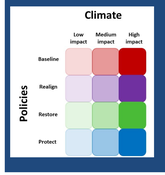
GRAYS HARBOR COUNTY COASTAL FUTURES PROJECT: SCENARIO REVIEW MEETING

DRAFT PROPERTY RISK STORYLINE

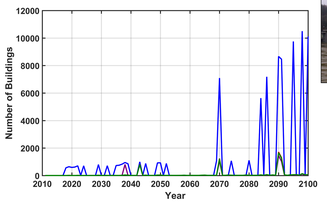
Assumptions:



- All dollar amounts are in 2010 dollars.
- Prograding shorelines are not considered for any climate scenarios.
- Event erosion is driven by large storm events, while chronic erosion is driven by sea level rise and sediment budget derived shoreline change rates.
- In these results, Backshore Protective Structures (BPS) and Dune Restoration Projects (DRP) are constructed along the length of each tax-lot, with no maximum length.
- The cost of BPS construction is approximately $125 per vertical foot in elevation by lineal foot in length.
- BPS maintenance costs are 2% of the capital cost plus the cost of raising the height at $125 per vertical foot, and can be maintained every 3 years.
- Costs for DRP construction and maintenance are similar to beach nourishment and costs $13/m^3.
- Annually any BPS or DRP is constructed if it fits the criteria (see next bullet), with no restrictions.
- BPS and DRP are constructed under a specific set of instances:
  - The beach is dune-backed **AND**
  - The land behind the dune is developed **AND**
  - The dune toe is impacted by the maximum daily Total Water Level (TWL) 50% of the year on average for 5 years **AND**
  - The average event erosion frequently impacts infrastructure 3 out of the last 5 years **AND**
  - The average event erosion distance over 2 years comes within 65ft of infrastructure.

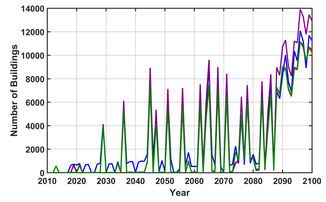
How will buildings be impacted by coastal flood and erosion hazards in the future?

Number of Buildings Impacted by Flooding in the Low Impact Climate Scenario

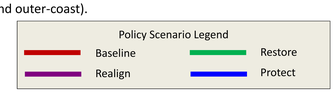


Flooding event driven by large storms

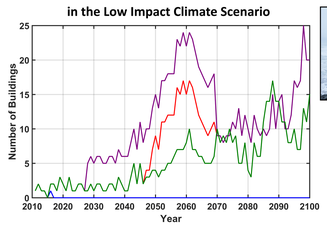
Number of Buildings Impacted by Flooding in the High Impact Climate Scenario



Figures 1 and 2: Number of buildings impacted by **flooding** under **low** (left) and **high** (right) impact climate scenarios from 2010 to 2100 (county-wide, bay and outer-coast).

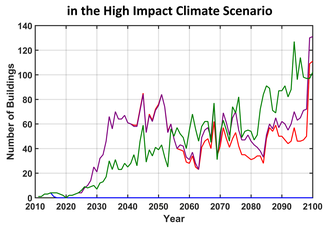


Number of Buildings Impacted by Event Erosion in the Low Impact Climate Scenario



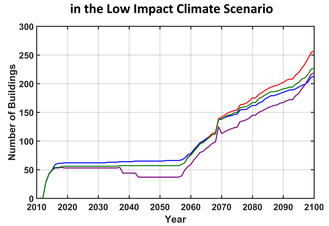
Event Erosion driven by big storms

Number of Buildings Impacted by Event Erosion in the High Impact Climate Scenario



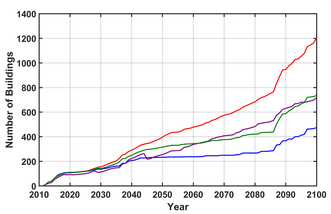
Figures 3 and 4: Number of buildings impacted by event **erosion** under **low** (left) and **high** (right) impact climate scenarios from 2010 to 2100 (county-wide, bay and outer-coast).

Number of Buildings Impacted by Chronic Erosion in the Low Impact Climate Scenario



Chronic Erosion driven by sea level rise?

Number of Buildings Impacted by Chronic Erosion in the High Impact Climate Scenario



Figures 5 and 6: Cumulative number of buildings impacted by chronic **erosion** under **low** (left) and **high** (right) impact climate scenarios from 2010 to 2100 (county-wide, bay and outer-coast).

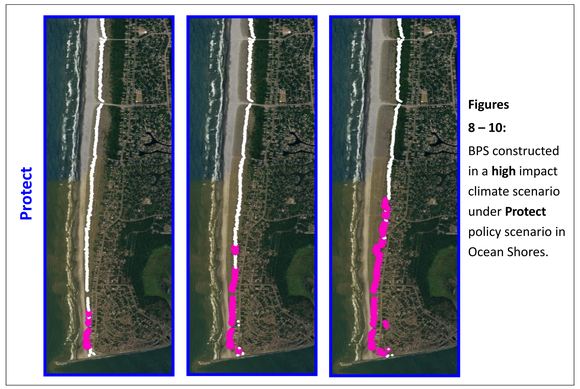
Take Home Messages:

- **Flooding and erosion impacts are variable** from year to year due to irregular climate events (damaging storms); however, unique trends are evident for all four policy scenarios (Figures 1 - 4).
- The **Protect** policy scenario has a **lower (effectively 0) number of buildings impacted by event erosion** as property owners construct BPS to limit erosion (Figures 3—4).
- The **Realign** policy scenario has **fewer buildings impacted by chronic erosion**, although it increases over time as climate impacts increase (Figures 5—6).

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

2010

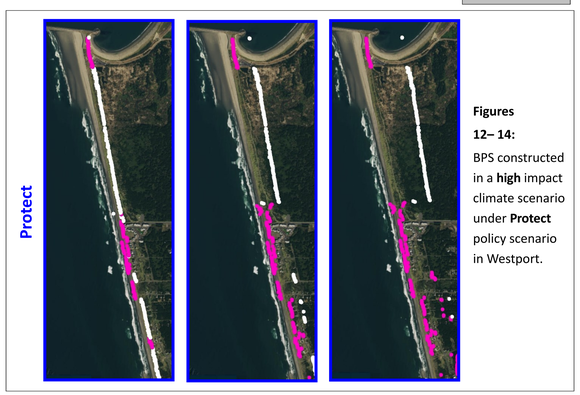
Figure 7: Current BPS location in Ocean Shores.



Figures 8 – 10: BPS constructed in a **high** impact climate scenario under **Protect** policy scenario in Ocean Shores.

2010

Figure 11: Currently no BPS In Westport.



Figures 12– 14: BPS constructed in a **high** impact climate scenario under **Protect** policy scenario in Westport.

Take Home Messages:

- **Only one area of the county currently has BPS** (in Ocean Shores), with none in Westport (Figures 7, 11).
- **More BPS are constructed over time in Westport** than in Ocean Shores (Figures 8—14).
- Notice that in areas where no BPS are placed, we can see the dune toe line erode landward more rapidly (Figures 8—14).
- Locations of BPS are staggered in the cross-shore due to different periods of time when they are constructed (Figures 8—14). We may choose to modify this policy to construct more coherent BPS along the coastline.
- Currently BPS is only constructed under the **Protect** policy scenario.

How do costs associated with protecting property on the coast change over time?

Cost of BPS versus DRP Construction Over Time

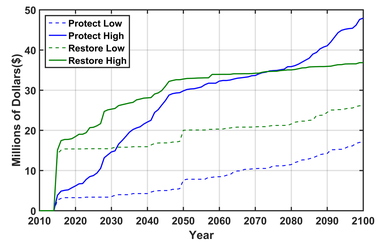


Figure 15: Cumulative cost of constructing new BPS in **Protect** (county-wide), versus constructing new DRP in **Restore** under **low and high** climate scenarios.

Cost of BPS versus DRP Maintenance Over Time

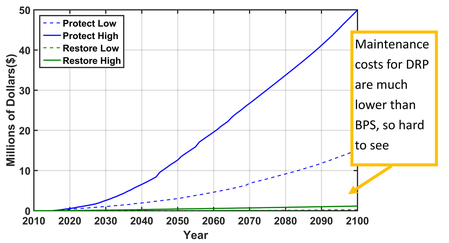
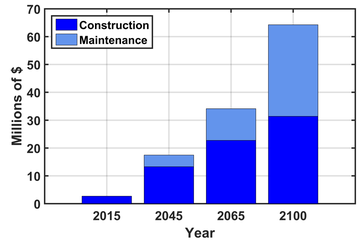
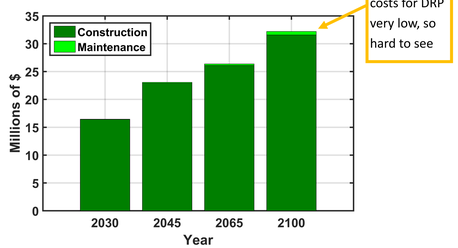


Figure 16: Cumulative cost of maintaining BPS in **Protect** (county-wide), versus constructing new DRP in **Restore** under **low and high** climate scenarios.

Cumulative Cost of BPS Construction and Maintenance Over Time



Cumulative Cost of DRP Construction and Maintenance Over Time



Figures 17 and 18: Cumulative cost of constructing and maintaining BPS in **Protect** (county-wide) under a **medium** climate scenario (left), and constructing and maintaining DRP in **Restore** (right).

Take Home Messages:

- The cost of building DRP under the **Restore** policy scenario **increases rapidly** in the beginning of the century (~ $15 million) as multiple projects are put in place, but levels off by the second half of the century (~ $35 million in 2100) (Figure 15).
- The cost of building BPS in the **Protect** policy scenario **increases more steadily** at the beginning of the century (<$10 million), but increases in the second half of the century (~$48 million in 2100) as more BPS projects are needed (Figure 16).
- **Backshore protection structure (BPS) construction and maintenance costs** under the **Protect** policy scenario are much **higher than the Dune restoration projects (DRP) construction and maintenance costs** under the **Restore** policy scenario (Figures 17—18).
- **Maintenance costs for DRP are much lower than construction costs** under the **Restore** policy scenario (Figure 18).
- **BPS projects need to be maintained right away,** while DRP need less maintenance, and costs remain **relatively low** over time (Figures 15-16).
- BPS is maintained under the **Baseline** policy scenario, but since there is only one stretch of coast currently with BPS (Ocean Shores), that **maintenance cost is very minimal** through time (Figure 16).
- BPS is currently **neither maintained nor removed** under the **Realign** policy scenario.
- DRP and BPS are **currently being placed only on the outer-coast** and not in the bay.