MIAMI-DADE COUNTY
FINAL OFFICIAL MINUTES
Miami-Dade Sea Level Rise Task Force

Overtown Transit Village North
701 N.W. 1st Court
2nd Floor Training Room
Miami, Florida 33136

April 4, 2014
As Advertised

Harvey Ruvin, Clerk
Board of County Commissioners

Christopher Agrippa, Director
Clerk of the Board Division

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CLERK'S SUMMARY AND OFFICIAL MINUTES
MIAMI-DADE COUNTY SEA LEVEL RISE TASK FORCE
APRIL 4, 2014

The Miami-Dade County Sea Level Rise Task Force (Task Force) convened a meeting on Friday, April 4, 2014, at the Overtown Transit Village North, 701 N.W. 1st Court, Miami, Florida, at 1:00 p.m. Present were Honorable Clerk of Courts Harvey Ruvin, Task Force Chairman; and members Dr. David Enfield, Ms. Sara Fain, and Mr. James Murley; (Mr. Willard T. Fair, Mr. Arsenio Milian, and Mr. Jorge Gonzales were absent).

In addition to the Task Force members, the following staff members were present: Ms. Nichole Hefty, Chief, Office of Sustainability, Planning Division, Miami-Dade Department of Regulatory and Economic Resources (RER); Assistant County Attorney Christopher Angell; Ms. Elizabeth Soto, Executive Assistant, Clerk of Courts; and Deputy Clerk Maryse Fontus.

I. Welcome and Introductions

Chairman Ruvin called the meeting to order, noting the Task Force was continuing the process of bringing presenters to provide the necessary information for its report. Chairman Ruvin said that he had asked Dr. David Enfield, an oceanographer, and a member of the Task Force, to review the Intergovernmental Panel on Climate Change (IPCC) sea level rise projections document and to present this document to the Task Force.

II. Dr. David Enfield, Oceanographer, University of Miami, "Overview of IPCC-ARS Sea Level Rise Projections and the Implications"

Dr. Enfield said that he would present the Working Group I contribution to the IPCC's Fifth Assessment Report, entitled "Climate Change 2013: The Physical Science Basis". He noted Chapter 13 of the report considered new evidence of climate change based on independent scientific analysis.

He stated that the two terms that were used consistently in the report were "likely" and "very likely". Dr. Enfield explained that the IPCC had two dozen computer models into which they fed different scenarios of carbon dioxide mitigation. He noted for each of these scenarios, there were two dozen outcomes, which defined the probability distribution: "likely" meant the middle two thirds of the probability, from 17 to 87 percentile; "very likely" meant from 5 to 95 percentile.

Dr. Enfield presented a slide depicting the processes affecting global and regional sea level rise. He said that the processes affecting global sea level rise included warmth of ocean water column, negative mass balance of ice sheets, runoff from melting mountain glaciers, and changes in ground water storage. Dr. Enfield indicated that the processes affecting the regional sea level rise included changes in ocean circulation, and subsidence or uplift of the land. He noted Alaska was rising, with an overall decrease in its sea level; conversely, New Orleans was sinking, thus resulting in an increase in its sea level significantly greater than the global average. However, said Dr. Enfield, there is a wild card, the possibility of ice sheet catastrophes, or collapses, in Antarctica. He noted Greenland had experienced record summer ice melts over the past decade.

Dr. Enfield noted Florida was geologically stable, and any regional departure from the global sea level rise would probably come from the changes in ocean circulation. He explained that because of the rotation of the earth the movement of the Gulf Stream had to be offset by a slope in the sea surface from the Bahamas to Miami. He said that should the Gulf Stream circulation decrease by 25 percent over the century, as the climate models suggest, sea levels would increase regionally by an additional 10-20 centimeters, or up to half a foot given the sea level slope.

Dr. Enfield presented a slide depicting sea level rise scenarios for South Florida. He explained that these were projections adopted by the South Florida Climate Change Compact (Compact), noting they were based on the 2010 sea level projection curves from the U.S. Army Corps of Engineers.

Dr. Enfield presented a slide depicting the most recent government projections of global sea level rise based on the National Oceanic and

Atmospheric Association's (NOAA) assessment. He explained that there was the linear historical projection curve; the yellow curve which assumed that there would be ocean warming but no contribution from the ice sheets and the glaciers; and the intermediate and high curves, which support a sea level rise of 4 to 6 and a half feet by 2100.

Dr. Enfield presented a slide depicting sea level rise projections for Miami-Dade County, which assumed the rate of sea level rise in the Compact's projections. He noted initially a great deal of land is inundated, mostly in the low-lying region near Homestead; then it subsides slightly because the inundation encounters the higher elevations in the County; and finally, the larger inundation rate resumes.

Dr. Enfield presented the following sea level rise planning projections: by 2030 there would be a third of a foot; by 2050 there would be a foot; by 2060 there would close to 2 feet; and by 2100 there would be between 3 and 4 feet.

Dr. Enfield presented inundation maps depicting Miami-Dade with the current sea level; then the County with one foot of sea level rise; and finally, illustrating that by 2 or 3 feet of sea level rise Turkey Point would be an island. He presented a slide depicting the present and future conditions of the Miami Beach area; a slide depicting Key Biscayne with 6 feet of sea level rise; and a slide depicting Virginia Key, the site of the water treatment plant. He noted although the plant was elevated, if storm surge was added to sea level rise, there could be potential problems.

Dr. Enfield noted when comparing the different projections – the IPCC, NOAA, and the U.S. Army Corps of Engineers – the IPCC projections were the lowest, at 1 to 3 feet by the end of the century; the NOAA projections were the highest, at 4 to 6 and a half feet; and the U.S. Army Corps of Engineers were intermediate, at approximately 2 to 5 feet by 2100.

Dr. Enfield said that according to the IPCC these discrepancies existed because the other projections were based on semi-empirical methods, whereas the IPCC used process-based projections. He explained that the IPCC calculated sea level rise by making the computer models emulate all of the processes, including the increase in the volume of the ocean, as well

as the changes to the ice sheets, and glaciers. On the other hand, said Dr. Enfield, the semi-empirical methods simply made projections by extrapolating the historical relationship between global temperature and sea level rise; the IPCC indicated that it had low confidence in the semi-empirical projections. However, he pointed out, the IPCC projections were not completely accurate because there were many processes in Greenland that could not be put into models. Dr. Enfield indicated that the Compact had adopted the intermediate projections.

Dr. Enfield noted the wild card was characterized as a collapse of the ice sheets in Antarctica; conversely, it was not believed that Greenland would be subject to a collapse of that kind. He explained what was meant by collapse, noting it would be a relatively gradual process. He said that the glaciers in Antarctica had a floating tongue and a grounding line where the tongue met the terrain; and that landward of the grounding line there was a dip in the terrain. He stated that if the ice were to retreat landward of that ridge, the rate of ice flow out to the ocean would increase. Dr. Enfield said that should this happen, the rate of contribution to sea level rise would increase due to a positive feedback, and this would have the potential of adding one foot to the current projections.

Dr. Enfield said that a census was conducted of 90 experts who had publications on the subject. He noted the census identified a probability distribution, and found that in the optimistic scenario, sea level rise was projected to reach 2 to 3 feet by 2100; whereas the pessimistic scenario projected approximately 5 feet of sea level rise.

Dr. Enfield noted there was another source of information that could be used to predict the rate of sea level rise by the end of the century. He said that it was possible to study everything that had occurred in the last 100,000 years, with special attention given to the last inter-glacial, because at that time the amount of ice was similar to the amount we have today. However, he said that the conditions do not exist today for the world to experience the very rapid rates of sea level rise that occurred when the last ice age ended.

Chairman Ruvin said he believed that the recent IPCC report would discuss sea level rise specifically, but it appeared that there was no chapter devoted to the subject.

Dr. Enfield noted sea level rise was embedded in the report, but it was necessary to read it very carefully to find the sections where sea level rise was mentioned.

Ms. Fain said she believed that the information presented by Dr. Enfield could be used in two ways: it would be useful for the Task Force's report because it identified the threats; and it seemed that many organizations were projecting 3 feet of sea level rise by the end of the century.

Pursuant to Dr. Enfield's comment that the Compact had not updated the projection curves, Ms. Fain pointed out that although it was necessary to constantly consider new data, and update the projections, it was also imperative to take action.

In response to a question by Captain Dan Kipnis, a member of the public, on changes to the circulation of the Gulf Stream by the end of the century, Dr. Enfield noted the models demonstrated that the total circulation of the North Atlantic, of which the Gulf Stream was a component, would decrease by 25 percent by the end of the century.

A discussion ensued between Dr. Enfield and members of the public on the impact of the Gulf Stream circulation on sea level rise.

Dr. Enfield said that the Gulf Stream circulation was currently being measured using an abandoned telephone cable between the Bahamas and Miami. He noted Light Detection and Ranging (LIDAR) technology was also being used. However, Dr. Enfield pointed out, the few inches that would be added to the level of the sea due to the changes in the Gulf Stream circulation were not significant enough to affect infrastructure planning; as a result, it was not necessary to invest a significant amount of money to monitor the Gulf Stream.

Dr. Douglas Yoder, Deputy Director, Miami-Dade Water and Sewer Department, noted planners were using an adaptive management

approach, which was based on the premise that by monitoring actions going forward, as the analytical ability to forecast improved, there would be greater certainty. He asked whether it was possible to monitor local actions regarding sea level rise to make more reliable forecasts, which could form the basis for infrastructure decisions.

Dr. Enfield said he believed that the projections would improve over time, and that there would be tremendous advances in the next ten years.

Ms. Fain cautioned against letting the perfect get in the way of the good. She pointed out that presenters had told the Task Force that no matter what was done, the level of the sea would rise, whether by 2.7 feet or 3 feet. Therefore, Ms. Fain suggested that an adaptation plan be adopted, while continuing to perfect the projections.

Dr. Enfield said he agreed with Ms. Fain's comments, noting he would suggest an adaptive adaptation methodology, similar to the design used in a lift-slab building in which the ability to add additional floors in the future is built into the original design. He noted this was a good analogy for the infrastructure adaptation that would be necessary to address sea level rise, and pointed out that the Water Management District was already thinking along those terms.

Ms. Fain noted if the government envisioned creating new regulations to address sea level rise, it would be necessary to have specific projections. She emphasized that it was important to plan for infrastructure adaptation, while seeking to obtain more specific projections.

Chairman Ruvin noted at some point the Task Force members would have to adopt a sea level rise range for planning purposes.

Mr. Murley said that the engineers responsible to build transportation infrastructure had projections, but did not trust their models beyond five years. He pointed out that Miami-Dade County updates its long-range transportation plans every five years. However, he noted, the government structures dealing with this issue were inelastic.

Chairman Ruvin noted the presence of Ms. Cindy Lerner, Mayor of Pinecrest, and President of the Miami-Dade League of Cities.

III. Mr. Glenn Landers, Civil Engineer, U.S. Army Corps of Engineers, Planning and Policy Division, Jacksonville, Florida

Mr. Landers noted he had worked for the U.S. Army Corps of Engineers (USACE) for over 35 years. He indicated that he had experience on projects involving large dams throughout the country, and had been working on the restoration of the Everglades since 1991. He said that he was on the U.S. Army Corps of Engineers' national team for sea level change.

Mr. Landers said that he planned to cover the following topics in his presentation:

- Current USACE and NOAA guidance on sea level change projections;
- Florida sea level change trends and projections;
- Sea level change trends beyond 2100;
- Sea level change concerns in Florida – current and future; direct and indirect;
- Systems approach to adaptation; and
- Building a more resilient future with public/private partnerships.

Mr. Landers explained that the U.S. Army Corps of Engineers was created during the revolutionary war by George Washington, and carries out civil works in the following areas: navigation, hydropower, reservoir regulation, coastal storm damage reduction, flood damage reduction, ecosystem restoration, emergency response, recreation, and regulatory.

Mr. Landers presented a slide detailing the following climate change concerns for Florida:

- Sea level rise
    - Salinity changes in coastal bays, plus tidally influenced creeks and rivers

- Shoreline retreat with natural habitat changes/losses
- Increasing flood frequency and depth in coastal areas
- Saltwater intrusion in water supply wells, or higher canal stages and flood risks
- Uncertainties and risks in rate and depth of sea level rise

➢ Warmer temperatures
- Evaporation losses up, water supply down
- Stresses on plant, animal, and marine ecosystems
- Changes in growing season and migratory patterns
- Changes in water quality

➢ Hydrologic pattern changes
Potential for less frequent and more intense rain events
Potential increased tropical storm intensity or frequency

Mr. Landers presented a slide depicting Florida through time, noting 120,000 years ago, sea levels were 20 feet higher than today, and Florida was much smaller; on the other hand, 18,000 years ago, sea levels were 420 feet lower than today, and Florida was much bigger than it is today.

Mr. Landers presented a slide depicting the rates of sea level rise since the last glacial maximum. He said that Florida was in the 2 millimeters a year range, and had been there for several years; but when the big glaciers were melting, the rates were as high as 40 millimeters, and at some point in history, there were sustained rates of 20 millimeters per year for centuries.

Mr. Landers presented a slide depicting the range of peer-reviewed estimates of global sea level change by 2100. He noted the 2013 IPCC report projected half a meter to 1.5 meters by 2100, whereas 2012 NOAA guidance projected up to 2 meters by 2100, which was recognized as the credible upper limit for sea level change projections by 2100.

Mr. Landers said that USACE had guidance on incorporating sea level change considerations, which applied to all phases of USACE civil works activities as far inland as the extent of new tidal influence. He explained that three estimates of future sea level change must be calculated for all civil works projects within the extent of estimated tidal influence: extrapolated historic trend; modified NRC Curve I (half a meter); and modified NRC Curve III (a meter and a half). Mr. Landers said that the

guidance suggested that staff consider the service life of their projects (100 years).

Mr. Landers presented a slide depicting historic rates of sea level change along Florida's Atlantic Coast, noting they were fairly constant ranging from 2.2 to 2.3 millimeters per year.

Mr. Landers presented slides depicting the projections for sea level change in Key West, and the relative sea level change scenarios for Key West. He said that USACE guidance allows for consideration of up to 2 meters of sea level rise by 2100 for areas that are very vulnerable to potential future sea level change and where adaptation would require a long lead time such as South Florida.

Mr. Landers noted USACE did not have any sea level change projections beyond 2100, but anticipated that it was likely to continue to accelerate. He said that for the very long term the sea level change may total 2.3 meters for each degree Celsius of global warming. Mr. Landers advised that the built environment should be protected as long as economically feasible, and the coastal ecosystems would need suitable space for sea level adaptation. He noted buildings and developed land would depreciate as sea level rise risks increase; therefore, it would be wise to prioritize long-term risk reduction, and to develop exit strategies to support timely voluntary action.

Mr. Landers presented a slide depicting sea level rise concerns in Florida, noting they involved primarily flood risks and water supply concerns. He said that shallow wells were the primary source of drinking water in South Florida communities, and continued sea level rise would cause saltwater intrusion into wells and create a need for new freshwater sources. On the other hand, noted Mr. Landers, protecting water supply wells with higher canal stages would increase flooding in many low elevation communities.

Mr. Landers presented slides depicting sea level rise in South Florida, noting there had been a little less than 1 foot during the past century measured at Key West; a 2 foot rise would have significant effects; and a 4-5 foot rise would have dramatic impacts.

Mr. Landers discussed the increasing flood risks from long-term sea level change. He noted risk was a measure of the probability and consequence of uncertain future events, and included the potential for gain (opportunities), as well as the exposure to losses (hazards).

Mr. Landers explained that USACE conducted a three-pronged risk analysis, including risk assessment, risk management, and risk communication. He discussed the United Kingdom's climate adaptation approaches, including the precautionary versus managed adaptive. Mr. Landers explained that the precautionary approach involved a single intervention at the start to manage the risk over the entire life of a project or building; whereas the managed adaptive approach involved several interventions over time to manage the risk.

Mr. Landers discussed the systems approach to adaptation: short-term for what was already built; and long-term for what would be built over the next 50 years to reduce future risks. He said that it was important to recognize the need for interagency collaboration and shared planning; address the combined needs of human and natural systems; shift from projects optimized for static future conditions to robust and adaptable systems; encourage public investment in framework infrastructure in low-risk areas; provide incentives for private development in low-risk areas; and implement pre-storm relocation agreements.

Mr. Landers pointed out that in the 1960s and 1970s California upgraded its building codes for earthquakes, noting perhaps this should be done for sea level rise.

Mr. Landers highlighted the following points from his presentation:

- USACE sea level rise projections are based on guidance from the National Research Council, and include local uplift or subsidence. They do not address wave and storm surge frequency;
- Sea level rise permanently increases coastal flood frequency;
- Leading indicators of sea level rise, such as the reduction in polar ice caps, and the rapid increases in the rate of glacier melting worldwide forecast significant sea level rise increases;

- Long-term sea level rise adaptation strategies are needed at project, community, watershed, and national scales; and
- USACE Watershed Planning Authority might be an option for coordinated interagency regional sea level rise adaptation planning with local support.

IV. Discussion/Questions and Answers

Mr. Murley said that in his presentation Mr. Landers referred to the USACE authorities, which were exercised with local partners. He noted Miami-Dade was the largest Ad Valorem tax payer to the 17-County Ad Valorem Taxing District. He noted the District was considering lowering the tax rate and reducing the amount of funds available for regional solutions. Mr. Murley suggested that the Task Force recommend that the County request funding from the District for the capital improvement plan, as this would give it a regional approach.

Mr. Landers said he agreed, noting different levels of government had roles to play. He pointed out that the State would have to coordinate with the County regarding work on the big infrastructure improvements, the interstate highways, and the flood protection water supply programs. Mr. Landers noted what had been presented to the County so far pertained to the local level, but it was important for the Task Force members to have presentations on how the federal government could be involved.

Ms. Fain said she agreed, noting it would be necessary for the Task Force to provide recommendations for federal, State and County action. She also stressed that the Everglades restoration should be a priority.

In response to a question from Mr. John Proni, Florida International University, as to whether there were any plans to install water-level and water-quality measurement instruments in Miami-Dade, Mr. Landers said that NOAA maintains tide stations, and the Water Management District also maintains tide stations for its operations. He noted the USACE engineers base their sea level change projections on tide stations with at least 40 years of continuous records, because they were looking for the long-term trend.

Ms. Marcia Steelman, Miami-Dade Public Works and Waste Management Department, said that the County had an agreement with the United States Geological Survey (USGS) to monitor saltwater intrusion. She stated that the County also funds water-quality monitoring in Miami-Dade's canals on a monthly and sometimes weekly basis, in coordination with the South Florida Water Management District. However, noted Ms. Steelman, the County does not monitor the water quality in the Everglades Park.

Mayor Lerner congratulated Mr. Landers for his informative presentation. She said that she had just returned from Tallahassee, and asked him whether he had made this presentation at the Cabinet and legislative levels.

Mr. Landers noted the State's Department of Economic Opportunity has an ongoing five-year program to understand potential sea level rise impacts, and improve community resilience. He said that NOAA had given them a grant.

A discussion ensued among Mayor Lerner, Mr. Murley, and Mr. Landers on the necessity to provide information on sea level rise to policymakers.

V. Extension of Meeting

It was moved by Mr. James Murley that the April 4th, 2014, meeting of the Sea Level Rise Task Force be extended to 12:30 p.m. This motion was seconded by Ms. Sara Fain, and upon being put to a vote, passed by a unanimous vote of those members present.

VI. Report Discussion

Chairman Ruvin said that he would close the presentations and move the discussion to the Task Force's report. He noted the previous week the Task Force members agreed to begin discussion on how to draft their report. Chairman Ruvin stated that the Assistant County Attorney had prepared a memorandum outlining the various options.

Assistant County Attorney Christopher Angell noted the middle of his email outlined three options to facilitate the drafting of the report:

- Have a Sunshine meeting in which all of the Task Force members gather as a cohesive team to draft the report;
- Staff and one Task Force member would work on the initial draft. Once done, staff would circulate that draft among all of the other Task Force members to review prior to another Sunshine meeting, at which the draft would be discussed and modified; and
- Staff alone would draft the report, and would then send it to all Task Force members. The Task Force members would review the draft and send their comments to staff before the Sunshine meeting. Staff would then review the comments, incorporate them into the report, and at the next Sunshine meeting the draft could be discussed. Alternatively, staff could gather the comments, which would be discussed at the next Sunshine meeting.

Chairman Ruvin noted these were the available options if the Task Force wanted to comply with the Sunshine law. He indicated that over the last week, Ms. Hefty and he began working on a draft. He noted he believed it was more practical for Ms. Hefty and him to produce a draft that would serve as a basis for discussion at more than one meeting.

Referring to the outline document that had been distributed to the Task Force, Chairman Ruvin asked the members to provide their comments on any additional elements that should be included into the draft. He said he believed that the members could also email their suggestions to Ms. Hefty and she and he would incorporate them into the draft.

Assistant County Attorney Angell pointed out that the suggestions must be made in a publicly noticed meeting.

Chairman Ruvin asked the Task Force members what other elements should be included in the outline document, noting this would be a product from the Task Force. Chairman Ruvin noted the next challenge would be to formulate the recommendations in a manner that would spur the County to implement a robust capital improvement plan over the next decades. He said that he was thinking of inviting the County procurement staff to make a

presentation. He emphasized that the message that would be transmitted to the Commission should be optimistic.

Ms. Fain noted she believed that the first section should be a qualitative description presenting the impacts of inaction; while the second section would contain the recommendations, and the deliverables. She said that based on the information that had been presented, it would be necessary to discuss the timeframe, and the sea level rise projections. Ms. Fain suggested that Section II. b) of the outline relating to the amendments to the Comprehensive Development Master Plan (CDMP) be more extensive. She pointed out that the Climate Change Advisory Task Force had some good recommendations regarding the CDMP, noting they should be updated.

Chairman Ruvin suggested that the Task Force call for an oversight and regular reporting on the implementation of the previous Task Force's recommendations.

Ms. Fain noted the Task Force should recommend that the Office of Sustainability be expanded as it relates to resources and staff. She suggested that the Task Force members review the recommendations of the previous Task Force. She said that the DERM presentation also contained some good recommendations, for example, regarding the Environmentally Endangered Lands (EEL) Program. Ms. Fain suggested that the program be renamed EEL +, and help achieve more goals than originally envisioned.

Chairman Ruvin noted some of the lands in the EEL program could be used to address sea level rise. He recalled that this program was approved by referendum and created in 1990 to acquire, preserve, enhance, restore, conserve, and maintain environmentally endangered lands for this and future generations; and the FY 91-92 property tax increase generated $90 million in revenue originally collected to fund the EEL Program. Chairman Ruvin said that it may be necessary to ask the voters to approve something similar to the EEL program for sea level rise.

Ms. Fain noted changes to the zoning code may be necessary, including a revised minimum freeboard. She noted the CDMP was already a good

document, and if applied correctly these policies would help achieve the Task Force's goals. She said that based on the information that was presented the Task Force may wish to recommend additional policies regarding housing, transportation, etc.

Mr. Murley pointed out that the CDMP applies primarily to unincorporated Miami-Dade, noting it would be necessary to recommend that the County work with the cities on this issue.

Chairman Ruvin noted according to the Charter, the County can impose stricter standards than the municipalities.

Mr. Murley noted the Deliverables in the outline had a) and b). He said that he would add c) which would pertain to intergovernmental entities, including the cities, the Compact, the Water Management District, the State, the Congressional delegations, and the federal agencies. He pointed out that some of these issues were regional and statewide, and should therefore be partially funded by the County's contribution to the 17-County Ad Valorem Taxing District. Mr. Murley said that the County paid for the Everglades restoration with a surcharge for flood control, and suggested that something similar be done for sea level rise.

Chairman Ruvin asked Mr. Murley to draft some recommendations along those lines for the next meeting.

Assistant County Attorney Angell noted Ms. Hefty could incorporate into the draft the Task Force's comments made in a Sunshine meeting; however, if she was working with the Chair, she would have to wait until the next meeting to incorporate the members' comments.

It was moved by Mr. James Murley that option No. 2 to facilitate the drafting of the report, presented by Assistant County Attorney Angell, be adopted. This motion was seconded by Ms. Sara Fain, and upon being put to a vote, passed by a unanimous vote of those members present.

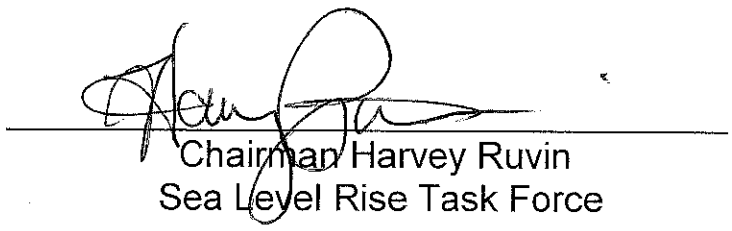
Assistant County Attorney Angell informed the Task Force members that the Chairwoman of the Board of County Commissioners (BCC) sponsored a proposed resolution which would be considered by the Infrastructure and

Capital Improvements Committee (ICIC) on April 9, 2014. He said that this was an infrastructure item related to sea level rise, which would require all County infrastructure projects, modifications, and renovations to consider the potential impacts of sea level rise during all project phases including but not limited to planning, design and construction; and would direct the Mayor to evaluate the existing infrastructure in the face of sea level rise. Assistant County Attorney Angell noted this item would likely be approved before the Task Force's report was due.

Chairman Ruvin noted this was a positive initiative, which showed that the BCC Chairwoman was taking ownership of the issue.

VII. Adjournment

There being no other business to come before the Sea Level Rise Task Force, the meeting adjourned at 12:26 p.m.



Chairman Harvey Ruvin
Sea Level Rise Task Force

Miami Dade County
Sea Level Rise Task Force
April 4, 2014

Prepared by: Maryse Fontus

EXHIBITS LIST

NO.	DATE	ITEM #	DESCRIPTION
1	4/4/14		Agenda
2	4/4/14		Attendance Sheets
3	4/4/14		Report Outline
4	4/4/14		Agenda Item 2D – Resolution setting policy for Miami-Dade County; directing the Mayor to require all County infrastructure projects to consider potential impacts of sea level rise during all project phases
5	4/4/14		Sea Level Change and Long Range Water Resources Planning for Florida
6	4/4/14		Sea Level Rise – What's in Store for Miami?
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Miami-Dade Sea Level Rise Task Force Meeting

April 4th, 2014

10:00 AM – 12:00 PM

Overtown Transit Village North
701 NW 1st Court, Second Floor Training Room
Miami, FL 33136

- **Welcome and Introductions**
  Honorable Clerk & Sea Level Rise Task Force Chair, Harvey Ruvin

- **Presentation** - Dr. David Enfield, Oceanographer, University of Miami
  "Overview of IPCC-AR5 Sea Level Rise Projections and the Implications"

- **Presentation –** Mr. Glenn Landers, Civil Engineer, U.S. Army Corps of Engineers, Planning and Policy Division, Jacksonville, Florida
  "Sea Level Change and Long Range Water Resources Planning for Florida"

- **Discussion/Q & A**

- **Report Discussion** (time allowing)

- **Questions and Comments from the Public**

- **Adjourn**

MIAMI-DADE SEA LEVEL RISE TASK FORCE
MEETING DATE OF April 4, 2014

	TASK FORCE MEMBERS	PRESENT	LATE	ABSENT
1	Enfield, David	✓		
2	Fain, Sara E.	✓		
3	Fair, T. Willard			✓
4	Gonzalez, Jorge			✓
5	Milian, Arsenio			✓
6	Murley, James F.	✓		
7	Ruvin, Harvey	✓		

Four (4) members constitutes a quorum

Sea Level Rise Task Force Meeting
April 4, 2014
10:00 AM
Overtown Transit Village North
2nd Floor Training Room

	Name	Organization	Phone Number	Email Address
1	Jim Ferguson	MD Water and Sewer	786-268-5250	JFERG@miamidade.gov
2	Margarita Wells	City of Miami Beach	305.673.7010	mwells@miamibeachfl.gov
3	Jim Murley	SFRPC	954 985 4416	Jmurley@sfrpc.com
4	DAN KIBALS		786·325·8518	captaindankibals@att.net
5	DAVID ENFIELD	U. of MIAMI	305-778-3410	denfield@earthlink.net
6	John Proni	FIU	305-282-0685	Jproni@FIU.edu
7	Chris Bergh	The Nature Conservancy	305 872 7071	cbergh@tnc.org
8	Julie Dick	Everglades Law Center	312-399-4057	julie@everglades law.org
9	Sara Jain	Member		
10	Chris Angel	CAO		
11	MARCIA STEELMAN	MD PWWM	(305) 372-6691	STEELM@miamidade.gov
12	Galen Treuer	U Miami	612·209·1451	g.treuer@umiami.edu

	Name	Organization	Phone Number	Email Address
13	GLENN LANDERS	USACE	904-232-2125	glenn.b.landers@saca.army.mil
14	NINA LINCOFF	MIAMI TODAY		
15	Cindy Lerner	mayor Pinecrest / MD League Cities		mayorlerner@gmail.com
16	MARK R. WAERNER	MDC - RER	305-375-2835	mwaerner@miamidade.gov
17	DOUG YODER	WASD	786 552 8979	yoderd@miamidade.gov
18	FERNANDO VAZQUEZ	JACOBS	954-261-7188	fernando.vazquez@jacobs.com
19	DAVID ADAIR	JACOBS	305-798-3855	david.adair@jacobs.com
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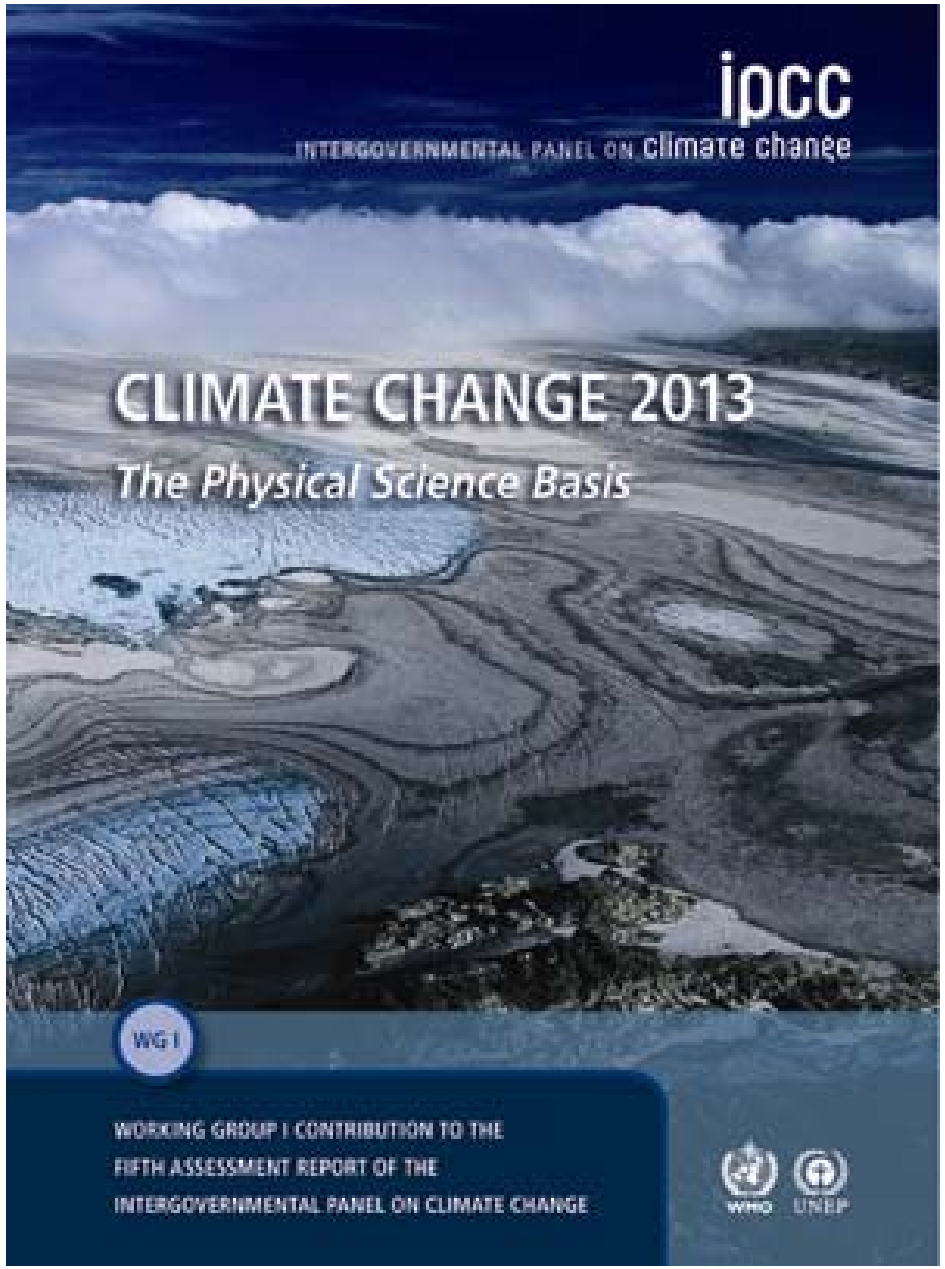
Sea Level Rise

What's in store for Miami?

David B. Enfield

UM-Rosenstiel & NOAA-AOML



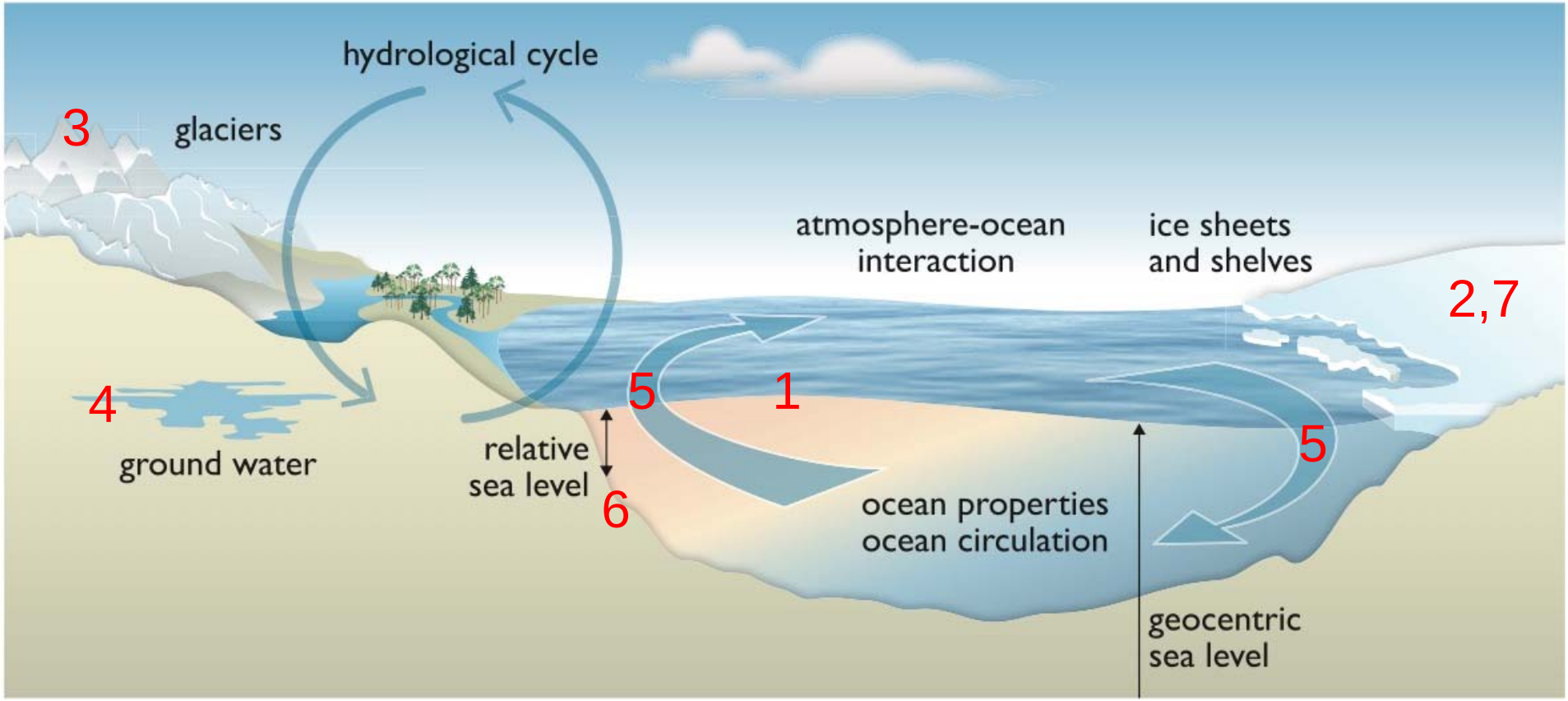
Wealth of information available at:

Intergovernmental Panel on Climate Change (IPCC) Working Group I, Fifth Assessment Report:

"Climate Change 2013: The Physical Science Basis."

(http://www.ipcc.ch/wg1)

Processes affecting regional sea level rise



Affecting global SLR:

1. Warmth of the ocean water column
2. Negative mass balance of ice sheets
3. Runoff from melting mountain glaciers
4. Changes in ground water storage

Affecting regional SLR:

5. Changes in ocean circulation
6. Subsidence or uplift of land

Wild card:

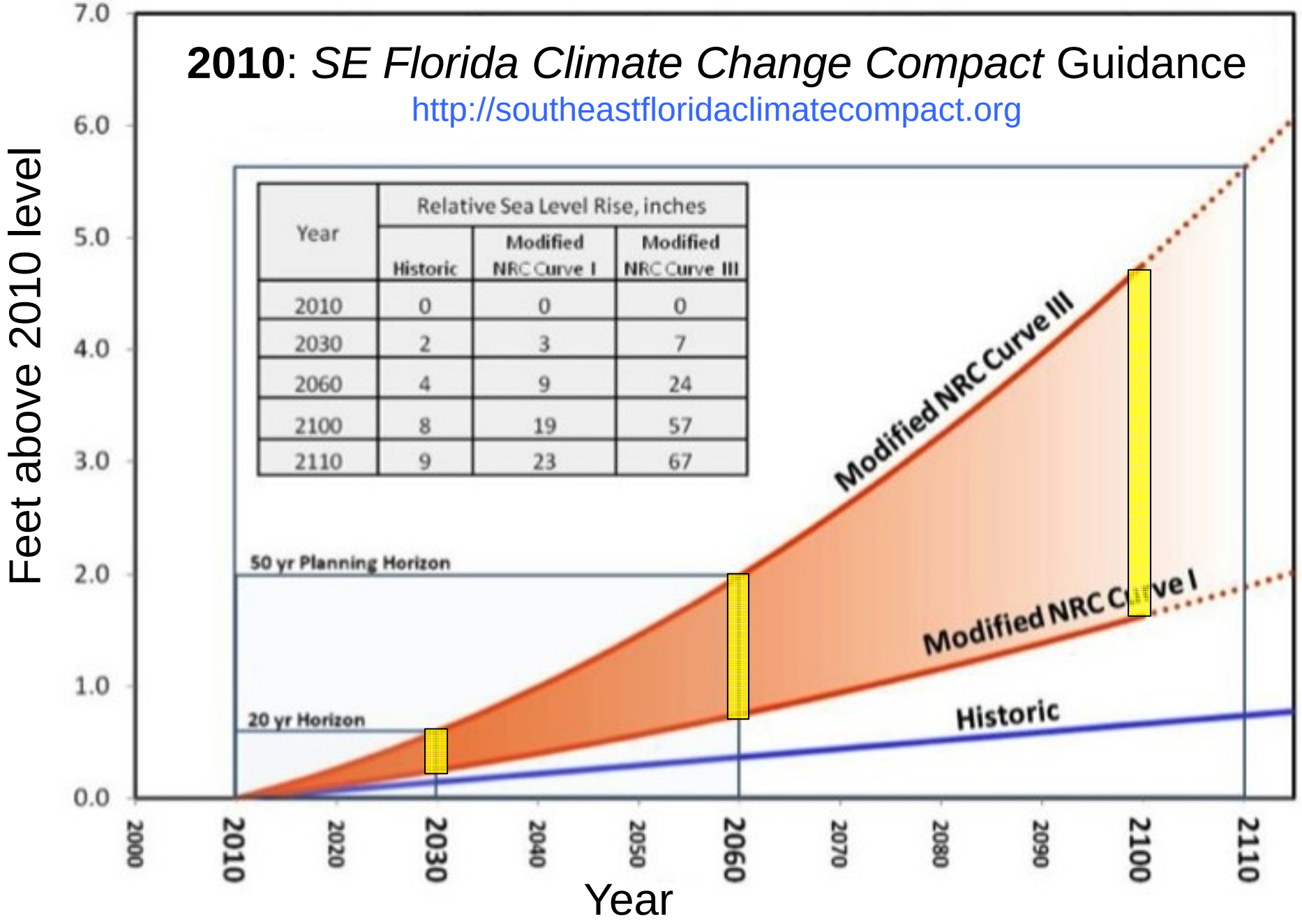
7. Ice sheet ‘collapse’

Sea Level Rise Scenarios for South Florida

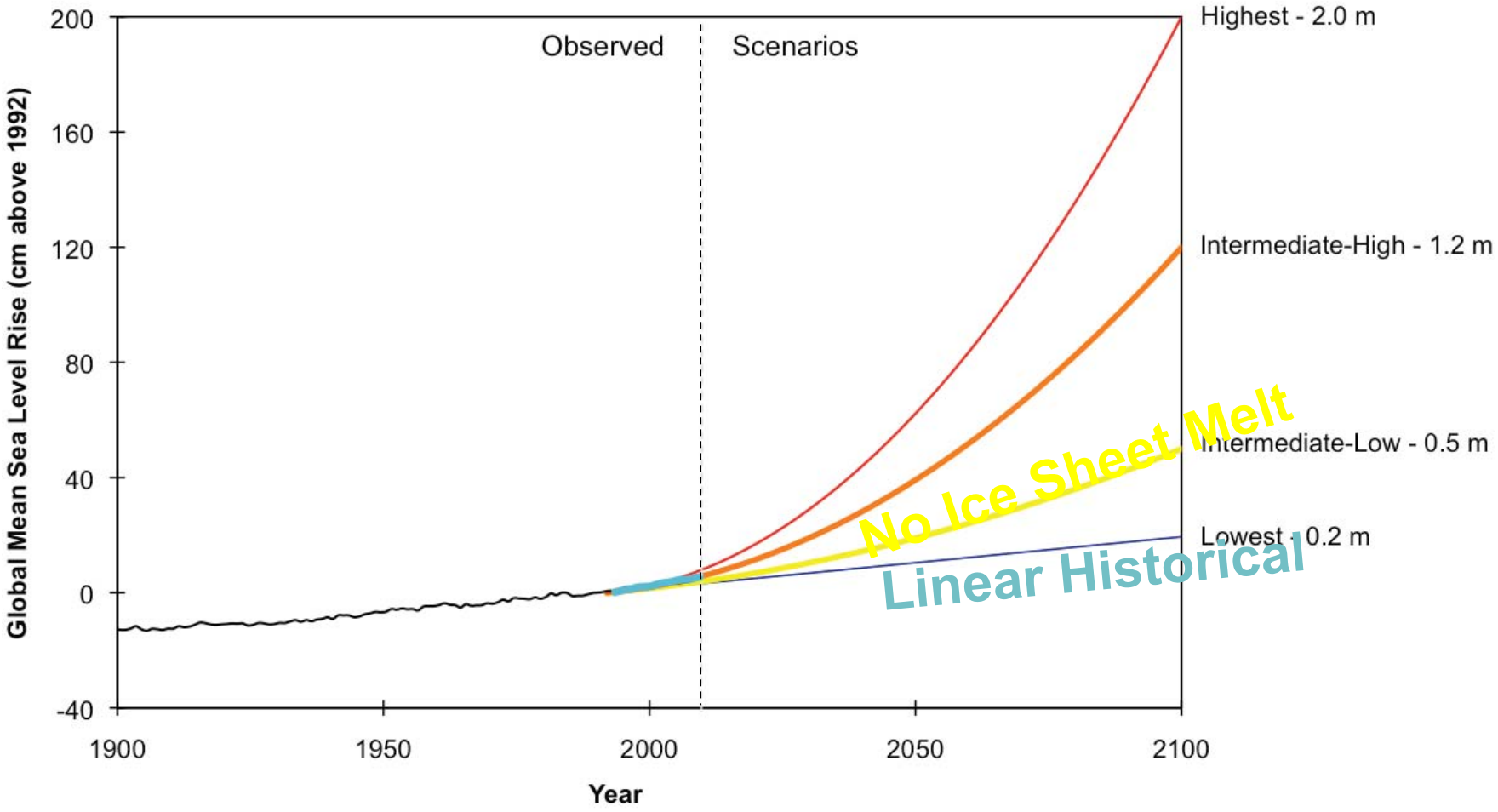
2010: *SE Florida Climate Change Compact* Guidance

http://southeastfloridaclimatecompact.org

Year	Relative Sea Level Rise, inches		
	Historic	Modified NRC Curve I	Modified NRC Curve III
2010	0	0	0
2030	2	3	7
2060	4	9	24
2100	8	19	57
2110	9	23	67



Most Recent Government Projections of Global Sea Level

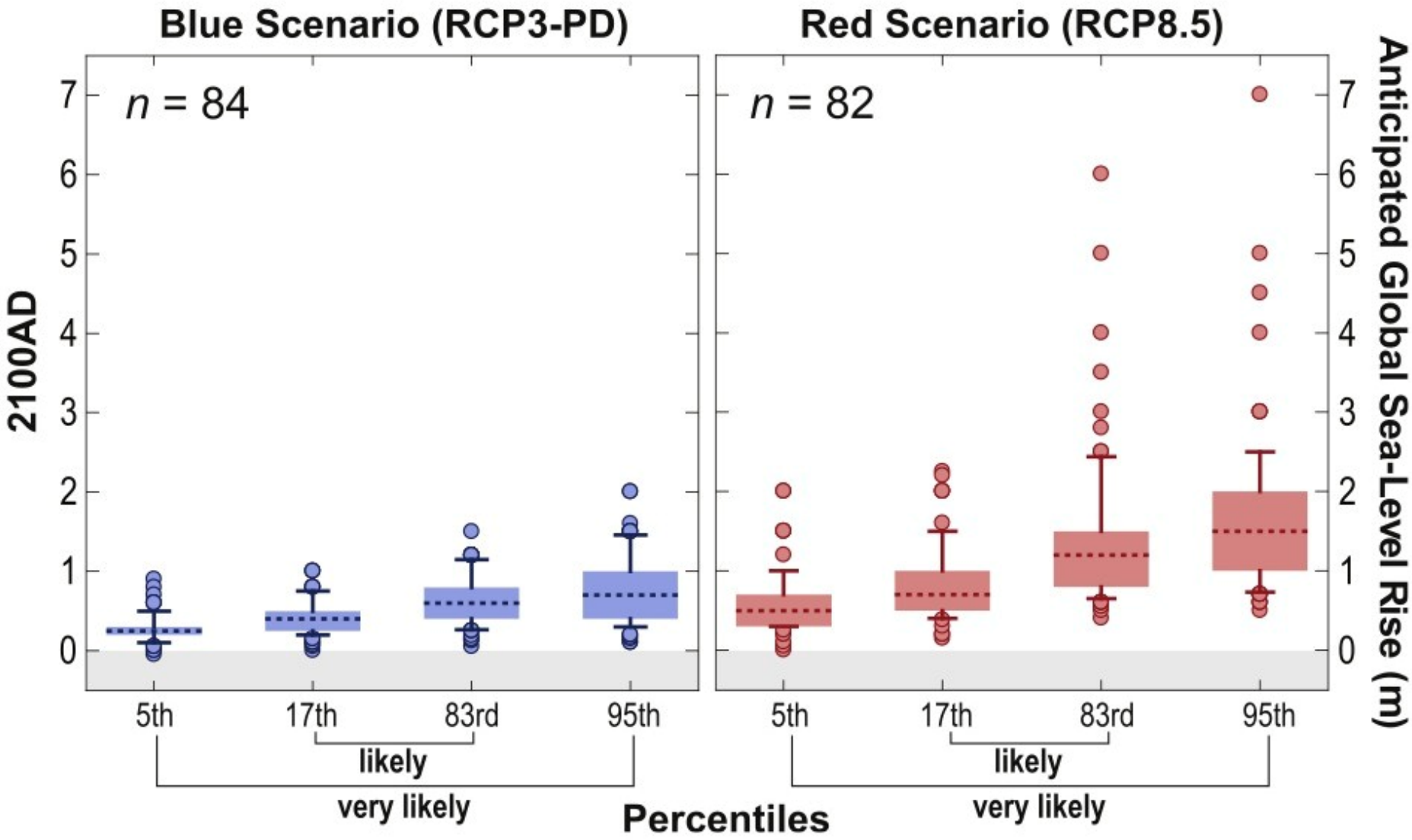


NOAA, Dec 6, 2012

In: "Global Sea Level Rise Scenarios for the United States National Climate Assessment"

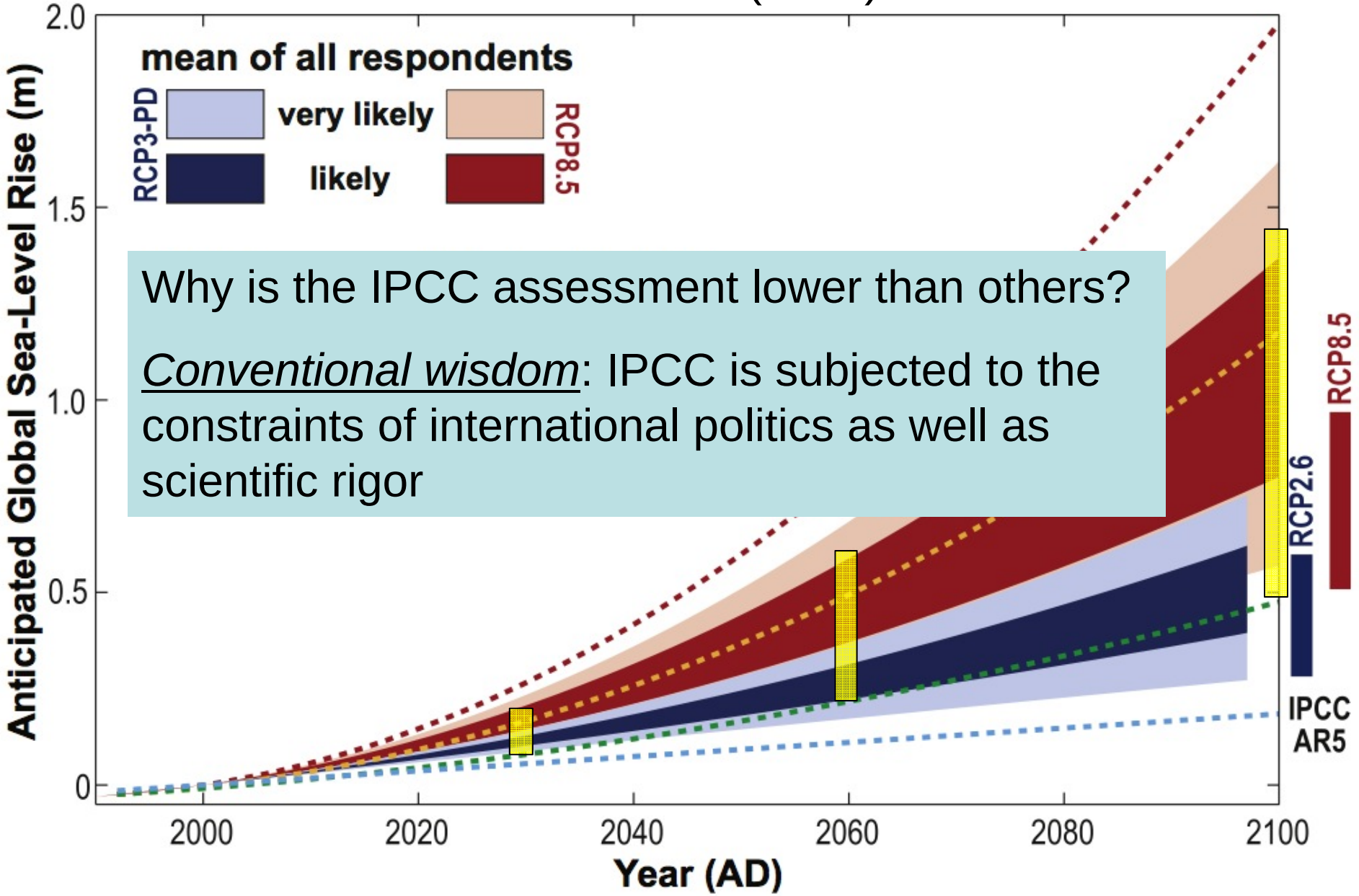
Assessment of 90 experts of sea level rise by 2100

Horton et al. (2014)



Assessment of 90 experts of sea level rise by 2100

Horton et al. (2014)



Why is the IPCC assessment lower than others?

Conventional wisdom: IPCC is subjected to the constraints of international politics as well as scientific rigor

IPCC statements regarding why their projections are lower than others

Process-based models (IPCC) are ones where the significant ice processes are represented physically in the global climate models

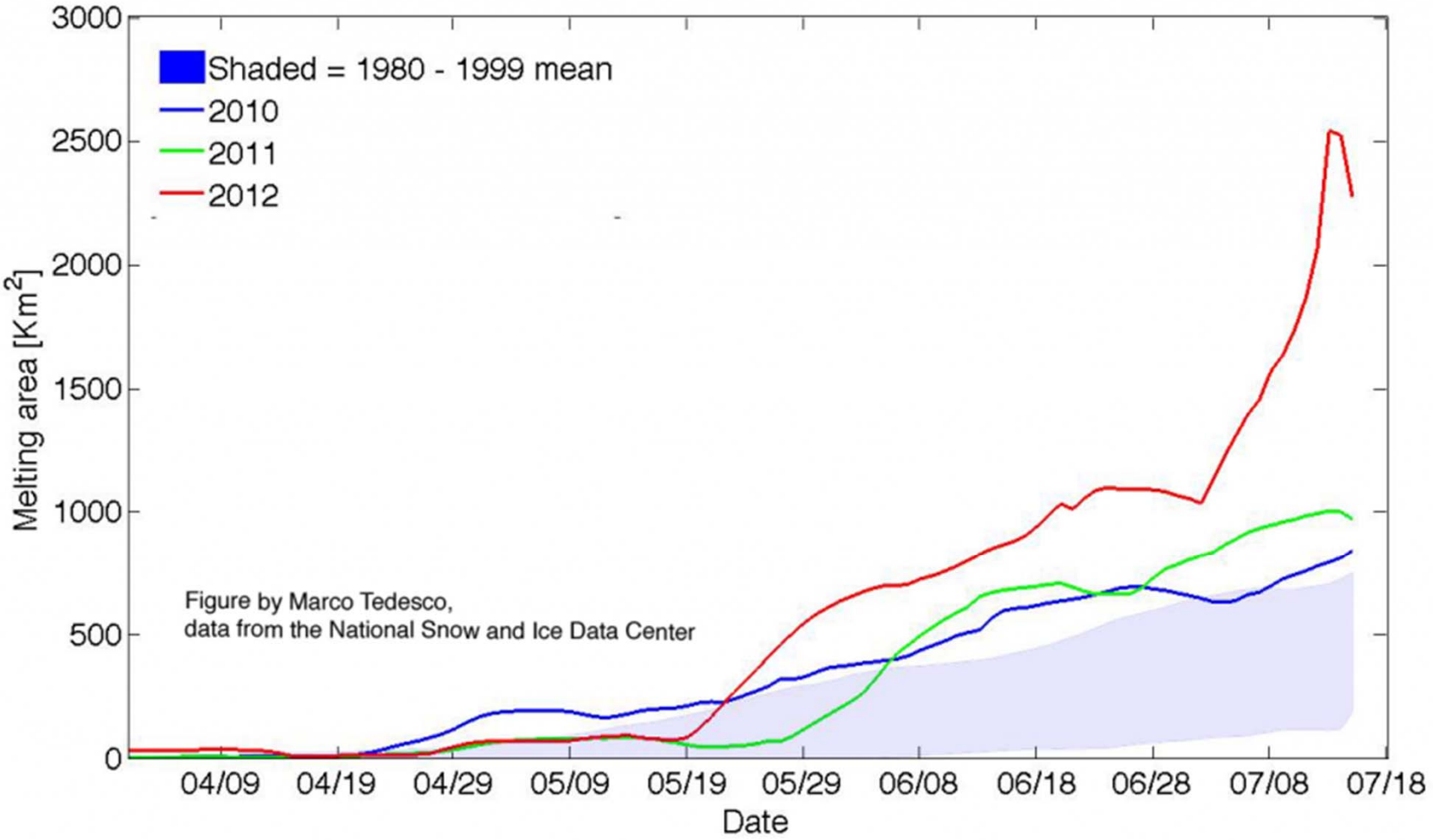
Semi-empirical models finesse the physical processes by using the historical relationship between global temperature and sea level

"Some semi-empirical models project a range that overlaps the process-based *likely* range while others project a median and 95th percentile that are about twice as large as the process- based models. In nearly every case, the semi-empirical model 95th percentile is higher than the process-based *likely* range."

"Despite the successful calibration and evaluation of semi-empirical models against the observed 20th century sea level record, there is no consensus in the scientific community about their reliability, and consequently *low confidence* in projections based on them."

Many would say there is also low confidence in the process-based models because of our poor knowledage & data

Record summer ice melt in Greenland over past decade

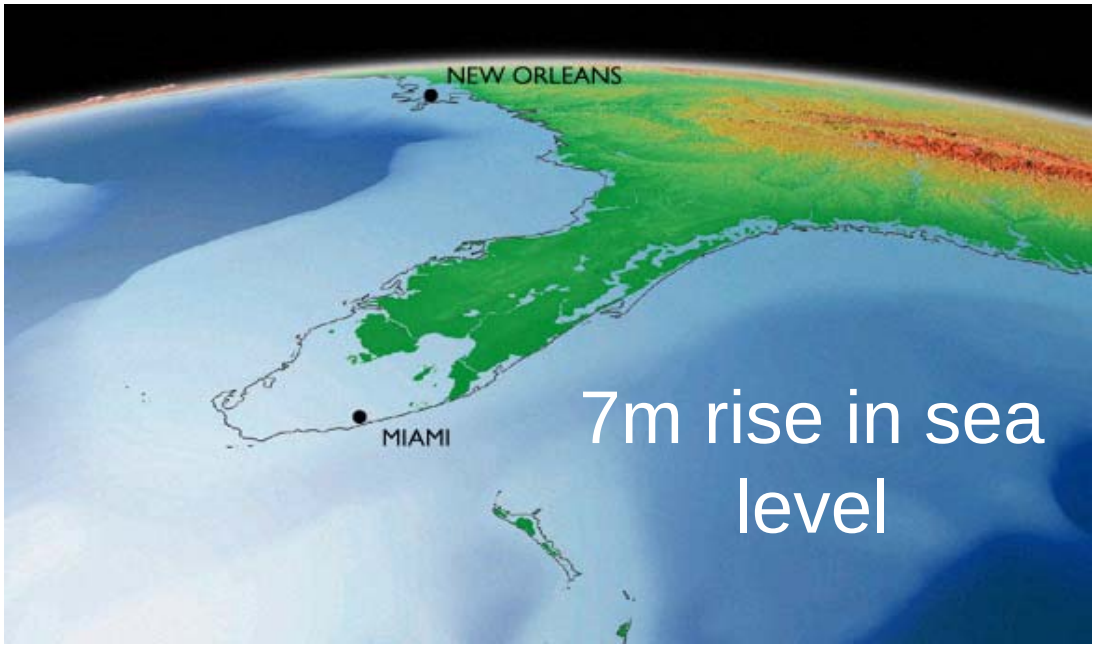


Sea Level Rise in the future

Melting ice sheets?

- Greenland: 7.4 m (25') potential
- Antarctica: 74 m (250') potential
  - West Antarctica (7 m)
  - East Antarctica (67 m)

West An
particula
much is
sea level, buttressed by two ice shelves that could break up.



Approximately 25% of US population lives in area that would be flooded by a 7m rise.

IPCC statements regarding the possibility of ice sheet ‘collapse’ leading to significantly greater sea level rise

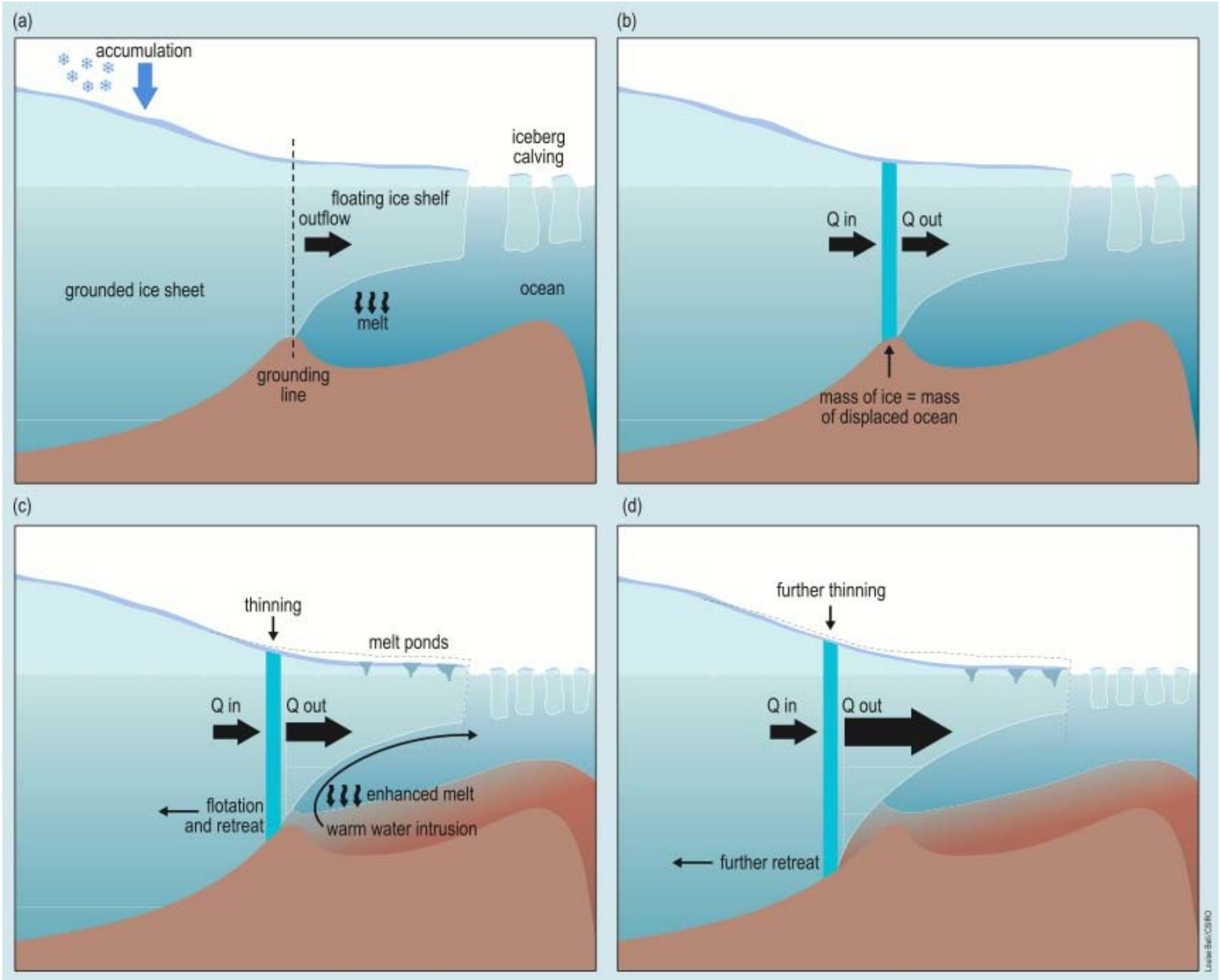
“We have considered the evidence for higher projections and have concluded that there is currently insufficient evidence to evaluate the probability of specific levels above the assessed *likely* range.”

“Based on current understanding, only the collapse of marine-based sectors of the Antarctic ice sheet, if initiated, could cause global mean sea level to rise substantially above the *likely* range during the 21st century.”

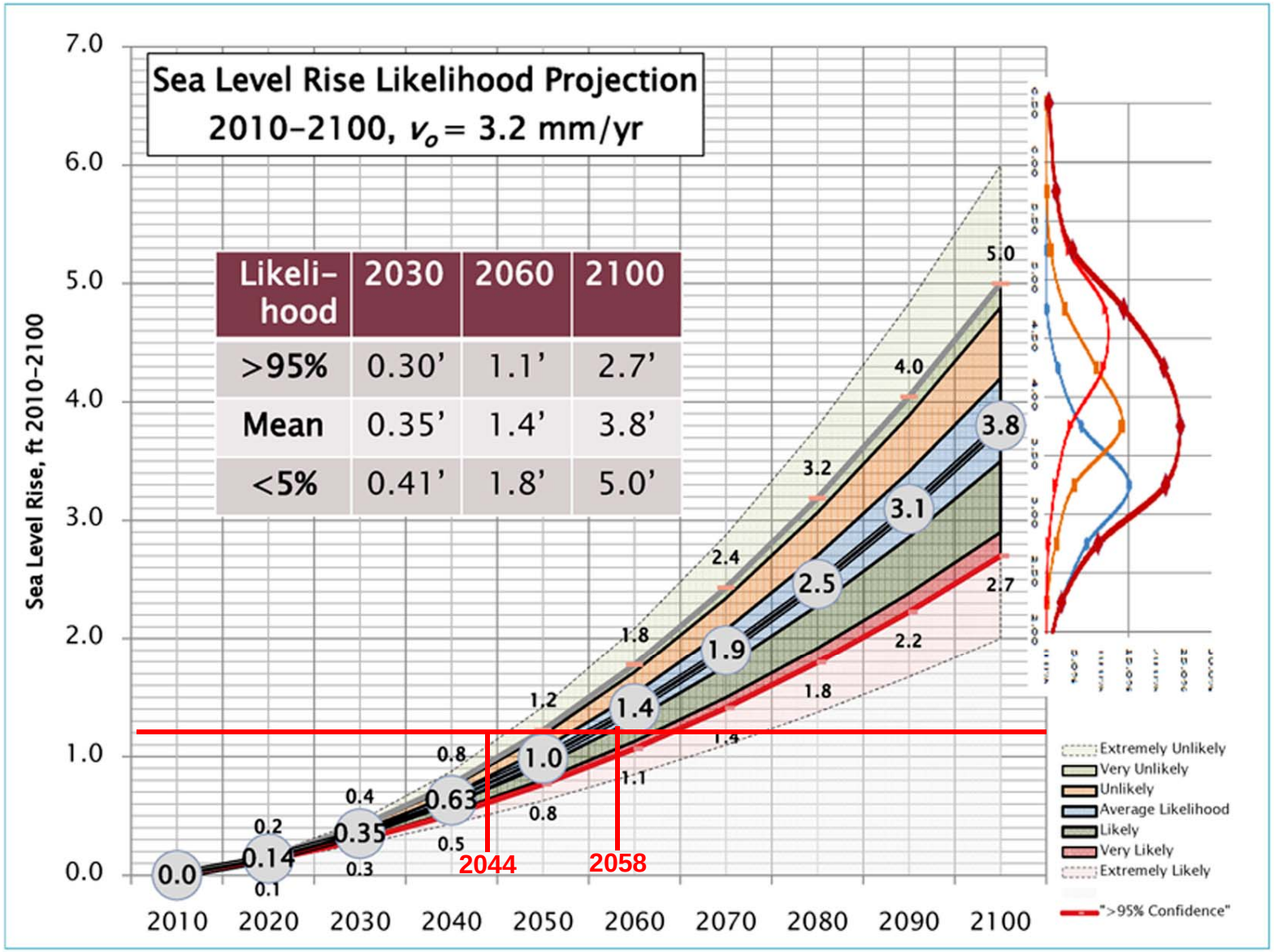
Rather than a ‘collapse’, it makes more sense to talk of a potential ‘instability’ whereby outlet glaciers in Antarctica could enter a phase of accelerated ice melt once forced to retreat landward from their grounding lines (see next slide).

“This potential additional contribution cannot be precisely quantified but there is *medium confidence* that it would not exceed several tenths of a meter of sea level rise during the 21st century.”

How an ice sheet instability could occur



Current SLR guidance for the 4-county Compact



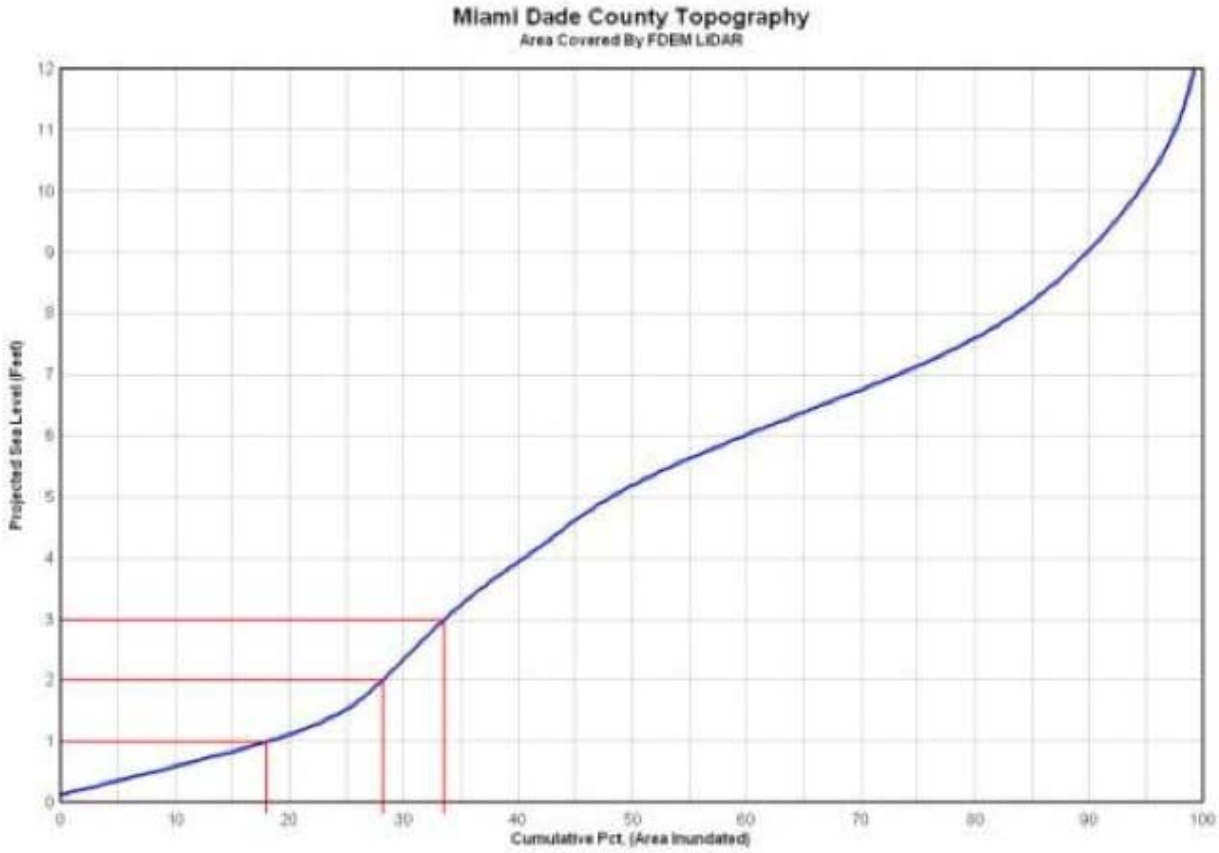
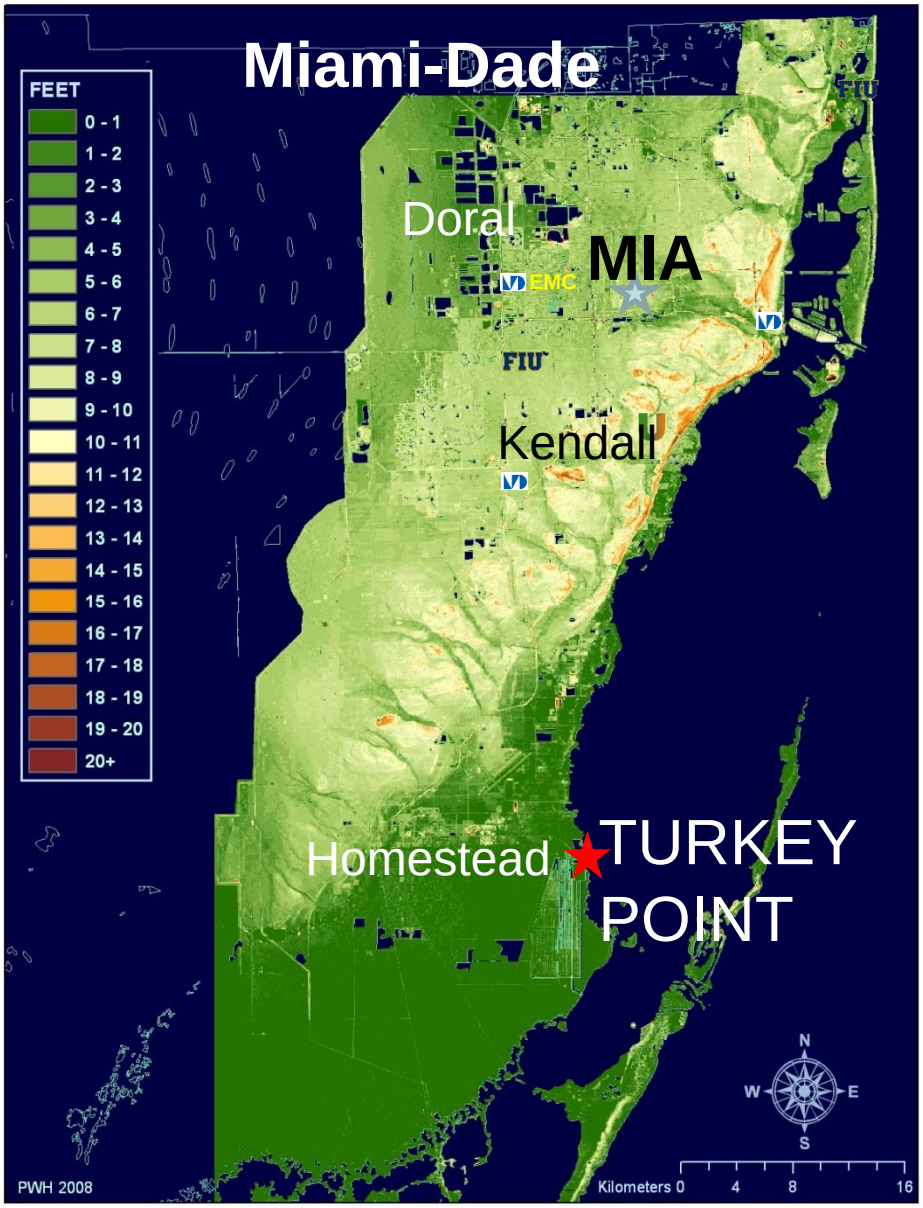
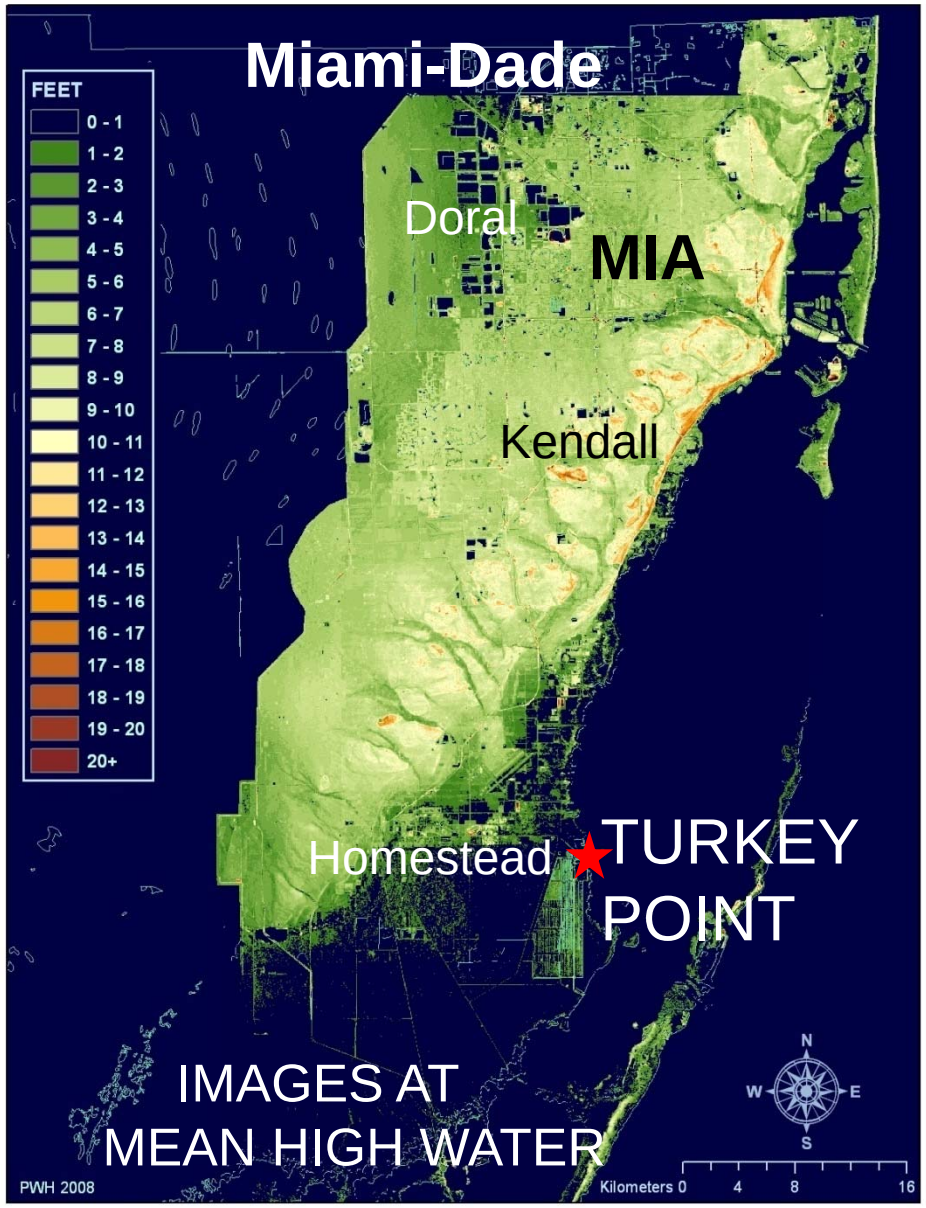


Table 8. The Percent of Land with Elevations Below Sea Level for the Urban Portion of Miami-Dade County for 1-3 Foot Sea Level Rise Scenarios. This table is derived from the hypsographic curve (Fig. 4). Note that each foot of rise produces a different percent of land area at elevations below sea level. This non-linearity through time is an important concept to apply to adaptation planning.

SLR Rise (Feet)	Land with Elevations Below Sea Level (%)	Change (%)
1	18.2	-18.2
2	28.2	-10.0
3	33.6	-5.4



Present topography

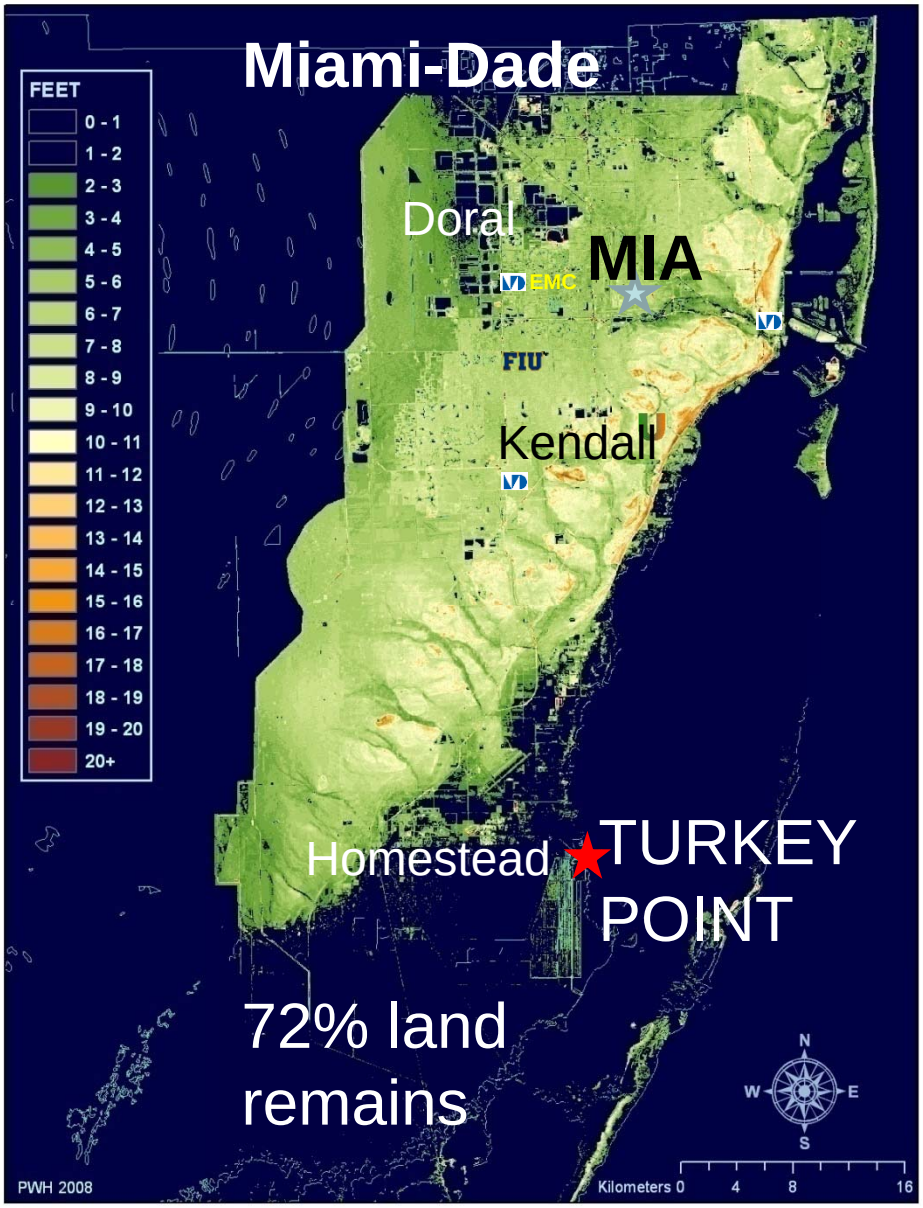


1 Foot Sea Level Rise (2031-2042)

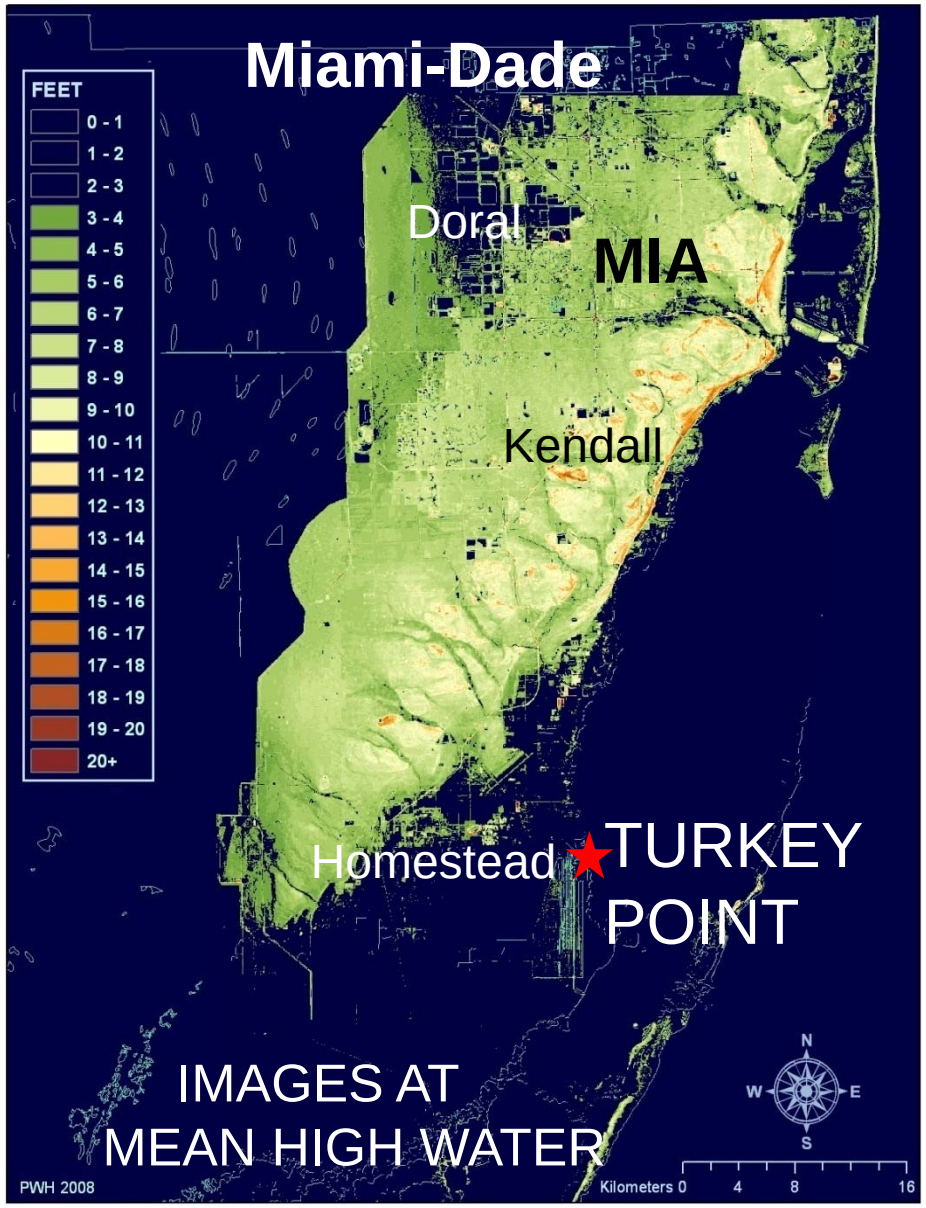
LiDAR elevation data

SLIDE #5 – H.R. Wanless, 2012

from P. Harlem,



2 Feet Sea Level Rise (2048-2066)

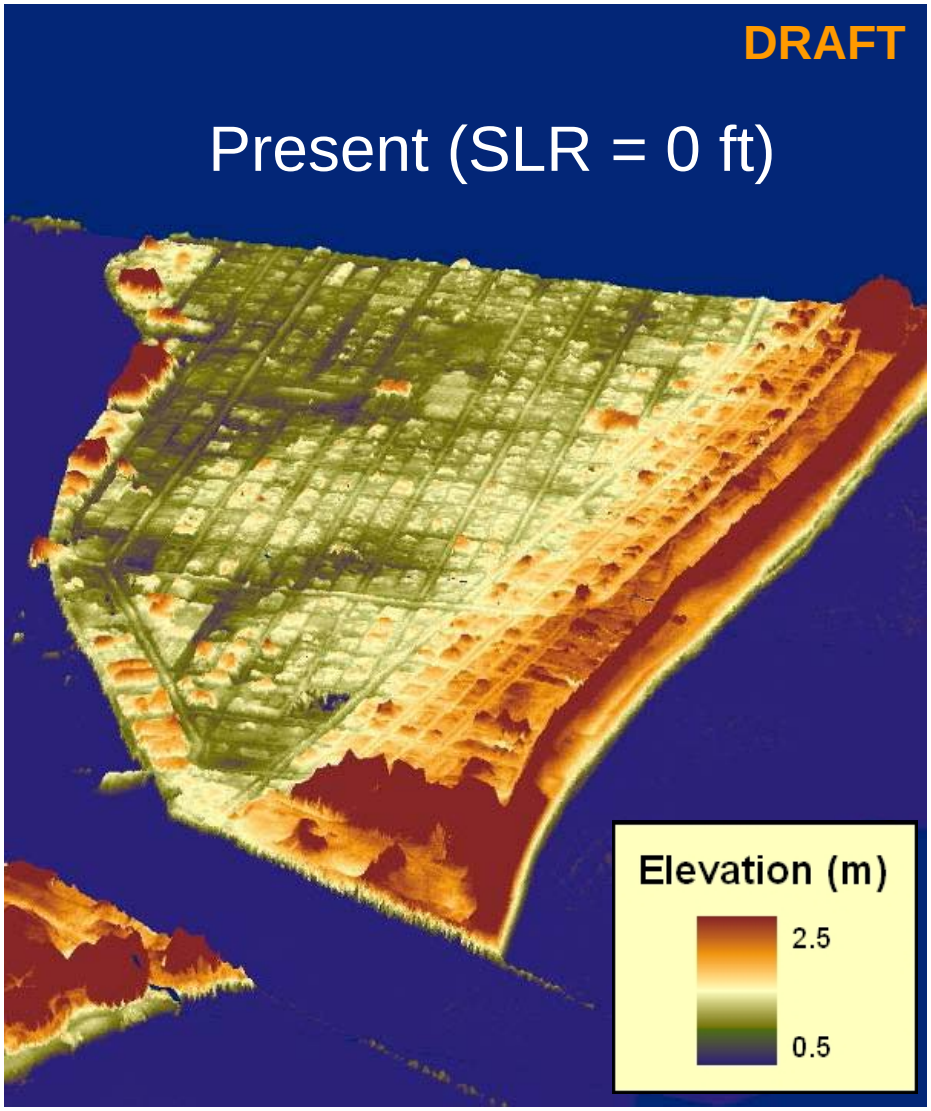


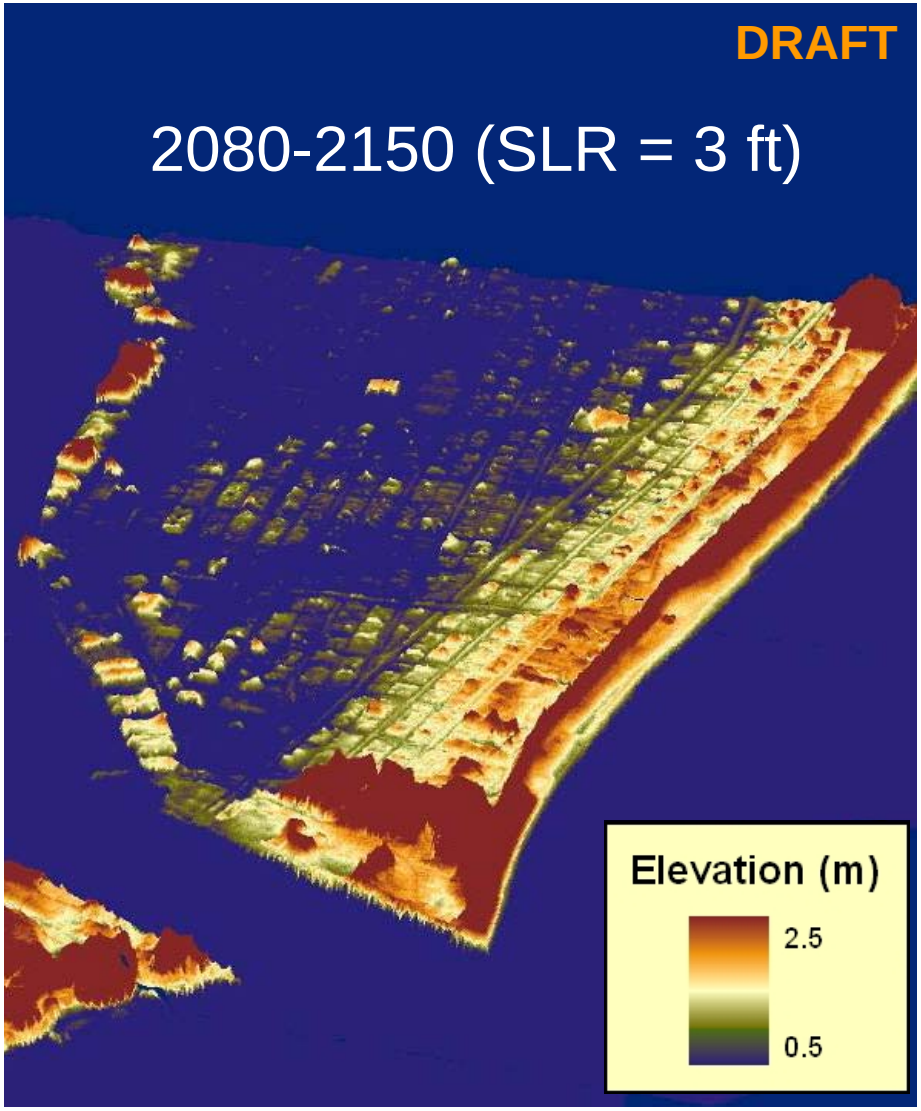
3 Feet Sea Level Rise (2063-2085)

Inundation projections using LiDAR elevation data

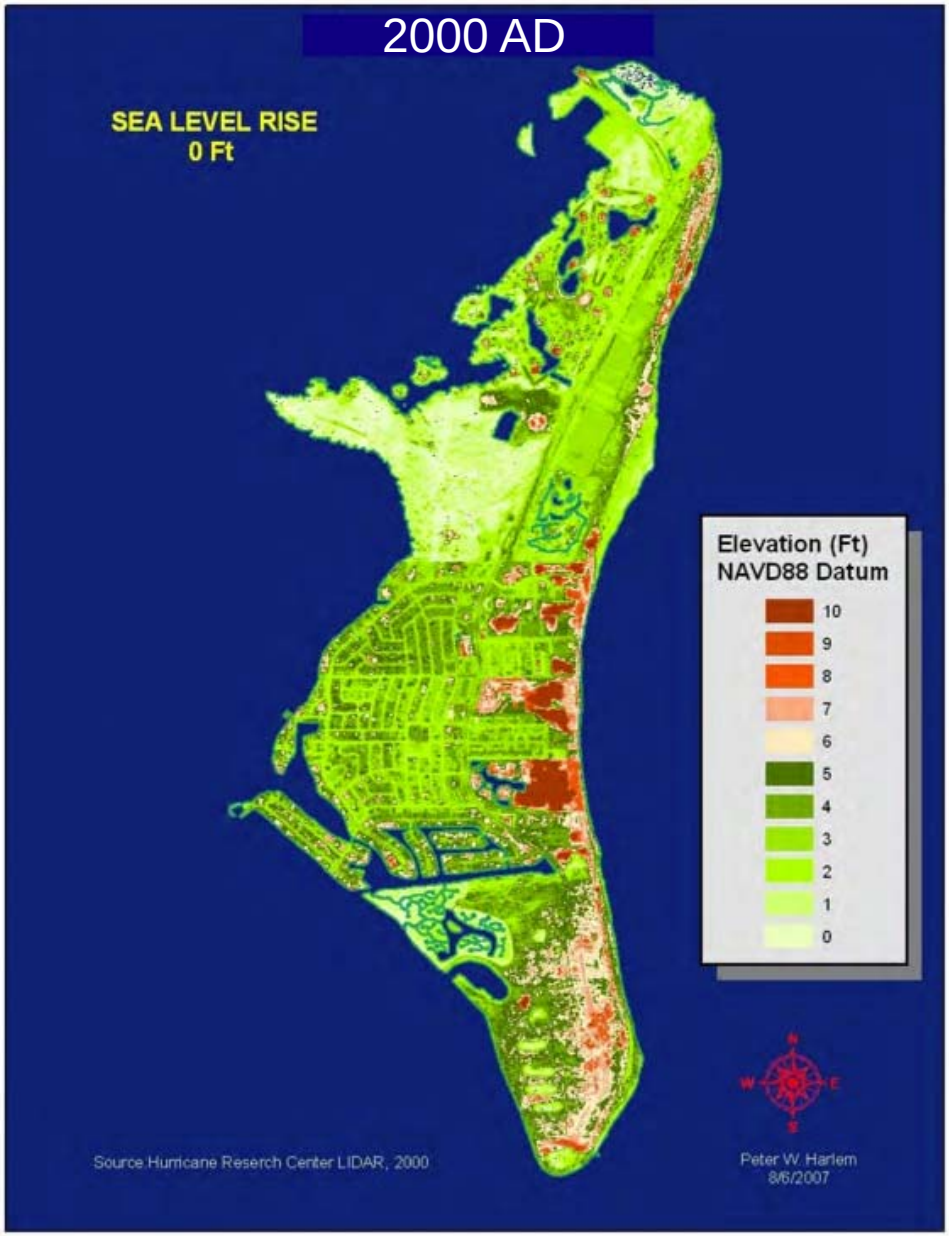
SLIDE #6 – H.R. Wanless, 2012 from P. Harlem,

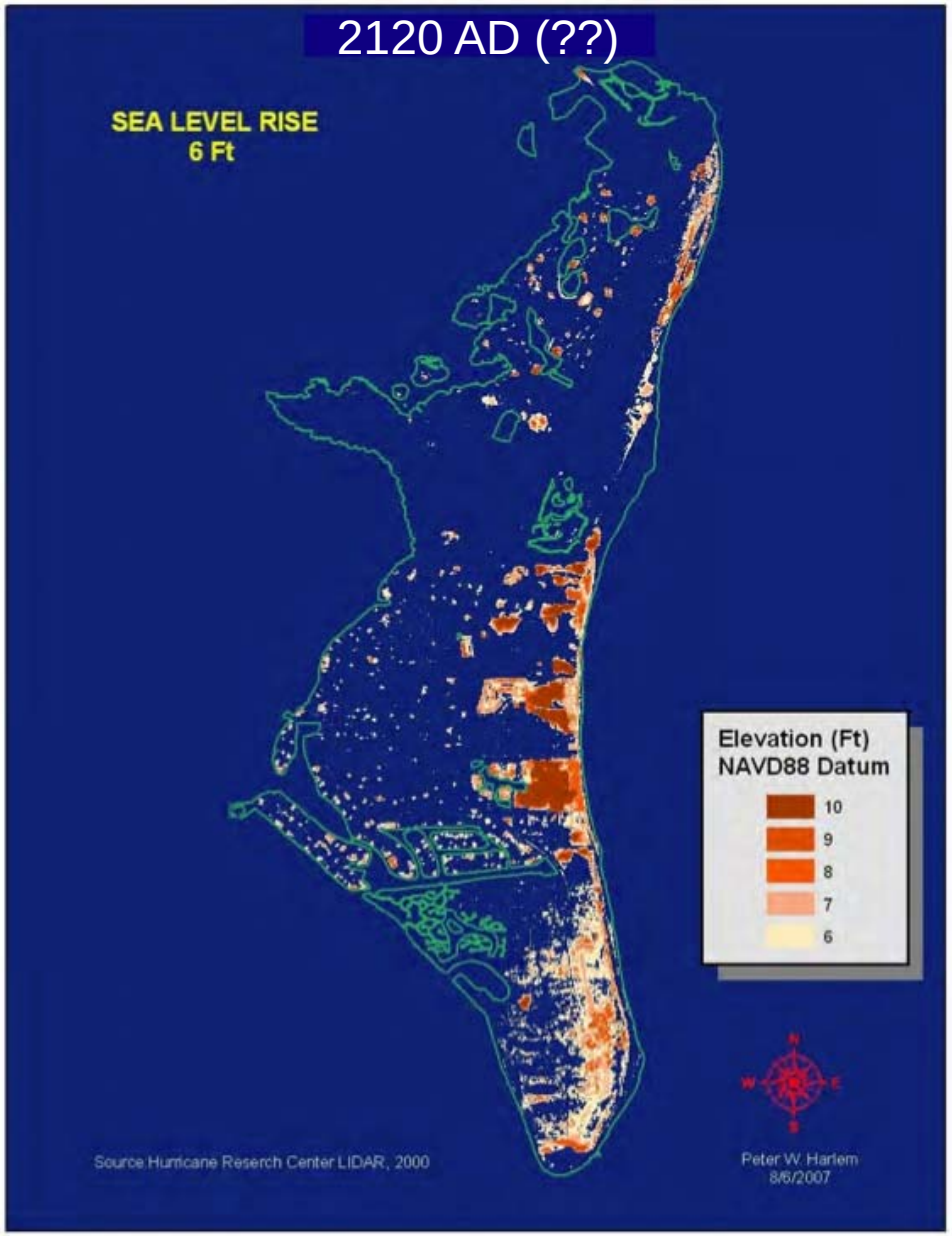
South Beach Area Showing present & Future Conditions.



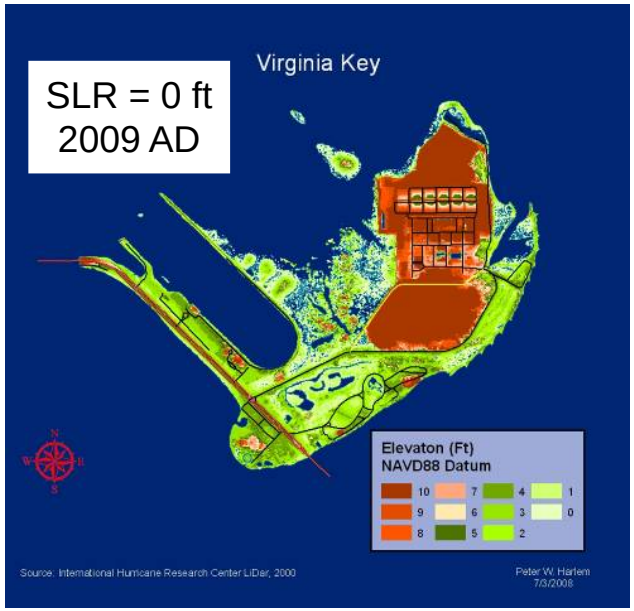


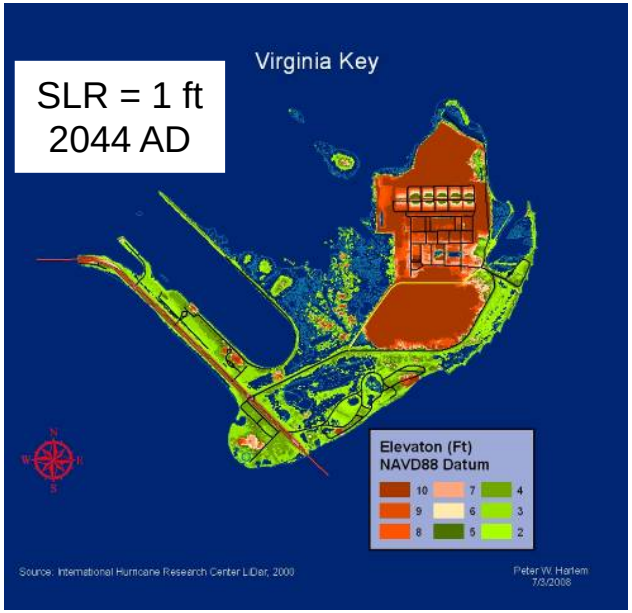
Key Biscayne — Now and Future

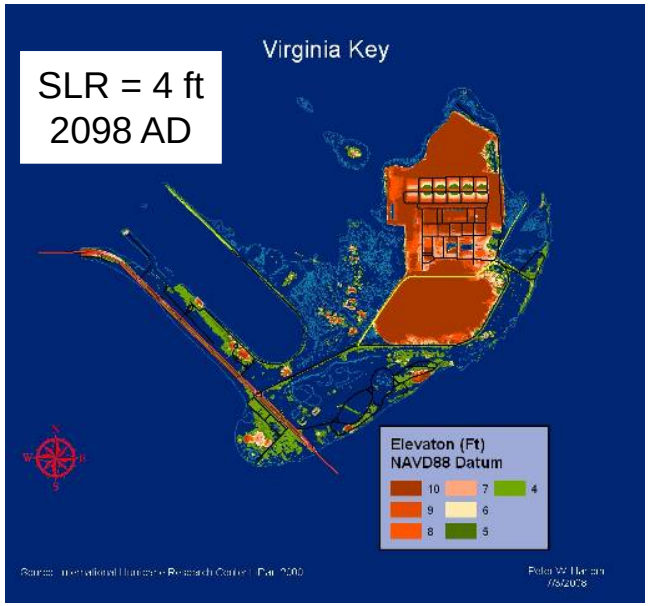


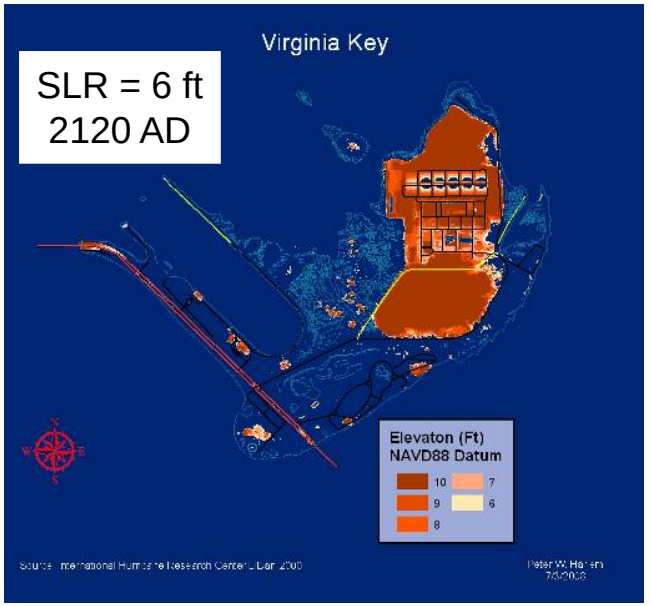


Sea Level Rise on Virginia Key










The End
Any questions?

Useful Websites

IPCC Working Group I, Fifth Assessment Report
www.ipcc.ch/wg1

SE Florida Climate Change Compact
southeastfloridaclimatecompact.org

NOAA SLR viewer
www.csc.noaa.gov/slr/viewer/#

Climate Central SLR viewer
sealevel.climatecentral.org/ssrf/florida

YouTube SLR animation
www.youtube.com/watch?v=inf-Wj2Xm40

Sea Level Change and Long Range Water Resources Planning for Florida

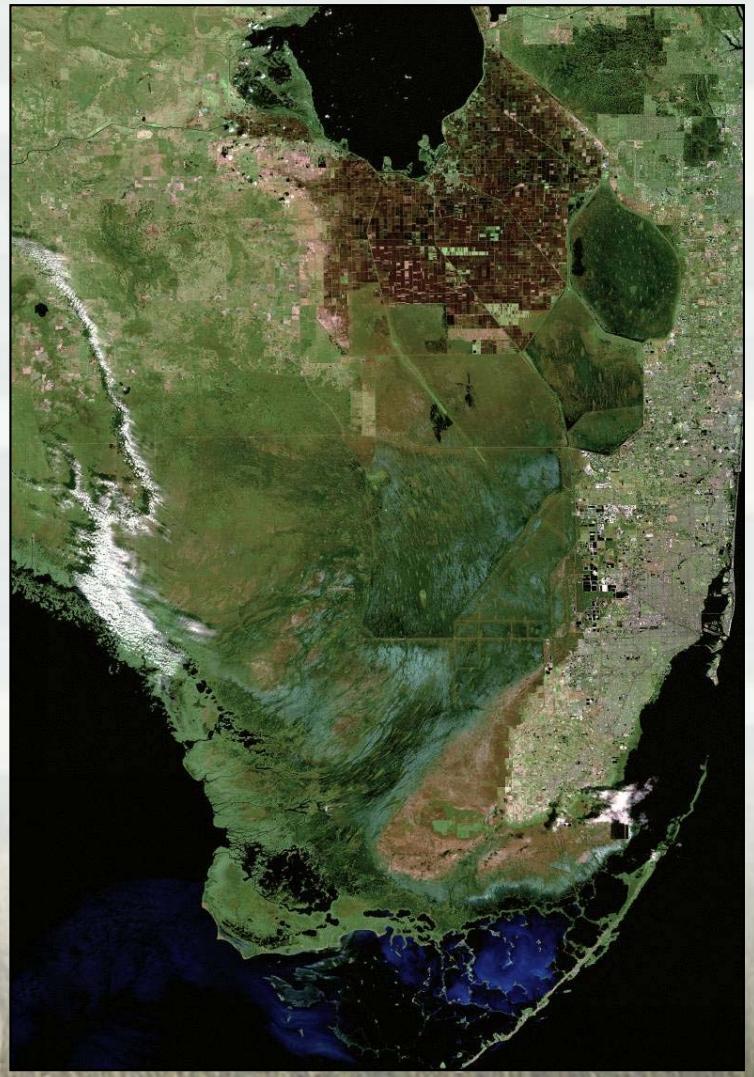
Miami-Dade Sea Level Rise Task Force

April 4, 2014 Miami, FL

Glenn B. Landers, P.E.
Planning and Policy Division
Jacksonville District

Presentation Outline

- Current USACE & NOAA guidance on Sea Level Change projections
- Florida SLC Trends & Projections
- SLC beyond 2100
- SLC Concerns in Florida – Current & Future; Direct & Indirect
- Systems Approach to Adaptation
- Building a More Resilient Future with Public/Private Partnerships?



US Army Corps of Engineers
Civil Works Mission Areas

- **Navigation**
  - Breakwaters and Jetties
  - Harbors, Navigation Channels and Ocean Disposal Sites
- **Hydropower**
- **Reservoir Regulation; Water Supply**
- **Coastal Storm Damage Reduction**
  - Beach fills and Shoreline protection structures
- **Flood Damage Reduction**
  - Storm Drainage, Dams, levees, floodwalls
- **Ecosystem Restoration**
- **Emergency Response**
- **Recreation**
- **Regulatory**

Climate change has the potential to impact all USACE mission areas

USGS (Robert Thieler, Nate Plant, Jeff Williams)
NOAA (Steve Gill, Billy Sweet, Kristen Tronvig, Carolyn Lindley)
Navy (Tim McHale, Shun Ling)
Bureau of Reclamation (Mike Tansey)
FEMA (Mark Crowell , Tucker Mahoney)
NPS (Rebecca Beavers, Maria Honeycutt, Jodi Eshleman)
US Naval Academy (Dave Kriebel)
FHWA (Kevin Moody)
Moffatt & Nichol (John Headland)
HR Wallingford, UK (Jonathan Simm, Peter Hawkes)
University of Southampton, UK (Robert Nicholls)

Procedures to Evaluate Sea Level Change Impacts, Responses, and Adaptation

Civil Works Technical Letter Team

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John Winkelman, NAE
Jeff Gebert, NAP
Larry Cocchieri, NAD and PCX
Chris Spaur, NAB

Heidi Moritz, NWP
Team Lead for Engineering
Bernie Hargrave, NWS
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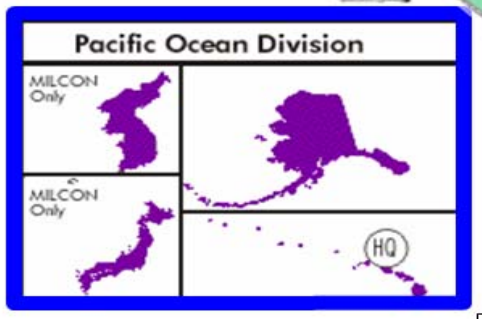
Henri Langlois, IWR
Team Lead, Planning
Jeff Arnold, IWR
Brian Harper, IWR
Rolf Olsen, IWR
Kate White, IWR
Andy Garcia, HQ

Tom Kendall, SPD



Mike Wutkowski, SAW

Matt Schrader, SAJ
Glenn Landers, SAJ
Mark Shafer, SAJ

Susan Rees, SAM
Dennis Mekkers, SAM
Patrick O'Brien, MVD

Julie Rosati, ERDC
Kevin Knuuti, ERDC

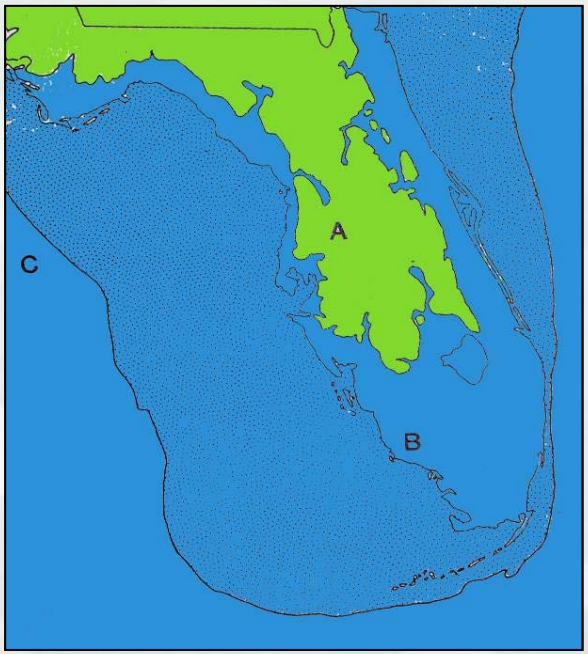
Justo Pena, SWG

Tom Smith, POH
Crane Johnson, POA

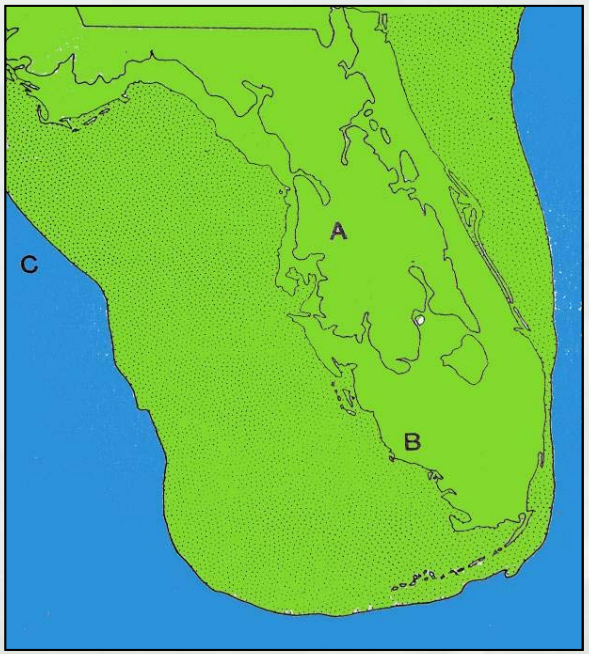
Climate Change Concerns for Florida

- **Sea Level Rise**
  - Salinity changes in coastal bays, plus tidally influenced creeks and rivers
  - Shoreline retreat with natural habitat changes/losses
  - Increasing flood frequency and depth in coastal areas
  - Saltwater intrusion in water supply wells, OR higher canal stages and flood risks
  - Uncertainties and risks in rate and depth of sea level rise
- **Warmer Temperatures**
  - Evaporation losses up; water supply down
  - Stresses on plant, animal, and marine ecosystems
  - Changes in growing season and migratory patterns
  - Changes in water quality
- **Hydrologic Pattern Changes**
  - Potential for less frequent and more intense rain events
  - Potential increased tropical storm intensity or frequency

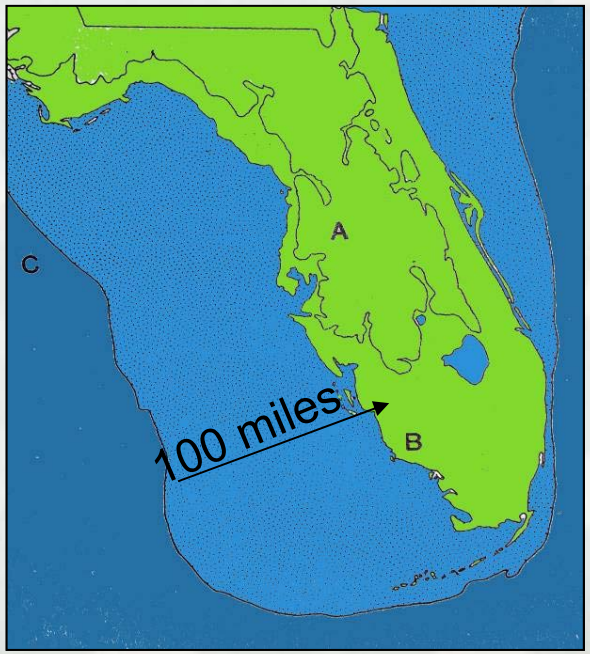
Florida Through Time – Sea Level Change Happens!



120,000 years ago
+ 6 meters (20')*



18,000 years ago
- 120 meters (420')

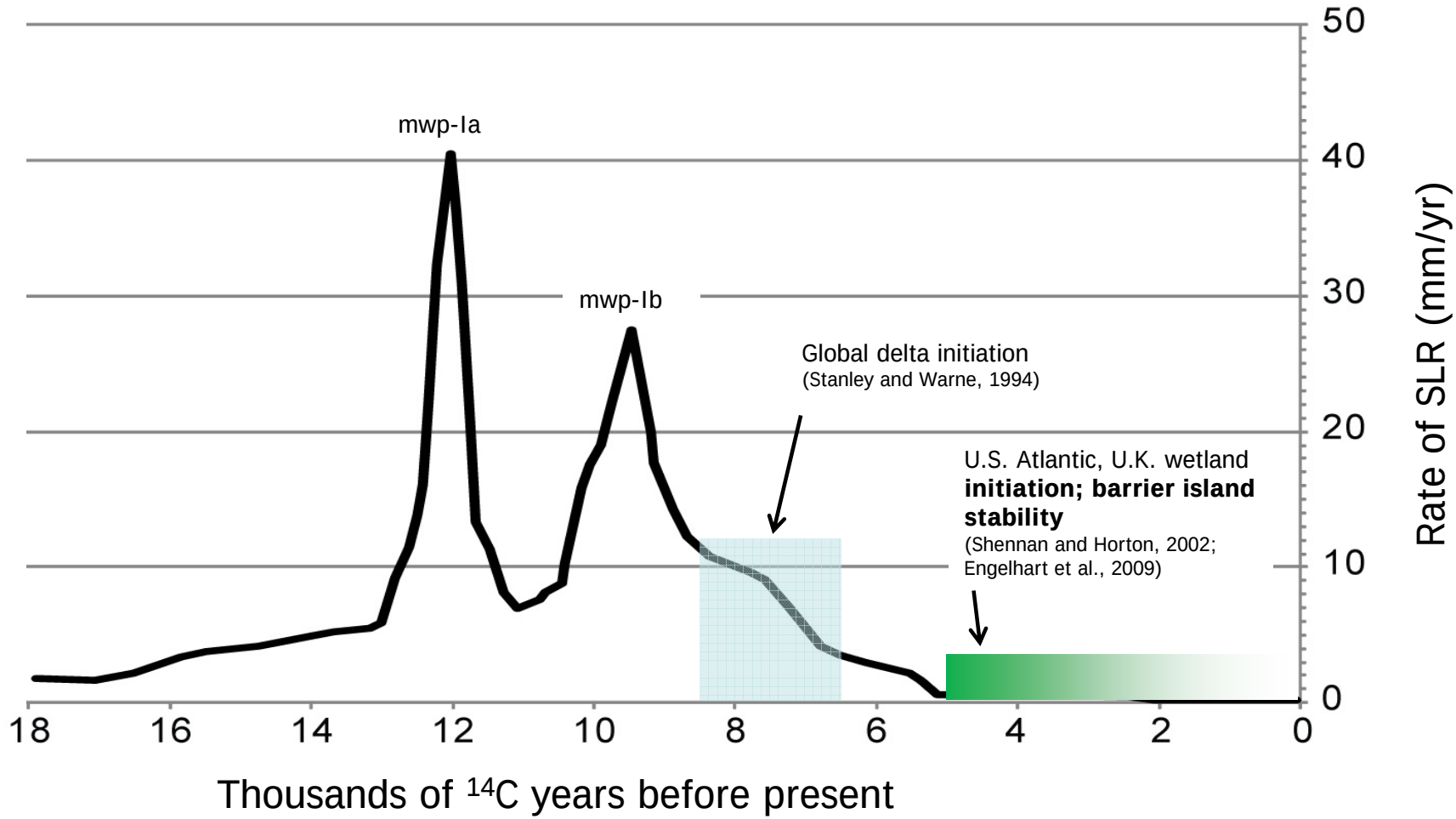


Today

*~ ½ from Greenland
*~ ½ from Antarctica

Credit: **Dr. Harold R. Wanless; University of Miami, Department of Geological Sciences; co-chair of Miami-Dade Climate Change Task Force**

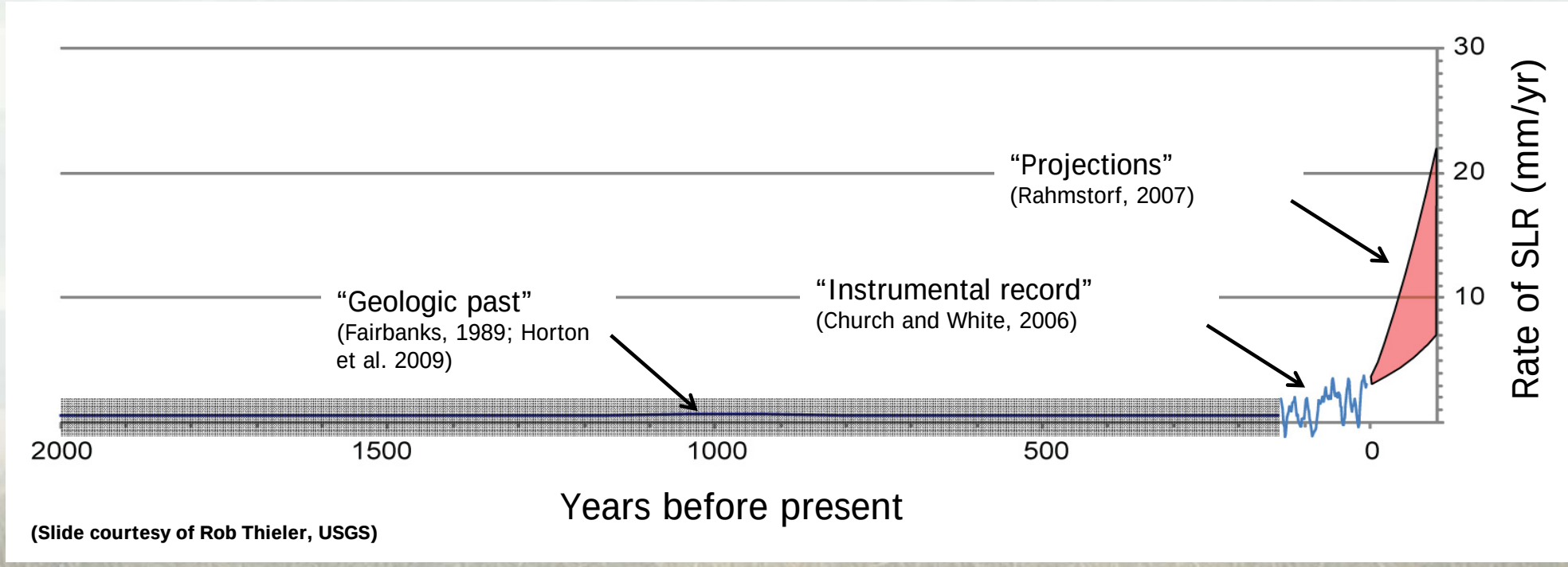
Rates of Sea-level rise since the Last Glacial Maximum



(Slide courtesy of Rob Thieler, USGS)

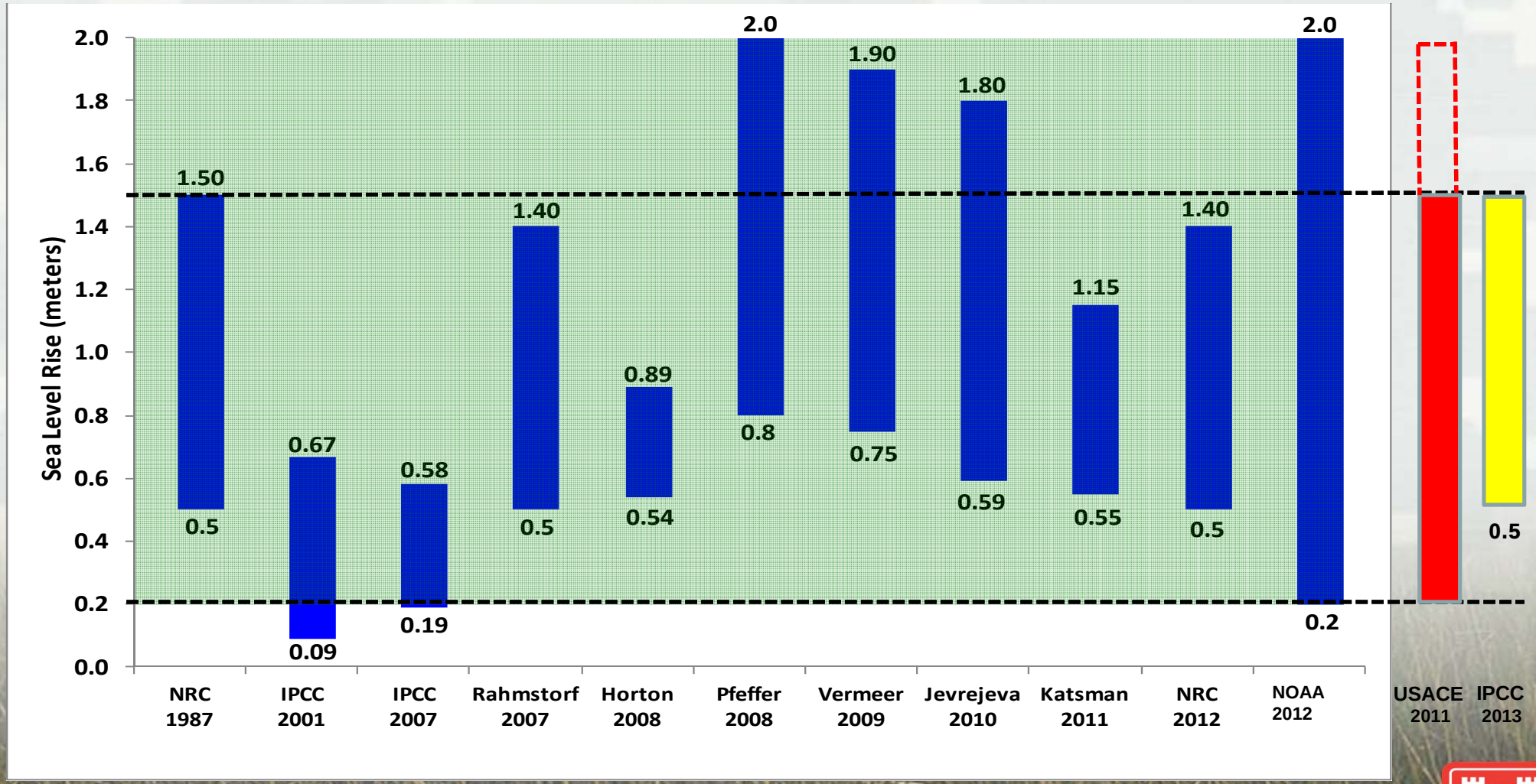
(SLR rate based on Fairbanks, 1989)

Past, present, and potential future rates of sea-level rise



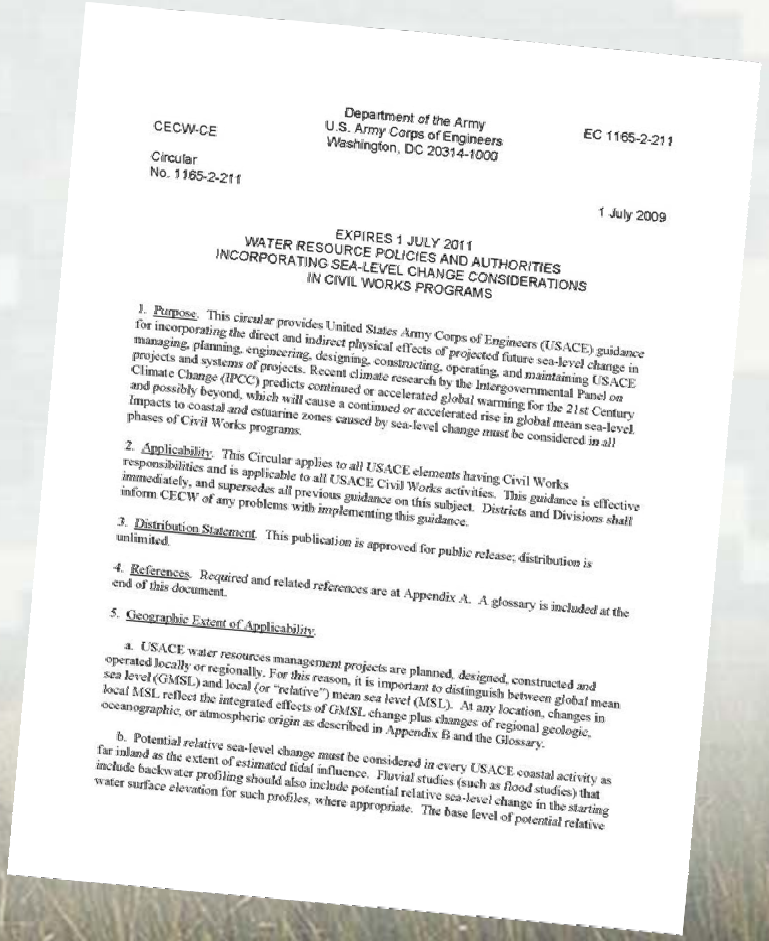
(Slide courtesy of Rob Thieler, USGS)

Estimates of Global Sea Level Change by 2100



USACE Guidance on Incorporating Sea Level Change Considerations

- EC 1165-2-212 was replaced with ER 1100-2-8162 on 31 Dec. 2013
- Permanent Design Requirement
- Applies to all phases of Corps Civil Works activities as far inland as extent of new tidal influence
- **ETL _____, *Procedures To Evaluate Sea Level Change: Impacts, Responses and Adaptation* effective 31 March 2014 to 31 March 2019 calls for analysis of 20, 50 and 100-year epochs**



CECW-CE

Department of the Army
U.S. Army Corps of Engineers
Washington, DC 20314-1000

EC 1165-2-211

Circular
No. 1165-2-211

1 July 2009

EXPIRES 1 JULY 2011

WATER RESOURCE POLICIES AND AUTHORITIES
INCORPORATING SEA-LEVEL CHANGE CONSIDERATIONS
IN CIVIL WORKS PROGRAMS

1. Purpose. This circular provides United States Army Corps of Engineers (USACE) guidance for incorporating the direct and indirect physical effects of projected future sea-level change in managing, planning, engineering, designing, constructing, operating, and maintaining USACE projects and systems of projects. Recent climate research by the Intergovernmental Panel on Climate Change (IPCC) predicts continued or accelerated global warming for the 21st Century and possibly beyond, which will cause a continued or accelerated rise in global mean sea-level. Impacts to coastal and estuarine zones caused by sea-level change must be considered in all phases of Civil Works programs.

2. Applicability. This Circular applies to all USACE elements having Civil Works responsibilities and is applicable to all USACE Civil Works activities. This guidance is effective immediately, and supersedes all previous guidance on this subject. Districts and Divisions shall inform CECW of any problems with implementing this guidance.

3. Distribution Statement. This publication is approved for public release; distribution is unlimited.

4. References. Required and related references are at Appendix A. A glossary is included at the end of this document.

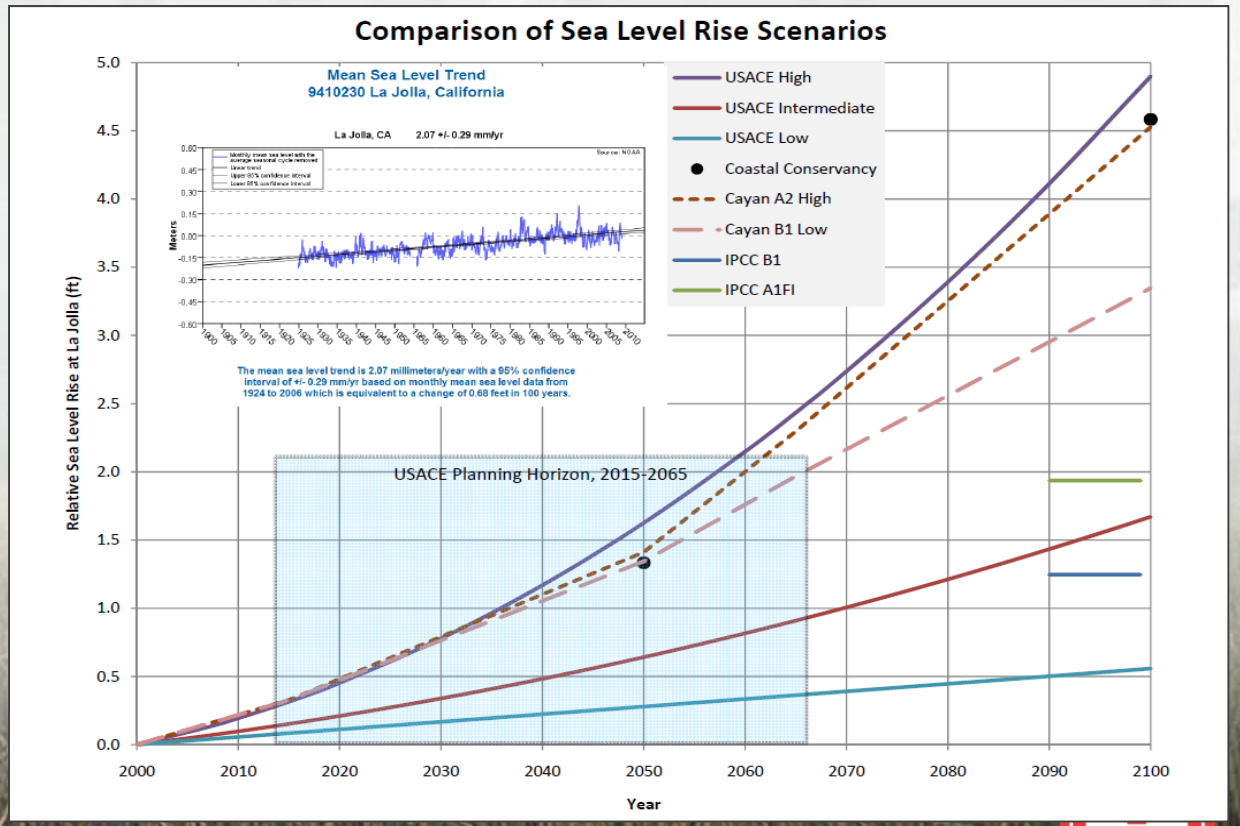
5. Geographic Extent of Applicability.

a. USACE water resources management projects are planned, designed, constructed and operated locally or regionally. For this reason, it is important to distinguish between global mean sea level (GMSL) and local (or "relative") mean sea level (MSL). At any location, changes in local MSL reflect the integrated effects of GMSL change plus changes of regional geologic, oceanographic, or atmospheric origin as described in Appendix B and the Glossary.

b. Potential relative sea-level change must be considered in every USACE coastal activity as far inland as the extent of estimated tidal influence. Fluvial studies (such as flood studies) that include backwater profiling should also include potential relative sea-level change in the starting water surface elevation for such profiles, where appropriate. The base level of potential relative

ER 1100-2-8162 Incorporating Sea Level Change Considerations in Civil Works Programs

- Three estimates of future SLC must be calculated for all Civil Works Projects within the extent of estimated tidal influence:
  - Extrapolated trend
  - Modified NRC Curve I
  - Modified NRC Curve III
- Requires creativity, funds to evaluate options



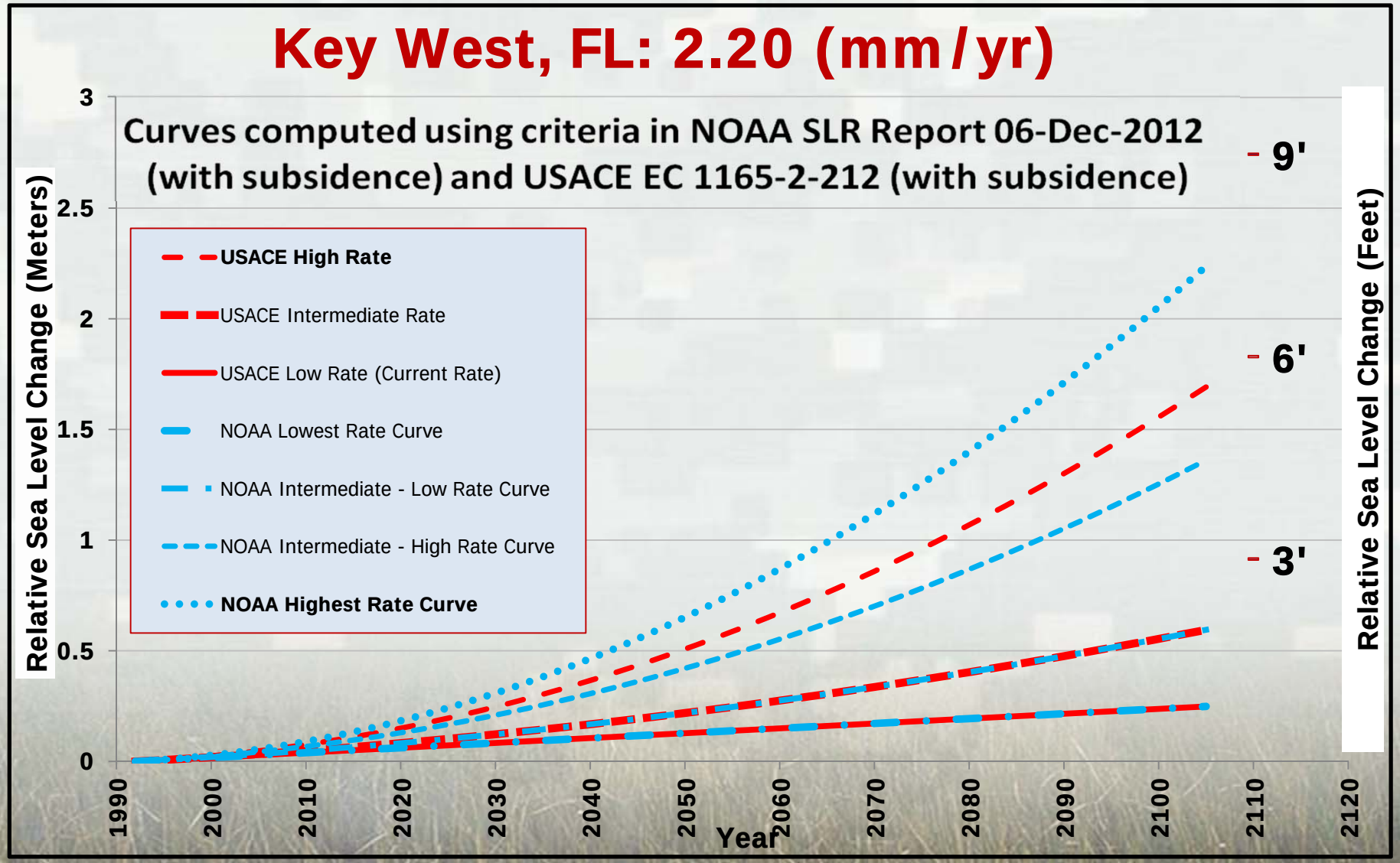
Florida Atlantic Coast
Historic Relative Sea Level Change

Relative Sea Level Change = Estimated Global Sea Level Trend (1.7 mm/yr) + local Vertical Land Motion

Reference: NOAA Technical Report NOS CO-OPS 065, *Estimating Vertical Land Motion from Long-Term Tide Gauge Records*, May 2013

Tide Station (# and Name)		mm/yr
8720030	Fernandina Beach (1897 to present)	2.30
8720218	Mayport	2.29
8721120	Daytona Beach *(Inactive)	2.32*
8723170	Miami Beach *(Inactive)	2.39*
8723970	Vaca Key **(<40 years)	2.90**
8724580	Key West (1913 to present)	2.20

Key West, FL: 2.20 (mm/yr)



Relative Sea Level Change Scenarios for Key West, FL (feet)

Year	USACE and NOAA Low	USACE Intermediate NOAA Int-Low (Mod. NRC Curve I)	NOAA Int-High	USACE High (Mod. NRC Curve III)	NOAA High
Scenario >	Continue Historic Relative SLC	Global SLC +0.5m by 2100	Global SLC +1.2m by 2100	Global SLC +1.5m by 2100	Global SLC +2.0m by 2100
1992	0.0	0.0	0.0	0.0	0.0
2010	0.1	0.2	0.2	0.3	0.3
2060	0.5	0.9	1.8	2.2	2.9
2100	0.8	1.8	4.1	5.1	6.7
2110	0.9	2.1	4.8	6.0	8.0
2120	0.9	2.4	5.6	7.0	9.3

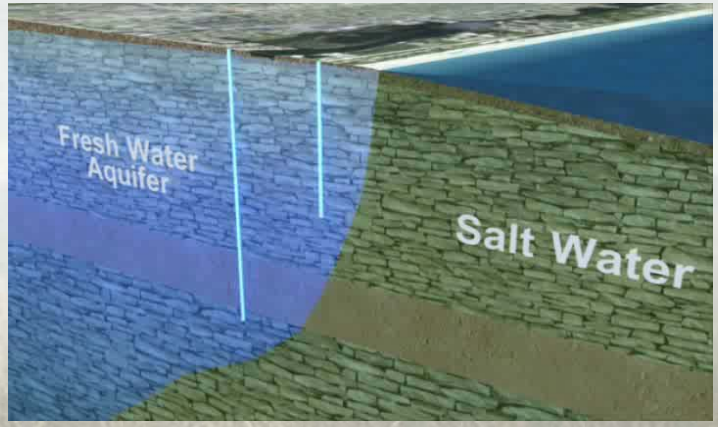
Notes: USACE projections are for historic, modified NRC Curve I and modified NRC Curve III rates of sea level change developed for Key West, Florida per USACE Engineering Circular (EC) 1165-2-212. This EC is based on guidance in the National Research Council (NRC) report, *Responding to Changes in Sea Level; Engineering Implications* dated September, 1987. The projections are developed using the local historic rate of sea level rise at Key West as reported by NOAA (2.20 mm/yr). NOAA projections use the same EC equations modified for different global SLR scenarios. The USACE and NOAA guidance documents do not address dates beyond 2100. All projections start from 1992 control for the national survey datum.

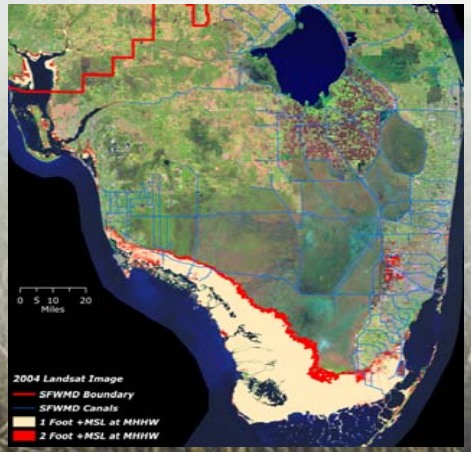
Sea Level Change Beyond 2100

- Anticipate accelerating SLC continuing well beyond 2100
- Very long term SLC may total 2.3m (7.5ft) for each degree Celsius in global warming. In geologic history, this may have taken a total of 1000 years. Impacts of modern high greenhouse gas levels?
- Protect existing built environment as long as economically feasible
- Buildings AND developed land will depreciate as SLR risks increase
- Develop "Exit strategies" to support timely voluntary actions
- Coastal ecosystems need suitable space for SLC adaptation
- Prioritize long term risk reduction. Shift from projects "optimized" for static future conditions to "robust and adaptable systems"

SLR Concerns in Florida

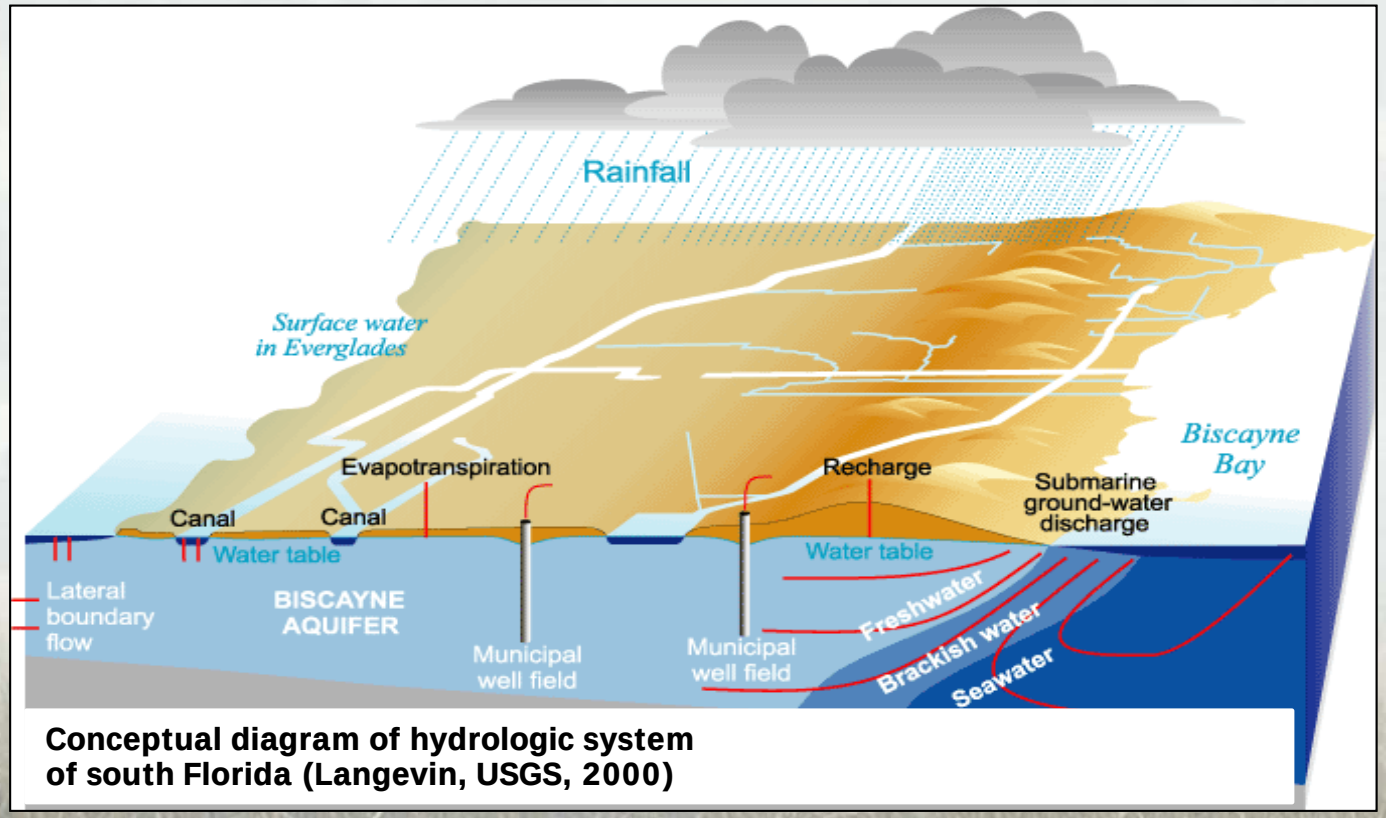
- Direct Impacts
  (SLR + waves or storm surge)
- Flood Drainage
  (increased frequency, depth and/or duration of interior areas flooding)
- Water Supply
  (**saltwater intrusion**)
- Natural System
  (coastal ecosystems and **rapid peat loss**)





(SFWMD, 2011)
(FAU, 2008)

Flood Risk vs Water Supply Concerns

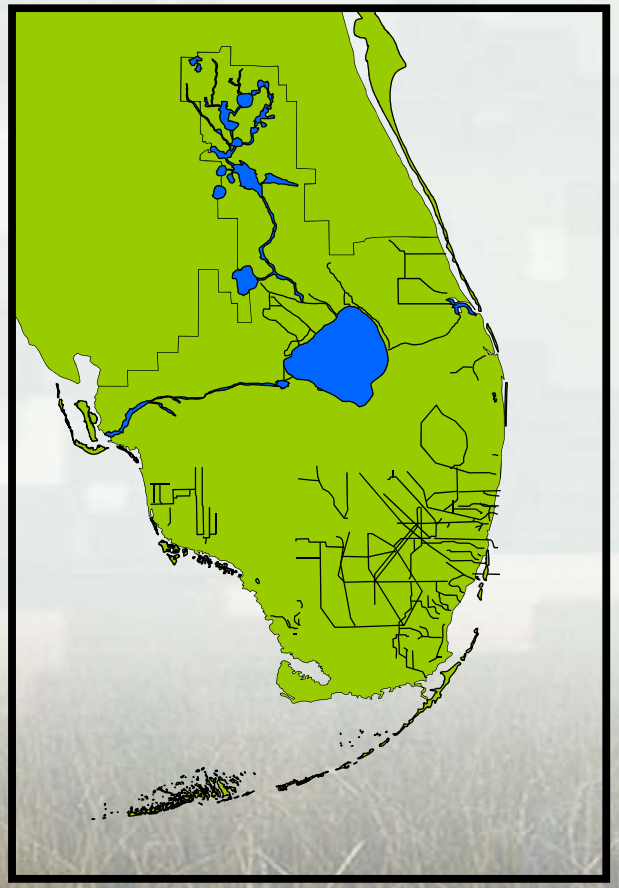


Conceptual diagram of hydrologic system of south Florida (Langevin, USGS, 2000)

- Shallow wells are the primary source of drinking water in South Florida communities
- Continued sea level rise will cause saltwater intrusion into wells and create a need for new freshwater sources
- --- OR ---
- Protecting water supply wells with higher canal stages will increase flooding in many low elevation communities

Water Supply Concerns

Kissimmee River Basin and Lake Okeechobee



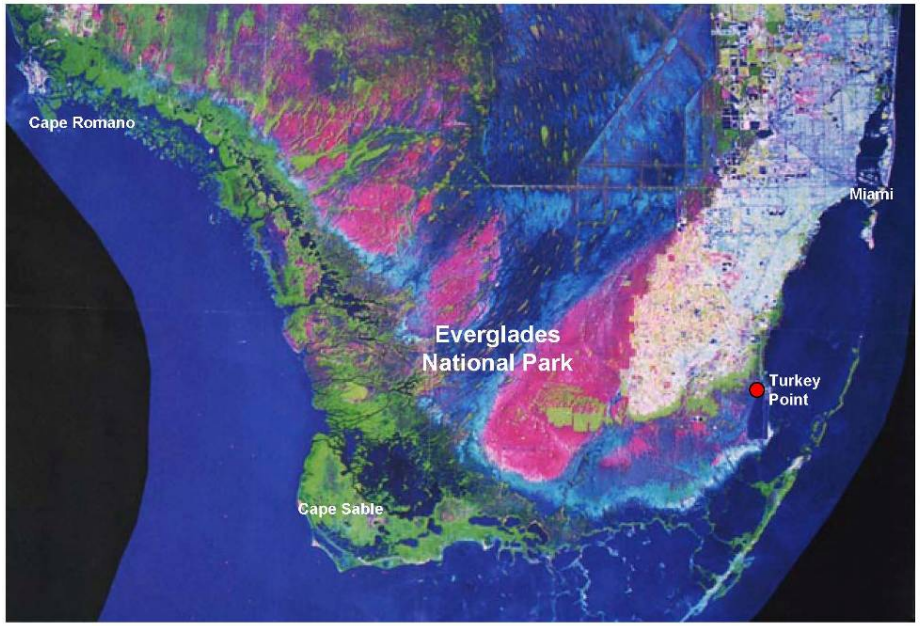
Lake Okeechobee Drought

- **Potential saltwater intrusion into coastal water supply wells, plus climate change impacts on rainfall patterns and evaporation will increase water supply demands and water storage needs**

Sea Level Rise in South Florida

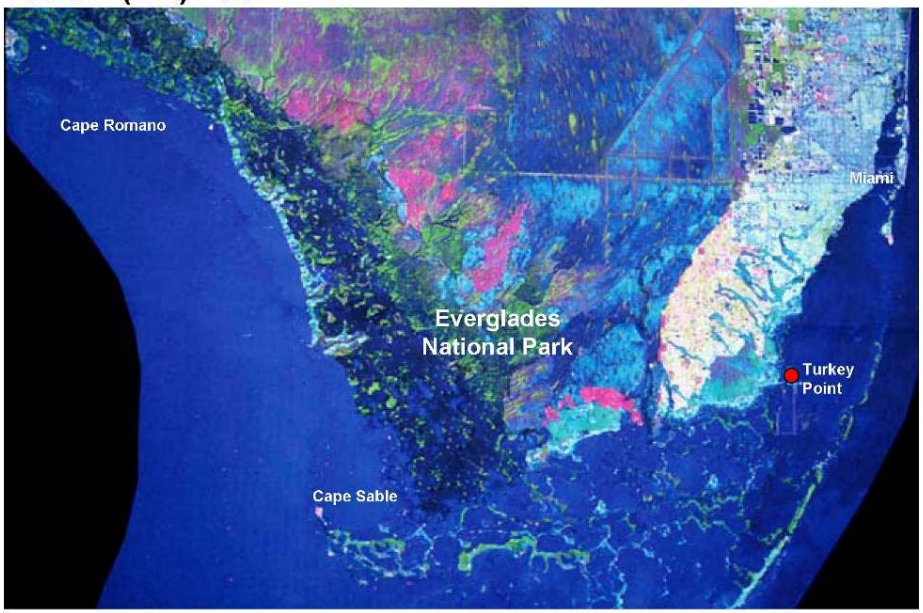
- A little less than 1 foot during the past century measured at Key West
- A 2 foot rise would have significant effects

South Florida 1995



Credit: Dr. Harold R. Wanless; University of Miami, Department of Geological Sciences; co-chair of Miami-Dade Climate Change Task Force

+60 cm (2 ft) rise

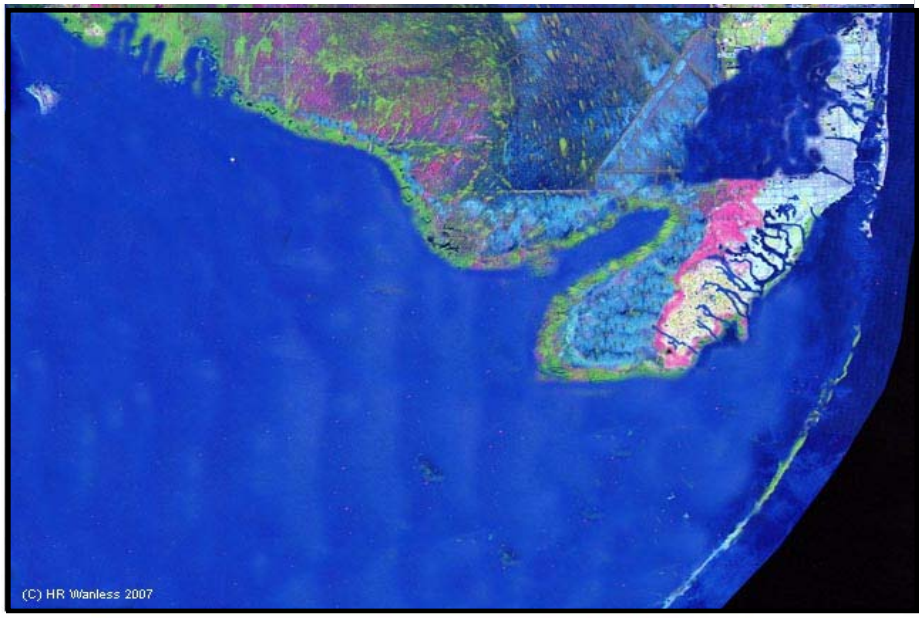


Credit: Dr. Harold R. Wanless; University of Miami, Department of Geological Sciences; co-chair of Miami-Dade Climate Change Task Force

Sea Level Rise in South Florida

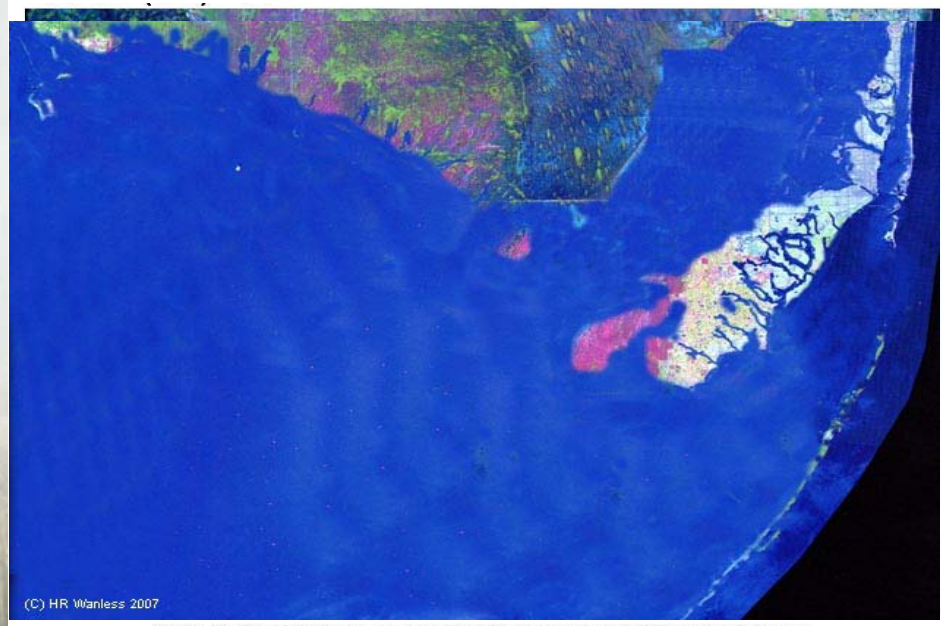
- A little less than 1 foot during the past century measured at Key West
- A 4-5 foot rise would have dramatic impacts

MHHW +120 cm (4 ft) rise

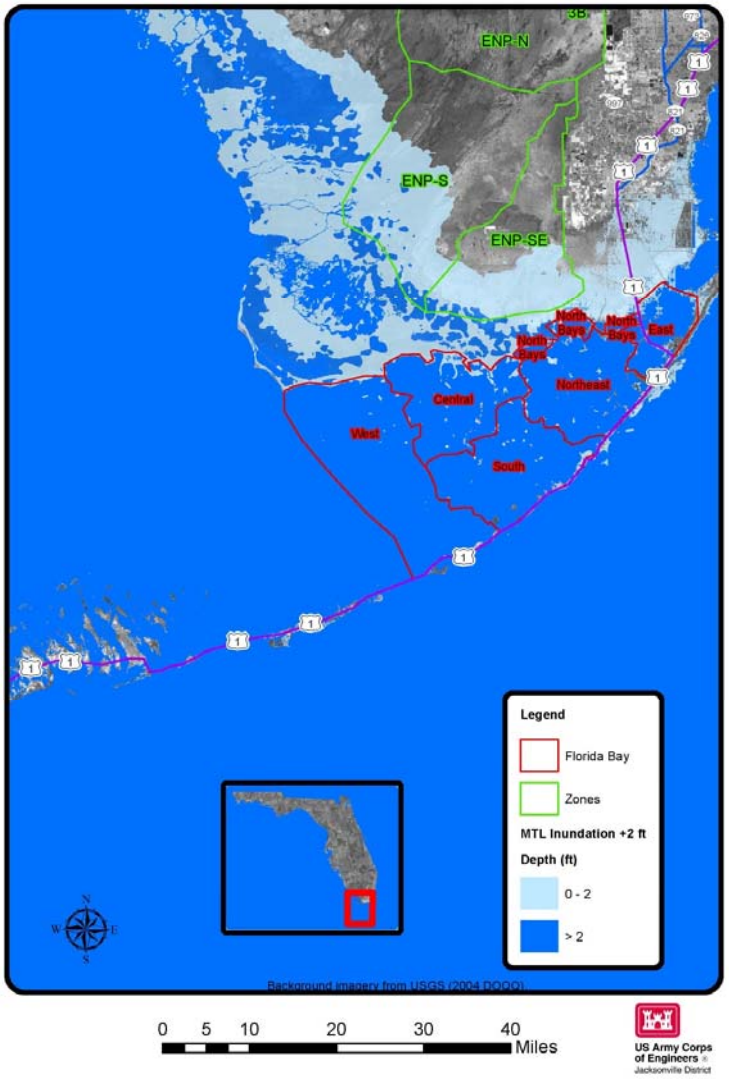


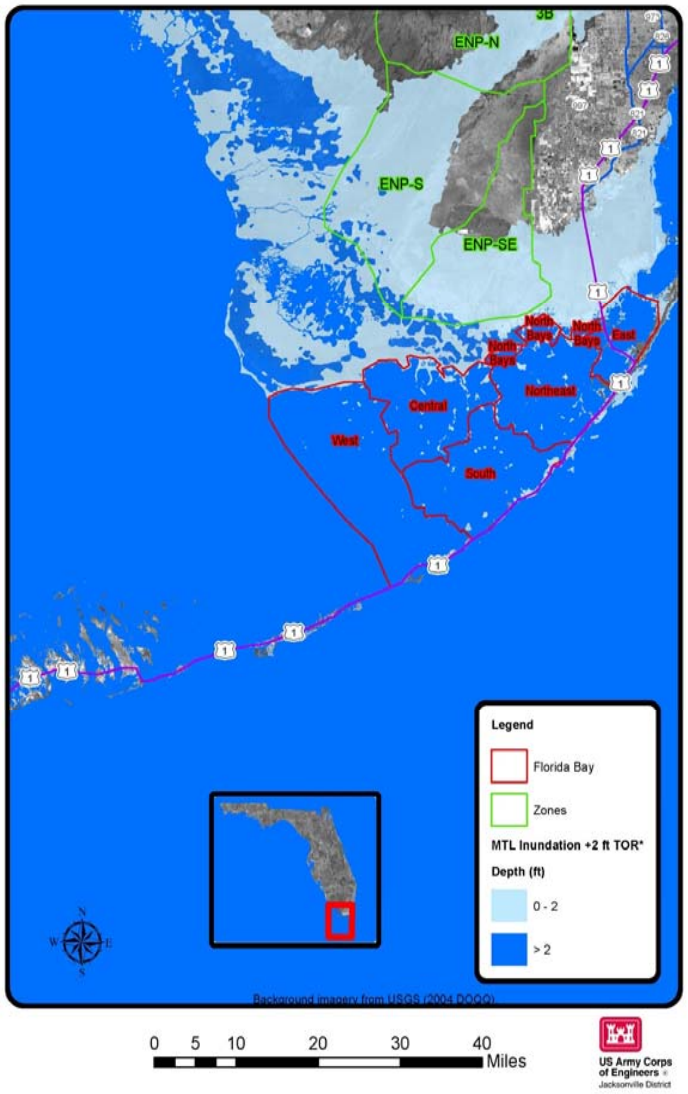
Credit: Dr. Harold R. Wanless; University of Miami, Department of Geological Sciences; co-chair of Miami-Dade Climate Change Task Force

MHHW +150 cm (5 ft) rise



Credit: Dr. Harold R. Wanless; University of Miami, Department of Geological Sciences; co-chair of Miami-Dade Climate Change Task Force





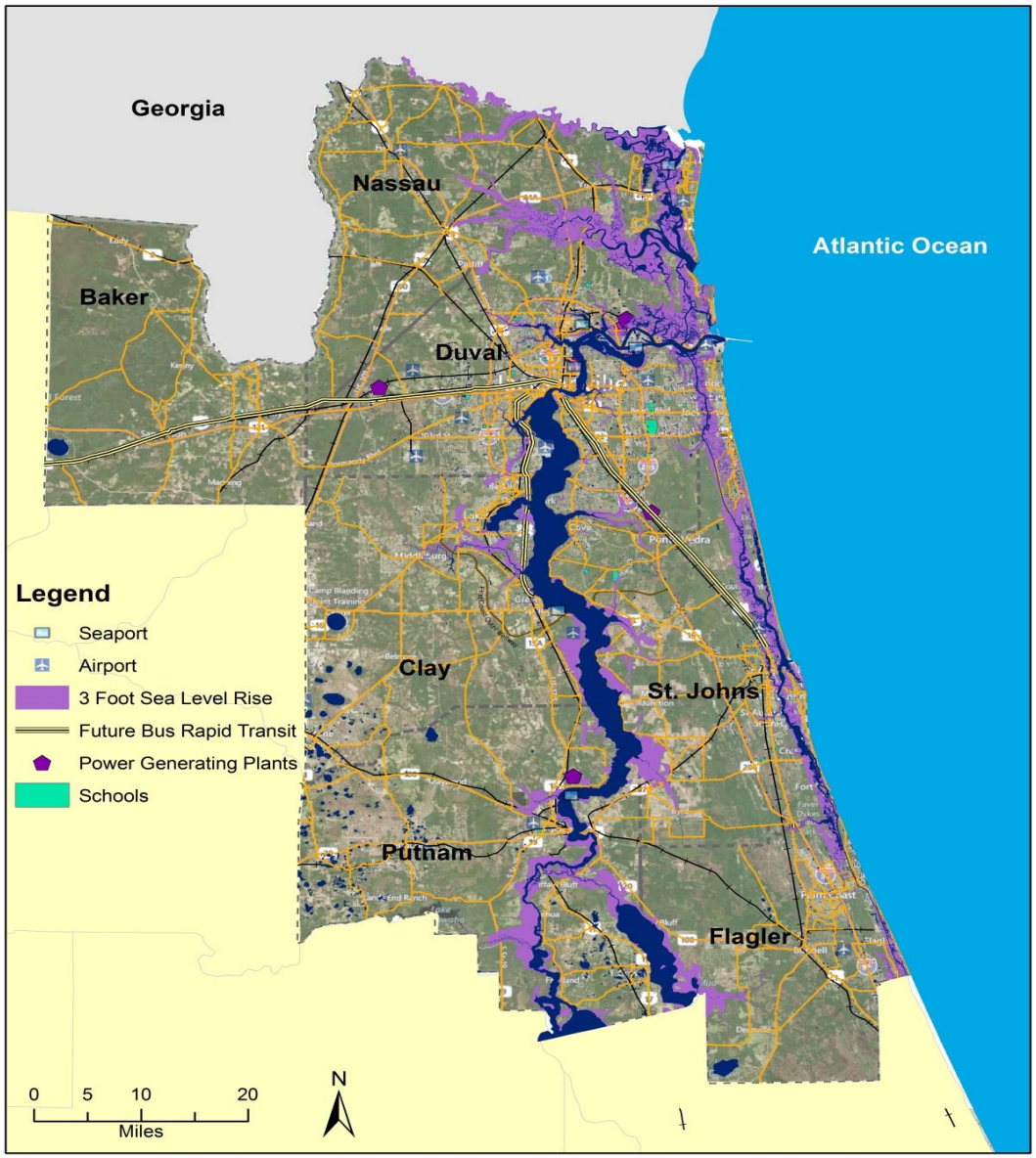
GIS projections of 2 ft of SLR over Everglades topography with / without Peat Soils

Northeast Florida Sea Level Rise - 1 Foot Rise

Credit: Northeast Florida Regional Council

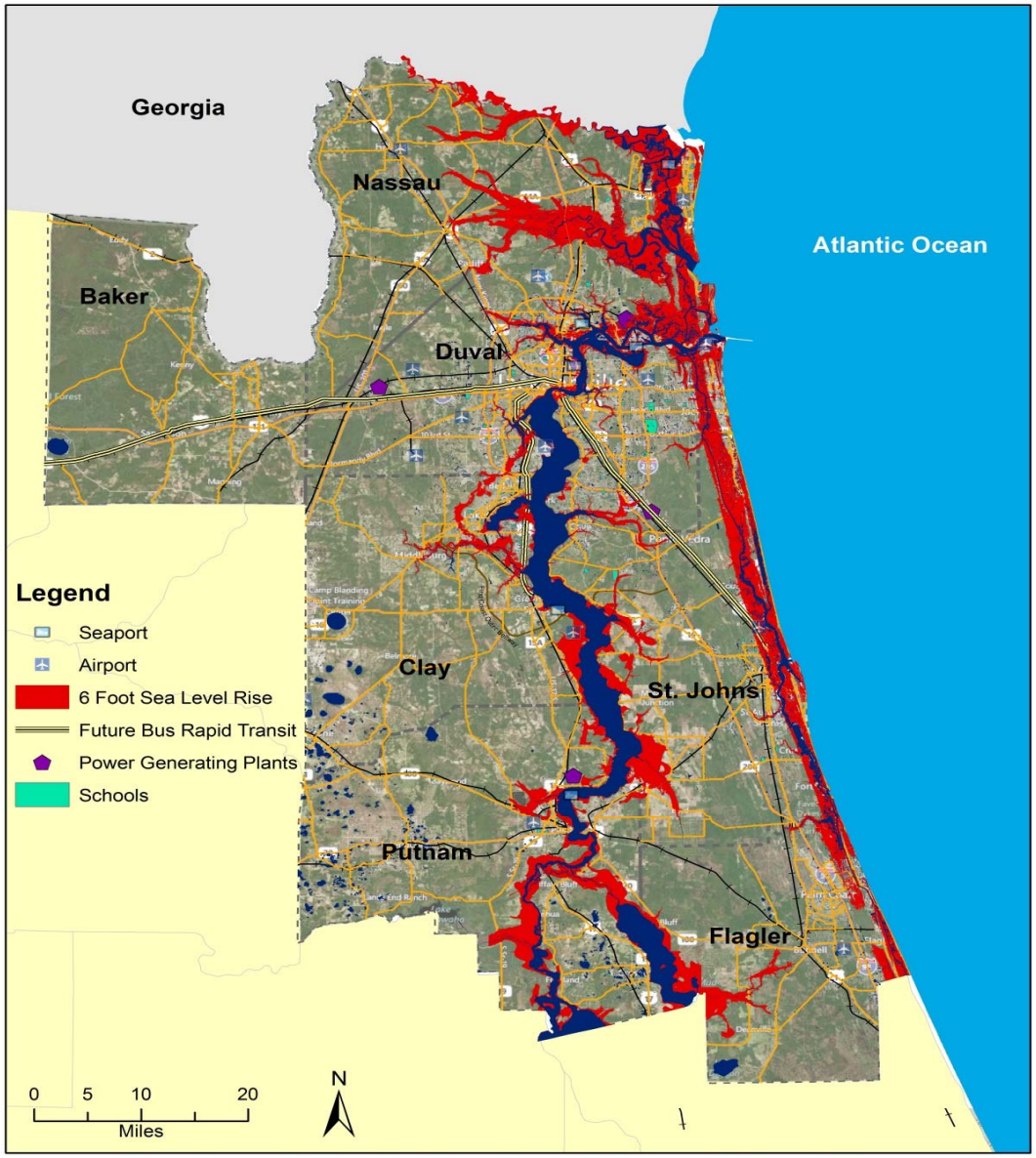
Sea Level Rise in St. Johns River

- **Increases Flood Risks**
- **Increases Salinity in River and adjacent groundwater**
- **Decreases surface storage of freshwater**



Northeast Florida Sea Level Rise - 3 Foot

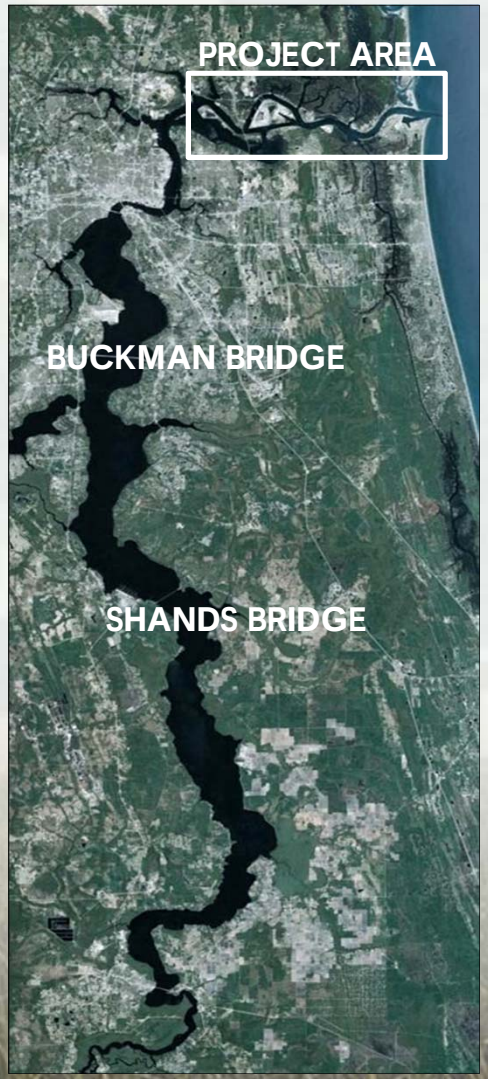
Credit: Northeast Florida Regional Council



Northeast Florida Sea Level Rise - 6 Foot Rise

Credit: Northeast Florida Regional Council

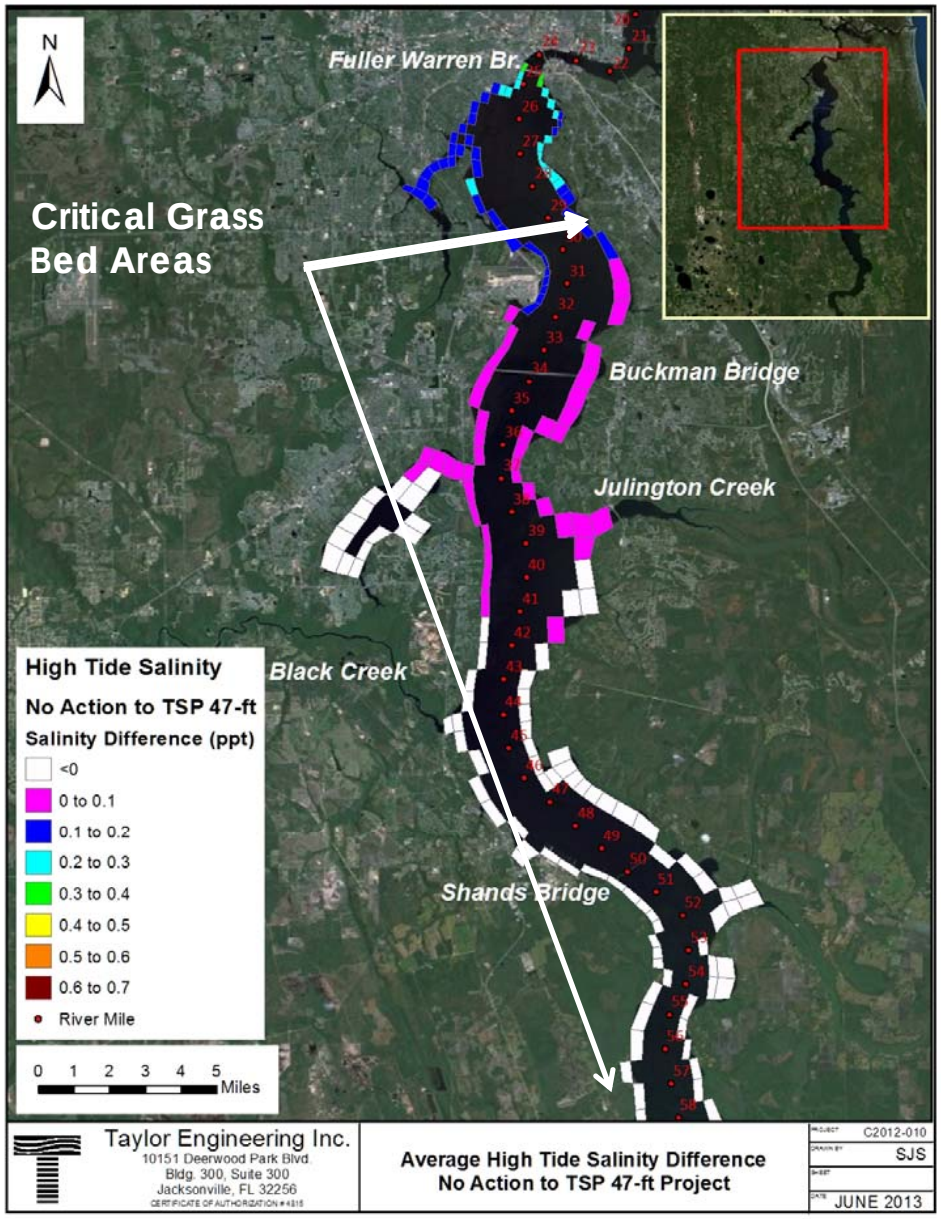
Changes to Salinity



- Hydrodynamic modeling predicts “small” increases in salinity levels within the St. Johns River main stem
- Small in comparison to other factors that can influence salinity such as drought, ocean level, sea level rise, etc.
- Tributary modeling is still ongoing, but effects are expected to be commensurate with findings in the mainstem.

Example, at Buckman Bridge, (Mile 34)

- Without-project average salinity = 2.0 ppt
- With-project average salinity increase < 0.1 ppt
- Extreme dry year (2011) average salinity = 7.3 ppt



Salinity	Time - Days: 1	7	30	90
25	Extreme Stress			
15	Low Stress	Moderate Stress		
10	Low Stress			
5	No Effect			Low Stress
3	No Effect			

Increasing Flood Risks from Long Term Sea Level Change

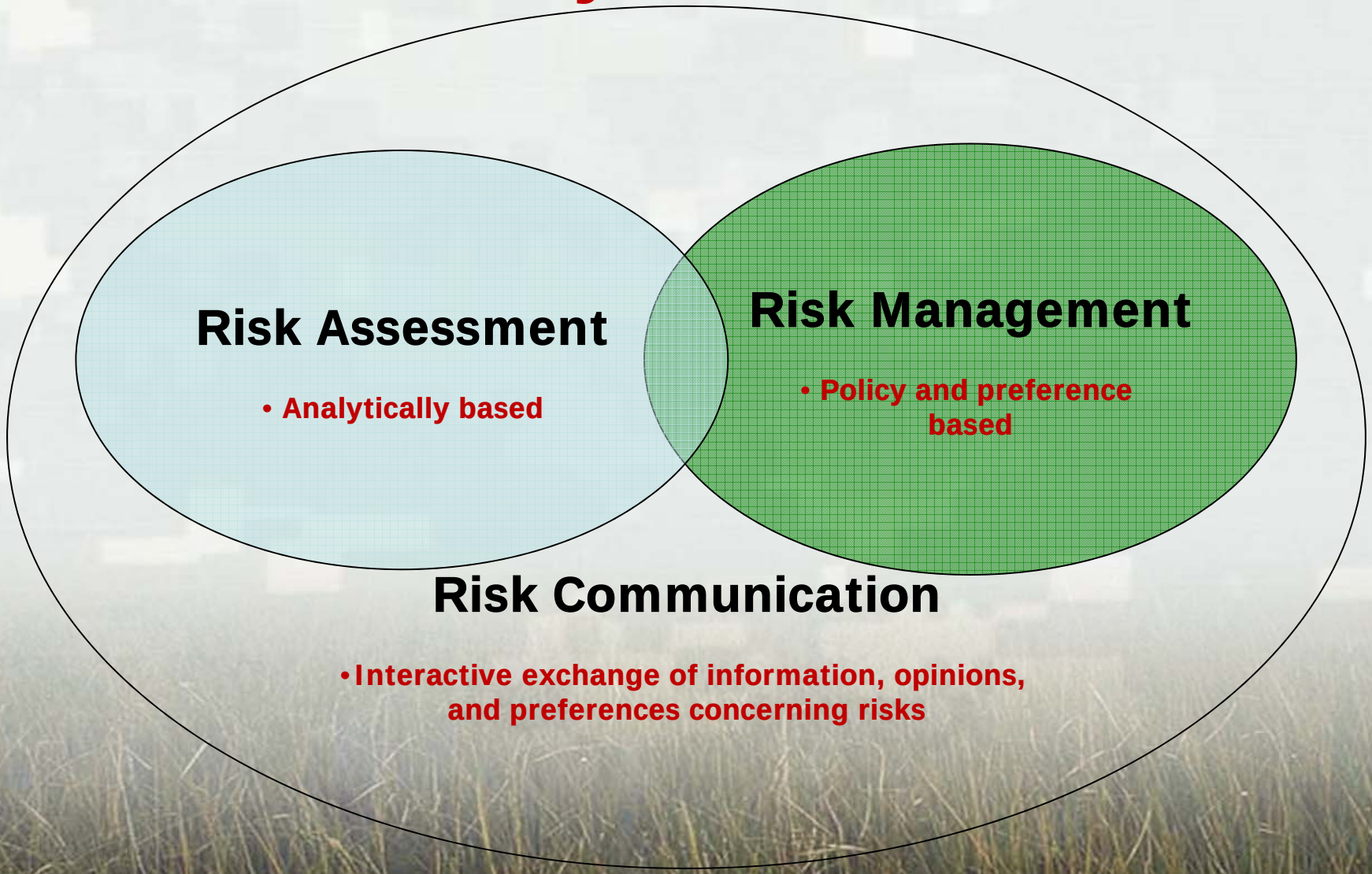
These estimates were created using the existing min/max elevations found in the county DEM data. All percentages are for full county area, including natural areas and parks.

County:	Percent below elevation 5ft:	Percent below elevation 10ft:	Percent below elevation 20ft:	Percent below elevation 30ft:
Dade	61	97	99+	99+
Brevard	17	26	64	96
Duval	15	27	51	67

Risk

- Risk is a measure of the probability and consequence of uncertain future events
- Risk includes
  - Potential for gain (opportunities)
  - Exposure to losses (hazards)

Risk Analysis in Three Tasks



United Kingdom Climate Adaptation Approaches: Precautionary versus managed adaptive

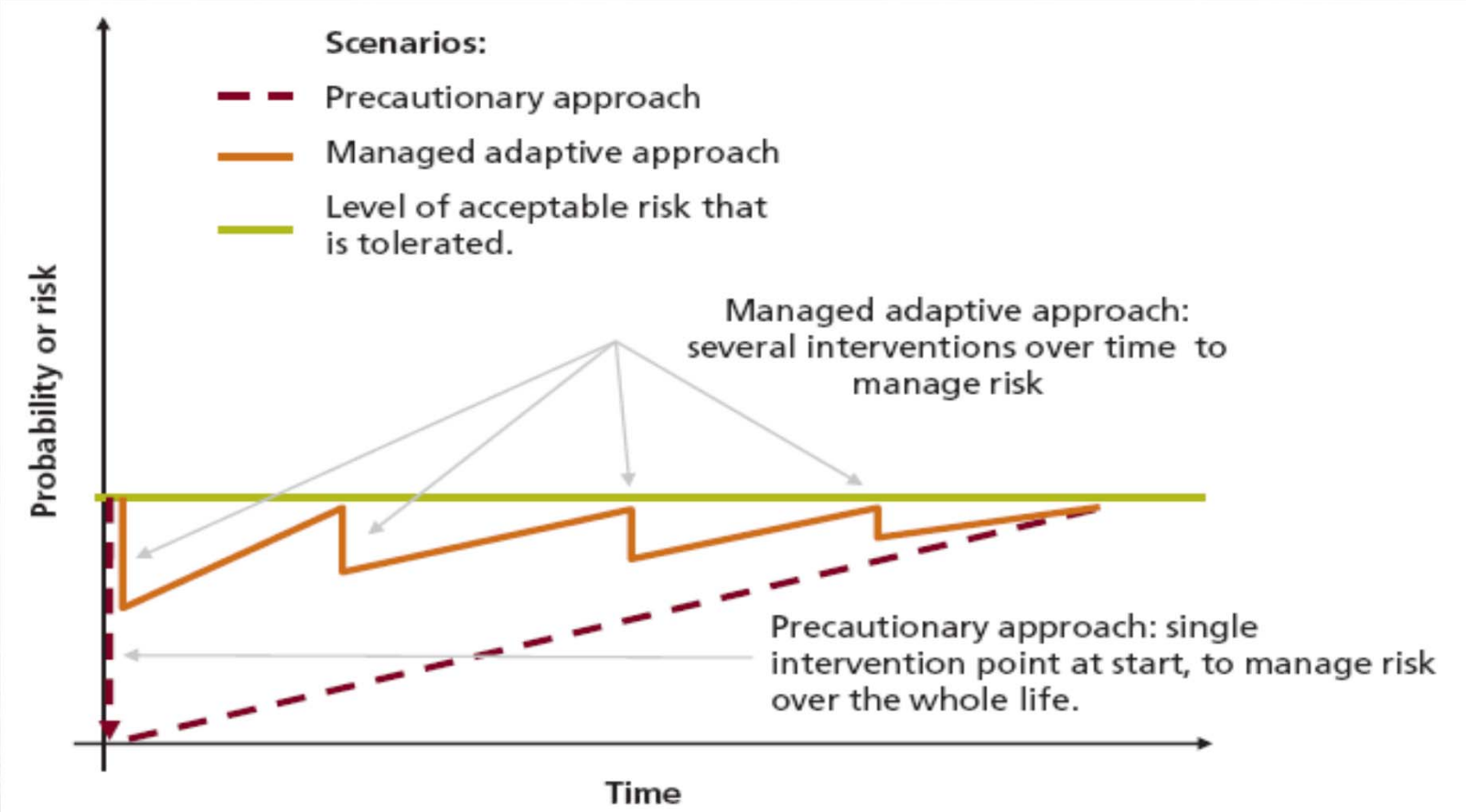


Figure courtesy of Jonathan Simm, HR Wallingford, UK

Risk Management Decision

- Sustainable
- Robust – performs well under wide range of future conditions
- Cost-risk trade-offs
  - Regret-based approach
  - If cost-cost trade-off, no firm rule
  - If trade-off of cost vs. safety, precautionary with respect to safety risk, minimize worst-case outcome

Systems Approach to Adaptation

- Two problems: short AND long term (100 yr++) risk reduction
- Recognize need for interagency collaboration and shared planning
- Address the combined needs of human and natural systems
- Prioritize long term risk reduction. Shift from projects "optimized" for static future conditions to "robust and adaptable systems"
- Encourage Public Investment in "Framework" Infrastructure in low risk areas (water supply, major roads, flood risk reduction, power, sewer, etc.).
- Provide Incentives for Private Development in low risk areas
- Hurricanes and other disasters are opportunities to redevelop in lower risk areas. Implement pre-storm relocation agreements.

Florida Sea Level Rise Concerns
Take Away Points

- USACE SLR projections are based on guidance from the National Research Council, are site specific and include local uplift or subsidence. Does not address wave and storm surge frequency.
- **SLR PERMANENTLY increases coastal flood frequency**
- Leading Indicators of Sea Level Rise, such as the reduction in polar ice caps, and the recent rapid increases in the rate of glacier melting worldwide forecast significant SLR rate increases
- **Long Term Sea Level Rise Adaptation Strategies** are needed at project, community, watershed, and national scales
- **USACE Watershed Planning Authority** – With local support, might be an option for coordinated interagency regional SLR adaptation planning. Cost share up to 75/25 federal/local.

Ideas for Discussion

- Focus on short AND long term (100 yr+) risk reduction
- Recognize many buildings are remodeled or rebuilt after 50 years
- Shift planning from projects “optimized” for static future conditions to “robust and adaptable systems” that support long term risk reduction plans
- Establish unified sea level rise scenarios for watersheds or other broad areas for coordinated planning purposes
- Remember how the Interstate Highway System changed city development patterns. Build “Framework” Infrastructure (major roads, power, water, sewer, etc.) in low risk areas and strongly encourage private development in these areas.
- Hurricanes and other disasters are opportunities to redevelop in low risk areas. Implement pre-storm relocation agreements.

Thank you!

For additional information, contact:

Glenn.B.Landers@usace.army.mil

Sea Level Rise Task Force Report - General Outline

Executive Summary and Recommendations (Cornerstones for resilience)

I. **Purpose**

Purpose: Review the relevant data and prior studies, assessments, reports, and evaluations of the potential impact of sea level rise on vital public services and facilities, real estate, water and other ecological resources, water front property, and infrastructure.

- *Include a timeline of climate change planning (build off the timeline in GreenPrint, delete non-climate related and add more recent events)*

II. **Deliverables:**

a. **Provide a comprehensive and realistic assessment of the likely and potential impacts of sea level rise and storm surge over time**

- Sea Level Rise Projection
  - Compact SLR Projection chart and short description of process
- Excerpts from Compact Vulnerability Analysis
  - Brief description of process and infrastructure analyzed and results
  - Some images from the Analysis – Inundation maps
- Examples of additional local/regional tools being developed
  - WASD/USGS Modeling and how it will help inform maps and stormwater planning
  - FHWA Pilot
  - AAA Pilot
- What else??

b. **Develop a set of recommendations relative to amendments to the Comprehensive Development Master Plan, capital facilities planning, budgetary priorities and other County programs**

Insert Table 4 - SLR Responses and Status of Development (from Georgetown Climate Ctr. Adaptation Took Kit)?

Base recommendations on key cornerstone concepts of policies adopted in the Comprehensive Development Master Plan (CDMP):

- **Develop Vital Signs (ecosystem, health based, other?)**
  - Relate and communicate the resiliency value added by ecology-based programs (reference Nature Conservancy work with Swiss Re)

- Use current BRACE project as a springboard and way of informing this work

➢ **All County department plans should include adaptation strategies**

- Develop a 2-foot SLR scenario map using the USGS surface groundwater model
- Establish degree of SLR and time period to consider for various planning and programming, i.e. land use planning: 2 feet by 2060. Update those standards to align with the regional unified SLR projection.
- Develop strategy with key departments for integration of cc consideration in design, location, and development of infrastructure and public facilities (Create a strategy workgroup with key staff from depts.. such as WASD, PWWM, Transit, Airport, Seaport, OEM, others?)
- Require consideration of future SLR in development of Capital Improvement Programs (using map and results from USGS model)

➢ **Resiliency in Development and Redevelopment Practices** *(i.e.: CDMP LU-3F. By 2017, Miami-Dade County shall develop a Development Impact Tool or criteria to assess how proposed development and redevelopment project features including location, site design, land use types, density and intensity of uses, landscaping, and building design, will help mitigate climate impacts or may exacerbate climate related hazards. The tool would also assess each development's projected level of risk of exposure to climate change impacts, such as inland flooding.)*

- Floodplain regulations (page 20 Georgetown Guide)
  - SAME STANDARDS FOR ALL AREAS (SFHA OR NOT)
  - MINIMUM FREEBOARD OF 12"
  - UPDATE OF THE COUNTY FLOOD CRITERIA
  - CRITICAL FACILITIES MINIMUM STANDARD – ABOVE 500-YEAR FLOOD PLAIN
- Building Codes and Resilient Designs (page 23 Georgetown Guide)
- Soft Armoring – adopt shoreline protection policies that emphasize use of living shorelines and seek to avoid shoreline hardening where feasible (page 39 Georgetown Guide)

Comment [DG1]: These are directly from the PWWM presentation.

- **Direct future population concentrations away from vulnerable areas**
    - Create a plan to locate infrastructure and dev. outside coastal or flood hazard prone areas using projections of SLR to identify those areas
- **Align planning to maximize resiliency** – create zones in which to coordinate community planning (urban centers in M-DC), economic development, brownfield development, community reinvestment, sustainability efforts with resiliency. *(Jeb Burgmann Resilience Zone concept.)*
    - Direct resources to coordinate these efforts.
- **Communication/Awareness**
- **Continue to evaluate projections for sea level rise**
    - Participate in update of the SE FL Regional Climate Change Compact Unified SLR Projection

III. Conclusion

MEMORANDUM

ICIC
Agenda Item No. 2D

TO: Honorable Chairwoman Rebeca Sosa
and Members, Board of County Commissioners

DATE: April 9, 2014

FROM: R. A. Cuevas, Jr.
County Attorney

SUBJECT: Resolution setting policy for Miami-Dade County; directing the Mayor to require all County infrastructure projects to consider potential impacts of sea level rise during all project phases

The accompanying resolution was prepared and placed on the agenda at the request of Prime Sponsor Chairwoman Rebeca Sosa.

R. A. Cuevas, Jr.
County Attorney

RAC/smm

MEMORANDUM

(Revised)

TO: Honorable Chairwoman Rebeca Sosa
and Members, Board of County Commissioners

DATE: May 6, 2014

FROM: R. A. Cuevas, Jr.
County Attorney

SUBJECT: Agenda Item No.

Please note any items checked.

_____ **"3-Day Rule" for committees applicable if raised**

_____ **6 weeks required between first reading and public hearing**

_____ **4 weeks notification to municipal officials required prior to public hearing**

_____ **Decreases revenues or increases expenditures without balancing budget**

_____ **Budget required**

_____ **Statement of fiscal impact required**

_____ **Ordinance creating a new board requires detailed County Mayor's report for public hearing**

_____ **No committee review**

_____ **Applicable legislation requires more than a majority vote (i.e., 2/3's ____, 3/5's ____, unanimous _____) to approve**

_____ **Current information regarding funding source, index code and available balance, and available capacity (if debt is contemplated) required**

Approved _____ Mayor
Veto _____
Override _____

Agenda Item No.
5-6-14

RESOLUTION NO. _____

RESOLUTION SETTING POLICY FOR MIAMI-DADE COUNTY; DIRECTING THE MAYOR OR DESIGNEE TO REQUIRE ALL COUNTY INFRASTRUCTURE PROJECTS TO CONSIDER POTENTIAL IMPACTS OF SEA LEVEL RISE DURING ALL PROJECT PHASES INCLUDING BUT NOT LIMITED TO PLANNING, DESIGN, AND CONSTRUCTION, AND FURTHER DIRECTING THE MAYOR OR DESIGNEE TO EVALUATE THE EXISTING INFRASTRUCTURE IN THE FACE OF SEA LEVEL RISE

WHEREAS, Southeast Florida is considered one of the most vulnerable areas of the country to the consequences of sea level rise; and

WHEREAS, Miami-Dade County is composed of a large section of waterfront property and is a low-lying coastal community at the frontline to experience the impacts of sea level rise; and

WHEREAS, Miami-Dade County has various vital facilities and infrastructure that could be adversely affected by sea level rise; and

WHEREAS, local and regional tide data show a trend of rising sea levels and more recent data and factors suggest this trend may accelerate in the future; and

WHEREAS, climate scientists and other groups such as the Southeast Environmental Research Center and the National Oceanic and Atmospheric Administration's Costal Services Center have predicted the potential erosion of dry land and loss of waterfront property in Miami-Dade County as a result of sea level rise; and

WHEREAS, according to the National Wildlife Federation and the Florida Wildlife Federation a mid-range sea level rise of fifteen (15) inches in Biscayne Bay would result in an 85% loss of cypress swamp, a 33% loss of inland fresh marsh, a 79% loss of tidal flats, and a 54% loss of salt marsh; and

WHEREAS, Miami-Dade County has been in the forefront of these issues for many years; and

WHEREAS, the Miami-Dade County Comprehensive Development Master Plan (hereinafter "the CDMP") was recently amended to address sea level rise and climate change, through policies which call for the consideration of sea level rise and climate change as an integral component of all planning processes, including incorporation into public investment processes and decisions; and

WHEREAS, Miami-Dade County is a member of the Southeast Florida Regional Climate Compact; and

WHEREAS, a "Unified Sea Level Rise Projection for Southeast Florida" was developed by a Sea Level Rise Technical Ad Hoc Work Group of the Southeast Florida Regional Climate Compact; and

WHEREAS, the Board of County Commissioners (hereinafter "the Board") had previously created the Miami-Dade Climate Change Advisory Task Force, established in July 2006 for a period of five years, through the adoption of Ordinance 06-113, which served as an advisory board to the Board on the issue of global warming climate change and was charged with identifying potential future climate change impacts to Miami-Dade County, while providing recommendations regarding mitigation and adaptation measures to respond to climate change; and

WHEREAS, the Miami-Dade Climate Change Advisory Task Force co-chaired the Interagency Climate Change Adaptation Task Force with the White House Council on Environmental Quality, the Office of Science and Technology Policy, and the National Oceanic and Atmosphere Administration, and released its interagency report in October of 2010 outlining recommendations to the President of the United States for how Federal Agency policies and programs can better prepare the United States to respond to the impacts of climate change; and

WHEREAS, in 2010, Miami-Dade County was featured as a best practice case study — Adapting to Sea Level Rise in Miami-Dade County, Florida — as part of the National Oceanic and Atmospheric Administration's Digital Coast Initiative and Inundation Toolkit; and

WHEREAS, the Miami-Dade Climate Change Advisory Task Force, sunset and dissolved in 2011, pursuant to Ordinance 06-113; and

WHEREAS, in 2012 the City of Miami Beach has developed a Stormwater Master Plan with estimated costs of over $206,000,000 in infrastructure needs for its drainage system, which is being increasingly compromised by sea level rise; and

WHEREAS, in 2012 through Resolution No. R-240-13, the Board accepted the Regional Climate Action Plan, with recommendations for regionally coordinated climate change mitigation, adaptation strategies, and efforts in building community resilience; and

WHEREAS, local, regional, and national news media outlets have recently featured numerous stories with varied predictions on Southeast Florida's vulnerability to sea level rise; and

WHEREAS, in July of 2013 the Board created the Miami-Dade Sea Level Rise Task Force through the adoption of Resolution No. R-599-13; and

WHEREAS, the Miami-Dade Sea Level Rise Task Force is currently reviewing the relevant data and prior studies, assessments, reports, and evaluations of the potential impact of sea level rise on vital public services and facilities, real estate, water and other ecological resources, water front property, and infrastructure; and

WHEREAS, the Miami-Dade Sea Level Rise Task Force will provide a comprehensive and realistic assessment of the likely and potential impacts to sea level rise and storm surge over time, which shall be used to help develop a set of recommendations relative to amendments to the CDMP, capital facilities planning, budgetary priorities and other County programs as necessary to ensure that Miami–Dade County is taking all appropriate actions to reduce its contributions to climate-induced sea level rise and to ensure its resiliency to the increase in sea level rise, storm surge and related impacts which are expected to occur,

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF MIAMI-DADE COUNTY, FLORIDA, that:

Section 1. It is the policy of Miami-Dade County that all County infrastructure projects, including but not limited to County building elevation projects, County installation of mechanical and electrical systems, County infrastructure modifications, and County infrastructure renovations, initiated from the effective date of this resolution shall consider sea level rise projections and potential impacts as best estimated at the time of the project, using the regionally consistent unified sea level rise projections, during all project phases including but not limited to planning, design, and construction, in order to ensure that infrastructure projects will function properly for fifty (50) years or the design life of the project, whichever is greater.

Section 2. This Board directs the Mayor or designee to establish recommended priorities for adapting existing County infrastructure located in areas at increased risk of flooding

and tidal inundation with increases in sea level to the degree opportunity and resources allow, and shall present such recommended priorities to the Board for approval, including committee review, within one-hundred-twenty (120) days of the effective date of this resolution.

The Prime Sponsor of the foregoing resolution is Chairwoman Rebeca Sosa. It was offered by Commissioner , who moved its adoption. The motion was seconded by Commissioner and upon being put to a vote, the vote was as follows:

Rebeca Sosa, Chairwoman
Lynda Bell, Vice Chair

Bruno A. Barreiro	Esteban L. Bovo, Jr.
Jose "Pepe" Diaz	Audrey M. Edmonson
Sally A. Heyman	Barbara J. Jordan
Jean Monestime	Dennis C. Moss
Sen. Javier D. Souto	Xavier L. Suarez
Juan C. Zapata	

The Chairperson thereupon declared the resolution duly passed and adopted this 6th day of May, 2014. This resolution shall become effective ten (10) days after the date of its adoption unless vetoed by the Mayor, and if vetoed, shall become effective only upon an override by this Board.

MIAMI-DADE COUNTY, FLORIDA
BY ITS BOARD OF
COUNTY COMMISSIONERS

HARVEY RUVIN, CLERK

By:_____
Deputy Clerk

Approved by County Attorney as
to form and legal sufficiency.

Christopher A. Angell