

## **Coastal Elevations and Sea Level Rise Advisory Committee**

Meeting Minutes: Monday, January 29, 2007

1310 L Street, NW  
Rooms 152 and 154  
Washington, DC

### **Committee Members:**

*Present:* Margaret Davidson (Chair), Rebecca Beavers, Alan Belenz, Mark Crowell, Andrew Garcia, Carl Hershner, Julie Hunkins, Mark Mauriello, Mark Monmonier, William Nechamen, Sam Pearsall, Tony Pratt, Greg Rudolph, Harvey Ryland, Gwynne Schultz

*Absent:* None

*Quorum present?* Yes

### *Others Present:*

Designated Federal Officer (DFO): Jack Fitzgerald

SAP 4.1 Presenting Authors: Jim Titus, Rob Thieler, Don Cahoon, Stephen Gill

EPA Information Quality Presenter: Karen Scott

Others: Eric Anderson, Jeff Williams, Ben Gutierrez, Zhao Liu, Michael Szabados, Heidi Keller, Joe Pica, Khanna Johnston, Fred Singer, Deborah Zabarenko, Dean Scott, Jeremy Martinich, Rona Birnbaum, Jose Aguto, Stefan Youngs, Kathryn Parker, Chuck Herrick, Beth Scherer

### **Proceedings:**

The meeting was called to order at 1:15 pm by Margaret Davidson, Chair.

#### *Presentation of the Committee Chair*

Margaret Davidson gave a presentation that covered the purpose of the Coastal Elevations and Sea Level Rise Advisory Committee (CESLAC), the objectives of the meeting, the future schedule of committee proceedings, steps taken to assure public participation, and the Synthesis and Assessment Product (SAP) 4.1 Prospectus and Climate Change Science Program (CCSP) context (Attachment 1).

#### *Description of Authors' Work and Technical Approaches*

Jim Titus, Don Cahoon, Rob Thieler, and Stephen Gill gave an overview of their work to date as related to the SAP 4.1 prospectus and technical approaches to the study (Attachment 2). Jim Titus introduced the presentation with an overview of the direct effects and impacts of sea level rise. He introduced the 4 Key Questions and 6 Supplemental Questions to be addressed by the study. Each of the presenting authors then explained the approach to these questions and talked briefly about the work conducted thus far. Jim Titus presented further details regarding Key Questions 1 and 4, and Supplemental Questions 7 through 10. Titus noted that the successful completion of Supplemental Questions 7, 9, and 10 will rely heavily on stakeholder input and that data and input that committee members are able to provide would probably result in a better final product. Don Cahoon addressed Key Question 3. Rob Thieler addressed Key

Question 2. Stephen Gill addressed Supplemental Questions 5 and 6 and explained the National Oceanic and Atmospheric Administration's (NOAA) logistical contribution with regard to the production of the final study product. Jim Titus summarized the preceding information, presented an outline for the final report, and acknowledged the contributing authors.

*Questions for SAP 4.1 Authors from CESLAC Members*

Greg Rudolph asked how the assumptions made in the current Intergovernmental Panel on Climate Change (IPCC) reports will be incorporated into this study. Jim Titus responded that the prospectus for the study provides a sea level rise range to consider and that ramifications of sea level rise, considered by IPCC Working Group 2, that apply to the mid-Atlantic will be incorporated in SAP 4.1.

Greg Rudolph asked if there are any funding issues that are anticipated in the successful completion of SAP 4.1 as laid out. Jim Titus does not anticipate any. Rudolph inquired about the future schedule of the report. Titus stated that the prospectus presents a challenging schedule and that the study is currently about 2 months behind. He emphasized the importance of stakeholder meetings in driving the timely completion of a first draft.

Sam Pearsall asked when CESLAC is likely to have a draft of SAP 4.1 to review. Jim Titus answered that a draft will be ready in time for the stakeholder meetings, thus as long as those meetings remain set, the first being in late May, a draft should be ready by mid-May. Pearsall inquired how the schedule for the stakeholder meetings affects the future schedule for CESLAC. Margaret Davidson responded that the CESLAC review of the study will run in parallel with the stakeholder review. Titus asked if CESLAC members would be attending the stakeholder meetings and suggested the formation of sub-committees which could attend those meetings and report back to the larger body.

Carl Hershner asked if the stakeholders have been identified. Stephen Gill responded that many have. Sam Pearsall inquired as to whether local hosts had been established for the stakeholder meetings. Gill responded that they have not found local hosts although they have identified a hosting facility for the North Carolina meeting. William Nechamen suggested speaking with the American Association of Floodplain Managers and local counterparts.

Sam Pearsall requested a copy of the Authors' PowerPoint presentation.

Gwynne Schultz asked if the time frames are comparable in all questions being addressed by SAP 4.1. Titus responded that the answer is question specific. In some of the questions, time is not important because they deal only with elevations, while in others, such as those that deal with wetlands, time is an important factor. The study addresses either rate or magnitude depending on critical processes.

Sam Pearsall asked if isostatic re-bound which varies with latitude across the project area is being included in the base rate for the study in the same way that wetland accretion is

being included in the base rate. In some cases, there are tide gauges that record rates that are different from the ones being used. Jim Titus responded that in general NOAA tidal data is being used for the study; however, if more detailed local information is available it will be used appropriately. The value of local data may differ by question, for instance local data would be used for the analysis of Question 1 but would not be as useful for Question 4 because it is not as sensitive. Don Cahoon added that for Question 3, rates of sea level rise are based on tide gauges, while rates of accretion are based on literature reviews. Stephen Gill noted that the tide gauges measure sea level rise relative to land. Titus continued by saying that while tide gauges do not account for everything, some level of abstraction is necessary to account for the different levels of data available for different locations.

Margaret Davidson asked about converting from the 29 datum to the more modern 88 datum. Stephen Gill responded that the base tidal information is often in 29, and that the authors know what the elevations are relative to one another. Jim Titus has converted them to take into account multiple factors.

Carl Hershner voiced concern about the committee's access to the underlying technical analysis on which SAP 4.1 is based, particularly the tidal epoch chosen by the authors. When the study will be used to affect local policy, it is critical that the document be based on the most accurate information for the region. Jim Titus stated that the report will be transparent and that the authors would cite the data sources used for the studies to the page and provide a background document that explains the approach, but would be unable to provide information about how the data used in the analysis was generated. Hershner asked if the background document would be available at the same time as the draft report. Titus saw no issue with that as transparency is important in this process.

Mark Monmonier asked if the report would include large scale maps (1/100,000 or larger). Jim Titus responded it depended on the question but that the planning maps provided in the report would not go beyond the metadata of the original maps used for the analysis, and that the focus of the report is on larger areas. Monmonier asked who the audience for the report is. He stated that some readers might need greater cartographic detail. Titus indicated that all data underlying the maps would be available and that county maps could be generated in the future although not in the time-frame of the study. Monmonier wondered if the study could at least include some examples of maps at the community level, even if they need to be caveated, for policy makers etc.

Andrew Garcia asked if the study will assume tidal characteristics independent of short term sea level to account for non-linearity in the tidal signal as affected by the sea level. Stephen Gill stated that while this assumption would not be made directly, it would be addressed by the North Carolina case study.

Alan Belenz asked how far up the Hudson River the geographic scope of the study extends. Jim Titus indicated that it depends on the question. The study focuses on areas with a lot of land at risk and where contour maps are detailed enough to be useful. He indicated that the study addressed shore protection in Westchester county, wetland

accretion is not relevant up the Hudson, and the erosion study was limited to the ocean coast, but that there may be a few locators in that area for Question 8. If more information was available pertaining to Question 8 in particular it would be useful. Belenz asked why the north shore of Long Island was excluded. Titus stated that region was excluded from the primary resource used from the study, as was the entirety of North Carolina.

Rebecca Beavers asked about the working definition for shore protection. Titus responded any measure to keep dry land from becoming wet including beach nourishment, sea walls, bulk heads, etc. Beavers asked if the authors have shore protection databases. Titus responded that shore protection characterizations were generated through 8 studies from county planners.

Harvey Ryland expressed concern that while the study considers Questions 5, 6, and 7 to be supplemental, they are of primary importance to him and that Questions 1-4 strike him as background information. He inquired as to the extent that these questions would be addressed. Jim Titus stated that while the prospectus dictates which questions are considered supplemental, all questions will be addressed to the best of the authors' ability. Stephen Gill assured Ryland that the questions are not secondary to him. Titus stated that public access to the shore as a result of sea level rise had not yet been addressed.

Gwynne expressed a desire to see a comparison between more recent data collected in Maryland and the data that will be used in addressing Question 6, which is based on the work of planners and EPA's assessment and elevation maps. Jim Titus discussed the importance of using data such as this in peer review of state reports to identify areas that were left out of the study, although recalculating statistics would be unlikely.

Tony Pratt asked how the study would address natural sediment movement and supplies. Rob Thieler stated that the study will use an expert panel approach to addressing this issue, but that the authors will not draw maps that suggest that they know with unwarranted confidence where future shorelines will be. Pratt indicated that the study's use of the Bruun Rule was of particular concern to him. Thieler stated that the study would address basic questions about the coastal sediment budget, and agreed that current models are not adequate to address this completely.

William Nechamen stated that for Questions 5 and 6 the real risk may be storm surges or waves on top of storm surges. He noted that in some cases, for example loss of wetlands and increased possibility of breaches of barriers the flood hazard may overwhelm the sea level rise issue. Stephen Gill responded that the study will try to put this issue in context, but will not try to formally model it.

Mark Mauriello asked what the biggest data gaps are in an attempt to help fill them in. Jim Titus responded that data would be most helpful in the qualitative sections of the report, particularly those that rely on literature reviews (Questions 5 and 8). Data can be accepted for Questions 5, 8, 9, 10, and potentially 7.

Carl Hershner asked about the use of ESI maps for Question 8, as they are a geographically distributed record of species depending on shoreline habitat in the region. Jim Titus will consider this as they were unavailable until recently.

#### *Future Scheduling*

Margaret Davidson inquired as to whether CESLAC could expect to see a draft of SAP 4.1 in sufficient time for a meeting the week of June 4, 2007. Jim Titus responded that the committee would be unlikely to see a draft of the report earlier than mid-May. The committee decided to stick to the current date and will change the date if need be. Mark Monmonier asked if the draft report would contain recommendations. Titus responded that the report would not include recommendations, there might be blanks, and that some graphics might be poor quality or missing altogether, but it will be good enough to tell where the report is going.

#### *Brief Break*

#### *Information Quality Requirements and Procedures*

Karen Scott gave a presentation on information quality requirements and procedures with regard to the U.S. Environmental Protection Agency's peer review process (Attachment 3). She noted that the report will be managed as a potentially highly influential document and reviewed accordingly.

Carl Hershner requested a list of the background documents being reviewed by EPA. Karen Scott stated that a list would be provided. Jim Titus indicated that the list would only include background documents produced by EPA.

Carl Hershner voiced concern over basing the study on documents that have not yet been peer reviewed. Karen Scott stated that the peer review will be completed by April, any document that is found lacking will have to be addressed at that time and adjustments to the study will need to be made accordingly. Hershner emphasized the challenges associated with this.

Carl Hershner inquired about geographic representation on the peer review panel. Karen Scott explained that there would be peer reviewers with both regional and national expertise.

Alan Belenzs inquired as to whether the September 2007 date could be moved. Jim Titus was unsure. Jack Fitzgerald stated that senior EPA management was committed to meeting this schedule, but that they would address the matter if the need arose. Greg Rudolph noted that he would hate to see the study rushed.

Mark Monmonier requested a list of the 7 substantive issues in the report identified for consideration in the peer review panel selection.

Julie Hunkins expressed concern that 1-2 weeks was not enough time to coordinate review of the draft before the second meeting. The committee decided to hold the week of June 4, 2007 open and await further scheduling information from the study authors. Margaret Davidson stated that the reason for coordination is so that members may act as representatives and get feedback from interested parties. Jack Fitzgerald stated that all non-federal members of the committee are technically representative members. Jim Titus asked how much time would be necessary for coordination. Hunkins indicated that 3-4 weeks would be minimally sufficient. Titus restated that the committee is unlikely to see a draft before mid-May, thus it might be wise to schedule the second CESLAC meeting for the end of June.

Mark Monmonier asked about confidentiality requirements when sharing the draft report with constituents. Carl Hershner responded that a draft would be made public for stakeholder comment at the same time that it was made available to the committee and Jack Fitzgerald reminded the committee that all committee materials must be made public unless they can and should be withheld under the Freedom of Information Act.

Greg Rudolph asked how the report would be advertised once completed. Margaret Davidson indicated that CCSP has outlined an outreach and education program and Jack Fitzgerald noted the wide attention received by the last SAP that was released.

*Public Comments/Statement*

A statement was given by Dr. S. Fred Singer. Singer expressed approval of the direction of the report, stating that sea level rise is going to occur regardless of anthropogenic factors, and that we need to plan for it. Singer can be contacted at [singer@sepp.org](mailto:singer@sepp.org) or [www.sepp.org](http://www.sepp.org).

Margaret Davidson adjourned the meeting at 4:15 pm.

**Attachment 1: Presentation of the Committee Chair; Margaret Davidson**

# Coastal Elevations and Sea Level Rise Advisory Committee

January 29, 2007

Washington, DC

Presentation by Chairperson Margaret Davidson





# Purpose of CESLAC

The purpose of CESLAC is to provide advice to the EPA Administrator on the conduct of a study titled *Coastal Elevations and Sensitivity to Sea Level Rise* which is being conducted as part of the U.S. Climate Change Science Program.



# Purpose of CESLAC cont.

Within the context of the basic study plan, CESLAC will advise on:

- specific issues to be addressed;
- appropriate technical approaches;
- the nature of information relevant to decision makers;
- content of the final report;
- compliance with the Information Quality Act;
- other matters important to the successful achievement of the objectives of the study.



# Objectives of the Meeting

The objectives of this meeting are:

- To review the objectives of CESLAC and scope of its activities;
- To establish its future schedule, at least tentatively;
- To review the matter of public participation;
- To understand the objectives of the study titled *Coastal Elevations and Sensitivity to Sea Level Rise* and the context for this study;



# Objectives of the Meeting cont.

- To develop an understanding of how the authors of the study are approaching their work;
- To receive information on what EPA is doing to ensure compliance with information quality requirements for the study;
- To receive comments and statements from the public;
- To ensure completeness and accuracy of the meeting record, this session is being taped.



# Future Schedule

- CESLAC will meet a second time to review an interim draft of the study and provide relevant advice, probably in June, July or August 2007.
- CESLAC will meet for a third time to review a draft final version of the study.
- CESLAC may meet an additional time if it is considered necessary for a successful completion of its mandate.
- The specific times of the meetings will depend on the timing of the study products.
- A tentative window for the second meeting should be established this afternoon.



# Public Participation

All meetings and activities of this committee that involve discussion of the substantive work of the committee are subject to the openness requirements of the Federal Advisory Committee Act, regardless of whether the meeting takes place in person, by teleconference, email or internet.

Email exchanges among half or more of the committee members relating to the substantive work of the committee are considered to be meetings and must be conducted in a manner that provides the public with access.



# Public Participation cont.

Notices of our meetings will be published in the Federal Register at least fifteen days before the meeting.

The public will be invited to submit written comments and make oral statements to the committee.

The public will be provided with materials prepared for or by the committee unless the material can and should be withheld under the Freedom of Information Act.



# Coastal Elevations and Sensitivity to Sea Level Rise Synthesis and Assessment Product

- The *Coastal Elevations and Sensitivity to Sea Level Rise Synthesis and Assessment Product* is part of a broad multi-year Administration effort to assess and synthesize the state of knowledge in a number of priority areas related to climate change.
- The U.S. Climate Change Science Program's 2003 Strategic Plan identified the need to develop "elevation maps depicting areas vulnerable to sea-level rise and planning maps depicting how states and local governments could respond to sea-level rise."
- EPA, the National Oceanic and Atmospheric Administration, and the U.S. Geological Survey are the principal Agencies involved in this synthesis and assessment.





# Coastal Elevations and Sensitivity to Sea Level Rise Synthesis and Assessment Product

The prospectus for this Synthesis and Assessment Product states that it will:

- “synthesize information from the ongoing mapping efforts by federal and non-federal researchers related to the implications of rising sea level;”
- focus on the U.S. coastal zone from New York through North Carolina;
- “also develop a plan for sea level rise research to answer questions that are most urgent for near-term decisionmaking;”
- “provide information that supports the specific goal” in the CCSP Strategic Plan “to analyze how coastal environmental programs can be improved to adapt to sea level rise while enhancing economic growth.”



# Coastal Elevations and Sensitivity to Sea Level Rise Synthesis and Assessment Product

The Synthesis and Assessment Product will examine four key questions.

1. “Which lands are currently at an elevation that could lead them to be inundated by the tides without shore protection?”
2. “How does sea level rise change the coastline?”
3. “What is the plausible range for the ability of wetlands to vertically accrete, and how does this range depend on whether shores are developed and protected, if at all?”



# Coastal Elevations and Sensitivity to Sea Level Rise Synthesis and Assessment Product

4. “Which lands have been set aside for conservation uses so that wetlands will have the opportunity to migrate inland; which lands have been designated for uses requiring shore protection; and which lands could realistically be available for either wetland migration or coastal development requiring shore protection?”

Six other questions described in the prospectus will receive lesser attention.



**Attachment 2: Presentation Describing Authors' Work and  
Technical Approaches to SAP 4.1; Jim Titus,  
Don Cahoon, Rob Thieler, Stephen Gill**

# **COASTAL ELEVATIONS AND SENSITIVITY TO SEA LEVEL RISE**

**The Lead Authors Respond to the Prospectus**

**Jim Titus**

**Don Cahoon**

**Rob Thieler**

**Steve Gill**

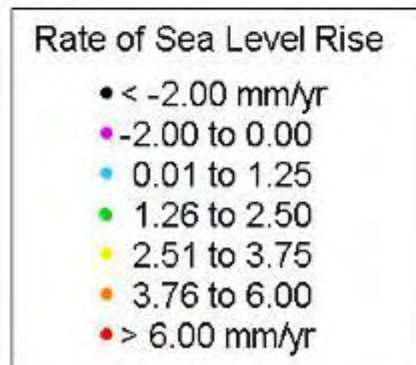
# Outline

- **Introduction (10 min)**
- **Answering the Key Questions:**
  - Questions 1, 4 (Titus 10 min)
  - Question 3 (Cahoon 7-1/2 min)
  - Question 2 (Thieler 7-1/2 min)
- **Answering the Supplemental Questions**
  - Questions 5, 6; North Carolina (Gill 10 min)
  - Questions 7-10 (Titus 5 min)
- **NOAA's Logistical Contribution (Gill 5 min)**
- **Wrap-up (Titus 5 min)**

**COASTAL ELEVATIONS  
AND  
SENSITIVITY TO SEA LEVEL RISE**

Black and Purple: sea level fall  
Blue: sea rise less than average

DRAFT



Green: Average

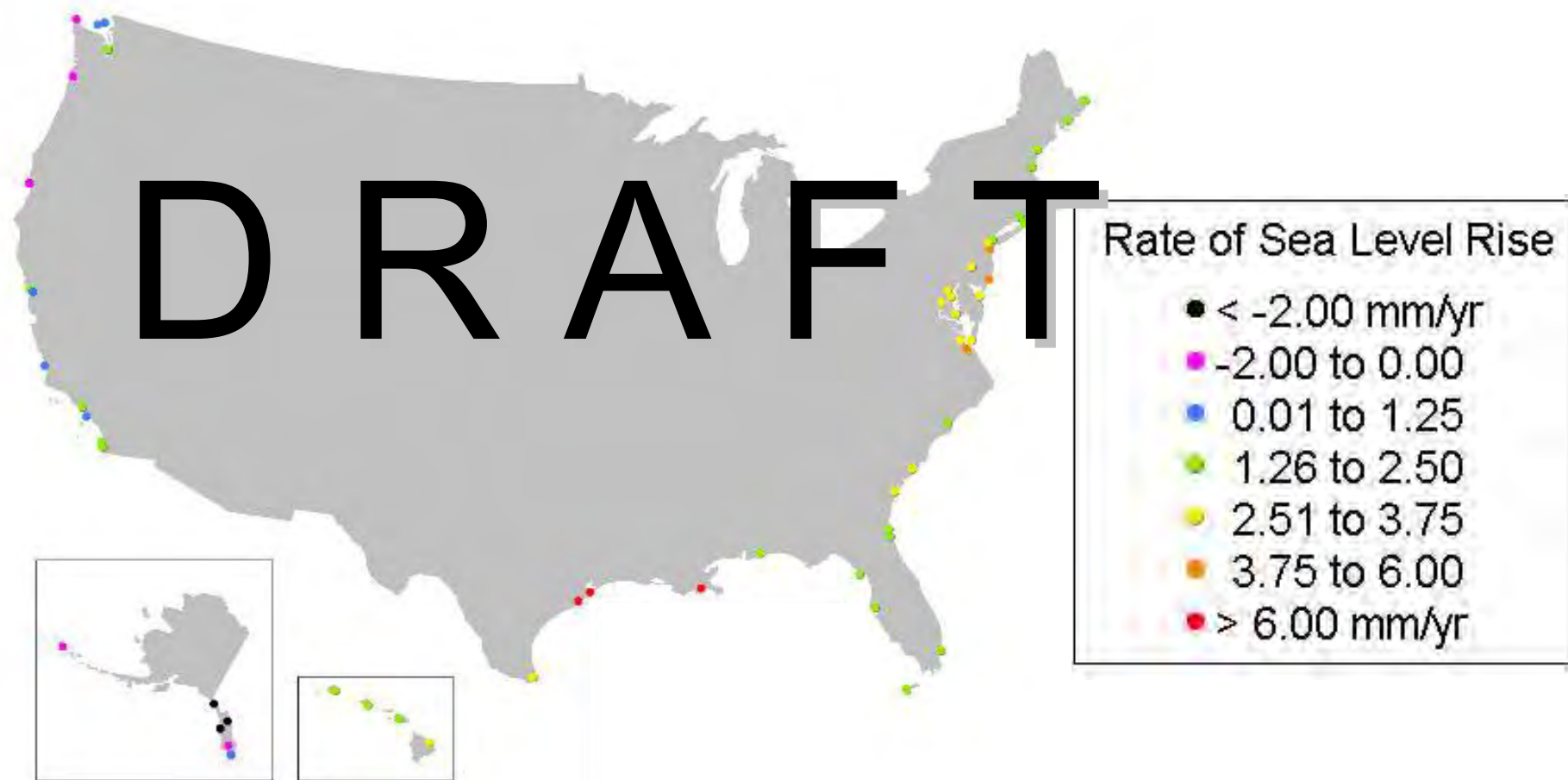
Yellow: Sea rising faster than average

Orange and Red: 2 to 5 times average



Prospectus: "...this product will focus on the impacts of a rise between 25 cm and 1 meter... [but] also consider ... a two meter rise."

We propose 3 scenarios: Current, +2mm/yr, +7mm/yr



# **Direct Effects of Sea Level Rise (EPA Report to Congress, and others)**

- **Inundation of dry land**
- **Shore Erosion**
- **Wetland Accretion and Erosion**
- **Changes in Flooding**
- **Saltwater Intrusion**

# **Direct Effects of Sea Level Rise (CCSP 4.1 Key Questions)**

- **Inundation of dry land**
- **Shore Erosion**
- **Wetland Accretion and Erosion**

# Impacts of Sea Level Rise (EPA Report to Congress, and others)

- **Adaptive Responses**
  - **Protect Shores or Retreat**
  - **Floodplain Management**
- **Costs**
  - **Shore Protection**
  - **Erosion and Flood Losses**
- **Who Is at risk?**
  - **Human Populations and Infrastructure**
  - **Species that rely on tidal habitat**

# Impacts of Sea Level Rise (CCSP 4.1 Questions 4-8)

- **Adaptive Responses**
  - **Protect Shores or Retreat**
  - **Floodplain Management**
  - 
  - 
  -
- **Who Is at risk?**
  - **Human Populations and Infrastructure**
  - **Species that rely on tidal habitat**

# Prospectus: Key Questions

- 1) Which lands could be inundated by the tides without shore protection? (EPA)
- 2) Which land could potentially erode? (USGS)
- 3) Ability of wetlands to vertically accrete: Will sea level rise cause the area of wetlands to increase or decrease? (USGS/EPA)
- 4) Which lands have been set aside so that wetlands will migrate inland; which land [will] require shore protection? Which lands could be available for either? (EPA)

*That is: What happens to the land?*

# Supplemental Questions: So What?

For alternate scenarios of sea level rise and shore protection

- Implications for floodplains and FEMA (NOAA)
- Population, economic activity, land use in vulnerable area? (NOAA)
- Public's access to the shore? (EPA/NOAA)
- Species that depend on threatened habitat? (EPA)

Decisions

- Which near-term actions (if any) justify different decisions? (Stakeholders)
- What options are being considered by specific organizations? (Stakeholders)

# Prospectus: “will address .... three spatial scales...

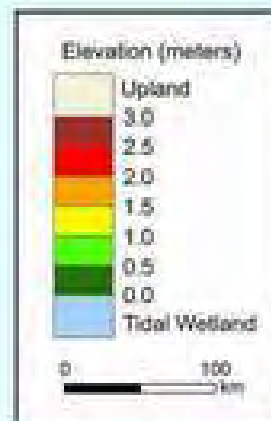
- National scale—Report Introduction
- Middle Atlantic—Quantitative estimates
- Estuary or county scale—Qualitative discussions



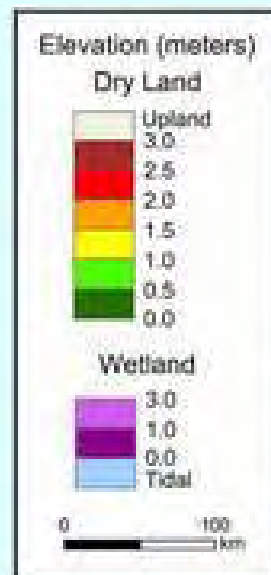
# Question 1

Which lands are currently at an elevation that could lead them to be inundated by the tides without shore protection measures?

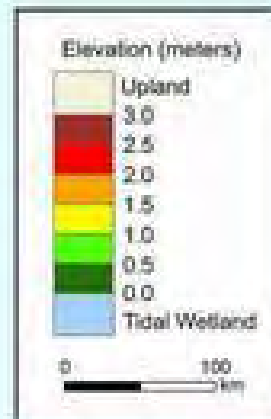
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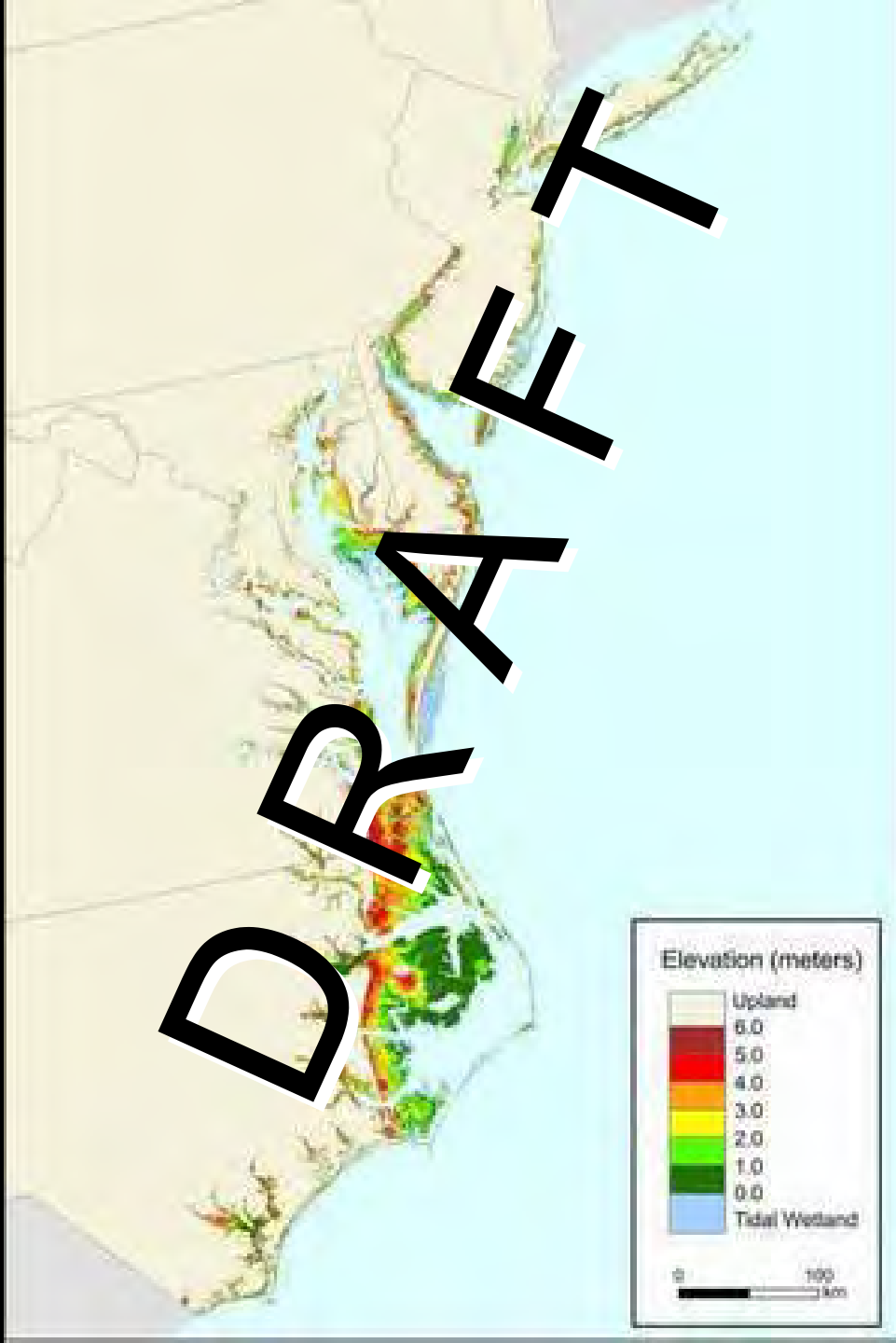
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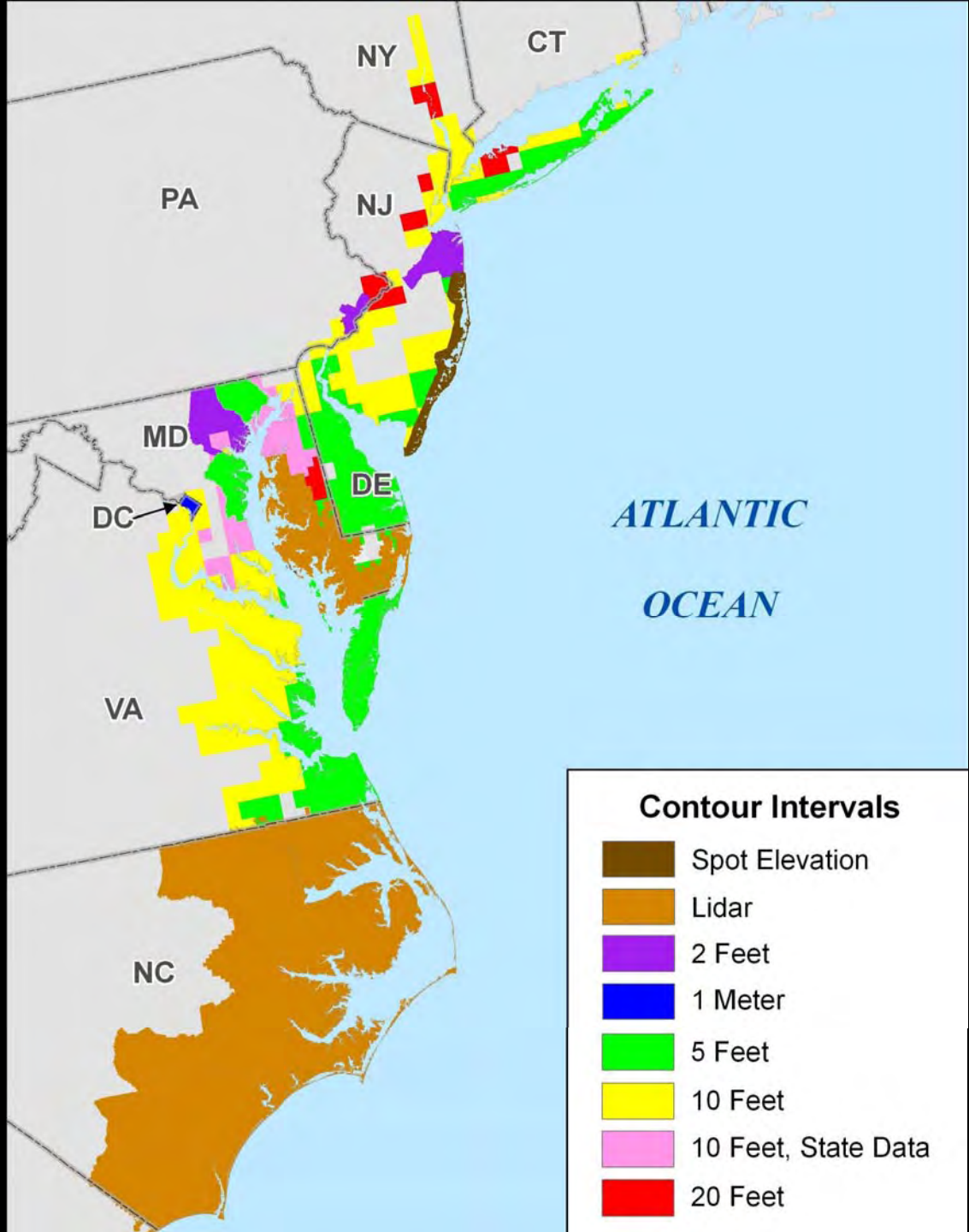


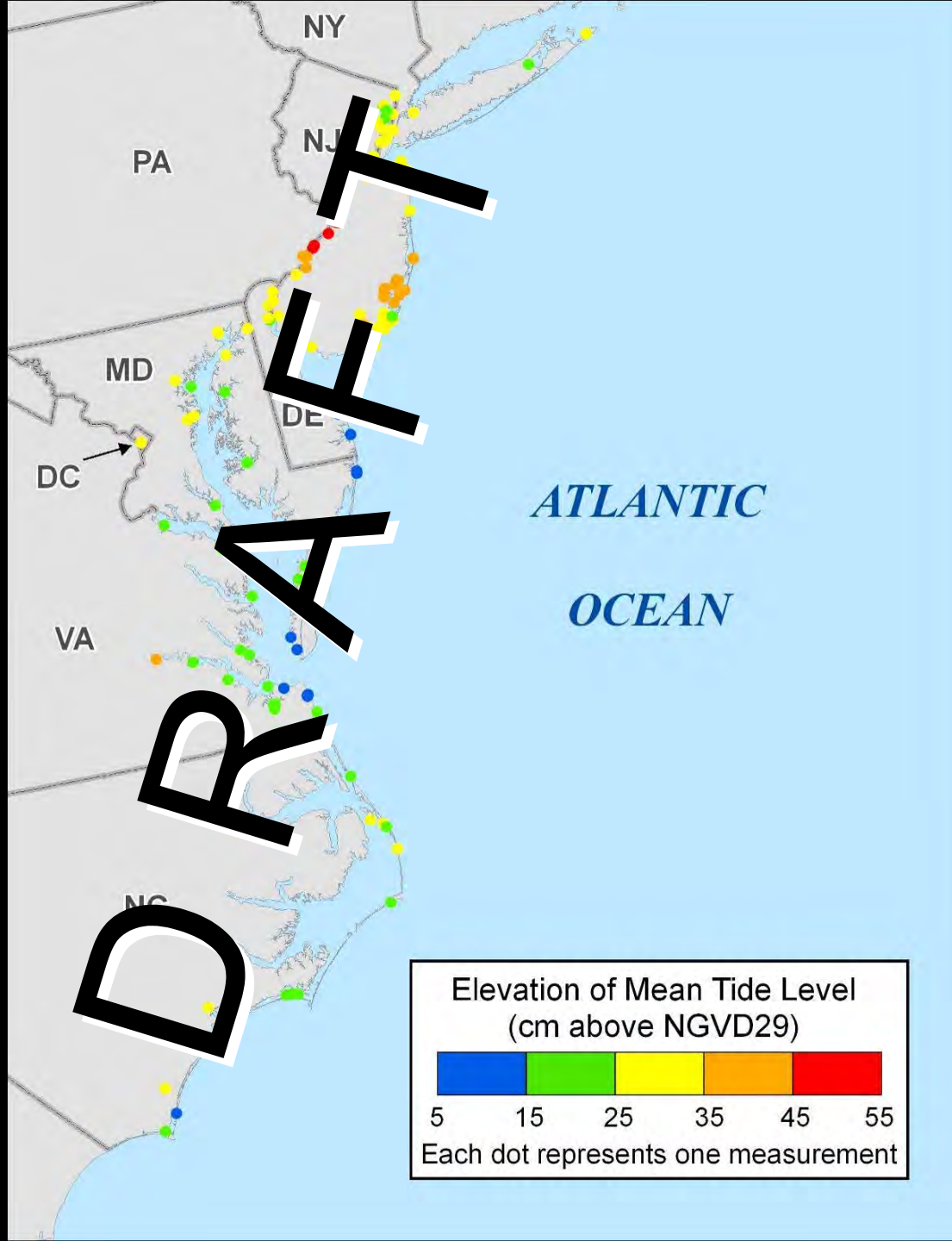
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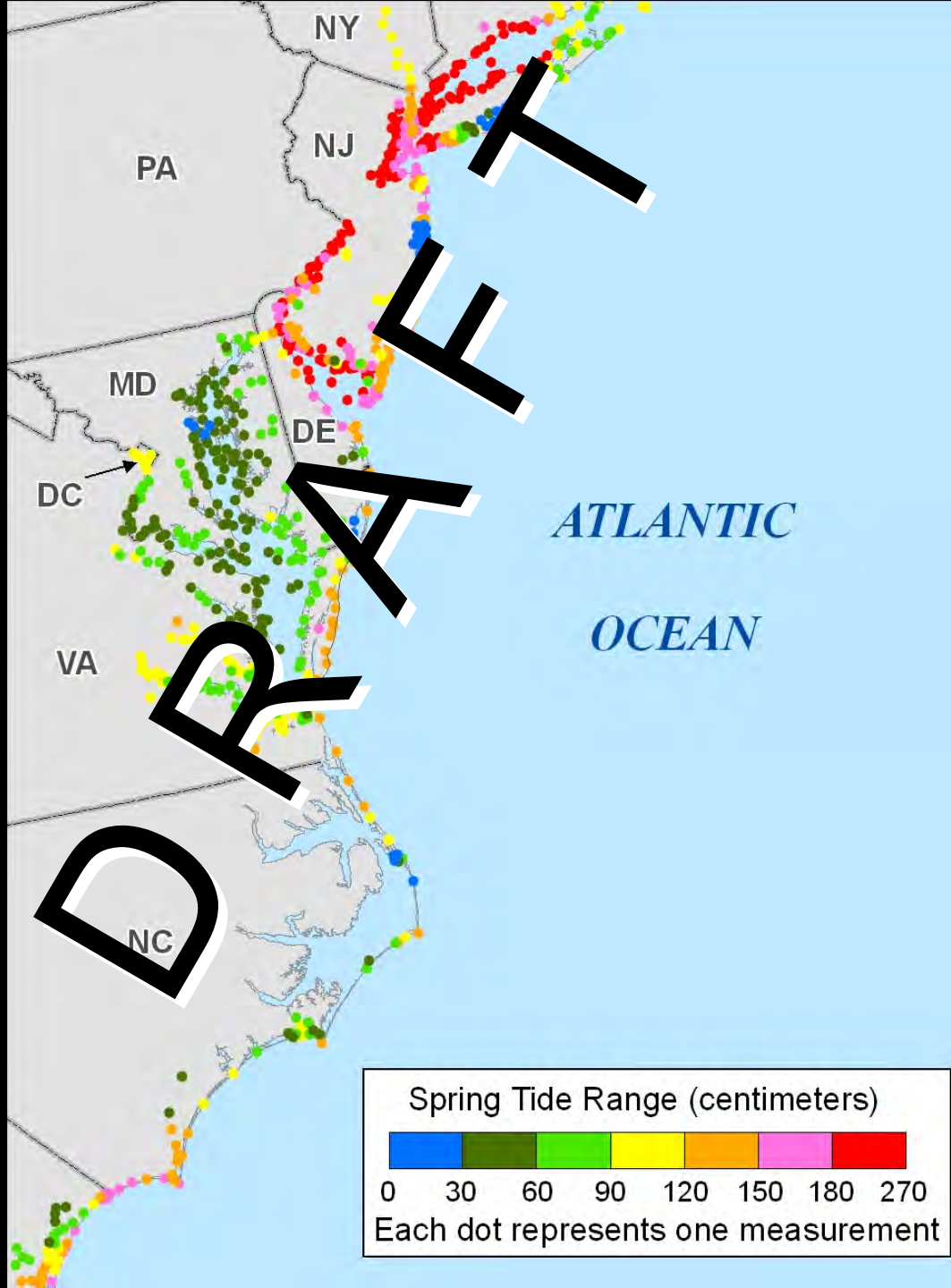


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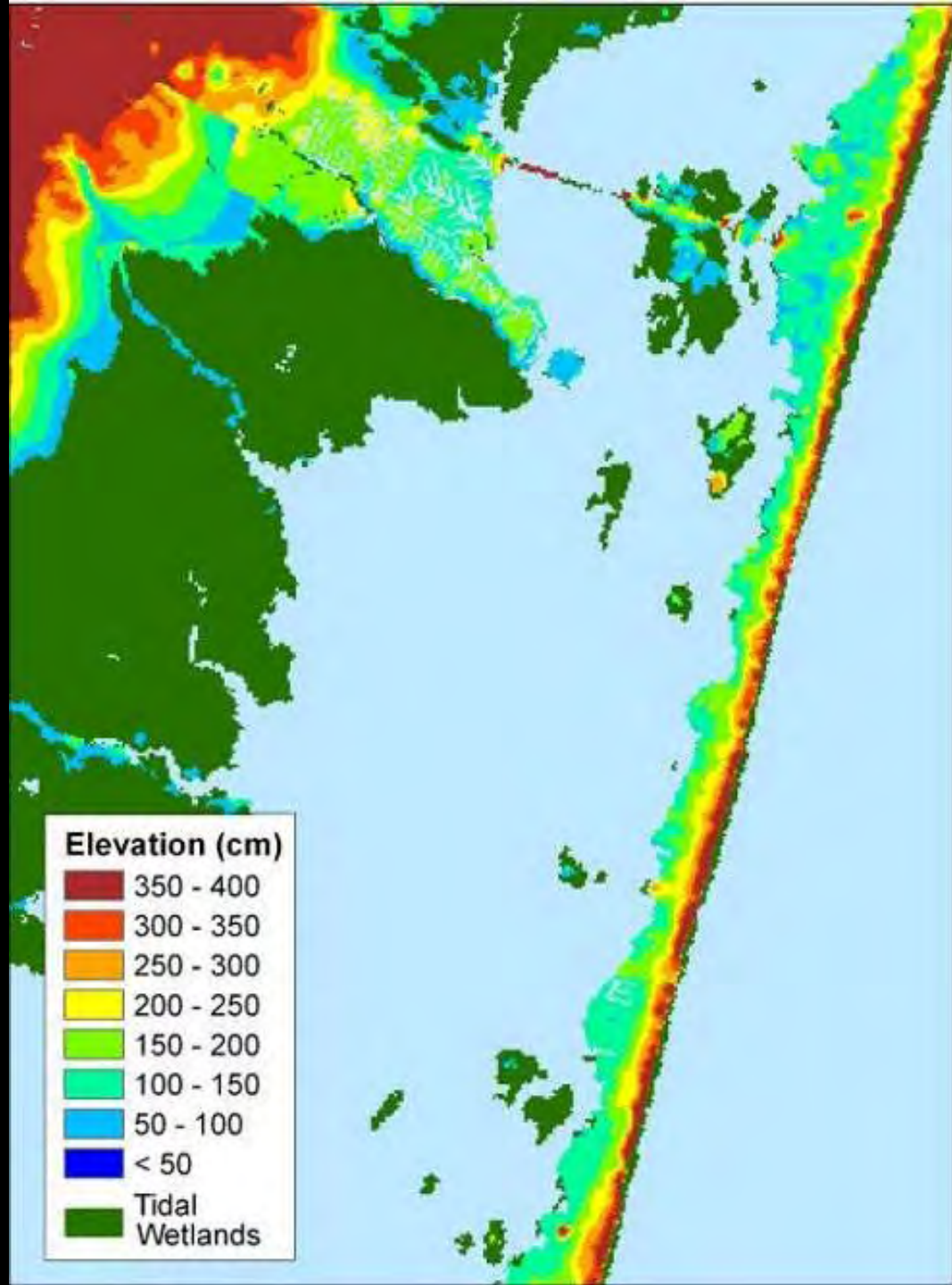


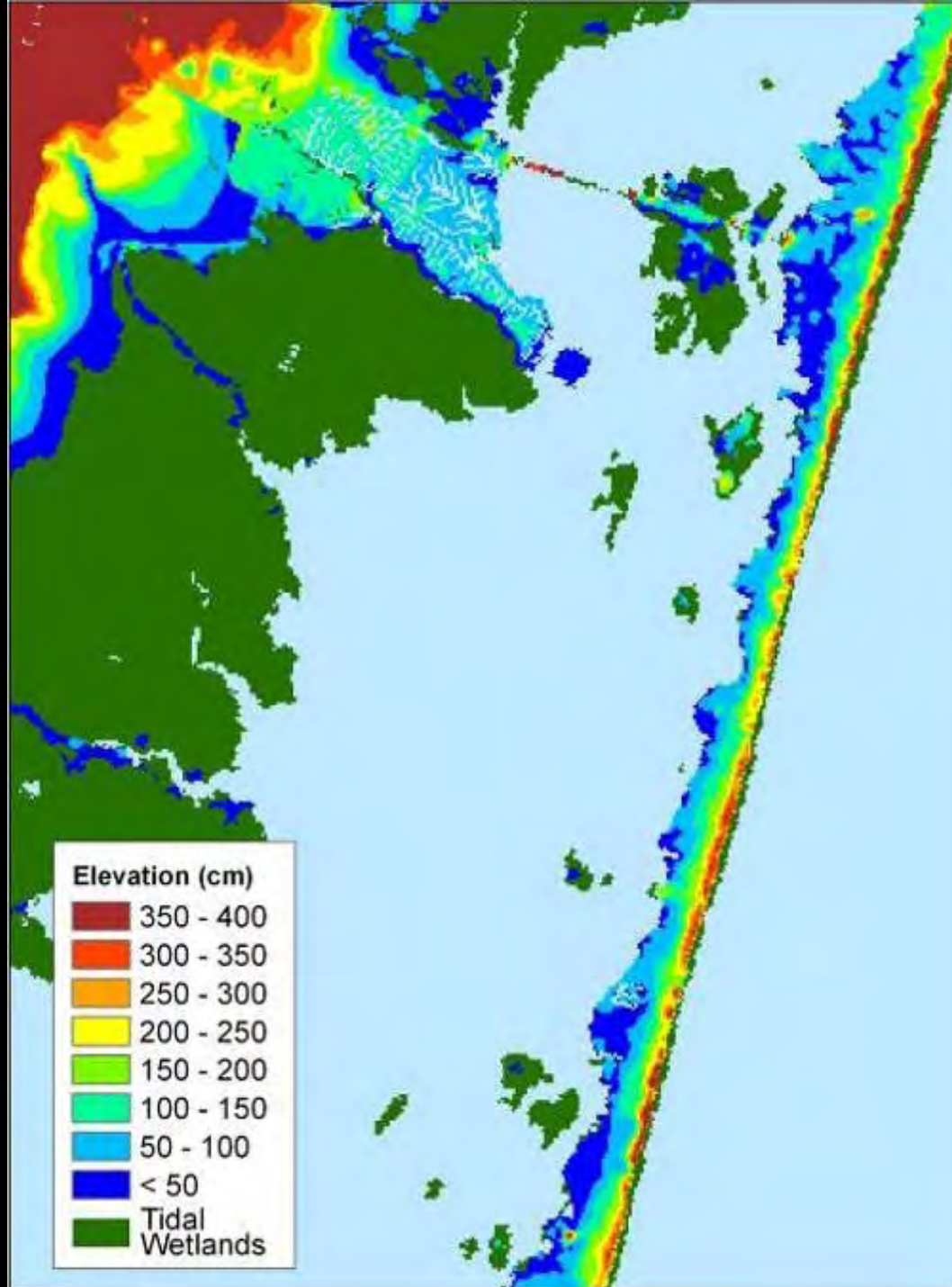












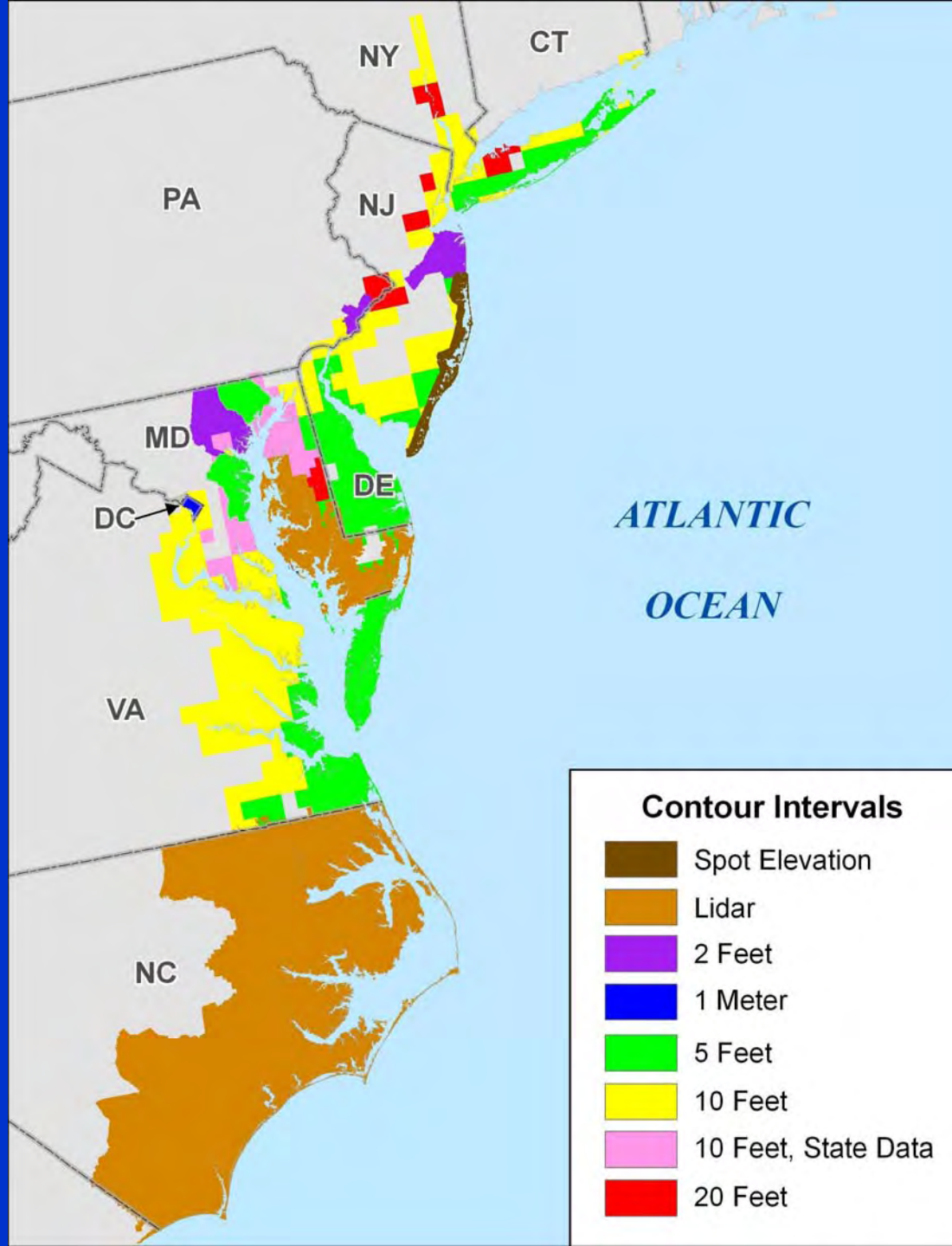


Ship Bottom, NJ  
Labor Day, 2002

Q: How do we account for uncertainty?

## Error:

- Contour maps: one-half contour interval
- LIDAR and spot elevations: RMS error provided by metadata



## Question 4

Which lands have been set aside for conservation uses so that wetlands will have the opportunity to migrate inland; which lands have been designated for uses requiring shore protection; and which lands could realistically be available for either wetland migration or coastal development requiring shore protection?

# Approach of Studies that Answered this Question

- Meet with land use planners and elicit decision rules.
- Create maps by applying decision rules to state and local GIS land use data
- Write draft report
- Meet again with local planners to get map changes and other comments
- Final Review, often with additional consultation










# Planning for Sea Level Rise: Shore Protection Is Usually....

Certain	All urban areas. Moderate development along calm bays.
Likely	Future development, light development along oceans. Farms in areas where dikes are common
Unlikely	Most farms. Conservation easements or regulations prohibit development
Not Allowed	Conservation Lands



Q: How do we account for uncertainty?

# NEW YORK SEA LEVEL RISE PLANNING MAP

- |  |   |
|--|---|
|  Shore Protection Almost Certain |  Non-Tidal Wetlands    |
|  Shore Protection Likely         |  Tidal Wetlands        |
|  Shore Protection Unlikely       |  Open Water            |
|  No Shore Protection             |  Outside of Study Area |
|  Not Considered                  |   |

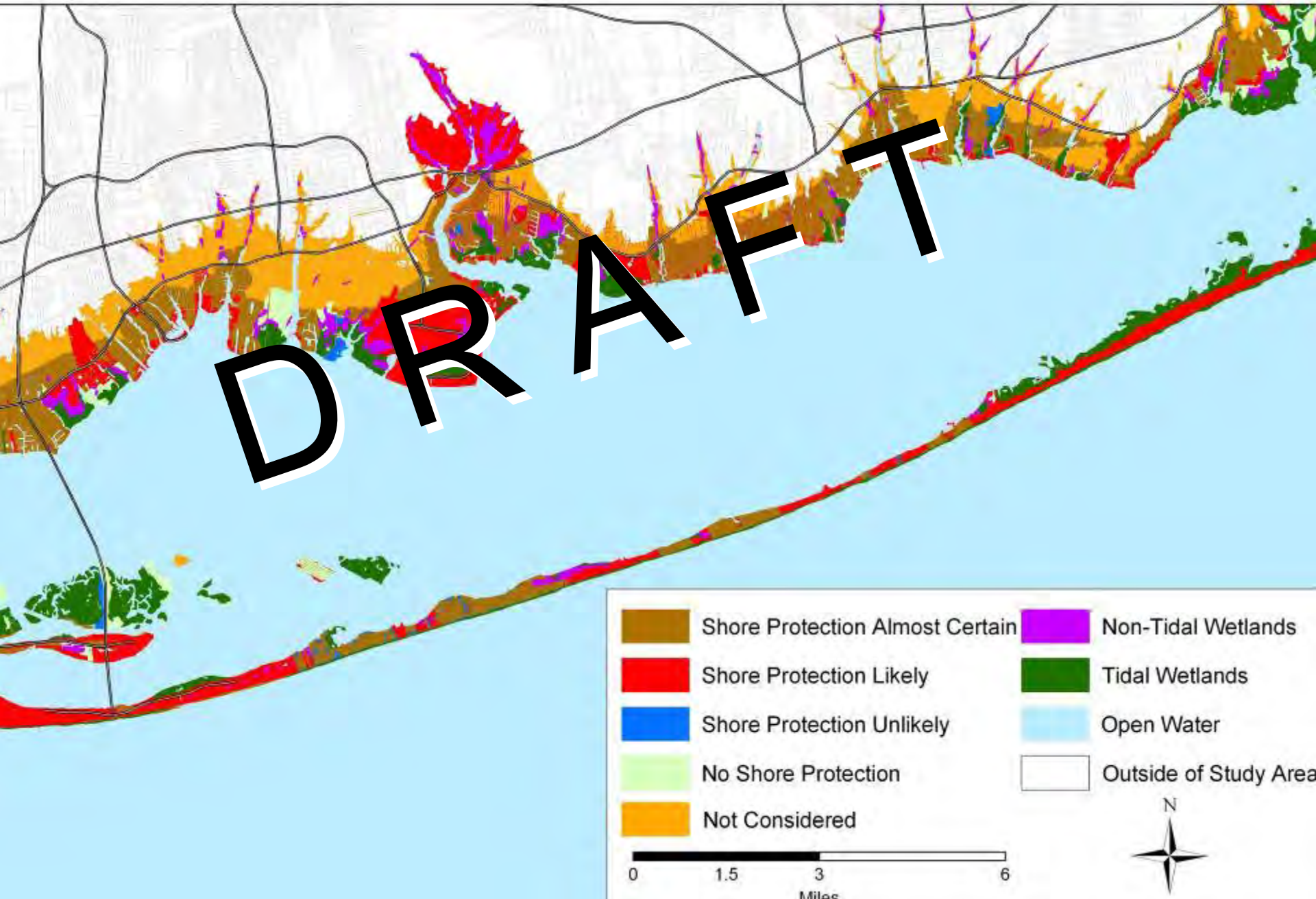
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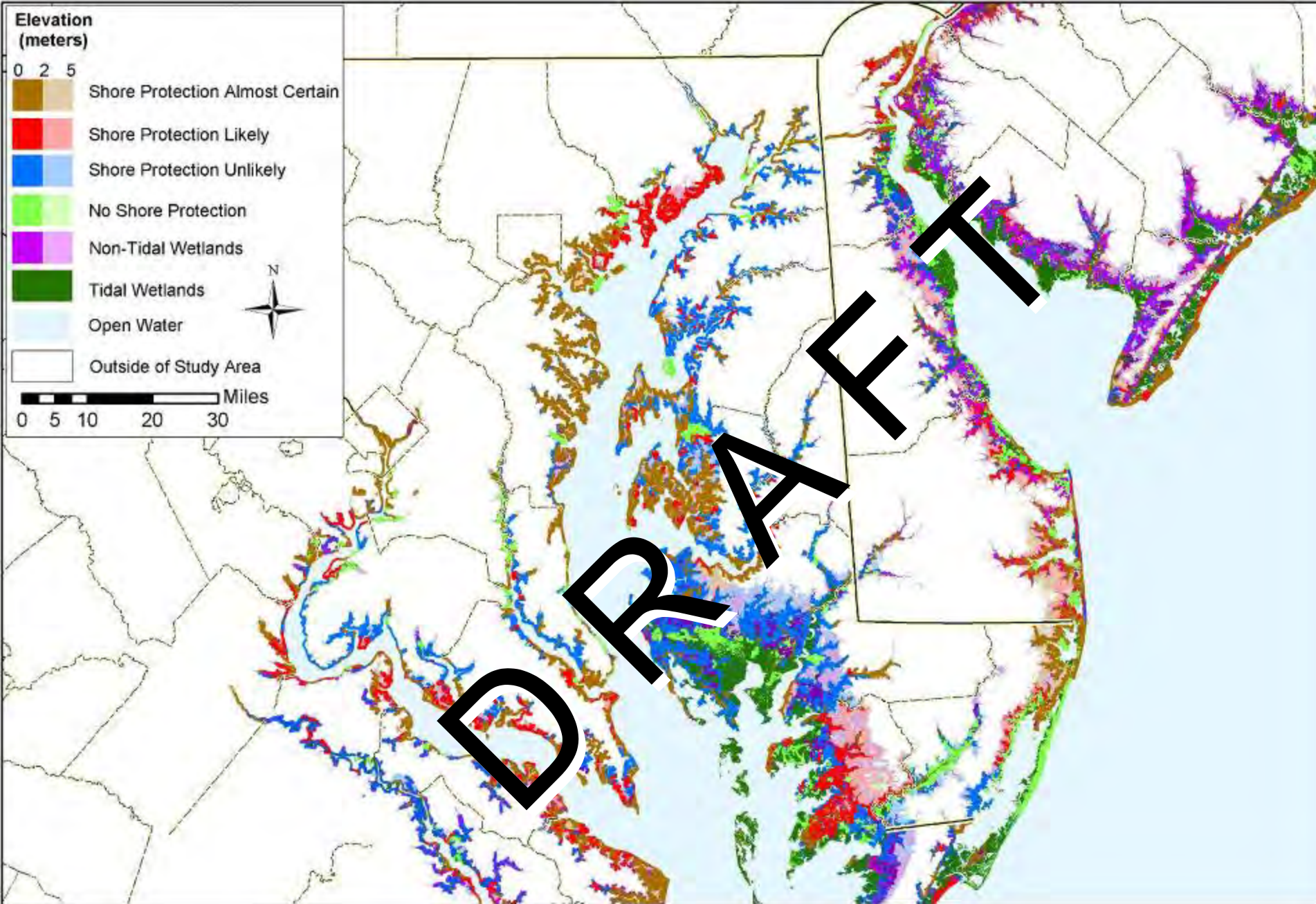
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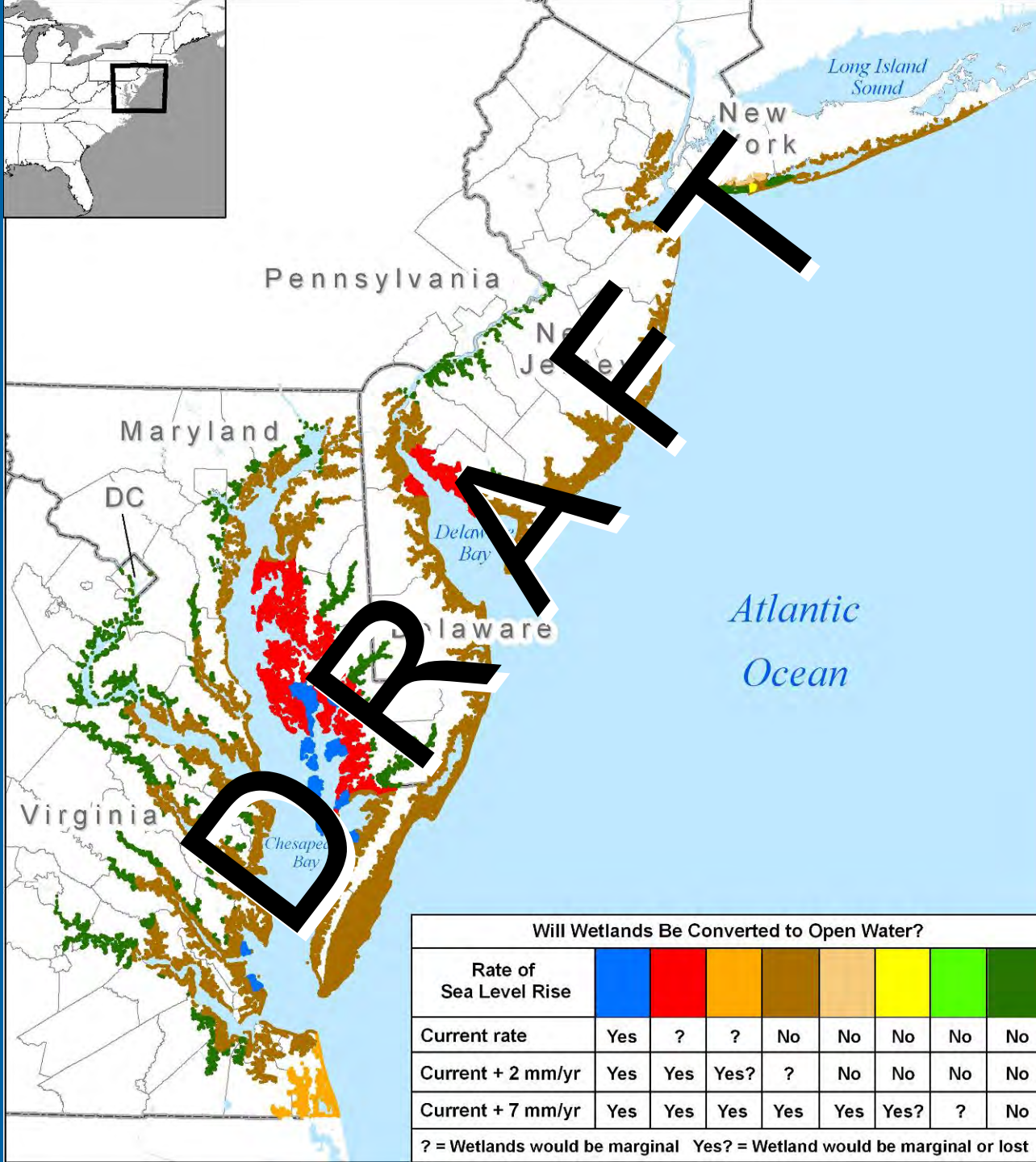










# Suffolk County, South Shore: Babylon to Belport



# MARYLAND SEA LEVEL RISE PLANNING MAP





Will Wetlands Be Converted to Open Water?								
Rate of Sea Level Rise								
Current rate	Yes	?	?	No	No	No	No	No
Current + 2 mm/yr	Yes	Yes	Yes?	?	No	No	No	No
Current + 7 mm/yr	Yes	Yes	Yes	Yes	Yes	Yes?	?	No
? = Wetlands would be marginal    Yes? = Wetland would be marginal or lost								

## Question 3

What is a plausible range for the ability of wetlands to vertically accrete, and how does this range depend on whether shores are developed and protected, if at all?  
That is: will sea level rise cause the area of wetlands to increase or decrease?

# Marsh Vertical Development vs. **Current** RSLR



## Local Wetland Biogeomorphic Data

Geomorphic Setting

Wetland Type

Accretionary Processes:

minerogenic, organogenic

Drivers: storms, tides,  
fluvial, oceanic

# Marsh Vertical Development vs. **Current** RSLR



Scale Up ?



Local Wetland Biogeomorphic Data

Geomorphic Setting

Wetland Type

Accretionary Processes:

minerogenic, organogenic

Drivers: storms, tides,  
fluvial, oceanic

No Regional/National Wetland  
Biogeomorphic Data Sets

Geomorphic Settings

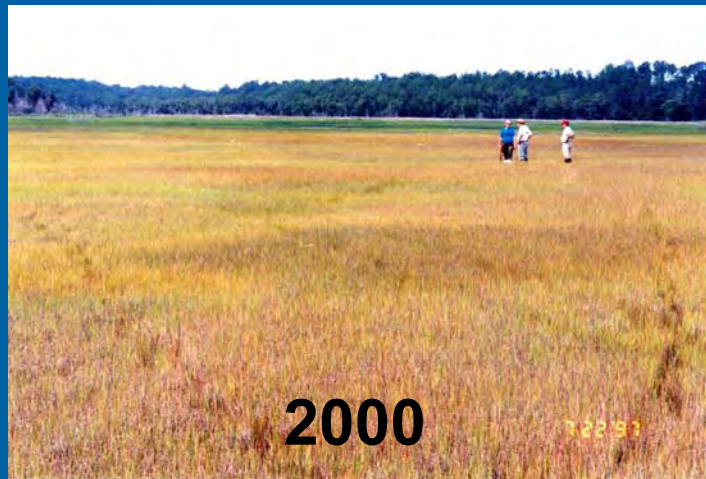
Wetland Types

Accretionary Processes

Drivers



# Marsh Vertical Development vs. **Future** RSLR

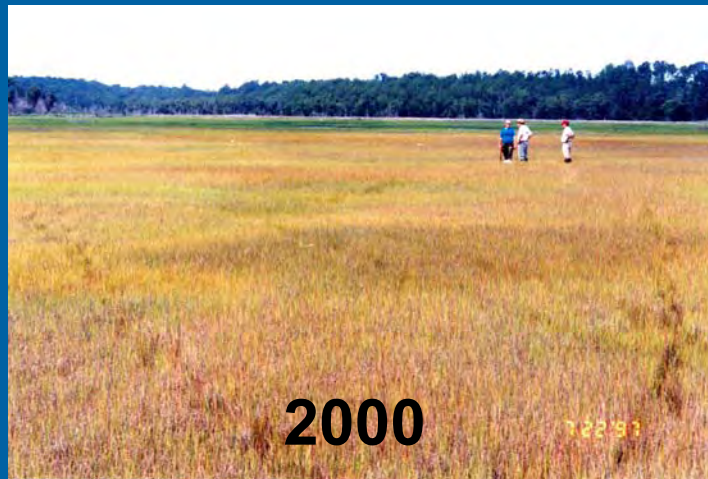


Short-term Wetland Biogeomorphic Data

Feedbacks: elevation, flooding, sedimentation

Major Events: storms, floods, droughts

# Marsh Vertical Development vs. **Future** RSLR



Short-term Wetland Biogeomorphic Data

Numerical Models: Rybczyk & Cahoon 2002

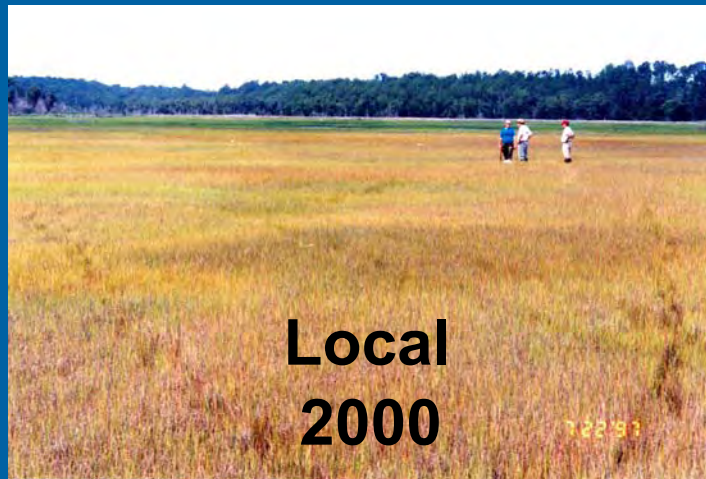
Feedbacks: elevation, flooding, sedimentation

Major Events: storms, floods, droughts



Numerical Models

# Marsh Vertical Development vs. Future RSLR



Scale Up ?



Local Wetland Biogeomorphic Data

Geomorphic Setting

Wetland Type

Accretionary Processes:

minerogenic, organogenic

Drivers: storms, tides,  
fluvial, oceanic

→ Numerical Models: Rybczyk & Cahoon 2002

→ No Regional/National Wetland Biogeomorphic Data Sets

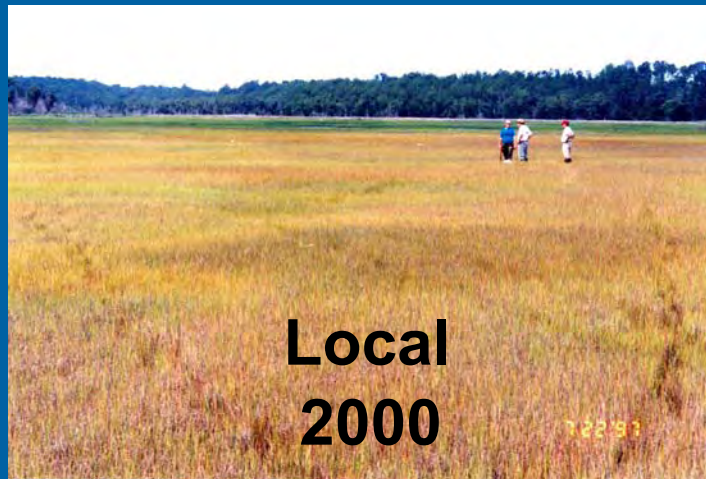
Geomorphic Settings

Wetland Types

Accretionary Processes

Drivers

# Marsh Vertical Development vs. **Future** RSLR



Scale Up ?



Local Wetland Biogeomorphic Data

Models: Rybczyk ~~X~~ & Cahoon 2002

Expert Panel Mid-Atlantic Region

Geomorphic Setting

Wetland Type

Accretionary Processes:

minerogenic, organogenic

Drivers: storms, tides,  
fluvial, oceanic

Geomorphic Settings

Wetland Types

Accretionary Processes

Drivers

# Expert Panel

- Denise J. Reed, Chair, University of New Orleans
- Donald R. Cahoon, U. S. Geological Survey
- Jeffrey Donnelly, Woods Hole Oceanographic Institution
- Michael Kearney, University of Maryland
- Alexander Kolker, State University of NY, Stony Brook
- Lynn L. Leonard, University of North Carolina, Wilmington
- Richard A. Orson, Orson Environmental Consultants
- J. Court Stevenson, University of Maryland

# Expert Panel Approach – SLR Scenarios

- Divided Mid-Atlantic region into a series of subregions based on similarity of process regime and current sea-level rise rate
- Evaluated wetland response to 3 sea level rise scenarios
  - Current SLR Rates: determined for each subregion from local tide gauge records
  - Current + 2 mm/yr
  - Current + 7 mm/yr

# Expert Panel Approach – Fate of Wetlands

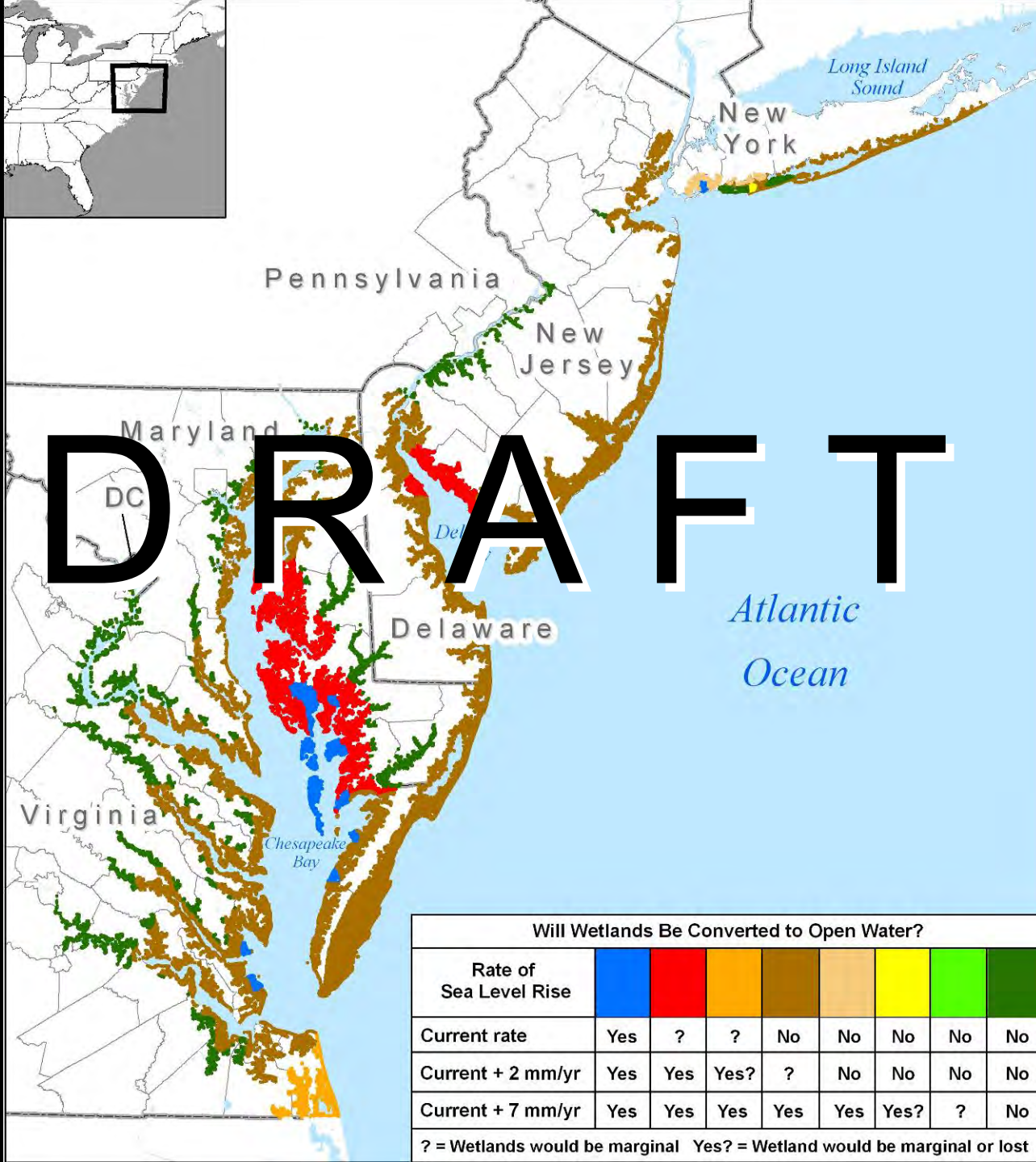
Geomorphic settings were delineated and the fate of wetlands within each subregion under three sea-level rise scenarios was agreed upon

- **Keeping pace**: wetlands will not be submerged by rising sea levels and will be able to maintain their relative elevation
- **Marginal**: wetlands will be able to maintain their elevation only under optimal conditions
- **Loss**: wetlands will be subject to increased hydroperiod beyond that normally tolerated by the vegetative communities, leading to deterioration and conversion to open water



DRAFT





**DRAFT**

Will Wetlands Be Converted to Open Water?								
Rate of Sea Level Rise	Blue	Red	Orange	Brown	Tan	Yellow	Light Green	Dark Green
Current rate	Yes	?	?	No	No	No	No	No
Current + 2 mm/yr	Yes	Yes	Yes?	?	No	No	No	No
Current + 7 mm/yr	Yes	Yes	Yes	Yes	Yes	Yes?	?	No

? = Wetlands would be marginal    Yes? = Wetland would be marginal or lost

## Question 2

How does sea level rise change the coastline? Among those lands with sufficient elevation to avoid inundation, which land could potentially erode in the next century? Which lands could be transformed by related coastal processes?

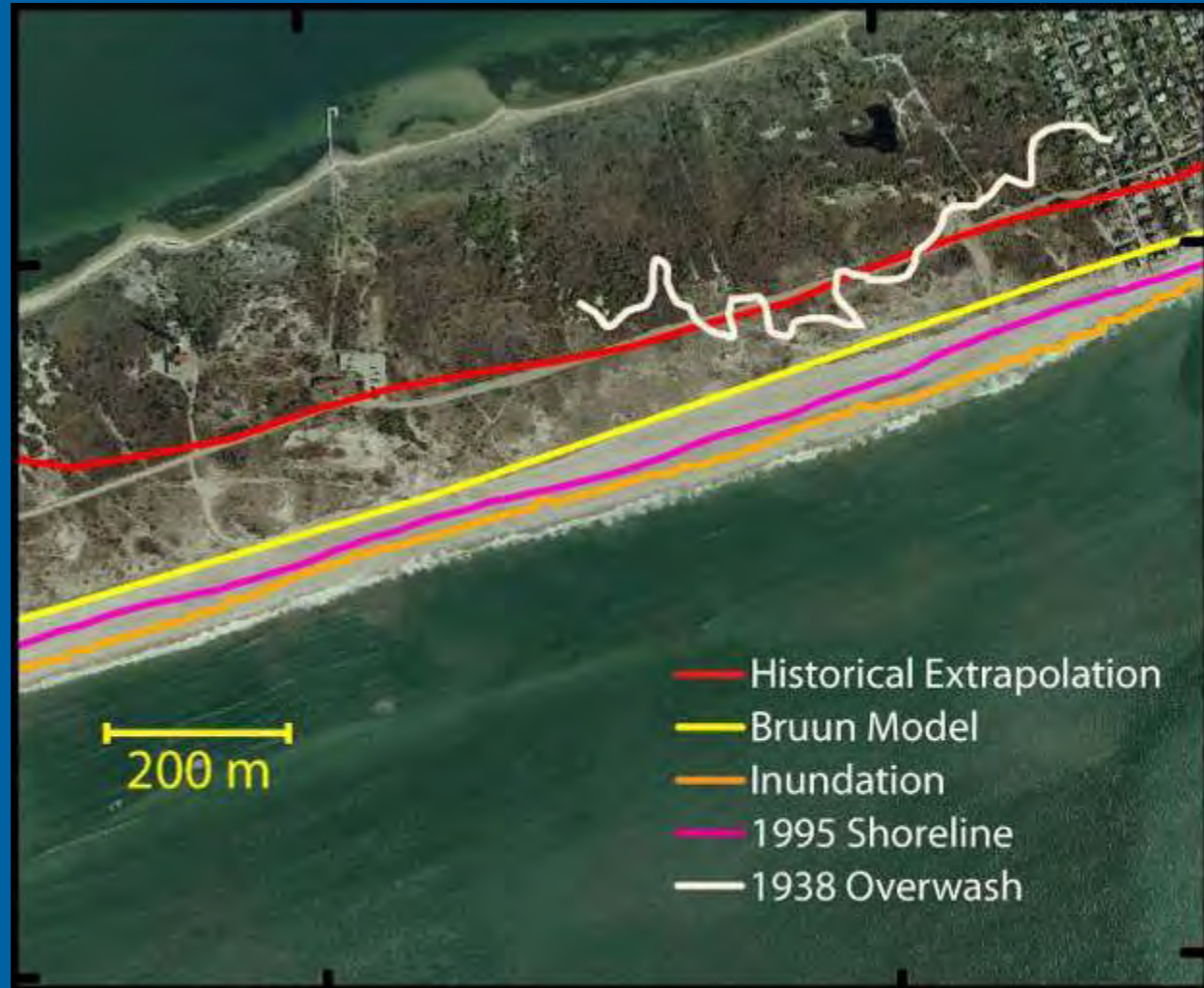
# Assessing Potential Coastal Changes

- **Question 2 will focus on open-ocean coasts**
  - Present physical setting
  - Current understanding of important processes
  - Potential impacts of SLR
- **Work will review and test extant models for predicting shoreline/coastal change**
- **Methodologies to be reviewed**
  - Erosion-rate extrapolation
  - Bruun Rule
  - Inundation
  - Index-ranking based on physical criteria
- **Review will guide research plan development**

# Erosion rate, Bruun Rule, and Inundation Predictions for 2100

- Erosion-rate extrapolation → large change
- Bruun → small change
- Inundation → small seaward change

- Western Fire Island, NY (near Saltaire)
- SLR = 59 cm = 48 cm IPCC + 11 cm local subsidence
- E-rate = long-term rate \* 105 yr



# Erosion rate, Bruun Rule, and Inundation Predictions for 2100

- Erosion-rate extrapolation → small change
- Bruun → small change
- Inundation → small change

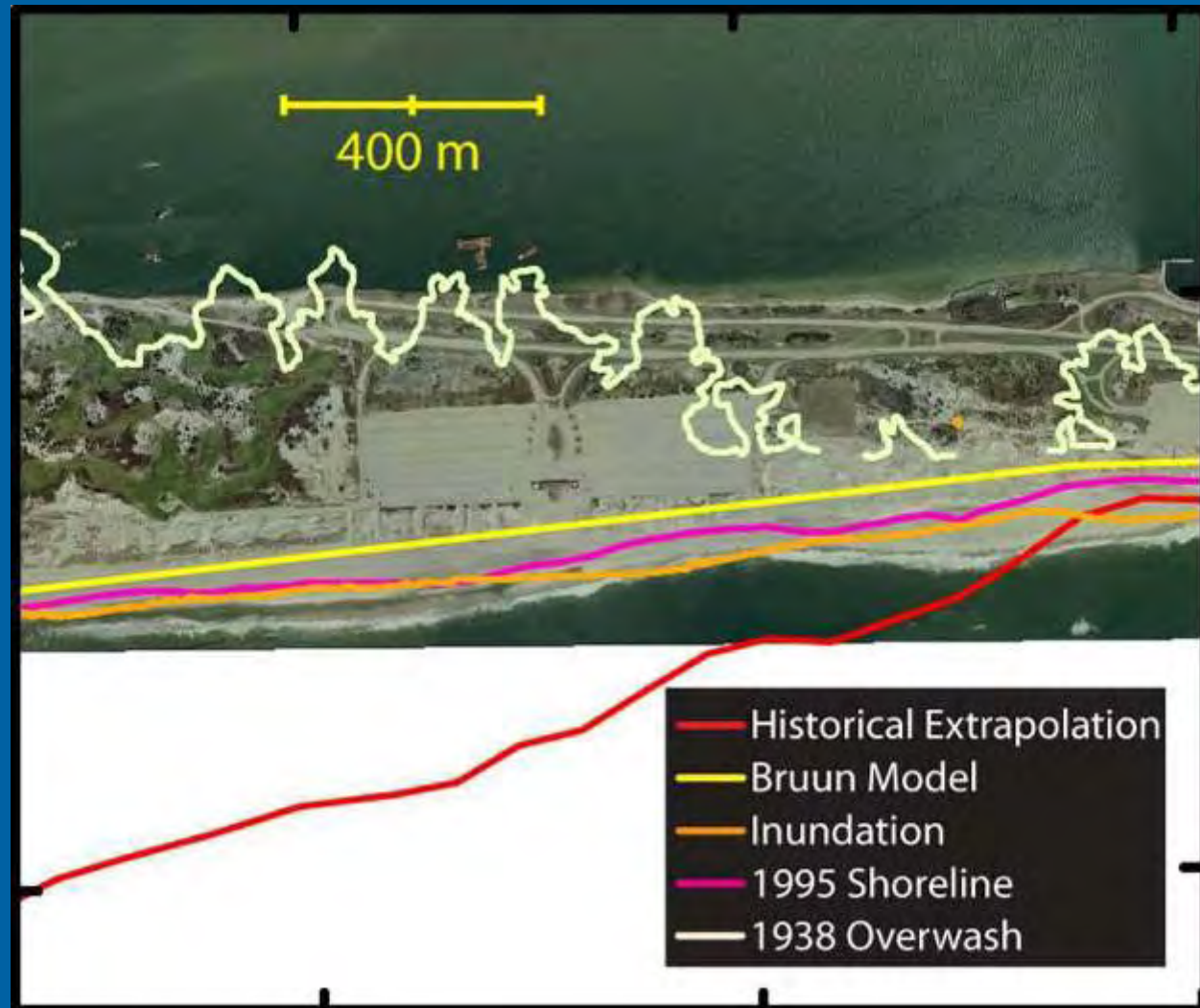
- Eastern Fire Island, NY (SW of Mastic Beach)
- SLR = 59 cm = 48 cm IPCC + 11 cm local subsidence
- E-rate = long-term rate \* 105 yr



# Erosion rate, Bruun Rule, and Inundation Predictions for 2100

- Erosion-rate extrapolation → large seaward change
- Bruun → small change
- Inundation → small change

- Western Fire Island, NY (near Democrat Point)
- SLR = 59 cm = 48 cm IPCC + 11 cm local subsidence
- E-rate = long-term rate \* 105 yr






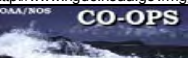





# USGS Preliminary National Coastal Vulnerability Assessment



(Thieler and Hammar-Klose, 1999; 2000a; 2000b)

# CVI Methodology

VARIABLES	SOURCE
GEOMORPHOLOGY	Aerial Photography from MassGIS and USGS   <a href="http://edcwww.cr.usgs.gov/">http://edcwww.cr.usgs.gov/</a> <a href="http://www.state.ma.us/mgis/">http://www.state.ma.us/mgis/</a>
SHORELINE EROSION/ACCRETION (m/yr)	USGS Administrative Report: The Massachusetts Shoreline Change Project: 1800s -1994 (Thieler et al., 2001)   <a href="http://www.state.ma.us/czm/shorelinechange.htm">http://www.state.ma.us/czm/shorelinechange.htm</a>
COASTAL SLOPE (%)	NGDC Coastal Relief Model Vol 01 12/17/1998  <a href="http://www.ngdc.noaa.gov/mgg/">http://www.ngdc.noaa.gov/mgg/</a>
RELATIVE SEA-LEVEL CHANGE (mm/yr)	NOAA Technical Report NOS CO-OPS 36 SEA LEVEL VARIATIONS OF THE UNITED STATES 1854-1999 (Zervas, 2001)  <a href="http://www.co-ops.nos.noaa.gov/publications/techrpt36doc.pdf">http://www.co-ops.nos.noaa.gov/publications/techrpt36doc.pdf</a>
MEAN SIGNIFICANT WAVE HEIGHT (m)	North Atlantic Region WIS Data (Phase II) and NOAA National Data Buoy Center   <a href="http://bigfoot.wes.army.mil/u003.html">http://bigfoot.wes.army.mil/u003.html</a> <a href="http://seaboard.ndbc.noaa.gov/">http://seaboard.ndbc.noaa.gov/</a>
MEAN TIDE RANGE (m)	NOAA/NOS CO-OPS Historical Water Level Station Index  <a href="http://www.co-ops.nos.noaa.gov/station_index.shtml?state">http://www.co-ops.nos.noaa.gov/station_index.shtml?state</a>



Utilize existing data for six geological and physical process variables:

- a) Geomorphology
- b) Historic shoreline change
- c) Coastal Slope
- d) Relative sea-level rise rate
- e) Mean sig. wave height
- f) Mean tidal range

VARIABLES	VERY LOW	LOW	MODERATE	HIGH	VERY HIGH
	1	2	3	4	5
GEOMORPHOLOGY	Rocky, cliffed coasts Fjords	Medium cliffs Indented coasts	Low cliffs Glacial drift Alluvial plains	Cobble Beaches Estuary Lagoon	Barrier beaches, Sand beaches, Salt marsh, Mud flats, Deltas, Mangroves, Coral reefs
SHORELINE EROSION/ACCRETION (m/yr)	> 2.0	1.0 - 2.0	-1.0 - 1.0	-2.0 - -1.0	< -2.0
COASTAL SLOPE (%)	> 1.20 >1.90	1.20 - 0.90 1.90 - 1.30	0.90 - 0.60 1.30 - 0.90	0.60 - 0.30 0.90 - 0.60	< 0.30 <0.60
RELATIVE SEA-LEVEL CHANGE (mm/yr)	< 1.8	1.8 - 2.5	2.5 - 3.0	3.0 - 3.4	> 3.4
MEAN WAVE HEIGHT (m)	< 0.55 < 1.10	0.55 - 0.85 1.1 - 2.0	0.85 - 1.05 2.0 -2.25	1.05 - 1.25 2.25 - 2.60	> 1.25 > 2.60
MEAN TIDE RANGE (m)	> 6.0	4.0 - 6.0	2.0 - 4.0	1.0 - 2.0	< 1.0



Data are scored using a simple ranking system, so that the variables can be expressed in a quantifiable manner.



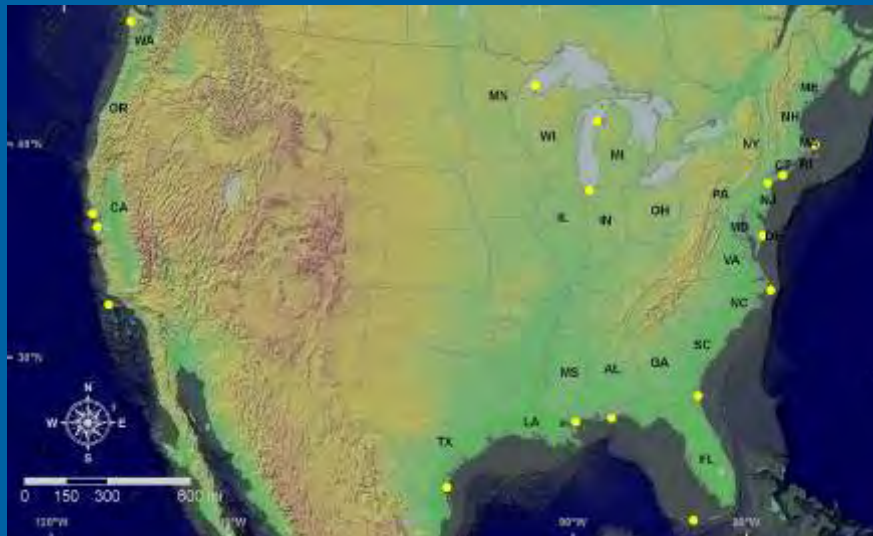
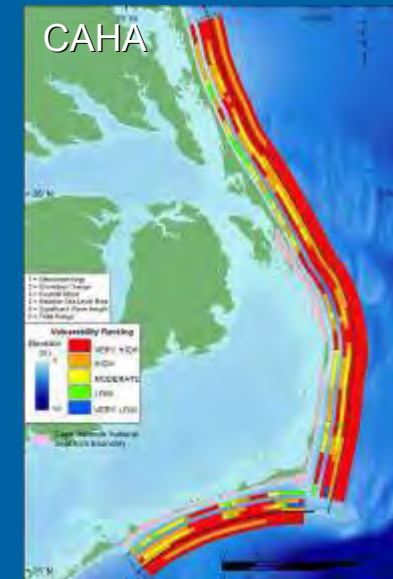
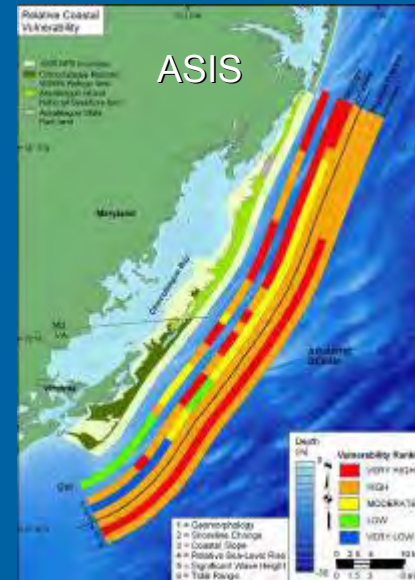
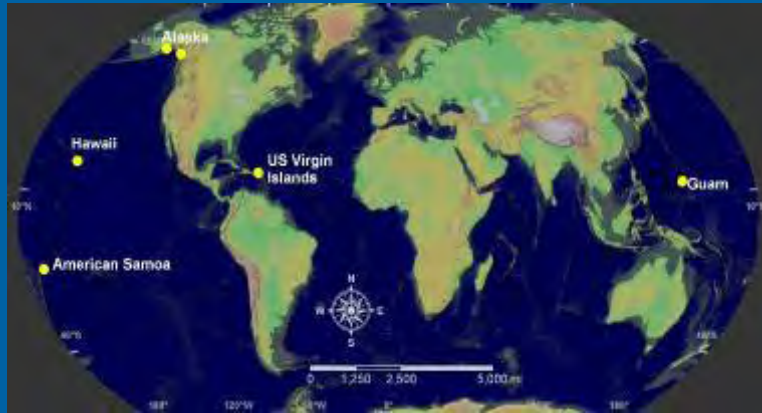
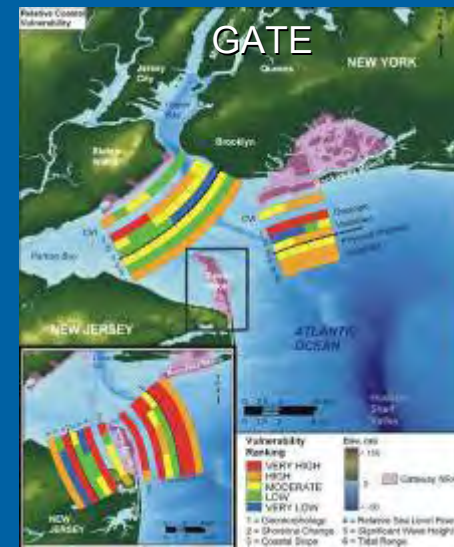
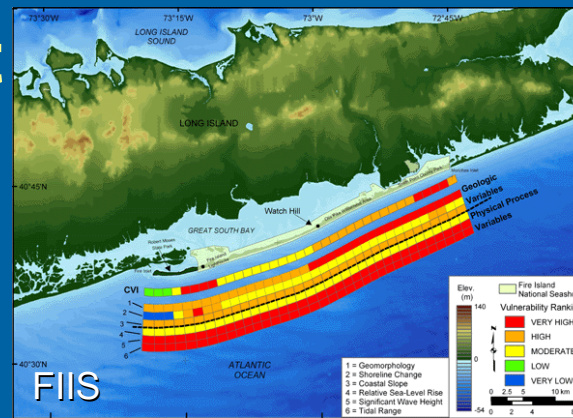
Once the data are complete in a GIS, an equation can be applied to calculate the CVI.

$$CVI = \sqrt[6]{(a \times b \times c \times d \times e \times f)}$$



# USGS-NPS CVI Project

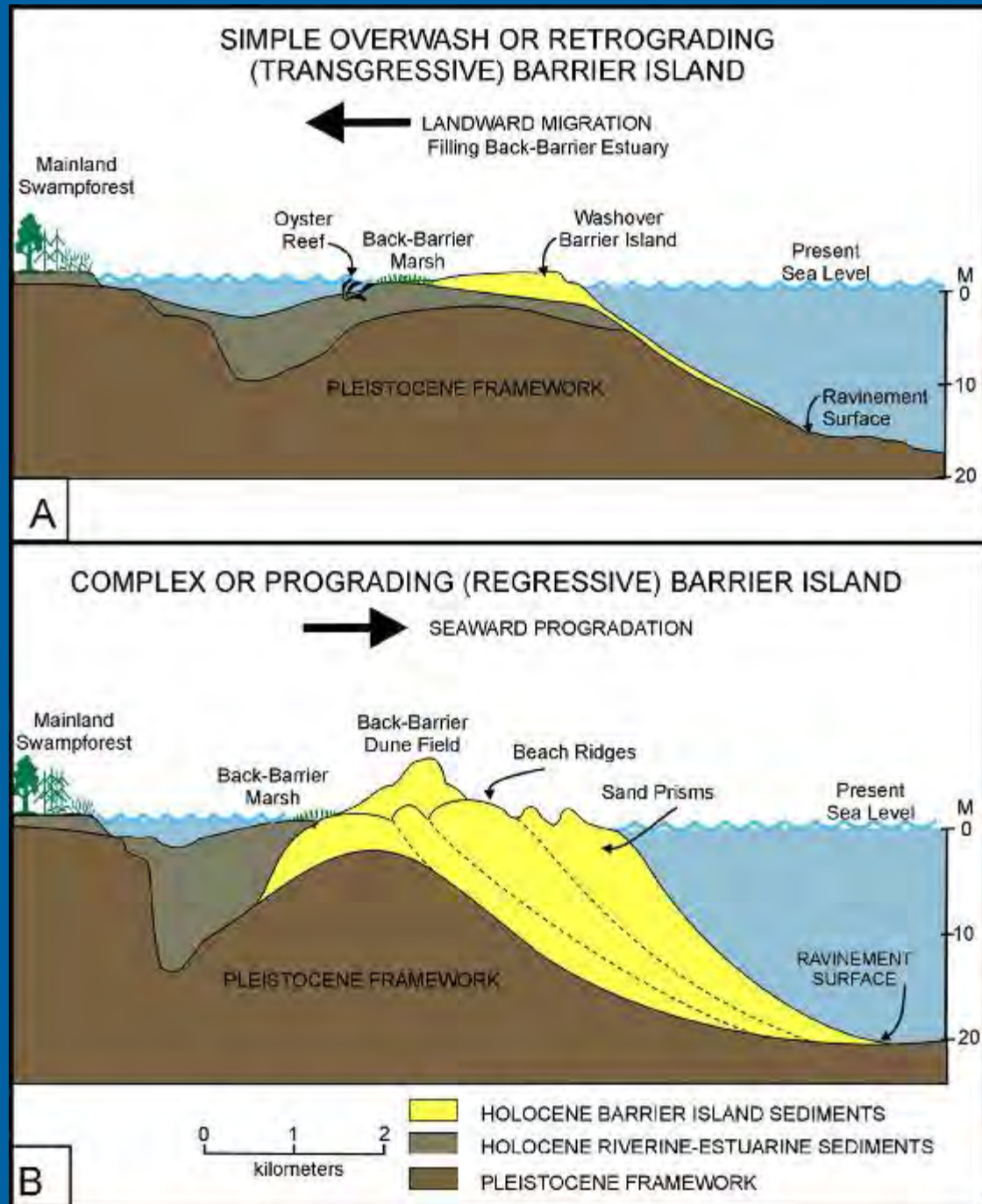
- Applied to 25 NPS units in U.S. and abroad
- Higher-resolution than national study (~1.5 km)



- 4 NPS units in SAP focus area

# Concern: “thresholds” of geomorphic evolution may be crossed

- Increasing evidence that SLR from 2000-100 yr BP was near zero
- Acceleration began at end of 19<sup>th</sup> century
- Consequences may be dire for U.S. barrier islands
- Barriers are ~50% of U.S. Coast; ~90+% of SAP focus area



# Assessing Potential Coastal Changes

- **Question 2 will focus on open-ocean coasts**
  - Present physical setting
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  - Potential impacts of SLR
- **Work will review and test extant models for predicting shoreline/coastal change**
- **Methodologies to be reviewed**
  - Erosion-rate extrapolation
  - Bruun Rule
  - Inundation
  - Index-ranking based on physical criteria
- **Review will guide research plan development**

## Question 5

What are the potential impacts of sea level rise on the coastal floodplains?

What issues would FEMA, coastal floodplain managers, and coastal communities face as sea level rises?

# Question 5 – A Qualitative Synthesis and Assessment

- **What are the potential impacts of sea level rise on the coastal floodplains?**
  - Generic discussion of floodplain characteristics and responses
  - What are the issues that FEMA must face if given a scenario of sea level rise?
  - How do we capture or map potential impacts of sea level rise on the coastal floodplains?
- **What is the current process for mapping and regulating our nation's floodplains?**
  - Overview of the National Flood Insurance Program
  - The FEMA floodplain mapping process
  - Review of “Effects of Sea Level Rise on the National Flood Insurance Program” FEMA, 1991.

## Question 6

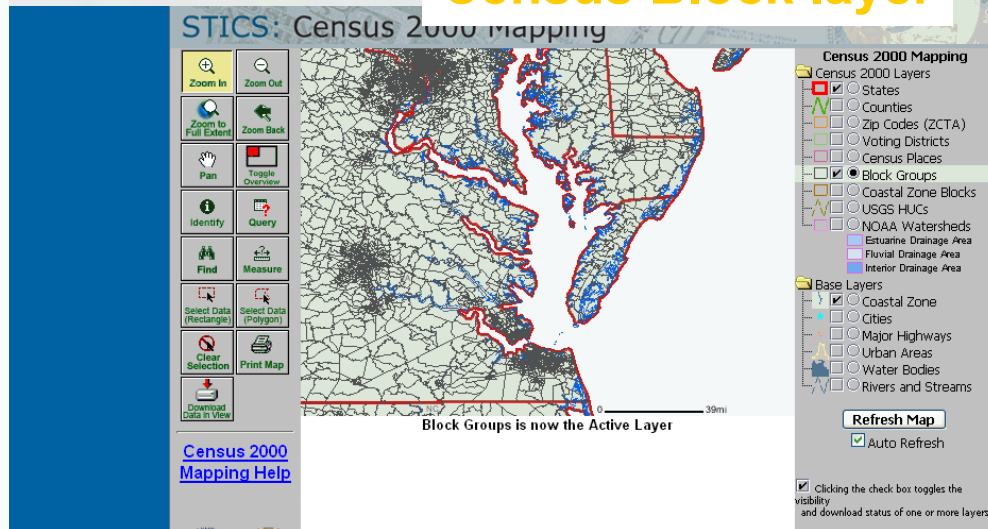
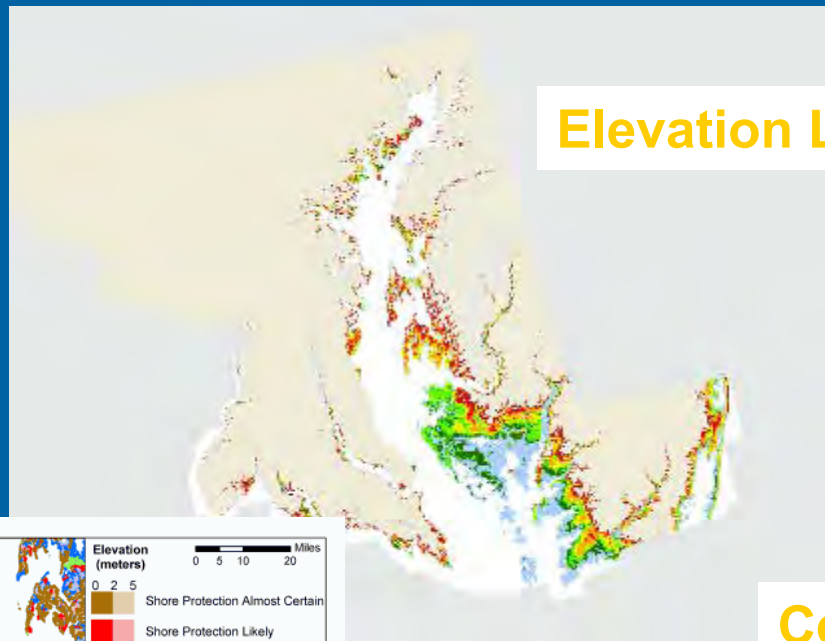
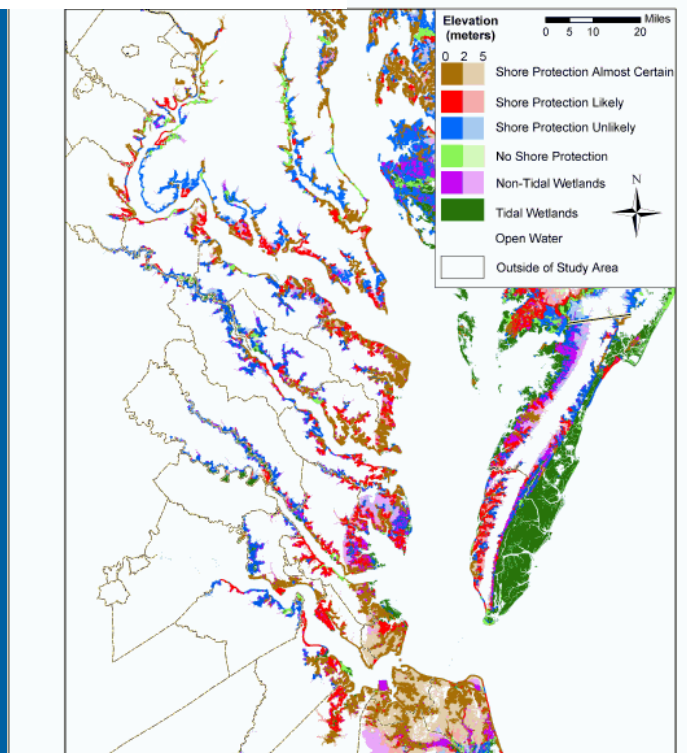
What are the population, infrastructure, economic activity, and value of property within the area potentially inundated by rising sea level given alternative levels of shore protection?

# Question 6 will be answered using a GIS analysis approach

Elevation Layer

Shore Protection Response layer

Census Block layer



# Question 6 – Approach

- **Classify the Census Blocks by Protection Category**
  - the percent of the block within a certain elevation,
  - the percent of the block within a shore protection category,
  - and the percent of a block that is both within an elevation and a shore protection category.
- **Determine Dominant Protection Category**
  - Exclude all open water, tidal wetlands, and nontidal wetlands.
  - Calculate the percentages of the blocks within each shore protection category (without regard to elevation)
  - Classify the blocks as follows, in the order, that is, each step only considers the blocks that have not already been classified.
    - More than 90% “certain”; More than 20% likely and more than 20% certain; More than 5% certain
    - More than 90% likely; More than 5% likely
    - More than 90% “unlikely”; More than 5% unlikely
    - More than 40% “no protection”
    - Other—everything else.



# How do we account for uncertainty?

- *Vertical (Elevation) Error*: High and low estimates (see question 1)
- *Horizontal Error*: Range of assumptions on how population is distributed within the block or tract
- *Census Error*: Negligible compared with vertical and horizontal error.

# Question 6 – Tables to be in the Report

- **Block Data.** Most likely, for each state, we will have a table of total population in the vulnerable area, by county, for 50, 100, and 200 cm SLR—with a range in each case based on the quality of topographic information and the range of methods.
- **Tract data.** We will also have a table of value of structures following the same format. That table might be split into several multi-county tables, however.
- **Land use:** We will have a statewide table that shows land use by shore protection category, for a one meter rise. We would include error bars as before.
- **Scenarios.** We will have a statewide table that shows land by shore protection category by sea level rise, with the same error bars.
- We will also have a table showing shore protection area by county, for a one meter rise. That table might be split, however, into a few multi-county tables that are spread throughout the chapter.

# **Case Study: Highlight NOAA Effort in North Carolina**

- **Study led and funded by NOAA National Centers for Coastal ocean Science**

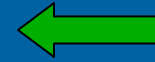
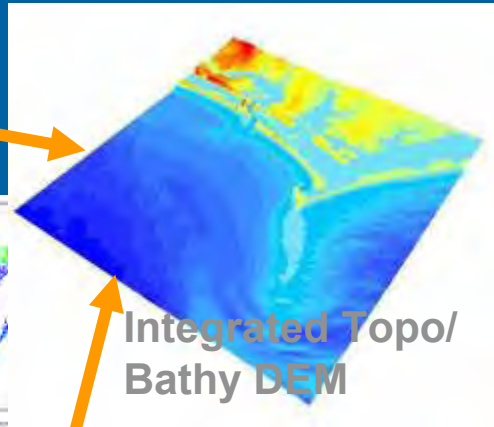
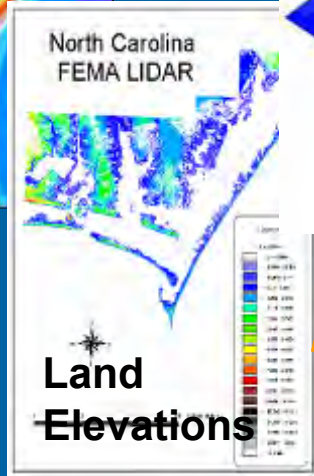
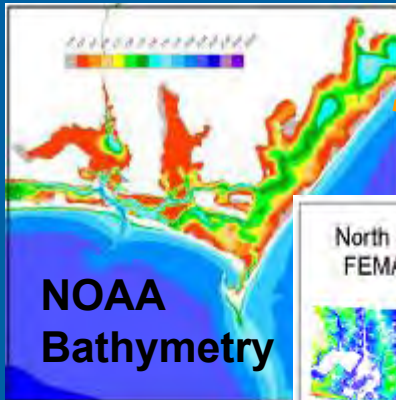
# **NOAA/NCCOS role is to develop ecological models**

- **Technical advisory committee**
- **Workshop of scientists and managers**
- **White paper**
- **Federal register notice for FY2004 funding-cooperative agreements**
- **Competitively funded: 3 proposals funded:**
  - **East Carolina University**
  - **UNC Institute of Marine Science (Beaufort Lab)**
  - **University of South Carolina/Vanderbilt**
- **CCSP 4.1 Authors are involved in this project as well (Donald Cahoon, USGS; Mark Brinson, East Carolina Univ.)**

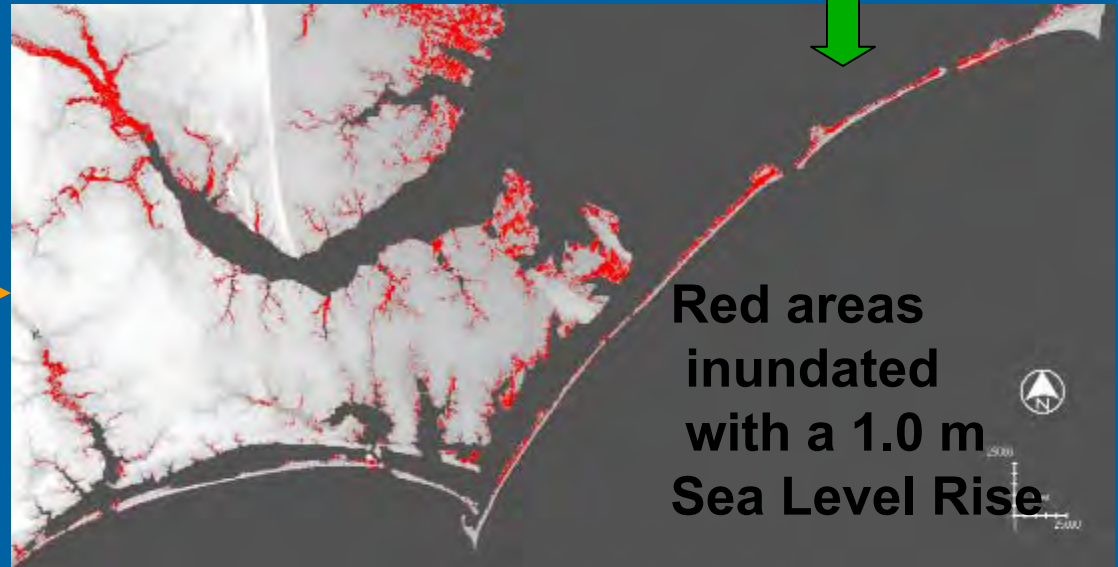
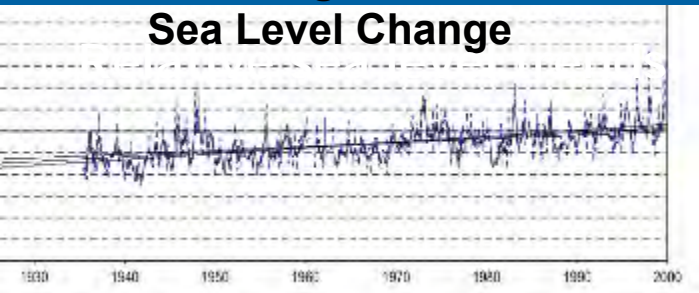
# CCSP 4.1 Featured Case Study: North Carolina Sea Level Rise Project

NOAA National Centers for Coastal Ocean Science

**Create Digital Elevation Model To Assess Sea Level Rise**

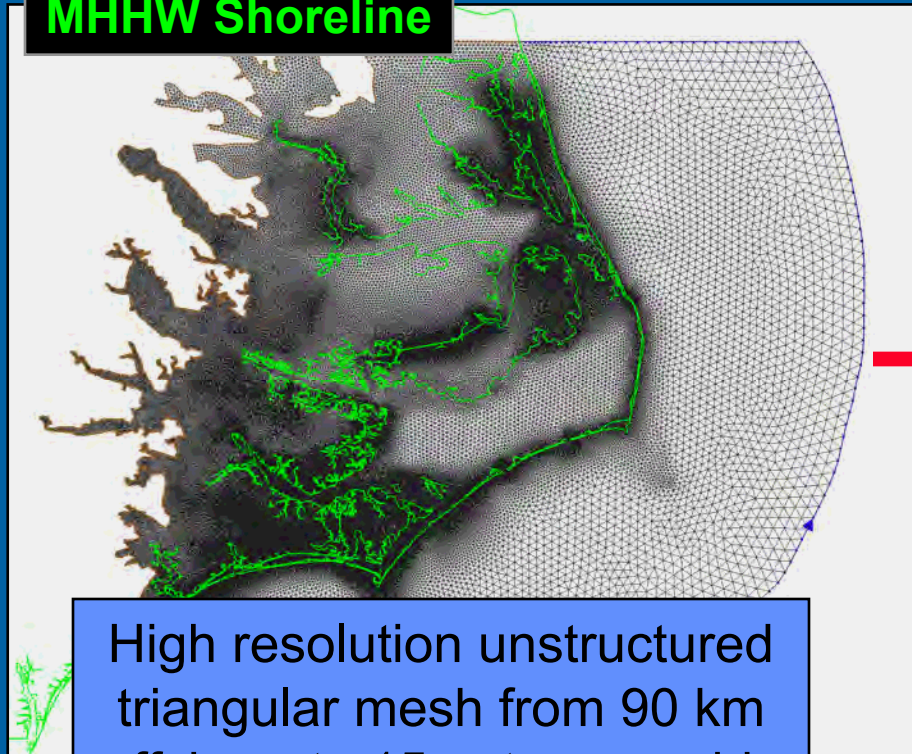


**Wilmington, NC  
Sea Level Change**

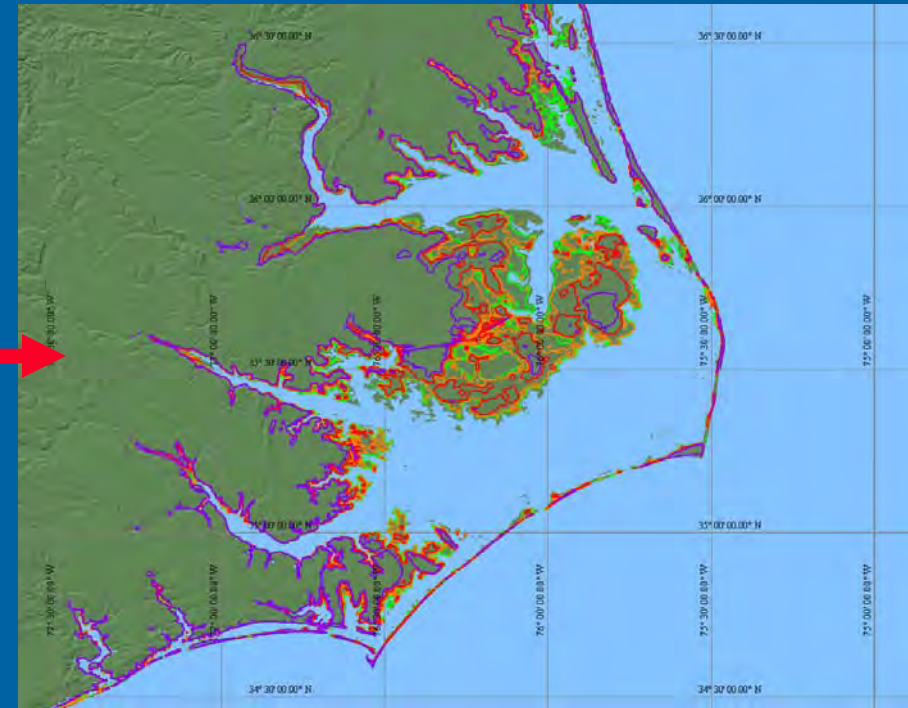


# NOAA - NC Coastal Flooding Model – Preliminary results

**MHW Shoreline**



High resolution unstructured triangular mesh from 90 km offshore to 15 m topographic contour

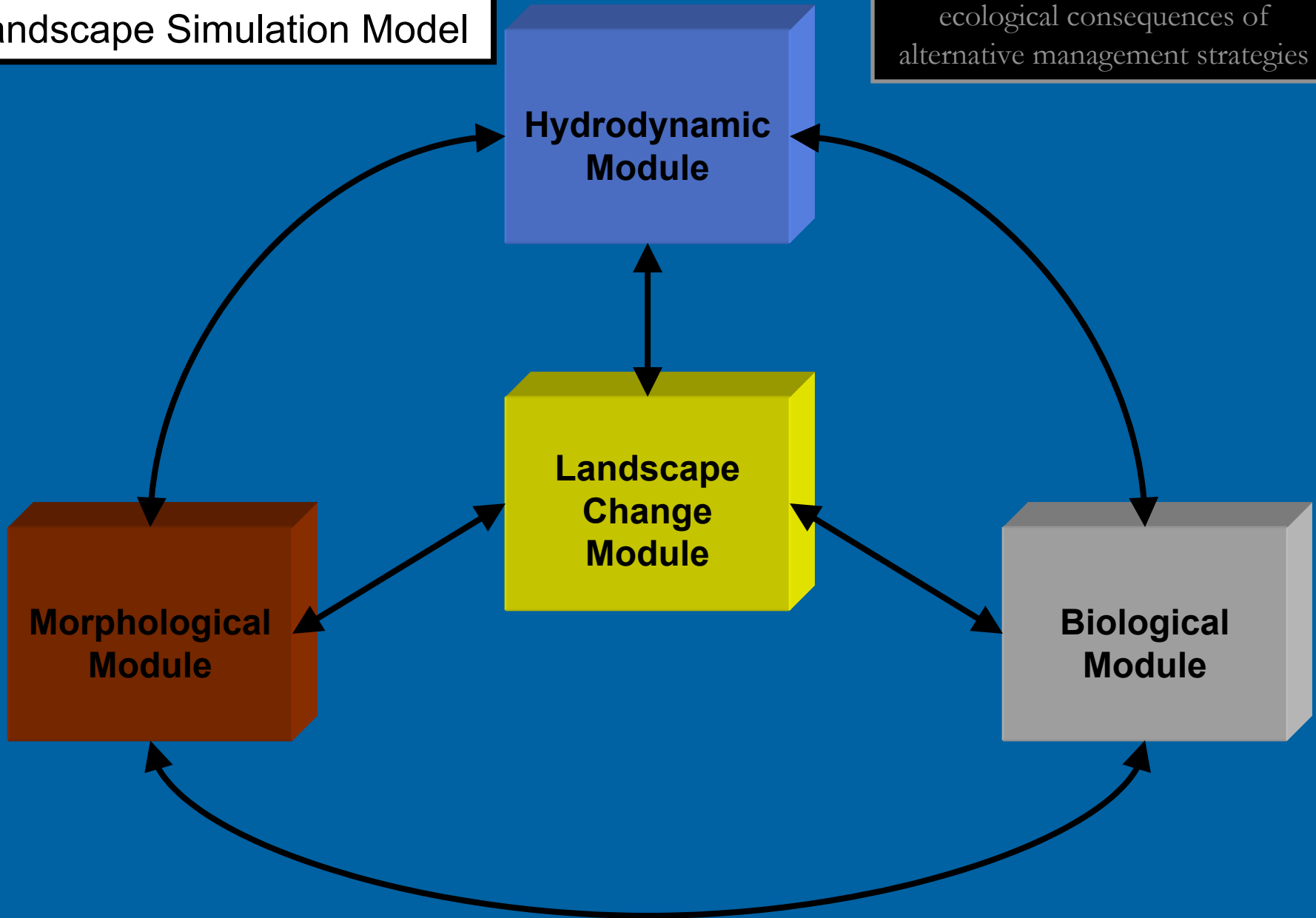


**Green – Present Day**  
**Orange – 25 cm SLR**  
**Red – 50 cm SLR**  
**Purple – 100 cm SLR**

# NOAA North Carolina Study

Purpose: provide ecosystem-scale forecasts that include the ecological consequences of alternative management strategies

Landscape Simulation Model



## Question 8

Which species depend on habitat that may be lost due to sea level rise given various levels of shore protection and other response options?



## To Answer Question 8, identify

- Vulnerable habitat (e.g. estuarine beaches, marsh, tidal forests, mudflats, SAV, bay islands)
- Species that depend on each type of habitat
  - literature review
  - interviews with local experts



**Places Examined by this Review**

Location		
Specific	General	
	n/a	Islands and Hummocks
		Nontidal Ecosystem
		Tidal Marsh
		Ocean Beach
		Estuarine Beach
		Mudflats
n/a		SAV & Other Shallow Water Habitat





# Question 7, 9, 10: Access and Adaptation

- Public's access to—and use of—the shore?
- Outcomes sufficiently sensitive to sea level rise to justify doing things differently
- Adaptation
  - What options are being considered:
    - environmental land management or regulation?
    - federal, state or local governments?
  - What are the institutional barriers?

“NOAA is responsible for setting up and hosting ... three [meetings] to be held at suitable locations in the mid-Atlantic regions to provide stakeholder input to the authors...”

# Synthesis and Assessment Product Stakeholder Meetings

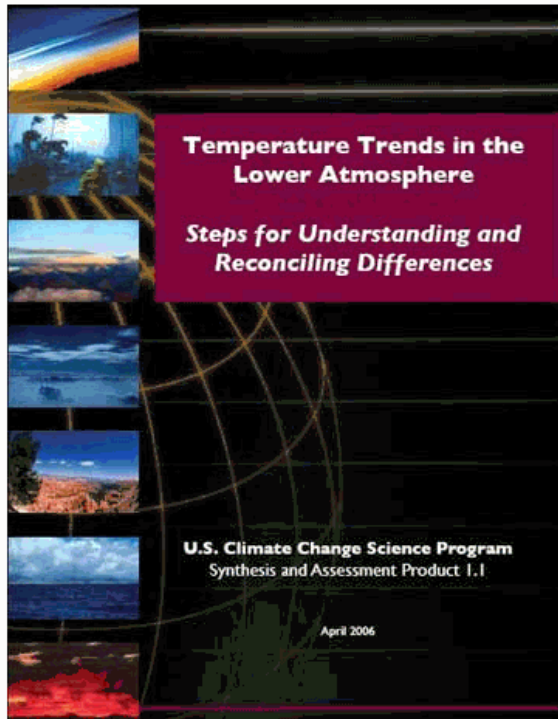
- **Purpose**
  - To present the stakeholder draft of the report to targeted regional stakeholders (coastal zone management community, coastal engineering community, etc..) and the general public
  - To discuss the report content among the contributing authors and the community, look for additional information and ideas to improve the product, and obtain feedback for the next draft
- **Schedule**
  - Three workshops- Tentative schedule:
    - Tyrell County, NC – late May 2007
    - Cambridge , MD – early June 2007
    - Red bank, NJ – mid June 2007
  - Each work shop is 3/4 day followed by a open public session and followed up with an author meeting

“NOAA is responsible for managing the compilation and production of the Final Report.”



# Example of “look and feel” of the Final CCSP Product

## Final Report, Synthesis and Assessment Product 1.1



Temperature Trends in the Lower Atmosphere - Understanding and Reconciling Differences

**EXECUTIVE SUMMARY**

**Convening Lead Author:** Tom M. L. Wigley, NSF/NCAR  
**Lead Authors:** V. Ramanammy, NOAA; J.R. Christy, Univ. of AL in Huntsville; J.R. Lanzante, NOAA; C.A. Mears, Remote Sensing Systems; B.D. Santer, DOE LLNL; C.K. Folland, U.K. Met Office

**Abstract**

Previously reported discrepancies between the amount of warming near the surface and higher in the atmosphere have been used to challenge the reliability of climate models and the reality of human-induced global warming. Specifically, surface data showed substantial global-average warming, while early versions of satellite and radiosonde data showed little or no warming above the surface. This significant discrepancy no longer exists because errors in the satellite and radiosonde data have been identified and corrected. New data sets have also been developed that do not show such discrepancies.

This Synthesis and Assessment Product is an important revision to the conclusions of earlier reports from the U.S. National Research Council and the Intergovernmental Panel on Climate Change. For recent decades, all current atmospheric data sets now show global-average warming that is similar to the surface warming. While these data are consistent with the results from climate models at the global scale, discrepancies in the tropics remain to be resolved. Nevertheless, the most recent observational and model evidence has increased confidence in our understanding of observed climatic changes and their causes.

**NEW RESULTS AND FINDINGS**

This Report is concerned with temperature changes in the atmosphere, differences in these changes at various levels in the atmosphere, and our understanding of the causes of these changes and differences. Considerable progress has been made since the production of reports by the NRC and the IPCC in 2000 and 2001. Data sets for the surface and from satellites and radiosondes (temperature sensors on weather balloons) have been extended and improved, and new satellite and radiosonde data sets have been developed<sup>1</sup>. Many new model simulations of the climate of the 20th century have been carried out using improved climate models<sup>2</sup> and better estimates of past forcing changes, and numerous new and updated comparisons between model and observed data have been performed. The present Report reviews this progress. A summary and explanation of the main results is presented first. Then, to address the issues in more detail, six questions that provide the basis for the six main chapters in this Synthesis and Assessment Report are posed and answered in Sections 1 through 5 below.

**The important new results presented in this Report include:**

**Global Average Temperature Results**

- For observations since the late 1950s, the start of the study period for this Report, the most recent versions of all available data sets show that both the surface and troposphere have warmed, while the stratosphere has cooled<sup>3</sup>. These changes are in accord with our understanding of the effects of radiative forcing agents<sup>4</sup> and with the results from model simulations.

<sup>1</sup> For details of new observed data see Table 3.1 in Chapter 3.  
<sup>2</sup> For details of new models and model simulations see Chapter 5 and <http://www.pcm8.llnl.gov/pcm8model.documentation>.  
<sup>3</sup> We use the words “warming” and “cooling” here to refer to temperature increases or decreases, as is common usage. Technically, these words refer to changes in heat content, which may occur through changes in either the moisture content and/or the temperature of the atmosphere. When we say that the atmosphere has warmed (or cooled) over a given period, this means that there has been an overall positive (or negative) temperature change based on a linear trend analysis. For more on the use of linear trends, including a discussion of their strengths and weaknesses, see Appendix A.  
<sup>4</sup> The main natural forcing agents are changes in solar output and the effects of explosive volcanic eruptions. The main human-

# Use of NOAA Resources for Getting CCSP SAP Reports Published

- **Editing Services**
- **Graphics**
- **Layout/Design**
- **Password Protected Development Web Site**
- **Printing**

# SAP Product Development Web Site

- 3.3 Home page
- Link to the main CCSP home page

NOAA Satellite and Information Service  
National Environmental Satellite, Data, and Information Service (NESDIS)

National Climatic Data Center  
U.S. Department of Commerce

DOC > NOAA > NESDIS > NCDC Search Field: Search NCDC

## Welcome to CCSP Synthesis Product 3.3

*Weather & Climate Extremes in a Changing Climate*  
[ClimateScience.gov](http://ClimateScience.gov)

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**Purpose of Website:** To make available for comment by the writing teams, the various versions of material that will be used to prepare the assessment report for CCSP product 3.3. These materials may include chapter outlines, chapter content, graphics, and other material (i.e., [related articles](#)) deemed appropriate for dissemination to the writing teams. All authors will have access to all materials on this site. A general username and password will be provided for website access.

The Chapter Lead Author (CLA) will be solely responsible for changes in the text and uploading new versions of chapter text. Microsoft Word Documents are to be submitted in the [upload section](#) of the web site. The CLA will insert line numbers in the Word Documents. The CLA will determine if he/she wants to indicate "strikeouts" and "insertions" explicitly in the revised text. A version control number will be provided by the CLA for document tracking. All versions of the documents will be stored and be available on the web site.

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<http://mesohigh.nodc.noaa.gov/oa/ccsp/index.php>

Summarizing...

# Summary: Answers to Key Questions

	Mapping/Quantify		Qualitative	
Question	Regional	Example	Regional	Example or Generic
Coastal Elevation	✓			
Erosion		✓	✓	
Wetlands	✓			
Shoreline Plan	✓			

# Summary: Supplemental Questions

	Mapping/Quantify		Qualitative	
Question	Regional	Example	Regional	Example or Generic
Floodplain				✓
Population	✓	✓		
Environment			✓	✓
Adaptation				✓

# Report Outline

- Introduction
- Background/Nationwide Context (30 p)
- Featured Studies (30 p)
- Answers at Regional Scale (30 p)
  - Question 1
  - Question 2...
  - Question 10
- Regional Discussion (100 p)
  - NY
  - NJ ...
  - NC

# Contributing Authors

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Sciences Consortium

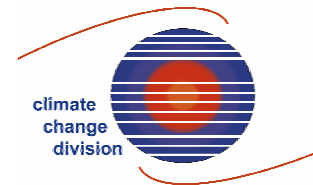
Robb Wright, NOAA

Jue Wang, Pyramid Systems Incorporated

**Attachment 3: Presentation Describing Information Quality  
Requirements and Procedures; Karen Scott**



CCSP SAP 4.1  
Coastal Elevations and Sensitivity to Sea Level Rise



# Outline of Review Process for CESLAC

*Presented by*

Karen Scott

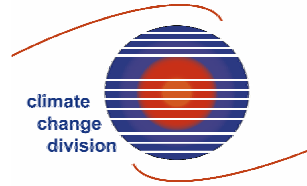
Climate Science and Impacts Branch

Climate Change Division

January 29, 2007



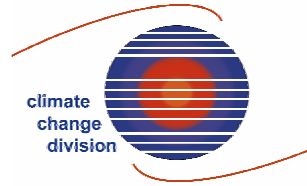
# Peer Review Guidelines



- OMB Information Quality Bulletin for Peer Review, December 2004
- EPA Peer Review Guidelines
  - Third Edition of Handbook, January 2006
  - Peer Review Coordinator for EPA Climate Change Division in Director's Office
  - Peer Review Leader in Climate Science and Impacts Branch

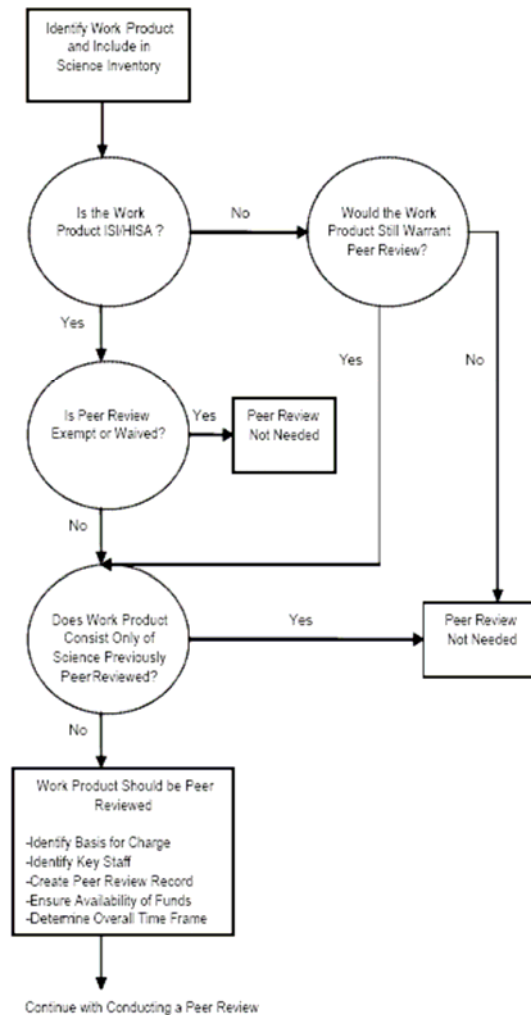


# Outline of Peer Review Process



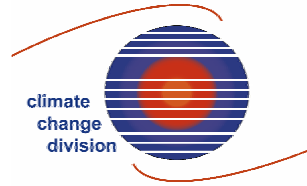
- Planning Peer Review
  - External review of background documents in addition to final report
  - Selection of Contracting Officer's Representative & Contractor
  - Contractor Work Plans
    - Background documents
    - Formal Peer Review of Final Report
  
- Conducting Peer Review
  - Review of Background Documents
    - Progress so far
  
- Completing Peer Review
  - Next Steps

# Planning Peer Review





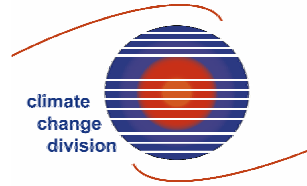
# Planning Peer Review



- External review of background documents in addition to final report (Planning begun in August '06)
  - Approximately 30 background, supporting, technical documents from EPA not previously peer reviewed
  - Final report to contain highly influential scientific information



# Planning Peer Review

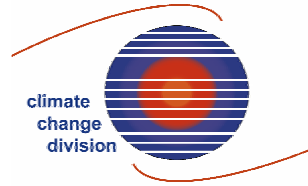


- Selection of COR/Contractor (Aug., Sep. '06)
  - Karen Scott, EPA Peer Review Leader and Contracting Officer's Representative
    - experienced COR
    - familiar with but not involved in sea level rise work at EPA
  - Perrin Quarles Associates (PQA), contractor
    - experienced in peer review coordination
    - no relationship with writing of report or background docs
    - to coordinate multitude of admin functions





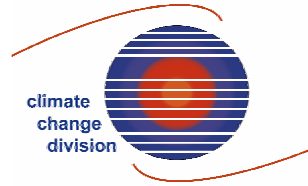
# PQA's Work Plan, Stage 1



- Review of Background Documents
  - Coordinate the identification of 2-3 technical expert reviewers for every document
  - Develop charge for reviewers in coordination with EPA COR
  - Arrange receipt of documents from EPA; distribute to reviewers
  - Collect and record into database all reviewer comments
  - Assure complete response to all comments
  - Administer any necessary costs, payments



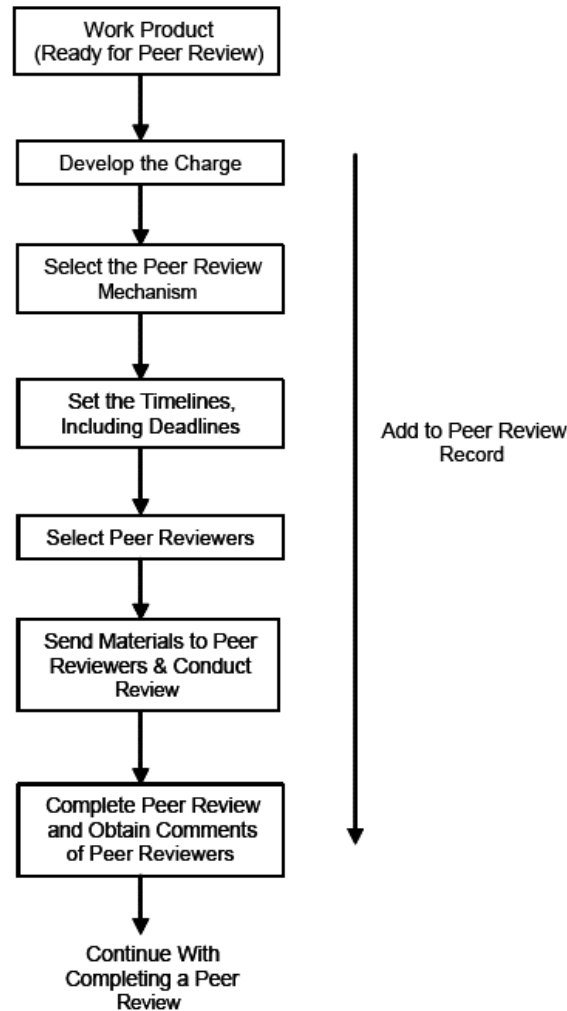
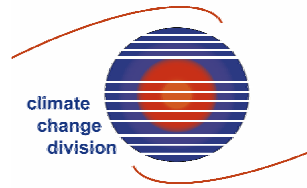
# PQA's work plan, Stage 2



- Formal Peer Review of Final Report
  - Coordinate identification of up to 21 highly qualified, independent technical experts for peer review panel (3 for each of 7 substantive issues in report)
  - Conduct at least 3 panel meetings: initial, middle and final
  - Develop charge for reviewers in coordination with EPA COR
  - Distribute final report to reviewers
  - Collect and record comments into database
  - Assure complete response to all comments
  - Administer payment of all associated costs for panel

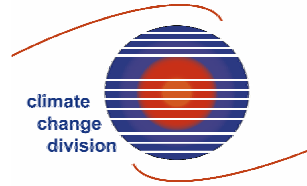


# Conducting Peer Review



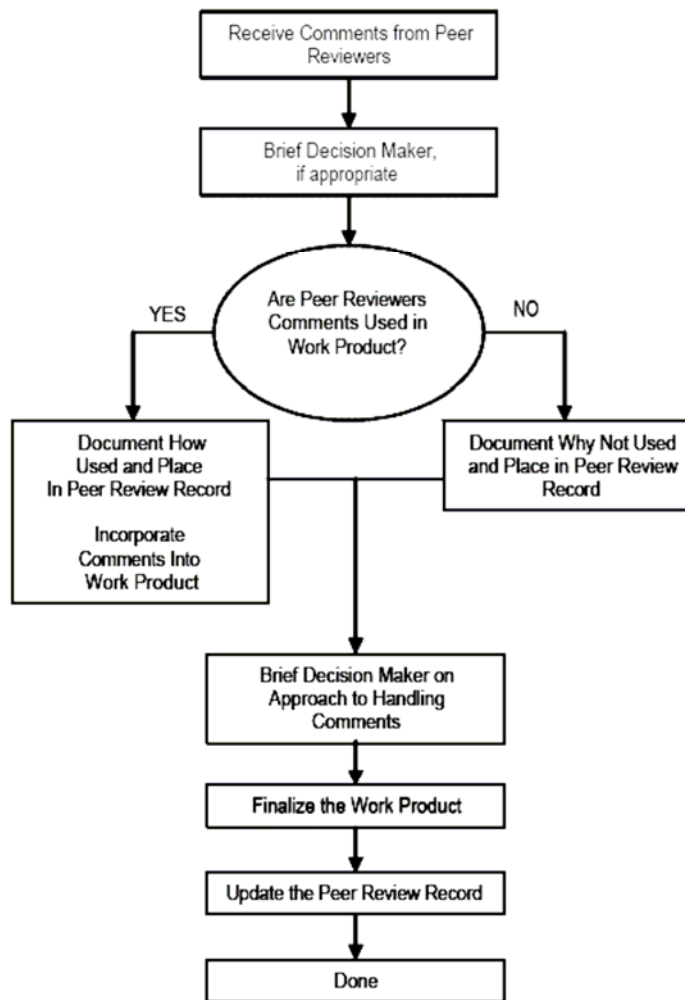


# Conducting Review of Background Documents



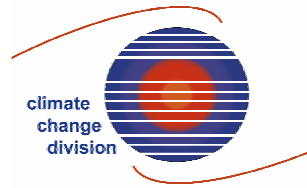
- PQA's Progress So Far
  - Coordinated the identification of 2-3 reviewers for every document (Dec. 06 - Jan. 07)
  - Developed charge for reviewers in coordination with EPA COR (Jan. 07)
  - Arranged receipt of documents from EPA; distributed to reviewers (Dec. 06 - Jan. 07)

# Completing Peer Review





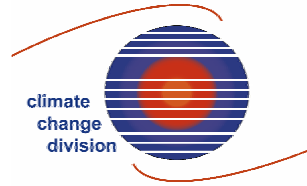
# Completing Review of Background Documents



- PQA's Next Steps
  - Collect and record into database all reviewer comments (Feb. - Mar. 07)
  - Assure complete response to all comments (Mar. - Apr. 07)
  - Administer any necessary costs, payments (Apr. - May 07)



# Summary

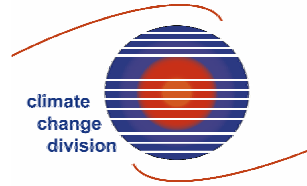


## Peer Review of CCSP SAP 4.1

- 2 stages or levels of review
  - Background documents
  - Final report
- Background document review well underway - to be completed April 2007
- Formal peer review of final report to begin approximately July 1, 2007



# Contacts



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