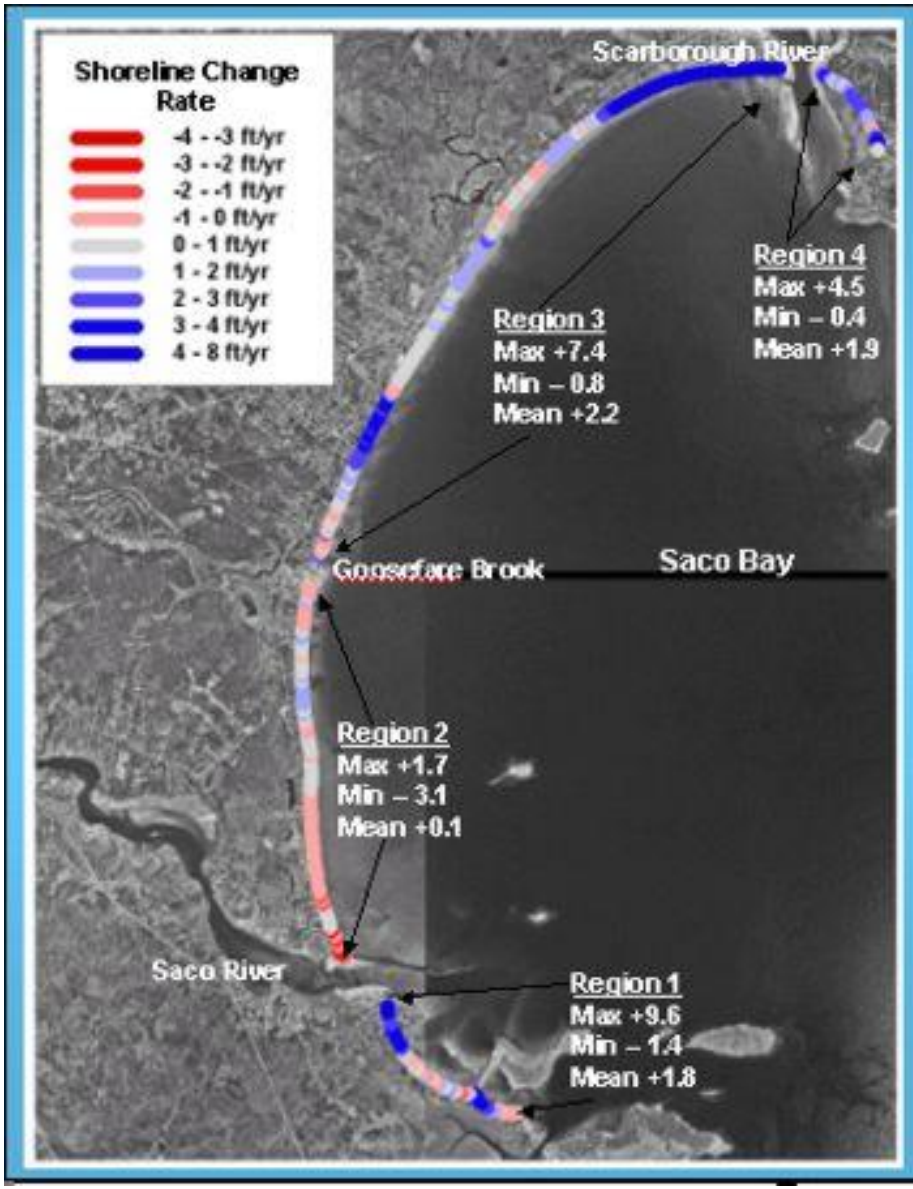
4. Determine Weights for Specific Management Actions

Specific management actions: beach nourishment; dune restoration; no action. Weights based on each characteristic's importance to the management action.

Criteria	Beach Nourishment	Dune Restoration	No Action
Δ Shoreline	0.20	0.15	0.19
Δ Volume	0.20	0.10	0.19
Diff from BFE	0.05	0.30	0.19
DBW	0.30	0.15	0.19
TW	0.20	0.10	0.19
Shore Type	0.05	0.20	0.05
Total	1.00	1.00	1.00

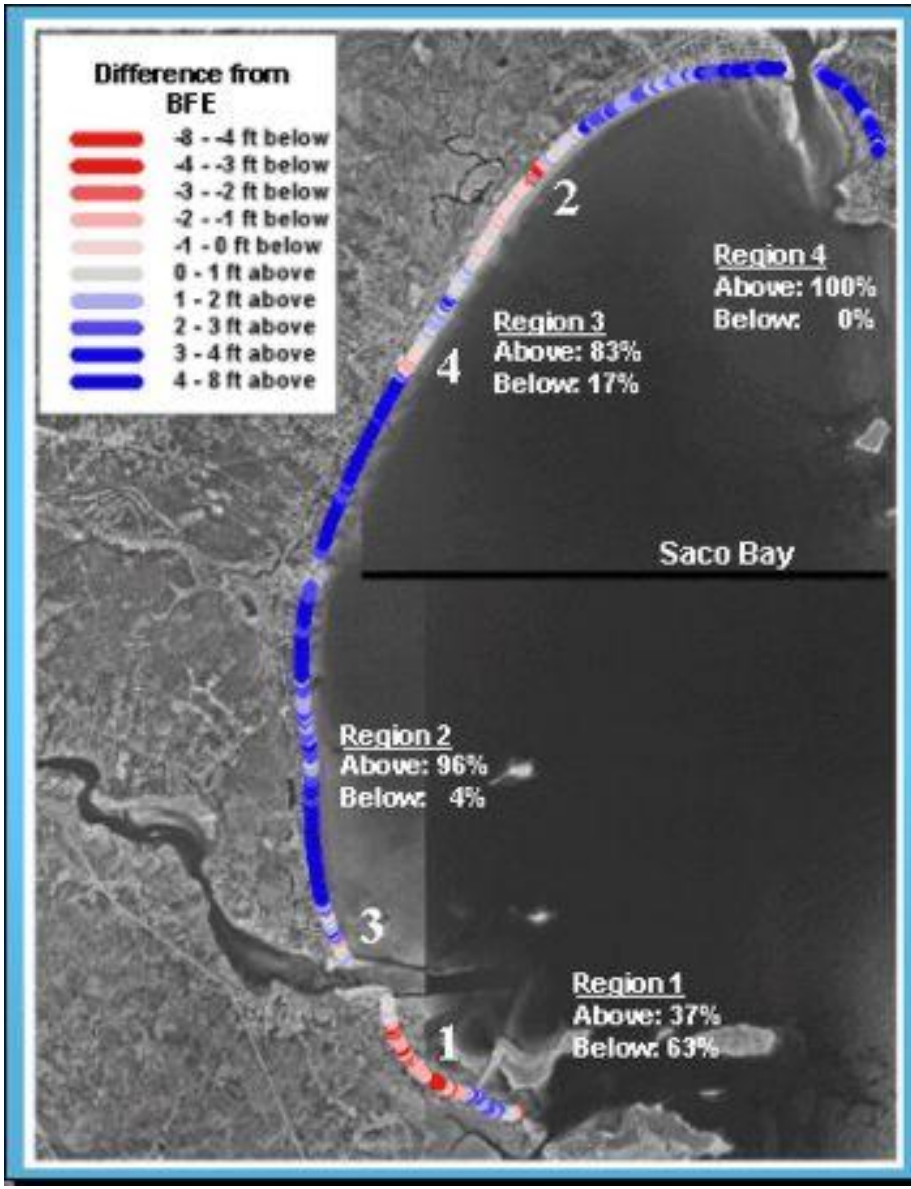
Utility of Scoring System

1. Creates database of vital shoreline characteristics
2. Identifies problem areas that need management
3. Provides initial guidance for areas that might be managed using beach nourishment, dune restoration, a combination, or no-action.



Shoreline Change

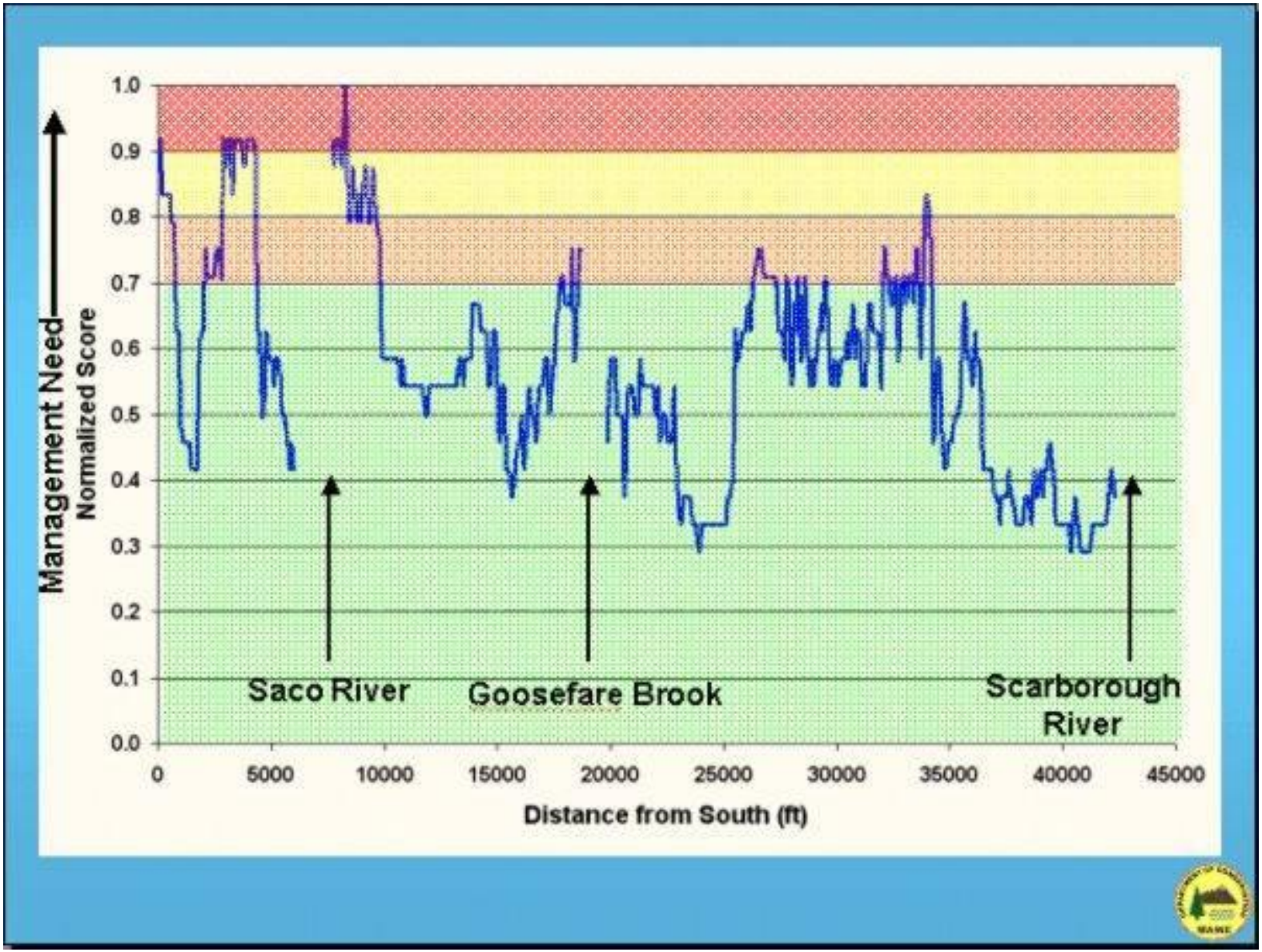
- Substantial erosion in southern end of Region 2 (Camp Ellis)
- Substantial accretion at northern ends of Region 1 and Region 3
- General pattern confirms a northerly sediment transport direction in Bay

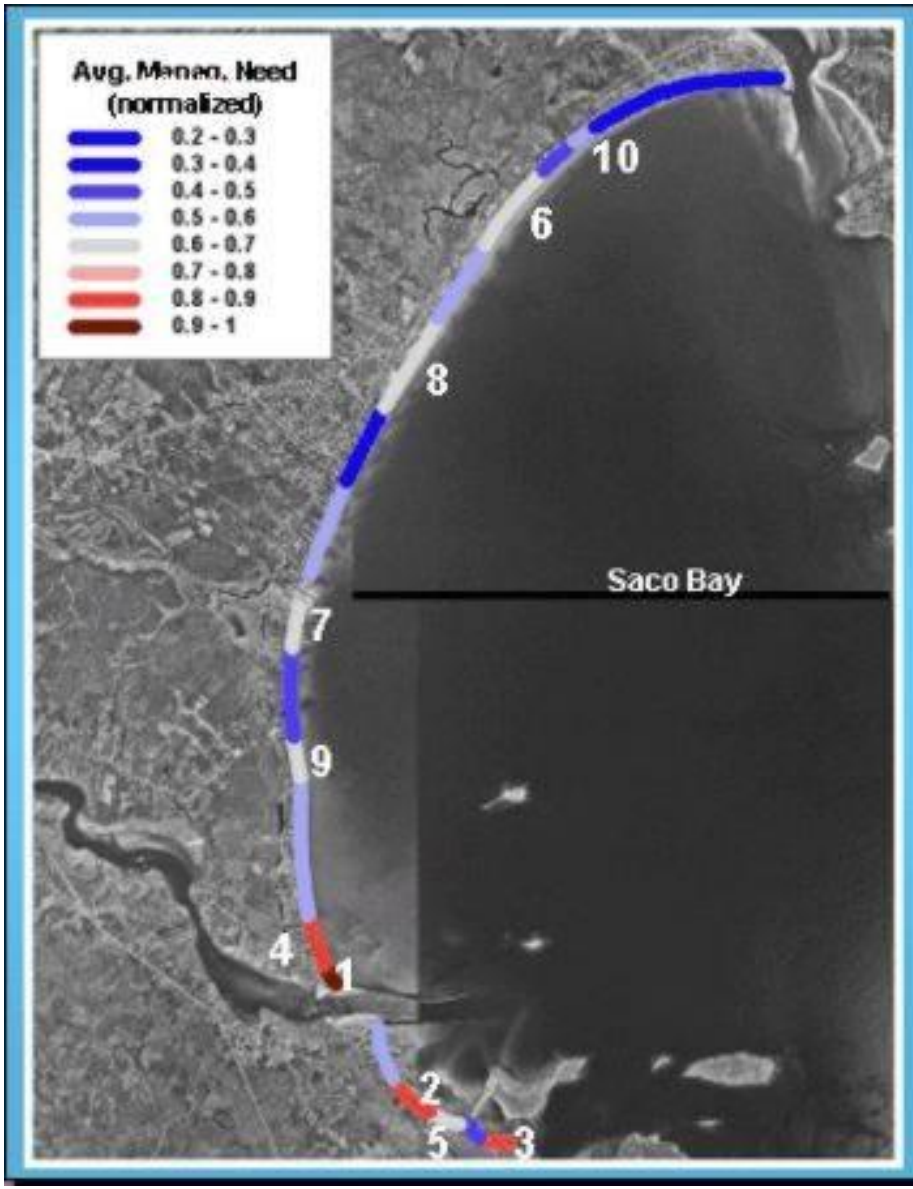


Difference from Base Flood Elevation

Problem areas:

1) Hills Beach
2) Surfside
3) Camp Ellis
4) Old Orchard

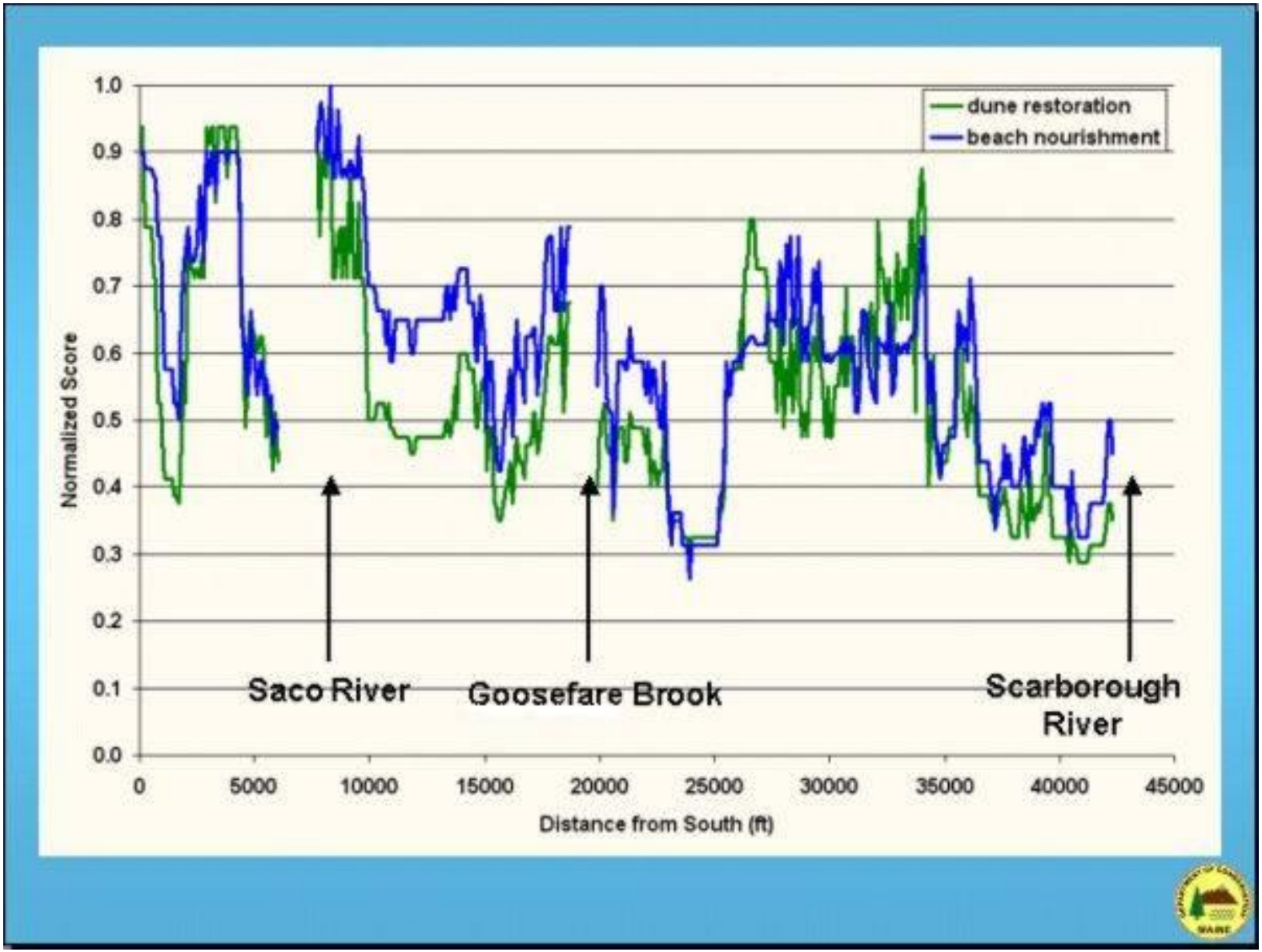

Management Need
Normalized Score
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Saco River
Goosefare Brook
Scarborough River
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
Distance from South (ft)

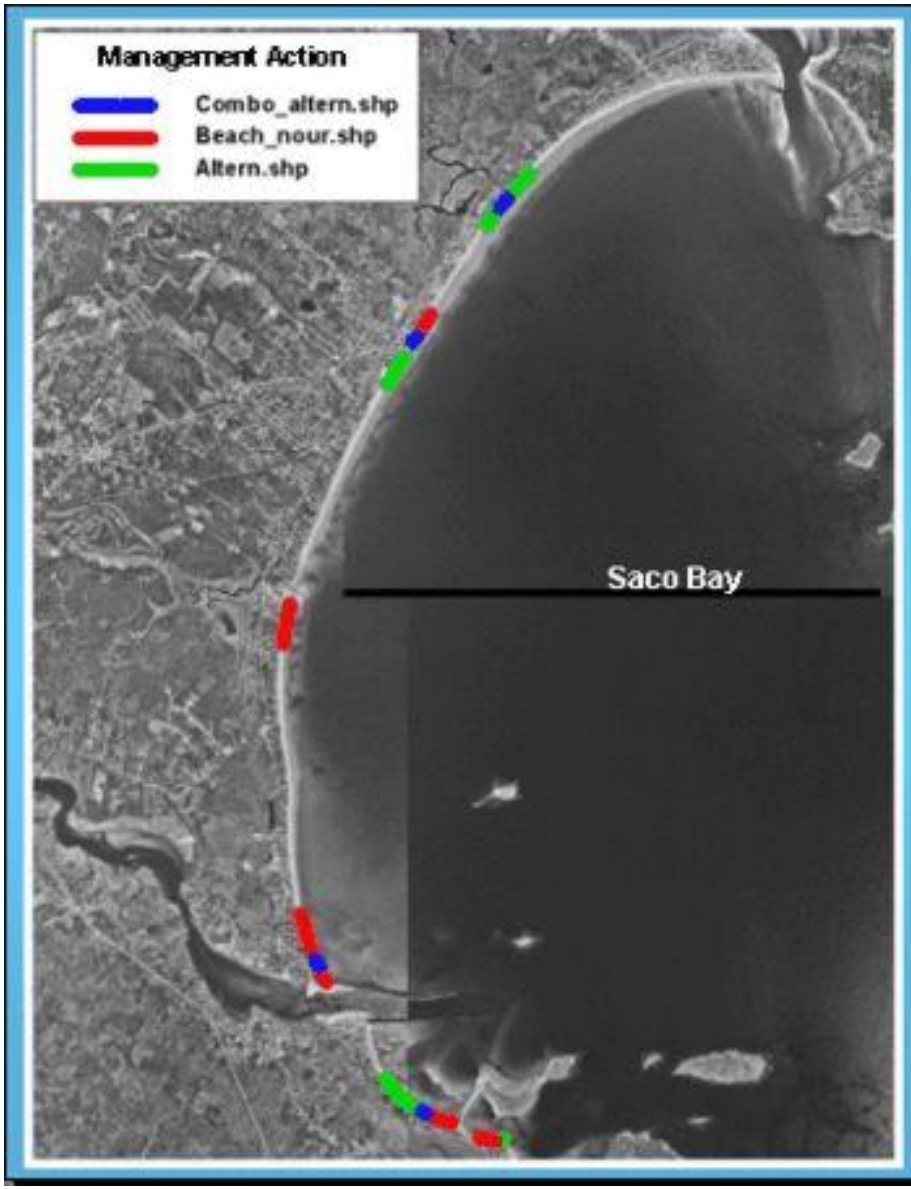


Averaged Management Need

Top 10 Reaches of Need

1) Camp Ellis (0.92)
2) Hills Beach (0.90)
3) Hills Beach (0.84)
4) Camp Ellis (0.82)
5) Hills Beach (0.70)
6) Surfside (0.68)
7) Kinney Shores (0.68)
8) Old Orchard (0.66)
9) Bay View (0.62)
10) Grand Beach (0.60)


dune restoration
beach nourishment
Normalized Score
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Saco River
Goosefare Brook
Scarborough River
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
Distance from South (ft)



Beach Management Actions

The Scoring System enabled the definition of areas that require management action:

- Dune Restoration (green)
- Beach Nourishment (red)
- Combination (blue)

Currently finishing Scoring for the Wells Beach area

SCORING SYSTEM UPDATES

MGS is in the process of updating the System for analysis of the Wells Embayment. Improvements and changes include:

- Use of orthorectified photographs (2003 base images)
- Use of a more complete shoreline database (1962, 1977, 1986, 1995, 2003)
- Examine updating overall management need and dune restoration management scores with a new scoring for shoreline type (4=dune, 3=dune/wall, 2=wall/dune, 1=wall) so that shorelines with existing dune could be targeted for management
- Examine removing shoreline type altogether from weightings for management need and different actions