

Humboldt State University

Digital Commons @ Humboldt State University

Local Reports and Publications

Humboldt State University Sea Level Rise
Initiative

12-2020

Compilation of Sea Level Rise Documents and References for Humboldt Bay

Aldaron Laird

Kristen Orth-Gordinier

Follow this and additional works at: https://digitalcommons.humboldt.edu/hsuslri_local

Compilation of Sea Level Rise Documents and References for Humboldt Bay

Prepared by:
Kristen Orth-Gordinier and Aldaron Laird



December 2020

Master Reference

This document is a compilation of sea level rise (SLR) related data and publications specific to Humboldt Bay. Documents are organized by leading organization and then year of publication.

Multiple links for documents are provided. The HSU Sea Level Rise Initiative has partnered with the HSU Library to create an online database for sea level rise documents through the library's website. This database can be visited at: <https://digitalcommons.humboldt.edu/hsuslri/>

If you wish to see additional documents added to this list or the Digital Commons database, please contact Kristen Orth-Gordinier at kmo29@humboldt.edu

Table of Contents

Local	2
Humboldt County	2
City of Eureka	7
City of Arcata	8
Humboldt Bay Harbor Recreation and Conservation District	9
Humboldt State University	11
Pacific Gas and Electric Company	15
State	15
Coastal Conservancy	15
Coastal Commission	18
Ocean Protection Council	19
Caltrans	20
State Lands Commission	22
Federal	23
USFWS	23
USGS	25
FEMA	27
Spatial Data	29
Interactive Sea Level Rise Viewer Maps	32
Sea the Future	32
CalFloD-3D Model	32
Sea-Level Rise Viewer	32
Coastal Resilience Evaluation and Siting Tool (CREST)	32
Digital Coast	32
Our Coast Our Future	32
Surging Seas Risk Finder	32
Coastal Storm Modeling System (CoSMoS)	33
Hazard Exposure Reporting and Analysis (HERA)	33
Coastal Resiliency Mapping Portal	33

Local

Humboldt County

Natural Shoreline Infrastructure in Humboldt Bay for Intertidal Coastal Marsh Restoration and Transportation Corridor Protection

Expected completion September 2021

Author(s): Humboldt County Public Works

Prepared for: Humboldt County Public Works, Caltrans

Funder(s): National Fish and Wildlife Federation and the Ocean Protection Council

Report pending, grant available online: <https://humboldt.gov/2487/Sea-Level-Rise>

Summary: This project will perform site characterization and prepare preliminary design (50%) for a project utilizing natural shoreline infrastructure techniques to help protect a portion of the Eureka-Arcata transportation corridor along Humboldt Bay from flood hazards. The project will lay the groundwork for implementation of an innovative approach to restore and perpetuate intertidal coastal marsh, increase community resilience to flooding, and demonstrate the use of natural ecological systems for sea level rise adaptation.

Sea Level Rise Adaptation Plan for Transportation Infrastructure in the Eureka Slough Hydrographic Area, Humboldt Bay – Working Draft

July 2020

Author(s): GHD, ESA, Northern Hydrology and Engineering, RCAA, Trinity Associates, and Philip King

Prepared for: Humboldt County Public Works, City of Eureka, and Humboldt County Association of Governments

Funder(s): Caltrans Adaptation Planning Grant program

Summary: The project will prepare an adaptation plan that identifies the specific flooding vulnerabilities within Eureka Slough hydrologic sub-unit of Humboldt Bay and develops adaptation project concepts, with an emphasis on stakeholder engagement, multi-benefit goals, best available scientific information, cost-effectiveness, and strategic planning. Due to various existing conditions, this area is especially vulnerable to flooding hazards, with vulnerability expected to increase due to the progressive rise of sea levels. The study area spans multiple municipal jurisdictions and includes multiple critical assets.

For more about the “Sea Level Rise Adaptation Plan for Humboldt Bay/Eureka Slough Area (2018-2020)” Project see <https://humboldt.gov/2487/Sea-Level-Rise>; website includes:

- Working Draft Report and Appendices 2020
- March 2020 Workshop documents
- Project Scope of Work and Maps
- Presentation slides from the Humboldt Bay Symposium and Jacobs Avenue Information Meeting

Humboldt Bay Shoreline, North Eureka to South Arcata: A History of Cultural Influences

June 2020

Author(s): Jerry Rohde

Prepared for: Humboldt County Public Works

<https://humboldt.gov/DocumentCenter/View/87242/Humboldt-Bay-shoreline-cultural-landscape-investigation-Rohde-2020>

https://digitalcommons.humboldt.edu/hsuslri_local/21/

Summary: The purpose of this study was to document the human influence on the landforms and features along the shoreline between Eureka and Arcata to help understand the geomorphic setting and to inform considerations for (1) how human alterations may have changed natural processes, and (2) how the existing landscape may evolve with sea level rise. This work utilizes historical maps and photos and outlines the timeline and scope of significant changes within the study area.

Humboldt County: Humboldt Bay Area Plan Consolidation of Key Sea Level Rise Information by Hydrologic Unit

February 2020

Author(s): Trinity Associates

Prepared for: Humboldt County Planning Department

Funder(s): California Coastal Commission

https://humboldt.gov/DocumentCenter/View/84376/Key_Sea_Level_Rise_Information_for_Humboldt_Bay_3-2020_PDF

https://digitalcommons.humboldt.edu/hsuslri_local/1/

Summary: This report summarizes region-wide geospatial data of sea level rise vulnerability statistics/findings from previous assessments to facilitate prioritizing hydrologic units and/or assets for adaptation planning for the six hydrologic/hydrographic units on Humboldt Bay.

Humboldt Bay Area Plan Communities at Risk Strategic Sea Level Rise Adaptation Planning Report

November 2019

Author(s): Trinity Associates

Prepared for: Humboldt County Planning Department

Funder(s): California Coastal Commission

<https://humboldt.gov/DocumentCenter/View/81417/Humboldt-Bay-Area-Plan-Communities-at-Risk-Strategic-SLR-Adaptation-Report-11-30-2019-final-reduced>

https://digitalcommons.humboldt.edu/hsuslri_local/29/

Summary: This adaptation planning report describes the characteristics of each of three Humboldt Bay Area Plan communities (King Salmon, Fields Landing, and Fairhaven/Finn Town) directly at risk from sea level rise, the sea level rise impacts they may be exposed to, a range of suitable adaptation goals, strategies, and solutions, and recommended adaptation strategies and solutions.

Humboldt County Operational Area Hazard Mitigation Plan 2019 – Volume 1 Area-Wide Elements – Public Review Draft

August 2019

Author(s): Tetra Tech

Prepared for: Humboldt County Office of Emergency Services

https://digitalcommons.humboldt.edu/hsuslri_local/31

Summary: Humboldt County prepared a hazard mitigation plan in compliance with the DMA in 2007. Cities and special purpose districts with jurisdiction inside the county participated as planning partners in the plan. That initial plan identified resources, information, and strategies for reducing risk from natural hazards. It called for ongoing updates and was last updated in 2014. This Humboldt County Operational Area Hazard Mitigation Plan 2019 fulfills the ongoing update requirement.

Humboldt Bay Area Plan Communities at Risk Sea Level Rise Vulnerability Assessment

November 2018

Author(s): Trinity Associates

Prepared for: Humboldt County Planning Department

Funder(s): California Coastal Commission

<https://humboldt.gov/DocumentCenter/View/81418/Humboldt-Bay-Area-Plan-Communities-at-Risk-SLR-Vulnerability-Assessment-12-02-2019-?bidId=>

https://digitalcommons.humboldt.edu/hsuslri_local/28/

Summary: This vulnerability assessment report describes properties and infrastructure that are at risk from sea level rise in three Humboldt Bay Area Plan communities (King Salmon, Fields Landing, and Fairhaven/Finn Town); identifies stakeholders and adaptive capacity for each community; summarizes stakeholder workshops; summarizes sea level rise adaptation planning in other economically disadvantaged communities; summarizes relevant portions of state reports; and reviews recent Coastal Commission Coastal Development Permits issued in at-risk communities.

Presentation Slides: King Salmon & Fields Landing Communities at Risk Strategic Sea Level Rise Adaptation Planning Workshop

August 2018

Author(s): Trinity Associates, Humboldt County Planning Department

Prepared for: Humboldt County Planning Department

Funder(s): California Coastal Commission

<https://humboldt.gov/DocumentCenter/View/65366/King-Salmon-and-Fields-Landing-8-7-2018-Workshop-PowerPoint-PDF>

https://digitalcommons.humboldt.edu/hsuslri_local/13/

Summary: PowerPoint presentation slides for a workshop with King Salmon and Fields Landing stakeholders (s property owners, residents, business owners, the general public, utility providers, and transportation agencies). This workshop discusses Humboldt County's Humboldt Bay Area Plan Update and impacts projected for the communities.

Presentation Slides: Fairhaven & Finn Town Communities at Risk Strategic Sea Level Rise Adaptation Planning Workshop

August 2018

Author(s): Trinity Associates, Humboldt County Planning Department

Prepared for: Humboldt County Planning Department

Funder(s): California Coastal Commission

<https://humboldt.gov/DocumentCenter/View/65369/Fairhaven-and-Finn-Town--8-14-2018-Workshop-PowerPoint-PDF>

https://digitalcommons.humboldt.edu/hsuslri_local/18/

Summary: PowerPoint presentation slides for a workshop with Fairhaven and Finn Town stakeholders (s property owners, residents, business owners, the general public, utility providers, and transportation agencies). This workshop discusses Humboldt County's Humboldt Bay Area Plan Update and impacts projected for the communities.

Humboldt County Humboldt Bay Area Plan Diked Shoreline Sea Level Rise Adaptation Feasibility Study

July 2018

Author(s): Trinity Associates

Prepared for: Humboldt County

Funder(s): California Coastal Commission

<https://humboldt.gov/DocumentCenter/View/64385/Humboldt-County-Diked-HBAP-Shoreline-Adaptation-Feasibility-Study-PDF>

https://digitalcommons.humboldt.edu/hsuslri_local/14/

Summary: This report describes the vulnerability of the diked shoreline on Humboldt Bay and the risk to land use, development, utility and transportation infrastructure and coastal resource assets protected by existing dikes from tidal inundation and sea level rise. The report builds on previous work; explores a range of sea level rise adaptation strategies and a suite of adaptation measures that are applicable to diked shoreline structures; investigates adaptation measure costs; and explores regulatory constraints and opportunities that the CCC could apply to further the adaptation of diked shoreline structures to sea level rise.

Humboldt County Humboldt Bay Area Plan Sea Level Rise Policy Background Study

July 2018

Author(s): Humboldt County Planning Department

Prepared for: Humboldt County Planning Department

<https://humboldt.gov/DocumentCenter/View/64596/HBAP-Sea-Level-Rise-Adaptation-Policy-Background-Study-August-2018-PDF>

https://digitalcommons.humboldt.edu/hsuslri_local/16/

Summary: This report presents local adaptation policies and strategies that the County may consider when updating the Humboldt Bay Area Plan. It summarizes local SLR projections; proposes a SLR overlay zone; discusses policy challenges posted by state retained permit jurisdiction; and the policy planning horizon.

Humboldt Bay Trail South: Sea-Level Rise Vulnerability and Adaptation Report

June 2018

Author(s): ESA

Prepared for: Humboldt County Public Works, GHD

<https://humboldt.gov/DocumentCenter/View/64364/Sea-Level-Rise-Vulnerability-and-Adaptation-Report-June-2018>

https://digitalcommons.humboldt.edu/hsuslri_local/15/

Summary: The purpose of this report is to support the County in designing and planning a trail facility along the Arcata-Eureka Highway 101 corridor which is intended to be resilient to the impacts of sea-level rise and to provide guidance to the County for developing a strategy for implementing future adaptation measures. This report presents a SLR vulnerability and adaptation assessment of the HBTS project, including development of coastal engineering design criteria, an assessment of potential sea-level rise impacts, and identification of possible adaptation measures and strategies to help manage sea-level rise related risks to the project.

Humboldt Bay Area Plan Sea Level Rise Vulnerability Assessment Report

January 2018

Author(s): Trinity Associates

Prepared for: Humboldt County

<https://humboldt.gov/DocumentCenter/View/62872/Humboldt-Bay-Area-Plan-Sea-Level-Rise-Vulnerability-Assessment-Report-PDF?bidId=>

https://digitalcommons.humboldt.edu/hsuslri_local/17/

Summary: This vulnerability and risk assessment identifies areas and assets that might be exposed to sea level rise and describes existing asset vulnerabilities and risks not directly attributable to sea level rise but due to potential barrier-type (dike) shoreline failures. This assessment is presented under five major asset classes: shoreline, land uses, transportation, utilities, and coastal resources.

Shoreline Conditions Assessment Memo – Humboldt Bay Trail, Memorandum

January 2017

Author(s): GHD

Prepared for: Humboldt County Public Works

No link

Summary: As part of the Route Determination task, a preliminary field level characterization of the levee, railroad bed, and shoreline along the trail corridor was conducted to provide background information and guidance for evaluating route alternatives. The following characterization is based on field walks along the potential levee, railroad bed and shoreline routes of the trail. The characteristics identified are based on engineering judgement and visual observations made in the field that were relevant to the evaluation of the trail alternatives without consideration for the condition of the railroad tracks or ties.

Jacobs Avenue Levee Bathymetric, Hydrologic and Hydraulic Study, Humboldt County, CA

March 2016

Author(s): Northern Hydrology & Engineering (NHE)

Prepared for: Humboldt County Public Works

<https://humboldt.gov/DocumentCenter/View/56631/Jacobs-Levee-Hydraulic-Study?bidId=>
https://digitalcommons.humboldt.edu/hsuslri_local/32

Summary: This technical memorandum describes a Hydrologic and Hydraulic Study for the Jacobs Avenue Levee. The Project Area consists of the entire length of the Jacobs Avenue Levee and a portion of the Murray Field Levee, both located within a slough complex draining to Humboldt Bay. The purpose of the Study is to provide water surface elevations along the Levee within the Project Area for 1% annual chance (100-yr) flood conditions, in support of the geotechnical evaluation of the Levee system.

City of Eureka

Elk River WWTP Enclosed Bays and Estuaries Compliance Feasibility Study: Climate Change Readiness Plan: Work Plan and Vulnerability Assessment

June 2019

Author(s): ESA, GHD

Prepared for: City of Eureka

Funder(s): City of Eureka

No link

Summary: The purpose of the CCRS Work Plan is to identify the primary climate change drivers, including sea-level rise and precipitation, as well as secondary effects on streamflow, that could induce potential impacts to the WWTP facilities and operations. This information will be used to develop the “exposure” maps and thresholds as part of the Vulnerability Assessment of the wastewater treatment facilities and collection system which is included in this document. The Vulnerability Assessment will be the basis for the evaluation and recommendations for climate adaptation measures, which will be presented in a subsequent report.

City of Eureka Sea Level Rise Adaptation Planning Report

December 2016

Author(s): City of Eureka

Prepared for: City of Eureka

Funder(s): Ocean Protection Council

http://www.eureka2040gpu.com/Links/pdfs/COE%20SLR%20Adaptation%20Plan_Final_161230.pdf

https://digitalcommons.humboldt.edu/hsuslri_local/10/

Summary: This Adaptation Planning Report includes recommendations to guide the update of the City’s Local Coastal Program (LCP) incorporation of SLR goals, policies, and regulations. The report focuses on planning approaches for priority assets, planning horizons or targeted water elevations, and specific geographic areas.

City of Eureka Sea Level Rise Adaptation Planning Report Addendum No. 1

December 2016

Author(s): Bayview Consulting

Prepared for: City of Eureka

http://www.eureka2040gpu.com/Links/pdfs/Eureka%20Adaptation%20Plan%20Addendum_Final_161230.pdf

https://digitalcommons.humboldt.edu/hsuslri_local/8/

Summary: The Addendum provides additional detail and analysis to support the information in the Adaptation Planning Report. It provides a summary of information about Eureka's shoreline and watershed basins; provides draft goals and policies that could potentially be included in the City's Local Coastal Plan; presents conceptual adaptation strategies and principles for considering strategies; and further builds on the three approaches described in the Planning Report (assets, planning horizons/water elevations, and geographic areas).

City of Eureka Sea Level Rise Assets Vulnerability and Risk Assessment

June 2016

Author(s): Trinity Associates

Prepared for: City of Eureka

Funder(s): Ocean Protection Council

<http://www.eureka2040gpu.com/Links/pdfs/COE%20SLR%20Assets%20Vulnerability-Risk%20Assessment%20Report-Appendix%2006302016.pdf>

https://digitalcommons.humboldt.edu/hsuslri_local/9/

Summary: This report describes expected sea level rise impacts in the City and its Planning Area, relative sea level rise projections for the Humboldt Bay region, potential areas of tidal inundation under existing tidal conditions and from projected sea levels. Vulnerable high priority assets are described by location and characteristics, projected timing of impact, susceptibility to tidal inundation or salt water intrusion and flooding, and consequences to the community if these assets are impaired or lost. At-risk assets are then prioritized for sea level rise adaptation based on their exposure, susceptibility, and consequence.

City of Arcata

Sea-Level Rise in the Humboldt Bay Region, Update 2

December 2018

Author(s): Jeffrey K. Anderson, Coastal Ecosystems Institute of Northern California

Funder(s): Partially funded by the City of Arcata

https://digitalcommons.humboldt.edu/hsuslri_local/20/

Summary: This document provides an overview of global and regional sea-level rise, with an emphasis on physical processes locally affecting sea levels in the Humboldt Bay

region and provides an update to Chapter 2 of the Humboldt Bay: Sea Level Rise, Hydrodynamic Modeling, and Inundation Vulnerability Mapping report.

City of Arcata Sea Level Rise Vulnerability Assessment

February 2018

Author(s): Trinity Associates

Prepared for: City of Arcata

https://digitalcommons.humboldt.edu/hsuslri_local/33

Summary: This vulnerability and risk assessment utilizes the best available science to identify areas and assets that might be exposed to sea level rise. This report would also describe existing asset vulnerabilities and risks not directly attributable to sea level rise but due to potential barrier-type (dike) shoreline failures. This information is critical to property owners, the public, and the City to inform land use decisions.

City of Arcata Coastal Land Use Element

April 2018

Author(s): City of Arcata

<https://www.cityofarcata.org/DocumentCenter/View/7194/CLUE-Draft-04-2018?bidId=>

Summary: The Coastal Land Use Element of the City of Arcata General Plan will help shape how the areas of the City of Arcata situated within the California Coastal Zone will look and function. This element is the City's companion land use document governing physical development and change affecting coastal resources within the City's Coastal Zone.

Sea Level Rise Draft Policies

June 2017

Author(s): City of Arcata

<https://www.cityofarcata.org/DocumentCenter/View/6429/Arcata-Sea-Level-Rise-Policies-DRAFT-June-2017?bidId=>

Summary: Draft policies to consider for the Coastal Land Use Element update. Policies support the goal to address sea level rise impacts by providing feasible and sustainable adaptation that preserves the economic function of the impacted area for as long as practicable, taking into account ecological integrity and social equity.

Humboldt Bay Harbor Recreation and Conservation District

Draft Program Environmental Impact Report for Humboldt Bay Sediment Management

November 2020

Authors(s): ICF

<http://humboltdbay.org/sites/humboltdbay2.org/files/HB%20Sediment%20Management%20PEIR%20-%20DEIR.pdf>

<https://ceqanet.opr.ca.gov/2018012052/2>

Summary: Draft PEIR assesses the potential environmental effects of implementing the Humboldt Bay Sediment Management Program. The objective of this PEIR is to explore alternatives and provide an environmental analysis of dredging methods, sediment processing, and sediment placement at beneficial-use sites that would guide implementation of the Coastal Regional Sediment Management Plan for the Eureka Littoral Cell (CRSMP) and steer sediment management for Locally Maintained Sites (LMSs) toward achievement of the objectives of the CRSMP. In recent years, dredged sediments have exclusively been transported to the Humboldt Open Ocean Disposal Site (HOODS) located approximately 3 nautical miles northwest of the Humboldt Bay entrance where the dredged material is deposited. Disposal at HOODS is not considered a beneficial use because it removes the sediments from the Eureka Littoral Cell (ELC). Located in Humboldt Bay, the Proposed Program consists of 25 sites where dredging may occur, three sites where sediment may be dewatered and temporarily stockpiled and 76 sites where sediment may be beneficially used.

Draft Program Environmental Impact Report for Humboldt Bay Sediment Management Appendix A: Humboldt Bay Potential Beneficial Uses of Dredged Sediment Report

December 2019

Author(s): Aldaron Laird

https://digitalcommons.humboldt.edu/hsuslri_local/34

<http://humboltdbay.org/sites/humboltdbay2.org/files/HB%20Sediment%20Management%20PEIR%20-%20DEIR.pdf>

Summary: The purpose of this study is to explore beneficial uses for sediments dredged from Humboldt Bay and to identify suitable use sites. The focus is on dredged sediments from locally maintained sites. Dredged sediment could be used to protect waterfront property from sea level rise, replenish beaches, increase resiliency of diked shoreline structures to sea level rise, raise the elevation of diked former tidelands now used for agriculture, create living shorelines, and restore historic salt marsh habitat. Seventy-six suitable sites on and adjacent to Humboldt Bay for each beneficial use are identified and their physical characteristics described.

Humboldt Bay Eelgrass Comprehensive Management Plan

October 2017

Author(s): Merkel & Associates

Prepared for: Humboldt Bay Harbor Recreation, and Conservation District.

Funder(s): U.S. EPA Regional Wetlands Program Development Grant Program

https://humboltdbay.org/sites/humboltdbay2.org/files/documents/Humboldt%20Bay%20Eelgrass%20Management%20Plan_10-10-17.pdf

Summary: The Humboldt Bay Eelgrass Comprehensive Management Plan is intended to be an ecosystem-based management (EBM) plan. The goals of the plan identified in the EPA grant proposal are to: (1) ensure that the sum of individual eelgrass restoration and protection actions has the greatest benefit to eelgrass and eelgrass functions,

(2) facilitate more efficient regulatory processes for projects in the bay; for example, by pre-identifying high priority eelgrass mitigation/conservation options, and (3) provide a long term eelgrass habitat conservation strategy that allows for sea level rise adaptation, dredging and economic development in Humboldt Bay.

Humboldt Bay Sea Level Rise Adaptation Planning Project: Phase I and II

February 2015

Author(s): Trinity Associates, McBain Associates, and Northern Hydrology Engineers

Funder(s): California Coastal Conservancy, Coastal Ecosystems Institute of Northern California

The two phases of the Humboldt Bay sea level rise adaptation planning project, produced several relevant GIS databases, which are located here:

<https://humboltdbay.org/humboldt-bay-sea-level-rise-adaptation-planning-project>

- *Phase I: 2010-2013 Humboldt Bay Shoreline Inventory, Mapping and Sea Level Rise Vulnerability Assessment, Shoreline Structure GIS Database, and Shoreline Mean Monthly Maximum Water GIS Database.*
- *Phase II: 2013-2015 Humboldt Bay Sea Level Rise Hydrodynamic Modeling and Inundation Vulnerability Mapping Description of GIS Database and Google Earth Data, GIS Database, and Google Earth Data.*

Humboldt State University

Social Science Research to Advance Regional Coordination and Collaboration of Sea Level Rise Adaptation and Planning on Humboldt Bay

Ongoing

Author(s): Kristen Orth-Gordinier

Purpose: Graduate Thesis

Funder(s): California Sea Grant

Summary: N/A

Stakeholder Analysis Related to Sea Level Rise Adaptation and Planning for the Eureka-Arcata 101 Corridor

Spring 2020

Author(s): Jonelle Alvarez, Diana Orozco, Penelope Ponce, Thomas Premo, and Robert Tatian-Burger

Purpose: Undergraduate Senior Planning Practicum

Prepared for: Caltrans

https://digitalcommons.humboldt.edu/hsuslri_student/8/

Summary: The purpose of this project is to conduct a stakeholder analysis related to SLR adaptation in the 101 Corridor in order to provide Caltrans with information relevant to fulfilling the conditions of their CDP – namely the requirement to develop a CAIP that reflects “outreach, education, and coordination” with stakeholders and other relevant entities and planning processes in the region.

Exploring Community Knowledge and Perceptions of Flooding and Sea-Level Rise in King Salmon, California

Fall 2019

Author(s): Kristina Kunkel

Purpose: Graduate Thesis

https://digitalcommons.humboldt.edu/hsuslri_student/9/

Summary: The coastal community of King Salmon, California could be at the highest risk of relative sea-level rise on the entire U.S. West Coast. In 2019, the community already experiences severe flooding at least annually and may be regularly inundated as early as 2050. Until this study, there had been no documented effort to reach out to the community to show them future sea-level rise projections, understand the context of life in King Salmon, and listen to their reactions and perceptions.

When Sea Level Rise Threatens: Asking initial questions on behalf of the community of Fairhaven, CA

Fall 2018

Author(s): Caroline Gagne, Evan Gamman, Joffrion Ginn, Alfonso Herrera, Brianna Salazar, Brian Sarff, Neil Patterson

Purpose: Undergraduate Senior Planning Practicum

https://digitalcommons.humboldt.edu/hsuslri_student/1/

Summary: This report focused on the current infrastructure, such as homes, businesses, shoreline, and utilities that are at risk as Fairhaven becomes tidally inundated, and sought to identify how long utilities and service providers can be expected to continue to maintain services, and what mitigation measures might allow the community to stay in place as long as possible before seeking a planned retreat from the shoreline.

Humboldt Baykeeper Sea-Level Inundation Community Education and Outreach Report

Spring 2017

Author(s): Haley Barnes, Tara Breen, Marlene Dusek, Elizabeth Nagle, Sarah Wood

Purpose: Undergraduate Senior Planning Practicum

https://digitalcommons.humboldt.edu/hsuslri_student/2/

Summary: This study provides a qualitative assessment of barriers to public participation among different demographic groups within the City of Arcata. Students reviewed the literature, conducted interviews, and looked at efforts that other communities have applied to promote civic engagement and SLR education that would be appropriate for Arcata.

Shoreline Protection Options for Humboldt Bay

Spring 2016

Author(s): Ryan Bowsby, Kevin Courtain, Rob Dumouchel, Forrest Hansen, Austin Theriault

Purpose: Undergraduate Senior Planning Practicum

Prepared for: Harbor District

https://digitalcommons.humboldt.edu/hsuslri_student/11/

Summary: This report reviews a series of non-structural, hybrid-structural, and structural armament shoreline protection methods that may be appropriate for use on Humboldt Bay. Each method is explained with technical detail, and is presented alongside site suitability requirements and the benefits and challenges associated with implementing each method.

Big Lagoon Estates Area of Deferred Certification North Coast Area Plan Humboldt County Local Coastal Program Proposed Amendment Recommendation

Spring 2015

Author(s): Kyle Copp, Patrick Flynn, Evan Johnson, Sarah West

Purpose: Undergraduate Senior Planning Practicum

https://digitalcommons.humboldt.edu/hsuslri_student/6/

Summary: Students developed policy options based on an understanding of the relevant policy framework and current geotechnical conditions and service infrastructure limitations of the area. We researched extensively, interviewed local experts, including the Humboldt County Planning Department and California Coastal Commission staff and conducted field visits in an effort to inform our geological, technical and spatial analysis of the issues.

Freshwater Farms Reserve Nature Trails: Public Access and Sea Level Rise Recommendations

Spring 2015

Author(s): Delia Bense-Kang, Monique Gil, German Gordo, Linnea Hampe, Kris Josh Schiebelhut

Purpose: Undergraduate Senior Planning Practicum

https://digitalcommons.humboldt.edu/hsuslri_student/4/

Summary: The Land Trust has plans and funding in place to begin construction of the trail, but has yet to develop management strategies for the property with this new addition. In order to best provide public access, as well as meet NRLT's needs, students developed a list of trail management suggestions, described the role a Trail Steward position would play, and analyzed the effects that Sea Level Rise may have on the property over time.

Analysis of Coastal Wetland Geography and Policy in Humboldt Bay: Adapting Wetland Policies for a Changing Climate

Fall 2015

Author(s): Dylan Loudon

Purpose: Graduate Thesis

https://digitalcommons.humboldt.edu/hsuslri_student/7/

Summary: This project sought to model the potential loss of tidal salt marsh around Humboldt Bay due to sea level rise and, in light of sea level rise, examine the difficulties in the permitting, planning and implementation processes of wetland projects.

Scenario Planning for Building Coastal Resilience in the Face of Sea Level Rise: The Case of Jacobs Avenue, Eureka, CA

Author(s): Kerry McNamee, Evan Wisheropp, Christopher Weinstein, Andrew Nugent, Laurie Richmond

Purpose: Published Article in Humboldt Journal of Social Relations

https://digitalcommons.humboldt.edu/hsuslri_student/12

Summary: This article examines issues surrounding flood control measures for the Jacobs Avenue community located in Eureka, California. Researchers conducted interviews with stakeholders, developed geospatial analyses, and reviewed policy documents in order to understand the social, environmental, and political context related to sea level rise planning for Jacobs Avenue. From this information we developed a scenario-based set of management options to guide stakeholders in future decision-making regarding the fate of Jacobs Avenue.

Potential Future Impacts of Sea Level Rise on Shellfish Mariculture in Humboldt Bay

Spring 2014

Author(s): Jim Fendt, Sydney Stewart, Denise Truong

Purpose: Undergraduate Senior Planning Practicum

https://digitalcommons.humboldt.edu/hsuslri_student/5/

Summary: This report examines the existing conditions for oyster cultivation in Humboldt Bay, how, according to the best available scientific information, conditions are expected to change as a result of sea level rise, and how these changes could influence oyster cultivation opportunities in the future.

Implications of Sea Level Rise on North Humboldt Bay

Spring 2011

Author(s): Victoria Blakeney, Wade Bonney, Nicholas Chang, Leah Healy, Elmer Llamas

Purpose: Undergraduate Senior Planning Practicum

https://digitalcommons.humboldt.edu/hsuslri_student/3/

Summary: Students developed an assessment of likely implications of sea level rise for the North Humboldt Bay Area by reviewing literature on sea level rise and interviewed staff from local, state and federal agencies, local elected officials, landowners, business owners and real estate brokers regarding their expectations about likely impacts of sea level rise and the responses that will need to be undertaken.

A Pre-Feasibility Study Examining Oyster Mariculture Expansion in Humboldt Bay

Spring 2010

Author(s): Carrie Carter-Griffin, Carson Hubauer, Andrew Minks, and Elissa Robinson

Purpose: Undergraduate Senior Planning Practicum

https://digitalcommons.humboldt.edu/hsuslri_student/10/

Summary: The focus of this study was to assess the feasibility of expanding oyster mariculture in Humboldt Bay.

Pacific Gas and Electric Company

Implications of Long-Term Global Warming and Tectonic Displacements at Buhne Hill, Humboldt County, California: Report to the California Coastal Commission

July 2005

Author(s): PG&E Geosciences Department

https://digitalcommons.humboldt.edu/hsuslri_state/12/

Summary: This report was developed in response to the California Coastal Commission's request to analyze PG&E's proposed ISFSI site on Buhne Hill at Humboldt Bay for stability 'in perpetuity.' It look at scenarios up to 100,000 years in the future to model potential changes for two geologic hazards: (1) Surface faulting hazard, related to the tectonic movement of the Little Salmon fault zone, and (2) Coastal erosion hazard, related to projected sea level rise and Pacific storm variability in an environment of global warming and tectonic uplift of Buhne Hill.

State

Coastal Conservancy

Presentation: Planning for the Future of Humboldt Bay Sea Level Rise, Sediment Management, Sand Spits and Salt Marshes

2018

Author(s): Joel Gerwein (SCC)

http://asbpa.org/wpv2/wp-content/uploads/2018/11/C4.Gerwein_Joel.pdf

Summary: These presentation slides provide an overview of Humboldt Bay sediment management including sediment budget, dredging and disposal, SLR planning, and beneficial reuse case studies.

Humboldt Bay: Sea Level Rise, Hydrodynamic Modeling, and Inundation Vulnerability Mapping

April 2015

Author(s): Northern Hydrology & Engineering

Funder(s): State Coastal Conservancy, Coastal Ecosystems Institute of Northern California

http://www.coastalecosystemsinstitute.org/humboldt/wp-content/uploads/2015/04/Final_HBSLR_Modeling_InundationMapping_Report_1504061.pdf

https://digitalcommons.humboldt.edu/hsuslri_local/7/

http://humboldt-bay.org/sites/humboldt-bay2.org/files/Final_HBSLR_Modeling_InundationMapping_Report_150406.pdf

KMZ Files: [Google Earth KMZ Files](https://digitalcommons.humboldt.edu/hsuslri_geospatial/3/) https://digitalcommons.humboldt.edu/hsuslri_geospatial/3/

Shape Files: [ArcGIS Shape Files](https://digitalcommons.humboldt.edu/hsuslri_geospatial/4/) https://digitalcommons.humboldt.edu/hsuslri_geospatial/4/

Summary: The purpose of this project is to (1) conduct detailed hydrodynamic modeling in Humboldt Bay to determine average high water levels and extreme high water level

event probabilities for existing sea levels and SLR scenarios, and (2) develop inundation maps of areas surrounding the bay that are vulnerable to inundation from existing and future sea levels. The ultimate goal of this project is to provide information on how SLR may affect high water levels in Humboldt Bay, including inundation vulnerability maps in a user-friendly format. SLR inundation vulnerability files are also linked in Google Earth KMZ files and ArcGIS shape files.

Humboldt Bay Sea Level Rise Adaptation Planning Project: Phase II Report

February 2015

Author(s): Trinity Associates

Funder(s): California Coastal Conservancy, Coastal Ecosystems Institute of Northern California

<http://www.coastalecosystemsinstitute.org/humboldt/wp-content/uploads/2015/04/Humboldt-Bay-Sea-Level-Rise-Adaptation-Planning-Project-Phase-II-Report-Compressed.pdf>

https://digitalcommons.humboldt.edu/hsuslri_local/4/

Summary: This report summarizes how the Adaptation Planning Project explored various aspects of sea level rise and adaptation planning on Humboldt Bay; presents in-depth adaptation planning case studies for two at-risk critical regional assets (agricultural lands and the Highway 101 corridor); and recommendations for next steps to build on the Project's regional collaboration to develop and implement adaptation options while engaging the public and affected property owners.

More information about the APWG can be found at <http://humboltdbay.org/humboldt-bay-sea-level-rise-adaptation-planning-project>.

Conceptual Groundwater Model of Sea Level Rise in the Humboldt Bay Eureka-Arcata Coastal Plain

December 2014

Author(s): Robert Willis, Ph.D.

Funder(s): State Coastal Conservancy, Coastal Ecosystems Institute of Northern California

http://www.coastalecosystemsinstitute.org/humboldt/wp-content/uploads/2015/04/Final_HBSLR_ConceptualGroundwaterModel_1412091.pdf

https://digitalcommons.humboldt.edu/hsuslri_local/3/

Summary: This study was performed to develop a conceptual groundwater model to analyze the effects of SLR on groundwater levels and saltwater intrusion in the Eureka-Arcata coastal plain.

Humboldt Bay Sea Level Rise DEM Development Report

May 2014

Author(s): Pacific Watershed Associates

Funder(s): State Coastal Conservancy, Coastal Ecosystems Institute of Northern California

http://www.coastalecosystemsinstitute.org/humboldt/wp-content/uploads/2015/04/Final_HBSLR_ProjectDEM_Development_Report_1410291.pdf

https://digitalcommons.humboldt.edu/hsuslri_local/6/

[Humboldt Bay DEM](#) – links to Google Drive to download

Summary: This report describes a seamless topographic/bathymetric digital elevation model (DEM) of Humboldt Bay to support the hydrodynamic modeling and inundation mapping components of the Humboldt Bay Sea Level Rise Adaptation Planning project. It was developed using the 2009-2011 California Coastal Conservancy LiDAR Project Hydro-flattened Bare Earth DEM (California Coastal DEM) and various subtidal bathymetric data sets.

Humboldt Bay Shoreline Inventory, Mapping and Sea Level Rise Vulnerability Assessment Addendum: Shoreline Vulnerability Ratings

July 2013

Author(s): McBain & Trush, Trinity Associates

Funder(s): State Coastal Conservancy

<http://humboldt-bay.org/sites/humboldt-bay.org/files/documents/HB%20Shoreline-Addendum-Vulnerability%20Rating.pdf#overlay-context=humboldt-bay-sea-level-rise-adaptation-planning-project>

https://digitalcommons.humboldt.edu/hsuslri_local/25/

Summary: The Humboldt Bay shoreline vulnerability rating is a quantitative measure of vulnerability that was developed as an addendum to the Humboldt Bay Shoreline Inventory, Mapping, and Sea Level Rise Vulnerability Assessment (2013). The vulnerability rating uses combinations of shoreline attributes to rank a shoreline segment's vulnerability to erosion and/or overtopping due to extreme tides, storm surges, and future sea level rise.

Humboldt Bay Shoreline Inventory, Mapping and Sea Level Rise Vulnerability Assessment, Phase 1 Report

January 2013

Author(s): Trinity Associates, McBain and Trush, Northern Hydrology and Engineering

Funder(s): State Coastal Conservancy

<http://scc.ca.gov/webmaster/ftp/pdf/humboldt-bay-shoreline.pdf>

https://digitalcommons.humboldt.edu/hsuslri_local/12/

<http://humboldt-bay.org/sites/humboldt-bay2.org/files/Humboldt%20Bay%20Shoreline%20Inventory%2C%20Mapping%20and%20SLR%20Vulnerability%20Assessment-A.Laird%20%281%29%20-%20Compressed.pdf>

Summary: The report describes the first phase of the Humboldt Bay Sea Level Rise Adaptation Planning Project which inventoried and mapped Humboldt Bay's 102 miles of shoreline. This report describes shoreline inventory and mapping methods; describes existing shoreline conditions of structure, cover, and elevation; contains a vulnerability assessment of existing shoreline conditions under current tidal and climatic conditions as well as to rising sea levels; and summarizes the project's findings and vulnerability assessment along with recommendations on subsequent phases of the sea level rise adaptation planning for Humboldt Bay.

Technical Memo: Estimates of Mean Monthly Maximum Water Surface Elevations in Humboldt Bay, Humboldt County, CA

September 2012

Author(s): Northern Hydrology & Engineering

Funder(s): State Coastal Conservancy

https://digitalcommons.humboldt.edu/hsuslri_local/22/

Summary: This technical memorandum briefly summarizes the methods and results used by Northern Hydrology & Engineering to provide estimates of mean monthly maximum water surface elevations in Humboldt Bay to support the Humboldt Bay Shoreline Inventory and Mapping Project. All work in this memo is referenced to the North American Vertical Datum of 1988 (NAVD88).

Humboldt Bay and Eel River Estuary Benthic Habitat Project

August 2012

Author(s): Susan Schlosser (California Sea Grant), Annie Eicher (HT Harvey & Associates)

Funder(s): NOAA's Sea Grant College Program, State Coastal Conservancy

http://www.coastalecosystemsinstitute.org/humboldt/wp-content/uploads/2014/10/Humboldt_Habitats.pdf

<https://caseagrants.ucsd.edu/sites/default/files/HumboldtLR.pdf>

https://digitalcommons.humboldt.edu/hsuslri_local/24/

Summary: The Habitat Project report provides a summary of intertidal and subtidal habitat information and habitat mapping in Humboldt Bay and the Eel River Estuary, building on previous assessments, plans and profiles.

Coastal Commission

Making California's Coast Resilient to Sea Level Rise: Principles for Aligned State Action

May 2020

Author(s): California Coastal Commission

Staff Report: <https://documents.coastal.ca.gov/reports/2020/5/W6g/w6g-5-2020-report.pdf>

Exhibit: <https://documents.coastal.ca.gov/reports/2020/5/W6g/w6g-5-2020-exhibits.pdf>

Summary: These principles are meant to guide unified, effective action towards sea level rise resilience for California's coastal communities, ecosystems, and economies, and are consistent with and complementary to the Coastal Commission's ongoing work to address sea level rise. The principles fall into six main categories: Develop and utilize best available science; build coastal resilience partnerships; improve coastal resilience communications; support local leadership and address local conditions; strengthen alignment around coastal resilience; and implement and learn from coastal resilience projects.

Sea Level Rise Policy Guidance: Interpretive Guidelines for Addressing Sea Level Rise in Local Coastal Programs and Coastal Development Permits

Adopted August 2015, updated November 2018

Author(s): California Coastal Commission

Funding assistance: NOAA

Website: <https://www.coastal.ca.gov/climate/slrguidance.html>

https://digitalcommons.humboldt.edu/hsuslri_state/4/

Summary: It provides an overview of the best available science on sea level rise for California and recommended methodology for addressing sea level rise in Coastal Commission planning and regulatory actions. It is a guidance document intended to serve as a multi-purpose resource for a variety of audiences. It does not include regulations and is not specific to a particular geographic location or development intensity.

Residential Adaptation Policy Guidance: Development Interpretive Guidelines for Addressing Sea Level Rise in Local Coastal Programs

Draft July 2017, revised Draft March 2018

Author(s): California Coastal Commission

Funding assistance: NOAA

Website: <https://www.coastal.ca.gov/climate/slr/vulnerability-adaptation/residential/>
https://digitalcommons.humboldt.edu/hsuslri_state/3/

Summary: Advisory guidance that provides the Commission's direction on how local governments can address sea level rise issues in Local Coastal Programs consistent with the Coastal Act.

Ocean Protection Council

State of California Sea-Level Rise Guidance

Update 2018

Author(s): California OPC

http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180314/Item3_Exhibit-A_OPC_SLR_Guidance-rd3.pdf

https://digitalcommons.humboldt.edu/hsuslri_state/6/

Summary: This updated document provides: (1) A synthesis of the best available science on sea level rise projections and rates for California; (2) A step-by-step approach for state agencies and local governments to evaluate those projections and related hazard information in decision making; and (3) Preferred coastal adaptation approaches.

Rising Seas in California: An Update on Sea-Level Rise Science

April 2017

Author(s): California Ocean Protection Council Science Advisory Team Working Group

<http://www.opc.ca.gov/webmaster/ftp/pdf/docs/rising-seas-in-california-an-update-on-sea-level-rise-science.pdf>

https://digitalcommons.humboldt.edu/hsuslri_state/5/

Summary: The report provides a synthesis of current state of sea-level rise science, including advances in modeling and improved understanding of the processes that could drive extreme global sea-level rise. It provides the scientific foundation for the SLR Guidance document update.

Comments on the 2017 Rising Seas in California: An Update on Sea-Level Rise Science and the upcoming update to California's Sea-Level Rise Guidance document

June 2017

Author(s): Northern Hydrology & Engineering, Trinity Associates, Cascadia GeoSciences

https://digitalcommons.humboldt.edu/hsuslri_local/30/

Summary: These comments were provided by local professionals to address the shortcomings of the best available science used in the Rising Seas Report as it relates to Humboldt Bay; specifically the high rate of tectonic land level change and use of local tide gauges. It provides additional research and recommendations for analysis of SLR in Humboldt Bay.

Caltrans

Caltrans Long-Term Sea Level Rise Phased Adaptation Plan for the Eureka-Arcata Highway 101 Corridor

In process

Author: Caltrans

No link

Summary: Caltrans is in the process of implementing a major safety improvement project along the Eureka-Arcata corridor including the construction of a large separated grade intersection. The coastal development permit from the California Coastal Commission contains a condition requiring Caltrans to prepare a long-term Phased Adaptation Plan for the Eureka-Arcata corridor, including a requirement to consider the feasibility of "living shoreline" and other natural features as elements of the adaptation strategy.

Caltrans Climate Change Vulnerability Assessments, District 1

October 2019

Author(s): Caltrans, WSP

Prepared for: Caltrans

Funder(s):

Summary Report: <https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/2019-climate-change-vulnerability-assessments/d1-summary-report-a11y.pdf>

https://digitalcommons.humboldt.edu/hsuslri_state/15

Technical Report: <https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/2019-climate-change-vulnerability-assessments/d1-technical-report-a11y.pdf>

https://digitalcommons.humboldt.edu/hsuslri_state/15

Summary: The following report summarizes a vulnerability assessment conducted for that portion of the State Highway System (SHS) located in Caltrans District 1. The vulnerability study had three objectives: (1) Understand the types of weather-related and longer-term climate change events that will likely occur with greater frequency and intensity in future years, (2) Conduct a vulnerability assessment to determine

those Caltrans assets vulnerable to various climate-influenced natural hazards, and (3) Develop a method to prioritize candidate projects for actions that are responsive to climate change concerns, when financial resources become available.

Caltrans Eureka-Arcata Corridor: Sea Level Rise Vulnerabilities and Adaptation Solutions

May 2019

Author(s): Caltrans, ICF

https://digitalcommons.humboldt.edu/hsuslri_state/10/

Summary: This report analyzes the vulnerability of the proposed Caltrans projects to SLR and other coastal hazards. The analysis enables identification of a range of adaptation options for the proposed projects along the study site. It addresses multiple planning needs: projected SLR ranges; SLR hazard impacts such as storm surge, wave run up, and erosion; local coastal resources; minimization of risk; and long-term adaptation efforts.

Sea Level Rise Analysis for Eureka-Arcata Corridor, Memorandum

October 2018

Author(s): Jason Meyer (North Region Environmental Planning, Caltrans)

https://digitalcommons.humboldt.edu/hsuslri_state/9/

Summary: This memo documents the rationale for decisions Caltrans made regarding the Eureka – Arcata Route 101 Corridor Improvement Project and long-term Sea Level Rise (SLR) planning for U.S. Highway 101 (US 101) between Eureka and Arcata. This memo begins with immediate design decisions regarding heights of structures on this current safety project, and then begins discussing various considerations for long-term planning.

District 1 Climate Change Vulnerability Assessment and Pilot Studies, and Appendices

December 2014

Author(s): GHD, ESA, PWA, Trinity Associates

Prepared for: Caltrans, Humboldt County Association of Governments

Final Report: https://digitalcommons.humboldt.edu/hsuslri_state/1/

<https://humboldt.gov/DocumentCenter/View/70095/Caltrans-District-1-Climate-Change-Vulnerability-Assessment---Main-Document>

Appendix: https://digitalcommons.humboldt.edu/hsuslri_state/8/

Summary: The objective of the study was to identify and classify the potential vulnerabilities of state owned transportation assets to climate change throughout District 1, which encompasses the counties of Del Norte, Humboldt, Mendocino, and Lake in north western California; and to identify and evaluate a range of adaption options to address the identified vulnerabilities at four prototype locations.

LAO

What Threat Does Sea-Level Rise Pose to California?

August 2019

Author(s): Gabriel Petek (LAO)

<https://lao.ca.gov/Publications/Report/4261#:~:text=SLR%20by%202100,-,Rising%20Seas%20Threaten%20the%20California%20Coast%20in%20Numerous%20Ways,most%20commonly%20referenced%20SLR%20risk.>

Summary: This report is intended to help the Legislature and the public deepen their knowledge of the threats that California faces from SLR. Developing a thorough understanding of the possible impacts associated with rising seas is an essential first step for the Legislature in determining how to prioritize efforts to help mitigate potential damage and disruption.

Preparing for Rising Seas: How the State Can Help Support Local Coastal Adaptation Efforts

December 2019

Author(s): Gabriel Petek (LAO)

<https://lao.ca.gov/Publications/Report/4121>

Summary: LAO Recommendations for Supporting Local Adaptation Efforts include: Foster Regional-Scale Adaptation; Support Local Planning and Adaptation Projects; Provide Information, Assistance, and Support; Enhance Public Awareness of SLR Risks and Impacts

CDFW

<https://wildlife.ca.gov/Conservation/Climate-Science/Resources>

This website includes links to some informational resources. CDFW does not endorse any specific climate change resources.

State Lands Commission

<https://www.slc.ca.gov/ab691/>

AB 691 (Muratsuchi) Chapter 592, Statutes of 2013, involves sea-level rise impacts on granted public trust lands. Assessing the impacts of sea-level rise for public trust lands is a management priority for local trustees. Trustees with annual gross revenue from their trust lands that exceed \$250,000 are required to prepare and submit to the Commission, by July 1, 2019, an assessment of how they propose to address sea-level rise.

Additional State Resources:

<https://www.slc.ca.gov/sea-level-rise/additional-resources-for-addressing-sea-level-rise/>

Federal

USFWS

Humboldt Coastal Resilience Project

Ongoing, 2015 to 2021

Author(s): USFWS

Funder(s): California Coastal Conservancy, Ocean Protection Council and Bureau of Land Management

Website: <https://www.fws.gov/nwrs/threecolumn.aspx?id=6442461340>

Summary: The beach and dunes of Humboldt Bay National Wildlife Refuge are at the vanguard of sea level rise and other climate impacts. The foredune is an important feature that buffers the effects of extreme storms, and the entire dune system protects the estuarine systems behind it. USFWS and its partners have posed the question of what our dunes will do in response to sea level rise and extreme events, and what measures we can take to increase resiliency. To answer these questions, the refuge has engaged in a collaborative, six-year research project known as the Humboldt Coastal Resilience Project (formerly, Climate Ready Project).

Humboldt Bay National Wildlife Refuge Response to Climate Change and Sea Level Rise 2020

Website: https://www.fws.gov/refuge/Humboldt_Bay/wildlife_and_habitat/ClimateChange.html

Summary: Website briefly discusses the refuge response to climate change and SLR, wetland habitats, and dune ecosystems.

Tectonic land level changes and their contribution to sea-level rise, Humboldt Bay region 2017 Final Report

Author(s): Cascadia GeoSciences, Humboldt State University, Northern Hydrology and Engineering, Pacific Watershed Associates, New Mexico State University, University of Oregon, USFWS, Stillwater Sciences, California Sea Grant, US Forest Service

Prepared for: USFWS

Funder(s): USFWS Landscape Conservation Cooperative

http://www.hbv.cascadiageo.org/HumBayVert/reports/USFWS/20170407/final_report_HBV_usfws_2017.pdf

https://digitalcommons.humboldt.edu/hsuslri_local/23/

Summary: This report characterizes the interseismic tectonic land-level change associated with the southern Cascadia subduction zone in order to quantify and predict future sea-level trends in northern California.

Humboldt Bay National Wildlife Refuge Sea Level Rise Modeling

2013

Author(s): UC Davis, USFWS, USGS, NOAA

Funder(s): USGS, USFWS

<https://www.sciencebase.gov/catalog/item/5293c685e4b0003223e07cd9>

Summary: This project applied sea-level rise (SLR) modeling approaches along the Pacific coast tidal gradient at a parcel scale through improved data collection tools and collaboration relevant to land managers. At selected salt marsh parcels in both the North Pacific and California LCCs, data collection techniques were employed to assess detailed baseline habitat elevations; tidal ranges, microclimate, and extreme weather events; sediment supply sources; vegetation community composition; and vertebrate population indices. The design provides resource managers with information on the value of different datasets and methods including their uncertainty, as well as determines their usefulness in climate change adaptation planning in tidal marsh habitats.

Humboldt Bay Region Sea Level Rise Data Synthesis Humboldt County, California

May 2012

Author(s): Pacific Watershed Associates

Funder(s): Sea Grant, USFWS

<http://www.coastalecosystemsinstitute.org/humboldt/wp-content/uploads/2014/10/HumboldtBaySynthesisReport.pdf>

Report: https://digitalcommons.humboldt.edu/hsuslri_local/27/

Appendix/Spreadsheet: https://digitalcommons.humboldt.edu/hsuslri_local/26/

Summary: This data synthesis report identifies and characterizes existing geospatial information and modeling tools relevant to sea level rise planning and adaptation for the Humboldt Bay region as well as identifies potential data gaps. A total of 294 individual sources of geospatial information were identified and evaluated.

Humboldt Bay Water Control Structure Inventory, Assessment, and Mapping, Final Report

October 2007

Author(s): U.S. Fish and Wildlife Service

Funder(s): Humboldt Bay Harbor, Recreation, and Conservation District, California Department of Fish and Game, U.S. Fish and Wildlife Service

https://digitalcommons.humboldt.edu/hsuslri_state/11/

<https://www.fws.gov/arcata/restoration/projects/waterControlStructure/FACT%20SHEET%20AFWO%20Water%20Control%20Structure%20Inventory%20Final.pdf>

Summary: Recent planning efforts completed for Humboldt Bay acknowledged the need to locate and assess tide gates and water control structures and also to know more about them for planning purposes. The objective of this project was to develop a GIS database containing spatial data for all tide gates, culverts, and other water control structures surrounding Humboldt Bay. The database was to be designed for ease of updating as new structures were installed, removed, or modified and also was designed to be shared with anyone who wished to use it.

USGS

Ecosystem and community vulnerability to surface and subsurface flooding and salinity dynamics with sea level rise and adaptation strategies

Ongoing, 2019-2022

Author(s): USGS, University of Wyoming, Greenway Partners

Prepared for: USGS

No link – in process

Summary: The purpose of the proposed study is to identify and constrain the role of NNBF and gray engineering approaches in controlling local and bay-scale hydrodynamics, groundwater dynamics, and long-term coastal ecosystem sustainability for present-day and future sea level conditions. A coupled modeling framework that incorporates coastal hydrodynamics, density dependent groundwater flow, and wetland accretion processes will be used to compare the effectiveness of NNBF and gray infrastructure strategies in reducing SLR-driven flood hazards. The modeling approach will be tested in two very different coastal settings – Santa Monica Bay and Humboldt Bay in California – to demonstrate the wide applicability of the proposed framework.

Amplified impacts of climate change on fine-sediment delivery from fluvial sources and implications for building ecosystem-based resiliency to sea-level rise, Humboldt Bay, California

2020

Author(s): Curtis, J.A., Flint, L.E., Stern, M.A., Lewis, J., and Klein, R.D.

No link - (in review)

Summary: N/A

Early results – salt marsh response to changing fine sediment supply conditions, Humboldt Bay, CA

2019

Author(s): Jennifer Curtis (USGS), Chase Freeman (USGS), Karen Thorne (USGS)

Prepared for: USGS

Funder(s): USGS

https://www.sedhyd.org/2019/openconf/modules/request.php?module=oc_proceedings&action=view.php&id=80&file=1/80.pdf&a=Accept

https://digitalcommons.humboldt.edu/hsuslri_state/17

Summary: This study uses direct measurements of vertical accretion, marsh elevation change, and suspended-sediment concentrations (SSC) to investigate salt marsh response to changing fine-sediment.

Effects of climate change on tidal marshes along a latitudinal gradient in California

2016

Author(s): Karen Thorne (1), Glen MacDonald (2), Rich Ambrose (2), Kevin Buffington (1), Chase Freeman (1), Christopher Janousek (1), Lauren Brown (2), James Holmquist (2), Glenn

Guntenspergen (1), Katherine Powelson (1), Patrick Barnard (1), and John Takekawa (1)
[Authors from: (1) USGS, (2) UCLA; Prepared in cooperation with the Southwest Climate Science Center]

U.S. Geological Survey Open-File Report 2016-1125, 75 p.,

<http://dx.doi.org/10.3133/ofr20161125>

https://digitalcommons.humboldt.edu/hsuslri_state/18

Summary: This report contains compiled physical and biological data, including coastal topography, tidal inundation, plant composition, and sediment accretion to project how SLR may alter these ecosystems in the future. The goal of our research was to provide results that support coastal management and conservation efforts across California.

Assessing coastal manager science needs and disseminating science results for planning

January 2016

Author(s): Karen Thorne (1), Katherine Powelson (2), Vivan Bui (1), Chase Freeman (1), John Takekawa (1), Christopher Janousek (3), Kevin Buffington (3), and Deborah Elliott-Fisk (2)

[Authors from: (1) USGS, (2) UC Davis, (3) Oregon State University]

Prepared for: California and North Pacific Landscape Conservation Cooperatives

<https://www.sciencebase.gov/catalog/item/597f8f16e4b0a38ca2774c51>

https://digitalcommons.humboldt.edu/hsuslri_state/19

Summary: To facilitate communication and outreach of sea-level tidal marsh modeling results, we convened managers, biologists, Tribes, and other important decision makers and partners and hosted in-person workshops with stakeholders in six Pacific coast estuaries. Our objectives were: (1) disseminate site-specific baseline data and modeling results, reveal coast-wide trends, and identify data gaps; (2) identify how local climate science results may be incorporated into habitat conservation, planning, and adaptation strategies; and (3) develop an understanding of coastal climate change science needs to inform the California and North Pacific Landscape Conservation Cooperatives.

Assessing marsh response from sea-level rise applying local site conditions: Humboldt Bay Wetlands

February 2016

Author(s): John Takekawa (USGS), Karen Thorne (USGS), Kevin Buffington (USGS), Chase Freeman (USGS), Katherine Powelson (USGS), Giselle Block (USFWS)

Prepared for: Humboldt Bay National Wildlife Refuge, USGS Western Ecological Research Center

Funder(s): USGS

<https://www.sciencebase.gov/catalog/item/54b017cee4b061c233108661>

https://digitalcommons.humboldt.edu/hsuslri_state/20

Summary: The broad goal of our research was to use site-specific data to develop local and regionally applicable models that inform management of tidal wetlands within Humboldt Bay. Our overarching question was: how vulnerable are Humboldt Bay tidal marshes to different rates of SLR. This question was addressed with three broad objectives: (1) Assess past patterns in sedimentation to inform current SLR

projections. This was accomplished by radioisotope dating of stratigraphic cores. (2) Measure baseline conditions in the tidal marshes. We characterized physical and biological properties at all study sites including topography, accretion rates, emergent vegetation, water level, salinity, and water temperature. These results are summarized in the main document, (3) Model tidal marsh elevation and habitat change under three SLR scenarios. We evaluated the degree of marsh habitat change under low, mid, and high SLR scenarios with the WARMER model (Swanson et al., 2014) for all study sites.

Assessing marsh response from sea-level rise applying local site conditions: Humboldt Bay National Wildlife Refuge

2013

Author(s): John Takekawa (USGS), Karen Thorne (USGS)

Prepared for: USFWS, R8 Inventory and Monitoring Program and North Pacific Landscape Conservation Cooperative

<https://www.sciencebase.gov/catalog/item/54b017cee4b061c233108661>

https://digitalcommons.humboldt.edu/hsuslri_state/21

Summary: This study focuses on seven marsh sites distributed throughout Humboldt Bay and largely within refuge boundaries; Hookton Slough Island, Salmon Creek marsh, White Slough marsh, Eureka Slough marsh, Jacoby Creek marsh, Mad River Slough marsh, and Manila marsh. These marshes provide important habitat for marsh-dependent species. This research effort to assess Humboldt Bay NWR response to SLR is conducted in two phases. The first phase is the collection of baseline data and elevation modeling presented in this report.

FEMA

Flood Insurance Study for Humboldt County and Incorporated Areas

October 2015

Author(s): FEMA

<https://humboldt.gov/DocumentCenter/View/56684/Draft-Flood-Insurance-Study?bidId=>

Summary: This countywide Flood Insurance Study (FIS) investigates the existence and severity of flood hazards in, or revises and updates previous FISs/Flood Insurance Rate Maps (FIRMs) for the geographic area of Humboldt County, California, including: the Cities of Arcata, Blue Lake, Eureka, Ferndale, Fortuna, and Rio Dell, and the unincorporated areas of Humboldt County (hereinafter referred to collectively as Humboldt County).

FEMA Region IX California Coastal Analysis and Mapping Project / Open Pacific Coast Study Intermediate Data Submittal #3: Nearshore Hydraulics Humboldt County, California

September 2014

Author(s): BakerAECOM

Prepared for: FEMA

<https://humboldt.gov/DocumentCenter/View/70093/FEMA-Open-Pacific-Coast-Study---Nearshore-Hydraulics>

https://digitalcommons.humboldt.edu/hsuslri_state/14

Summary: FEMA performed a detailed coastal engineering analysis and mapping for the Pacific coast of California, including Humboldt Bay. Tidal stillwater levels, wind waves, and wave runup were analyzed to generate predictions for total water levels along the shoreline for current conditions (not reflecting sea level rise projections). Total water levels within the project area range from 11 to 14 feet NAVD 88. The analysis of wind waves in this study was relatively simplified but provided the first bay-wide estimate of total water levels.

Working Draft

Spatial Data

Data Access Viewer (includes 2009, 2019 Humboldt County LIDAR)

Last updated 8/19/2020

NOAA

<https://coast.noaa.gov/dataviewer/#/>

Summary: NOAA hosts this interactive viewer that contains elevation, imagery, and land cover data for the coastal U.S. and territories. Data can be viewed on the Viewer or downloaded for free.

Topobathymetric Model of Northern California, 1986 to 2019

August 2020

Author(s): Dean Tyler, Jeffrey Danielson, Ryan Hockenberry, Sean Beverly

<https://www.sciencebase.gov/catalog/item/5ebc4ba682ce25b51365d660>

Summary: The USGS Coastal National Elevation Database (CoNED) integrated 1-meter topobathymetric digital elevation model (TBDEM) for the Northern California Coast. This model was created to support the modeling of storm-induced flooding.

Humboldt Bay: Sea Level Rise, Hydrodynamic Modeling, and Inundation Vulnerability Mapping

April 2015

Author(s): Northern Hydrology & Engineering

Funder(s): State Coastal Conservancy, Coastal Ecosystems Institute of Northern California

[http://www.coastalecosystemsinstitute.org/humboldt/wp-](http://www.coastalecosystemsinstitute.org/humboldt/wp-content/uploads/2015/04/Final_HBSLR_Modeling_InundationMapping_Report_1504061.pdf)

[content/uploads/2015/04/Final_HBSLR_Modeling_InundationMapping_Report_1504061.pdf](http://www.coastalecosystemsinstitute.org/humboldt/wp-content/uploads/2015/04/Final_HBSLR_Modeling_InundationMapping_Report_1504061.pdf)

https://digitalcommons.humboldt.edu/hsuslri_local/7/

http://humboldt-bay.org/sites/humboldt-bay2.org/files/Final_HBSLR_Modeling_InundationMapping_Report_150406.pdf

KMZ Files: [Google Earth KMZ Files](#) https://digitalcommons.humboldt.edu/hsuslri_geospatial/3/

Shape Files: [ArcGIS Shape Files](#) https://digitalcommons.humboldt.edu/hsuslri_geospatial/4/

Summary: The purpose of this project is to (1) conduct detailed hydrodynamic modeling in Humboldt Bay to determine average high water levels and extreme high water level event probabilities for existing sea levels and SLR scenarios, and (2) develop inundation maps of areas surrounding the bay that are vulnerable to inundation from existing and future sea levels. The ultimate goal of this project is to provide information on how SLR may affect high water levels in Humboldt Bay, including inundation vulnerability maps in a user-friendly format. SLR inundation vulnerability files are also linked in Google Earth KMZ files and ArcGIS shape files.

Humboldt Bay Sea Level Rise DEM Development Report

May 2014

Author(s): Pacific Watershed Associates

[http://www.coastalecosystemsinstitute.org/humboldt/wp-](http://www.coastalecosystemsinstitute.org/humboldt/wp-content/uploads/2015/04/Final_HBSLR_ProjectDEM_Development_Report_1410291.pdf)

[content/uploads/2015/04/Final_HBSLR_ProjectDEM_Development_Report_1410291.pdf](http://www.coastalecosystemsinstitute.org/humboldt/wp-content/uploads/2015/04/Final_HBSLR_ProjectDEM_Development_Report_1410291.pdf)

https://digitalcommons.humboldt.edu/hsuslri_local/6/

[Humboldt Bay DEM](#) – links to Google Drive to download

Summary: This report describes a seamless topographic/bathymetric digital elevation model (DEM) of Humboldt Bay to support the hydrodynamic modeling and inundation mapping components of the Humboldt Bay Sea Level Rise Adaptation Planning project. It was developed using the 2009-2011 California Coastal Conservancy LiDAR Project Hydro-flattened Bare Earth DEM (California Coastal DEM) and various subtidal bathymetric data sets.

Humboldt Bay and Eel River Estuary Benthic Habitat Project

August 2012

Author(s): Susan Schlosser (California Sea Grant), Annie Eicher (HT Harvey & Associates)

http://www.coastalecosystemsinstitute.org/humboldt/wp-content/uploads/2014/10/Humboldt_Habitats.pdf

<https://caseagrants.ucsd.edu/sites/default/files/HumboldtLR.pdf>

https://digitalcommons.humboldt.edu/hsuslri_local/24/

Summary: The Habitat Project report provides a summary of intertidal and subtidal habitat information and habitat mapping in Humboldt Bay and the Eel River Estuary, building on previous assessments, plans and profiles.

Humboldt Bay Water Control Structure Inventory, Assessment, and Mapping, Final Report

October 2007

Author(s): U.S. Fish and Wildlife Service

Link to shapefiles in PDF:

<https://www.fws.gov/arcata/restoration/projects/waterControlStructure/FACT%20SHEET%20AF%20Water%20Control%20Structure%20Inventory%20Final.pdf>

Summary: Recent planning efforts completed for Humboldt Bay acknowledged the need to locate and assess tide gates and water control structures and also to know more about them for planning purposes. The objective of this project was to develop a GIS database containing spatial data for all tide gates, culverts, and other water control structures surrounding Humboldt Bay. The database was to be designed for ease of updating as new structures were installed, removed, or modified and also was designed to be shared with anyone who wished to use it.

Humboldt County Web GIS

(ongoing)

<https://webgis.co.humboldt.ca.us/HCEGIS2.0/>

Link to some data sets: <https://humboldt.gov/276/GIS-Data-Download>

Summary: Interactive website with County information including (but not limited to): critical facilities, jurisdictional boundaries, parcels, hazard maps, natural resources.

City of Eureka Community Development Web Application

(ongoing)

<https://arcgis-svr.ci.eureka.ca.gov/portal/apps/webappviewer/index.html?id=49037ddcf4474c6ba4bdb661ee203604>

Summary: Interactive website with City information including (but not limited to): critical facilities, jurisdictional boundaries, parcels, hazard maps, natural resources.

City of Arcata Parcel Finder

(ongoing)

https://gis01.cityofarcata.org/web/COA_Parcel_finder/

Summary: Interactive website with City information including (but not limited to): critical facilities, jurisdictional boundaries, parcels, hazard maps, natural resources.

Working Draft

Interactive Sea Level Rise Viewer Maps

Sea the Future

Produced by: State Coastal Conservancy

<https://www.seathefuture.org/#/>

This interactive tool provides information on the features and functionality of multiple SLR and flood visualization tools.

CalFloD-3D Model

Produced by: Cal-Adapt

<https://cal-adapt.org/tools/slr-calflod-3d/>

Sea-Level Rise Viewer

Produced by: California State Lands Commission

<https://cslc.maps.arcgis.com/apps/webappviewer/index.html?id=9d545ba8f5b446aaa32596b97d0e7ee6>

Coastal Resilience Evaluation and Siting Tool (CREST)

Produced by: National Fish and Wildlife Foundation (NFWF)

<https://resilientcoasts.org/#Home>

Digital Coast

Produced by: NOAA

<https://coast.noaa.gov/digitalcoast/>

SLR Viewer: <https://coast.noaa.gov/slr/>

Coastal Flood Exposure Mapper: <https://coast.noaa.gov/floodexposure/#-10575352,4439107,5z>

Our Coast Our Future

Produced by: Point Blue

<http://data.pointblue.org/apps/ocof/cms/>

Surging Seas Risk Finder

Produced by: Climate Central

https://ss2.climatecentral.org/#11/40.7270/-74.0921?show=satellite&projections=0-K14_RCP85-SLR&level=5&unit=feet&pois=hide

Coastal Storm Modeling System (CoSMoS)

Produced by: USGS

https://www.usgs.gov/centers/pcmssc/science/coastal-storm-modeling-system-cosmos?qt-science_center_objects=0#qt-science_center_objects

Hazard Exposure Reporting and Analysis (HERA)

Produced by: USGS

<https://www.usgs.gov/apps/hera/>

Coastal Resiliency Mapping Portal

Produced by: The Nature Conservancy

<https://maps.coastalresilience.org/california/>

Main geographic scope includes Monterey, Santa Barbara, and Ventura, with limited statewide information.