

Department of Ecology WORKING WITH YOU FOR A BETTER WASHINGTON

Washington State & Rising Tides



Washington State APA Conference 2013

Bobbak Talebi
Department of Ecology

Shipman, Jan 2010

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Brief History

West Coast Governors Alliance on Ocean Health 2006
Vision for the health of our West Coast coastal and ocean resources, including clean coastal waters and economically and environmentally sustainable communities.

Executive Order 07-02
Basis for creating the Climate Advisory Team to recommend ways to reduce greenhouse gas emissions. It also directed the state to assess steps required to prepare for the impacts of climate change on water supply, public health, agriculture, forestry and coastal areas.

Executive Order 09-05
Washington's Leadership on Climate Change requires the state to, among other strategies, prepare for rising sea levels and the risk to water supplies caused by climate impacts.

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Brief History

Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments 2007
King County and ICLEI Local Governments for Sustainability

Sea Level Rise in the Coastal Waters of Washington 2008
Mote, Petersen, Reeder, Shipman, and Whitley-Binder

The Washington Climate Change Impacts Assessment 2009
University of Washington Climate Impacts Group

The Response of the Salish Sea to Rising Sea Level: A Geomorphic Perspective 2009
Shipman; Washington State Department of Ecology

Sea Level Rise on the Coasts of California, Oregon, and Washington 2012
National Academy of Sciences' National Research Council

Preparing for a Changing Climate: Washington State's Integrated Climate Response Strategy 2012
Washington State Department of Ecology

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Adaptation Planning



SCOPE & ORGANIZE

- Choose project area
- Convene partners & stakeholders
- Set resilience goals
- Identify sectors, services & assets
- Select climate scenarios & impacts

ASSESS

- Review existing conditions
- Evaluate assets' climate change vulnerability & risk
- Characterize vulnerabilities & risks
- Identify priority issues

PLAN

- Refine resilience goals
- Select evaluation criteria
- Develop adaptation responses
- Evaluate and select adaptation responses
- Prepare response plan or integrate responses into other plans

IMPLEMENT & MONITOR

- Implement high priority responses
- Utilize plans to seek funding
- Track progress and evaluate effectiveness
- Communicate accomplishments
- Assess new impacts information
- Revise priorities and strategies as needed


RESILIENCE

San Francisco Bay Conservation and Development Commission (BCDC): Adapting to Rising Tides (ART) Project

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Planning & Regulatory Approaches


- Climate Action Plans
- Shoreline Master Programs
- Comprehensive Plans
- Hazard Mitigation Plans
- Flood Plans



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Shoreline Management

Shoreline Management Act has been in effect now for over 30 years... Responding to a voter initiative, the State Legislature adopted an alternative proposal that took effect June 1971



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Ecology Efforts





Climate Change (Initiatives in Shoreline Master Programs)

Action Plan

Regional Support Guidance Education

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Regional Support

The *West Coast Governors' Agreement on Ocean Health* recognizes that Washington, Oregon, and California can achieve more by working together on issues important to all of us.

-September 18, 2006

Actions

- Create a National-Level Commitment to the Ocean
- **Mitigate and Adapt to Climate Change**
- Ensure Clean Coastal Waters and Beaches
- Improve Coastal Air Quality
- Protect a Healthy Ocean and Coastal Habitats
- Implement Ecosystem-Based Management
- Reduce Impacts of Offshore Energy Development
- Promote Citizen Ocean Awareness and Literacy
- Expand Ocean and Coastal Scientific Information, Research, and Monitoring
- Work for Sustainable Coastal Communities



WEST COAST GOVERNORS' ALLIANCE - OCEAN HEALTH

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Regional Support

Climate Change Action Coordination Team

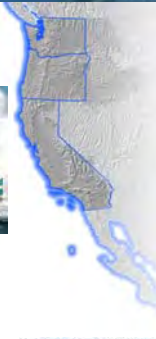
2009 National Academy of Sciences' National Research Council on the effects of Sea Level Rise on the West Coast

2012 West Coast Coastal Hazards and Sea Level Rise Workshops



Next Steps:

- A total of 34 Action Coordination Team (ACT) members and partners convened for a strategic planning workshop in Santa Cruz, July 2013.
- ACT members are currently developing a new work plan, including new roles, goals, and activities.




WEST COAST GOVERNORS' ALLIANCE - OCEAN HEALTH

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State Guidance

The Shoreline Management Act (SMA) and the Shoreline Master Program (SMP) Guidelines currently contain no explicit references to climate change or sea level rise. However, the Guidelines require local governments use "the most current, accurate and complete scientific and technical information available" (WAC 173-26-201(2)(a)).

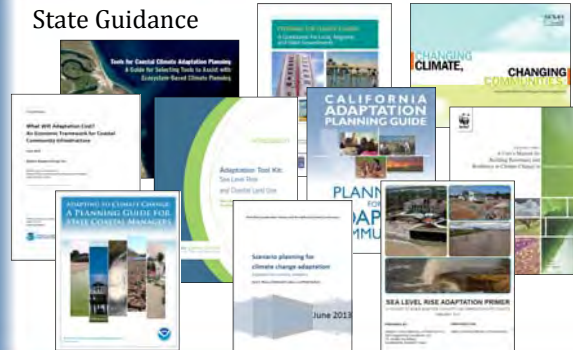
RCW 90.58.100 (1)(c): Consider all plans, studies, surveys, inventories, and systems of classification made or being made by federal, state, regional, or local agencies, by private individuals, or by organizations dealing with pertinent shorelines of the state;



Env 1978, WA King Tides Initiative

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State Guidance




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State Guidance

Characterize and disseminate sea level rise information and resources to local governments

Improve efficiency in the planning process and application of adaptation tools at the local scale

Enhance local capacity



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Education

The Coastal Training Program (CTP) provides practical, science-based training to professionals who make decisions about coastal management in Washington State.

Past Efforts & New Directions:

- 2009 Planning for Climate Change
- Climate Adaptation Needs Assessment
- Climate Adaptation Series, Spring 2014
- Climate Change Integration into all CTP Classes
- Incorporation of Climate Change into CTP Official "Purpose" Statement



COASTAL TRAINING PROGRAM Washington



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Conclusion

3,447 miles of marine shoreline in Washington State

Good Governance:
Ensure the safety, health and welfare of communities now and into the future.




Shipman, December 2012

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Questions

Contact Information:
Bobbak Talebi
Shorelands and Environmental Assistance Program
Washington State Department of Ecology
360-407-6529 | Bobbak.Talebi@ecy.wa.gov



City of Olympia: Land use categories and essential transportation corridors with inundation limits of 100-year total water level, existing sea level

Case Study in Resilience: When In-place Community Recovery Is Not an Option

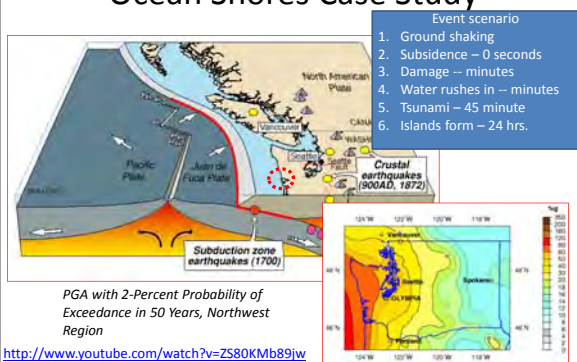
Bob Freitag, Director
Institute for Hazards Mitigation
Planning and Research

Case Studies in Resiliency

Discussions of resilience are in vogue, and is resilience always possible?

- Resilience is the capacity of a community to absorb change from an event and reorganize so as to retain the ability to provide goods and services necessary for human well-being.

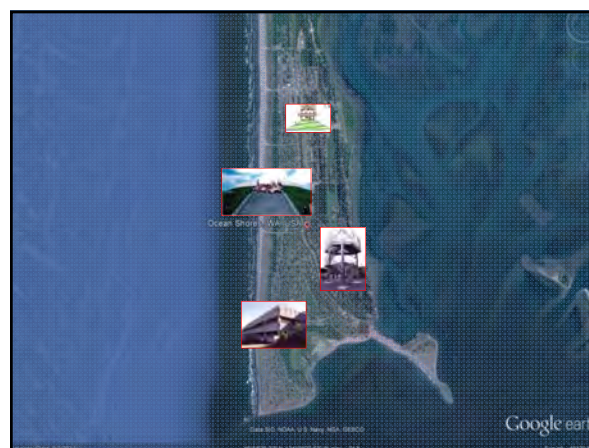
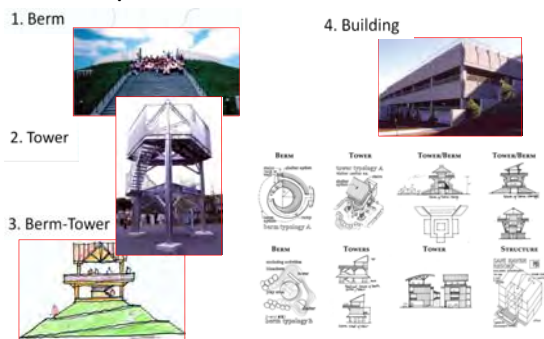
Ocean Shores Case Study

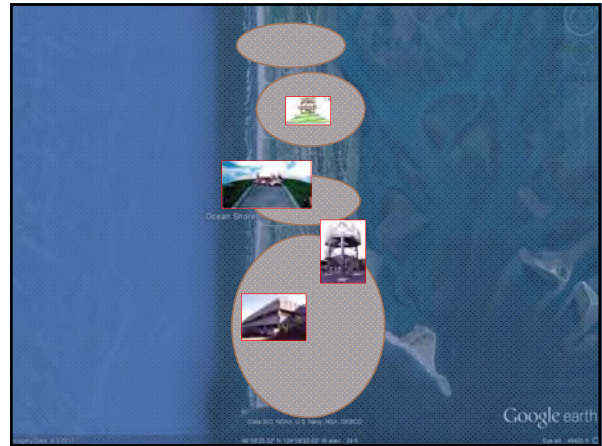
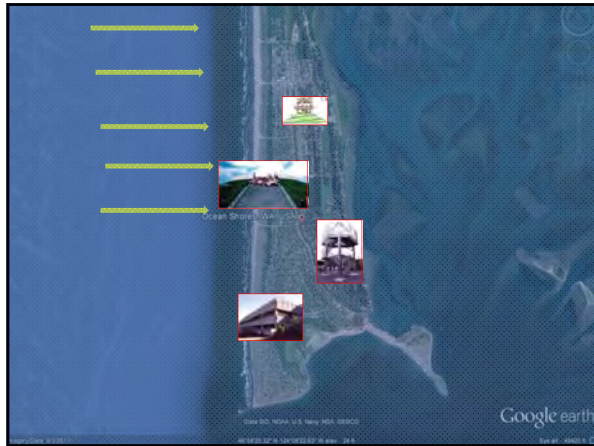


Tsunamis



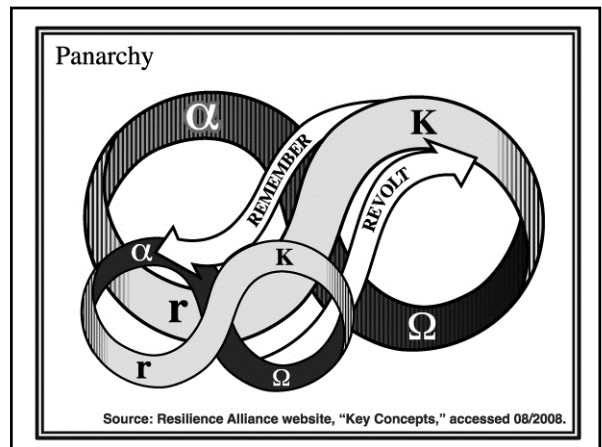
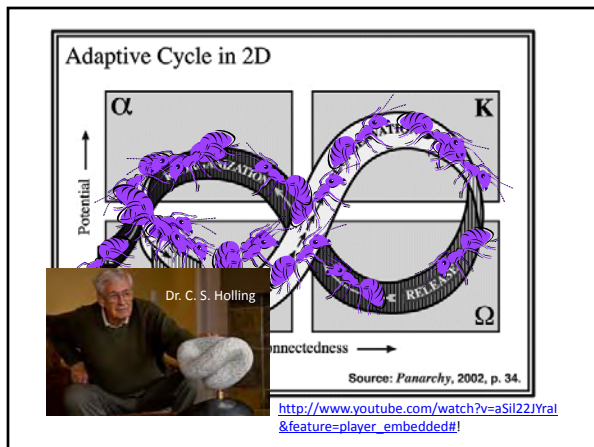
Strategy: Purchase Flood Insurance and provide Tsunami Safe Havens





Project Safe Haven: Tsunami Vertical Evacuation Opportunities Grays Harbor County

Tsunami Hazard	Preferred Tsunami Vertical Evacuation Strategy	Vertical Evacuation Typologies
<p>A magnitude 9.0 Cascadia earthquake and tsunami... had approximately 1000-6000 ft tall tsunamis along the Washington coast. Grays Harbor County's vulnerability to a tsunami combined with the difficulty of rapid horizontal evacuation spurred interest in the exploration of alternative evacuation methods. A series of Washington research trips with representatives from county, tribal and state emergency management officials resulted in a consensus process to identify potential locations for vertical evacuation in Grays Harbor County. This project addresses three of the most vulnerable coastal communities in Grays Harbor County.</p>	<p>Project Approach:</p> <ol style="list-style-type: none"> 1. Working Committee assembled to guide project. 2. Site visit to identify opportunities for vertical evacuation. 3. Community Call: public meeting to solicit ideas and concerns about vertical evacuation typologies: berms, towers, and buildings. Participants used interactive board maps to discuss conceptual locations for the structures, and the pros and cons of each structure type. 4. Strengths and Weaknesses public meeting to present the preliminary vertical evacuation strategy and to discuss the strengths and weaknesses. Ultimately, a preferred strategy emerged for each community. 5. Community design charrettes conducted to identify the specific design constraints and opportunities. Day-to-day functions and uses of each proposed structure were also explored and identified. 6. Two final open house meetings. 	<ol style="list-style-type: none"> 1. Berm 2. Tower 3. Berm-Tower 4. Building



Begin by determining a focal point:
Resilience for whom



1. **Remembering**
2. **Revolt**
3. **Feedback**
4. **Tipping Point**
5. **Transformability**

Begin with a Focal point: Resilience for whom

1. **Remembering.** This occurs when the potential for recovery is accumulated and stored.
2. **Revolt.** This occurs when forces or events overwhelm recovery.
3. **Feedback.** Resilient communities have self-organizing feedback mechanisms.
4. **Tipping Point.** This is a point at which a relatively small change in external conditions causes a rapid change.
5. **Transformability:** This is the capacity to create a fundamentally new system when conditions make the existing system untenable—where organizations are capable of exploiting new opportunities.



Questions:

Protecting Ecosystem Function with Sea Level Rise and Cumulative Effects Management Tools: Case Study from San Juan County

Funded by an EPA/WDFW *Improving Regulatory Effectiveness*
National Estuary Program Grant. Match funding from the Bullitt
Foundation.



San Juan County SLR Project

Project Partners:

Friends of the San Juans, Coastal Geologic Services, Salish Sea Biological, the Washington Department of Fish and Wildlife.

Technical Team:

SJC Lead Entity for Salmon Recovery, SJC Public Works, Tulalip Tribes, Skagit Systems Research Cooperative, USGS, Puget Sound Partnership, WA Dept. of Fish and Wildlife, University of Washington Friday Harbor Labs, WA Dept. of Ecology, Padilla Bay Estuarine Research Reserve, retired WA Dept. Natural Resources, Fish and Wildlife and Ecology.



Why Worry About Sea Level Rise (SLR)?

- Fish, shellfish and human communities depend on beaches
- Modified shorelines are less resilient to the impacts of SLR
- Impacts to beach spawning forage fish habitat are likely to be early and significant
- Significant private & public infrastructure is vulnerable



Project Rationale

- Long-term protection of habitat will require a deliberate SLR adaptation approach by informed managers and an aware public.
- The alternative is greatly increased demand for shoreline armoring.
- San Juan County has over 400 miles of marine shoreline, diverse shoreline types and significant remaining intact habitat and processes as well as undeveloped shoreline property- providing an excellent place to develop and test new tools and management strategies.
- Improved information/processes are needed to catalyze adaptation efforts.



San Juan County SLR Project

Primary Project Elements:

- Regulatory Review
(local, state and federal)
- Sea Level Rise Vulnerability Assessment for San Juan County
(erosion and/or inundation hazard areas- ranked low, moderate and high risk for habitat, structures, and roads)
- Stakeholder Interviews
(planners, scientists, managers, elected officials, regulators)
- Management Recommendations
(improving effectiveness of existing regulations, regulatory reform, non-regulatory options)
- Outreach and Engagement
(land managers, tribes, at risk communities/property owners)
- Application of Results
(Shoreline Master Program, regulatory reform, land conservation)

Regulatory Review

Federal Law	State & Local Law	Other Legal Authority	Non-legal Options
Clean Water Act (1972)	Aquatic Lands Law (1984) – DNR	Public Trust Doctrine – state has trustee duty to protect public resources	Conservation Easements
Coastal Zone Mgmt Act (1972)	Growth Mgmt Act (1990) and Critical Areas Ordinances	Rolling Easements/Reliction – as waters rise, public lands should be allowed to migrate inland	Tax incentives for retaining natural shorelines
Endangered Species Act (1973)	Hydraulic Code (1943) – WDFW	Tribal Treaty Rights – US gov't guaranteed tribes right to harvest salmon in traditional fishing areas	Funding/programs to relocate public infrastructure
National Env't'l Policy Act (1970)	Shoreline Mgmt Act (1971)		Funding/programs to purchase at risk private property
National Flood Insurance Act (1968)	State Env't'l Policy Act (1971)		



San Juan County SLR vulnerability assessment

Objectives:

Develop a GIS tool that integrates erosion with inundation to better understand future conditions

Use results to assess habitat, structures and infrastructure vulnerable to erosion and inundation

Link vulnerable areas with appropriate management strategies



Implications of SLR & CC on Coastal Areas

Increase bluff recession rates
via erosion caused by + precip &
waves

Increase in high water events
storms and el ninos

Habitat loss via coastal squeeze
bedrock and armored

Risk Dependant on:

Shoretype

Upland topography and bathymetry

Geology

Sediment supply

Space and ability of shoreline to transgress

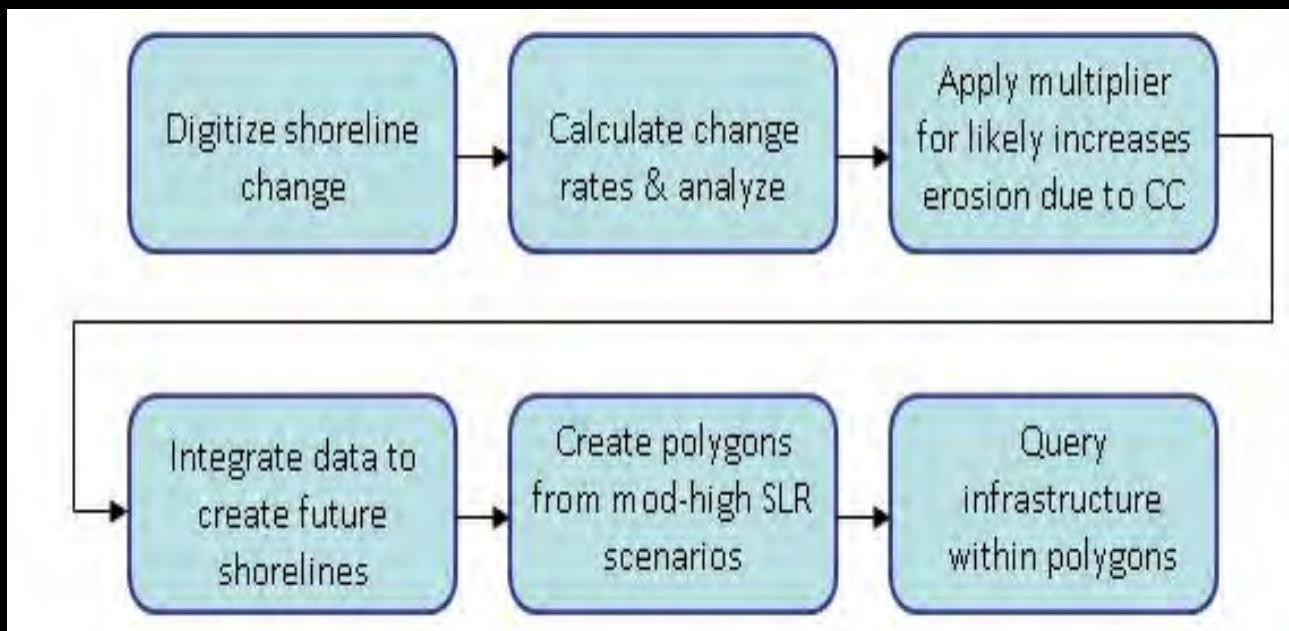


San Juan County SLR vulnerability assessment

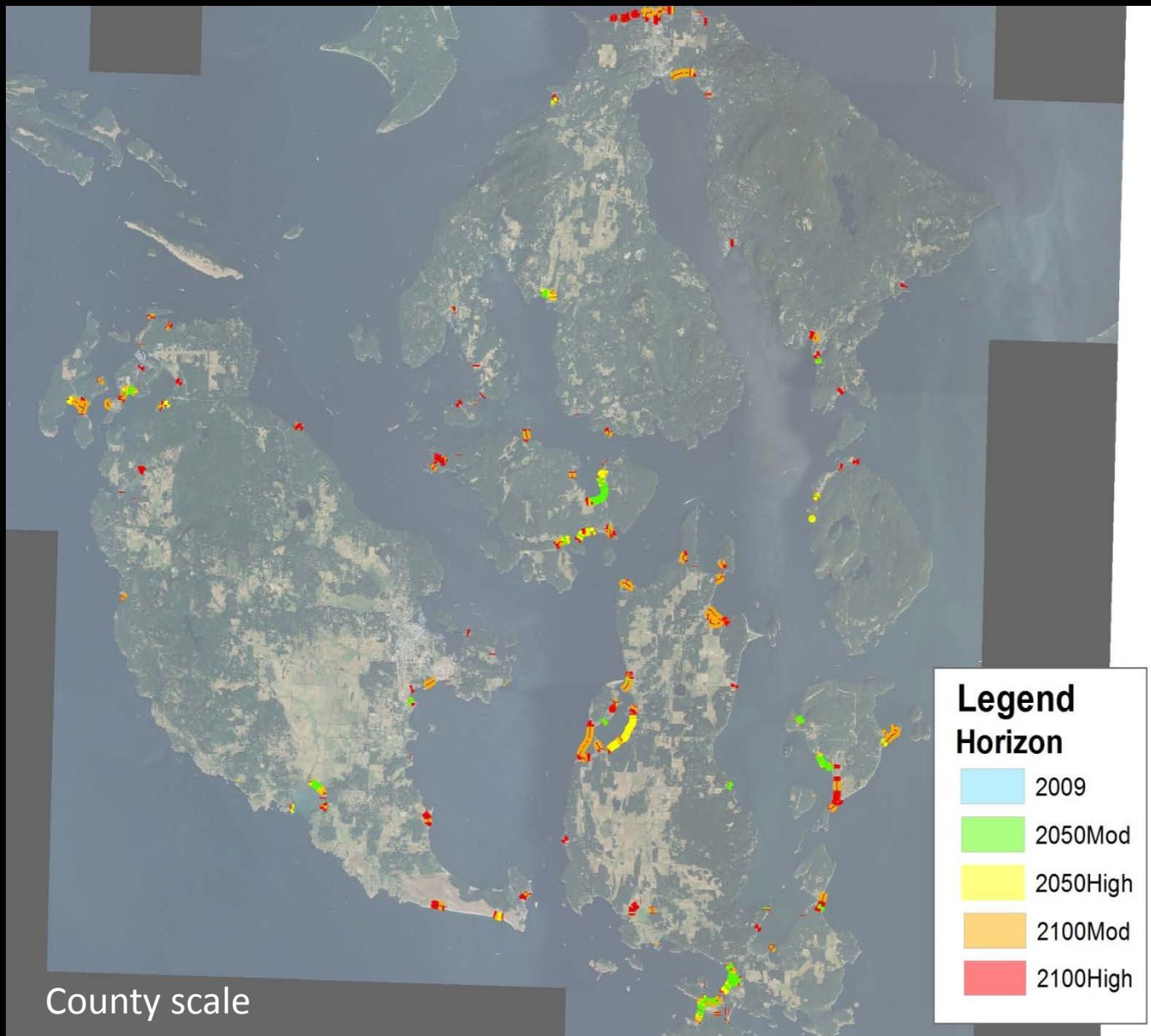
General Approach:

Integrate background erosion rates with inundation model

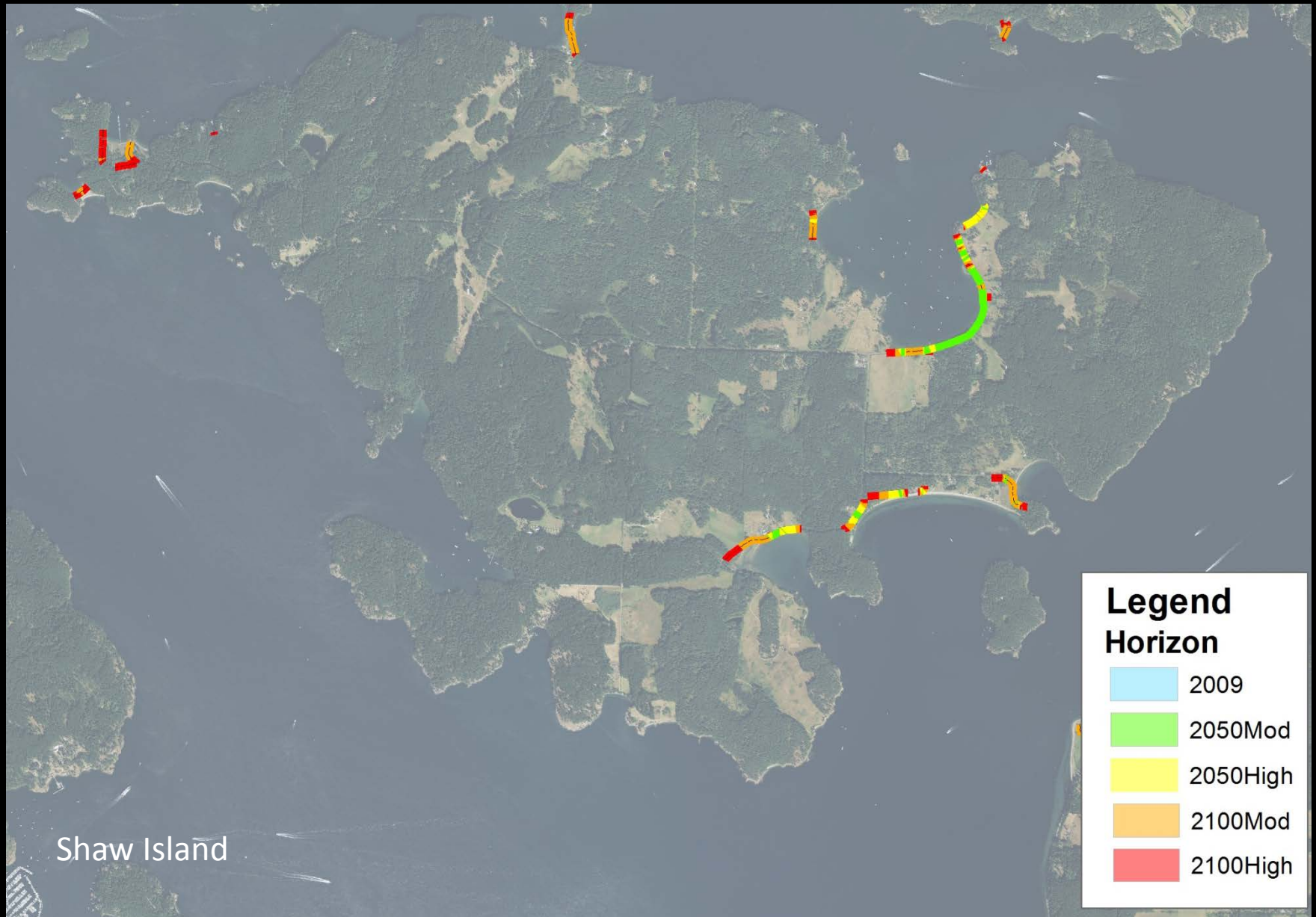
Create polygons of areas of vulnerability from which infrastructure would be selected



SJC Preliminary Results – Vulnerable Roads



SJC Preliminary Results – Vulnerable Roads



SJC SLR assessment- initial recommendations

Integrate uncertainty into maps

Expand research of background erosion rate by shoretype

Set up long-term monitoring stations to assess changing conditions

Perform outreach to most vulnerable areas to initiate proactive management approaches

Apply greater setbacks to development in vulnerable areas

Public infrastructure provides an opportunity to initiate adaptation conversation with the community

Develop risk specific (flood/erosion and habitat/structure/roads decision trees to illustrate cost/benefit of various management responses



Stakeholder Interviews- Key Findings

Top recommended actions from interviews with 28 local and regional shoreline scientists, regulators, planners and managers:
(not in order)

- Broad support for stronger implementation/enforcement of existing shoreline armoring regulations.
- Improvements hydraulic code a top recommendation- split between enhancing existing rules or major regulatory reform.
- Support for expanded education, but associated with the acknowledgement that outreach alone will not be successful.
- Require planning for sea level rise in Shoreline Master Program updates.
- Provide tax incentives for managed retreat.



SJC SLR Assessment -Next Steps

Final review of sea level rise model uncertainty assessment

Final management recommendations developed by project partners and full technical team

Meetings with managers

Develop decision trees

Community outreach and engagement strategies



Project contact: Tina Whitman
tina@sanjuans.org





Sea Level Rise and Coastal Hazard Resilience in Washington

Jamie Mooney
Coastal Resources Specialist
Washington Sea Grant
October 3, 2013

Sea Grant
Washington
Planning for Sea Level Rise

WA APA Fall Conference
October 2, 2013

Presentation Overview


- Climate Adaptation Survey
- Coastal Hazard Resilience Network
- Witness King Tides
- Shoreline and Coastal Planners Group

Planning for Sea Level Rise Sea Grant

WA APA Fall Conference
October 2, 2013

Climate Change Adaptation Survey

- Conducted in August 2012
- Sent to 339 coastal practitioners in the Coastal and Shoreline Planners Group
- 98 responses
- Elected officials
- Document in review, to be published this year
- Part of a larger National Effort

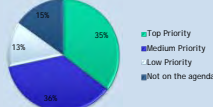


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Identified Climate Risks

- 31/87 responses listed sea level rise as the first risk associated with a changing climate that comes to mind
- 35% identify adaptation as a top priority to dealing with the projected impacts of climate change (36% medium priority)



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Climate Adaptation Planning

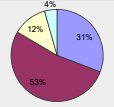
Understanding → Planning → Implementing

■ NOT CURRENTLY INVOLVED at all in planning to adapt to the effects of climate change.

■ UNDERSTANDING: We're in a relatively early stage, trying to understand what the potential impacts of climate change and our vulnerabilities are.

■ PLANNING: We're in a more advanced stage, trying to assess what our options are to prepare for and reduce the risks from climate change.

■ IMPLEMENTING: We're in a fairly advanced stage, starting to implement some identified adaptation options and monitoring how they're performing.

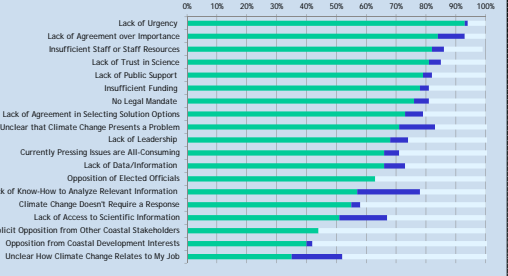


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Hurdles to the Adaptation Process

Percent of Respondents




Hurdle	Encountered (%)	Overcame (%)
Lack of Urgency	~95	~5
Lack of Agreement over Importance	~85	~15
Insufficient Staff or Staff Resources	~80	~20
Lack of Trust in Science	~75	~25
Lack of Public Support	~70	~30
Insufficient Funding	~65	~35
No Legal Mandate	~60	~40
Lack of Agreement in Selecting Solution Options	~55	~45
Unclear that Climate Change Presents a Problem	~50	~50
Lack of Leadership	~45	~55
Currently Pressing Issues are All-Consuming	~40	~60
Lack of Data/Information	~35	~65
Opposition of Elected Officials	~30	~70
Lack of Know-How to Analyze Relevant Information	~25	~75
Climate Change Doesn't Require a Response	~20	~80
Lack of Access to Scientific Information	~15	~85
Explicit Opposition from Other Coastal Stakeholders	~10	~90
Opposition from Coastal Development Interests	~5	~95
Unclear How Climate Change Relates to My Job	~5	~95


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Coastal Hazard Resilience Network




- Sea level rise through coastal hazard lens
- NOAA Coastal Services Center CREST (Coastal Resilience Networks) Competition
 - Funding October 2013 - September 2015
- WA State: 2 primary objectives
 1. State Level Coordination to assist local communities
 2. Pilot studies: Pacific and Grays Harbor Counties
- OR: a similar but different initiative
 - Resilience Plan as an end goal


Planning for Sea Level Rise 

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Goal: Integrated Hazard Maps

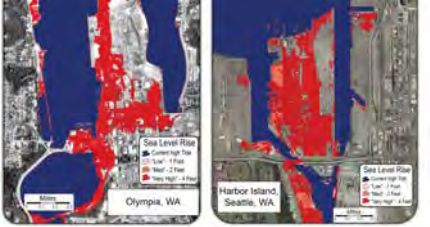
- Coastal Erosion + Tsunami Inundation + SLR
 - Funding from CSC grant as part of pilot project
 - PMEL liaison
- Use new information for more accurate Vertical Evacuation planning




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Sea Level Rise




USGCRP 2009


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Tsunami Inundation




Green: 0-0.5 m, Yellow: .5-2 m, Orange: 2-5m, Seattle Fault Scenario


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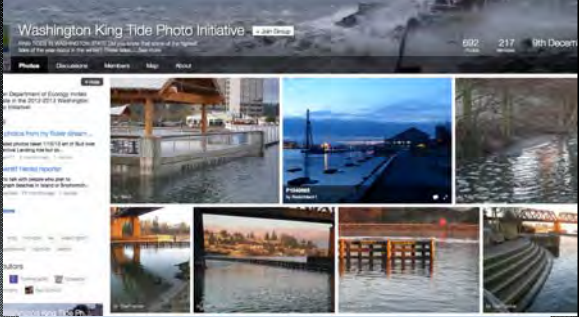
Witness King Tides

- King Tides are extreme high tides that occur during times of the year when the moon is closest to the Earth
- Can visualize what future SLR will look like by taking pictures and sharing
- Kingtides.wordpress.com
- WA King Tide Photo Initiative: Flickr Page




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Washington King Tide Photo Initiative: Flickr Group

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King Tides

- Visualize Sea Level Rise! June 2013: Alki



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United States King Tides Initiatives





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Resource Available - WA Sea Grant - Shoreline and Coastal Planners Group

- For coastal practitioners and shoreline planners
- Variety of coastal management issues
- Geographic scope: WA coastlines
 - November 2012: SLR workshops
 - March 2013: Net pen Aquaculture
 - July 2013: Elwha Dam Removal





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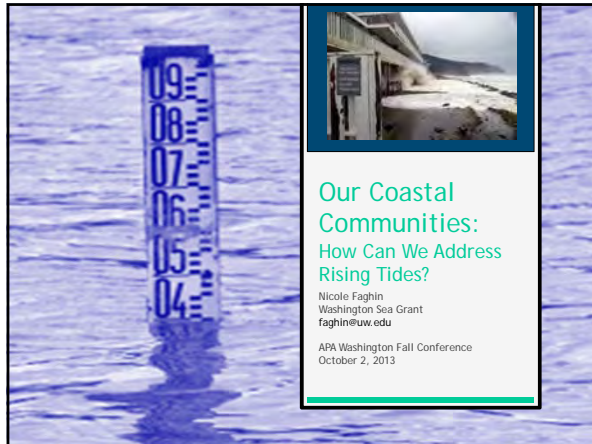
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Questions?

Jamie Mooney
Coastal Resources Specialist
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206.616.3368



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**Our Coastal Communities:
How Can We Address
Rising Tides?**


Nicole Faghin
Washington Sea Grant
faghin@uw.edu

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Topics

- Sea Level Rise and Coastal Hazards
- Implications for Built Environment
- Adaptation vs. Mitigation
- Resilience vs. Adaptation Planning
- What are the barriers to adaptation?

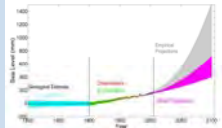
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Sea Level Rise Predictions

National Research Council 2012 Global Sea Level Rise Predictions (*relative to yr. 2000 as baseline*) for West Coast:

- 2030: 3-9 in.**
- 2050: 7-19 in.**
- 2100: 20-55 in.**




NRC Report for WA/Or/CA:
http://nap.edu/catalog.php?record_id=13389

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Washington State Implications

- Tectonic Shifts
- Land Subsidence
- Earthquakes
- That's why its important to address Hazards and Sea Level Rise from Climate Change



Ore. Climate Assessment Report 2010

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Coasts and the Environment

Interface of water, sky and land

- Climate (atmosphere)**
 - Storms
 - Convergence zones
 - Frequency
- Water (hydrosphere)**
 - Waves and Tides
 - Sediments
 - Storm Surges
- Land (lithosphere)**
 - Tectonic plates and tsunamis
 - Stormwater Runoff
 - Beaches, Barrier Islands and Sand Spits



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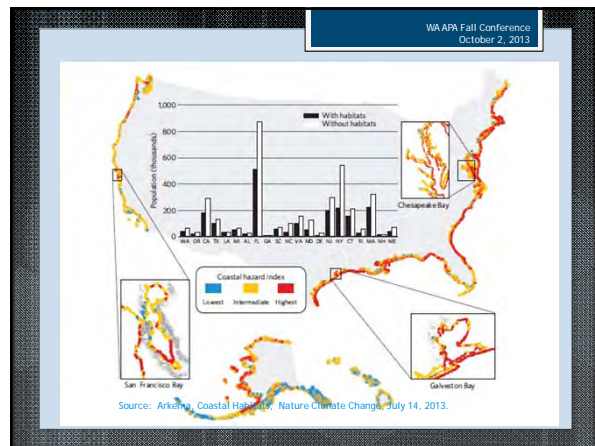
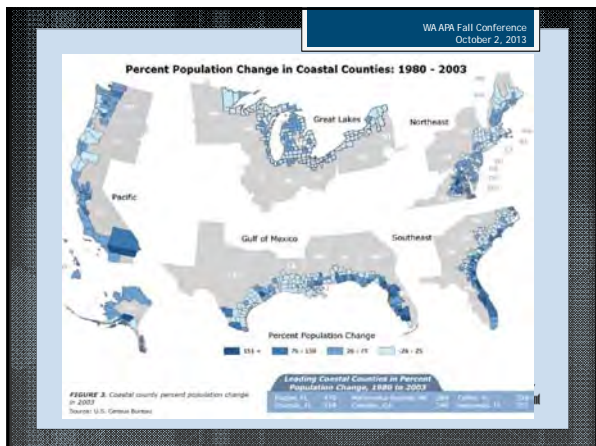
Coasts and the Environment

Sea Level Rise can be Gradual or Sudden:

- Gradual:**
 - Regular inundation
 - Increased erosion
- Sudden:**
 - Higher Storm Surges
 - Flooding
 - Wave forces



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Impacts on Built Environment

- Flooding
- Erosion

Washington DOT

Gerald Thorsen, Smith Island

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Mitigation vs. Adaptation

- **Mitigation is...**
An intervention to reduce greenhouse gas sources and emissions.
- **Adaptation is...**
Changes in response to actual and expected impacts from Climate Change.
- **Caveat...**
FEMA uses the term Mitigation in different way...take action now to reduce risk.

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Resilience vs. Adaptation

- Adaptation:
 - Protect
 - Accommodate
 - Retreat
- Resilience:

cityspeak.org/2013/02/11/the-parallel-pathways-of-resilience-and-sustainability/

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What are Barriers to Adaptation?


- Property Rights Issues
- Challenge to get people's attention
 - Does it take a crisis to make people change e.g. Super Storm Sandy?
- Requires Political Will

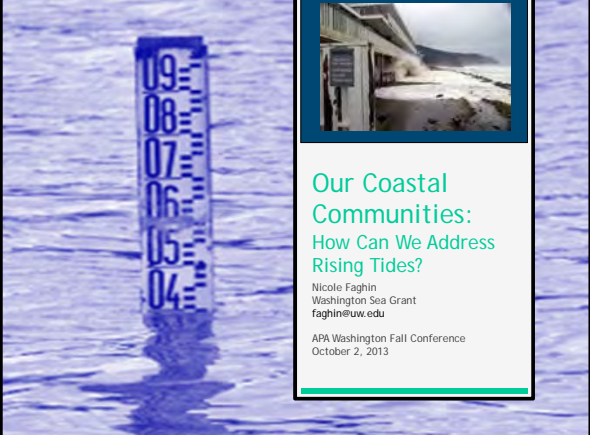
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What's Happening in Washington

- Bobbak Talebi, *Shoreline Planning Guidance*
- Jamie Mooney, *Coastal Resilience Network*
- Bob Freitag, *Staged Retreat*
- Linda Lyshall, *San Juan Sea Level Rise Initiative*

Planning for Sea Level Rise 



Our Coastal Communities: How Can We Address Rising Tides?

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