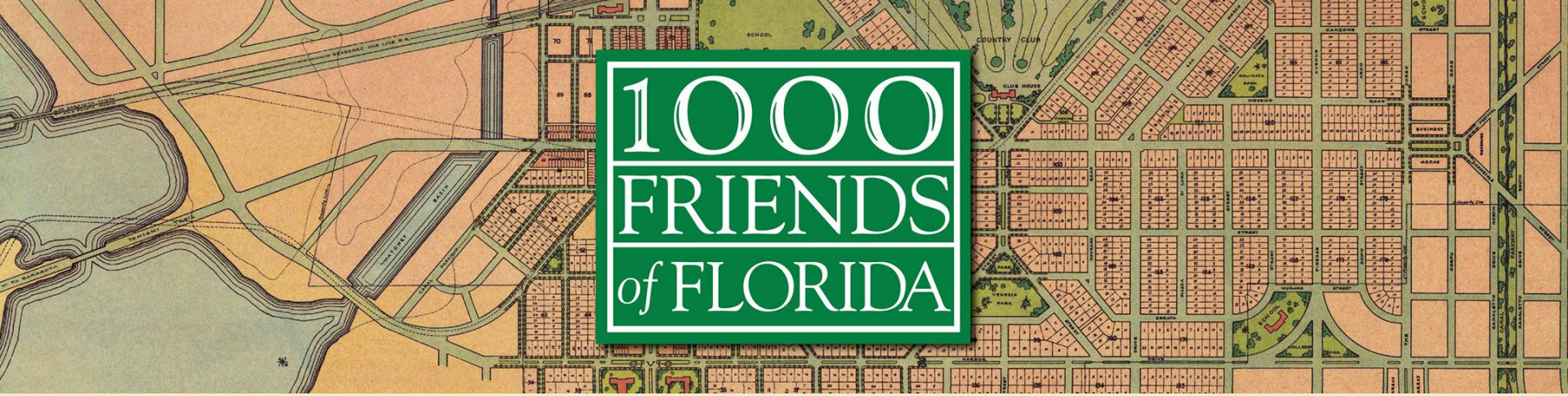

Planning for Sea Level Rise: State Resources for Florida Communities

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- We educate, advocate and negotiate to protect Florida's high quality of life.
- Our bipartisan board of directors includes advocates and experts from across the state.
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Upcoming DeGrove Webinars:

- **Registration Open: October 8, 2014, Noon to 2 p.m.**
  Planning for Sea Level Rise: Broward County Responds
- **Registration Open: November 12, 2014, Noon to 1:30 p.m.**
  Planning for Complete Streets in Florida
- **Wednesday, December 10, Noon to 1:30**
  Planning for Greenways: Florida's Expanding System of Regional Connectors
- **January 14, 2015, Noon to 1:30 p.m.**
  Planning for Sea Level Rise: Legal Issues Facing Florida
- **February 11, 2015, Noon to 1:30 p.m.**
  Victor Dover on Street Design: The Secret to Great Cities and Towns
- **March 11, 2015, Noon to 1:30 p.m.**
  2015 Florida Legislative Update

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Sea Level Rise Survey:

10-question anonymous Florida Sea Level Rise Survey on local and regional planning efforts at www.surveymonkey.com/s/FloridaSeaLevel

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This Webinar Has Been Approved For:

- 2.0 AICP CM (#e.27938) for Planners
- 2 contact hours for Certified Environmental Health Professionals
- 1 CEC for Certified Floodplain Managers
- CLE (#1405923N) for Florida attorneys

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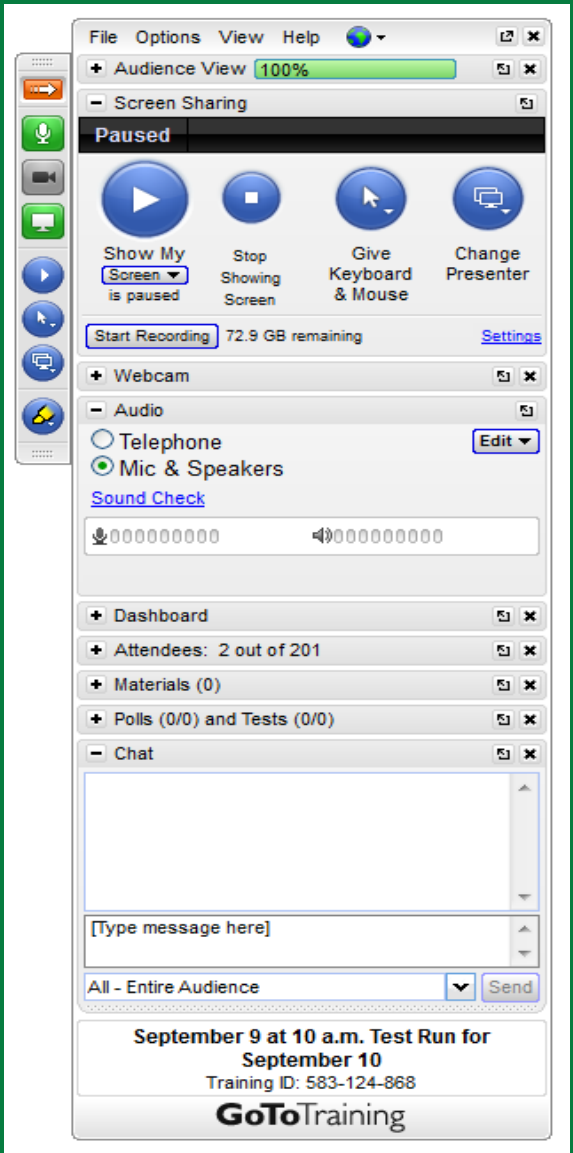
QUESTIONS



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Presenters

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DANIEL FITZ-PATRICK
Florida Department of Economic Opportunity

- Coordinates the Department's Community Resiliency Initiative, a five-year project to integrate adaptation to potential sea level rise into current planning mechanisms
- Effort steered by the Community Resiliency Initiative's Focus Group
- Previous work has focused on hazard mitigation, flood resilient construction practices, flood insurance education
- Holds graduate degrees in Urban & Regional Planning, Administration and Environmental Geography
- Has taught related undergraduate coursework at Bryn Mawr College, Florida State University and West Chester University.

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CRYSTAL GOODISON
University of Florida GeoPlan Center

- Project Manager at the University of Florida GeoPlan Center, a GIS research center in the Department of Urban and Regional Planning
- 15 years of experience in Geographic Information Systems (GIS), database administration, data management, and the creation of decision support tools for environmental and transportation planning
- B.A. in Geography and a M.A. in Urban & Regional Planning from the University of Florida, with a specialization in Planning Information Systems and a certification in Interdisciplinary Geographic Information Systems
- Chairs the Gainesville City Plan Board

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TOM BECK
Florida Department of Environmental Protection

- Director of the Office of Water Policy at DEP
- Office has responsibility for working with water management districts on consistency with state requirements for the consumptive use permitting program and establishment of minimum flows and levels for water bodies
- Office reviews water management district regional water supply plans and their five–year water resource development work program
- Office also publishes the Annual Report on Regional Water Supply Planning for Florida

MEREDITH JAGGER
Florida Department of Health

- Environmental epidemiologist focusing on climate-sensitive diseases and health adaptation planning.
- Manages Florida Department of Health (DOH) Building Resilience Against Climate Effects (BRACE) Program
- Has professional experience working in HIV and chronic disease surveillance
- MS in environmental science from the University of Tennessee at Chattanooga, pursuing a MPH in disaster management and humanitarian relief from USF
- Experience collecting specimens for the All Taxa Biodiversity Inventory in the Great Smoky Mountains National Park and environmental education

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Florida Department of Economic Opportunity Adaptation through the Community Resiliency Initiative

By Daniel Fitz-Patrick

1000 FRIENDS of FLORIDA

FLORIDA DEPARTMENT of ECONOMIC OPPORTUNITY

Adaptation through the Community Resiliency Initiative

Daniel Fitz-Patrick
Division of Community Development

COMMUNITY RESILIENCY

DEPARTMENT OF ENVIRONMENTAL PROTECTION FLORIDA

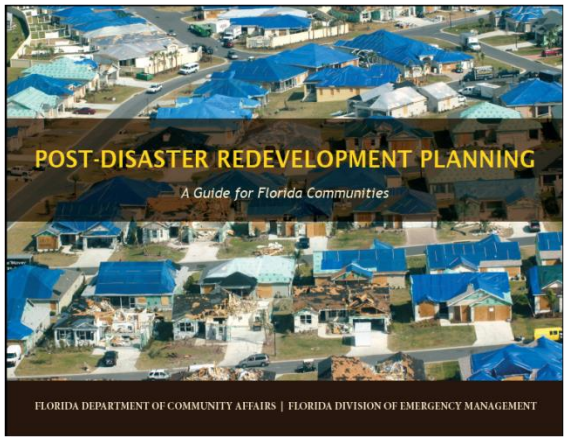
Florida Coastal Management Program

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NOAA U.S. DEPARTMENT OF COMMERCE

STATE EMERGENCY FLORIDA SERT RESPONSE TEAM

Coastal Planning Initiatives

Waterfronts Florida
PARTNERSHIP PROGRAM



COMMUNITY RESILIENCY

FLORIDA DEPARTMENT of ECONOMIC OPPORTUNITY

Community Resiliency Scope of Work

- **Year 1**: Partnership building, information gathering and establishing parameters.
- **Year 2:** Evaluating vulnerability analyses, selecting pilots and developing preliminary guidance on adaptation planning / Adaptation Action Areas Pilot Project
- **Year 3:** Piloting adaptation planning guidance in two different communities.
- **Year 4:** Compiling Lessons Learned a disseminating results.
- **Year 5:** Information Dissemination and Outreach.

Community Resiliency Initiative Goals

- Follow the lead of local governments
- Provide the coastal resilience and adaptation technical assistance to local governments in the way that is most useful to them.
- Approach community resiliency at both the “grassroots” and statewide level.
- Coordinate all existing efforts regarding adaptation in Florida.
- Better prepare the state for a resilient future.

Focus Group Members

Local Government

- Lorenzo Aghemo, Palm Beach County
- Joan LeBeau, City of Punta Gorda
- Eugene Henry, Hillsborough County
- Christine Hurley, Monroe County
- Dr. Jennifer Jurado, Broward County
- Susanne Torriente, City of Fort Lauderdale
- Nichole Hefty, Miami-Dade County
- Jimmy Morales, City of Miami Beach

Regional Planning

- James F. Murley, South Florida Regional Planning Council
- Jim Beever, Southwest Florida Regional Planning Council
- Margo Moehring, Northeast Florida Regional Planning Council
- Jayantha Obeysekera, South Florida Water Management District
- Hugh Harling, East Central Florida Regional Planning Council

Focus Group Members

State Government

- Jim Wood, Dept. of Transportation
- Danielle Irwin, Department of Environmental Protection
- Kelly Samek, DEP Florida Coastal Management Program
- Whitney Gray/Scott Saunders, Florida Wildlife Conservation Commission
- Joy Duperault, Division of Emergency Management
- Meredith Jagger, Department of Health
- Rosalyn Kilcollins, DEP Coastal Training Program
- Tim Parsons, Department of State (Historic Preservation)

Federal Government

- Heidi Stiller, NOAA, Coastal Service Center
- Valerie Anderson, FEMA Region IV
- Tucker Mahoney, FEMA IV
- Glenn Landers, Army Corps of Engineers
- Amanda Smith, Navy

Focus Group Members

Private Sector and Non-Profit Organizations

- Todd Powell, Plum Creek Timber Co.
- Alex Magee, American Planning Association, Florida Chapter
- Eric Draper, Florida Audubon
- Gary Appelson, Sea Turtle Conservancy
- Janet Bowman, The Nature Conservancy
- Steve Adams, Institute for Sustainable Communities
- Leticia Adams, Florida Chamber of Commerce
- Stan Bronson, Florida Earth Foundation
- Charles Pattison, 1000 Friends of Florida

Focus Group Members

University Partners

- Dr. Len Berry, Florida Center for Environmental Studies, FAU
- Dr. James Jones, Florida Climate Institute, UF
- Dr. Bob Deyle, Dept. of Urban and Regional Planning, FSU
- Thomas Ankersen, Law Conservation Clinic, UF
- Dr. Ken Lindeman, FIU
- Dave Markell, College of Law, FSU
- Dr. John Jaeger, Professor/GSAA Vulnerability Assessment Representative, UF
- Dr. Kathryn Frank, Dept. of Urban and Regional Planning, UF
- Thomas Ruppert, Florida Sea Grant, UF (Built Environment)
- Whitney Gray, Florida Sea Grant, UF (Natural Environment)
- C.J. Reynolds, Coastal Areas Climate Change Education Partnership, USF

Adaptation Action Areas

Section 163.3164(1), Florida Statutes

"Adaptation action area" or "adaptation area" means a designation in the coastal management element of a local government's comprehensive plan which identifies one or more areas that experience coastal flooding due to extreme high tides and storm surge, and that are vulnerable to the related impacts of rising sea levels *for the purpose of prioritizing funding for infrastructure needs and adaptation planning.*

Adaptation Action Area

Section 163.3177(6)(g)(10), Florida Statutes

At the option of the local government, develop an adaptation action area designation for those low-lying coastal zones that are experiencing coastal flooding due to extreme high tides and storm surge and are vulnerable to the impacts of rising sea level. *Local governments that adopt an adaptation action area may consider policies within the coastal management element to improve resilience to coastal flooding resulting from high-tide events, storm surge, flash floods, stormwater runoff, and* related impacts of sea-level rise. *Criteria for the adaptation action area may include, but need not be limited to, areas for which the land elevations are below, at, or near mean higher high water, which have an hydrologic connection to coastal waters, or which are designated as evacuation zones for storm surge*

Project of Special Merit

- Implementing “Adaptation Action Area” Policies in Florida
- Partnership with City of Ft. Lauderdale, Broward County, South Florida Regional Planning Council and Southeast Florida Regional Climate Compact.
- Address AAA in City of Ft. Lauderdale Local Comprehensive Plan.
- Create guidance for statewide dissemination.

Daniel Fitz-Patrick
Daniel.FitzPatrick@deo.myflorida.com
(850) 717-8511

www.floridajobs.org/adaptationplanning

Florida Department of Transportation's Sea Level Scenario Sketch Planning Tool

By Crystal Goodison

1000 FRIENDS of FLORIDA

FDOT's Sea Level Scenario Sketch Planning Tool

Crystal Goodison
University of Florida GeoPlan Center

1000 Friends of Florida Webinar: Planning for Sea Level Rise: State Resources for Florida's Communities
September 10, 2014

A1A
Fort Lauderdale, Hurricane Sandy, October 2012

Susan Stocker,
Sun Sentinel

Florida's Exposure

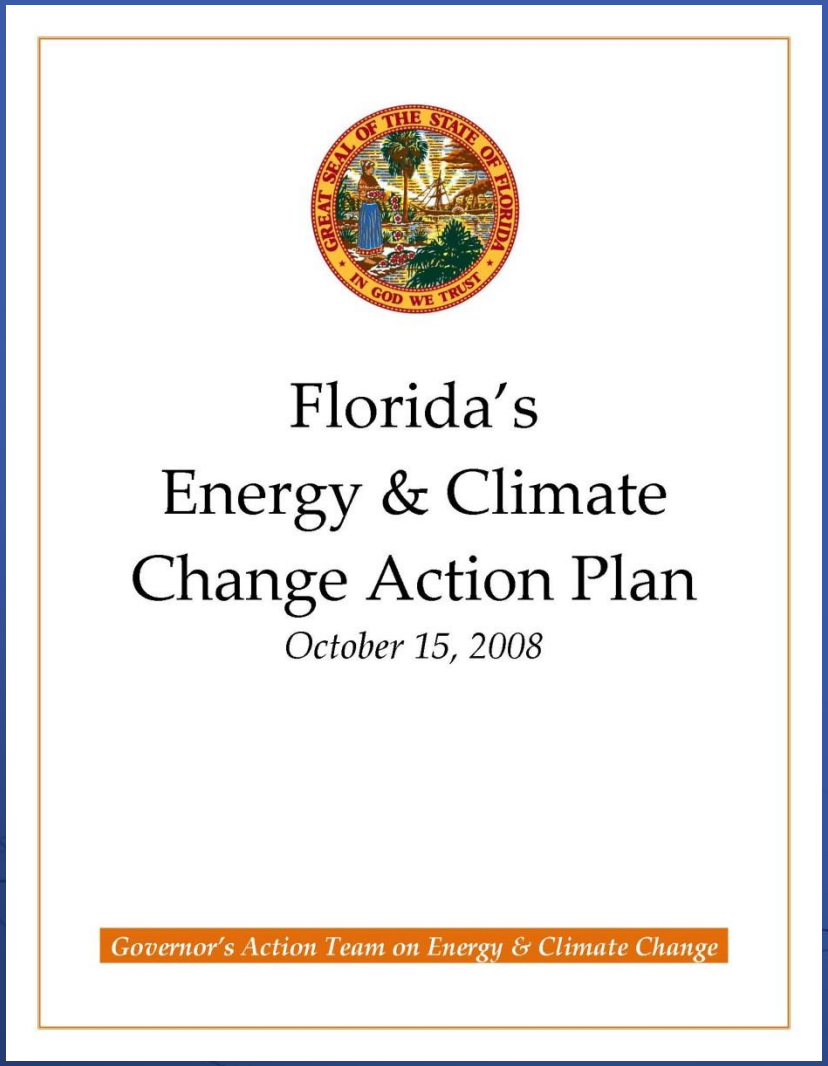
Florida's population – 19.5 million people

Climate Central analysis "finds that floods rising 3 feet above the high tide line at Key West are near certain this century under any sea level rise scenario" (Nov 2013)

Less than 3 feet above high tide:

- 2,120 square miles of land
- Nearly 490,000 people
- $156 billion in property value
- 300,000 homes
- 2,555 miles of road

Policy Framework



FDOT's SLR Research

FAU's Research Report (completed Jan 2012)

Comprehensive analysis of SLR projections, studies, models and methodologies used in Florida. Resulting recommendations:

(1) *Apply U.S. Army Corps of Engineers (USACE) methodology to develop statewide and regional projections of SLR*

(2) *Develop a sketch planning tool to identify potentially vulnerable infrastructure*

UF GeoPlan Center Research

* Implement FAU recommendations
* Phase 1: Feb 2012 - Oct 2013, Phase 2: Dec 2013 – June 2015

UF GeoPlan Phase 1 Goals

- **Map Inundation:** Map where & when inundation is projected to occur in Florida. Use USACE methods to develop statewide and regional sea level change projections by decade 1992 - 2100.
- **Develop GIS planning tool to facilitate identification of transportation infrastructure potentially at risk to projected sea level changes.**

Project Team

Florida Department of Transportation, Office of Policy Planning

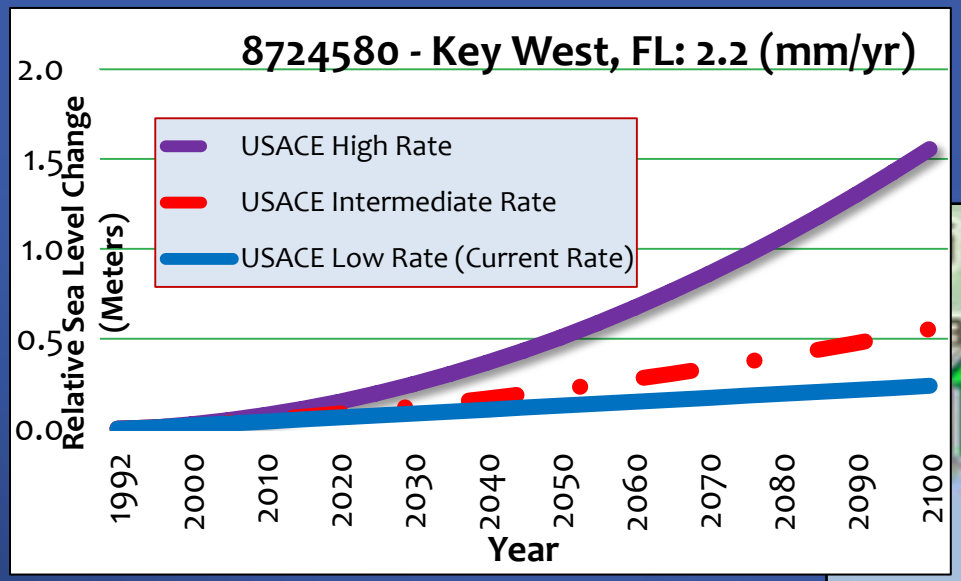
* Maria Cahill, Project Manager

University of Florida GeoPlan Center

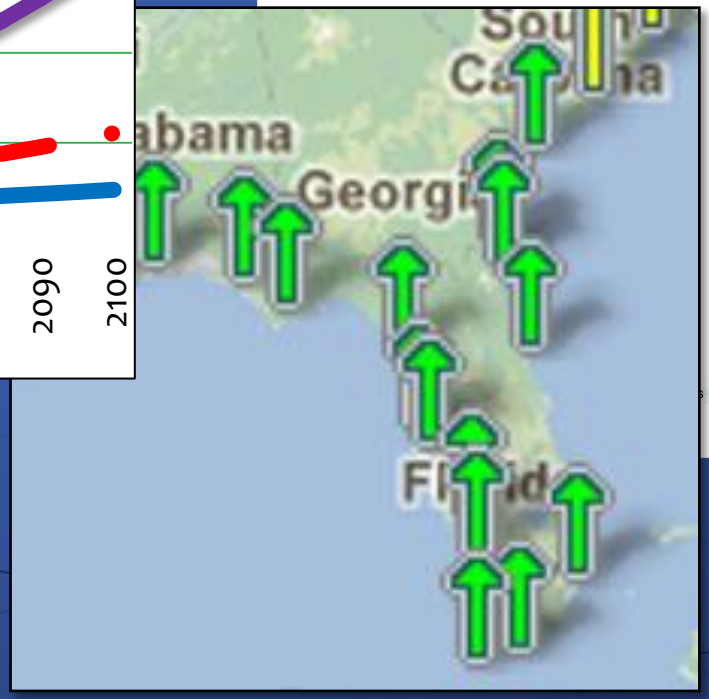
* Crystal Goodison, Principle Investigator – Phase 2
* Alexis Thomas, Principle Investigator – Phase 1, Co- PI Phase 2
* Russell Watkins, Ph.D, Co-Principle Investigator – Phase 1
* Reginald Pierre-Jean
* Katherine Norris
* Sam Palmer
* Daniel Downing
* Lance Barbour

Mapping Inundation: Data Inputs

USACE Sea Level Change Projections & Methods

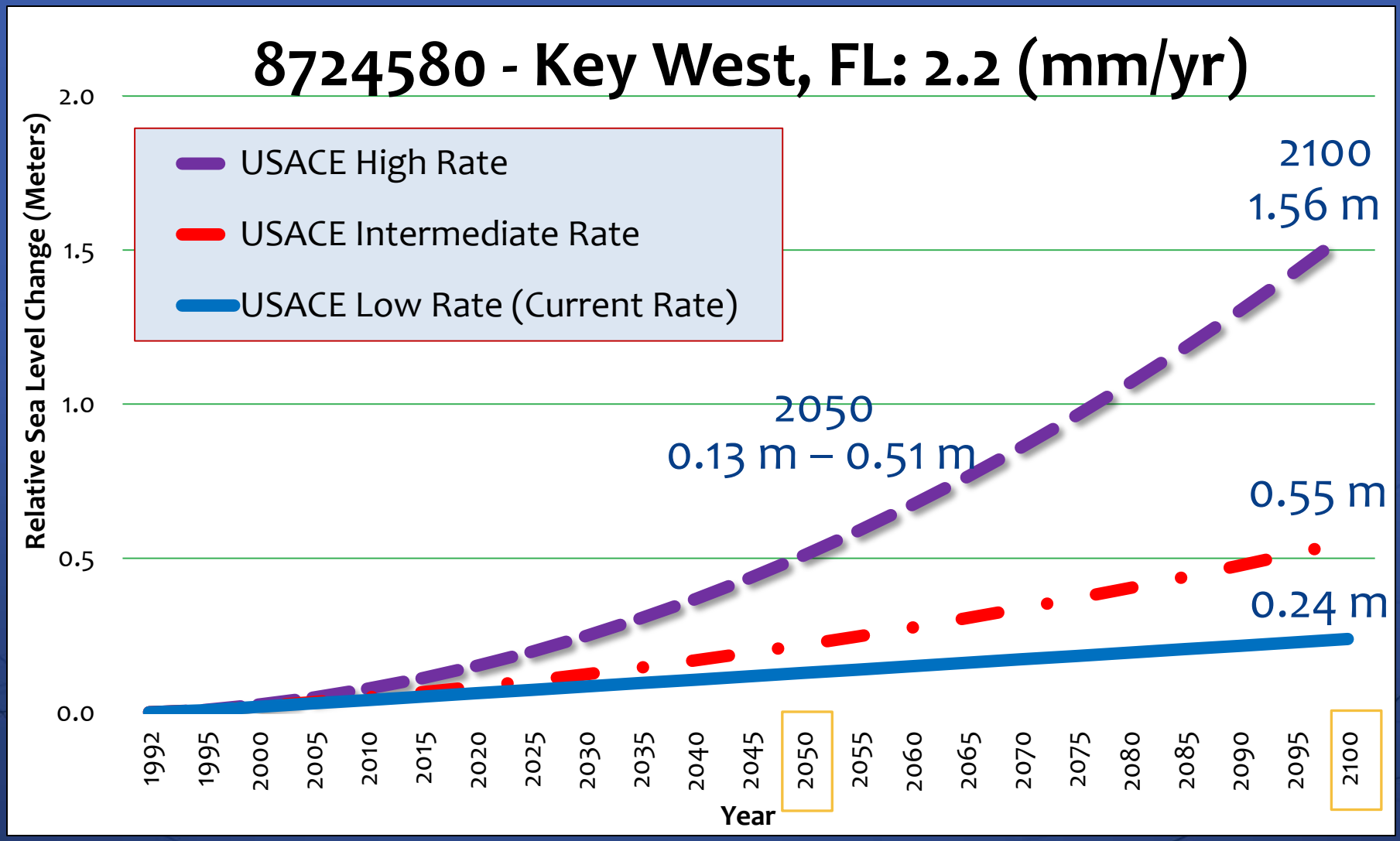


Digital Elevation Model



NOAA Tide Gauge Data & Sea Level Trends

USACE Sea Level Change Projections



Mapping Inundation: Output Data Layers

* Hundreds of layers, each representing a scenario:

  Where Scenario =

  Region, Year, Projection, Tidal Datum

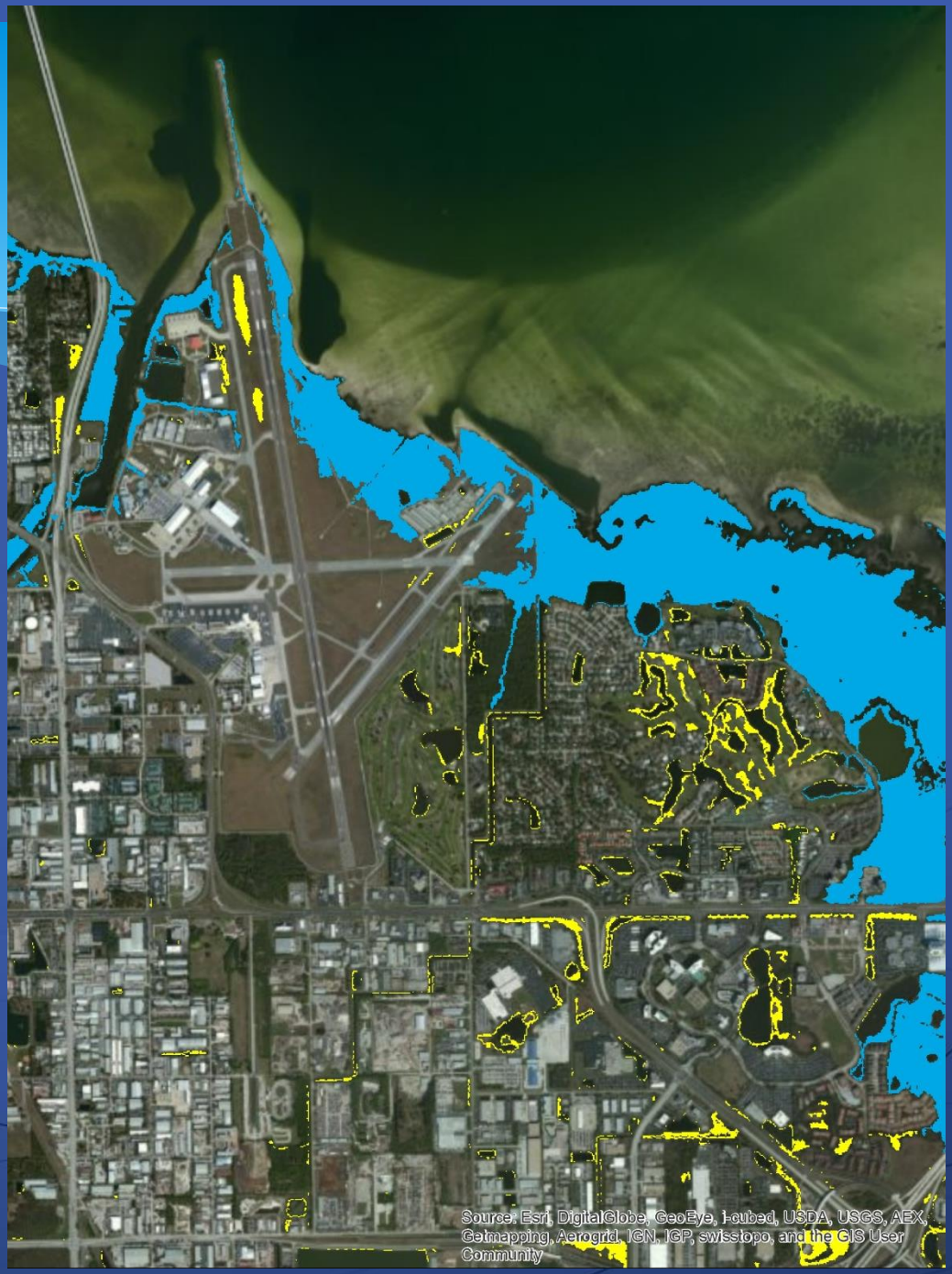
* Region: statewide or for FDOT District
* Year: decadal intervals, 2040 – 2100
* Projection: USACE – low/ historic, intermediate ,or high
* Tidal Datums: **MHHW**, MHW, **MSL**, MLW, MLLW
* Bathtub inundation and hydro-connected inundation

Inundation Data Layers

Subset of Clearwater Airport/ Old Tampa Bay 2060, High Curve, MHW = 1-meter inundation

Inundation with Hydro-connectivity filter

Bathtub Inundation



Potentially Affected Transportation Infrastructure

* Intersected inundation layers with **transportation layers:** roadways, rails, rail freight connectors, SIS airports, SIS sea ports
* Focus on State owned and maintained facilities
* Planning horizons: 2040, 2060, 2080, 2100
* **Outputs:** GIS layers identifying potentially at-risk transportation facilities w/ approximate miles or area affected/ inundated

UF GeoPlan Phase 1 Goals

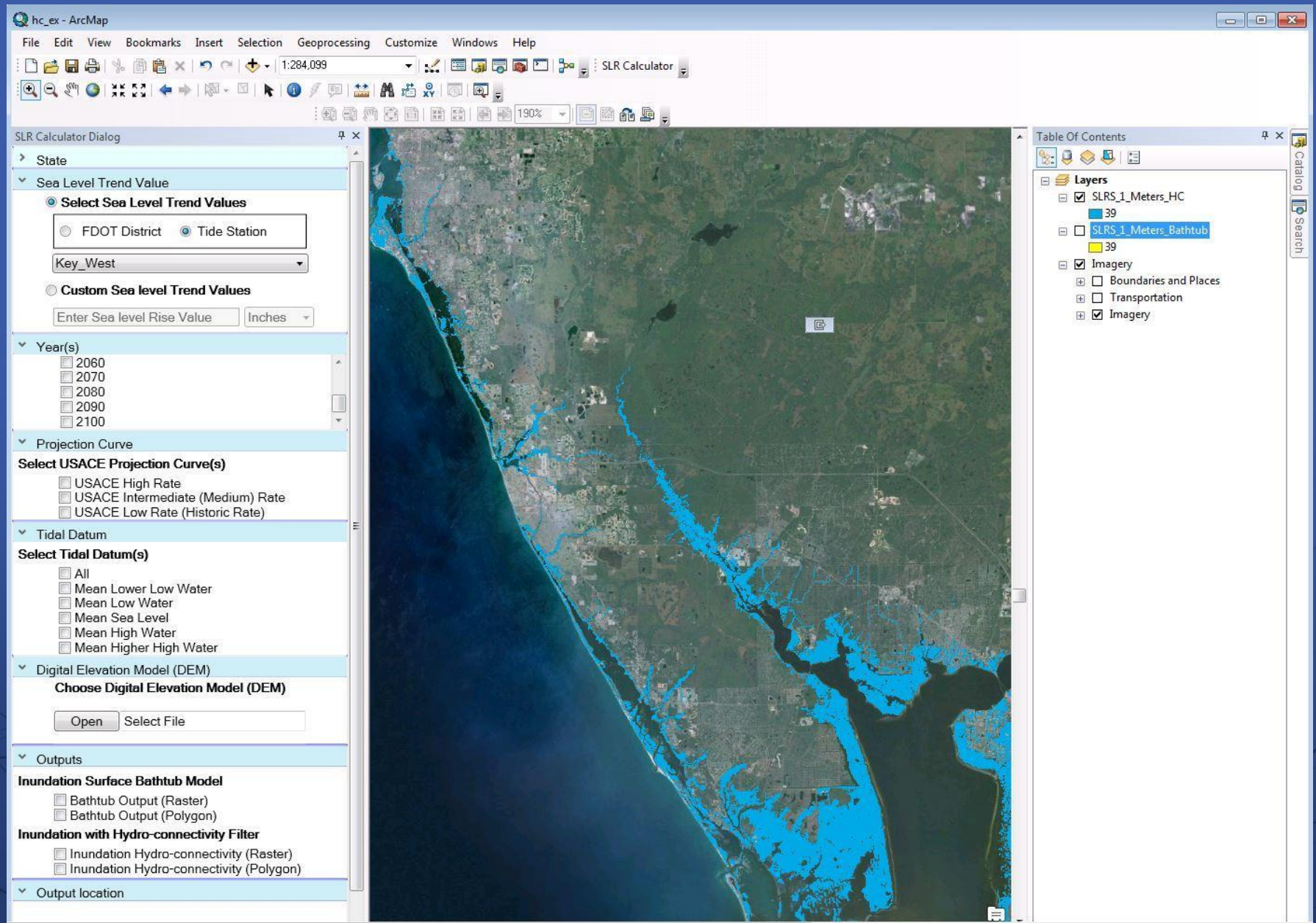
- **Map Inundation:** Map where & when inundation is projected to occur in Florida. Use USACE methods to develop statewide and regional sea level change projections by decade 1992 - 2100.
- **Develop GIS planning tool to facilitate identification of transportation infrastructure potentially at risk to projected sea level changes.**

Sea Level Scenario Sketch Planning Tool

1. **Map Viewer**
   * **Visualize** areas of **inundation** and affected infrastructure
   * Low technical expertise needed, no GIS software needed
2. **GIS Data Layers**
   * SLR Inundation Surfaces & Affected Infrastructure layers
   * GIS Software and intermediate GIS expertise needed
3. **Sea Level Change Inundation Surface Calculator**
   * For creating custom inundation layers
   * Intermediate/ Advanced technical/ GIS expertise needed

Map Viewer Demo

SLR Inundation Surface Calculator, ArcMap



GeoPlan Phase 2 Research

Work with FHWA Climate Resiliency Adaptation pilots (Hillsborough MPO and Broward MPO) and other communities (Satellite Beach, Monroe County) doing adaption planning:

* Test tools and gather feedback
* Enhance and refine tools based on input
* Look at local versus state/ regional approach

Data Enhancements:

* Explore increased resolution of data inputs, close data gaps (ex: bridge data)

Research methods for modeling storm surge & inland flooding

Project Website

http://sls.geoplan.ufl.edu

Website includes:

* Map Viewers
* GIS data downloads
* SLR Calculator download
* Final report and supporting documentation

Water Management Strategies to Address Sea Level Rise in Florida

By Tom Beck, Ph.D.

1000 FRIENDS of FLORIDA

Florida Department of Environmental Protection

Office of Water Policy

Water Management Strategies to Address Sea Level Rise in Florida

Sea Level Rise Workgroup
(DEP and the Water Management Districts)



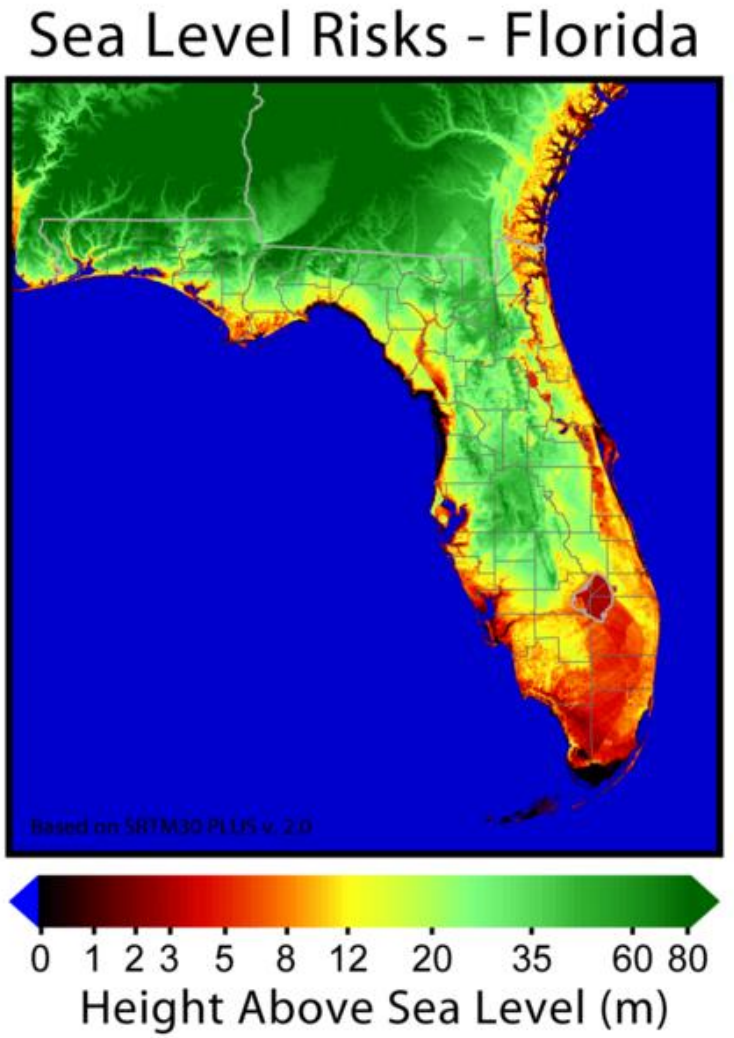


Workgroup Meetings/Teleconferences

- August 2013 kickoff meeting in SFWMD St. Cloud field office
- Four teleconferences among districts based on an outline prepared by SFWMD
- Teleconference discussions included saltwater intrusion, flood protection, and adaptation strategies
- Last April meeting in St. Cloud field office included discussions on a final report for sea level rise strategies

Sea Level Rise Strategies Report

1. Background
2. Workgroup Scope and Objectives
3. Effects of Sea Level Rise on Water Management
   a. Specifics from each WMD
   b. FDEP
4. Statewide Strategies to Address Sea Level Rise
5. Short-term Implementation
6. Conclusions
7. References



Water Management Concerns

- SLR has statewide potential to affect water supply, flood control, water quality and natural systems
- SLR can affect coastal wells and flood control infrastructure
- SLR can affect erosion of our beaches and other important coastal resources

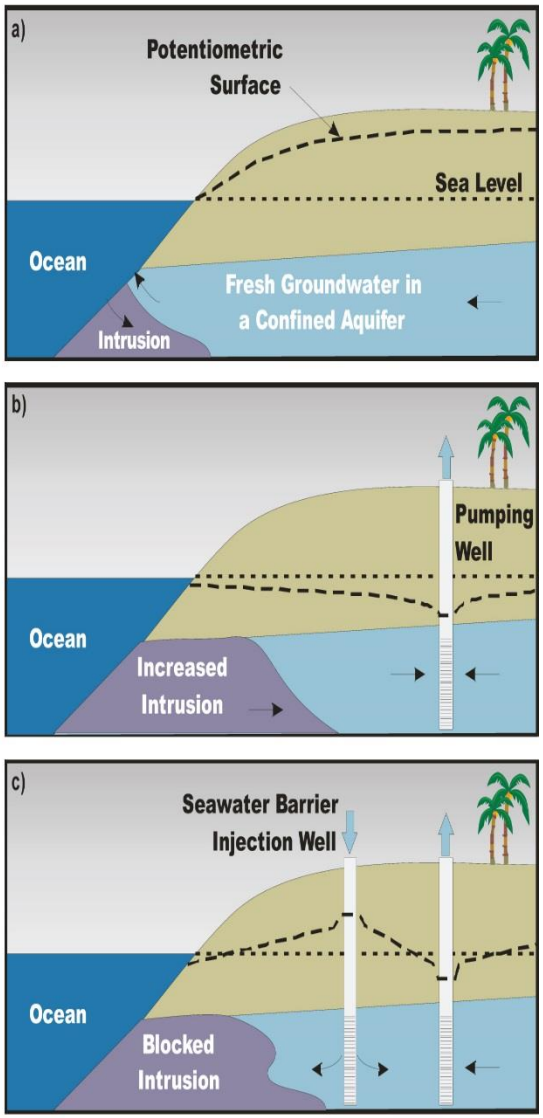
Water Management Adaptation

- **Aggressive Alternative Water Supply Development**
  - Diverse water sources will make Florida more resilient
  - WPSP has funded 389 AWS projects to date
  - 700 MGD will be produced when all projects completed
  - Continued diversification will better prepare Florida for loss of existing water supply sources due to SLR

Water Management Adaptation

- **Aggressive Water Conservation**
  - Ensure our water supplies will last longer
  - Gross and residential per capita water use decreased 21 and 16 percent, respectively in last 15 years
- **Everglades Restoration**
  - Increased water flows and increased storage will mitigate the adverse effects of SLR and saltwater intrusion

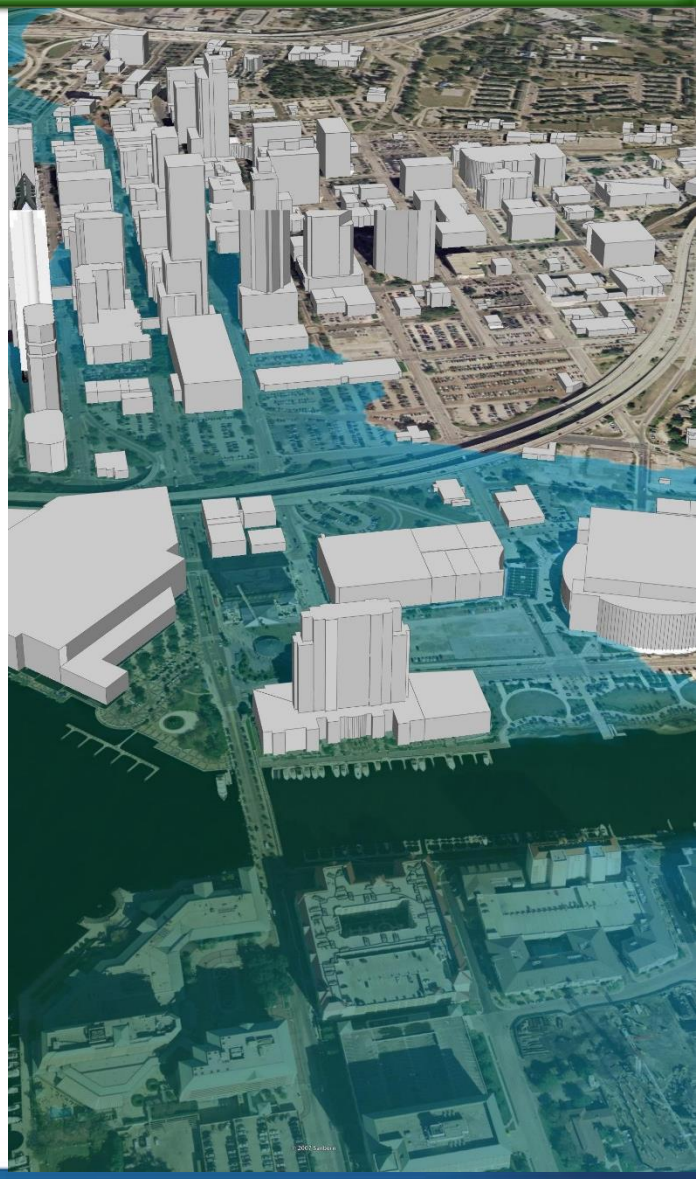
Sea Level Rise Strategies



- Establish statewide monitoring system for mapping saltwater intrusion
- Using USACE projections conduct saltwater intrusion modeling for 20 year and 50 year scenarios to identify impacts on coastal wells and flood control structures
- Conduct hydrodynamic studies in coastal areas to identify storm surge impacts under various SLR scenarios

Sea Level Rise Strategies

- Develop adaptive risk management strategies to address identified vulnerabilities
- Participate in quarterly Florida Water Climate Alliance/Florida Climate Institute meetings and conferences in order to:
  - regularly engage in SLR issues,
  - obtain latest research documentation, and
  - obtain best practice documents



Other State Efforts to Address SLR

- **Florida Fish and Wildlife Conservation Commission**
  - In 2012 produced the State Wildlife Action Plan which included SLR as the main theme throughout the chapter sections and highlighted as one of the major threats to Florida from effects of long-term environmental changes.

SEA LEVEL RISE

Community Resilience

- Collecting and sharing information on sea level rise monitoring and community resilience planning.
- Developing mitigation strategies, special area management plans and post-disaster redevelopment plans for two pilot communities.
- Developed tool to assess the vulnerability of transportation facilities.
- Monitoring the operation, maintenance and engineering/ retrofitting of flood control structures.

Environment

- Monitoring sea level, coastal habitat and biology.
- Assessing impact on wildlife.
- Administering the Florida Salinity Monitoring Network to monitor movement of saline water in coastal aquifers.
- Sharing research findings, access to resources, data and tools.
- Maintaining water level monitoring protocols and engaging local, state and federal partners to deploy the most effective way to monitor changes.

Water Supply

- Monitoring for saltwater intrusion.
- Planning for sea level rise impacts on coastal water bodies, well fields and other infrastructure, and promoting alternative water supplies and conservation.
- Projecting water supply needs and planning for adequate water supplies.

Public Health

- Ensuring sustainable potable water supplies.
- Improving ability to respond to any health effects related to conditions resulting from sea level rise.

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Director, Office of Water Policy

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Assessing Community Health Vulnerability to Sea Level Rise in Florida

By Meredith Jagger, MS

1000 FRIENDS of FLORIDA

Florida Department of Health
Division of Disease Control and Health Protection
Bureau of Epidemiology

Assessing Community Health Vulnerability to Sea Level Rise in Florida

Planning for Sea Level Rise: Resources for Florida's Communities

September 10, 2014

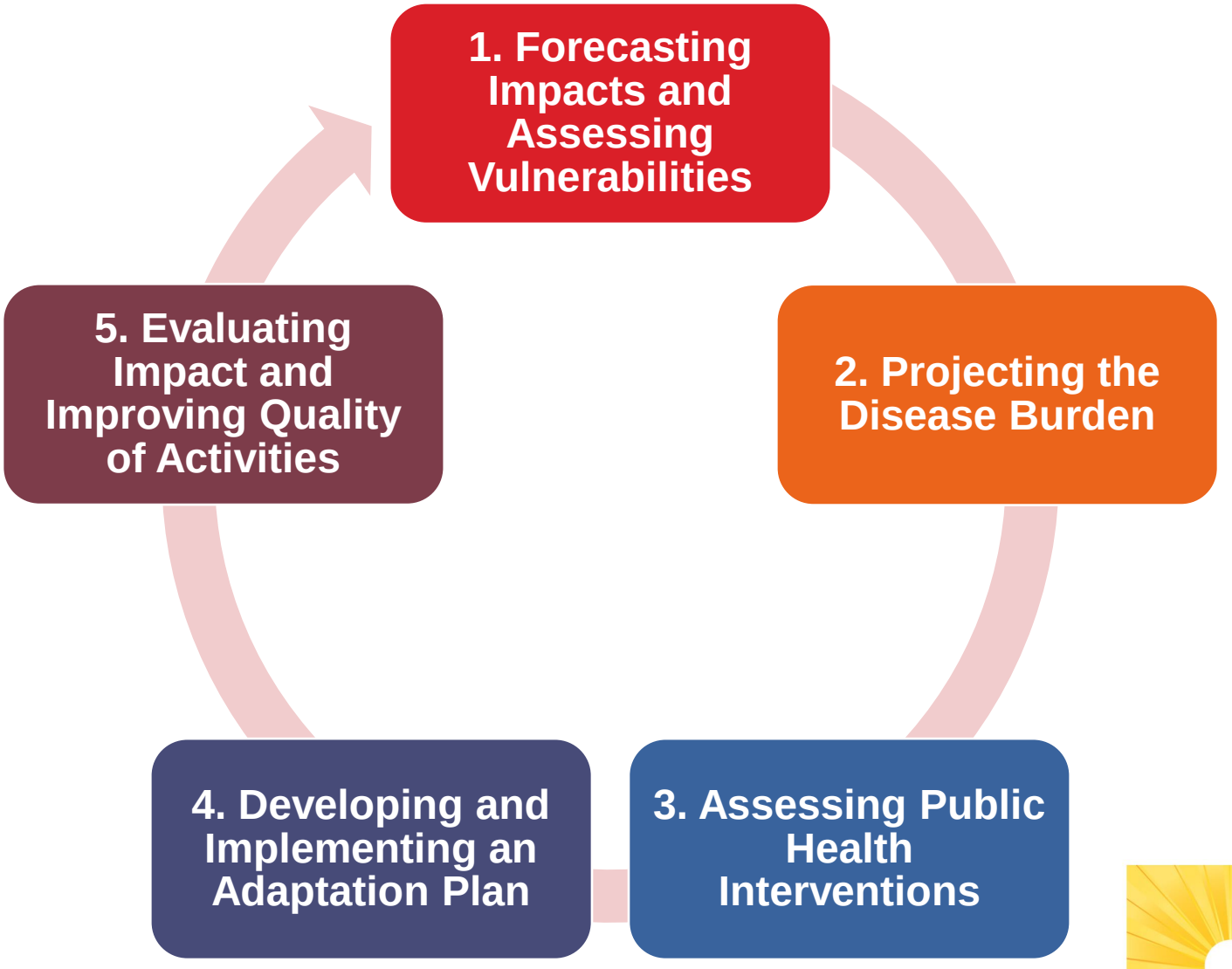
Meredith Jagger, MS, BRACE Program Manager

To protect, promote & improve the health of all people in Florida through integrated state, county, & community efforts.

Florida BRACE Program

- The BRACE Program is funded by the Centers for Disease Control and Prevention's Climate-Ready States and Cities Initiative.
- The Department of Health (DOH) is implementing CDC's Building Resilience Against Climate Effects (BRACE) framework.
- Work includes collecting hazard-sensitive health data and modeling future disease burdens, which will be used to develop and implement health adaptation plans.

BRACE Framework



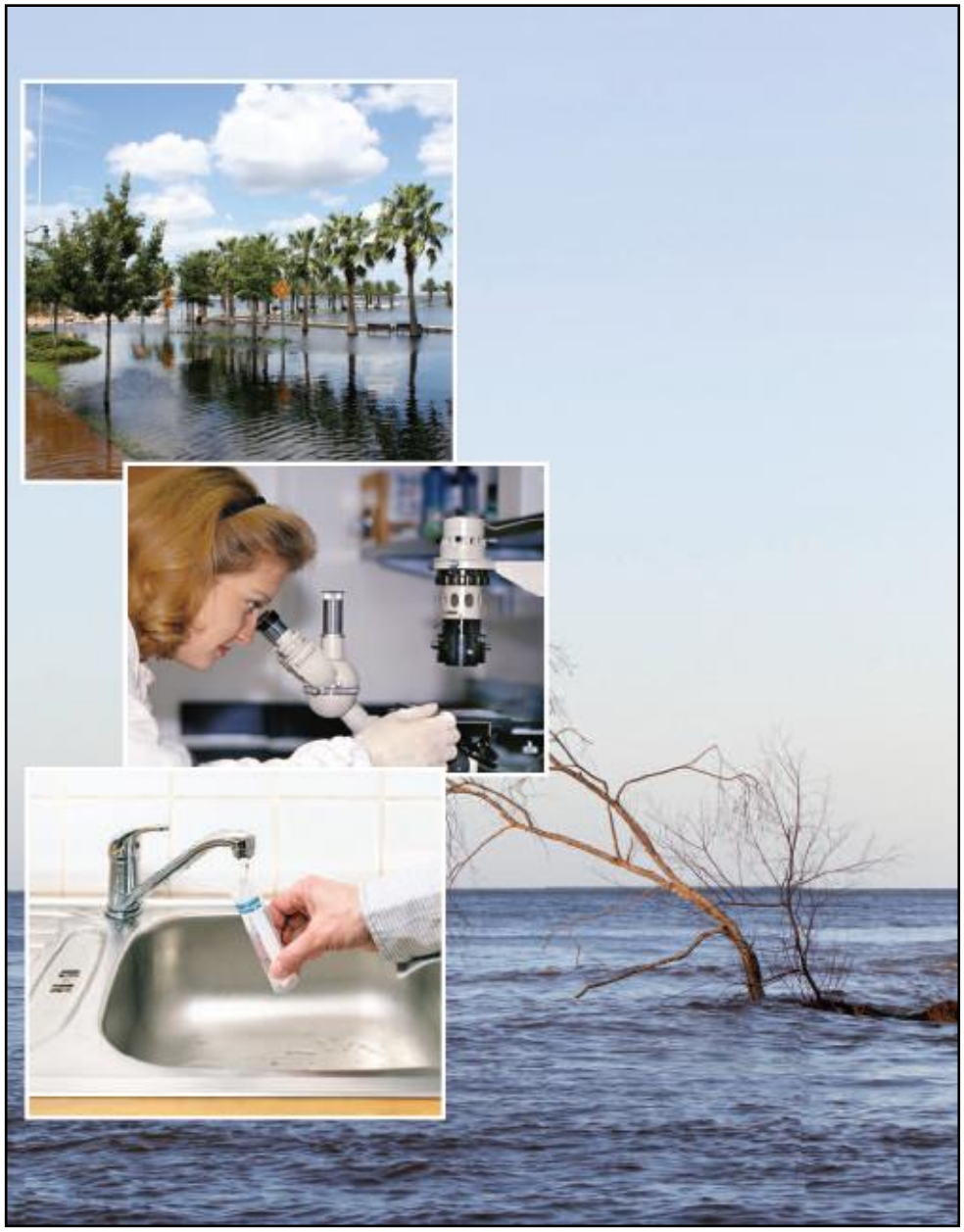
Division of Disease Control and Health Protection

To protect, promote & improve the health of all people in Florida through integrated state, county, & community efforts.

Florida BRACE Hazards

- Hurricanes and Other Storms
  - Storm Surge
  - Wind Hazard
- Flooding
- Sea Level Rise
- Extreme Heat
- Drought
- Wildland Fires

Sea Level Rise (SLR)



Summary Points

- SLR can directly and indirectly impact human health and public health systems.
- Quantifying direct associations between retrospective health data (i.e., outcomes) and sea level in Florida is challenging.
- Storm surge can be used as a proxy.
- Assessing critical sanitation infrastructure can help quantify potential risk.

Possible Effects of SLR on Human Health

- Critical infrastructure damage
- Release of biological and chemical pollutants
- Change in distribution and habitats for disease vectors
- Aerosolized marine toxins
- Food and water contamination/insecurity
- Population displacement (immigration and emigration)
- Injury
- Impacts on mental health

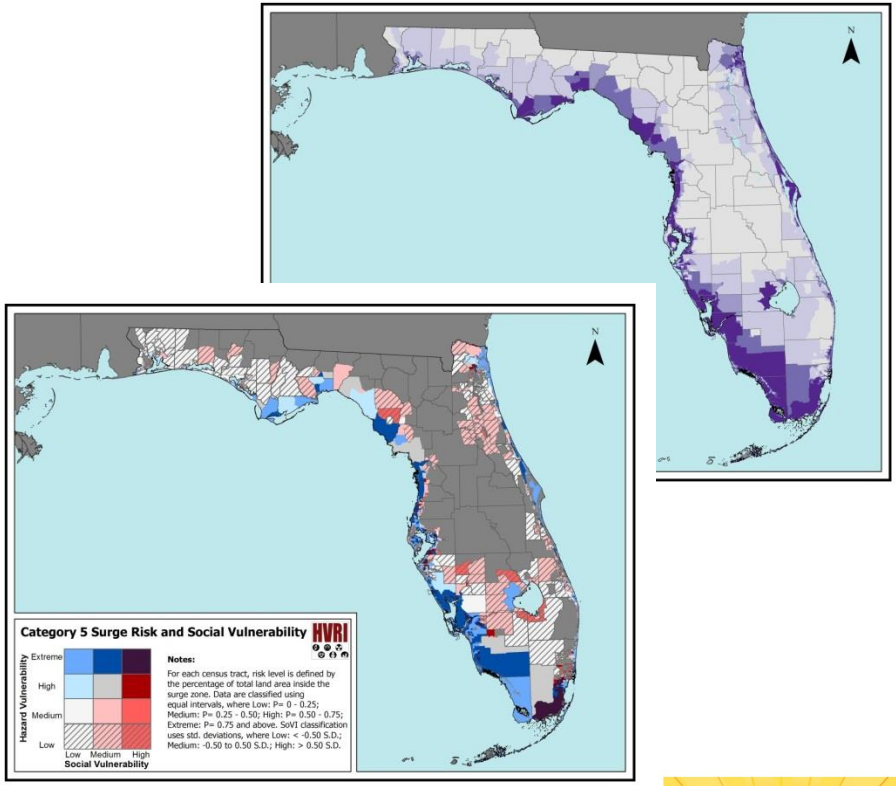
Literature Review

Limited research available regarding both short- and long-term effects of SLR on health

- Micronesia 2007 (Keim, 2010)
  - Crop loss, coastal erosion, shoreline inundation, saltwater intrusion
- Bangladesh and Bay of Bengal 2011 (Khan et al., 2011)
  - Associated salinity levels in drinking water with hypertension in pregnancy and is season-dependent
- Most studies group SLR in with other weather variability events, thus hard to pinpoint SLR-specific health outcomes

Vulnerability Assessment

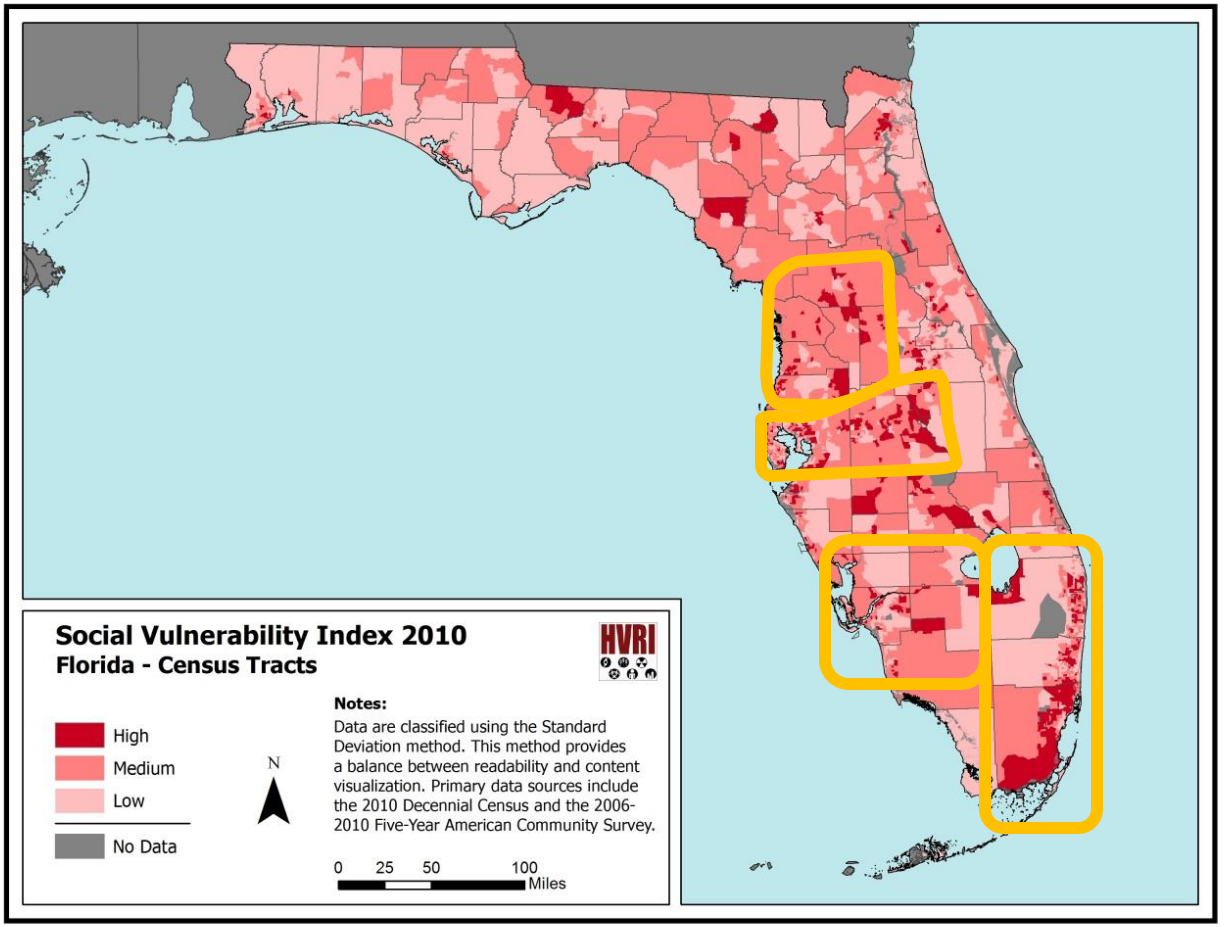
- Spatial analysis of future hazards and intersection of hazards with social and medical vulnerability
- Completed in consultation with the University of South Carolina Hazards and Vulnerability Research Institute (USC HVRI)



Social Vulnerability (SoVI)

- Reflects characteristics of social groups that influence differential capacity to prepare for and respond to environmental threats
- Uses 28 variables from the 2010 U.S. Census (i.e., race-ethnicity, socioeconomic status, gender, age, rural/urban location, renter status, occupations, family structure, employment, education, population growth)

Social Vulnerability (SoVI)

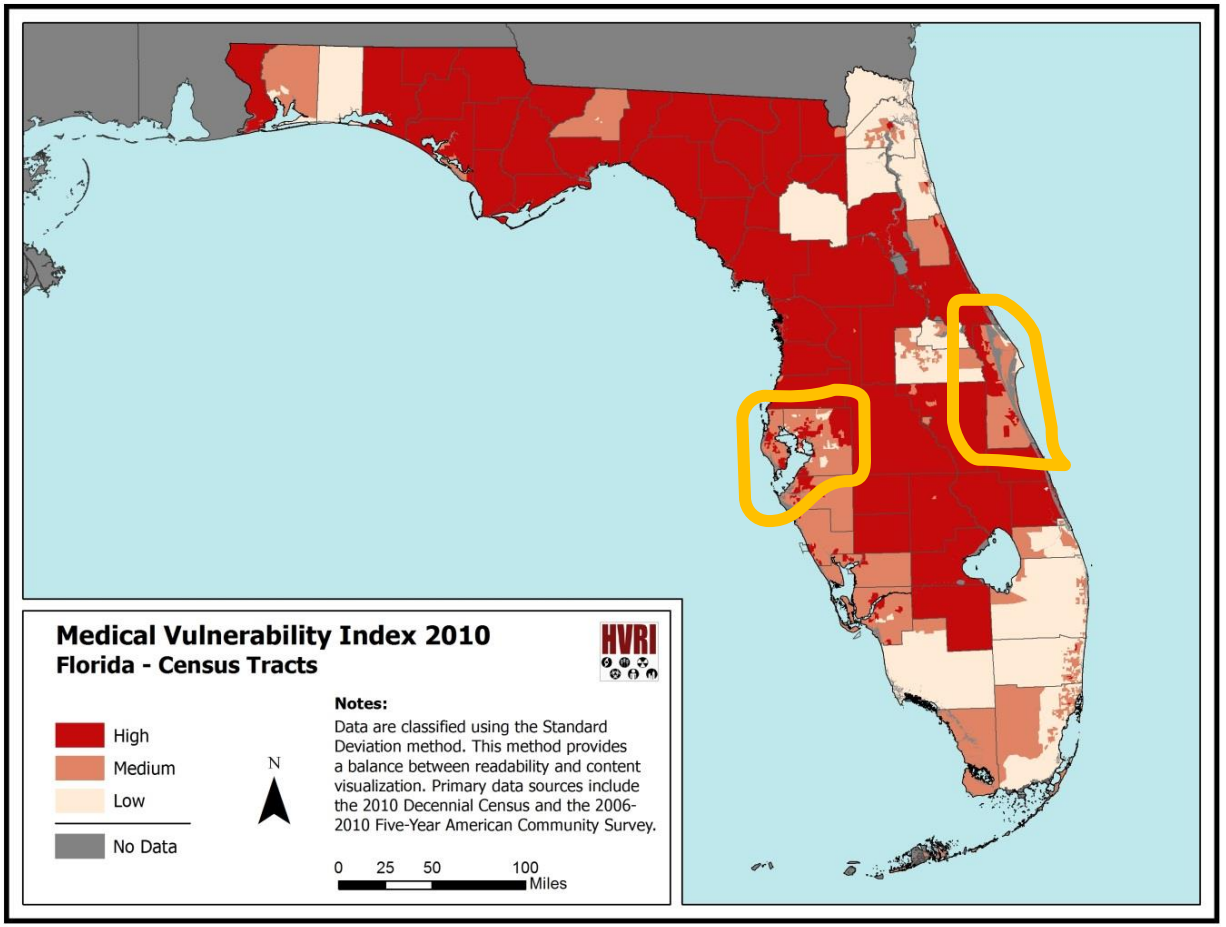


Source: C. Emrich, University of South Carolina Hazards and Vulnerability Research Institute, 2014.

Medical Vulnerability (MedVI)

- Reflects indicators of health need with inherent medical vulnerability independent of social factors
- Data collected from sources including DOH Vulnerable Population Profiles, Florida Law Enforcement, County Health Rankings, Florida Agency for Health Care Administration
- Includes 61 indicators that can be broadly classified as physical health needs, psychological health needs, health care access, health system capacity

Medical Vulnerability (MedVI)

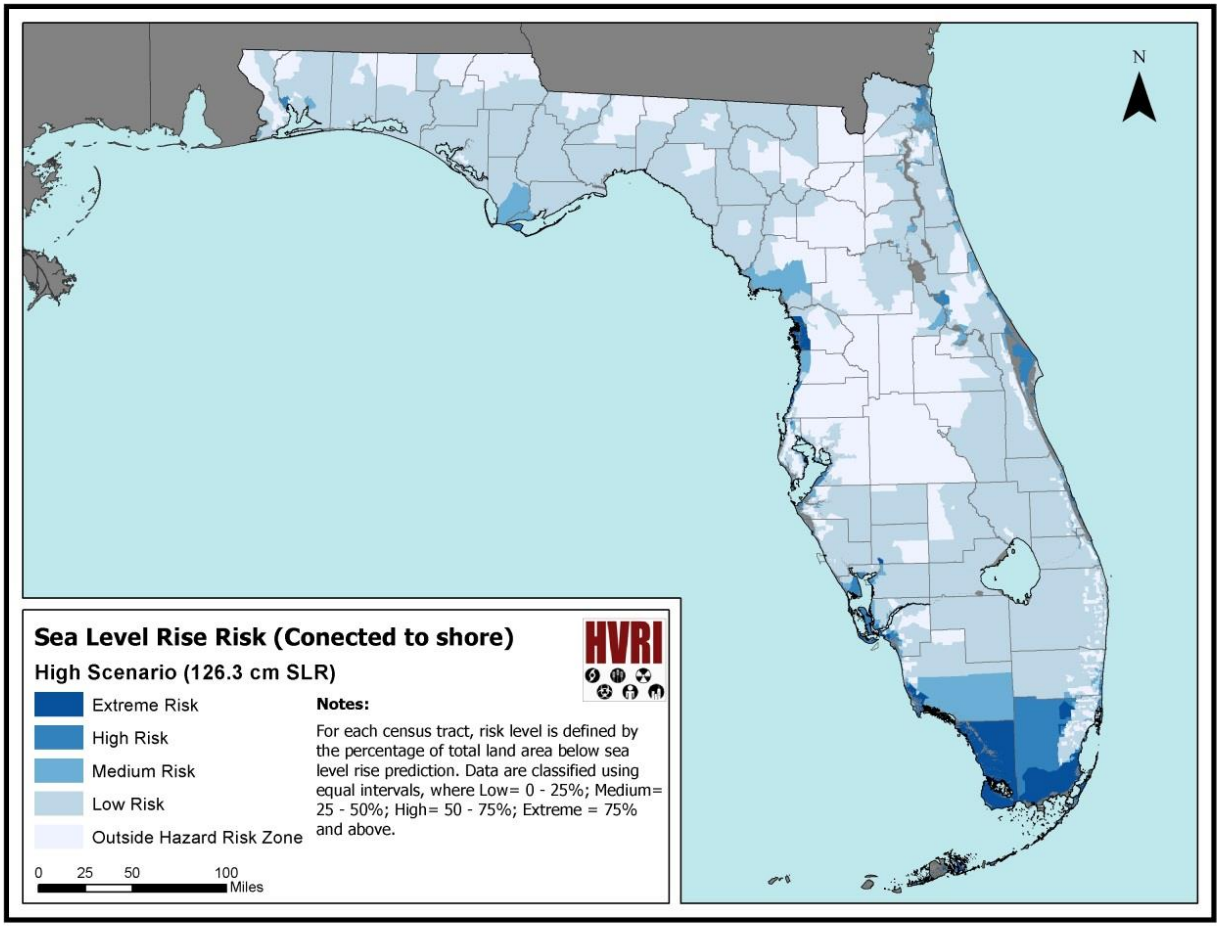


Source: C. Emrich, University of South Carolina Hazards and Vulnerability Research Institute, 2014.

Intersectionality

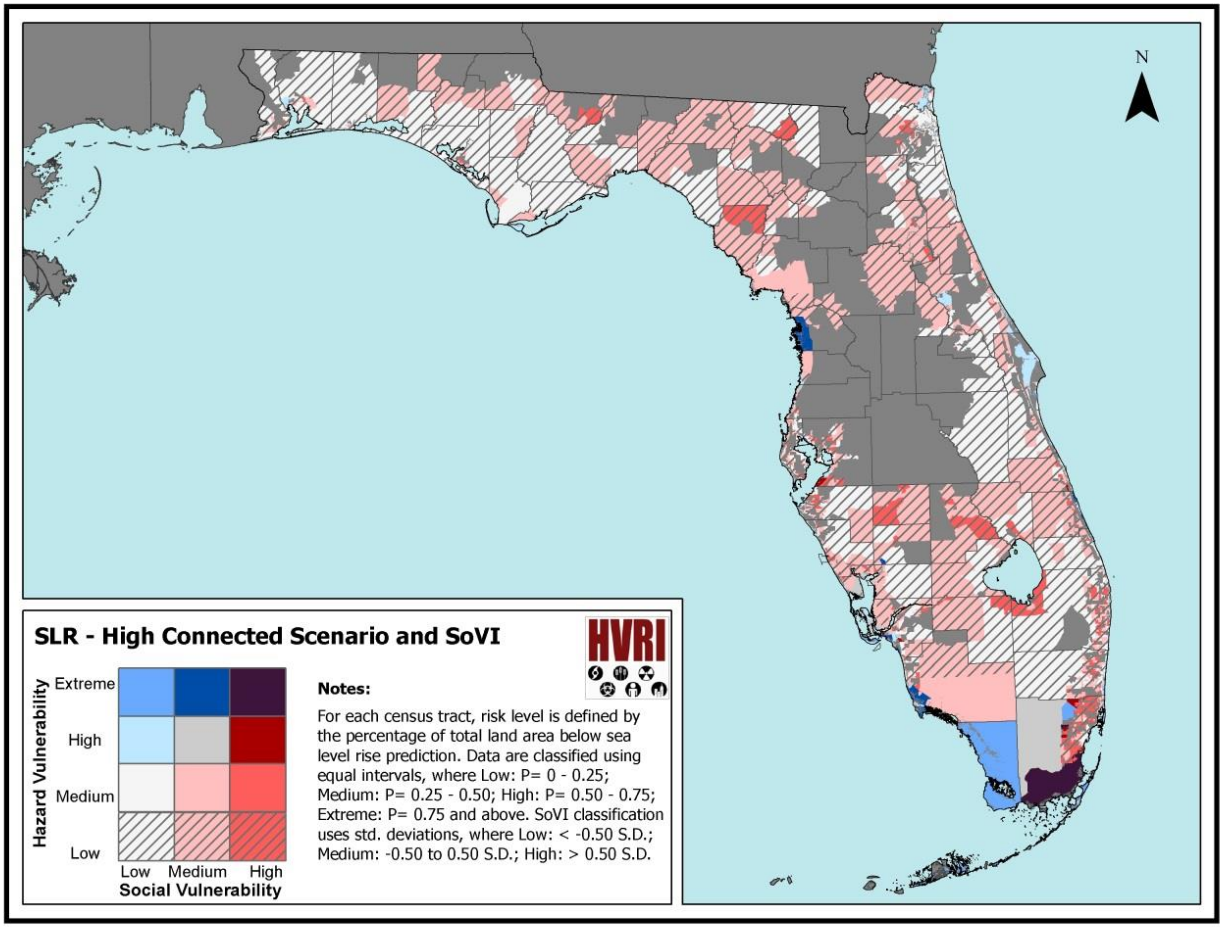
- One negative factor will likely not be problematic in the long run.
- However, places with higher risk and higher vulnerability are more likely to see adverse outcomes.
- Analysis allows for identifying areas where:
  - The hazard itself should be the main focus.
  - Underlying social demographics provide the biggest opportunity for positive outcomes.
  - A combination of hazard and social adaptation/mitigation practices can maximize positive outcomes.

SLR High Scenario



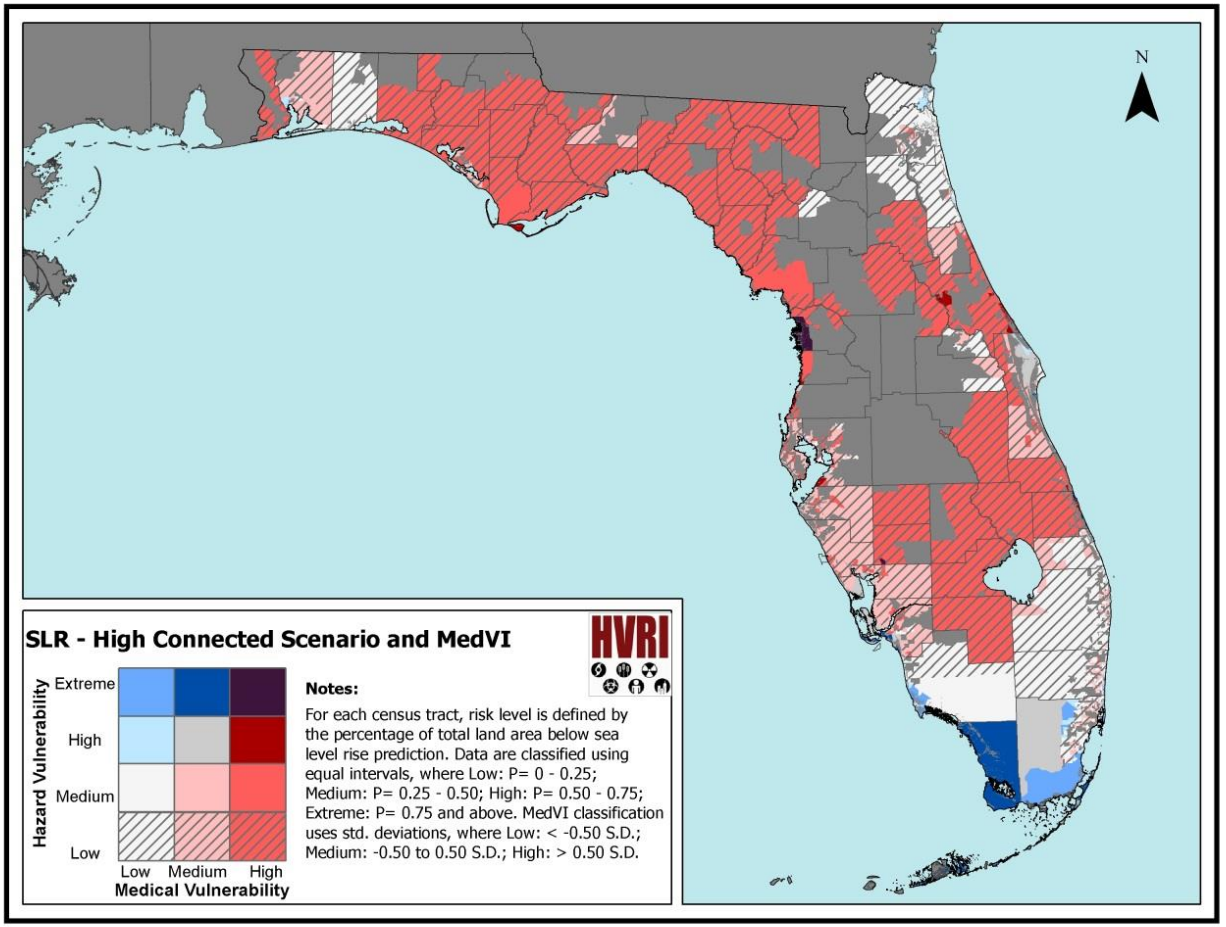
Source: C. Emrich, University of South Carolina
Hazards and Vulnerability Research Institute, 2014.

SLR High Scenario and SoVI



Source: C. Emrich, University of South Carolina Hazards and Vulnerability Research Institute, 2014.

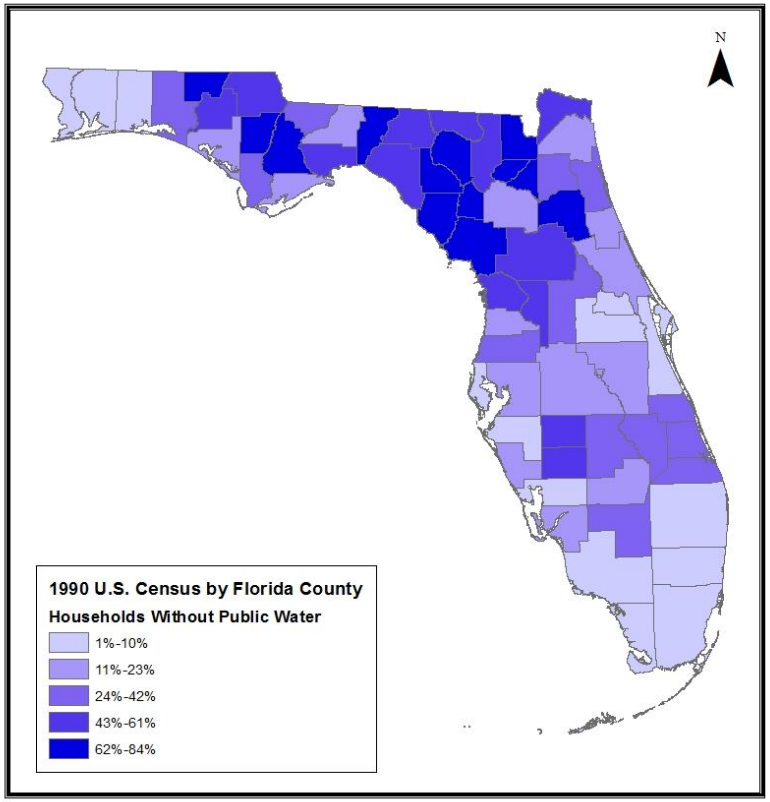
SLR High Scenario and MedVI



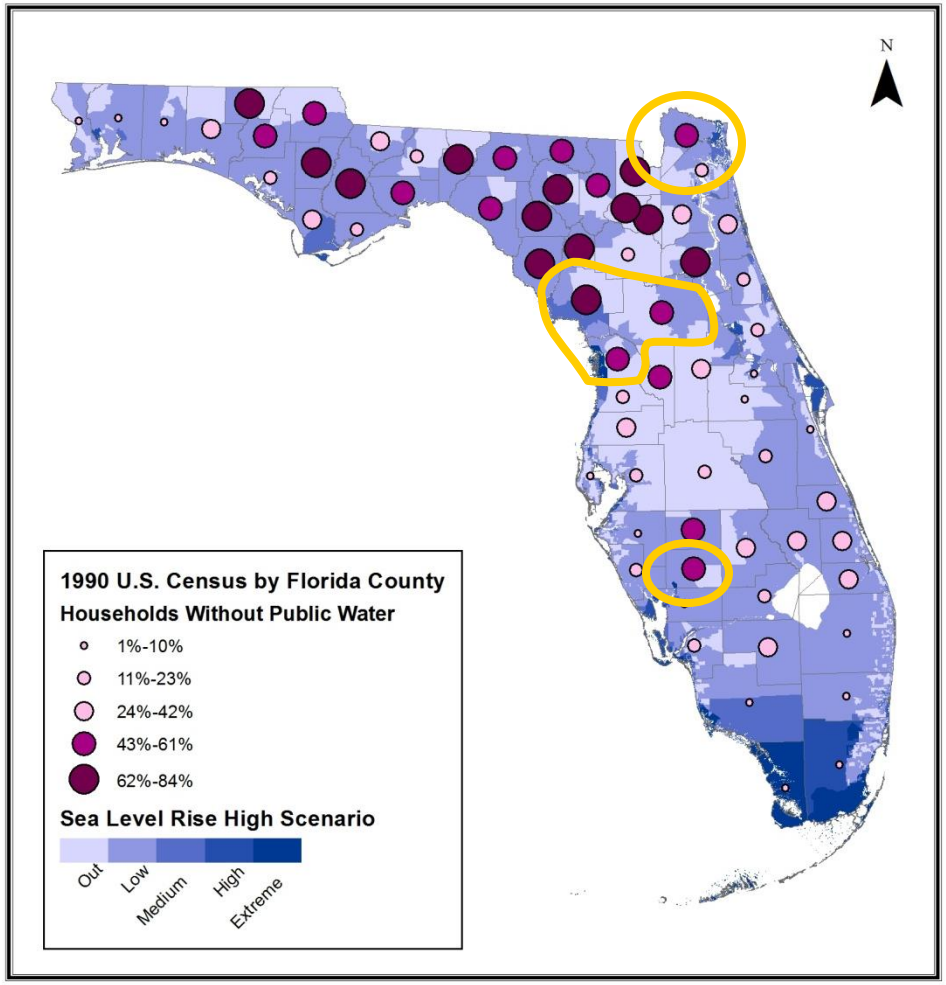
Source: C. Emrich, University of South Carolina Hazards and Vulnerability Research Institute, 2014.

SLR Health Data (1/2)

- Indicator: Household source of drinking water
- Measure: Percent non-public drinking water source (e.g., drilled well, dug well, or other)
- Data Source: U.S. Census (1990)
- Geographic Resolution: County



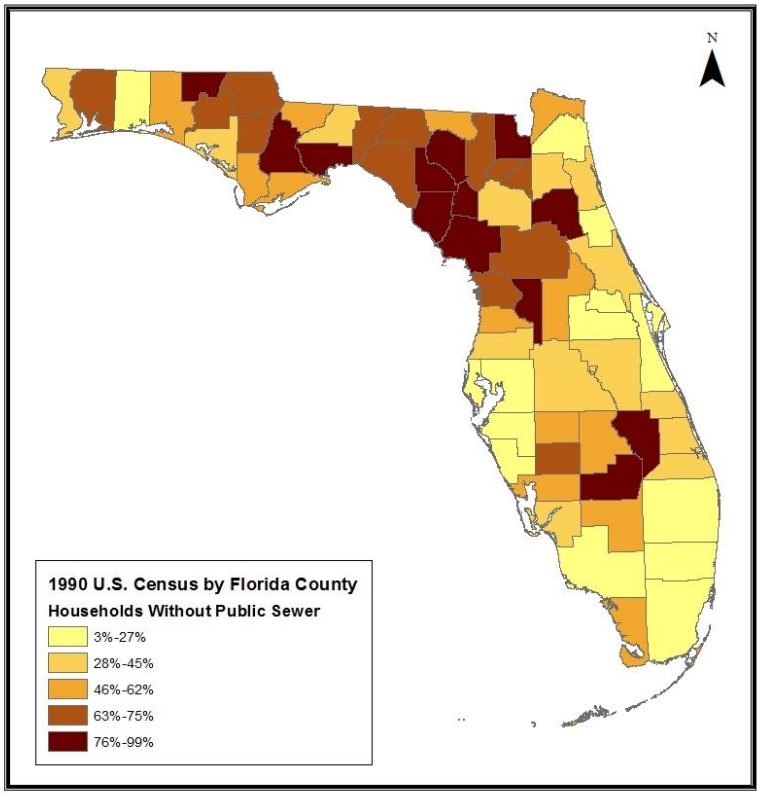
SLR and Water Source



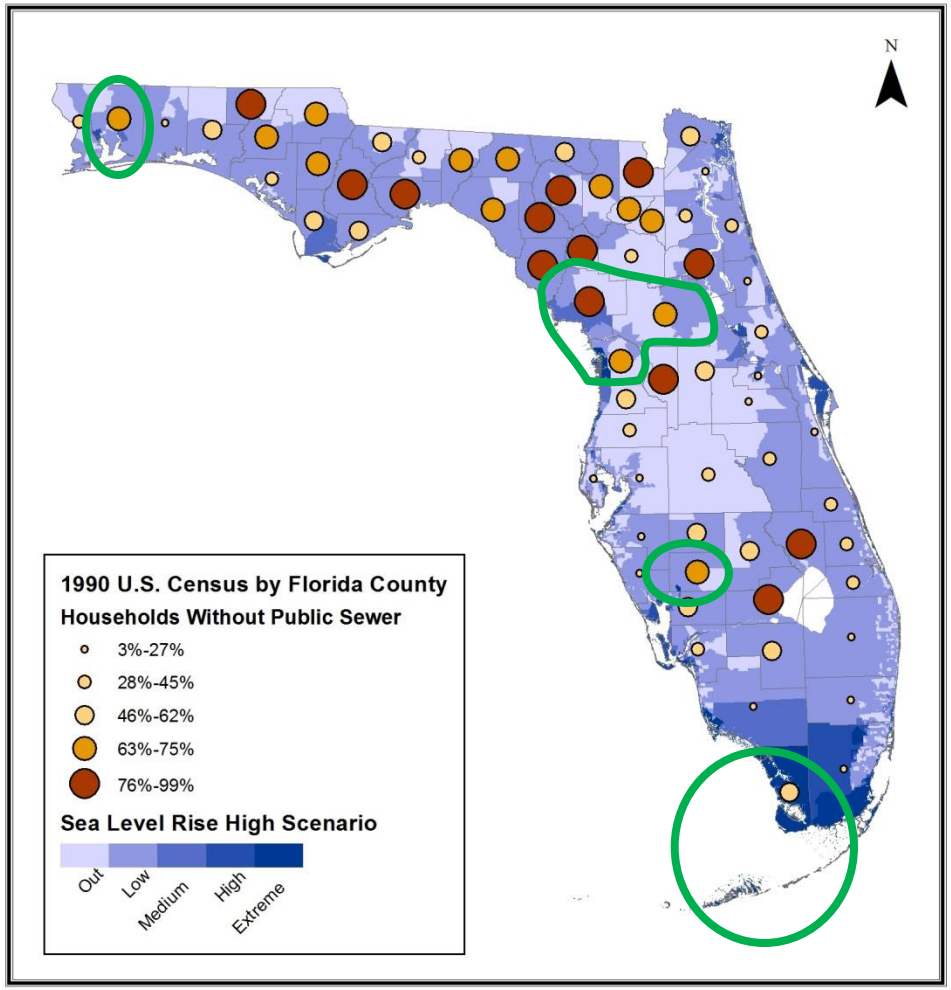
- Although vulnerable to SLR, the counties in southern Florida have high rates of regularization.
- Tracts in Citrus, DeSoto, Levy, Marion, and Nassau counties are most at risk.

SLR Health Data (2/2)

- Indicator: Household source of sewage disposal
- Measure: Percent non-public sewage disposal (e.g., septic tank/cesspool or other)
- Data Source: U.S. Census (1990)
- Geographic Resolution: County



SLR and Sewage Disposal Method



- In southern Florida, 51% of Monroe County households are not connected to a public sewer.
- Dual vulnerability also presents a risk along the Gulf Coast.

Summary Points

- Sea level rise can directly and indirectly impact human health and public health systems.
- Quantifying direct associations between retrospective health data (i.e., outcomes) and sea level in Florida is challenging.
- Storm surge can be used as a proxy.
- Assessing critical sanitation infrastructure can help quantify potential risk.

Florida Department of Health
Division of Disease Control and Health Protection
Bureau of Epidemiology

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To protect, promote & improve the health of all people in Florida through integrated state, county, & community efforts.

References

1. Keim, M. E. (2010). Sea-level-rise disaster in Micronesia: sentinel event for climate change? *Disaster Med Public Health Prep,* 4(1), 81-87.
2. Khan, A. E., Ireson, A., Kovats, S., Mojumder, S. K., Khusru, A., Rahman, A., & Vineis, P. (2011). Drinking Water Salinity and Maternal Health in Coastal Bangladesh: Implications of Climate Change. *Environ Health Perspect*. doi: 10.1289/ehp.1002804.

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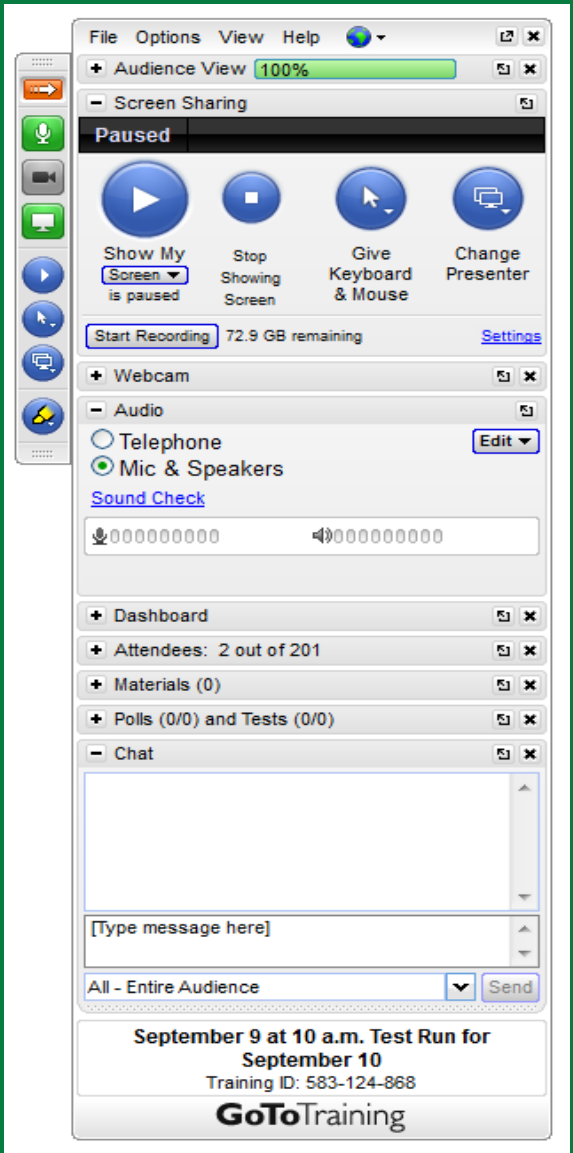
QUESTIONS



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- **Wednesday, December 10, Noon to 1:30**
  Planning for Greenways: Florida's Expanding System of Regional Connectors
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  Planning for Sea Level Rise: Legal Issues Facing Florida
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  2015 Florida Legislative Update

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