

Executive Summary

East Contra Costa Adapting to Rising Tides Project

Contra Costa County is one of the nine Bay Area counties and is the ninth most populous county in the state—home to over one million residents. In the coming years Contra Costa faces a number of opportunities, as well as numerous challenges. Many regionally important assets and services are located in the East Contra Costa County, such as passenger and cargo rail lines, communities with affordable housing, industry, agriculture, employment centers, wetlands, creeks, popular parks, boating and recreation hubs, and miles of Bay Trail. The East Contra Costa (ECC) Adapting to Rising Tides Project Area (see Figure 0-1) includes the shoreline cities of Pittsburg, Antioch, Oakley, and the inland adjacent city of Brentwood. Also included in the Project Area are the unincorporated communities of Bethel Island, Discovery Bay, Knightsen, and Byron. Many of the challenges faced in the County are familiar to communities around the Bay Area, such as the need for affordable housing, increased traffic congestion, issues of equity, a need for diverse and well-paying employment, safe and healthy neighborhoods, and current seismic and flood risks. In addition, the County is learning how to view these current challenges in light of the future risks associated with climate change, such as increased flood risk, higher heat, changes in ecological systems and possible changes to drought patterns.

In 2014, local interest in understanding and addressing these challenges led the ART Program to initiate a project to conduct a sea level rise vulnerability assessment and adaptation project along the west and central Contra Costa County shoreline extending from Richmond to Bay Point. The West Contra Costa County ART project concluded in 2016. The ECC Project was initiated in late 2017, funded by the Delta Stewardship Council, and in partnership with Contra Costa County, in order to complete the sea level rise study for the entire County. ART ECC continues from Pittsburg all the way to the eastern edge of the County and south to Clifton Court Forebay. This project builds off previous ART work and completes the vulnerability assessment of the entire County.

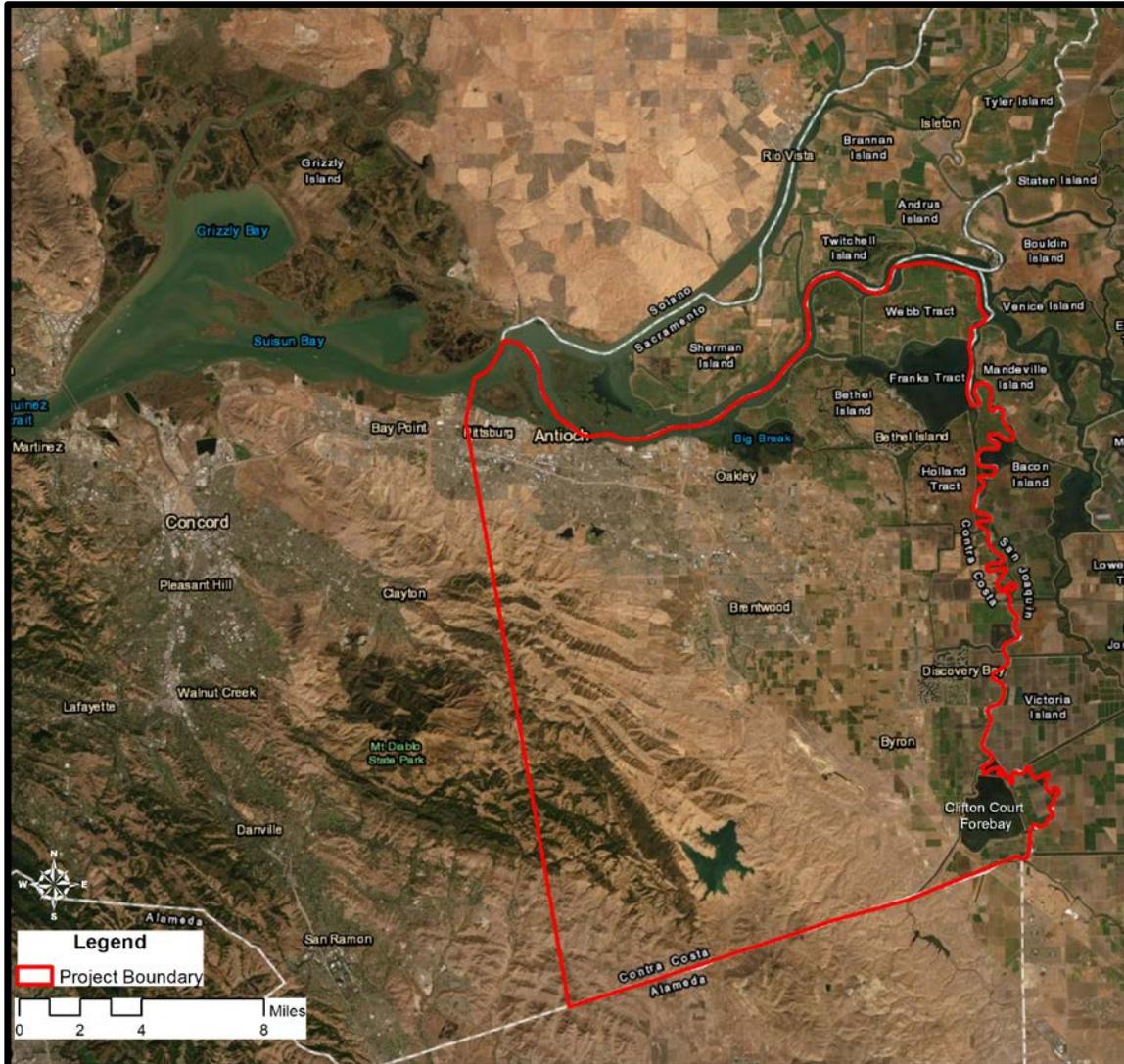


Figure 0-1. East Contra Costa County Project Area is outlined in red.

While many vulnerability and adaptation issues are similar between West Contra Costa and East Contra Costa, the ECC Project Area differs from that of the West Contra Costa ART Project in that it contains significant subsided land ranging from 0 to -15 feet below sea level, has much of its coastline protected by levees, has Delta islands, and is a more rural agricultural landscape. The ECC Project Area includes part of the Delta, which introduces new flooding dynamics and vulnerabilities. This includes risks such as saline intrusion from tidal influences, subsided lands that are more susceptible to flooding, especially with electricity outages due to pump failures, and levee failure on Delta islands.

The Contra Costa shoreline, with its varying local shoreline topographies (wetlands, industries, creeks, etc.), different types of land uses, diverse communities, and the presence of extensive rail and energy infrastructure, offered an excellent opportunity to better understand the varied vulnerabilities and consequences of current and future flooding. This project, along with others around the region, will increase local and regional capacity address the myriad challenges posed by sea level rise.

Over the past two years, BCDC has worked with key stakeholders such as the Delta Stewardship Council, Contra Costa County agencies, cities within the Project Area, Contra Costa Resource Conservation District, representatives from elected officials' offices, regional and state agencies, nonprofits, and private organizations. The project has produced many work products and partnerships and has increased the knowledge and information needed for long term flood resilience in Contra Costa County. Some of the key outcomes of the work include:

- A diverse and capable working group
- Broad resilience goals
- Locally refined sea level rise maps and shoreline analyses
- An online flood explorer
- A robust vulnerability assessment of the Project Area's assets
- Vulnerabilities and consequences of how flooding may impact the Project Area's assets
- Detailed adaptation responses
- A clear case for taking action
- A path forward toward resilience

Included in This Report

This report is a summary of the products and outcomes from the project team and working group. It is intended to serve as a resource for advancing resilience action in East Contra Costa County, the region and providing information that can be used by other communities around the region. The chapters provide an introduction to the ART Program and a summary of the planning process for this project. The report and its appendices include detailed vulnerability assessments of 34 asset categories from 14 different sectors; key planning issues that summarize the major issues; adaptation responses developed for asset categories and key planning issues; a summary of the mechanisms for evaluating specific adaptation responses; and guidance on next steps to progress adaptation planning in Contra Costa County.

Sectors and Assets Analyzed

The East Contra Costa ART project analyzes 14 sectors and 34 asset categories for vulnerabilities to temporary and permanent inundation. Table 0-1 provides a summary of the sectors and assets considered and subsequent chapters provide detailed information about the vulnerabilities they face, the consequences that could occur if they are impacted, and possible adaptation actions that could be taken to reduce those risks.

Table 0-1. Sectors and assets analyzed in the ART ECC Project Area.

Sector	Asset
Agriculture	<ul style="list-style-type: none"> • Agriculture
Business and Industry	<ul style="list-style-type: none"> • Industrial Land Use Categories • Commercial Land Use Categories • Hazardous Materials Sites
Community Engagement	<ul style="list-style-type: none"> • Community Engagement
Critical Facilities and Services	<ul style="list-style-type: none"> • Emergency Response Facilities • Public Healthcare Facilities • Faith-Based Organizations • Solid Waste Disposal Sites • Schools
Delta Islands	<ul style="list-style-type: none"> • Delta Islands and Reclamation Districts
Energy	<ul style="list-style-type: none"> • Pipelines • Power Distribution • Power Generation • Oil and Gas Production Fields
Natural Areas & Outdoor Recreation	<ul style="list-style-type: none"> • Shoreline Parks • Water Trail • Marinas • Fishing Piers • Natural Areas
People	<ul style="list-style-type: none"> • Communities • Social Vulnerability • In-Delta Legacy Communities
Transportation	<ul style="list-style-type: none"> • Rail • Roadways • Ports
Water	<ul style="list-style-type: none"> • Water Treatment Facilities • Water Conveyance • Pumps, Diversions and Intakes • Mutual Water Companies • Water Rights
Wastewater	<ul style="list-style-type: none"> • Wastewater
Flood and Stormwater	<ul style="list-style-type: none"> • Creeks • Stormwater

The Working Group

During the first step of the ART Planning Process, Scope and Organize, ART staff worked with local representatives to identify and invite a diverse group of stakeholders to participate in the project's Working Group. A primary goal for the Working Group was to bring in members that had strong knowledge and expertise of the communities, services and assets in the Project Area; however, anyone who wanted to participate was welcome. Members of the Working Group included representatives from eight County Departments, four shoreline cities, six special districts, regional transportation and planning agencies, state and federal agencies, as well as private utilities, community-based organizations, and private organizations. The group met five times over the course of the project and helped, create Resilience Goals, review deliverables, refine adaptation responses, and discuss next steps for the project.

Resilience Goals

Project Resilience Goals were developed to help define the desired outcomes of the project and provide a foundation upon which future project decisions could be made. Resilience Goals were developed and refined by the Working Group around four key areas: Governance, Society and Equity, Economy and Environment.

Climate Scenarios and Impacts

The ECC ART Project evaluated both current and future flooding that could either be temporary or permanent in nature. As sea level rises, higher water levels will become more frequent, increasing the extent, depth, and duration of temporary flooding and expanding the area that is permanently inundated. These impacts will not be confined to the Bay-Delta shoreline as sea level rise will also affect tidal creeks and the Delta. As the Bay rises, water levels in tidal creeks and in the Delta will also rise, pushing the extent of tidal influence further upstream, potentially making riverine flooding that already occurs worse.

Climate Scenarios

Future coastal flooding was evaluated for a range of possible futures that modeled both temporary and permanent flooding for ten climate scenarios summarized in Table 0-2.

Table 0-1 ART ECC's ten climate scenarios that were modeled for permanent and temporary flood inundation.

Permanent Flooding Scenarios	Permanent + Temporary Flooding Scenarios
MHHW*	MHHW* + 100-year storm
12"	12" + 100-year storm
24"	24" + 100-year storm
36"	36" + 100-year storm
83"	83" + 100-year storm

*MHHW= Mean Higher High Water. This is the average water height of the highest tides. All other sea level rise scenarios are added to MHHW. For example, 12" of sea level rise is 12" + MHHW.

Flood Modelling and Mapping

The Delta shoreline will be impacted by sea level rise differently than the Bay. The Delta is influenced by both daily tides coming through the Golden Gate and freshwater flowing into the Delta from the Sacramento and San Joaquin Rivers. The ART Program worked with the consultants AECOM and AnchorQEA to model impacts from freshwater inflows and ocean tides. Additional model inputs include historical inflows from rivers, wind, evaporation, and precipitation.

The maps of the model outputs are available to view through an online flood viewer, located at www.eccexplorer.adaptingtorisingtides.org as well as in the Appendix. The ART flood mapping includes inundation locations, depth of flooding, low-lying areas (areas below the modeled water level) and overtopping locations (the lowest location where water breaches the shoreline). These maps were developed through discussions with stakeholders, who reviewed the preliminary maps and provided on-the-ground verification and supplemental data to improve their accuracy.

Climate Impacts

Current and future flooding can have a number of impacts on communities, infrastructure and natural areas. The ECC ART Project considered the following impacts that could occur from either temporary or permanent coastal flooding, riverine or localized nuisance flooding:

- Areas that currently flood may flood more frequently
- More extensive, longer-duration flooding in areas that currently flood and flooding of new areas
- Permanent inundation of areas currently not exposed to regular tides
- Shoreline erosion
- Elevated groundwater and increased salinity intrusion

Key Planning Issues and Adaptation Responses

Seven key planning issues were identified, which encompass many of the vulnerabilities and consequences that may have the greatest impact on the sustainability and resilience of East Contra Costa County. The first five key planning issues were adapted from the West Contra Costa ART Project, while the last two are unique to the ECC Project Area. Below are the key planning issues and a top adaptation responses developed to address them. These adaptation responses were voted on by the working group and include the top voted priority adaptation response and the top voted low-hanging fruit (or easier to implement) adaptation response. The full suite of adaptation responses can be found in the Appendix.

SHORELINE INDUSTRIES

Key Planning Issue: The County’s working shoreline is at risk from current and future flooding and is a major source of current and future employment sites (i.e. Northern Waterfront Economic Development Initiative). Marinas, harbors, boat rentals, and bait and tackle shops are major sources of jobs, recreation and tourism for the region (Bethel Island alone would lose 400-700 jobs). The industrial and manufacturing sites on the shoreline (mostly concentrated in Pittsburg and Antioch) rely on utility networks (e.g. water, wastewater, power, and drainage) that are vulnerable to sea level rise, storm events and power outages. Flooding of these industrial sites could also mobilize hazardous materials, impacting the health of the environment, communities, and our water supply. Workers from within and outside of the County commute to employment sites by ferry, bridge, rail, road and bus, which if impacted could prevent employees’ ability to get to work. Flooding of critical roads, rail lines, or pipelines both within the County and beyond could disrupt critical supply chains that employment sites rely on, resulting in lost employee wages, reduced output and profit, and impacts to the regional economy through loss of critical oil-based and manufacturing exports.

Top Priority Adaptation Response	Top Low-Hanging Fruit Adaptation Response
Form or expand existing private-public partnerships to develop a regional plan to protect or relocate the nexus of pipelines, marine terminals, roads and rail lines that water-dependent industries rely on for continued operations.	Consider future sea level rise and storm flooding in future iterations to the Northern Waterfront Economic Development Initiative and consider changes in General Plans/zoning that balance incentivizing economic growth with shoreline flood protection.

VULNERABLE COMMUNITIES

Key Planning Issue: Shoreline communities in the Project Area located in or near the floodplain of the Delta or a tidal creek (i.e. Marsh Creek) have low-income communities (e.g. Pittsburg, Antioch, Brentwood, Byron, and the Delta Islands) that are likely to experience flooding from extreme storms, sea levels rise, or a combination of both. Residents of creek- or Delta-side communities have limited control over the maintenance and management of the waterways they live along. Those that are low-income, linguistically or socially isolated, without access to a car, elderly, very young, disabled, homeless, undocumented, or mobility-challenged may be less able to prepare for, respond to, and/or recover from flood events. Vulnerable community members with these specific characteristics can face difficulties evacuating and finding resources and temporary shelter during a flood event due to mobility, transportation, or language issues. Further, unless resources are in place to assist in rebuilding, many of these community members may face permanent displacement or homelessness after damaging flood events.

Top Priority Adaptation Response	Top Low-Hanging Fruit Adaptation Response
Develop a program to simply and directly fund low-income homeowners and owners of affordable rental properties to implement near term flood mitigation strategies, in coordination with seismic retrofitting strategies.	Develop an outreach program conducted in all locally spoken languages to educate communities about their current and future flood risks and the actions they can take to reduce risks.

ACCESS TO SERVICES

Key Planning Issue: A lack of redundant transportation options (i.e. Antioch Bridge, Bethel Island Bridge, Jersey Island Bridge, ferries) and the limited number of public facilities in this part of the County may result in shoreline communities becoming isolated from emergency services, public and private healthcare providers, jobs, schools, grocery stores, and other critical services during flood events. The food grown in ECC may be unable to reach the rest of the County, affecting food supply. Loss of transportation, power, water, and wastewater could have significant consequences on public health and safety, local economies, and community function, and will be a particular challenge for vulnerable communities. Highway 4 and State Route 160 are the only major transportation arteries in the region and may become grid-locked during flood emergencies. The following may be at risk of flooding: 1 fire station, 2 police stations, some retail, 1 school and possibly many other services (such as dentists offices, post offices, etc.) that were not included in the analyzed data set.

Top Priority Adaptation Response	Top Low-Hanging Fruit Adaptation Response
Develop a program to simply and directly fund low-income homeowners and owners of affordable rental properties to implement near term flood mitigation strategies, in coordination with seismic retrofitting strategies.	Build or strengthen relationships between public agencies, private entities, nonprofit, community, and faith-based organizations, and neighborhood groups to increase flood resilience.

AD-HOC FLOOD PROTECTION

Key Planning Issue: Some communities are protected from coastal flooding by rail lines, shoreline parks, and tidal wetlands. Rail lines are typically built on earthen mounds, which can act as a flood barrier. Shoreline parks typically go from sea level and rise in elevation, acting as the first line of defense. Tidal wetlands can help reduce wave height and coastal erosion. While these built and natural areas reduce the flood risks of adjacent communities, assets, and infrastructure, they have not been specifically designed or maintained for this function and, therefore, provide only ad-hoc flood protection. Increased wind, wave, and tidal energy, higher extreme high tides, and more frequent exposure to the tides as sea levels rise can decrease the ability of these ad-hoc systems to maintain the flood protection benefits they currently provide. In areas of ad-hoc flood protection, flood insurance policy rates may be low, so although people think they are protected it can create a false sense of security, resulting in a costly recovery.

Top Priority Adaptation Response	Top Low-Hanging Fruit Adaptation Response
Initiate tidal wetland restorations that will protect and enhance the broad benefits they provide, including flood risk reduction, habitat, biodiversity, and water quality.	Advocate for the federal government to require that railroad owners partner with local communities in determining how to protect or relocate rail lines to address sea level rise.

PARKS AND OPEN SPACE

Key Planning Issue: Shoreline parks and open spaces are not only the first line of defense against inland flooding, they are also themselves vulnerable to the early impacts of sea level rise and, therefore, are key early adaptation opportunity sites. However, some areas of the shoreline (e.g. Oakley) have a more concentrated area of shoreline parks that provide these benefits. Damage or loss of these uniquely valuable parks and open spaces would have significant impacts on wildlife habitat, recreational uses, and the health of communities in the project area. Reduction in access to parks, open spaces, bike trails, fishing piers and boat launches would affect some individuals and communities more adversely than others (e.g. homeless and/or low-income populations), depending on their unique needs and capacity.

Top Priority Adaptation Response	Top Low-Hanging Fruit Adaptation Response
Establish a new authority, or expand an existing authority, to plan, fund, manage and maintain shoreline solutions to protect existing parks, open space, and the Bay Trail.	Educate the public about the early risk to parks from sea level rise, the multiple benefits parks provide (flood protection, wildlife, educational and recreational values), and the opportunities for adaptation to protect these functions.

LEVEES, RECLAMATION, AND SUBSIDENCE

Key Planning Issue: Agricultural practices and land reclamation in the Delta have caused significant land subsidence, causing both communities and agricultural fields to rely on levees and pumps to stay dry. Current pumping practices to keep land dry continue to exacerbate subsidence. Reclamation Districts and the Bethel Island Municipal Improvement District are responsible for maintaining the levees and pumps; many of these Districts do not have adequate funds to properly inspect, maintain or rehabilitate these levees. The levees are in various states of safety design standards since some levees protect communities and others protect agricultural land. Some are at a FEMA standard while others, such as agricultural levees, don't provide a level of flood protection considered sufficient for cities and towns by FEMA's National Flood Insurance Program. Additionally, no standards address the risks associated with earthquakes. These levees are funded primarily through State funds, which puts control and decision-making out of local hands.

Sea level rise and subsidence could worsen flood risks by increasing hydrostatic pressure on levees, increasing the liquefaction potential during seismic events due to rising groundwater, and by increasing reliance on (and cost of operating) pumps, which are sensitive to flooding and to power outages. Pumps do not always have redundancy through backup pumps or fuel supplies. Loss of communities, homes, businesses, and agricultural lands due to levee failure could cause catastrophic loss of life, livelihoods, and assets, with significant impacts to the State's water quality (i.e. increasing salinity) and the economy. There could be substantial economic losses for the region due to losses in tourism visitation, recreation, agriculture and gas extraction. Farmland could be ruined by salinization of soils through contact with brackish/saline water from the Delta. Finally, if flooded, contaminants from homes, businesses, gas extraction sites, and farms could be mobilized .

Top Priority Adaptation Response	Top Low-Hanging Fruit Adaptation Response
Model how sea level rise and sea level rise combined with major storms will affect levee stability and update design and engineering standards accordingly.	Develop new microgrids to create a more resilient power system less reliant on the regional grid, ensuring that pump and drainage systems do not lose function if the electricity grid is not functioning.

WORSENING WATER QUALITY

Key Planning Issue: Sea level rise is likely to cause a worsening of water quality due to contaminant mobilization and salinity increases from the tidally influenced Bay reaching further into the Delta. Flooding will mobilize contaminants from industries, businesses, homes, roads, lawns, and farms, negatively effecting water quality. Surface water is used for drinking water intakes by many small, local communities in the Delta, as well as East Bay residents and users of the Central Valley Project and State Water Project (millions of users in total). Groundwater could also experience increasing salinity close to the shore, possibly affecting water supplies from wells. There are many private wells in the Project Area. Additionally, increasingly saline water could cause corrosion of infrastructure that were not originally protected against saltwater, such as landfills, septic tanks, wells, pumps, pipes, and water treatment facilities. Finally, habitats can also be affected by contamination and as salinity changes.

Top Priority Adaptation Response	Top Low-Hanging Fruit Adaptation Response
Develop and implement a county-wide program to monitor salinity conditions, including the progress of saltwater up into creeks and salinity conditions in the groundwater near vulnerable infrastructure, wells, or surface water.	Educate and provide resources for well users to ensure that they are aware of potential impacts to their wells from flooding or saline conditions and encourage them to have emergency water supplies on hand.

Evaluation and Next Steps

Evaluation Criteria

The development of project-specific evaluation criteria plays a central role in ensuring transparent decision-making in adaptation planning. Evaluation criteria are used to prioritize various adaptation responses and help decide which ones to go forward with. To keep consistency between the two projects within the County, the ECC ART project kept the same evaluation criteria as West Contra Costa ART, which include criteria around feasibility, social benefits, economic benefits, environmental impact, governance and disaster lifestyle.

Implementation

The Working Group discussed ways that the ART process, sea level rise adaptation planning and implementation could be progressed within the County. The following outlines this discussion:

- To get adaptation responses implemented in the County it is necessary to have a core ask, a clear message, and educating elected officials about the ART findings.
- The biggest hurdle to implementing adaptation planning and strategies within the County is due to there being no overarching authority to move any of the actions forward. The Working Group could become the basis to form a JPA to move adaptation planning forward at the County and local scale.
- Continuing the Working Group and expanding it to include more decision-makers, such as additional County agency staff, would enable continued cross-agency collaboration, sharing of local best practices, and the creation of design standards for the shoreline and shoreline buildings.
- Another hurdle to implementation is the lack of funding to do adaptation planning. County and local staff are already overburdened with their existing work. The County needs dedicated staff to be able to move ahead with adaptation recommendations. Grants that could help fund staff and consultants to advance adaptation planning should be sought out.