



Broward Water Resources Task Force Report and Climate Initiatives

Presented to:

Broward Leaders Water Academy

April 8, 2011



**BROWARD WATER
RESOURCES TASK FORCE**

Overview – Broward WRTF

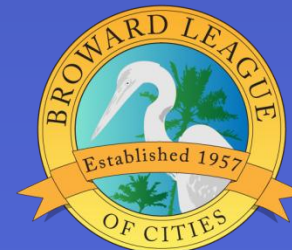
- Background
- Creation of Task Force
- Focal Areas
- Analyses
- Recommendations

The Water Climate in 2008

- **Regional Water Availability Rule adopted in 2007**
- **Lower East Coast Water Supply Plan Update completed in 2007**
- **Projected 2020 water deficit requires 106 MGD in alternative water supplies**
- **10-year Water Supply Facility Workplans under development**
- **Ocean outfall legislation under consideration**

Joint Governing Board and Broward Workshop

- May, 2008 – Participants included municipalities, Broward County, and SFWMD
- Convened to discuss regional water supply challenges, requirements, and opportunities
- Participants called for the creation of a Broward Water Resources Task Force
- Task Force to evaluate sub-regional and regional water supply options and water conservation strategies and present recommendations



Broward Water Resources Task Force

- **15 Member Task Force**
- **21 Member Technical Team**
- **Created with adoption of enabling resolutions:**
 - **Broward County**
 - **Broward League of Cities**
 - **South Florida Water Management District**
- **Kick off – September 19, 2008**

Broward Water Resources Task Force

Shannon Estenoz, Chair
Kristin D. Jacobs, Vice Chair

Members

Lisa Aronson

Douglas Bell

Peter Bober

Joy Cooper

Lamar Fisher

Beth Flansbaum-Talabisco

Glen Hanks

Richard Kaplan

Jack McCluskey

Charlotte Rodstrom

Donald Rosen

Susan Starkey

Allegra Webb Murphy

Alternates

Richard Blattner

Thomas Good

John Sims

Joe Varsallone

Robert Fennel

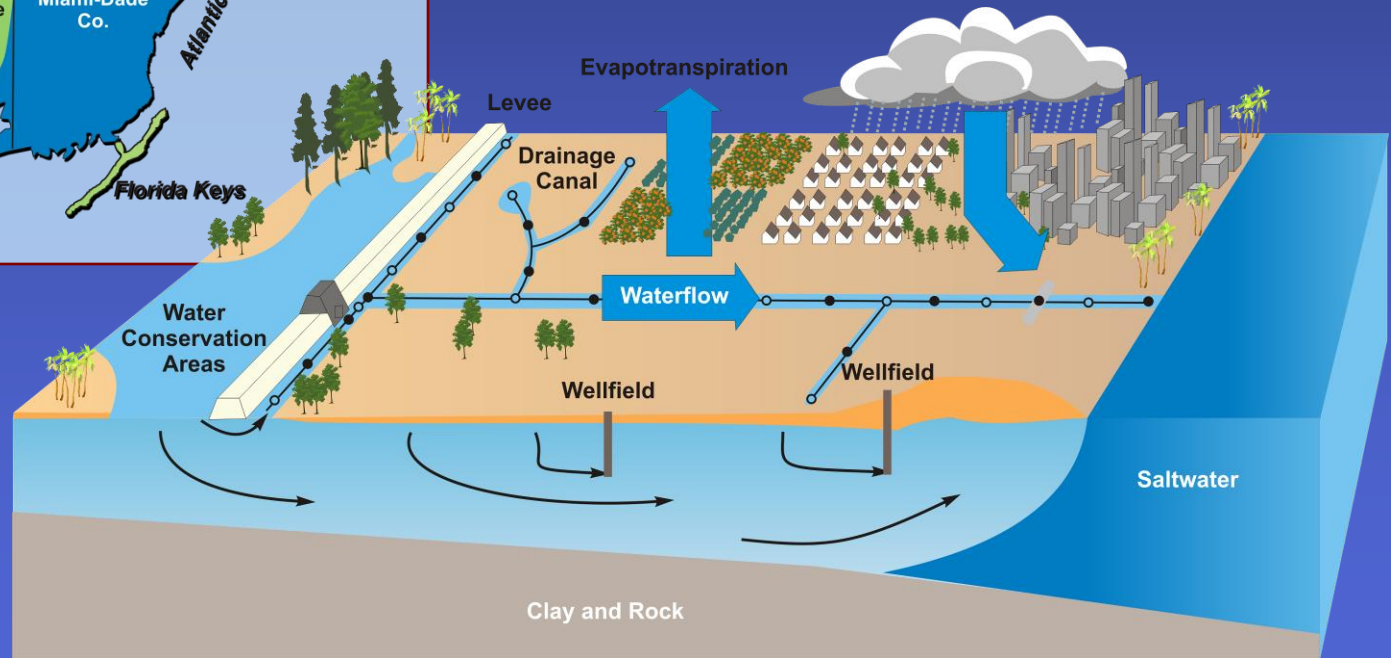
Task Force Strategy

- Review current system
- Update water demand projections
- Emphasize water conservation
- Address ocean outfall legislation
- Identify and evaluate regional water supply opportunities

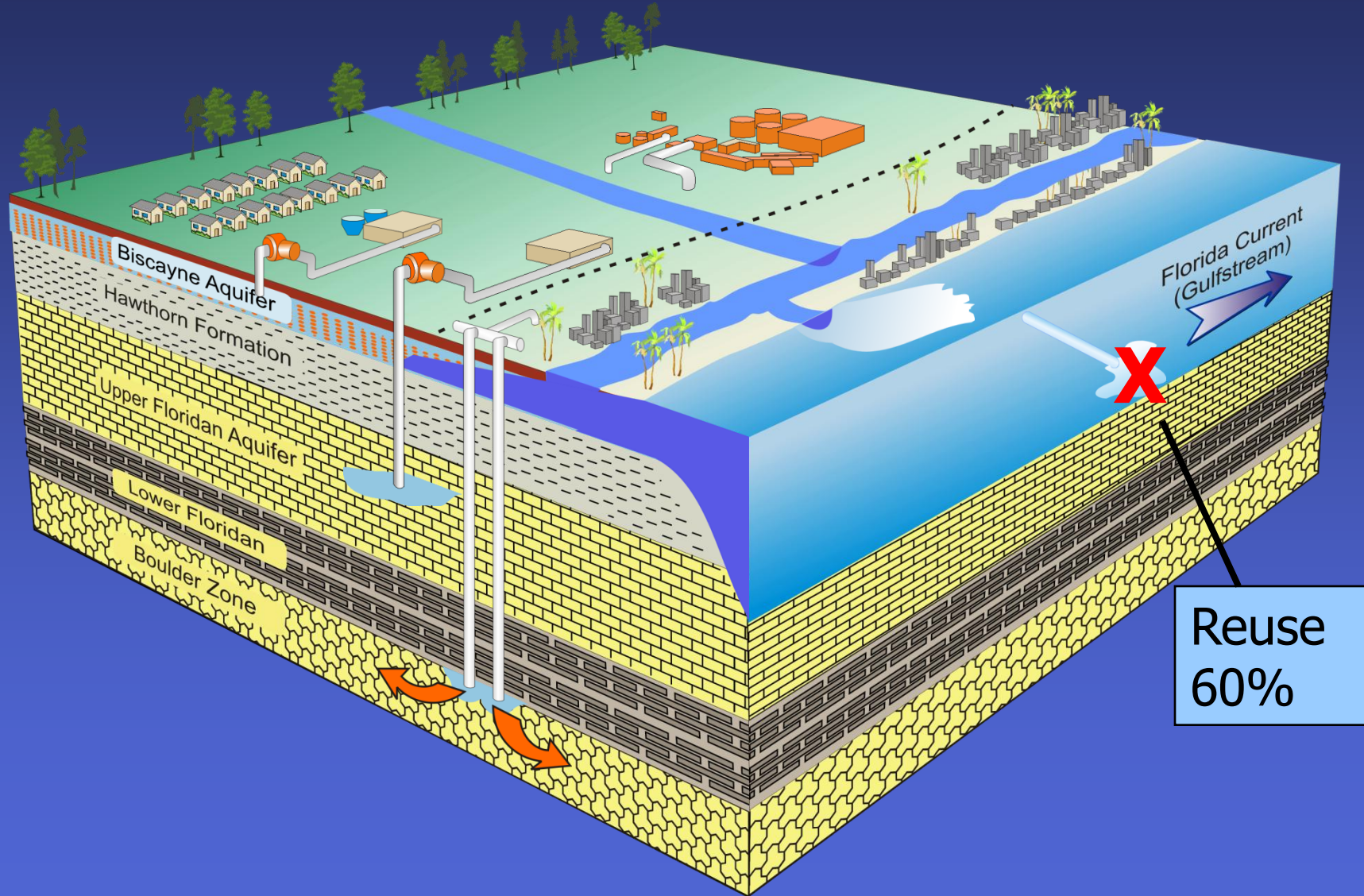
The Biscayne Aquifer



Source: LEC Plan, 2000 SFWMD

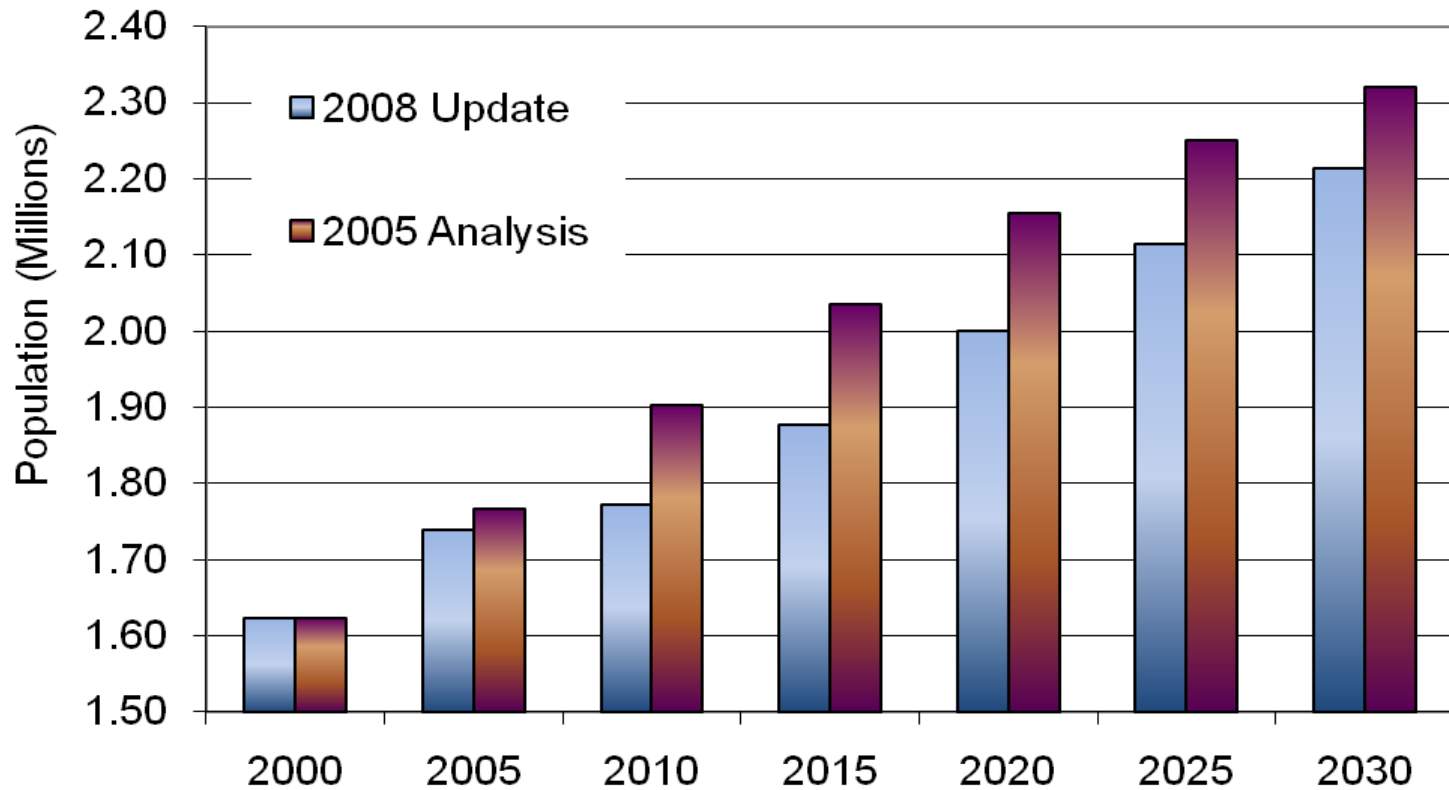


Beyond the Biscayne



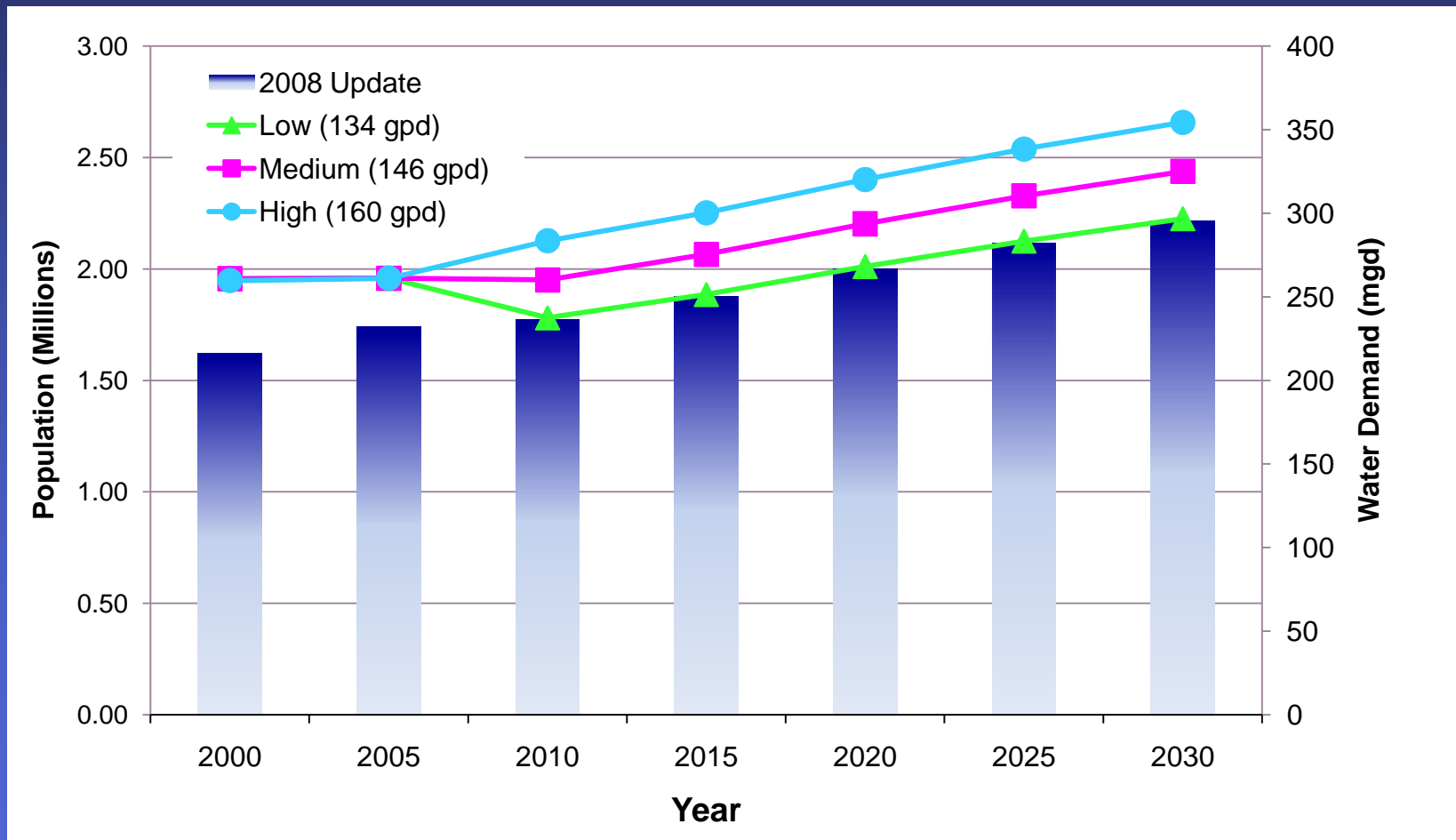
Updated Population Projections

Broward Population Projections



Water Demand as a Function of Per Capita Consumption

Revised projections suggest a 20 to 47 MGD increase by 2025



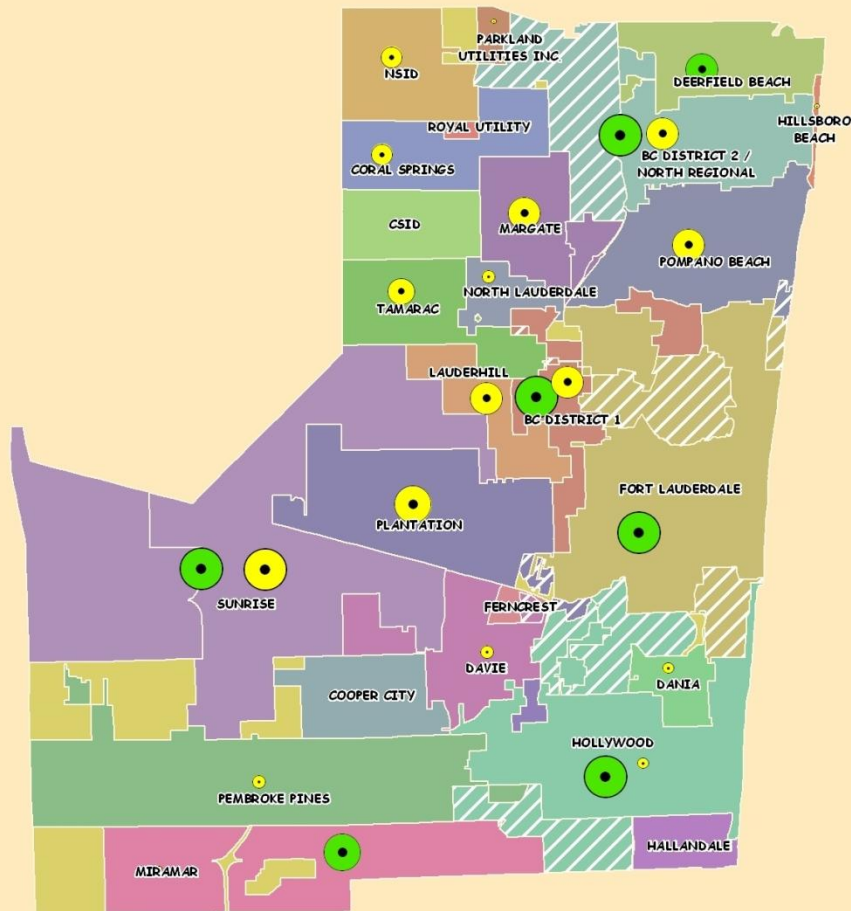
Options for Meeting Unmet Demands

- **Water conservation – a 10% reduction would achieve a 30 MGD water savings by 2030.**
- **Floridan projects and current commitments can meet much of short-term demands**
- **Reuse obligations might serve to further reduce demands or provide offsets**
- **Regional water supply projects offer further possibilities**

Floridan Water Supply Commitments

UNMET NEEDS ABOVE BISCAIYNE ALLOCATIONS FUTURE FLORIDAN PROJECTS

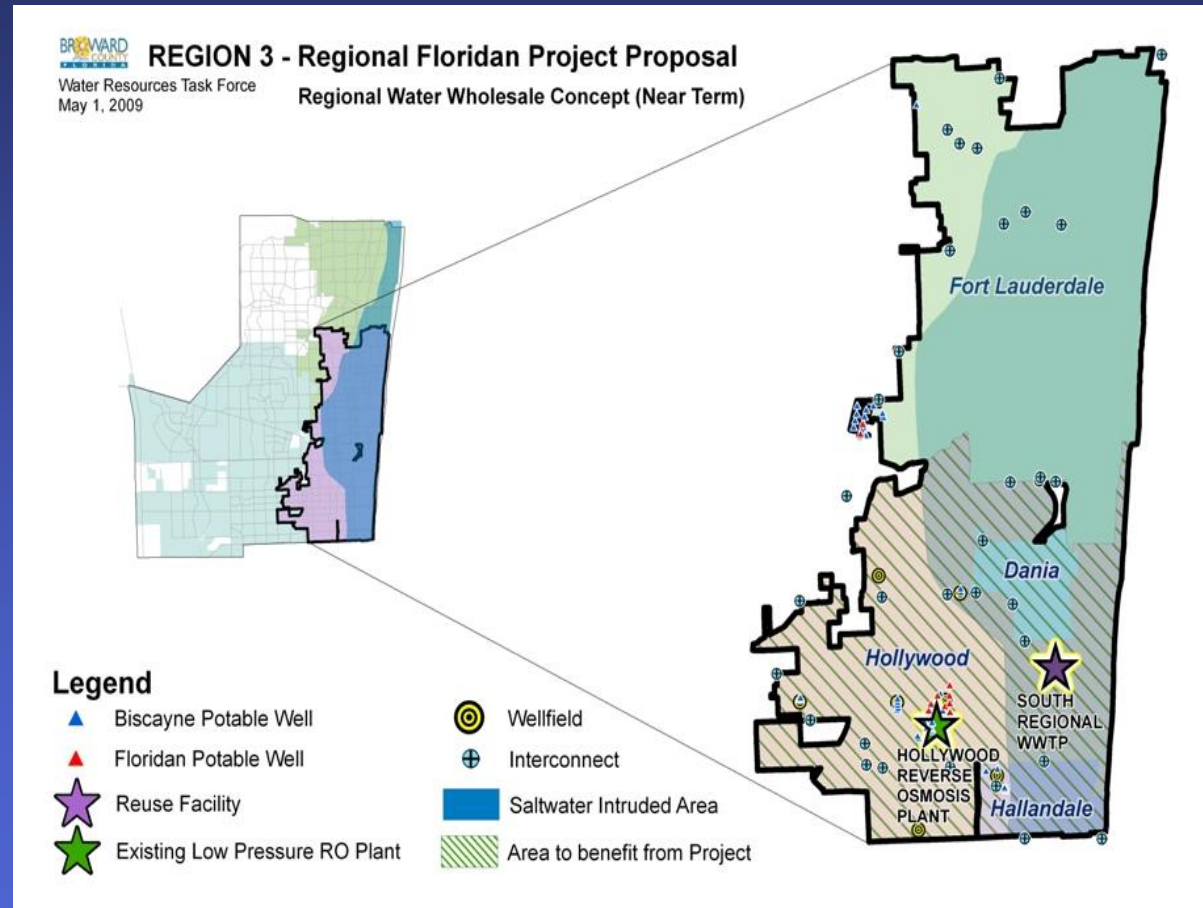
March 6, 2009



- 10-year Water Supply Facility Workplans contain Floridan commitments
- 6 water providers will maintain Floridan systems in 2013
- Projects will jointly produce 24 MGD by 2013
- Spatial analysis of project locations and remaining unmet demands reveals opportunities

Sub-Regional Water Supply Concepts

- Identified 3 sub-regions
- Developed 14 project concepts
 - 6 Floridan
 - 7 Reuse
 - 1 Stormwater
- Projects were evaluated and ranked
- Presented for further development by likely partners



The C-51 Project – A Proposed Regional Reservoir

7 Utilities

Broward and Palm Beach Counties

- Broward County
- Palm Beach County
- Sunrise
- Plantation
- Hollywood
- Pompano Beach
- Fort Lauderdale

Proposed 1,200 acre reservoir

Estimated to capture 120 MGD runoff

Potential 60 MGD water offset for Broward County



40 Recommendations

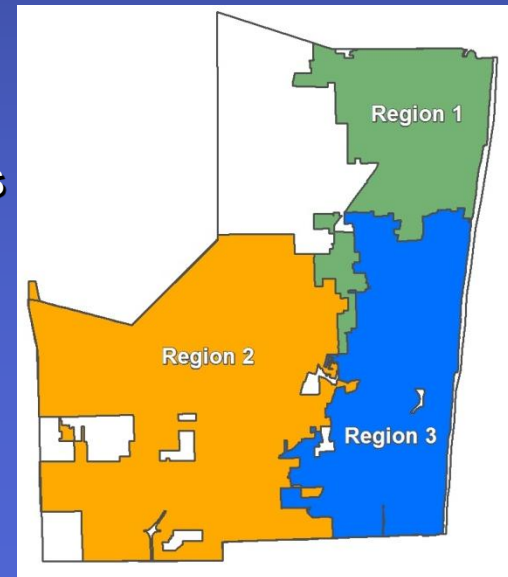
■ Water conservation

- Provide Incentives (public and utility)
- Pursue code amendments (cooling towers, irrigation, landscape)
- Support regional programs
- Further through development/building practices



■ Regional Project Concepts

- Explore C-51 Reservoir
- Develop further the sub-regional concepts
- Pursue regional storage and recharge
- Support collaborations



40 Recommendations

■ Research and Investigations

- Develop essential tools and provide monitoring
- Research Floridan Aquifer
- Evaluate and manage saltwater intrusion
- Consider and plan for climate change

■ Reuse

- Collaborate and coordinate regionally
- Develop a regional master plan
- Utilize corridors for infrastructure
- Maximize through irrigation
- Amend comprehensive plans to better integrate

■ Role of Task Force



Broward Water Resources Task Force Report

Report Status:

- Accepted by the Broward Commission - Sept. 2010
- Accepted by the SFWMD Governing Board – Oct. 2010
- Accepted by the Broward League of Cities – Apr. 2011

Next Steps:

- Task Force to continue to convene quarterly
- Oversee implementation of recommendations
- Monitor progress and issues and adjust as needed

WRTF REPORT IMPLEMENTATION

Broward Water Conservation and Incentives Program

- **Issue:** Need to achieve measurable and sustained water conservation as part of regional water supply strategy
- **Strategy:**
 - Encourage a stronger water conservation ethic among water users through increased public education and outreach
 - Provide incentives and resources to residents for significant water savings through plumbing retrofits



Program Approach

- **County-wide program delivered in conjunctions with 18 municipal and water utility partners**

- **Provide uniform branding, messaging, and services with the availability of incentives and rebates for high efficiency**
 - **Toilets**
 - **Showerheads**
 - **Faucets**
 - **Pre-rinse Spray Valves**



Cooling Towers and Condensate Recovery

- **Issue:**
 - Cooling towers account for up to 80% of a building's water consumption
 - To prevent scaling, water is bled off and replaced
 - Alternative technologies substantially increase the cycles of concentration and reduce the need for bleed down
 - Condensate recovery provides additional conservation with use as makeup water
- **Strategy:** Pursue building code amendment to require installation with system replacement and new development

Implementation Options

- **Amendment to Florida Building Code**
 - **General vs. Section specific**
 - **Constraint - Timing**
- **Local Amendment**
 - **Geographical justification**
 - **Constraint – 3 yr renewals**
- **Legislative Option**
 - **Seek regional collaboration**
 - **Constraint – collaborative process**



Status and Next Steps

- **Coordination with the Broward Board of Rules and Appeals (BORA)**
- **Convening of a Joint Broward/Miami – Dade BORA Workshop**
- **Convening of a Broward BORA Water Conservation Subcommittee to evaluate range of issues and options**
- **Technical review and assessment of technologies and drafting of recommendations for more thorough vetting**

Reuse Planning and Development

- **Issue: Lack of regional strategy for ensuring cost-efficient and timely development reuse projects**
- **Strategy: Develop a regional reuse master plan to coordinate local efforts and installation of infrastructure**
- **To consider:**
 - Planned roadway improvements
 - Canal easements and rights-of-way
 - Potential end users and projects
 - Existing and planned facilities



Next Steps

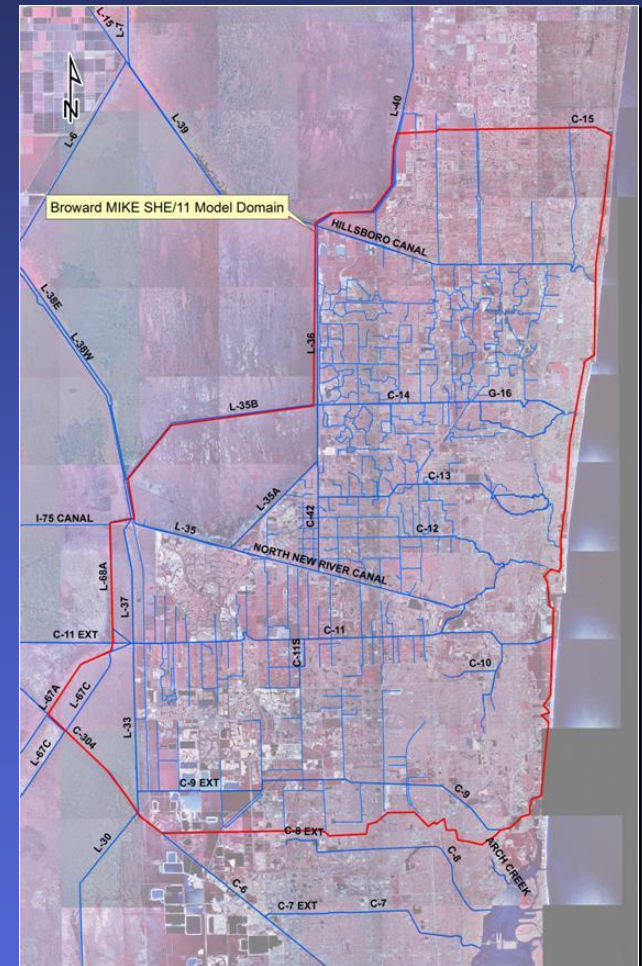
- **Reuse subcommittee convened under the WRTF to include representation of key stakeholders in master plan development**
- **Professional services to be solicited**
- **Subcommittee will help craft a scope of services, provide project oversight, and participate in the review of project deliverables**

Technical Investigations and Regional Project Analysis

- **Issue: No regional analysis of planned alternative water supply projects and lack of information pertaining to the Floridan Aquifer**
- **Strategy: Assess existing, planned, and proposed Biscayne and Floridan projects as part of the Broward Integrated Water Resources Management Master Plan (IWRMMP)**

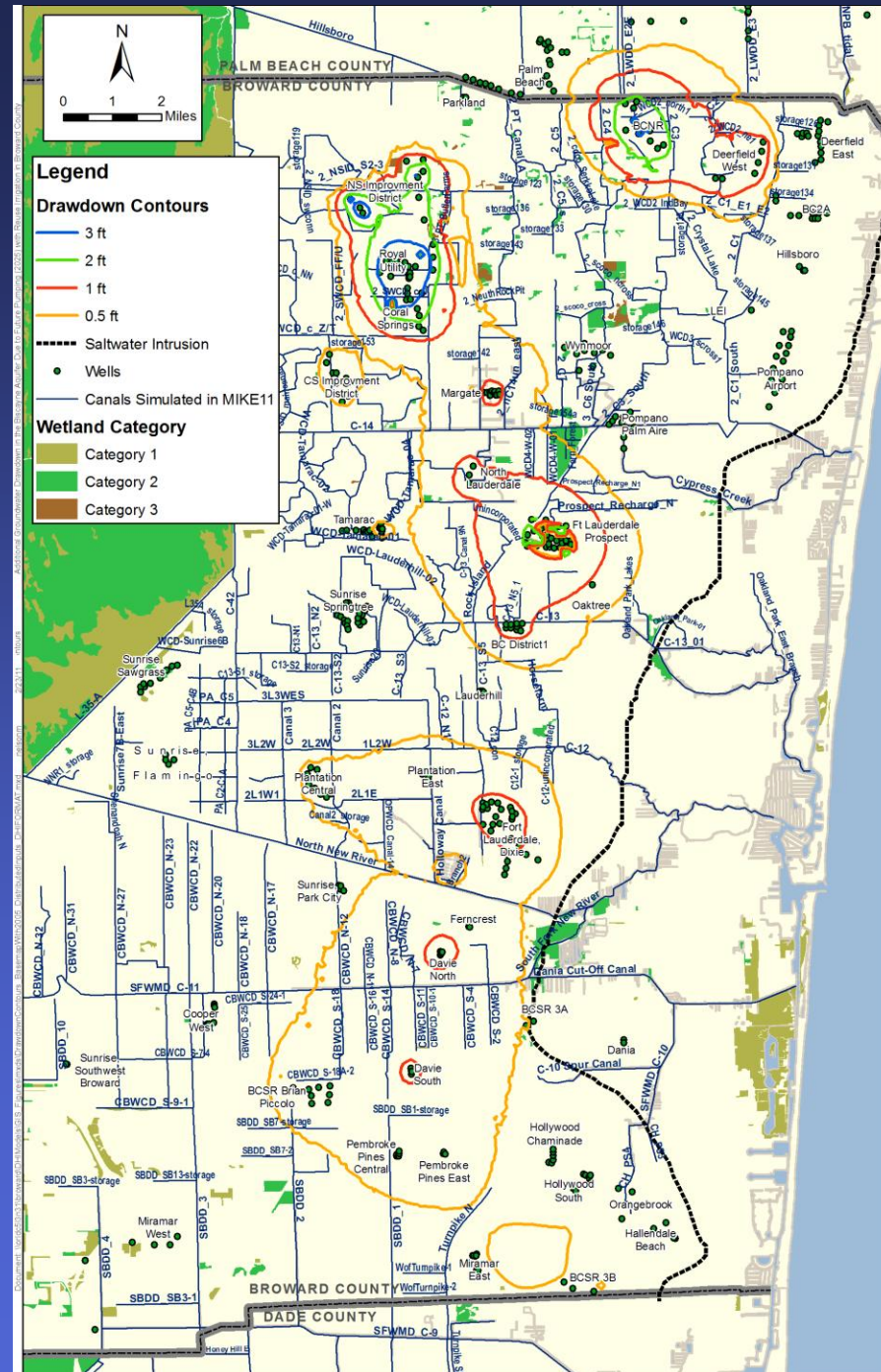
Biscayne Model

- **Baseline Model**
 - 5 layers, 471 wells, 350 canals, 404 structures
- **255 mgd baseline withdrawal**
- **Evaluate various AWS plans**
 - Increased reuse w/ irrigation & injection
 - Utilization of storm water via C-51 reservoir
 - Relocation of coastal wells



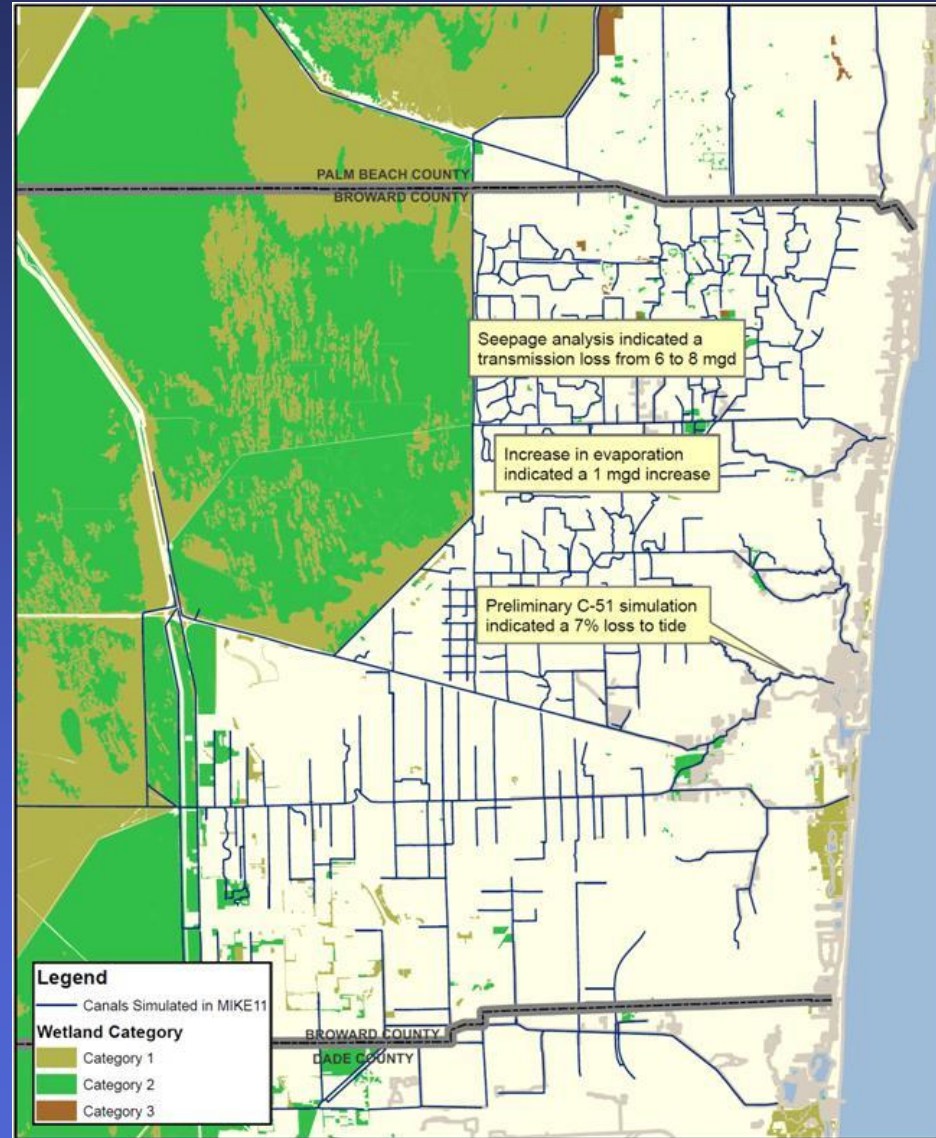
Simulated 2025 Reuse Irrigation

- Increased withdrawal of 75 MGD
- 18 MGD reuse irrigation
 - Dania,
 - Davie,
 - Deerfield Beach,
 - Hallandale,
 - Hollywood,
 - Pompano Beach,
 - Sunrise,
 - Brian Piccolo Well Field
- Serves to isolate cones of influence



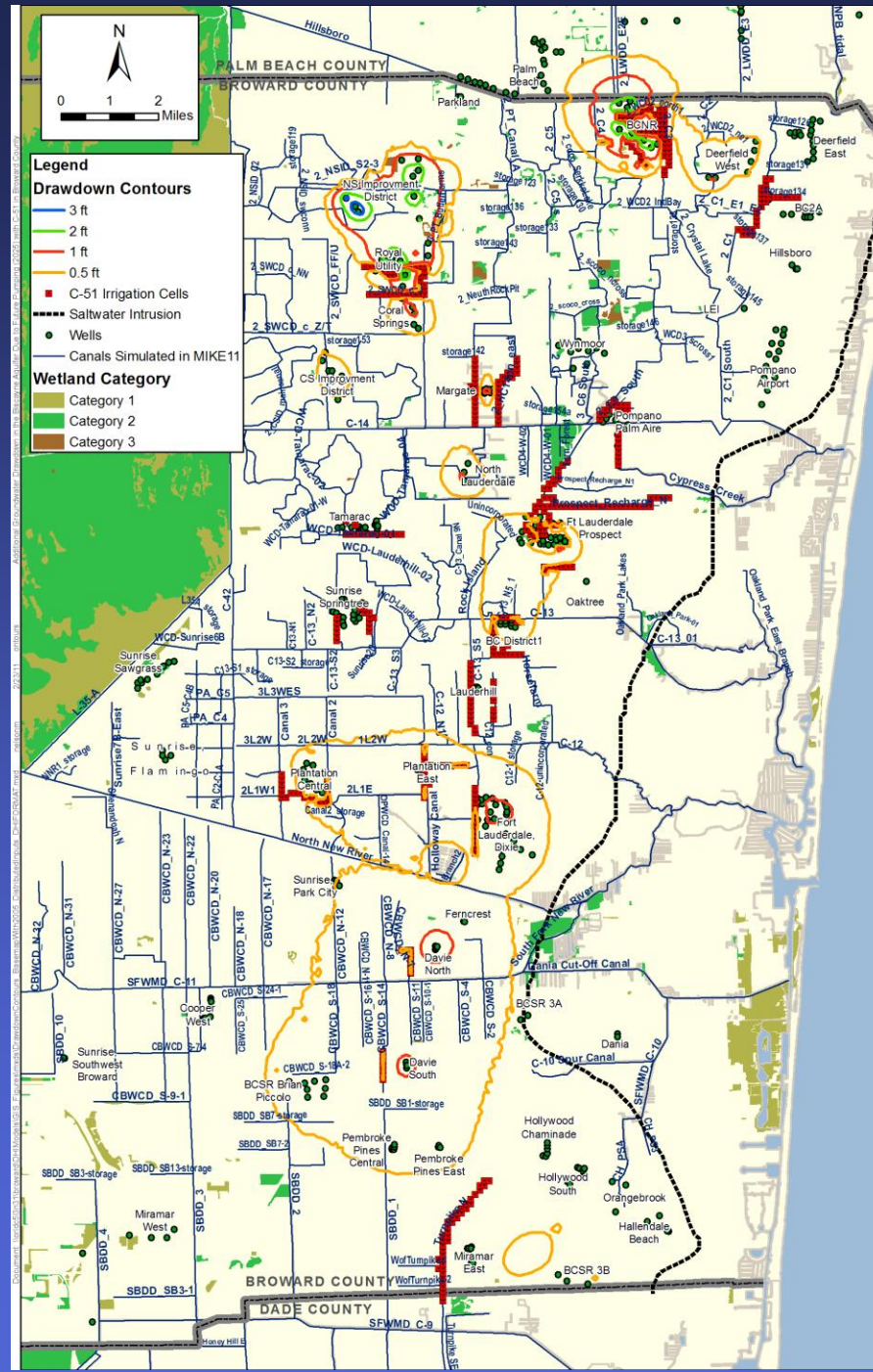
Conceptualization of C-51 Reservoir Project

- Assumed 60 mgd of water available from reservoir
- Estimated losses
 - 10% to tide (6 mgd)
 - 14% canal seepage (8 mgd)
 - 1% evaporation from canal network (1 mgd)
- Total losses during conveyance ~ 25% (15 mgd)
- Net result: 45 mgd to provide direct recharge to wellfields



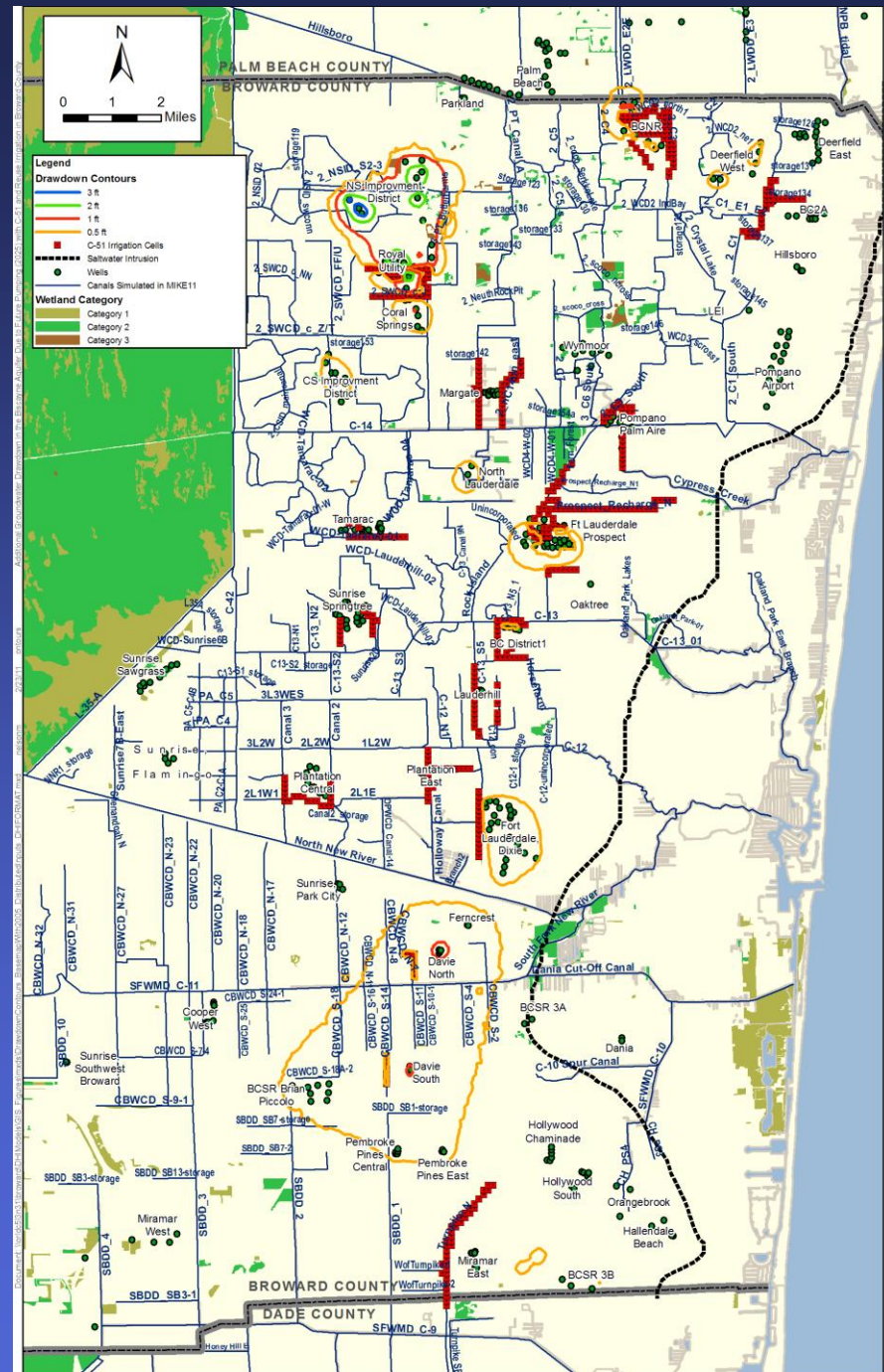
Simulated 2025 w/ C-51 Project

- Drawdowns decreased from 2-3 ft to 1-2 ft in northern BC



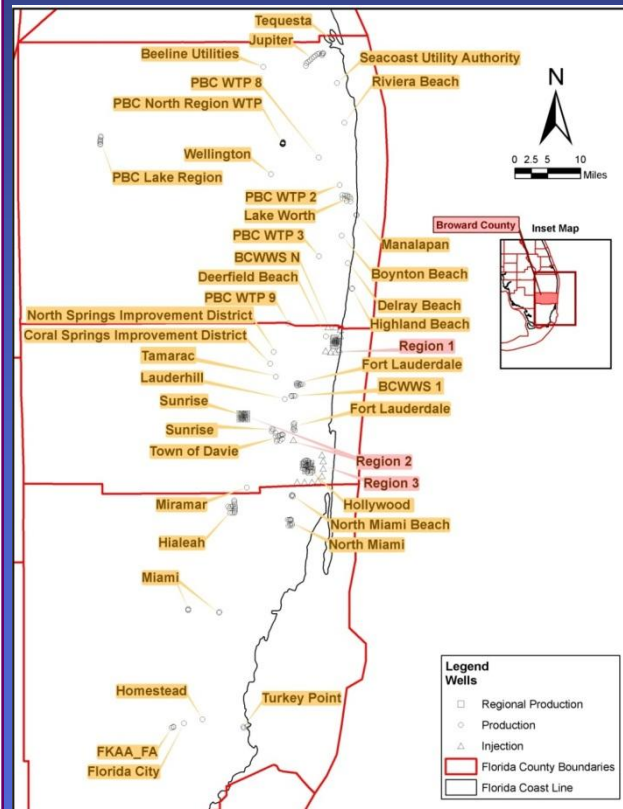
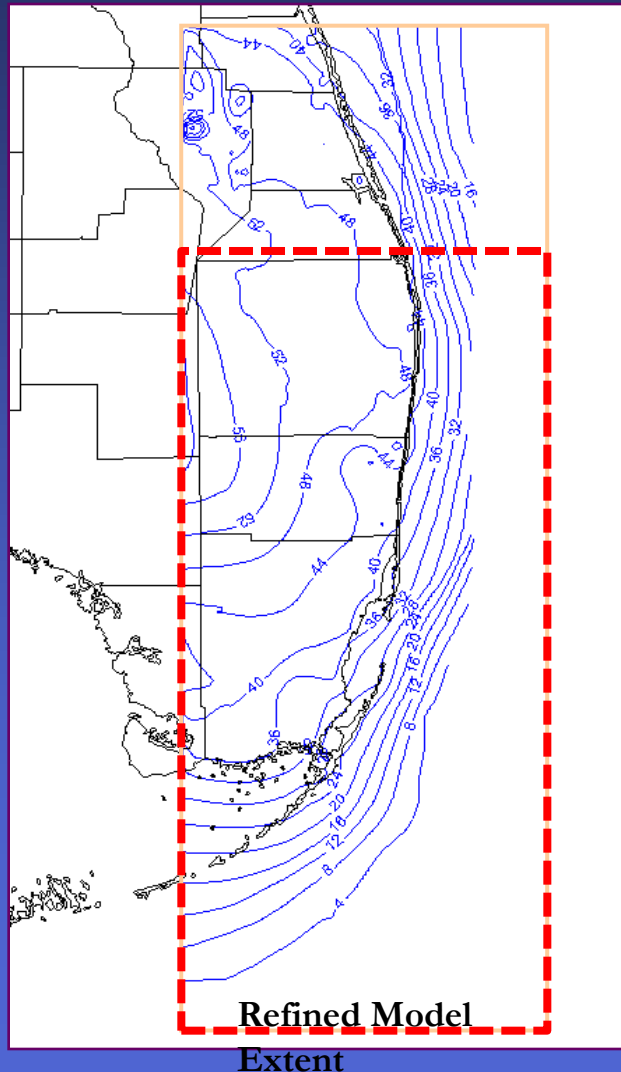
2025 Simulation Reuse & C-51

- 18 mgd reuse irrigation
- 60 mgd (net 45 mgd) C-51 recharge
- Provides significant drawdown recovery
 - 1 ft drawdowns eliminated or confined to immediate vicinity of wells



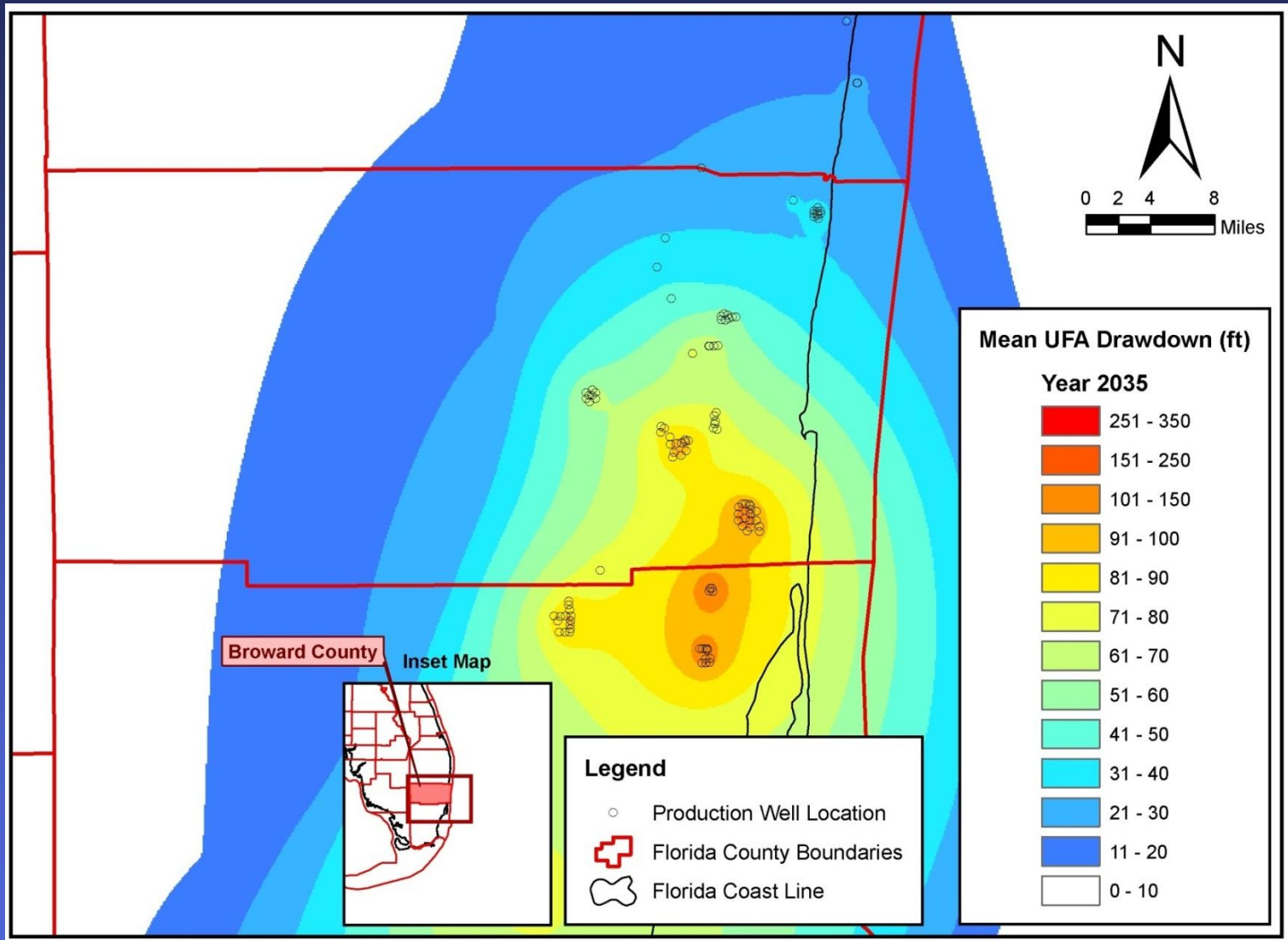
Floridan Model

Refined SFWMD Phase II Model



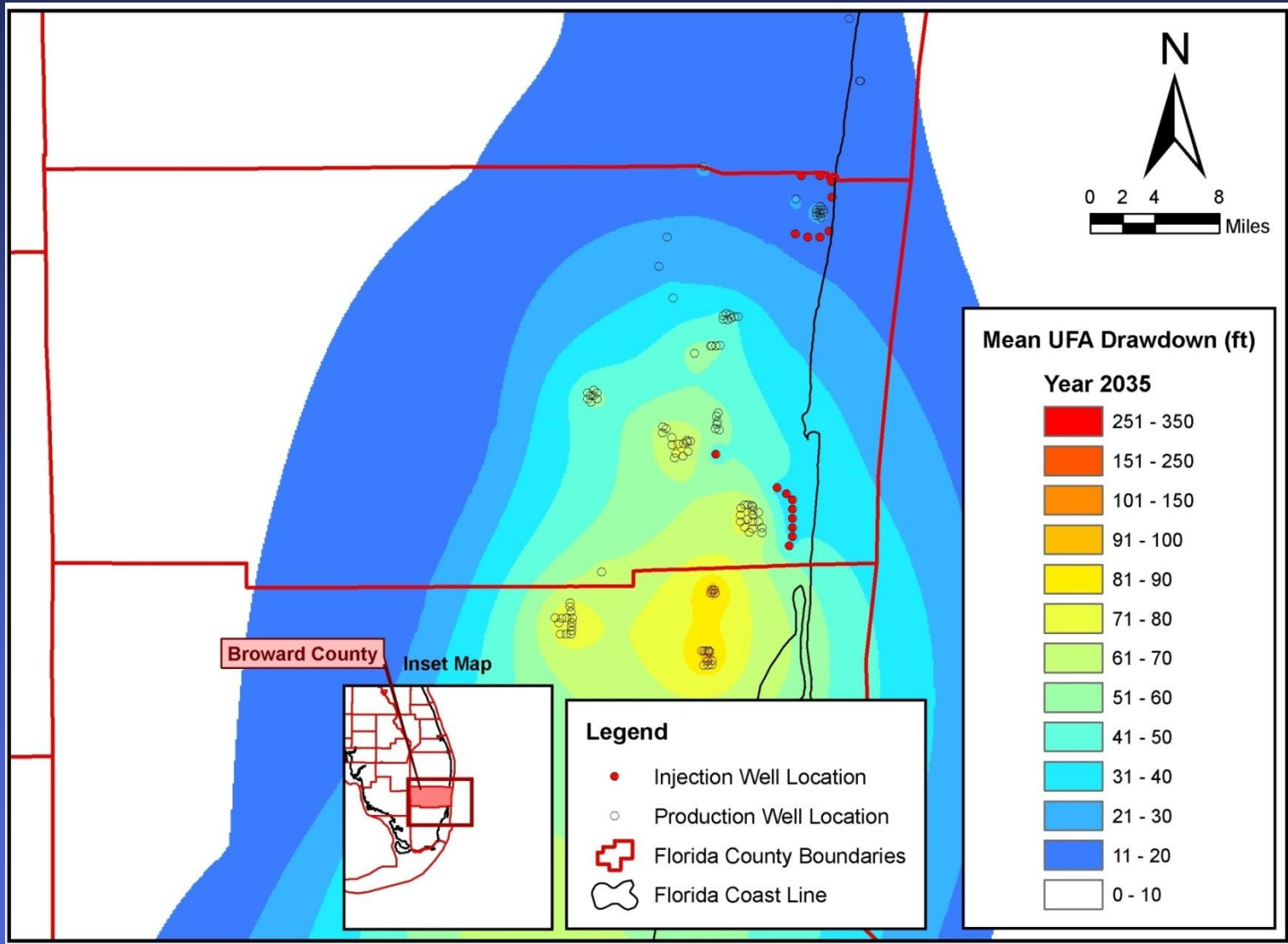
- Refined Grid for BC
- Additional layer added to UFA
- Includes 196 wells and analyses through 2035
 - 56 Broward wells
 - 18 Regional wells
 - 17 Injection wells
 - 103 mgd Broward withdrawal
 - 53 mgd recharge

Predictive Simulation Results



Simulated 2035 **Drawdown Without** Injection

Predictive Simulation Results

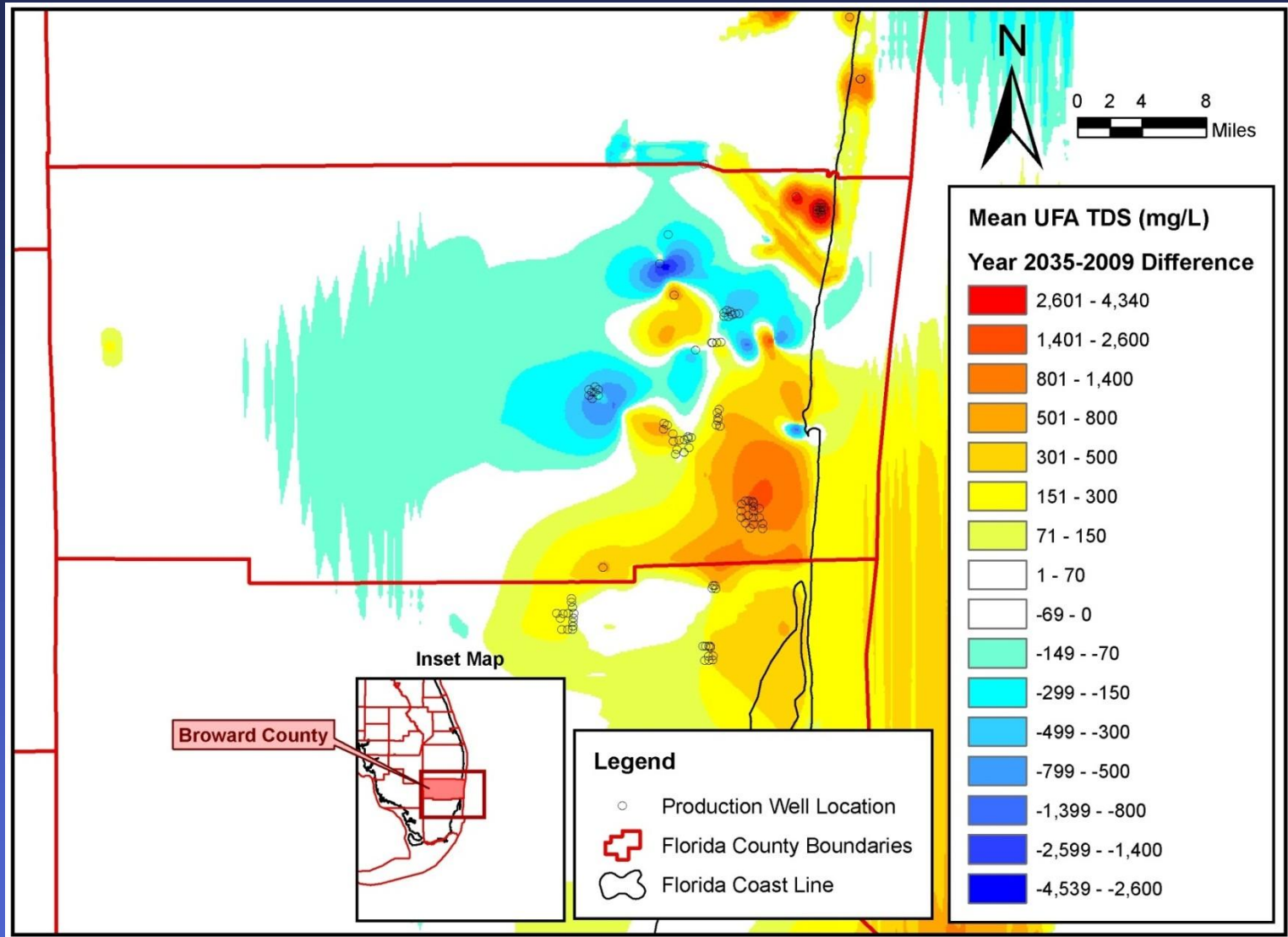


Simulated 2035 **Drawdown With** Injection

Predictive Simulation Results

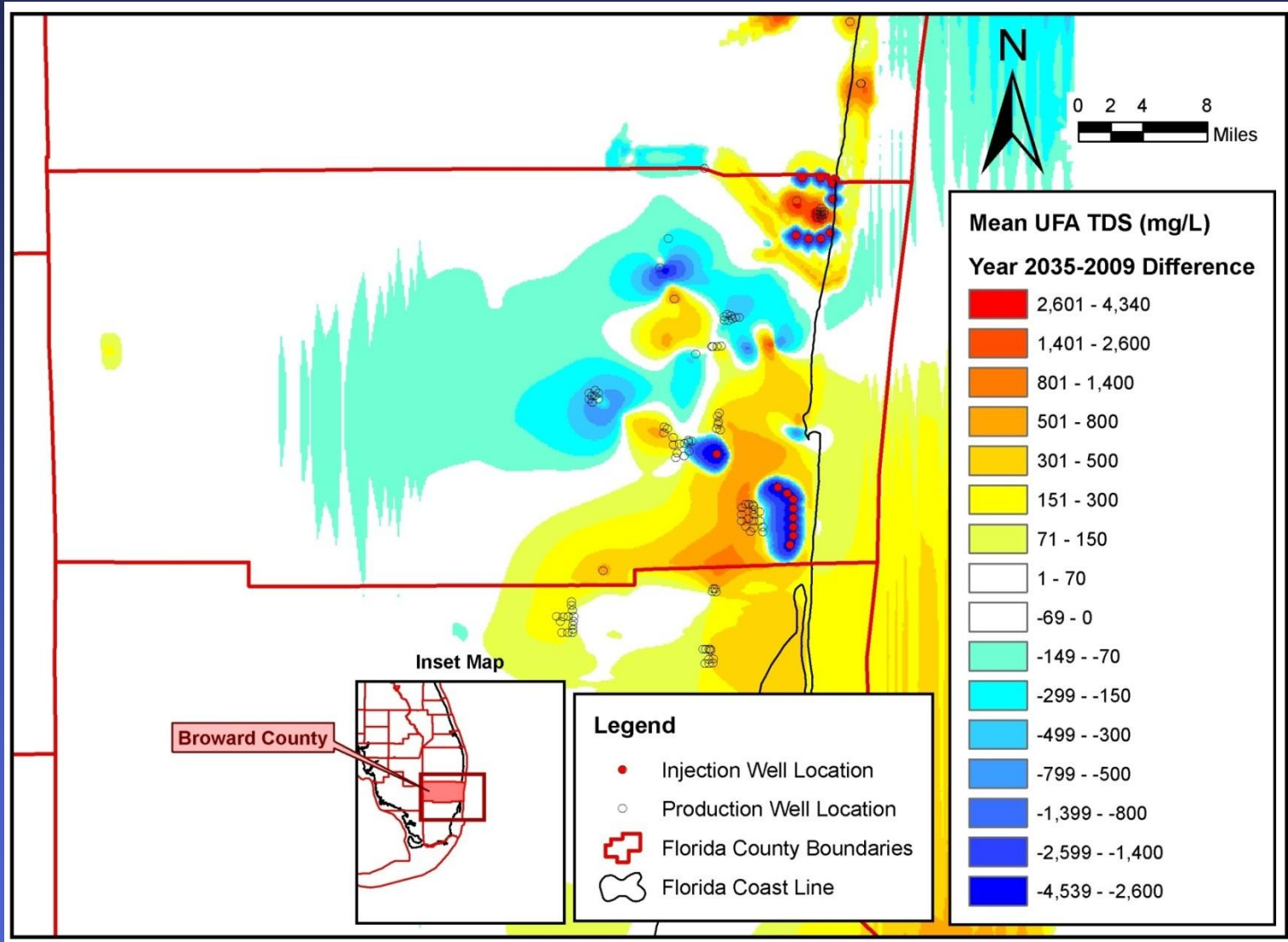
- **Key benefits of injection:**
- **2035 drawdown improvements relative to no injection:**
 - **14 feet at BCWWS N**
 - **30 feet at Hollywood**
 - **20 feet at Davie**

Predictive Simulation Results



Simulated 2035 Concentration Change Without Injection

Predictive Simulation Results



Simulated 2035 Concentration Change With Injection

Predictive Simulation Results

- **Key benefits of injection:**
 - **2035 concentration decreases relative to no injection:**
 - **2,200 mg/L at BCWWS N (↓ 25%)**
 - **530 mg/L at Hollywood (↓ 9%)**
 - **270 mg/L at Davie (↓ 5%)**

Floridan Projects Cost Analysis

- **\$612 million likely capital cost for individual utility scenario without injection**
- **\$550 million likely capital cost for regional wellfield scenario without injection**
- **\$487 million likely capital cost for Floridan recharge facilities**
- **15% higher TDS concentration at BCWWS N regional wellfield**

Floridan Conclusions

- **Saltwater intrusion a problem at simulated rates (150-1210 mg/L or 3 to 26% increase)**
- **Significant drawdown (23-110 feet)**
- **Large capital costs associated with construction of appropriate treatment facilities**
- **Injection of reuse water improved model results by reducing heads and chloride concentrations**

Floridan Summary

- 103 MGD demand from Floridan

	Local Utility Representation					
	Without Injection		With Injection		Difference	
Utility	Head (ft)	Conc (mg/L)	Head (ft)	Conc (mg/L)	Head (ft)	Conc (mg/L)
BCWWS 2A	40	8820	26	6650	-14	-2170
Hollywood	100	5820	71	5290	-29	-530
Davie	92	5470	72	5200	-20	-270

	Region Representation					
	Without Injection		With Injection		Difference	
Utility	Head (ft)	Conc (mg/L)	Head (ft)	Conc (mg/L)	Head (ft)	Conc (mg/L)
BCWWS 2A	43	9660	29	7250	-14	-2410
Hollywood	110	5950	81	5590	-29	-360
Davie	80	5480	60	5370	-20	-110

Conclusions

- **Biscayne appears to support 75 MGD additional demand with combination of AWS projects**
- **Slight impacts along saltwater intrusion line and at wetlands require additional mitigation**
- **Production of 103 MGD from Floridan cannot be sustained without water quality impacts**
- **Injection of 53 MGD proved beneficial but does not fully mitigate the trend of increasing chlorides**
- **Efforts to reduce overall demands on the Floridan would improve the longer-term quality of this resource**

BROWARD CLIMATE CHANGE INITIATIVES

Overview – Climate Initiatives

- **Water Resource Considerations**
 - **Water Supply**
 - **Flood Control**
- **Technical Investigations**
- **Regional Climate Compact**
 - **Background**
 - **Work Products**
 - **Work Groups**

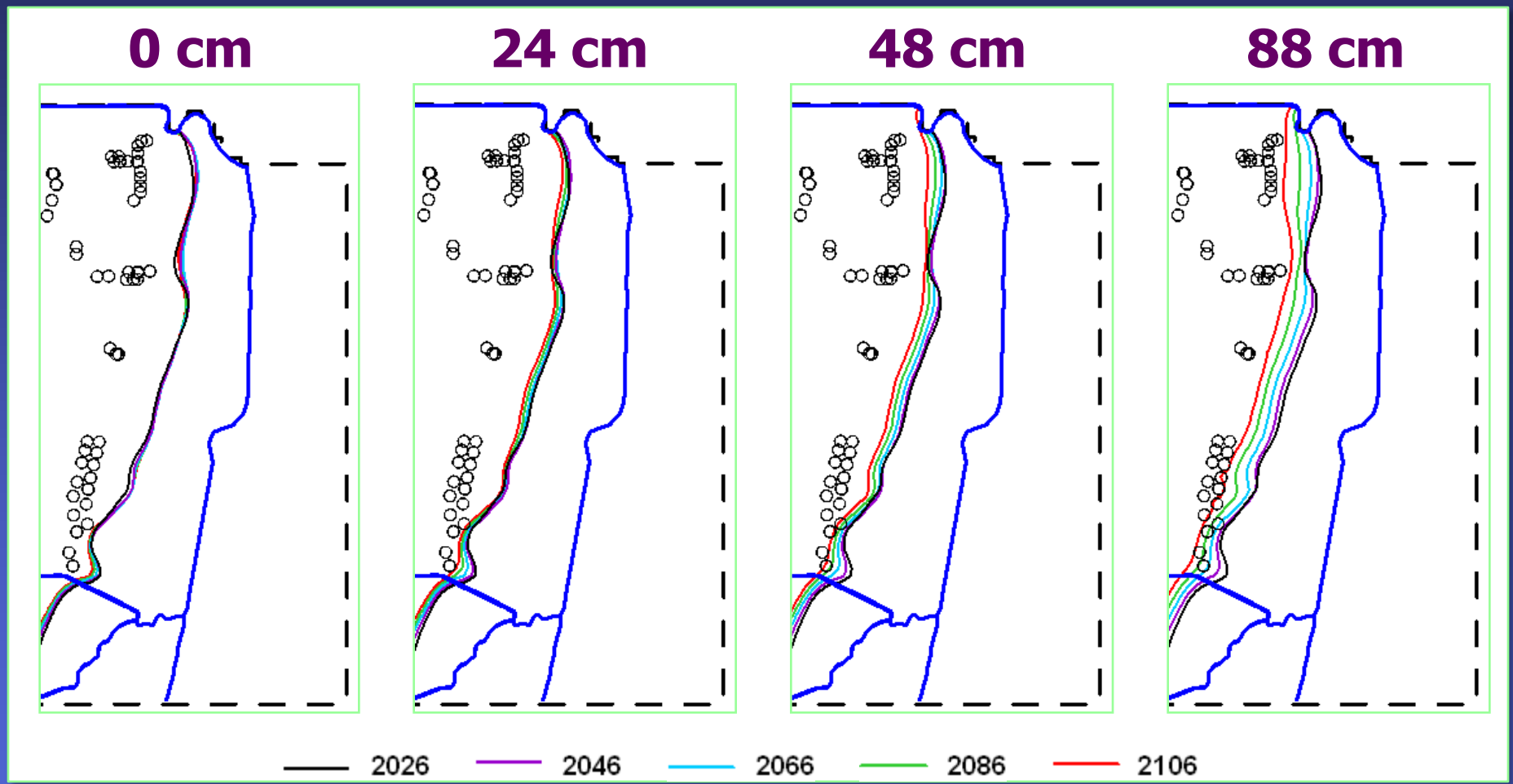
Climate Change Implications for Water

- **Increased potential for:**
 - **Coastal flooding due to rising sea level, low land elevations and flat topography**
 - **Inland flooding due to constraints on drainage and flood control infrastructure**
 - **Contamination of drinking water supplies due to saltwater intrusion**
 - **Water shortages due to increased frequency and severity of drought**

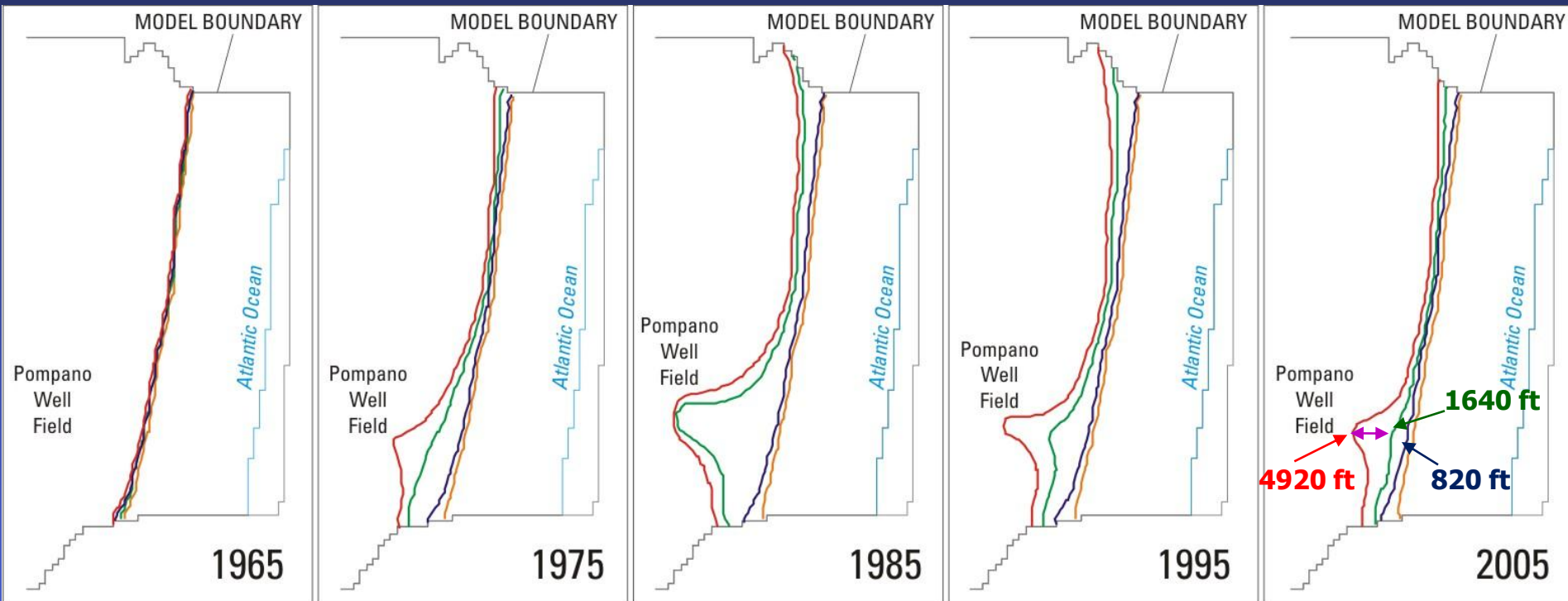
Models to Evaluate Saltwater Intrusion Potential



North County - Movement of 250 mg/L Salt Front with Varying Sea Level Rise Estimates



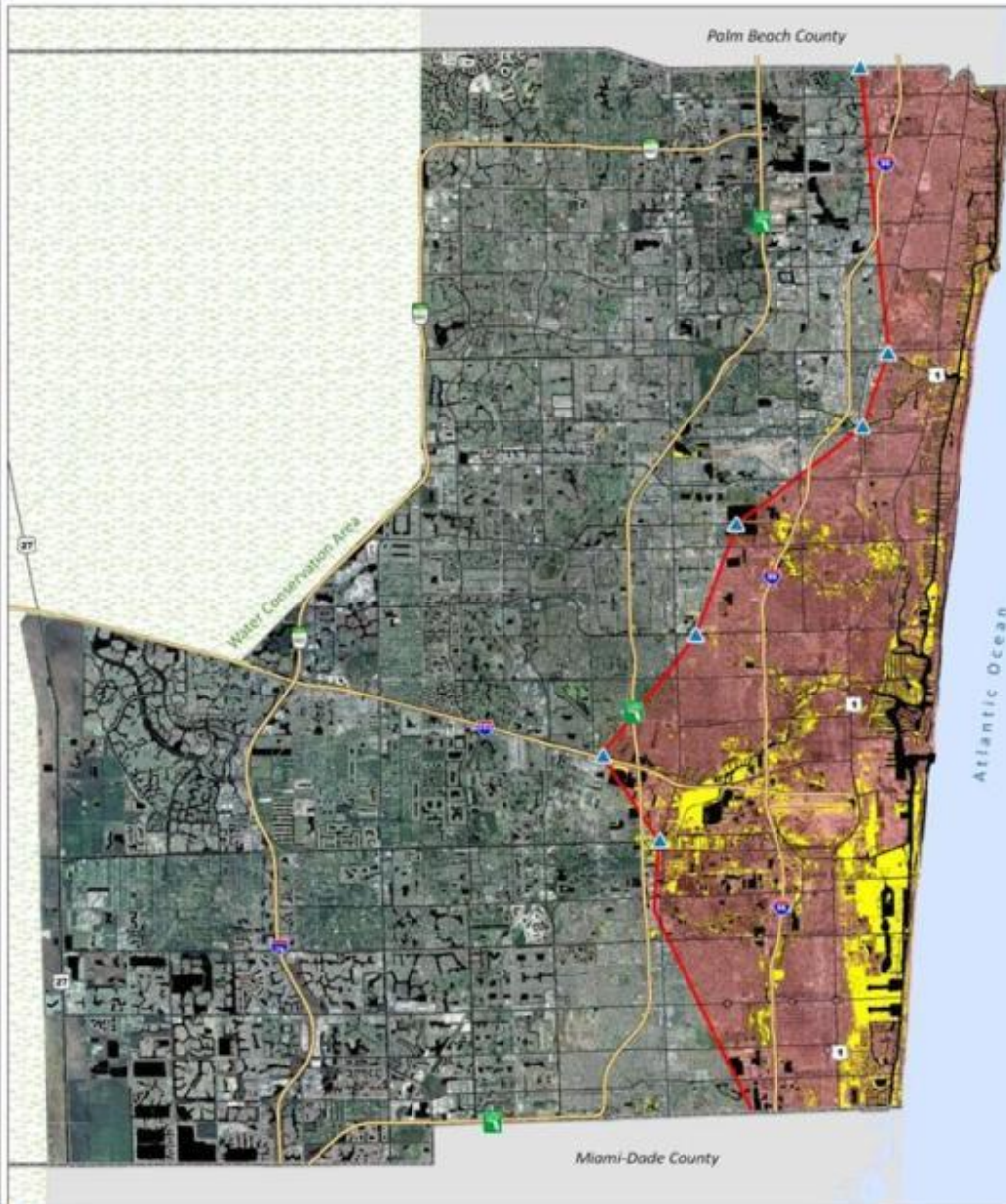
Wellfield Operations and Sea Level Rise



EXPLANATION

- Base historical
- No sea level
- No withdrawals
- No sea level rise and no withdrawals

AREAS AT RISK OF TIDAL FLOODING DUE TO SEA LEVEL RISE (3 FOOT)



Prepared By:
Broward County GIS
Planning and Redevelopment Division
Environmental Protection and Growth Management Dept

DRAFT

This map is for illustrative purposes only.

August 2009

Tidal Flooding

8 inches above average high tide,
Sept. 18, 2009



•Las Olas Isles



•Isle of Capri Drive



•Coral Way



MOLA AVE

For Sale
Bass Realty
And Investments, Inc.
(954) 525-2069

Water front
& pool

Tidal Flooding – December 2010



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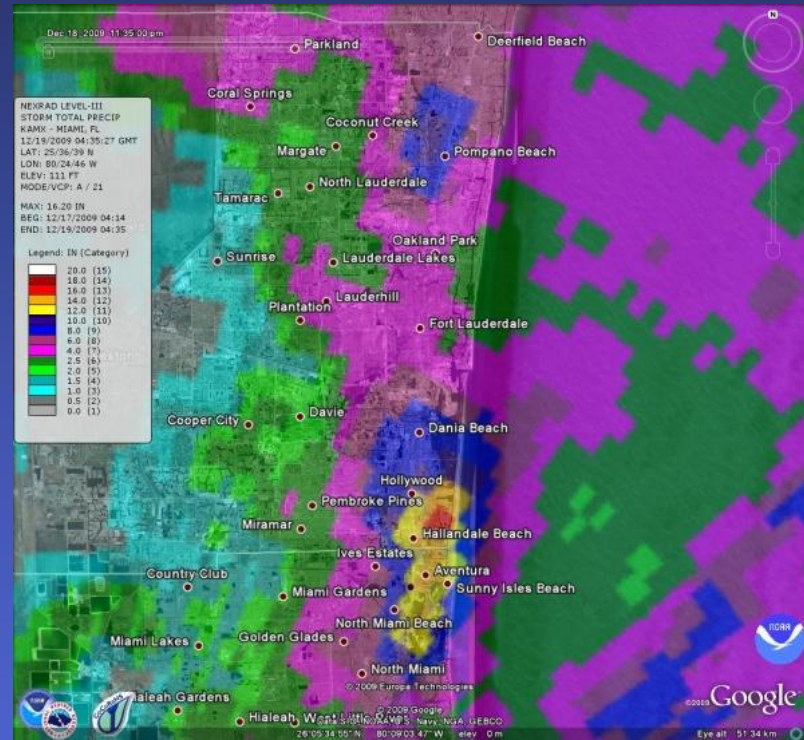
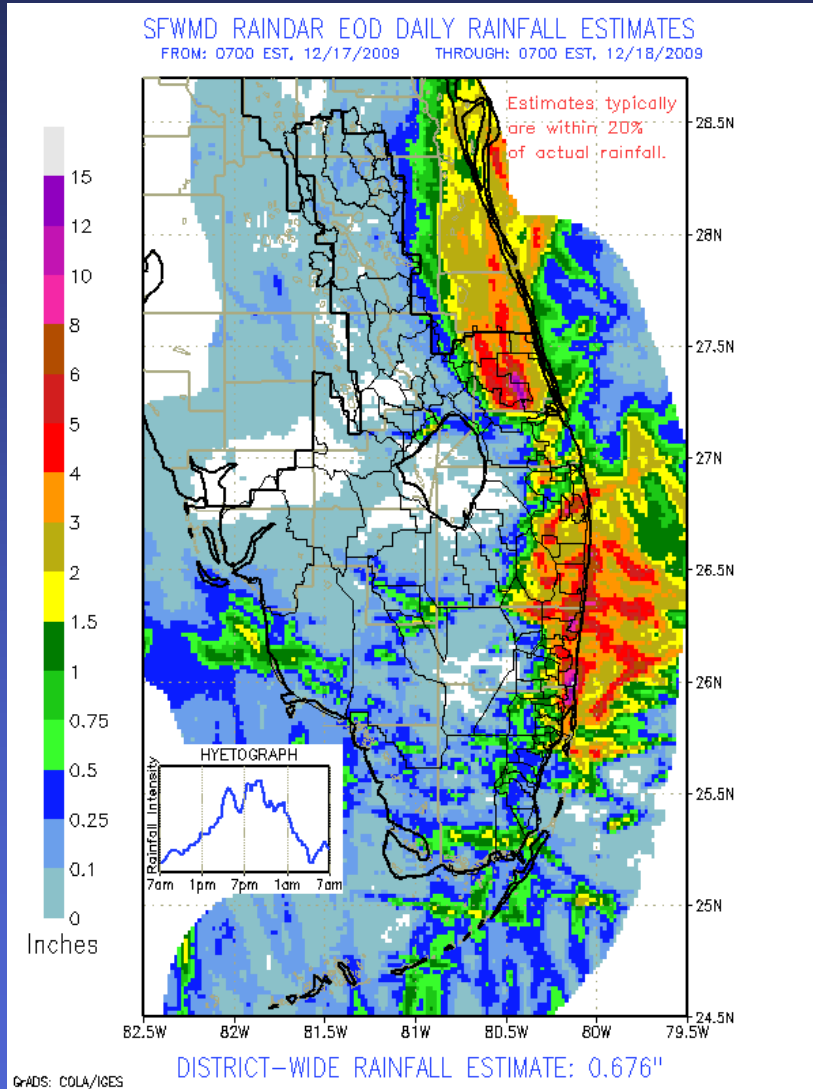
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Seasonal Flooding from Storm Events

Dec. 17-19, 2009
9.5" in Northern Broward County



Climate Change Adaptation and Mitigation Strategies

- **Variable density models will guide placement of water wells and operations**
 - **North County model is complete**
 - **Central and South County Models are under development**

Climate Change Adaptation and Mitigation Strategies

- **Project with the USGS to develop adaptation planning model to address drainage and flood control**
 - **Downscale global climate models**
 - **Integrate with regional surface water/groundwater models and variable density models**
 - **Identify areas vulnerable to climate influences**
 - **Propose and test adaptation measures to maintain existing levels of service**

Climate Change Adaptation and Mitigation Strategies

- **The value of conservation will increase as it serves to:**
 - **Lessen water shortages that may accompany drought**
 - **Maintain aquifer levels needed to abate saltwater intrusion**
 - **Reduce the demand for energy-intensive alternative water supplies**
- **Diversification of water supplies will serve to reduce impacts of water shortages**



**SOUTHEAST FLORIDA
REGIONAL CLIMATE CHANGE
COMPACT**



Southeast Florida Regional Climate Leadership Summit

Friday, October 23, 2009



Coordination of the 1st Summit

- 300 participants
- 56 elected officials
 - Federal
 - State
 - County
 - Municipal
- 34 municipalities
- Members of green teams & task forces



Regional Summit Program



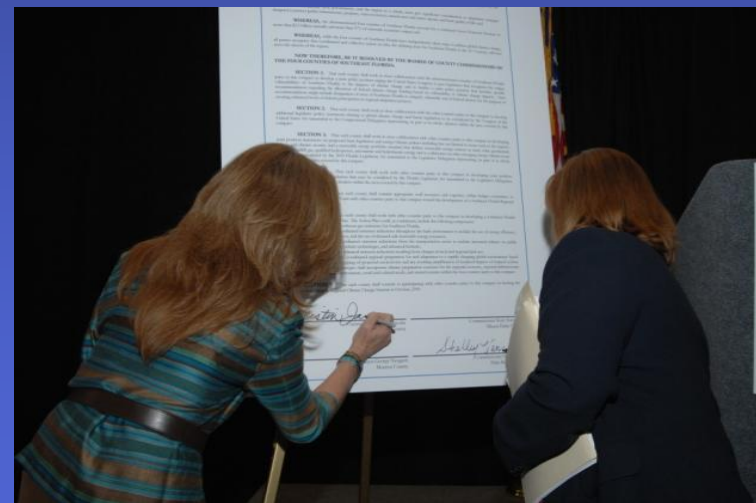
Presentations by national experts



Panel on climate initiatives



Discussion on how to move forward regionally



Climate Compact – Summit Deliverable

Regional Efforts – Climate Compact



- Adopted by the four County Commissions and finalized by unanimous votes – January 2010
- Coordinate effort to develop a regional climate action plan reflecting shared mitigation and adaptation goals
- Participants
 - SFWMD
 - Climate Leadership Institute/University of Oregon
 - City of Key West
 - FECC Chair
 - ICLEI

Compact Commitments

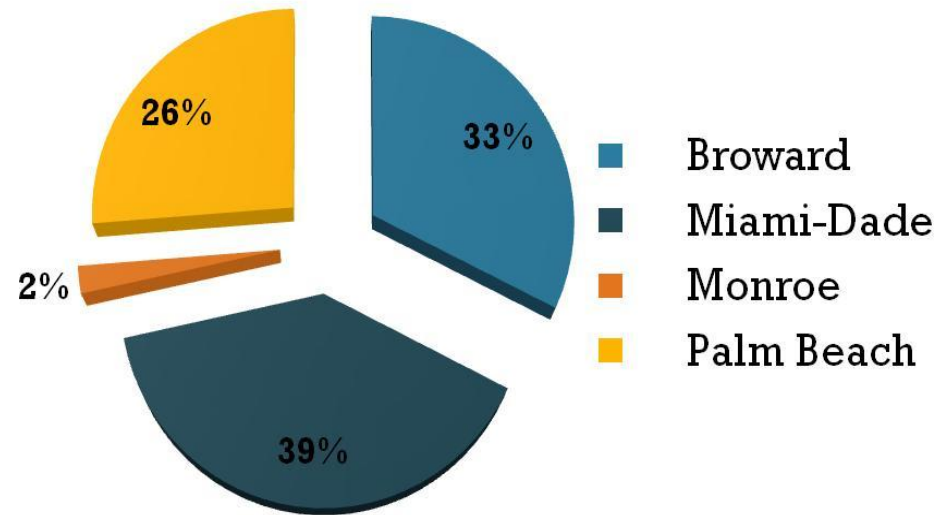
- **Creation of a Regional Climate Team and development of a Regional Climate Change Action Plan**
 - **Develop regional baseline information**
 - **GHG analysis**
 - **SLR Projections**
 - **Vulnerability Analyses**
 - **Develop regional mitigation and adaptation strategies**

Regional Climate Action Plan

GHG Work Group

- Cooperative Data Collection
- Summary for years 2005-2008
- Regional comparative analysis of emissions
- Create a baseline for planning efforts

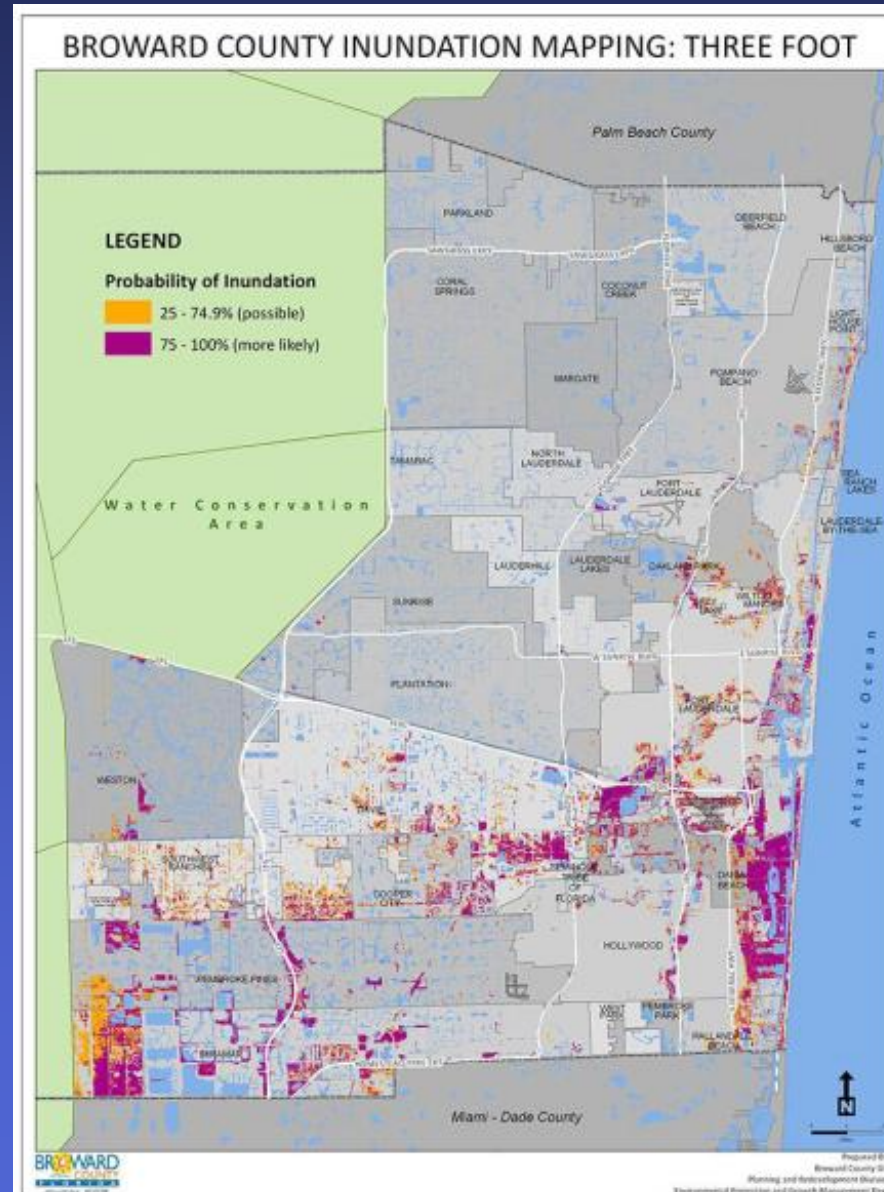
Regional Emissions – Residential Electricity Emissions (2008)



Regional Climate Action Plan

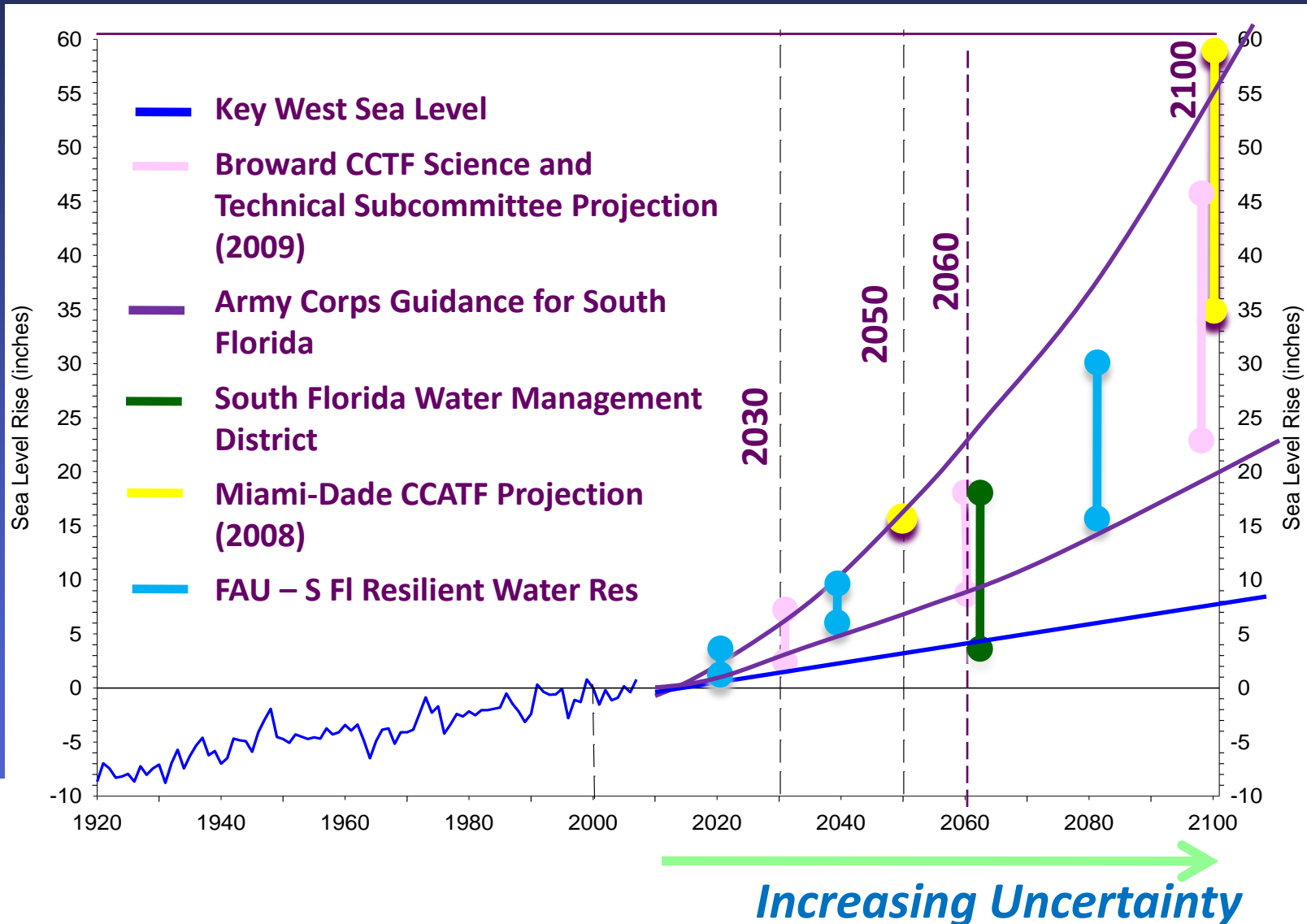
Vulnerability Work Group

- Advances in the regional vulnerability analysis
 - Completion of the digital elevation modeling
 - Agreement on assessment intervals (1, 2, and 3 feet)
 - Prioritization of infrastructure for analysis
 - Tested application of protocol by Broward
 - Regional presentations
 - Agreed upon refinements



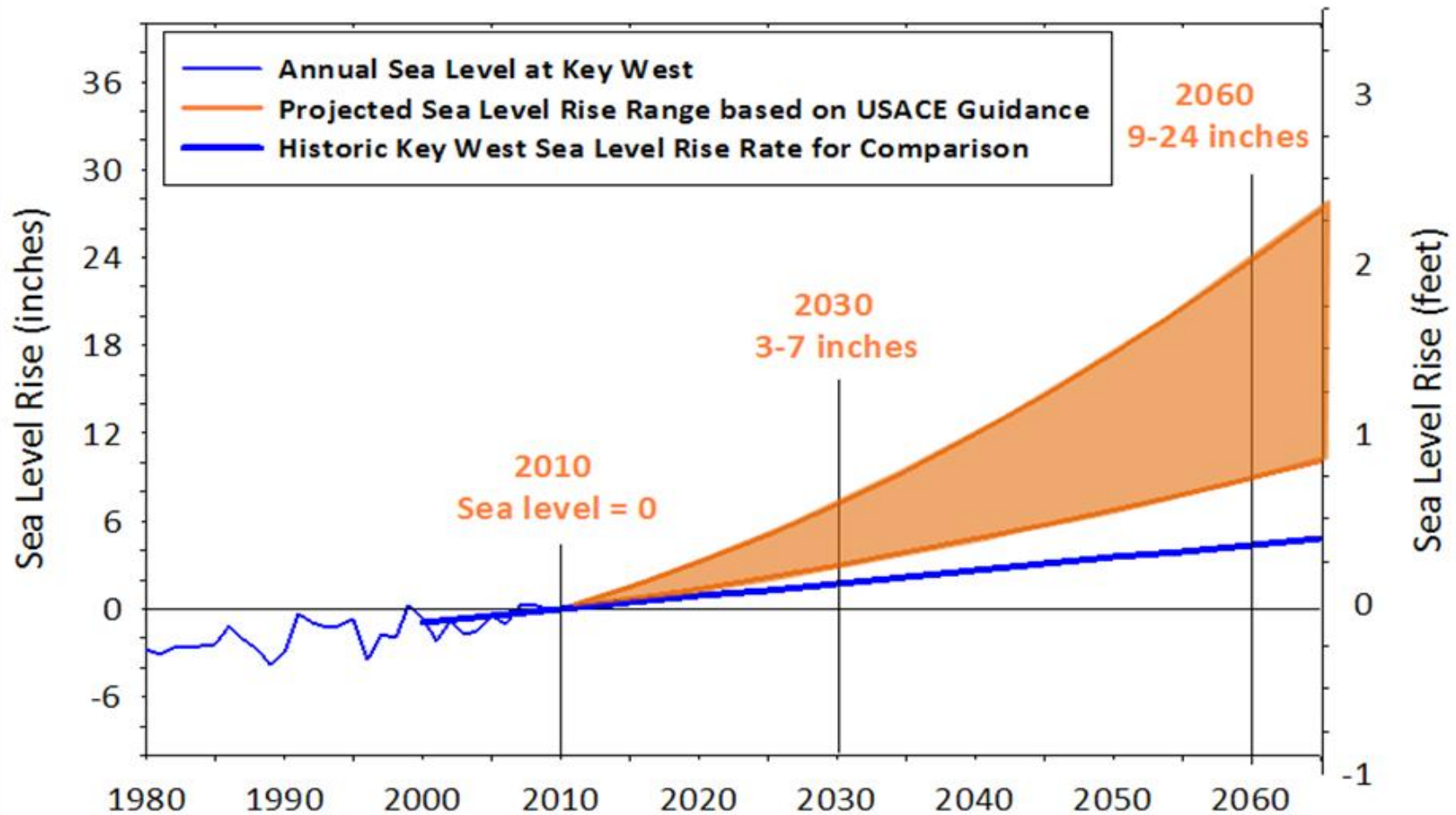
Regional Climate Action Plan

Common Region/Different Approaches e.g. Sea Level Rise Projections



Regional Climate Action Plan

Sea Level Rise Work Group



Regional Compact Work Groups

- Convene Built Environment, Transportation, and Land and Natural Systems Workgroups
- Focus on areas where efficiency and effectiveness to be gained through regional strategy and coordination
- Built Environment Work Group
 - Water resources infrastructure
 - Energy use and production
 - Building codes
 - Economic development
 - Priority planning areas



Activities and Timelines

- **Consider and apply regional work products in analyses**
 - **September 2011 - Identify and develop priority recommendations**
 - **October 2011 - Present recommendations at 3rd Annual Summit**
 - **February 2012 – Finalize regional action plan**

Questions?