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West Whidbey Island beach and bluff change between 2015, 2018, and 2021 from boat-based lidar

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INTRODUCTION

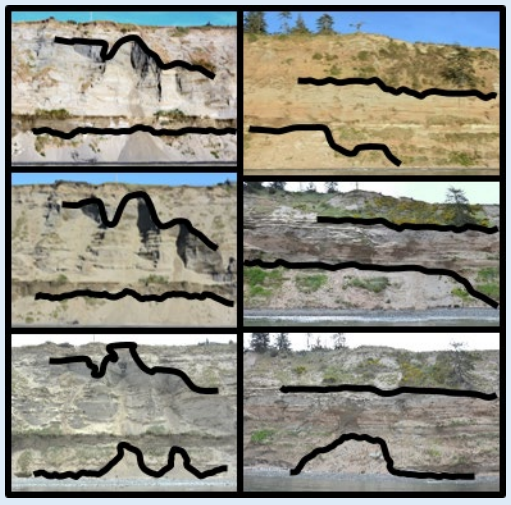
The Washington State Department of Ecology Coastal Monitoring & Analysis Program (CMAP) collected high-resolution coastal topographic data along west Whidbey Island with boat-based lidar in 2015, 2018, and 2021. These data are compared to reveal patterns of bluff erosion, sediment supply, and beach change over the three and six years between surveys.

Localized rates of bluff retreat inform planning and decision-making for bluff-top development on a parcel-by-parcel basis, and help landowners understand their erosion risks.

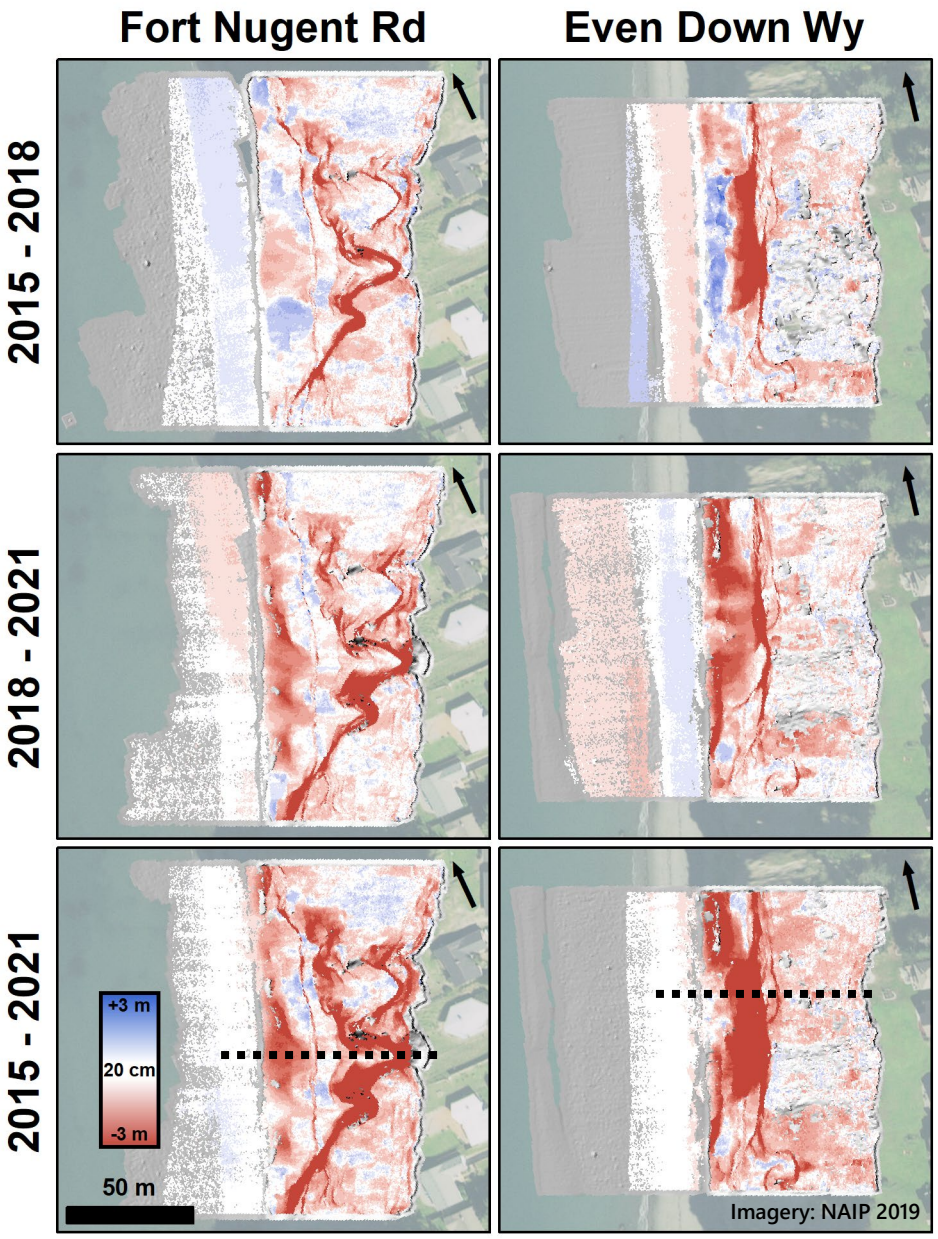
SITE OVERVIEW

Northwest Whidbey Island is a 23-km drift cell with relatively high wave exposure from the Strait of Juan de Fuca. The overlap between all three datasets is a 9-km reach dominated by feeder bluffs along the updrift end of the drift cell.

Fort Nugent and Even Down, named for nearby roads, were identified as erosion areas of interest in the 2015-2018 comparison.

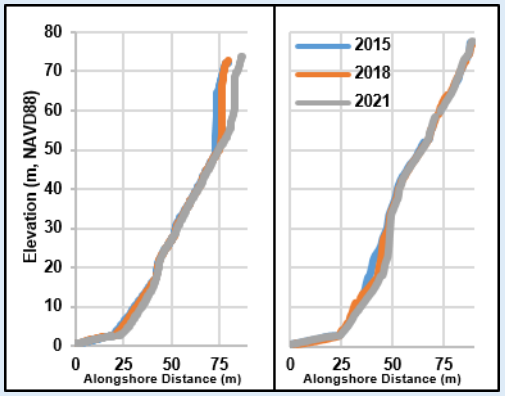


Photographs of Fort Nugent (L) and Even Down (R) during surveys in 2015, 2018, and 2021 (top to bottom) showing active scarps and talus deposits.



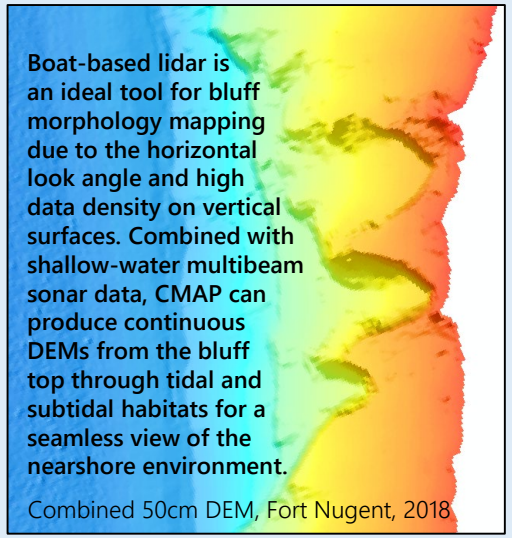
Vertical change near Fort Nugent Road and Even Down Way on northwest Whidbey Island. The 2015-2018 interval was characterized by bluff erosion and talus accumulation, and the 2018-2021 interval was characterized by bluff and talus erosion, leading to net bluff and toe erosion. Beach height varied by smaller amounts and netted a change of less than 20cm.

PROFILE CHANGE



Across-shore profiles at Fort Nugent (L) and Even Down (R), showing up to 10 m of bluff top retreat and mid-bluff erosion from 2015 to 2021.

LIDAR & SONAR INTEGRATION



Boat-based lidar is an ideal tool for bluff morphology mapping due to the horizontal look angle and high data density on vertical surfaces. Combined with shallow-water multibeam sonar data, CMAP can produce continuous DEMs from the bluff top through tidal and subtidal habitats for a seamless view of the nearshore environment.

Combined 50cm DEM, Fort Nugent, 2018

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