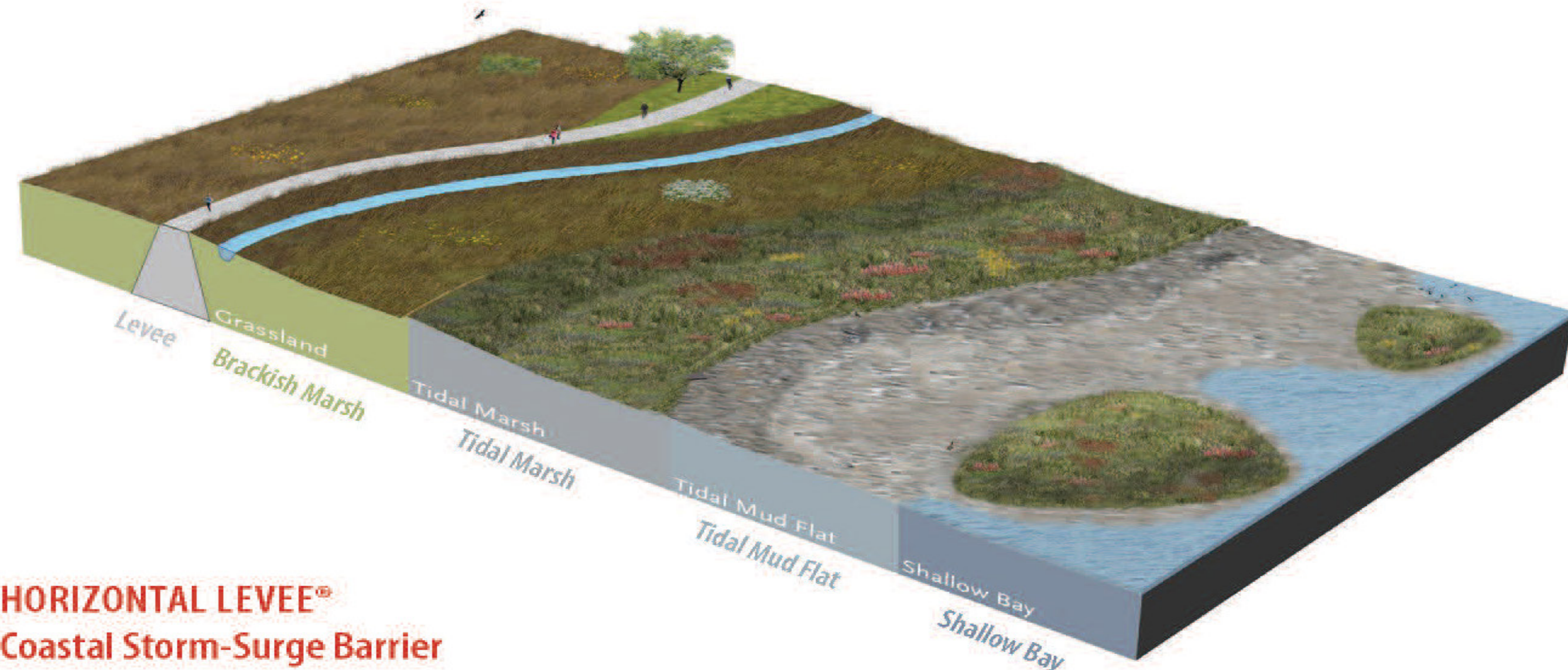


## OVERVIEW

Restoring marine wetlands and shoreline vegetation can buffer wave impacts, and improve habitat and water quality. In Bolinas Lagoon and Tomales Bay, where waves are small, these methods could effectively limit erosion of exposed road embankments. Where room exists, a horizontal levee, an at-grade levee fronted by extensive marsh and wetland habitat sloping toward the waters edge, could decrease tidal flood risk and erosion for large areas of low-lying terrain.



**HORIZONTAL LEVEE®**  
Coastal Storm-Surge Barrier

## PROS

- Tidal marsh effectively reduces wind-wave erosion and flooding on the shoreline
- Can significantly reduce the height and cost for coastal levees when fronted by tidal wetlands
- Benefits habitat, recreation, and aesthetics.

## CONS

- For best results, may require relocating existing structure or realigning roadways.
- Can require a large area.
- Habitat can take several years to establish, if successful
- Horizontal Levee can be costly.
- Limited applicability to low to medium wave energy areas.
- May be costly depending on the amount and type of fill.

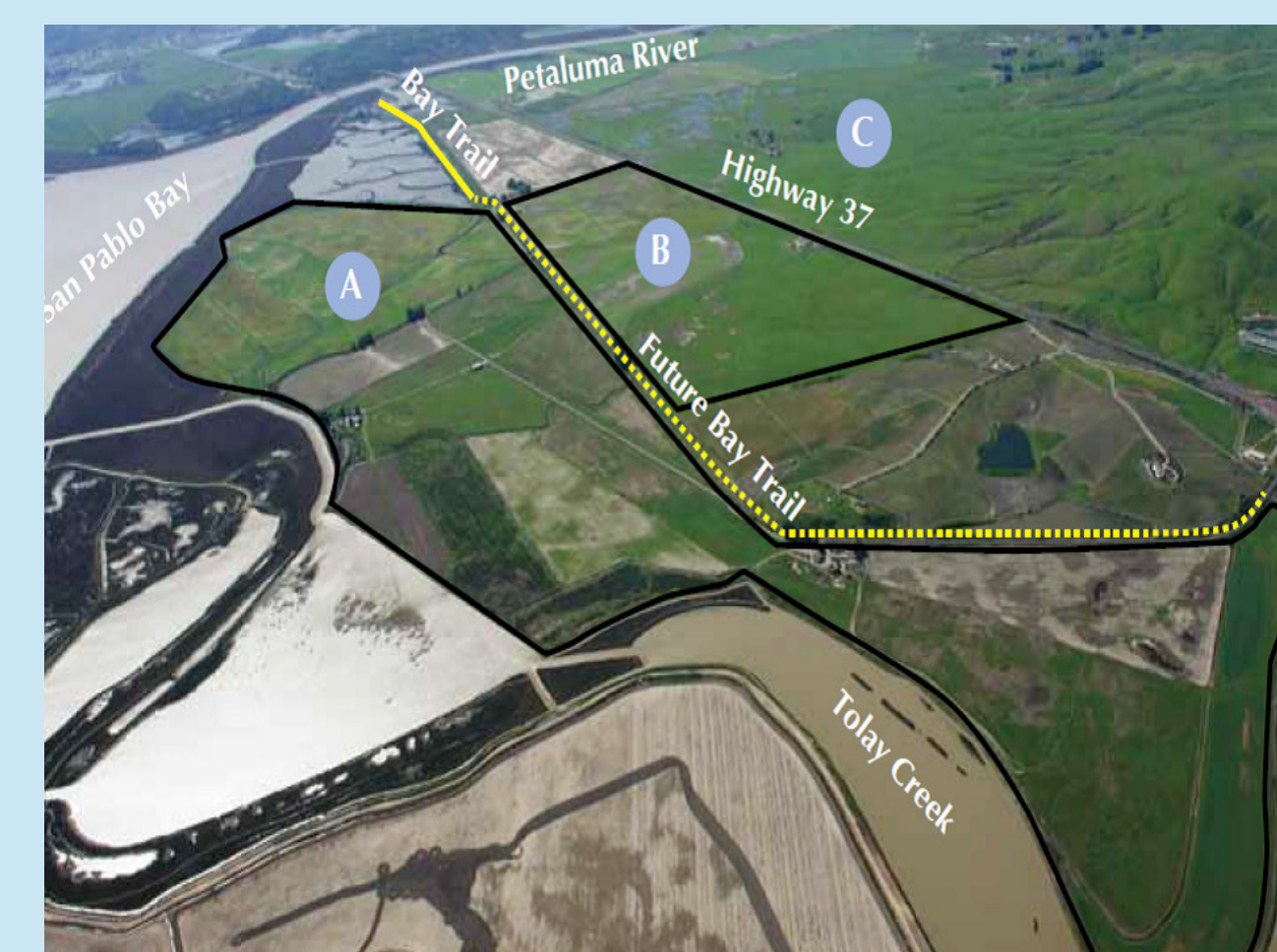
## Warm Springs Marsh

Located in south San Francisco Bay, Warm Springs Marsh has seen 730 acres of restored farmlands and dredge storage sites from 1970-2000. Several wetland functions, including serving as a buffer between land and sea, are now restored.



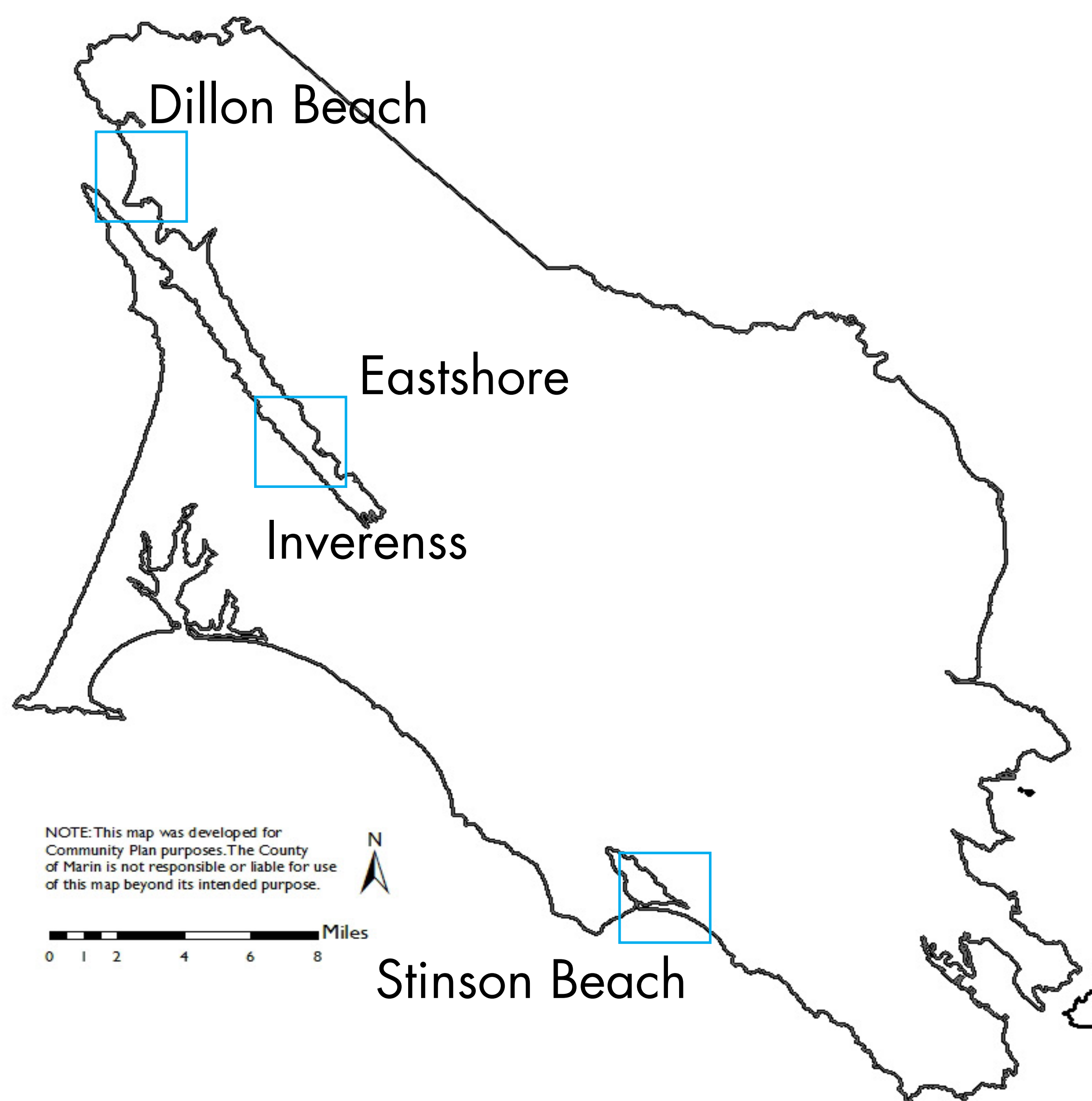
## Sear's Point

Sonoma Land Trust (SLT) will restore and enhance 960 acres of tidal marsh and nearly 1,350 acres of associated ecotonal seasonal wetlands, riparian corridors, and upland grasslands at Sear's Point. This project includes an eco-tone or horizontal levee that gradually slopes towards the water. The estimate cost is \$18 million.

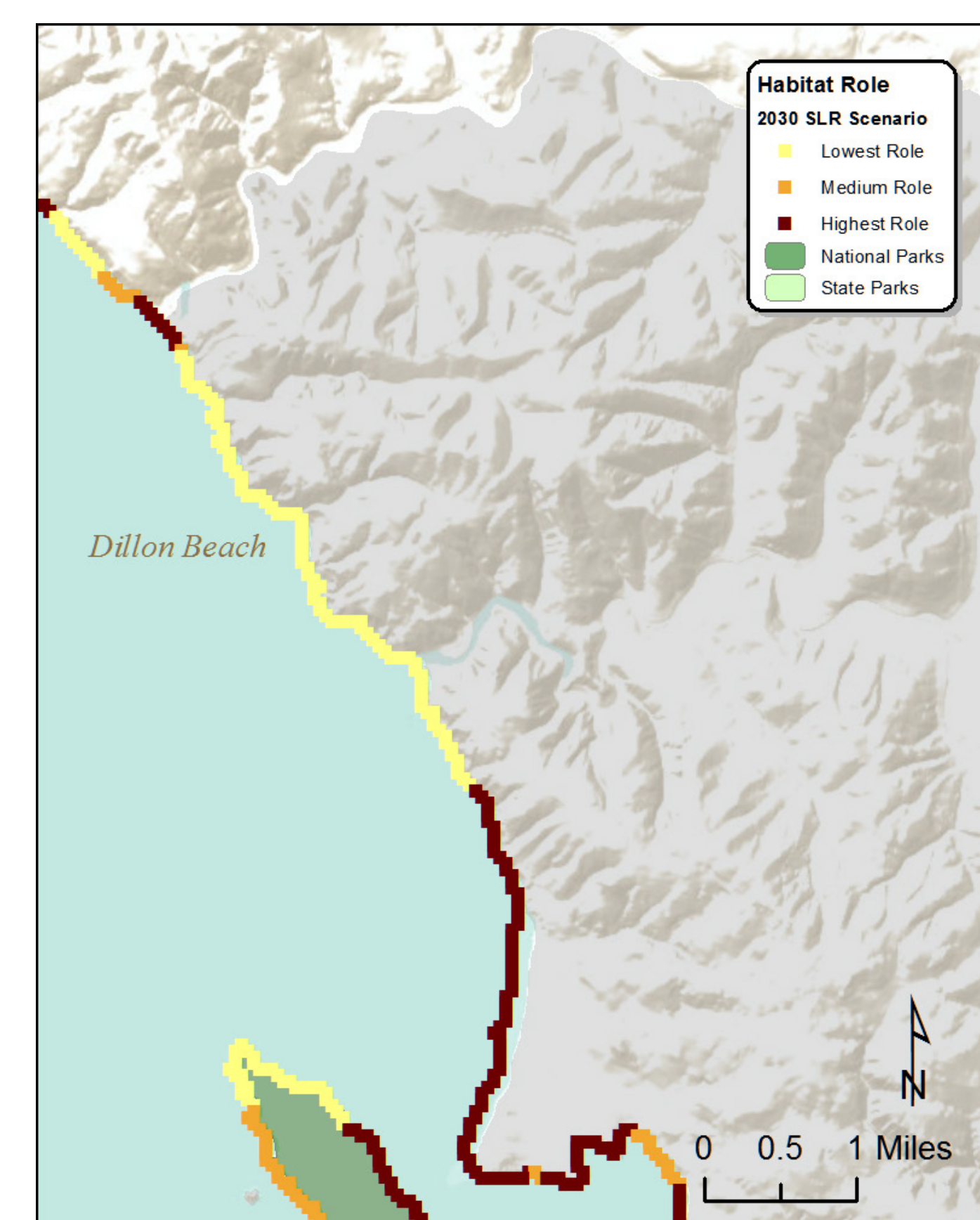
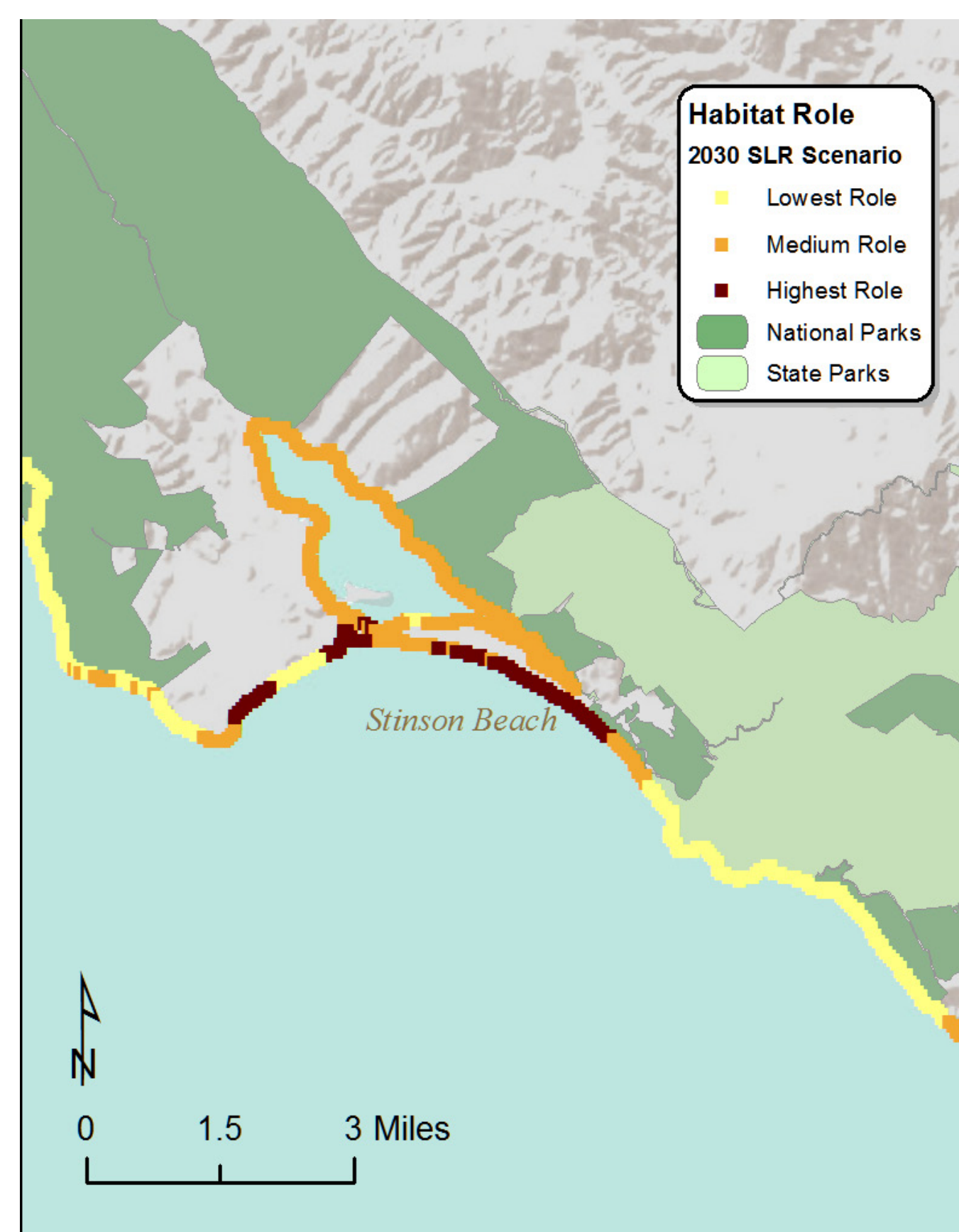


Credit: Robert Janover

## Where could this strategy be located?



NOTE: This map was developed for Community Plan purposes. The County of Marin is not responsible or liable for use of this map beyond its intended purpose.



Source: Center For Ocean Solution, 2015

These maps show where enhancing or restoring nature based methods could be supported based on existing coastal habitats. Darker colors denote a greater role the habitat could play in reducing flooding and erosion from sea level rise and storms.