

# Envisioning Coastal Futures:

*Exploring alternative scenarios for  
Tillamook County coastlines*



Sponsored by the Tillamook County Futures Council

Open to the public

Light refreshments available

For more information, please contact David Yamamoto: [yamamoto.david@gmail.com](mailto:yamamoto.david@gmail.com)  
(503) 701-1235

**Thursday, May 28, 2015**

**6:00 – 8:00 p.m.**

**Officer's Mess Hall Meeting  
Room—6825 Officer's Row,  
Tillamook, OR 97141**

**(Port of Tillamook Bay)**



**Oregon State  
UNIVERSITY**

College of Earth, Ocean, and Atmospheric Sciences • Oregon State University  
104 CEOAS Admin Bldg. Corvallis, OR 97331-5503 • 541-737-3504

## Meeting Agenda



- **6:00 - 6:10** Welcome and Introductions
- **6:10 - 6:20** Meeting Objectives/  
Setting Expectations
- **6:20 - 7:05** Presentation of Project Setup  
and Results
- **7:05 - 7:20** Question and Answer
- **7:20 - 7:45** Poster session
- **7:45 - 7:55** Wrap up
- **7:55 - 8:00** Survey

## Project Objective:

Develop the information and tools necessary to envision future scenarios, assess impacts and vulnerability associated with erosion and flood hazards, and initiate adaptation strategies.



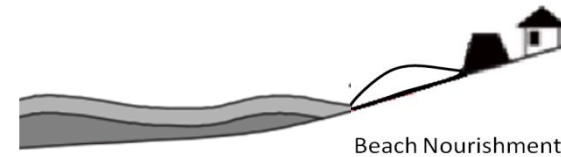


## Project Objective:

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Build more rip rap  
revetments?



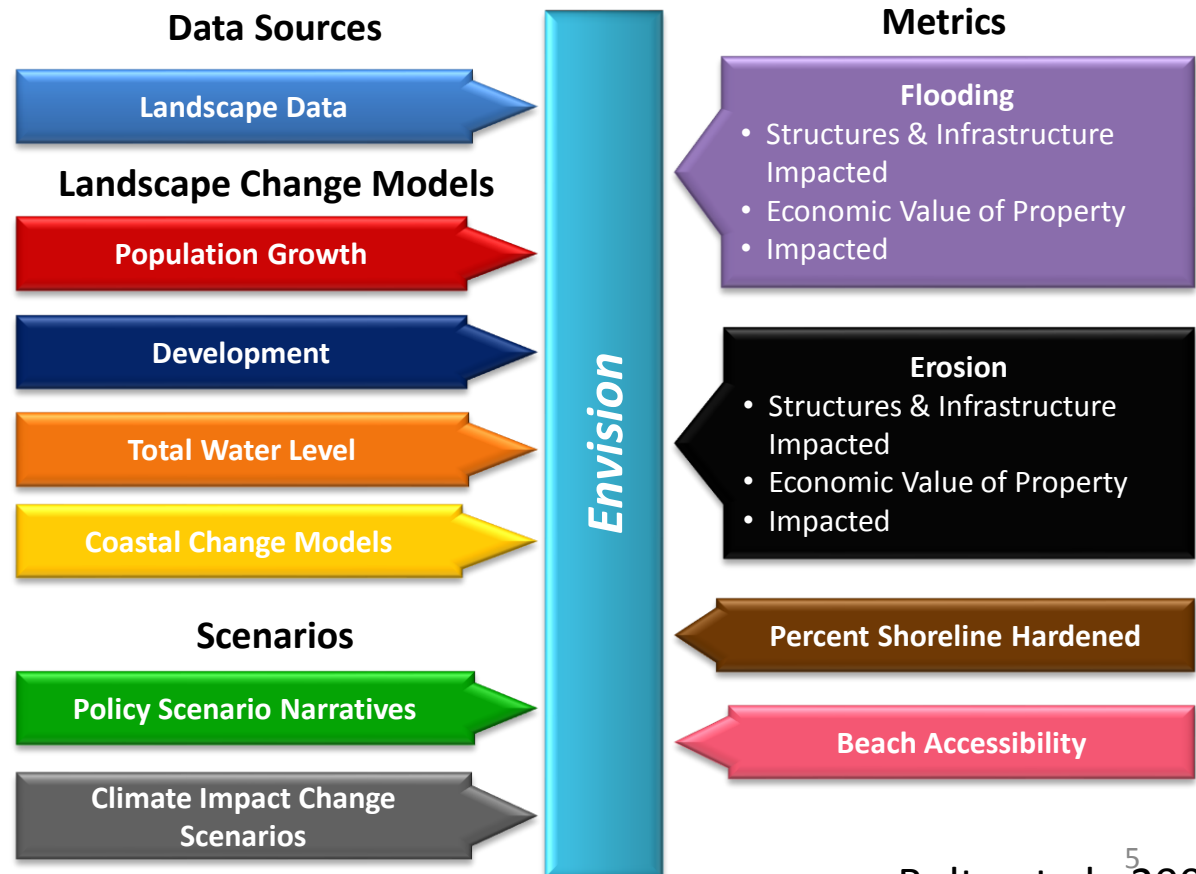
Nourish our coastline?



Move away from coast?

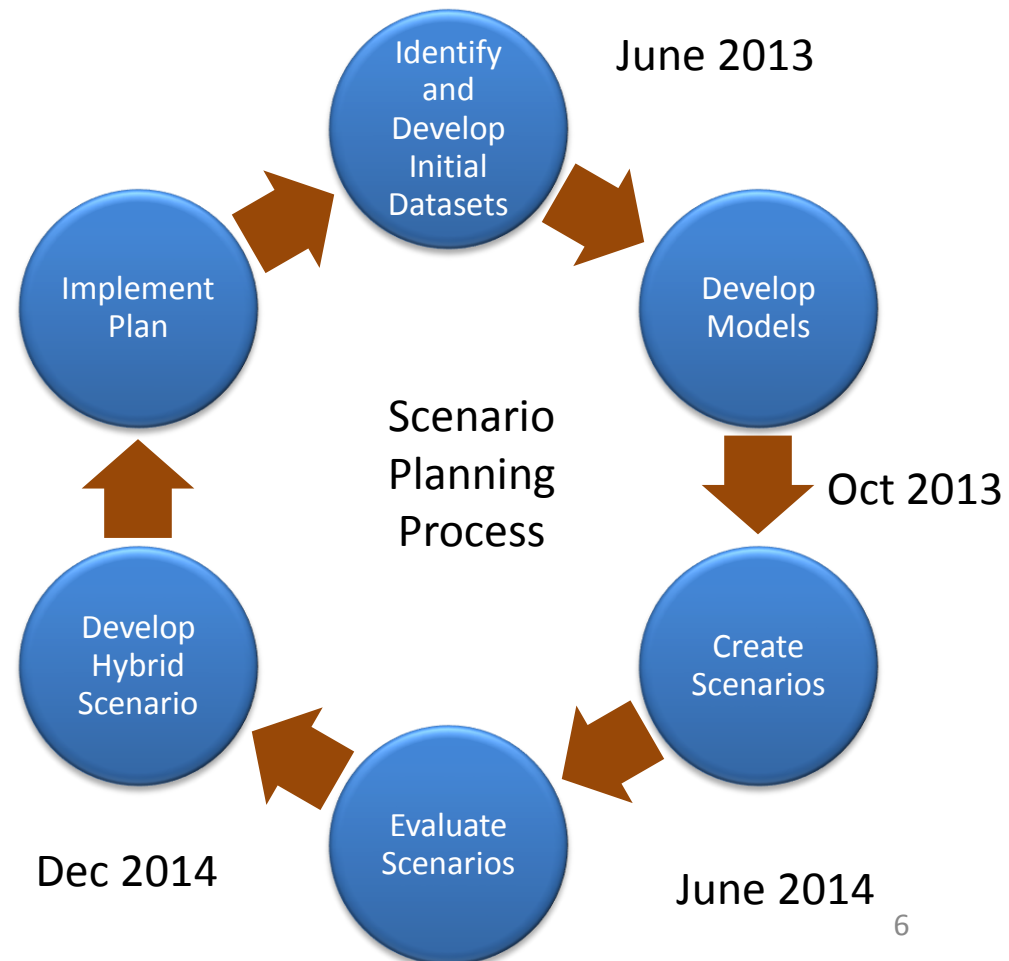
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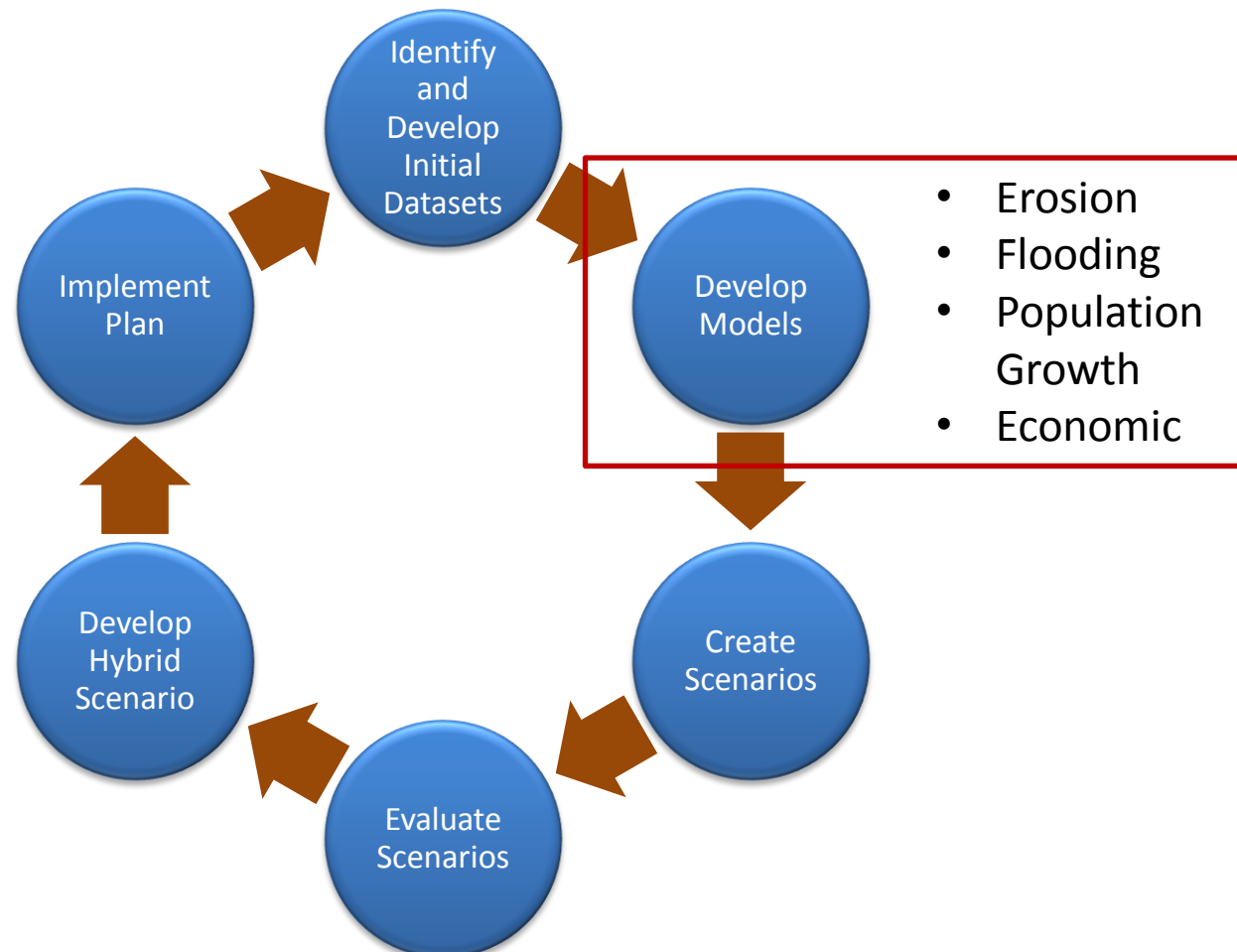
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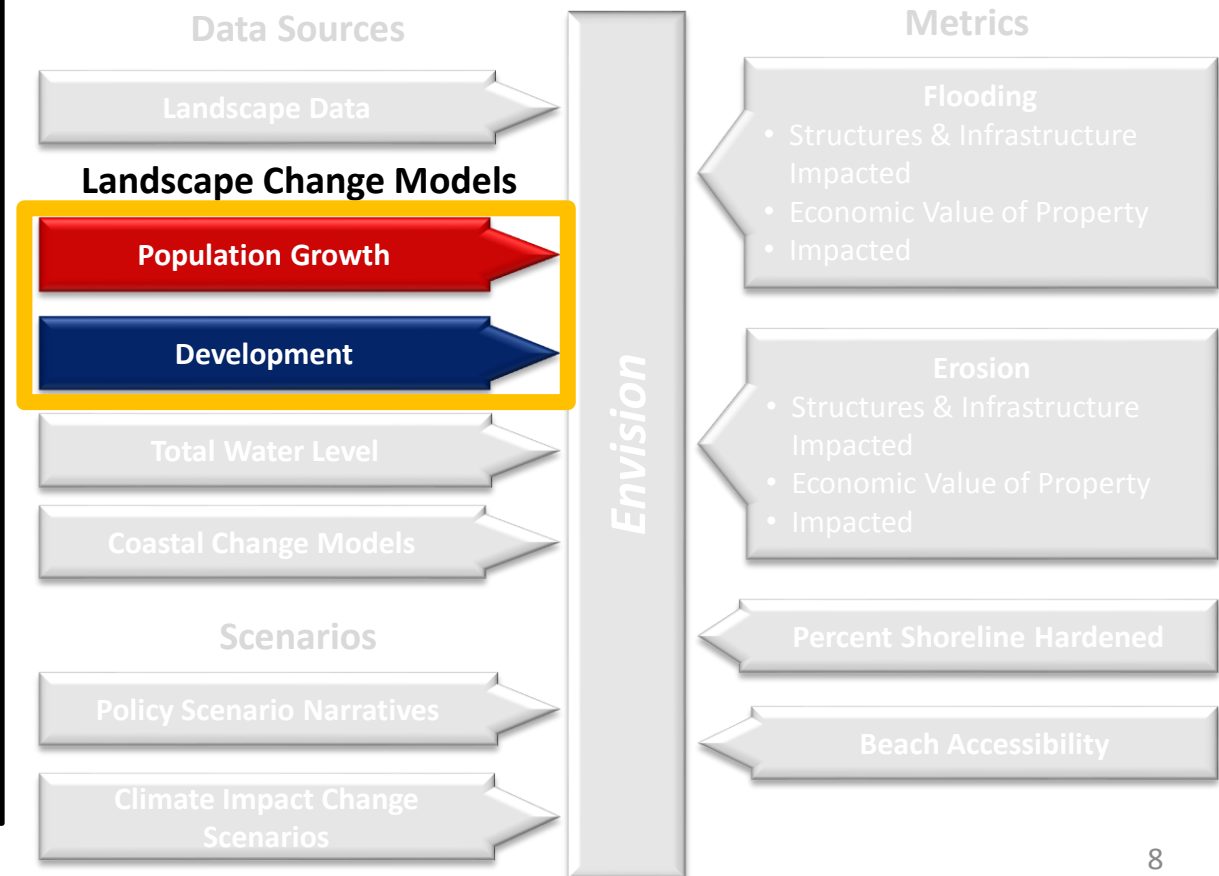
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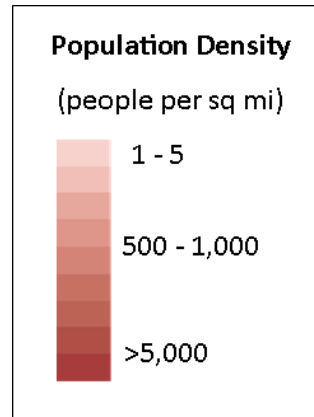
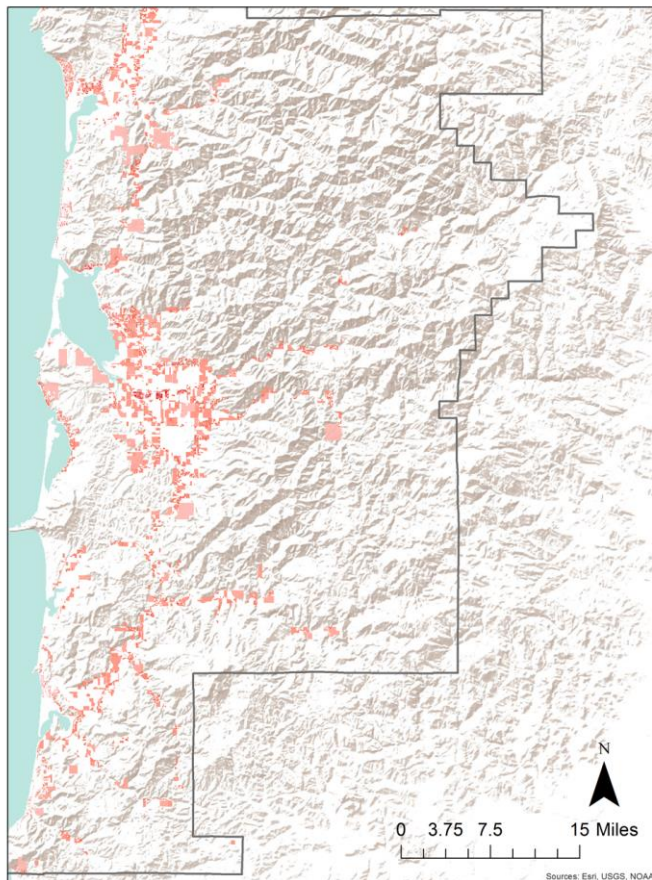




## How do development patterns change over time in Tillamook County?

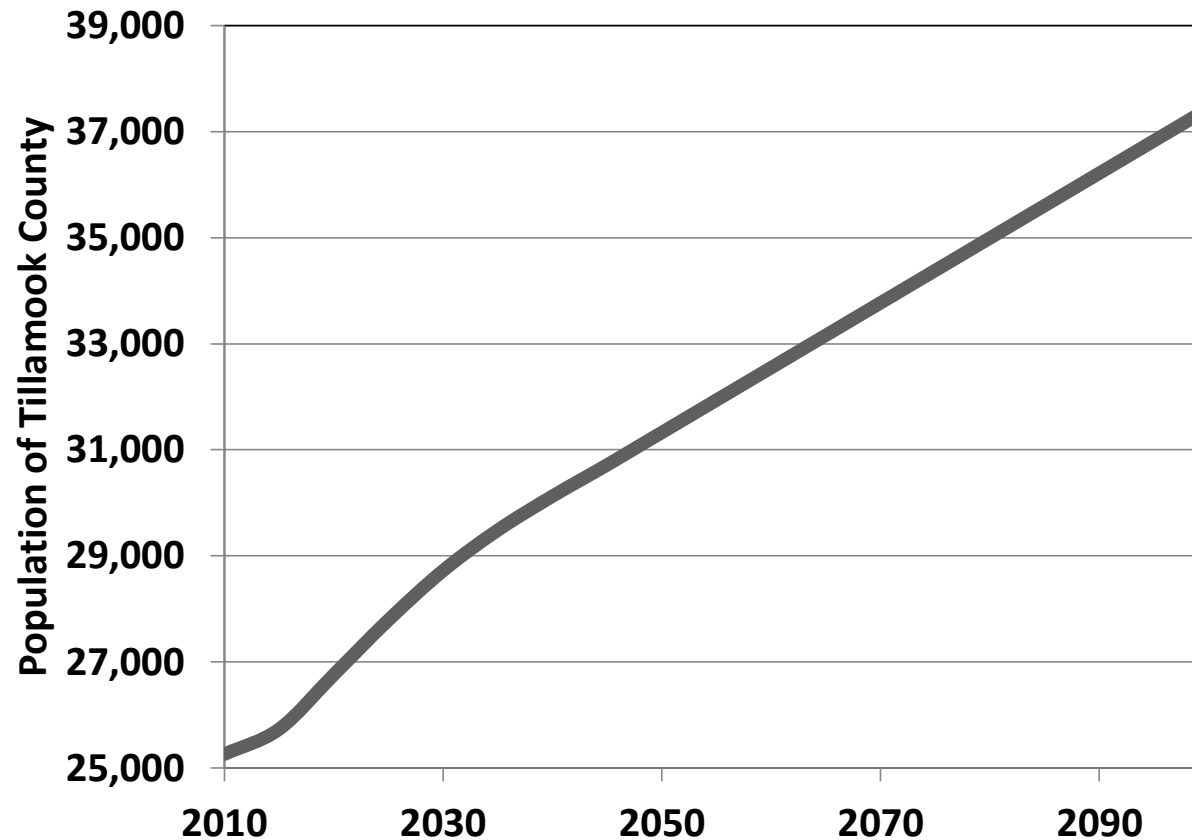
### Population Density

2010



## How do development patterns change over time in Tillamook County?

### Population Growth (County-Wide)

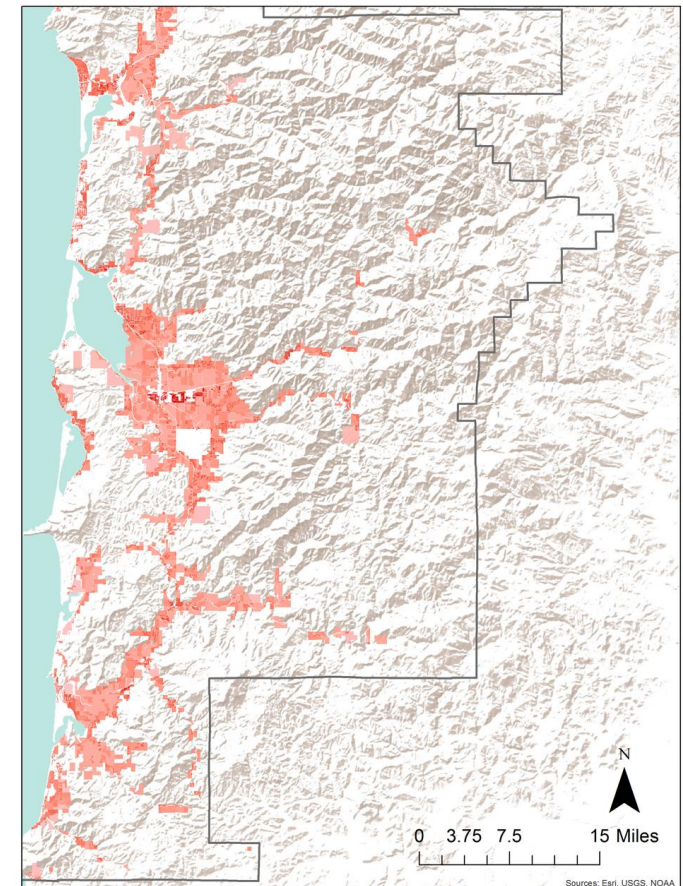
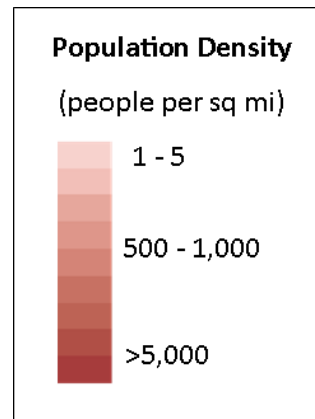
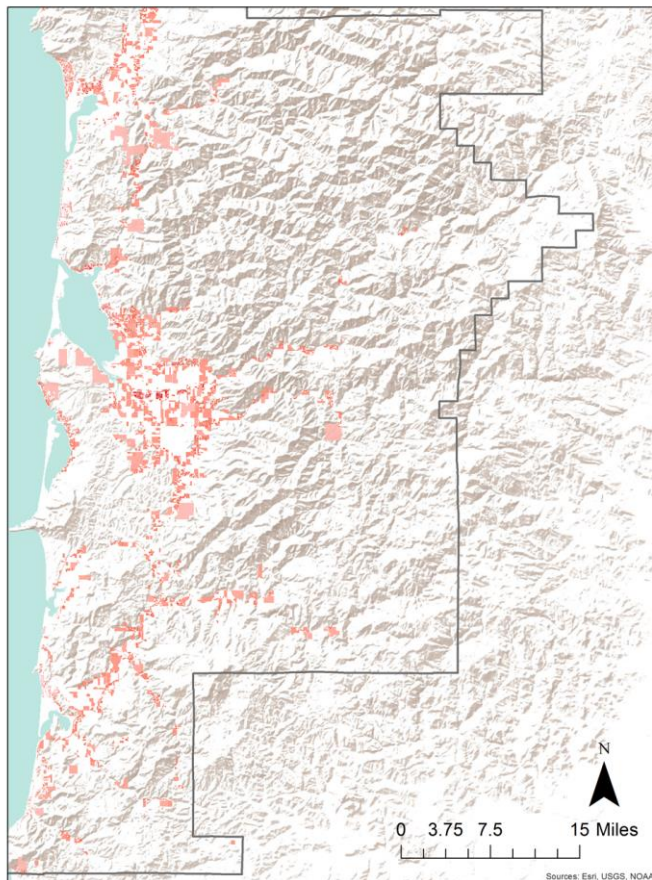


## How do development patterns change over time in Tillamook County?

### Population Density

2010

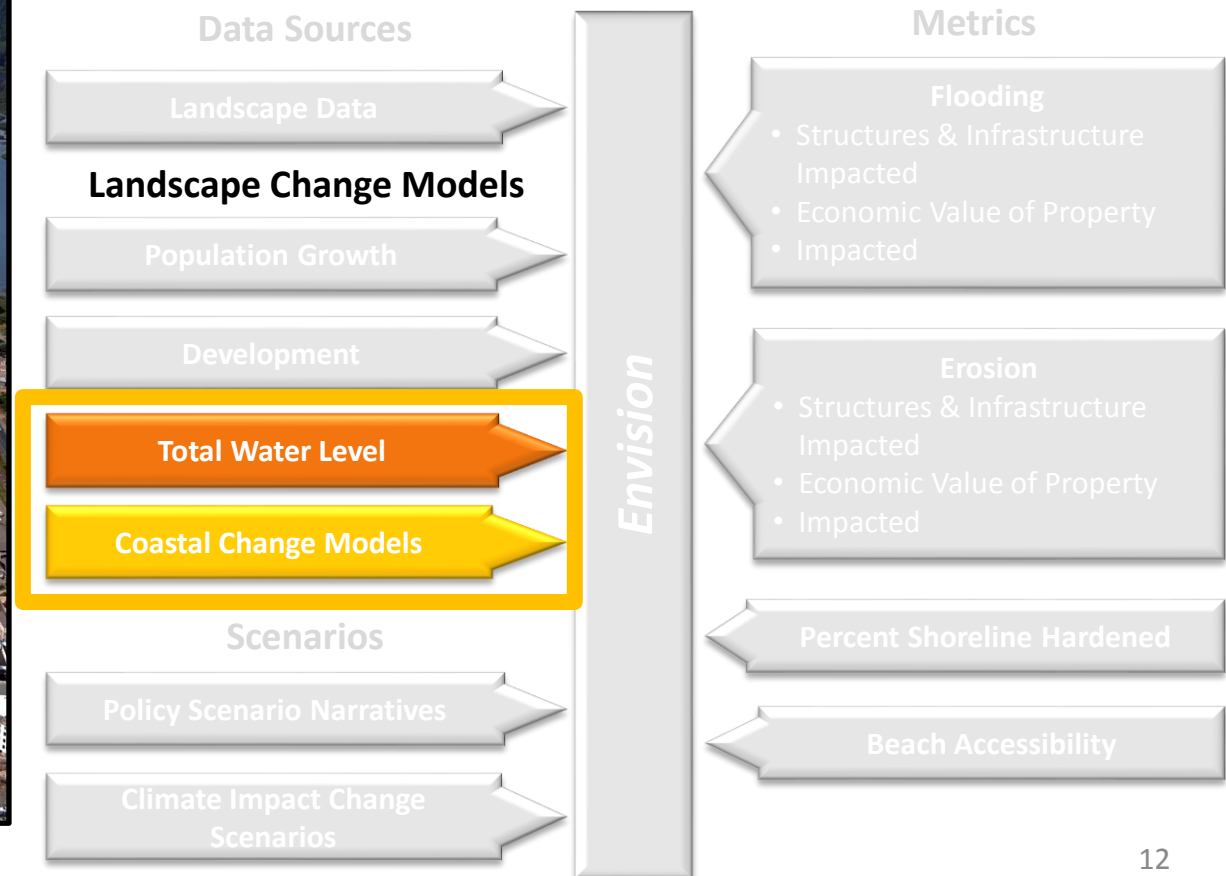
2100





## Project Objective:

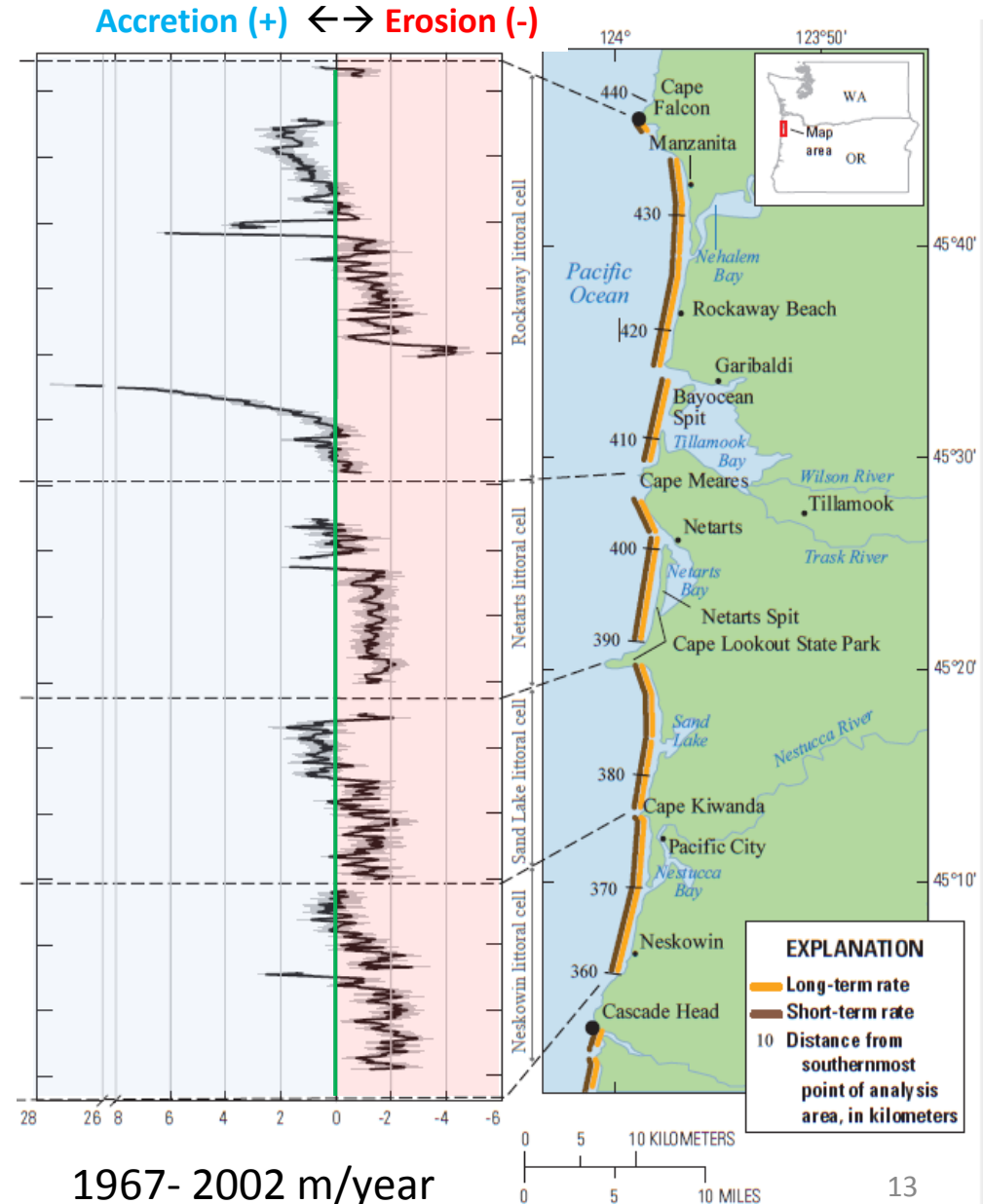
Develop the information and tools necessary to envision future scenarios, assess impacts and vulnerability associated with erosion and flood hazards, and initiate adaptation strategies.





## Short-term Shoreline Change in Tillamook County

Location	% eroding	% eroding > 1 m/year
Rockaway	47	25
Netarts	86	69
Sand Lake	63	38
Neskowin	86	58



Quantifying how big waves and high water levels combine to cause flooding and erosion on the coast.

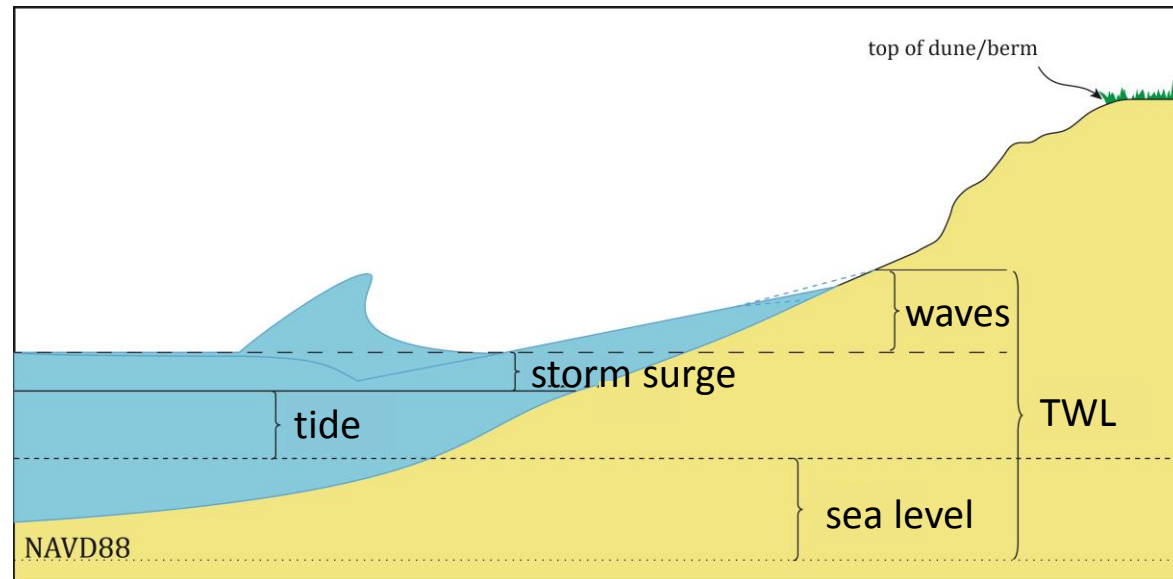


+



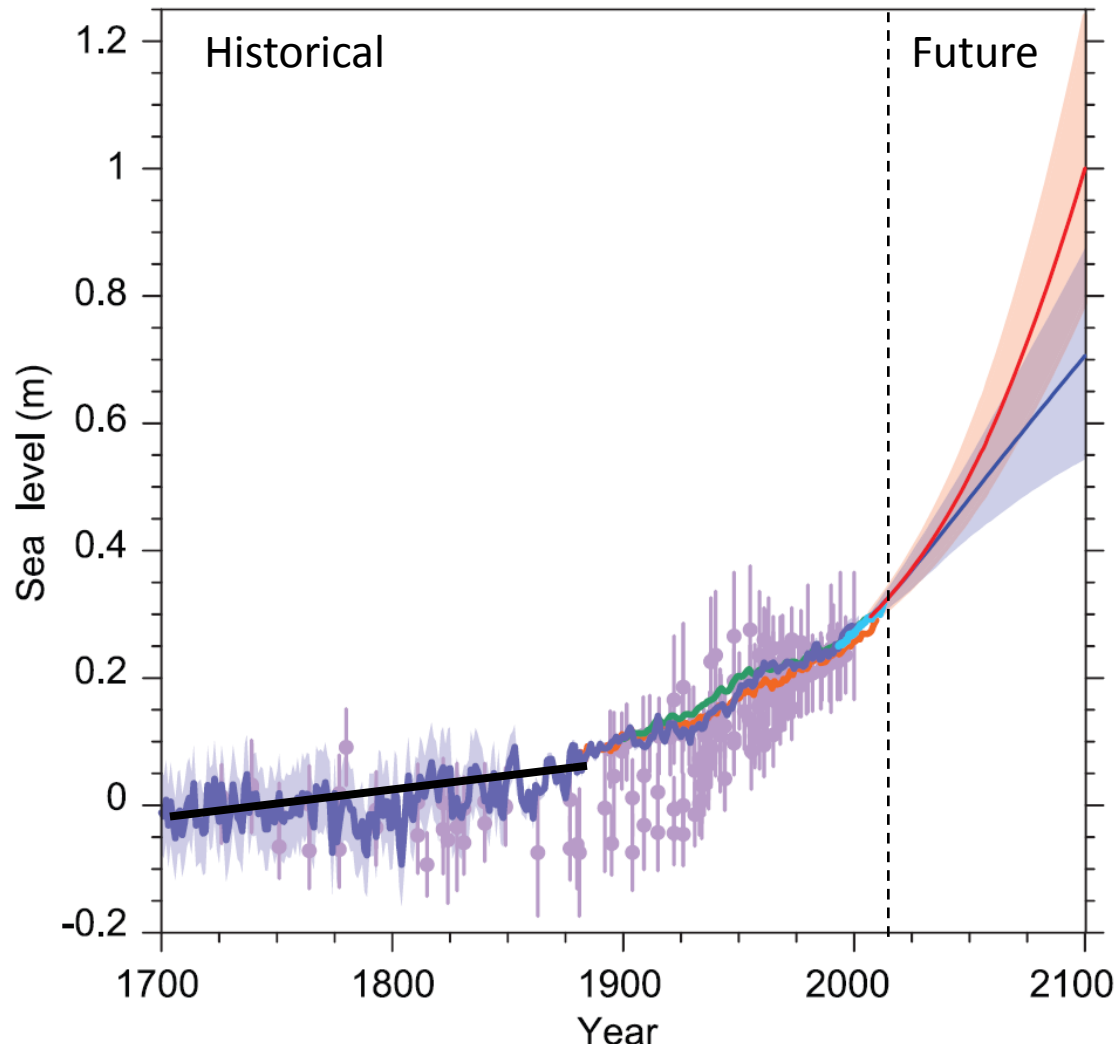


Total Water Level =  
sea level + tide + storm surge + waves



## Climate Controls on Coastal Flooding and Erosion: *Sea Level Rise*

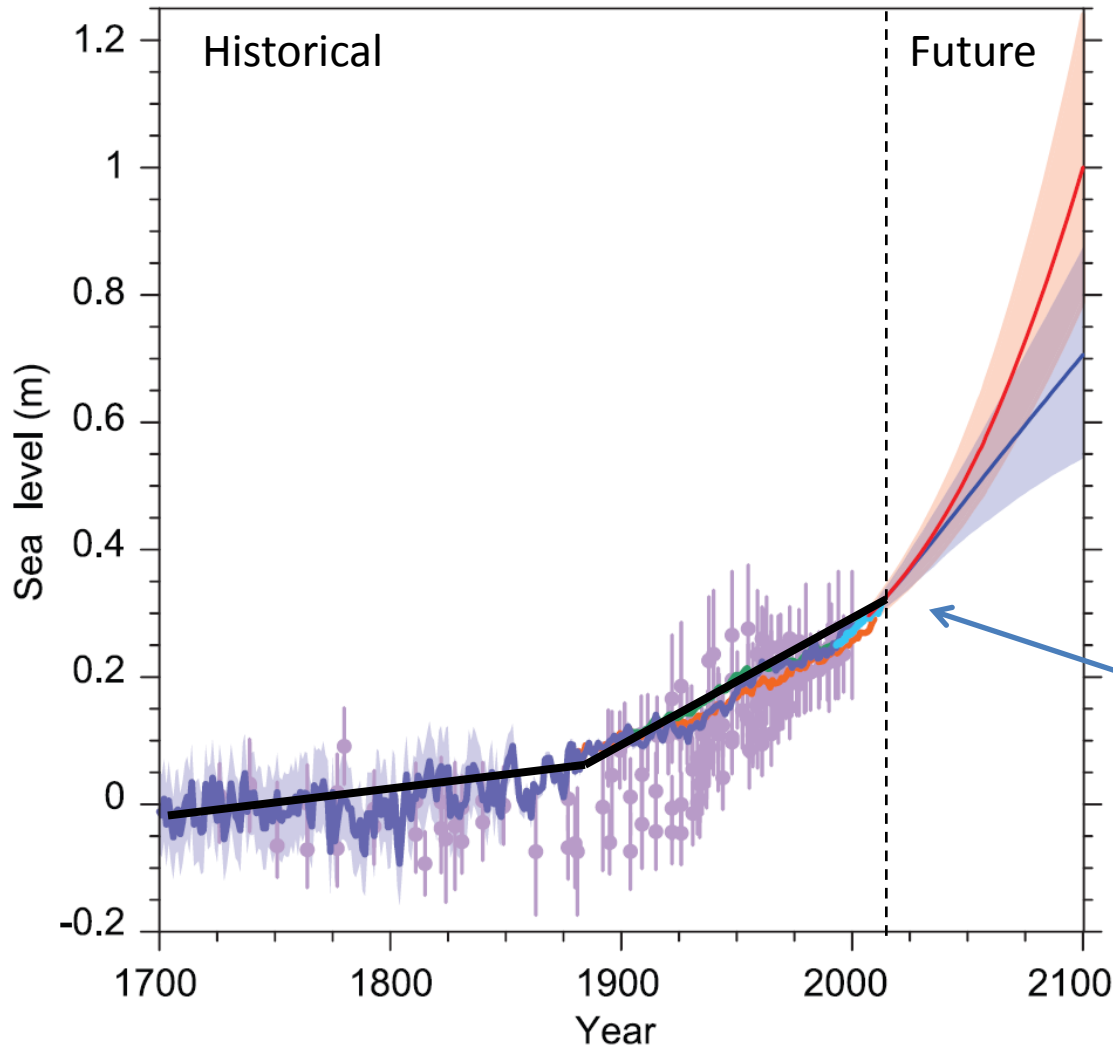
### Global Mean Sea Level (1700-2100)





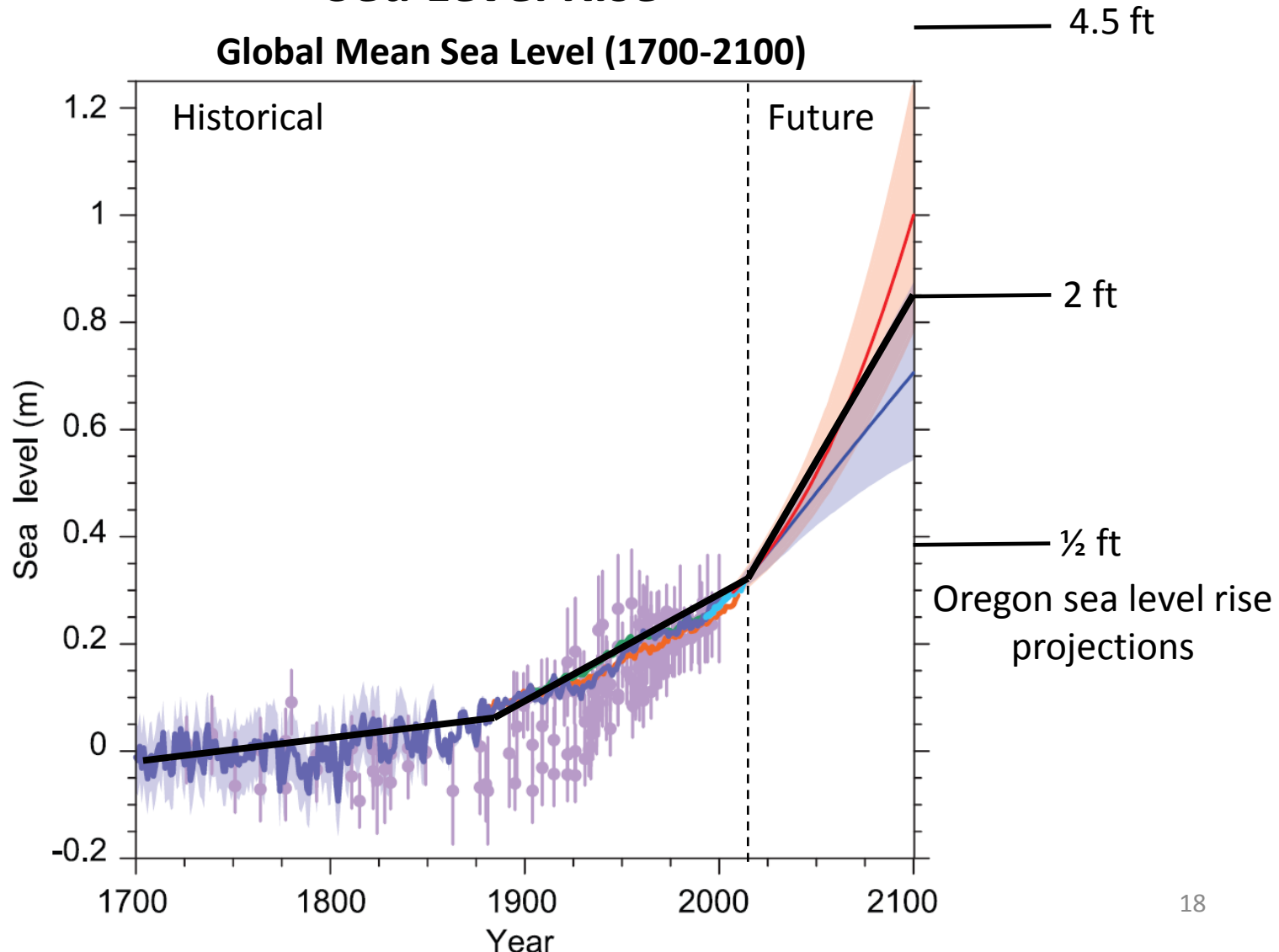
## Climate Controls on Coastal Flooding and Erosion: *Sea Level Rise*

### Global Mean Sea Level (1700-2100)

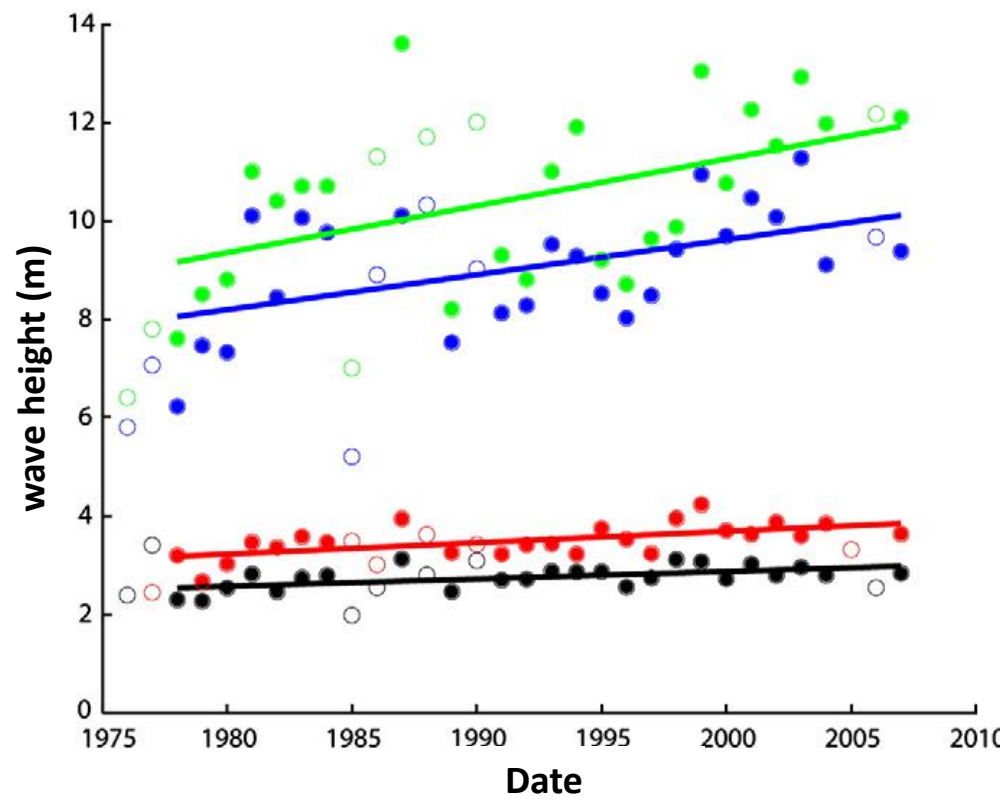


Present day  
global mean sea  
level ~ 10 inches  
higher than 100  
years ago

## Climate Controls on Coastal Flooding and Erosion: *Sea Level Rise*



## Climate Controls on Coastal Flooding and Erosion: *Increases in wave heights*



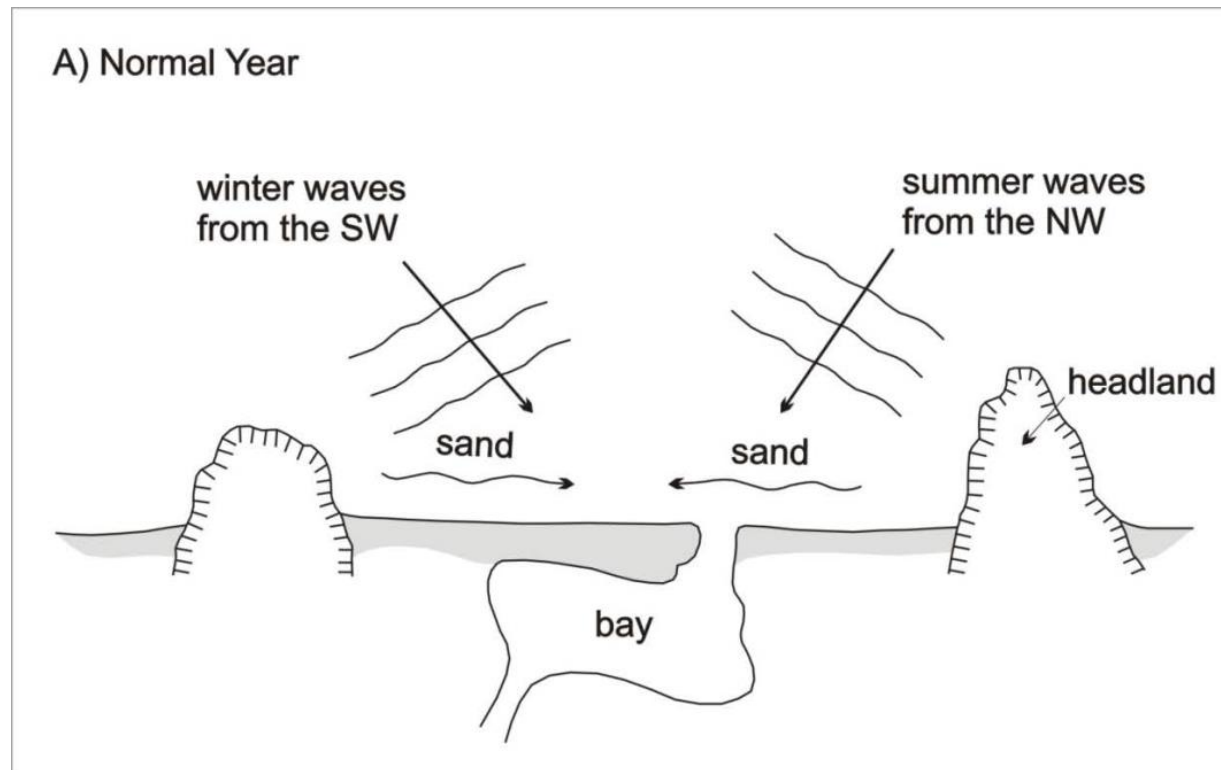
**Annual Max**  
**+9.5 cm/yr**

**Avg. 5 Largest**  
**+7.1 cm/yr**

**Winter Mean**  
**+ 2.3 cm/yr**

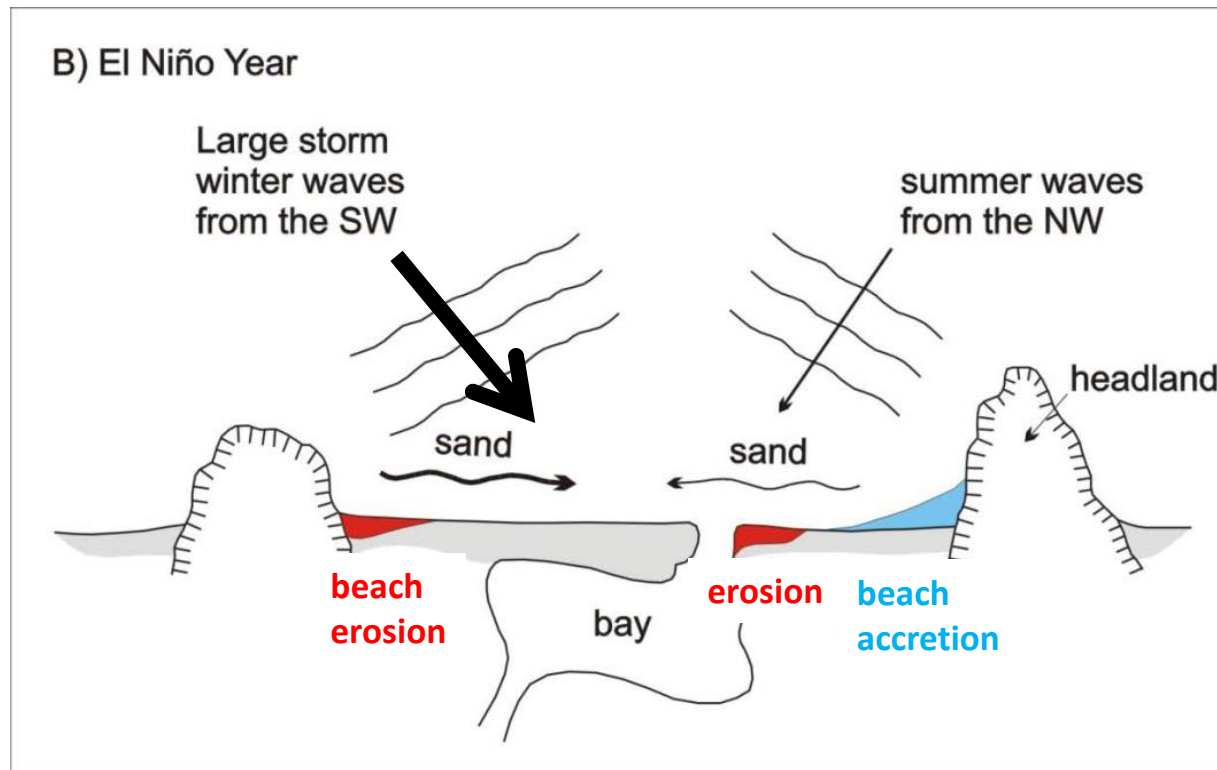
**Annual Mean**  
**+ 1.5 cm/yr**

## Climate Controls on Coastal Flooding and Erosion: *El Niño Events*

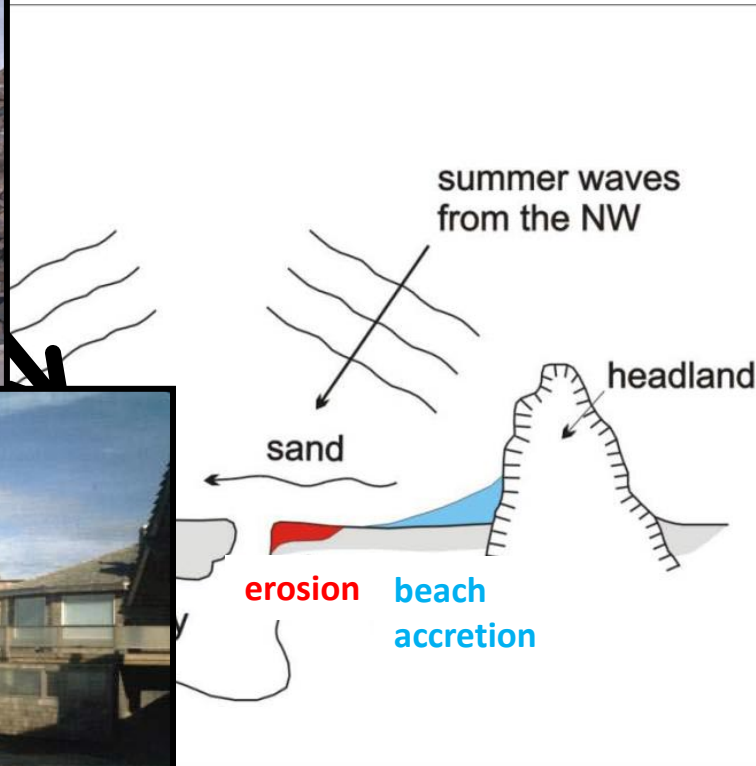
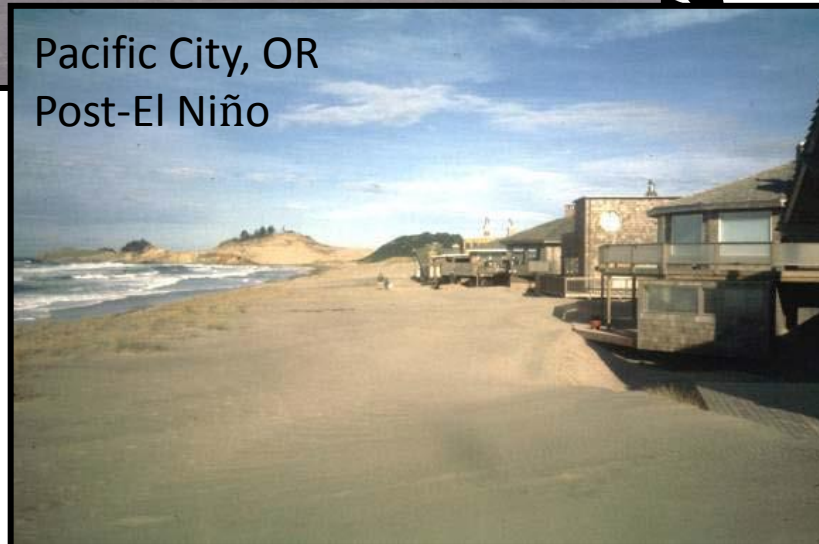
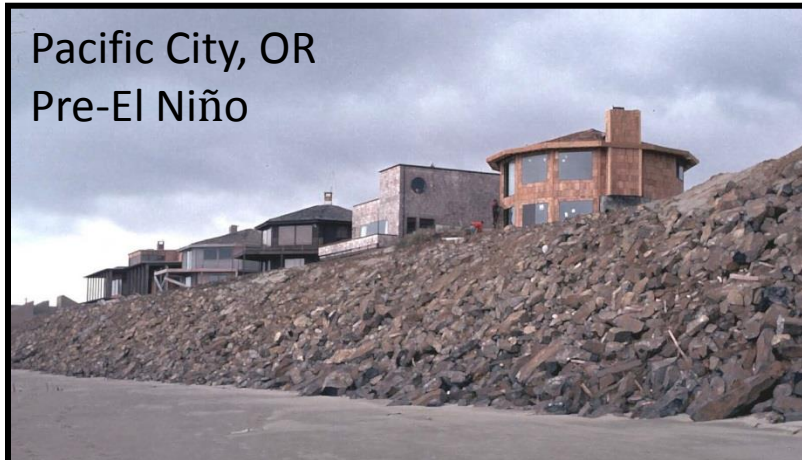




## Climate Controls on Coastal Flooding and Erosion: *El Niño Events*

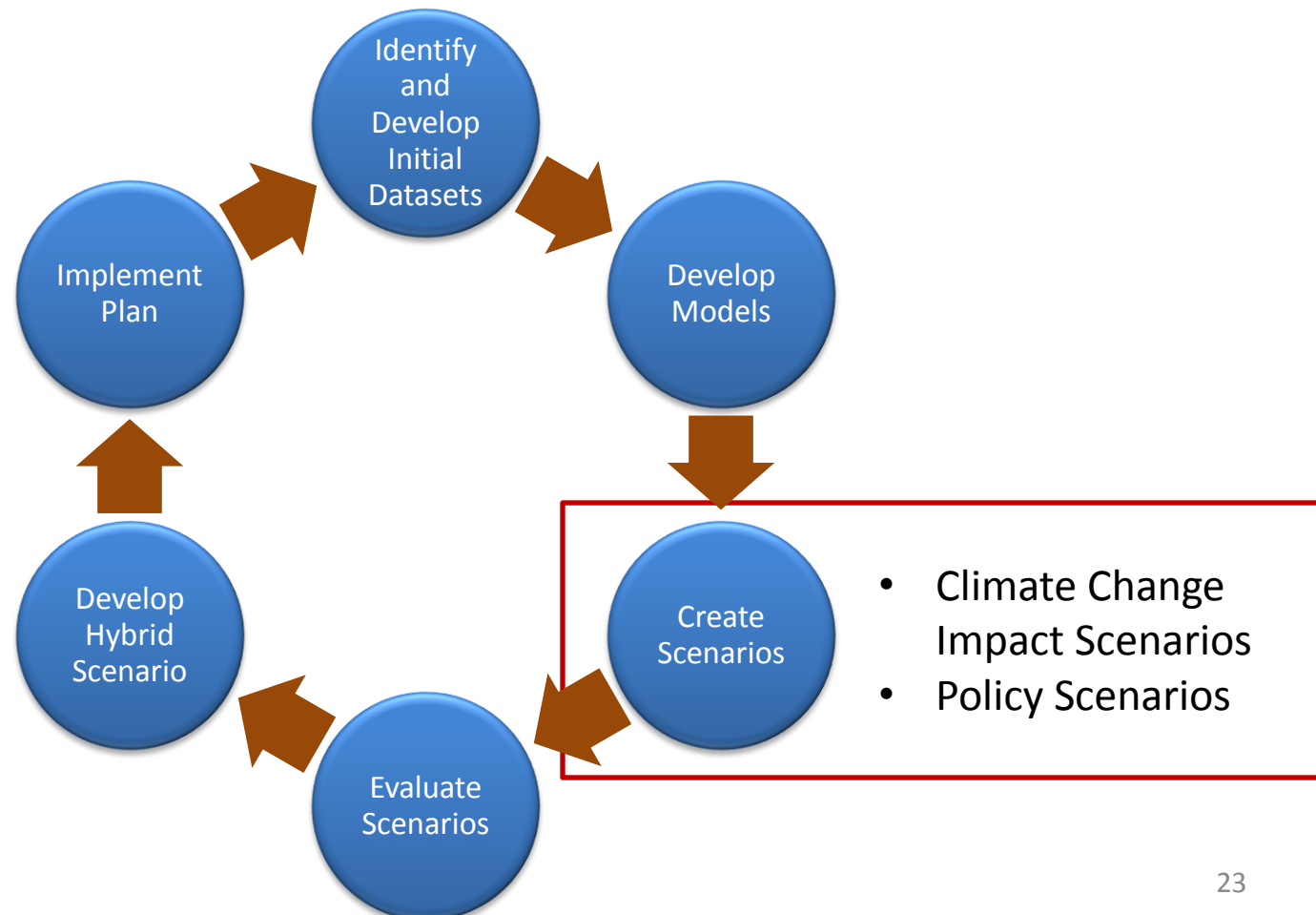


## Climate Controls on Coastal Flooding and Erosion: *El Niño Events*

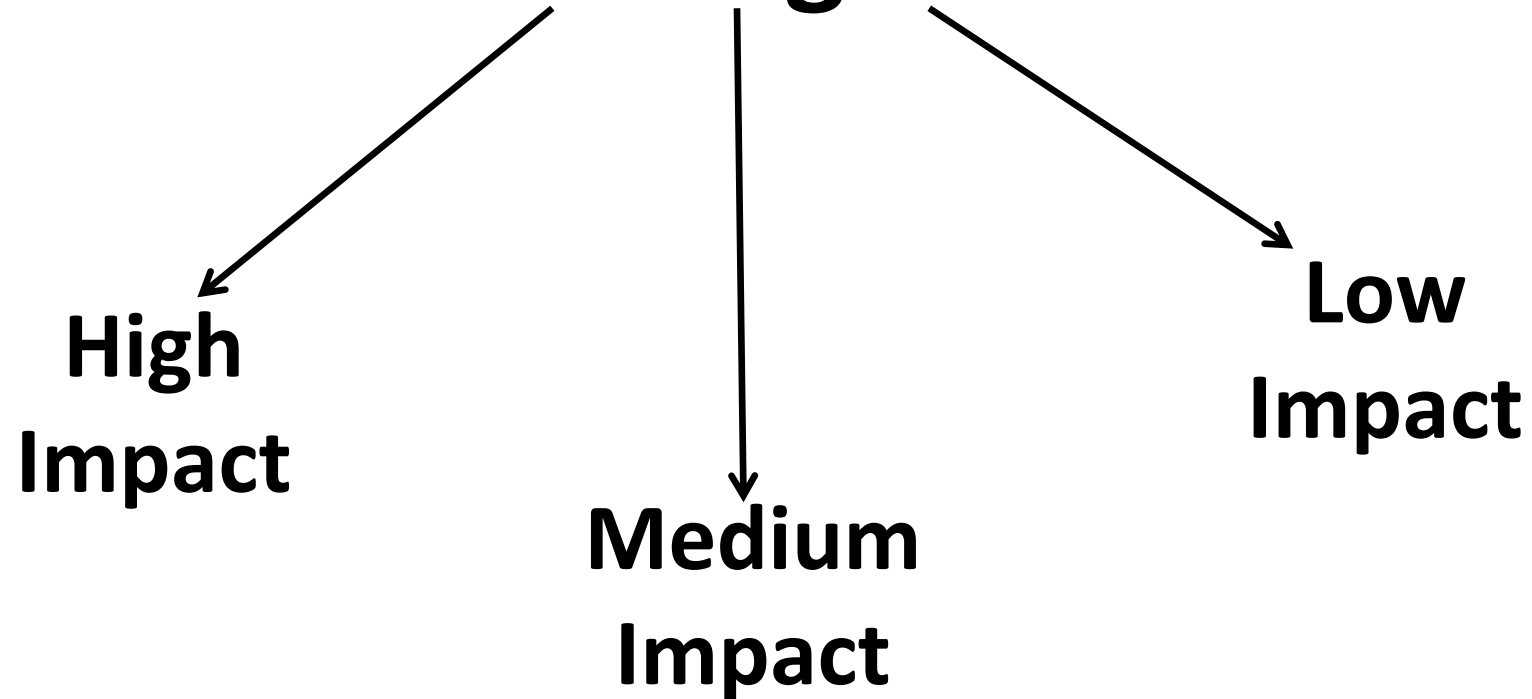


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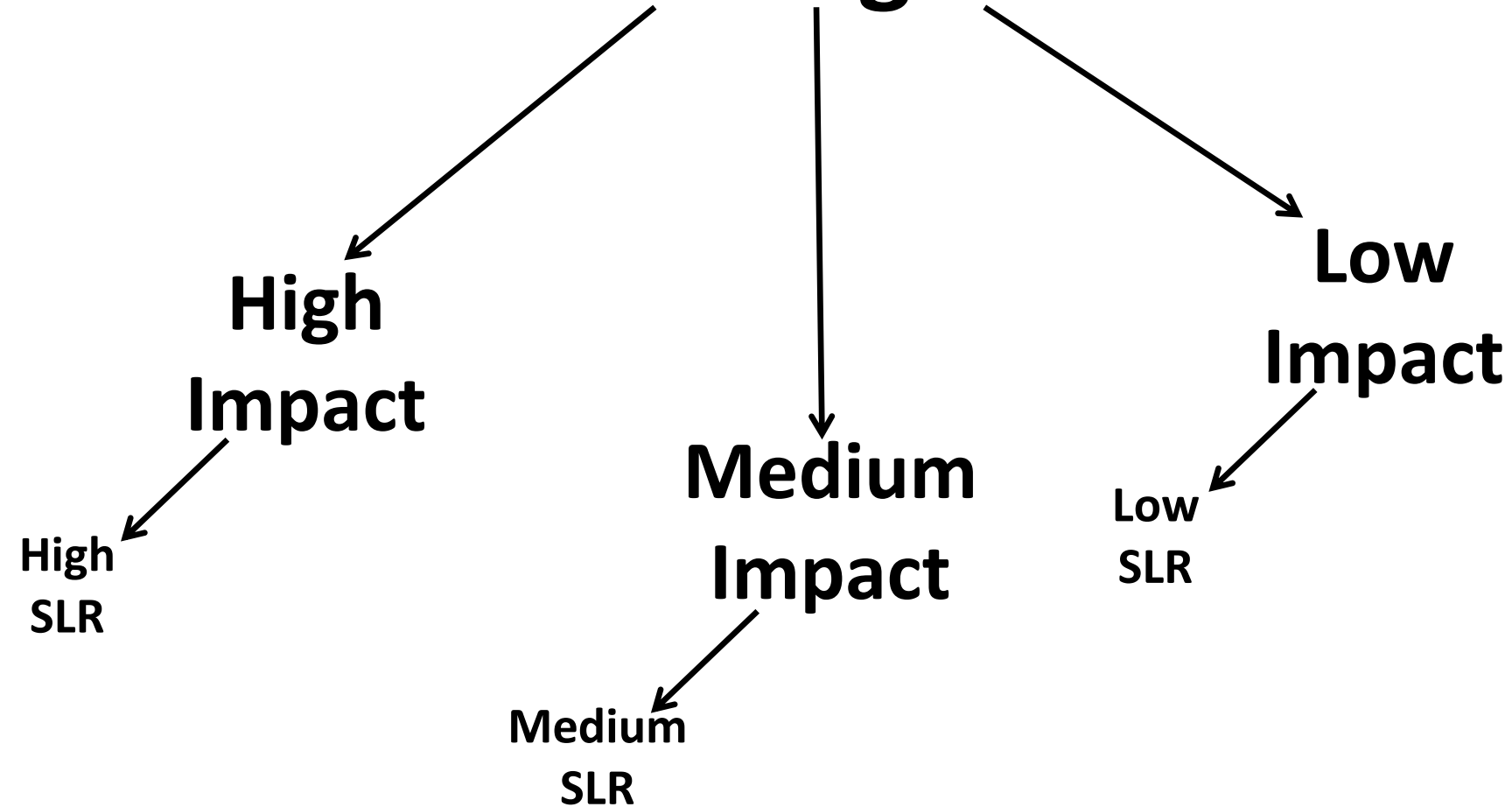


# Climate Change Scenarios

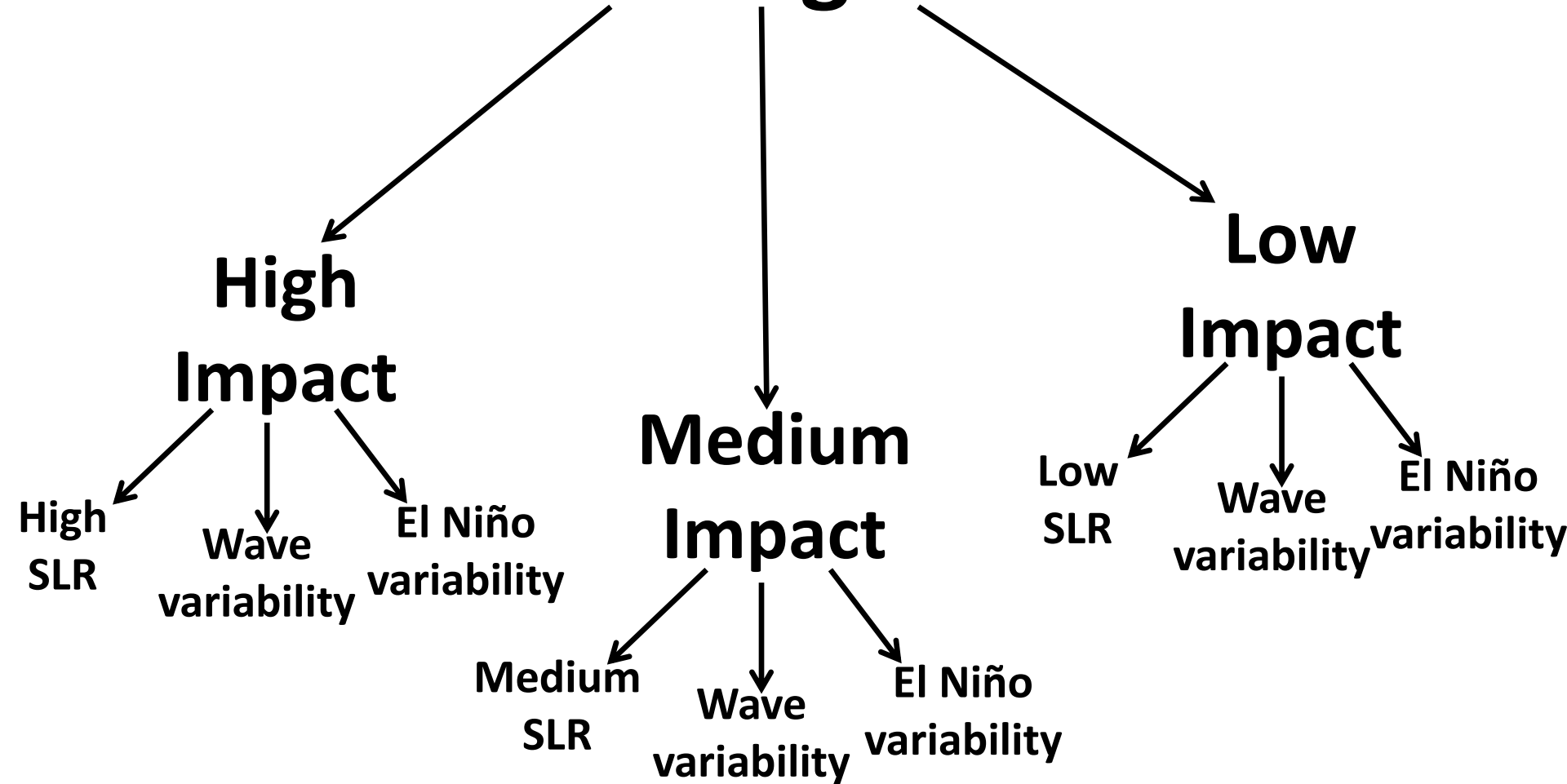




# Climate Change Scenarios



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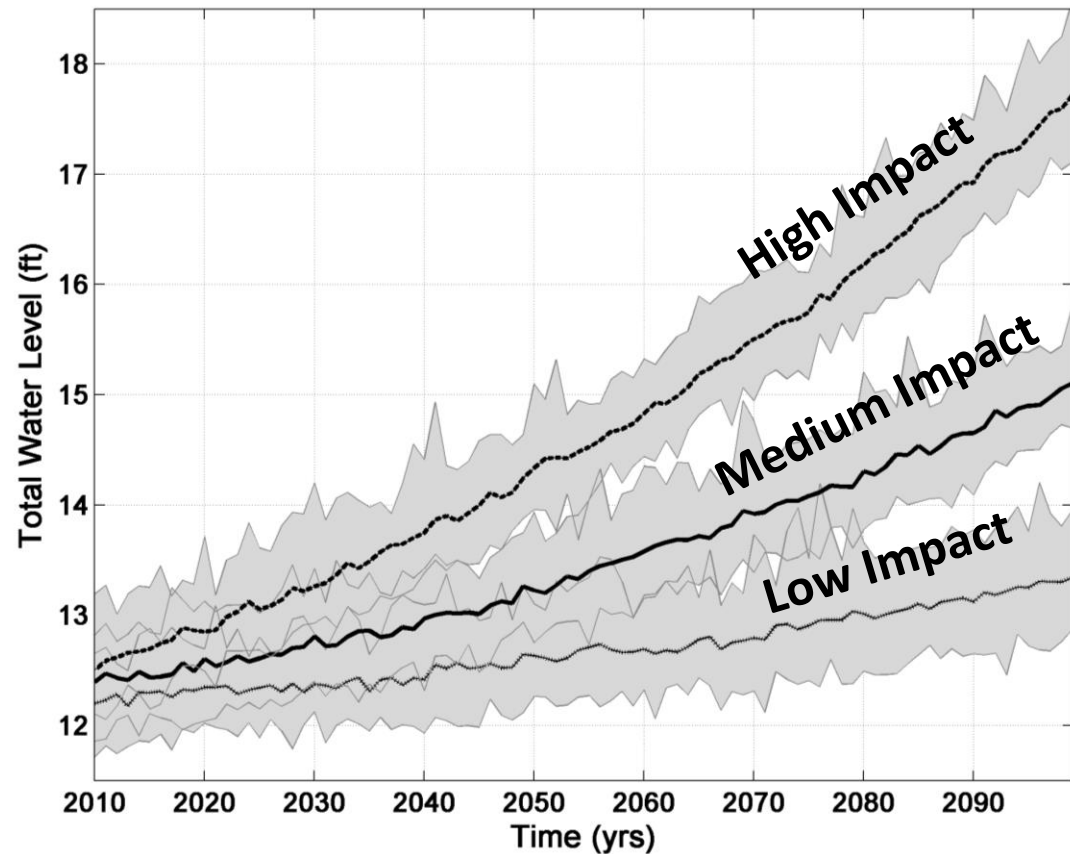


# Climate Change Scenarios

sea level rise

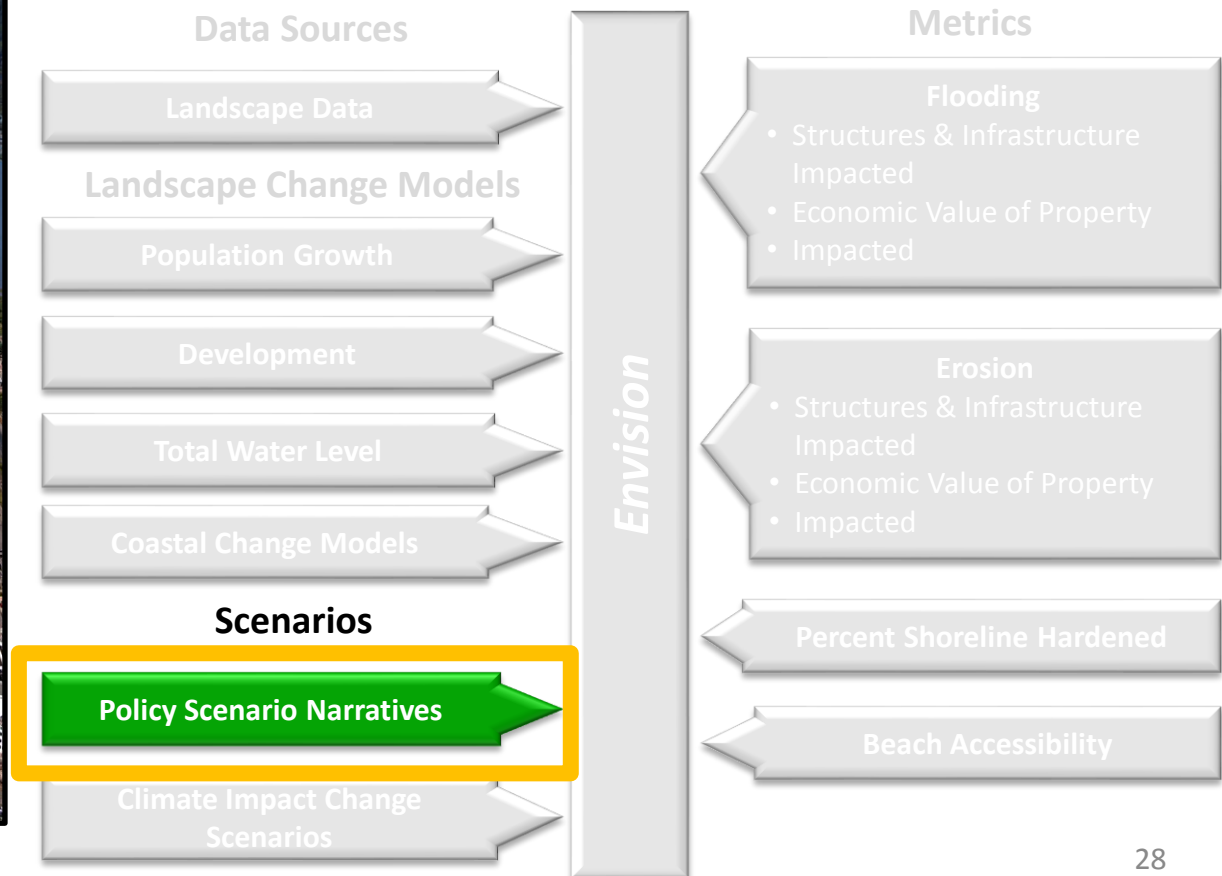
wave  
variability

El Niño  
variability

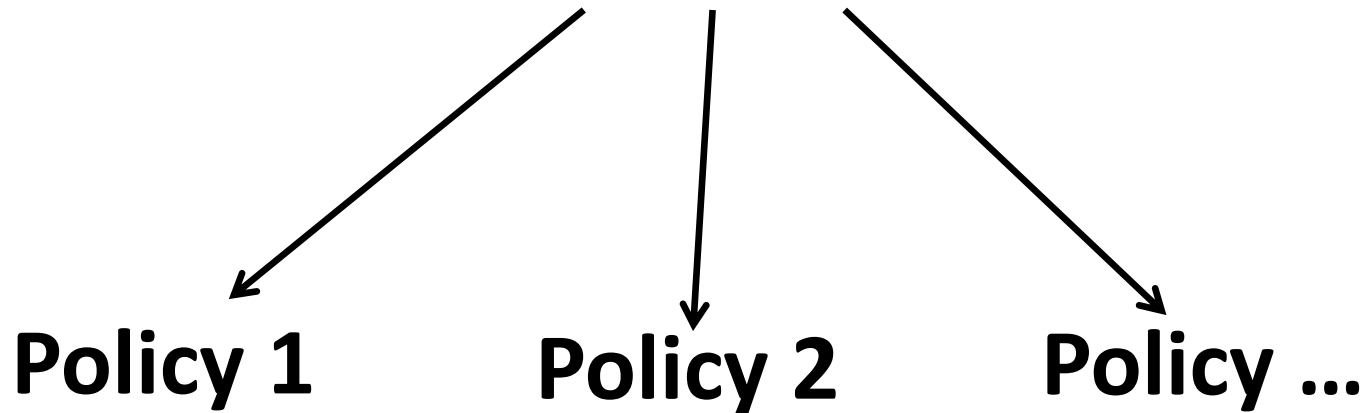


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Develop the information and tools necessary to envision future scenarios, assess impacts and vulnerability associated with erosion and flood hazards, and initiate adaptation strategies.



## Policy Scenario Narratives





## Policy Scenario Narratives

### 1. Status Quo

*Continue* present-day policies.



## Policy Scenario Narratives

### 1. Status Quo

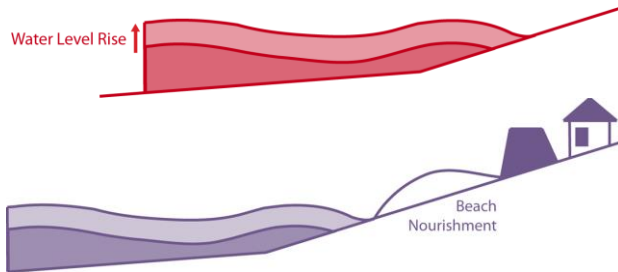
*Continue* present-day policies.



**Example Policy: Maintain current rip rap revetments and allow more to be built on eligible lots.**

## Policy Scenario Narratives

### 1. Status Quo



### 2. Hold the Line

Resist environmental change in order to preserve existing infrastructure and human activities.

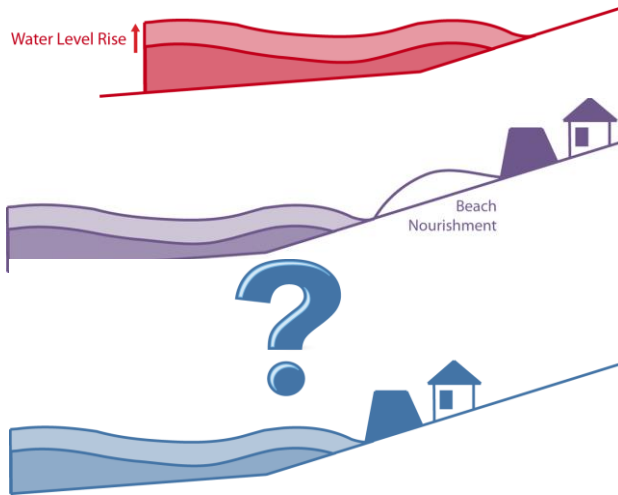
## Policy Scenario Narratives

### 1. Status Quo

### 2. Hold the Line

### 3. Laissez-Faire

*Relax* current policies such that existing homes, infrastructure and new development are more important than the protection of coastal resources, public rights, recreational use, beach access, scenic views.



## Policy Scenario Narratives

### 1. Status Quo



### 2. Hold the Line



### 3. Laissez-Faire



### 4. ReAlign



*Change human activities to suit the changing environment.*



## Policy Scenario Narratives

### 1. Status Quo



### 2. Hold the Line



### 3. Laissez-Faire



### 4. ReAlign



### 5. Neskowin

Implement policies in accordance with the Neskowin Coastal Hazards Adaptation Plan that involves both resisting environmental change and changing human activities.



## Policy Scenario Narratives

### 1. Status Quo



### 2. Hold the Line



### 3. Laissez-Faire



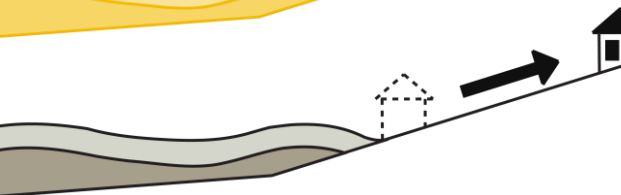
### 4. ReAlign



### 5. Neskowin



### 6. Hybrid

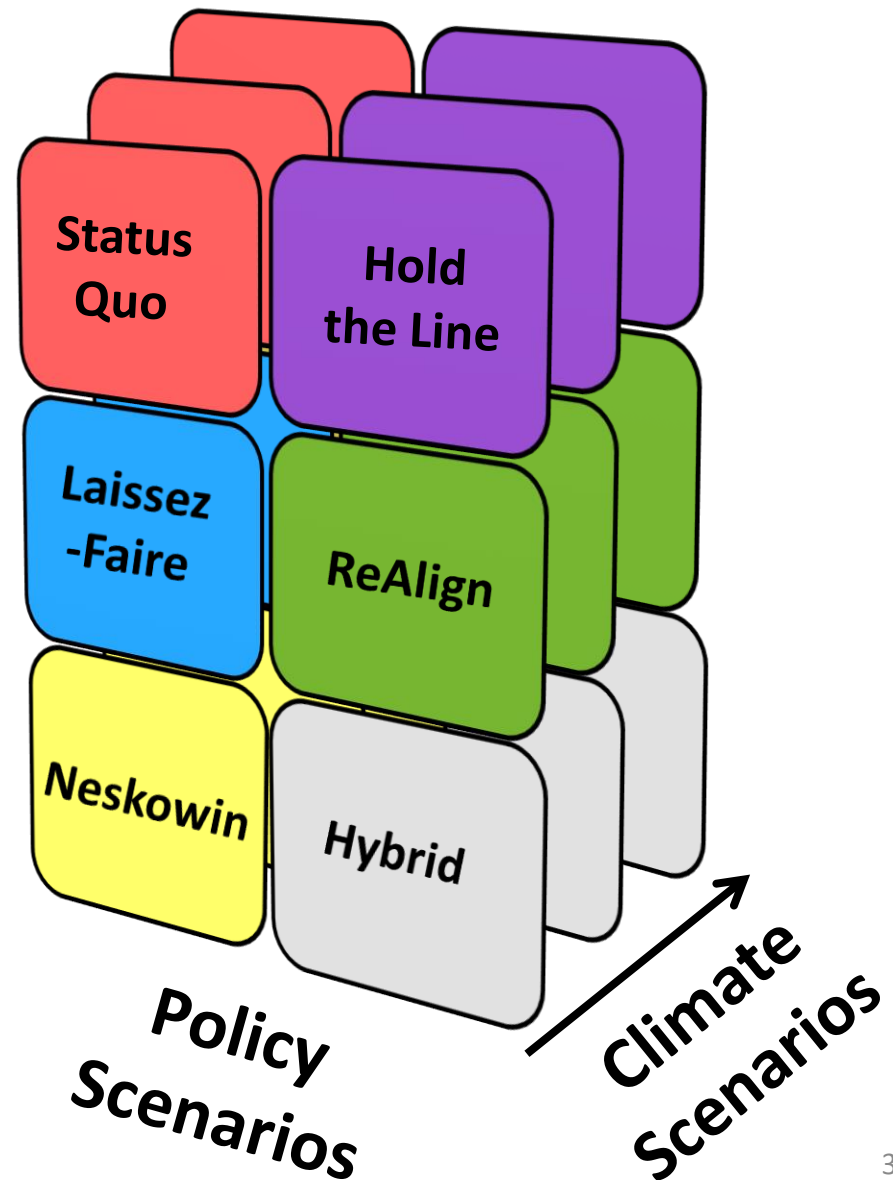


Implement policies in accordance with the preferences established by the KTAN during the December 2014 stakeholder meeting to change human activities in order to suit the changing environment.

**Climate Scenarios  
(Physical Drivers)**

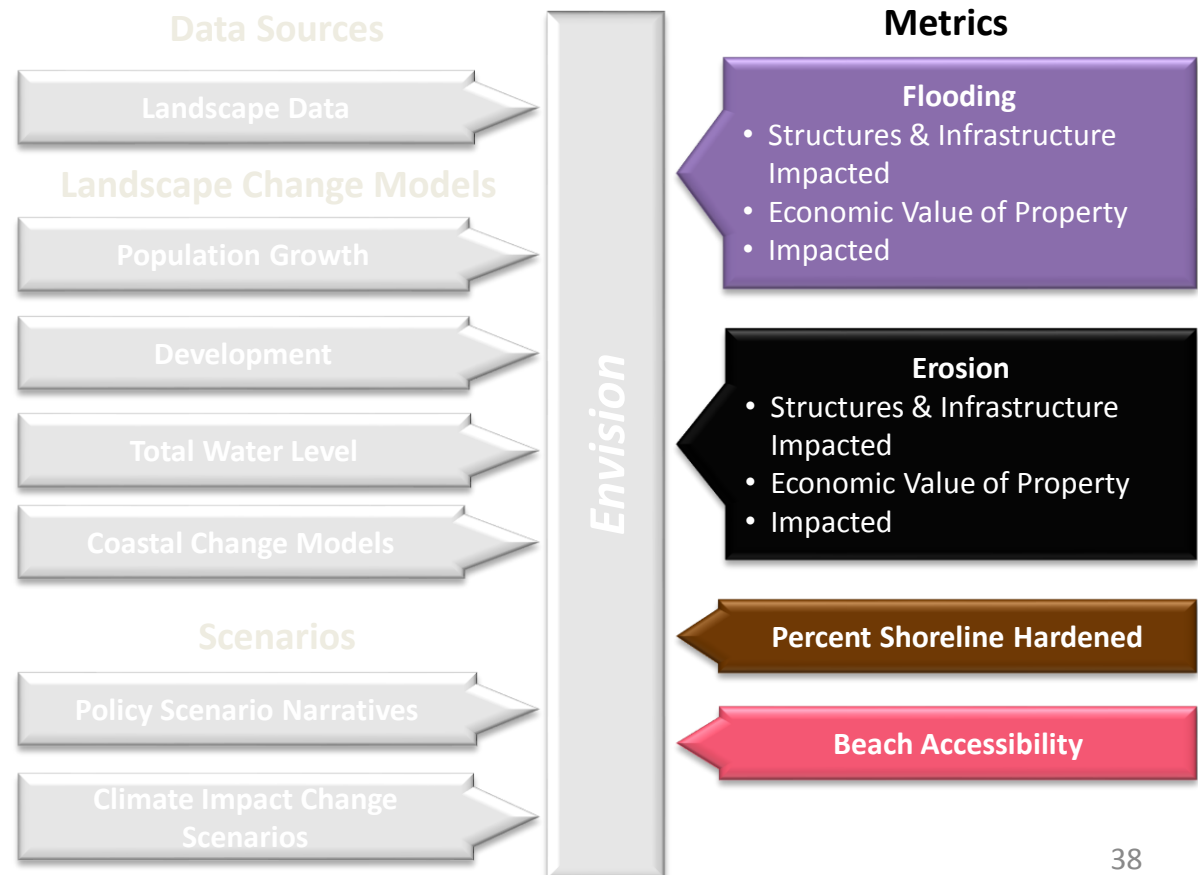
**X**

**Policy Scenarios  
(Human Drivers)**



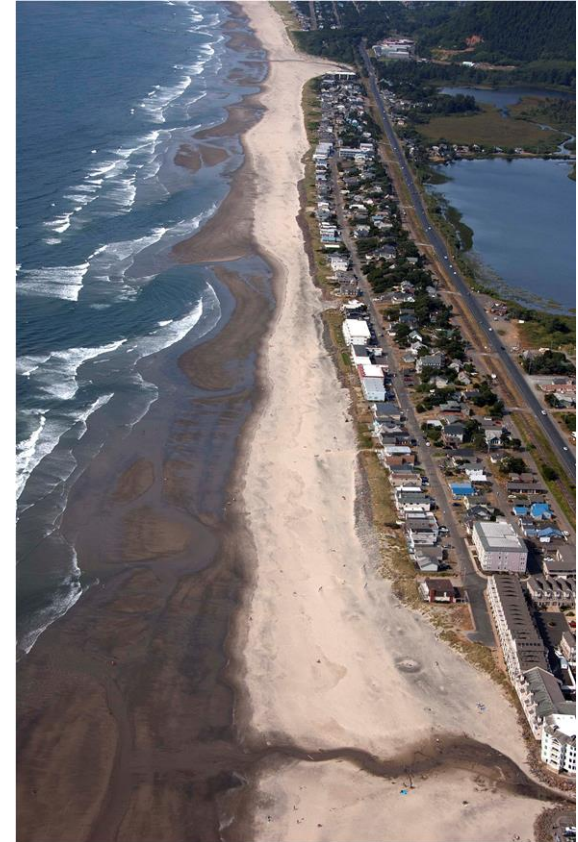
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## Storylines

- Property Risk
- Public Good
- Development
- Community Comparison





## Storyline: Property Risk

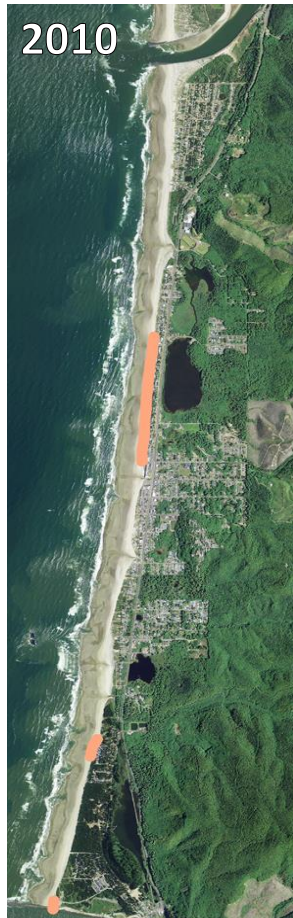
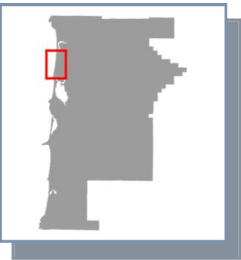
When will homeowners need backshore protection structures (BPS) to protect their property?



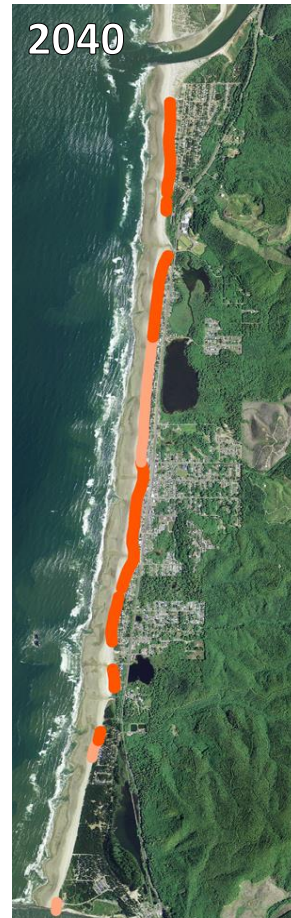
*Armand Thibault, Neskowin, 2008*

# Storyline: Property Risk

## When will homeowners need BPS to protect their property?



Present Day



Status Quo

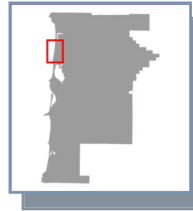
### *Rockaway Beach Littoral Cell*

Existing BPS    New BPS

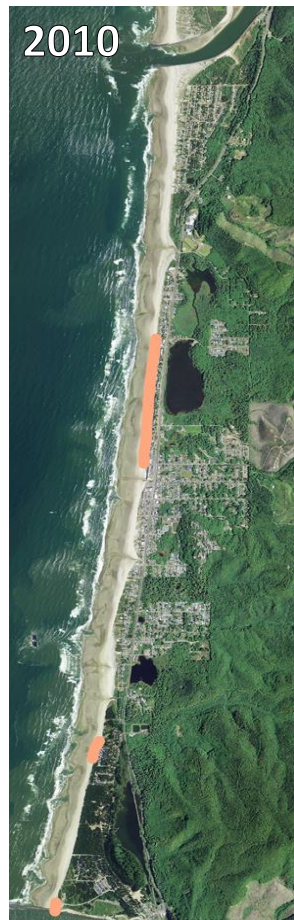


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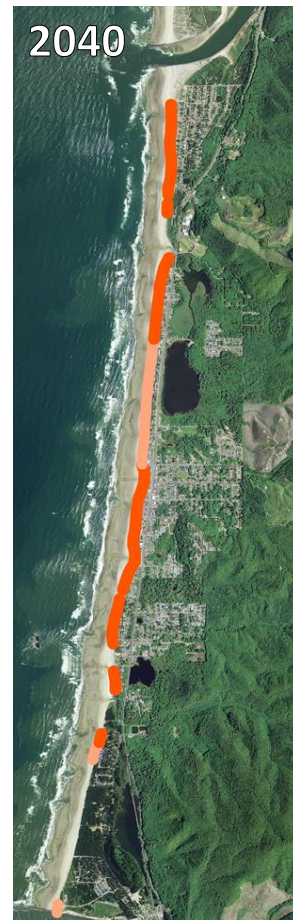
### Rockaway Beach Littoral Cell



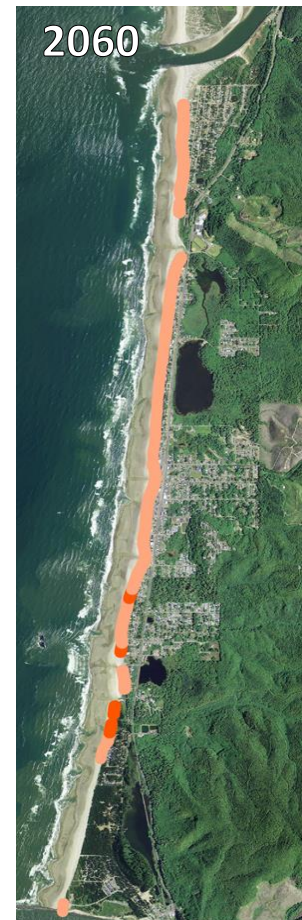
Existing BPS    New BPS



Present Day



Status Quo

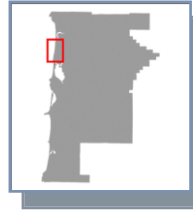


Status Quo

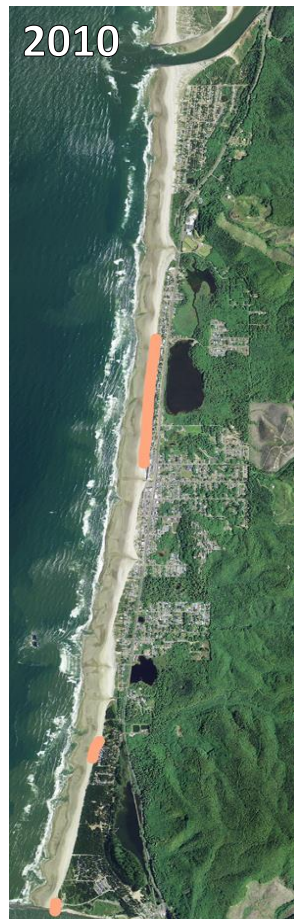


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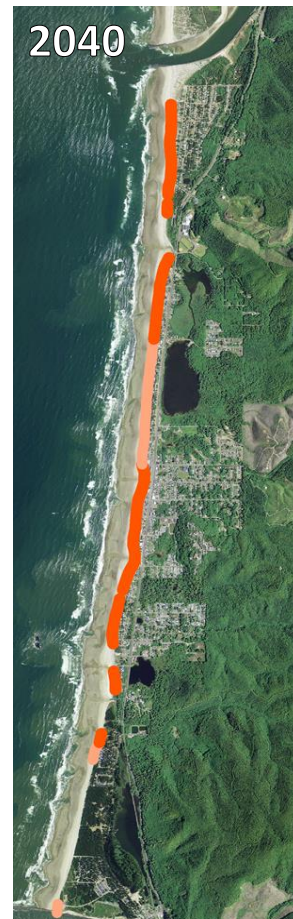
### Rockaway Beach Littoral Cell



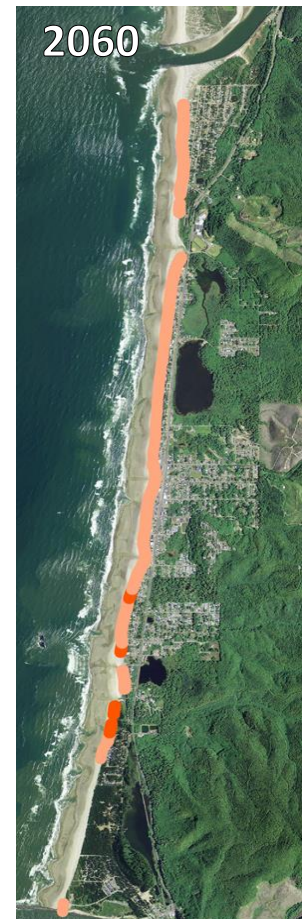
Existing BPS    New BPS



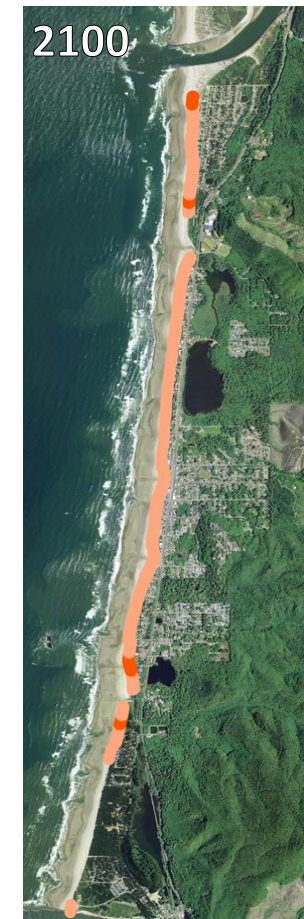
Present Day



Status Quo



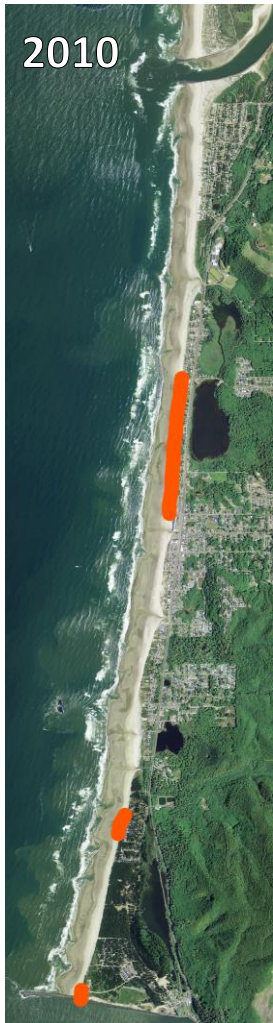
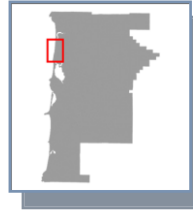
Status Quo



Status Quo

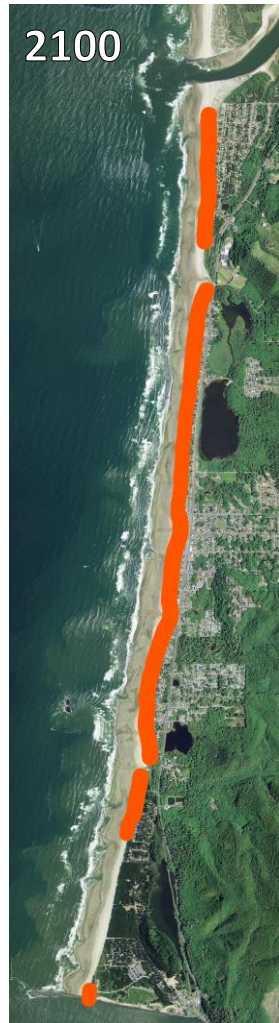
## When will homeowners need BPS to protect their property?

### Rockaway Beach Littoral Cell



2010

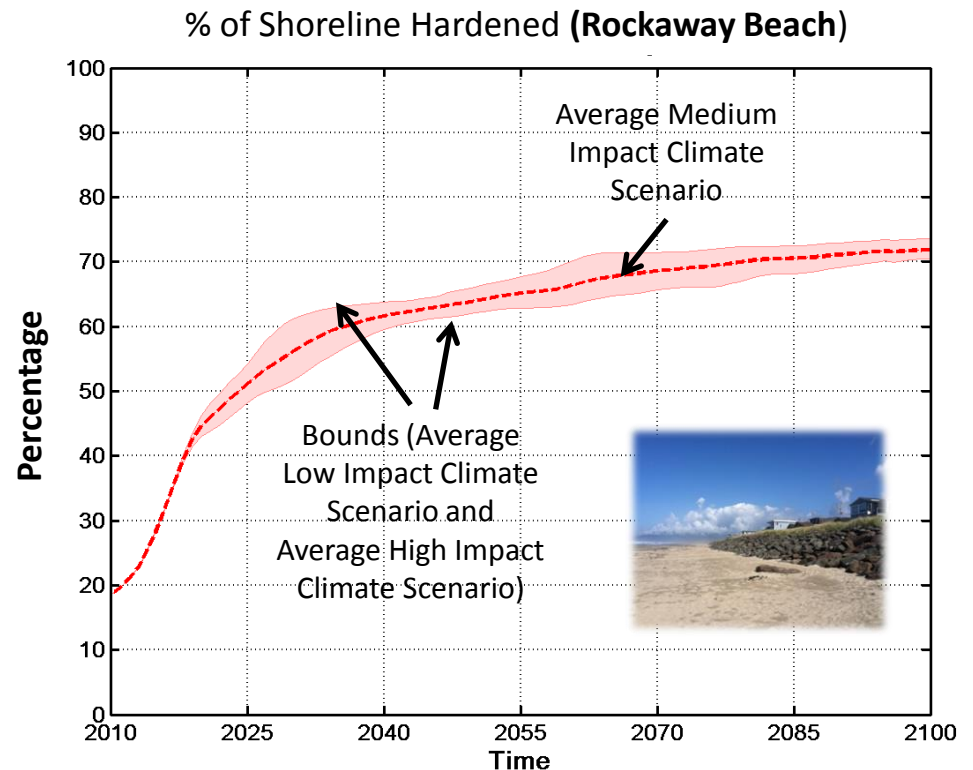
Present Day



2100

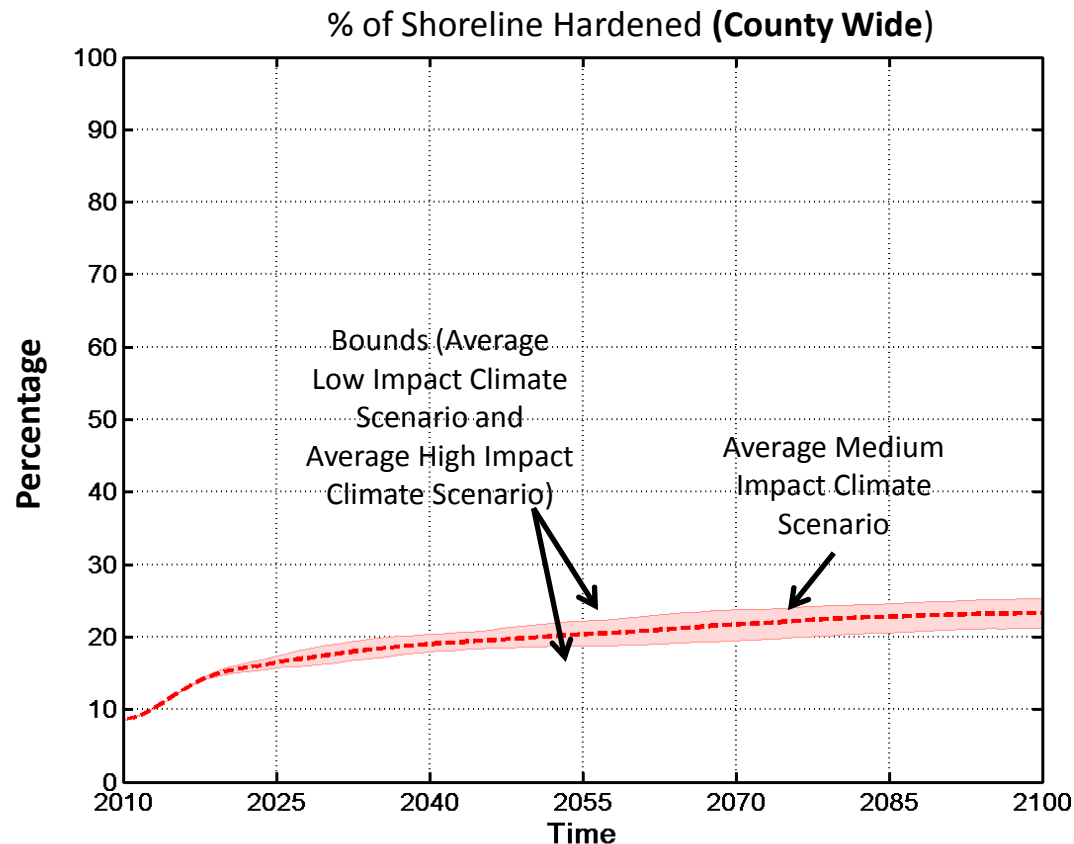
Status Quo

— Location of BPS





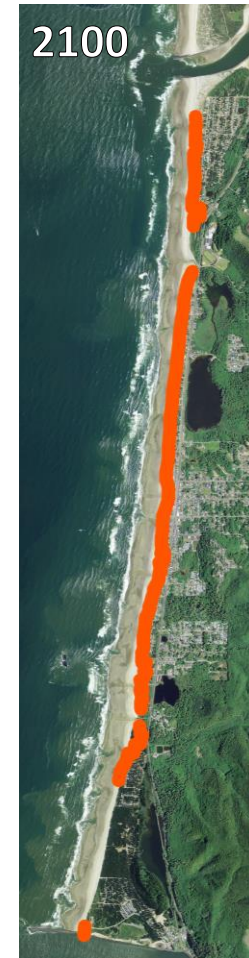
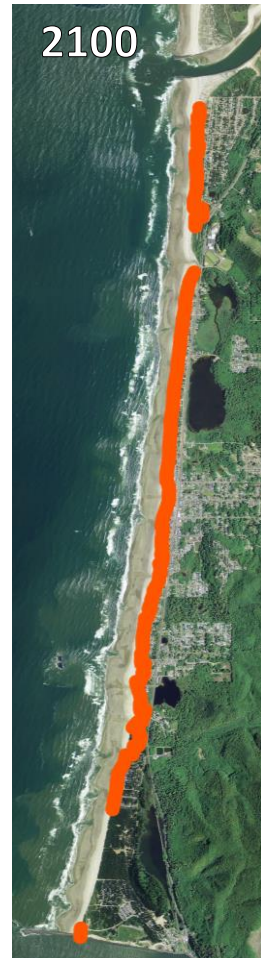
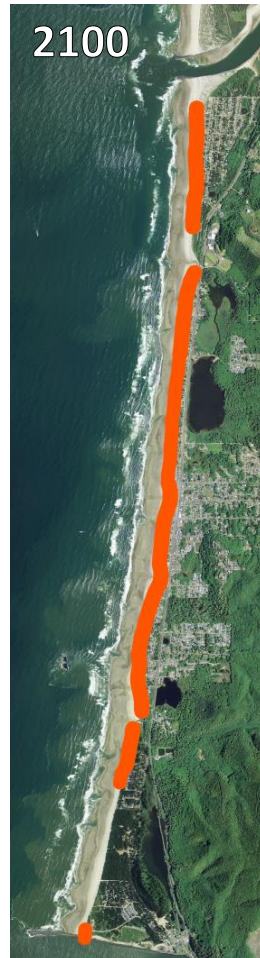
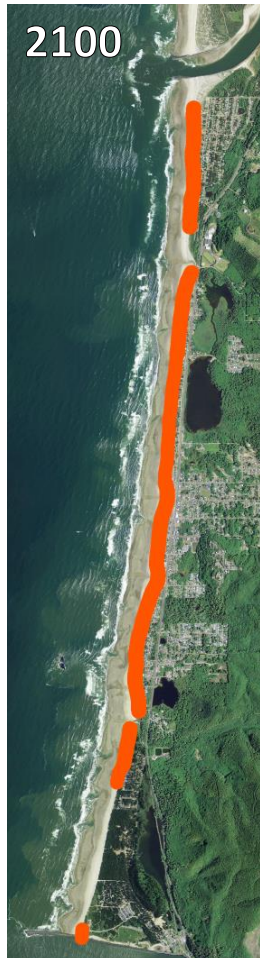
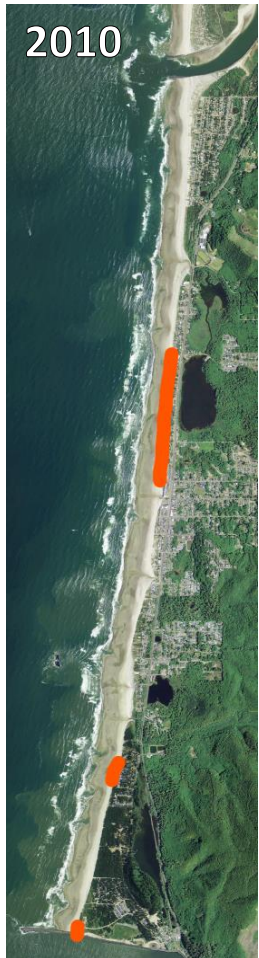
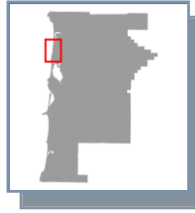
## When will homeowners need BPS to protect their property?



## When will homeowners need BPS to protect their property?

### Rockaway Beach Littoral Cell

— Location of BPS



Present Day

Status Quo

Hold the Line

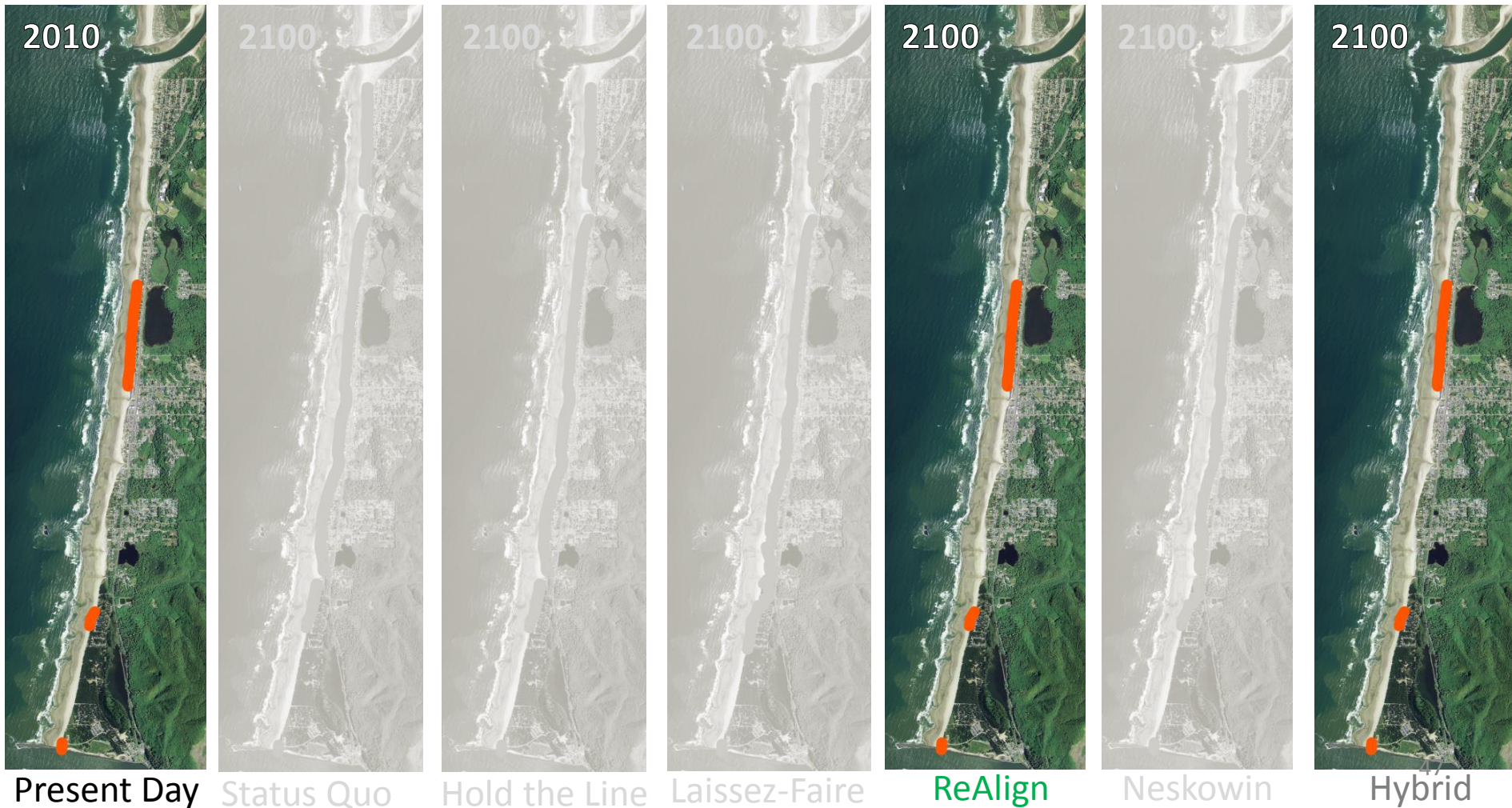
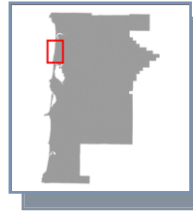
Laissez-Faire

Neskowin

## When will homeowners need BPS to protect their property?

### Rockaway Beach Littoral Cell

— Location of BPS

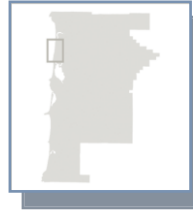




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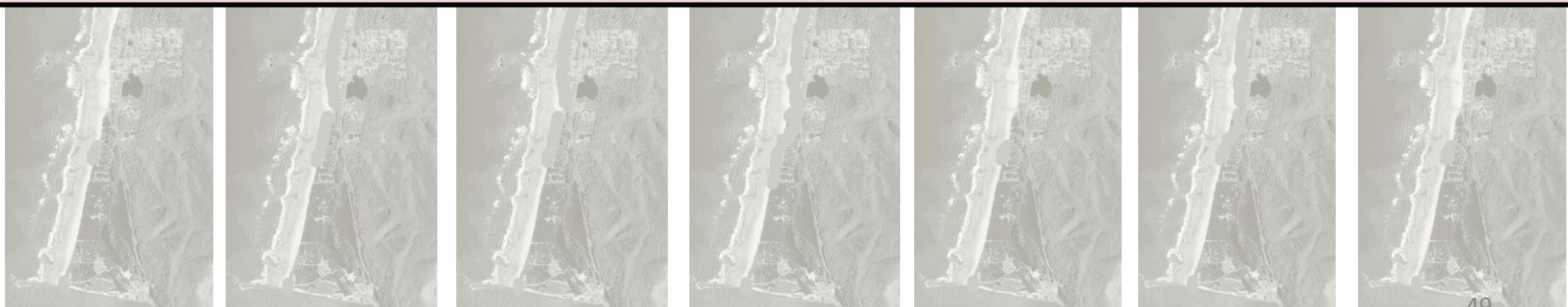
### Rockaway Beach Littoral Cell

— Location of BPS



### Take Home Message:

To protect property from erosion, the majority of beachfront property owners will need to armor their properties prior to 2040.



Present Day   Status Quo   Hold the Line   Laissez-Faire   ReAlign   Neskowin   Hybrid

## Storyline: Public Good

What extent of the beach is accessible?



## Storyline: Public Good

### What extent of the beach is accessible?

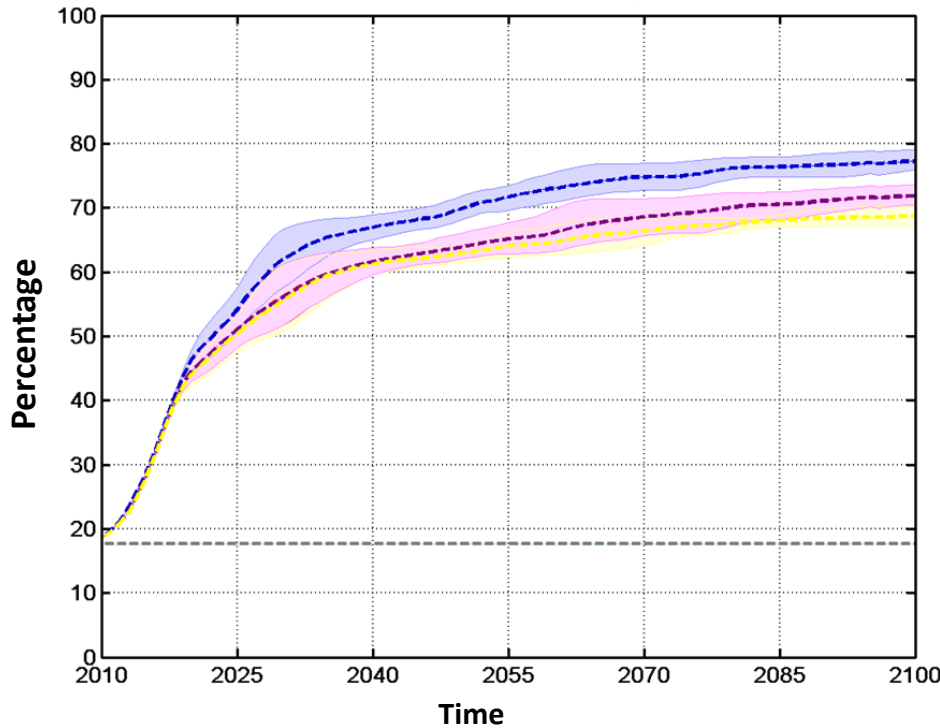


 Limited Beach Access       Unlimited Beach Access

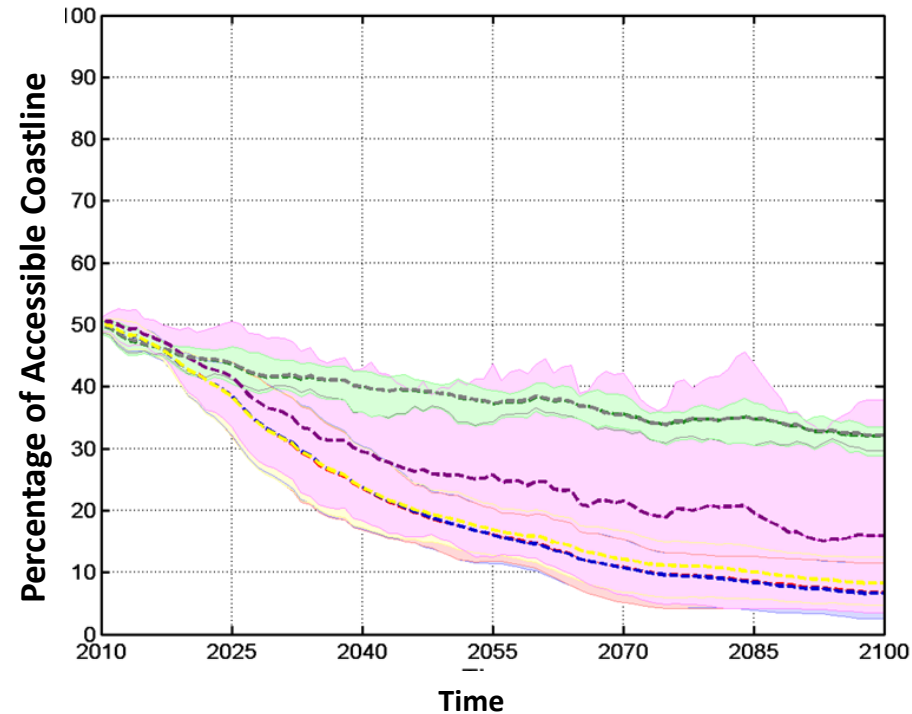


## What extent of the beach is accessible?

% of Shoreline Hardened (Rockaway Beach)



Beach Accessibility (Rockaway Beach)

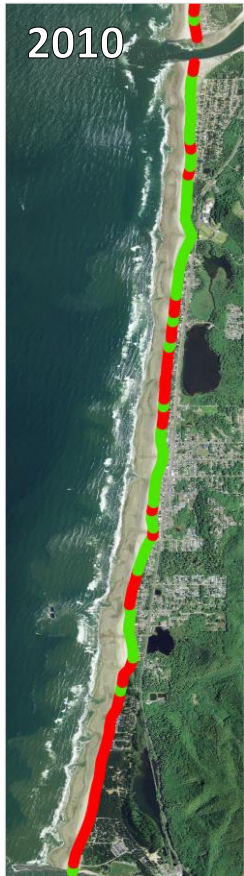
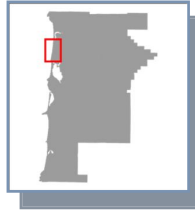


- Status Quo
- Hold The Line
- Laissez-Faire
- Neskowin
- ReAlign
- Hybrid

## What extent of the beach is accessible?

### Rockaway Beach Littoral Cell

— Limited Beach Access      — Unlimited Beach Access

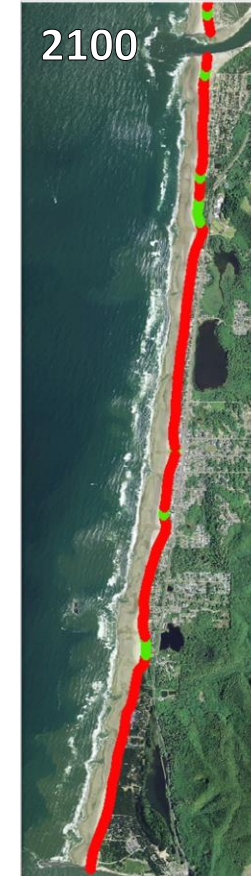
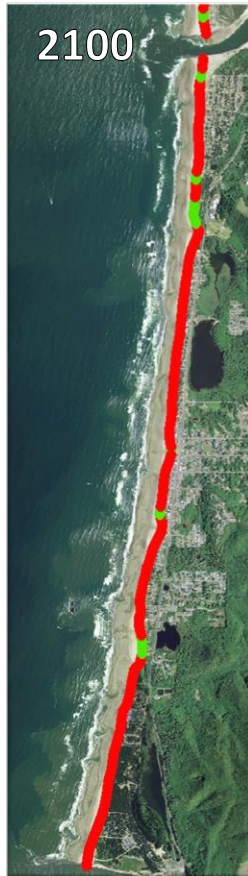
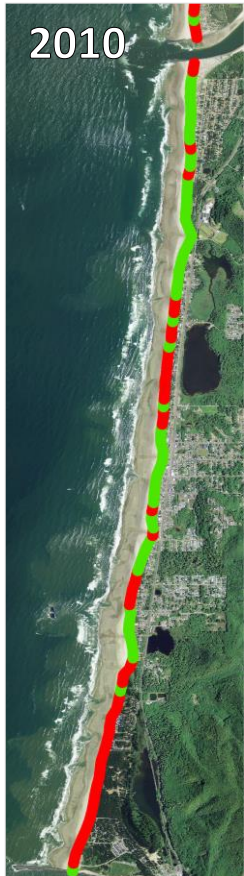
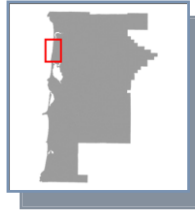


Present Day

## What extent of the beach is accessible?

### Rockaway Beach Littoral Cell

— Limited Beach Access    — Unlimited Beach Access



Present Day

Status Quo

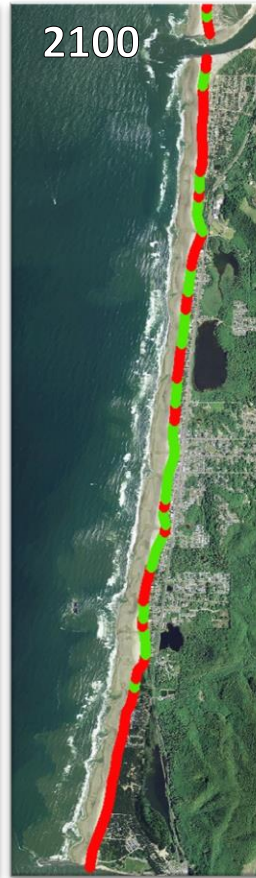
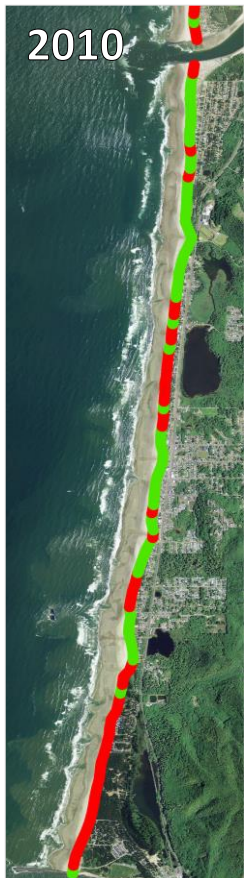
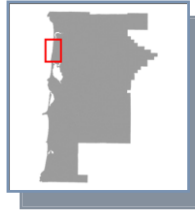
Laissez-Faire

Neskwini

## What extent of the beach is accessible?

### Rockaway Beach Littoral Cell

■ Limited Beach Access    ■ Unlimited Beach Access



Present Day

Status Quo

Hold the Line

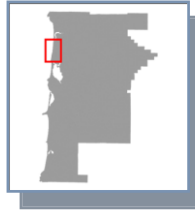
Laissez-Faire

Neskowin

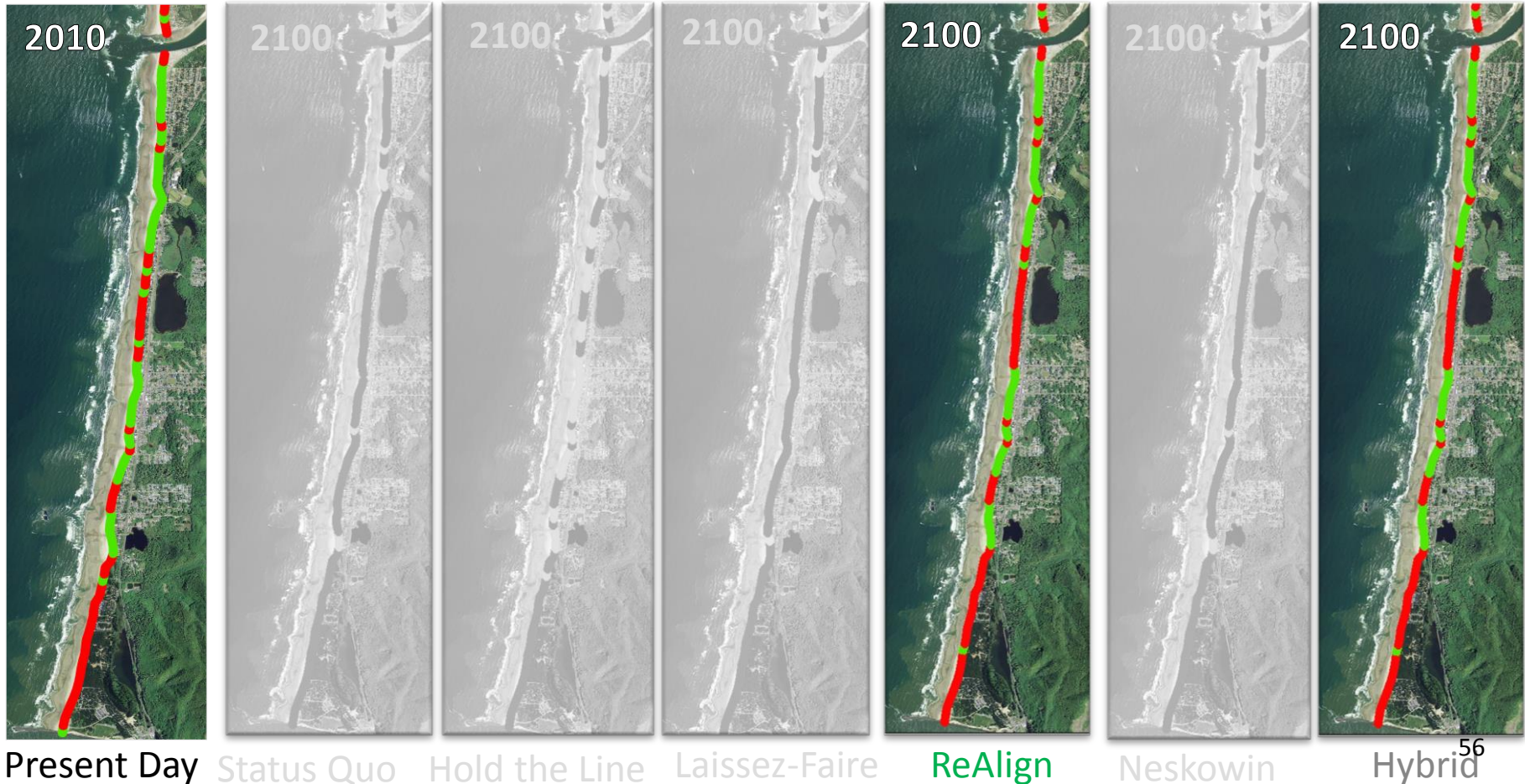


## What extent of the beach is accessible?

### Rockaway Beach Littoral Cell



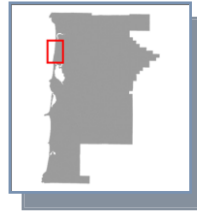
 Limited Beach Access       Unlimited Beach Access



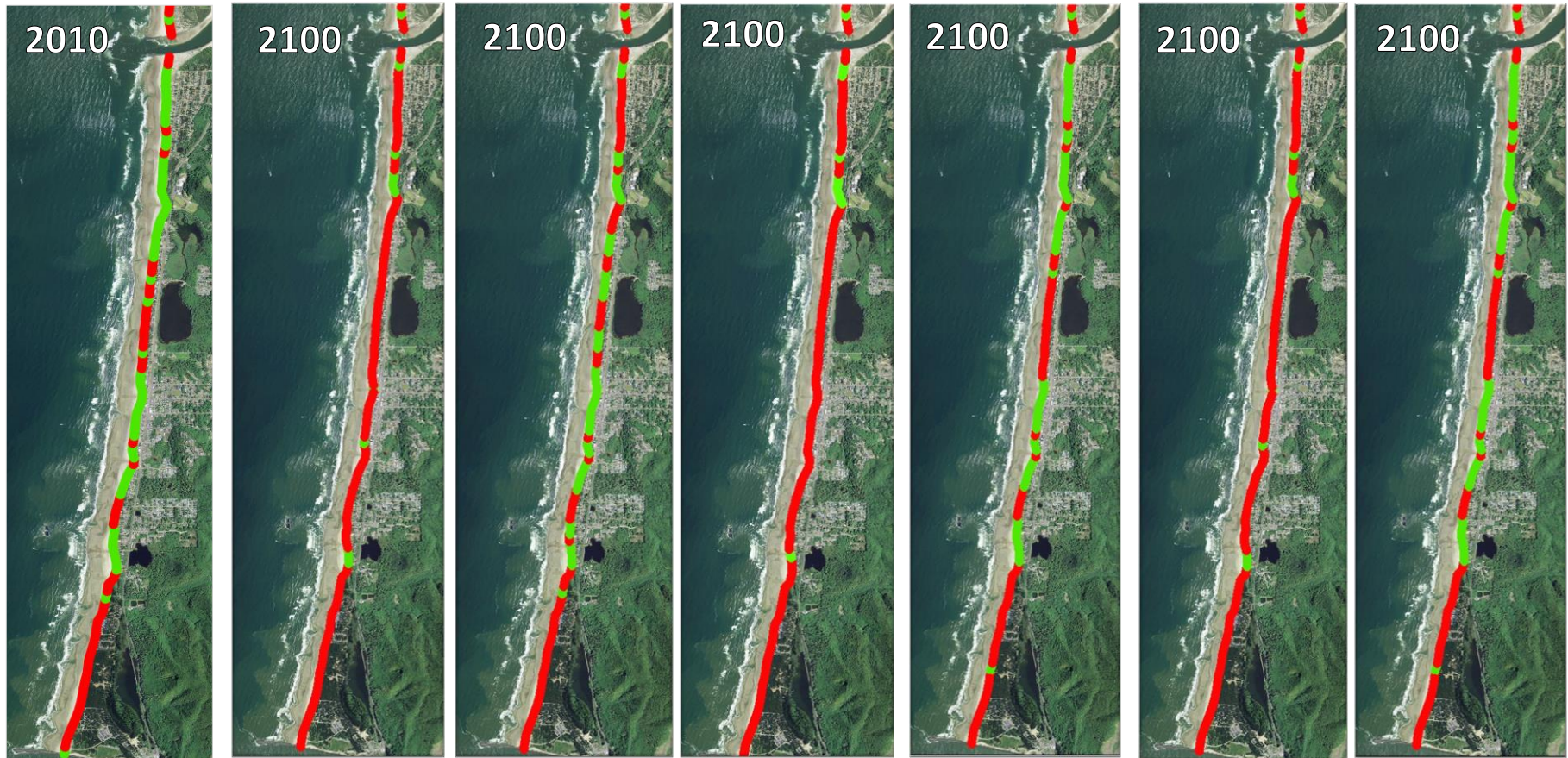


## What extent of the beach is accessible?

### Rockaway Beach Littoral Cell



 Limited Beach Access       Unlimited Beach Access

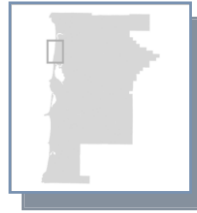


Present Day    Status Quo    Hold the Line    Laissez-Faire    ReAlign    Neskowin    Hybrid



## What extent of the beach is accessible?

### Rockaway Beach Littoral Cell

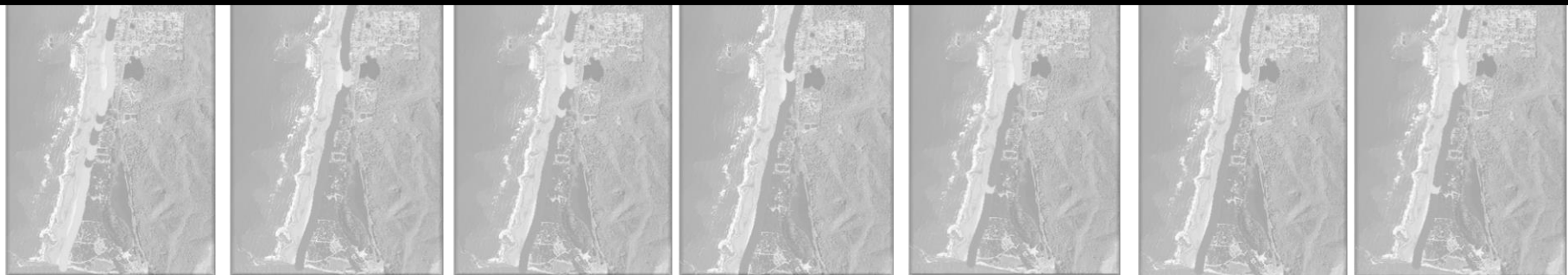


— Limited Beach Access    — Unlimited Beach Access



### Take Home Messages:

Beach accessibility decreases under all policy scenarios by 2100, but less so in the Hold the Line, ReAlign, and Hybrid policy scenarios.



Present Day    Status Quo    Hold the Line    Laissez-Faire    ReAlign    Neskowin    Hybrid

## Storyline: Development

### How does the implementation of adaptation policies alter development?

Neskowin

Rockaway Beach



 Moderate Hazard Zone

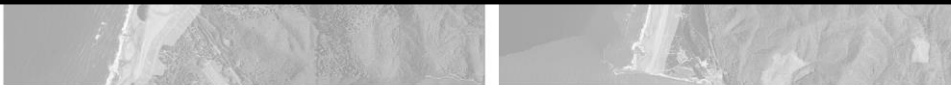
**Land Use Adaptation Policy** –  
i.e., implement DOGAMI coastal hazard zones and prevent further development within the hazard zones.

## Storyline: Development

How does the implementation of adaptation policies alter development?

### Take Home Messages:

- Land use adaptation policies shift population and buildings outside the hazard zones.
- In the medium and high impact climate scenarios, a greater population and number of buildings is relocated outside of the hazard zones than in a low impact climate scenario.



## How is the information used?

- We are working with our partners to explore the impacts that both a **changing climate** and a range of plausible **adaptation strategies might** have on the Tillamook County coast.
- By co-developing and assessing alternative Tillamook County futures, we can consider **trade-offs**, benefits, pros, cons, etc.





# Questions?



## Meeting Agenda



- **6:00 - 6:10** Welcome and Introductions
- **6:10 - 6:20** Meeting Objectives/  
Setting Expectations
- **6:20 - 7:05** Presentation of Project Setup  
and Results
- **7:05 - 7:20** Question and Answer
- **7:20 - 7:45** Poster session
- **7:45 - 7:55** Wrap up
- **7:55 - 8:00** Survey



## Poster Session

- Scenarios
- Three Storylines
  - Development
  - Property Risk
  - Public Good
- Community Comparison
  - Neskowin and Pacific City
  - Rockaway Beach and Manzanita
- Map exercise
  - Where do you recreate on the coast?
  - Where have you seen evidence of coastal flooding/erosion?



Ocean Shores, WA -  
Winter 1997

## Take Home Messages

- Policies that move people and buildings away from coastal hazards are most successful in protecting property from flooding impacts whereas policies that permit the construction of BPS (e.g. rock revetments) protect property from erosion impacts.
- To protect property from erosion, the majority of beachfront property owners would need to armor their properties prior to 2040.
- Cost associated with protecting the assessed value of coastal property increases overtime in all of the policy scenarios.
- By mid-century, climate impacts and hardening of the shoreline significantly reduce beach accessibility.
- Beach accessibility decreases under all policy scenarios by mid-century, but less so in the Hold the Line, ReAlign, and Hybrid policy scenarios.



## Next Steps

- OSU and the Tillamook County Knowledge to Action Network will continue to explore alternative policy and climate scenarios using Envision.
- We welcome a dialogue with the community regarding how the approach and findings that were presented tonight might inform the land use planning process.



# Thank you!

