

# Climate Change

Issues and Options  
for Your Community

































MISS CHRISTY





















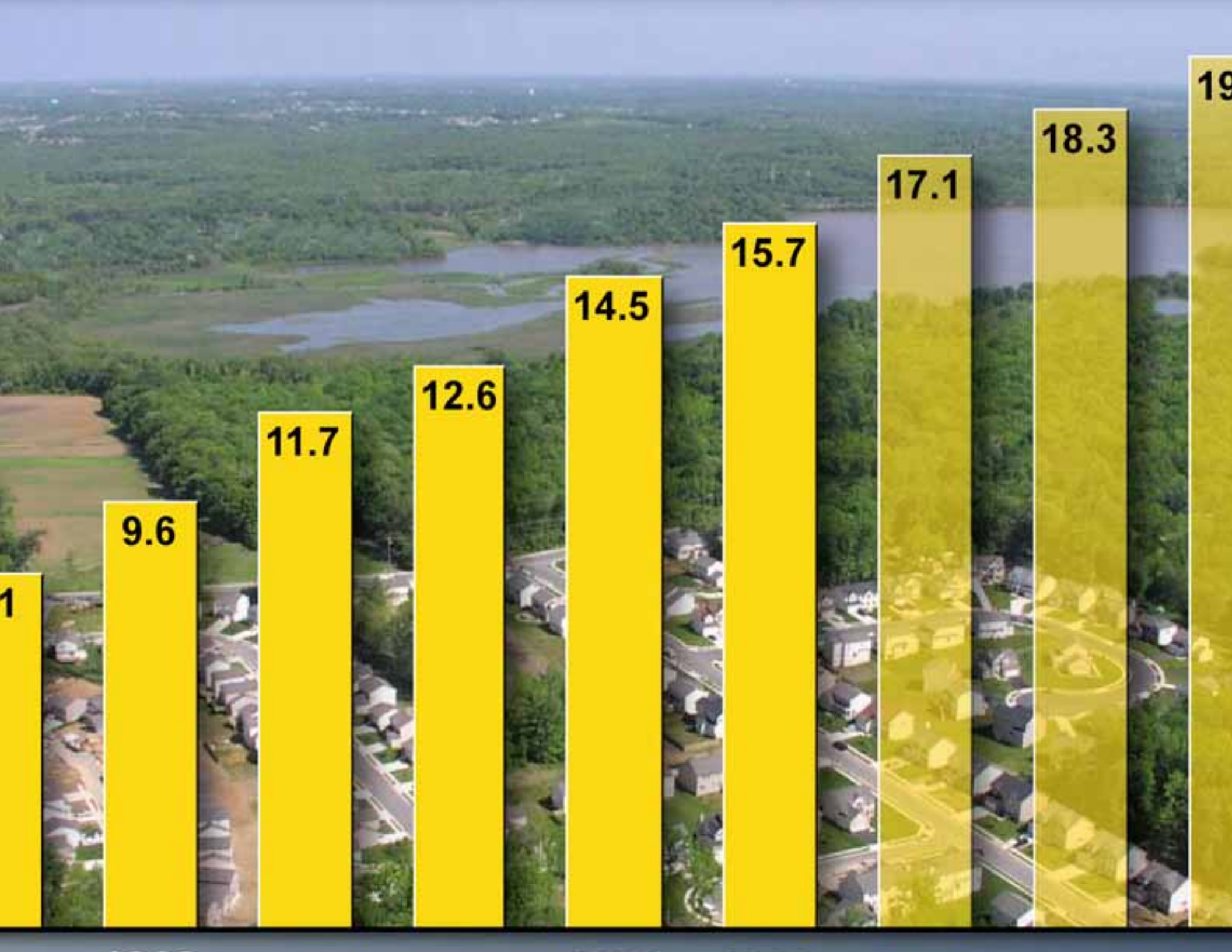
























SAWLING

TT

VA 2344 AM

GEORG'S WEAVERS

TROPHY















**Growing Coastal Population**



**State & Local Economies**



**Coastal Commercial Centers**



**Unpredictable Coastal Weather Events**





Growing Coastal Population

State & Local Economies

# Climate Change

Coastal Commercial Centers

Unpredictable Coastal Weather Events

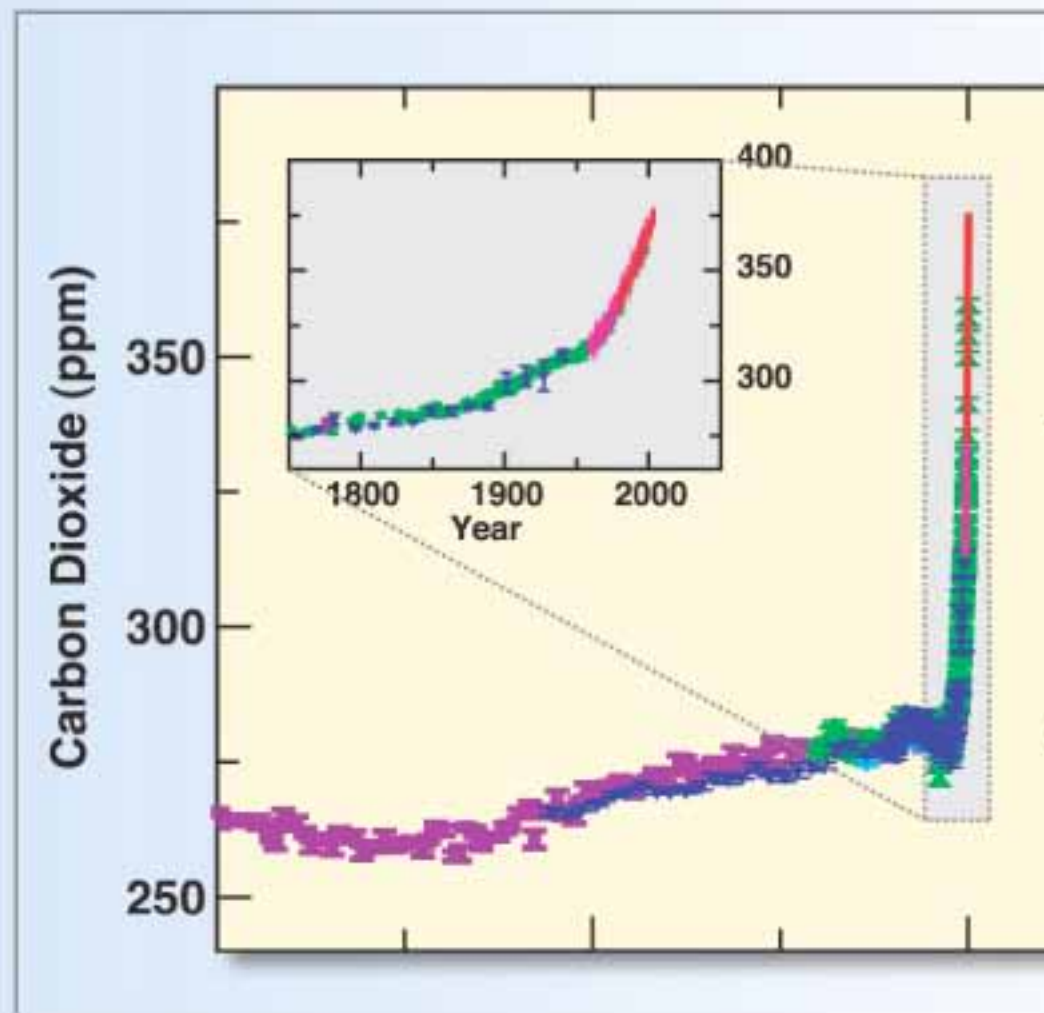
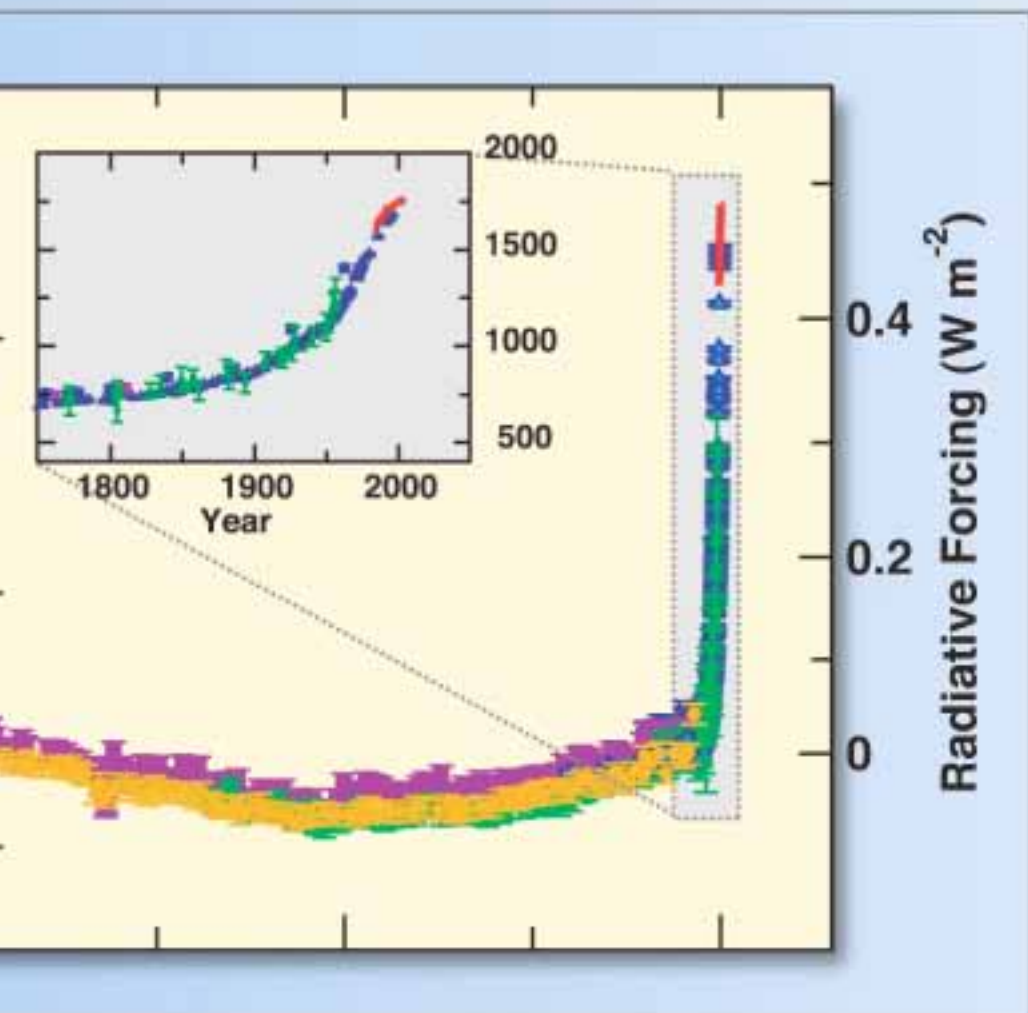




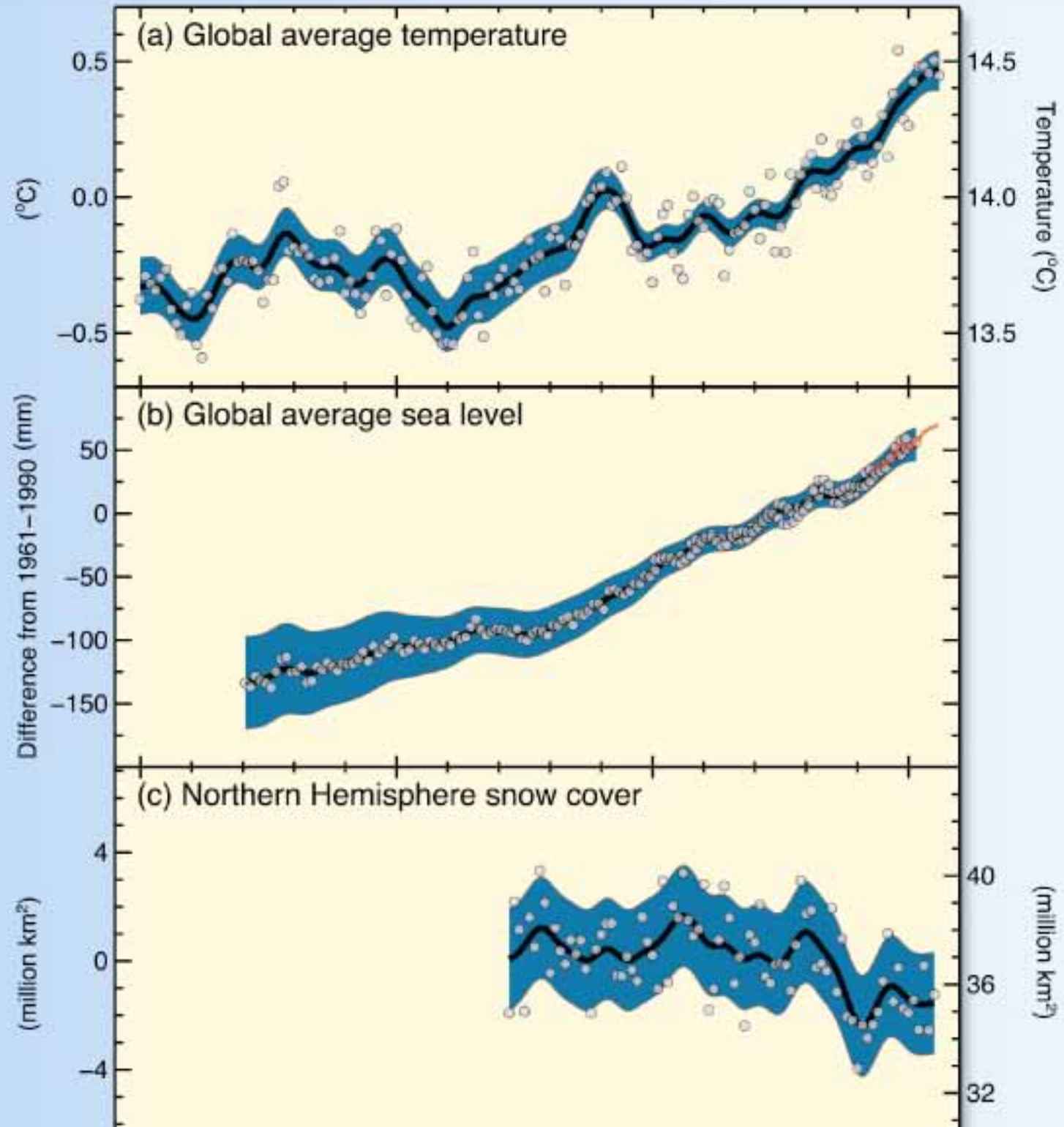




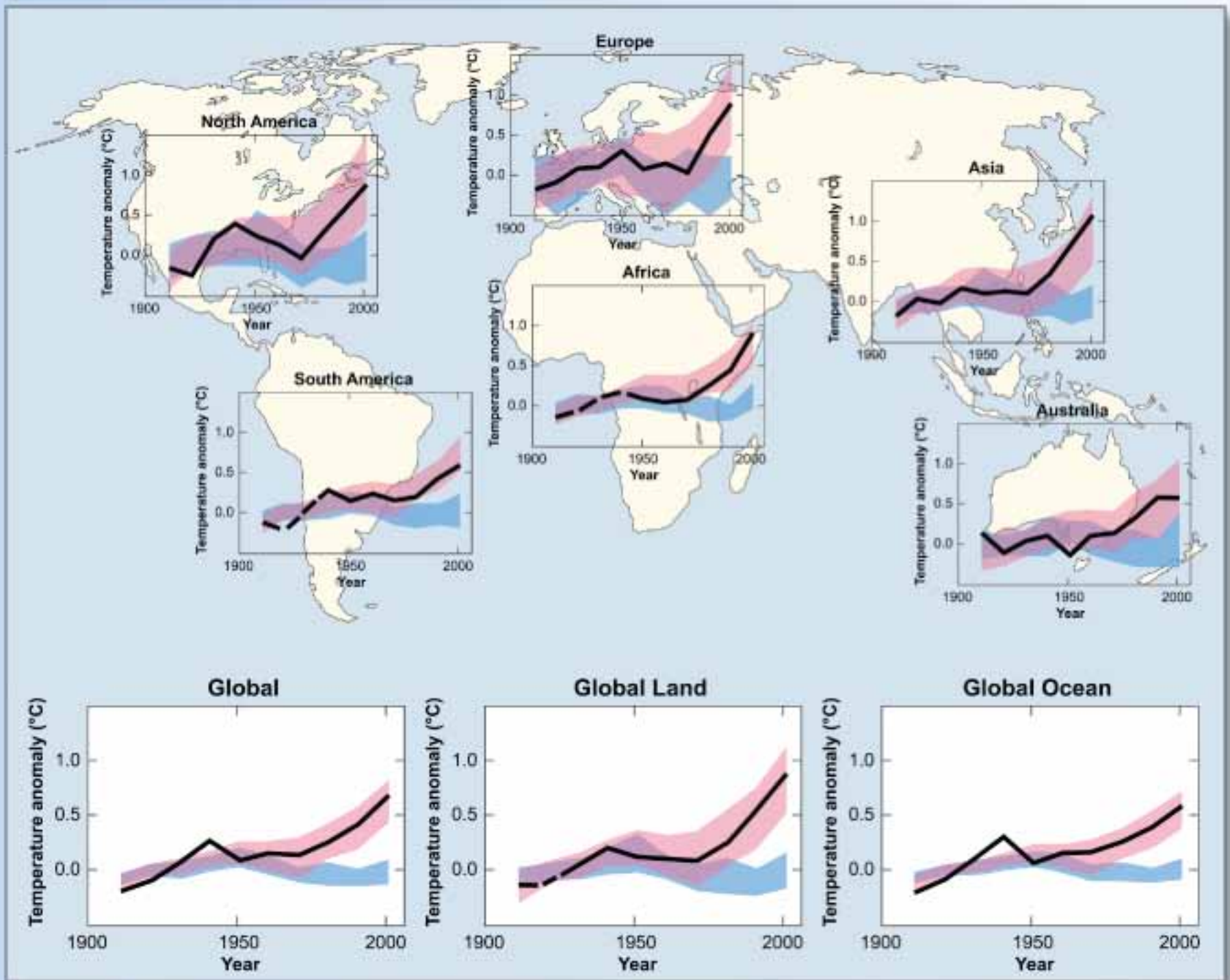












models using only natural forcings

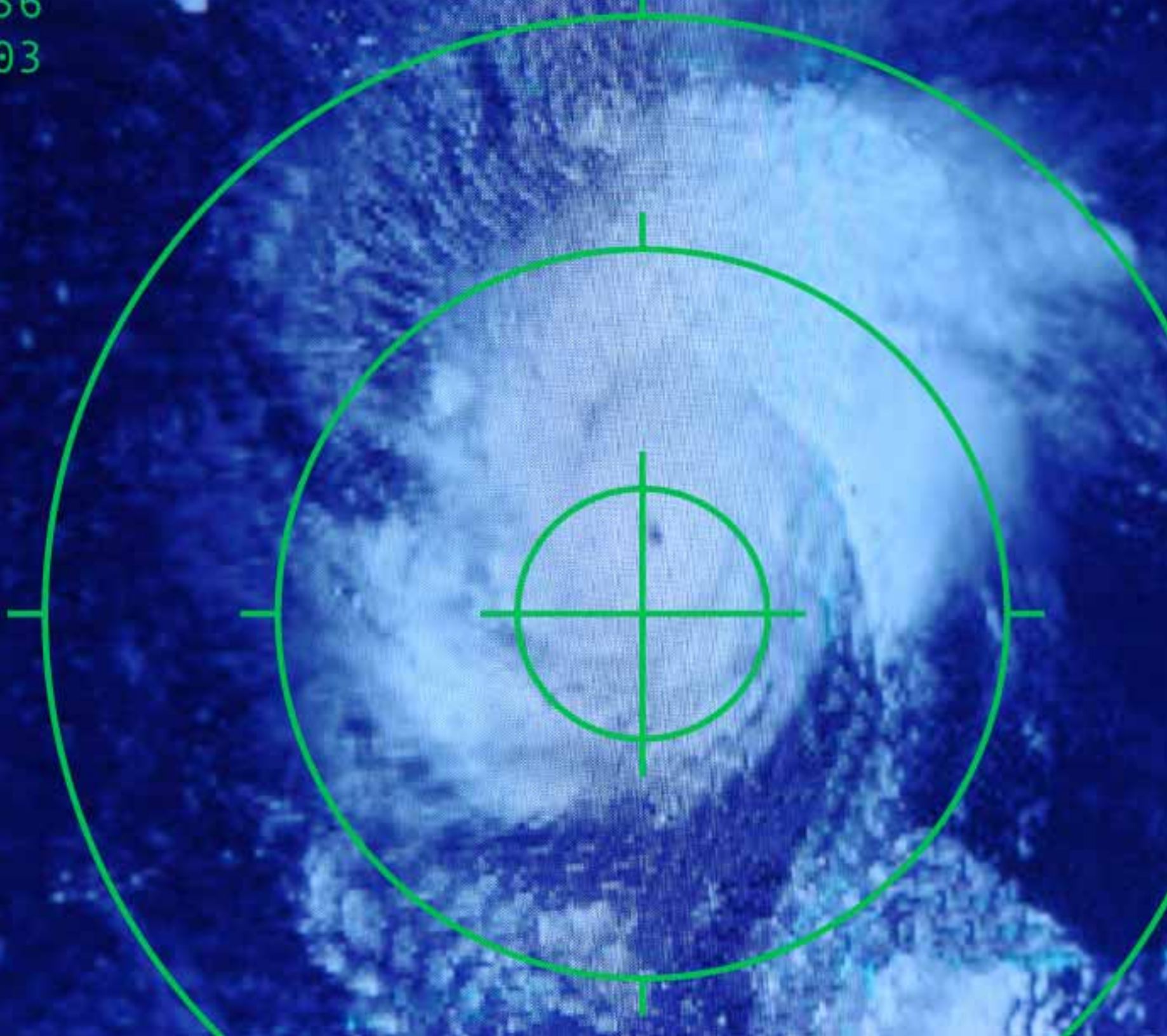
— observations







07.24.56  
09.11.03



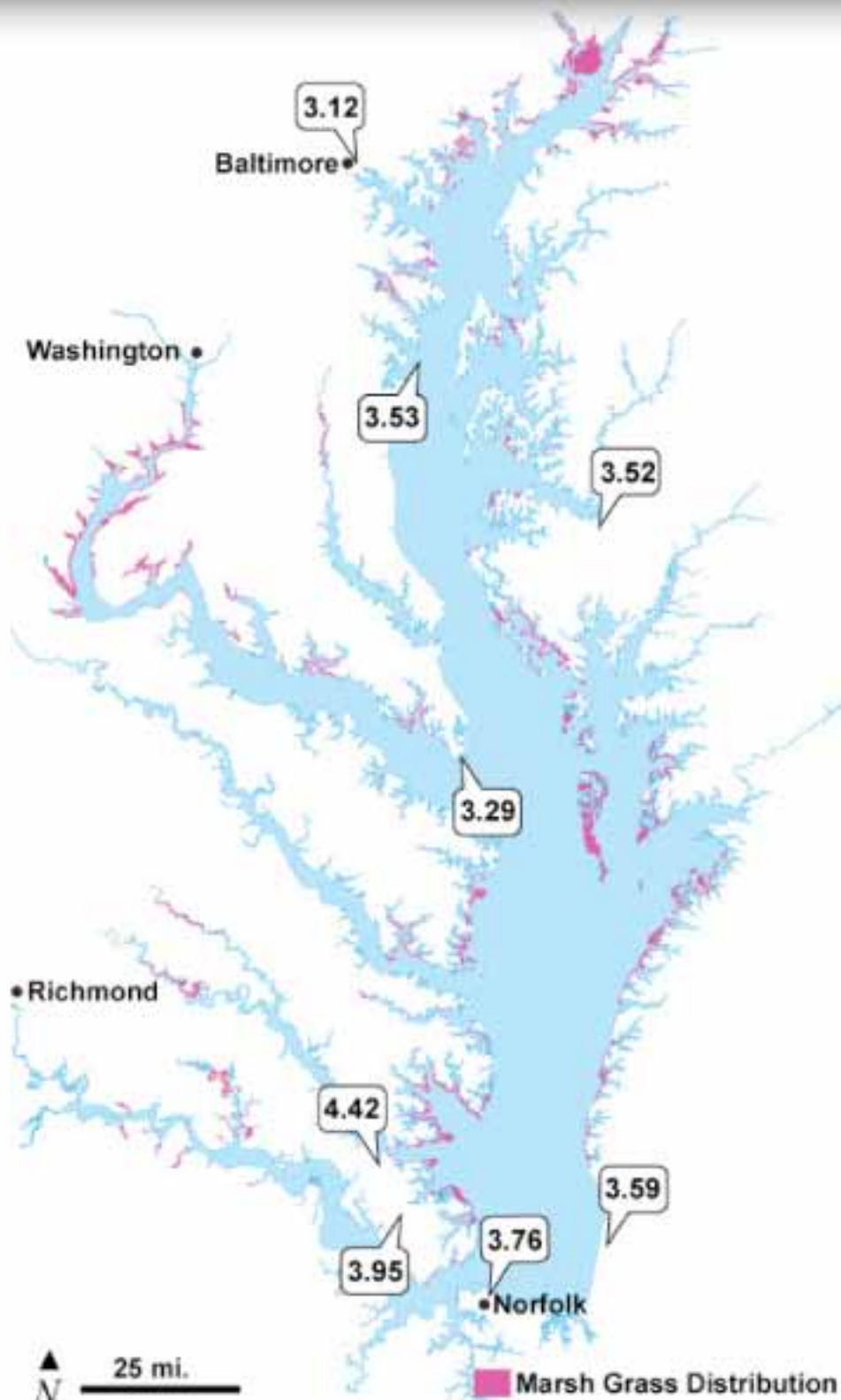
























































Winchester, VA

Fredericksburg

Richmond

Petersburg

Williamsburg

Hampton

Newport News

Portsmouth

Salisbury

Roanoke City

Chesapeake

Oranoke

York County

York

Gloucester

Stafford

Stafford

Stafford

Stafford

Stafford

Stafford

Stafford

Stafford

Stafford

Stafford

Stafford

Stafford

Stafford

Stafford

Stafford

Stafford



# Sea Level Rise







# Sea Level Rise



More frequent intense  
storms and storm sur



A satellite-style map of the Chesapeake Bay region in the United States, showing the bay and surrounding land. Three circular insets are overlaid on the map: a wave crashing, a dark storm cloud with lightning, and a person standing in heavy rain. The text 'Sea Level Rise' is centered over the upper part of the bay.

**Sea Level Rise**

**More frequent intense  
storms and storm sur**

**Shifts in familiar rainfall  
and temperature patterns**





---

# Sea Level Rise

---





## **Sea Level Rise**

Coastal land is subsiding





## Sea Level Rise

Coastal land is subsiding

Low lying areas are inundated





## **Sea Level Rise**

Coastal land is subsiding

Low lying areas are inundated

Water table is rising





**the Frequent Intense Storms and Storm Surges**





## **the Frequent Intense Storms and Storm Surges**

Rivers overflowing their banks



## **More Frequent Intense Storms and Storm Surges**

Rivers overflowing their banks

Culverts and drainage overflows





## **More Frequent Intense Storms and Storm Surges**

Rivers overflowing their banks

Culverts and drainage overflows

Disruption of power supplies and  
transportation networks



# Shifting Patterns of Temperature and Rainfa





## Shifting Patterns of Temperature and Rainfall

Less predictable rain-dependant water supplies



## Shifting Patterns of Temperature and Rainfall

Less predictable rain-dependant water supplies

- Unpredictability of non irrigated agriculture





## Shifting Patterns of Temperature and Rainfall

Less predictable rain-dependant water supplies

- Unpredictability of non irrigated agriculture
- Difficulty ensuring adequate commercial and residential water supplies



## Sea Level Rise

---

- Coastal land is subsiding
- Low lying areas are inundated
- Water table is rising



## More Frequent Intense Storms and Storm S

---

- Rivers overflowing their banks
- Culverts and drainage overflows
- Disruption of power supplies and transportation networks



## Shifting Patterns of Temperature and Rainfa

---

- Less predictable rain-dependant water supplies
  - Unpredictablility of non irrigated agriculture
  - Difficulty ensuring adequate commercial and residential water s







● **Natural Resources**



● **Cultural Resources**



● **Economic Resources**

● **Community Infrastructure**







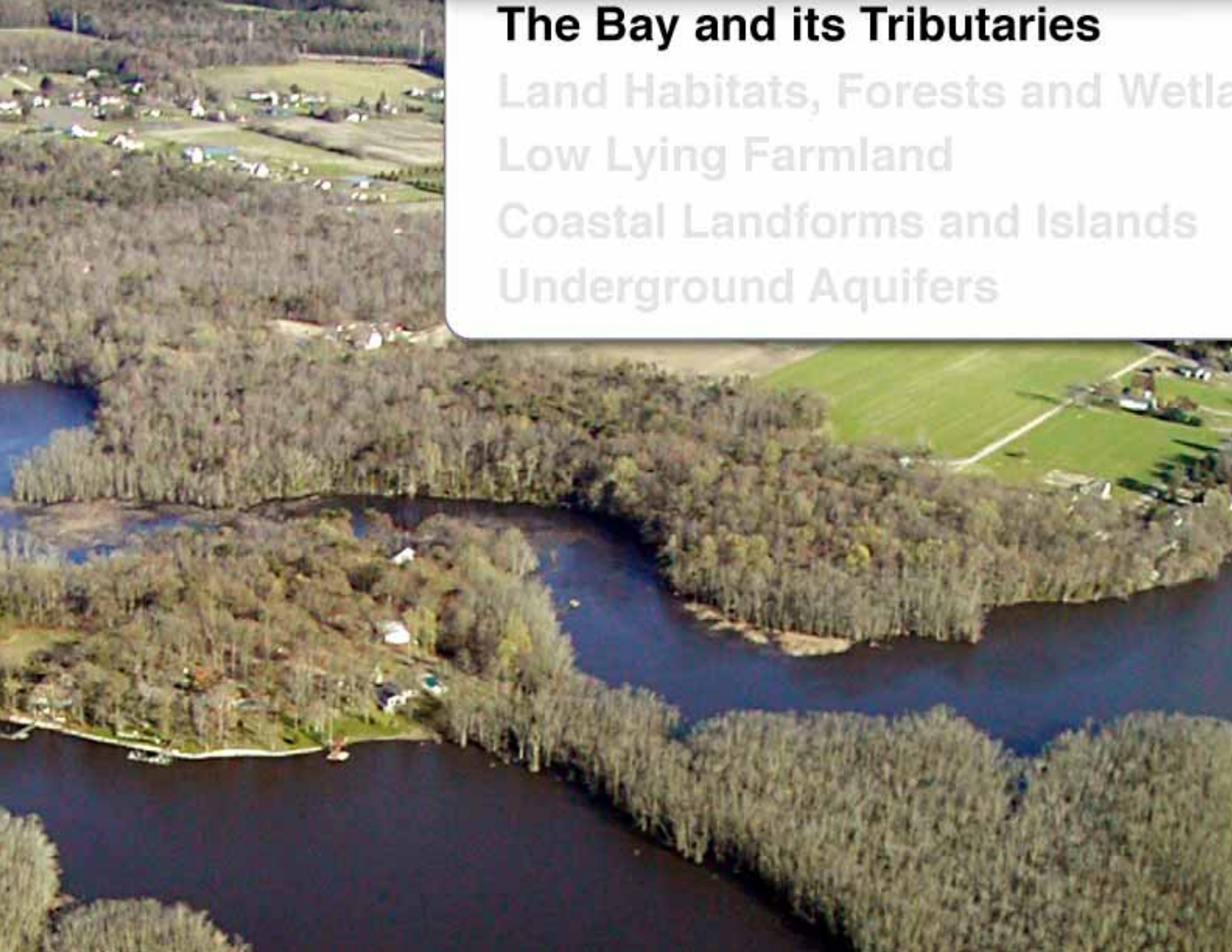
# The Bay and its Tributaries

Land Habitats, Forests and Wetlands

Low Lying Farmland

Coastal Landforms and Islands

Underground Aquifers





The Bay and its Tributaries

**Land Habitats, Forests and Wetlands**

Low Lying Farmland

Coastal Landforms and Islands

Underground Aquifers





The Bay and its Tributaries

Land Habitats, Forests and Wetlands

**Low Lying Farmland**

Coastal Landforms and Islands

Underground Aquifers





The Bay and its Tributaries

Land Habitats, Forests and Wetlands

Low Lying Farmland

**Coastal Landforms and Islands**

Underground Aquifers





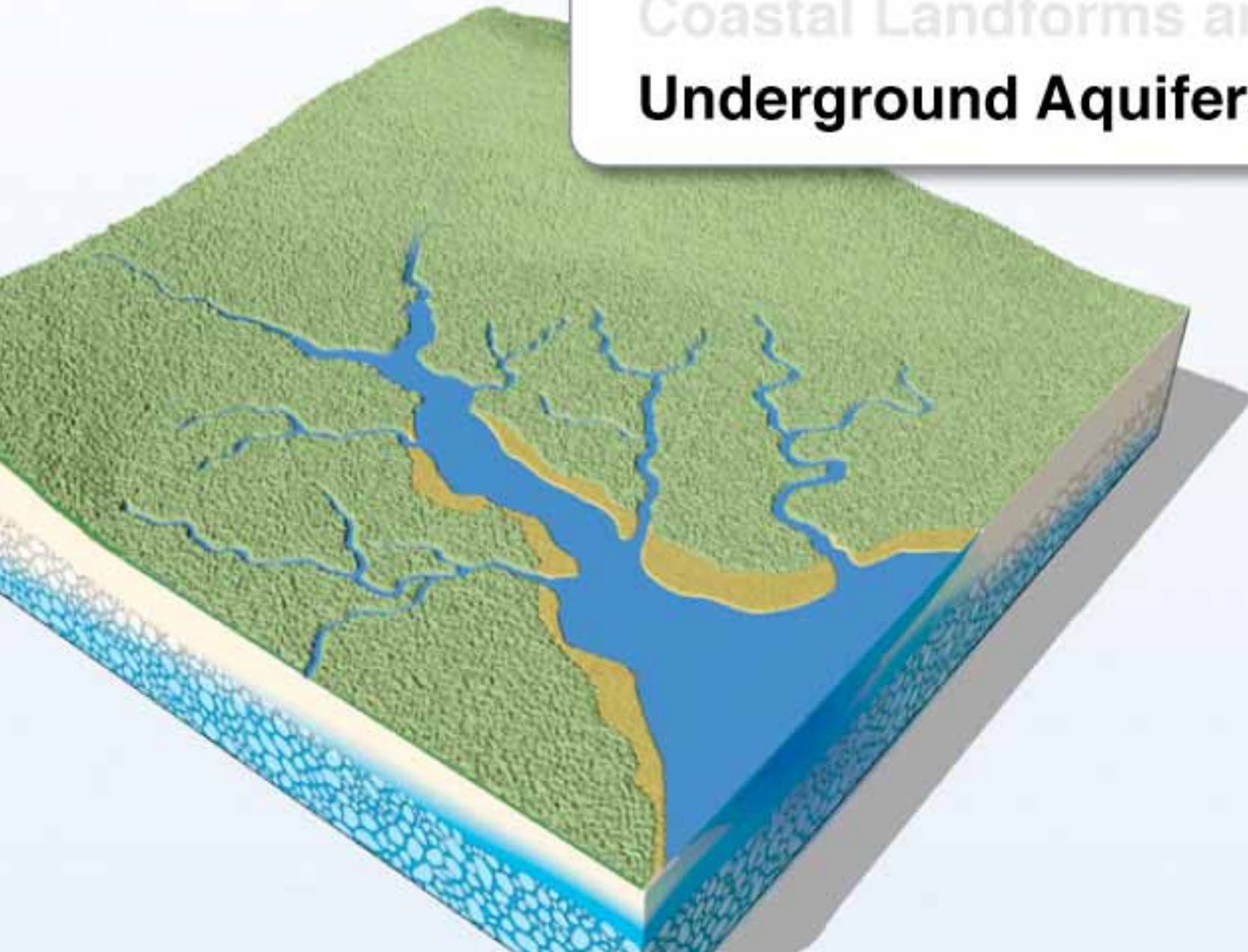
The Bay and its Tributaries

Land Habitats, Forests and Wetlands

Low Lying Farmland

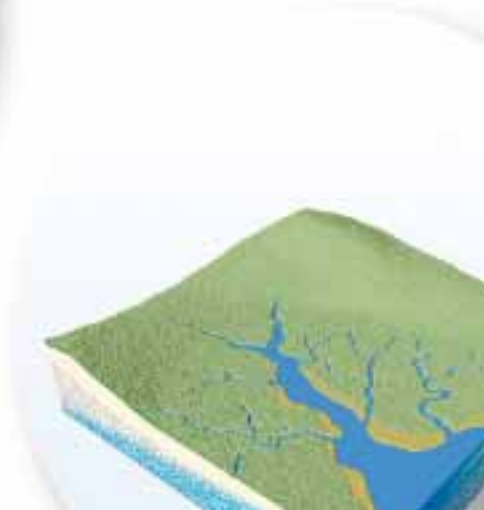
Coastal Landforms and Islands

**Underground Aquifers**





**The Bay and its Tributaries**  
**Land Habitats, Forests and Wetlands**  
**Low Lying Farmland**  
**Coastal Landforms and Islands**  
**Underground Aquifers**



# Chesapeake Bay Vulnerability to Sea Level Rise



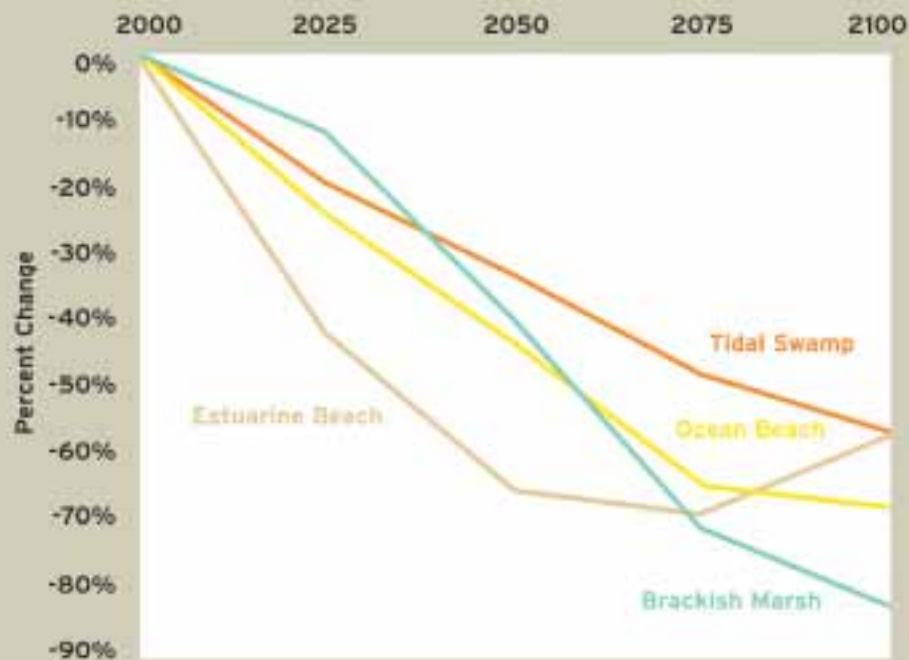




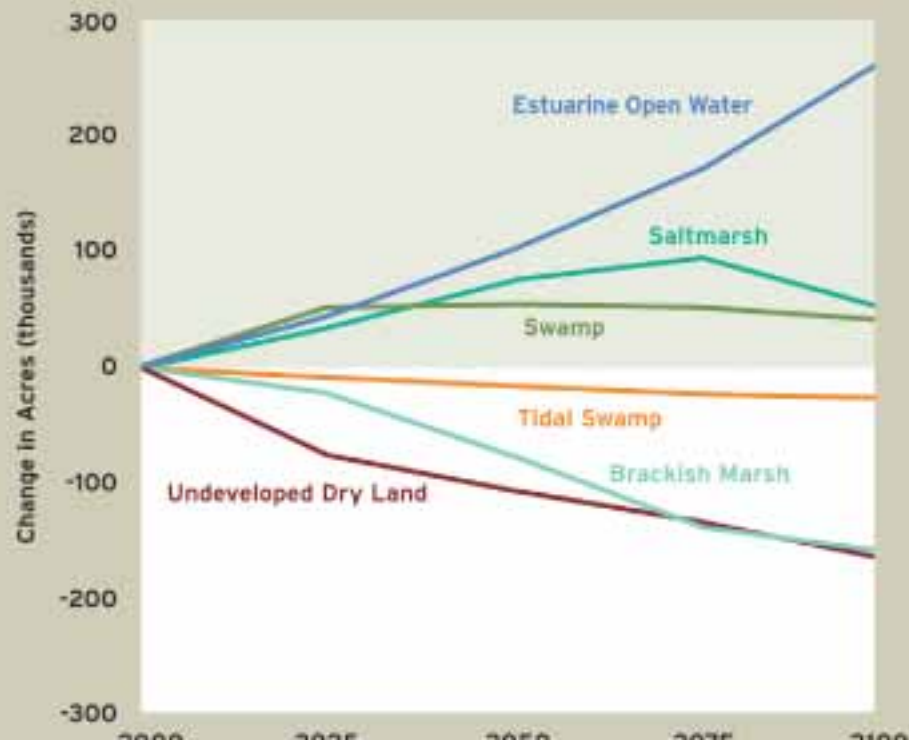








Habitat types in the Chesapeake Bay region projected to lose over 50 percent of their area by 2100 with a 27.2-inch rise in global sea level. Results are shown for the entire study area.



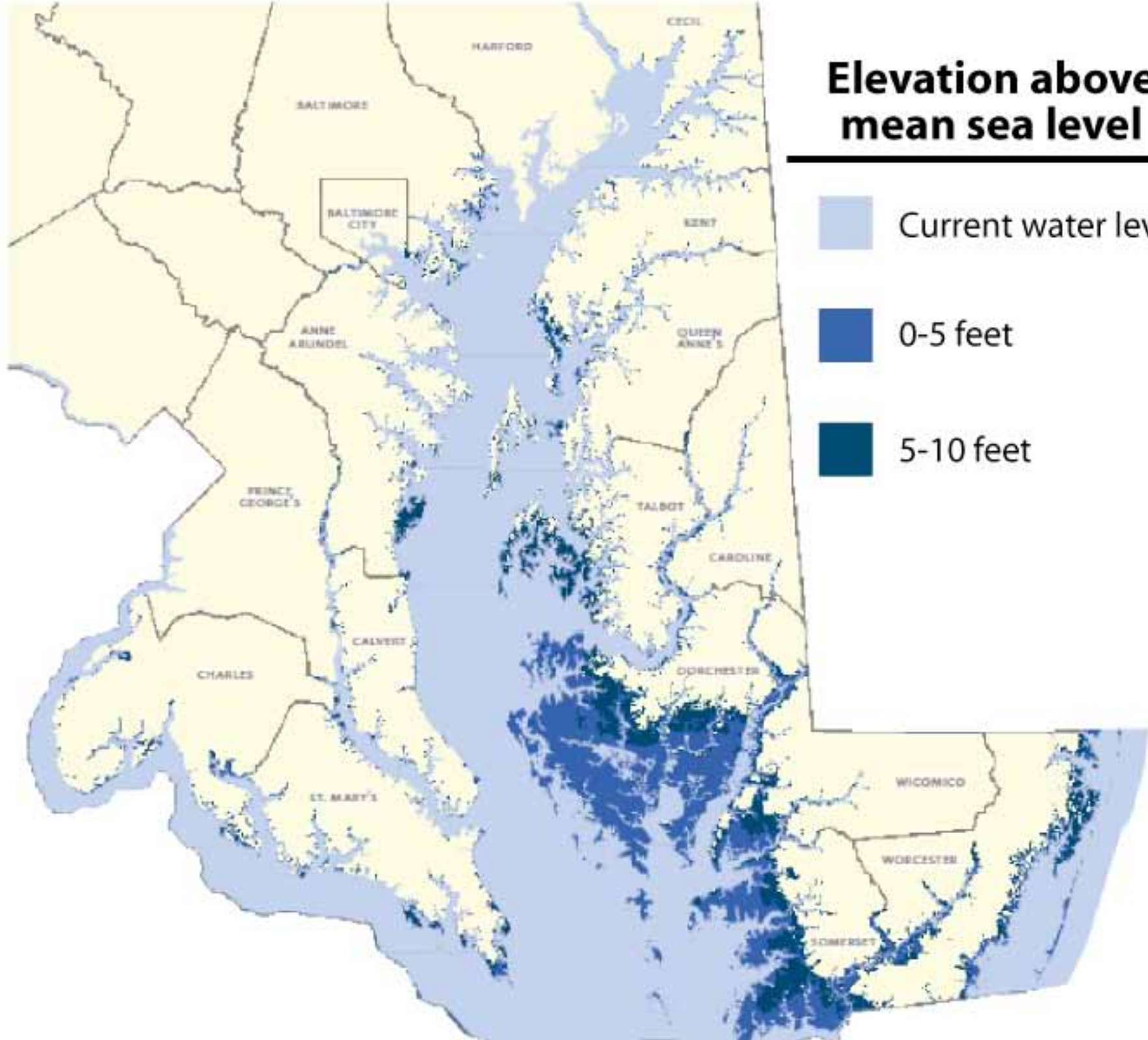
Habitat types in the Chesapeake Bay region projected to experience the largest changes in overall area due to a 27.2-inch increase in global sea level. Results are shown for the entire study area.





# Elevation above mean sea level

- Current water level
- 0-5 feet
- 5-10 feet









... will change  
blackish wetlands



to salt marsh

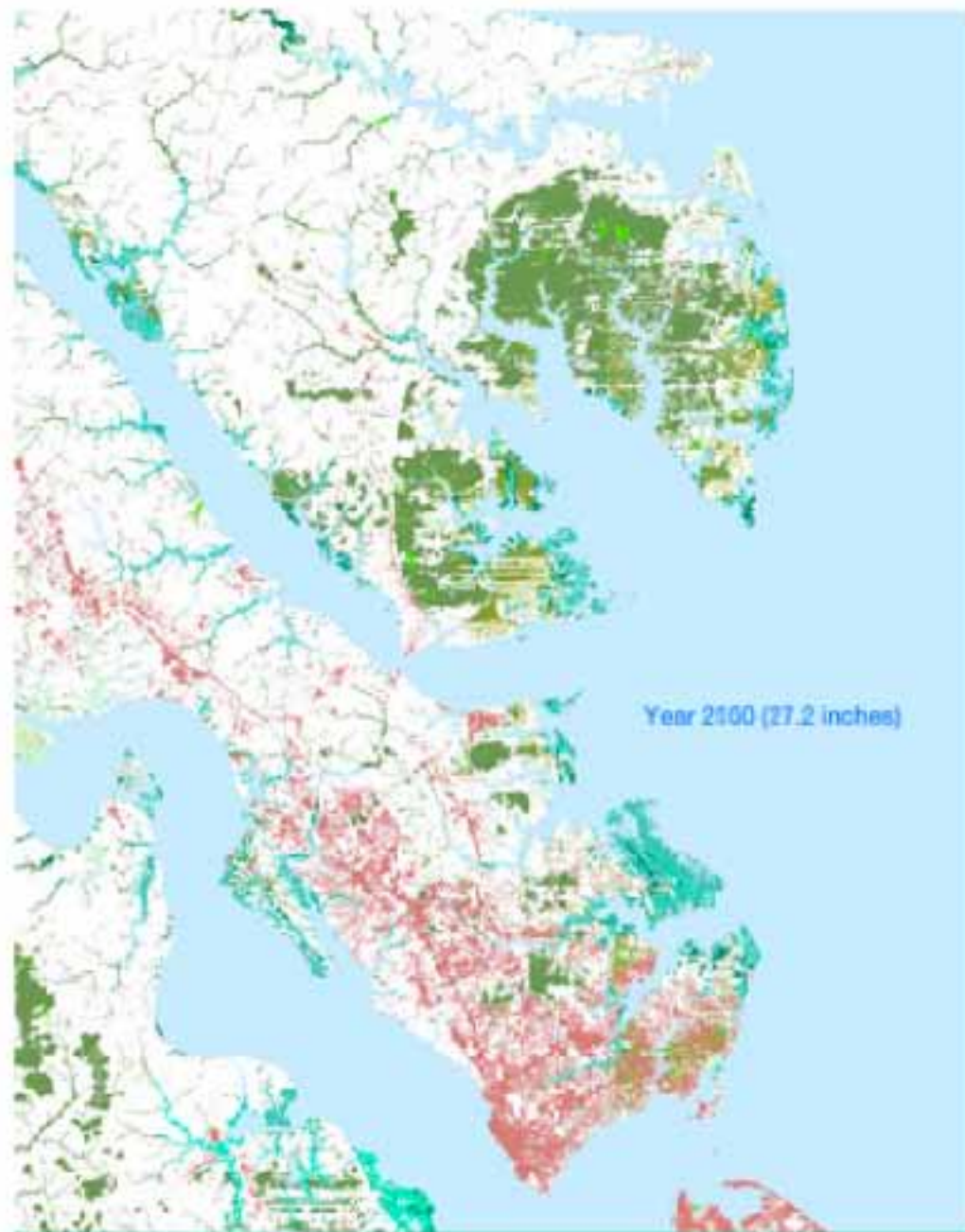


and make parts of rivers saltier









Year 2100 (27.2 inches)

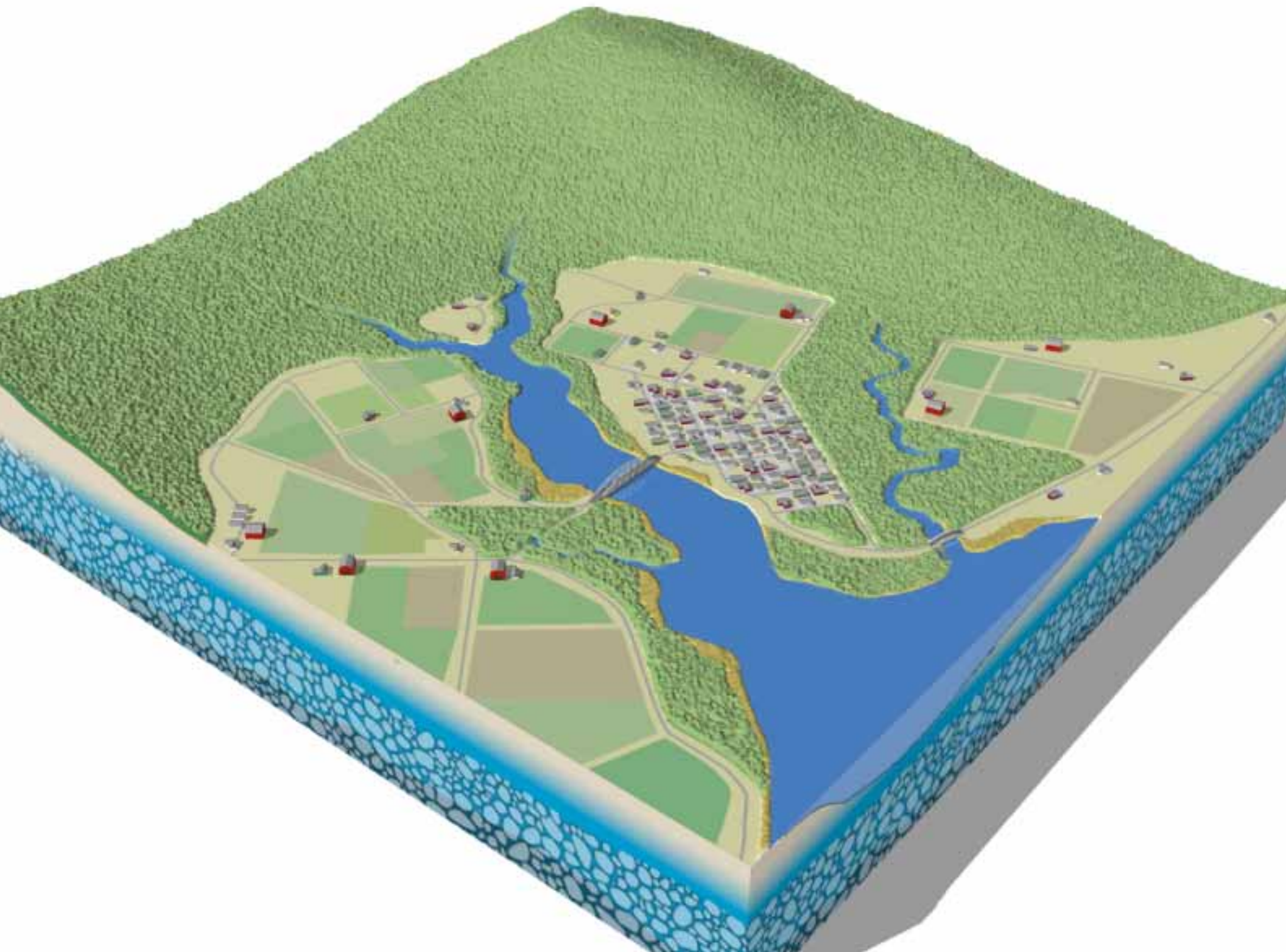
### Upper Tidewater Region

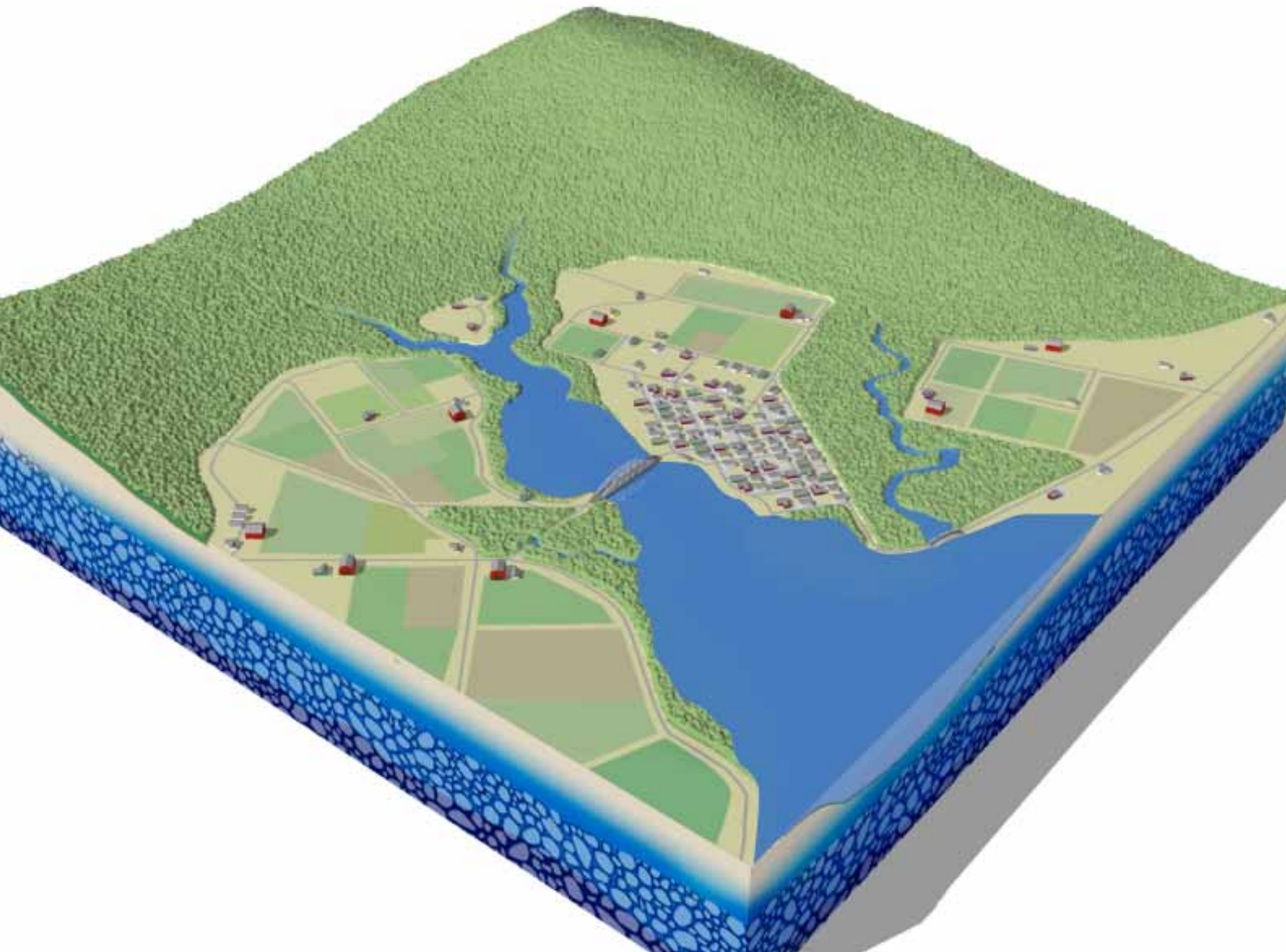
- View Initial Condition
- View 50 Years

- View 100 Years
- Display Animation













## Sea Level Rise

---

- More sdsjkf fg askj adlkjf as scklfgj weov, kdj
- Frequent djgdak g djgk kdflj dk a dkhgf



## More Frequent Intense Storms and Storm S

---

- Rivers overflowing their banks
- Culverts and drainage overflows
- Disruption of power supplies and transportation networks



## Shifting Patterns of Temperature and Rainfa

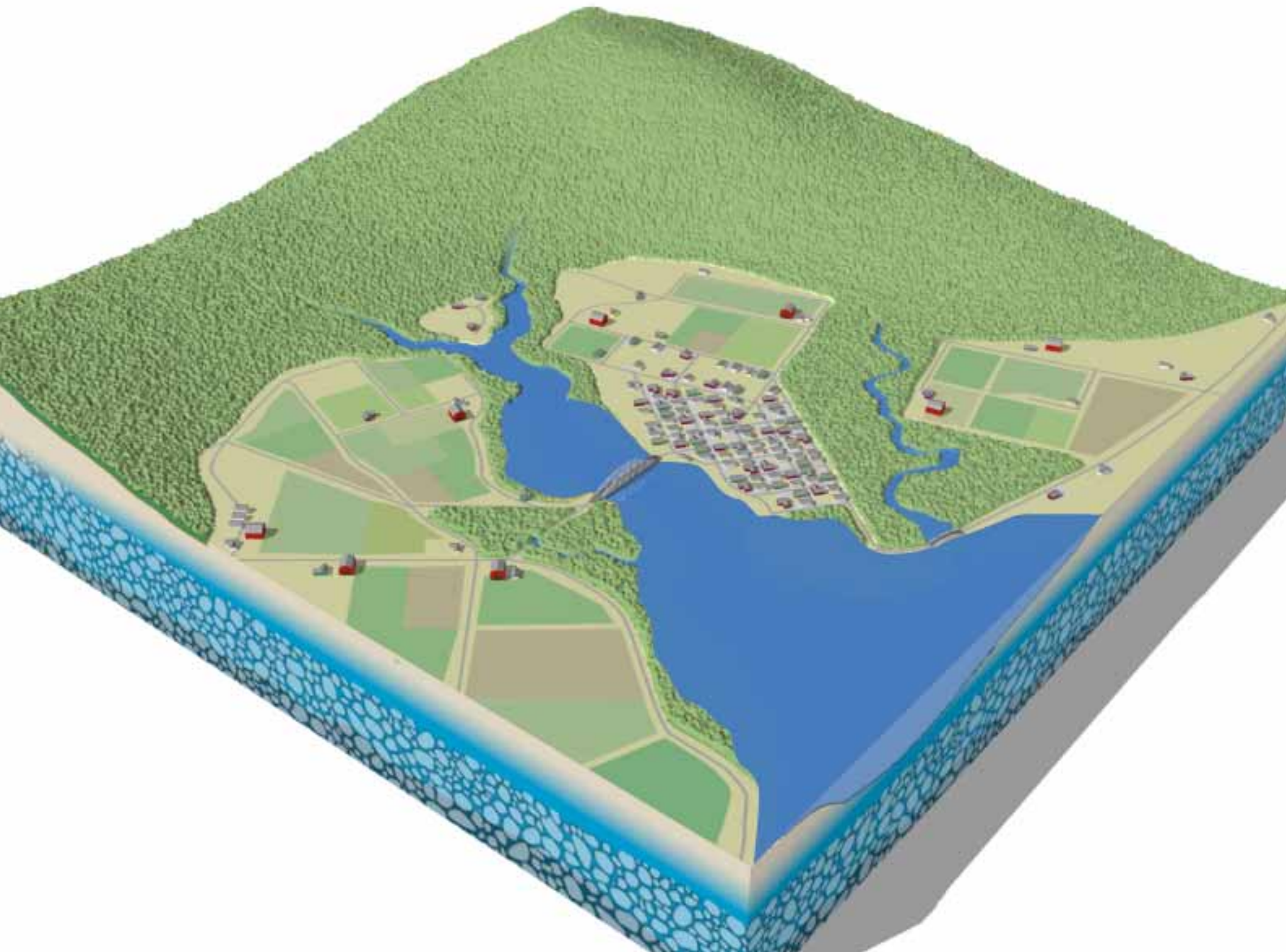
---

- Less predictable rain-dependant water supplies
  - Unpredictablility of non irrigated agriculture
  - Difficulty ensuring adequate commercial and residential water supplies

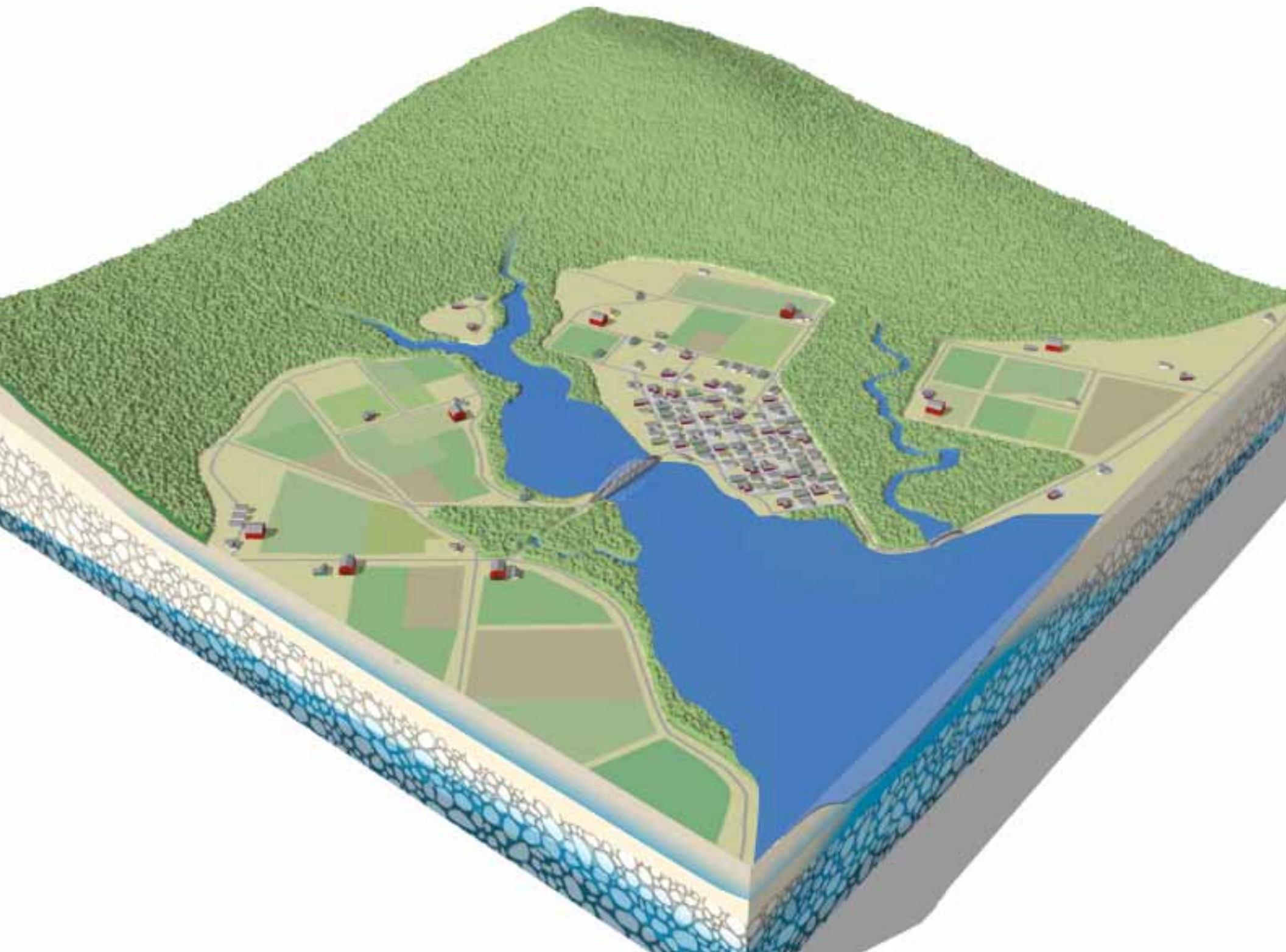




















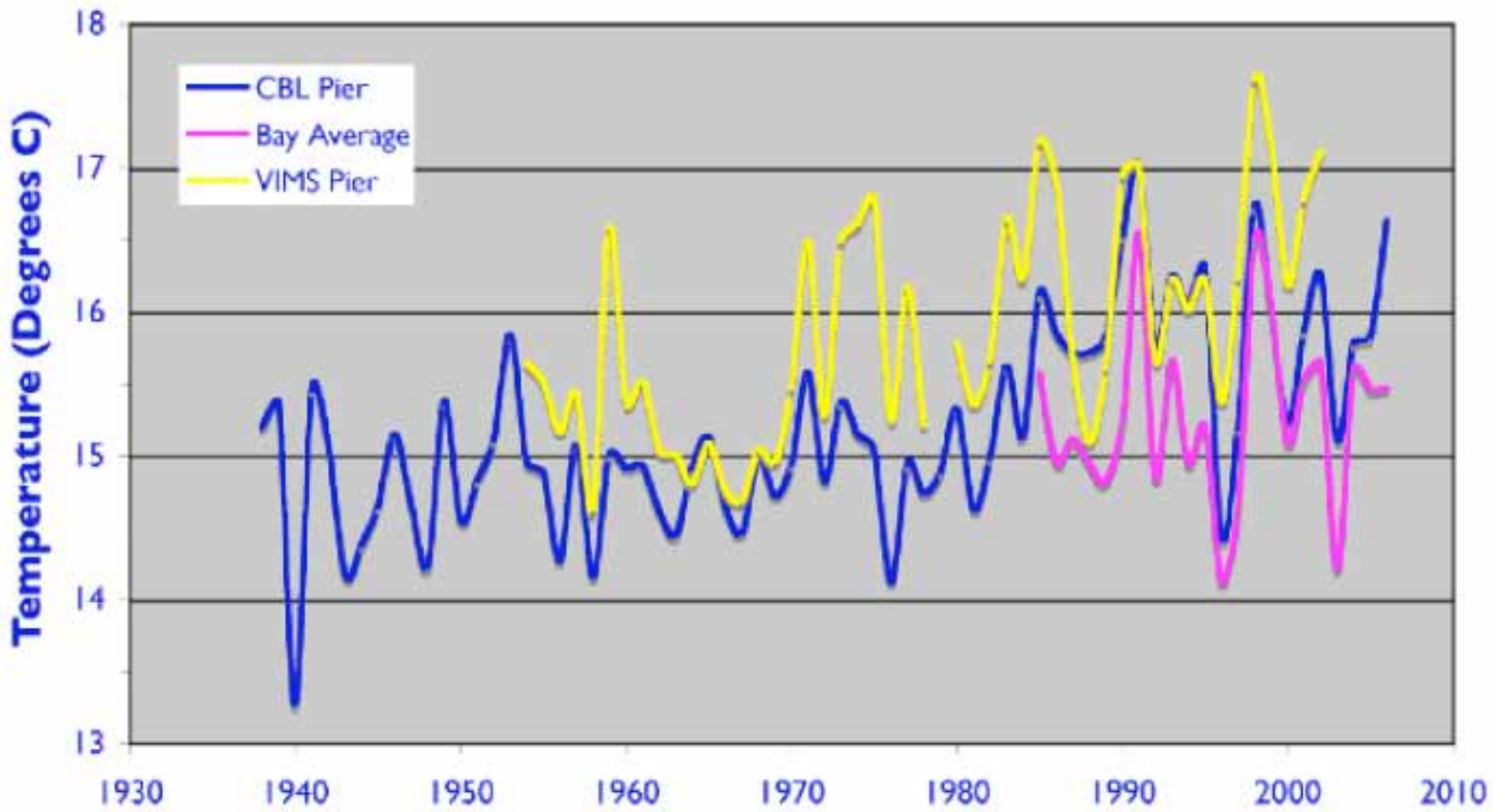




















**OYSTERS**



**CRABS**



**STRIPED  
BASS**



**CLAMS**

























































**ROAD  
CLOSED**





































## ● Natural Resources



## ● Cultural Resources



## ● Local Economies



## ● Infrastructure







FIRE DEPT.













FJ15526772A  
J10



THIS NOTE IS LEGAL TENDER FOR ALL DEBTS, PUBLIC AND PRIVATE  
*Benjamin Franklin*



ONE HUNDRED DOLLARS





























**GOING OUT OF  
BUSINESS!**



# Insurance Policy













# Endemic Aquatic Species



Spooker



Summer Flounder



Blue Crabs



Striped Bass



Soft Cl











Minimum Wage















**Lay the Foundation For Your Effort**

**Assess Your Resources**

**Develop an Action Plan**

# **Lay the Foundation For Your Effort**

- **Assemble a team to guide your efforts**



# **Lay the Foundation For Your Effort**

- **Assemble a team to guide your efforts**
- **Inventory Community Resources**

# **Lay the Foundation For Your Effort**

- **Assemble a team to guide your efforts**
- **Inventory Community Resources**
- **Build Community Support**



# Lay the Foundation For Your Effort

- Assemble a team to guide your efforts
- Inventory Community Resources
- Build Community Support



# Lay the Foundation For Your Effort

- Assemble a team to guide your efforts
- Inventory Community Resources
- Build Community Support

## Products

- Resource Inventory
- Outlets for Public Communication
- Citizen Advisory Group



# Assess Your Resources

The background of the slide is a photograph of a bright blue sky filled with soft, white, wispy clouds. At the bottom of the image, there is a horizontal line of trees with foliage in shades of orange, yellow, and green, suggesting an autumn setting. The text 'Assess Your Resources' is overlaid on the upper left portion of the sky in a bold, dark blue font.

# **Assess Your Resources**

- **Vulnerability Assessment**



# Assess Your Resources

- Vulnerability Assessment



# Assess Your Resources

- Vulnerability Assessment





# Assess Your Resources

## ● Vulnerability Assessment

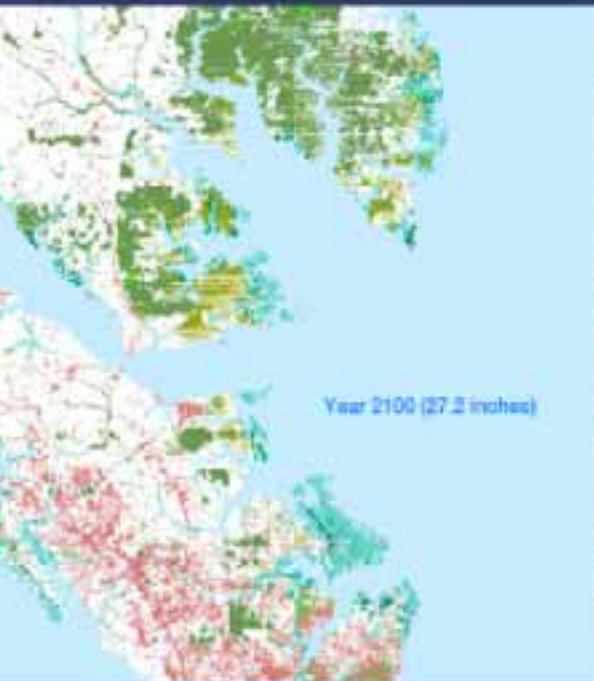








# VULNERABILITY ASSESSMENT 2009



Year 2100 (27.2 inches)

Coastal Regional Assessment







VULNERABILITY

ASSESSMENT

RISK  
ASSESSMENT 2009



Atlantic Region



# ● Resource Sensitivity

VULNERABILITY

ASSESSMENT

RISK  
ASSESSMENT 2009



Atlantic Region

# Resource Sensitivity

## Location

VULNERABILITY

ASSESSMENT

RISK  
ASSESSMENT 2009



Atlantic Region



# Resource Sensitivity

## Location

VULNERABILITY

ASSESSMENT

RISK  
ASSESSMENT 2009



# Resource Sensitivity

## Location

VULNERABILITY

ASSESSMENT

RISK  
ASSESSMENT 2009





# Resource Sensitivity

## Location

VULNERABILITY

ASSESSMENT

RISK  
ASSESSMENT 2009



# Resource Sensitivity

## Location

VULNERABILITY

ASSESSMENT

RISK  
ASSESSMENT 2009



Atlantic Region



# ● Resource Sensitivity

● Location

● Ecological Options for Natural Systems

VULNERABILITY

ASSESSMENT

RISK  
ASSESSMENT 2009



# ● Resource Sensitivity

● Location

● Ecological Options for Natural Systems

● Resource Responses - Positive or Negative

VULNERABILITY

ASSESSMENT

RISK  
ASSESSMENT 2009



Atlantic Region































# CHESAPEAKE BAY

*Health & Restoration Assessment*

**Integrating Build-Out Analysis and  
Quality Modeling to Predict the Environmental  
Impacts of Alternative Development**

CBRTWS 2007P  
EPA 600/R-07-004

## A Comprehensive List of Chesapeake Bay Basin Species 2007



Chesapeake Bay Program  
*A Watershed Partnership*

Chesapeake Bay Program  
August 2007

Chesapeake Bay Program

1996



Chesapeake Bay Program



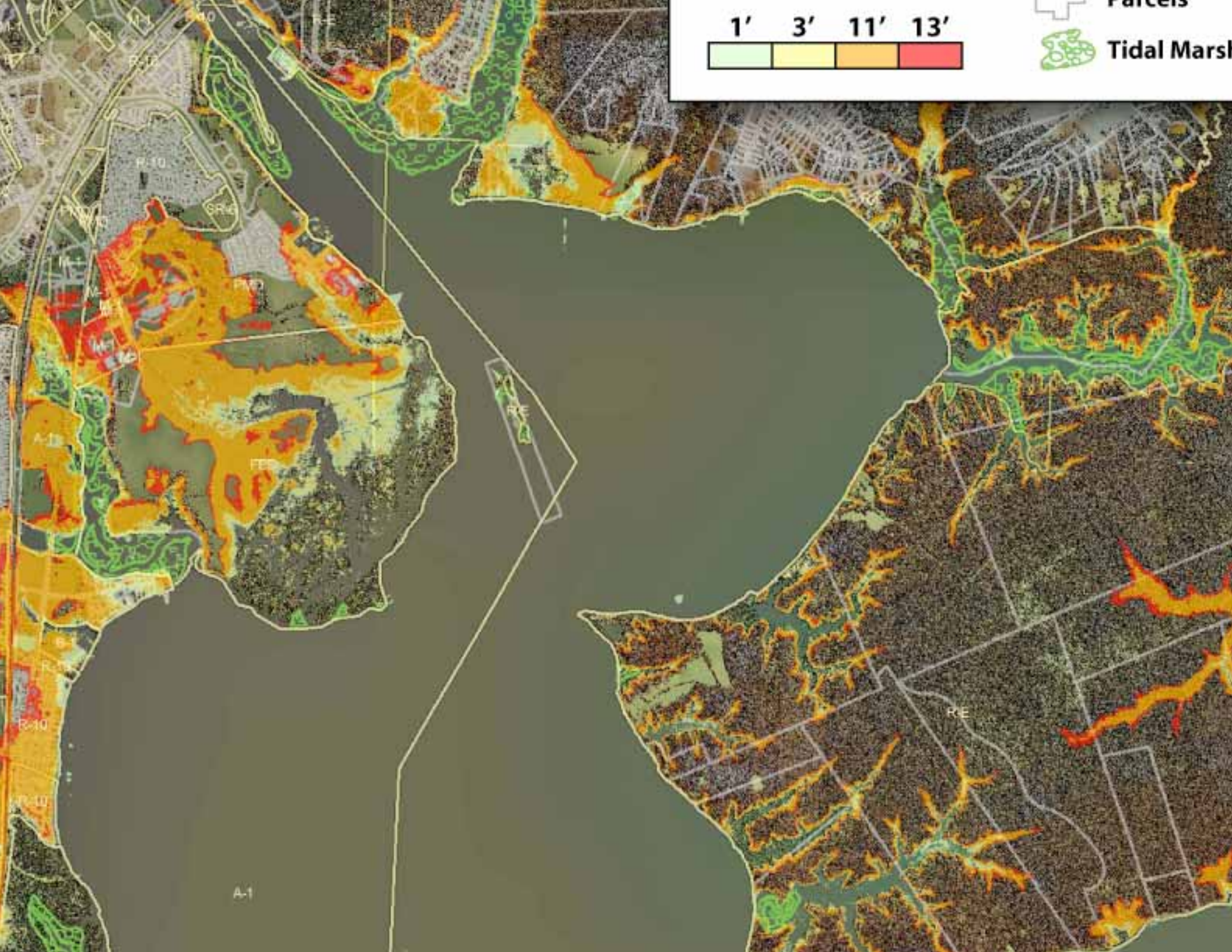




**McNABBY OYSTER CO.**  
*Home of the ANNAPOLIS MARITIME MUSEUM*

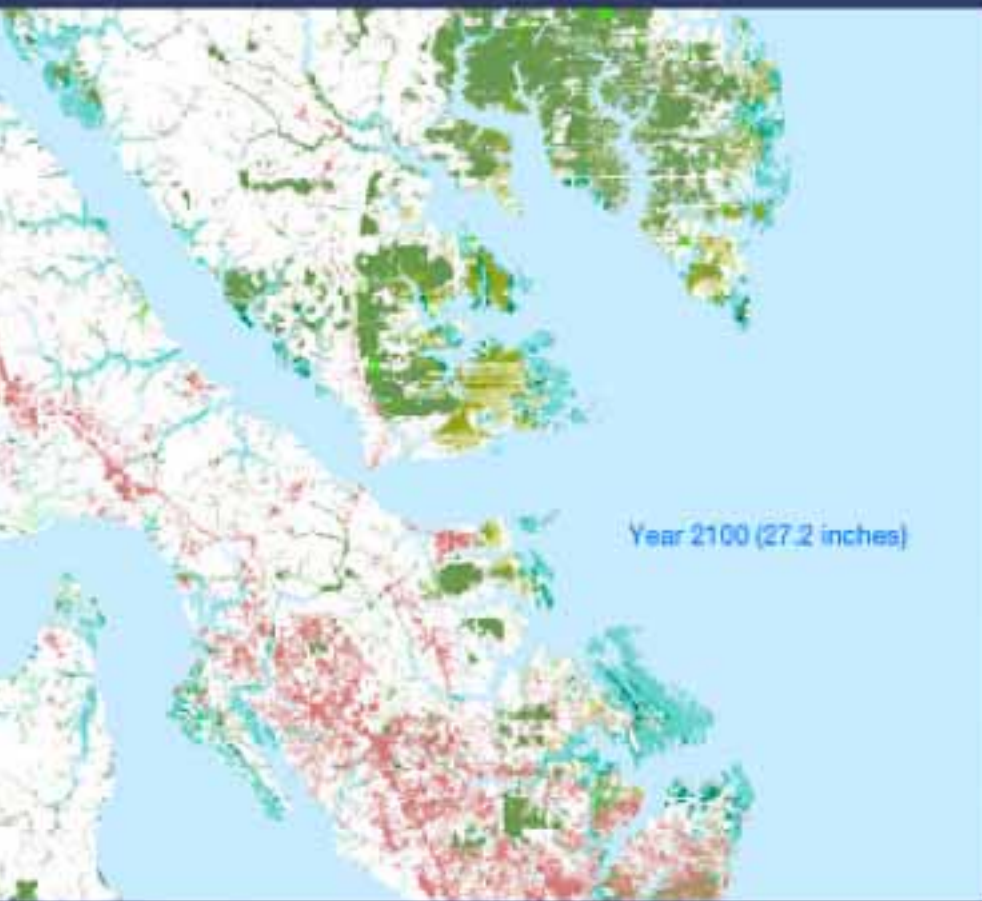








# VULNERABILITY ASSESSMENT 2009



Mid Atlantic Regional Assessment

# RISK ASSESSMENT 2009



Mid Atlantic Regional Assessment





# Develop an Action Plan

The background of the slide is a photograph of a bright blue sky filled with soft, white, wispy clouds. At the bottom of the image, there is a horizontal line of trees with foliage in shades of orange, yellow, and green, suggesting an autumn setting. The text 'Develop an Action Plan' is overlaid on the upper left portion of the sky.



# **Develop an Action Plan**

- **Set Priorities and Goals**

# Develop an Action Plan

- Set Priorities and Goals





# Develop an Action Plan

- Identify Preparedness Options



# Develop an Action Plan







# Elevating Structures





# Elevating Structures





# Elevating Structures Revised Building Codes in Flood Prone Areas





**Elevating Structures**  
**Revised Building Codes**  
**in Flood Prone Areas**





# Elevating Structures Revised Building Codes in Flood Prone Areas





# Elevating Structures

## Revised Building Codes

### Flood Prone Areas









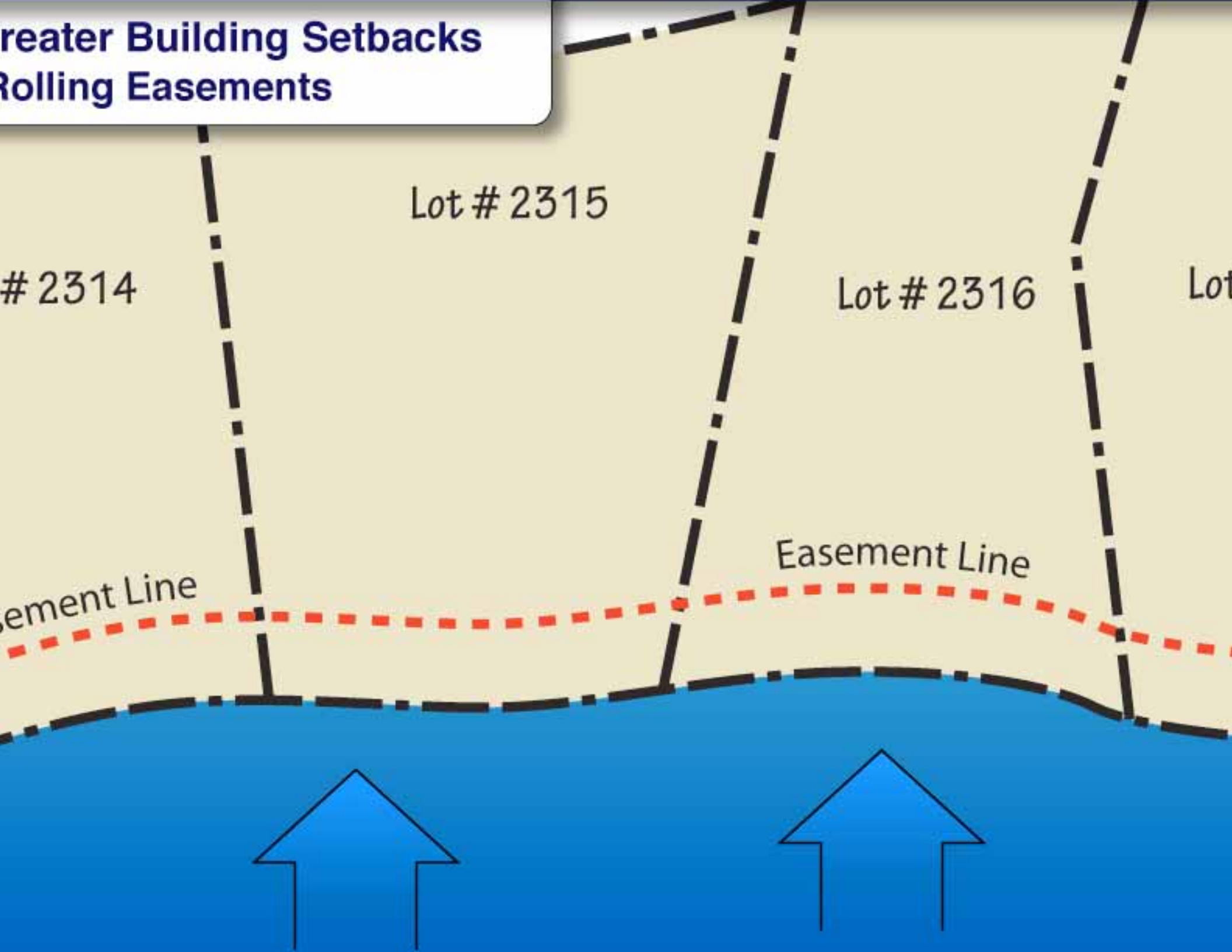


# Greater Building Setbacks





# Greater Building Setbacks Rolling Easements



Lot # 2315

# 2314

Lot # 2316

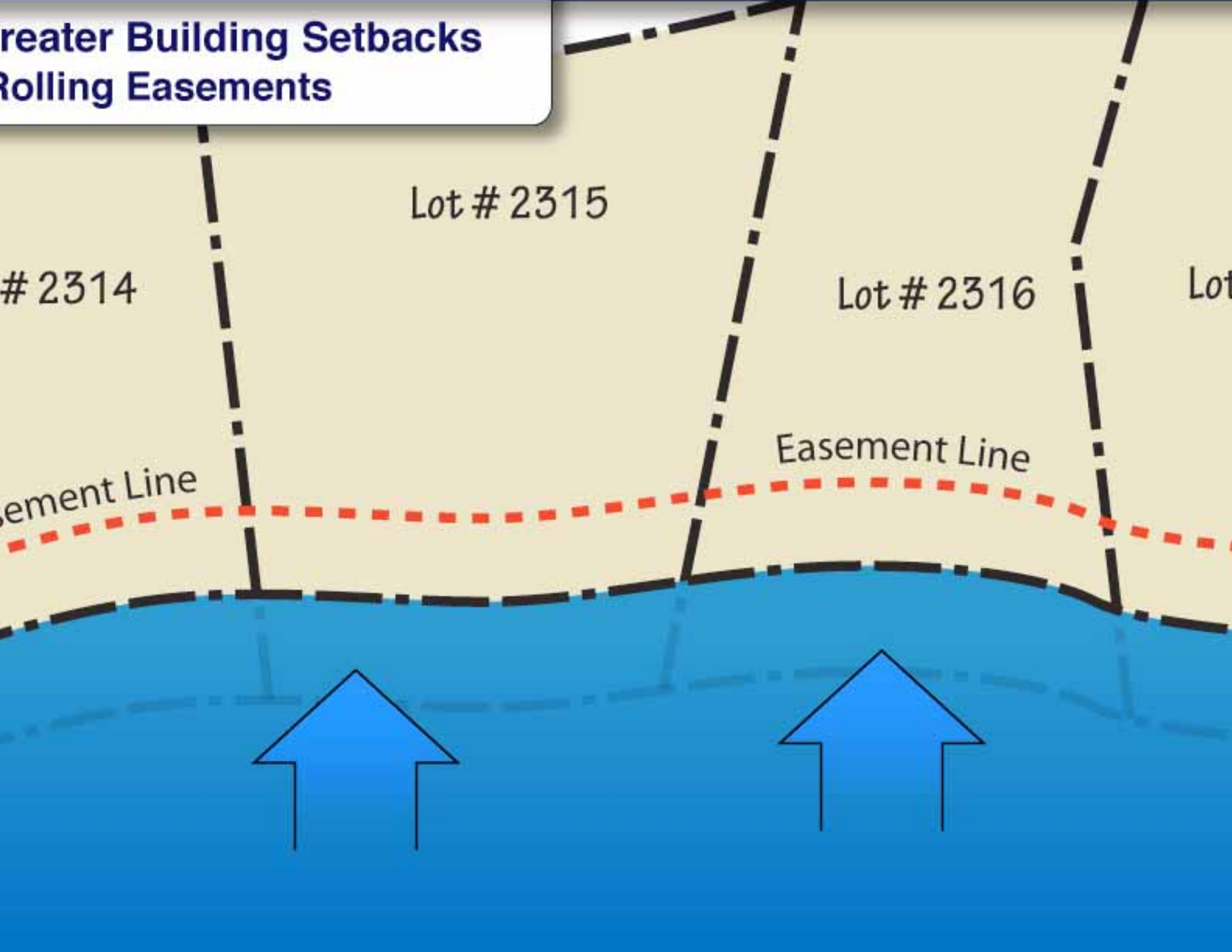
Lot

Easement Line

Easement Line



# Greater Building Setbacks Rolling Easements



Lot # 2315

# 2314

Lot # 2316

Lot

Easement Line

Easement Line











# ard Engineering





# ard Engineering





# ard Engineering





ard Engineering

oft Engineering

Beach Renourishment





**ard Engineering**  
**oft Engineering**  
**Beach Renourishment**





ard Engineering

oft Engineering

Beach Renourishment







**What is the best approach  
for your community?**

Community

# Disaster Preparedness Plan





Community

# Disaster Preparedness Plan

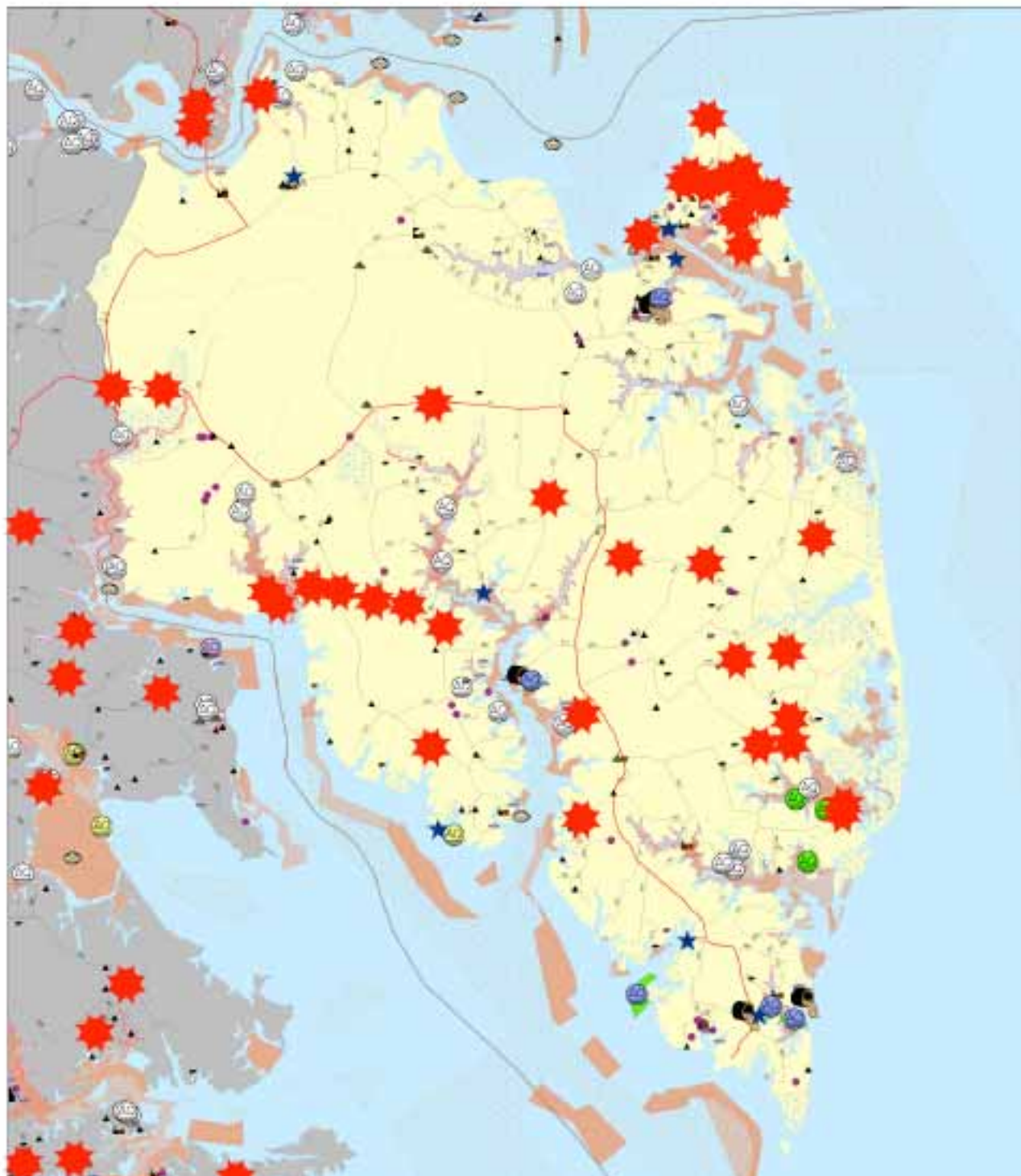


— **Modifications to Zoning  
Planning, and Building Co**









- Legend**
- Aquaculture Sites**
    - Oyster Concessions
    - Oyster Reef Concessions
    - Oyster Shell
    - Oyster Shell
    - Oyster Shell
  - Oyster Reefs**
    - Oyster Reef
  - Boat Ramp (DOF)**
    - Boat Ramp (DOF)
  - Input from Workgroup**
    - NOI Unapproved Structure
    - NOI Water-based Structure
    - Structure
  - Workgroup Oyster Lease
  - NOI Oyster Management Area
  - Whole Oyster Lease Area
  - Boat Ground
  - Condemned Area
  - VDH Impairments
  - Subsiding Activity
  - Annual Prohibitory
  - Interim Use Only Areas
  - Temporary Prohibitory
  - Work of Nature
  - No Facilities
  - Potential Prohibitory
  - Storage Treated Facilities
  - Sanitary Dumpsite


  
 This map was prepared for the Virginia Coastal Zone Workgroup. It is intended to provide a visual summary of the data collected during the field surveys and is not intended to be used for legal or regulatory purposes. The map is a simplified representation of the data and does not show all details. The map is not a scale drawing and is not intended to be used for navigation.


  
 Virginia Coastal Zone

1 Miles
 

Notes:

# City Planning & Zoning







United States  
**Global Change**  
Research Program



**NOAA**  
**Habitat Priority Planner**



Environmental Protection Agency's  
**COASTAL TOOLKIT**

















