

This presentation premiered at WaterSmart Innovations

watersmartinnovations.com



The Water-Energy-Greenhouse Gas Connection:

Gary Klein

Affiliated International Management, LLC.

Email: gary@aim4sustainability.com

916-549-7080

Drought in North Carolina

A Birdseye View...

December 13, 2007, 1 PM

Courtesy of:

- Lana Armstrong
- Waterfront Sportsman
- Dale Swiggett
- Bob Epting



Photographs by:

- Eric Schneider

Falls Lake, North Carolina



**Water level down
approximately 20 feet**

Jordan Lake, North Carolina



**Water level down
approximately 10 feet**

Wastewater Treatment



These are source of water running in the “rivers” shown entering Falls Lake and Jordan Lake



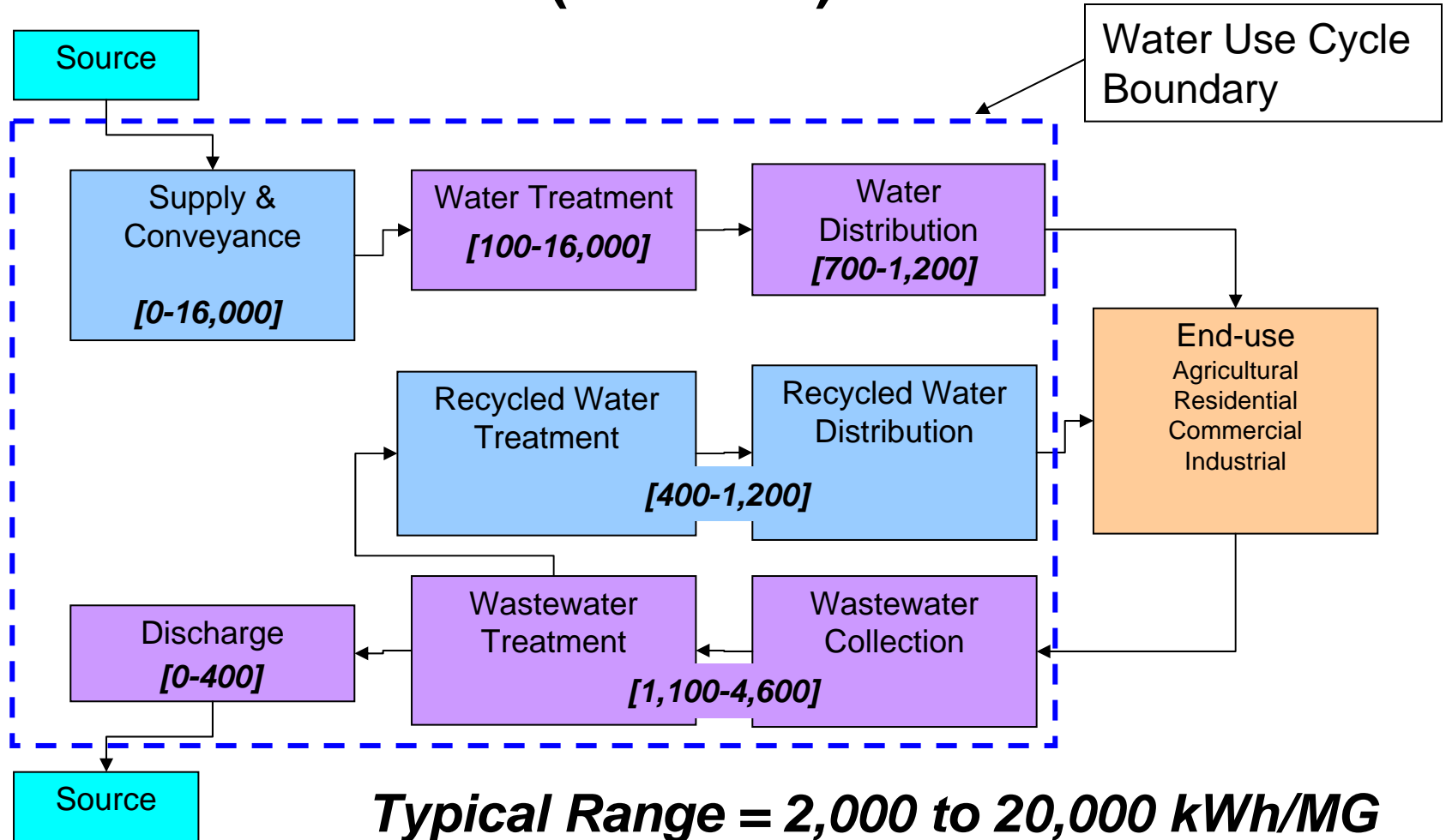
Sharon Harris Nuclear Power Plant



Evaporates approximately $\frac{1}{2}$ gallon of potentially potable water per kWh to produce electricity

The Water-Energy Relationship

Water Use Cycle Energy Intensities (kWh/MG)



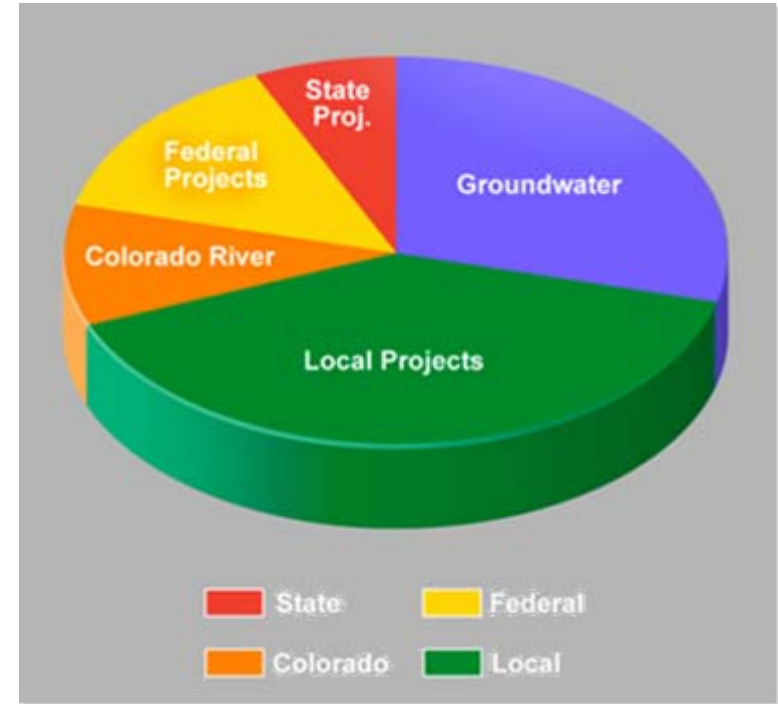
Water-Related Energy Use-CA 2001

	Electricity (GWh)	Natural Gas (Million Therms)	Diesel (Million Gallons)
Water Supply and Treatment			
Urban	7,554	19	?
Agricultural	3,188		
End Uses			
Agricultural	7,372	18	88
Residential	27,887	4,220	?
Commercial			
Industrial			
Wastewater Treatment	2,012	27	?
Totals	48,012	4,284	88
2001 Consumption			
	250,494	13,571	?
Percent of Energy Use			
	19%	32%	?
CO₂ e (Million Metric Tons)	56	50	

Approximately 25% of the nation's stationary energy use goes to water in some form.

Source: California Energy Commission, 2005 Integrated Energy Policy Report

California's Water Supply Systems



Lester Snow, California
Department of Water
Resources

Regional Differences

Northern California	Southern California
kWh/MG	kWh/MG

Supply & Conveyance	150	8,900
Water Treatment	100	100
Distribution	1,200	1,200
Wastewater Treatment	<u>2,500</u>	<u>2,500</u>
Regional Total	3,950	12,700

Source: California Energy Commission, 2005 Integrated Energy Policy Report

**What is the Water-Energy Relationship
where you live or work?**

California's Energy Efficiency Programs' Resource Value Compared to a Potential Water Use Efficiency (WUE) Program

	<u>Energy Efficiency Programs</u>		<u>WUE</u>
	<u>2004-2005</u>	<u>2006-2008</u>	
GWh (Annualized)	2,745	6,812	6,500
MW	690	1,417	850
Funding (\$ million)	\$762	\$1,500	\$826
\$/Annual kWh	\$0.28	\$0.22	\$0.13
WUE Relative Cost	46%	58%	

How do your energy efficiency programs compare to the potential energy savings due to water use efficiency?

Water-Energy Relationship: Synergies

✓ End-User Water and Energy Conservation

- ✓ Saving water can save energy
- ✓ Saving energy can save water

✓ Improve Price Signals

- ✓ Time of use water rates and meters
- ✓ Time of use electric rates and meters

✓ Water and Wastewater Utility Operational Efficiency

- ✓ Increasing water and wastewater system efficiency reduces energy in the water use cycle

✓ Water Storage

- ✓ Increased water storage and more flexible water storage shifts peak energy requirements
- ✓ Pumped storage increases peak electric generation and improves electric system efficiency

✓ Renewable Generation by Water and Wastewater Utilities

- ✓ Increase generation from in-conduit hydro and biogas. Add generation from solar and wind.
- ✓ Assist in meeting California's renewable generation goals

If we did all this,

what would be the combined impact on GHG emissions?

Current Activities in California

- California Public Utility Commission (CPUC):
- Climate Action Team
- California Legislature
- Governor Schwarzenegger

California Public Utility Commission

- Energy Embedded in Water Pilot Program with Investor-Owned Energy Utilities
 - Programs
 - Evaluation, Measurement and Verification
- Investor-Owned Water Utilities
 - Decoupling of sales from profits
 - Establish water conservation programs

Climate Action Team

CAT Subgroups

- Agriculture
- High GWP Gases
- Electricity
- Land-Use
- Forests
- Manufacturing
- General Combustion
- WATER**

- Oil and Gas Production and Refining
- Goods Movement
- Recycling/Waste Management
- Government
- Vehicles-Engines
- Green Buildings

Contact for Water Subgroup:

Lorraine White

California Energy Commission

lwhite@energy.state.ca.us

916-654-4075

Scoping Plan Purpose

- Successfully outlines California's path to a low-carbon future.
- Comply with AB 32's requirement for achieving maximum technologically feasible and cost-effective reductions in greenhouse gas emissions by 2020, and
- Provide the pathway to meeting the goals established in Executive Order S-3-05 of reducing GHG emissions to levels that are 80% below 1990 levels by 2050.

DRAFT Strategies and Measures

- **Water Recycling**

- Goal to recycle 23% of municipal wastewater by 2030.
- Require Water Recycling Plans at Wastewater Treatment Plants.
- Greatest opportunity to save energy and reduce emissions exists in communities that import water.

DRAFT Strategies and Measures

- **Urban Water Reuse**

- Capture and reuse urban runoff and discharges
- Complements Low Impact Development
- At this time, this measure is being evaluated for future consideration

DRAFT Strategies and Measures

- **End Use Water Conservation & Efficiency**
 - Establish water conservation and efficiency standards that save both water and energy
 - Promote greater implementation of water conservation measures and best management practices
 - Increase landscape and agriculture irrigation efficiency and conservation

DRAFT Strategies and Measures

- **Energy Intensity of Water System**
 - Increase energy efficiency measures in water system infrastructure projects
 - Construct tools and protocols to evaluate, measure and verify the energy impacts
 - Conduct research and demonstration projects that explore ways to reduce the energy intensity of the water system.

DRAFT Strategies and Measures

- **Renewable Resources Development**
 - Develop renewable projects that can be co-located with existing water system infrastructure.

Outreach

- Provide feedback and guidance
- Help identify barriers and solutions
- Provide data, analyses and case studies
- Assist in defining implementation steps and schedule
- Assist in assessing potential reductions and how to measure them

California Legislature

AB 2466 (Laird)

- Authorizes a city, county, city and county, or joint powers agency formed by a city, county, or city and county to:
 - receive a bill credit, as defined, to a benefiting account, as defined,
 - for electricity supplied to the electric grid by an eligible renewable generating facility, as defined, and:
 - requires the commission to adopt a rate tariff for the benefiting account.

California Legislature

AB 1560 Huffman

- Requires the California Energy Commission to develop regulations for water efficiency and conservation standards for new residential and non residential buildings.

AB 662 Ruskin

- Requires the California Energy Commission to develop regulations for energy and water efficient appliances.

Governor Schwarzenegger

- February 28, 2008 Letter to legislature on water issues
 - Achieve a 20 percent reduction in per capita water use by 2020
- June 3, 2008: Declared drought
 - 1st time since 1991
 - Executive Order directs DWR to:
 - facilitate water transfers;
 - work with local water districts and agencies to improve coordination;
 - help local water districts and agencies with water efficiency and conservation;
 - and expedite grant funding to assist local agencies to conserve.

Climate Change

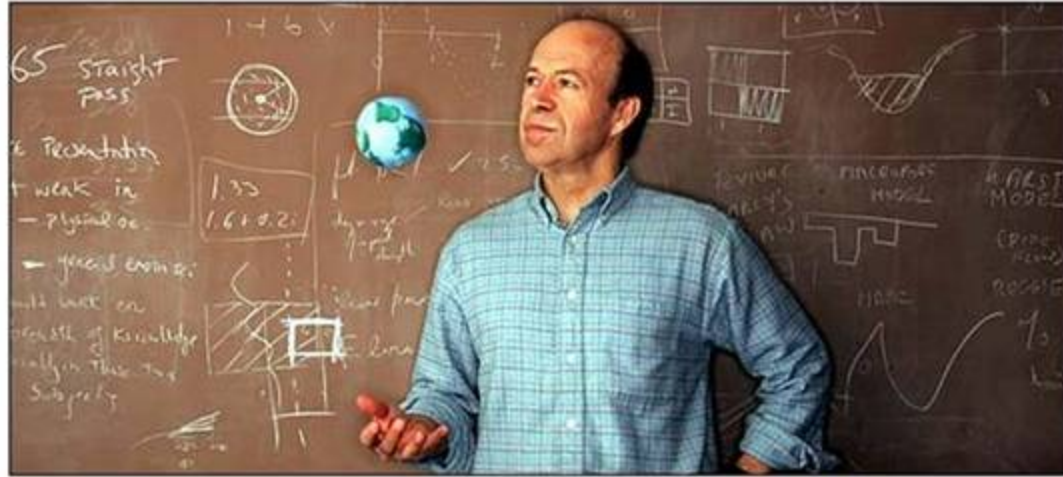
The World's Largest Experiment

Do you want to bet on the outcome?
Would you like to buy some insurance?

The 2030 °C Challenge

Ed Mazria, Inc.

www.2030challenge.org



Fred R. Conrad/The New York Times

Is There Still Time to Avoid 'Dangerous Anthropogenic Interference' with Global Climate?

Dr. James E. Hansen
Director, NASA Goddard Institute for Space Studies
December 6, 2005

Dr. James E. Hansen, continued

- “Warming of more than 1°C above today’s level will make the Earth warmer than it has been in a million years”.
- “Business-as-usual, with fossil fuel CO₂ emissions continuing to increase will mean an additional warming of 2°C to 3°C this century and will make the Earth a different planet.”
- “At 2°C to 3°C the new equilibrium sea level is approximately **25 meters (80 feet) higher than today**. Real world data suggest sea level changes in centuries rather than millennia.”
- “Action must be prompt, otherwise CO₂- producing infrastructure will be built **within a decade** that will make it impractical to keep further warming under 1°C ”.
- “I refer especially to the large number of **coal-fired power plants** that China, the U.S. and India are planning to build...”



New Haven

Montauk

New York City

Long Beach

Atlantic City

Wildwood



New Haven

Montauk

New York City

Long Beach

Atlantic City

Wildwood

Sea Level +1M



New Haven

Montauk

New York City

Long Beach

Atlantic City

Wildwood

Sea Level +6M



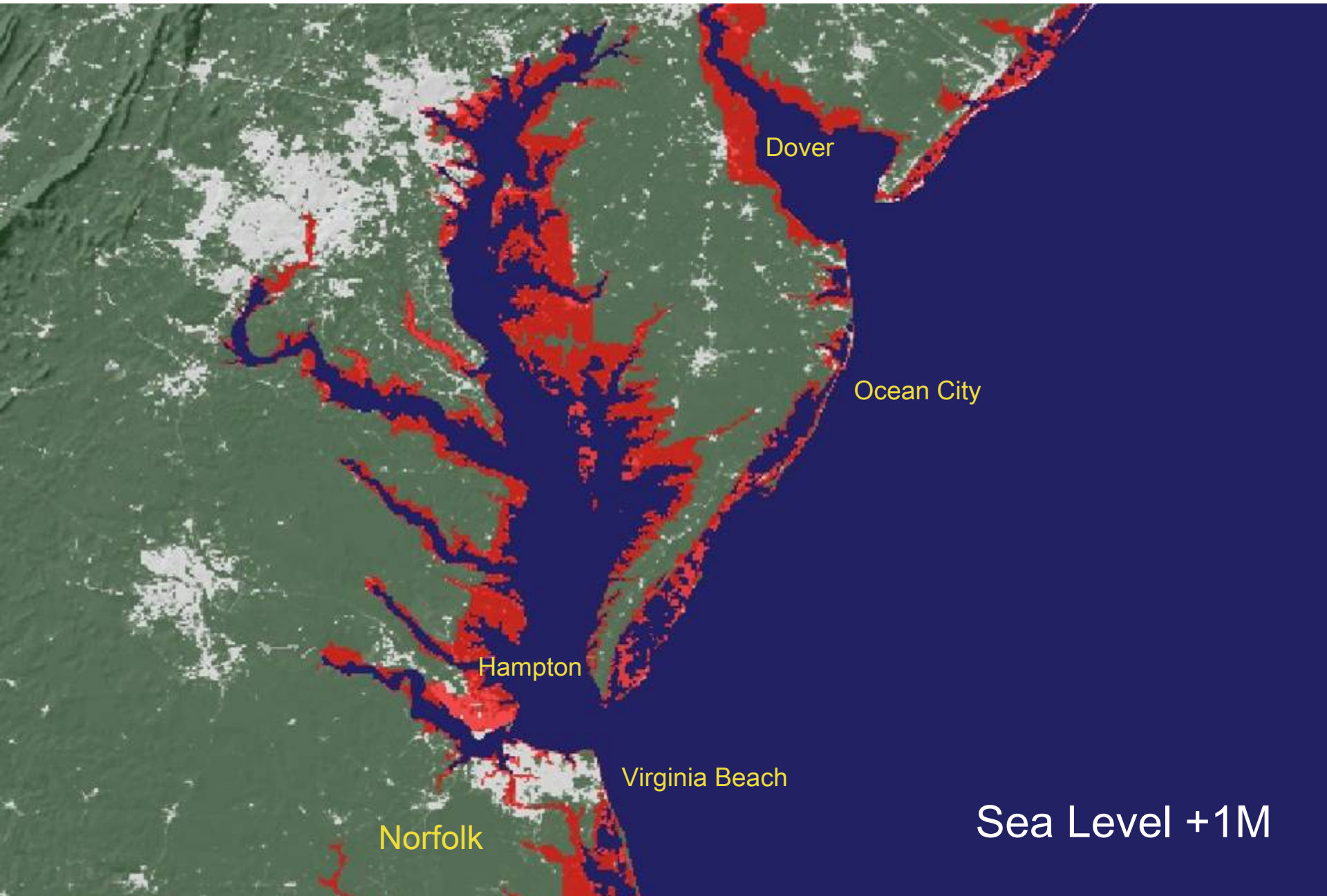
Dover

Ocean City

Hampton

Virginia Beach

Norfolk



Dover

Ocean City

Hampton

Virginia Beach

Norfolk

Sea Level +1M



Dover

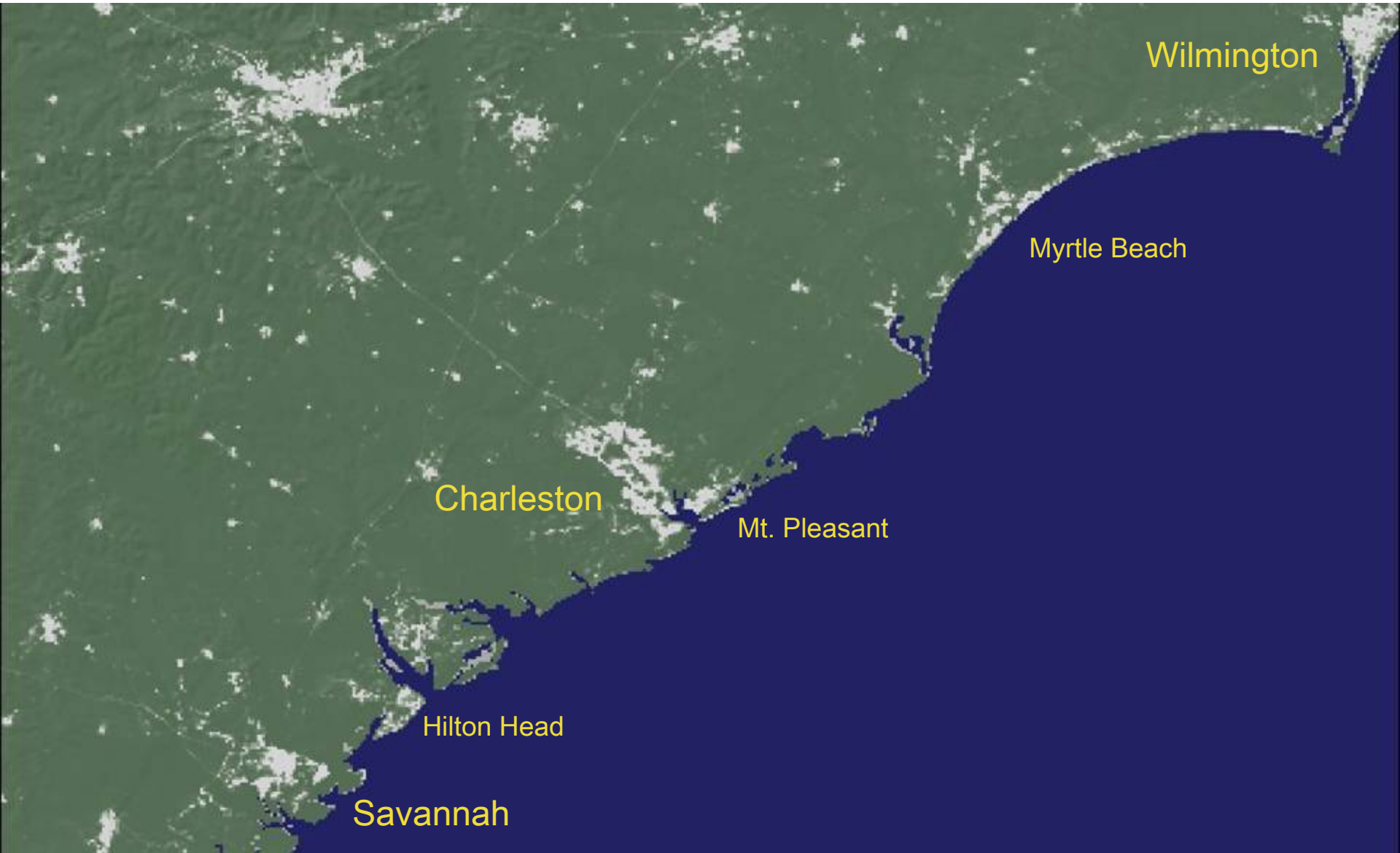
Ocean City

Hampton

Norfolk

Virginia Beach

Sea Level +6M



Wilmington

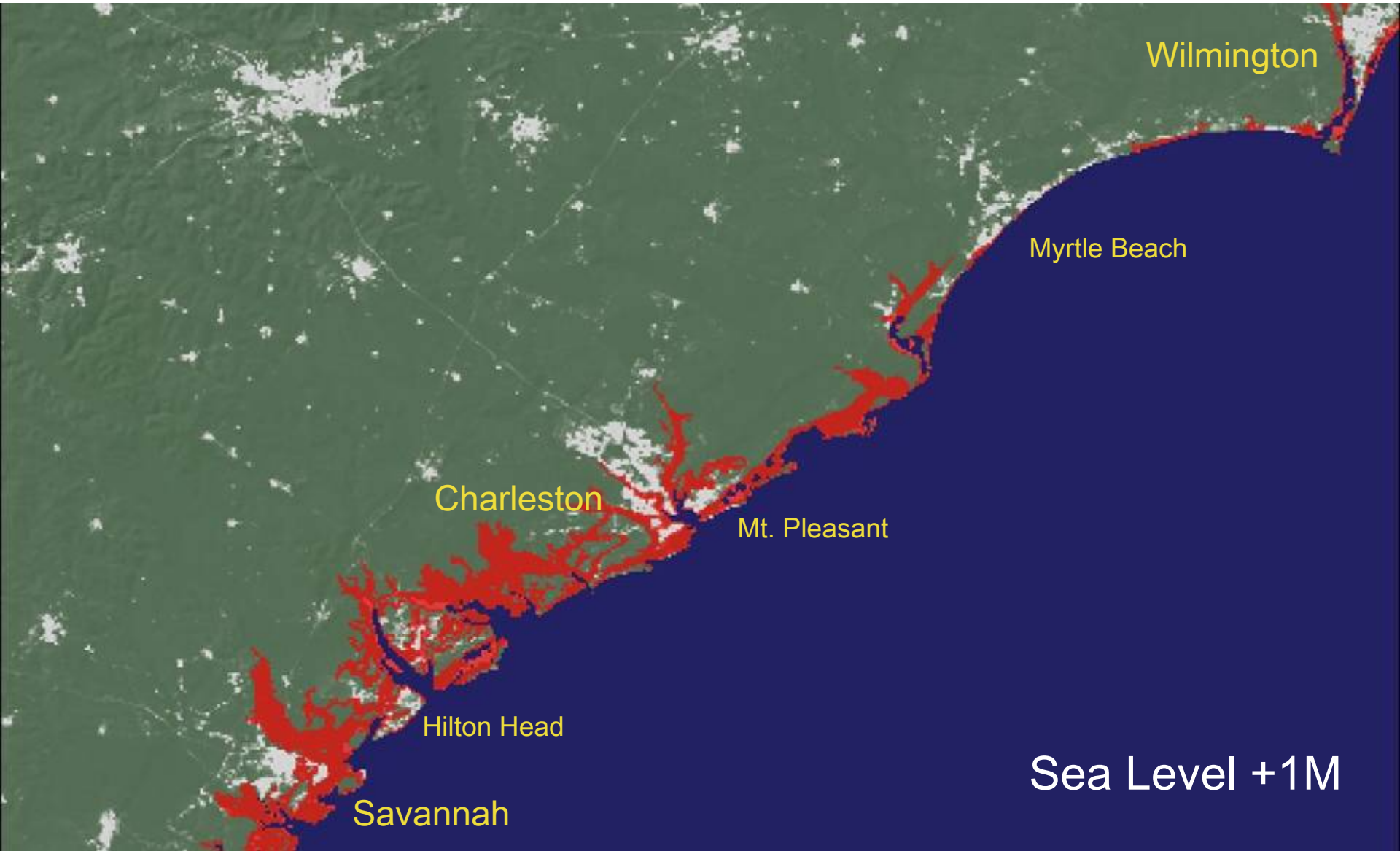
Myrtle Beach

Charleston

Mt. Pleasant

Hilton Head

Savannah



Wilmington

Myrtle Beach

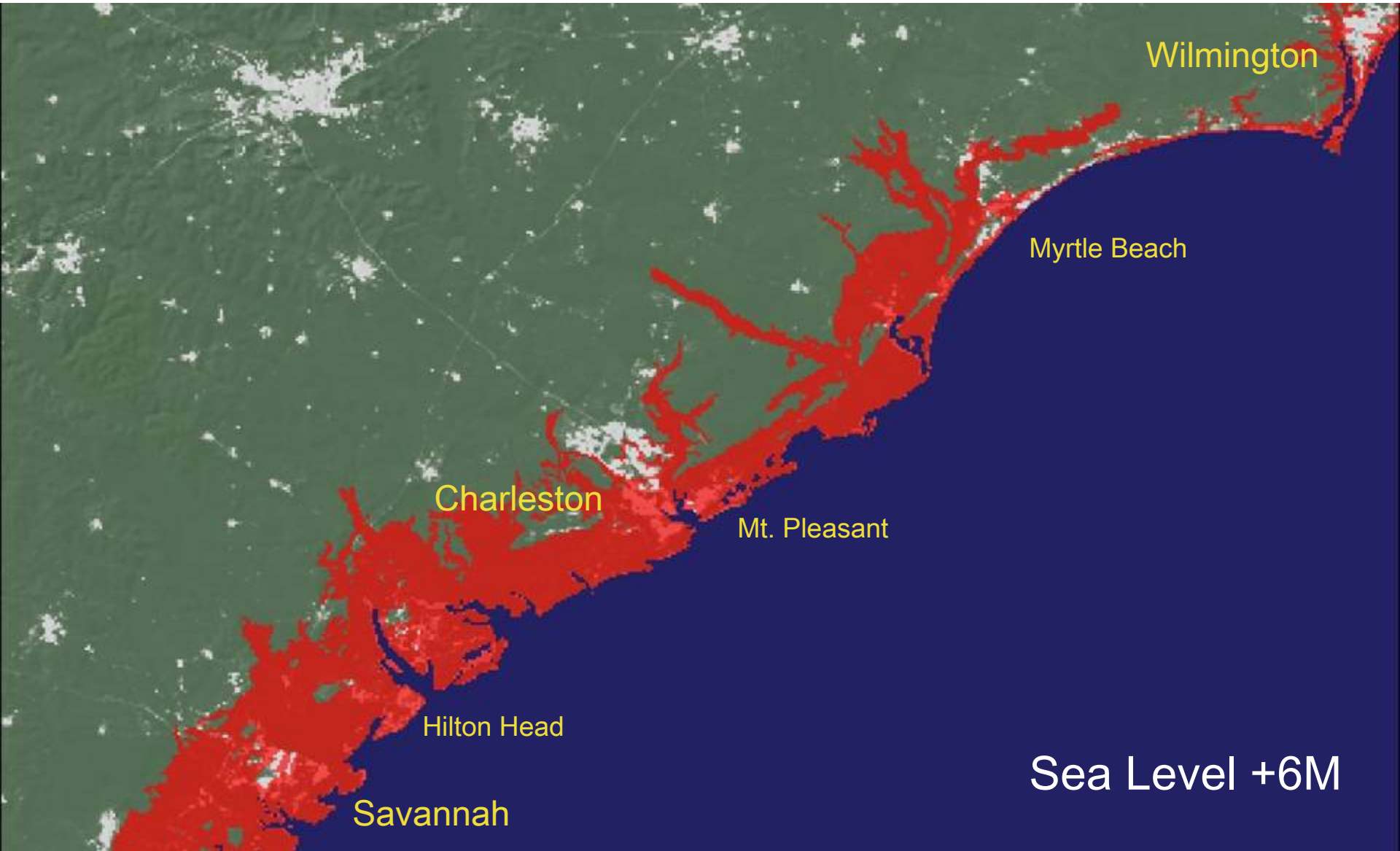
Charleston

Mt. Pleasant

Hilton Head

Savannah

Sea Level +1M



Wilmington

Myrtle Beach

Charleston

Mt. Pleasant

Hilton Head

Savannah

Sea Level +6M



Jacksonville

Panama City

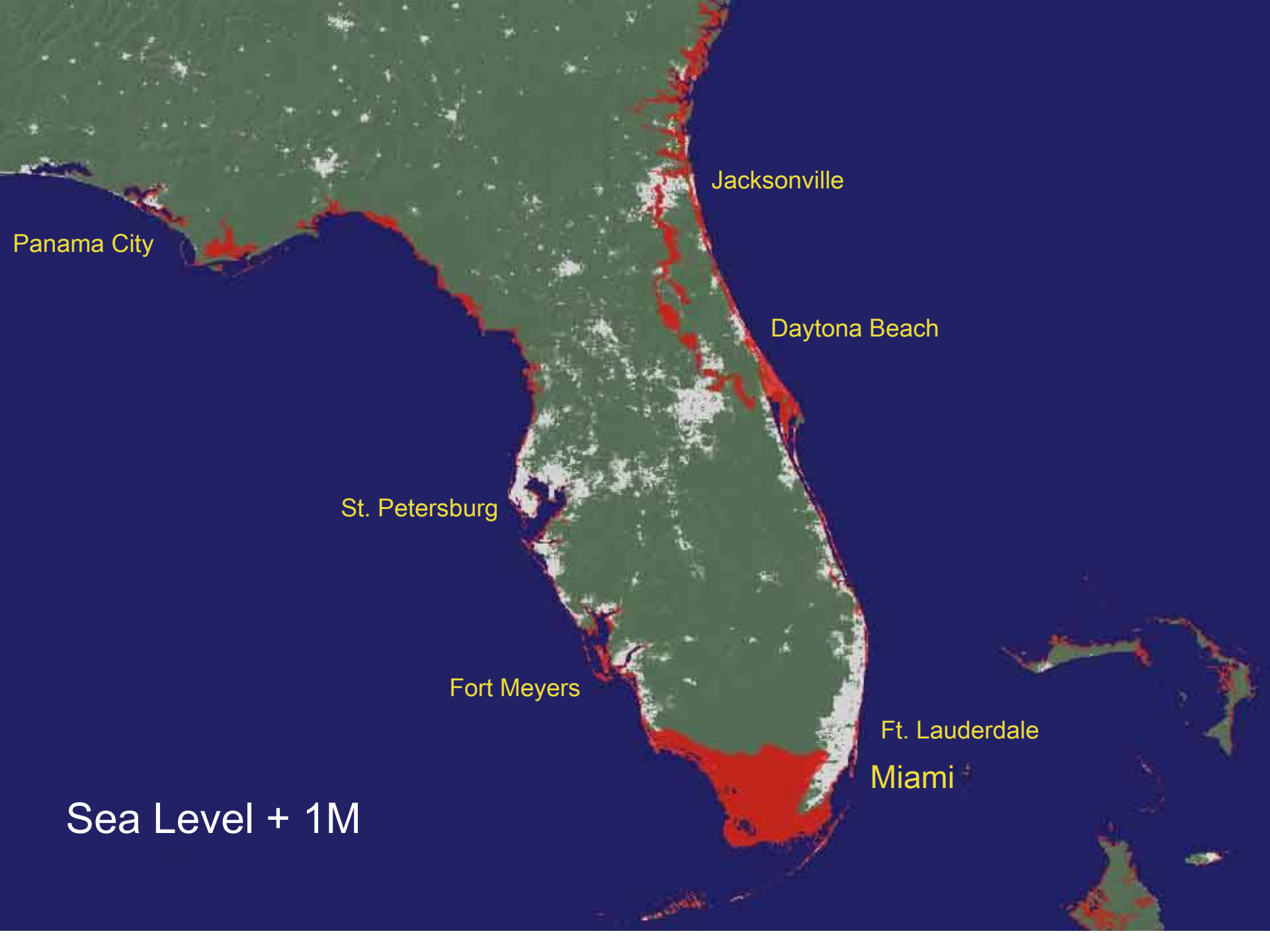
Daytona Beach

St. Petersburg

Fort Meyers

Ft. Lauderdale

Miami



Jacksonville

Panama City

Daytona Beach

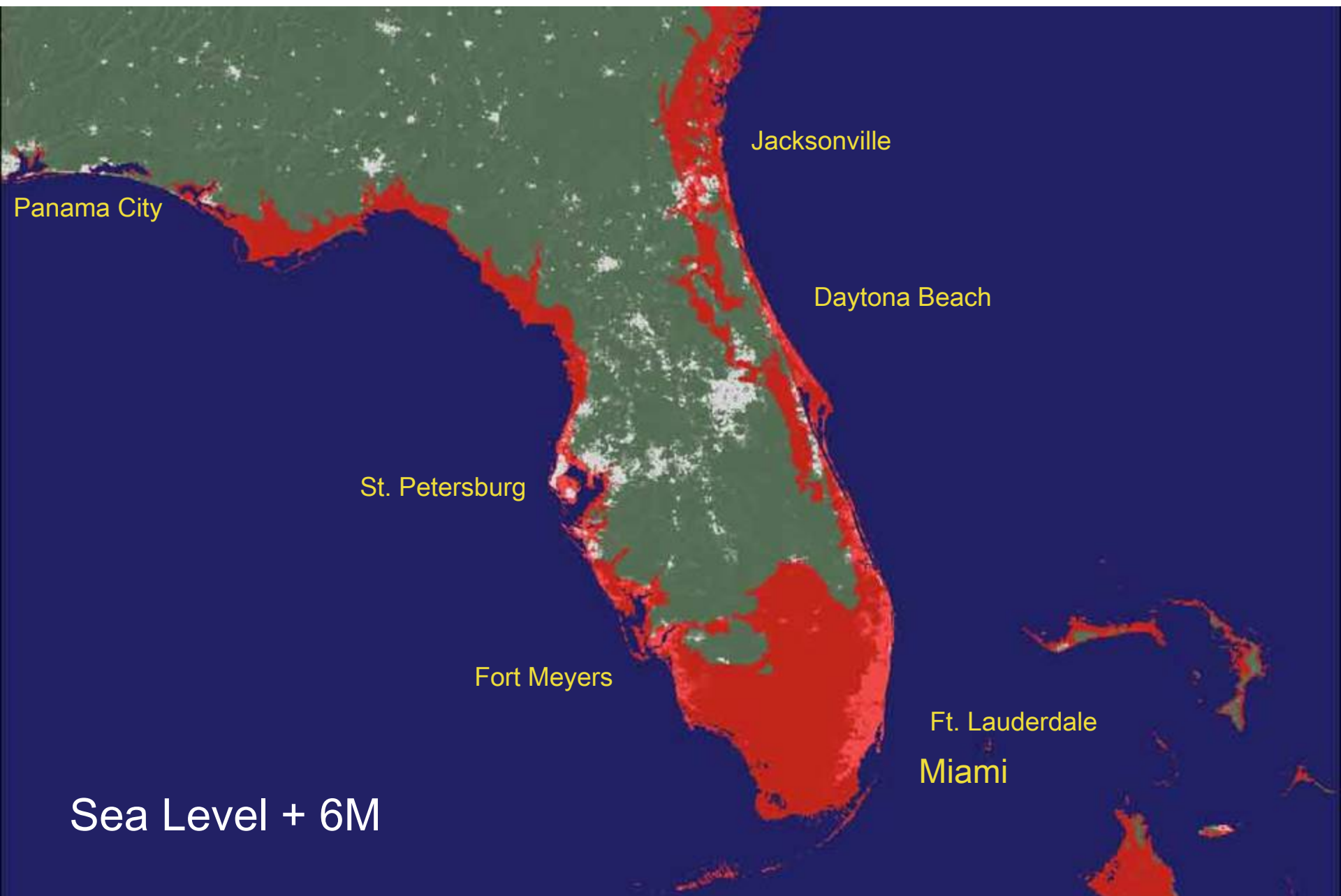
St. Petersburg

Fort Meyers

Ft. Lauderdale

Miami

Sea Level + 1M



Jacksonville

Panama City

Daytona Beach

St. Petersburg

Fort Meyers

Ft. Lauderdale

Miami

Sea Level + 6M

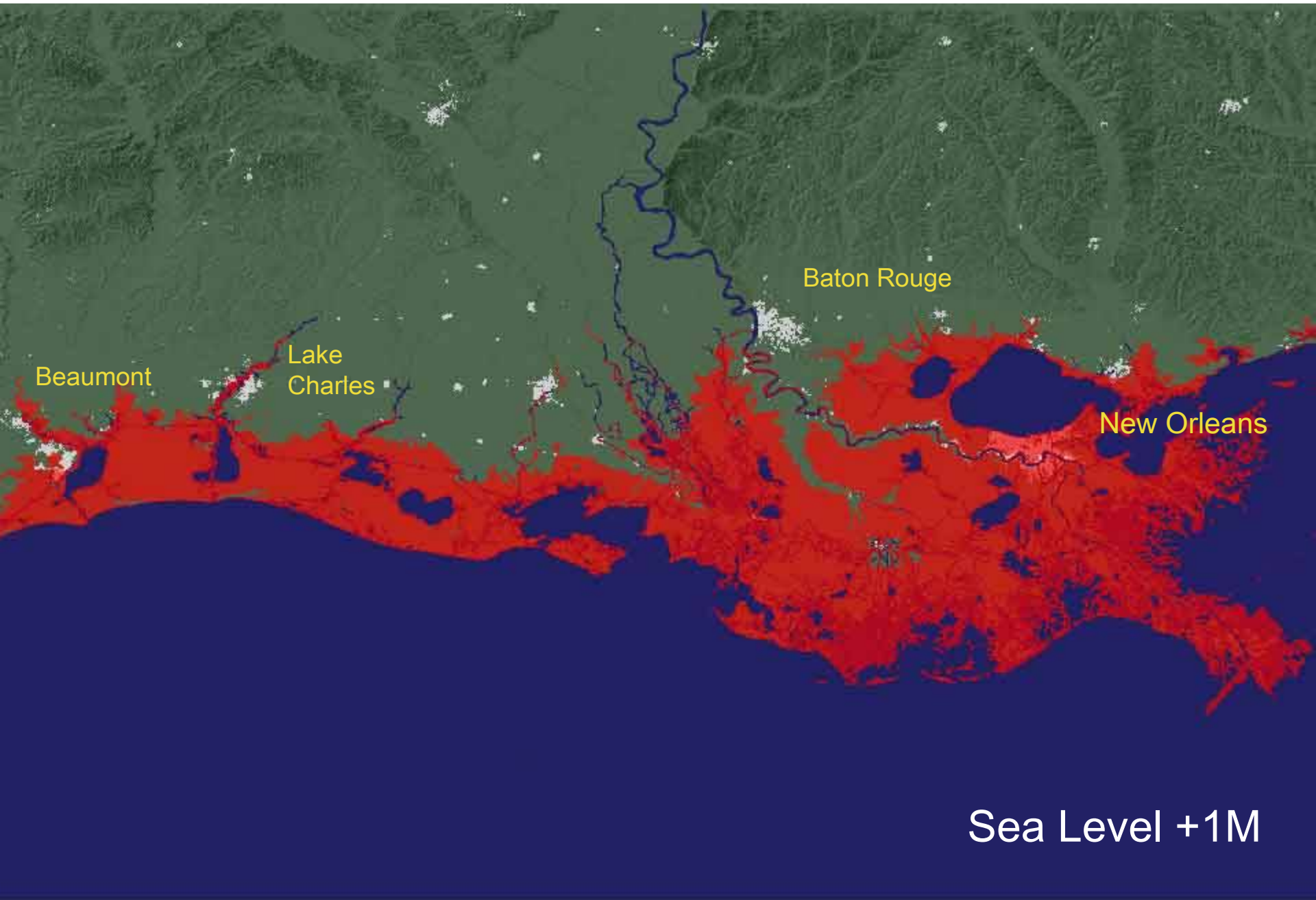


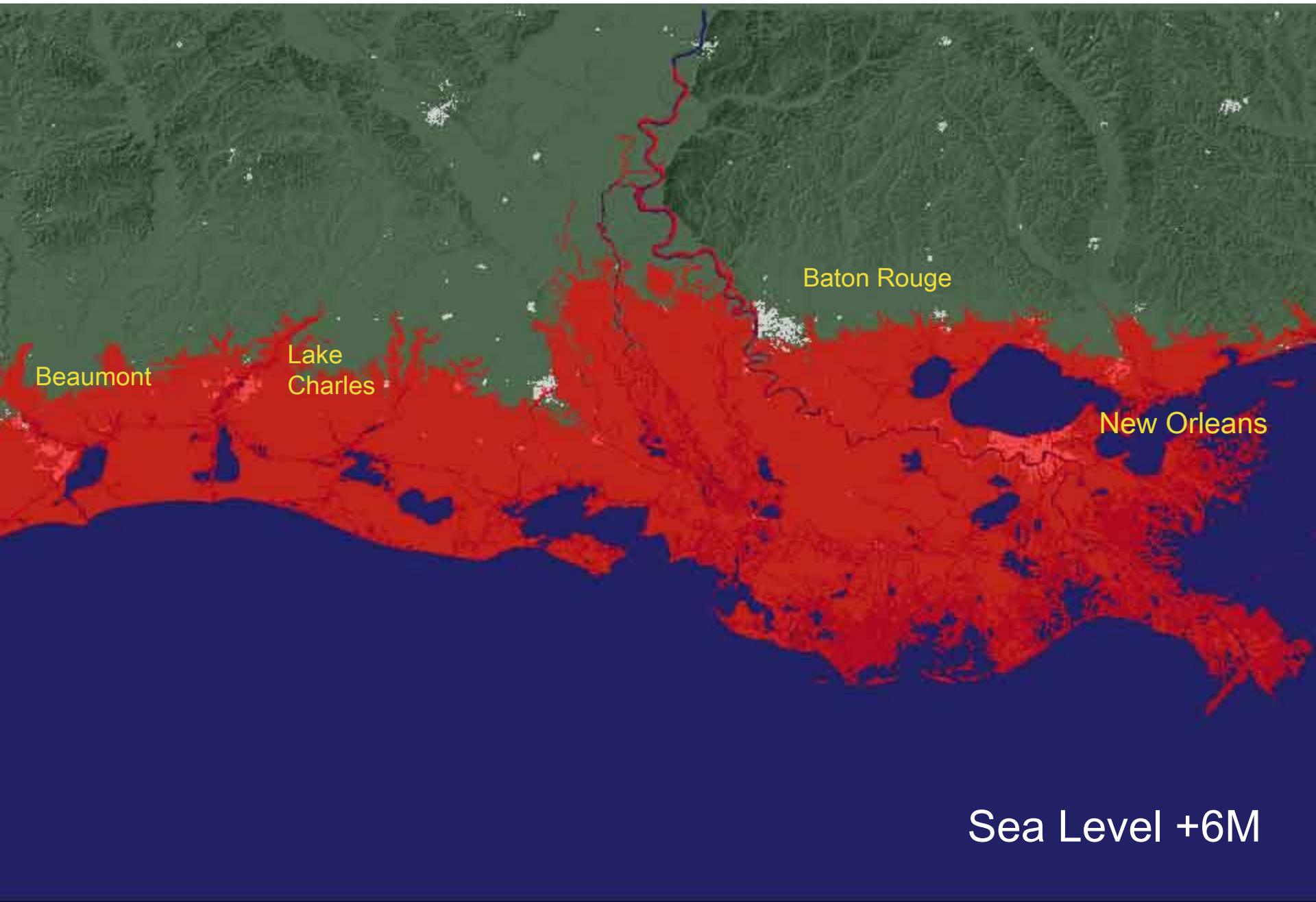
Beaumont

Lake
Charles

Baton Rouge

New Orleans





Beaumont

Lake Charles

Baton Rouge

New Orleans

Sea Level +6M

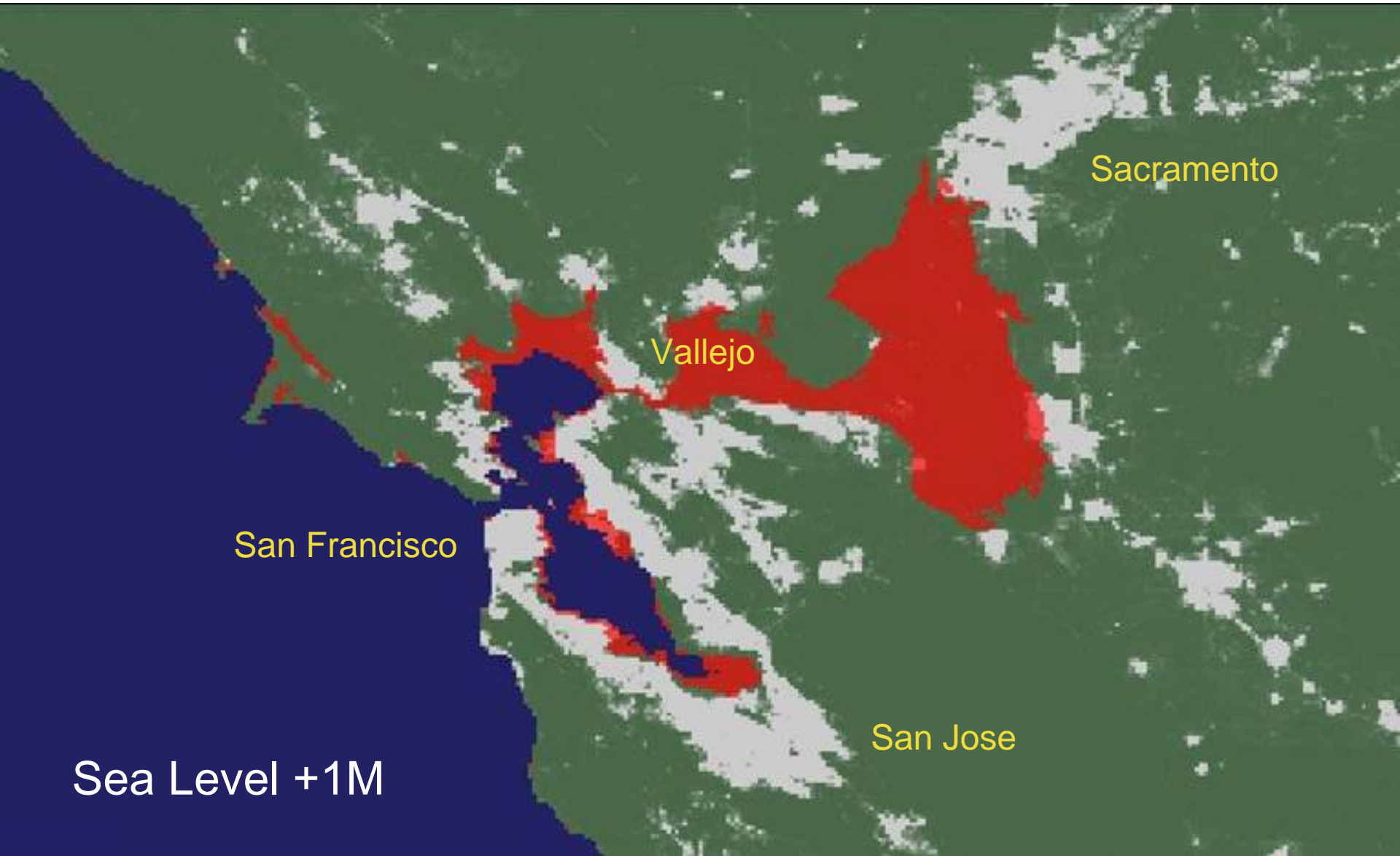


San Francisco

Vallejo

Sacramento

San Jose



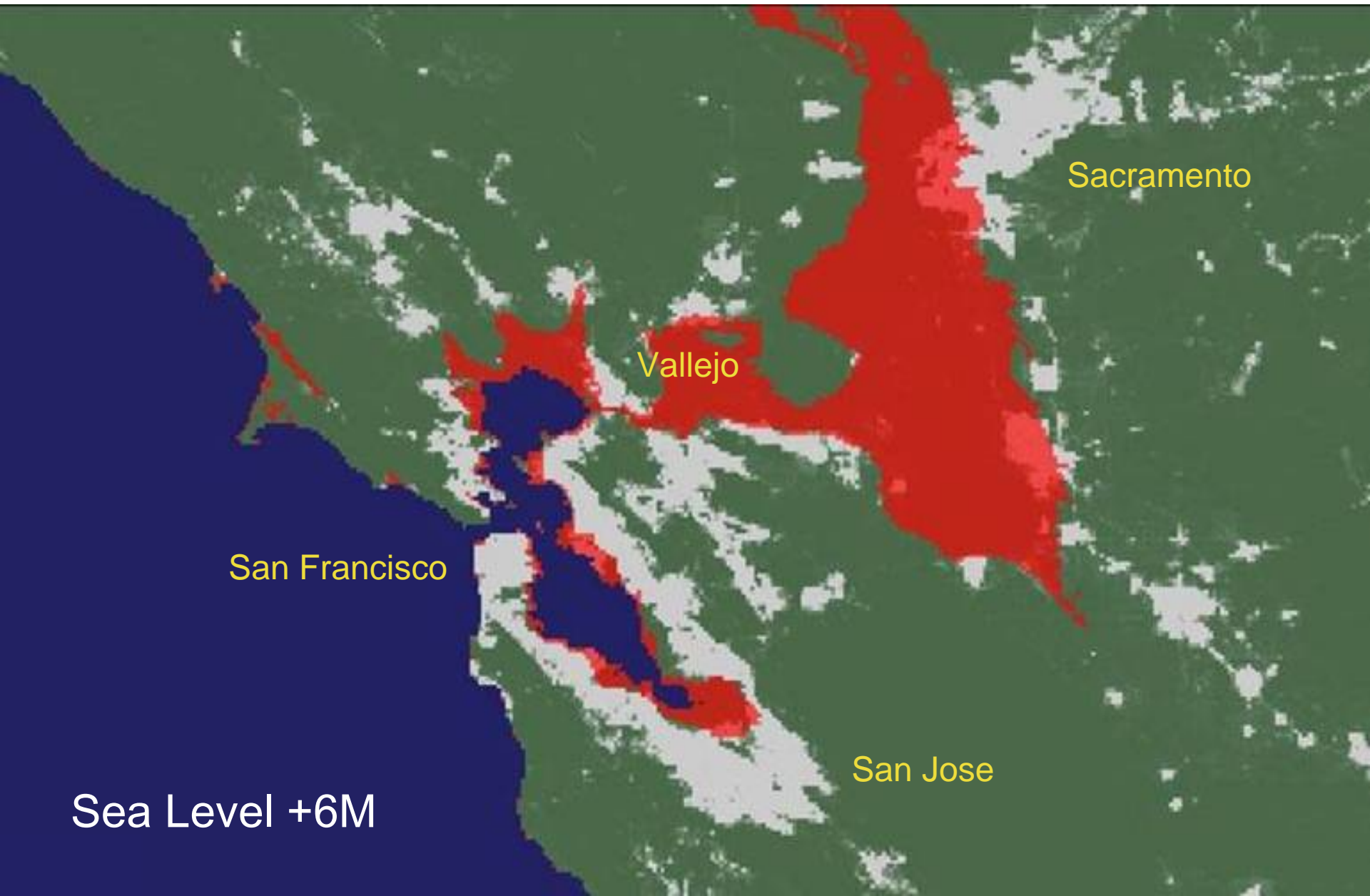
Sea Level +1M

San Francisco

Vallejo

Sacramento

San Jose



Sacramento

Vallejo

San Francisco

San Jose

Sea Level +6M

Adopt these Targets

1. All new buildings, developments and major renovations meet a fossil fuel energy-consumption performance standard of **50%** of the regional (or country) average for that building type.
2. That at a minimum an equal amount of existing building area be renovated annually to use **50%** of the fossil fuel energy they currently consume.
3. Increase Fossil Fuel Reduction Standard to:
 - 2010 – 60%
 - 2015 – 70%
 - 2020 – 80%
 - 2025 – 90%

Goal is to be Carbon Neutral by 2030

No Fossil Fuel to Operate our Buildings

Global Emergency Teach - In “THE 2010 IMPERATIVE”



www.the2010imperative.org
Teach-In was held February 20, 2007



Resources

California Energy Commission

www.energy.ca.gov

2005 Integrated Energy Policy Report,
Chapter 8 Integrating Water and Energy Strategies

<http://www.energy.ca.gov/2005publications/CEC-100-2005-007/CEC-100-2005-007-CMF.PDF>

California's Water-Energy Relationship-Final Staff
Report

<http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF>

Resources

California Public Utilities Commission

www.cpuc.ca.gov

- Water Action Plan

http://www.cpuc.ca.gov/static/hottopics/3water/water_action_plan_final_12_27_05.pdf

- Joint Agency Symposium: “*The Regulatory Challenge Linking Water and Energy*” March 28, 2006. http://energy.ca.gov/process/water/2006-03-28_symposium/index.html

- Water-Energy Partnership

- CPUC Rulemaking 06-04-010 on Energy Efficiency –Proceedings

<http://www.cpuc.ca.gov/Published/proceedings/R0604010.htm>

Resources

- Climate Action Team and Initiatives
 - http://www.climatechange.ca.gov/climate_action_team/index.html
- State Water Resources Control Board (SWRCB) Calendar
 - http://www.swrcb.ca.gov/board_info/calendar/2008.html
- California Department of Water Resources (DWR) Water Plan
 - <http://www.waterplan.water.ca.gov/>