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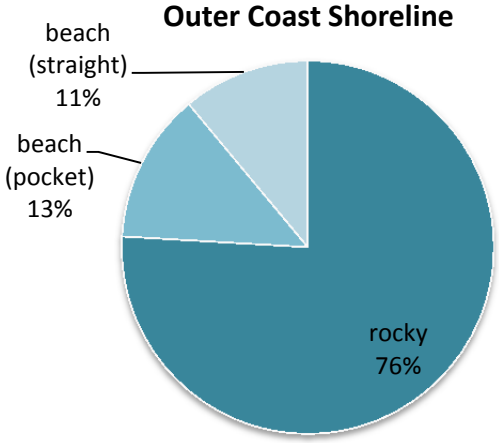
Coastal Zone

Sonoma County's 70 miles of shoreline and 56,233 acres (88 square miles) of coastal zone includes agricultural lands, timber preserves, open space areas, and an extensive network of recreational lands, parks, and beaches. A significant portion of the coastline property is in public ownership, including holdings of the Sonoma County Regional Parks Department and the University of California's Bodega Marine facility. California State Parks owns Fort Ross State Historic Park, Salt Point State Park, Kruse Rhododendron State Natural Reserve, and Sonoma Coast State Park, with 17 miles of coastline from Bodega Point to Jenner. The Sonoma County coast also supports an important harbor facility for commercial and recreational boating as well as a U.S. Coast Guard Station at Bodega Bay. Greater Farallones National Marine Sanctuary encompasses the offshore marine area.

Outer Coast Shoreline



Coastal Zone Resources

Ports & Harbors: Bodega Bay
Publicly Owned/Accessible: 14,600 acres
Public Access Coastal Areas: 61 locations
Coastal Zone Wetlands: 2,500 acres

Ocean Economy

2013 County Ocean Sectors GDP	$303 M
2013 Major Ocean Economic Sectors in 2013	
Tourism and Recreation GDP	$197 M
Transportation GDP	$14 M
Construction GDP	$12 M

1%

of State Ocean Sector GDP

Source: National Ocean Economics Program, 2016

Sonoma County's ocean economy accounts for 1% of the State's total ocean sector gross domestic product (GDP). Tourism and recreation make up approximately two-thirds of Sonoma County's ocean economy. Transportation is also a very important sector in this county, however, many transportation routes are at risk, and vulnerability assessments have highlighted the economic consequences associated with damages and closures to roads. Damage and closures of roads will also hamper the public's ability to access the coast and has financial implications for the tourism and recreation sectors of the county's economy.

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Hazards and Vulnerability

Sonoma County's "Climate Ready Hazards and Vulnerabilities" study provides an in depth analysis of climate hazards and vulnerabilities, and uses the National Research Council's (NRC) west coast projections of 2-12 inches of sea level rise by 2030, 5-24 inches by 2050 and 17-66 inches by 2100. According to the study, Sonoma County is expected to have higher sea levels and storm surge, more frequent inundation, increased erosion and saltwater intrusion [1]. Erosion is currently a problem along the Sonoma coastline, and increased erosion from rising sea levels will threaten coastal infrastructure [1]. The study also highlights that coastal communities will face a number of public safety hazards associated with rising seas including flooding, larger waves, increased storm surges, and wave run up. Diked areas adjacent to Petaluma and Russian Rivers and in Bodega Bay that are used for agriculture or residential use will be at risk from even low or moderate amounts of rising sea level as flooding is expected to be the worst in areas where streams and rivers meet the ocean or bay [1]. Many levees in the county do not meet current construction standards, putting the land behind it (mostly agricultural land in formal tidal areas) at high risk of levee breaches and inundation [1].

Failing seawalls at Gleason's Beach, Sonoma County, 2005

Population at risk to 100yr Flood

580 = current risk | 700 = future 1.4m SLR

Source: Heberger et al., 2009

In another study, the Sonoma County General Vulnerability Assessment rated regions of Sonoma County by vulnerability (low, medium, and high) based on 39 inches (100cm) of sea level rise and a 20 year storm (using Our Coast Our Future Flood Maps) [2,3]. The three regions with highest vulnerability are highlighted here. In the Highcliff/Muniz-Jenner area, public access, public and protected land, and residential development were found to be at risk [2]. In the Pacific View/Willow Creek and State Beach-Bodega regions, multiple public access points and trails, recreation, public and protected land, habitat, public infrastructure, and development, and marinas are highly vulnerable [2].

Potential Bluff Erosion Risk w/ 1.4m SLR

500 properties | 300 people

Source: Heberger et al., 2009

Regarding public infrastructure, Sonoma County has many roads and highways that were constructed on former estuarine and tide lands. These roads are highly vulnerable to rising sea levels, and even now are subject to closure and flood damage (during storms)[4]. Some of the major roads highlighted as vulnerable are Highway 1, Highway 101, Lakeville Highway (US 116), and Carneros Highway (US 121) [1]. Not only will sea level rise cause physical danger to those living along the coast, but the study predicts that it will also impact the economy of people living near bay lands or the coast by disrupting the movement of people and goods [1]. This could also be a major problem during extreme storms, as transportation routes provide emergency and recovery services to those residing in low-lying communities. Facilities for the Sonoma Valley County Sanitation District are also located in low lying

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areas that are expected to see increased flooding [1].

Many prime recreational and natural areas, including marshes, beaches, mudflats, and dunes, and anadromous fish habitats at the mouth of Russian River are at high risk of being lost to rising sea levels [4]. This could lead to a loss of biodiverse transitional habitats which currently also serve as a buffer against storm surge.

Habitat loss will also lead to losses in fishing, recreational and other commercial activities which are dependent on bay or ocean habitats. This could also be detrimental to Sonoma County's ocean economy.

LCP and Sea Level Rise Planning

Local Coastal Programs (LCPs) are planning tools used by local governments to guide development in the coastal zone, in partnership with the Coastal Commission. LCPs specify the appropriate location, type, and scale of new or changed uses of land and water and include a land use plan and measures to implement the plan (such as zoning ordinances). The Coastal Commission has awarded three rounds of the Local Assistance Grant Program to support certification and updates of LCPs, with an emphasis on addressing the impacts of climate change, since January 2014. Sonoma County has not received any of these grants from the Coastal Commission, but the county has received a grant from the Ocean Protection Council. Table 1 below shows the County's LCP "progress" to address sea level rise.

Table 1. LCP Planning in Sonoma County (as of Dec. 2016)

Jurisdiction/Segment	Certified LCP?	Grant?	Vulnerability Assessment?	Updated for SLR?	Shoreline by Jurisdiction
Sonoma County	1982	OPC	Yes [1,2,3]	In progress	100%

Coastal Act Management Priorities

Sonoma County's Pacific coast faces multiple sea level rise vulnerabilities related to infrastructure (including Highway 1), public access, and natural resources (including wetlands, tidal zones, beaches, and dunes).

Coastal Development and Hazards (Coastal Act Sections 30235, 30236, 30250, 30253)

Highway 1 is probably the most prominent infrastructure asset threatened by sea level rise along Sonoma County's Pacific coast. One particularly vulnerable area is the residential and highway infrastructure development located at Gleason's Beach, about 5 miles north of Bodega Bay. At Gleason's Caltrans is in the early stages of devising a highway realignment project that would move Highway 1 inland. The county, with Caltrans and other relevant agencies, should prioritize planning for road improvements, replacements, and relocations at already identified hazardous locations, especially along Highway 1 where there is a history of damaging events due to landslides and coastal erosion. Landslides, erosion and flooding also pose risks to agriculture and community development. The county should begin to evaluate adaptation responses for targeted, highly vulnerable areas like diked lands along Russian River (i.e. Jenner) and Bodega Bay.

Public Access and Recreation (Coastal Act Sections 30210, 30211, 30213, 30220, 30221)

One of the highest priorities in the Coastal Act is the mandate to protect and maximize public access to the coast. Sea level rise in Sonoma County could lead to a loss of public access and recreational opportunities due to permanent inundation, episodic flooding or erosion of beaches, recreational areas, and trails. Because a significant portion of coastal property in Sonoma County is in public ownership,

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State Parks and Sonoma County Regional Parks are also important partners with the county and the Coastal Commission in working toward maximizing public access and recreation in light of sea level rise.

Coastal Habitats, ESHA, and Wetlands (Coastal Act Sections 30230, 30231, 30233, 30240)

Inundation and increased erosion from sea level rise could convert habitats from one type to another and generally reduce the amount of nearshore habitat, such as sandy beaches and rocky intertidal areas. Planning for the migration of the sandy beaches, tidal salt marsh, and extensive lagoon mudflats and sandflats near and around Bodega Bay should be a top priority. These areas provide critically important ecosystem services and functions (i.e., water quality, wave attenuation, carbon storage, etc.) in addition to providing critical habitat for numerous species.

Additional Considerations

- Due to the open space and rural nature of most of the Sonoma coast, it will be important for the county to account for natural resource benefits and values in exploring and determining feasibility of various adaptation strategies.
- In southern Sonoma County, adaptation planning should address risks of flooding of agricultural lands as well as for residential development and public infrastructure.

References

[1] North Bay Climate Adaptation Initiative. 2014. "Climate Ready Sonoma County: Climate Hazards and Vulnerabilities."

[2] Sonoma County Permit and Resource Management Department. 2016. “County of Sonoma County General Vulnerability Assessment.” OPC LCP Sea-Level Rise Grant Program grant deliverable.

[3] USGS, Point Blue Conservation Science, and University of Southern California. 2016. Our Coast, Our Future Flood Maps.

[4] California Coastal Commission North Central Coast District Staff Interview. May 26, 2016.