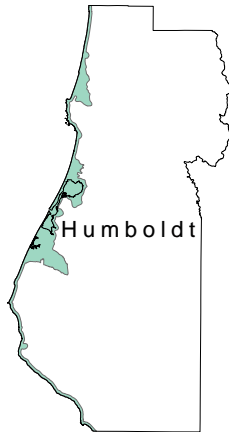




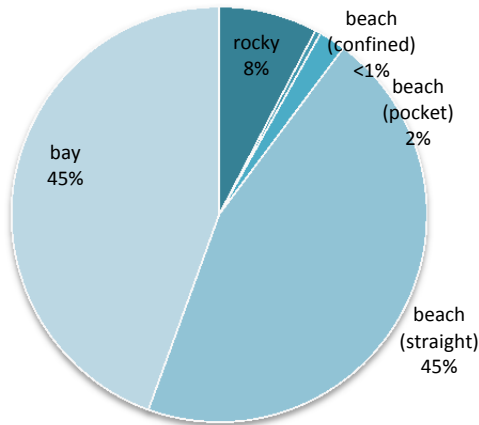
# Humboldt County

## Coastal Zone



With approximately 124 miles of mainland outer shoreline, plus an additional 390 miles of other shoreline which includes Humboldt Bay and many riverine areas, Humboldt County leads the state with the most coastal wetlands (44% of the state total), as well as the greatest intertidal frontage. The terrestrial coastal zone is approximately 130,000 acres. Humboldt Bay is the second largest natural bay in California and the largest estuary between San Francisco Bay and Coos Bay, Oregon. The bay is a significant harbor for port-related commercial and industrial uses as well as valuable for its ecological (especially eelgrass and salmonids), aesthetic, and recreational resources. Historically, the bay supported 10,000 acres of tidal marsh habitats. Since the mid- 1800s, the majority of the historic tidelands were diked or filled, and today, only 10% of the historic tidal marsh habitat remains. Federal lands, such as the Humboldt Bay National Wildlife Refuge and Bureau of Land Management areas of Samoa Dunes and King Range National Conservation area, support conservation for coastal resources and complex marine and dune ecosystems as well as providing additional recreation areas in Humboldt’s coastal zone.

## Outer Coast Shoreline (includes Humboldt Bay)



### Coastal Zone Resources

Ports & Harbors: Humboldt Bay, Trinidad, Shelter Cove

Publicly Owned/Accessible: 29,500 acres

Public Access Coastal Areas: 104 locations

Coastal Zone Wetlands: 34,300 acres

## Ocean Economy

**2013 County Ocean Sectors GDP** **\$151 M**

### 2013 Major Ocean Economic Sectors

Tourism and Recreation GDP	\$118 M
Living Resources GDP	\$17 M
Transportation GDP	\$2.2 M

**0.4%**

of State Ocean Sector GDP

Source: National Ocean Economics Program, 2016

While Humboldt County accounts for only 0.4% of the state’s total ocean sector Gross Domestic Product (GDP), roughly 77% of the county’s ocean economy relies on tourism and recreation. Many individuals travel to Humboldt County to enjoy its natural beauty: its national and state parks, pristine beaches, camping, and fishing. Many of these activities could be limited by rising sea levels, and negatively affect the county’s economy. The county also has a large fishing economy. Humboldt Bay, declared the “Oyster Capital of California” by the state legislature [1], supports 70% of the state’s aquaculture (oysters, clams). Although not part of the ocean economy, coastal agricultural also contribute to the county’s economy and a loss of agricultural lands to sea level rise could also have negative economic impacts.



# Humboldt County

## Hazards and Vulnerability

Multiple vulnerability assessments conducted in Humboldt County identified several imminent vulnerabilities to sea level rise. Although most of the Pacific Northwest coastline north of Cape Mendocino is actively experiencing vertical land uplift, the Humboldt Bay region is experiencing a significant rate of land subsidence, and its average rate of sea level rise is the highest in the state [2,4]. Subsidence, tectonic uplift, and soil compaction could affect inundation with future sea level rise, highlighting the importance of local adjustments for vertical land motion. For Humboldt Bay, the vulnerability assessments demonstrate that sea level rise will have significant implications for daily tidal water level changes as well as storm flooding [2-7].



Pasture near Liscom Slough during a King Tide, Arcata CA, Dec 2012

and local roads, urban residential and commercial areas, cultural resources, and thousands of acres of agricultural lands are located in areas

vulnerable to inundation if the dikes and levees are breached or overtopped. The Cities of Eureka and Arcata identified similar vulnerabilities to those in Humboldt County's jurisdiction. The City of Eureka developed its own assessments for priority assets using

### Potential Dune/Bluff Erosion Risk with 1.4m SLR

570 properties | 580 people  
Source: Heberger et al., 2009

### Outer Pacific Coast Population\* at risk to 100yr Flood

3,700 = current risk | 7,800 = future w/  
1.4m SLR Source: Heberger et al., 2009

*\*Note that if Humboldt Bay coastal population is considered, the population at risk to 100-year storm flooding with 1.5 m sea level rise will be significantly higher [1,2].*

The 2013 Humboldt Bay Shoreline Inventory, Mapping and Sea Level Rise Vulnerability Assessment found that 50% of Humboldt Bay's 102-mile long shoreline is composed of artificial dike and railroad structures constructed over 100 years ago and in varying stages of disrepair. Some 26 miles of shoreline are rated as highly vulnerable to breaching and/or overtopping under today's higher high tide events [2]. Using sea level rise projections of 12 inches by 2050 and 36 inches by 2100, the study shows that numerous critical regional assets and coastal resources in the county, including municipal utility and storm water infrastructure, state highways

vulnerability work done for Humboldt Bay. Failure of the dikes and levees could threaten the Eureka's sewer lines and lift stations which could overwhelm the city's wastewater treatment plant, its primary drinking water transmission lines, natural gas lines, U.S. Highway 101, Murray Field airport, streets, commercial, and agricultural properties, state wildlife refuges and valuable coastal wetlands and wildlife habitats [4]. Other high priority assets in low-lying areas threatened by 2050 (with 1.9ft sea level rise) are commercial fishing docks and facilities and recreational boating docks and launches [4]. The Eureka Vulnerability and Risk Assessment report also states that by 2100, 80% of the coastal zone in the city could become subject to tidal inundation [4], putting land uses and development, utilities, roads, coastal resources and public access at risk. Breaching or overtopping of the shoreline on Arcata Bay has the potential to flood the City of Arcata's wastewater treatment facility and the City's marsh and wildlife area in addition to residential and industrial properties [2].



# Humboldt County

The City of Trinidad’s vulnerability assessment identified that an increase in mean sea level could reduce the size of public beaches, increase coastal bluff erosion, and threaten Trinidad harbor as

well as land uses adjacent to coastal bluffs [3]. These effects would also reduce public access and recreational opportunities there.

---

## SEA LEVEL RISE VULNERABILITY AND HUMBOLDT BAY

In March 2015, a group of California state coastal agencies, including the California Coastal Commission, sponsored a one-day workshop in Eureka for stakeholders and partners from Humboldt Bay to learn about local and regional priorities as well as to discuss opportunities for state agencies to support the region and communities working on sea level rise planning and adaptation projects. As a result of the feedback from community members at the workshop, state agencies concluded that the top ten priority issues or areas for sea level rise planning were:

- |                                      |                           |
|--------------------------------------|---------------------------|
| 1. Natural resources                 | 6. Utilities              |
| 2. Dikes & levees                    | 7. Wastewater             |
| 3. Agricultural lands                | 8. Local economic impacts |
| 4. Transportation                    | 9. Stormwater             |
| 5. Saltwater intrusion & groundwater | 10. Education & outreach  |



Workshop participants found priority needs to involve planning for reinforcement of dikes and levees, engaging utilities in identifying vulnerable buried infrastructure, and collecting data on sediment dynamics, dune ecosystem processes, and groundwater vulnerabilities. Lastly, developing capacity to address sea level rise will be crucial as a variety of public and private entities will need to be engaged for effective regional planning. This direct community feedback can be used to help focus state and regional efforts for future sea level rise planning, regional collaboration and inter-agency work.

---

## 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 since January 2014 to support certification and updates of LCPs, with an emphasis on addressing the impacts of climate change. Within this county, the Humboldt Bay Segment (Round 1 and 2) and the Cities of Trinidad (Round 2) and Arcata (Round 1) have all been awarded grants from the Coastal Commission to address the impacts of sea level rise within their LCP jurisdictions. Table 1 below shows whether jurisdictions have LCPs that address sea level rise. "In part" means an LCP segment has some explicit policy language addressing sea level rise.



# Humboldt County

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

Jurisdiction/Segment	Certified LCP?	Grant?	Vulnerability Assessment?	Updated for SLR?	Shoreline by Jurisdiction
Humboldt County	No		Yes [2,5,6,7]	No	72%
Northcoast segment	Yes (1986)	No	No	No	
Trinidad Area Segment	Yes (1986)	No	No	No	
McKinleyville Segment	Yes (1986)	No	No	No	
Humboldt Bay Segment	Yes (1986)	SCC, OPC, CCC	Yes [2,5,6,7]	In Progress	
Eel River Segment	Yes (1986)	No	No	No	
Southcoast Segment	Yes (1986)	No	No	No	
City of Trinidad	Yes (1980)	CCC	Yes [3,6]	In Progress	1%
City of Arcata	Yes (1989)	CCC	Yes [2,5,6,7]	In Progress	2%
City of Eureka	Yes (1984)	OPC	Yes [2,4,5,6,7]	In Progress	9%
City of Fortuna	No	No	No	No	<1%
Federal Lands and Ports					16%

## Coastal Act Management Priorities

Humboldt County faces significant sea level rise risks in many sectors, including coastal agriculture. The natural and built assets in and around Humboldt Bay are particularly vulnerable due to local subsidence and the condition of dikes and levees.

### **Coastal Agriculture (Coastal Act Sections 30241- 30243)**

Sea level rise could lead to a significant increase in flooding and inundation of low-lying agricultural land, saltwater intrusion into agricultural water supplies, and a decrease in the amount of freshwater available for agricultural uses around Humboldt Bay. In addition, adaptation planning for vulnerable levees in and around Humboldt Bay raises potential Coastal Act policy conflicts between preserving agricultural lands, currently located behind levees, and restoring these areas to tidal wetlands as an adaptation approach for managing higher sea levels.

### **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. Under current tidal conditions, seasonal freshwater wetlands, inter-tidal wetlands and wildlife refuges are already experiencing seasonal inundation. Opportunities for restoring former salt marsh habitat are promising (e.g. White Slough Restoration Project in South Humboldt Bay); however, land subsidence and sediment availability will be key factors to successful restoration efforts.

### **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 Humboldt 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. Planning is needed to address future erosion and flooding of a significant portion of the Humboldt Bay Trail, a planned section of the California Coastal Trail, that is proposed between Eureka and Arcata, within the U.S. Highway 101 and railroad transportation corridors—locations already noted as highly vulnerable to sea level rise impacts.

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



# Humboldt County

---

Many types of development are threatened by sea level rise in Humboldt County: roads, railroads, water pipelines, gas lines, wastewater infrastructure, industrial uses, and residential areas. While reinforcing levees and elevating structures might allow development to adapt in the short and medium term, planning for the long-term impacts of sea level rise will require additional adaptation strategies. In addition, multi-agency and stakeholder collaboration is essential for developing meaningful long-term plans, including with tribes, Caltrans, Humboldt County Association of Governments, State Lands Commission, Pacific Gas and Electric, and others, especially for vulnerable critical infrastructure located in/behind levees and for residential development on former tidelands.

## **Additional Considerations**

- Knowledge gaps related to land subsidence, sediment transport, and saltwater intrusion are areas that should be a priority for further study.
- Adaptation measures for sea level rise in the county should be mindful to presence and preservation of cultural resources.
- Current planning efforts underway for Humboldt County and the City of Eureka should include sea level rise considerations in evaluating land use and zoning changes for under-utilized coastal dependent industrial use areas.
- Living shorelines should be considered as a future adaptation strategy option for areas along Humboldt Bay; however, design, planning and permitting issues will need to be evaluated to determine feasibility, permissibility, and long-term success.

## **References**

- [1] California Coastal Commission North Coast District Staff Interview. July 18, 2016.
- [2] [Trinity Associates. 2013. "Humboldt Bay Sea Level Rise Adaptation Planning Project: Phase 1. Shoreline Inventory, Mapping, and Vulnerability Assessment."](#)
- [3] [GHD. 2016. "City of Trinidad Draft Climate Change Vulnerability Report and Adaptation Response."](#)
- [4] [Trinity Associates. 2016. "City of Eureka Sea Level Rise Assets Vulnerability and Risk Assessment."](#)
- [5] [McBain & Trush and Trinity Associates. 2013. "Humboldt Bay Shoreline Inventory, Mapping and Sea Level Rise Vulnerability Assessment. Addendum: Dike and Railroad Shoreline Vulnerability Rating."](#)
- [6] [GHD, ESA PWA, Trinity Associates. 2014. "Caltrans District 1 Climate Change Vulnerability Assessment and Pilot Studies. FHWA Climate Resilience Pilot Final Report."](#)
- [7] [Northern Hydrology & Engineering. 2015. "Humboldt Bay: Sea Level Rise, Hydrodynamic Modeling, and Inundation Vulnerability Mapping"](#)
- [8] [Heberger M, H Cooley, P Herrera, PH Gleick, E Moore. 2009. The Impacts of Sea-Level Rise on the California Coast. Prepared by the Pacific Institute for the California Climate Change Center.](#)