Preparing our Wetlands for Tomorrow's High Tide

Recommendations for Adapting to Sea Level Rise in Delaware

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Delaware Wetlands Conference

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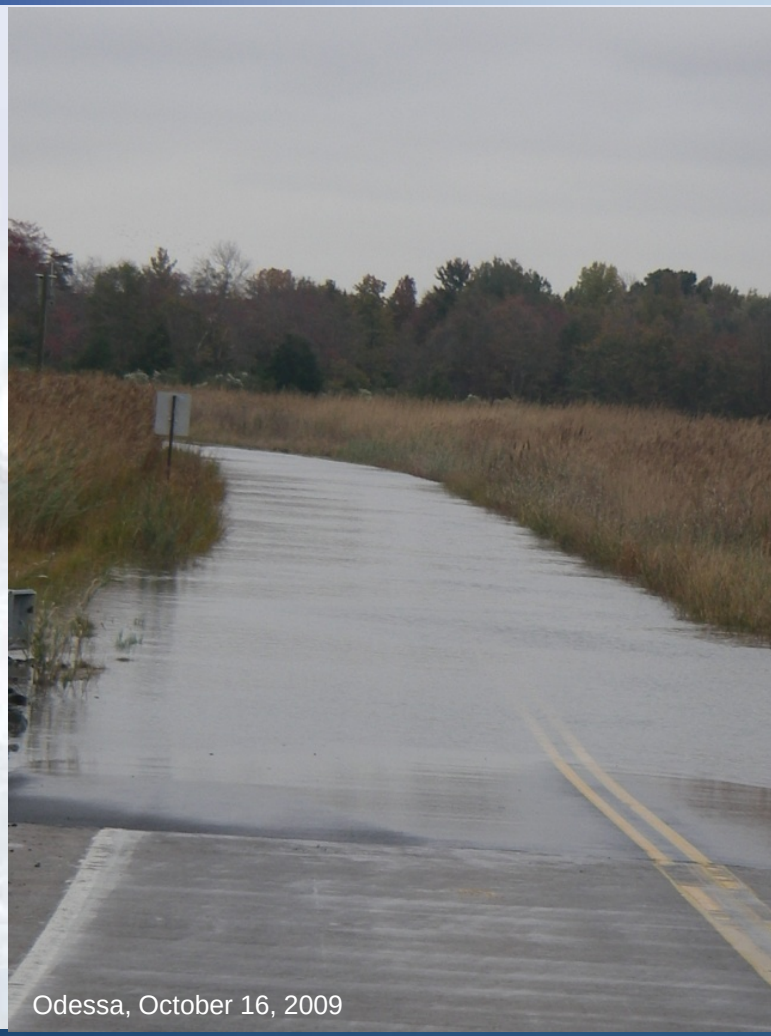
DNREC Delaware Coastal Programs

Sea Level Rise is one of the major impacts of global climate change

- Sea level rise is an increase in average tide height over time as a result of:
  - ✓ Thermal Expansion
  - ✓ Melting of glaciers & ice caps
- Influenced locally by *subsidence*

Potential Impacts of Sea Level Rise

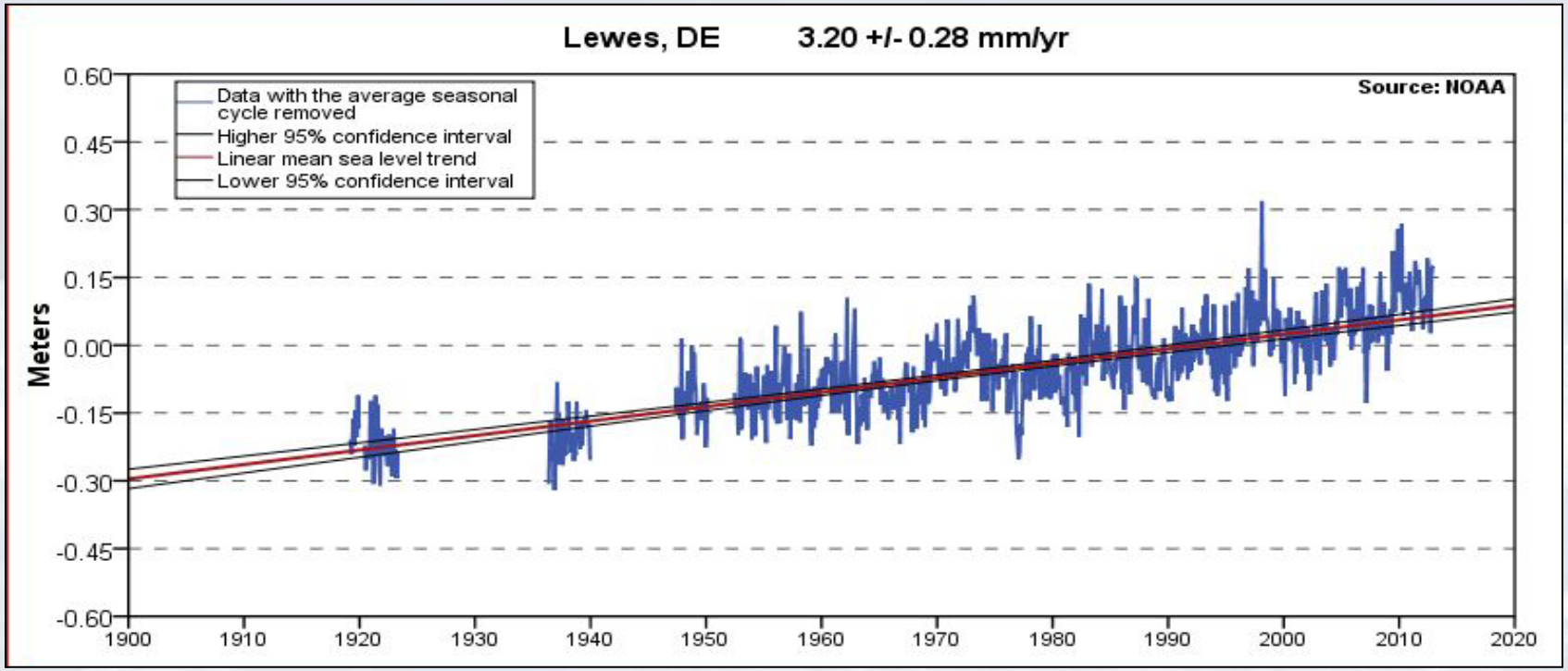
- Increased extent of periodic flooding from storms
- Permanent inundation of coastal areas
  - ✓ Including wetlands
- Saltwater Intrusion
  - ✓ Vegetative and habitat changes
- Rising water tables
  - ✓ More non-tidal wetlands creation?
- Economic & Social Impacts



Odessa, October 16, 2009

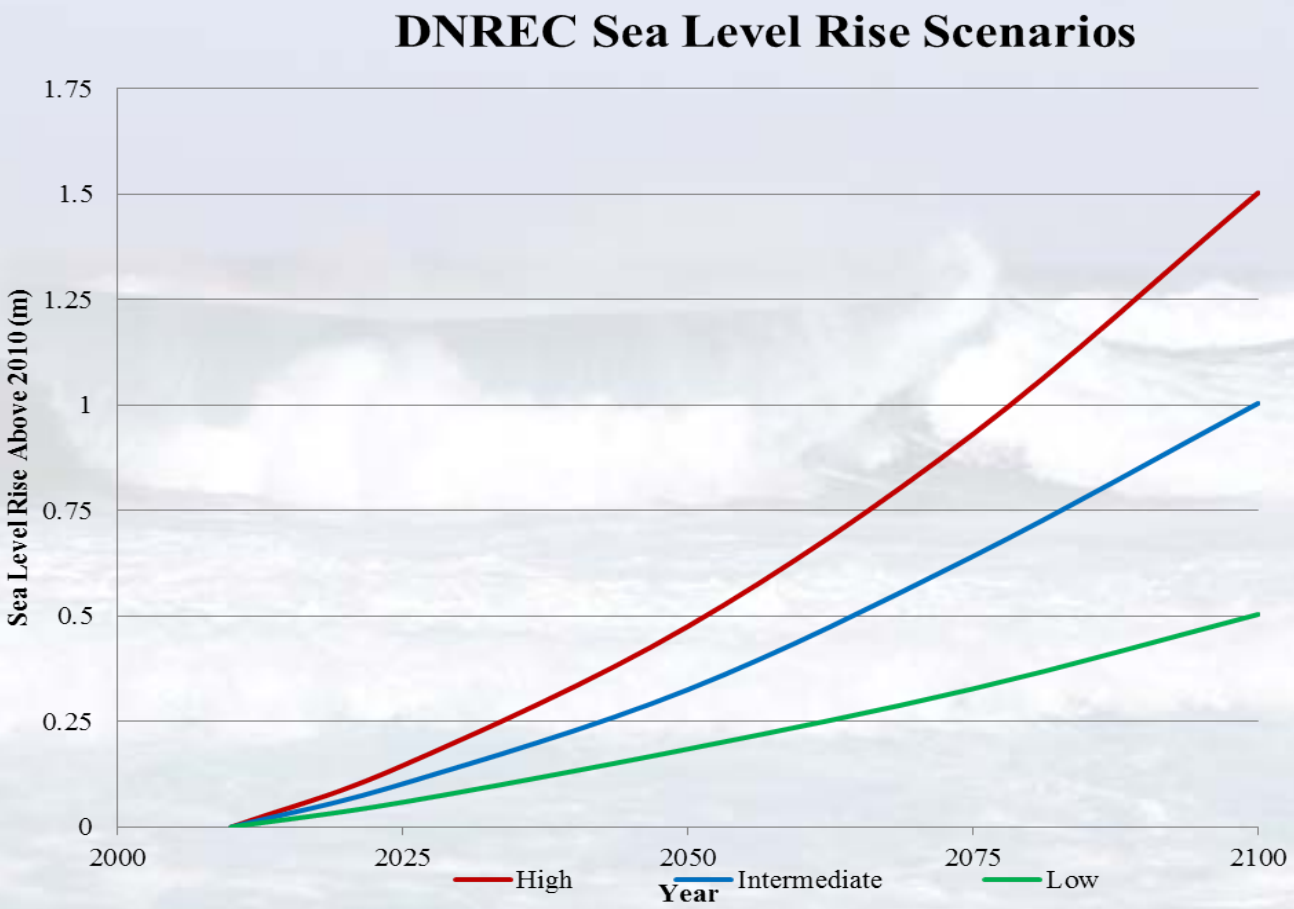
Annual Rate of Sea Level Rise

Average annual rate in DE = 3.35 mm/yr
(13 Inches/100 years)



Global rate = 1.7 mm/yr

Rates of SLR are very likely to accelerate in the future

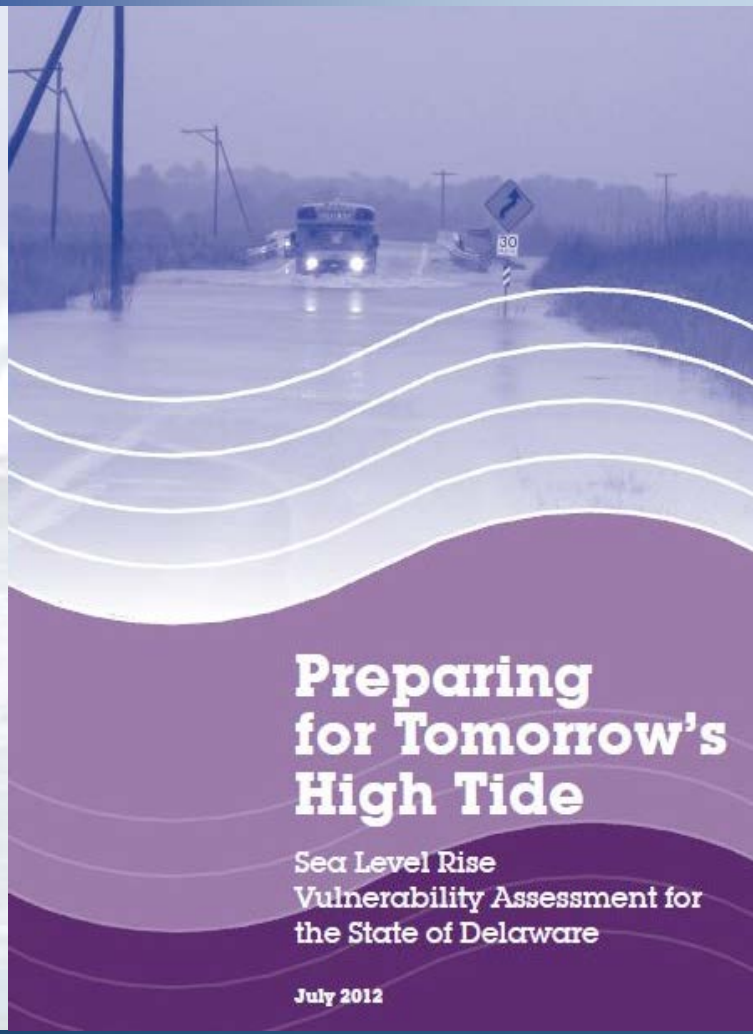


Delaware's Sea Level Rise Advisory Committee

The goal of the Sea Level Rise Advisory Committee is to assess Delaware's vulnerability to current and future inundation problems that may be exacerbated by sea level rise and to develop a set of recommendations for state agencies, local governments, businesses and citizens to enable them to adapt programs, policies, business practices and make informed decisions.

Vulnerability Assessment: Results

- All of Delaware is impacted!
- Of 79 resources assessed, wetland related resources were among the most vulnerable:
  - ✓ Tidal Wetlands
  - ✓ Freshwater Tidal Wetlands
  - ✓ Coastal Impoundments
  - ✓ USFWS Refuges
  - ✓ Protected Lands Statewide



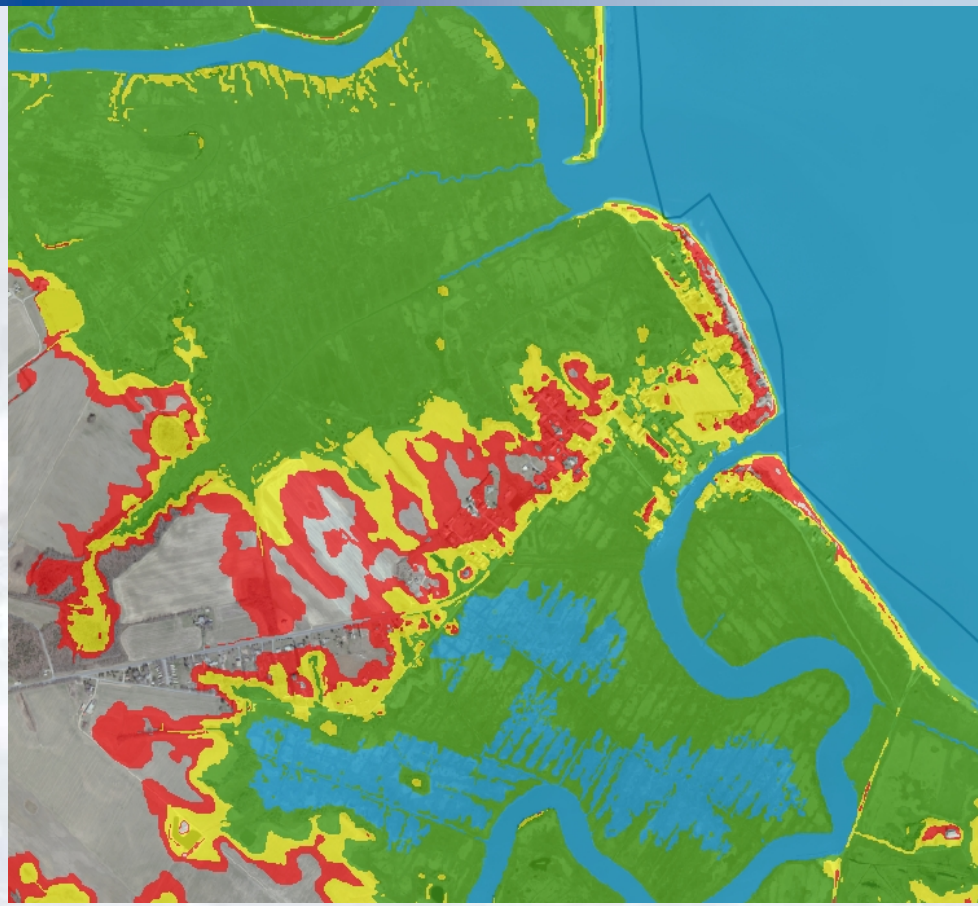
SLR will affect all of Delaware

- Urban Areas in Northern Delaware:
  - ✓ Transportation Networks
  - ✓ Neighborhoods
  - ✓ Economic Development Zones
  - ✓ Contaminated soils
  - ✓ Public Safety Facilities
  - ✓ Sewer Capacity

South Wilmington and Surrounding Areas with 0.5, 1.0 and 1.5 meters of SLR to 2100

Sea Level Rise will affect all of Delaware

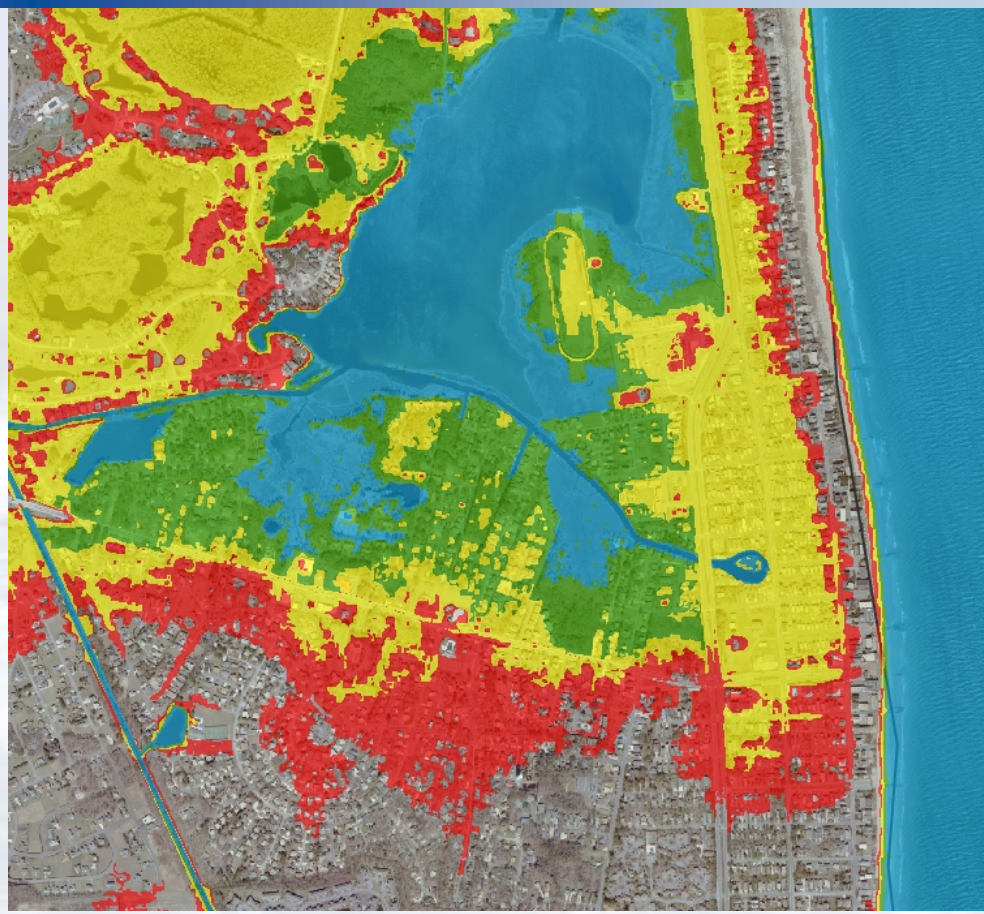
- At risk in Coastal Kent County:
  - ✓ Commercial/Recreational Fishing Docks
  - ✓ Residences
  - ✓ Habitat
    - ***Wetlands***
    - ***Shorebirds***
    - ***Horseshoe Crabs***
  - ✓ Way of Life



Bowers Beach and Surrounding Areas with 0.5, 1.0 and 1.5 meters of SLR to 2100

Sea Level Rise will affect all of Delaware

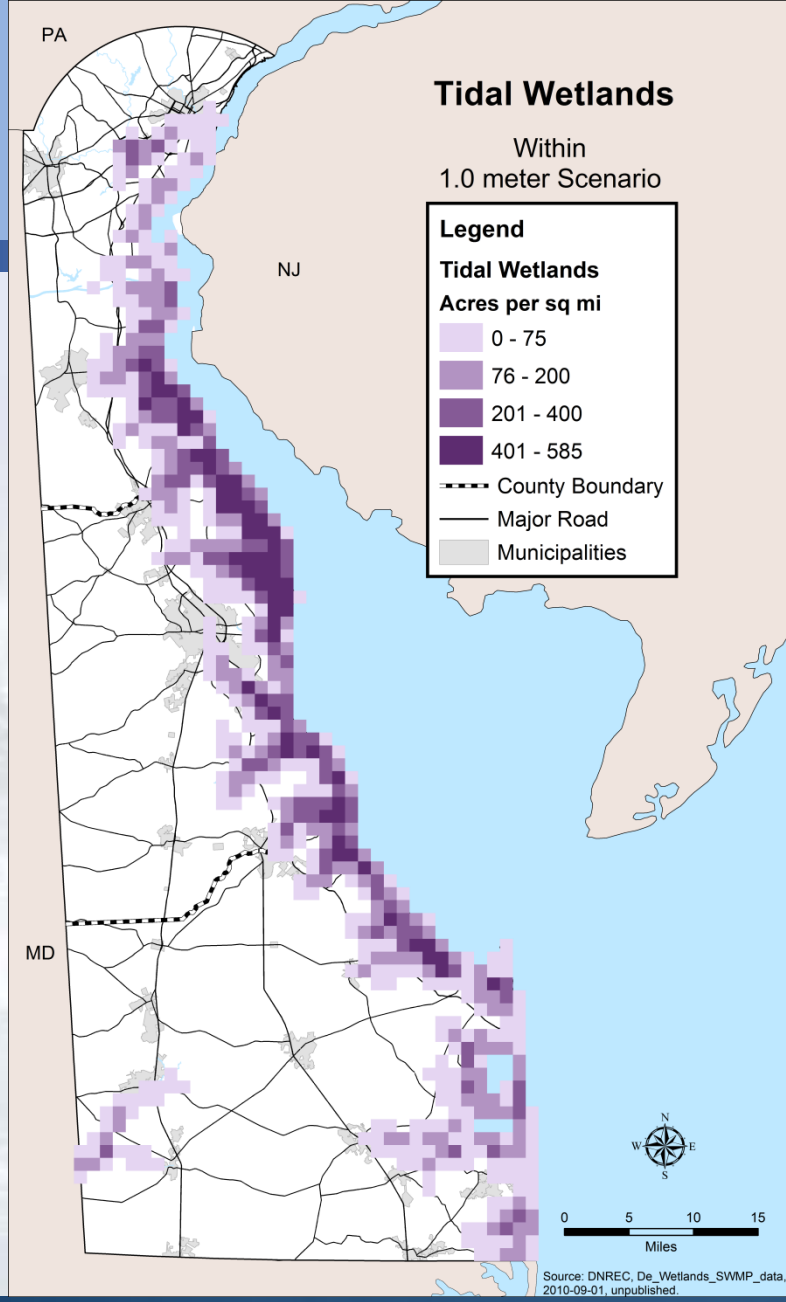
- At risk in the Sussex Coastal Area:
  - ✓ Homeowners
    - ***Bayfront and Oceanfront***
    - ***Septic Systems***
  - ✓ Tidal Wetlands and riparian areas
    - ***Habitat***
    - ***Flood Attenuation***
    - ***Water Quality***
  - ✓ Transportation Networks
  - ✓ DE National Guard



Bethany Beach and Surrounding Areas with 0.5, 1.0 and 1.5 meters of SLR to 2100

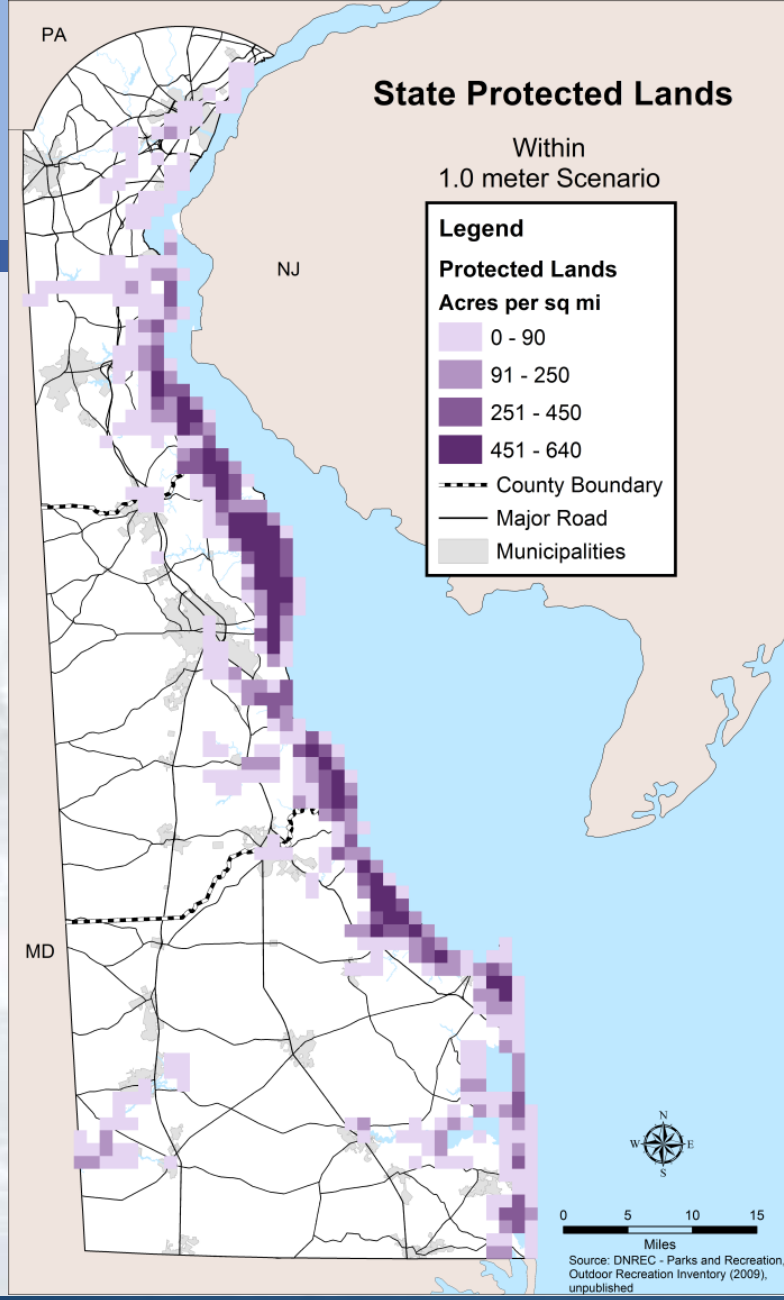
Tidal & Freshwater Tidal Wetlands

- Tidal
  - ✓ 97% to 99% of 73,000 acres potentially inundated
- Freshwater Tidal
  - ✓ 84% to 98% of 11,000 acres potentially inundated
- Conversion to open water
- Future salinity changes potential issue for tidal fresh
- Ranked as high



Protected Lands Statewide

- 37% to 44% statewide potentially inundated
- Includes
  - ✓ State owned lands
  - ✓ federal refuges
  - ✓ municipal holdings
  - ✓ public and private conservation easements
- Represent a variety of habitat types and outdoor recreation opportunities



Adapting to sea level rise means changing our status quo

Protect

Retreat

Accommodate

Avoid

Adapting to sea level rise means changing our status quo

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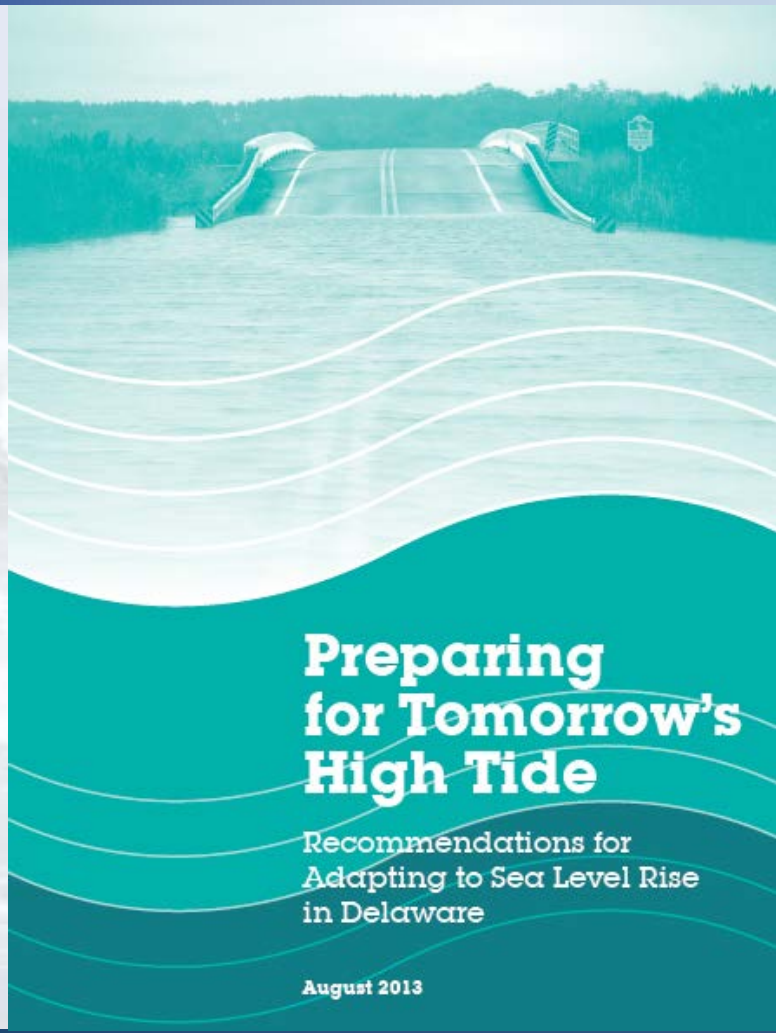
These are the most likely adaptation strategies for managing and conserving Delaware's tidal wetlands, but much work remains before a comprehensive strategy will emerge.

Recommendations for Adapting to Sea Level Rise in Delaware

- A call to action
- Explains and guides adaptation responses
  - ✓ Guiding Principles
  - ✓ Case Studies
  - ✓ Resources and Assistance
- 55 approved recommendations for "*building adaptive capacity*"
  - ✓ 36 are associated with wetlands



Executive Order-Palooza!

- Governor Markell's Executive Order 41 "Preparing DE for Emerging Climate Impacts..." (September, 2013)
- President Obama's Executive Order on Climate Preparedness (November, 2013)

Photo: Delawareonline.com

President Obama and Governor Markell agree that sea level rise is no laughing matter

Adaptation Objectives

- Improve Coordination and Communication…
- Provide Increased Regulatory Flexibility…
- Provide Consistent Policies for Future Growth…
- Increase Public Awareness…
- Improve Sea Level Rise Data…
- Provide Technical Assistance…
- Expand Funding Opportunities

Bowers Beach, November 2009

Adaptation Recommendation Highlights

- Create new partnerships for innovative projects
- Incorporate SLR into long range and comp plans
- Create regulatory incentives for adaptation projects
- Create an E.O. for state agencies (check!)

Photo credit: Partnership for Del Estuary

Adaptation Recommendation Highlights

- Modernize and update Regulatory Tidal Wetlands Maps
- Develop comprehensive wetlands strategy for SLR
  - ✓ *has research prereqs
- Re-evaluate management strategies for coastal impoundments
- Designate shoreline zones for adaptation strategies

Adaptation Recommendations specific to improving data

- Expand studies on sediment accretion rates and susceptibility of wetlands
- Develop a model for surface water salinity changes
- Develop a model for ground water salinity changes
- ID areas for wetland migration
- Install add'l water level and salinity recorders

Adaptation Activities Already Underway!

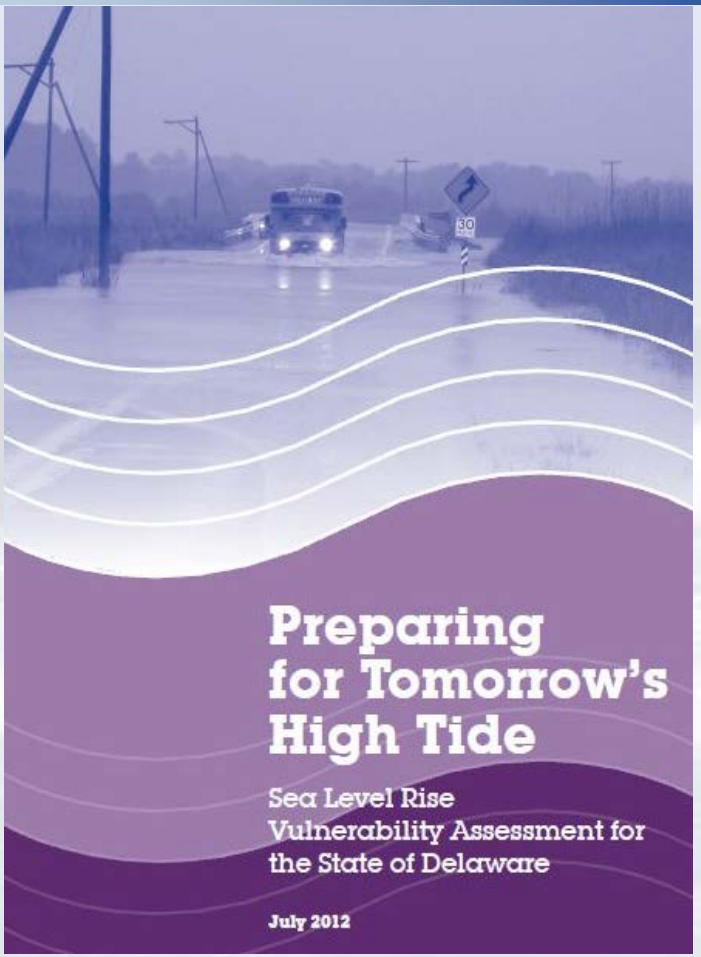
- State and federal response to EOs
- SLR included in:
  - ✓ State land purchase criteria
  - ✓ UD research agenda
  - ✓ South Wilmington green infrastructure
  - ✓ DE Hazard Mitigation Plan
- Green Infrastructure Projects
  - ✓ Beach Replenishment
  - ✓ South Wilmington Wetland
  - ✓ Pepper Creek Pilot

YOU can play an important role in adaptation

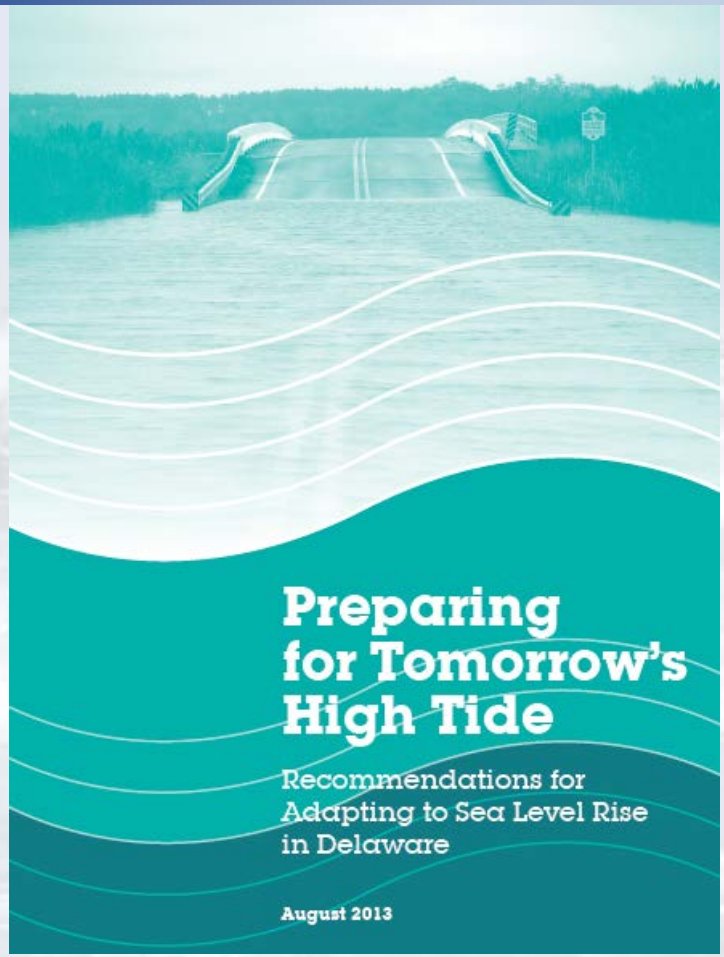
- Conduct a SLR/CC vulnerability assessment and adaptation plan
  - ✓ For facilities, land-holdings
- Incorporate SLR into your long-range and strategic plans
- Spearhead on-the-ground innovative pilot projects
- Participate in Executive Order meetings/surveys
- Talk about it!

Are you ready to put on your adaptation shoes?

Getting Started – Excellent Background Reading…



http://de.gov/slrva



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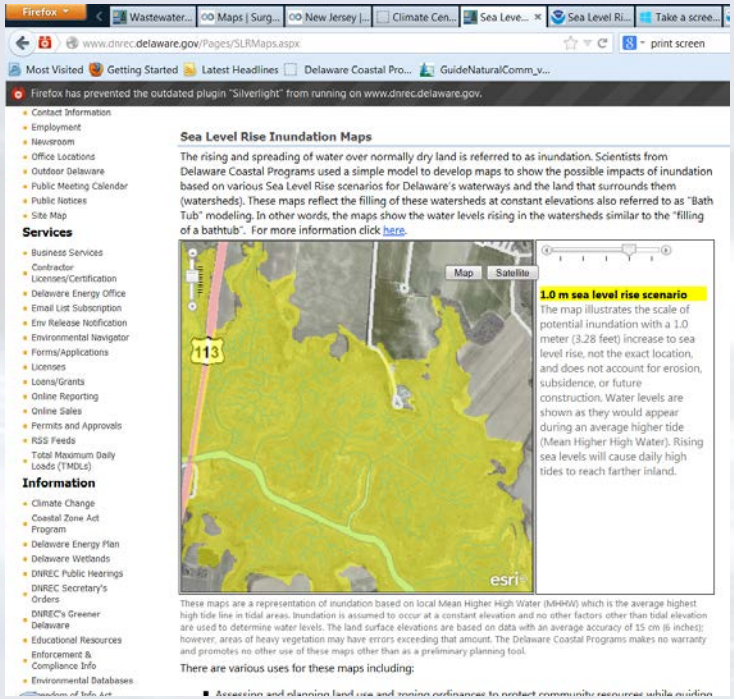
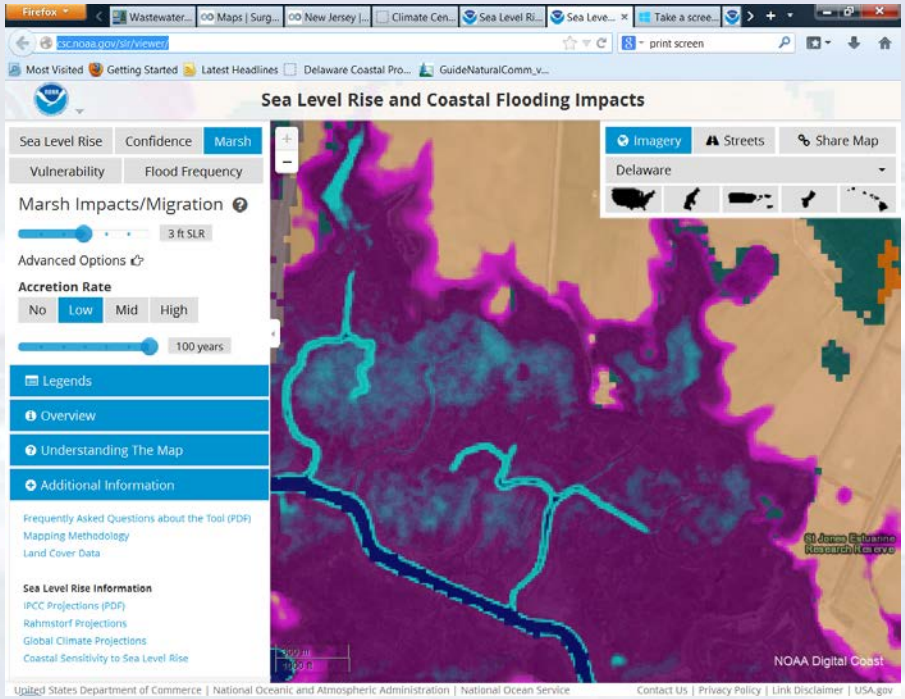
Mapping Tools

Delaware SLR Maps



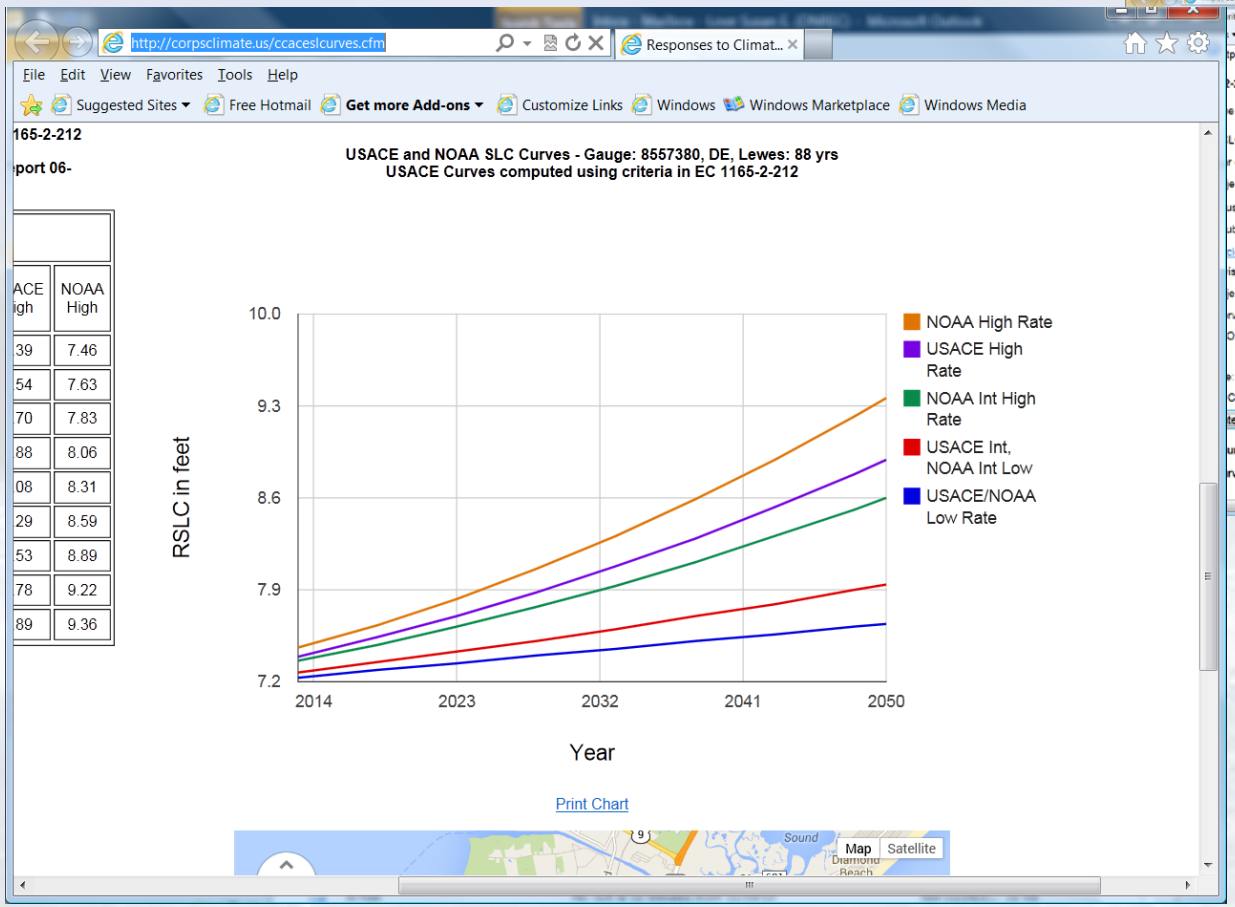
de.gov/slrmap

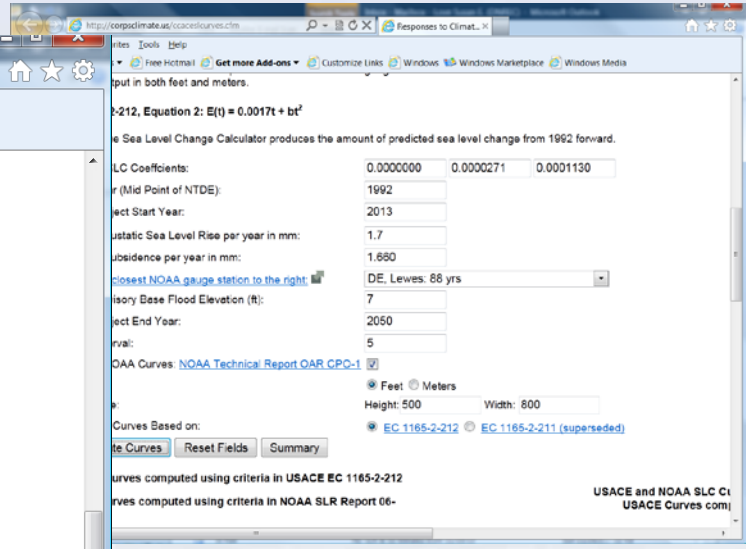
NOAA Digital Coasts



csc.noaa.gov/slr/viewer

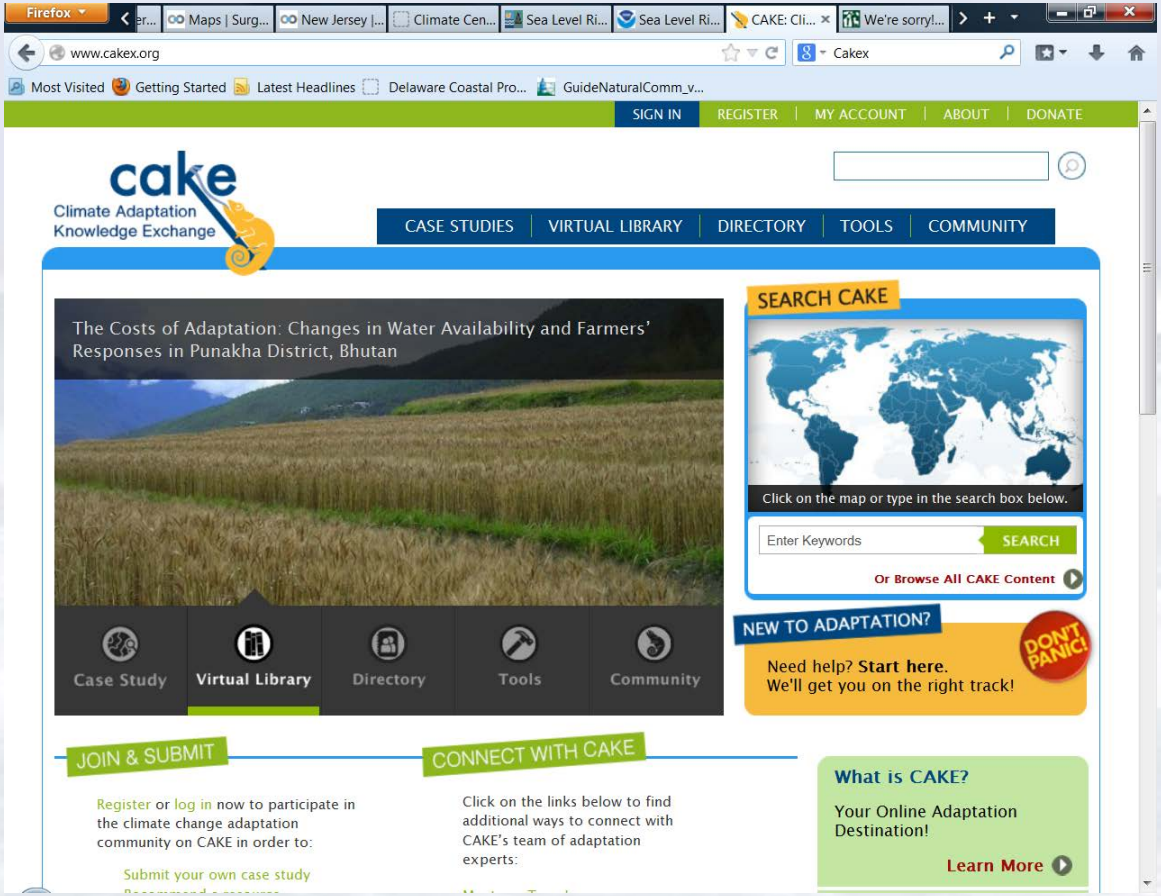
USACE SLR Rate Calculator





http://corpsclimate.us/ccaceslcurves.cfm

Web-based Adaptation Clearinghouse



www.cakex.org

Your helpful friends at DNREC…

Questions?

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http://de.gov/sealevelrise