

**Bay Flooding and Erosion in the Long Island South Shore Estuary  
Reserve:  
Findings and Recommendations**

**Long Island South Shore Estuary Reserve Council  
August 2005**

**George E. Pataki, Governor**

**Randy A. Daniels, Secretary of State  
Chair, South Shore Estuary Reserve Council**

## **ACKNOWLEDGMENTS:**

This report: Bay Flooding and Erosion in the Long Island South Shore Estuary Reserve was prepared by the South Shore Estuary Reserve (SSER) Office with assistance from members of the Student Conservation Association and the New York State Department of State, Coastal Resources Division. Justin Reiser and Karen Eichelberger were the principal researchers and authors, with assistance from Kimberly Rancourt, all through the generous assistance of the Student Conservation Association. Writing, editing and project oversight were provided by Barry Pendergrass of the Coastal Resources Division. Peter Lauridsen and Jeff Herter supplied report mapping, while Rod McNeil helped make the survey workable, also through the Coastal Resources Division. Jeff Fullmer of the SSER Office provided guidance and review of intermediate products.

Information from local governments of the Reserve was essential to the report. Without their support and assistance this project would not have been possible. Additional information was provided by the Federal Emergency Management Agency, Fire Island National Seashore and members of the South Shore Estuary Reserve Council. The survey and report were undertaken in response to research implementation actions recommended in the *Long Island South Shore Estuary Reserve Comprehensive Management Plan*.

### **Long Island South Shore Estuary Reserve Council**

#### South Shore Estuary Reserve Council Members/Designees

Randy A. Daniels, NYS Secretary of State/Council Chair  
Joseph Kayal, Citizens Advisory Committee Chair  
Cornelia Schlenk, NY Sea Grant/Technical Advisory Committee Chair  
Steve Levy, Suffolk County Executive  
Thomas Suozzi, Nassau County Executive  
Charles T Theofan, City Manager, City of Long Beach  
Kate Murray, Supervisor, Town of Hempstead  
John Venditto, Supervisor, Town of Oyster Bay  
Steve Bellone, Supervisor, Town of Babylon  
Peter McGowan, Supervisor, Town of Islip  
John Jay LaValle, Supervisor, Town of Brookhaven  
Patrick A. Heaney, Supervisor, Town of Southampton  
William Glacken, Mayor, Village of Freeport/  
NYS Conference of Mayors  
Robert Grover, Great South Bay Audubon Society

Michael Eagan, Captree Boatman's Association  
David Conover, Dean and Director, Marine Sciences Research Center, SUNY at Stony Brook  
Carl LoBue, Long Island Chapter of The Nature Conservancy  
Mitch Pally, Long Island Association  
Patrick H. Augustine, New York Sportsfishing Federation  
Christopher Squeri, New York Marine Trades Association  
Gregory LoVece, Brookhaven Bayman's Association  
Robert Wieboldt, Long Island Builders Institute, Inc.

#### Ex-officio Council Members

Denise M. Sheehan, Acting Commissioner, NYS Department of Environmental Conservation  
Bernadette Castro, Commissioner, NYS Office of Parks, Recreation and Historic Preservation  
Thomas J. Madison, Jr., Acting Commissioner, NYS Department Of Transportation



Preparation of this report was financially aided by : the New York State Environmental Protection Fund, the Student Conservation Association, and a grant from the U. S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended.



# TABLE OF CONTENTS

PURPOSE .....	1
INTRODUCTION .....	1
METHODOLOGY .....	3
Initial Survey .....	3
Supplementary Survey .....	4
SURVEY RESULTS .....	5
Bay Flooding and Erosion: Extent and Mitigation Plan/Program Adequacy .....	5
Events .....	5
Causes of Damage .....	5
Frequency of Bay Flooding or Erosion Events .....	5
Most Recent Severe Damage Experience .....	5
Damages .....	5
Number of Properties Affected by Bay Flooding or Erosion .....	6
Bay Flooding and Erosion Mitigation Actions .....	6
Planning .....	6
National Flood Insurance Program .....	6
Education and Outreach .....	6
Mapping .....	6
Efforts to Inform and Evacuate .....	7
Volunteer Recruitment and Preparedness Education Needs .....	7
Erosion .....	7
FINDINGS AND RECOMMENDATIONS .....	8
A. Frequency of Bay Flooding or Erosion Events/Most Recent Severe Damage Experience	8
B. Number of Properties Affected by Bay Flooding or Erosion .....	9
C. Coastal Hazard Damages and Mitigation Planning .....	9
D. Mitigation Actions .....	10
E. Post-Disaster Plans .....	11
F. Education and Outreach .....	12
G. Disaster Education and Volunteer Recruitment Needs .....	12
H. Erosion .....	13
I. Standardization of Damage/Scope Definitions and Monitoring Methodology .....	14
J. Flood and Erosion Record Keeping .....	14
K. Flood Preparedness .....	15
L. Future Actions .....	15
Contact Information .....	19
Sources of Disaster Response Education .....	29
Volunteer Opportunities in Emergency Response .....	31

## APPENDICES

Appendix A: Literature Reviewed .....	A-1
Appendix B: Original Survey .....	B-1
Appendix C: Additional Survey Questions .....	C-1
Appendix D: Severe Bay Flooding or Erosion .....	D-1
Appendix E: Plan Adequacy .....	E-1
Appendix F: Coastal Hazard Events .....	F-1
Appendix G: Causes of Damage .....	G-1
Appendix H: Frequency of Bay Flooding or Erosion Events .....	H-1
Appendix I: Most Recent Severe Damage Experience .....	I-1
Appendix J: Types of Damage .....	J-1
Appendix K: Bay Flooding and Erosion Mitigation Actions .....	K-1
Appendix L: Coastal Hazard Planning .....	L-1
Appendix M: National Flood Insurance Program .....	M-1
Appendix N: Education and Outreach .....	N-1
Appendix O: Mapping .....	O-1
Appendix P: Flood Early Warning and Evacuation Plans .....	P-1
Appendix Q: Need for Preparedness Education or Volunteers .....	Q-1
Appendix R: Erosion .....	R-1

## MAPS

Coastal Hazards Map for Town of Hempstead .....	Map-1
Coastal Hazards Map for Towns of Oyster Bay and Babylon .....	Map 2
Coastal Hazards Map for Town of Islip .....	Map 3
Coastal Hazards Map for Town of Brookhaven .....	Map 4
Coastal Hazards Map for Town of Southampton .....	Map 5

## **PURPOSE**

The primary purpose of this report is to improve understanding of flooding and erosion affecting areas adjacent to the bays of the Long Island South Shore Estuary Reserve (SSER). The report summarizes results of community surveys carried out by the Reserve Office between 2003 and 2005.

Documentation of flooding and erosion has a number of anticipated benefits:

- Better identification of the type, location and extent of flood and erosion impacts.
- Improved understanding of the causes and consequences of flooding and erosion.
- Supports additional planning or management actions.
- Creates an information resource for communities about mutual coastal hazard impacts and solutions.

In addition to documenting coastal hazard conditions among communities in the Reserve, this report contains descriptions of a number of programs designed to help manage coastal hazard impacts. The Contact Information section of the report provides these program descriptions and sources for additional information from the agencies offering assistance. We hope you will find both the survey results and the contact information helpful for managing coastal hazards..

## **INTRODUCTION**

With passage of the South Shore Estuary Reserve Act, the New York State Legislature defined both the extent of the SSER and the responsibilities of the Council to protect and restore the natural, cultural and economic resources of the estuary. Accordingly, in 2001 the Council adopted a Comprehensive Management Plan (CMP) for the Reserve. The Council recognized the need to address bay flooding and erosion as a management issue of concern for shoreline communities. Recommended actions in the CMP include research on "...the natural causes of bay flooding and erosion, the impacts of development in erosion prone areas and the effects of shoreline hardening."<sup>1</sup> A first step to directing research on solutions to bay flooding and erosion is to understand the nature, extent and existing provisions for coastal hazards in the SSER. That was the reason for initiating the present study.

Development of the CMP included compilation and interpretation of existing information. The New York State Department of State, Division of Coastal Resources (DOS) prepared a summary report on flooding and erosion for the SSER in March, 2000.<sup>2</sup> DOS analysis highlighted the potential scope of flooding and erosion as well as the need for a comprehensive approach to manage these hazards. The present investigation attempts to develop an

---

<sup>1</sup>Long Island South Shore Estuary Reserve Comprehensive Management Plan, South Shore Estuary Reserve Council, New York, 2001, para. 6-12, pg. 89.

<sup>2</sup> Coastal Flooding and Erosion in the South Shore Estuary Reserve, Prepared for the South Shore Estuary Reserve Council by the New York State Department of State, March, 2000

understanding of the significance of flooding and erosion hazards from the viewpoint of the SSER communities, to summarize the extent to which existing management plans address those hazards, and to present recommendations based on survey findings. By documenting community perception of coastal hazards and the extent to which existing measures address them, this report establishes a context for further action.

The report is a joint effort of the SSER Office and the New York State Department of State, Coastal Resources Division. After background research on programs available to address coastal hazards, we proceeded by surveying SSER communities on their experience with flood and/or erosion problems and the types of management measures they employ for coastal hazards. The report is based on the results of these surveys, conducted through mailings and interviews with staff of SSER member communities. It generally summarizes flood and erosion experiences and related coastal hazard management measures in Reserve communities. The report is not exhaustive in detail, but does summarize the type, frequency and extent of coastal hazards, recent damage history, and existing management provisions, as reported by the communities. Additional research would be necessary to describe specific sites or to prepare support for decision making on particular management measures.

Through the survey process a picture emerged of a range of coastal hazard experiences and a wide variety of management measures in use. It's clear no single outside observer could accurately characterize SSER coastal hazards without asking primary sources for information in the member communities. SSER members may be best equipped to interpret survey results and identify patterns of impacts or their geographic distribution, if they exist. If patterns are discovered, SSER communities may consider long term management approaches, partnerships, demonstration projects or other strategies that could have broad application beyond individual sites. Programs aimed at assisting communities with coastal hazards may be appropriate for site specific application or for more regional, long term applications. In either case, management requires persistent effort and investment of resources, (time, energy and funding) to reduce risks.

We hope the information provided in this report will assist SSER communities and help reduce the frequency and severity of coastal hazard damages. Assistance, research and innovative mitigation techniques are available for communities that choose to address coastal hazards before an emergency occurs. The type, location and timing of planning and mitigation actions is a matter to be determined by individual communities, but they may also be advanced through cooperative efforts uniting common interests, such as the SSER.

## **METHODOLOGY**

Flood and erosion literature was reviewed (listed in Appendix A) in order to gain familiarity with historic problems and mitigation efforts in the Reserve. With the assistance of DOS and Reserve Office staff, that information was used to create a series of questions for the communities in survey form. The survey was aimed at developing descriptions of the nature and extent of flood and erosion conditions and related mitigation activities in each community. These surveys were distributed to Reserve communities between October 2003 and January 2005. Appropriate maps for each community were included with the survey to indicate the location of any impact areas they chose to describe.

Separate surveys were distributed to the two counties, six towns, one city and twenty three of the villages located within the Reserve. All communities with bay side property and/or significant tidal creek shoreline received the survey. A few Reserve communities were not surveyed because they are not exposed to flooding or erosion associated with the bays or bay tributaries. Each surveyed community identified an individual(s) responsible for responding to the questions. The title and responsibilities of respondents varied by community, but surveys were generally answered by individuals with planning or emergency service roles.

Following survey distribution the Reserve Office contacted recipients directly through mail, phone calls, faxes and e-mail. Face to face meetings were scheduled whenever possible to develop clear communication about the nature of flood and erosion experience in each community. Based on results from the first survey, a supplementary survey was undertaken to refine hazard severity and location information. Combined results from the two surveys are tabulated, mapped, and summarized in this report.

After survey results were tabulated, mapped and summarized, the draft report was prepared and distributed to the Long Island South Shore Estuary Reserve Council (Council) for review. The Council then recommended inclusion of Fire Island National Seashore, Heckscher State Park, Jones Beach State Park and Captree/Robert Moses State Parks in the survey, which was done. Survey findings, conclusions and appendices were revised as well as other editorial changes, to produce the final report.

### **Initial Survey [Appendix B]**

The first survey was divided into three sections. In the first section, each community answered questions about existing programs, preparedness and response, planning provisions and mapping efforts related to coastal hazards. Recipients were also asked to indicate the location of any bay flooding or erosion sites on maps provided with the survey. 30 of 32 local governments surveyed responded to section one, as did all the parks.

Only communities reporting flooding or erosion that could threaten lives or property, or with coastal hazards requiring management or emergency response, were asked to proceed with section two. In this section, respondents answered questions about existing mitigation plans and programs. 20 local governments and 2 parks identified these coastal hazards needs and responded to this section.

Only communities reporting flood or erosion impacts not adequately addressed by existing mitigation programs were asked to proceed with the third section. Section three requested descriptive information about the hazard impacts, including frequency of flooding or erosion, a description of the structures or resources effected, previous mitigation measures employed, depth of flooding or rate of erosion, and apparent causes of the impacts. Three communities and 2 parks recognized a need for additional measures and responded to this section of the survey.

### **Supplementary Survey [Appendix C]**

After collecting results from the first round of surveys, some gaps in coverage and descriptive information were found. One page of Additional Survey Questions was prepared and circulated to improve results by better defining the nature and extent of hazards. The Additional Survey Questions were distributed to all local governments who received the first survey and to the Parks. Through this supplemental survey, most participants who did not provide detailed flooding and erosion information during the first survey were able to do so. The combination of results from the original survey and the Additional Survey Questions provided much improved documentation on Reserve community flooding and erosion.

## **SURVEY RESULTS**

This section of the report presents results compiled from the Bay Flooding and Erosion surveys distributed to Reserve communities and parks. Charts and graphs illustrating these results appear as Appendices to the report, referenced in **bold face** type below.

### *Bay Flooding and Erosion: Extent and Mitigation Plan/Program Adequacy*

#### **[Appendix D and E]**

Bay flooding and erosion are widespread in the Reserve, affecting approximately two thirds of all survey respondents (22 of 34, Appendix D). Of the remaining one-third of respondents with no coastal hazard impacts, eight reported no severe bay flooding or erosion, three reported the presence of bay flooding or erosion is unknown, and one reported possible flooding or erosion. Impacts are distributed throughout the Reserve (see Maps). Survey respondents generally report existing plans for managing flood or erosion impacts are adequate (Appendix E).

### *Events* **[Appendix F]**

Respondents associated two principal conditions with bay flooding and erosion: storms (27) and tides (24). Storm and tidal events were often mentioned in combination as sources of bay flood and erosion damages.

### *Causes of Damage* **[Appendix G]**

Three causes of damage were cited by multiple respondents: storm surge (14) , storm water runoff (6) and flooding (5). Ice, boat wakes, wave velocity, wind and bulkheads were each reported once as sources of damage.

### *Frequency of Bay Flooding or Erosion Events* **[Appendix H]**

Almost half of all respondents (11 of 24) did not know, could not determine, or did not answer the question about the frequency of bay flood or erosion events. Of the remaining 13 respondents, 10 experience a range of severe events from less than one per year up to 12 times per year. One community reported severe events occur "seldom", and two reported damages occur "only during extreme events". Seven communities experience damages they characterize as severe between 0.5 and 2.5 times per year.

### *Most Recent Severe Damage Experience* **[Appendix I]**

A majority of respondents (10) said their most recent damage experience was in the early 1990's. 2003-04 had the second most citations (5). Damage experiences were split between those that occurred nearly a decade ago (11) and those that occurred during 2003-2004 (5). 1992 and 2004 were the two years cited most often with 4 citations each.

### *Damages* **[Appendix J]**

Road flooding (14) was the impact cited most frequently in the surveys. Road flooding was followed by building flooding (6), property damage (6), road damage (4), building damage (4) and erosion (4) as a negative consequence of coastal hazards. In total, bay related flooding (roads, buildings, boardwalks and landscape) accounts for forty percent of all reported damages.

### Number of Properties Affected by Bay Flooding or Erosion

Question 1c of the supplemental survey (Appendix C) attempted to quantify the number and types of buildings at risk from coastal hazards. Due to the broad range of answers received, no graph was prepared to illustrate survey results on this question. Almost half the respondents (10 of 22) said they could not determine the number of properties at risk. Five provided information about general areas affected. The remaining seven provided answers ranging from as many as 625 properties to as few as 2.

### Bay Flooding and Erosion Mitigation Actions [Appendix K]

36 different bay flooding and erosion mitigation actions were reported by survey respondents. 24 of these mitigation actions were only reported once. The two actions cited most often were road raising (6) and tidal check valve installation (5). One quarter of respondents reported mitigation actions involving elevation of structures and infrastructure. Another quarter reported bay flooding and erosion mitigation actions involving drainage improvements.

### Planning [Appendix L]

Ten respondents stated existing Flood Mitigation or All Hazard Mitigation Plans include measures to address the bay flooding and erosion sites identified in the survey. Eight reported existing Mitigation Plans do not include measures for the identified sites. 9 of 23 communities reported they intend to prepare a Local Waterfront Revitalization Program with hazard mitigation. 13 communities are not planning to prepare an LWRP with hazard mitigation, one community is undecided. Nearly half the respondents reported current disaster planning has provisions to address uncompensated costs such as business interruption, natural resource damages and services for vulnerable populations. Only nineteen percent (5 of 26) have a post-disaster plan that includes hazard mitigation.

### National Flood Insurance Program [Appendix M]

Nearly all survey respondents participate in the National Flood Insurance Program (NFIP) and almost three quarters have submitted NFIP claims. Of those submitting NFIP claims, all but one have submitted repetitive claims (as defined in the NFIP program). Half of all respondents who participate in the NFIP also participate in the Community Rating System.

### Education and Outreach [Appendix N]

Survey respondents reported 17 different education and outreach types utilized to convey information on coastal hazards. Most education and outreach efforts (14 of 17) are not being utilized by multiple respondents. Of the 14 measures utilized by only one respondent, three were components of management/mitigation plans (Flood Mitigation Plan, Hurricane Coastal Storm Plan, Stormwater Management Plan). Three different measures were utilized by more than one respondent: annual mailings (5), presentations/exhibits (3) and websites (2).

### Mapping [Appendix O]

Flood and erosion area mapping, as well as drainage mapping, were reported by the majority of survey respondents. Several respondents reported partial flood and erosion mapping, often limited to Federal Emergency Management Agency (FEMA) flood zone mapping. Mapping of shore protection structures was reported significantly less (11 of 30) than either flood or erosion mapping. Nearly half of the survey respondents who cited maps reported digital mapping efforts.

Efforts to Inform and Evacuate [Appendix P]

20 of 25 respondents have emergency evacuation plans. 12 of 26 respondents reported flood early warning systems.

Volunteer Recruitment and Preparedness Education Needs [Appendix Q]

Forty-three percent of respondents reported a need for additional disaster preparedness education. Fifty-three percent stated they have sufficient preparedness education already. Approximately one quarter of reporting communities indicated a need for additional volunteer recruitment for emergency response. Seven communities identified a need for both disaster preparedness education and volunteer recruitment.

Erosion [Appendix R]

Sixteen communities, about half of all respondents, reported erosion areas. One quarter experience some form of coastal hazard damage but did not specify erosion. The remaining quarter of the respondents stated they have no erosion problem. Ten communities reported an erosion monitoring program. In general, erosion impacts were limited and communities did not emphasize a need for mitigation assistance.

## **FINDINGS AND RECOMMENDATIONS**

### **A. Frequency of Bay Flooding or Erosion Events/Most Recent Severe Damage Experience**

**SURVEY FINDINGS:** The years cited most often as the recent dates when severe flood or erosion damage occurred were either in the early 1990's or during 2003-04. Eleven communities reported severe damage in 1994 or earlier, compared with four communities and one park whose most recent severe damage occurred in 2003-04 (Appendix I). One community reported twelve severe damage events per year, on average (Appendix H). Other damage frequencies ranged from "Seldom" to 4.5 events per year (Appendix H). Two communities and one park could not determine the frequency of severe damages, six communities stated the frequency is not known, and two communities did not respond to this question (Appendix H). 22 communities or parks responded to the question about frequency of bay flooding or erosion events (two did not respond), nine of the respondents did not know or could not determine the frequency of severe damage events.

**DISCUSSION:** Severe coastal hazard damages affect multiple communities with varying frequency. Eight communities and one park experience severe damages once every two years or more, on average. Some communities suffer few flood and erosion damages. Some communities do not have sufficient records to answer this question. The survey does not contain enough detail on damages at specific sites to formulate management recommendations. The dates of severe damage citations generally correspond with years of severe weather. Wind driven waves and storm surges are known causes of coastal hazard impacts.

#### **RECOMMENDATIONS:**

1. Site specific investigations are necessary to identify the causes and potential management options for locations that experience frequent severe damage. If existing plans are not adequate for these locations, consider using one of the FEMA programs described in the Contact Information section as a means to assess high-risk sites and prepare management plans. The FEMA tool Community Vulnerability Assessment Tool is a practical means to review both high risk sites and potential causes of damages as a basis for mitigation planning.
2. Communities that experience severe impacts need adequate descriptive information to prepare plans, mitigation actions and to support future requests for assistance. If your community does not have standard procedures for documenting such damages, review information needs and consider options for obtaining them.
3. Communities that experience damages on an infrequent basis may still need long-term management measures. Either severe weather events exceeding recent experiences or changing conditions over time (erosion, sea level rise, at-risk development, storm water discharge, etc.) could increase risk exposure.

## **B. Number of Properties Affected by Bay Flooding or Erosion**

SURVEY FINDINGS: As described in the Survey Results section no graph was prepared on the results of this question due to the broad range of answers. 45% of the respondents (10 of 22) did not specify the number of properties at risk. Five respondents (23%) provided general information about areas affected, while the remaining seven (32%) provided answers ranging from as many as 625 properties to as few as 2.

DISCUSSION: There is a wide variation in risk among SSER communities. At least one local government reported a large number of properties at risk from coastal hazards. Local knowledge of conditions could be critical to identify areas of impact and to support appropriate management actions. Communities should be aware of how knowledge on coastal hazards and impacts is stored so it can be applied to planning and mitigation. Standardized and well documented community records could be important to support management actions. Standardized information collection would avoid "event bias" (the impression that one event characterizes the situation and is used to determine community responses) and simplify record keeping. It would be worthwhile to discuss reporting needs with assistance agencies (FEMA, SEMO) to find out what information is required for assistance and what format should be used. A record of impacts over time would help communities determine whether existing plans and programs are adequate and accurate (compare to National Flood Insurance Program maps).

### RECOMMENDATIONS:

1. Communities with flood or erosion damage risks could create standardized record keeping on areas at risk and types and amounts of damages experienced to support or improve management measures.
2. Knowledge of the actual number and location of properties at risk would help in preparation of management plans and provide information for assisting agencies.
3. Communities should compare properties actually affected by flooding or erosion with existing plans and programs and evaluate whether management measures are appropriate based on experience.

## **C. Coastal Hazard Damages and Mitigation Planning**

SURVEY FINDINGS: Most survey respondents reported some damage experience from bay flooding or erosion. The total number of damage citations was 56 (Appendix J). A majority of respondents (19 of 25, 76%) stated existing plans are adequate to address coastal hazards. Appendix L summarizes a variety of questions related to coastal hazards and planning. As shown, 11 of 25 respondents have existing plans or plans underway that address all coastal hazard sites in their community, 8 of 25 (32%) have plans for none of their identified sites, five did not answer the question (20%), and one states the question is not applicable.

13 of 23 responding communities (57%) do not plan to include coastal hazard mitigation in a Local Waterfront Revitalization Plan, 9 do plan to include it (39%). 13 of 29 respondents (45%) have provisions for uncompensated costs like business closure, lost wages, damages to natural resources, social costs, lost tax revenue, etc., while 11 communities (38%) do not have plans in place for these coastal hazard costs. Of 26 respondents, 17 communities and two parks (73%) do not include coastal hazard mitigation in post-disaster planning while five communities (19%) do.

DISCUSSION: Damages are widely experienced in the Reserve but most communities state they are adequately addressed by existing plans. Less than half (40%) of the respondents have plans in place or underway for all identified coastal hazard sites. Almost one-third (32%) have plans for none of the identified coastal hazard sites and 20% did not answer the question. Therefore, at least 32% and as much as 52% of the respondents still require management plans for some sites where damages occur from coastal hazards. These results indicate management plans and mitigation actions exist for some, but not all SSER sites vulnerable to coastal hazards. To improve coastal hazard management, some opportunity exists through new LWRPs, through FEMA Hazard Mitigation Plans and grants, through adding provisions to existing plans for uncompensated costs, and through new post-disaster planning.

RECOMMENDATIONS:

1. Encourage coastal hazard management planning and mitigation for sites where such provisions do not already exist.
2. Add provisions for coastal hazards to existing LWRPs, or prepare new LWRPs with such provisions in communities that do not already have them. The New York State Environmental Protection Fund can help support preparation of LWRPs, amending LWRPs or implementation of projects identified in approved plans.
3. Encourage post-disaster planning as a means to use the recovery process to develop disaster resilient communities. Such plans must be in place before a disaster occurs so redevelopment can be managed to create healthier, less vulnerable communities.

## **D. Mitigation Actions**

SURVEY FINDINGS: 36 different mitigation actions were reported (Appendix K). Two thirds of the actions (24 of 36) were cited only once (Appendix K). The most frequently cited flood mitigation action reported was Road Raising, reported by six communities. Installation of Tidal Check Valves was cited by five communities. Four communities cited Home Raising (elevation) and four cited Development Regulations. Utility Raising and Bulkheading were each reported by three communities. Drainage Installation, Debris Removal, Emergency Response Planning, Leaching Basins, Open Space Acquisition and Tide Gages were each cited by two communities.

DISCUSSION: The wide range of mitigation actions could indicate Reserve communities select measures to meet specific local needs. It also demonstrates the variety of mitigation options are available. The number of individual, site specific measures employed is also an indication of the costs associated with maintaining development in high risk locations. Comprehensive management plans may be more effective than piece-meal approaches to mitigating coastal hazards if applied to broader areas.

RECOMMENDATIONS:

1. Support management measures tailored to meet specific local needs if they are cost-effective.
2. SSER communities should share information about effective mitigation tools.
3. Consider preparation of comprehensive plans to address coastal hazards if costs for site specific mitigation become excessive or efficiencies of scale offer more effective management.

## **E. Post-Disaster Plans**

SURVEY FINDINGS: 5 of 26 respondents (19%) have post-disaster plans that include mitigation of flood and erosion hazards. 19 respondents (73%) do not have post-disaster plans, one was uncertain and one did not answer the question.

DISCUSSION: Reconstruction following a disaster can be an opportune time to rebuild communities in a more disaster resistant form. However, few resources are available for planning when a disaster occurs, so post-disaster plans must be in place before they are needed in order to be effective. Post-disaster plans can reduce future damages through relocation of development or infrastructure, flood resistant reconstruction, acquisition of open space, set backs from flood inundation zones, lowering density in high-risk locations, and change to less vulnerable uses. Actions resulting from these plans may include regulations, long-term capital programs and creation of relocation/acquisition/reconstruction funds. Some options for creating post-disaster plans include community comprehensive plans, LWRPs, and Flood or All Hazard Mitigation Plans through FEMA. LWRPs and portions thereof are eligible for funding assistance through the New York State Environmental Protection Fund. By reducing future damages while recovering from a disaster, local governments could address both public and private storm damages and respond to changing conditions over the course of time. Without post-disaster reconstruction plans to reduce future damages, the same conditions that existed prior to a disaster could be recreated during recovery, resulting in repeat losses during future disasters.

RECOMMENDATION: Consider post-disaster recovery planning as means to create disaster resistant communities.

## **F. Education and Outreach**

SURVEY FINDINGS: One-third of the respondents (10 of 29, Appendix N) did not answer the question about whether they have education or outreach programs on bay flooding and erosion. Seven communities reported they do not have such a program. Among the remaining 12 communities that do provide outreach, a wide range of tools were reported. 14 of 17 education and outreach measures in use were reported by only one community. Website use was reported by only two communities.

DISCUSSION: 17 communities who either did not answer this question or reported no active coastal hazard outreach programs suggests opportunities are available to improve community preparedness and support for mitigation and planning through expanded outreach. The wide variety of tools in use provide examples of effective methods to deliver information and help inform residents about coastal hazards, natural conditions, management alternatives and emergency preparedness/response. Adapting outreach tools used by other communities or sharing outreach resources could offer opportunities to reach wider audiences. Low use of websites for outreach is probably related to the recent emergence of this technology. As communities develop websites for other needs, opportunities to provide and/or link to other sources for coastal hazard information will become available.

### RECOMMENDATIONS:

1. Consider expanding education and outreach related to coastal hazards as a means to increase awareness and build support for management actions.
2. Review examples of outreach tools in Appendix N to see whether any would be useful for your community or agency. Consider opportunities for sharing outreach information or venues.
3. As websites are developed consider providing information to support planning and mitigation actions for coastal hazards in your community. Also, consider providing links to other sources of information on coastal hazards.

## **G. Disaster Education and Volunteer Recruitment Needs**

SURVEY FINDINGS: 13 local governments reported a need for additional disaster preparedness education while 12 local governments and four parks reported they do not (Appendix Q). The survey did not investigate what types of preparedness education are needed. Eight local governments reported a need for volunteer recruitment assistance for emergencies while 17 local governments and three parks do not.

DISCUSSION: About half the responding SSER communities need additional disaster preparedness education. Since the other half of the responding communities have adequate disaster preparedness education, results indicate that either: a) Sources for this education are

available that those with needs could tap into, b) existing training programs or support should be modified so that disaster preparedness education is available to all communities, or c) some communities are in the process of training and will obtain it through existing programs. 28% of the responding communities need help with volunteer recruitment.

#### RECOMMENDATIONS:

1. The basis for requesting further disaster preparedness education needs further investigation. Local governments may identify the needs with emergency response staff or coastal hazard managers. Sources of disaster response education are listed following the Contact Information section in this report. The FEMA Emergency Management Institute offers an extensive training program (see description in Contact Information).
2. Volunteer opportunities in emergency response are listed following the Contact Information section in this report.

## **H. Erosion**

SURVEY FINDINGS: Slightly more than half of the respondents (16 of 31, Appendix R) mentioned erosion problems of some form. Most references provided minimal descriptions (see maps for distribution), did not emphasize a need for mitigation and did not attribute the erosion to a specific cause. Some significant localized erosion was reported, in particular on the barrier island bay shores. Respondents who mentioned erosion were geographically distributed throughout the Reserve (see maps). Nearly 40% of all respondents (10 of 26, Appendix R) stated they already have erosion monitoring programs.

DISCUSSION: Bay erosion issues are widely distributed among Reserve communities and in some instances have a substantial impact. Other than the bay side of the barrier islands, erosion is not concentrated geographically and therefore may be related to unique local conditions. Specific information about conditions at erosion prone areas is necessary to prepare appropriate management measures or to formulate a monitoring program. Some communities already have an erosion monitoring program. Creation of a generic erosion monitoring program would be premature at this time due to the variety of local conditions and potential causes in the SSER.

#### RECOMMENDATIONS:

1. Erosion management may be needed in a few locations but it does not appear to be a priority for most communities in the SSER.
2. Site specific studies may be necessary to understand the causes of erosion and formulate appropriate management plans. Communities that share erosion prone sites could consider a mutually supported monitoring program or scientific study if common needs are identified.

3. A generic monitoring program is not appropriate based on survey information because the types and causes of erosion are not well enough understood to formulate standards.

## **I. Standardization of Damage/Scope Definitions and Monitoring Methodology**

SURVEY FINDINGS: During the survey a number of respondents asked for clarification on the definition of "significant" damages caused by bay flooding and erosion. One intention of the survey was to let respondents determine what damages are significant to allow communities to set their own standards and a consider full range of management measures. As a result survey results show a wide variety in significant impacts.

DISCUSSION: There does not appear to be a regional standard for significant coastal hazard impacts. Impacts that are currently below the significant level may become more serious during severe storm conditions or over the course of time with changing local conditions and sea level rise. As a result, it might be worthwhile to formulate management measures now to address future coastal hazard impacts. Documentation of impacts could help establish a basis for local decisions on when or whether to implement management measures. It may also be worthwhile to document the change in coastal hazard impacts over time for sites where management measures or assistance may be necessary in the future. Most federal programs require establishing of a positive cost-benefit ratio to implement storm damage management measures.

### RECOMMENDATIONS:

1. If they are not already documented, consider recording coastal hazard impacts for sites where damages currently fall below the level of significance. Use this documentation to support local decision making and requests for federal assistance, now or in the future.
2. If appropriate, prepare management plans for sites where impacts are not presently significant but are likely to rise to the significant level in the future.

## **J. Flood and Erosion Record Keeping**

SURVEY FINDINGS: Staff carrying out the surveys observed that for many respondents multiple inquiries were necessary to reach appropriate contacts and obtain all requested information. Respondents frequently consulted a number of local sources with various responsibilities to gather bay flooding and erosion information.

DISCUSSION: Management of coastal hazards may be distributed among a number of agencies or staff in local government (planning, public works, emergency services, etc.), therefore, record keeping may not be centralized. Some vulnerable shoreline areas are shared among multiple communities (see map section) where shared information could support a

joint management approach. In addition, applications for assistance to other agencies (NYS-DEC, FEMA, USACE), as well as comprehensive planning for coastal hazards, is supported by documentation of damage experience and local conditions. Finally, reporting is useful because conditions in coastal areas change over time with sediment migration, changes in hydrology, sea level rise and development. Standardized reports on risk exposures, management expenses and damage experience could benefit local planning as well as providing support for assistance.

RECOMMENDATION: Improve communication links within and among communities for the purpose of supporting decision making, preparing joint management measures and sharing lessons learned.

## **K. Flood Preparedness**

SURVEY FINDINGS: 20 of 25 respondents indicated they have existing emergency evacuation plans (Appendix P). 13 of 26 respondents indicated they do not have a community early warning system for floods.

DISCUSSION: Evacuation plans should be prepared for areas vulnerable to inundation. Some of the communities that do not have evacuation plans may not face inundation risk. FEMA storm surge maps are available that provide guidance on "worst case scenarios" for storm surge. The National Weather Service will issue bulletins for projected flooding, however, community based communication systems may be more effective in the event of an emergency.

### RECOMMENDATIONS:

1. FEMA/USACE may have already prepared a Hurricane Evacuation Study for your community. If not, evacuation plans may be necessary. Check FEMA storm surge maps to determine your communities vulnerability.
2. If flood early warning systems are needed consider cooperative efforts with nearby communities where they are already in place.

## **L. Future Actions**

SURVEY FINDINGS: In reviewing the completed surveys a number of trends begin to emerge. Coastal hazard damages are not confined to one area or a few communities in the SSER but are widely distributed throughout the Reserve, as shown on the report maps. Other trends include the periodic occurrence of severe flood and erosion events, dominance of storms and high tides, sometimes in combination, as sources of damage, the wide variety of mitigation and outreach measures already being used to manage coastal hazards, and the opportunity for sharing experience on education, outreach and mitigation options.

The type and frequency of coastal hazard impacts varies among individual communities (Appendices H, I and J). 22 of 34 respondents (almost 65%, Appendix D) indicated flood and erosion problems are severe enough to threaten lives or property, require emergency response or need mitigation planning and projects.

Of those experiencing severe impacts, 19 of 25 (76%, Appendix E) stated their existing plans are adequate to manage the situation. Only 40% have existing plans that include mitigation of coastal hazards (Appendix L, survey section 2, question 4). 39% of the SSER communities plan to prepare an LWRP with coastal hazard mitigation while 56% do not. Only 19% have post-disaster plans that include hazard mitigation.

Almost 90% of the communities participate in the National Flood Insurance Program (NFIP) and half of the respondents participate in the Community Rating System (CRS) to boost community flood resistance and lower insurance premiums. 81% of the communities report experience with repetitive flood insurance claims (Appendix M).

40% of respondents reported some type of education or outreach program in their community for coastal hazards (Appendix N). 36 different mitigation activities were cited by respondents (Appendix K). 43% of respondents reported a need for disaster preparedness education, while 27% indicated a need for emergency volunteer recruitment (Appendix Q).

36% of respondents have mapped shoreline structures, 50% have mapped drainage structures, 63% have some type of flood zone mapping and 48% have digital map resources for some of this information.

DISCUSSION: Coastal hazard impacts are experienced by a wide variety of communities distributed throughout the SSER. Variation in weather conditions, topography, hydrography or development exposure may explain the differing level of impacts in location and time among respondents.

Most respondents indicated existing coastal hazard planning is adequate to address needs. Based on survey results, there are still some opportunities to create coastal hazard management plans and to make improvements to existing LWRPs and hazard mitigation plans. Post-storm mitigation plans are under-utilized among SSER communities. LWRPs, hazard mitigation plans and post-storm mitigation plans can be flexible to allow communities to adapt to changing conditions over time as the need or opportunity arises. Since FEMA requires local governments to prepare All-Hazard Mitigation Plans for Hazard Mitigation Grants, numerous SSER communities have recently prepared such plans or are in the process of doing so. This creates an excellent opportunity for local governments to prepare mitigation plans and post-storm redevelopment plans to reduce future coastal hazard risks.

High participation in the NFIP and CRS by SSER communities extends flood insurance benefits to residents and helps communities achieve national design standards for flood plains and construction. The high response rate for repetitive flood insurance claims is an indication flood damages are widespread among SSER communities and many sites with repeat damages exist.

Many different education and outreach programs are being used in the SSER. 40% of the respondents are using education and outreach to distribute coastal hazard information. In addition, 36 different mitigation measures were mentioned. With so many education and mitigation options available, opportunities may exist for sharing successful programs or mitigation measures. Joint outreach programs might be possible where issues shared in common can be addressed. Existing education and outreach programs might offer forums for new information as it is developed over time. There are needs for disaster preparedness education and volunteer recruitment. Joint training or recruiting programs or shared information from successful programs might help address these needs.

Since mapped coastal infrastructure, resources and conditions are available for less than half of communities, there could be opportunities to improve planning and management by improving these inventory tools.

### RECOMMENDATIONS:

1. Support existing coastal hazard planning. Augment existing plans and LWRPs over the course of time to manage coastal hazards if they are not fully addressed already. Update plans with new or revised information as it is developed, such as projections for sea level rise. Utilize FEMA programs such as Hazard Mitigation Grant Program, Flood Mitigation Assistance Program and Pre-Disaster Mitigation Grant program to address coastal hazards. These plans offer an excellent opportunity to plan mitigation activities that can be implemented over the course of time as damages occur (post-storm redevelopment) or as other resources and capital investments allow. The Community Vulnerability Assessment Tool developed by FEMA can help assess local conditions and event frequency so that appropriate plans can be prepared. Contact FEMA for more information on this valuable tool.
2. Encourage use of the NFIP by residents to minimize flood losses. Consider utilizing existing education and outreach programs as a venue for distributing NFIP information. Utilize the FEMA Increased Cost of Compliance program (see FEMA contact information) to help reduce future damages.
3. Review the report summary of Education and Outreach (Appendix N) and the list of mitigation options already in use (K). Education or mitigation options may be listed in these appendices that could augment existing programs. Consider combining outreach or training efforts with neighboring communities if information, distribution or cost advantages can be achieved. Check with the FEMA Emergency Management Institute (EMI) for training programs and support if needed. A brief description of EMI is provided in the Contact Information section of the report. Some education efforts are eligible for use in the Community Rating System (CRS) of the National Flood Insurance Program. Contact FEMA for more information on CRS.
4. Computer mapping technology has evolved rapidly in recent years. Since infrastructure mapping is used for maintenance it is likely communities will improve these resources

over the course of time. Consider incorporating coastal hazard conditions into existing community mapping as upgrades occur over time. Inventories of damages, flooding or erosion conditions, as well as shore protection structures, are potential additions to map resources.

## **CONTACT INFORMATION:**

### **Federal Emergency Management Agency (FEMA)**

#### **Opportunities for assistance in reducing the impacts of natural hazards:**

##### **National Flood Insurance Program**

The Mitigation Division, a component of the Federal Emergency Management Agency (FEMA), manages the National Flood Insurance Program. The three components of the National Flood Insurance Program (NFIP) are:

- Flood Insurance
- Flood plain Management
- Flood Hazard Mapping

Nearly 20,000 communities across the United States and its territories participate in the NFIP by adopting and enforcing Flood plain management ordinances to reduce future flood damage. In exchange, the NFIP makes Federally backed flood insurance available to homeowners, renters, and business owners in these communities. Community participation in the NFIP is voluntary.

Flood insurance is designed to provide an alternative to disaster assistance in order to reduce the escalating costs of repairing damage to buildings and their contents caused by floods. Flood damage is reduced by nearly \$1 billion a year through communities implementing sound Flood plain management requirements and property owners purchasing of flood insurance. Additionally, buildings constructed in compliance with NFIP standards suffer approximately 80 percent less damage annually than those not built in compliance. Every \$3 paid in flood insurance claims saves \$1 in disaster assistance payments.

In addition to providing flood insurance and reducing flood damages through Flood plain management regulations, the NFIP identifies and maps the Nation's flood plains. Mapping flood hazards creates broad-based awareness of the flood hazards and provides the data needed for Flood plain management programs and to actuarially rate new construction for flood insurance.

You can learn more online at FEMA's website: [www.fema.gov/fima/nfip.shtm](http://www.fema.gov/fima/nfip.shtm)

##### **Hazard Mitigation Grant Program (HMGP)**

HMGP assists States and local communities in implementing long-term hazard mitigation measures following a major disaster declaration. HMGP can be used to fund projects to protect either public or private property, as long as the overall project fits within the State's and local governments' overall hazard mitigation strategy and complies with program guidelines. FEMA is currently implementing All Hazard Mitigation grant programs for States and Municipalities. These comprehensive programs address both natural and man-made disasters. Future HMGP activities should complement these All Hazard Mitigation Plans. Examples of HMGP projects include:

- Acquiring and relocating structures from hazard-prone areas
- Retrofitting structures to protect them from floods, high winds, and other hazards
- Constructing certain types of minor and localized flood control projects
- Developing State, local, or tribal mitigation plans

Eligible applicants must apply for the HMGP through the State. Contact the New York State Hazard Mitigation Office at 518-485-1797 for specific details on applying for the HMGP.

You can learn more online at FEMA's website: [www.fema.gov/fima/hmgrp.html](http://www.fema.gov/fima/hmgrp.html)

#### Flood Mitigation Assistance (FMA)

FMA is a pre-disaster grant program that provides funding to States and communities to assist in their efforts to reduce or eliminate the risk of repetitive flood damage to buildings and structures insurable under the National Flood Insurance Program (NFIP). FMA prioritizes projects that mitigate NFIP-insured structures with multiple flood losses. Examples of projects include:

- Elevation of NFIP-insured structures
- Acquisition of insured structures and real property
- Relocation or demolition of insured structures

Any State agency, participating NFIP community, or local organization is eligible to participate in FMA. Contact the New York State Hazard Mitigation Office at 518-485-1797 for specific details on applying for FMA. Individuals wishing to participate in FMA should contact their community officials.

You can learn more online at FEMA's website: [www.fema.gov/fima/planfma.htm](http://www.fema.gov/fima/planfma.htm)

#### Pre-Disaster Mitigation Program (PDM)

The PDM program assists State, local, and tribal governments in implementing cost-effective hazard mitigation activities that complement a comprehensive mitigation program. Examples of projects include:

- Elevation of NFIP-insured structures
- Acquisition of insured structures and real property
- Local Drainage Improvements
- Coastal Shoreline Protection Measures

As of November 1, 2003, local governments and Indian Tribal governments applying for PDM funds through the State must have an approved local mitigation plan prior to the approval of local mitigation project grants. Contact the New York State Hazard Mitigation Office at 518-485-1797 for specific details on applying for the PDM program.

You can learn more online at FEMA's website: [www.fema.gov/fima/pdm.shtm](http://www.fema.gov/fima/pdm.shtm)

### Increased Cost of Compliance (ICC)

ICC provides coverage to all new and renewed Standard Flood Insurance Policies that helps cover the cost of rebuilding a damaged structure to current Flood plain management requirements. Flood insurance policyholders in special flood hazard areas can get up to \$30,000 to help pay the costs to bring their home or business into compliance with their community's Flood plain ordinance. Examples of fundable activities include:

- Elevation of NFIP-insured structures
- Relocation of NFIP-insured structures
- Demolition of NFIP-insured structures
- Floodproofing of NFIP-insured structures

You may file a claim for your ICC coverage in two instances:

- if your community determines your home or business is damaged by flood to the point that repairs will cost 50 percent or more of the buildings pre-damage market value; or
- if your community has a repetitive loss provision in its Flood plain management ordinance and determines that your home or business was damaged by a flood two times in the past ten years, where the cost of repairing the flood damage, on the average, equaled or exceeded 25 percent of its market value at the time of each flood. Additionally, there must have been flood insurance claim payments for each of the two flood losses.

To make an ICC claim, contact the insurance company or agent who wrote your flood policy. You can learn more online at FEMA's website: [www.fema.gov/nfip/f663\\_icc.shtm](http://www.fema.gov/nfip/f663_icc.shtm)

### Federal Emergency Management Agency Emergency Management Institute

FEMA's National Emergency Training Center in Emmitsburg, MD, is the home of the Emergency Management Institute (EMI) and the National Fire Academy. There, emergency managers, firefighters, and elected officials can take classes in many areas of emergency management, including emergency planning, exercise design and evaluation disaster management, hazardous materials response, and fire service management. EMI courses are also given by many states. An Independent Study Program is also available to private citizens. Special seminars and workshops are offered via satellite as part of FEMA's Emergency Education Network, called EENET.

Courses of special interest to engineers, architects and building code officials are:

Retrofitting Floodprone Residential Buildings  
Multihazard Building Design Summer Institute  
Digital Hazard Data Course  
Managing Flood plain Development Through the National Flood Insurance Program  
National Flood Insurance Program - Community Rating System

You can learn more online at EMI's website: [www.training.fema.gov/emiweb/](http://www.training.fema.gov/emiweb/)

## **United States Department of Agriculture, Natural Resources Conservation Service**

The United States Department of Agriculture, Natural Resources Conservation Service (NRCS) helps individuals and governmental agencies conserve, maintain and improve their natural resources and environment. Their conservation efforts are incredibly varied and include: wetland creation and restoration; watershed planning, protection and restoration; erosion and flood prevention; and protection of lives and properties from natural disasters.

### **Watershed Protection and Flood Prevention Act**

The Watershed Protection and Flood Prevention Act authorizes federal assistance, both financial and technical, in planning and undertaking projects that preserve, protect, and/or improve the land and water resources in small watersheds. Watershed protection projects can include structural and land treatment measures for flood mitigation.

You can learn more at the NRCS' website: [www.nrcs.usda.gov/programs/watershed/ws\\_main/law.html](http://www.nrcs.usda.gov/programs/watershed/ws_main/law.html)

### **Watershed Surveys and Planning**

The Watershed Surveys and Planning program's purpose is to aid parties in protecting and restoring watersheds; conserving and developing watershed resources; and solving natural resource and economic problems involving watersheds. Some applications of the program include watershed protection; flood prevention; erosion and sediment control; wetland creation; restoration; and upstream flood damage mitigation.

This program provides both technical and financial assistance.

You can learn more at the NRCS' website: [www.nrcs.usda.gov/programs/watershed/Surveys\\_Plng.html](http://www.nrcs.usda.gov/programs/watershed/Surveys_Plng.html)

### **Emergency Watershed Protection**

The purpose of the Emergency Watershed Protection program is to assist in the installation of emergency measures in order to protect lives and property during a natural disaster.

This program provides both technical and financial assistance. Possible assistance includes aid in debris removal, river bank stabilization, and the purchase of flood plain easements.

You can learn more at the NRCS' website: [www.nrcs.usda.gov/programs/ewp/](http://www.nrcs.usda.gov/programs/ewp/)

## **National Oceanic and Atmospheric Administration - National Weather Service**

The National Weather Service (NWS) reports the weather and provides forecasts to the general public. This includes issuing warnings about natural events such as hurricanes, tornadoes and floods; providing special services in support of aviation, marine activities, agriculture, forestry, urban air-quality control and other weather-sensitive activities; and monitoring all non-federal weather modification activities conducted in the United States.

### **Local Flood Warning Systems**

A Local Flood Warning System (LFWS) is a system of volunteers, hydrologic gauges (rainfall, river, etc.), hydrologic protocols, a communications network and a flood coordinator.

A Local Flood Warning System is a partnership between the federal government and a community. In

general, communities fund, run and maintain the LWS; communicate local conditions to the NWS; and relay flood warnings. The NWS generally aids in the selection and installation of the LWFS; provides assistance and training; and broadcasts forecasts and warnings.

You can learn more at the NWS' website: [www.nws.noaa.gov/oh/docs/alfws-handbook/](http://www.nws.noaa.gov/oh/docs/alfws-handbook/)

**National Oceanic and Atmospheric Administration - National Ocean Service**  
**Office of Coastal Resource Management**

The Office of Coastal Resource Management (OCRM) is responsible for implementing the Coastal Zone Management Act and two programs the act created: The National Coastal Zone Management (CZM) Program and The National Estuarine Research Reserve System. The former program promotes the enrichment and responsible development of coastal communities and resources. The latter program networks protected estuaries in order to facilitate estuary understanding, research and stewardship.

To carry out its responsibilities, the OCRM aids in the development of new CZM programs and Estuarine Research Reserve sites; provides technical and financial assistance, compiles information from participating sites; and completes network wide projects.

**Coastal Zone Management Program (CZMP)**

The Coastal Zone Management Program is a federal-state partnership in which coastal management is undertaken through the administration of state laws and regulations while the federal government provides funding, technical assistance, and support.

The CZMP covers a range of issues including coastal habitat protection and hazard mitigation. Objectives of the CZMP include: management of coastal development to protect life and property from coastal hazards; protection of wetlands and other coastal ecosystems; and maintenance and improvement of coastal waters.

You can learn more at OCRM's website: [www.ocrm.nos.noaa.gov/czm](http://www.ocrm.nos.noaa.gov/czm)

## **U.S. Department of the Interior - U.S. Geological Survey (USGS)**

The USGS serves the Nation by providing reliable scientific information to:

- describe and understand the Earth;
- minimize loss of life and property from natural disasters;
- manage water, biological, energy, and mineral resources; and
- enhance and protect our quality of life.

The USGS performs surveys, investigations and research covering topography, geology, hydrology and the mineral resources of the United States. They classify lands as to mineral and water resources and publish data relative to the foregoing activities. The USGS also publishes flow rates and peak flows of certain streams and rivers.

You can learn more at USGS' website : [www.usgs.gov](http://www.usgs.gov)

## **U.S. Department of the Interior - National Park Service**

The objectives of the National Park Service are to administer properties under its jurisdiction; to work with communities to protect and preserve historic properties; to protect the natural environment; and to assist in park development.

### **Rivers, Trails and Conservation Assistance Program**

The Rivers, Trails and Conservation Assistance Program provides National Park Service staff for assistance to communities for river and trail corridor planning and open space preservation efforts. Program personnel are acknowledged experts in facilitating cooperative planning efforts. Projects are all based on substantial involvement of varied community interests. Targeted National Park Service assistance with grassroots planning can help communities make informed choices based upon consensus about future growth and development that will help avoid future flood losses.

You can learn more at the National Park Service's website: [www.nps.gov](http://www.nps.gov)

## **U.S. Department of the Interior - Fish and Wildlife Service**

The mission of the U.S. Fish and Wildlife Service is to work with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people. Their major responsibilities are: migratory birds, endangered species, freshwater and anadromous fish, the National Wildlife Refuge System, wetlands, conserving habitat, and environmental contaminants.

The Fish and Wildlife Service provides expertise on questions relating to fish, wildlife, and habitat resource, preservation and maintenance. They also review wetland projects as part of the U.S. Army Corps of Engineers' 404 permit program.

You can learn more at the Fish and Wildlife Service's website: [www.fws.gov](http://www.fws.gov)

## **U.S. Environmental Protection Agency**

Watershed Management can be a key component of local efforts to manage storm water and pollution from runoff. The U.S. EPA administers regulations and programs for wastewater designed to protect water quality.

For descriptions of permit requirements and programs offered by the U.S. EPA visit their website: [www.epa.gov/npdes/pubs/sw\\_resource\\_list.pdf](http://www.epa.gov/npdes/pubs/sw_resource_list.pdf)

## **Department of Defense - U.S. Army Corps of Engineers**

The Corps' Civil Works Program is the Nation's major water resources development program. It engineers works such as major dams, reservoirs, levees, harbors, waterways, locks, and other types of structures. Planning assistance is provided to states and other non-federal entities for the comprehensive management of water resources, including pollution abatement works. The Corps provides both flood damage reduction and emergency response services.

The Corps conducts feasibility studies and builds flood damage reduction projects. Major projects require specific authorization and funding by Congress, while some small projects can be implemented with existing agency authorities.

You can learn more at the Corps' main website: [www.usace.army.mil](http://www.usace.army.mil), New York District, website: [www.nan.usace.army.mil](http://www.nan.usace.army.mil), or contact the Corps Readiness Unit at: (212) 264-0162

## **The Center for Stormwater Technology Evaluation and Verification**

Need Help Weathering the Storm? A new center is supporting stormwater managers in the Northeast and beyond. The Center for Stormwater Technology Evaluation and Verification (CSTEV) conducts scientific field testing of stormwater treatment technologies and offers workshops for those who develop and implement stormwater management plans. CSTEV is funded by the Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET), a partnership between NOAA and the University of New Hampshire.

Located in Durham, N.H., the field facility is equipped with conventional stormwater treatments such as swales and ponds, as well as low impact development designs and manufactured devices. These devices include a sand filter, a bioretention system, a gravel wetland, a detention pond, a swale, infiltration and filtration devices, and manhole retrofits. Two field projects (a porous pavement parking lot and a street vacuuming study) seek to treat and minimize stormwater at the source.

For workshop information, contact Co-director Robert Roseen at [robert.roseen@unh.edu](mailto:robert.roseen@unh.edu) or visit CSTEV's Web site at: <http://www.unh.edu/erg/cstev>

## **New York Sea Grant**

New York Sea Grant (NYSG) is one of the 30 university-based Sea Grant programs. NYSG is a joint program of the State University of New York and Cornell University. NYSG's research, outreach, and

education programs incorporate the talent of university scientists and extension specialists to promote better understanding, conservation, and use of New York's coastal resources. Issues addressed by NYSG include the impact of barrier island breaches on Long Island's estuaries, sea level rise response, and coastal flooding. NYSG funding is provided by the State University of New York and Cornell University educational systems and by the parent agency of the U. S. Department of Commerce, the National Oceanic Atmospheric Administration.

For contact information (staff directories) and to learn more visit NYSG's website:  
<http://www.nyseagrant.org>

## **New York State Department of State - Coastal Resources Division**

The Department of State's Division of Coastal Resources works with communities throughout New York State to help them make the most of what their waterfronts have to offer. Whether you are a municipal official, community group, non-profit organization, business, or someone who has an interest in the waterfront, the Division of Coastal Resources can help. The Division offers technical assistance, planning and project grants and information resources to help improve waterfronts. The Division assists local governments in preparation of Local Waterfront Revitalization Programs (LWRPs) that provide comprehensive planning for coastal areas, including management of coastal hazards. Grants may be obtained through the New York State Environmental Protection Fund, Local Waterfront Revitalization Grant Program for preparation of LWRPs and for implementation of projects identified in the LWRP.

The Division's Coastal Hazards Unit works with communities and other government agencies to find solutions to coastal storm, flood and erosion hazards, and to help protect the beaches and natural resources of our coasts. The Coastal Hazards Unit provided guidance on preparation of this report. To discuss coastal hazards in your community, Coastal Resources Division programs, or information contained in the report, contact Mr. Barry Pendergrass directly at 518-486-3277.

To find out more about the Coastal Resources Division enter the "Coastal Resources Website" at: [www.nyswaterfronts.com](http://www.nyswaterfronts.com)

## **The New York State Emergency Management Office**

The New York State Emergency Management Office (SEMO) is responsible for coordinating all activities necessary to protect New York's communities from natural; technological and man-made disasters; and other emergencies that threaten the State. SEMO coordinates Emergency Management Services for the State by providing leadership, planning, education and resources to protect lives, property and the environment.

In times of emergency or disaster, SEMO coordinates the response of State agencies ensuring the most appropriate resources are dispatched to the impacted area. Through its major programs, SEMO works with local governments, volunteer organizations and the private sector across New York State to develop disaster preparedness plans and mitigation projects, and provide training and exercise activities.

SEMO initiates and promotes mitigation planning and project implementation to protect lives and reduce the impact of disasters on developed land including roads, bridges, and buildings in New York State. SEMO provides project management and technical assistance for planning, project identification, application development, environmental review, and benefit cost analysis. Major mitigation programs include Hazard Mitigation Grant Program, Flood Mitigation Assistance Program, and Pre-Disaster Mitigation Program. You can learn more at SEMO's website: [www.nysemo.state.ny.us](http://www.nysemo.state.ny.us)

## **New York State Department of Environmental Conservation (NYS-DEC), Bureau of Program Resources and Flood Protection**

The Bureau of Program Resources and Flood Protection ensures the health, safety and welfare of New York's citizens by joining forces with federal, state, regional and local funding partners to restore New York's watersheds to healthy conditions and to reduce flood risks through both structural and non-

structural means.

Within the NYS-DEC Bureau of Program Resources and Flood Protection are programs for Flood Control Projects and for Flood plain Management. In the Flood plain Management section National Flood Insurance Program Activities include:

- Detailed community assistance meetings
- Technical assistance contacts
- National Flood Insurance Program (NFIP) workshops
- Local law reviews and assistance
- Coordinate FEMA map revisions
- Draft state flood mitigation plan
- Assistance with local and Regional flood mitigation plans
- Post flood assistance

You can learn more about these programs at the NYS-DEC website:

[www.dec.state.ny.us/website/dow/bprfp/index.html](http://www.dec.state.ny.us/website/dow/bprfp/index.html)

## **SOURCES OF DISASTER RESPONSE EDUCATION:**

### **Adelphi University: Emergency Management**

Phone: 516-877-4110

E-mail: [vetter@adelphi.edu](mailto:vetter@adelphi.edu)

Website: <http://academics.adelphi.edu/artsci/emgmt/>

### **FEMA: Community Hazards Emergency Response Capability Assurance Process**

Website: <http://www.fema.gov/preparedness/ahrca.shtm>

### **FEMA: Emergency Education Network (EENET)**

National Emergency Training Center, 16825 South Avenue, Emmitsburg, MD 21727

Phone: 800-500-5164 or 301-447-1068

Website: <http://www.usfa.fema.gov/fire-service/nfa/resources/nfa-train4.shtm>

### **FEMA: Emergency Management Institute**

16825 South Seton Avenue, Emmitsburg, MD 21727

Phone: 301-447-1000

Website: <http://training.fema.gov/EMIWeb/>

### **FEMA: National Emergency Training Center (Virtual Campus)**

Website: <http://www.training.fema.gov/wrningBanner.html>

### **FEMA: Noble Training Center**

P.O. Box 5237, Ft. McClellan, AL 36205

Phone: 256-741-3600

Website: <http://training.fema.gov/emiweb/ntc/>

### **International Critical Incident Stress Foundation, Inc.**

E-mail: [ahowell@icisf.org](mailto:ahowell@icisf.org)

Website: <http://www.icisf.org/>

### **Nassau County Community Emergency Response Team Training**

Website: <http://www.co.nassau.ny.us/oem/certraining.html>

### **Nassau County Red Cross**

195 Willis Avenue, Mineola, NY 11501

Phone: 516-747-3500

E-mail: [nassau@usa.redcross.org](mailto:nassau@usa.redcross.org)

Website: <http://www.nassauredcross.org/training/index.html>

### **National Organization for Victim Assistance (NOVA) Training**

170 Park Road NW, Washington, DC 20010

Phone: 202-232-6682

Website: [http://www.trynova.org/ab/basic\\_NOVA\\_training.html](http://www.trynova.org/ab/basic_NOVA_training.html)

**National Weather Service: StormReady**

Phone: 631-924-0037

E-mail: [Gary.Conte@noaa.gov](mailto:Gary.Conte@noaa.gov)

Website: <http://www.stormready.noaa.gov/>

**New York State Emergency Management Office (SEMO): Emergency and Public Education**

1220 Washington Avenue, Suite 101, Building 22, Albany, NY 12226

Phone: 518-485-5666

E-mail: [postmaster@semo.ny.us](mailto:postmaster@semo.ny.us)

Website: <http://www.nysemo.state.ny.us/TRAINING/TrainingHome.htm>

**New York State Emergency Management Office (SEMO): Training and Exercises**

1220 Washington Avenue, Suite 101, Building 22, Albany, NY 12226

Phone: 518-457-9986

E-mail: [postmaster@semo.ny.us](mailto:postmaster@semo.ny.us)

Website: <http://www.nysemo.state.ny.us/TRAINING/TrainingHome.htm>

**Suffolk County Red Cross**

95 Horseblock Road, P.O. Box 745, Yaphank, NY 11980

Phone: 631-924-6700

Website: <http://suffolkcounty.redcross.org/Classes/disasterClasses.html>

## **VOLUNTEER OPPORTUNITIES IN EMERGENCY RESPONSE:**

### **Americorps**

Phone: 1-800-942-2677

E-mail: [Questions@AmeriCorps.org](mailto:Questions@AmeriCorps.org)

Website: <http://www.americorps.org/>

### **Americorps: National Civilian Community Corps**

Phone: 1-800-731-0002

E-mail: [anccc@cns.gov](mailto:anccc@cns.gov)

Website: <http://www.americorps.org/nccc/index.html>

### **Americorps: VISTA\***

E-mail: [vista@americorps.org](mailto:vista@americorps.org)

Website: <http://www.americorps.org/vista/index.html>

### **Long Beach Auxiliary Police**

P.O. Box 28, Long Beach, NY 11561

Phone: 516-431-6868

E-mail: [recruiting@lbapd.com](mailto:recruiting@lbapd.com)

Website: <http://www.lbapd.com/>

### **Nassau County Department of Health: Medical Reserve Corps**

240 Old Country Road, Mineola, NY 11501

Contact: Elizabeth Scanlon

Phone: 516-571-2672

E-mail: [escanlon@health.co.nassau.ny.us](mailto:escanlon@health.co.nassau.ny.us)

### **Nassau County Auxiliary Police**

1490 Franklin Avenue, Mineola, NY 11501

Community Safety Unit - Auxiliary Police Section

Phone: 516-573-7521

E-mail: [nassau@auxiliary-police.org](mailto:nassau@auxiliary-police.org)

Website: <http://www.police.co.nassau.ny.us/auxpolice.htm>

### **Nassau County CERT**

Office of Emergency Management

E-mail: [NCOEM@mail.co.nassau.ny.us](mailto:NCOEM@mail.co.nassau.ny.us)

Please enter "CERT INQUIRY" in the subject line and include your first name,

last name, address, village, zip code, phone number, e-mail address and a brief comment

Website: <http://www.co.nassau.ny.us/oem/cert.html>

**Nassau County Citizen Corps**

1194 Prospect Avenue, Westbury, NY 11590

Contact: Jennifer Mincin

Title: Deputy Commissioner

Phone: 516-571-9636

E-mail: [jmincin@nassaucountyny.gov](mailto:jmincin@nassaucountyny.gov)

**Nassau County Red Cross**

195 Willis Avenue, Mineola, NY 11501

Phone: 516-747-3500

E-mail: [nassau@usa.redcross.org](mailto:nassau@usa.redcross.org)

Website: <http://www.nassauredcross.org/>

**New York State Citizen Corps**

250 Veteran's Memorial Highway, Hauppauge, NY 11788

Phone: 631-952-3361

E-mail: [nyscitizencorps@semo.state.ny.us](mailto:nyscitizencorps@semo.state.ny.us)

Website: <http://www.nysemo.state.ny.us/nyscitizencorps.htm>

**Rockville Centre Auxiliary Police**

34 Maple Avenue, Rockville Centre, NY 11570

Phone: 516-657-0705

E-mail: [RVCAUXPD@OPTONLINE.NET](mailto:RVCAUXPD@OPTONLINE.NET)

**The Salvation Army of Greater New York**

120 W. 14th Street, New York, NY 10011

Phone: 212-337-7200

Website: <http://www.salvationarmy-newyork.org/>

**Senior Corps**

Phone: 1-800-424-8867

Website: <http://www.seniorcorps.org>

**Senior Corps: RSVP**

Phone: 1-800-424-8867

Website: <http://www.seniorcorps.org/joining/rsvp/index.html>

**Suffolk County Fire and Emergency Medical Services**

Phone: 1-877-932-9268

Website: <http://www.co.suffolk.ny.us/wewantu/>

**Suffolk County Medical Reserve Corps**

P.O. Box 127, Yaphank, NY 11717

Phone: 631-852-4908

E-mail: [thomas.o'hara@co.suffolk.ny.us](mailto:thomas.o'hara@co.suffolk.ny.us)

**Suffolk County Red Cross**

95 Horseblock Road, P.O. Box 745, Yaphank, NY 11980

Phone: 631-924-6700

Website: <http://suffolkcounty.redcross.org/>

**Suffolk County Auxiliary Police**

P.O. Box 127 Yaphank, NY 11980

Phone: 631-924- 4343

Website: <http://www.co.suffolk.ny.us/webtemp3.cfm?dept=12&id=1044>

**Suffolk County Citizen Corps Council/Suffolk County CERT**

P.O. Box 127, Yaphank Avenue, Yaphank, NY 11980

Phone: 1-877-932-9268

E-mail: [thomas.ohara@co.suffolk.ny.us](mailto:thomas.ohara@co.suffolk.ny.us)

Website: <http://www.co.suffolk.ny.us/citizencorps/>

**Suffolk County, Town of Islip: Community Emergency Response Team**

Sponsoring Agency: East Brentwood Fire Department

Phone: 631-273-4560

E-mail: [fdchief31@aol.com](mailto:fdchief31@aol.com)

## **Appendix A: Literature Reviewed**

Long Island Regional Planning Board (1984) Hurricane Damage Mitigation Plan for the South Shore of Nassau and Suffolk Counties, Hauppauge, NY. 196 pages.

Long Island Regional Planning Board (1989) Proposed Long Island South Shore Hazard Management Program, Hauppauge, NY. 72 pages.

New York State Department of State, Division of Coastal Resources (1994) Governor's Coastal Erosion Task Force, Final Report, Volumes 1 and 2, Albany, NY. 206 pages + appendices.

New York State Department of State, Division of Coastal Resources (2000) Coastal Flooding And Erosion in the South Shore Estuary Reserve, Albany, NY. 51 pages.

New York State Department of State, Division of Coastal Resources (2001) New York State Long Island South Shore Estuary Reserve Comprehensive Management Plan, Albany, NY.

New York State Department of State, Division of Coastal Resources and Waterfront Revitalization (1993) Design of an Erosion Monitoring Program For The Marine Shoreline of New York, Final Report, Albany, NY.

New York State Emergency Management Office, Hazard Mitigation Branch (1993) Status of Approved HMGP Projects by Type and Disasters, Albany, NY.

US Army Corps of Engineers, New York State Department of Environmental Conservation and New York State Department of State (2001) Atlantic Coast of New York Monitoring Program Project Management Plan for Continuation of Study.

US Department of Commerce (1986) State of New York Coastal Management Program and Final Environmental Impact Statement, State Coastal Policies, National Oceanic and Atmospheric Administration, Office of Coastal Zone Management and New York State Department of State.

US Department of Commerce (2001) State of New York Coastal Management Program and Final Environmental Impact Statement, National Oceanic and Atmospheric Administration, Office of Coastal Zone Management and New York State Department of State.

## Appendix B: Original Survey

### South Shore Estuary Reserve Flood and Erosion Hazards Survey

The South Shore Estuary Reserve (SSER) Office is conducting research on bay flooding and erosion as called for in the South Shore Estuary Reserve Comprehensive Management Plan. Please assist us by completing this survey from the perspective of your community. All questions apply to flood and erosion conditions within the boundary of the SSER. Please use extra sheets to provide explanations if necessary.

If you have any questions regarding this survey please call Karen Eichelberger at (516) 378-2679.

Please provide the following contact information:

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Department: \_\_\_\_\_

Local Government: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

E-mail Address: \_\_\_\_\_

#### **Section I.**(To be completed for all communities within the South Shore Estuary Reserve)

1. List any community education/awareness programs that are presently being used to inform and involve the public about flooding and erosion issues.

2. Does your community need:

a) additional disaster preparedness education?

yes       no

b)recruitment of resident volunteers for local emergency response agencies?

yes       no

3. Has your community mapped:

a) shore protection structures?

yes       no

b) drainage systems affecting the estuary?

yes       no

c) flood and erosion areas?

yes       no

4. For any mapped items in question #3, are digital copies of the information available?

yes       no

5. Does your community's disaster planning include provisions for business interruptions, natural resource losses, vulnerable populations (ie. elderly, economically disadvantaged, non-English speaking) or other uncompensated costs?

yes       no

6. On the attached map provided, outline the location(s) and extent of flood and erosion problems in your community.

7. Are any of the flood or erosion problems severe enough to threaten lives or property, require emergency response, or need mitigation planning and projects?

yes       no

If you answered yes to question 7 then proceed to Section II. Otherwise, the survey is complete.

**Section II.**

1. Does your community participate in:  
a)the National Flood Insurance Program (NFIP)?

yes       no

b)the Community Rating System (CRS)?

yes       no

2. Have claims been filed for compensation from NFIP?

yes       no

3. If you answered "yes" to question 2, have there been repetitive claims at specific sites in your community?

yes       no

4. Which sites identified in Section I. are included in a Flood Mitigation Plan or an All Hazard Mitigation Plan that includes flood and erosion hazard mitigation?

5. Is your community planning to prepare a Local Waterfront Revitalization Program component that includes mitigation of flood and erosion hazards for the sites identified in Section I?

yes       no

6. Does your community have a flood early warning system?

yes       no

7. Does your community have a program for monitoring erosion problem?

yes       no

8. Does your community have a flood/erosion emergency evacuation plan?

yes       no

9. Does your community have a post-storm or post-disaster redevelopment plan that includes mitigation of flood and erosion hazards?

yes       no

10. Describe other actions your community has undertaken to mitigate flood and erosion damages.

11. Does your community have flood and/or erosion problems that are not adequately addressed by the activities described in Section II. above, but serious enough to need a plan for hazard mitigation?

yes       no

If you answered yes to question 11 then proceed to Section III. Otherwise, the survey is complete.

### **Section III.**

1. What is the average frequency of problem occurrence at each location, (ie. chronic, # of events per year, or only during extreme events)?
  
2. Describe the problem for each separate location in terms of the approximate number of public facilities, businesses, homes or resources affected.
  
3. At each location, what mitigation measures have been applied previously that did not adequately address the problem?
  
4. Estimate the depth of flooding or rate of erosion at known reference points, if possible.
  
5. Identify apparent cause(s) of the flood or erosion problem.

Thank you for your assistance.

## **Appendix C: Additional Survey Questions**

### **Bay Flooding and Erosion Survey: Additional Questions** **(To be completed by all communities in the South Shore Estuary Reserve)**

**Question 1a:** Can you describe the type of flood or erosion events your community experiences? For instance, in each location, how severe is the flooding, if there is any .

**Question 1b:**What types of damages have been experienced in your community? For example, has there been street flooding, a disruption in utility service, or damage to property?

**Question 1c:** What is an approximate number and type of properties effected by flooding or erosion? Where type means homes, businesses, schools, etc.

**Question 2:**Do you have some idea of the cause of these events? For instance, storm water runoff or storm surges?

**Question 3:**What is an approximate frequency of flooding or erosion?

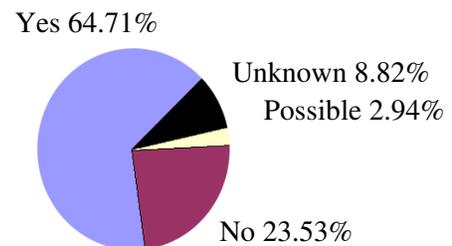
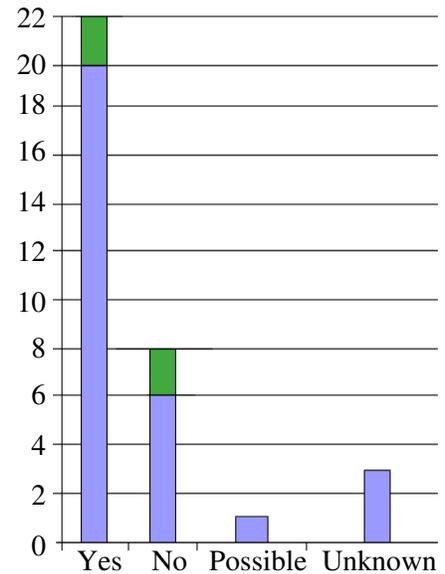
**Question 4:**When was the last time your community experienced severe damages?

## Appendix D: Severe Bay Flooding or Erosion

**Are flood or erosion impacts severe enough to threaten lives or property?**

State or Federal Recreation Area	Severe Flooding or Erosion
Captree and Robert Moses State Parks	Yes
Fire Island National Sea Shore	Yes
Heckscher State Park	No
Jones Beach State Park	No

Community	Severe Flooding or Erosion
Amityville	Yes
Atlantic Beach	No
Babylon (town)	Yes
Babylon (village)	Yes
Brightwaters	No
Brookhaven	Yes
East Rockaway	Yes
Freeport	Yes
Hempstead	Yes
Hewlett Bay Park	Unknown
Hewlett Harbor	Yes
Hewlett Neck	Unknown
Island Park	Yes
Islip	Possible
Lawrence	No
Lindenhurst	Yes
Long Beach	Yes
Massapequa Park	No
Nassau	Yes
Ocean Beach	Yes
Oyster Bay	Yes
Patchogue	Yes
Quogue	Yes
Rockville Centre	Yes
Saltaire	Yes
Southampton (town)	Yes
Southampton (village) *	No
Suffolk	Yes
West Hampton Beach	No
Woodsburgh	Unknown

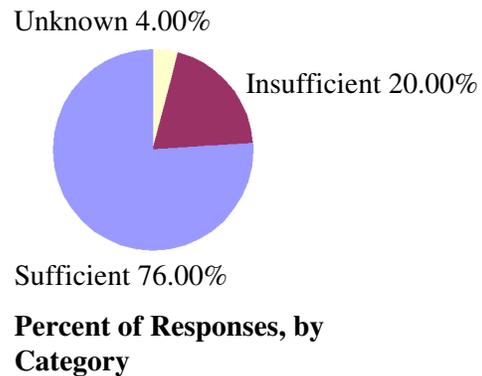
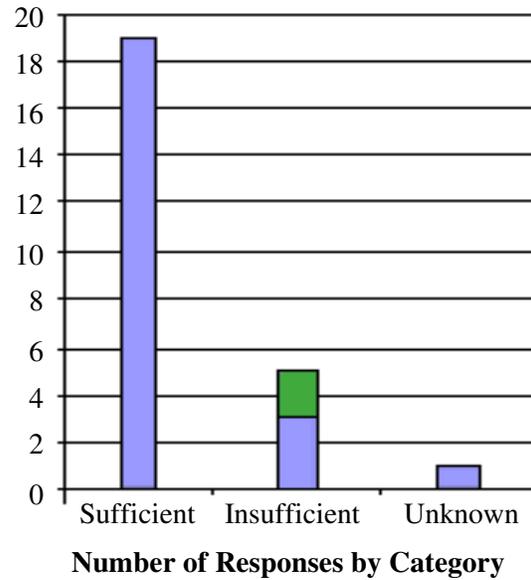


In the above graphs, the vertical axis represents the number of responses. Green indicates responses from State and federal parks. D-1

## Appendix E: Plan Adequacy

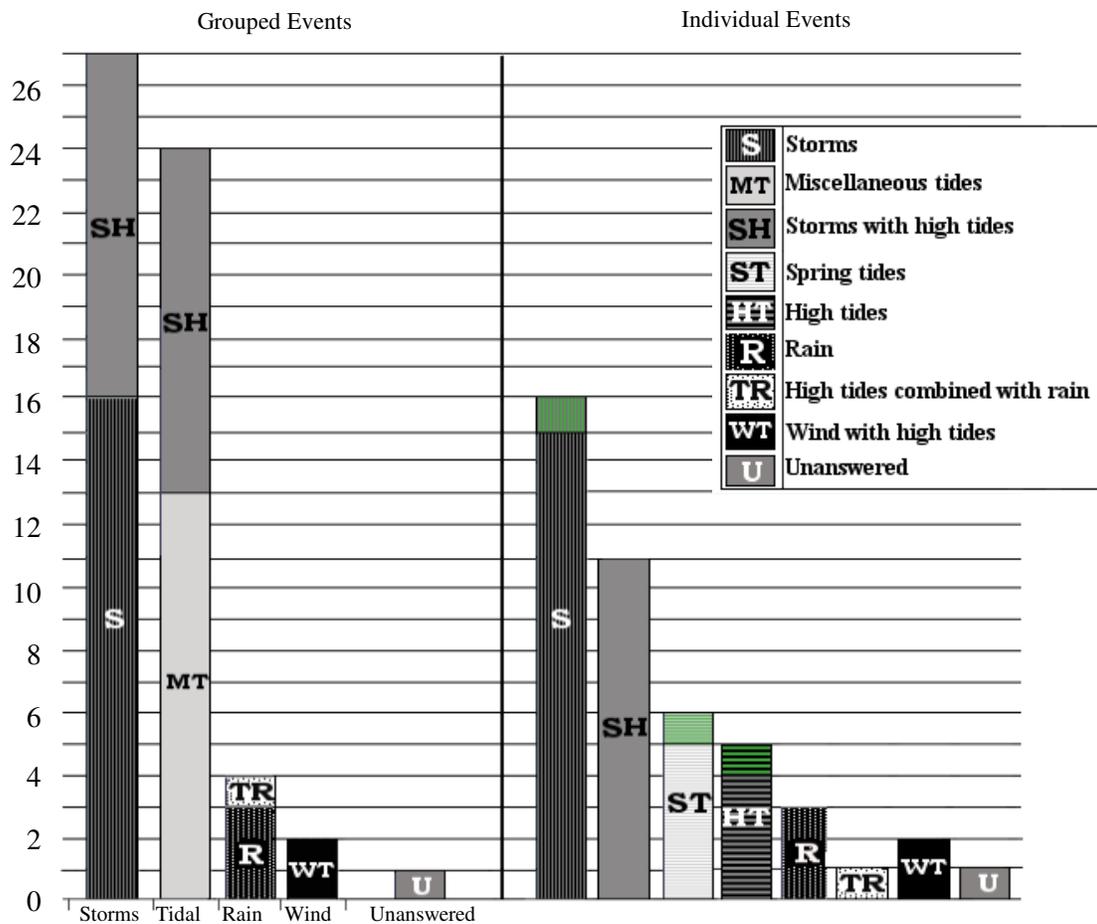
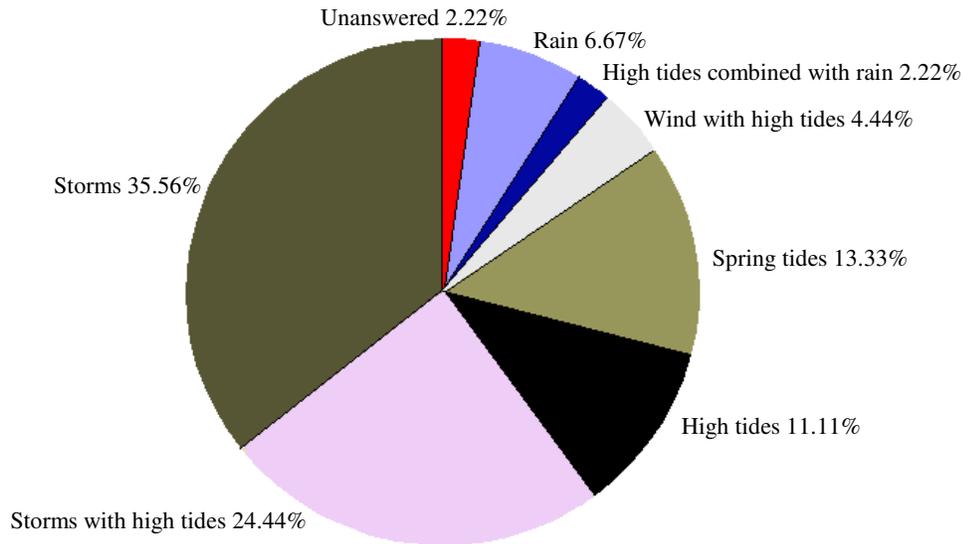
### Is Your Existing Planning Sufficient to Address Coastal Hazards?

Community or Park	Plan Adequacy
Captree and Robert Moses State Parks	Insufficient
Fire Island National Seashore	Insufficient
Amityville	Sufficient
Atlantic Beach	Sufficient
Babylon (town)	Sufficient
Babylon (village)	Sufficient
Brookhaven	Sufficient
East Rockaway	Sufficient
Freeport	Sufficient
Hempstead	Sufficient
Hewlett Harbor	Sufficient
Island Park	Sufficient
Islip	Unknown
Lindenhurst	Sufficient
Long Beach	Sufficient
Nassau	Insufficient
Ocean Beach	Sufficient
Oyster Bay	Sufficient
Patchogue	Insufficient
Quogue	Sufficient
Rockville Centre	Sufficient
Saltaire	Sufficient
Southampton (town)	Sufficient
Suffolk	Insufficient
West Hampton Beach	Sufficient



In the above bar graph, the vertical axis represents the number of responses. Green indicates responses from State and federal parks.

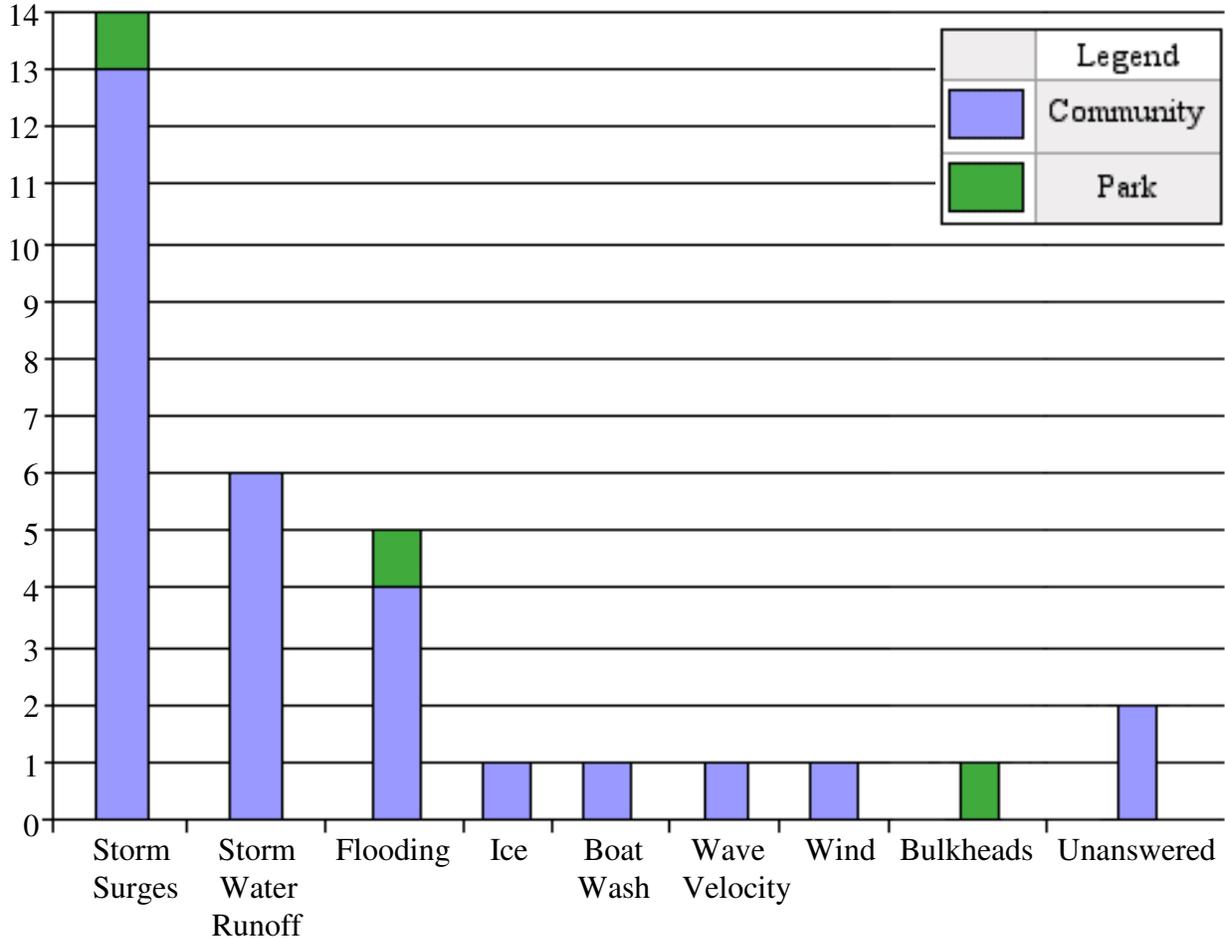
## Appendix F: Coastal Hazard Events



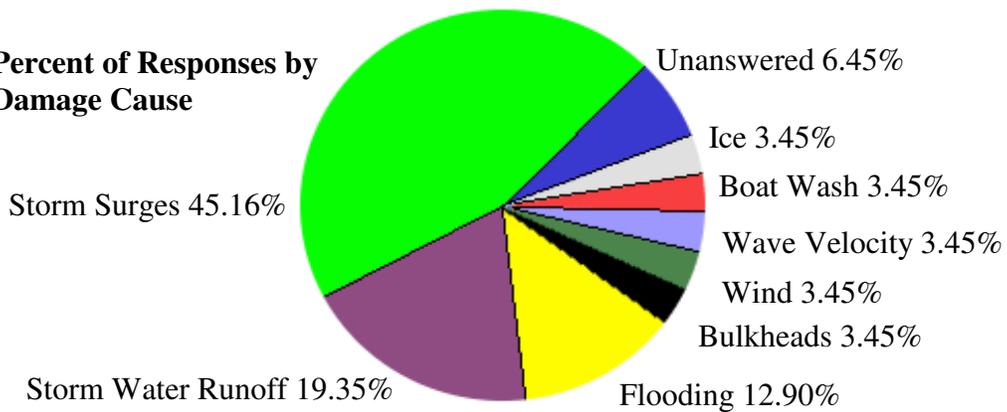
In the bar graph above the vertical axis represents the number of responses. Green indicates responses from State and federal parks.

## Appendix G: Causes of Damage

**Number of Responses by Damage Cause**

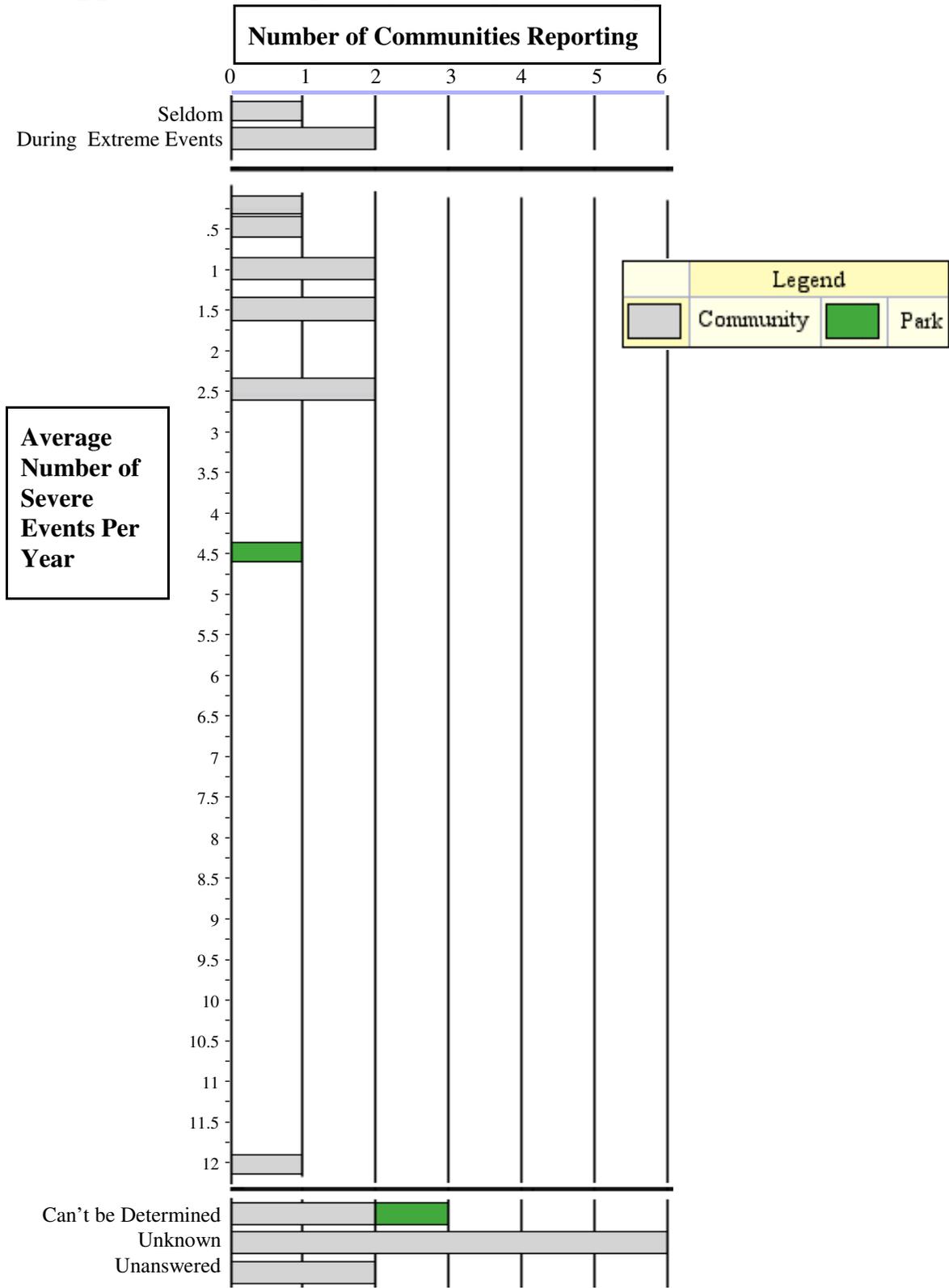


**Percent of Responses by Damage Cause**



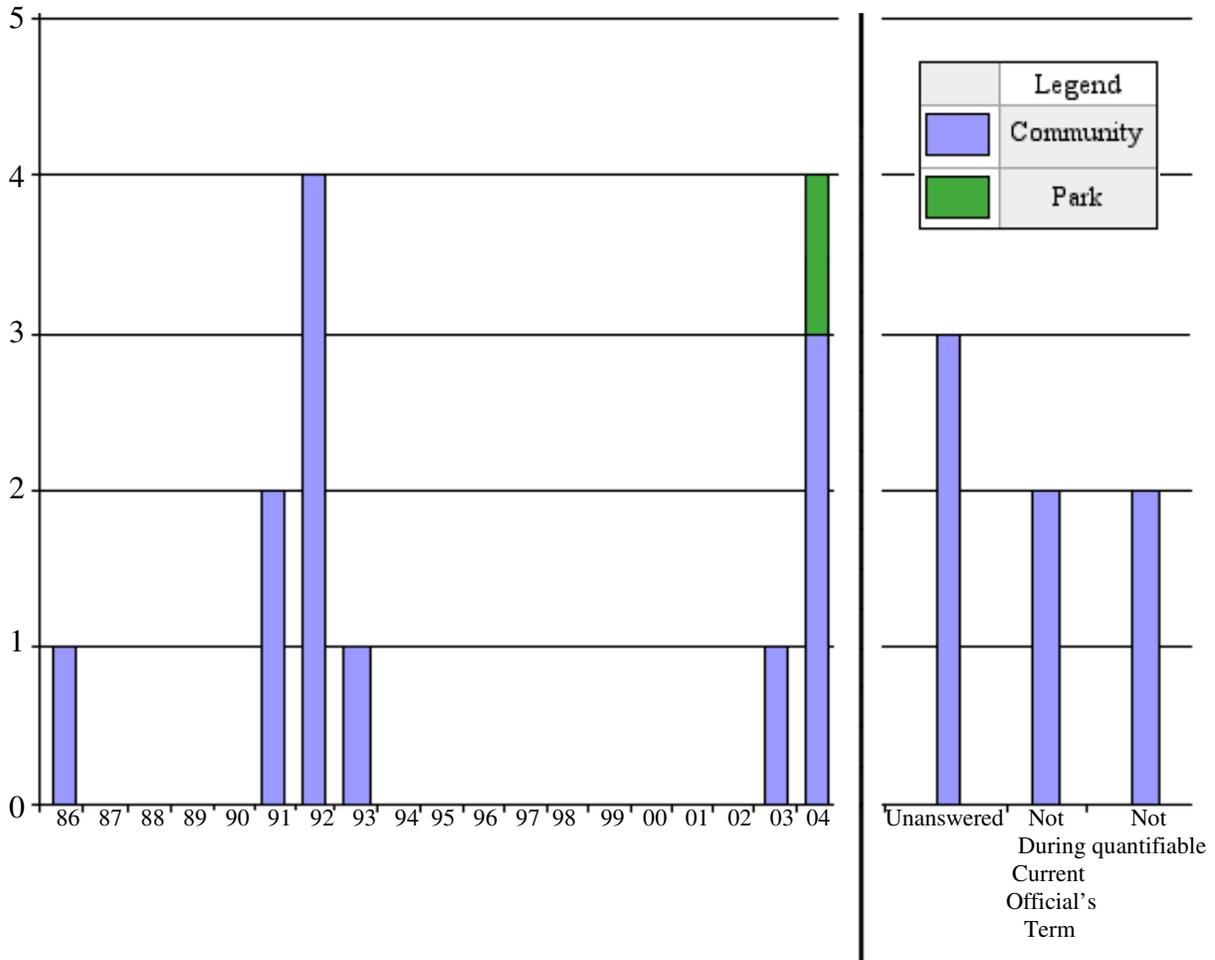
In the bar graph above the vertical axis represents the number of responses. Green indicates responses from State and federal parks.

## Appendix H: Frequency of Bay Flooding or Erosion Events



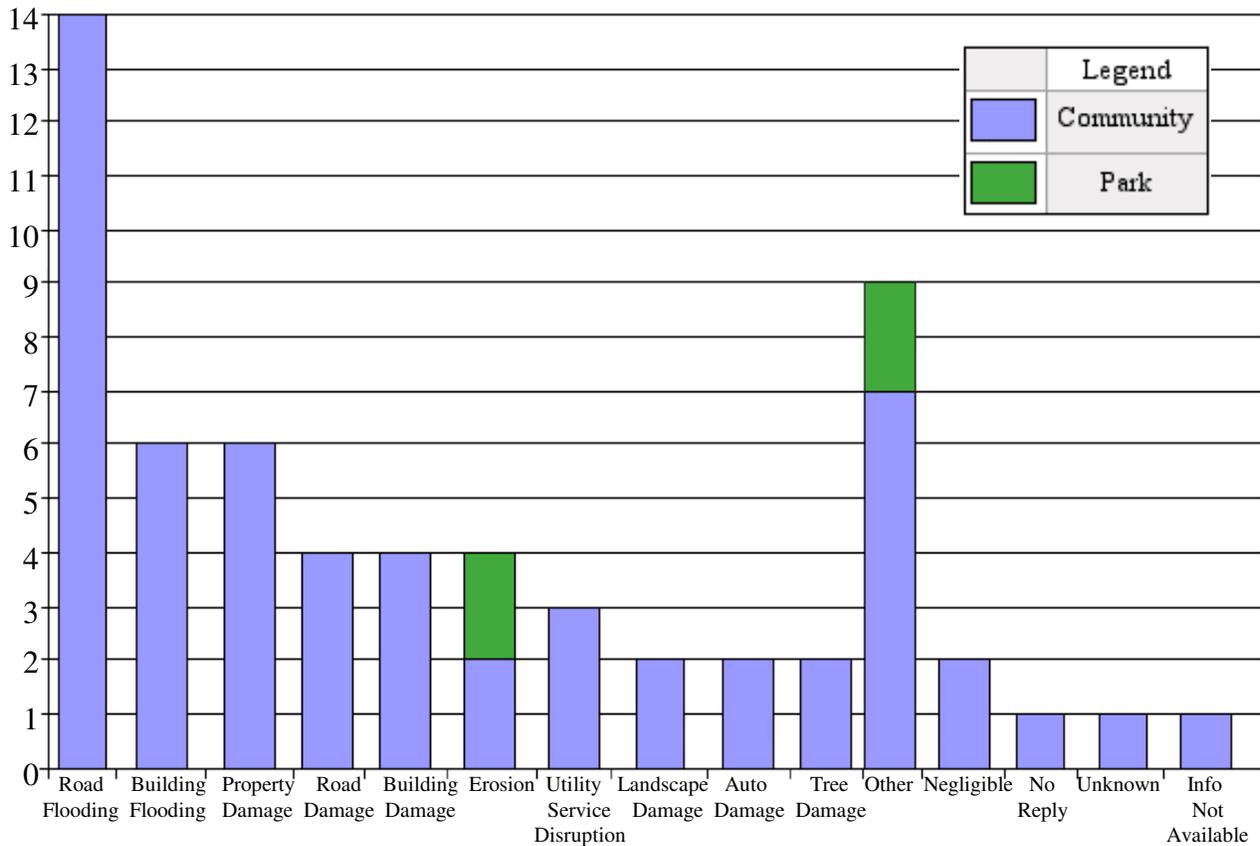
# Appendix I: Most Recent Severe Damage Experience

By number of respondents reporting damages

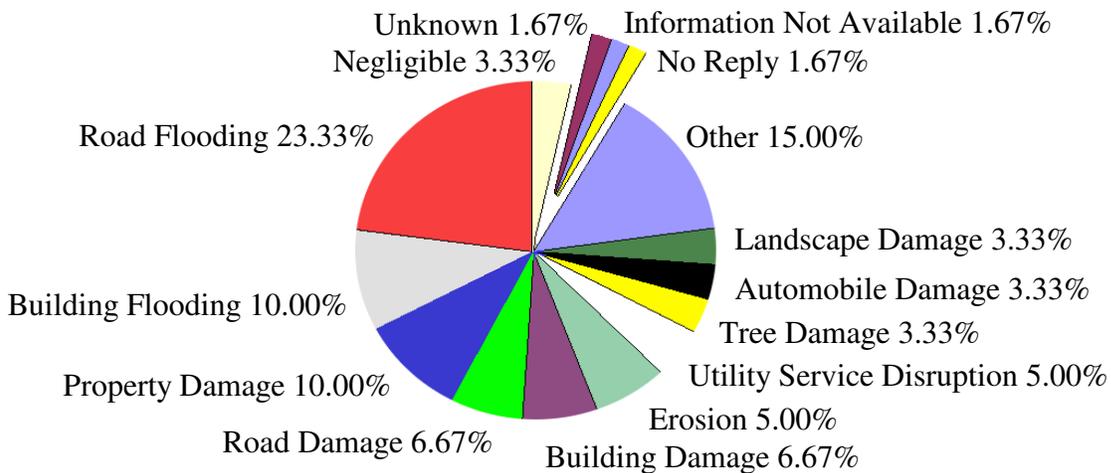


Note: Three responses from individual communities are not shown in the graph:  
 One community stated their most recent severe event occurred in 1991 or 1992  
 One community stated their most recent severe event occurred in 1993 or 1994  
 One community stated their most recent severe event occurred in the early 1990's

## Appendix J: Types of Damage



In the bar graph above the vertical axis represents the number of responses. Green indicates responses from State and federal parks.



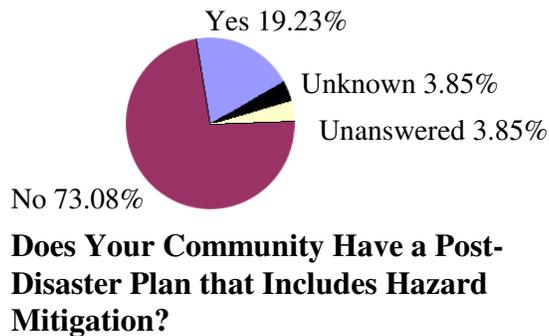
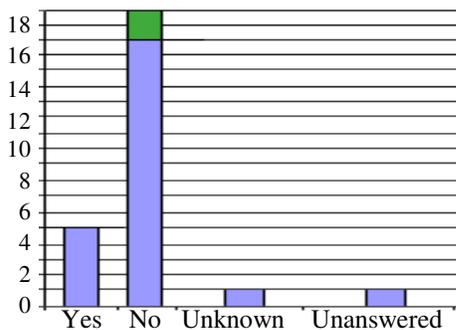
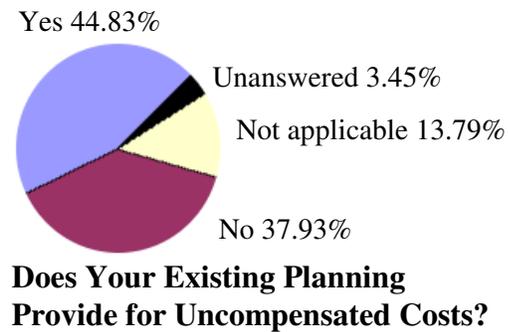
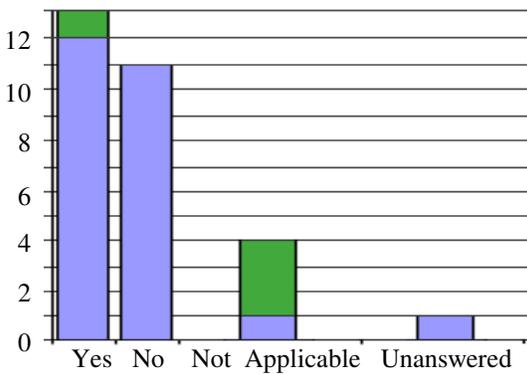
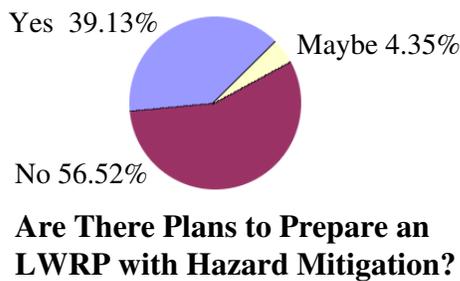
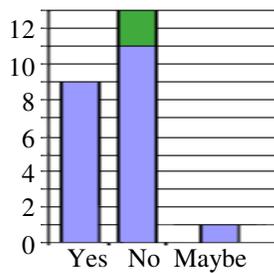
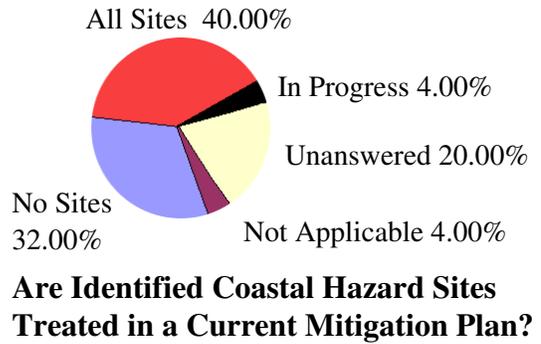
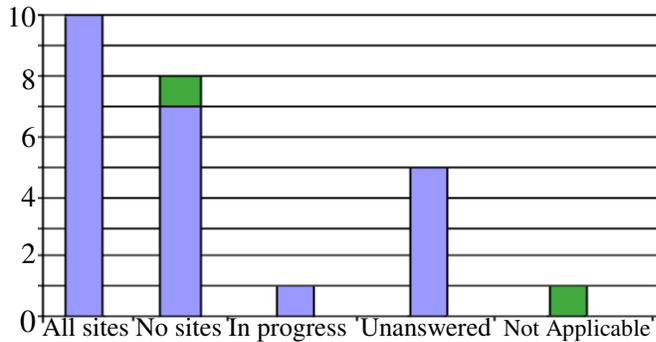
Single Responses Not Shown: Ferry station erosion, flooded boardwalks, landscape flooding, no facility access (Parks), power line damage, sewage plant damage, sewer system damage, storm drain damage, structure loss (Parks).

## Appendix K: Bay Flooding and Erosion Mitigation Actions

Mitigation Actions by Number of Communities Reporting Each Type of Action

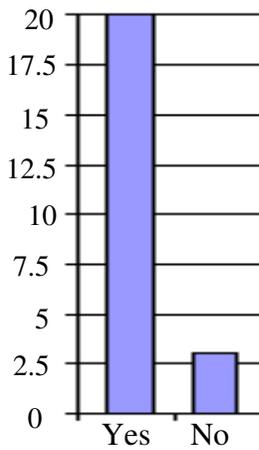
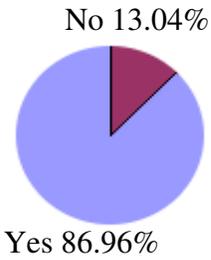
Number of responses	Action
6	Road raising
5	Tidal check valves
4	Home raising Development regulations
3	Utility raising bulkhead projects
2	Drainage installation Debris removal Emergency response plan Leeching basins Open space acquisition Tidal gauges
1	Beach replenishment (Park) Beach use policy (Park) Bulkhead replacement assistance program Bulkhead requirements Catch basins Culverts Disaster assistance commitments Drainage raising Drainage standards model Erosion control fence (Park) Federal Flood Management and Hazard Mitigation Plan French drains Gabion construction GIS mapping Grant applications Placing utilities underground Plastic leechfield chamber systems Research (Park) Sand movement program(Park) Sediment and Erosion Control Law Stormwater Management Plan Sumps Upgrading power plant Website

## Appendix L: Coastal Hazard Planning

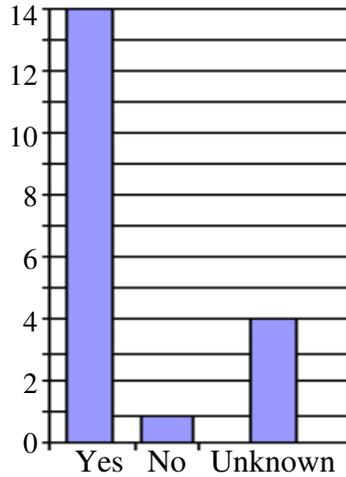
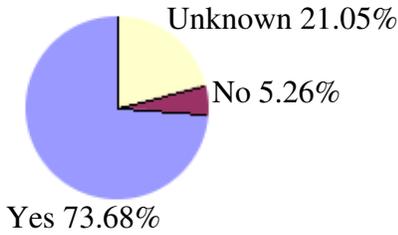


In the above graphs, the vertical axis represents the number of responses. Green indicates responses from State and federal parks

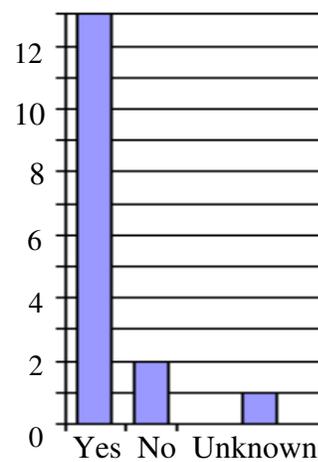
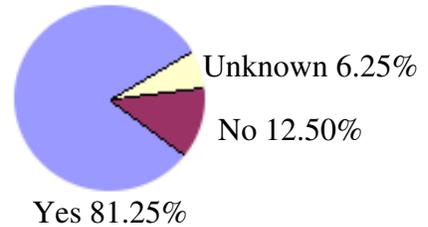
## Appendix M: National Flood Insurance Program



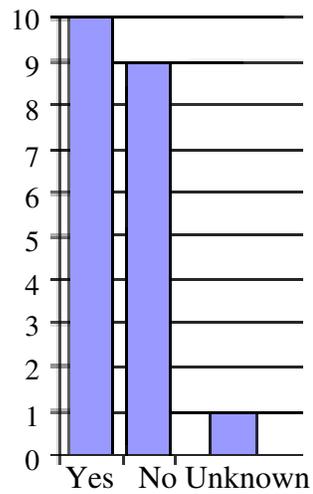
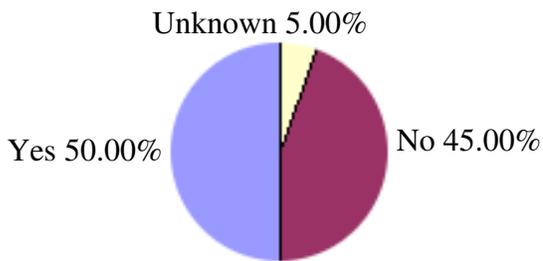
**NFIP Participation**



**NFIP Claims**



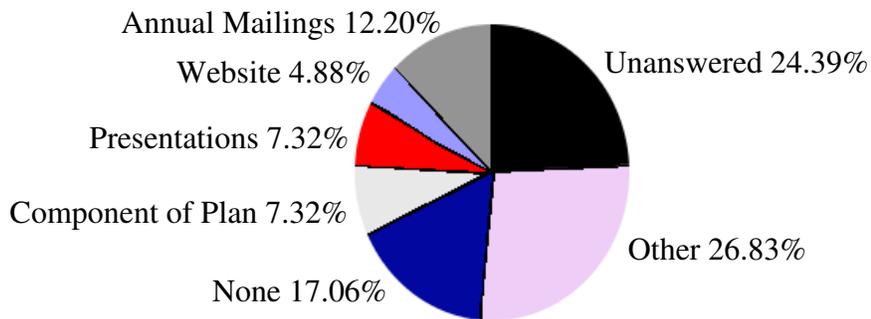
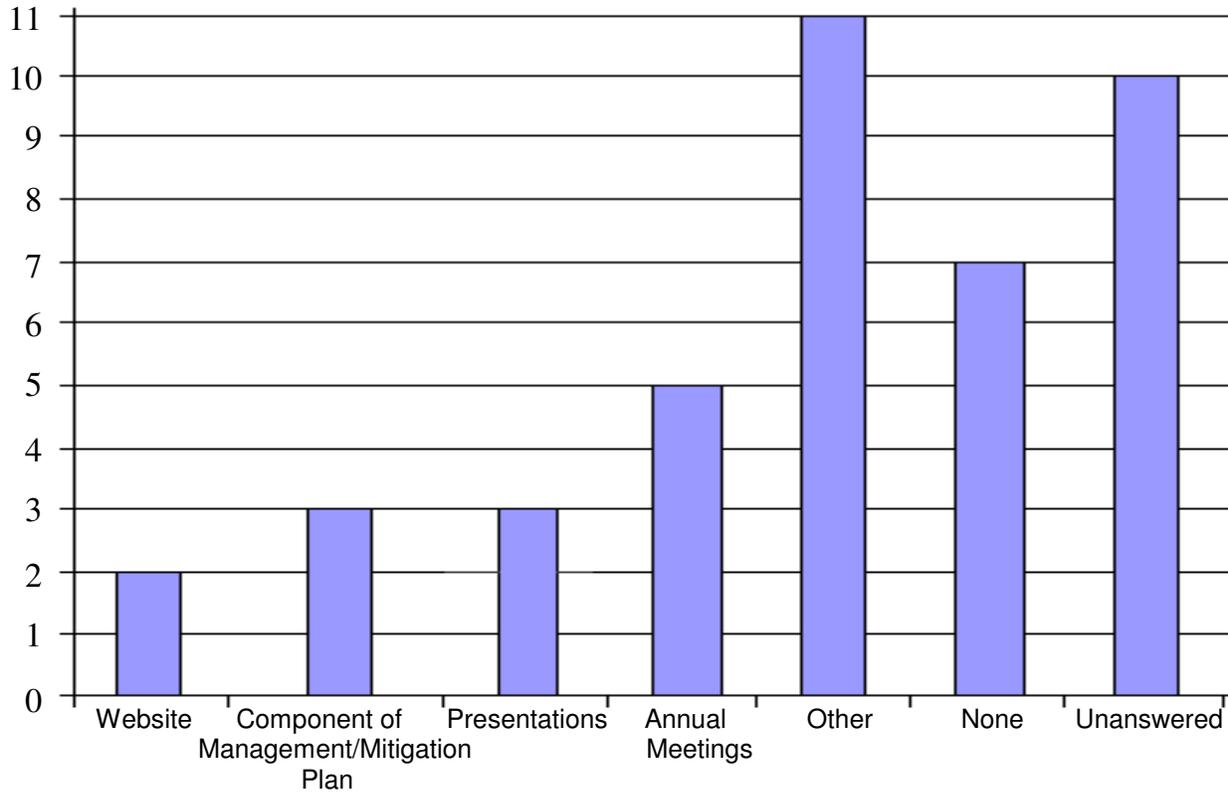
**Repetitive NFIP Claims**



**CRS Participation**

## Appendix N: Education and Outreach

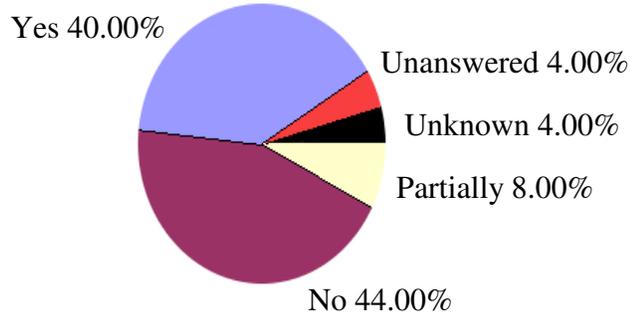
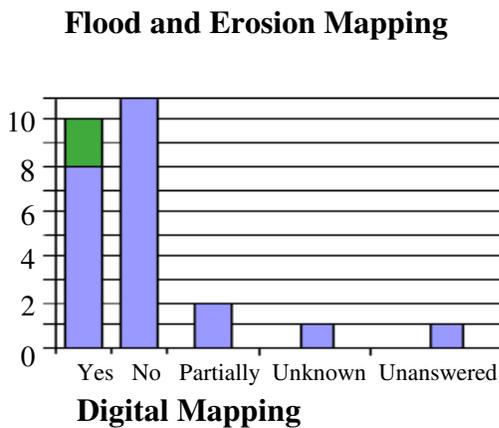
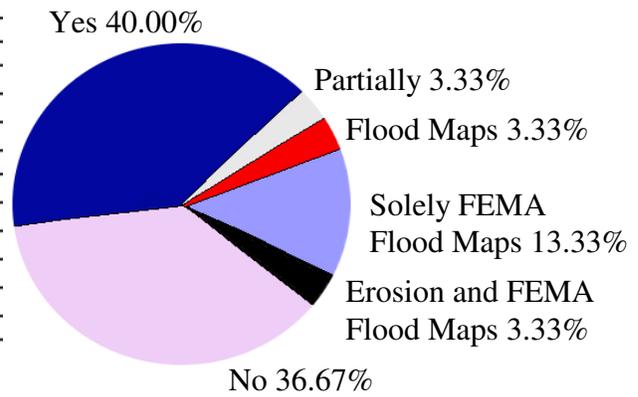
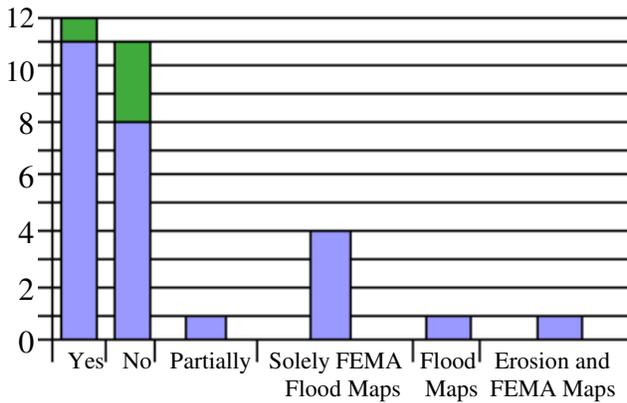
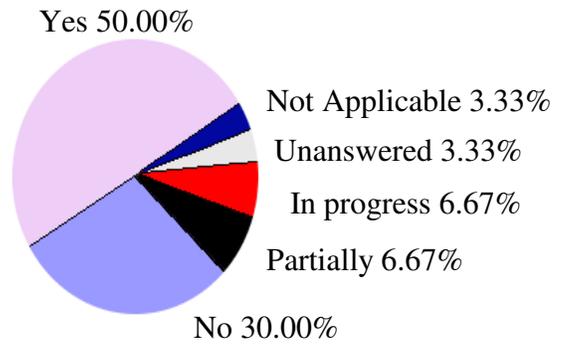
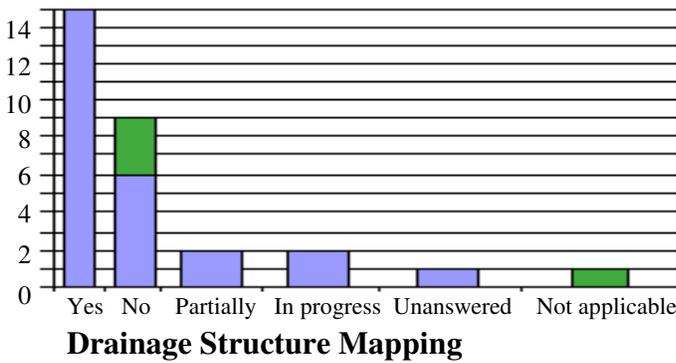
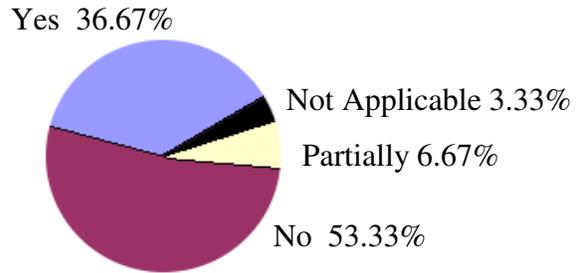
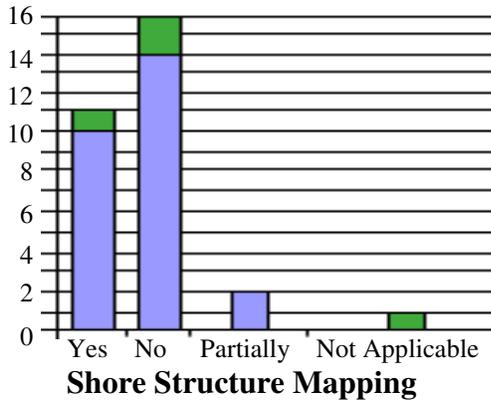
**Types of Coastal Hazard Education and Outreach Available in SSER Communities**



'Other' Includes: An occasional topic in one marine nature study program, education programs, evacuation placards, exhibits, flood zone map usage education, information programs, public awareness events, stenciling, storm tutorial, tide gauge access, weather awareness in school curriculum.

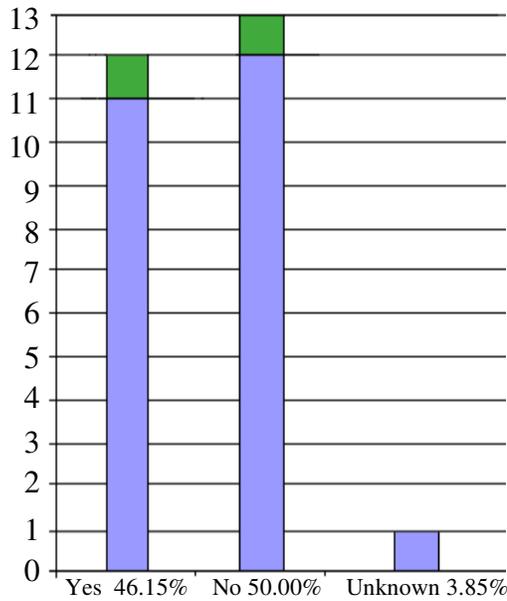
'Management/Mitigation Plan' includes: Flood Mitigation Plan, Hurricane Coastal Storm Plan, or Stormwater Management Plan with a public outreach component.

## Appendix O: Mapping

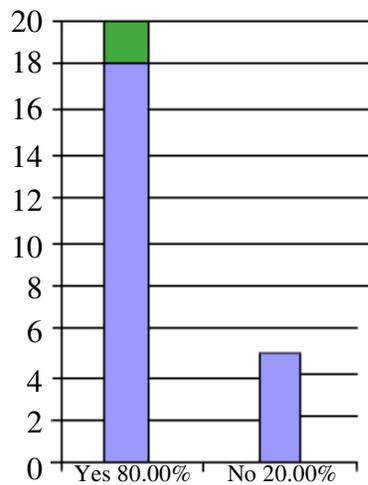


In the bar graphs above the vertical axis represents the number of responses. Green indicates responses from State and federal parks.

## **Appendix P: Flood Early Warning and Evacuation Plans**



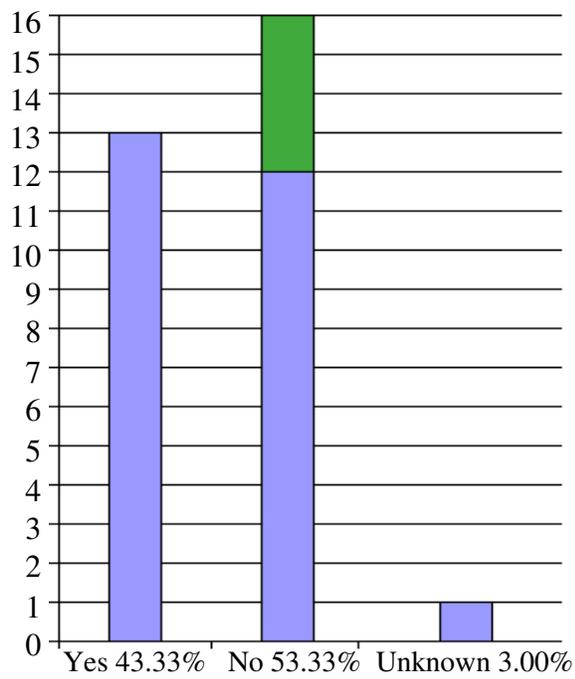
**Flood Early Warning System**



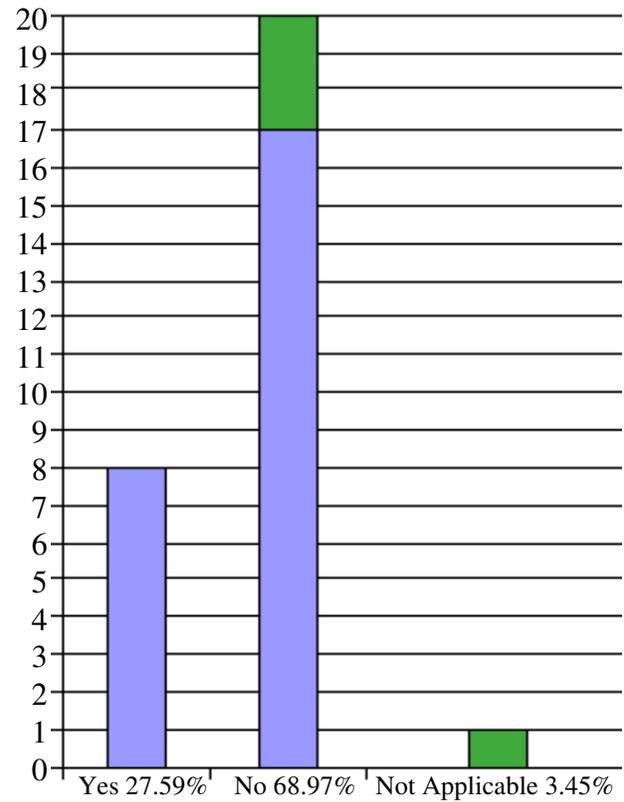
**Flood/Erosion Emergency Evacuation Plan**

In the above graphs, the vertical axis represents the number of responses. Green indicates responses from State and federal parks.

## Appendix Q: Need for Preparedness Education or Volunteers



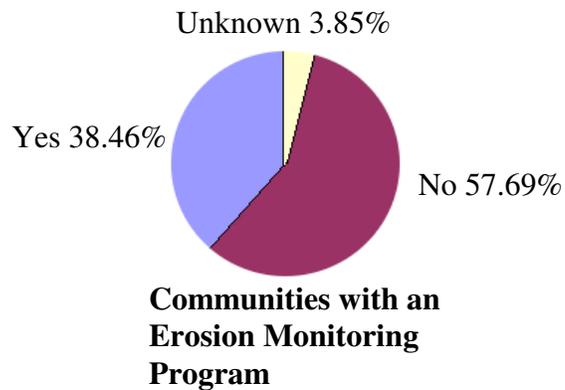
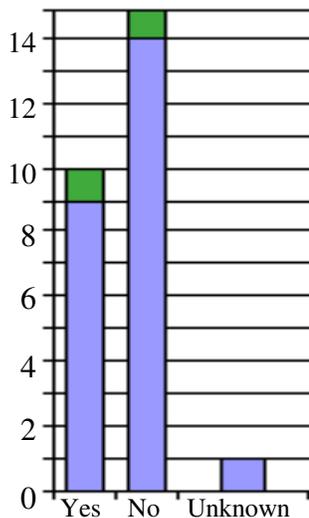
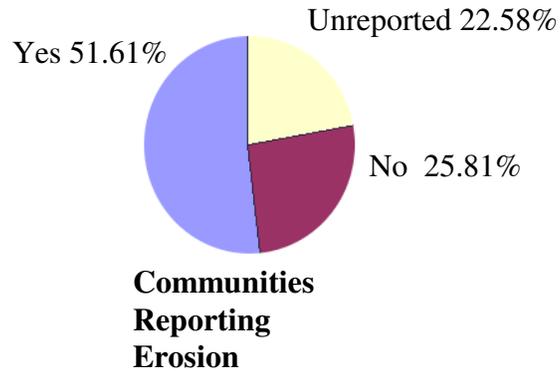
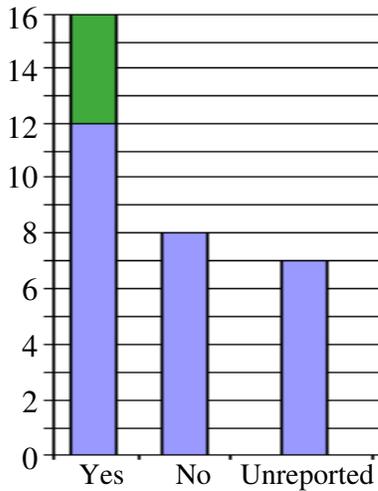
**Need for Additional Disaster Preparedness Education**



**Need for Volunteer Recruitment for Local Emergency Response Agencies**

In the above graphs, the vertical axis represents the number of responses. Green indicates responses from state and federal parks.

## Appendix R: Erosion

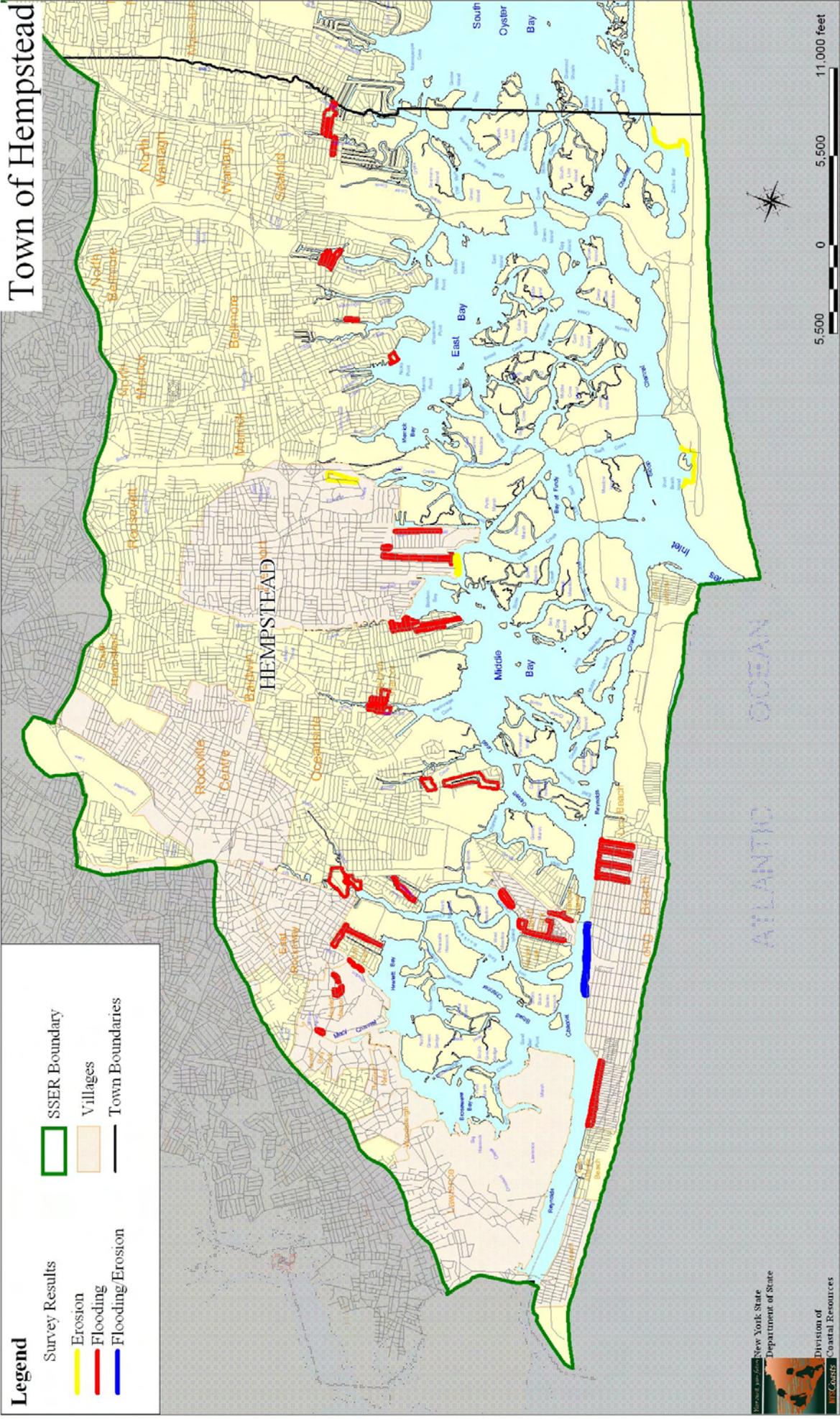


In the above graphs, the vertical axis represents the number of responses. Green indicates responses from State and federal parks.

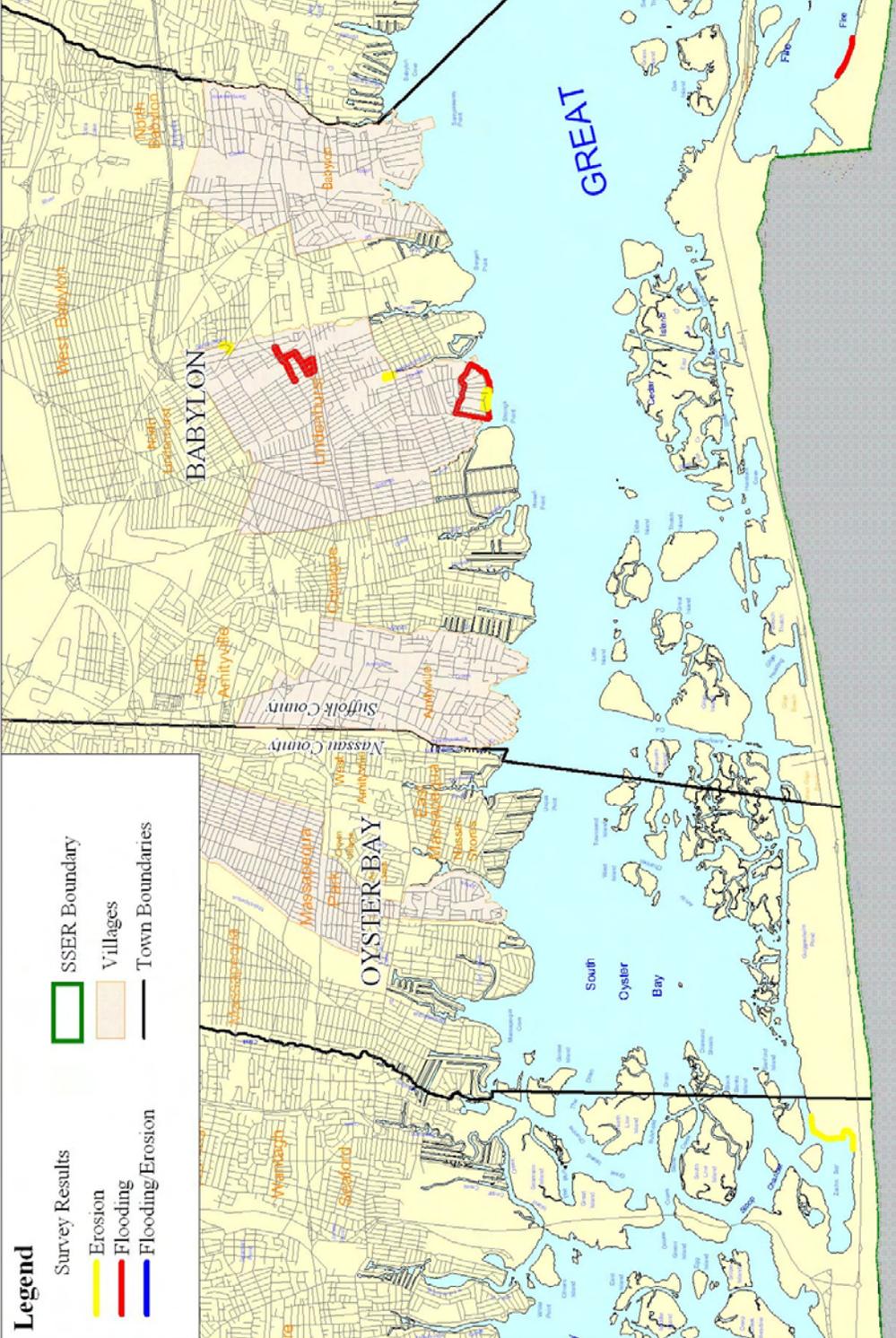
# Town of Hempstead

**Legend**

	SSER Boundary
	Villages
	Town Boundaries
	Erosion
	Flooding
	Flooding/Erosion



# Towns of Oyster Bay and Babylon



**Legend**

Survey Results

- Erosion
- Flooding
- Flooding/Erosion

SSER Boundary

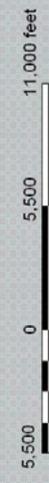
Villages

Town Boundaries



Produced by New York State Department of State, Division of Coastal Resources, GIS Unit - 15 March 2005

G:\GIS\Projects\SSER\Flood\_Report\_2004\LT\_Flood\_Arrows wor



# Town of Islip



**Legend**

Survey Results

- Erosion
- Flooding
- Flooding/Erosion

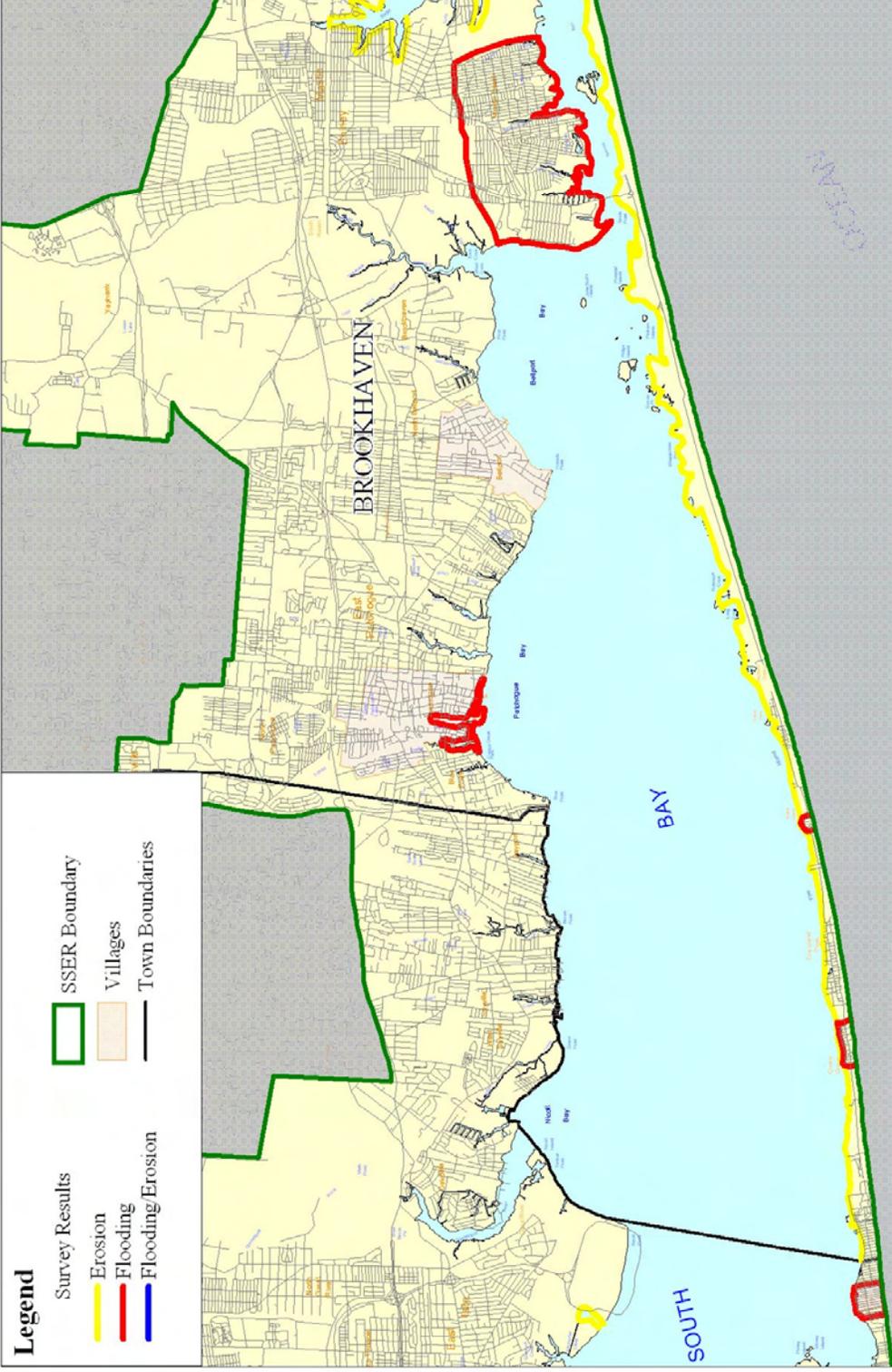
SSER Boundary

Villages

Town Boundaries

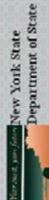


# Town of Brookhaven



**Legend**

 SSER Boundary	 Villages
 Erosion	 Town Boundaries
 Flooding	
 Flooding/Erosion	

New York State  
Department of State

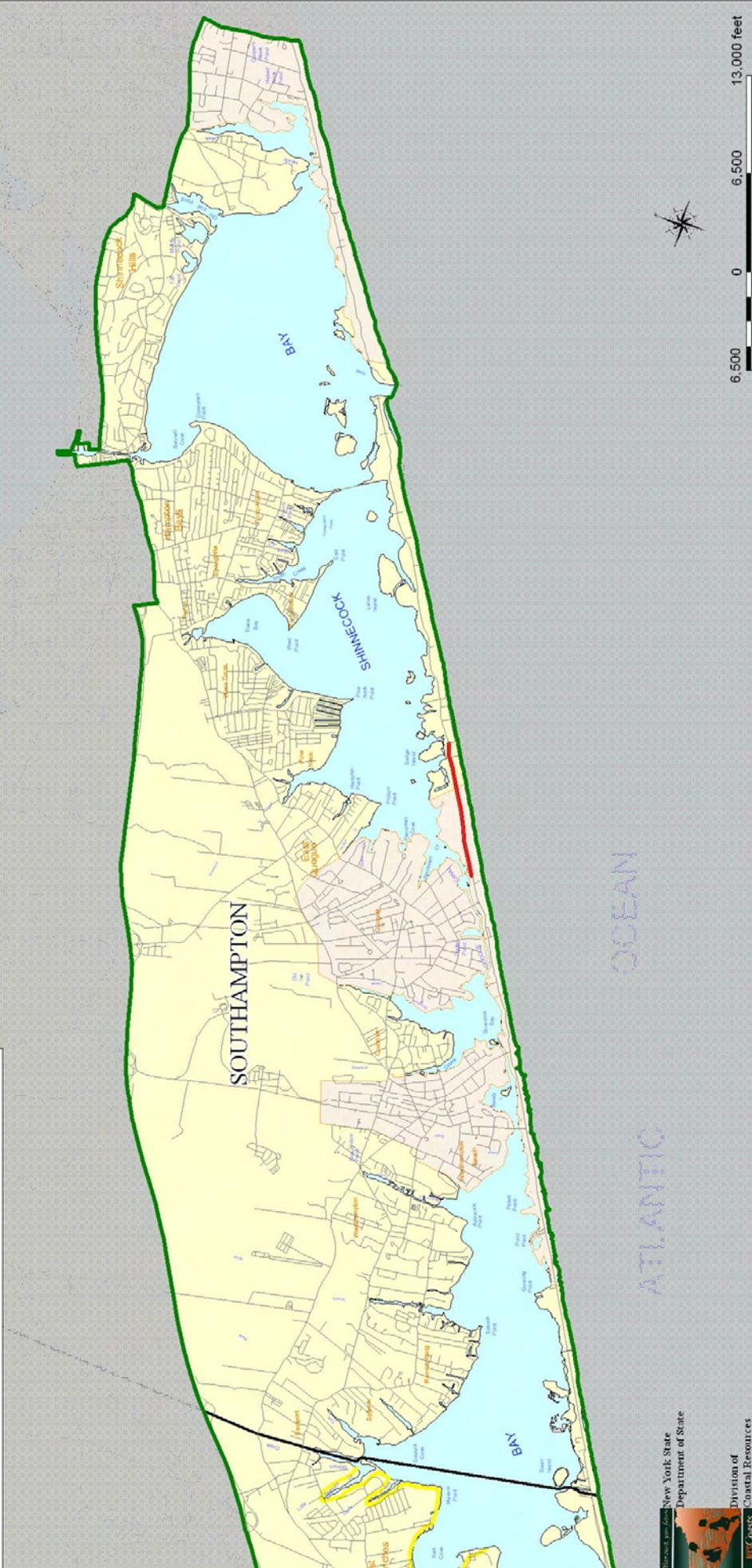


Division of  
Coastal Resources

# Town of Southampton

**Legend**

	SSER Boundary
	Erosion
	Flooding
	Flooding/Erosion
	Villages
	Town Boundaries



New York State  
Department of State  
Division of  
Coastal Resources

