

INFORMATION ITEM

Remaining Key Draft Findings from the Delta Adapts Vulnerability Assessment

Summary: Delta Adapts: Creating a Climate Resilient Future (Delta Adapts) is the Council’s climate change study— the first-ever climate change vulnerability assessment and adaptation strategy conducted for the Delta and Suisun Marsh. At the November 2020 Council meeting, Council staff presented selected key findings from the draft vulnerability assessment. At today’s meeting, Council staff will review remaining key findings related to changing climate stressors and hazards, people and communities, agriculture, recreation, and infrastructure.

BACKGROUND

The Delta Reform Act (DRA) specifies consideration of “the future impact of climate change and sea level rise” in restoration planning for the Sacramento-San Joaquin Delta and Suisun Marsh (Delta) (Water Code [Wat. Code] section 85066) and identifies a restoration timeline horizon of the year 2100 (Wat. Code section 85302). Executive Order B-30-15, signed by Governor Brown in April 2015, requires that State agencies incorporate climate change into planning and investment decisions and requires State agencies to prioritize natural infrastructure and actions for climate preparedness and protection of the most vulnerable populations.

Delta Adapts will help the Council assess specific climate risks and vulnerabilities in the Delta and, in coordination with a diverse group of stakeholders, develop adaptation strategies to address those vulnerabilities. The Council endorsed a set of Climate Change Resilience Goals (resilience goals) in early 2019 to provide a long view toward Delta regional values and priorities. The project team used the resilience goals to focus Delta Adapts’ methods and recommendations.

Delta Adapts consists of two phases: 1) a **vulnerability assessment** to improve understanding of regional vulnerabilities due to climate change in order to protect the vital resources the Delta provides to California and beyond with a focus on State interests and investments; followed by 2) an **adaptation strategy** detailing strategies and tools that State, regional, and local governments can use to help communities, infrastructure, and ecosystems thrive in the face of climate change.

The vulnerability assessment analyzes the vulnerability of various asset types within the Delta to several climate stressors and hazards. Climate stressors include sea level rise, precipitation and runoff patterns, and air temperature changes. Climate hazards include flooding, extreme heat, drought, and wildfire smoke.

Asset types include:

- Residents
- Agriculture
- Key community facilities and services
- Flood control infrastructure
- Parks and recreation
- Transportation
- Water supply
- Ecosystems

DELTA ADAPTS' APPROACH

Delta Adapts is a regional, planning-level study prepared to inform policy. Delta Adapts draws on the best available science and uses state guidance, including the Adaptation Planning Guide, Safeguarding California Plan: 2018 Update (California's Climate Adaptation Strategy), sea level rise planning guidance from the Ocean Protection Council, the Bay Conservation and Development Commission's Adapting to Rising Tides project, and guidance on defining vulnerable communities from the Governor's Office of Planning and Research.

DELTA ADAPTS' GOALS

The Delta Adapts study has an overarching goal of building climate resilience in the Delta and several specific goals:

- Inform future work at the Council;
- Provide local governments with a toolkit of information to incorporate into their regulatory and planning documents;
- Integrate climate change into the state's prioritization of future Delta actions and investments; and
- Serve as a framework to be built upon by the Council and others in years to come.

OUTREACH AND ENGAGEMENT

To promote information exchange between diverse Delta stakeholders, the Council established a **Stakeholder Work Group** (SWG) comprised of representatives from

local and regional government agencies, State agencies, utility companies, water districts, and environmental organizations. SWG members reflect the broad range of stakeholder interests in the Delta. The SWG met on October 2, 2019, to provide input on key assets to be considered in the analysis. The SWG met again on December 10, 2020, to provide preliminary feedback on draft vulnerability assessment results. The SWG will meet one or two additional times in 2021.

A **Technical Advisory Committee** (TAC) provides expert knowledge, peer-review, and guidance throughout the development of Delta Adapts. The TAC is comprised of experts from public agencies, academic institutions, non-profit organizations, the private sector, and individuals with particular knowledge of climate change, the Delta, and its resources. The TAC has met both as a larger group and in smaller group briefings on technical subjects. A list of the TAC members can be found on the Delta Adapts webpage, <https://deltacouncil.ca.gov/delta-plan/climate-change>.

In addition to convening the SWG and TAC, Council staff have provided briefings to various agencies and working groups, including the Department of Water Resources (DWR), California Natural Resources Agency, and the Delta Levees and Habitat Advisory Committee, among others.

Council staff have also presented on Delta Adapts at various regional events. Particular focus has been given to briefing local governments and flood control agencies on the draft flood maps in order to ground-truth the data and analysis and seek recommendations for improvements. Staff have also conducted outreach with community-based organizations (CBOs) that represent and provide services to vulnerable communities in the Delta region. Council staff have reached out to over 40 CBOs and consulted with 16 of these organizations to establish relationships and receive input toward a goal that the engagement approach is equitable and inclusive.

KEY FINDINGS

At the November 2020 Council meeting, Council staff presented key findings from the draft vulnerability assessment related to equity, flood hazards, water supply, and Delta ecosystems. The remaining key findings of the draft vulnerability assessment are presented below. These include findings regarding changing climate stressors and hazards, Delta people and places, agriculture, recreation, and infrastructure.

CHANGING CLIMATE STRESSORS AND HAZARDS

Climate change is already resulting in increased temperatures, changing precipitation patterns, and sea level rise. These changes will stress the Delta and its watershed and

pose physical hazards, including worsening floods, extreme heat, wildfires, and drought. The following key findings from the Vulnerability Assessment relate to these changing climate stressors and hazards:

Air Temperature

- Air temperatures in the Delta are projected to increase by +3.2°F to +5.8°F by mid-century and +3.6°F to +9.6°F by the end of the century, depending on future mitigation efforts and the climate's response to increased atmospheric greenhouse gas concentrations. Historically, the Delta experienced an average daily maximum temperature of 73.8°F.

Precipitation

- Climate models project that average annual precipitation may increase slightly across the Delta in the future; however, the magnitude of changes is uncertain and small relative to typical year-to-year variability.
- Climate models project less frequent but more extreme precipitation events over the Delta watershed area, increased year-to-year precipitation variability, and an increase in the number of dry years.
- Climate whiplash events—the rapid transition from extreme dry to extreme wet conditions—are projected to occur approximately 25% more often by the end of the century. It is also projected that the frequency of very dry or very wet years will approximately double.

Sea Level Rise

- Sea level rise in San Francisco Bay will affect daily tide and peak stormwater levels throughout the Delta. Scientists estimate that sea levels could rise by up to 1.9 feet by 2050 and 6.9 feet by 2100.
- Daily tide levels will respond to sea level rise differently across the Delta and Suisun Marsh depending on the amount of sea level rise, proximity to the Bay, and local hydrodynamic conditions.

Flooding

- Climate change will concentrate high runoff events within the core winter months, increasing the likelihood that large inflow events may coincide with high astronomical Bay tide levels during January and February.

- Climate change will increase runoff from Delta watersheds and increase peak water levels throughout the Delta. It is estimated that storm runoff to the Delta may increase by 44% by mid-century and 77% by end-of-century.
- Climate change will affect peak water levels differently in each region of the Delta. Peak water level changes in the western and central Delta will be driven by sea level rise. Changes in watershed hydrology will drive peak water level changes in the north and south Delta.
- Sea level rise and changes in hydrologic patterns in Delta watersheds will increase peak water levels and flooding in the Delta in the coming decades, exposing up to 250 square miles of land to flooding by mid-century and up to 600 square miles of land by end-of-century.

Extreme Heat

- A warming climate will increase the number of extreme heat days in the Delta. Delta-wide, communities may see six times as many extreme heat days by mid-century and six to 10 times as many extreme heat days by end-of-century, depending on future global emissions. Historically, the Delta has experienced 4 or 5 extreme heat days per year on average; that number is expected to grow to 17 to 24 days by mid-century.

Wildfire

- Wildfire frequency and severity throughout California are expected to increase in the future as a result of increased temperatures and atmospheric aridity, more frequent droughts, and altered precipitation patterns.
- Wildfires will primarily impact the Delta by reducing local air quality caused by smoke from remote fires in other parts of the state.

Drought

- A warming climate, reduction in snowpack, changes in the timing of spring snowmelt, and increased reservoir releases to counter salinity intrusion will all contribute to increased severity and frequency of drought in the future.

PEOPLE

The Delta is home to more than 500,000 people, spread across rural agricultural communities, legacy towns, and urban areas, including portions of the cities of Sacramento, West Sacramento, Stockton, Lathrop, Manteca, and the east Bay Area. The following key findings from the Vulnerability Assessment indicate how flooding,

extreme heat, and wildfire smoke will negatively impact Delta residents:

- Approximately 66,000 residents will be exposed to flooding from levee overtopping by mid-century, and 133,000 residents will be exposed by end-of-century.
- Exposure to flooding is particularly disruptive and dangerous for those living in areas with high concentrations of socially vulnerable populations that may have very limited resources for flood impact preparedness and recovery.
- People with greater exposure, heightened sensitivity, or reduced adaptive capacity to extreme heat are more likely to experience adverse health effects during extreme heat events. These include outdoor workers, older adults, young children, people experiencing homelessness, people with certain existing health conditions, and incarcerated populations, among others.
- The communities most vulnerable to extreme heat are in Stockton and Tracy. These communities have high urban heat island effects and high concentrations of people who are more socially vulnerable to heat impacts. By mid-century, these communities are projected to experience approximately 25 extreme heat days per year—compared to just five extreme heat days currently.
- Although climate change is not expected to greatly affect the frequency or severity of wildfires in the Delta, projected changes in wildfire risk in other parts of the state and the western U.S. will increase the occurrence of hazardous air quality conditions in the Delta.

PLACES

The Delta is home to important cultural resources, critical facilities, residential areas, and commercial and industrial areas. The following key findings from the Vulnerability Assessment indicate how important places in the Delta will be negatively impacted by flooding and extreme heat in the future:

Cultural Resources

- Six (6) culturally significant sites will be exposed to flooding from levee overtopping by mid-century, and 12 culturally significant sites will be exposed by end-of-century.
- Flood impacts to the Delta's cultural resources could damage or destroy landmarks that played a pivotal role in the region's history.

- Without modifications to accommodate extreme heat conditions, the continued use of many Delta historic buildings is at risk.

Critical Facilities

- Eleven (11) life safety facilities (fire stations, police stations, and hospitals) will be exposed to flooding by mid-century, and 19 life safety facilities will be exposed by end-of-century.
- Nineteen (19) schools will be exposed to flooding from levee overtopping by mid-century, and 41 schools will be exposed by end-of-century.
- Eleven (11) wastewater treatment plants will be exposed to flooding by mid-century, and 17 plants will be exposed by end-of-century.
- Extreme heat will increase demand on the Delta's critical facilities and supporting personnel, particularly the life safety assets of fire, police, and hospitals.

Residential Areas

- Flooding due to climate change will directly impact the households of many Delta residents.
- By mid-century, 16,990 residential parcels with structure improvements valued at \$2.7 billion will be exposed to flooding. By end-of-century, 37,490 residential parcels will be exposed to flooding.

Commercial and Industrial Areas

- Flooding due to climate change will directly impact commercial and industrial activities in the Delta, including buildings, facilities, and economic activity.
- By mid-century, 2,026 commercial and industrial parcels with structural improvements valued at \$1.1 billion and supporting \$1.8 billion in annual net revenues will be exposed to flooding.
- By end-of-century, 3,814 commercial and industrial parcels will be exposed to flooding.

AGRICULTURE

Agriculture is the dominant land use in and cultural backbone of the Delta. Agriculture drives the local economy and supports surrounding communities, and provides many of the available jobs in the Delta Primary Zone. The following key findings from the

Vulnerability Assessment indicate how Delta agriculture will be impacted by changing climate stressors and hazards:

- Delta crop yields will respond both positively and negatively to longer, hotter summers as a result of climate change
- Warming temperatures, increased temperature variability, and temperature-related water stress will decrease yields for most Delta crops.
- Warmer winters and fewer chilling hours resulting from climate change will reduce yields of most fruit and nut trees in the Delta.
- Delta farmers will face increased uncertainty and impacts due to extreme precipitation events and shifts in the timing of peak runoff from Delta watersheds.
- Sea level rise may increase salinity exposure of crop and rangelands in some Delta regions, especially during droughts.
- Sea level rise and land subsidence will increase levee seepage rates, raise groundwater levels on islands, and expand wet, non-farmable, and marginally farmable areas in the Delta.
- Approximately 148,000 acres of agricultural lands, \$72 million in agricultural assets, and \$79 million in annual agricultural economic activity will be exposed to flooding by mid-century. Approximately 257,000 acres of agricultural lands will be exposed by end-of-century.
- Increases in the frequency and duration of extreme heat days may lead to crop losses due to heat stress, water stress, and early development.
- Many Delta crops are vulnerable to drought and water stress.

RECREATION

The Delta offers various recreational opportunities, including parks, campgrounds, marinas, scenic highways, and trails. The following key findings from the Vulnerability Assessment indicate how future flooding, extreme heat, and drought conditions could negatively impact Delta recreation:

- Forty-five (45) parks and campgrounds will be exposed to flooding by mid-century, and 69 parks and campgrounds will be exposed by end-of-century.
- The Delta is already short on public access areas; flooding of recreational facilities would exacerbate this problem.

- Increases in the occurrence of extreme heat events could affect visitor patterns to the Delta's recreational sites, reduce the availability of heat refuges, and alter the use of the Delta's recreational sites.
- An increasing frequency and duration of drought conditions will impact the Delta's water-based recreation activities such as fishing and boating.

INFRASTRUCTURE

The Delta contains critical infrastructure supporting energy and utilities, transportation, solid and hazardous waste management, flood management, and water supply. The following key findings from the Vulnerability Assessment indicate how future flooding, extreme heat, and wildfire conditions may negatively impact Delta infrastructure:

Energy and Utilities

- Much of the Delta's energy industry, a critical source of electricity and gas for Delta communities and key to the local economy, may be exposed to flooding in the future, with the greatest number of exposed assets located in San Joaquin County.
- Energy infrastructure is highly sensitive to flooding, and exposure could result in substantial and cascading impacts to the Delta's public health, safety, and economy.
- An increase in the frequency and duration of extreme heat events will place increased demand on the energy grid, affecting regional power supply.
- Increased frequency and severity of wildfires within and outside the Delta may impact the region's power supply in the future.

Transportation

- Climate change-related flooding will impact key regional transportation routes in the Delta, including roads, highways, rail, and evacuation routes.
- Degradation of roadway and rail surfaces and subsurface materials from repeated flood events may require additional road maintenance and repairs.
- Disruption of Delta ports by climate-related flooding may result in loss of jobs and impact businesses that rely on port operations.
- Extreme heat may increase maintenance and repair needs for transportation infrastructure as assets are placed under increased heat stress in a warmer

climate.

- Wildfires could impact roadway and rail networks traversing the Delta and connecting to the greater region.

Solid and Hazardous Waste

- Numerous solid waste facilities, contaminated areas, and hazardous waste sites will be exposed to flooding from levee overtopping in the coming decades.

Flood Management Infrastructure

- Sea level rise and changes in hydrologic patterns in Delta watersheds will place greater stress on the Delta's flood management infrastructure, such as Delta levees, pumps, and upstream reservoirs.

Water Supply Infrastructure

- Sixteen miles of the Mokelumne Aqueduct will be exposed to flooding by mid-century and nearly 50 miles of water conveyance infrastructure will be exposed by end-of-century. The Delta's 31 state and local water diversions and over 3,400 private points of diversion may be impacted by flooding of Delta islands.

TODAY'S MEETING

At today's meeting, Council staff will present the remaining key findings from the draft Vulnerability Assessment and describe the next steps. The Council will have the opportunity to ask questions about Delta Adapts and the key findings presented. A written draft of the Vulnerability Assessment will be publicly available in January 2021. Council staff will be seeking Council endorsement of the final Vulnerability Assessment in early 2021.

QUESTIONS TO CONSIDER

1. Which of these findings are the most important and who should we communicate them to?
2. What effective adaptation strategies are you aware of that staff should start to investigate for applicability to the Delta?

FISCAL INFORMATION

Not applicable

LIST OF ATTACHMENTS

None

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