

**Ecological Effects of Marsh Erosion  
on Benthic Communities at  
Pasture Point, Indian River Bay**

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# Salt Marsh

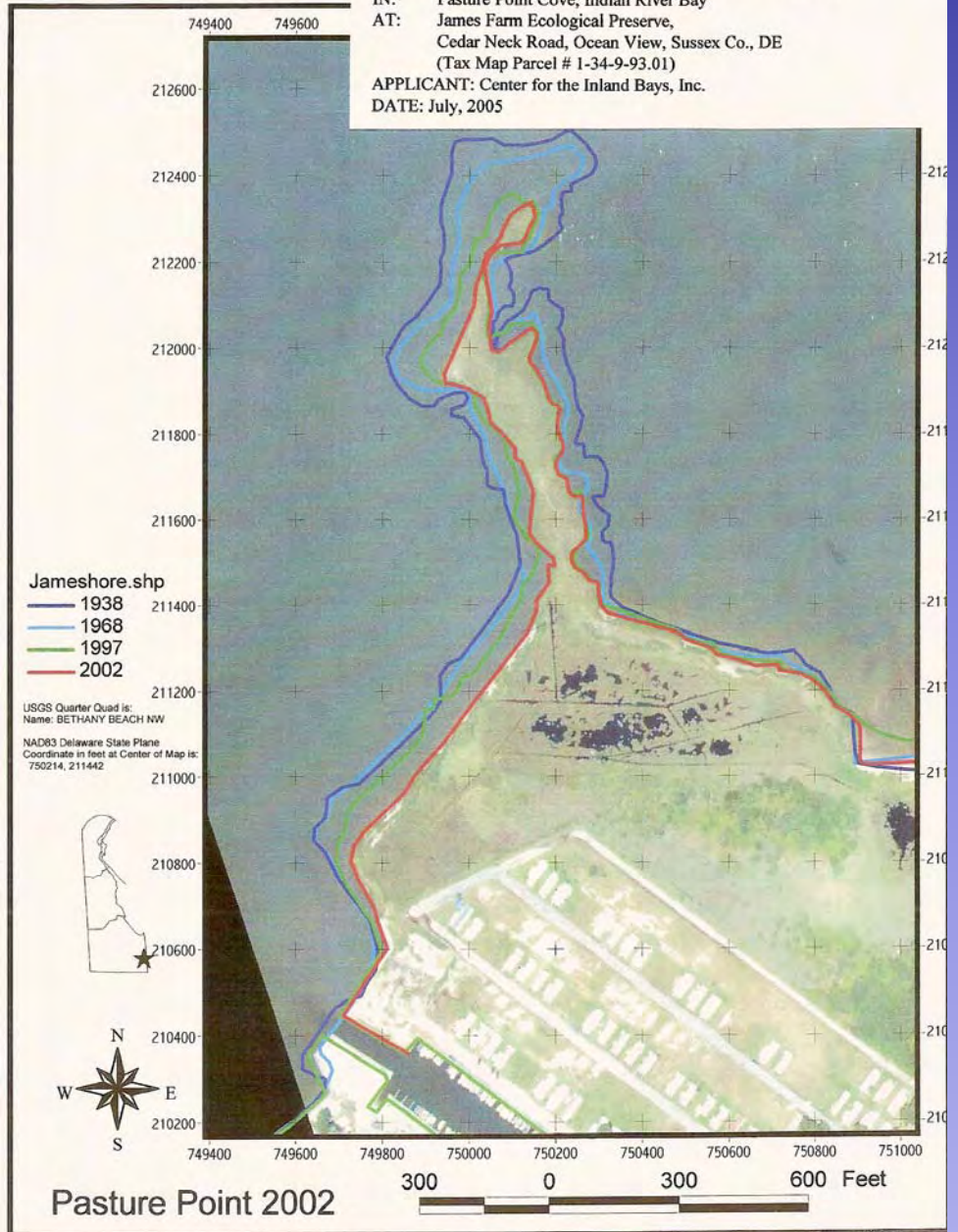
- Transitional habitat between ocean and land characterized by salt tolerant plants
- Highly productive
- Protects coastline from storm surges

# Marsh Erosion

- Increased wave action (Schwimmer, 2001; Morton *et al.*, 2003)
  - stronger storms
  - recreational boating
- Elevated sea level
- Bioturbation
  - Fiddler Crabs



**PROPOSED SHORELINE PROTECTION/HABITAT RESTORATION PROJECT, PASTURE POINT, JAMES FARM ECOLOGICAL PRESERVE**  
**RIP-RAP; SANDY FILL; VEGETATIVE STABILIZATION**  
 IN: Pasture Point Cove, Indian River Bay  
 AT: James Farm Ecological Preserve, Cedar Neck Road, Ocean View, Sussex Co., DE (Tax Map Parcel # 1-34-9-93.01)  
 APPLICANT: Center for the Inland Bays, Inc.  
 DATE: July, 2005



# Pasture Point Marsh



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38°34'52.05" N 75°05'15.43" W

elev 0 m

Sep 2005

Eye alt 477 m

# Types of Erosion

## Cleft Formation





# Types of Erosion Overhang





# Processes of Erosion

## Slumping



# Marsh Blocks



# Objectives

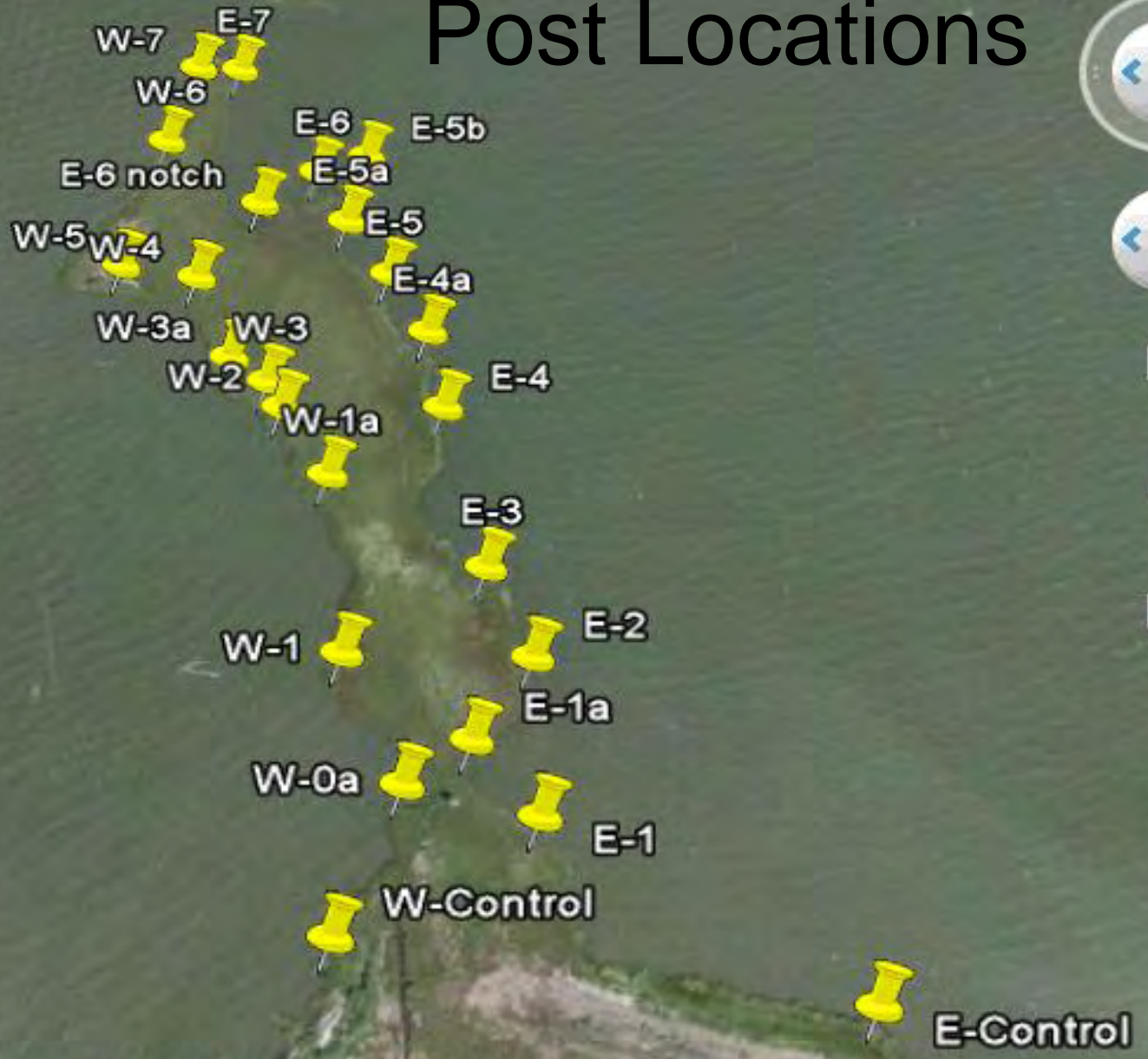
- Calculate yearly rate of erosion
- Compare differences in erosion between Eastern and Western sides of marsh
- Determine abundance of benthic fauna on marsh blocks
- Determine if there is a correlation between erosion and abundance of fauna

# Methods for Quantifying Erosion

- 24 PVC posts placed in marsh
  - 250 cm from the edge
- Measure distance from post to marsh edge every few months
- Track coastline using GPS



# Post Locations



77 m

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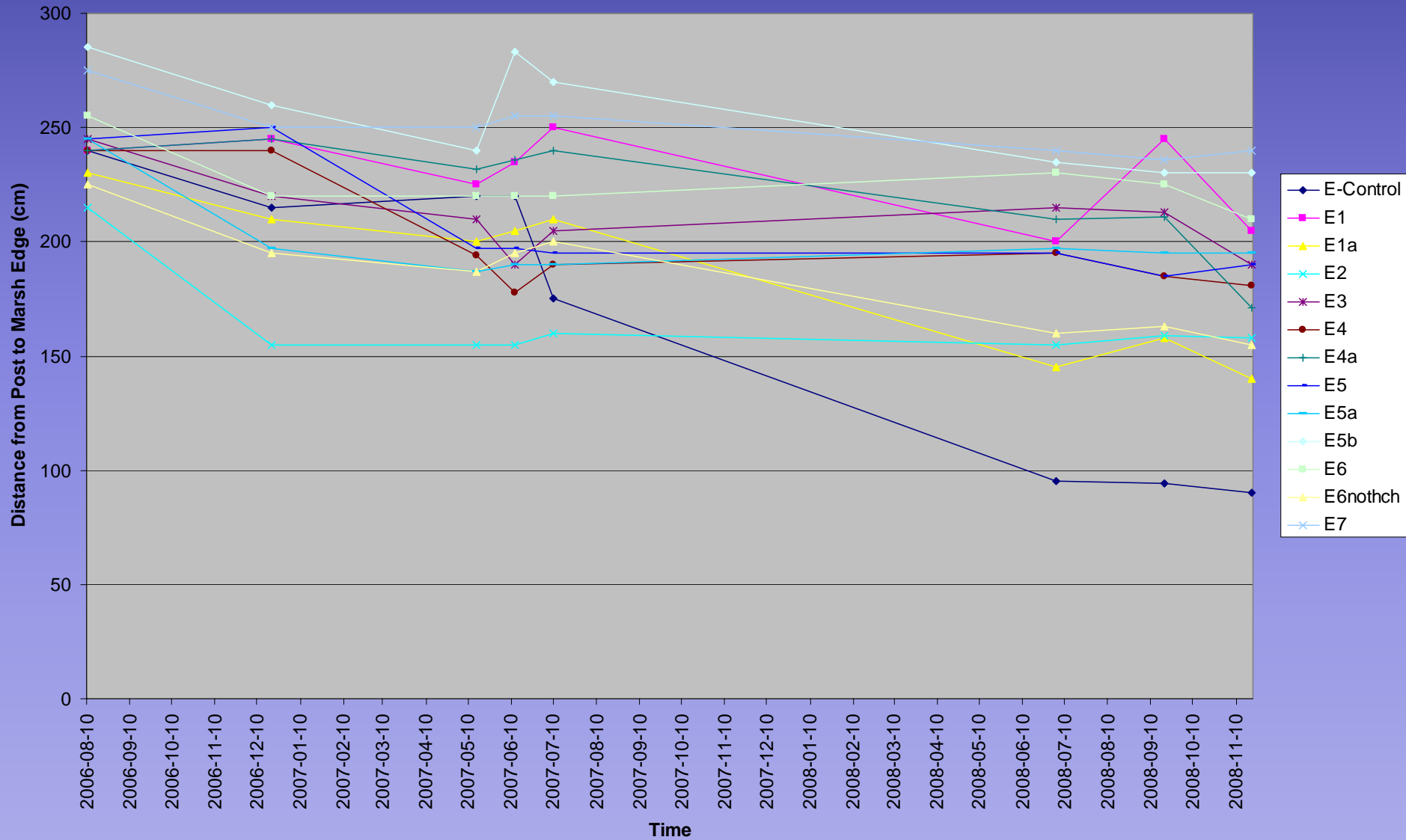
38°34'50.62" N 75°05'15.74" W

elev 0 m

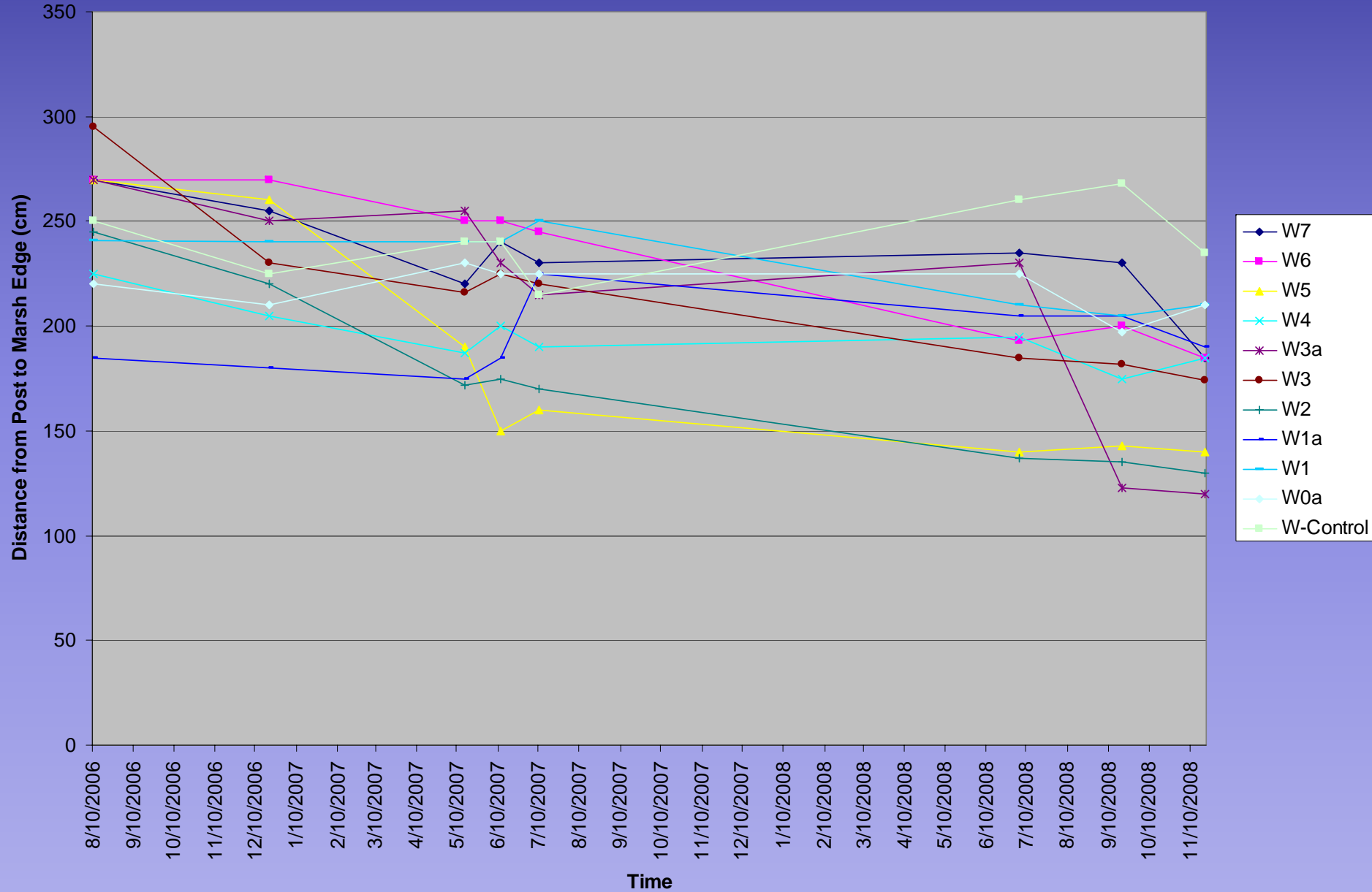
Sep 2005

Eye alt 290 m

# Eastern Erosion



# Western Erosion





# Eastern Side Erosion

Post	10- Aug-06	20-Dec- 06	16- May-07	12-Jun- 07	10- Jul-07	4- Jul- 08	19-Sep- 08	11/21/ 2008	Total Erosion	Erosion Rate
E- Control	240	215	220	220	175	95	94	90	150	0.175
E1	240	245	225	235	250	200	245	205	35	0.041
E1a	230	210	200	205	210	145	158	140	90	0.105
E2	215	155	155	155	160	155	159	158	57	0.067
E3	245	220	210	190	205	215	213	190	55	0.064
E4	240	240	194	178	190	195	185	181	59	0.069
E4a	240	245	232	236	240	210	211	171	69	0.081
E5	245	250	197	197	195	195	185	190	55	0.064
E5a	245	197	187	190	190	197	195	195	50	0.058
E5b	285	260	240	283	270	235	230	230	55	0.064
E6	255	220	220	220	220	230	225	210	45	0.053
E6notch	225	195	187	195	200	160	163	155	70	0.082
E7	275	250	250	255	255	240	236	240	35	0.041

Erosion Mean = 63.46 cm ± 29.84 cm

Erosion Rate Mean = 0.074 cm/day ± 0.035 cm/day

# Western Side Erosion

Post	10- Aug-06	20-Dec- 06	16- May-07	12- Jun-07	10- Jul-07	4- Jul- 08	19-Sep- 08	11/21/ 2008	Total Erosion	Erosion Rate
W7	270	255	220	240	230	235	230	185	85	0.099
W6	270	270	250	250	245	193	200	185	85	0.099
W5	270	260	190	150	160	140	143	140	130	0.152
W4	225	205	187	200	190	195	175	185	40	0.047
W3a	270	250	255	230	215	230	123	120	150	0.175
W3	295	230	216	225	220	185	182	174	121	0.142
W2	245	220	172	175	170	137	135	130	115	0.135
W1a	185	180	175	185	225	205	205	190	-5	-0.006
W1	241	240	240	240	250	210	205	210	31	0.036
W0a	220	210	230	225	225	225	197	210	10	0.012
W- Control	250	225	240	240	215	260	268	235	15	0.018

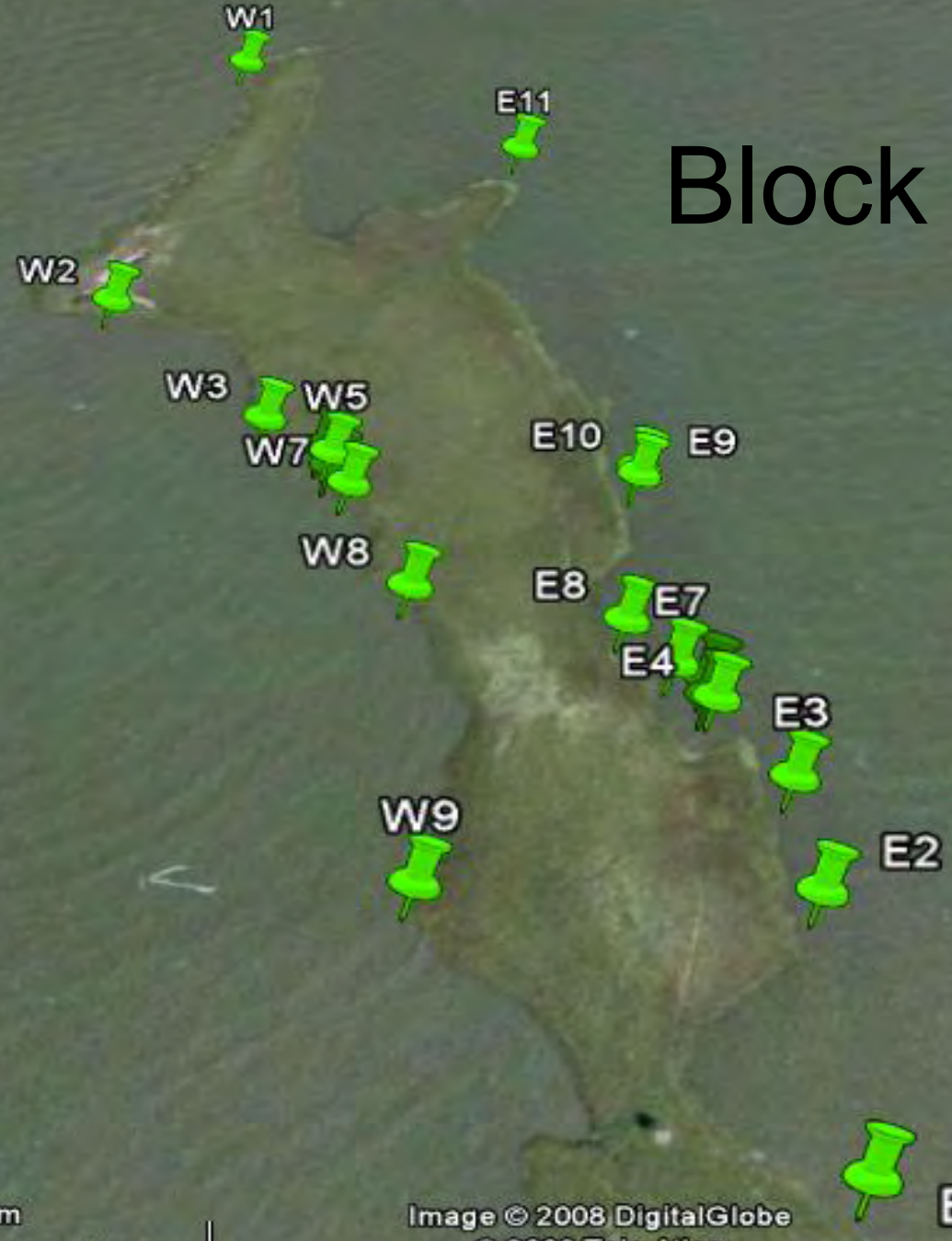
Erosion Mean = 70.64 cm ± 54.54 cm

Erosion Rate Mean = 0.083 cm/day ± 0.064 cm/day

# Methods of Collecting and Observing Benthic Fauna

- One 10 cm x 10 cm sample collected per marsh block
  - 20 blocks sampled
- Preserve in formalin
- Classify fauna
- Compare abundance

# Block Locations



42 m  
38°34'51.13" N 75°05'15.89" W

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elev 0 m

Sep 2005

Eye alt

158 m

Google

# List of species found on marsh blocks

- Ribbed Mussel
- Blue Mussel
- *Littorina littorea*
- *Boreotrophon clathratus*
- *Nereis virens*
- *Paranais litoralis*
- Ivory Barnacle
- *Gammarus A*
- *Gammarus B*
- *Gammarus C*
- *Diadumene lineata*



# Eastern Marsh Block Fauna

	Ribbed Mussel	Nereis virens	Ivory Barnacle	Gammarus C	Blue Mussel	Gammarus A	Paranais litoralis	Littorina littorea	Boreotrophon clathratus	Gammarus B	Diadumene lineata
E1	49	3	0	0	0	0	0	0	0	0	0
E2	7	0	1	0	0	0	0	0	0	0	0
E3	18	0	0	4	1	0	0	0	0	0	0
E4	18	0	0	3	0	0	0	0	0	0	0
E5	11	0	2	7	0	0	0	0	0	0	0
E6	14	0	0	1	0	1	11	0	0	0	0
E7	37	1	3	2	0	0	1	0	0	0	0
E8	0	0	0	20	0	7	0	2	0	0	0
E9	13	0	0	41	0	11	2	0	1	0	0
E10	2	0	0	7	0	3	5	0	1	0	0
E11	4	0	1	35	0	12	5	0	0	40	3

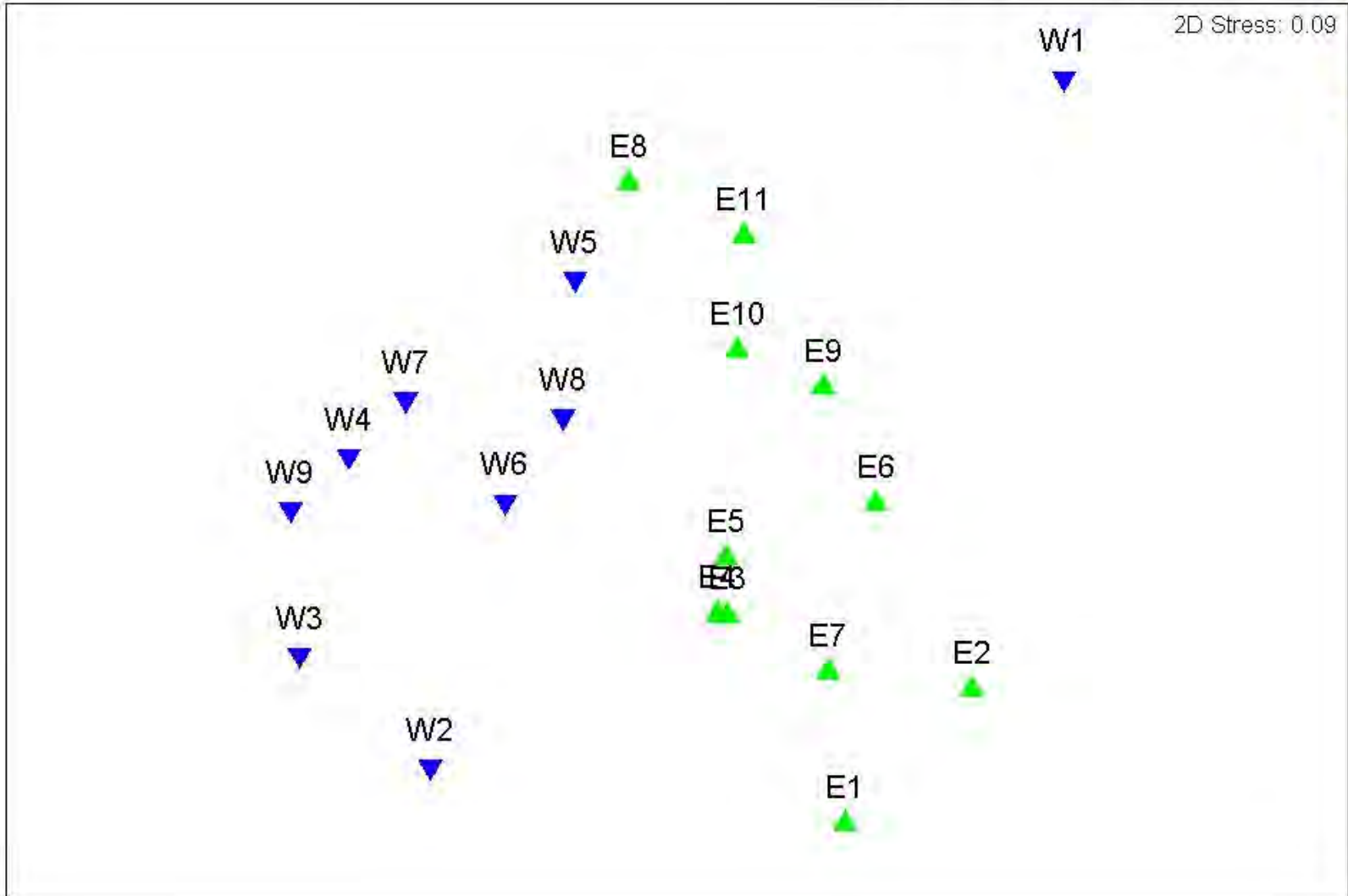
# Western Marsh Block Fauna

	Ribbed Mussel	Nereis virens	Ivory Barnacle	Gammarus C	Blue Mussel	Gammarus A	Paranais litoralis	Littorina littorea	Boreotrophon clathratus	Gammarus B	Diadumene lineata
W1	0	0	0	0	0	2	1	15	0	0	0
W2	0	5	0	2	0	0	0	0	0	0	0
W3	0	0	0	1	0	0	0	0	0	0	0
W4	0	0	0	2	0	0	0	0	0	3	0
W5	1	0	0	17	0	6	0	0	0	9	0
W6	1	0	0	3	0	0	0	0	0	1	0
W7	0	0	0	6	0	0	0	0	0	3	0
W8	1	0	0	6	0	1	0	0	0	1	0
W9	0	0	0	1	0	0	0	0	0	1	0

Transform: Square root  
Resemblance: S17 Bray Curtis similarity

2D Stress: 0.09

Side  
▲ E  
▼ W

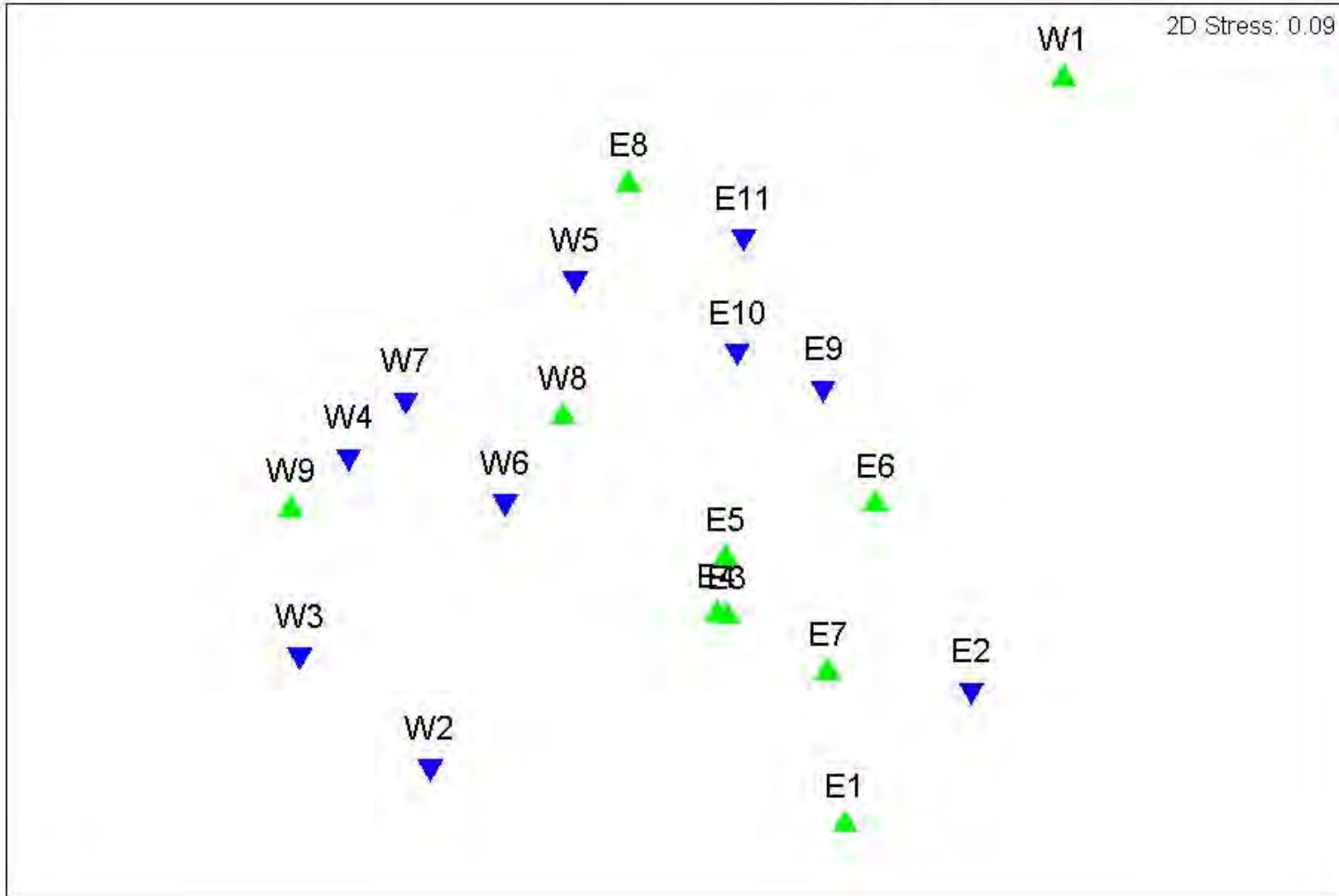




Transform: Square root  
Resemblance: S17 Bray Curtis similarity

2D Stress: 0.09

*Erosion*  
▲ Low  
▼ High

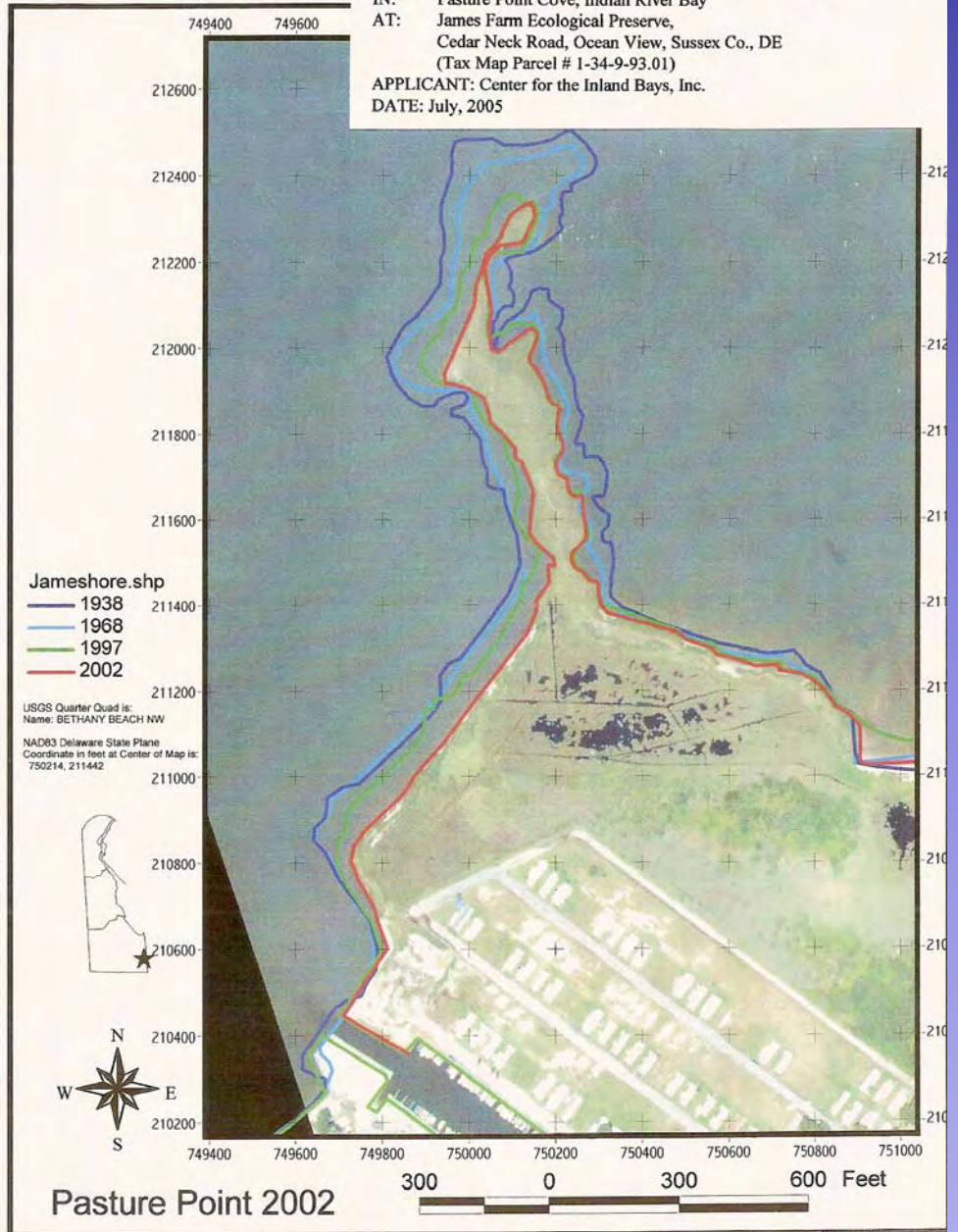


# Take Home Bullets

- Erosion of  $\approx 30$  cm per year over 2 years
  - East  $\approx$  West and near  $\approx$  far
  - Clefts on far end, west side
  - Undercutting, slumping, calving of blocks
- Blocks colonized by ribbed mussels on East, lacking on West
  - Community not related to erosion rate



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Questions?

# Work Done to Date

- 2 years of erosion post measurements (August '06 – September '08)
- Collection of fauna samples (July '08)
- 10 fauna samples analyzed

# Work to be Completed

- Final erosion post measurement (November '08)
- Finish analysis of fauna samples