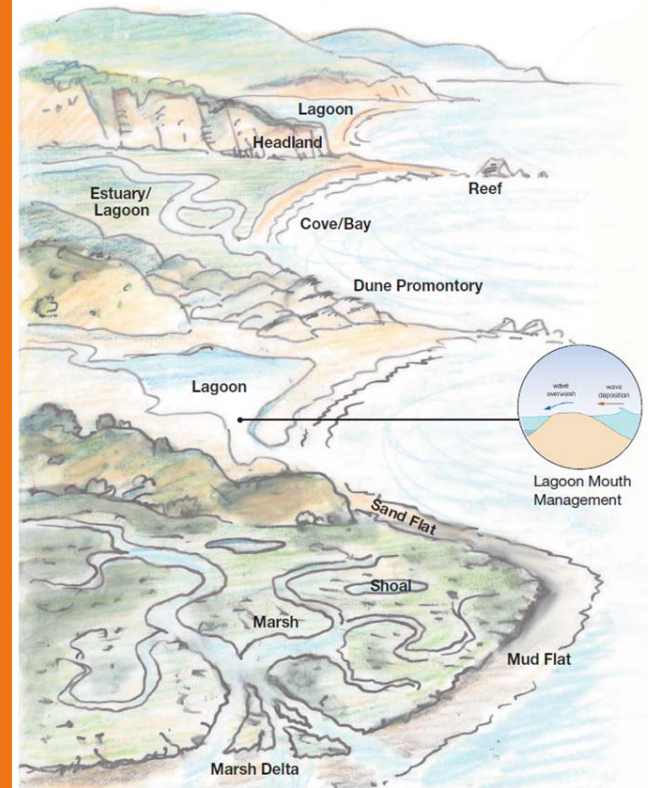


# Cobble Berms and other Coarse but Adaptable Natural Shoreforms

Bob Battalio, PE  
April 2019 – Ocean Climate Summit  
San Francisco, CA

Coastline with Estuary and Beach Sections



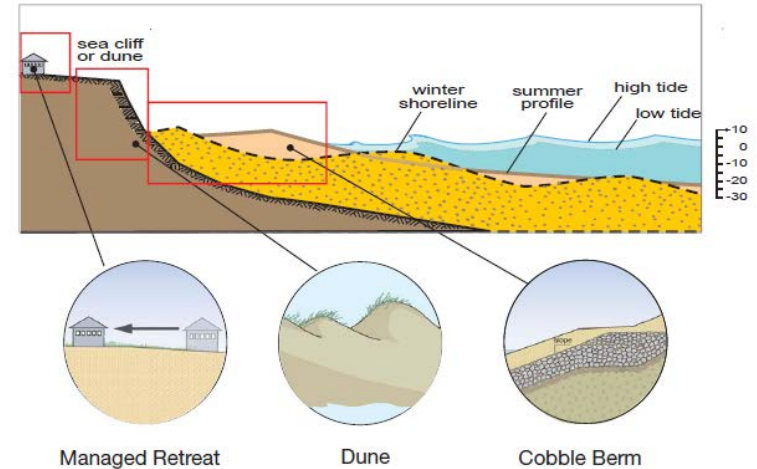
# Toward Natural Shoreline Infrastructure to Manage Coastal Change

## A Report for California's Fourth Climate Change Assessment

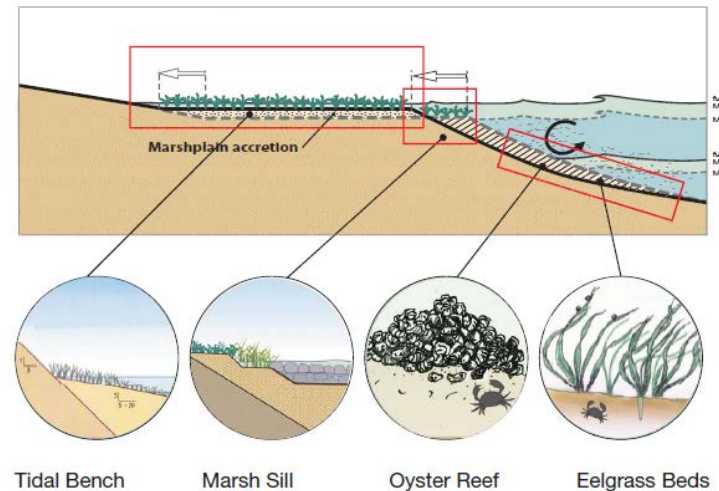
### Coastline with Estuary and Beach Sections



### Open Coast Environment



### Estuarine Environment

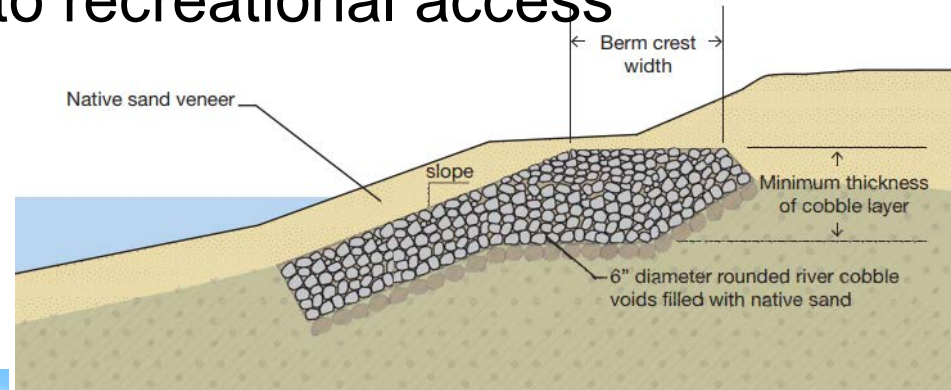




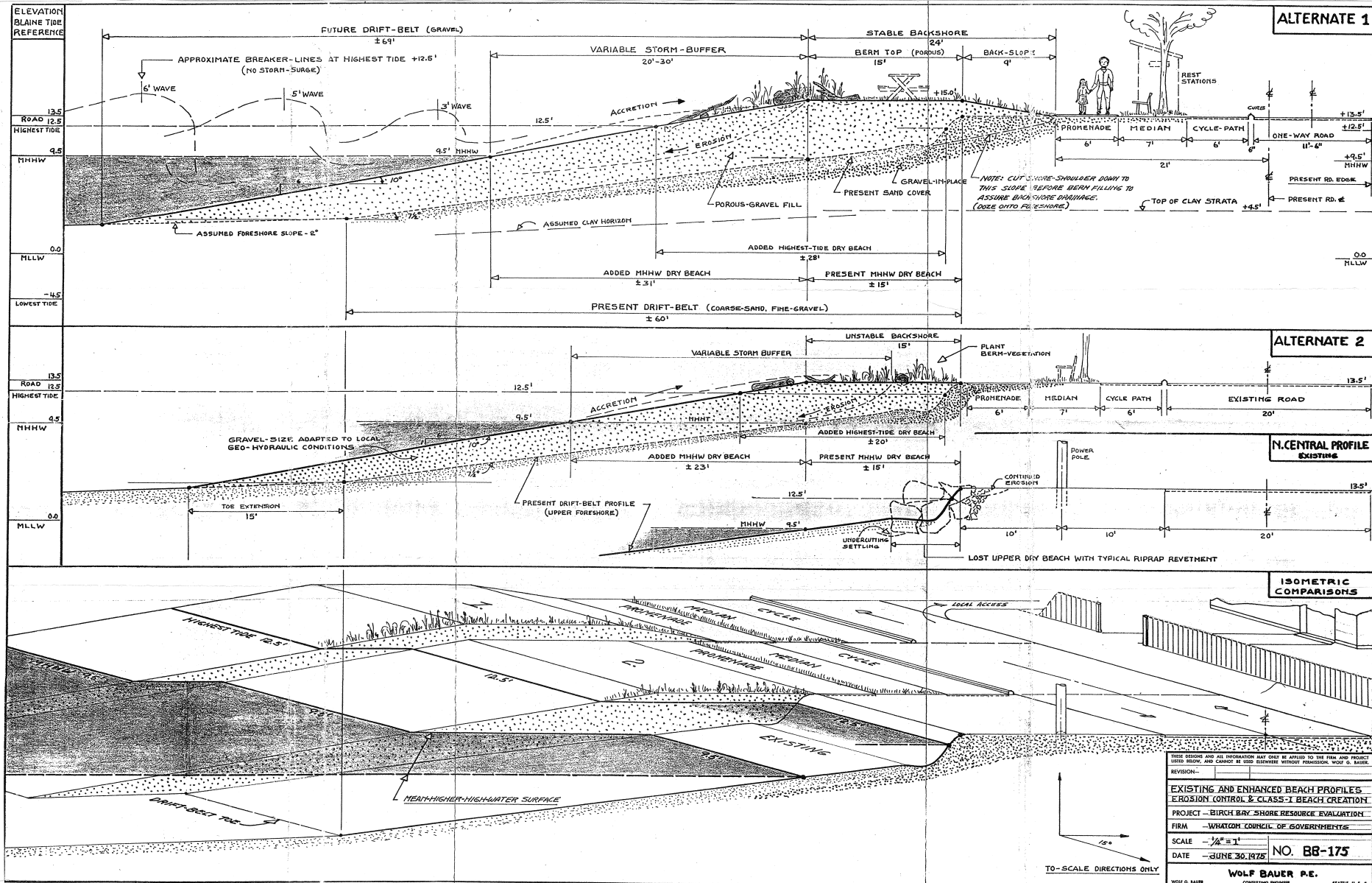
- Dissipate wave energy and act as a “backstop,” limiting landward extent of shoreline erosion
- Can provide habitat equivalency for marine invertebrates and enhance natural aesthetics
- Traversable and friendly to recreational access

Source: Toward Natural Shoreline Infrastructure to Manage Coastal Change in California

[http://www.climateassessment.ca.gov/techreports/docs/20180827-Ocean\\_CCCA4-CNRA-2018-011.pdf](http://www.climateassessment.ca.gov/techreports/docs/20180827-Ocean_CCCA4-CNRA-2018-011.pdf)



Pacifica State Beach Photos Peter Baye





(right)

Cobble berm – lag deposit Goleta, Santa Barbara County, 2017. This cobble is typically covered with sand but has remained exposed after extreme winters 2015-16 and 2016-17. Source: Surfrider Foundation.



(left)

Pacifica CA in eroded condition at low tide with cobble lag-substrate exposed. Picture 2005 by Bob Battalio, ESA.



(right)  
Cobble Berm, Goleta, Santa Barbara County, CA. March 8, 2017. Note deposition of wrack on berm crest, indicating extent of wave runup and physical process supporting ecological function. Source: Surfrider Foundation.



(left)  
Cobble berm at Prisoner's Harbor, Santa Cruz Island, CA. Photograph by Jenny Dugan.



(right)

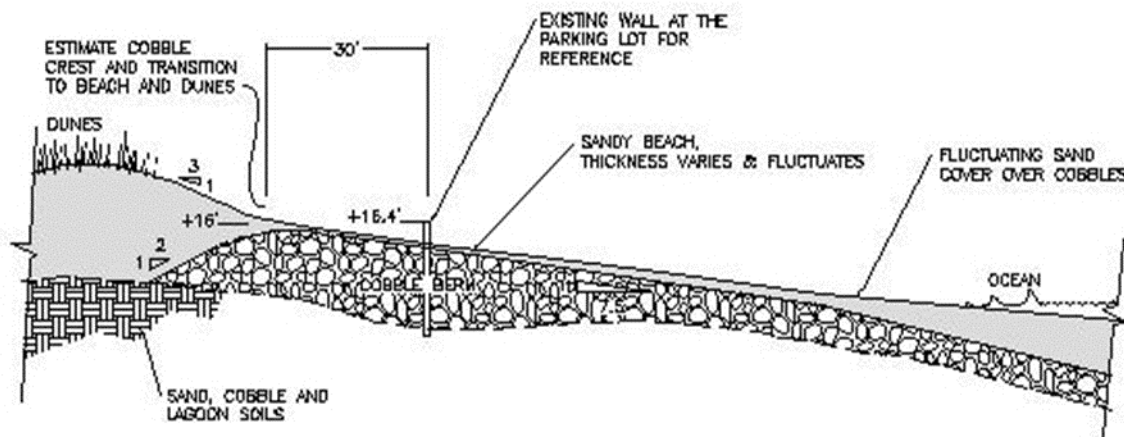
Salt grass established on cobble berm in Goleta, Santa Barbara County, CA. August 30, 2017. Photograph Dave Hubbard.



(left)

Salt grass established on cobble berm at Arroyo Burro Beach, Santa Barbara County, CA. Photograph by Jenny Dugan.

(right)  
Emma Wood State Park. Migrating cobble berm backed by vegetation and fronted by sand. Reference sight for Surfers Point. Early 2000s. Photograph: Bob Battalio.



(left)  
Conceptual cross-section for Pacifica State Beach managed retreat and backshore restoration.  
Source: PWA, 2002





**Before**

Ventura, CA  
Open-coast environment  
Eroding rivermouth delta



**After**



Extreme Swell Event, December 11, 2015



March 2016



November 2017





Boulder Fingers  
retain cobble  
where oblique  
wave approach; to  
build-out delta  
shore

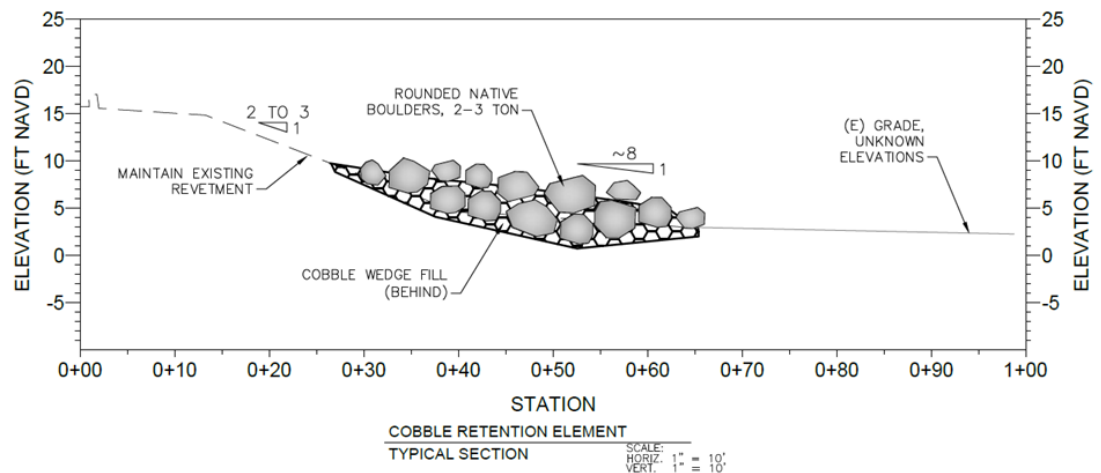
Concept developed  
by Surfrider  
Foundation  
(Ventura Chapter)  
and ESA 2017



ESA

Surfer's Point Promenade Alternatives Analysis - D160285.00

**Figure A.5**  
Cobble Retention Structures  
Plan View





# THANK YOU !

Robert (Bob) Battalio PE

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Practices management and enhancement of natural aquatic ecosystems, primarily shores, inlets, lagoons and tidal wetlands, also hazard mapping

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Photograph © Colin Brown