

ADAPTING TO CLIMATE CHANGE NOW **FUTURE WATER AVAILABILITY**



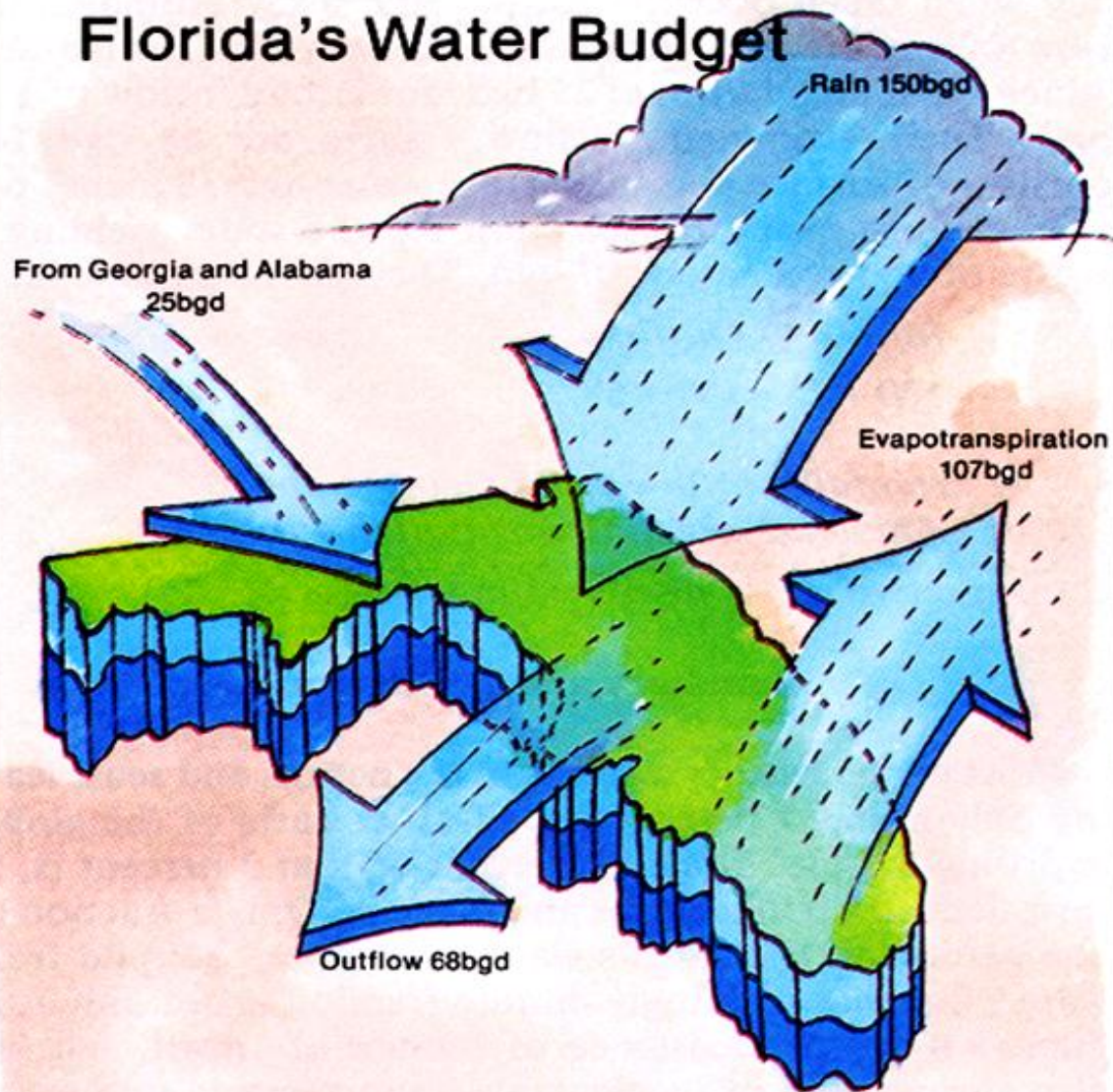
Florida Chapter of the American Planning Association
Fall Conference September 7-10, 2011



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Florida's Water Budget



WATER BALANCE

Water in = Water Out +/- Storage

**Precipitation + Groundwater_{in} + Surface Water_{in}
= Evapotranspiration – Groundwater_{out} –
Surface Water_{out} +/- Storage**

WATER BALANCE

- On average, Florida receives around 50"/ yr of rain, with around 37"/ yr of ET
- This leaves approximately 13"/yr to recharge surface water and groundwater
- Any increase in ET will reduce the water available for recharge of groundwater

“Evaluating Sustainability of Future Water Demands Under Future Climate Change Scenarios”

- Commissioned by the Natural Resources Defense Council
- Conducted by Tetra Tech, Inc. in July 2010
- Further refinement and evaluation of work conducted by IPCC, USGS and others
- Provides projections of future available freshwater due to changing climate pattern

“Evaluating Sustainability of Future Water Demands Under Future Climate Change Scenarios”

- Report is not a prediction that water shortages will occur, but rather an indication of where they will occur
- This gives water managers opportunity manage supply and demand
- Florida’s water management districts prepare water supply plans on 20 year horizon with 5 year updates

GLOBAL CLIMATE CHANGE MODELS

- GCMs are relied upon to provide plausible, physically based estimates of climate response to changes in boundary conditions and increasing atmospheric greenhouse gas concentrations
- Many GCMs are in use and are included in the IPCC Fourth Assessment Report (IPCC AR4, 2007)

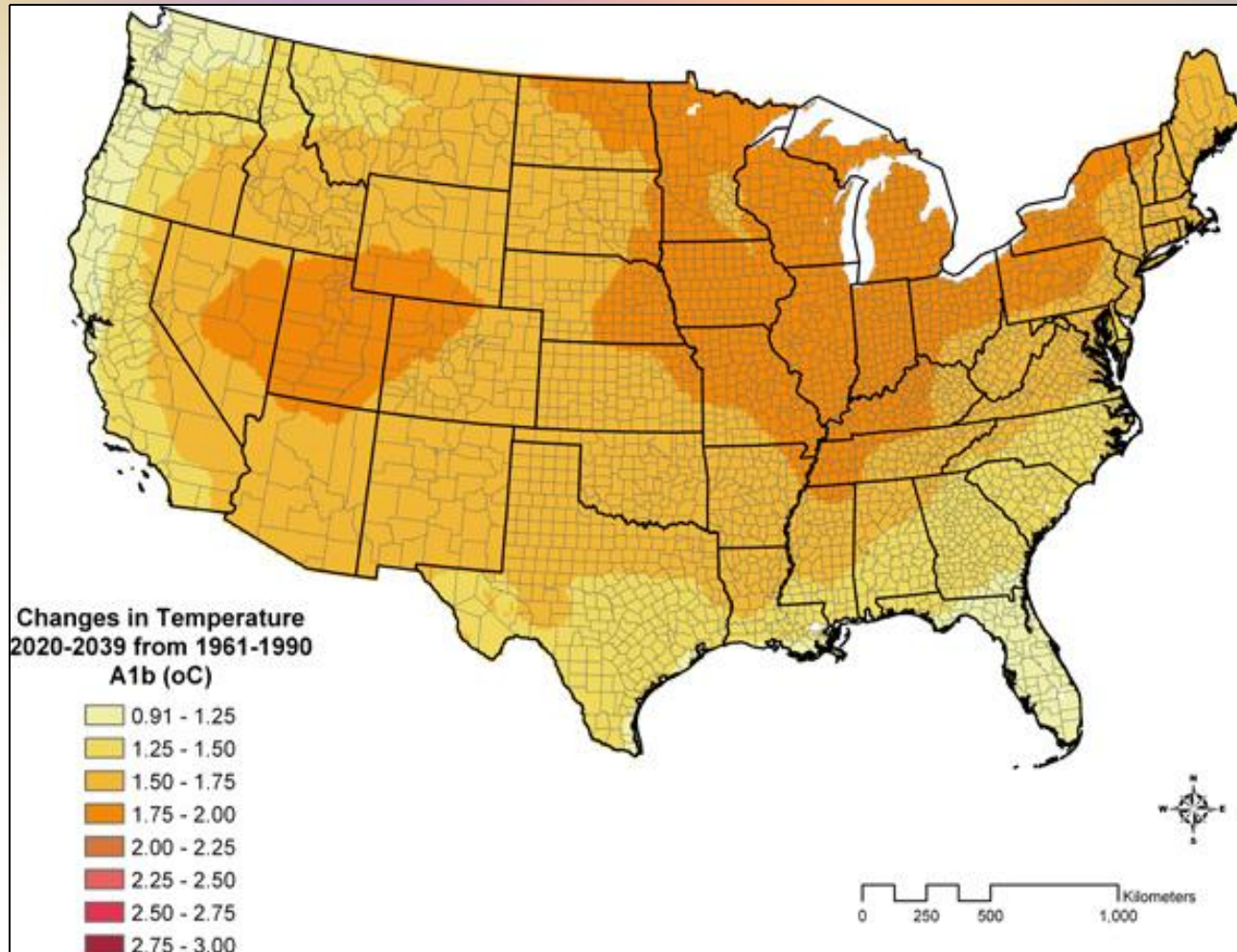
GLOBAL CLIMATE CHANGE MODELS

- The complexity of GCMs produce varied responses especially when precipitation is varied
- For impact studies, it is appropriate to use an ensemble of multiple models to represent a range of future conditions
- As with any mathematical model, there is no unique solution

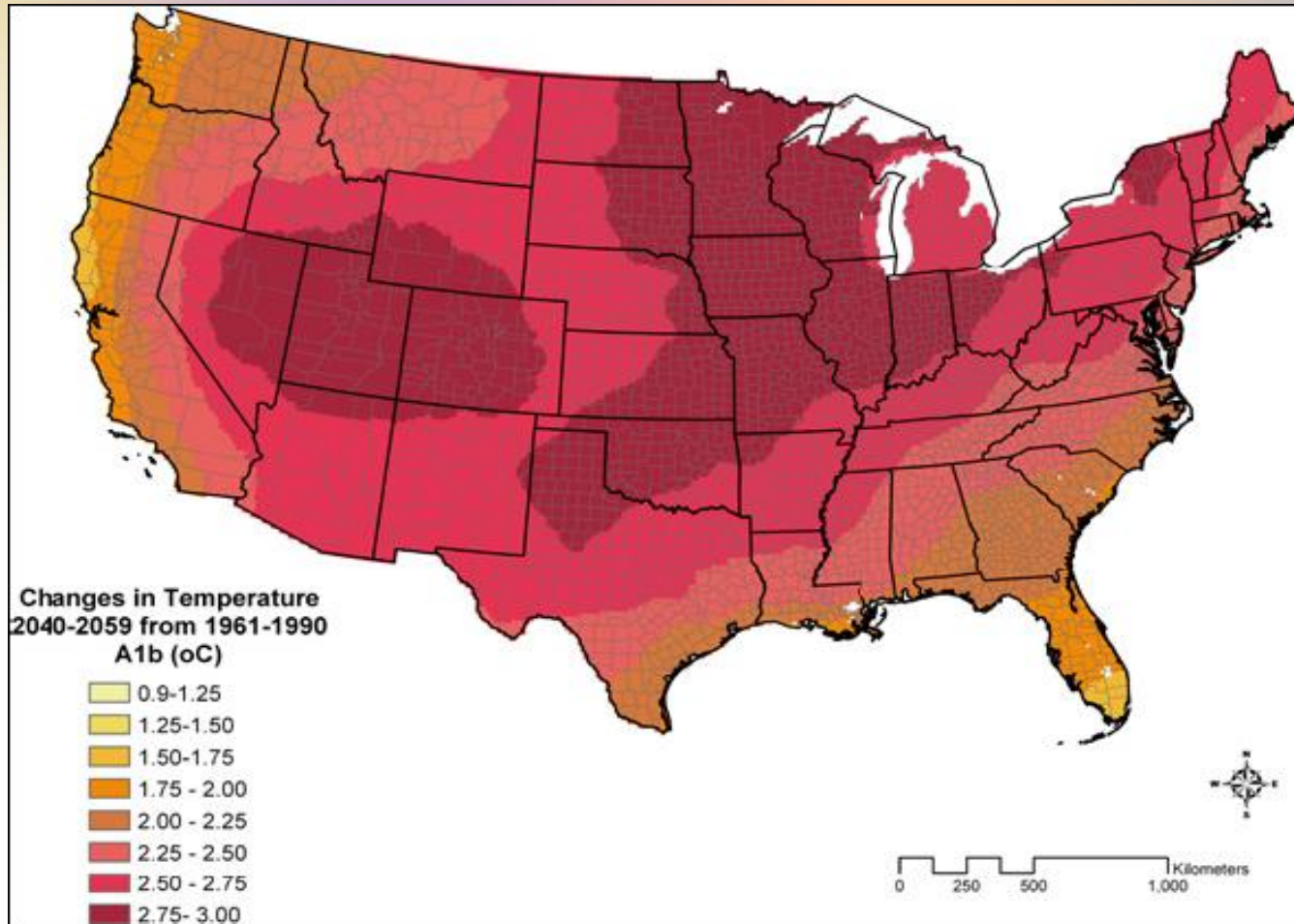
GLOBAL CLIMATE CHANGE MODELS

- For these simulations, a set of 16 GCMs were used for 21st century predictions
- Output from the World Climate Research Programme's (WCRPs) Coupled Model Intercomparison Project phase 3 was used
- GCM results were spatially downsized to regions resulting in 12km x 12km grid
- 54,000 cells over 48 conterminous United States

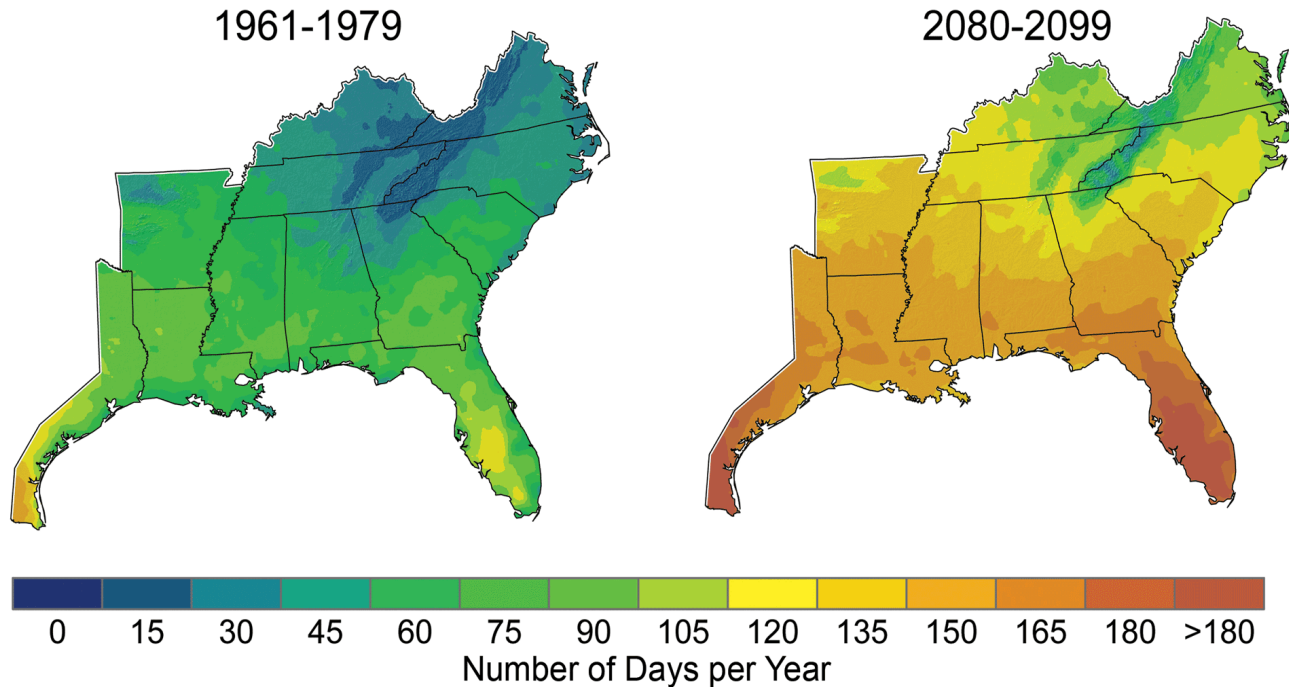
MEAN CHANGES IN TEMPERATURE 2020-2039



Mean Changes in Temperature 2040- 2059



Days with Peak Temperature >90°F



CMIP3-B¹¹⁷

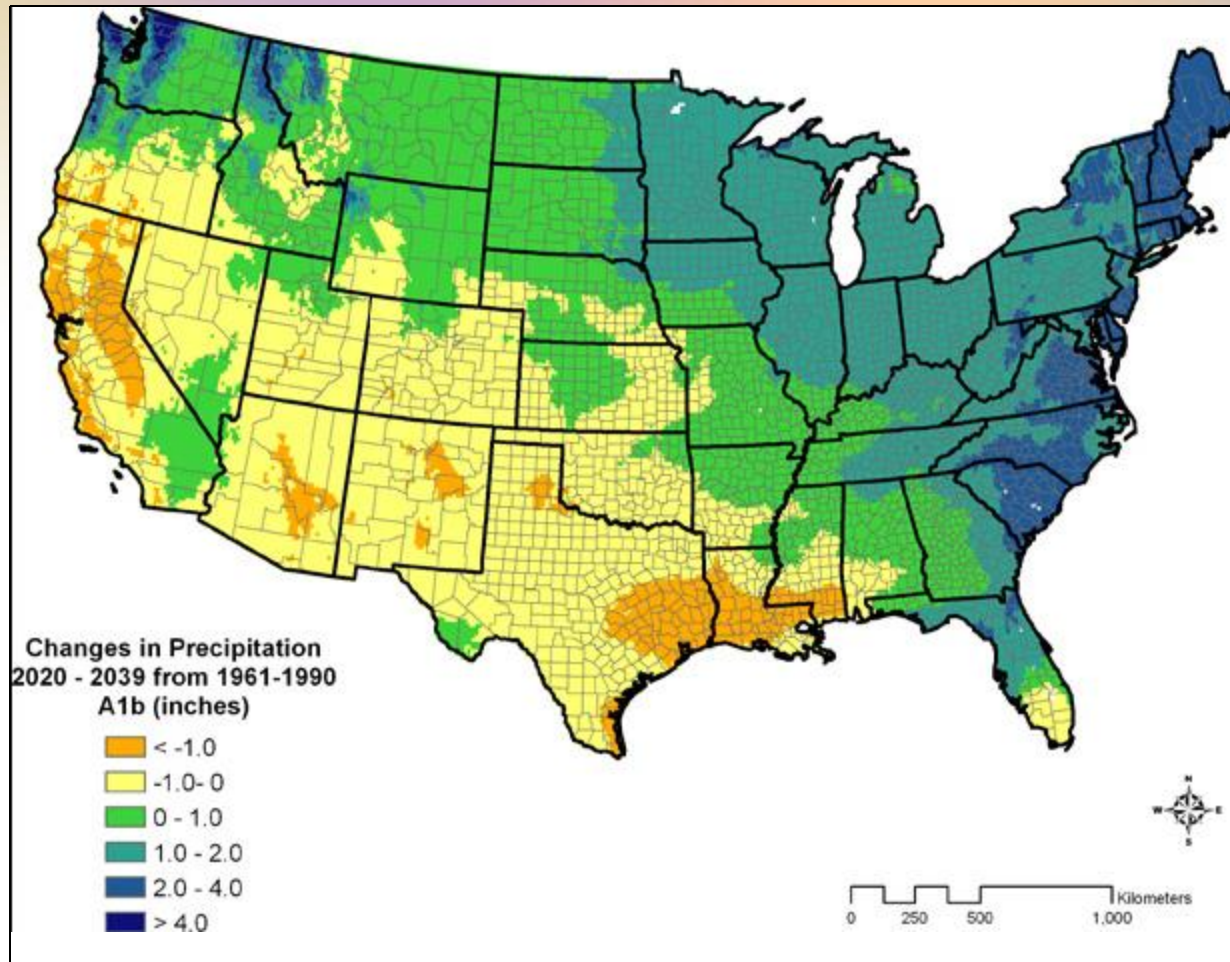
The number of days per year with peak temperature over 90°F is expected to rise significantly, especially under a higher emissions scenario⁹¹ as shown in the map above. By the end of the century, projections indicate that North Florida will have more than 165 days (nearly six months) per year over 90°F, up from roughly 60 days in the 1960s and 1970s. The increase in very hot days will have consequences for human health, drought, and wildfires.

(www.globalchange.gov/usimpacts)

IMPACT OF TEMPERATURE CHANGES

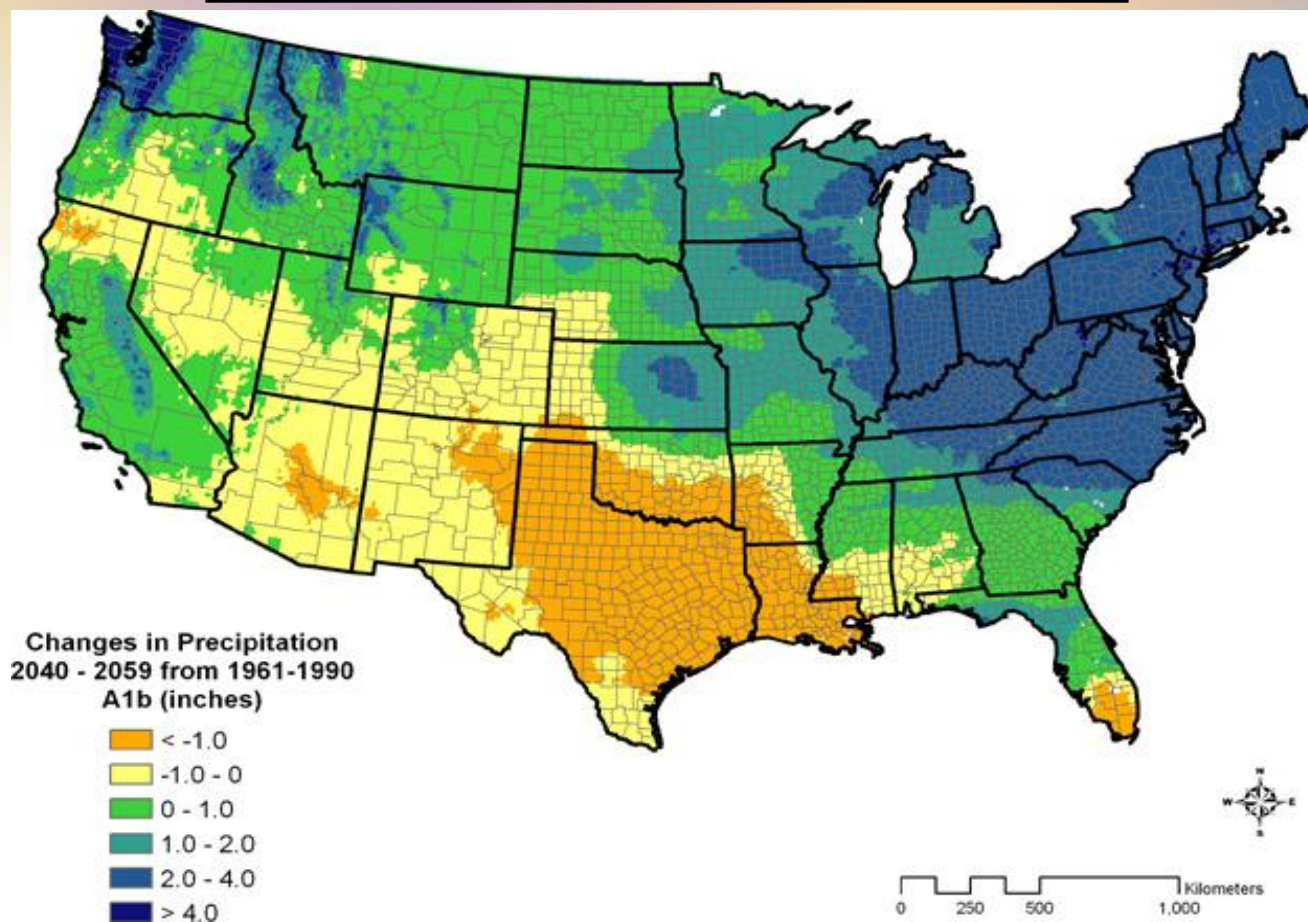
- Increases in temperature are likely to cause decrease in precipitation due to increased evaporation
- Increased temperature results also in increased evapotranspiration (ET)
- Less precipitation and more ET results in less available water for recharge and available water

CHANGES IN PRECIPITATION WITH CLIMATE CHANGE 2020-2039

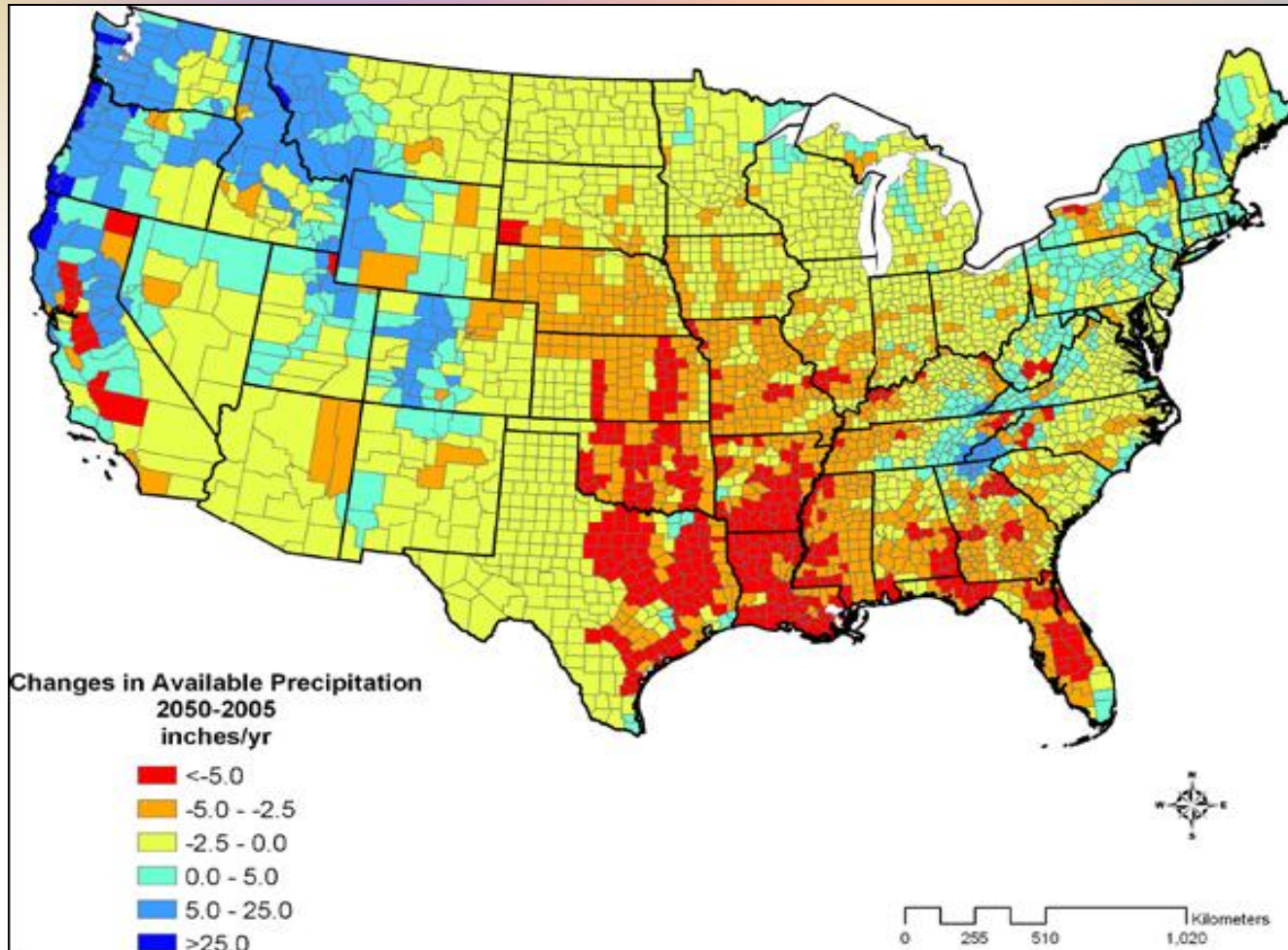


CHANGES IN PRECIPITATION 2040-2059

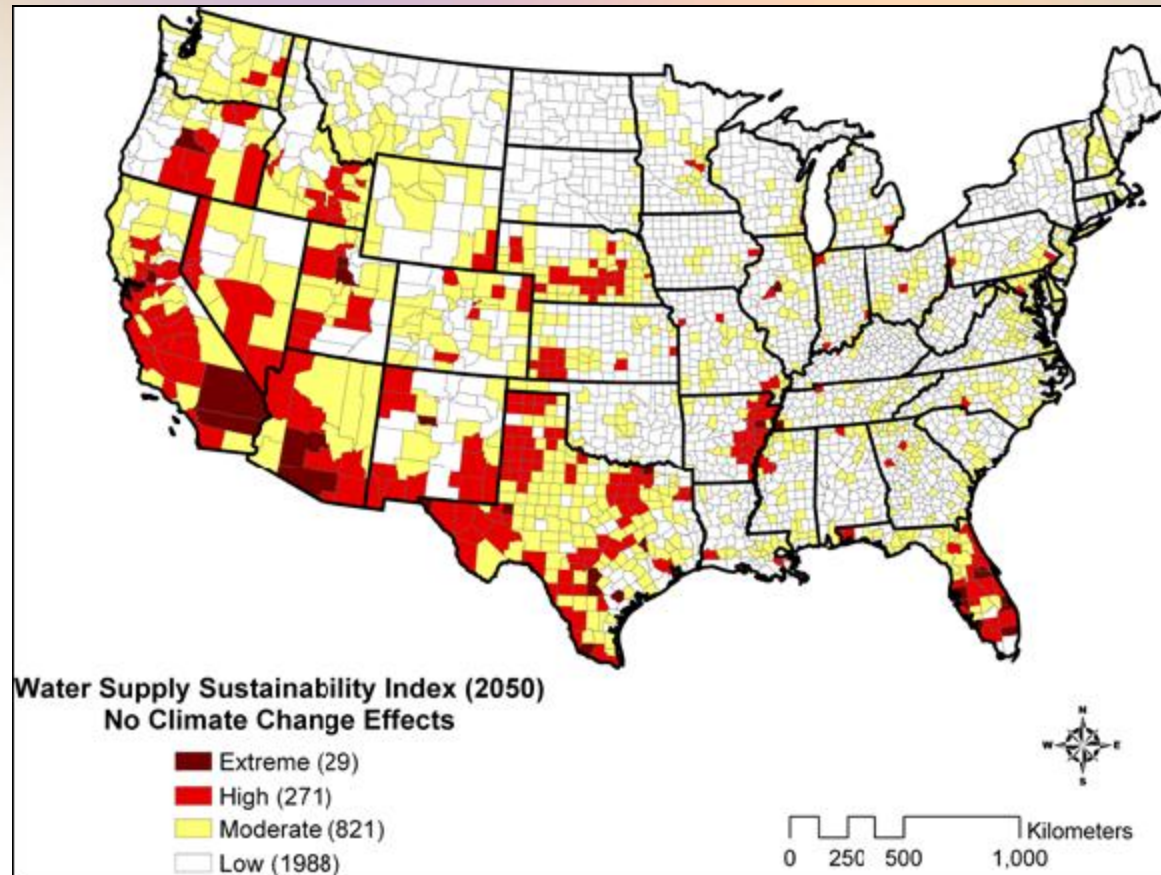
MEDIAN OF 16 GCMs



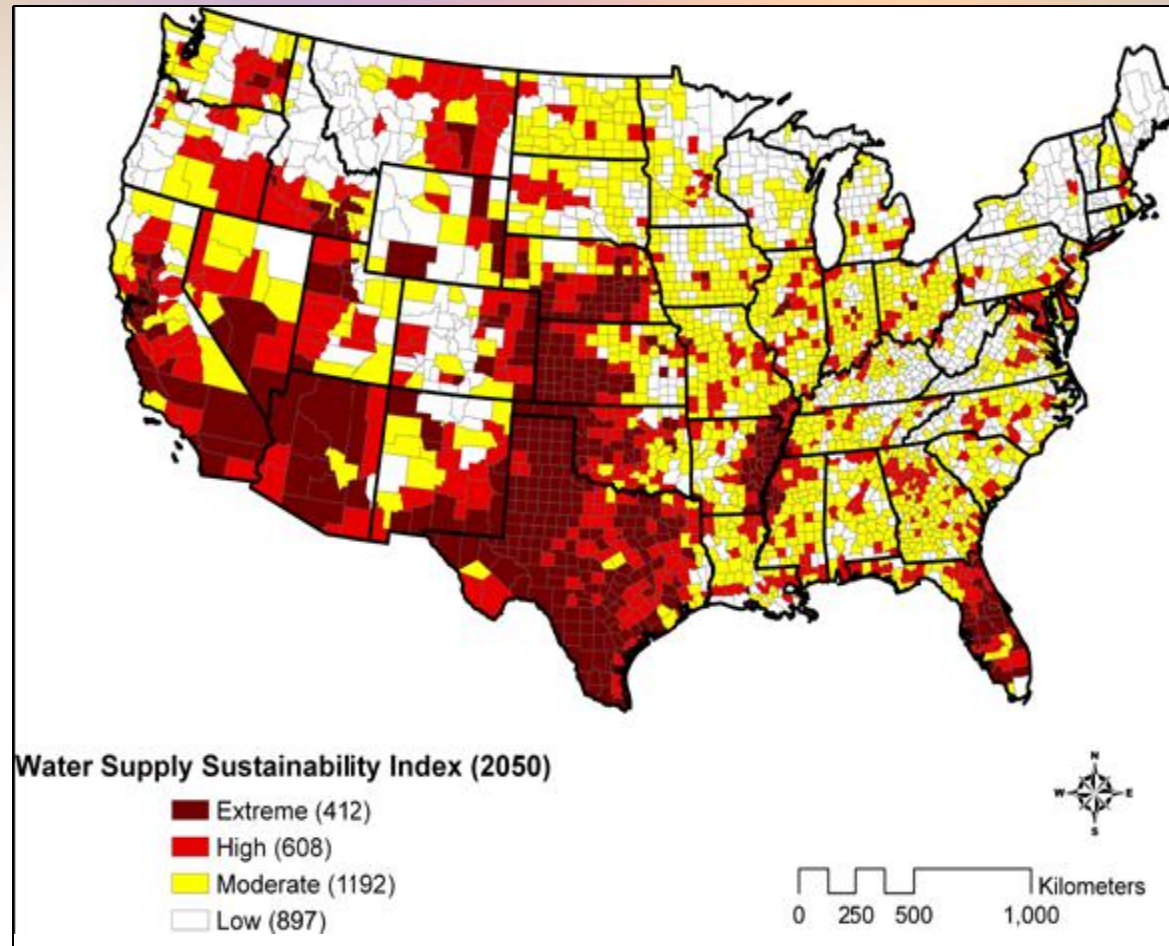
AVAILABLE PRECIPITATION 2040-2059 COMPARED TO 1934-2000



RISK TO AVAILABLE WATER SUPPLY WITHOUT CLIMATE CHANGE



RISK TO WATER AVAILABILITY WITH CLIMATE CHANGE



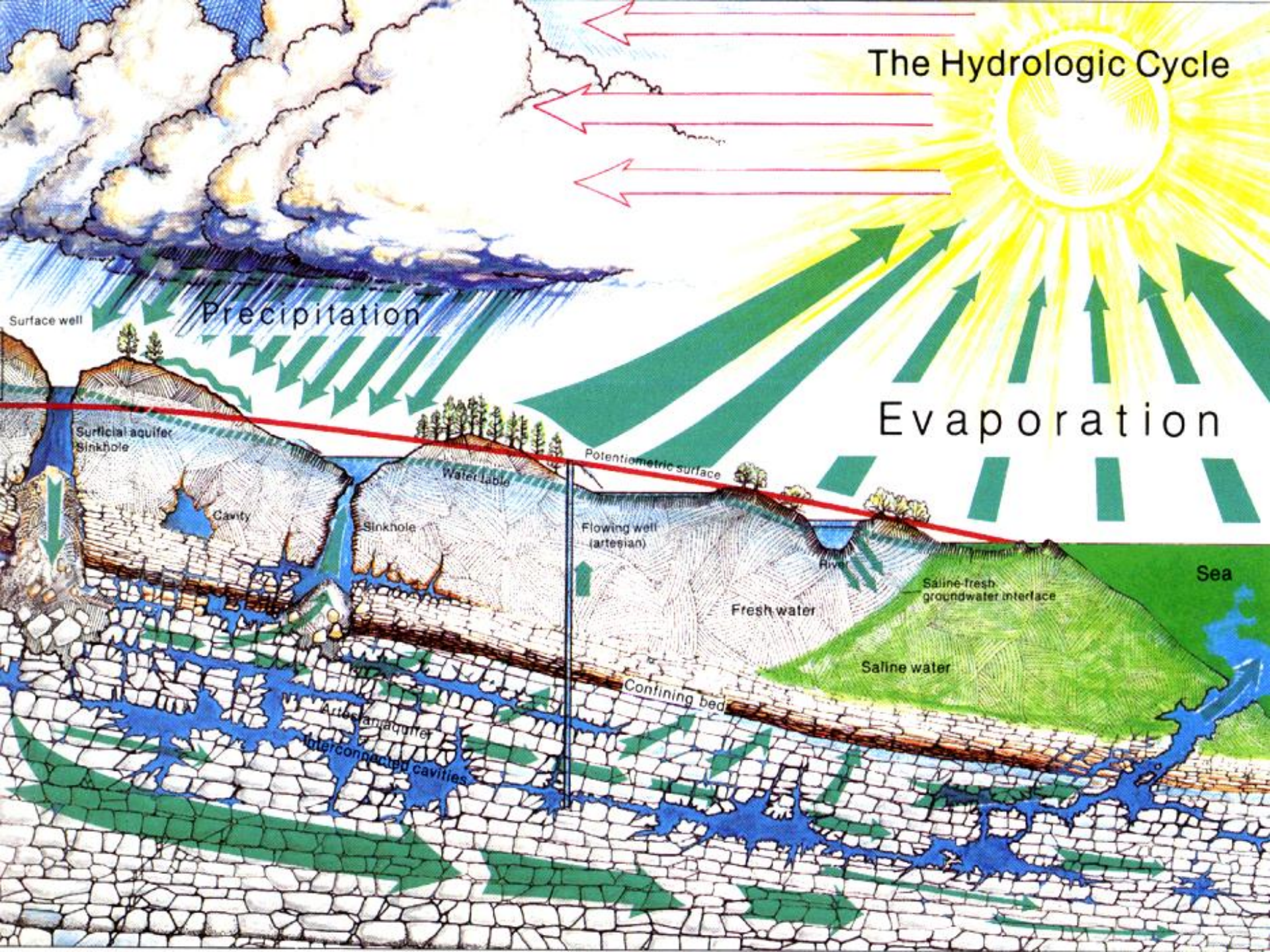
CHANGES IN AVAILABLE AVAILABLE PRECIPITATION

- Change due to change in ET
- Central Florida estimated to have $>-5.0''/\text{yr}$
- South Florida estimated to have $+0.0-5.0''/\text{yr}$
- Five inches less precipitation in Orange County is approximately 238,000,000 gallons per day
- $1''/\text{square mile}=17,378,560$ gallons per square mile)

Sea Level Rise

- Rise in sea level will cause increase in saltwater intrusion
- Saltwater could move inland via rivers, canals, etc (at least up to control structures)
- Increased saltwater head pressure, due to density difference, will restrict/ hold back freshwater out flows of groundwater and surface water, elevation may not decrease as much

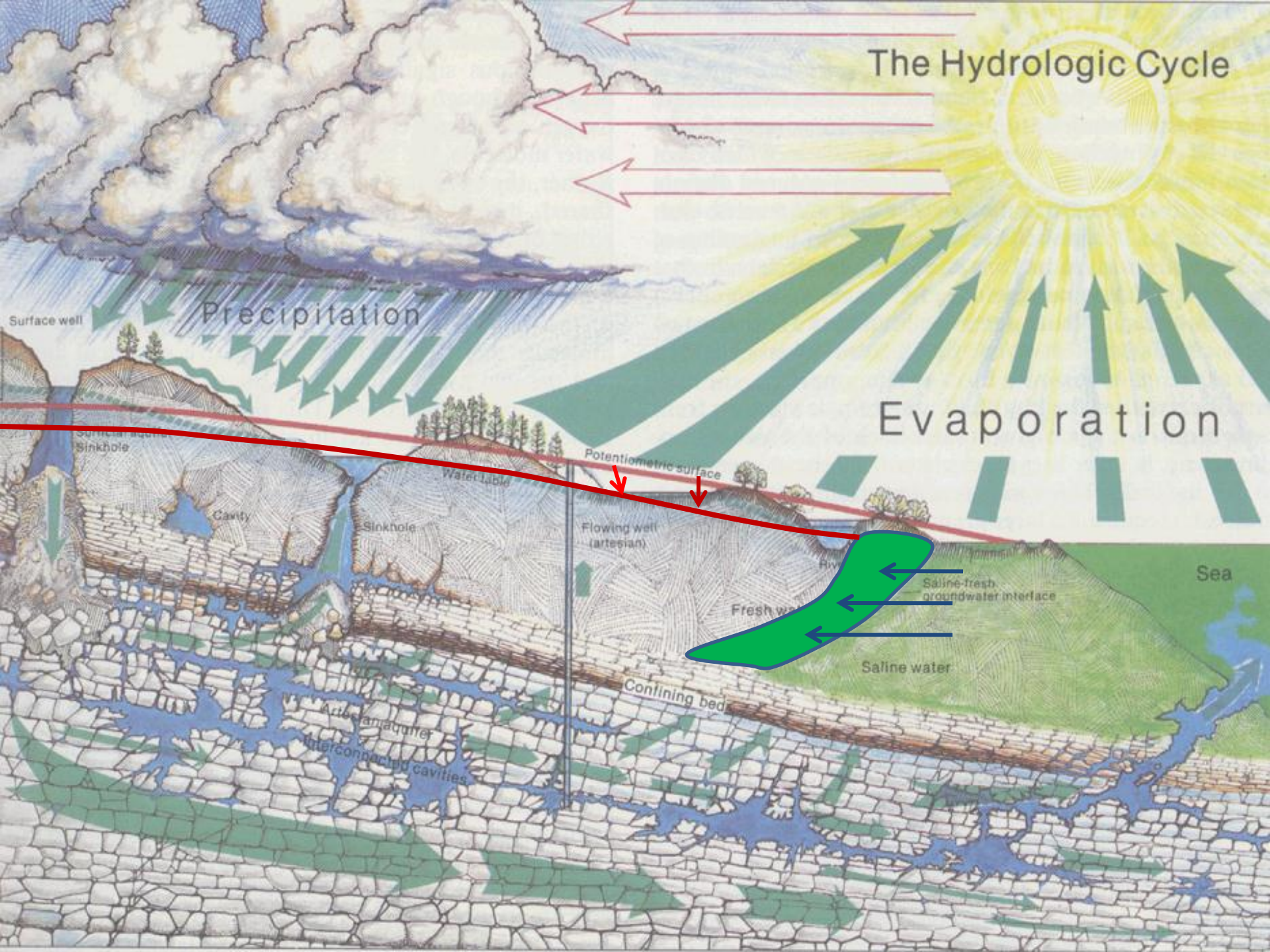
The Hydrologic Cycle



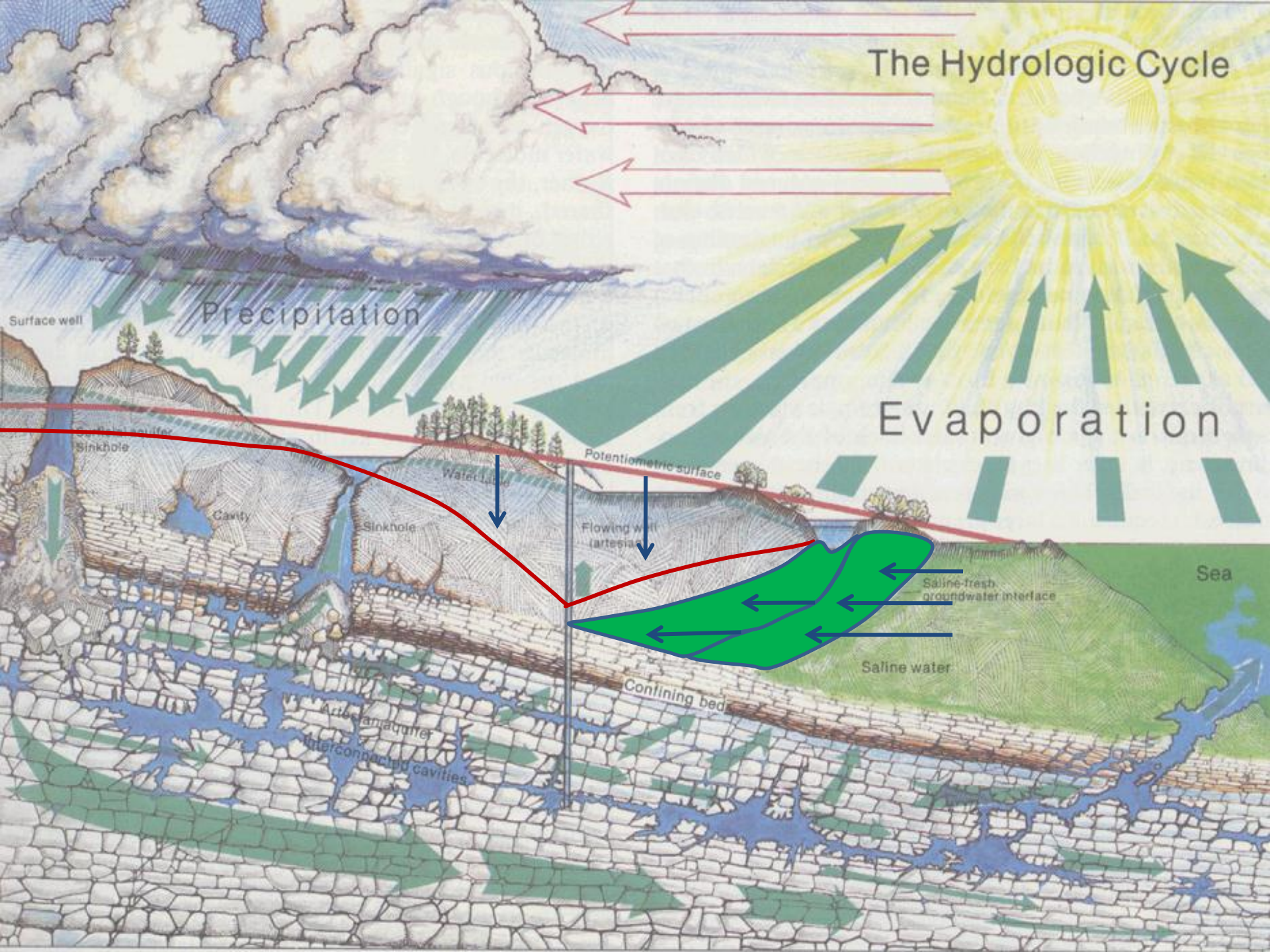
Potential Impacts of Sea Level Rise

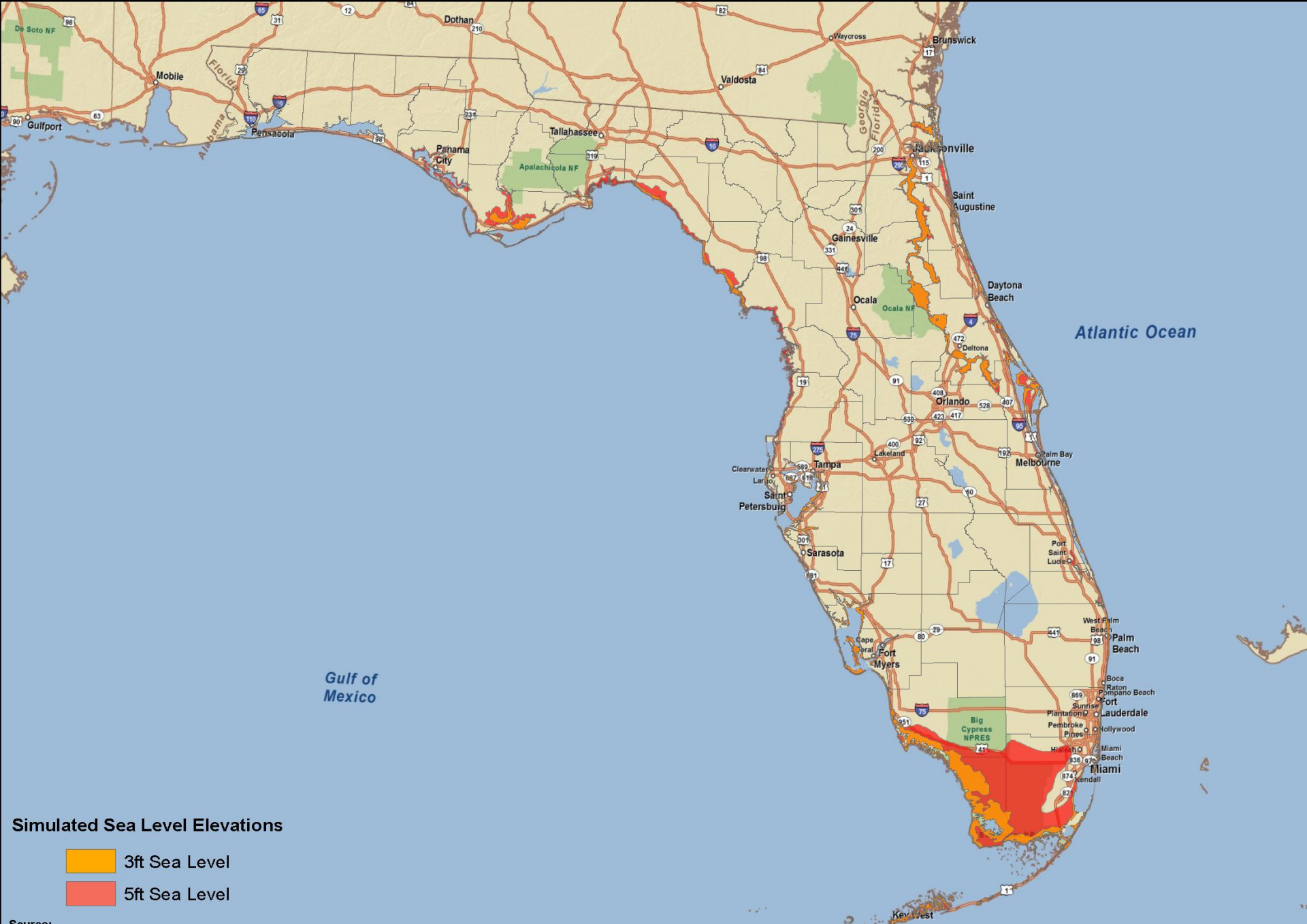
- As sea level rises, salt water will move inland through rivers and canals
- St. Johns River is predicted to increase in elevation, salt water will move inland
- Peace River discharges into Charlotte Harbor. Rising sea levels will push salt water into the estuary, changing the habitat
- This may also affect the surface water intake at the Peace River Manasota Regional Water Supply Authority

The Hydrologic Cycle

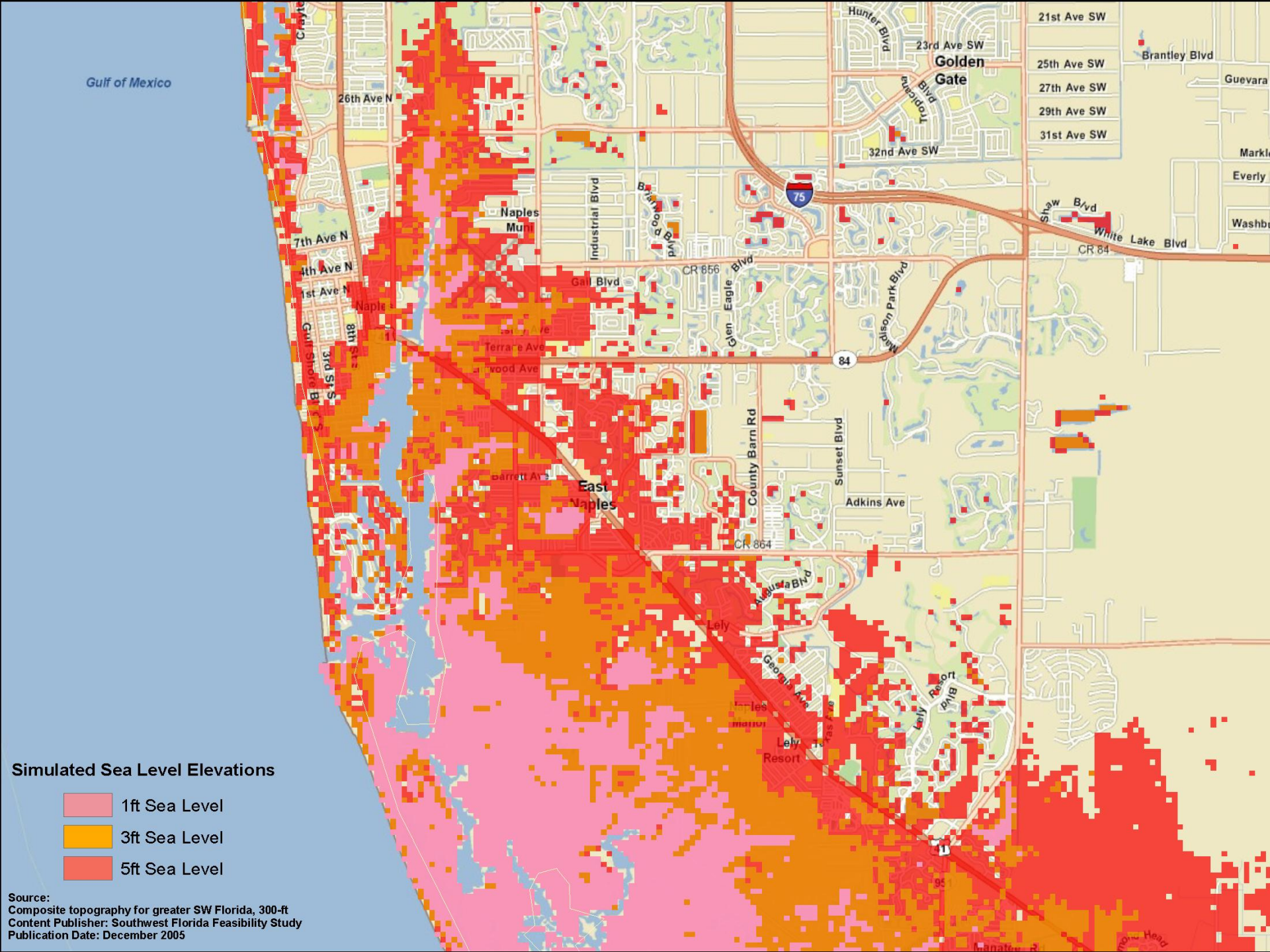


The Hydrologic Cycle





Source:
USGS National Elevation Dataset; Florida
1 Meter Digital Elevation Model



Gulf of Mexico

Golden Gate

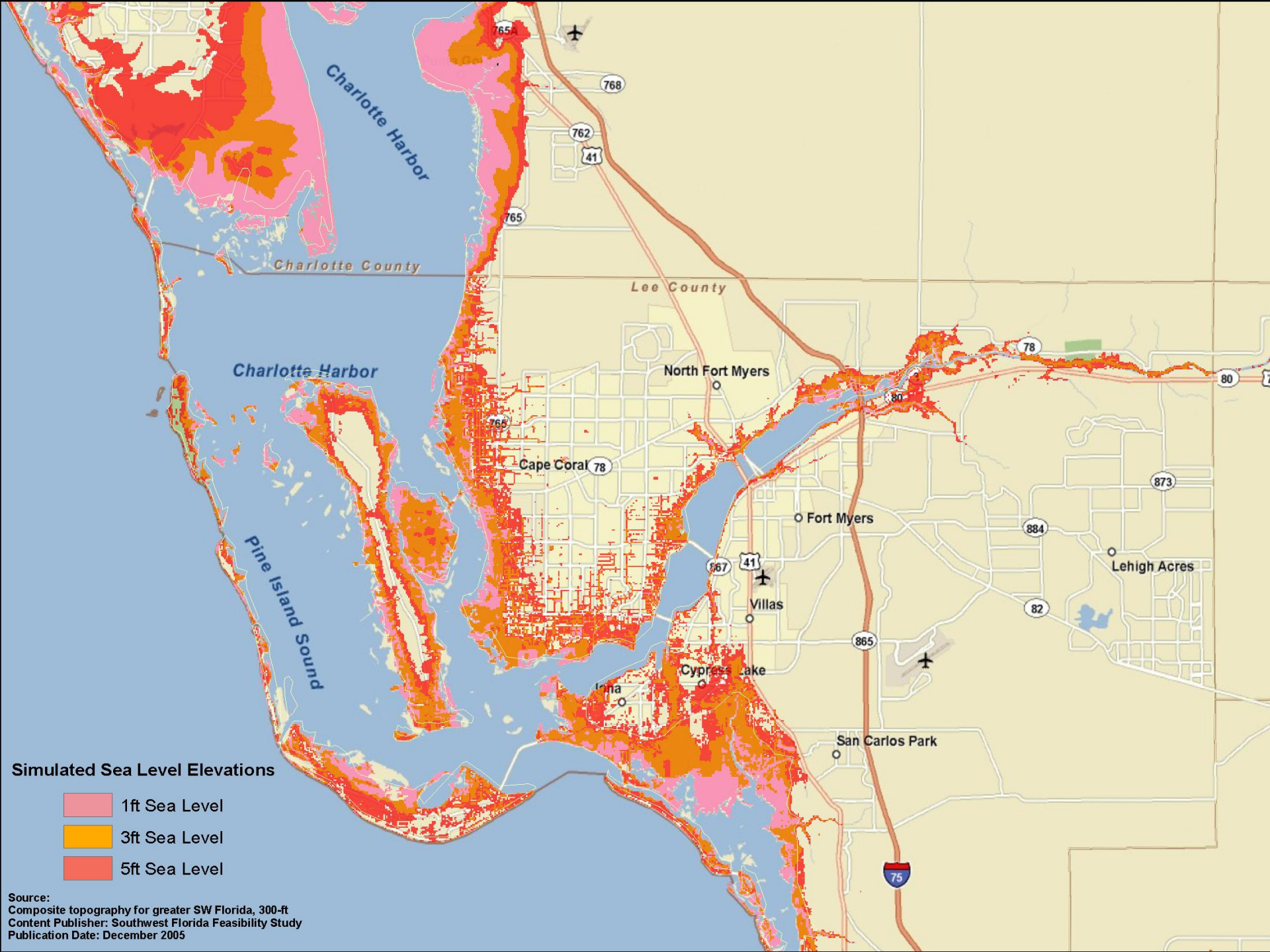
East Naples

Lely Resort

Simulated Sea Level Elevations

- 1ft Sea Level
- 3ft Sea Level
- 5ft Sea Level

Source:
Composite topography for greater SW Florida, 300-ft
Content Publisher: Southwest Florida Feasibility Study
Publication Date: December 2005



Simulated Sea Level Elevations

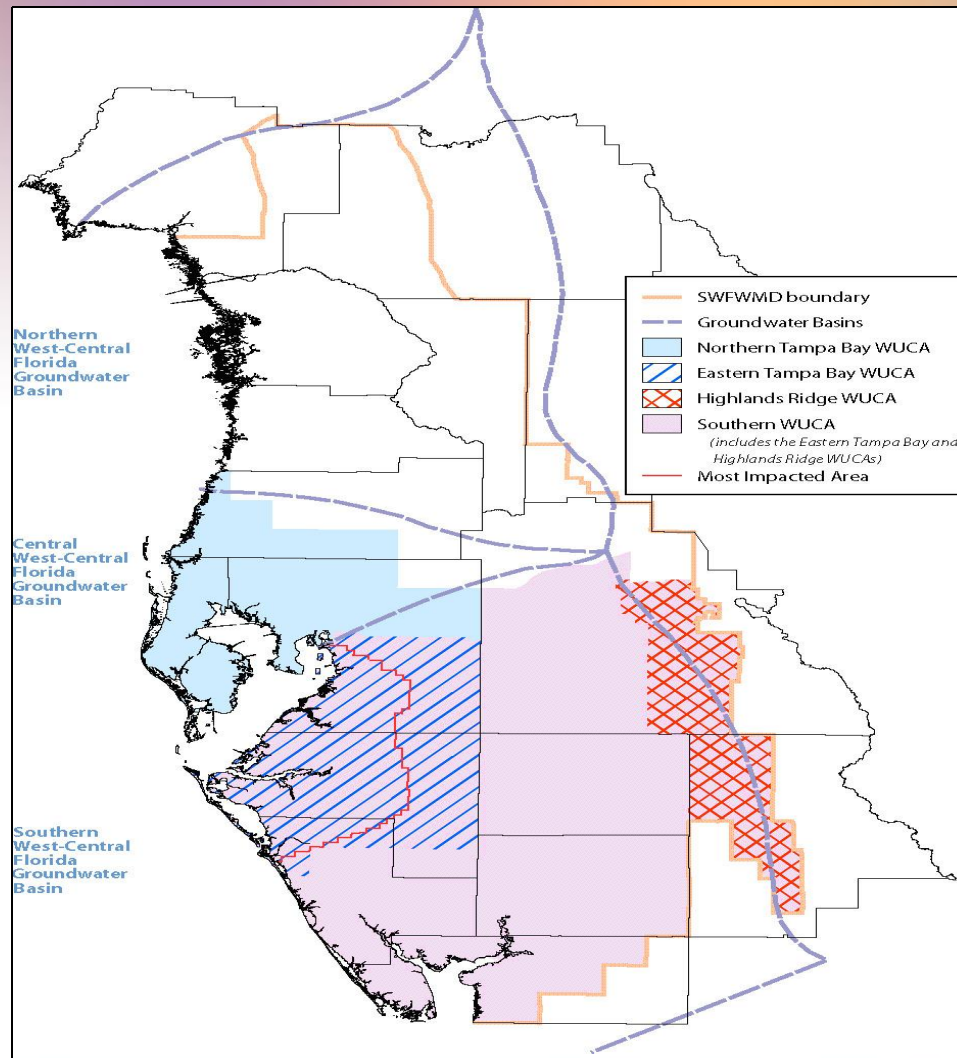
- 1ft Sea Level
- 3ft Sea Level
- 5ft Sea Level

Source:
Composite topography for greater SW Florida, 300-ft
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NORTHWEST FLORIDA



SWFWMD SWUCA



SWFWMD SWUCA GOALS

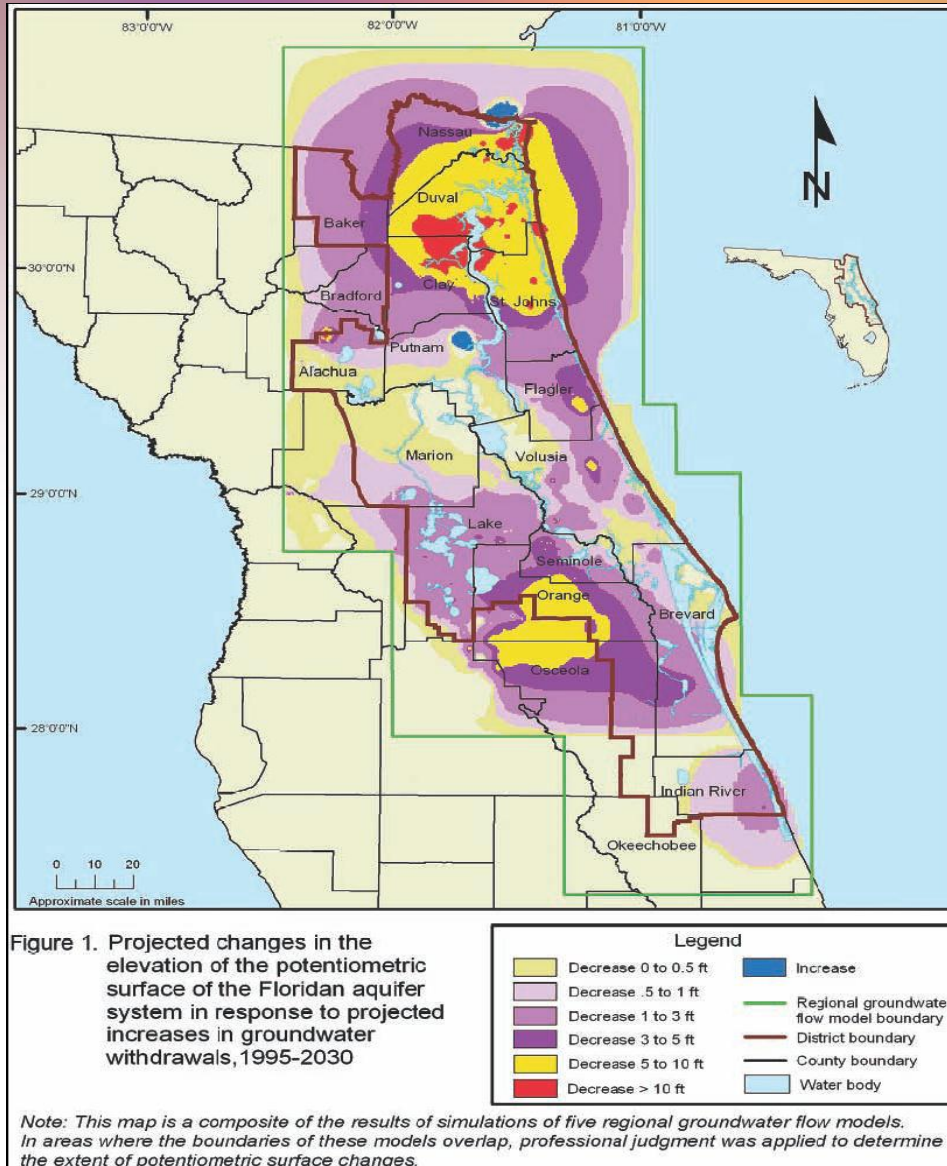
- Restore minimum levels to priority lakes in the Lake Wales Ridge
- Restore minimum flows to the upper Peace River
- Reduce the rate of saltwater intrusion in coastal Hillsborough, Manatee and Sarasota counties
- Ensure sufficient water supplies for all existing and projected reasonable-beneficial uses
- Protect investments of existing water use permittees

CENTRAL FLORIDA WATER INITIATIVE

SJRWMD, SFWMD, SWFWMD

- Fresh groundwater withdrawals are limited to 650 million gallons per day
- No new fresh groundwater withdrawals are allowed beyond 2013; withdrawal is limited to permitted 2013 allocation
- Utilities must have alternative or supplemental water supplies on-line by 2013
- Due to reduction in groundwater withdrawals, the WMDs are discussing modification of existing WUPs to extend the date or quantity of water

PROJECTED CHANGES IN UPPER FLORIDAN AQUIFER



CONCLUSIONS TO PROJECTED WATER AVAILABILITY

- Results of median GCMs show increase in temperature and ET with corresponding decrease in available recharge
- Increase in sea level rise will cause inland movement of saltwater interface into surface water and groundwater
- This may cause increase in freshwater elevation but may be offset by increase ET

CONCLUSIONS TO PROJECTED WATER AVAILABILITY

- SWFWMD and SJRWMD have implemented recovery strategies and limits on fresh groundwater withdrawal
- NFWMD and SRWMD are continuing investigation of declining groundwater supplies
- Reductions in fresh groundwater and surface water will drive the use of brackish groundwater and/ or ocean water desalination
- IMPACT ON WATER POLICY?

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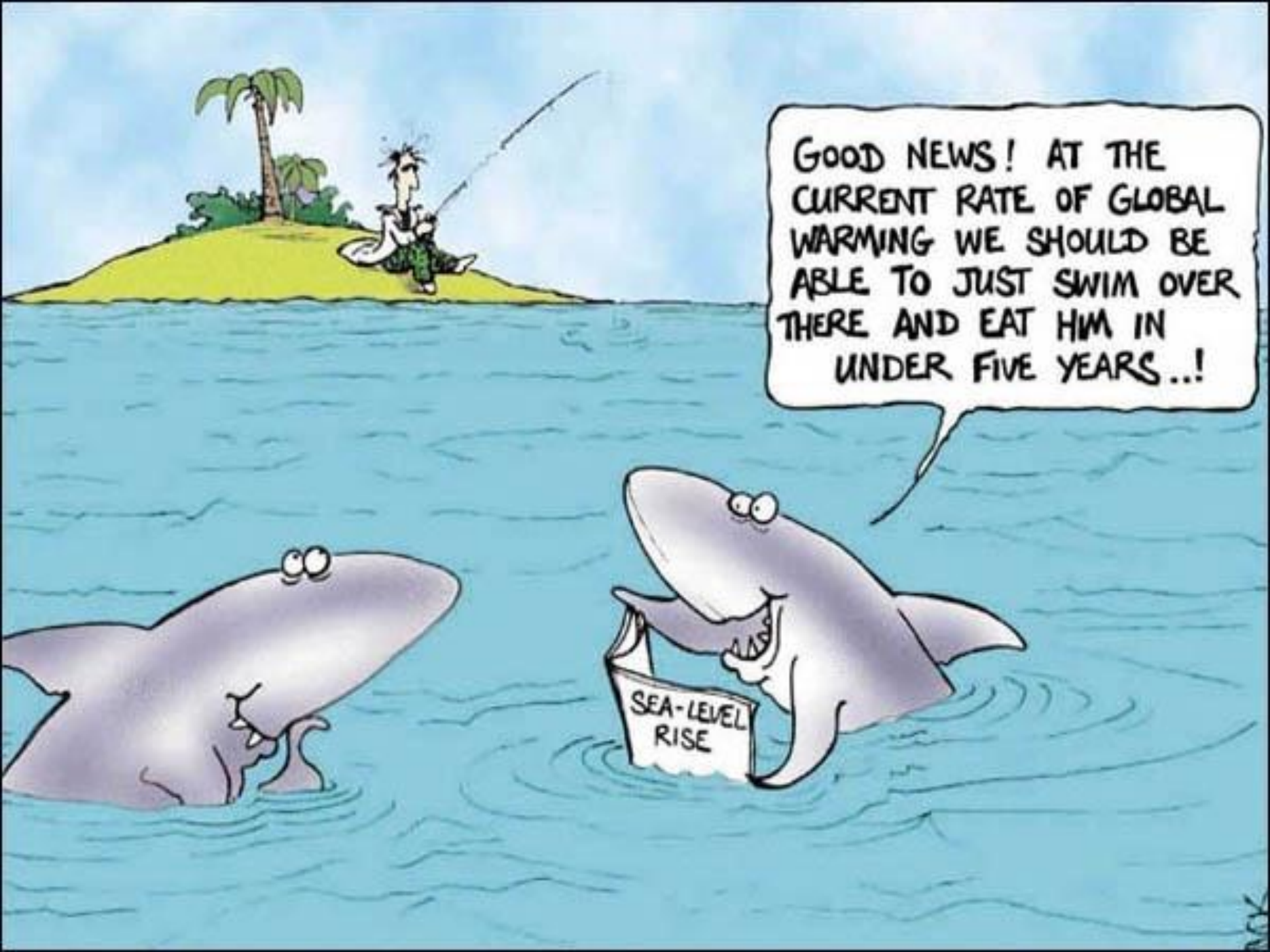
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The Law of Climate Change

A PRESENTATION BY ERIN DEADY, ESQ., AICP





GOOD NEWS! AT THE
CURRENT RATE OF GLOBAL
WARMING WE SHOULD BE
ABLE TO JUST SWIM OVER
THERE AND EAT HIM IN
UNDER FIVE YEARS...!

SEA-LEVEL
RISE

Overview of Presentation

- National Approach and Regulations
- Florida Approach and Regulations
- The Cases
- Florida Cases
- New Trends
 - International
 - Adaptation



The Climate Change Legal Framework



Regulations & Codes (International Treaty, Federal, State and local)

Litigation

Private Sector Actions:

- Power facilities, development, mining, corporate social responsibility
- Harm to people/property

Public Sector Actions:

- Health, safety & welfare
- Compliance with regulations
- Compelling new government actions & initiatives
- Stopping government actions

The National/Federal Issues

- Climate change legislation
- Energy policy/ESA

The State/Local Issues

- Regional climate change issues
- Challenges to “green” decision making ie; procurement policies (taxi preferences), green building regs

Unique Issues to Consider

- Data
- International issues
- New impacts: Ocean Acidification

A small, realistic-looking globe of the Earth is positioned in the center of a large, vibrant green leaf. The leaf has prominent veins and a slightly serrated edge. The background is a light green gradient with faint, stylized circular patterns and a large, semi-transparent recycling symbol on the left side. The overall composition suggests a focus on nature, environment, and sustainability.

NATIONAL APPROACH TO CLIMATE CHANGE: GHGS

Leading to Mass v. EPA



- **“In the judgment of most climate scientists, Earth’s warming in recent decades has been caused primarily by human activities that have increased the amount of greenhouse gases in the atmosphere.”**
 - Report by the National Academies of Science, National Academies of Engineers, Institute of Medicine, and National Research Council, March 2006.
- **“There is a growing scientific consensus that human activity is a substantial cause of greenhouse gas accumulation in the atmosphere; and, mandatory steps will be required to slow or stop the growth of greenhouse gas emissions into the atmosphere.”**
 - SENSE OF THE SENATE ON CLIMATE CHANGE, 54 to 43 vote, June 2005.

Massachusetts v. EPA



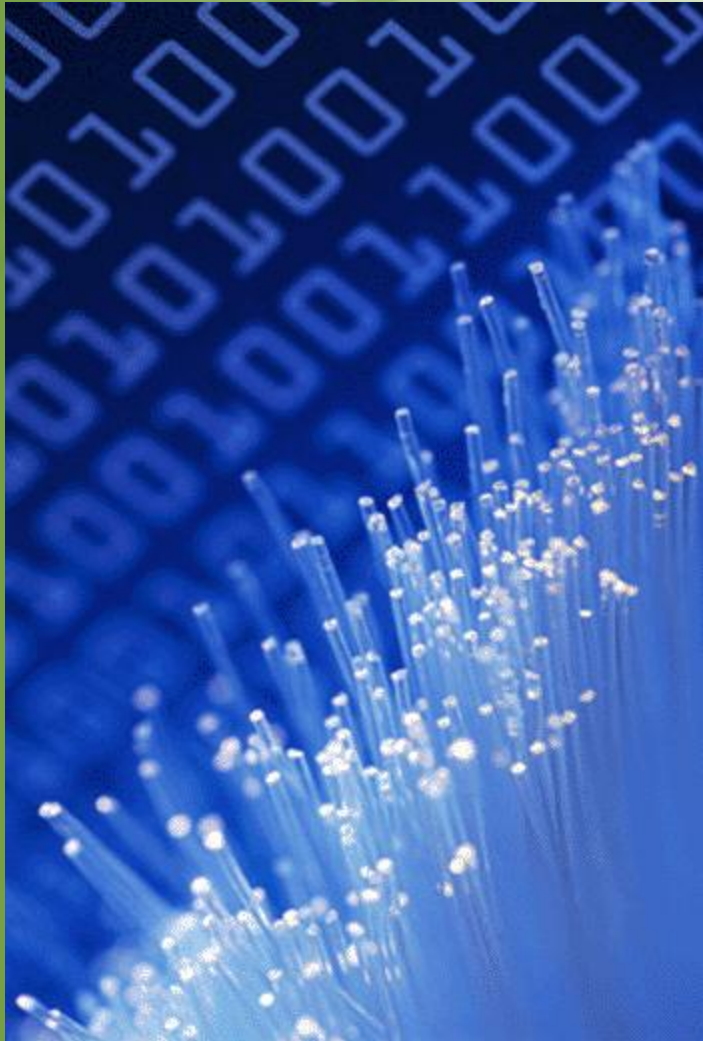
- 549 U.S. 497 (2007), U.S. Supreme Court 5-4 decision in which 12 states and several cities sued EPA based on its denial of a petition for rulemaking that EPA must control emissions of GHGs from new motor vehicles and new motor vehicle engines under section 202(a) of the CAA.
- Decision: EPA has the authority and the obligation to regulate GHGs under the CAA.
- Administrator required to determine whether or not GHGs from new motor vehicles “cause or contribute” to air pollution which may reasonably be anticipated to “endanger public health or welfare,” or whether the science is too uncertain to make a reasoned decision. “Endangerment finding.”

EPA Findings



- **Endangerment Finding:** Current and projected concentrations of the six key GHGs — carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆) — threaten the public health and welfare of current and future generations.
- **Cause or Contribute Finding:** The combined emissions of these GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution which threatens public health and welfare.
- Texas petitioned the U.S. Court of Appeals for the D.C. Circuit to stay the EPA's greenhouse gas Endangerment Finding, the Light-Duty Vehicle Rule, the Prevention of Significant Deterioration (PSD) Interpretive Rule, and the Tailoring Rule. (No. 10-1131, September 15, 2010). Stay lifted January 2011.

Reporting GHGs



- Mandatory Reporting of Greenhouse Gases (40 CFR Part 98) GHG emissions from **large sources and suppliers** over 25,000 metric tons (manufacturers of vehicles and engines, and facilities). Additional sectors covered 4/10 (oil and natural gas systems, industries that emit fluorinated GHGs, and facilities that inject and store CO₂ underground)
- SEC guidance on existing disclosure requirements as they apply to climate change (legal proceedings and management policies). 17 CFR Parts 211, 231 and 241.
- Reporting of corporate parent information (revisions to 40 CFR Part 98), primary North American Industry Classification System code(s); and an indication of whether or not any of their reported emissions are from a cogeneration unit.

Mobile Sources: Transportation



- May 7, 2010: Light-Duty Vehicle and Corporate Average Fuel Economy Standards for passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering model years 2012 through 2016
- September 30, 2010: EPA and National Highway Traffic Safety Administration (NHTSA) issued a Notice of Intent to begin developing new standards for GHGs and fuel economy for light-duty vehicles for the 2017-2025 model years.



A conceptual image featuring a small, realistic globe of the Earth, showing continents and oceans, resting on a large, vibrant green leaf. The background is a light green gradient with faint, stylized recycling symbols and circular patterns. The text "THE WEIRD, THE BAD AND THE UGLY" is prominently displayed in the lower half of the image.

**“THE WEIRD, THE BAD AND
THE UGLY”**

• ESA Cases

- Center for Biological Diversity v. Kempthorne, Case No. C-05-5191-JSW (N.D. Cal.) (filed December 15, 2005) & *In re* Polar Bear ESA Listing and § 4(d) Rule Litigation, Misc. Action No. 08-0764 (EGS) (D.D.C.).
- List as a threatened species under the ESA, 16 U.S.C. §§ 1531-1544, due to the loss of the bear's sea ice habitat, which CBD attributed to global climate change.



Critical habitat designation (smaller than originally proposed). Notice of Intent filed on both sides. Inupiat Eskimos challenge on grounds that designation penalizes them for pollution created elsewhere and designation does nothing to help mitigate decline of polar bear.
– January 2011.

Cap and Trade



- Power sector GHGs capped through 2014 and then reduced by 2.5% per year for the next four years (10% by 2018).
- Argument: NY (and Consolidated Edison's) did not have legal authority to join the cap-and-trade system without authorization from the state legislature, and that a multi-state system such as RGGI cannot exist without Congressional authorization.
- And, RGGI places an unfair tax on electric generators in NY who are bound by long-term contracts.

- Indeck Corinth, L.P. v. Paterson (No. 5280-09) Supreme Court of the State of NY (January 29, 2009).
- Regional Greenhouse Gas Initiative ("RGGI"): agreement among 10 Northeast and Mid-Atlantic states, including NY, to limit GHG emissions through cap-and-trade.

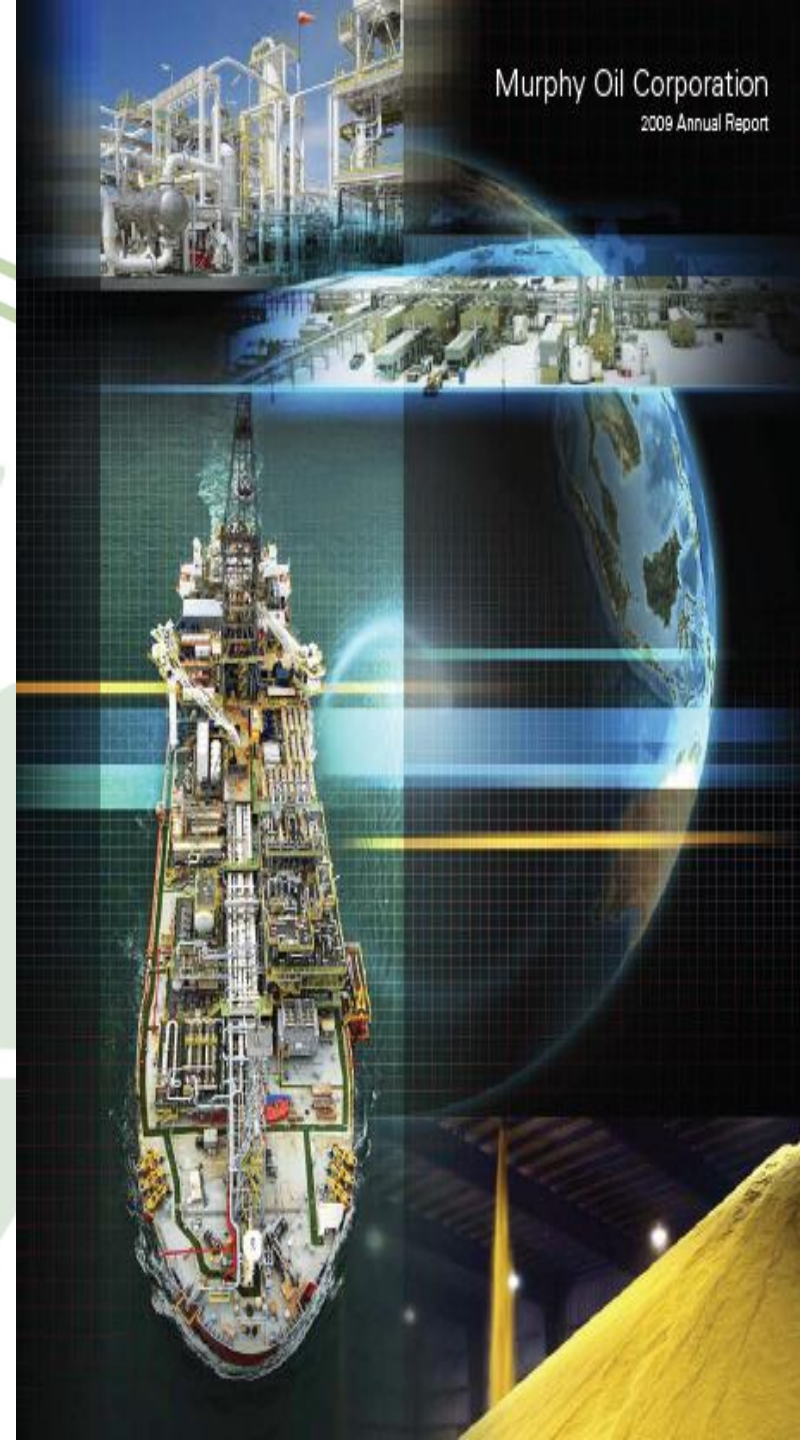
Renewable Energy



- Equity for all providers/vendors: TransCanada v. Bowles, Civil Action No. 4:10-cv-40070-FDS, C.D. Mass (April 2010), discrimination against Non-Mass vendors.
- Anti-wind cases: Animal Welfare Institute v. Beech Ridge Energy, LLC, (U.S. Dist. Court, Maryland), national environmental group and local community sued to halt 124 turbine project on the ground that the turbines would “take” endangered Indiana bats but Beech Ridge had failed to get an incidental take permit under the ESA. 100 turbines approved, operate from Nov. 16-Mar. 31 until ITP issued.
- Other things to fight about:
 - Who owns renewable energy credits?
 - How can we finance energy efficiency and renewable energy? (Fannie/Freddie)
 - Who can sell renewable energy and to whom? Power purchase agreements.

Climate Change Impacts

- Comer v. Murphy Oil, 607 F. 3d 1049 (S. D. Miss. 2006 (5th Cir. October 2009)
- Land owners along Mississippi Gulf Coast bring class action against oil companies alleging (public/private nuisance/trespass and negligence):
 - GHG emissions contribute to global warming
 - Adds to “ferocity” of hurricane Katrina
 - Destroys their property
- Motion to Dismiss granted in District Court (standing and political question) owners appealed, 5th Circuit reversed and remanded.



Really?



- The en banc 5th Circuit only consisted of 9 of the 5th Circuit judges, 7 recused themselves from the case.
- The remaining judges agreed 6-3 to rehear the case en banc, an action that automatically vacated the panel opinion.
- Three months later another judge recused herself.
- The en banc court lost its quorum.
- Without a quorum, the 5th Circuit could not rehear the case en banc—but it also had no authority to reinstate the vacated panel decision (remanding the case). The court voted 5-3 to dismiss the appeal.
- Comer has petitioned the Supreme Court for a Writ of Mandamus ordering the Fifth Circuit to reinstate the appeal. DENIED. Epic fail?

In Ain't Over...



- Public nuisance theory gaining momentum: AEP v. Connecticut heads to Supreme Court (cert. granted 12/6/10)
- 8 states and NYC sue power generators over their emissions on public nuisance theory-
- DC dismisses “non-judicial political question” in 2005. 2009 Second Circuit reverses: while we’ve enacted GHG regs, they don’t displace common law legal theories
- Members of Congress weigh in on non-justiciable political question.
- The Supreme Court will soon be required to determine whether Congress’ debate and EPA’s regulations are sufficient to remove the case from the federal courts.
- *Native Village of Kivalina v. ExxonMobil Corporation*, suit claimed that the defendant’s emissions contributed to global warming, which caused the Arctic sea ice to melt, which in turn flooded the village
- Decision was appealed to the Ninth Circuit Court of Appeals, but *American Electric Power Co.* may moot the Ninth Circuit’s review.

Other Issues



- Climategate: The Climatic Research Unit email controversy began in November 2009 with the illegal (hacked) release of thousands of emails and other documents from the University of East Anglia's (UEA) Climatic Research Unit (CRU). March 2010 findings: No evidence of scientific malpractice.
- Greenwashing: (June 9, 2009): FTC filed suit against Kmart, Tender Corporation and Dyna-E International for making false and unsubstantiated claims that their products were biodegradable. FTC released proposed revisions to “Green Guides” (10/6/10): use of product certifications and seals of approval, “renewable energy” claims, “renewable materials” claims, and “carbon offset” claims. The FTC was seeking public comments until December 10, 2010.
- Ocean Acidification: EPA issues memo (Nov. 15) that states should include ocean acidification in lists of impaired waters (marine pH) to resolve a March 2010 lawsuit by Center for Biological Diversity.

Florida Cases



- *Palm Beach County Environmental Coalition v. DCA*, (DOAH Case No. 10-5608GM) July 2010: Challenge to Briger Tract Comp Plan amendments for Scripps (PBG Amendments). Dismissed, HB 697 issues raised.

A conceptual image featuring a small, realistic globe of the Earth with blue oceans and brown/green landmasses, positioned centrally on a large, vibrant green leaf. The leaf has prominent veins and a slightly serrated edge. In the background, there are faint, stylized green circular arrows and a larger, semi-transparent recycling symbol (three chasing arrows) on the left side. The overall color palette is green and white, suggesting an environmental or sustainable theme.

FLORIDA'S APPROACH



**July 15, 2007.... Florida Summit on
Global Climate Change....**

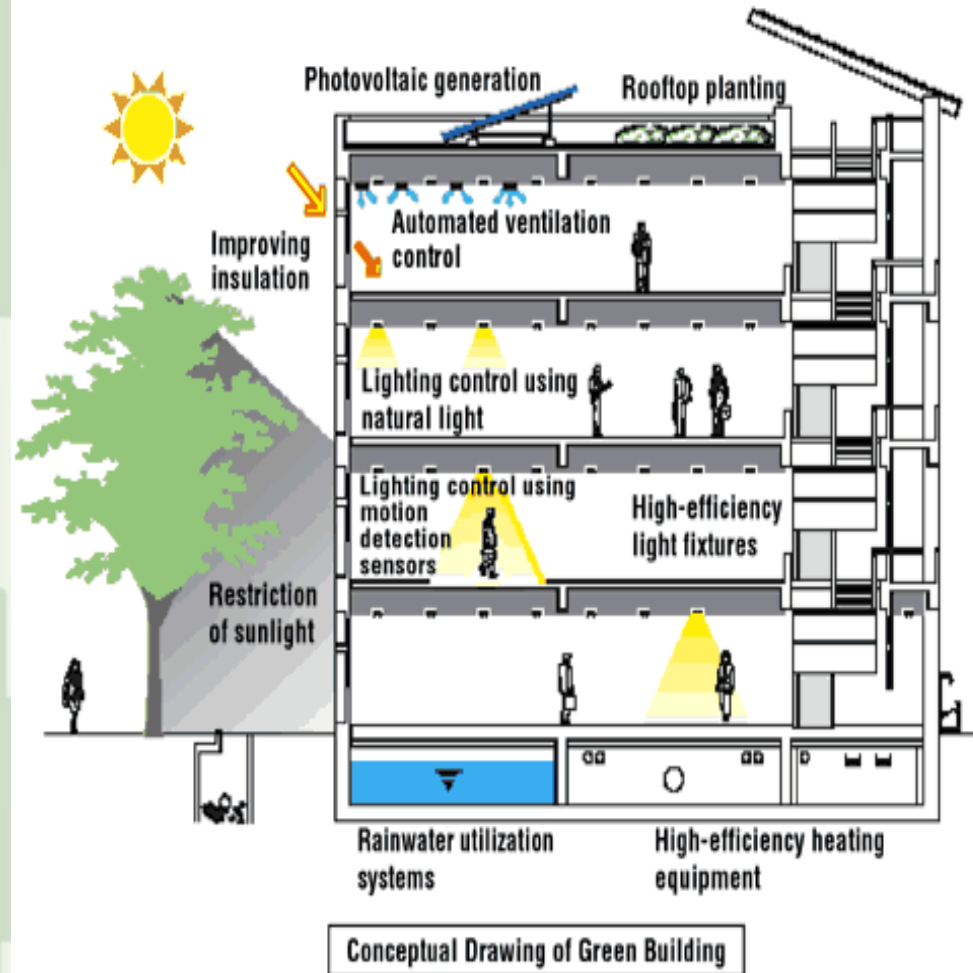
Florida EO 07-127



- Reduction of emissions to 2000 levels by 2017, to 1990 levels by 2025, and by 80 percent of 1990 levels by 2050.
- Florida adopted the California motor vehicle emission standards, pending approval of the U.S. Environmental Protection Agency waiver.
- The standard is a 22-percent reduction in vehicle emissions by 2012 and a 30-percent reduction by 2016.

Overview of Florida Law

- Reporting GHGs
- Building Efficiencies/Code, Chapter 553, F.S. increasing stds.
- Renewable Energy/Portfolio Standard? Un-adopted rule
- Public Service Commission-regulatory authority over utilities: rate base/economic regulation; competitive market oversight; and monitoring of safety, reliability, and service issues.
- Land Use / Comprehensive Planning / State Comprehensive Plan
 - Significant Coastal High Hazard Areas
 - laws



Other Coastal Issues



- Rule 9J-5.012(2)(h), F.A.C.: Analyses shall be prepared which estimate future needs for those facilities, and which shall address the fiscal impact in terms of estimated costs, funding sources and phasing of any needed improvements.
- “Natural disaster” planning, Rule 9J-5.012(2)(e)3., F.A.C.: Coastal high-hazard areas shall be identified and the infrastructure within the coastal high-hazard area shall be inventoried. **The potential for relocating threatened infrastructure shall be analyzed.**



Sea Level Rise in the Planning Process



- Coastal Element Policy 11.4.1.21: Volusia County should continue to monitor sea level rise science to determine how sea level rise will affect the County. Based on pertinent data, the County will act accordingly.
- Collier County (2007 Update): Coastal Element: (I)(VI) Policy 10.6.2: For shoreline development projects where an EIS is required, an analysis shall demonstrate that the project will remain fully functional for its intended use after a six-inch rise in sea level.
- Charlotte County: The County shall amend the Land Development Regulations by December 2012 to require all proposed development address ways to minimize damage from coastal erosion, 100-year floods, tidal surges from hurricanes and coastal storms, and a 0.5 meter sea level rise by 2050.
- City of Punta Gorda: Address sea level rise (coordination with RPC) and seek strategies to “combat” its effects.

HB 7207



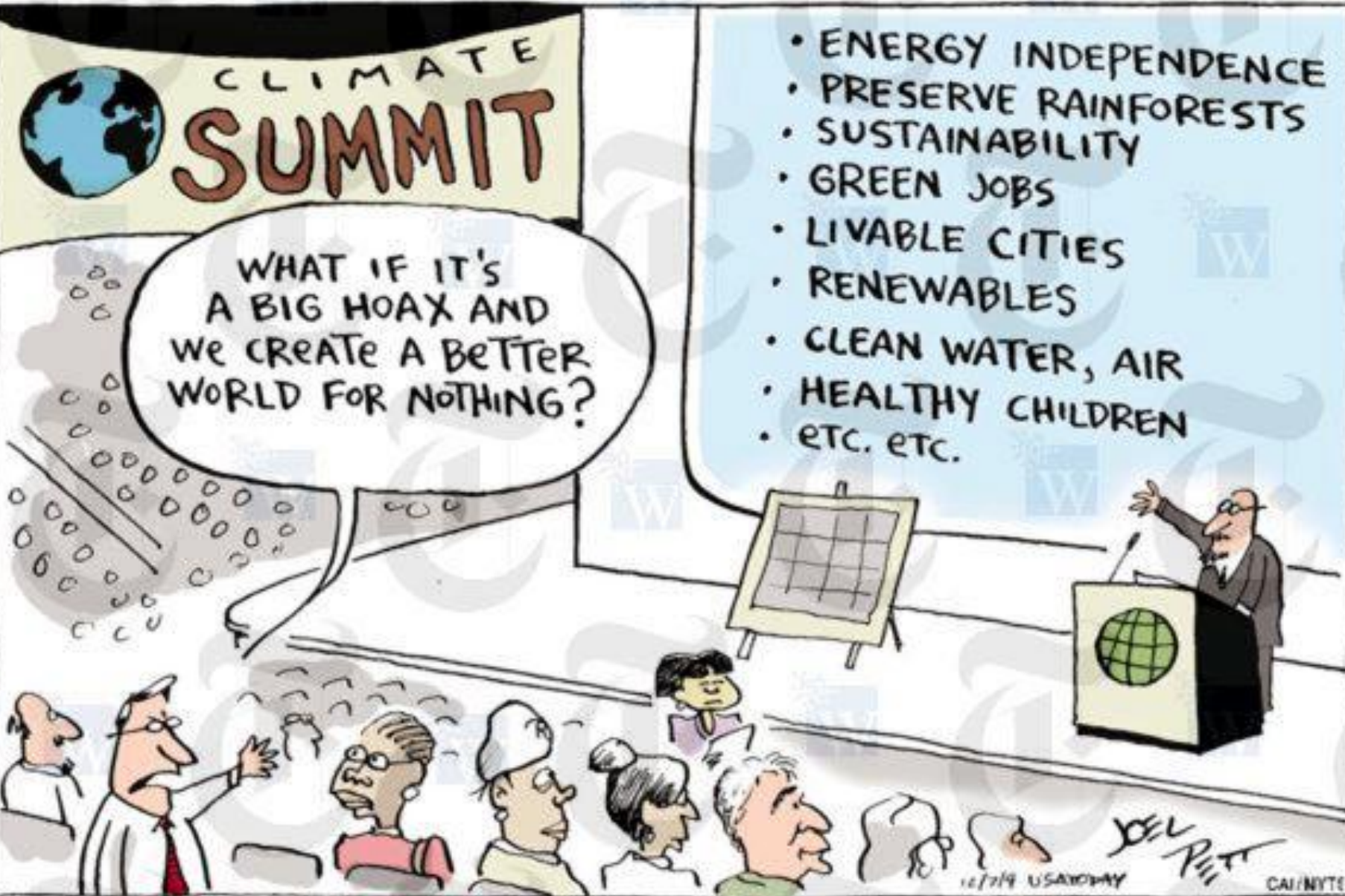
- Section 163.3177(1), F.S. provides for permissive “optional elements”.
- Section 163.3177(1)(f)1-2, F.S. “Appropriate” and “professionally accepted” data
- Section 163.3177(6)(a)9.a.: ...plan or plan amendment does NOT discourage the proliferation of sprawl (VIII) ... land use patterns or timing which disproportionately increase the cost in time, money, and energy of providing and maintaining facilities and services, including roads, potable water, ...
- Section 163.3177(6)(a)9.b.: discourage the proliferation of sprawl if it (IV) promotes conservation of water and energy.
- Section 163.3177(6)(g) adaptation action areas.

Future Trends



- Corporate Accountability: Friends of the Earth v. Watson, 2005 WL 2035596 (N.D. Cal. 2005), non-profits sued the Overseas Private Investment Corp. and the Export Import Bank alleging that they had contributed to global warming by provided assistance to projects without complying with the requirements of the NEPA (EIS).
- International: Inuit Circumpolar Conference, filed a petition to the Inter-American Commission on Human Rights seeking relief from human rights violations resulting from global warming caused by acts and omissions of the US, on behalf of all Inuit of the Arctic regions of the US and Canada.
- Native Village of Kivalina v. ExxonMobil Corp., 663 F. Supp. 2d 863 (N.D. Cal. 2009) Coastal erosion impacts. Due to the amount of erosion that Kivalina has already endured, and its increased vulnerability to continued damage, the GAO has determined that remaining on the island is no longer a viable option for the community.

JOEL PETT
USA TODAY



CartoonArts International: www.nytsyn.com/cartoons