

CHIPPS ISLAND TIDAL HABITAT RESTORATION PROJECT

DELTA PLAN CERTIFICATION OF CONSISTENCY

GP 1 – MITIGATION MEASURES,
BEST AVAILABLE SCIENCE, AND ADAPTIVE MANAGEMENT

2. Mitigation_Science_Management

INTRODUCTION

The Chipps Island Tidal Habitat Restoration Project (Restoration Project) is consistent with Delta Plan Policy GP 1. The Restoration Project is a 910-acre ecosystem restoration project located within the eastern Suisun Marsh, a Priority Habitat Restoration Area that the Delta Plan states that California agencies “must . . . protect” because it “present[s] opportunities to reestablish land-water connections” and “present[s] the most promising restoration opportunities” within the Delta. (See Chapter 4, 2022 Update, pp. 4-47 through 4-50.)

The Restoration Project will fulfill the compliance requirements for covered actions included in the Delta Plan’s Policy G P1, including:

1. Consistency with relevant Delta Plan regulatory policies (as addressed in later sections of this document),
2. Inclusion of applicable feasible mitigation measures adopted and incorporated into the Delta Plan (see 3a. GP1_Mitigation_Consistency),
3. Documentation of the use of best available science (addressed later in this section),
4. Adequate provisions to assure continued implementation of adaptive management, including an adaptive management plan (see 4. GP1C_AdaptiveManagementPlan), and

The Restoration Project will restore, enhance, and permanently protect approximately 910 acres of tidal marsh habitat (Restoration Project Site) within a Delta Plan Priority Habitat Restoration Area, the Suisun Marsh. (See Chapter 4, 2022 Update, pp. 4-47 through 4-50.) The Restoration Project will restore approximately 362 acres of tidal habitat as well as preserve and enhance approximately 546 acres of tidal marsh and tidal channels. In addition to assisting with implementation of the Delta Plan (see Chapter 4, 2022 Update), the Restoration Project will contribute toward the restoration acreage requirements of the 2010 Fish Restoration Program Agreement (FRPA), including updated requirements established under Biological Opinions by the NMFS (2019) the USFWS (2019) for Long-Term Operations of the State Water Project (SWP) and the Federal Central Valley Project (CVP). The Restoration Project would also contribute to restoration acreage required under the California Department of Fish and Wildlife’s (CDFW) Incidental Take Permit (2020, Permit No. 2081-2019-066-00) to benefit four state listed species, including spring-run Chinook, winter-run Chinook, Delta smelt, and longfin smelt.

The Restoration Project will partially fulfill the Delta Plan’s target of restoring 60,000 to 80,000 acres of habitat by 2050 (see Chapter 4, 2022 Update, pg. 4-40), as well as the Department of Water Resources (DWR) requirement to restore 8,000 acres of intertidal and associated subtidal habitat for Delta Smelt and salmonids and 800 acres of intertidal and associated subtidal wetland habitat in a mesohaline part of the estuary for Longfin Smelt. The Restoration Project is consistent with relevant Delta Plan Policies and with the Suisun Marsh Habitat Management, Preservation, and Restoration Plan (SMP), which provides a comprehensive 30-year plan for management of activities within Suisun Marsh, including tidal restoration activities. The Restoration Project will contribute significantly to the SMP’s goal of converting 5,000 to 7,000 acres of managed wetlands to tidal marsh over the next 30 years.

PROJECT GOALS AND OBJECTIVES

Consistent with the Delta Plan’s goal of “reestablish[ing] land-water connections with the Suisun Marsh, the Restoration Project is designed to restore unrestricted tidal connectivity to the interior of the Restoration Project Site. Tidal connectivity will restore tidal channels and tidal marsh onsite to benefit native fish species. Table 1 demonstrates the consistency of the Restoration Project’s objectives with the Delta Plan’s Five Core Strategies by listing which objectives are related to each strategy.

Project Objectives

- 1) Enhance habitat appropriate for rearing salmonids, Delta Smelt, Longfin Smelt, and other native fish species.
- 2) Enhance available productivity for native fish within and adjacent to the restoration site.
- 3) Provide connectivity to the marsh plain.
- 4) Avoid promoting conditions, such as invasive species infestations, that are in conflict with the above project objectives.

Table 1. Restoration Project Objectives consistency with the Delta Plan’s Five Core Strategies

Delta Plan Core Strategies	Related Project Objectives
Create more natural, functional flows	1, 3
Restore ecosystem function	1, 2, 3
Protect land for restoration and safeguard against land loss	1
Protect native species and reduce the impact of nonnative invasive species	1, 2, 3, 4
Improve institutional coordination to support implementation of ecosystem protection, restoration, and enhancement	1, 2, 3, 4 (Institutional coordination and collaboration were utilized in developing Restoration Project to meet all objectives.)

COVERED ACTION SUMMARY

PROJECT LOCATION

A description of the Restoration Project's location, historic and current land uses, and existing conditions is provided in the Chipps Island Tidal Habitat Restoration Project Addendum to the *Suisun Marsh Habitat Management, Preservation, and Restoration Plan Environmental Impact Statement/Environmental Impact Report* (SMP EIS/EIR).

The Restoration Project is on the southeastern edge of Suisun Marsh, in Solano County, California. It is located within one of the six Priority Habitat Restoration Areas that the Delta Stewardship Council identified in its 2022 Update to Chapter 4 of the Delta Plan, and in Region 1 designated by the Suisun Marsh Habitat Management, Preservation, and Restoration Plan (SMP). The Restoration Project is bordered by Honker Bay to the west, the Sacramento River to the south, and Spoonbill Creek to the northeast. Although the nearest public boat ramp is located at the Pittsburg Marina to the south, the nearest land to Chipps Island is Van Sickle Island across Spoonbill Creek.

Chipps Island is composed of three separate parcels, historically managed as individual duck clubs: the north parcel with approximately 362-acres of diked waterfowl hunting area with seasonal and permeant non-tidal wetlands; the east parcel with approximately 303-acres of tidal marsh with some tidal connectivity through culverts and openings in the levees; and the west parcel with approximately 243-acres of tidal marsh with tidal connectivity though eroded levees. All parts of the island have been used historically for waterfowl hunting and contain permanent sloughs, ponds, and ditches, as well as remnant infrastructure of past land uses.

PROJECT DESCRIPTION

The Restoration Project would assist with implementation of the Delta Plan by restoring tidal hydrology to approximately 362 acres as well as preserve and enhance approximately 546 acres of existing tidal marsh habitat on Chipps Island for the benefit of native fish species. The Restoration Project would consist of restoring managed marsh, managed channels, and uplands in the north parcel to tidal marsh habitat and enhancing existing tidal marsh, upland, and tidal channel habitat in the east and west parcels.

The Restoration Project would excavate several existing drainage ditches as well as create new channels in a meandering channel form, increasing channel edge habitat and complexity to mimic natural tidal channels in the Project vicinity (Attachment 1. SectionD_CoveredAction_Summary: Figure 2-3). All channel excavation in the north parcel would be conducted while it is dewatered or through use of amphibious and low ground pressure (LGP) equipment if dewatering is not feasible. To accelerate development of a dendritic channel network connecting the marsh plain to the primary channels, shallow "starter" channels would be partially excavated in strategic locations. To encourage natural channel formation through incision and headward erosion by tidal flows, clearing and grubbing of preferred pathways may be extended from these starter channels into isolated portions of the marsh plain.

Following channel excavation, exterior levees of the north parcel would be breached in multiple locations to reintroduce full tidal exchange to the north parcel, including three breaches along Honker Bay to the west, three breaches along Spoonbill Creek to the east, a breach connecting the north and east parcels, as well as a breach connecting the north parcel to the Sacramento River to the south. In addition to channel excavation to the interior of the west parcel, three remaining WCS

in the east parcel would be removed, with one being plugged and the other two remaining unplugged to increase tidal exchange between the site interior and the surrounding waterways. Two WCS in the north parcel would be removed and remain unplugged to also increase tidal connectivity. A complete Project Description with a thorough discussion of construction methodologies can be found in Attachment 1. SectionD_CoveredAction_Summary.

With restoration completed, the Restoration Project’s interior would experience full tidal flows and a conversion of all managed marsh habitat to tidal habitat would occur. The entire Restoration Project Site would be more readily available to fish, and the vegetated marsh plain would result in increased productivity to support fish on and offsite. Existing tidal marsh in the north and west parcels would be enhanced and protected, while managed marsh habitat interior of the levees would be restored to tidal marsh. **Table 1** shows the acreages of each habitat type before and after restoration.

Table 2. Changes in Habitat and Natural Community types between existing and post restoration conditions

Habitat Classification	Existing (acres)¹	Change (acres)	Post Restoration (acres)²
Open Water, muted tidal	18.8	-18.8	0.0
Open Water, tidal	45.3	23.3	68.6
Tidal Wetland	491.3	276.6	767.9
Managed Wetland	285.5	-285.5	0.0
Developed/Barren	0.1	-0.1	0.0
Upland/Grassland	13.4	4.6	18.0
Total	854.4		854.4

ENVIRONMENTAL COMMITMENTS

The Restoration Project is tiered from the SMP EIS/EIR and therefore would incorporate environmental commitments consistent with relevant Delta Plan Policies and the Delta Plan, and identified in the SMP EIS/EIR Chapter 2 and Appendix F, *Mitigation Monitoring and Reporting Program*, where appropriate. (See Attachment 3a. GP1_Mitigation_Consistency and 3b. GP1_MitigationMonitoringReporting.)

Each commitment is consistent with, and at least as effective as, relevant mitigation measures included within the Delta Stewardship Council's Mitigation MMRP. An analysis of Delta Plan mitigation measures as compared to the Restoration Project's environmental commitments is included in Attachment 3a. GP1_Mitigation_Consistency. DWR may make additional commitments during the course of obtaining permits; any such commitments would be included in the *Chippis Island CEQA Addendum, Appendix A* (Attachment 9. CEQA_ChippisIsland) as permits are obtained.

BEST AVAILABLE SCIENCE

The Restoration Project design and adaptive management plan are based on the best available science, as demonstrated by the following elements incorporated into planning of the Restoration Project:

- Well-stated objectives and hypotheses
- Conceptual models of tidal wetland functions, habitat requirements and distribution of sensitive fish and wildlife species
- Literature review of studies on wetland habitats in the Suisun Marsh and Delta (provided at the end of the CEQA Addendum and Adaptive Management and Monitoring Plan [AMMP])
- Site-specific hydrodynamic modeling of various design alternatives, and water quality assessment
- The best professional judgment of experts

Through Restoration Project planning and implementation, DWR commits to utilizing the best available science to design, manage, and monitor the site. Adaptive management of the Restoration Project will be based on best available science, including the utilization of input from monitoring data in conjunction with adaptive review of whether restoration goals and objectives are being achieved.

OBJECTIVES AND HYPOTHESES

The Restoration Project is consistent with relevant Delta Plan Policies and with the *Tidal Wetland Monitoring Framework for the Upper San Francisco Estuary* (Framework), which was developed by the Interagency Ecological Program (IEP) Tidal Wetland Monitoring Project Work Team (TWM PWT). Please see the Chippis Island AMMP and the Framework for a full description of monitoring activities, performance standards, and hypotheses.

The Restoration Project's AMMP is structured around hypotheses that were derived from conceptual models of tidal wetland function with respect to smelt and salmon. The theoretical underpinnings of the conceptual models derive from peer-reviewed literature and government

reports describing studies throughout the estuary and relevant ecosystems elsewhere. The methods and sampling strategy described are designed to provide data that are comparable across restoration projects and with ongoing regional monitoring surveys. Comparable data from the channels adjacent to the Restoration Project Site and a reference site will facilitate monitoring as well as the eventual assessment of restoration program effectiveness. Restoration Project monitoring and adaptive management strategies are subject to adjustment as new information arises. Data comparability and transparency will be maintained throughout the evolution of the Restoration Project and its monitoring period.

One of the steps for achieving the best science is to provide clearly stated objectives. The progress towards each Restoration Project objective will be evaluated based on monitoring hypotheses selected from the Framework and modified to reflect site-specific considerations. Some hypotheses can be addressed within the scope of project or programmatic monitoring, while others require detailed mechanistic studies that would require special studies. Framework hypotheses are sorted by Restoration Project objectives and identification codes from the Framework are noted in parentheses.

Convert muted tidal emergent wetland and open water habitats into tidal areas to increase available Delta smelt and longfin smelt habitat:

- The area of substrate and structure suitable for rearing, refuge, and/or adult residence of at-risk fish species on the Restoration Project Site will increase after restoration. (P1)
- Water quality will be suitable for smelt during the time they are likely to be present. (P2)
- Connections between the restoration sites and surrounding sloughs will be characterized by structure, water quality, and flow that allow fish increased opportunity to access high quality habitat. (P3)
- At risk fish species including Delta Smelt, Longfin Smelt, Chinook Salmon, Green Sturgeon, and steelhead will be present in and adjacent to the restored and enhanced tidal marsh habitat for some portion of their life history, with a frequency similar to, or higher than the existing tidal marsh and adjacent sloughs, and reflecting current population trends. (P4)
- Establishment and growth of aquatic vegetation will influence fish community structure and abundance on the Restoration Project Site. (P14)

Enhance regional food-web productivity and export to support pelagic fish species and emigrating salmonids:

- Pelagic invertebrate (zooplankton) community composition and size structure will change seasonally and affect fish diet. (F4)
- Increased area of tidal marsh will increase the contribution of epiphytic, epibenthic, and drift invertebrates to fish diets relative to appropriate temporal and spatial comparison data. (F5)
- Increased emergent vegetation will increase the contribution of periphyton, detritus, and other marsh-derived carbon to fish diets. (F6)
- Fish on or adjacent to Chipps Island will have higher food consumption, resulting in

higher condition and/or growth rate relative to current conditions and similar to appropriate spatial comparison data. (F7)

- Restoration will result in a net increase of primary production (phytoplankton and detritus) and secondary production (zooplankton and other invertebrates) exported from Chipps Island, or at a minimum increase access to productivity by making it available at certain times in the tidal cycle. (F9 and F10)

Provide rearing, breeding, and refugia habitats for a broad range of other aquatic and wetland dependent species that utilize or depend on the combination of brackish aquatic/tidal marsh habitat:

- Establishment and growth of aquatic vegetation will result in localized decreases in water velocity, promoting sediment accretion, which in turn will promote more emergent aquatic vegetation (EAV) establishment. (P12)

Avoid promoting conditions, such as invasive species infestations, that are in conflict with the above Project objectives:

- Restored tidal marsh will be passively colonized by emergent aquatic vegetation species that are proximate and connected to Chipps Island. (P7)
- Planting, plant propagation method and propagule size, along with timing of restoration action and initial colonizer species will influence vegetation community composition. (P8)

CONCEPTUAL MODELS

Please see the Tidal Wetland Monitoring Framework for the Upper San Francisco Estuary (Framework), and IEP Technical Report 91: *Effects of Tidal Wetland Restoration on Fish: A Suite of Conceptual Models* for a full description of the conceptual models.

The AMMP is structured around hypotheses that were derived from conceptual models of tidal wetland function with respect to smelt and salmon (IEP PWT 2017 and Sherman et al. 2017). The theoretical underpinnings of the conceptual models derive from peer-reviewed literature and government reports describing studies throughout the estuary and relevant ecosystems elsewhere. This understanding informed the design of sustainable habitat features that would increase rearing habitat for salmonids and increase food web export while minimizing potential negative effects on other species. The methods and sampling strategy incorporated into the Restoration Project provide data that are comparable across restoration projects and with ongoing regional monitoring surveys. Comparable data from multiple sites will facilitate Restoration Project monitoring as well as the eventual assessment of restoration program effectiveness. Restoration Project monitoring and adaptive management strategies are subject to adjustment as new information arises. Data comparability and transparency will be maintained throughout the evolution of the Restoration Project and its monitoring period.

BASIS OF DESIGN

All projects designed to satisfy the USFWS BiOp and CDFW ITP are based on an understanding of target fish species and Delta-Suisun Marsh ecosystem functions. This includes the life history

and habitat requirements of special-status species, as well as the role tidal wetlands play in Delta-Suisun Marsh-wide productivity. Using the best available science, the projects are designed to provide habitat features that will likely benefit Delta Smelt, Chinook Salmon, Longfin Smelt, and their food resources, while minimizing potential negative effects.

The Restoration Project was carefully planned with alternative restoration designs analyzed and modeled to produce the most environmentally beneficial outcome. The design underwent multiple iterations and was subject to numerous surveys and models, including hydraulics, sea level rise, species surveys and data investigation, a wetland delineation, geotechnical report, cultural resources survey and report, vegetation surveys, and more. Hydraulic modeling included velocity, water quality (salinity), particle tracking, particle exposure time, particle age and distribution, and residence time. Bathymetric, topographic, and rare plant surveys were performed to gather preliminary data for modeling and to determine an appropriate design.

The Restoration Project design includes strategically located channels that will return the Restoration Project Site to full-tidal conditions to provide maximum benefits to native species. Model results were used to inform and alter the Restoration Project design to improve restoration benefits. Modeling informed the channel and breach widths to ensure appropriate velocities, which can influence habitat suitability and water quality factors such as turbidity.

TECHNICAL ADVISORY GROUPS

The Restoration Project design has been refined through repeated collaboration with multiple agencies, entities, and scientists. The Restoration Project is part of DWR's Fish Restoration Program, which includes regular meetings with multiple technical experts, as well as review of Restoration Project documents. Additionally, the SMP Adaptive Management Plan called for the formation of an Adaptive Management Advisory Team (AMAT) to help achieve objectives and implement adaptive management, including use of best available science. The AMAT is staffed with technical experts who provide guidance to project proponents and the SMP Principals. The Restoration Project design has been presented to the AMAT to solicit input and incorporate recommended changes on February 8, 2022.

Through this process, experts from a variety of fields provided feedback and input to improve the Restoration Project prior to permit consultation, facilitating the Restoration Project's success. Multiple changes in the Restoration Project design have occurred based on expert feedback to effectively direct the flow of water and improve circulation in the restored Restoration Project Site, incorporating best available science.

ADAPTIVE MANAGEMENT

This section provides a summary of the Adaptive Management and Monitoring Plan as it relates to regulatory policy GP1. The AMMP will be implemented within a management and monitoring framework consistent with relevant Delta Plan Policies and with the Tidal Wetland Monitoring Framework for the Upper San Francisco Estuary and Appendix 1B of the Delta Plan. Please see the Chipps Island Adaptive Management and Monitoring Plan for further details. Adaptive management will be implemented according to the Delta Plan's three-phase and nine-step adaptive management framework:

- I. Plan

1. Define/Redefine the Problem
 2. Establish Goals and Objectives
 3. Model linkages between Objectives and Proposed Action(s)
 4. Select Action(s) (Research, Pilot, or Full-scale) and Develop Performance Measures
- II. Do
5. Design and Implement Action(s)
 6. Design and Implement Monitoring Plan
- III. Evaluate and respond
7. Analyze, Synthesize, and Evaluate
 8. Communicate Current Understanding
 9. Adapt

PURPOSE OF THE AMMP

The Suisun Marsh ecosystem is extremely dynamic on multiple temporal and spatial scales. In the absence of rigorous monitoring, fluctuations in natural populations of native and non-native flora and fauna, as well as variations in the physical environment related to climate and anthropogenic influences, are likely to complicate the assessment of tidal wetland restoration actions. The AMMP outlines a scientifically defensible approach to ascribing changes in habitat and food web characteristics in the vicinity of Chipps Island to restoration actions. Monitoring is an integral component of adaptive management as well. The AMMP incorporates elements of the Framework (IEP TWM PWT 2017a) and comprises three major components:

- Compliance monitoring – determining whether restoration actions have been completed as planned, including compliance with construction-related permitting requirements.
- Routine effectiveness monitoring – evaluating hypotheses related to the premise that tidal wetland restoration will benefit listed fish species in accordance with Project objectives.
- Potential special studies – Effectiveness monitoring that is too intensive in terms of time, expertise, and resources for regular implementation, but that would provide detailed information on the mechanisms responsible for wetland physical and ecological processes.

MONITORING PROGRAM DESIGN

The effects of restoration on local and regional biological resources will be evaluated relative to pre-construction conditions (“baseline”), concurrent monitoring of an existing wetland (reference site), and conditions in the channels adjacent to the Restoration Project. To test for differences between areas within Chipps Island, sampling will target multiple habitat types.

Monitoring activities are subject to adaptation. Considerable uncertainty about the response of

the ecosystem to tidal wetland restoration is identified in the suite of Tidal Wetland Conceptual Models (chapters in Sherman et al. 2017). Sampling methods, frequency, and/or location may be adjusted. We will not increase the intensity of sampling using any method that could incur take of listed species and that is included in project Biological Opinions without prior discussion with the appropriate agency (USFWS, NMFS, and/or CDFW). Where possible, existing data will be leveraged from long-term fish and zooplankton monitoring conducted by various IEP and academic programs.

This regular long-term monitoring (approximately 10 years, with the frequency of some measures decreasing with time) will be supplemented with special short-term studies as needed to test specific hypotheses of the relationships between fish, food, and tidal restoration sites.

ADAPTIVE MANAGEMENT RESPONSE

While it is not anticipated that major modification to the Restoration Project Site will be needed, an objective of the AMMP is to guide monitoring to identify any thresholds that may compromise the Restoration Project objectives, and to propose potential management responses or further focused monitoring efforts. Minor site alterations or management activities may be needed if sediment buildup, invasive species establishment, or other detrimental site characteristics are observed. DWR shall consult with the resource agencies before taking any major corrective measures.

RESOURCES TO IMPLEMENT ADAPTIVE MANAGEMENT

The Fish Restoration Program (FRP) is funded in whole by DWR through State Water Project (SWP) funding to meet permit compliance for SWP operations. The Restoration Project is a DWR FRPA Project, therefore, funding for full implementation of the action, maintenance activities, and monitoring is guaranteed in perpetuity. The FRP has both an annual program budget and individual project budget. Plans for individual projects include DWR funding sufficient to accomplish full implementation of the action.

The long-term costs for implementation of individual actions would be directly funded by DWR in lieu of endowment funding since DWR is able to provide adequate funding assurances into the future based on DWR's long-term SWP water supply contracts. Pursuant to the Burns-Porter Act, DWR is authorized to use SWP revenue without annual approval by the State Legislature to pay the operations and maintenance of the SWP (Water Code Section 12937(b)). This revenue is not appropriated under the annual State budget process. Costs incurred to pay for the long-term operations and maintenance of fish and wildlife mitigation areas for SWP activities are considered SWP maintenance and operations obligations, included within the first priority before payment of other SWP obligations.

In addition, DWR has a strong AA bond rating and is in a good financial position to make any on-going payments for mitigation purposes. DWR's SWP contractors, which include Metropolitan Water District of Southern California, also have strong credit ratings, which provide additional assurances of DWR's ability to make on-going payments for fish and wildlife mitigation purposes required by FRPA. DWR has notified the SWP contractors of the mitigation costs estimated by FRPA for compliance with the Biological Opinions and ITP, which is now being included in annual charges to the SWP contractors.

REFERENCES

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