

Cox Reservation Resilience Planning

Funded by the Mass Office of Coastal Zone Management and the Towards Sustainability Foundation

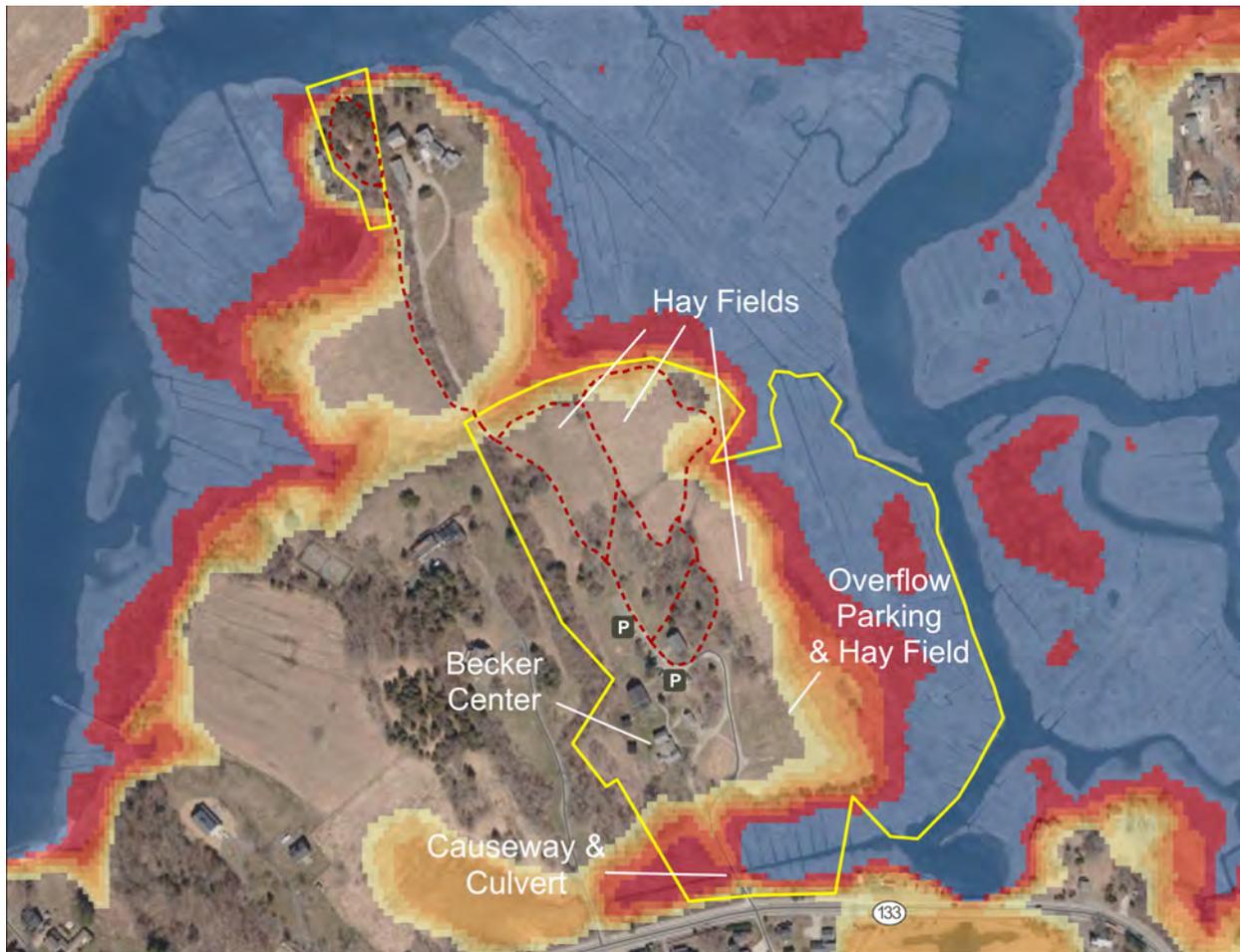
Climate Threats to Cox Reservation

If you were standing at the Allyn Cox Reservation 30 years ago during a king tide or raging Nor'easter, you would see the great marsh absorbing the tidal surge and protecting the upland area. Today, if you were to see a king tide or large storm at the Cox Reservation, there is a good chance you may be stranded, due to the driveway (called a causeway) being underwater.

As our climate is rapidly changing and sea levels are rising, the Cox Reservation faces many threats; the worst being flooding. In recent years, there have been large tidal surges, usually associated with storms, that cause a considerable amount of flooding on the property. The causeway is the only access that allows Greenbelt staff, members, and other visitors to get to the Cox Reservation. Erosion of transitional areas between wetlands and uplands, and damages to the salt marsh from storm surges are a few more examples of threats that the reservation now faces. Due to these

recent climate impacts, it became clear that developing a climate based management plan for the property was crucial.



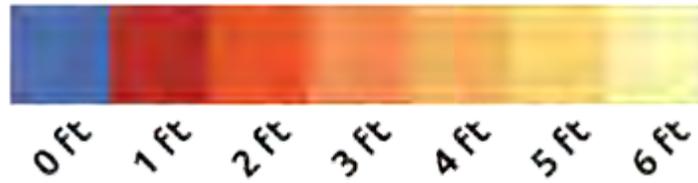


NOAA Inundation Scenarios

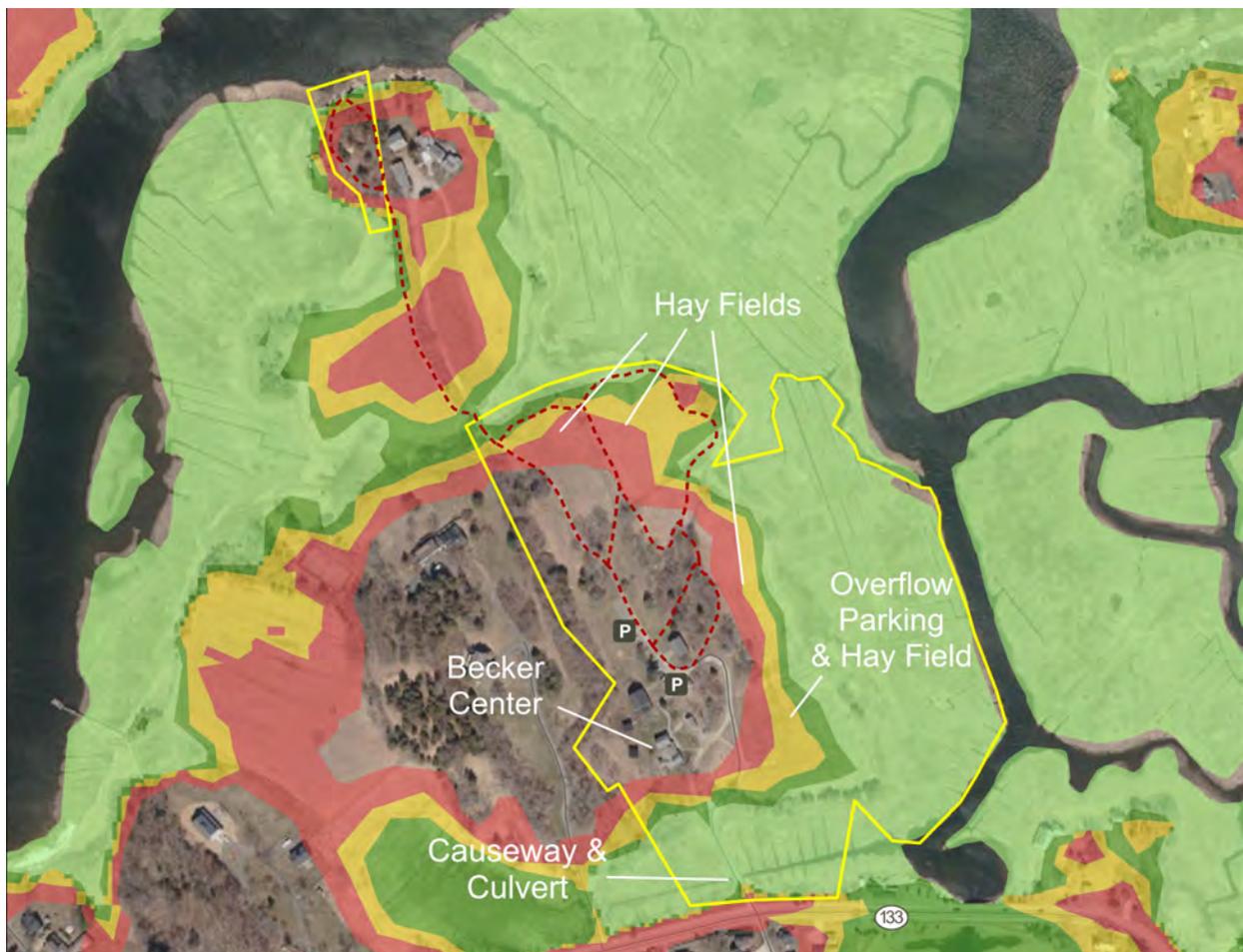
This map shows the Cox Reservation with sea level rise scenario data that was developed by the National Oceanic Atmospheric Administration (NOAA) to allow communities to visualize potential impacts from future sea level rise at high tide. We used this data to identify the areas in the Cox Reservation that are most at risk. This data shows the average height of daily highest tide plus one foot increments of sea level rise up to 6 feet. The data shown does not take erosion, storm surges, or waves into account.

 Cox Reservation & Clam House Landing

Projected Sea Level Rise



Looking at the map, it is clear to see that the causeway, the only access into and out of the property, will be the most impacted as sea level rises. The hay fields located to the east and northeast of the Becker Center are also vulnerable, including the area commonly used for overflow parking at Greenbelt events.



Engineering Analysis

In order to prepare for the worst impacts of the changing climate an engineering analysis of the causeway was completed, in order to allow Greenbelt to better plan for the future. The causeway flooding is projected to increase in severity and duration in the future, which necessitates a plan be put in place if the property is to be kept open and accessible.



Existing Conditions

The Cox Reservation's main access point is a 12-foot wide gravel causeway that cuts through the salt marsh between the main road and the reservation.

Tidal water flows through a culvert located under the causeway. The condition and size of the culvert is unknown since there are boulders covering the culvert's entry ways. However, the differential water elevations occurring on the east side of the causeway

compared to the west side suggests that the culvert causes tidal restrictions.

In recent years, the causeway has been impacted by large storm events. The water level on the east side rises faster than on the west side causing water to flow over the causeway. This spillover causes erosion to the causeway and damage to the gravel surface.



Vulnerability Assessment

After the sea level rise (SLR) and storm surge projections were finished, it is assumed that the 100 Year Base Flood elevation will rise from 10 feet in 2021 to 10.7 feet by 2030 and 13.4 feet by 2070.

As sea level rise progresses, the reservation's sole access will continue to be impacted. By 2030, the causeway storm surge inundation conditions will become more frequent. By 2070, SLR

projections indicate that the causeway will be inundated during the normal daily tide cycle, restricting access and egress each day.

Without design improvements, the culvert and causeway will continue to degrade. This will compromise safe passage of vehicular traffic, maintenance vehicles and emergency vehicles. A large storm surge has the potential to cause enough damage to make the causeway unsafe and impassable. The possibly of water service pipes and other subsurface utilities that may be located in the causeway are also at risk of being damaged.



Conceptual Design Improvements

Three areas of improvement were evaluated in the engineering analysis:

1. Remove and replace existing culvert with one or more new culverts to reduce or eliminate the tidal restrictions.

2. Raise the causeway to reduce or eliminate inundation spillover conditions.
3. Rebuild or repair the causeway, using current design techniques to improve climate change resiliency.

Improving the causeway and culvert will allow Greenbelt staff and visitors to safely access the reservation for years to come.