FRANKS TRACT FUTURES 2020

reimagined

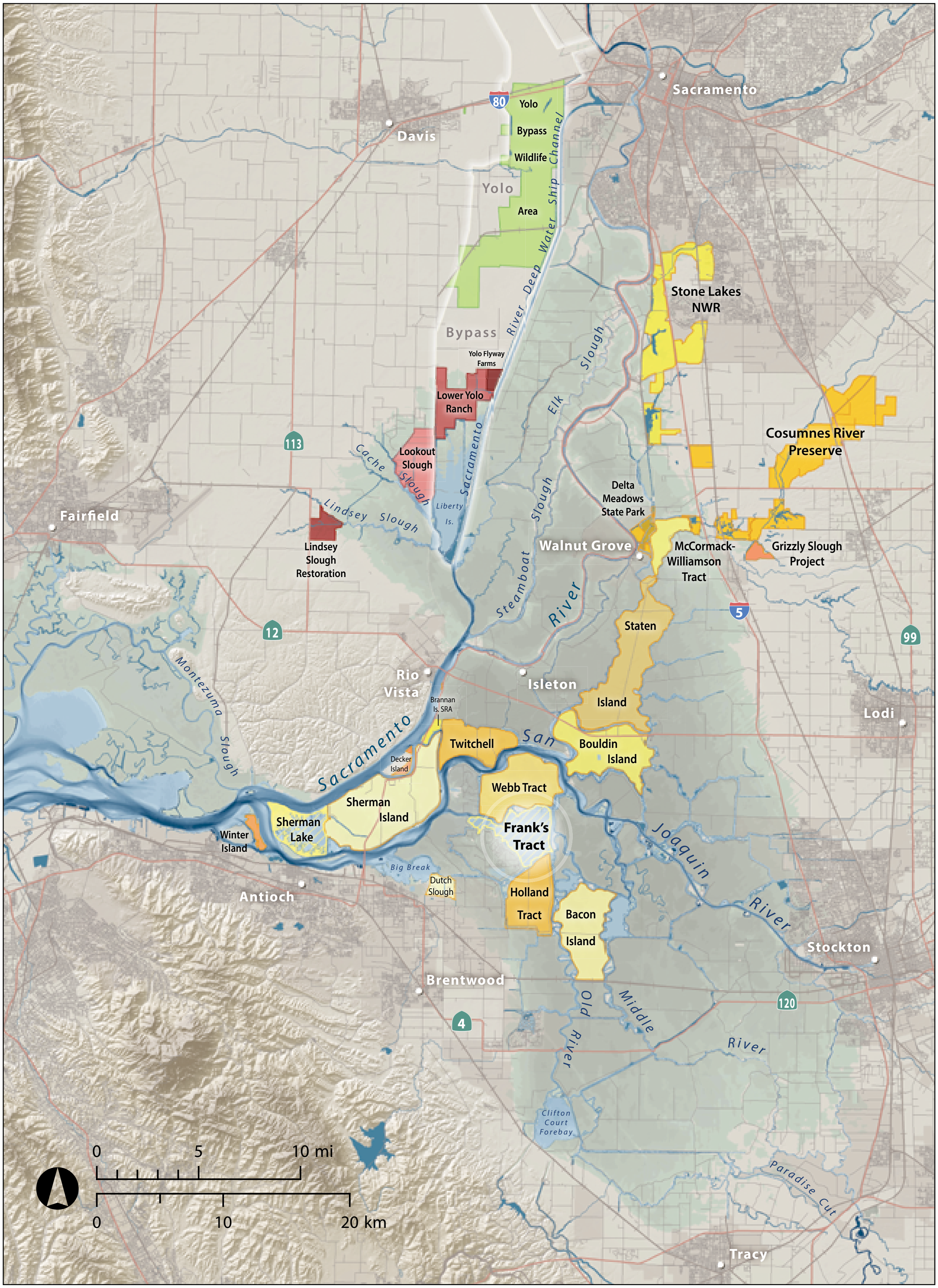
Options for enhancing navigation, recreation, ecology, and water quality in the central Delta

California Department of Fish and Wildlife

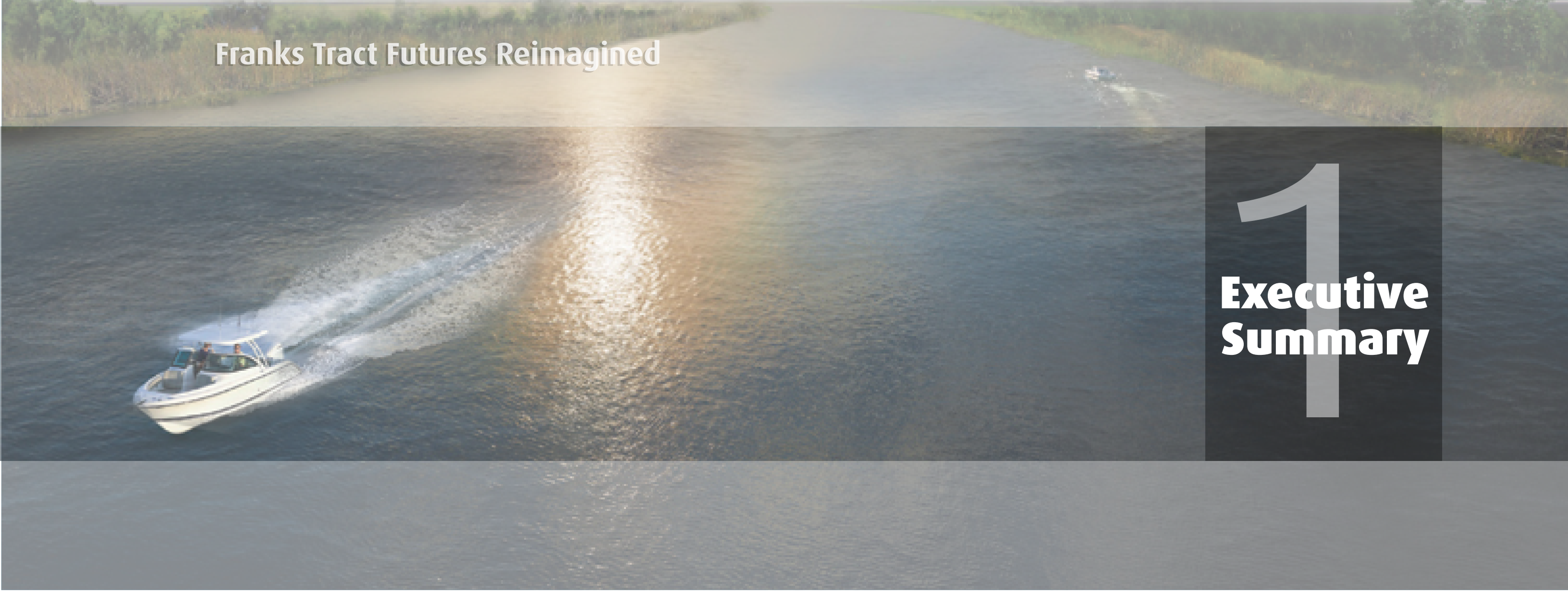
EXECUTIVE SUMMARY

September 30, 2020

Delta Restoration Frontiers



Planned restoration and fish habitat: Cache Slough (red); Yolo Bypass Wildlife Area (green); Bypass (white boundary) and public lands corridor (various shades of yellow). Map: Amber Manfree



1 Executive Summary

A Bold Landscape Redesign in the Heart of the Delta

This summary of the 2020 Franks Tract Futures Reimagined report describes a proposal to redesign and enhance the 3,000-acre flooded island, and the smaller adjacent Little Franks Tract. The Tract is located about 40 miles south of Sacramento, California in the Sacramento-San Joaquin River Delta. The report covers a 2019-2020 planning process and community input into a proposal for improving conditions within the Tract first explored in 2017-2018.

Franks Tract, a shallow lake-like area, is a popular recreational and fishing destination in the Delta, with associated important benefits to the local economy on Bethel Island. However, it is also a hot spot for invasive plants, predatory fishes and saltwater intrusion from the ocean into waterways used to convey freshwater supplies to cities and agriculture throughout California.

As one of the least subsided and largest flooded islands in the central Delta, Franks Tract is a strong candidate for regional scale improvements to navigational channels, shoreline recreational amenities, and ecosystem function. Since 2017, the California Department of Fish and Wildlife, working with other state agencies and a multi-disciplinary consultant team, has undertaken a two-stage planning process to develop and evaluate a multi-benefit project for enhancing Franks Tract. After the second 2019-2020 phase, which involved four public-facing rounds of design and comment, a single design was selected as the preferred concept. The process and proposed changes embody emerging conservation guidance for the region described in the 2018 *A Delta Renewed, 2019 Delta Conservation Framework*, and the ongoing Public Lands Strategy.

Project Benefits

The preferred concept for Franks Tract would redesign the landscape, adding new land masses, tidal marshes, navigation channels, beaches and other amenities. The design addresses deteriorating environmental, safety, and water quality conditions in the area (see p.2). Among diverse benefits, it would: improve recreational boating and navigation (through dredging and reduction in aquatic weeds); create beaches, mooring sites, sheltered coves, day-use areas, and other amenities within the state recreation area; improve remnant levees that provide wave sheltering adjacent to Bethel Island and Little Franks Tract while maintaining open water views and marina access; create large areas of tidal marsh, riparian channel edge, and ecologically valuable features that provide habitat for a variety of species, including species of concern, sport fish and waterfowl; improve water quality for human use by reducing salinity in the central and south Delta; and help Franks Tract and local communities adapt to sea level rise (see map p.4).

Photo: Rick Lewis

Co-Design with the Public and Stakeholders

Meaningful public engagement in planning and design has been a guiding principal of the Franks Tract landscape redesign and enhancement project. Designing with, rather than designing for, those who have a stake in the outcome was and is a top priority. Incorporating local knowledge and stakeholder priorities also requires a strong grounding in place – the unique place that is Franks Tract in the central Delta.

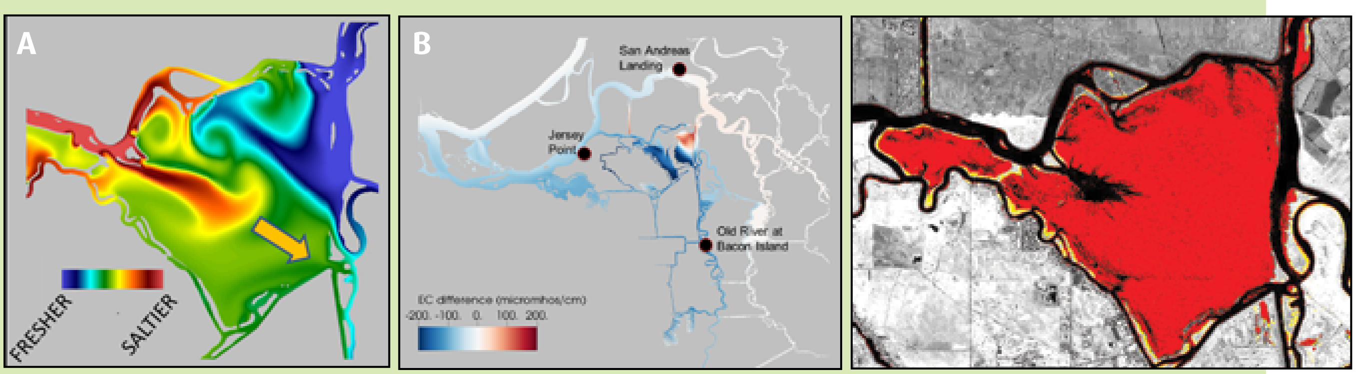
The goals of the Franks Tract project are to benefit native and desirable species by re-establishing natural ecological processes and habitats, provide enhanced recreational opportunities and other community benefits, and improve water quality. More detailed project objectives reflect input from prior Franks Tract restoration efforts, State Parks' General Plan for the Tract, and stakeholder input. Overall, the project seeks to find a balance of benefits across all objectives that will be sustainable over time.

The project team engaged with state and federal agencies, local districts, community members and other stakeholders throughout the planning process, and made the results transparent at every level. The project formed a Steering Committee, comprised of relevant state and local agency representatives, and an Advisory Committee, comprised of representatives of many diverse stakeholder interests. These committees served as the central bodies for deep engagement in the Franks Tract planning process. Public input was solicited early in the process, as well as during and after concept refinements via meetings held in the vicinity of Bethel Island, online Franks Tract user surveys, and other outreach (see timeline p.3). Public comments received on a draft version of this report resulted in revisions incorporated into the final report.

Deteriorating Conditions

While boaters, hunters, and anglers clearly value the open waters of Franks Tract, the ecological and water quality problems of this island are now impinging on the greater Delta and California water uses and compromising what the local economy values most: access to first- rate recreational and fishing waters. If no steps are taken to improve conditions on Franks Tract, current conditions could easily worsen. Dense mats of aquatic weeds will continue to degrade fish and wildlife habitat, spur algal blooms, and impede boat passage. Management with herbicides must be ongoing and remains burdensome. At the same time, healthy tidal marshes critical to native species will remain scarce in the Delta unless more are restored in the least subsided areas like Franks Tract.

Another contributor to deteriorating conditions is the direct connection provided between the lower San Joaquin River and Old River through Franks Tract. This allows saltier water and fish to be drawn into the south Delta into the zone of influence of the state and federal water projects. The presence of even small quantities of salt compromises the quality of fresh water needed for irrigation, drinking, and other uses throughout the state. As droughts recur more frequently or lengthen with climate change, and as the sea level rises, countering salt water intrusion from the ocean will require expensive and disruptive management measures such as the emergency drought barrier built on False River in 2015. The barrier consisted of 150 tons of rock, 750 feet across the top and 120 feet wide at the base. Installation and removal cost taxpayers approximately $37 million.



Current tidal conditions pump salt water into the Tract but don't let it out again (A). Modeling suggests a reduction in these conditions in a reconfigured landscape (B). Conditions under a project would be less favorable to submerged aquatic vegetation (fall 2019 extent shown in red) Sources: DWR & Khanna, CSTARS, UCD .

Over 14 months, the planning team worked through a public process on four rounds of concepts for redesigning Franks Tract. The first round consisted of 7 potential project designs plus the No Action (no project) alternative. Input from committees and the public narrowed the field down to 3 designs, and more recently to a preferred concept (see next page).

Co-Design Timeline 2019-2020

2019

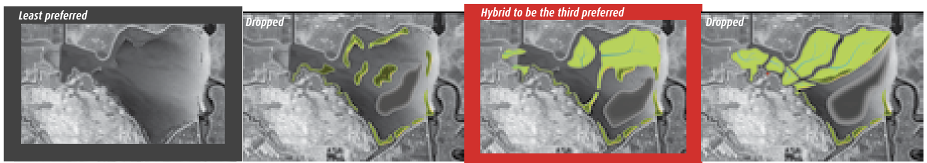
07/11 Kick-off Meeting (public)

Project background and planning process overview.
Introduction to ESA-led team and overall project approach.

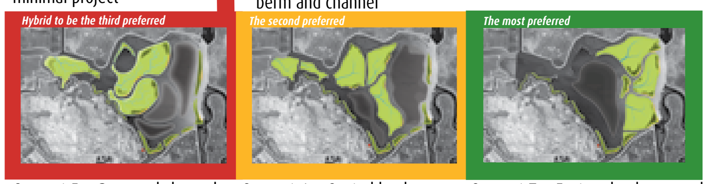
08/29 The First AC/SC Workshop

Reviewed and received input on the project goals and objectives
Reviewed and received input on the No Action alternative scenario
Shared the initial results of the (online) Stakeholder Survey
Conducted a design charrette to receive input on the first round of design concepts

ROUND 1



Concept 1 - No Action
Concept 2 - Light touch - minimal project
Concept 3 - Open water berm and channel
Concept 4 - Northern archipelago

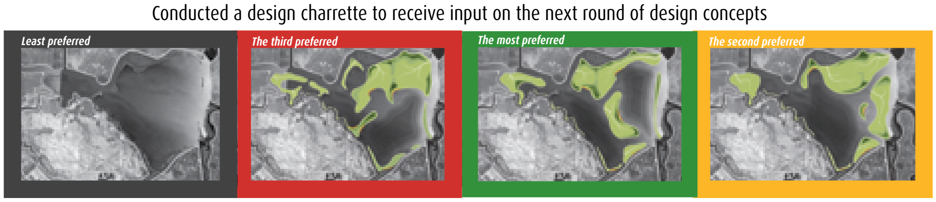


Concept 5 - Bays and channels
Concept 6 - Central land mass
Concept 7 - Eastern landmass and central island

11/06 The Second AC/SC Workshop

Reviewed and received input on the revised design concepts
Reviewed and received input on the draft evaluation methods and criteria
Shared the initial results of hydraulic modeling, received input on the initial recreational features design ideas and marsh aesthetic surveys
Conducted a design charrette to receive input on the next round of design concepts

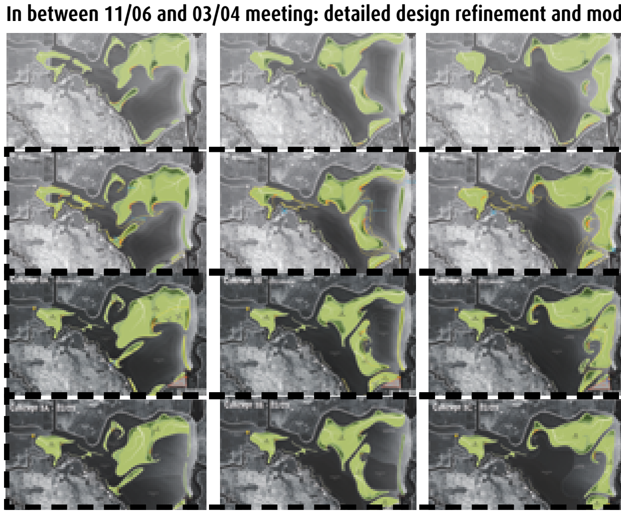
ROUND 2



Concept 2A - Open water berm and channel
Concept 2B - Central land mass
Concept 2C - Eastern landmass and central island

ROUND 3

In between 11/06 and 03/04 meeting: detailed design refinement and modeling



Revision based on 11/06 meeting feedback (AC and SC members)

Revision based technical input (construction, dredge material calculations, State Park management logistics)

Draft plan for Round 3

2020

03/04 The Third AC/SC Workshop

Reviewed and received input on the revised, 3rd round of design concepts
Reviewed the performance of the three concepts in meeting the project objectives
Conducted a design charrette to receive input on the next round of design concepts

ROUND 4

Concept 1 - No Action
Concept 3A - Open water berm and channel
Concept 3B - Central land mass
Concept 3C - Eastern landmass and central island

process is ongoing

Preferred Landscape Redesign Concept

The project design for Franks Tract and Little Franks Tract establishes a large area of intertidal marsh with channels, deepens open water areas to discourage nuisance submerged aquatic vegetation, and creates water and land based recreational opportunities. Re-establishing tidal marsh and associated channels would require raising selected areas 8-11 feet as Franks Tract is currently subsided below sea level. The design addresses all local, state and regional priorities (see pp.10-13 FTF2020) and meets all project goals and objectives (see Sections 4-5 FTF2020).

Navigation: Fast water navigation routes between key locations were identified as critical by boaters and recreational users. The project includes extensive deeper dredged areas in open water and navigable channels that would reduce growth of shallow water weeds identified as a nuisance to boating. The project includes other measures to improve boating safety, such as removing existing underwater snags and hazards, and sheltering the more wave-exposed eastern entrances to the Tract. Finding a way to allow for fast and safe boat navigation through Franks Tract while also meeting the water quality objectives was a key planning consideration. Channel widths were modeled to quantify the effects of channel size on

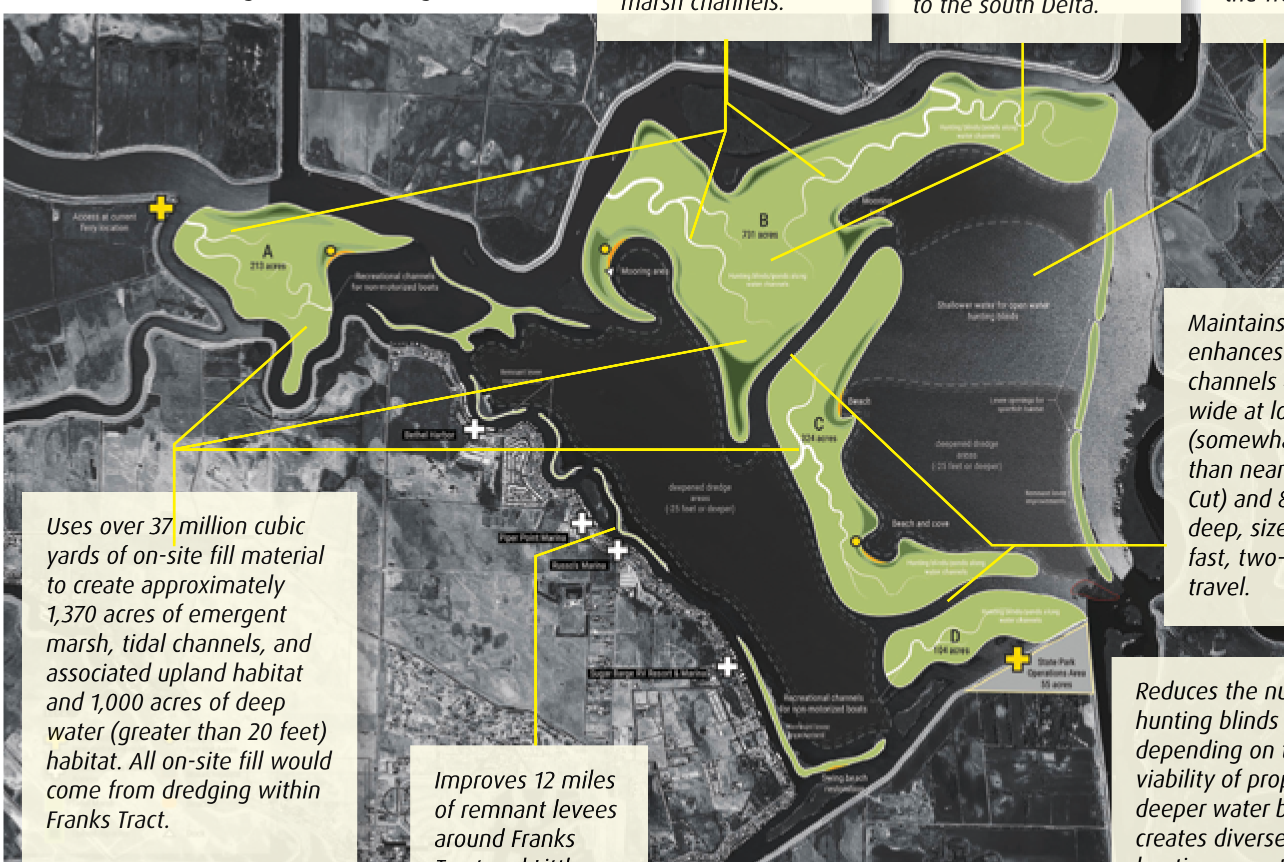
New Marsh, New Beaches, New Amenities, Less Weeds, Less Salt

The project proposed for Franks Tract develops three focal points for boat-to access to recreational activities that would attract three different user groups. The design pairs the eastern open water area with the active water sports enthusiasts; the Little Franks Tract with non-motorized boaters and paddlers; and the north end of the western open water area with a mooring for those with larger boats.

Creates approximately 21 miles of tidal marsh channels.

Builds a central tidal marsh landmass which maintains open water in front of Bethel Island, creates accessible, boat-in, land-based recreation, and impedes salt water movement from the western Delta to the south Delta.

Maintains about 1,900 acres of shallow water (less than 6-8 feet deep) on the Tract.



Maintains and enhances through-channels 400 feet wide at low water (somewhat wider than nearby Holland Cut) and 8-9 feet deep, sized to allow fast, two-way boat travel.

Uses over 37 million cubic yards of on-site fill material to create approximately 1,370 acres of emergent marsh, tidal channels, and associated upland habitat and 1,000 acres of deep water (greater than 20 feet) habitat. All on-site fill would come from dredging within Franks Tract.

Improves 12 miles of remnant levees around Franks Tract and Little Franks Tract to shelter flood protection levees and adjacent waterways from waves.

Reduces the number of hunting blinds by 29-36, depending on the viability of proposed deeper water blinds, but creates diverse new hunting opportunities in tidal marshes.

Does not significantly alter flood conveyance or high water levels in Franks Tract.

Creates 5 sheltered beach locations.

LEGEND

- Public Access Point (non-motorized only)
- Private Marina Water Access
- Tidal Marsh
- Upland Riparian
- Camp Sites/ Day-use Areas
- Beaches
- Dock

water quality impacts. The resulting channels are sized to allow fast, two-way boat travel.

Recreation: Recreational features focus on maintaining open water areas for boating and creating new types of recreational opportunities. Slow-water channels, especially in Little Franks Tract, would allow for non-motorized boating. Well-designed beaches would offer day use, sunbathing, swimming, as well as proximity to the water for water skiing and wakeboarding. Mooring coves would provide sheltered destinations for boaters. Opportunities to maintain or enhance sport fishing were integrated into the design of habitat enhancements (See Ecology).

Local Economy: The economic wellbeing of Bethel Island is reliant on the popularity of outdoor recreation in the central Delta. Jobs data show that approximately half the employment on Bethel Island is directly tied to recreation. A key planning consideration for the project was how best to balance the range of recreation interests while maintaining or benefiting the local economy. The current and ongoing degradation of environmental conditions in Franks Tract is a business risk. If the boating and fishing conditions are first-rate, and navigation and access are sustained or improved, the prospects for ongoing local business success are strongest. Overall, the key objectives of the Franks Tract project are in line with local business goals and economic development. The project seeks to reduce weeds, restore native ecology, and enhance recreation, all which could help grow local economic opportunity.

Ecology: Extensive new areas of tidal wetland would provide enhanced habitat and food production for fish and wildlife. Tidal marsh with narrow channels along the north of Franks Tract would provide refuge and a corridor for out-migrating juvenile Chinook salmon. The creation of tidal marsh in Little Franks Tract and the western part of Franks Tract would provide rearing and foraging habitat and food web support in the areas Delta smelt are most likely to occur. Modeling indicates that fisheries benefit from the project due to reduced risk of entrainment into Old River and the water supply pumps. The redesign project would maintain areas of sportfish habitat, as bass fishing is a key economic driver. The additional edge habitat along tidal marshes and remaining open water provided would be desirable for largemouth bass and striped bass respectively.

Water Quality: Based on hydrodynamic modeling conducted for the project, the overall configuration of tidal wetlands in all three final landscape redesign concepts would reduce salinity transport through Franks Tract, with meaningful improvements to water quality for drinking and irrigation supply, among many beneficial uses. More in-depth modeling indicates that the preferred concept improves water quality in the central Delta under a variety of flow conditions and reduces potential fish entrainment, which currently limits in-Delta diversions and the reliability of water operations. The project provides significant drought protection, reducing the frequency with which an emergency salinity control structure would be needed. Moreover, the relative efficacy of the project goes up as sea level rises.

Flood Protection: Remnant levees around Franks Tract shelter critical flood protection levees from overtopping and erosion from waves. The Bethel Island Municipal Improvement District and others are interested in project features that enhance the remnant levees in order to reduce required flood protection levee maintenance activities and associated costs. The preferred concept for the project would raise and widen levees with dredge or other material while retaining key gaps used by boaters. Flood modeling was conducted on the preferred concept using 2017 flood season data to simulate flood water levels throughout the Delta. Results indicate the preferred concept does not significantly alter flood conveyance or high water levels on the Tract.

Construction & Cost

Rearranging a vast shallow open water area into a new landscape is an ambitious construction task. The Franks Tract 2020 project conducted an assessment of construction options, reviewing feasibility and engineering constraints, types of onsite fill material, duration of construction, and unit rates for movement of material. The assessment concludes that the preferred design concept is feasible to construct (see chart). Local material dredged from Franks Tract is the least cost alternative and is available in sufficient quantities to construct the preferred concept. The project pricetag is estimated at $560 million, though costs could be lowered by reducing the area of constructed land mass in Franks Tract and Little Franks Tract. The duration of the construction period is estimated at four to nine years minimum.

Restoration Quantity	Preferred Concept
Marsh Area (acres)	1,370
Recreational Use (acres)	12
Fill to Grade (CY)	25,834,000
Consolidation (CY)	11,401,000
Total Fill/ Dredging (CY)	**37,235,000**

CY= cubic yards

Project Relation to Water Project Operations

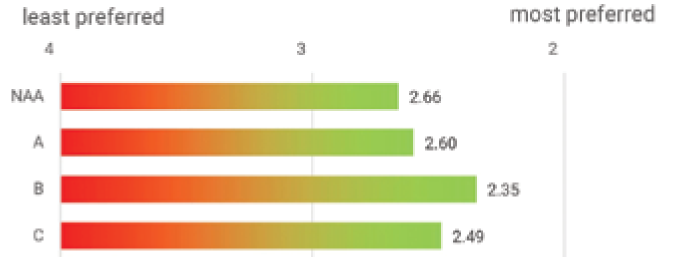
The Franks Tract project does not influence decisions about water project operations, water quality standards, direct improvement of existing flood protection levees, and local infrastructure planning. However, the Advisory Committee did ask the planning team to qualitatively consider how ongoing water project operations and any delta conveyance project may relate to the proposed Franks Tract reconfiguration. The planning team considered various seasonal and flow scenarios and concluded that changes in water project operations in response to the project are unlikely to significantly offset the project's water quality benefits in the central Delta for most seasons across a range of wet and dry hydrologies. Tunnels would not alter the Delta outflow required to meet regulatory requirements nor do they free the agencies from their obligations to do so. The scenario in which Franks Tract and any Delta conveyance project would most likely have to be considered together is the fall during dry or critically dry years (see p.55 FTF2020 & Appendix D for details).

Future Outlook

The landscape redesign and enhancement actions developed and selected through the 2019-2020 co-design process suggest a bold, sustainable change in the heart of the Delta. Stakeholders recognize that any feasible project must achieve multiple benefits to generate sufficient public and financial support for what would be a major construction effort. In addition, any project must ultimately be supported by the local community to move forward. As stakeholders and the public consider the future of Franks Tract, the following key findings offer a foundation for next steps.

- At the highest level for consideration, a redeveloped Franks Tract offers an opportunity for improvements in ecology, recreation, water quality, and other community benefits.
- Public surveys agree with the Advisory and Steering Committees that Concept B currently offers the best redesign vision for Franks Tract.
- There would be unavoidable trade-offs with any project, especially with respect to costs and construction impacts, but the cost of taking no action is high.
- Project benefits are expected to be resilient to future sea-level rise.

Overall Comparative Ranking of Design Concepts



Summer 2020 public survey rankings of 3 design concepts for Franks Tract and No Action alternative. Source: UCD

- For the local community, enhancing recreational opportunities is a must. A project without a robust recreational component and reliable sources of funding to maintain this component will lose community support.
- For State Parks, the proposed recreational components would require: development of new State Park operation and maintenance facilities in the vicinity of Franks Tract, a General Plan amendment or new management plan for the State Recreation Area, funding to support the operation and maintenance of the new recreation facilities and recreation use, and the establishment of new staff positions to support the new facilities and activities.
- Broad local, regional, state, and federal support is needed to move the project forward, including identifying sources of funding. Before any project would move forward, construction funding would need to be secured, along with a commitment to long-term operations and maintenance funding for recreational, habitat and water quality changes.
- Since cost remains a high-level feasibility issue, the next phase would explore project refinements to reduce overall costs.
- Other outstanding issues remain further work on how best to make boating through the dangerous corner at Holland Tip safer; further consultation with duck hunters and others in the design and management plans for the proposed marshlands and hunting blinds; further discussions with stakeholders on marsh aesthetics and the experience of boating through a channel between landmasses; further efforts to creatively separate conflicting activities (such as motorized and non-motorized boating) by distancing them in time and space; developing a clearer design for a State Parks facility in the vicinity of Franks Tract; and considering key remaining design issues for Little Franks Tract so that it can provide scarce habitat and food for native fish.

Acknowledgements in Brief
Advisory & Steering Committees

Primary Consultants: Environmental Science Associates; University of California Davis; Dangermond Group; Compass Resource Management; Moffat & Nichol; Economic and Planning Systems.

California Agencies: Fish & Wildlife, Water Resources, Parks & Rec

Report Production: Ariel Okamoto & Darren Campeau

Project Contact: Carl.Wilcox@wildlife.ca.gov

Franks Tract Futures Information: https://franks-tract-futures-ucdavis.hub.arcgis.com https://wildlife.ca.gov/Conservation/Watersheds/Franks-Tract

FRANKS TRACT FUTURES 2020

reimagined

Options for enhancing navigation, recreation, ecology, and water quality in the central Delta

California Department of Fish and Wildlife

September 30, 2020

Acknowledgements

The planning team would like to thank the members of the project's Advisory Committee and Steering Committee for all the time, effort and great ideas they contributed to the project. We would also like to thank East Bay Regional Parks and the San Joaquin Yacht Club for providing us with space to gather for our project meetings and thank local residents, boaters, business owners and the general public for all their input and feedback throughout this planning process. Thanks also to those who took the time to comment on the draft version of this report; the final version benefitted greatly from the comments received. Without all the assistance, knowledge sharing and participation from these people, there would be no report to share. Thank you.

Credits

PROJECT MANAGEMENT

Carl Wilcox, California Department of Fish and Wildlife

Michelle Orr, P.E., Environmental Science Associates (ESA)

Kathleen Berridge, ESA

Technical Teams

CONCEPTUAL DESIGN AND INTEGRATION

ESA Associates
Michelle Orr, PE
Kathleen Berridge

UC Davis
Brett Milligan, Professor of Landscape Architecture and Environmental Design, UC Davis

Alejo Kraus-Polk, Ph.D. candidate in Geography, UC Davis

Yiwei Huang, Ph. D. candidate in Department of Human Ecology, UC Davis

Compass
Dan Ohlson, Compass Resource Management

STAKEHOLDER AND PUBLIC OUTREACH AND ENGAGEMENT

Milligan, Kraus-Polk, Huang, UC Davis (see above)

STRUCTURED DECISION MAKING

Ohlson, Compass (see above)

HYDRODYNAMICS

Eli Ateljevich PE, Ph.D. Bay-Delta Office, Delta Modeling Section California Department of Water Resources (DWR)

Kijin Nam PE, Ph.D. Bay-Delta Office, Delta Modeling Section, DWR

ECOLOGY

Berridge, ESA (see above)

Chris Fitzer, ESA

Rachel Brownsey, ESA

John Bourgeois, ESA

Bruce Herbold, Ph. D. Fish Biologist

Lars Anderson, Ph. D. Botanist

RECREATION AND NAVIGATION

Karin Winters, The Dangermond Group (TDG)

Pete Dangermond, TDG

Milligan, Kraus-Polk, Huang, UC Davis (see above)

LOCAL ECONOMY

Ben Sigman, Economic & Planning Services (EPS)

Ashley Boots, EPS

CONSTRUCTABILITY AND COSTS

Mads Jorgenson, PE. Moffatt & Nichol

DESIGN GRAPHICS AND REPRESENTATION

Milligan, Kraus-Polk, Huang, UC Davis (see above)

REPORT PRODUCTION

Editor: Ariel Rubissow Okamoto

Design: Darren Campeau

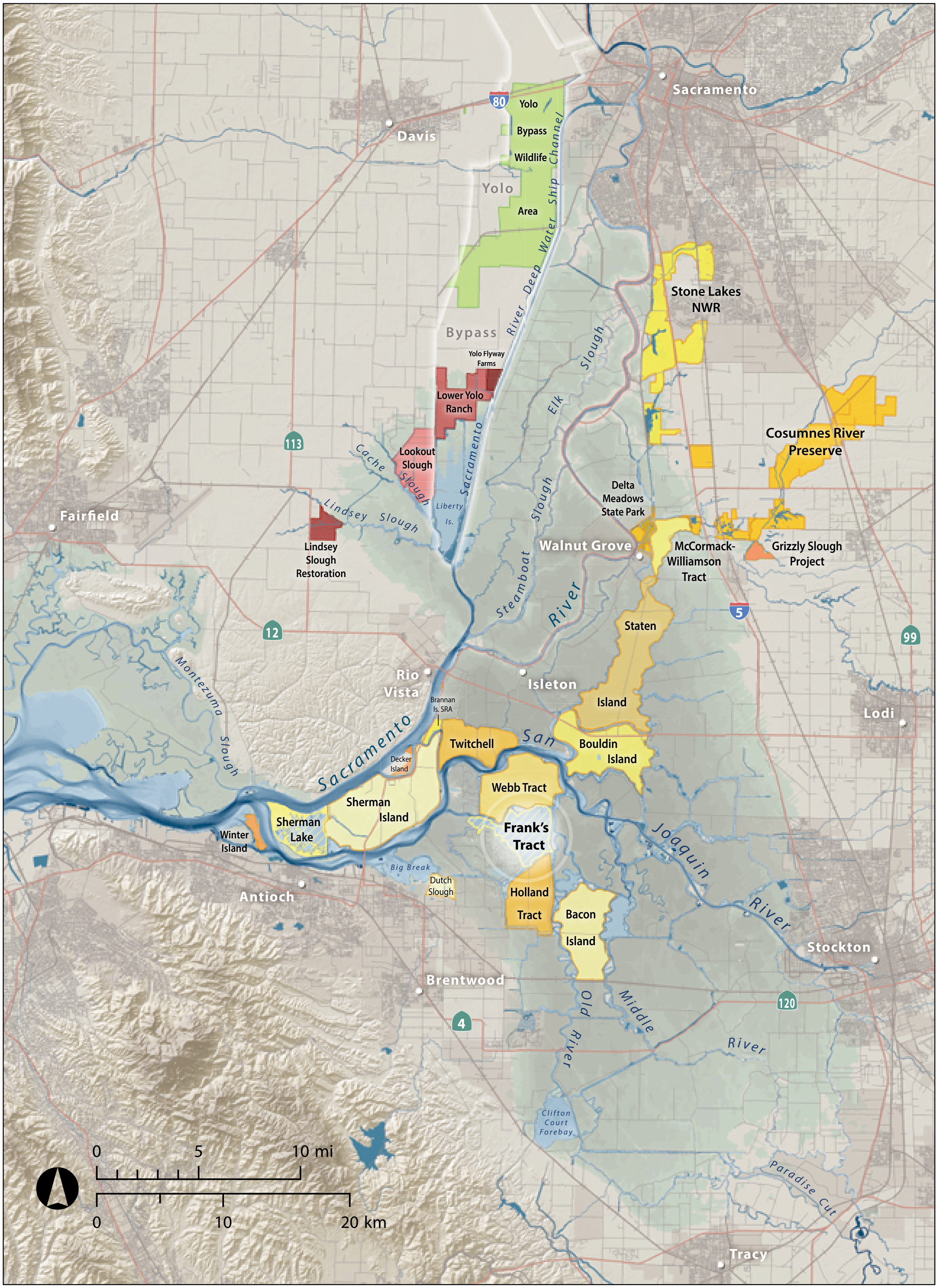
Funding provided by the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 (Proposition 84).

Franks Tract Futures Project Website:

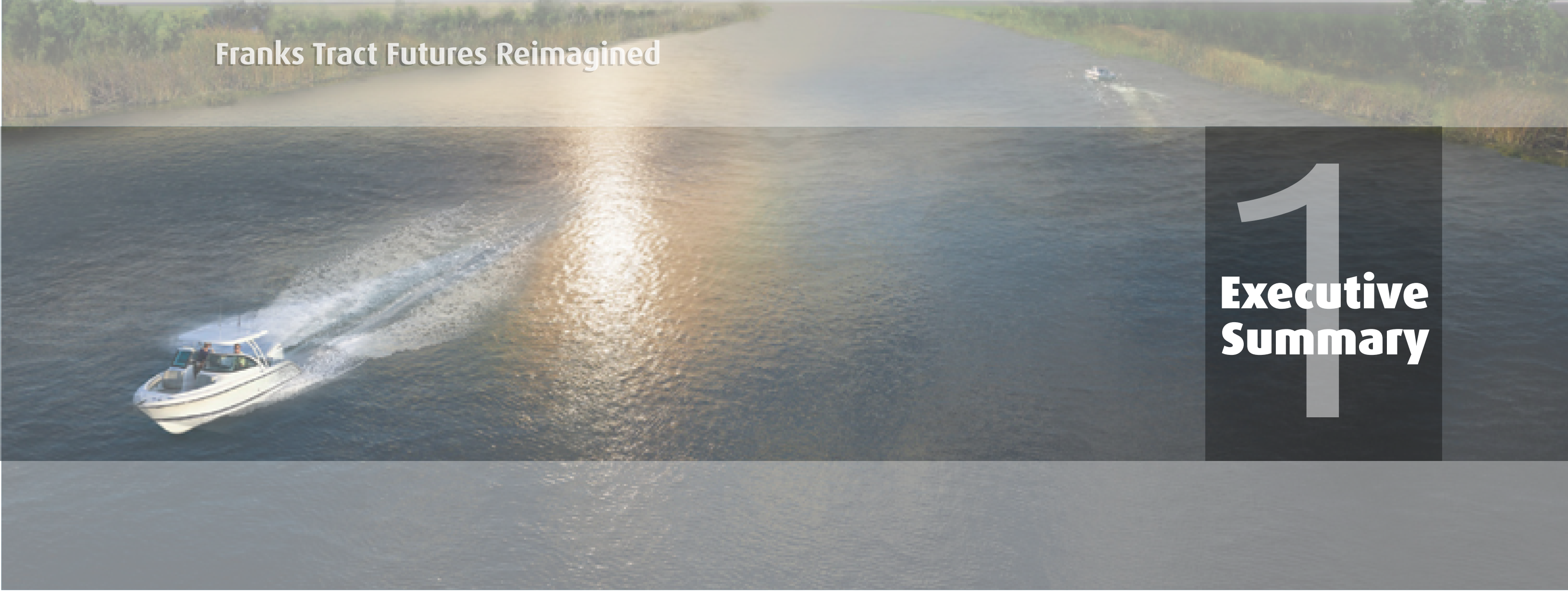
https://franks-tract-futures-ucdavis.hub.arcgis.com

CONTENTS

Delta Restoration Frontiers



Planned restoration and fish habitat: Cache Slough (red); Yolo Bypass Wildlife Area (green); Bypass (white boundary) and public lands corridor (various shades of yellow). Map: Amber Manfree



1 Executive Summary

A Bold Landscape Redesign in the Heart of the Delta

This summary of the 2020 Franks Tract Futures Reimagined report describes a proposal to redesign and enhance the 3,000-acre flooded island, and the smaller adjacent Little Franks Tract. The Tract is located about 40 miles south of Sacramento, California in the Sacramento-San Joaquin River Delta. The report covers a 2019-2020 planning process and community input into a proposal for improving conditions within the Tract first explored in 2017-2018.

Franks Tract, a shallow lake-like area, is a popular recreational and fishing destination in the Delta, with associated important benefits to the local economy on Bethel Island. However, it is also a hot spot for invasive plants, predatory fishes and saltwater intrusion from the ocean into waterways used to convey freshwater supplies to cities and agriculture throughout California.

As one of the least subsided and largest flooded islands in the central Delta, Franks Tract is a strong candidate for regional scale improvements to navigational channels, shoreline recreational amenities, and ecosystem function. Since 2017, the California Department of Fish and Wildlife, working with other state agencies and a multi-disciplinary consultant team, has undertaken a two-stage planning process to develop and evaluate a multi-benefit project for enhancing Franks Tract. After the second 2019-2020 phase, which involved four public-facing rounds of design and comment, a single design was selected as the preferred concept. The process and proposed changes embody emerging conservation guidance for the region described in the 2018 *A Delta Renewed, 2019 Delta Conservation Framework*, and the ongoing Public Lands Strategy.

Project Benefits

The preferred concept for Franks Tract would redesign the landscape, adding new land masses, tidal marshes, navigation channels, beaches and other amenities. The design addresses deteriorating environmental, safety, and water quality conditions in the area (see p.2). Among diverse benefits, it would: improve recreational boating and navigation (through dredging and reduction in aquatic weeds); create beaches, mooring sites, sheltered coves, day-use areas, and other amenities within the state recreation area; improve remnant levees that provide wave sheltering adjacent to Bethel Island and Little Franks Tract while maintaining open water views and marina access; create large areas of tidal marsh, riparian channel edge, and ecologically valuable features that provide habitat for a variety of species, including species of concern, sport fish and waterfowl; improve water quality for human use by reducing salinity in the central and south Delta; and help Franks Tract and local communities adapt to sea level rise (see map p.4).

Photo: Rick Lewis

Co-Design with the Public and Stakeholders

Meaningful public engagement in planning and design has been a guiding principal of the Franks Tract landscape redesign and enhancement project. Designing with, rather than designing for, those who have a stake in the outcome was and is a top priority. Incorporating local knowledge and stakeholder priorities also requires a strong grounding in place – the unique place that is Franks Tract in the central Delta.

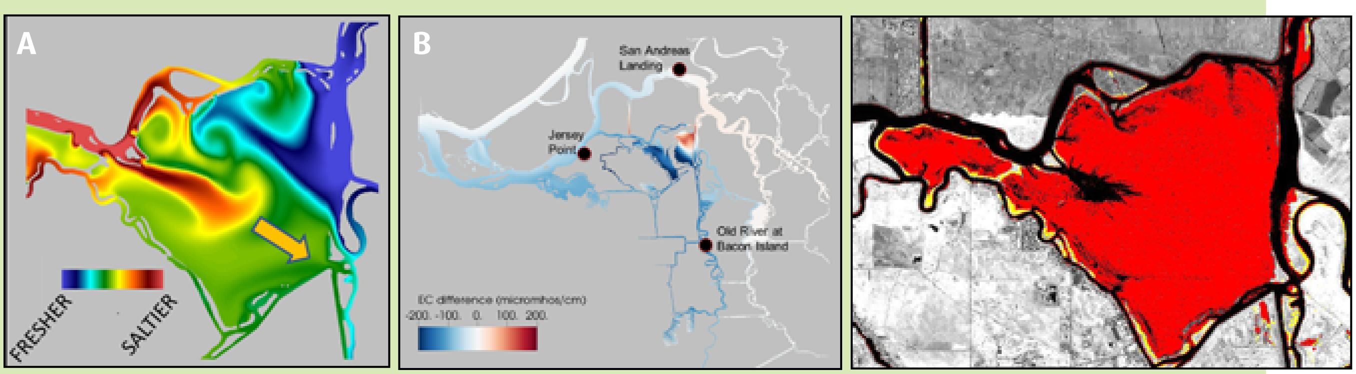
The goals of the Franks Tract project are to benefit native and desirable species by re-establishing natural ecological processes and habitats, provide enhanced recreational opportunities and other community benefits, and improve water quality. More detailed project objectives reflect input from prior Franks Tract restoration efforts, State Parks' General Plan for the Tract, and stakeholder input. Overall, the project seeks to find a balance of benefits across all objectives that will be sustainable over time.

The project team engaged with state and federal agencies, local districts, community members and other stakeholders throughout the planning process, and made the results transparent at every level. The project formed a Steering Committee, comprised of relevant state and local agency representatives, and an Advisory Committee, comprised of representatives of many diverse stakeholder interests. These committees served as the central bodies for deep engagement in the Franks Tract planning process. Public input was solicited early in the process, as well as during and after concept refinements via meetings held in the vicinity of Bethel Island, online Franks Tract user surveys, and other outreach (see timeline p.3). Public comments received on a draft version of this report resulted in revisions incorporated into the final report.

Deteriorating Conditions

While boaters, hunters, and anglers clearly value the open waters of Franks Tract, the ecological and water quality problems of this island are now impinging on the greater Delta and California water uses and compromising what the local economy values most: access to first- rate recreational and fishing waters. If no steps are taken to improve conditions on Franks Tract, current conditions could easily worsen. Dense mats of aquatic weeds will continue to degrade fish and wildlife habitat, spur algal blooms, and impede boat passage. Management with herbicides must be ongoing and remains burdensome. At the same time, healthy tidal marshes critical to native species will remain scarce in the Delta unless more are restored in the least subsided areas like Franks Tract.

Another contributor to deteriorating conditions is the direct connection provided between the lower San Joaquin River and Old River through Franks Tract. This allows saltier water and fish to be drawn into the south Delta into the zone of influence of the state and federal water projects. The presence of even small quantities of salt compromises the quality of fresh water needed for irrigation, drinking, and other uses throughout the state. As droughts recur more frequently or lengthen with climate change, and as the sea level rises, countering salt water intrusion from the ocean will require expensive and disruptive management measures such as the emergency drought barrier built on False River in 2015. The barrier consisted of 150 tons of rock, 750 feet across the top and 120 feet wide at the base. Installation and removal cost taxpayers approximately $37 million.



Current tidal conditions pump salt water into the Tract but don't let it out again (A). Modeling suggests a reduction in these conditions in a reconfigured landscape (B). Conditions under a project would be less favorable to submerged aquatic vegetation (fall 2019 extent shown in red) Sources: DWR & Khanna, CSTARS, UCD .

Co-Design Timeline 2019-2020

Over 14 months, the planning team worked through a public process on four rounds of concepts for redesigning Franks Tract. The first round consisted of 7 potential project designs plus the No Action (no project) alternative. Input from committees and the public narrowed the field down to 3 designs, and more recently to a preferred concept (see next page).

2019

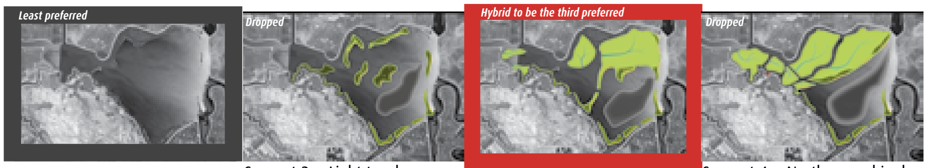
07/11 Kick-off Meeting (public)

Project background and planning process overview.
Introduction to ESA-led team and overall project approach.

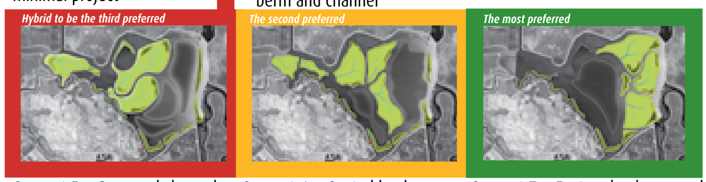
08/29 The First AC/SC Workshop

Reviewed and received input on the project goals and objectives
Reviewed and received input on the No Action alternative scenario
Shared the initial results of the (online) Stakeholder Survey
Conducted a design charrette to receive input on the first round of design concepts

ROUND 1



Concept 1 - No Action
Concept 2 - Light touch - minimal project
Concept 3 - Open water berm and channel
Concept 4 - Northern archipelago

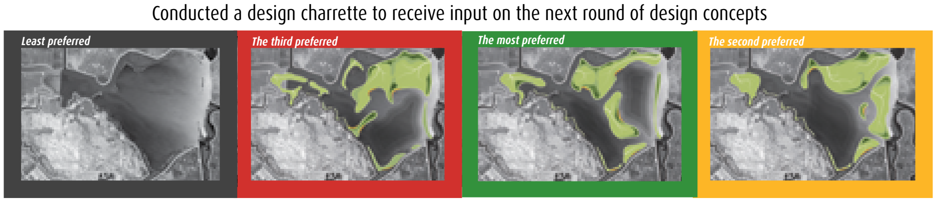


Concept 5 - Bays and channels
Concept 6 - Central land mass
Concept 7 - Eastern landmass and central island

11/06 The Second AC/SC Workshop

Reviewed and received input on the revised design concepts
Reviewed and received input on the draft evaluation methods and criteria
Shared the initial results of hydraulic modeling, received input on the initial recreational features design ideas and marsh aesthetic surveys
Conducted a design charrette to receive input on the next round of design concepts

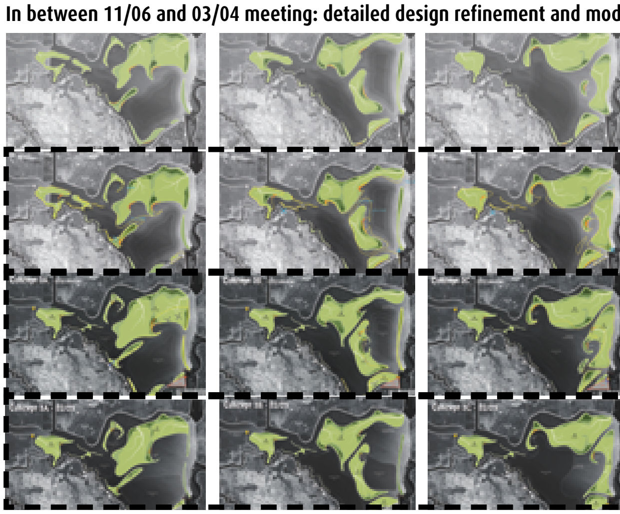
ROUND 2



Concept 2A - Open water berm and channel
Concept 2B - Central land mass
Concept 2C - Eastern landmass and central island

ROUND 3

In between 11/06 and 03/04 meeting: detailed design refinement and modeling



Revision based on 11/06 meeting feedback (AC and SC members)

Revision based technical input (construction, dredge material calculations, State Park management logistics)

Draft plan for Round 3

2020

03/04 The Third AC/SC Workshop

Reviewed and received input on the revised, 3rd round of design concepts
Reviewed the performance of the three concepts in meeting the project objectives
Conducted a design charrette to receive input on the next round of design concepts

ROUND 4

Concept 1 - No Action
Concept 3A - Open water berm and channel
Concept 3B - Central land mass
Concept 3C - Eastern landmass and central island

process is ongoing

Preferred Landscape Redesign Concept

The project design for Franks Tract and Little Franks Tract establishes a large area of intertidal marsh with channels, deepens open water areas to discourage nuisance submerged aquatic vegetation, and creates water and land based recreational opportunities. Re-establishing tidal marsh and associated channels would require raising selected areas 8-11 feet as Franks Tract is currently subsided below sea level. The design addresses all local, state and regional priorities (see pp.10-13 FTF2020) and meets all project goals and objectives (see Sections 4-5 FTF2020).

Navigation: Fast water navigation routes between key locations were identified as critical by boaters and recreational users. The project includes extensive deeper dredged areas in open water and navigable channels that would reduce growth of shallow water weeds identified as a nuisance to boating. The project includes other measures to improve boating safety, such as removing existing underwater snags and hazards, and sheltering the more wave-exposed eastern entrances to the Tract. Finding a way to allow for fast and safe boat navigation through Franks Tract while also meeting the water quality objectives was a key planning consideration. Channel widths were modeled to quantify the effects of channel size on

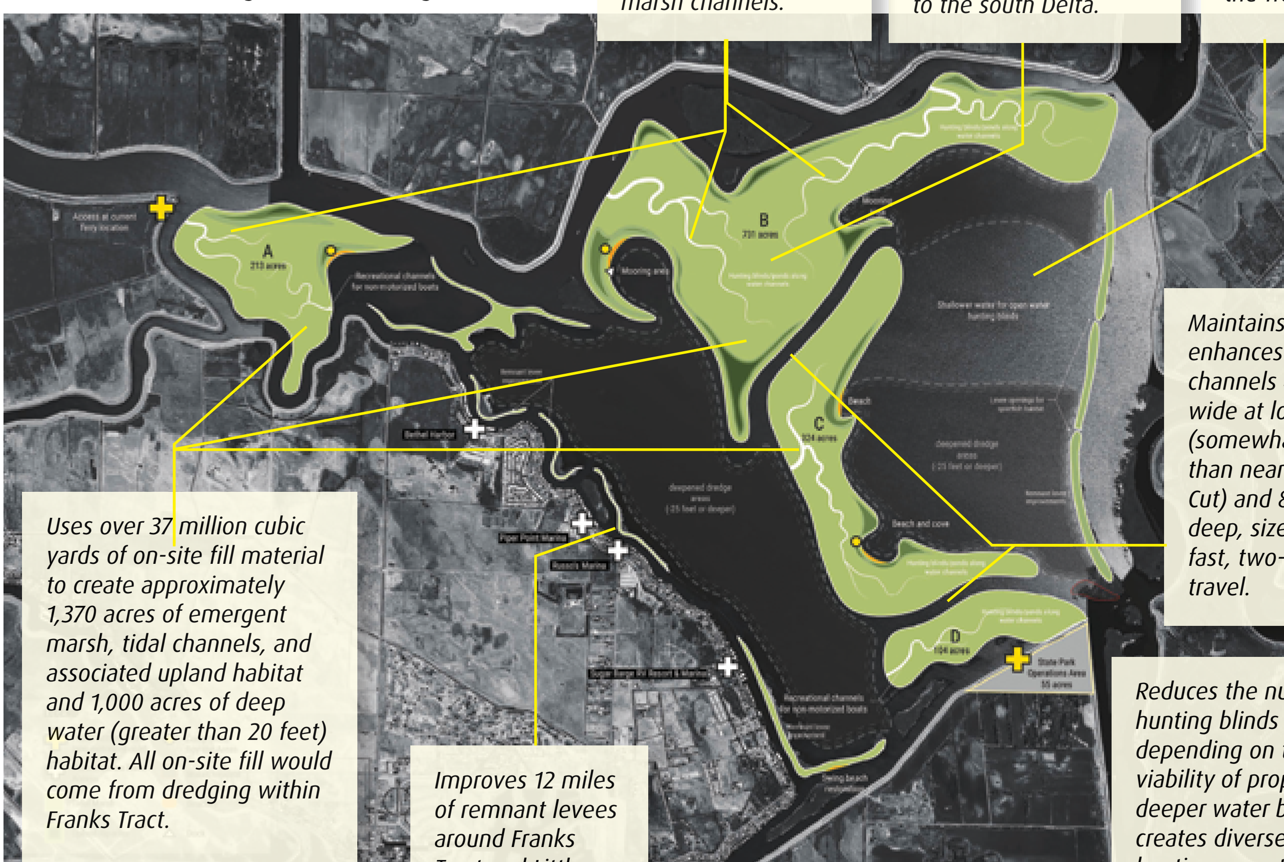
New Marsh, New Beaches, New Amenities, Less Weeds, Less Salt

The project proposed for Franks Tract develops three focal points for boat-to access to recreational activities that would attract three different user groups. The design pairs the eastern open water area with the active water sports enthusiasts; the Little Franks Tract with non-motorized boaters and paddlers; and the north end of the western open water area with a mooring for those with larger boats.

Creates approximately 21 miles of tidal marsh channels.

Builds a central tidal marsh landmass which maintains open water in front of Bethel Island, creates accessible, boat-in, land-based recreation, and impedes salt water movement from the western Delta to the south Delta.

Maintains about 1,900 acres of shallow water (less than 6-8 feet deep) on the Tract.



Maintains and enhances through-channels 400 feet wide at low water (somewhat wider than nearby Holland Cut) and 8-9 feet deep, sized to allow fast, two-way boat travel.

Uses over 37 million cubic yards of on-site fill material to create approximately 1,370 acres of emergent marsh, tidal channels, and associated upland habitat and 1,000 acres of deep water (greater than 20 feet) habitat. All on-site fill would come from dredging within Franks Tract.

Improves 12 miles of remnant levees around Franks Tract and Little Franks Tract to shelter flood protection levees and adjacent waterways from waves.

Reduces the number of hunting blinds by 29-36, depending on the viability of proposed deeper water blinds, but creates diverse new hunting opportunities in tidal marshes.

Does not significantly alter flood conveyance or high water levels in Franks Tract.

Creates 5 sheltered beach locations.

LEGEND

- Public Access Point (non-motorized only)
- Private Marina Water Access
- Tidal Marsh
- Upland Riparian
- Camp Sites/ Day-use Areas
- Beaches
- Dock

water quality impacts. The resulting channels are sized to allow fast, two-way boat travel.

Recreation: Recreational features focus on maintaining open water areas for boating and creating new types of recreational opportunities. Slow-water channels, especially in Little Franks Tract, would allow for non-motorized boating. Well-designed beaches would offer day use, sunbathing, swimming, as well as proximity to the water for water skiing and wakeboarding. Mooring coves would provide sheltered destinations for boaters. Opportunities to maintain or enhance sport fishing were integrated into the design of habitat enhancements (See Ecology).

Local Economy: The economic wellbeing of Bethel Island is reliant on the popularity of outdoor recreation in the central Delta. Jobs data show that approximately half the employment on Bethel Island is directly tied to recreation. A key planning consideration for the project was how best to balance the range of recreation interests while maintaining or benefiting the local economy. The current and ongoing degradation of environmental conditions in Franks Tract is a business risk. If the boating and fishing conditions are first-rate, and navigation and access are sustained or improved, the prospects for ongoing local business success are strongest. Overall, the key objectives of the Franks Tract project are in line with local business goals and economic development. The project seeks to reduce weeds, restore native ecology, and enhance recreation, all which could help grow local economic opportunity.

Ecology: Extensive new areas of tidal wetland would provide enhanced habitat and food production for fish and wildlife. Tidal marsh with narrow channels along the north of Franks Tract would provide refuge and a corridor for out-migrating juvenile Chinook salmon. The creation of tidal marsh in Little Franks Tract and the western part of Franks Tract would provide rearing and foraging habitat and food web support in the areas Delta smelt are most likely to occur. Modeling indicates that fisheries benefit from the project due to reduced risk of entrainment into Old River and the water supply pumps. The redesign project would maintain areas of sportfish habitat, as bass fishing is a key economic driver. The additional edge habitat along tidal marshes and remaining open water provided would be desirable for largemouth bass and striped bass respectively.

Water Quality: Based on hydrodynamic modeling conducted for the project, the overall configuration of tidal wetlands in all three final landscape redesign concepts would reduce salinity transport through Franks Tract, with meaningful improvements to water quality for drinking and irrigation supply, among many beneficial uses. More in-depth modeling indicates that the preferred concept improves water quality in the central Delta under a variety of flow conditions and reduces potential fish entrainment, which currently limits in-Delta diversions and the reliability of water operations. The project provides significant drought protection, reducing the frequency with which an emergency salinity control structure would be needed. Moreover, the relative efficacy of the project goes up as sea level rises.

Flood Protection: Remnant levees around Franks Tract shelter critical flood protection levees from overtopping and erosion from waves. The Bethel Island Municipal Improvement District and others are interested in project features that enhance the remnant levees in order to reduce required flood protection levee maintenance activities and associated costs. The preferred concept for the project would raise and widen levees with dredge or other material while retaining key gaps used by boaters. Flood modeling was conducted on the preferred concept using 2017 flood season data to simulate flood water levels throughout the Delta. Results indicate the preferred concept does not significantly alter flood conveyance or high water levels on the Tract.

Construction & Cost

Rearranging a vast shallow open water area into a new landscape is an ambitious construction task. The Franks Tract 2020 project conducted an assessment of construction options, reviewing feasibility and engineering constraints, types of onsite fill material, duration of construction, and unit rates for movement of material. The assessment concludes that the preferred design concept is feasible to construct (see chart). Local material dredged from Franks Tract is the least cost alternative and is available in sufficient quantities to construct the preferred concept. The project pricetag is estimated at $560 million, though costs could be lowered by reducing the area of constructed land mass in Franks Tract and Little Franks Tract. The duration of the construction period is estimated at four to nine years minimum.

Restoration Quantity	Preferred Concept
Marsh Area (acres)	1,370
Recreational Use (acres)	12
Fill to Grade (CY)	25,834,000
Consolidation (CY)	11,401,000
Total Fill/ Dredging (CY)	**37,235,000**

CY= cubic yards

Project Relation to Water Project Operations

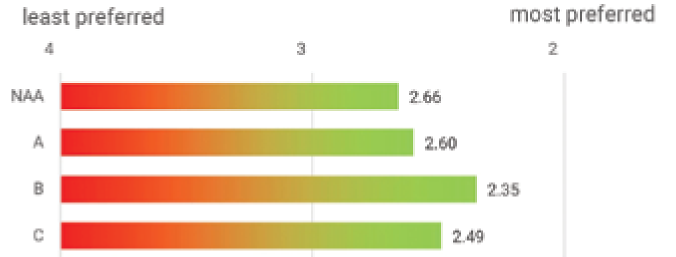
The Franks Tract project does not influence decisions about water project operations, water quality standards, direct improvement of existing flood protection levees, and local infrastructure planning. However, the Advisory Committee did ask the planning team to qualitatively consider how ongoing water project operations and any delta conveyance project may relate to the proposed Franks Tract reconfiguration. The planning team considered various seasonal and flow scenarios and concluded that changes in water project operations in response to the project are unlikely to significantly offset the project's water quality benefits in the central Delta for most seasons across a range of wet and dry hydrologies. Tunnels would not alter the Delta outflow required to meet regulatory requirements nor do they free the agencies from their obligations to do so. The scenario in which Franks Tract and any Delta conveyance project would most likely have to be considered together is the fall during dry or critically dry years (see p.55 FTF2020 & Appendix D for details).

Future Outlook

The landscape redesign and enhancement actions developed and selected through the 2019-2020 co-design process suggest a bold, sustainable change in the heart of the Delta. Stakeholders recognize that any feasible project must achieve multiple benefits to generate sufficient public and financial support for what would be a major construction effort. In addition, any project must ultimately be supported by the local community to move forward. As stakeholders and the public consider the future of Franks Tract, the following key findings offer a foundation for next steps.

- At the highest level for consideration, a redeveloped Franks Tract offers an opportunity for improvements in ecology, recreation, water quality, and other community benefits.
- Public surveys agree with the Advisory and Steering Committees that Concept B currently offers the best redesign vision for Franks Tract.
- There would be unavoidable trade-offs with any project, especially with respect to costs and construction impacts, but the cost of taking no action is high.
- Project benefits are expected to be resilient to future sea-level rise.

Overall Comparative Ranking of Design Concepts



Summer 2020 public survey rankings of 3 design concepts for Franks Tract and No Action alternative. Source: UCD

- For the local community, enhancing recreational opportunities is a must. A project without a robust recreational component and reliable sources of funding to maintain this component will lose community support.
- For State Parks, the proposed recreational components would require: development of new State Park operation and maintenance facilities in the vicinity of Franks Tract, a General Plan amendment or new management plan for the State Recreation Area, funding to support the operation and maintenance of the new recreation facilities and recreation use, and the establishment of new staff positions to support the new facilities and activities.
- Broad local, regional, state, and federal support is needed to move the project forward, including identifying sources of funding. Before any project would move forward, construction funding would need to be secured, along with a commitment to long-term operations and maintenance funding for recreational, habitat and water quality changes.
- Since cost remains a high-level feasibility issue, the next phase would explore project refinements to reduce overall costs.
- Other outstanding issues remain further work on how best to make boating through the dangerous corner at Holland Tip safer; further consultation with duck hunters and others in the design and management plans for the proposed marshlands and hunting blinds; further discussions with stakeholders on marsh aesthetics and the experience of boating through a channel between landmasses; further efforts to creatively separate conflicting activities (such as motorized and non-motorized boating) by distancing them in time and space; developing a clearer design for a State Parks facility in the vicinity of Franks Tract; and considering key remaining design issues for Little Franks Tract so that it can provide scarce habitat and food for native fish.

Acknowledgements in Brief
Advisory & Steering Committees

Primary Consultants: Environmental Science Associates; University of California Davis; Dangermond Group; Compass Resource Management; Moffat & Nichol; Economic and Planning Systems.

California Agencies: Fish & Wildlife, Water Resources, Parks & Rec

Report Production: Ariel Okamoto & Darren Campeau

Project Contact: Carl.Wilcox@wildlife.ca.gov

Franks Tract Futures Information: https://franks-tract-futures-ucdavis.hub.arcgis.com https://wildlife.ca.gov/Conservation/Watersheds/Franks-Tract

2 Introduction

This report describes a proposal to improve Franks Tract, a 3,000-acre flooded island, and the smaller adjacent Little Franks Tract, about 40 miles south of Sacramento, California. The report covers a 2019-2020 planning process and community input into a proposal for enhancement and renewal of the Tract first explored in 2017-2018.

Franks Tract, a shallow lake-like area, is a popular recreational and fishing destination in the heart of the Delta region, with associated important benefits to the local economy. However, it is also a hot spot for invasive plants, predatory fishes and saltwater intrusion from the ocean into waterways used to convey freshwater supplies to cities and agriculture throughout California.

As one of the least subsided and largest, flooded islands in the central Delta, Franks Tract is a strong candidate for regional scale improvements to navigational channels, shoreline recreational amenities, and ecosystem function. Since 2017, the California Department of Fish and Wildlife (CDFW), working with other state agencies and experts, has undertaken a two-stage planning process to develop and evaluate a multi-benefit project for enhancing Franks Tract. To conduct the planning process, CDFW hired a multidisciplinary consultant team led by Environmental Science Associates and supported by University of California Davis researchers, the Dangermond Group, Compass Resource Management, Moffat & Nichol, Economic and Planning Systems, and others. During the most recent 2019-2020 planning phase, the team worked with a steering committee and an advisory committee made up of local stakeholders and the public to co-design four iterations of conceptual designs, including evaluations of their respective benefits to navigation, recreation, local economies, ecological processes, tidal marsh habitat, flood protection, water quality, and water supply reliability, as well as construction costs, and construction impacts. Ultimately, a single design was selected as the preferred concept. This report outlines the processes used to engage stakeholders and the public, presents conceptual designs, and explores the benefits and tradeoffs of the preferred concept in achieving multiple benefits for the community and Delta region.

Site History

Franks Tract is located in the Sacramento –San Joaquin Delta (Delta) in California's Central Valley. The Delta is where fresh water from major rivers (the Sacramento River in the north and the San Joaquin River in the south) mixes with salt water from ocean tides (San Francisco Bay and the Pacific Ocean to the west). Historically, the Delta, including Franks Tract and Little Franks Tract, was an extensive network of tidal marsh and inter-tidal channels. Beginning in the late 1800s, levees were constructed to create islands for agricultural use. Over time, these levees degraded and breached. Levees around Franks Tract and Little Franks Tract repeatedly failed. After a breach in 1938, the Franks Tract levees were not repaired, leaving the island submerged. Decades later, in 1982, Little Franks Tract also flooded, leaving the large flooded island landscape seen today.

In terms of the historic Delta landscape, reclamation fundamentally altered the region's character by creating islands and eliminating, straightening and connecting dead-end channels. The increase in interconnectedness, along with subsequent flooding of subsided islands like Franks and Little Franks Tract, has doubled the area of open water habitat in the Delta, changed tidal circulation patterns, reduced water residence times, and increased flow velocities. These changes have also reduced food web production, shelter, and habitat complexity for aquatic species throughout the Delta (*Delta Transformed*, SFEI, 2014).

Navigation Map Franks Tract

Franks Tract today consists of two main water bodies — a large 3,000 acre submerged area and a 330-acre portion known as Little Franks Tract. The Tract is surrounded by a network of waterways and adjacent islands. On the north side lies False River and Webb Tract, on the east Old River and Mandeville Island, on the south Sand Slough and Holland Tract, and on the west Piper Slough and Bethel Island.

Current Conditions

Franks and Little Franks Tract are vast, flooded islands dominated by shallow open water with little tidal marsh. The majority of the open-water area is less than 10 feet deep (6 to 8 feet below mean lower low water) and filled with dense submerged aquatic vegetation. The substrate is relatively uniform, composed of silt, sand, and peat. Tules and submerged aquatic vegetation grow in the open water areas and along the shorelines of the Tract. Extensive reaches of Brazilian waterweed (*Egeria densa*), a non-native submerged plant species, can be found in Franks Tract and throughout the Delta. The infestation of Egeria and other submerged aquatic plants presents challenges for navigation, recreation, agriculture, and ecosystem processes. Nonetheless, the Tract supports a variety of native and non-native wildlife including fish, birds, mammals, and plants. Most of the fish currently in Franks Tract are non-native fish species, particularly largemouth bass, striped bass, and sunfishes. The prevalence of invasive plants and the associated predatory fish community (Grossman 2016) make the area poor habitat for native species such as Delta smelt.

Franks Tract encompasses the Franks Tract State Recreation Area, owned and managed by the California Department of Parks and Recreation (State Parks). Classification as a State Recreation Area indicates the area was selected and developed, and is now operated, to provide outdoor recreation opportunities (Public Resources Code Section 5019.56). Franks Tracts is a popular destination for boating and water sports, fishing, and waterfowl hunting but the area offers few land-based recreational opportunities for non-boaters. Fishing tournaments and other recreational events are often based in marinas along the Bethel Island waterfront. These facilities contribute to the local community and economy.

While boaters, hunters, and anglers clearly value the open waters of Franks Tract, the ecological and water quality problems of this island are now impinging on the greater Delta and California water uses. The biggest problem is the direct connection provided by Franks Tract between the lower San Joaquin River and Old River through False River. This allows salt water and fish to be drawn into the south Delta into the zone of influence of the state and federal water projects.

See Background Primer (p.14) for more detailed background on key environmental problems in the Tract.

Future Outlook

If no steps are taken to improve recreational and habitat conditions on Franks Tract, current conditions could easily worsen. While sportfishing and other current recreational activities may continue, navigational hazards and poor ecosystem quality will persist as aquatic vegetation grows and spreads. Dense mats of aquatic weeds will continue to degrade fish and wildlife habitat, spur algal blooms, and impede boat passage. Management with herbicides must be ongoing and remains costly.

Healthy tidal marshes critical to native species will remain scarce in the Delta unless more are restored in the least subsided areas like Franks Tract. As droughts recur or lengthen with climate change, and as the sea level rises, salt water from the ocean will intrude increasingly into Franks Tract and the Delta. Countering such water quality challenges will require additional expensive and disruptive management measures such as emergency drought barriers like the one built on False River in 2015 (see pp. 14 and 59).

Previous Franks Tract Initiatives

The project and process described in this report build on a prior feasibility study prepared by CDFW in 2017 and 2018. The study, entitled Franks Tract Futures?, explored options for achieving multiple ecosystem and water quality benefits at the central Delta site. The 52-page 2018 study described preliminary proposals for changes to the local landscape and waterways, early stakeholder feedback from State Parks and neighboring communities, and results from initial hydrodynamic modeling and engineering studies.

One primary outcome of the 2018 planning effort was a stronger understanding of local views and concerns. From a stakeholder and public perspective, the initial design concept presented in this early study was clearly not feasible in terms economic, recreational and aesthetic values. Planners found local communities were wary of significant change to the tract, as well as of any top-down decision making that did not take their interests and place values into account. Local communities expressed significant interest in being involved in any future design and planning processes for potential changes to Franks Tract. The 2018 effort concluded with recommendations for more intentional and open communication between state agencies and the general public (see Section 3).

The current 2019-2020 design process responds to the public concerns outlined above. The team used a transparent and participatory process to see if options proposed were feasible, not just from an engineering and ecological perspective, but also in terms of community support. Throughout this document, the prior effort will be referred to as Franks Tract Futures 2018 and the current effort as Franks Tract Futures Reimagined 2020.

Photo: Brett Milligan

Context for CDFW Involvement

As California's trustee agency for the fish and wildlife, CDFW has long advocated for ecosystem restoration in the Delta. As part of the California Natural Resources Agency 2016 Delta Smelt Resiliency Strategy (see p. 10), CDFW took the lead in assessing the feasibility of restoring some of Franks Tract's historical ecological and hydrodynamic functions based on the guidance of A Delta Renewed *(2016). In the past, state and federal agencies had investigated a variety of alternatives for improving conditions at the Tract. Most prior proposals focused on water quality and supply. The current proposal focuses on achieving multiple benefits and ecological reconciliation.*

At the same time the initial Franks Tract Futures project feasibility study was being developed, CDFW was also working collaboratively within Delta communities to develop the 2018-2050 Delta Conservation Framework. *The Framework emphasizes early and active engagement with communities affected by conservation projects in order to co-create strategies to conserve natural resources. The Framework also emphasizes the importance of recognizing the Delta as place as required by the Delta Reform Act.*

At CDFW's direction, the current Franks Tract proposal addresses these other priorities, and reflects multi-objective, multi-interest decision-making by a variety of environmental, water quality, recreation, and local stakeholders. Beyond ecosystem restoration, the current planning process recognizes that any feasible project must generate sufficient public and financial support for what would be a major construction effort. The process also recognizes that any project must ultimately be supported by the local community to move forward. CDFW funded the most recent 2019-2020 Franks Tract planning process with Proposition 84 bond funds for Delta restoration.


Photo: CDFW

PLANNING PRIORITIES

The restoration and renewal of Franks Tract will not be feasible without careful consideration of the interests of its owners, neighbors, and local communities, as well as state interests in providing recreational opportunities, preserving navigational routes, recovering native species, and protecting water quality and supply for all Californians. All participants in the planning process were invited to co-create and co-design the project products, and to weave their local expertise and priorities into the knowledge base of the project.

Local Priorities

Any proposed changes to Franks Tract and Little Franks Tract will affect those who live, work and play in the area. In an effort to learn more about how the area is currently used, CDFW reached out to many of these people, using a landscape research team from UC Davis. Outreach from prior and current efforts yielded the following common areas of concern and interest:

- Navigability and access to fast water navigable channels.
- Real estate values based on access to fast water, recreation opportunities, and open water views.
- Protection of the existing local economy including marinas and service industry (restaurants, gas stations, repair shops, storage, etc.). Any proposed project should contribute to, rather than compete with, the local economy.
- Creation of, and improvements to, recreation features (beaches, mooring and day use areas, wildlife viewing, etc.).
- Secured and sustained funding for ongoing maintenance and operation of recreational facilities.
- Reduction in nuisance species like aquatic weeds.

State and Federal Priorities

The priorities and interests of both state and federal agencies are also relevant to any proposals to improve or change Franks Tract. The Tract includes a state recreation area. And early on, California recognized the potential at Franks Tract to contribute to state goals for ecosystem health and native species recovery, as well as to facilitate improved recreation and water quality in the region.

Delta Smelt Resilience

The habitat improvements proposed for Franks Tract and presented in this report would further the goals, objectives and actions recommended in the State of California's 2016 Delta Smelt Resiliency Strategy. Delta smelt is an endangered native fish species uniquely adapted to life in the estuarine mixing zone, which occurs near Franks Tract (see 2018 report). The Strategy is a science-based document prepared by the state to address both immediate and near-term needs of Delta smelt, and to promote their resiliency to drought conditions as well as future habitat variations. The Strategy relies on conceptual models developed through intensive, interagency, science modeling and research conducted in 2015 and compiled in the Interagency Ecological Program Delta Smelt Management, Analysis, and Synthesis Team (MAST) Synthesis Report. This research helped articulate a suite of actions to be implemented by state agencies in the near future to benefit Delta smelt. A team of state and federal agencies, water contractors and NGOs also developed a framework that will be used to assess the outcomes of these actions individually and synergistically over time.

The Strategy's primary objective is positive population growth (>1) for Delta smelt. Goals related to achieving this objective include population growth, improvements to habitat conditions such as increasing small dendritic channels in restored marsh and shallow turbid areas, food resources, and turbidity, as well as reducing levels of invasive species (e.g. aquatic weeds and predators) and harmful algal blooms.

Parks & Recreation

Franks Tract encompasses a State Recreational Area (SRA). These areas are selected, developed, and operated by State Parks to provide outdoor recreational opportunities. The declaration of purpose developed for the Franks Tract SRA and approved by the State Park and Recreation Commission in 1966 is to permanently provide water-related recreational activities so that the recreational, scenic, historic, and scientific values of the area may be enjoyed by the public. The most current management plan for the area dates back to 1988. Given the potential magnitude of the changes to the Franks Tract SRA, as a result of the enhancement and renewal actions proposed in the Franks Tract 2020 study, it is likely that either an amendment to the existing General Plan, or a new management plan, is needed.

The 1988 General Plan for the Franks Tract SRA describes resource management policies; proposed uses, facilities and interpretive programs; and physical, biological, ecological, cultural, esthetic and recreational resources. In terms of its recreational value, the plan recognizes Frank Tract is an open waterway with no land-based facilities. The plan identifies fishing, waterfowl hunting, and navigation through the Delta as key existing recreational uses.

Overall State Parks supports the concept of restoring portions of Franks Tract SRA in order to benefit native fish species and to minimize habitat for non-native fish and plant species. State Parks does, however, have related concerns about ongoing maintenance and management costs resulting from the proposed creation of additional recreational features.

Water Quality and Supply

The Delta is a primary source of the state's freshwater supply for human consumption and agricultural uses. The two main water diversion programs, in addition to in-Delta uses, are the State Water Project and the Central Valley Project. The State Water Project, administered by the California Department of Water Resources (DWR), captures, stores, and conveys water from the Sacramento and San Joaquin Rivers to several water agencies throughout the state. Similarly, the Central Valley Project is a federal facility administered by the United States Bureau of Reclamation that stores and transports water for irrigation and municipal purposes used in the Central Valley and elsewhere.

Water derived in the Delta is used for a variety of purposes, including irrigation, domestic consumption, industrial use (i.e., power plant cooling), and environmental protection (i.e., habitat maintenance and water quality improvement). Water use and the volume of water available for use are in part controlled by water quality standards established in the Bay-Delta Water Quality Control Plan and enforced by State Water Resource Control Board to protect beneficial uses.

The planning team proposing a landscape redesign and enhancement of Franks Tract evaluated benefits and impacts under existing water operations and potential future operations of interest or concern to stakeholders. While DWR is coordinating with the project and provided hydrodynamic modeling of enhancement scenarios, the project is being developed independently from ongoing water operations, Delta exports, or proposals for alternate conveyance (see p. 23 Scope and p. 58).

Hunters enjoy blinds in Franks Tract. Photo: Alejo Kraus-Polk

Emerging Conservation Guidance

The landscape redesign and enhancement actions described in the following pages suggest a bold, sustainable change in the heart of the Delta that is in keeping with current and emerging state priorities. The proposed design offers a model of the kind of larger scale approach based on natural physical processes recommended in three important conservation visions for the region and the upper part of the San Francisco Estuary: the 2016 *A Delta Renewed*, the 2018 *Delta Conservation Framework*, and *the Delta Public Lands Strategy*.

A Delta Renewed is the last of a series of three sequential reports developed by the San Francisco Estuary Institute with support from CDFW. The reports provide the technical and scientific basis for a suggested approach to restoring the Delta. Based on input from twelve academic and government science advisors, the reports outline the Delta's past and present conditions, and suggest restoration approaches focused on harnessing the remaining natural physical processes in this much-altered and re-engineered system for the future. The Franks Tract restoration approach applies the recommendations in *A Delta Renewed* for flooded islands and former marsh (see Franks Tract Futures 2018 pp. 22-23).

The *Delta Conservation Framework* was developed between 2016 and 2018 by CDFW in partnership with Delta stakeholders. These stakeholders included federal, state, and local government representatives, conservation practitioners, non-profit organizations, landowners, residents, and business owners. Three primary sets of resources guided development of the Framework: feedback from a series of public workshops held in 2016; prior plans focused on the people and ecosystems of the Delta; and best available science on ecosystem processes in the Delta. From this foundation emerged seven conservation goals, 26 strategies to reach those goals, 200 pages of details, seven appendices, and a 30-year vision for a healthier Delta for both humans and wildlife: the *Delta Conservation Framework*.

The Franks Tract Futures Reimagined 2020 vision and planning process reflects at least three Delta Conservation Framework goals prioritizing stakeholder communication, socioeconomic considerations, multi-benefit solutions, and improvement of ecological processes to benefit society, natural communities, and species recovery.

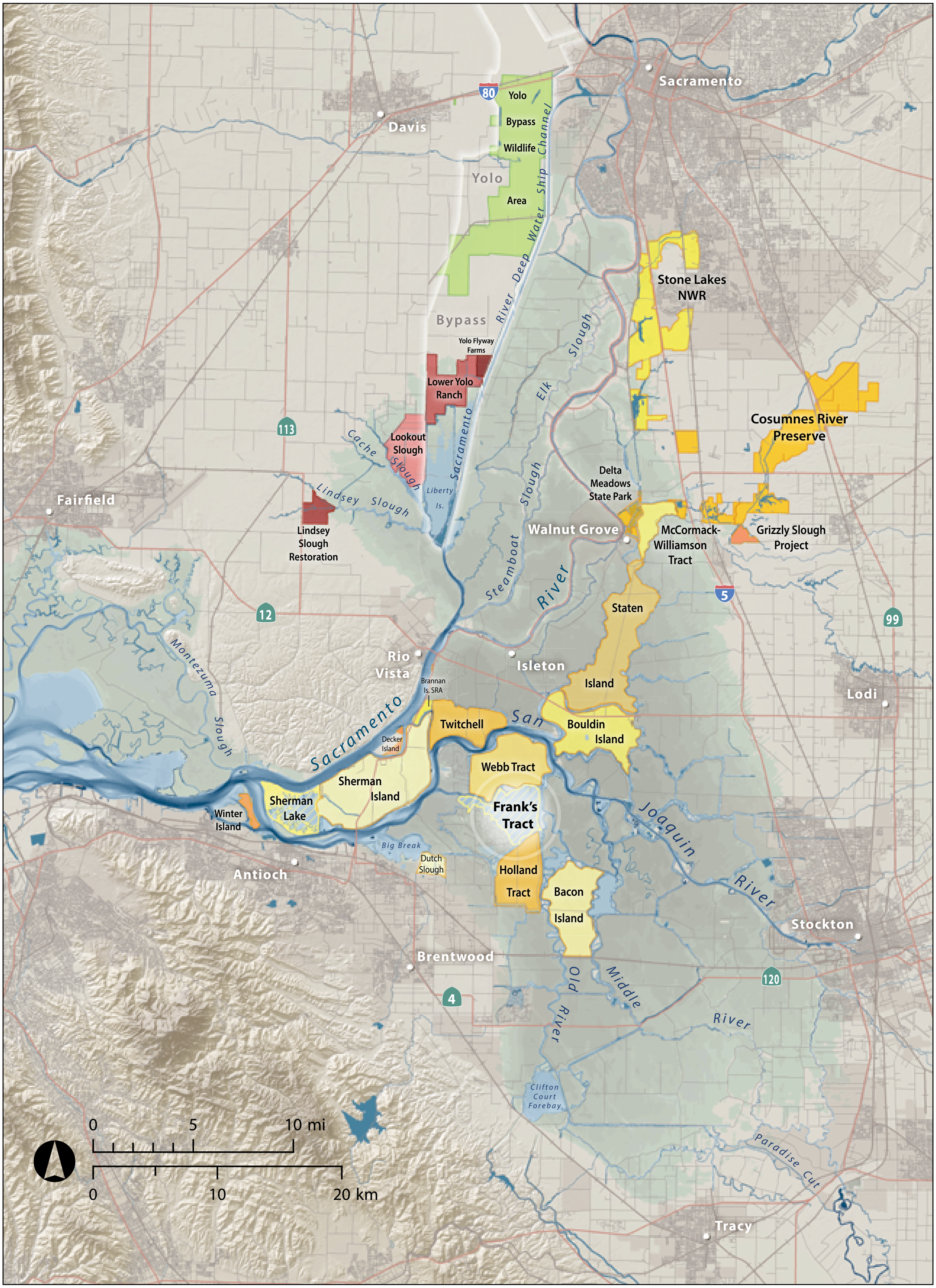
The changes proposed for Franks Tract also complement the larger conservation vision of the Delta

Healthy tidal marsh at Lindsey Slough near Cache Slough, one target area in the Delta for habitat restoration. Photo: Amber Manfree

Public Lands Strategy (formerly the Central Delta Corridor Partnership). The Strategy recognizes the need to succeed in habitat restoration on public lands first, before approaching private landowners. It focuses on engaging the owners of public, and publicly-financed lands, interconnected throughout the central Delta from north to south, in forming a conservation lands corridor. With water and landscapes connected in this corridor, more benefits for fish and wildlife can be achieved. In the north and northeast areas, the corridor is characterized by lakes, floodplains, and tidal wetlands within the Stone Lakes National Wildlife Refuge, Cosumnes River Preserve, and the Cosumnes-Mokelumne river confluence. Southward, the corridor encompasses deeply subsided islands (Staten, McCormack-Williamson Tract, Bouldin, Webb, Holland, Bacon, Twitchell, Sherman, and Decker) and the flooded Franks Tract State Recreation Area (see map p.13).

Through the public lands strategy, public landowners hope to control invasive species, improve habitat for endangered Delta smelt and salmon populations, and support recreational boating, fishing, wildlife viewing, and waterfowl hunting, among other priorities — all elements of the current vision for improving Franks Tract.

Restoration Frontiers in Delta



Planned restoration and fish habitat: Cache Slough (red); Yolo Bypass Wildlife Area (green); Bypass (white boundary) and public lands corridor (various shades of yellow). Map: Amber Manfree

Background Primer on Marshes, Weeds, Barriers


Water primrose.

Re-establishing Tidal Marsh

Over the last several decades, numerous tidal wetland restoration actions have been planned and implemented throughout San Francisco Bay and the Delta. Most of the restoration sites are highly altered from their historic natural states and have ground elevations below sea level, like Franks Tract. The basic restoration approach, and the one proposed for Franks Tract, is to place fill to raise ground elevations to intertidal elevations at which emergent marsh vegetation can establish and persist. Beyond this, there are many additional considerations for re-establishing a diversity of aquatic habitats and natural processes to the site. For example, achieving habitat heterogeneity and complexity will require the re-establishment of blind channels that help drain the tidal marsh and provide food web nutrients that can flush into larger channels to support native fish species such as Delta smelt (see also A Delta Renewed, SFEI 2016).

It is critical to achieve vegetated tidal marsh and channel forms before new marsh sediment accretion is no longer able to keep pace with rising sea levels naturally (Baylands Goals Climate Change Update 2015). Marshes maintain themselves in relation to sea level by trapping inorganic matter in the form of sediment and accumulating organic matter in the form of plant roots and other plant material. Vertical accumulation via the buildup of organic matter (such as eventually forms peat) is particularly important for marsh sustainability in the central Delta. The Franks Tract landscape redesign project would use dredge material to provide intertidal elevations necessary for marsh plant growth. This is designed to allow vegetation establishment and provide for long term resilience to rising sea levels.

Discouraging Invasive Aquatic Weeds

Invasive aquatic plants have far-reaching impacts on the Delta ecosystem and are now widespread. The total invaded area in the Delta (submerged and floating aquatic vegetation, or SAV and FAV) increased from 5,000 acres in 2008 to 16,000 acres in 2014 and almost 17,400 acres in 2015 (Khanna et al. 2016). Invasive aquatic plants have changed shoreline habitat in the Delta by slowing water velocities and increasing water clarity, conditions which further their spread (Hestir et al. 2016). This dense mat of vegetation can also offer largemouth bass places to hide and hunt. Meanwhile, native species like Delta smelt, who like to stay in open water, are more vulnerable to attack in clearer waters. Such effects can propagate up and down the food chain, affecting the entire ecosystem. Invasive aquatic plants also impede boat travel and often require mechanical removal or chemical spraying to control. Prolonged drought has likely increased shallow habitat with slow moving water ideal for aquatic weeds.

*Submerged aquatic weeds in the central Delta increased each year from 2014-2017 (Ustin et al. 2017, Khanna: personal communication). More specifically, Franks and Little Franks Tracts are heavily vegetated by aquatic weeds including Richardson's pondweed (*Potamogeton richardsonii*), Brazilian waterweed (*Egeria densa*), and water primrose (*Ludwigia spp.*). Recent drought conditions may have promoted this growth. When the emergency barrier was installed and removed in 2015, changes in the movement of water within the Tract also changed the orientation and location of weed patches, worsening them in some areas and clearing them up in others. The state has been spraying Franks Tract with the aquatic herbicide Fluridone since 2006, targeting Egeria. Over the last five years, measures of native plant species diversity indicate some promising results of continued herbicide management. At present, however, aquatic weeds remain a key reason that Franks Tract supports more non-native than native fish species. The Franks Tract project would change the island's topography, deepening some areas and raising others so that conditions are not so conducive to submerged and floating aquatic vegetation.*

Protecting Water Quality During Drought

During drought and dry summer months, salt water from ocean tides intrudes into the western Delta — closer to irrigation and drinking water intakes— because there isn't as much freshwater flowing downstream from rivers, runoff and reservoir releases to push it back out. There are few options for keeping the tides out when major reservoir levels are drawn down, snowpack is low, and so many Delta channels are connected to others except to build multiple temporary barriers across key channels. The state first built such barriers in the Delta during the mid-1970s — two in 1976 and six in 1977. In 2015, following up on modeling suggesting that a single obstruction might be less disruptive to fish habitat while still protecting water supplies, the state built the most recent barrier across the False River.

The barrier was huge - 750 feet across the top and 120 feet wide at the base, and consisted of 150 tons of rock. Installation and removal cost taxpayers approximately $37 million (see photo p.59).

While engineers estimate the 2015 barrier served its purpose of protecting water supply, it was hugely disruptive to the local community in the vicinity of Franks Tract. The barrier significantly rerouted boat traffic, created unsafe high velocities in certain channels, threatened ferry operations to Bradford Island, and created slow water in Franks Tract that has been blamed for the spread of nuisance aquatic weeds. Temporary rock barriers also impede natural physical and biological processes still at work in the Delta ecosystem and fail to provide long term, permanent solutions to salinity intrusion problems. The Franks Tract project would change the way water moves and mixes through Franks Tract, offering a more sustainable approach to water quality management.

3 Engaging Stakeholders & the Public in Design

Meaningful public engagement in planning and design has been a guiding principal of the Franks Tract landscape redesign and enhancement project. Designing with, rather than designing for, those who have a stake in the outcome was and is a top priority.

Incorporating local knowledge and stakeholder priorities requires a strong grounding in place – the unique place that is Franks Tract in the central Delta. Regional interests charged with Delta planning and stewardship have made consideration of the Delta as a special place a policy priority. Core components of that regional vision include protecting the Delta's lands and communities, economy and way of life (Delta Protection Commission 2019).

The Delta is characterized by high rates of change, wherein even without the landscape transformations considered by the project – the "No Action alternative" – the Delta will continue to change. In this evolving place there will be more aquatic weeds, increasing rates of sea level rise, and further problems with salinity intrusion, changing conditions even if residents, scientists, water exporters and state agencies don't want them to (Milligan & Polk 2017).

So the real question is how to go about design and planning for these socio-ecological changes in an equitable and inclusive manner. Without engaging local place values no planning process can be successful or representative (Milligan & Polk 2017).

The Franks Tract project's engagement goals aimed to create and facilitate opportunities for stakeholders and members of the public to be integrally involved in the project planning and design process, from beginning to end. All participants co-created and co-designed the knowledge and products that emerged over the year-long project timeline. Co-design generally refers to inclusive and creative design processes that attempt to include all who might be positively, negatively, or neutrally affected by a design intervention or change in place. In this 2019-2020 project, co-design meant that diverse groups and experts, including designers, engineers, scientists, public agency representatives, boaters, fishers, hunters and local residents and business owners (all experts of the landscape in their own distinct way) worked together to contribute ideas and values driving the design concepts. It also entailed the iterative refinement of design concepts through inclusive rounds of review by these same participants (see Section 5).

Lessons Learned

Engagement efforts for the 2019-2020 project were based on the outcomes and recommendations of the prior 2018 Franks Tract Futures feasibility study. The latter clearly identified that although the first conceptual designs met state goals for water quality and ecological restoration, they fell far short of being accepted by the local and regional communities who would be the most impacted by the project. Based on those findings, the study stated that: "more detailed restoration planning will take into account the social, economic, and recreational interests of the affected local communities and user groups, in keeping with the collaborative principles outlined in the multi-agency Delta Conservation Framework". Based on outreach efforts, the study found that stakeholders and the public wanted to be involved in any further planning efforts, from the very beginning, and that that process should be fully transparent.

As next steps, the 2018 study proposed:

"...developing a variety of scenarios considering both the CDFW restoration design, as well as community and user group alternatives" as well as, "convening of a facilitated advisory group of local community interests (boating, fishing, economic, landowners, and hunting), local government, and other interested stakeholders..."

Accordingly, the follow-up 2019-2020 planning effort primarily focused on determining if the project could be redesigned to benefit both local and regional communities (such as through the creation of desirable recreational features), as well as to minimize detrimental impacts of the project to these same communities, while still meeting ecological and water quality goals.

Project Engagement and Co-Design Methods

Franks Tract 2020 used multiple modes of engagement to facilitate feedback and co-design activities with diverse stakeholders and the general public. In addition to in-person participation through committees and public meetings, modes of engagement included project website hosting, social media communications, creation of public online map-based surveys, fieldwork, canvassing and interviews. Each of these methods is briefly described below, with many of the products and results of each method are fully documented in Appendix A.

Project Startup, July 2019

Prior to the first project meeting and public workshop, UC Davis team members conducted outreach to support the project through background research, one-on-one meetings and on-the-ground fieldwork in the project region. This work served to solidify new committees (see below), to ensure that stakeholders and residents were aware of the upcoming planning process, and to confer with them on how the process should best unfold to ensure participation (timing of meetings, tour, etc.). This work built off contacts and relationships fostered in the earlier Franks Tract Futures 2018 feasibility study. Additional activities included regional canvassing and social media communication, creation of the project website, and collection of tidal marsh imagery to use in aesthetic preference surveys.

Formation of Project Advisory and Steering Committees, Spring-Summer 2019

The 2019-2020 planning process included formation of two important committees. The Advisory Committee (AC) was made up of representatives from all known key interests in the Franks Tract area, including local residents and landowners, marina and small business owners, local government representatives and reclamation districts, local hunters, fishers, boaters and recreational advocates. The AC served as the central forum for deep engagement and evaluation of Franks Tract Futures design concepts. Members had the opportunity to directly participate in, and influence the outcomes of, the design process. Throughout the yearlong process, members not only attended AC meetings, but also reviewed and commented on design materials and served as liaison to the larger stakeholder community (see Sections 4-5).

The Steering Committee (SC) was comprised of senior representatives from state, regional and local agencies responsible for decisionmaking, funding and implementation of the planning project, including California Departments of Fish and Wildlife, Water Resources, and Parks and Recreation, as well as the Delta Protection Commission and Delta Stewardship Council. Their primary responsibilities were to provide overall guidance for the project, attend project AC meetings for technical support, and to secure and share information within their respective agencies regarding the project.

Steering Committee

Name	Affilliation
Bill Harrell	California Department of Water Resources (DWR)
Erik Loboschefsky	DWR
Ted Sommer	DWR
Eli Ateljevich	DWR
Jacob McQuirk	DWR
Edward Hard	Division of Boating and Waterways (DBW)
Gina Benigno	California Department of Parks and Recreation (State Parks)
Steve Musillami	State Parks
Jim Micheaels	State Parks
Jennifer Cabrera	State Parks
David Moffat	State Parks
Erik Vink	Delta Protection Commission (DPC)
Karen Kayfetz	Delta Stewardship Council (DSC)
Jeff Henderson	DSC
Louise Conrad	DSC
Mike Roberts	California Natural Resources Agency (CNRA)
Jim Starr	California Department of Fish and Wildlife (CDFW)
Maureen Martin	Contra Costa Water District (CCWD)
Deanna Sereno	CCWD
Brian Holt	East Bay Regional Park District (EBRPD)
Mike Moran	EBRPD

Advisory Committee

Name	Affilliation
Regina Espinosa	Bethel Island Municipal Improvement District (BIMID)
Ryan Hernandez	Contra Costa County Water Agency
Russ Ryan	Metropolitan Water District (MWD)
Brian Sak	San Francisco Public Utilities Commission (SFPUC)
Karen Mann	Save the California Delta Alliance (STCDA)
Jan McCleery	STCDA
David Gloski	Bethel Island resident
Jamie Bolt	Bethel Harbor
Lenora Clark	STCDA, former commissioner DBW
Chuck Russo	Russo's marina
David Riggs	Sugarbarge RV resort and marina
Kathleen Stein	Bethel Island realtor
Blake Johnson	Engineer RD 2059
Robert Davies	President RD 2059
Bill Jennings	California Sportfishing Protection Alliance
John Francisco	Franks Tract hunter
Andy Rowland	San Joaquin Yacht Club
Mark Whitlock	BIMID, BI Chamber of Commerce, Delta Chamber of Commerce
Joshua Ireland	Bethel Island Resident and Pro Fishermen
Karen + Smith Cunningham	Five Palms Cattle
Paul Seger	Sierra Club, Diablo Water Agency
Katherine Jones Smith	San Joaquin Yacht Club
Jim Cox	California Striped Bass Association Western Delta Chapter
Tyson Zimmerman	Assistant GM. Ironhouse Sanitary District, RD 830 Trustee

Public and Advisory Committee Meetings, 2019-2020

The backbone of the engagement process consisted of both public and AC meetings. Outreach for the July 2019 kickoff meeting included canvassing on Bethel Island and the Franks Tract region, as well as online and media outreach efforts using social media, list serves, and print and online media outlets (the team later repeated these efforts to promote surveys). All public meetings were held in the immediate vicinity of Franks Tract and Bethel Island, with the farthest being at the Big Break Visitors Center in Oakley, although Covid-19 forced later meetings online.

July 2019 public meeting

The planning team held the two larger public meetings (up to 160 people) at key points within the project timeline to provide project information to the public and to receive their feedback (see also Sections 4-5). The team held an additional three AC meetings (all with SC members in attendance) throughout the project. These smaller, more focused meetings enabled the team to engage with advisors and stakeholders on project status and review detailed design, modeling, and evaluation criteria. Within these meetings, the primary objective of was to conduct "hands-on" design workshops to review, refine and advance the design concepts and their evaluation methods. The team provided all SC and AC members with meeting materials and surveys prior to in-person meetings, including those who could not attend the meetings. The team also compiled and shared meeting notes with all members by email and with the general public via the project website.

Fieldwork & Canvassing, 2019-2020

As part of its project fieldwork, the planning team visited precedent landscapes in the Delta, such as existing recreational areas like Sherman Island and Brannan Island, and took guided tours with the public agencies who manage these areas. The team also performed fieldwork to validate and assess conditions on-the-ground within the project boundaries, such as the condition of levees, boating routes, and boating hazards, among other factors. The team also conducted many interviews with stakeholders and residents in the field.

Website and Social Media 2018-2020

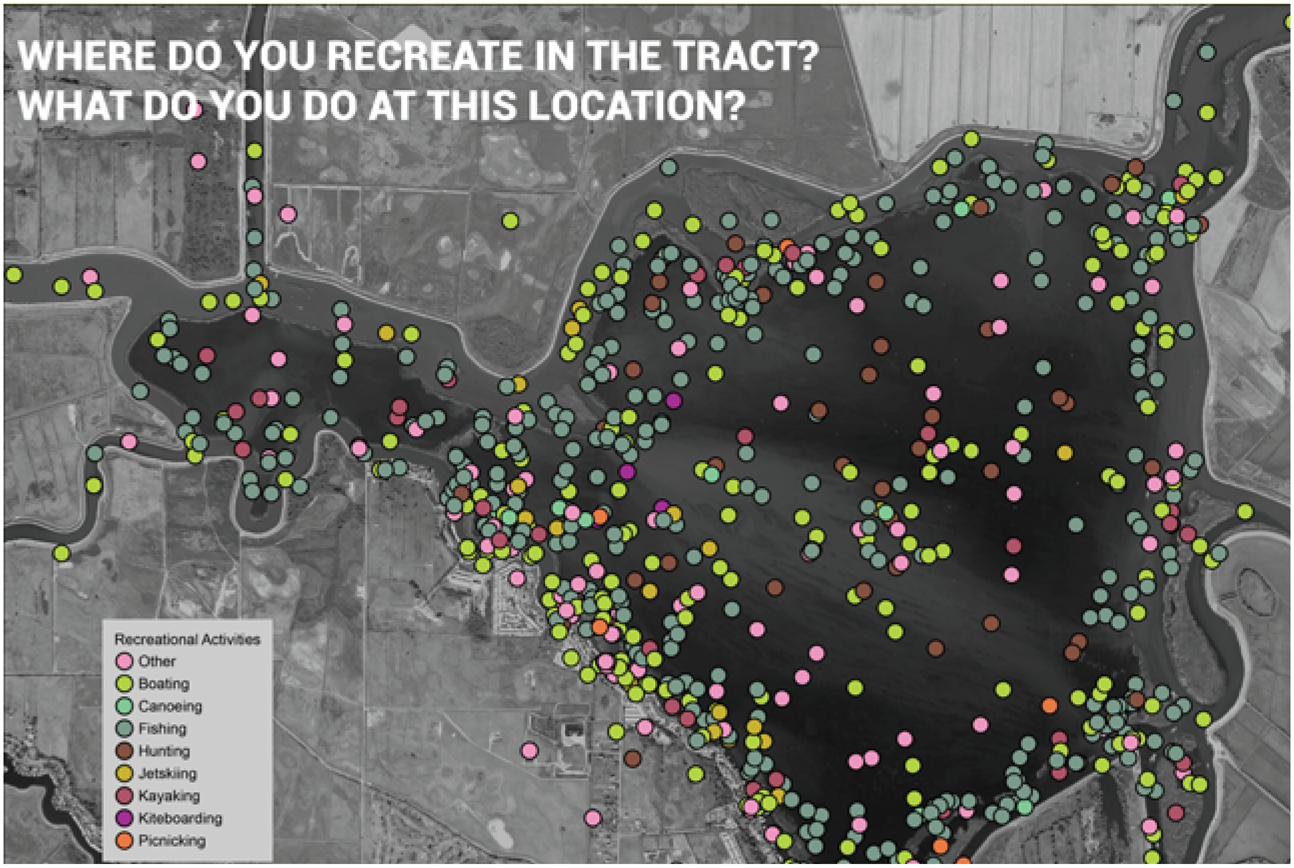
The planning team created the Franks Tract Futures website in 2018 (https://franks-tract-futures-ucdavis.hub.arcgis.com/) as a central hub for broad public involvement and planning information. Since then, the team has maintained and updated the site as new information has become available (posting meeting notes, sharing presentations, and making announcements, etc.). The team also created social media accounts (Twitter, Facebook, Instagram) to expand engagement, disseminate information, and provide additional forums for project-related discussion and communication with the community and stakeholders.

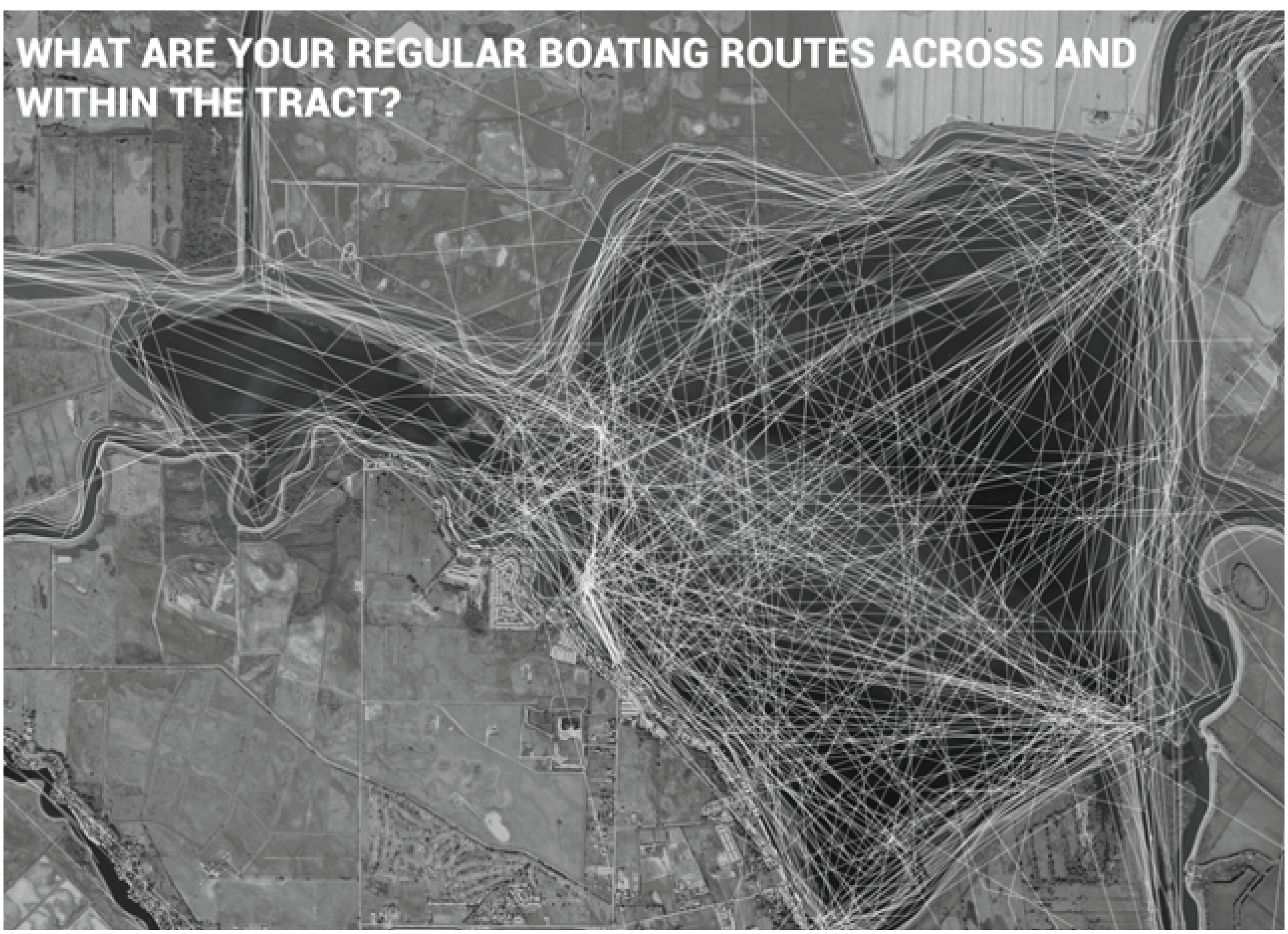
Geospatial Public Surveys, 2019-2020

To inform design concepts during the planning process, the team created and deployed two online public surveys. Both of these used Maptionnaire, a web-based, relatively easy-to-use, mobile compatible survey platform. This software allows survey participants to provide map-based, georeferenced and geo-specific information that can be uploaded to Geographic Information System (GIS) platforms for analysis (participatory GIS methods, or PPGIS).

The first survey, conducted in 2019 at the beginning of the second planning effort, was intended to assess current Franks Tract user preferences. The survey included map-based questions related to recreational activities, boating routes, launching and berthing, areas of potential improvement, and tidal marsh placement. Questions were informed by a previous survey conducted as part of the 2018 Franks Tract Futures feasibility study, which generated useful insights into the demographics and preferences of a substantial group of people who live, work, and play in and around Franks and Little Franks Tracts.

2019 Survey Results





The maps created from the first survey were thus crowdsourced and user drawn, rather than primarily authored, composed, or decided by the planning team. Participants were also asked to rank concerns and state their perspective regarding climate change in relation to the Tract. Findings from this survey are discussed Section 5 and provided in Appendix A.

The second survey, conducted in the summer of 2020, solicited comments and feedback on the concepts developed through the design development process. This survey relied on the same map-based platform and contained fly-through three-dimensional renderings of the design concepts as well as images of key proposed recreational and navigation features. The survey enabled participants to provide spatially explicit input on three design concepts and a No Action alternative. At the end, participants were asked to rank the four concepts. Findings from this survey are summarized in Section 5 and detailed in Appendix A.

Agency Presentations 2019-2020

The planning team made presentations of project goals, concepts, and processes to multiple state and regional agencies, including the Delta Protection Commission, the Delta Stewardship Council and the Collaborative Science and Adaptive Management Program to keep them informed of project activity and to solicit feedback. Presentations were also provided to interdisciplinary technical groups, such as the Interagency Ecological Program's estuarine ecology work team.

Looking Ahead

The project's engagement goals created and facilitated opportunities for stakeholders and members of the public to be integrally involved in the project planning and design process, from beginning to end. Indeed, public comments on the draft version of this report were used to revise and improve the final report. As stated before, designing with, rather than designing for, those who have a stake in the outcome was and is a top priority.

User interface of second survey showing one of the design concepts.

4 Design with Goals & Objectives in Mind

Photo: Rick Lewis

Common goals and objectives are critical to any successful planning, design, or decisionmaking endeavor. Over the course of the project, the planning team has worked with the Advisory Committee, Steering Committee, the public and the California Department of Fish and Wildlife (CDFW) to develop goals and objectives for enhancing Franks Tract and Little Franks Tract, and to design various concepts for landscape change that meet these objectives.

The design approach is based on input from these participants, as well as on past investigations, expert consultation, local user input, ecosystem restoration actions called for in various plans, and State Parks' General Plan. Additional input will be considered if and when a design concept is approved for further development.

The project team applied a Structured Decision Making (SDM) approach to guide and integrate technical design and engagement results during planning. This decision making approach seeks to guide groups of people working together on complex environmental and social planning problems in a way that is rigorous, inclusive, defensible, and transparent (Gregory et al. 2012).

Project Goals and Objectives

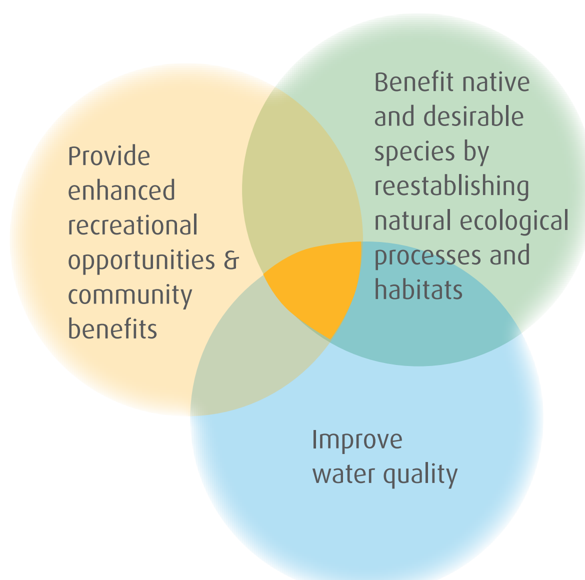
The goals of the Franks Tract Futures project are to enhance recreational opportunities and provide other community benefits, to support native and desirable species by re-establishing natural ecological processes and habitats, and to improve water quality. Project objectives elaborate on each of the goals (see table). Overall, the project seeks to find a balance of benefits across all objectives that will be sustainable over time. Together, these goals and objectives serve as the roadmap for redesigning the Franks Tract landscape.

Transparency in Project Scope

This project explores opportunities to achieve multiple benefits at many levels, from the community to the Delta region to the state, on Franks Tract. As an exploratory effort, no project "owner" or final decision-maker was identified up front. Any future project would require both local community and agency support to attract planning and implementation funding. The study funder, CDFW, was only one voice among many in a collaborative planning process.

Early on in planning, members of both the public and the Advisory Committee requested clarity on how the project related to water operations. Advisors wanted the project to be transparent in evaluating benefits and impacts under both existing water operations and potential future operations of interest to stakeholders, such as various conveyance alternatives including tunnels (to the extent they have been defined). While the California Department of Water

Project Goals



Resources is a project partner, with a primary focus on hydrodynamic modeling of enhancement scenarios, the Franks Tract Futures project has no influence over water operations, Delta exports, or proposals for alternate conveyance.

Structured Decision Making

The structured decision making approach guides groups of people working together on complex environmental and social planning problems such as Franks Tract stakeholders and communities. Careful attention is paid to separating judgments and deliberations about facts (such as outcomes that can be counted, measured or modeled) from judgments and deliberations about values (such as whether the benefits of an option outweigh its costs). As such, structured decision making facilitates the incorporation of important scientific and technical information into a formal deliberative options analysis process, with the aim of seeking consensus agreements on proposals and solutions.

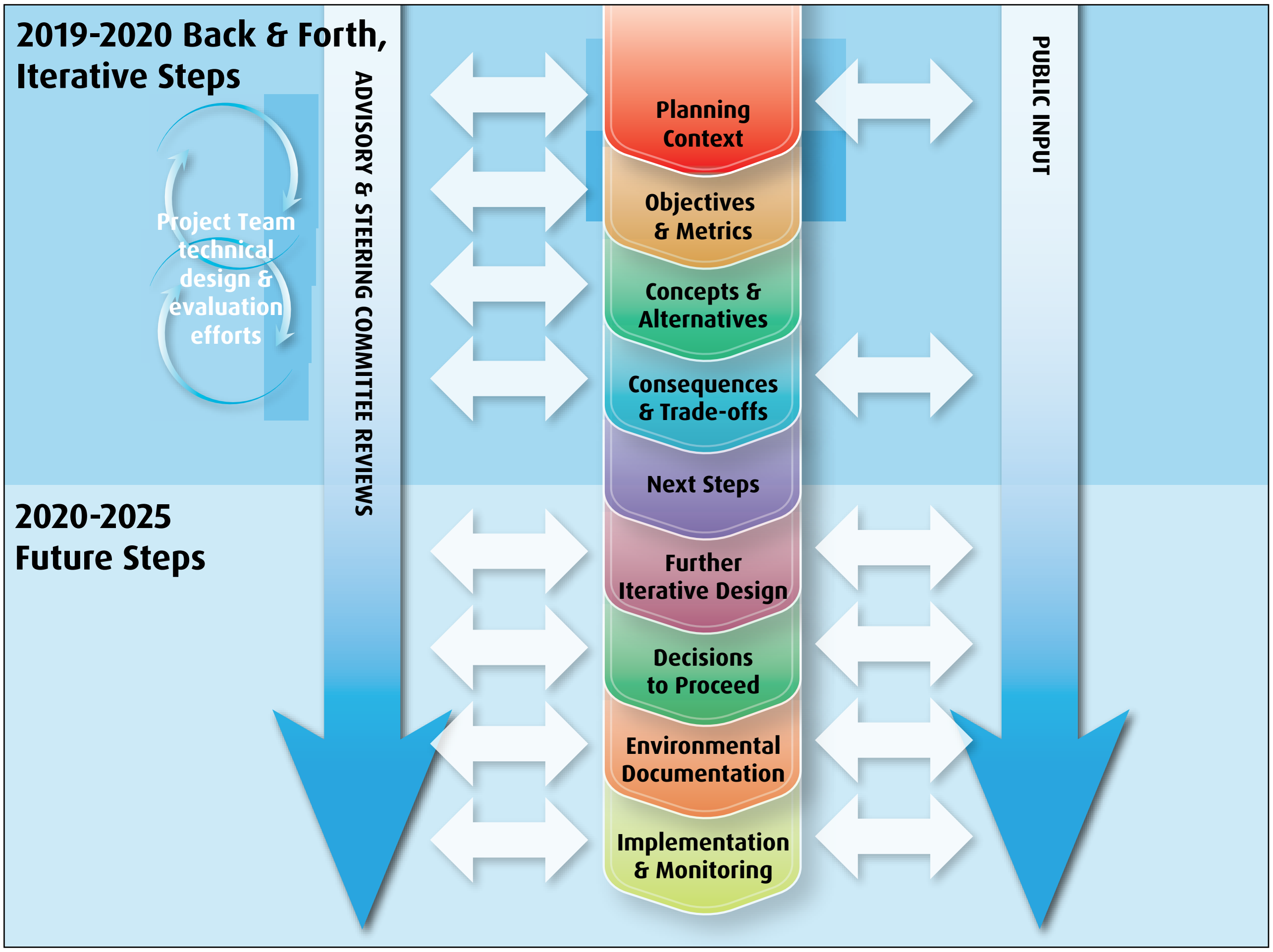
Basic iterative steps

- Clarify the decision making context – make clear what is in and out of scope, who the decision makers are, and how this planning process interrelates with other planning initiatives.
- Define clear goal, objectives and metrics – get to the root of 'what matters' and develop specific metrics (or evaluation criteria) that will be used to compare alternatives.
- Develop alternative concepts – iteratively develop and improve on the alternative concepts and detailed design features that best address the full range of objectives.
- Estimate consequences – use the best available data and analyses to describe how well the alternative concepts might perform with respect to the objectives and metrics, while documenting key uncertainties.

Objectives for Franks Tract's Future

Resource Area	Project Objectives
Recreation	• Enhance recreation opportunities for fishing, motorized and non-motorized boating, waterfowl hunting, and shoreline recreation while minimizing impacts to existing recreational uses.
Navigation	• Minimize impacts to current boating travel times between key locations. • Maintain minimum depths for safe navigation around the Tract. • Reduce boating hazards and nuisance conditions.
Local Economy	• Maintain or enhance local economic benefits.
Ecology	• Maintain or enhance habitat for fish species of interest, specifically largemouth bass, Chinook salmon, striped bass and Delta smelt. • Minimize the risk of entrainment of special status fish species into Old River and the south Delta. • Minimize conditions that could result in the spread of undesirable invasive species. • Benefit a range of native species by establishing large areas of tidal marsh and associated habitats.
Water Quality & Supply	• Maintain or enhance water quality for human uses such as irrigation and drinking water. • Improve water supply reliability by reducing entrainment at the South Delta pumps. • Reduce the disruptions and costs associated with installation of emergency drought barriers.
Levee & Flood Protection	• Improve levels of flood protection, where possible, and avoid any adverse flood impacts.
Project Cost	• Minimize construction costs within the context of other project objectives. • Minimize long term total costs for ongoing operations and maintenance within the context of other project objectives.
Other	• Minimize impacts associated with project construction.

Reimagining Franks Tract



What's included in project scope?

In Scope	Out of Scope
• Full consideration of a No Action or "business as usual" alternative • Enhancement of opportunities for fishing, motorized and non-motorized boating, waterfowl hunting, and shoreline recreation • Navigation routes and boating travel times • Creation of tidal marsh for a range of ecological benefits • Control of undesirable aquatic invasive species • Potential water quality and supply reliability benefits • Wave sheltering of flood protection levees to reduce erosion risk • Local economic benefits • Consideration of alternatives representing a variety of CDFW, stakeholder and community interests	• Water operations decisions • Water quality standards decisions • Direct improvement of existing flood protection levees (indirect improvements from wave sheltering are in scope) • Local area infrastructure planning (roads, etc.)

- Evaluate trade-offs and preferences – evaluate the potential trade-offs and which alternative concept(s) deliver the best balance across the multiple objectives.
- Guide next steps – describe what the next steps in the planning process are, and – should a project move forward – how the detailed design, environmental documentation and implementation occur.

The decision making context and project goals and objectives (Steps 1 and 2) are described above. The planning team also developed detailed metrics for use in evaluating the performance of each proposed design concept relative to the project objectives (Step 2). Other sections in this report detail these metrics, as well as how alternatives were developed, consequences estimated, trade-offs and preferences evaluated, and next steps explored (Steps 3, 4, 5, 6).

From an engagement perspective, the project team planned workshops and outreach activities to extensively integrate stakeholders' interests, gather detailed input, share the consequences of different concepts with transparency, and openly engage in the discussion of potential trade-offs (see also Section 3).

Key benefits of this engagement approach

- Leveling the playing field – by explicitly defining everything that matters as objectives and distilling all technical analyses into an understandable set of evaluation criteria, everyone with a stake in the planning process can participate at an appropriate level, whether they have technical expertise or not.
- Facilitating joint learning – by transparently exploring a range of alternative design concepts and listening to expert and public opinions about any potential consequences and trade-offs, all participants learn together and actively contribute toward iterative improvements that seek to achieve the best balance for a feasible design.

From a technical design and analysis perspective, the project's team of experts in various fields applied the best available information and analysis methods to develop alternative designs. They then evaluated how concepts performed in achieving the project objectives, and refined specific design features (such as navigation channel widths and depths) based on committee and public feedback (see Section 5).

Key benefits of this technical approach

- Adding rigor and defensibility – while the technical analysis is still at the feasibility stage, a rigorous approach was taken toward each aspect of design and analysis, adding defensibility to the holistic planning process.
- Applying a structured framework – consistent and systematic methods of documentation and presentation enabled large amounts of information to be distilled into the key messages to inform judgements and understanding.

The figure on p. 27 shows how integrated planning, technical design and engagement unfolded over the duration of the 2019-2020 project as guided by the structured decision making approach. Over the year-long process, four formal workshops with the Advisory Committee and Steering Committee served as cornerstones of engagement as described above.

In sum, this report describes in detail how both engagement and technical design efforts have occurred in a collaborative, integrated manner. The next steps point toward a potential future planning phase in which further iterative design and environmental documentation would be developed with a similar commitment to engagement and collaboration.


Public workshop. Photo: UCD

5 Developing Design Concepts

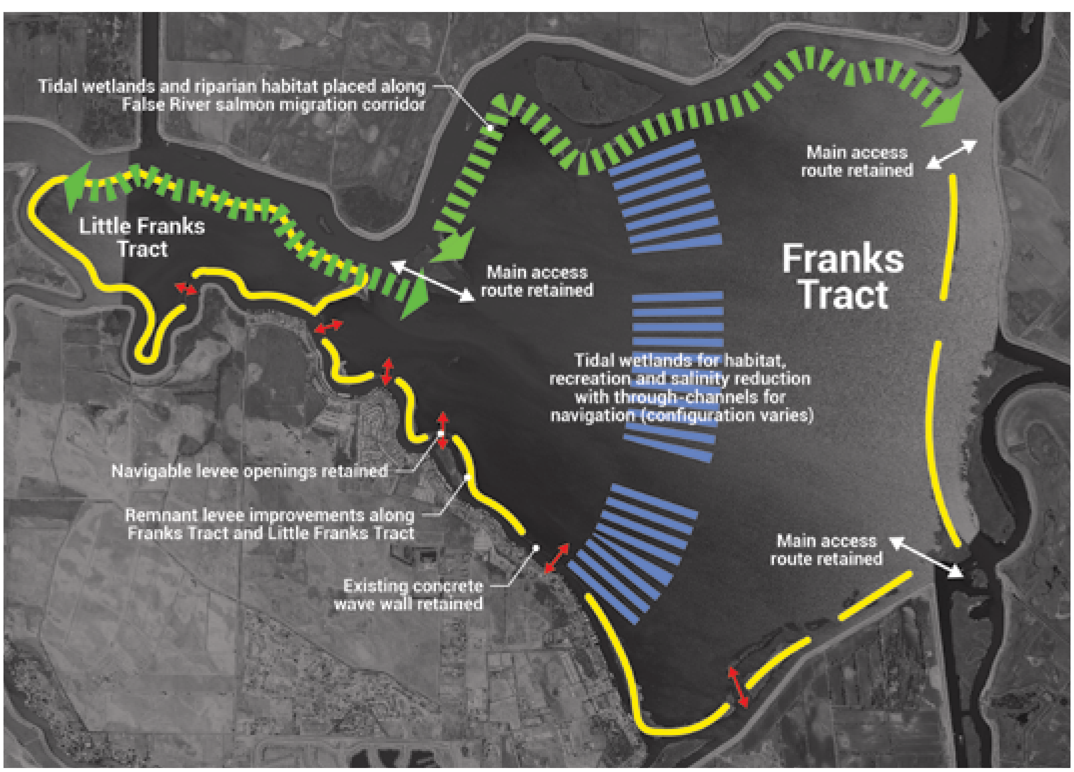
The Franks Tract planning team developed and evaluated a variety of different ways to achieve the project goals and objectives for enhancing this 3,300-acre flooded area. The process resulted in seven alternative designs for adding new land masses, redefining channels, and reshaping shorelines and levees. Each design concept integrated diverse features intended to improve public access, recreation, and water quality and supply reliability, as well as to enhance habitat for fish and wildlife.

The project generated four rounds of design concepts for review and evaluation by the Advisory and Steering committees, the public, and team experts (see also Sections 3 and 4). The team began by screening seven initial concepts, then developed three concepts in more detail, then refined those concepts. Each round included a No Action alternative for comparison. The year-long process — which occurred between the summers of 2019 and 2020 and included workshops, charettes, surveys, and questionnaires — culminated with selection of one preferred concept by the committees and the public.

Features Common to all Design Concepts

To guide development of the design concepts, the planning team began by identifying the following preliminary list of common features that would be a part of any future for Franks Tract (see figure below).

- Retain the existing breaks in the remnant levee between Piper Slough and adjacent Franks Tract open water and in select additional locations for navigation.
- Retain the existing fast water navigation paths in approximately their current positions, as much as possible.
- Retain the existing Bradford Island Ferry location.



- Create extensive tidal wetlands and deepened open water areas to enhance habitats for native fish and popular sport fish. Re-establishing tidal marsh and associated channels will require raising selected areas 8 to 11 feet.
- Enhance Chinook salmon habitat by creating a band of tidal wetland along the False River channel (in green). Tidal marsh in these areas will provide places for salmon fry to feed and grow. The wetlands will also provide refugia for juvenile Chinook salmon along their outmigration path.
- Enhance habitat for Delta smelt by creating open water, and possibly turbid areas, fringed by tidal marsh in Little Franks Tract, closest to primary smelt habitats in the west Delta.
- Reduce the potential for aquatic invasive plants by converting existing shallow water areas to intertidal marsh and deep water (borrow) areas (see Background Primer, p.14).
- Limit or otherwise manage exchange of flow between the northwestern part of Franks Tract at the "nozzle" and the southeast corner at Old River to improve water quality, reduce entrainment of regulated fish, and improve water supply reliability. In general, this means locating restored marsh or a berm to divide the Tract in two between these locations.
- Build up the remnant Franks Tract and Little Franks Tract levees to provide wave sheltering for adjacent (maintained) levees on Bethel Island and other adjacent islands.
- In general, Little Franks Tract is prioritized for non-motorized boating and native fish species, while Franks Tract proper is prioritized for sport fish, motorized boat recreation, and destination beach and recreational areas.


Photo: Brett Milligan

Four Rounds of Design and Public Input

Round 1 Concepts

At the first Advisory and Steering Committee workshop on August 29, 2020, participants provided input on the project goals and objectives, the No Action alternative, and the first round of seven design concepts presented by the planning team (see timeline opposite). These "Round 1" concepts built on earlier concepts developed for the 2018 Franks Tract Futures feasibility study, including the locally preferred plan, and those developed for a 2018 landscape design studio hosted by UC Davis with select stakeholder and state agency input.

An interactive design charrette enabled participants to discuss and evaluate the seven Round 1 concepts, providing useful and detailed input on preferences and concerns about each one. The planning team used input from the design charrette, as well as written evaluation forms, to rank least and most preferred concepts and to refine concepts for the next round. The four concepts that moved forward in design and evaluation (Round 2), in order of most to least preferred (1-4) were:

1. Eastern Landmass and Central Island
2. Central Landmass
3. Combination of the Open Water Berm and Channel concept and Bays and Channels concept
4. No Action Alternative

The team dropped two designs after the first round of evaluation. The "light touch" or No Action Alternative Plus concept, which included dredging and levee fortification, failed to move forward because it did not meet water quality and ecological goals. The northern archipelago was dropped because participants did not like the layout of tidal marsh directly in front of Bethel Island for aesthetic and navigability reasons, as well as concerns for property values. This concept was also unlikely to meet the water quality goals.

Round 2 Concepts

For the second Advisory and Steering Committee workshop on November 6, 2020, participants provided input on three Round 2 concepts and the No Action alternative. In addition to design review, participants reviewed and commented on draft evaluation methods and criteria (see opposite). The planning team presented three more detailed and refined concepts for improving Franks Tract. Refinements reflected technical input for constructability, initial assessment of water quality improvements, and further detailing of potential public access features.

Co-Design Timeline 2019-2020

Over 14 months, the planning team worked through a public process on four rounds of concepts for redesigning Franks Tract. The first round consisted of 7 potential project designs plus the No Action (no project) alternative. Input from committees and the public narrowed the field down to 3 designs, and more recently to a preferred concept (see next page).

2019

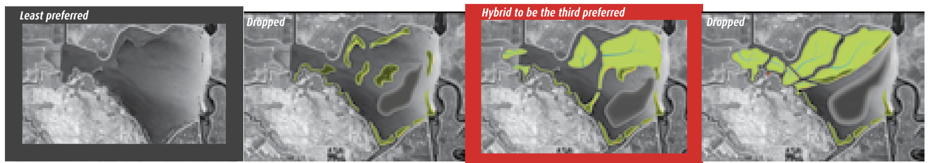
07/11 Kick-off Meeting (public)

Project background and planning process overview.
Introduction to ESA-led team and overall project approach.

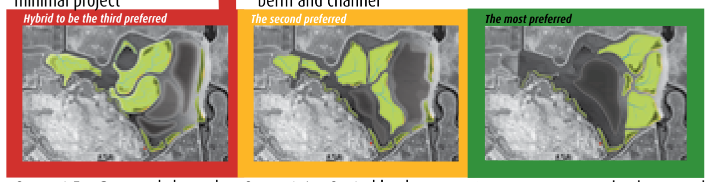
08/29 The First AC/SC Workshop

Reviewed and received input on the project goals and objectives
Reviewed and received input on the No Action alternative scenario
Shared the initial results of the (online) Stakeholder Survey
Conducted a design charrette to receive input on the first round of design concepts

ROUND 1



Concept 1 - No Action | Concept 2 - Light touch | minimal project | Concept 3 - Open water berm and channel | Concept 4 - Northern archipelago



Concept 5 - Bays and channels | Concept 6 - Central land mass | Concept 7 - Eastern landmass and central island

11/06 The Second AC/SC Workshop

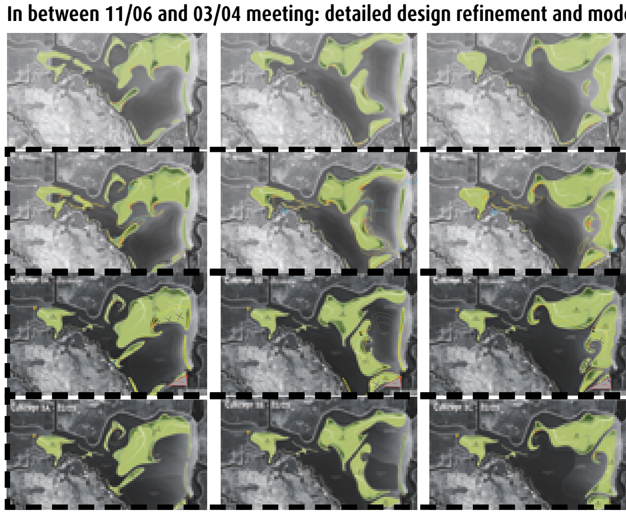
Reviewed and received input on the revised design concepts
Reviewed and received input on the draft evaluation methods and criteria
Shared the initial results of hydraulic modeling, received input on the initial recreational features design ideas and marsh aesthetic surveys
Conducted a design charrette to receive input on the next round of design concepts

ROUND 2

Concept 2A - Open water berm and channel | Concept 2B - Central land mass | Concept 2C - Eastern landmass and central island

ROUND 3

In between 11/06 and 03/04 meeting: detailed design refinement and modeling



Revision based on 11/06 meeting feedback (AC and SC members)

Revision based technical input (construction, dredge material calculations, State Park management logistics)

Draft plan for Round 3

2020

03/04 The Third AC/SC Workshop

Reviewed and received input on the revised, 3rd round of design concepts
Reviewed the performance of the three concepts in meeting the project objectives
Conducted a design charrette to receive input on the next round of design concepts

ROUND 4

Concept 1 - No Action | Concept 3A - Open water berm and channel | Concept 3B - Central land mass | Concept 3C - Eastern landmass and central island

process is ongoing

Evaluation of the Round 2 concepts suggested:

- Design of Little Franks Tract could be held consistent between all concepts for ecological benefits and as a focal area for non-motorized recreation,
- The entry to Franks Tract from Roosevelt Cut in the southeastern part of the site should be reconfigured to improve navigability at a dangerous boating intersection and to improve the quality of water moving into the south Delta,
- The widths of the through-channels – the channels that allow boat access between land masses onsite – are critical to navigation and require further hydrodynamic modeling to identify the appropriate balance between fast-water navigation safety and water quality benefits,
- The size of tidal marsh landmasses should be reduced to limit the amount of fill material and associated costs.

Feedback on the Round 2 concepts during the charrette, and results of a written questionnaire completed by workshop participants, indicated a shift in preference to the Central Landmass, or Concept 2B. Members of both committees liked the combination of open water adjacent to Bethel Island; relative proximity of the beaches, day use area and other land-based recreational features to Bethel Island (compared to the Eastern Landmass); and the creation of two open water areas, each relatively protected from waves since the central landmass would shelter the eastern open water area, which is currently prone to waves. The second preferred concept was the eastern landmass, or Concept 2C, followed by the open water berm and channel, Concept 2A. The No Action alternative remained the least preferred.

Rounds 3 and 4 Concepts

The planning team presented three Round 3 revised concepts and the No Action alternative at the third Advisory and Steering Committee workshop on March 4, 2020. In the presentation, the team retained the general approach of the Round 2 concepts - open water with berm, central land mass and eastern landmass – but made refinements to the through-channel widths, recreational features, and other adjustments to improve project performance.

After another workshop, the team made minor adjustments to the Round 3 concepts. To avoid confusion, the project team called these the Round 4 concepts, though they are very similar to Round 3.

Rating the Design Concepts

In the evaluation process, the planning team developed a detailed set of metrics, or evaluation criteria, to measure the performance of each design concept relative to the eight project objectives (see Section 4). Technical experts on the team then rated concepts with respect to each objective based on detailed site conditions, hydrodynamic model results, and input from committee members with specific expertise. To help facilitate overview comparisons, the team summarized evaluation criteria for each project objective using a 1 (worst) to 10 (best) rating scale. The team solicited committee member and other stakeholder input to develop the evaluation criteria and ratings.

By way of example, one navigation objective is to minimize impacts to current boating travel times between key locations. Planning team members worked with local boaters on the Advisory Committee and used data from the project's User Survey to identify six key travel routes through the site. They measured and compared the distance of each of these routes for each project concept and the No Action alternative. Since the project commitment is to provide fast water access along these routes (e.g., no "no wake" zones), distance is considered a reasonable proxy for relative travel time. The team then rated overall performance for travel distance on a 1 to 10 scale for comparison between concepts.

Using this overall approach, the team created a summary consequence table rating each concept based on each primary objective (see p. 29). All consequence tables were color-coded on a scale from worst (1-red) to best (10-green). The range of scales and colors is based on all seven concepts evaluated during the iterative planning process. At a glance, the colors highlight potential trade-offs and the need for detailed discussions.

Ratings and evaluations provided in the following pages refer to Round 4 concepts. Ratings were updated with each round of concept development.

Ultimately, how one design concept and vision for Franks Tract's future layout compares to another depends on the values attached to different aspects of concept performance. Values vary by individual, reflecting their individual priorities.

At the highest level for consideration, overall ratings indicate that a redeveloped Franks Tract offers an opportunity for improvements in recreation, ecology, and water quality and potentially other objectives. Of course, the evaluation also finds there would be some unavoidable trade-offs, especially with respect to costs and construction impacts. More details and finer scale considerations are explored in the following tables (see p.29) as well as Appendix A.

Worst — Best

OVERALL SUMMARY

At the highest level for consideration, a redeveloped Franks Tract offers an opportunity for improvements in recreation, ecology, and water quality and potentially other objectives. Of course, the evaluation also finds there would be unavoidable trade-offs, especially with respect to costs and construction impacts. More details are explored in the following tables. A complete description of evaluation criteria and ratings can be found in Appendix A.

Objectives	No Action	Concept A	Concept B	Concept C
Navigation	7.4	6.1	7.2	7.3
Recreation	2.3	5.3	6.1	5.6
Local Economy & Community	4.5	5.2	6.2	6.4
Ecology	2.5	6.0	6.2	6.0
Water Quality & Supply Reliability	3.3	7.3	7.0	6.7
Flood Protection	4.0	7.5	7.5	7.5
Construction Impacts	6.0	4.0	4.0	4.0
Total Cost: Construction and O&M	$	$$$	$$$	$$$

NAVIGATION

Project objectives call for minimizing impacts to current boating travel times between key locations and improving boating safety. Ratings from the evaluation confirmed that the current wide-open Franks Tract offers the shortest travel distances in any direction. Next best, in order of performance, were design Concepts C, B and finally A, which would

create the largest increase in navigation distances. These potential increases need to be weighed against improvements to boating safety within the Tract, with the three concepts maintaining minimum depths for safe navigation and reducing boating hazards. Another important consideration will be potential increases in conflicts between fast water navigation and recreation activities in any new multi-use recreation area.

Objectives	No Action	Concept A	Concept B	Concept C
Navigation	7.4	6.1	7.2	7.3
Travel Distance	10.0	6.4	8.4	8.8
Boating Safety	4.7	5.7	6.0	5.7

RECREATION

Project objectives call for enhancing recreational opportunities for fishing, boating, waterfowl hunting, and shoreline recreation, and minimizing impacts to existing recreational uses. Ratings from the evaluation suggest diverse recreational opportunities (such as beaches, mooring sites, and shoreline access) could be designed into any of the three new concepts, with Concept B offering the greatest opportunity for sheltered open water boating areas. In terms of fishing, the rating is based on both sportfish habitat and access to a quality fishing experience (potential changes to the fishing experience warrant further review). In terms of the future hunting experience, which could include both open water and marsh-based blinds, further input from the hunting community is still needed on how this new, more diverse system would work best.

Objectives	No Action	Concept A	Concept B	Concept C
Recreation	2.3	5.3	6.1	5.6
Fishing	5.1	6.0	6.2	6.3
Motorized Boating	2.0	5.0	8.0	5.0
Non-Motorized Boating	1.0	5.5	5.5	6.0
Shoreline Recreation	1.0	4.5	4.5	5.0
Waterfowl Hunting				

LOCAL ECONOMY

Project objectives call for providing local economic benefits where possible and for minimizing disruptions to the local economy and community. Ratings from the evaluation, with a specific focus on Bethel Island, suggest significant interest in maintaining or improving effects on local businesses, real estate and aesthetics. One aesthetic priority is to preserve current open water views from Bethel Island. Each concept rates differently in that regard, but all preserve open water adjacent to Bethel Island. All concepts would add naturalistic features to views, like tidal wetlands, and reduce nuisance aquatic weeds, both considered potential benefits. Both real estate values and local business effects are seen to be linked with these aesthetic conditions, as well as being dependent on the overall navigation and recreation opportunity ratings discussed above.

Objectives	No Action	Concept A	Concept B	Concept C
Local Economy & Community	4.5	5.2	6.2	6.4
Business Effects	4.9	5.7	6.7	6.5
Real Estate	4.6	5.4	6.3	6.4
Aesthetics	4.0	4.7	5.7	6.3

ECOLOGY

Project objectives call for benefits to both native and sport fish by creating tidal marsh and other habitats, reducing the spread of undesirable invasive species, and minimizing the risk of entrainment of special status species into the south Delta. Ratings from the evaluation suggest that all three new concepts present a significant opportunity to improve the overall ecological conditions, especially for special status native species (Chinook salmon, Delta smelt). The area supporting aquatic invasive species would also be reduced, another improvement in conditions. How the concepts would change conditions for sportfish needs more evaluation. While the overall sportfish ratings for the three concepts compare fairly evenly with the No Action Alternative, there would be a significant shift away from open-water shallow habitat toward more open-water deep-to-shallow edge and marsh-edge habitats with increased velocity gradients.

Objectives	No Action	Concept A	Concept B	Concept C
Ecology	2.5	6.0	6.2	6.0
Special Status Species	2.5	6.8	6.2	6.2
Sportfish Habitat	5.4	6.2	6.5	5.8
Conditions for Native Species	1.0	4.0	5.0	5.0
Conditions for AIS Spread	1.0	7.0	7.0	7.0

WATER QUALITY

Project objectives call for enhancing water quality for human uses (such as irrigation and drinking water), improving water supply reliability by reducing fish entrainment at the water project pumps, and reducing disruptions associated with emergency drought barriers. Ratings from the evaluation suggest improved water quality and supply reliability with all three new concepts performing much better than the No Action alternative. There would be improvements in salinity conditions for water use and consumption under a variety of flow conditions, as well as a net reduction in potential entrainment of protected fish, which currently limits the reliability of water operations. In addition, the project is projected to reduce the need for salinity control barriers on False River under severe drought conditions.

Objectives	No Action	Concept A	Concept B	Concept C
Water Quality & Supply Reliability	3.3	7.3	7.0	6.7
Water Quality: Human Uses (salinity)	3.0	8.0	7.0	6.0
Emergency Drought Protection	2.0	7.0	7.0	7.0
Supply Reliability (entrainment)	5.0	7.0	7.0	7.0

Worst — Best

FLOOD PROTECTION

Project objectives call for improved flood protection, where possible, and avoidance of any adverse flood impacts. Ratings from the evaluations suggest all three concepts would benefit flood protection levees by enhancing remnant historic levees around the Tract that provide wave sheltering. Flood modeling suggests that none of the three project concepts significantly alter high water levels compared to the No Action alternative.

Objectives	No Action	Concept A	Concept B	Concept C
Flood Protection	4.0	7.5	7.5	7.5
Sheltered Levee	3.0	10.0	10.0	10.0
Flood Risk Reduction	5.0	5.0	5.0	5.0

CONSTRUCTION

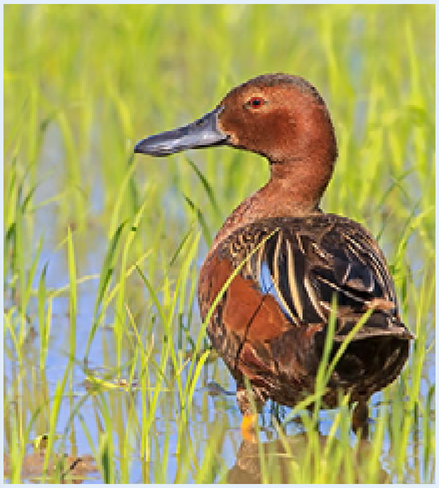
Project objectives are to minimize or mitigate construction impacts in both the near and long term. Ratings from the evaluation leave no doubt that the construction period for any of the three proposed concepts would have near-term impacts on the local community and use of Franks Tract. Activities such as dredging and materials transport would be ongoing over a period of years, as would noise and changes in navigable routes. Staging future construction to accommodate tract uses and key hunting or fishing periods could help mitigate impacts. On the benefit side, as discussed above, the project would reduce periodic impacts over the long term from construction of emergency drought barriers.

Objectives	No Action	Concept A	Concept B	Concept C
Construction Impacts	6.0	4.0	4.0	4.0
Construction Period Impacts (short term)	10.0	1.0	1.0	1.0
Drought Barrier Impacts (long term)	2.0	7.0	7.0	7.0

PROJECT COSTS

Project objectives call for minimizing construction costs, as well as long term operations and maintenance costs. Though detailed cost estimates are not yet available, any evaluation would conclude that both construction and long-term operations and maintenance costs would be much higher for any of the three Concepts relative to the No Action alternative. As described above, however, the project would reduce long term costs for levee maintenance, and drought barrier construction and removal. Costs could potentially be reduced for nuisance weed management. As the project evolves, 'who pays' needs to be aligned with the agencies and organizations with the most to gain. A commitment to long-term operations and maintenance funding would also need to be in place before any project could move forward. A major consideration for the project overall is whether the potential increased costs are warranted by the potential for multiple objective project benefits.

Objectives	No Action	Concept A	Concept B	Concept C
Total Cost: Construction and O&M	$	$$$	$$$	$$$
Construction Costs	0.0	$$$	$$$	$$$
Operations & Maintenance Costs	$$	$$$	$$$	$$$



Arriving at a Preferred Concept

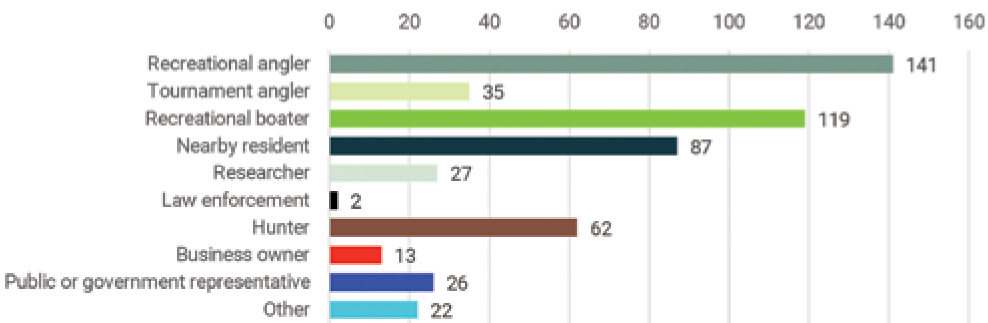
In spring 2020, the Advisory and Steering committees selected Concept B as offering the best balance between project objectives and the best opportunity to improve local conditions. According to the results of a written questionnaire completed by committee members in the March 2020 workshop, Concept B ranked first, followed in order of preference by C, A and the No Action alternative. In Concept B, committee members like the combination of open water adjacent to Bethel Island; relative proximity of the beaches, day use area and other land-based recreational features to Bethel Island; and the creation of two open water areas, each relatively sheltered from waves. This preference was confirmed based on the evaluation and rating results, as interpreted and weighed through the values of each committee member.

Later in spring and summer of 2020, the planning also solicited public preferences, comments and questions on the design concepts and No Action alternative through an online survey platform. Some of the results of the survey appear in the charts and maps on the following pages, but are detailed in Appendix A.

The survey asked respondents to rank the three landscape design concepts and the No Action alternative (NAA) for Franks Tract in terms of preference on a scale of 1-4. As shown in the chart below on average, the NAA was the lowest-ranked, but only by a small margin with concepts A and C slightly more preferred. Currently, Design Concept B (Central Landmass) is the most preferred by survey respondents, which was also the most preferred concept among the Advisory and Steering committees. The committees' Concept B was preferred by a considerably larger majority, however.

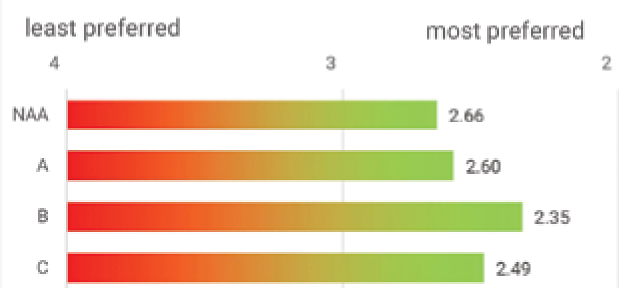
Which of the following categories do you most identify with? (multiple answers can be given)

Total single category count



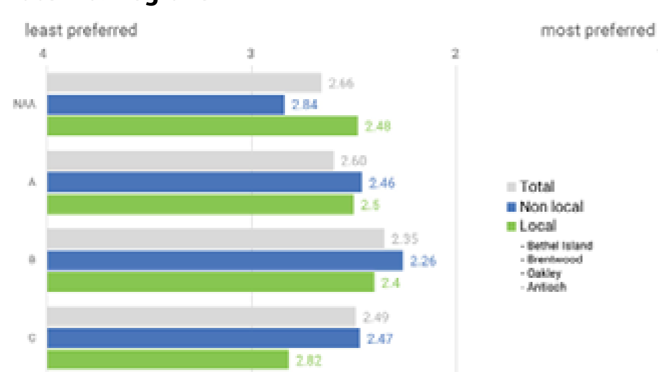
Users were asked to pick multiple categories they identify with, which resulted in a plethora of hybrid categories (see Appendix A).

Final Rankings of Design Concepts from Public Survey



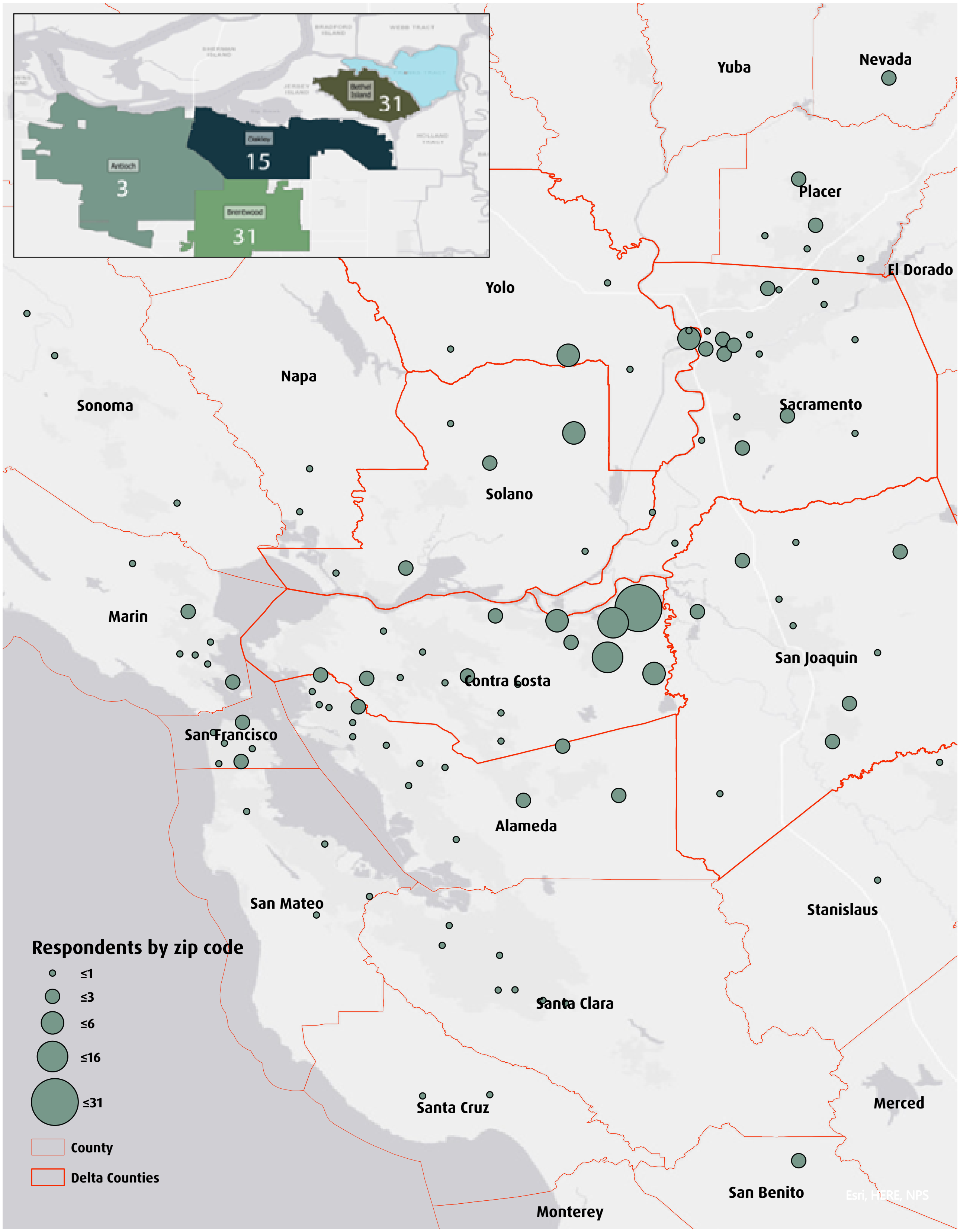
Concept B was the most preferred design by survey respondents. On average, there was similar support across the NAA and concepts A through C. Although 36 (39%) respondents chose the NAA as their most preferred option, over two times as many people (75) selected at least one of the three design concepts as their most preferred, suggesting significantly higher preferences overall for the design concepts.

Overall Comparative Ranking of Design Concepts: Local vs. Regional



Ranking based on the respondent's zip code location,comparing local (Bethel Island, Oakley, Antioch, Brentwood) responses (32%) to non-local respondents (68%). The preference for the NAA was slightly higher among local respondents compared to non-local. A similar difference was observed between respondents from Delta and non-Delta Counties. Thus although the overall top preference for Concept B was consistent across all geographic scales of respondents (local, Delta, and regional) preference for Concept B was greatest at the regional scale.

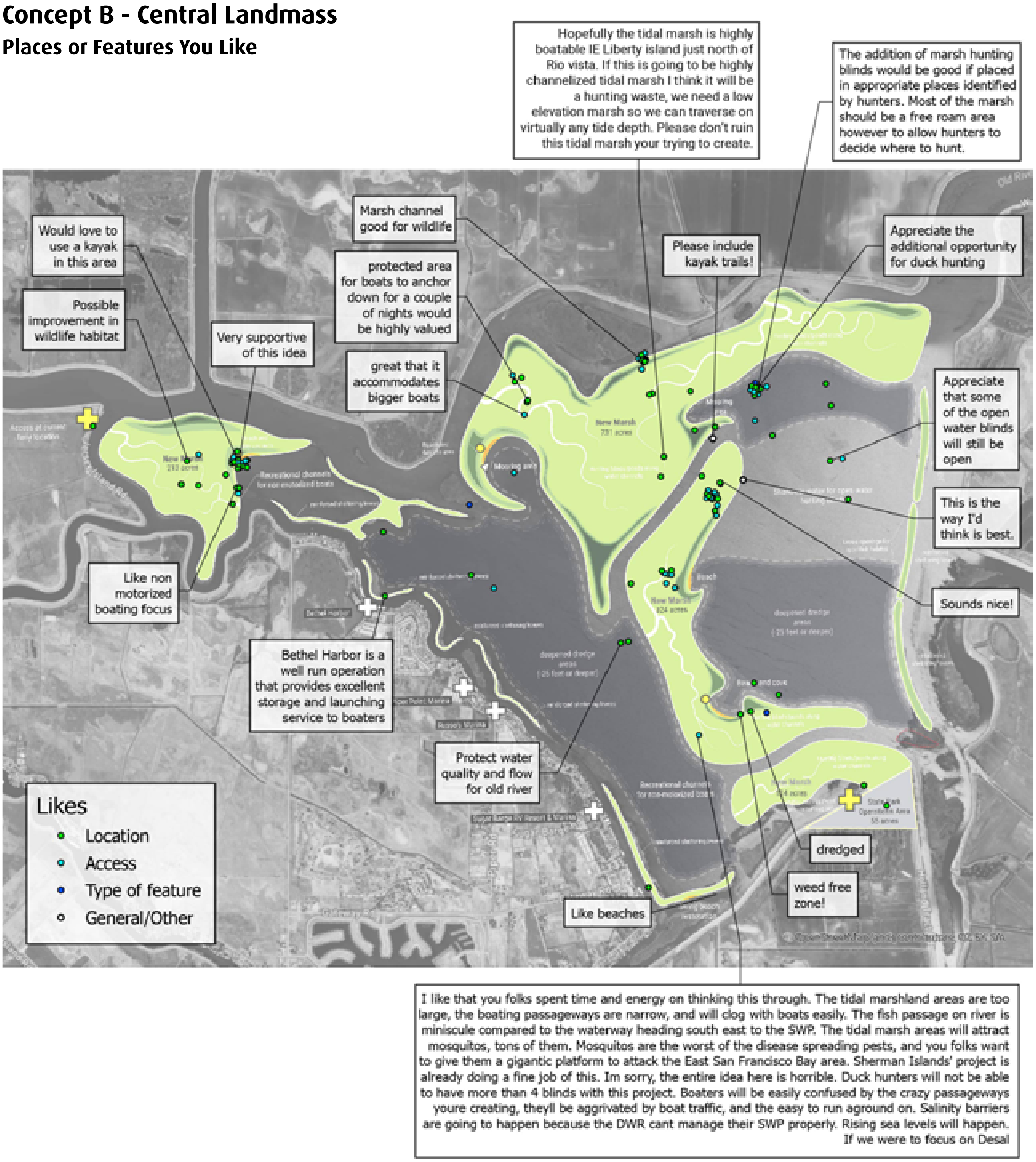
Residential Zipcode of Survey Respondents



Map showing survey respondent count by zip code. Delta counties are shown in darker red. Approximately 72% of respondents listed a zip code located within a Delta County; 32% of respondents were from Bethel Island, Brentwood, Oakley, or Antioch, and therefore considered local.
INSET: Number of local survey respondents (in white) from the cities of Bethel Island, Oakley, Antioch, Brentwood), which we defined as 'local' to Franks Tract for the survey analysis. Together these local cities accounted for approximately ⅓ of respondents.

Concept B - Central Landmass

Places or Features You Like

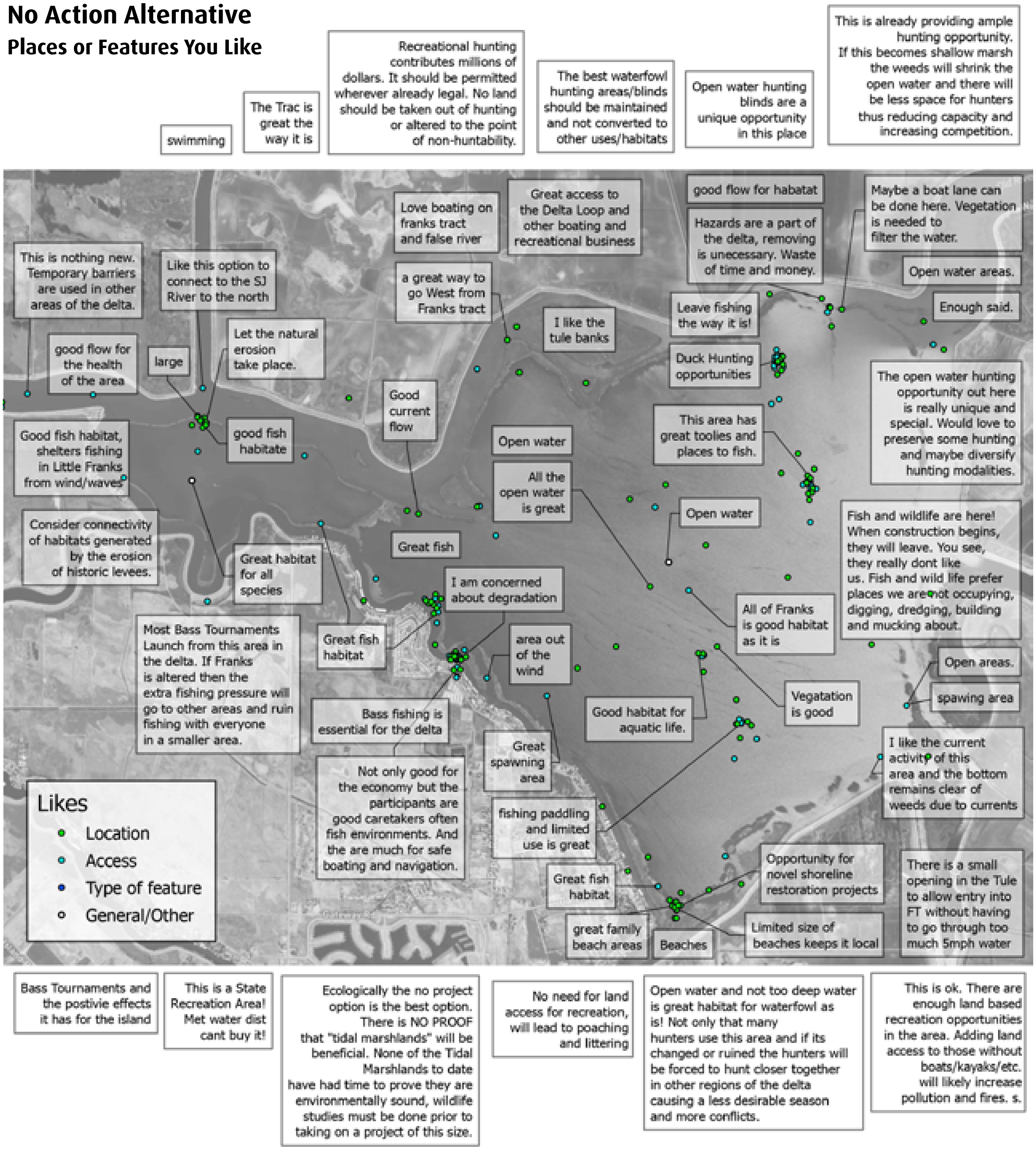


Interactive Mapping Responses

The planning team asked survey participants to mark the places and features they liked and disliked on interactive computer maps of all three design concepts, as well as the No Action alternative. Upon placing a pin, participants were asked as multiple choice questions on why they liked or disliked a feature.

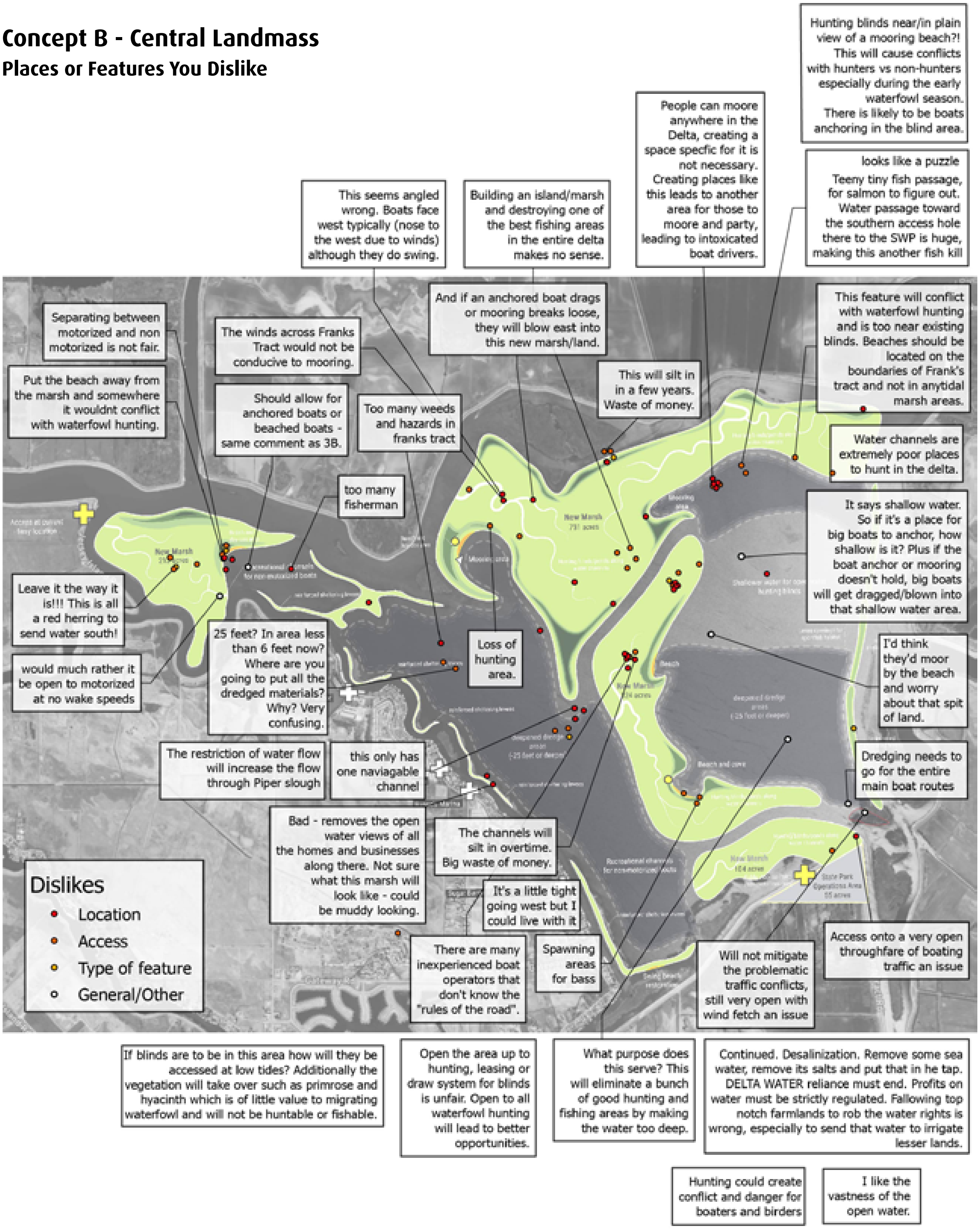
The choices for the like and dislike related to location, feature, and access. Participants were also given the opportunity to make other comments and ask questions. The maps shown on these pages offer one set of examples of actual responses (see Appendix A for all 12 maps).

No Action Alternative
Places or Features You Like



Concept B - Central Landmass

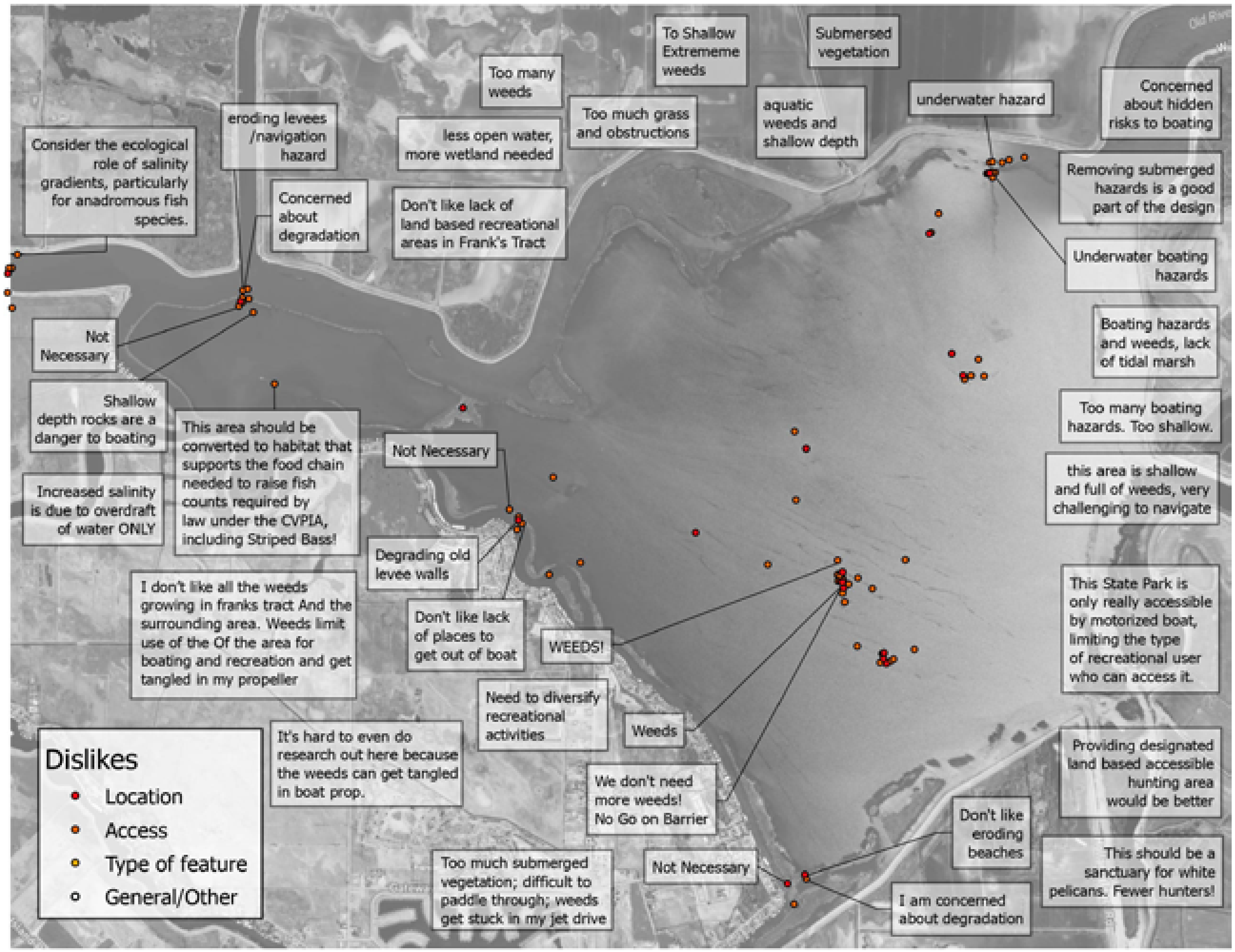
Places or Features You Dislike



No Action Alternative
Places or Features You Dislike

So with regards to the vastness of the open water... It's boring to look at. It's flat open water with a fringe of riprap levees. Would love aesthetic improvements of seeing marshes or even trees on the horizon instead of huge expanse of nothing.

The current. Met Water District, the DWR and the rest of the SWP users were supposed to make efforts to DECREASE RELIANCE on Delta water. The pumps are sucking so hard, so much current is generated by them, its hard to back my boat out of its slip. They dont think we notice, but when the current is going the wrong direction, even though its timed USUALLY with tides, anyone that operates a boat can tell whats happening isnt natural. Getting the boat out isone thing, returning it to a slip when the pumps are working requires good aim, full throttle and a couple words with God when you slam the motors in reverse just before your boat hits the marina dock....



Submerged aquatic vegetation is a nuisance for research, recreation, and native species.

Change is needed. The flooded island is useless. It should be redesigned into the habitat necessary to boost the food chain that supported the once significant fisheries of just 50 years ago.

Take Homes from Map Mark Ups

The map-based survey results indicate that respondents provided substantial and detailed consideration (likes and dislikes) of the design concepts. This represents a significant change from the first survey for the initial feasibility study where most respondents provided only negative/dislike comments. Overall, some concerns still remain for a portion of respondents, and there are detailed design questions (such as placement of features, the design of tidal marsh land masses to optimize recreational and ecological benefits) that would need to be worked through, should the Franks Tract landscape redesign project progress forward. Based on results, the potential for a co-designed, multifunctional design concept that is able to preserve and enhance existing desirable features while developing new benefits is becoming more widely embraced.

Public Survey

Comment Summary from Map Mark Ups

No Action Alternative

When asked what they currently like in Franks Tract, respondents commented on fish habitat, fishing quality, bass tournaments, open water, waterfowl habitat, hunting opportunities, "good" vegetation, access and flow. When asked what they do not like in the Tract, respondents commented on aquatic weeds, shallowness, levee degradation, boating hazards, eroding beaches, the lack of access, dangerous currents, too much open water, salinity intrusion, and a need to diversify recreational opportunities.

Not everyone likes and dislikes the same thing. Some people find open water attractive while others prefer more marsh and shallowness, which is seen as necessary for good waterfowl habitat, but also creates boating hazards. The tract is large enough to support a diversity of features, including those where preferences are divided.

Overall Commonalities and Differences across the NAA and Design Concepts

Participants made supportive comments about the NAA focused on unique features such as open water, spawning areas, fishing, hunting, good flows, and access. Some respondents were concerned that these features might be lost or diminished if a design concept were implemented. Participants also made supportive comments regarding potential modifications that could enhance these unique existing features, address current concerns, and create new opportunities and improve Franks Tract.

Beaches were a common liked feature across the design concepts. However, there were concerns voiced about their proximity to hunting areas and the potential for them to become too popular and thus an attractive nuisance.

There was a recurrent concern voiced regarding the channel widths and navigability in the design concepts. Comments to this effect raised concerns about inexperienced boaters, the narrowness of the channels (and whether they would silt up over time), and the hazard created by adjacent tidal marsh.

In general, there was widespread support for the proposed modifications to Little Franks Tract. Some were concerned about the potential exclusion of motorized boats in the area, while others were supportive of the idea of exclusion in one portion of the Tract. Others questioned the accessibility of Little Franks Tract for non-motorized boaters.

Participants made many comments across all concepts related to hunting. Several voiced concerns about the potential eradication of existing hunting opportunities, where others appeared supportive of new marsh-based hunting opportunities, often contingent upon the resolution of access issues, and the inclusion of hunter preferences in the marsh habitat design.

The proposed modification to Holland Tip to improve navigation, which varied amongst concepts, drew many comments. Despite considerable efforts made in all the design concepts, with input from the advisory committee, to minimize risks and enhance safety, there remain concerns regarding fetch, wind, navigability, and traffic-related hazards at this dangerous corner.

Comments diverged regarding the benefits of creating marshlands and dividing the Tract into two separate water bodies. While many supported the idea based on improved navigability, habitat, and recreation, others were concerned about navigation, local businesses, aesthetics, and existing recreational opportunities. Concerns were voiced regarding mosquitoes and the marsh smell, which have been recurrent throughout the process.

Take Homes for Next Planning Round?

Based on respondent comments, the next round of planning should focus on the following:

- Resolving the issues related to the dangerous corner at Holland Tip.
- Including duck hunters, and others in the design and management plans for the proposed marshlands.
- Continuing to include stakeholders in discussions related to marsh aesthetics and the experience of boating through a channel between landmasses.
- Discussing conflicts between potential recreational activities and creatively imagining solutions based on the separation of conflicting activities by distancing them in time and space.
- Undertaking further detailed design of land-based recreation opportunities such as picnic areas, campgrounds, wildlife viewing platforms, etc.
- Developing a clearer design for a State Parks facility somewhere in the vicinity of the Tract. Holland Tip has been identified as a potential location, however, there may be others, such as Jersey Island that may warrant consideration as well.
- Building upon the significant consensus regarding the design of Little Franks Tract, consider key issues including non-motorized boating access; possible exclusion of motorized boating; habitat value for smelt and other desirable species; relationship to Jersey Island and Bradford Island, and the ferry connecting the two (including maintaining the Bradford Island terminal).

6 Preferred Design Concept

Overview

The project design for Franks Tract and Little Franks Tract establishes a large area of intertidal marsh with channels, deepens open water areas to discourage nuisance submerged aquatic vegetation, and creates water and land based recreational opportunities. The design attains all project goals, discussed in detail throughout this section.

The preferred design concept was chosen by stakeholders, advisors, and the public after a year-long collaborative process (see Sections 3-5). The preferred concept creates two, large open water areas in Franks Tract, connected by tidal wetlands and deeper navigable channels. The eastern water body features sheltered coves and recreational features, with the marsh landmasses helping to reduce prevailing winds and waves.

Re-establishing tidal marsh and associated channels would require raising selected areas 8-11 feet as Franks Tract is currently subsided below sea level. Water depths at the lowest tides range from 6-8 feet (MLLW). To fill proposed new landmasses to elevations where marsh plants can grow, some areas of the Tract would be dredged (see Section 7).

The preferred concept would restore 1,370 acres of intertidal habitats, marsh and tidal channels within Franks Tract and Little Franks Tract. About 1,900 acres of shallow water (less than 6-8 feet) and 1,000 acres of deep open water would remain on the Tract.

KEY ELEMENTS OF THE DESIGN

Build a central tidal marsh landmass which maintains open water in front of Bethel Island, creates accessible land-based recreation, and impedes salt water movement from the western Delta to the south Delta.

Use over 37 million cubic yards of on-site fill material to create approximately 1,370 acres of emergent marsh, tidal channels, and associated upland habitat and 1,000 acres of deep water (greater than 20 feet) habitat.

Creates approximately 21 miles of tidal marsh channels.

Create 5 sheltered beach locations.

Establish a designated non-motorized recreational area.

Improve 12 miles of remnant levees around Franks Tract and Little Franks Tract to shelter flood protection levees and adjacent waterways from waves.

Recreational access would be maintained from the Bethel Island marinas. Additional public access is proposed at a new 55-acre State Parks Operations Area at the northern tip of Holland Tract.

The project design also divides the Tract in a way that improves water quality conditions and reduces salinity intrusion in the central Delta while maintaining navigation routes through Franks Tract to surrounding areas from Bethel Island. One big change in the landscape configuration from earlier (2018) designs is that False River remains an open, navigable channel, with enhanced connection to new tidal marsh.

This chapter discusses how the preferred concept performs in meeting objectives for navigation, recreation, local economy, ecology, water quality and supply reliability, and flood protection. Construction objectives for the preferred concept are discussed in Section 7.

NAVIGATION

Overview

Franks Tract is heavily used and valued by boaters due in part to its fast water channels and easy access to multiple destinations. Boaters use Franks Tract as a way to get from one side of the Delta to another, taking many different routes to access a variety of locations. Creating the proposed tidal marsh landmasses within Franks Tract will affect most navigation routes, but properly located and designed channels through the future landmasses will allow fast water boating to continue.

Boating on Franks Tract does not come without challenges and dangers. Parts of Franks Tract are very shallow; many have become choked with aquatic weeds. In addition, remnant tree stumps and branches protrude above the water level at low tide, or worse, lie hidden right below the water surface. Other hidden hazards include degraded remnant levees and riprap. Boaters who are "in the know" avoid the worst of these areas, however new boaters are often caught unaware. The California Division of Boating and Waterways works to minimize weed growth and to remove weeds and boating hazards, however the high acreage of hazardous area across the Franks Tract makes it challenging to sustain an effective level of management.

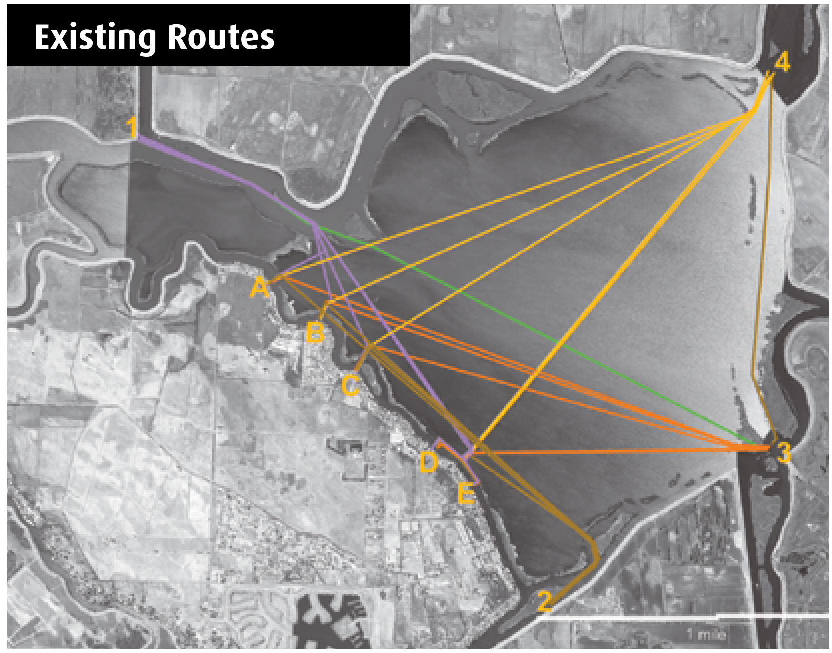
Boaters also enter and traverse Franks Tract through numerous levee breaks, where conditions can be dangerous. Boaters passing through these breaks often enter directly into waves that form across the vast open water of the Tract. Challenging boating conditions are

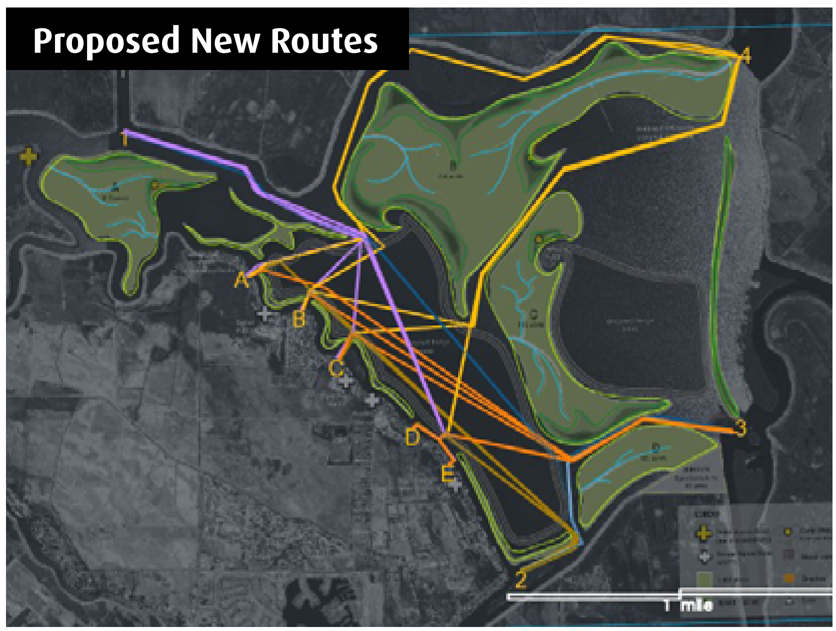

Photo: Brett Milligan

compounded at the southeastern corner of Franks Tract, where four navigation channels intersect in a location with limited visibility.

Objectives of the Franks Tract project include maintaining or improving the navigability of Franks Tract and minimizing potential conflicts between navigation and recreation.

The preferred design concept maintains open fast water channels, and easy access to multiple destinations. Other navigational benefits would be a reduction in existing hazards and nuisance conditions such as aquatic weeds and submerged hazards left over from flooding of the Tract, as well as a reduction of hazards at a variety of entry points to Franks Tract.





Boating Travel Distances

Fast water navigation routes between key locations are critical to local boaters and recreational users. Finding a way to allow for fast and safe boat navigation through Franks Tract while meeting the water quality objectives was a key planning concern.

Key locations for boat travel were determined with input from stakeholders and the public on Existing Routes map. Key navigation routes are:

- North Bethel Island to south Bethel Island (parallel to Piper Slough) (1 to 2)
- Bethel Island openings to southern corner of Franks Tract (Roosevelt Cut) (ABCDE to 2)
- Bethel Island openings to Holland Cut (ABCDE to 3)
- Bethel Island openings A, B, C, D, and E to NE corner of Franks Tract (ABCDE to 4)
- Bethel Island openings to Fisherman's Cut (ABCDE to1)
- Fisherman's Cut to Holland Cut (1 to 3)

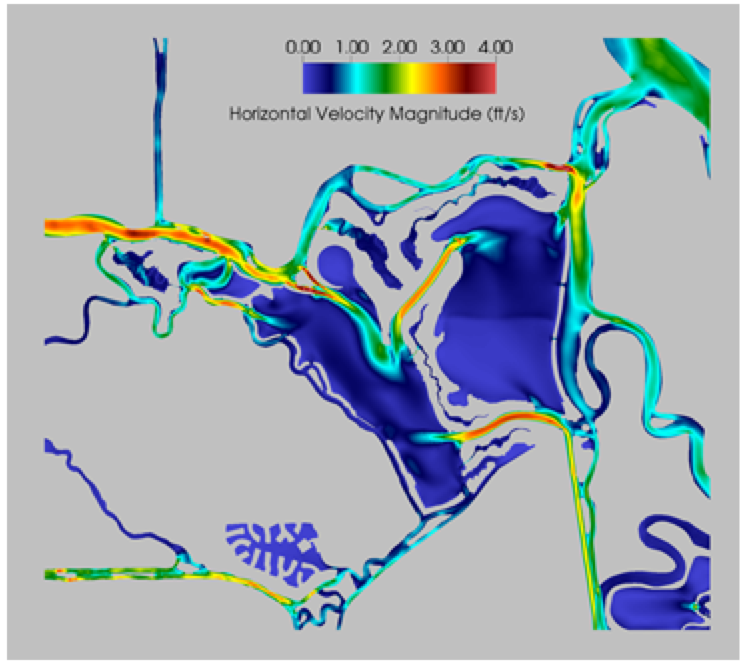
The planning team calculated the boating distance for each key navigation route under both existing conditions and the preferred design concept.

The preferred design concept maintains primary routes through the Tract with slight increases in travel distance. The preferred design concept maintains all boating routes as fast water without no wake zones. With these considerations, the preferred concept adds an average 8% increase in travel distances for key navigation routes, while improving the navigability of these routes through channel deepening and weed reduction.

Designing Channels for Fast Water Navigation

Different types of boats navigate and pass through Franks Tract, including motorboats, bass boats, ski boats, non-motorized kayaks and sail boats. These vessels can take any route, however most routes are compromised by snags, debris, or submerged vegetation. Creating tidal marsh landmasses, as proposed in the preferred design concept, will limit navigation to the through-channels between the landmasses. In designing for continued fast water navigation through these channels and the proposed marshes, the planning team made the channels as wide and deep as possible, while still meeting the project goal for water quality.

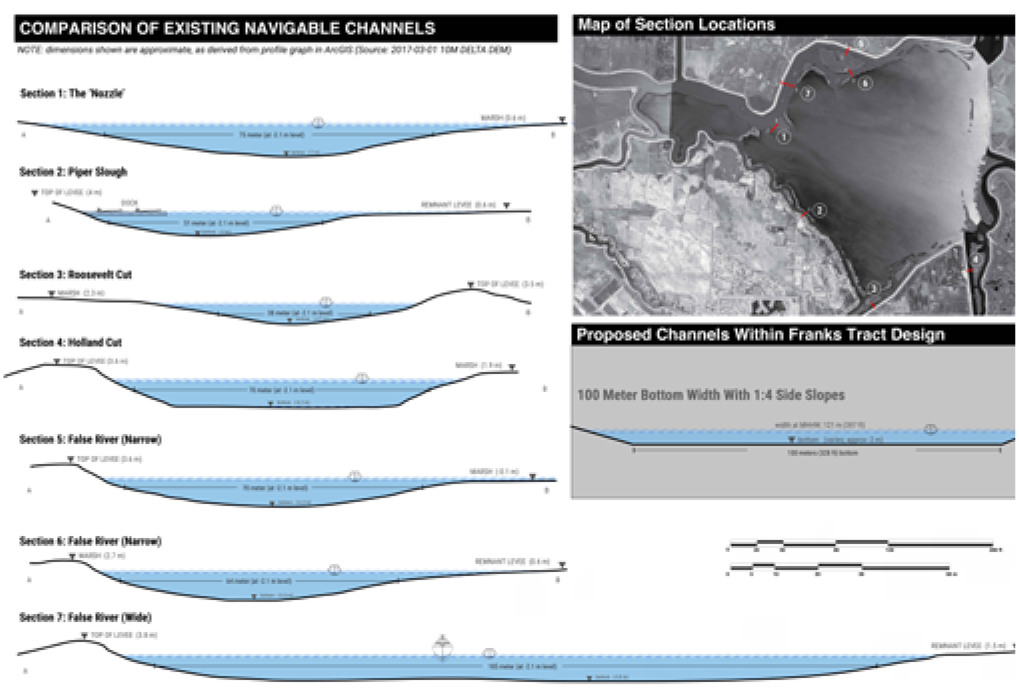
The preferred design concept includes through-channels 100 meters (330 feet) wide (similar in width to nearby Holland Cut) and 7-8 feet deep, sized to allow fast, two-way boat travel. The planning team modeled channel widths to confirm consistency with meeting the project goal for water quality (see below). The preferred concept also improves navigation by deepening channels, creating conditions unfavorable to the colonization of aquatic weeds, and removing hazards.



Modeled velocities at new entry points and intersections within a redesigned Franks Tract.

Boating Hazards

Boat entry into and out of Franks Tract can be somewhat hazardous from the east into Franks Tract, including from Old River on the north-east, Old River on the east, and Holland Cut on the southeast. Local stakeholders note that the long fetch and subsequent high waves at the eastern end create these hazardous conditions. In addition, the entry at the southeast corner of Old River/Holland Cut is especially hazardous due to impaired visibility at the intersection of five major channels. At another entry point, from False River on the north-west, high water velocities and existing levee remnants and snags create more hazards. As described above, submerged debris and snags, shallow water, and aquatic vegetation augment boating hazards throughout Franks Tract.



The preferred design concept calls for dredging to create landmasses and improve channels, which would remove many existing boating hazards. Dredging to create more extensive deeper areas on the Tract will reduce the potential for the shallow water weeds. The preferred concept includes other measures to improve boating safety such as removing existing underwater snags and hazards, sheltering the more wave-exposed eastern entrances to the Tract, and redesigning a safer entry from the southeast corner. Velocity models indicate that typical flows through the designed channels will be safe for motorized boating in all but rare extreme conditions, comparable to velocities in existing channels in the vicinity.

Minimizing Navigation and Recreational Use Conflicts

Maintaining navigation and improving recreation are both objectives of the Franks Tract Futures project. Water based recreation in Franks Tract takes diverse forms (see also next section). For example, bass boaters in a tournament may zoom from one side of the Tract to the other, searching out the best fishing spot, or aiming to get their catch in before deadlines. Kayakers may want to paddle slowly and watch birds, or sit in one place and fish. Larger motor craft may want to cruise up north to reach other recreation destinations. Meanwhile, visitors to any new beaches or shoreline amenities may want to launch kayaks or stand up paddleboards, or water ski. Allowing for all uses can be done within properly designed and sited areas that minimize placement of fast water channels adjacent to areas designed for other recreation activities. Nevertheless, if boat traffic is increased dramatically and holding capacity is exceeded due to increased recreation, conflicts may arise.

The preferred design concept sites recreation uses so as to minimize conflicts with fast water navigation. The planning team designed Little Franks Tract for non-motorized craft with no fast water navigation channels. They also placed mooring areas away from fast water navigation channels, and protected beaches from wind, waves and fast water.

RECREATION

Overview

Franks Tract supports a wide variety of recreation uses, including a world class bass fishery, waterfowl hunting, and various motorized and non-motorized boating activities. Before surrounding levees eroded, they provided boat-in access to fishing, walking, and nature viewing on their remnant shorelines.

Franks Tract also includes a State Recreation Area. Recreational use of the area is limited to boaters, anglers, and hunters. A General Plan for the area was prepared in 1988 (see Section 2, p.11) and has not been updated since that time. The 1988 plan identified a lack of a recreational land base, and thus its land use and development goals call for additional landforms, including the creation of beaches and vegetated upland areas for low intensity recreational use, while limiting the area to boat-in visitors.

Delta waterways have long been favored for recreation, primarily boating and water sports, along with fishing, hunting and day use picnicking and camping. These traditional activities and patterns of use should all be considered in planning for a future Franks Tract, however the design process opens up some new opportunities. New waterway and water body shapes, sizes and orientations could make the area more amenable to new types of recreation and safer and more pleasant for traditional activities.

A Franks Tract project objective is to enhance existing recreation uses, as much possible, while creating or expanding opportunities for new types of recreation.

The preferred design concept integrates diverse recreational improvements with consideration for, and benefits to, the local economy. The scale and diversity of these features has the potential to foster unique and regionally distinctive recreational experiences and a sense of place.

Fishing

Franks Tract currently supports a world-class bass fishery and many annual bass fishing tournaments (including striped bass, largemouth bass and other black basses). Other sportfish caught in Franks Tract include salmon, catfish, perch, and sunfish/panfish. There is no shoreline fishing activity within Franks Tract as there is no legal access to the shores.

Maintaining, improving, and creating recreation areas are companion goals to goals for tidal marsh restoration in the Franks Tract 2020 project. Restoring tidal wetland habitat will support native fisheries and improve recreational fishing.

The preferred design concept improves the recreational fishing experience at Franks Tract, primarily through enhanced sportfish habitat (see Ecology, p.54). Access to fishing from a boat at Franks Tract is presently through private marinas, predominantly on Bethel Island. In order to help maintain and enhance the local economy, no additional public boat launch points are planned on Bethel Island. The project plan does propose shoreline fishing access on Jersey Island, and perhaps Holland Tract along with non-motorized boat access. The project may increase conflict between anglers and other recreationists or boaters, depending on the popularity of proposed additional features in the project.

Motorized Boating

Water sports areas require a large open body of water somewhat sheltered from waves (with shorter fetch), ideally adjacent to beaches and mooring areas. The open water area should be large enough to allow for fast boats navigating across, water skiing/wakeboarding, as well as have quiet edges for fishing and non-motorized boating.

The Delta has a shortage of beaches, as well as places to simply get out of a boat and walk around.

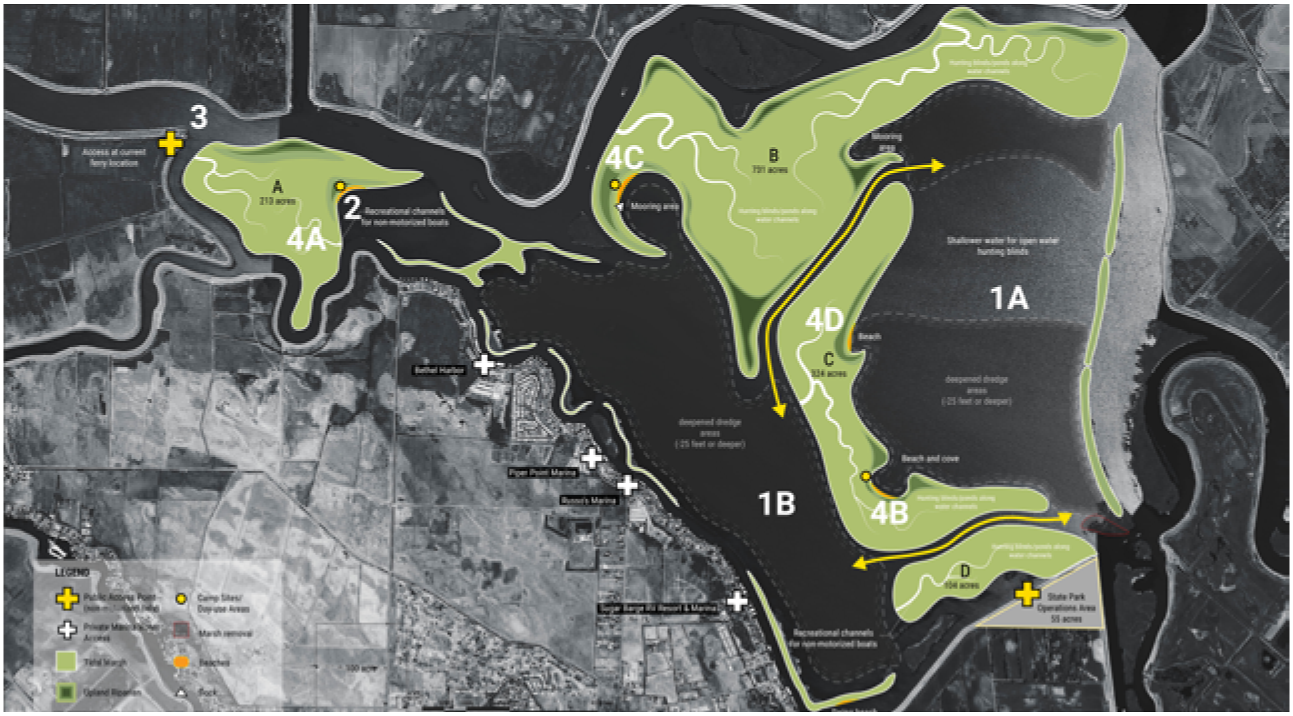
Based on input from the Advisory Committee, a good beach should include sandy surfaces adjacent to active water sports pools and sheltered from winds coming from the west and northwest by landmasses and vegetation. A good beach should also be close to (but safe from) take-off and landing spots for water-skiers and wake-boarders.

Day use facilities should be large enough to accommodate multiple and various users, and include shade (either trees and/or shade structures), picnic tables, access to beaches, and perhaps a barbeque and coal disposal facility.

Mooring facilities should allow larger boats that cannot be directly beached to tie off and access beach and/or day use areas. Facilities should only be for larger boats (>20') and would allow for a reservation system for day or overnight. Mooring areas should be protected from wind and waves.

All of the above should also be situated whenever possible near restrooms.

The preferred design concept offers desirable water and sculpted landforms for recreation. It features two major open water areas perpendicular to the prevailing summer winds, providing shelter from wind and waves (see 1a and 1b on map). The project sites the widest pool on the eastern side, encouraging most of the water sports activity to locate in that area. The marsh islands between the two pools could accommodate land recreation activities with a desirable east facing orientation, sheltered from afternoon glare and wind. Marsh Islands would also provide opportunities for water-based recreation in and along their channels, such as birding, nature observation and seasonal hunting (discussed below).



The preferred concept would create two open water areas east (1A) and west (1B) of the central landmass, a sheltered water area in Little Franks Tract for non-motorized boating (2), a potential public access point on Jersey Island (3), four new beaches (4A, B, C, D) and improvements to Swing Beach, mooring areas (triangles), and several potential day use areas (circles).

The preferred design concept has three focal points for boat-to access to recreational activities that would attract three different user groups. The design pairs the eastern open water area with the active water sports enthusiasts; the Little Franks Tract with non-motorized boaters and paddlers; and the north end of the western open water area with those operating larger boats (see map above). The project proposes a cluster of facilities in each location to serve these users. All three have a beach and day use facilities and the two adjacent to the larger open water areas also have a protected area for boat mooring.

The preferred design concept also provides smaller boat-to sites, including four potential new beaches. Nearly all of the Delta shorelines and levees are privately-held and the most common request from the public and stakeholders is for shoreline destinations.

Non-motorized Boating

Boats without motors, including kayaks, stand up paddleboards, canoes, and sailboards, are increasingly popular. Many sports enthusiasts enjoy combining motorized boating with non-motorized boating (such as paddle boarding while moored) and non-motorized boating with nature viewing. Little Franks Tract was a destination for nature lovers in these kinds of boats until it became unnavigable.

The preferred design concept creates natural and restored wetlands that include destination areas with beaches, where people may want to pull small boats ashore to picnic, swim, or launch stand up paddleboards or kayaks. The design specifies Little Franks Tract as an area for non-motorized boating with a no-wake zone. The design includes a day-use and beach area oriented for non-motorized recreation, providing a focal point for access to restored tidal lands with slow channels for wildlife viewing.

Shoreline Recreation

As described above, Franks Tract has historically offered little access to the shoreline for hikes, picnics or shoreline fishing. Day use facilities and campsites would attract more visitors to Franks Tract and should be designed to accommodate multiple and various types of users.

The preferred design concept allows for shoreline recreation from Jersey Point and/or Holland Tract, but not from Bethel Island. This design protects the existing Bethel Island businesses who provide water access to the Tract. Any new shoreline facilities could include fishing piers, restrooms, picnic tables, wildlife viewing trails, shade structures, parking, and non-motorized boat access.

Hunting

Waterfowl hunters have historically visited Franks Tract for sport through a regulated system of permits for use of state hunting blinds, small structures that hide hunters from wildlife. Administering the permits for this unique system is one of State Park's primary management activities in the State Recreation Area. Management entails running the permit process for 54 hunting blind locations, as well as patrol and enforcement during the hunting season. Local hunters highly value the current hunting blind registration system and would like to see it maintained into the future.

The Franks Tract project would significantly change recreational hunting activity. Impacts to current shallow water hunting locations could be somewhat mitigated through the creation of marsh-based and free-roam hunting opportunities, as well as open water blinds in new deeper water areas and new upland habitats for breeding waterfowl.

The preferred design concept reduces the number of existing hunting blinds but improves upland habitat for breeding waterfowl and potentially creates new blinds in deeper water and opportunities for marsh-based hunting. The preferred concept assumes the loss of between 29 (62%) and 36 (77%) of existing open water blind locations, depending on the viability of deeper water blinds. Blinds could potentially be installed in the new deeper water areas but would require different techniques for securing them (such as floating blinds and/or the use of a buoy system). The deeper open water areas created by dredging will attract different waterfowl (diving ducks) than shallow water areas (dabbling ducks).

Approximately 50 new marsh-based hunting blinds could be created around constructed ponds and along the new marsh channels. As designed, the result would be a net gain of between 14 and 21 blinds above the current 54 maximum permits. Alternatively, a lesser number of fixed blinds could be permitted within the new marshes to allow for free range hunting opportunities. Free range hunting enables hunters who might not have the resources to own or create blinds to hunt, as well as allowing for movement and creativity in hunting techniques not afforded by blinds.

Interviews with hunters suggest that many will be interested in taking advantage of new marsh-based hunting opportunities, but current hunters would face a change and reduction in conditions they value. By maximizing the number of open water blinds (by adjusting the current grid to optimize for the new configuration of the Tract) the preferred design can retain hunting capacity in the area.

Strategically placed upland areas, adjacent to brood ponds, could support more local waterfowl breeding (further consultation will be required to inform the design of upland-pond complexes to optimize breeding potential).

The preferred project encourages continued hunter stakeholder input in the development of any new hunting opportunities and protocols. Stewardship opportunities - such as hunter management of hunting ponds – could provide mutual gain among agencies, hunters and members of the general public.

LOCAL ECONOMY

Photo: Brett Milligan

Overview

An economic assessment conducted for the Franks Tract 2020 project explored current conditions and potential impacts on the local economy, which revolves around Bethel Island. Bethel Island businesses benefit from proximity to visitors from the urbanized Bay Area but the island is not a traditional business location. Indeed, the economic wellbeing of Bethel Island is reliant on the popularity of outdoor recreation in the central Delta, particularly boating and fishing. Jobs data show that approximately half of the employment on Bethel Island is directly tied to recreation. Accommodation and food service are the most significant employers (pre Covid-19). Despite the Bay Area's strong recovery from the 2008-9 recession, the local Bethel Island economy supports roughly 15 percent fewer jobs than it did about 15 years ago.

While the local economy has contracted, some local businesses on Bethel Island are thriving today. A number of marinas reported successful business models that focus on unique customer groups. The popularity of largemouth bass fishing tournaments has also been a boon for Bethel Island. While participation in fishing is waning nationally and in California, largemouth bass fishing has continued to grow in popularity. With various Delta tournaments occurring weekly during fishing season, Franks Tract has been and could continue to be a central hub for this economic activity.

The Franks Tract project planning team reviewed all available economic data and also conducted in-person and telephone interviews with business owners, association members, recreation guides and participants, and residents to better understand how the project could affect the local economy, with a focus on Bethel Island. Interviews explored whether the proposed recreation and restoration plan could be good or bad for business, increasing or decreasing customer volume, spending, or other business factors (pre-Covid).

Overall, the key objectives of Franks Tract project are in line with local business goals and economic development. The project seeks to improve water quality, restore native ecology, and enhance recreation. And with the Bethel Island economy tied to the quality of local environmental conditions and recreational opportunities, specifically factors that influence boating and fishing, the proposed project is expected to sustain and grow local economic opportunity. The economic analysis is provided in Appendix C.

Improved Navigation & Safety

The current and ongoing degradation of environmental conditions in Franks Tract is a business risk, with invasive aquatic weeds generating the most concern. Likewise, conditions in some fast-water channels and intersections can be treacherous, while submerged snags and thick weeds continue to pose navigational hazards. Recent trends in environmental quality at Franks Tract and the Delta have been detrimental to recreation. While the state has taken actions to reduce invasive plants in the Delta, such as spraying herbicides, locals worry that control measures may harm fish populations and fishing.

For local businesses, if the boating and fishing conditions are first-rate, and navigation and access are sustained or improved, the prospects for ongoing local business success are strongest.

The preferred concept will benefit the local economy by improving environmental conditions and navigational safety (see Navigation p.44). The possibility that the water depths achieved by the Franks Tract project could reduce invasive weeds is seen as a positive for recreation and related businesses.

Environmental Quality

Water quality in Franks Tract is of significant concern to local business. The continued spread of aquatic weeds and increasing herbicide use are often cited as worrisome. Warmer water and continued weed growth can also result in harmful algal blooms, odors, and fish kills that aren't good for boating- and fishing-based businesses. Business owners also mentioned increasing intrusion of salt water as a concern.

The preferred design concept would improve water quality by dredging and deepening areas plagued by aquatic weeds. The project could also reduce herbicide use depending on management. The project avoids creating areas of poor circulation that would be prone to harmful algal blooms and associated problems. The project acts to block salinity intrusion with new land masses, though the small changes in salinity associated with the project are meaningful only in terms of water quality for human use. Even with nearly two feet of sea-level rise (see Water Quality p.55), salinities are still generally considered "fresh water" in terms of effects on environmental and recreational uses. The project, however, might reduce the need for emergency drought barriers disruptive to the local and state economy.

Access, Amenities & Leisure

Easy access to Bethel Island across Franks Tract is essential to the local economy. Bethel Island's historical success as a recreation economy is largely due to its central location within the Delta and convenient access to major waterways. For boaters driving in from the Bay Area, it is among the best launch locations for trips into the heart of the Delta.

The Bethel Island business community acknowledges that the Delta remains somewhat undiscovered and that the natural beauty and recreational opportunities are not well marketed. While there is some concern that increased consumer awareness of Franks Tract and economic growth could erode the tightknit community and the rustic character that makes Bethel Island so special, locals seem to agree that the economy will benefit from investment, along with marketing and branding to leverage that investment.

For boating in particular, the project introduces significant opportunities for improvement, by increasing access and re-establishing Franks Tract as a compelling destination recreation area within the Delta. Boaters, including power boaters, sailors, and paddlers, seek outings that are structured around a place to go, and the Franks Tract project could become a must-visit point of interest.

The preferred design concept increases the attractiveness and draw of Franks Tract for leisure activity, and businesses likely will benefit from new visitors (see Recreation p.43). The concept includes significant enhancements to the existing State Recreation Area. The recreation components of the preferred design include new day use areas with picnic areas and restrooms, overnight camping, mooring fields for day and overnight use, docks, beaches, and enhanced public access. These recreational improvements, in combination with successful environmental restoration and improved navigation, have the potential to increase visitation and economic activity on Bethel Island.

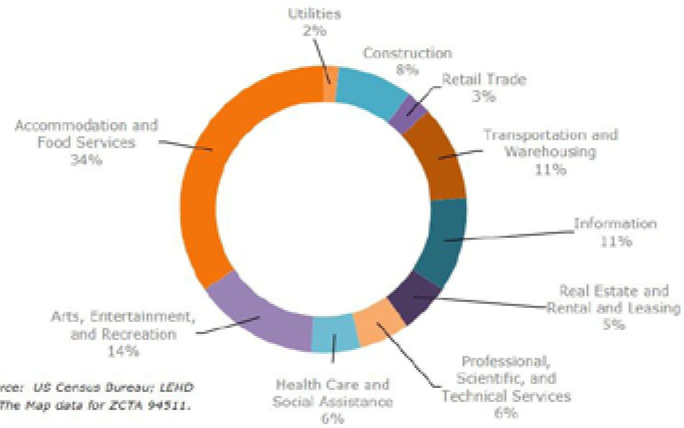
Competition

Locals are concerned that new recreational amenities will compete with local business. The most frequently voiced concern was the possibility of public boating access on Bethel Island, be it non-motorized or motorized. Stakeholders expressed similar concerns about motorized boating access on North Holland Tract at a parks facility, but were not concerned about potential non-motorized boating access at that location. The launch business is an important source of revenue for Bethel Island businesses.

The preferred design concept does not include a public boat launch on Bethel Island.It does propose a potential new non-motorized boat launch facility that would improve accessibility to Franks Tract's expanded recreational amenities. Details of this facility would need to be explored in future planning phases.

Real Estate Values

Figure 5 The Bethel Island Economy—Jobs by Industry (2017)



Source: US Census Bureau; LEHD On The Map data for ZCTA 94511.

Economic research reveals that real estate with scenic or water views, nearby open spaces, and recreational opportunities achieves a price premium in the market. Residential and commercial properties on the northeast shore of Bethel Island enjoy expansive views of Franks Tract. Vegetation at the edge of Piper Slough interrupts the view slightly, but beyond that, one can see the vast waterbody and distant horizon.

Local experts confirm that boat access to fast water and scenic views of open water are key determinants of residential real estate value on Bethel Island. Accordingly, home prices on the northeast side of Bethel Island enjoy a premium over other locations. While the west side of the Island has sunset views, Taylor Slough is weedy and westward horizon views are partially obstructed by utility lines, which undermine values.

The preferred concept locates new landmasses away from the Bethel shoreline, protecting property values derived from open water views. Despite some potential for viewshed impacts, if boating navigation improves dramatically as a result of the project, that could have a positive, offsetting effect on property values. Property values may also increase with new amenities and wildlife habitats in their vicinity.

Construction & Maintenance

Construction and maintenance of the Franks Tract project could bring new jobs to the area, and support local restaurants, services, and businesses in Bethel Island.

The preferred concept, as a design proposal, does not yet implement operations and maintenance of the Franks Tract Futures project. If the project is developed successfully but poorly managed, there could be negative impacts. If the project is well-run and maintained to high standard, with sufficient safety services, public information, and capacity control, the benefits to the local economy could be significant.

Any construction team would need to address concerns about one time impacts such as inhibited business activity, disturbed fisheries, displaced bird populations, compromised navigation, and other issues during the construction period. Strategies to minimize recreation and business impacts from construction would be implemented extent practicable (see Section 7).

Collective Benefit

Businesses on Bethel Island are working together to advocate for Franks Tract and the Delta. There is a realization among business owners that collective action is needed to avoid further deterioration of environmental quality and the local economy. Significant public investment in Franks Tract is perceived to be beneficial to the community broadly. Many of the perceived local economic benefits are derived from improved recreational opportunities, without which the project would lose support from local business owners, residents, and longtime recreational users.

The preferred concept does not create disproportionate impacts on any particular business type or location on Bethel Island. The well-distributed potential benefits of the Franks Tract project support continued business collaboration. Cohesion within the business community on Bethel Island is a positive attribute of the local economic fabric that may be leveraged to increase benefits from the Franks Tract project. The planning team recognizes that the combined depth of knowledge in the business community offers an invaluable resource for any future project development and implementation.

ECOLOGY


Photo: Rick Lewis

Before humans reclaimed vast marshy flats in the Delta to convert them to farmland and build towns, the region featured a complex network of rivers, sloughs, and tidal wetlands. The historical landscape supported native estuarine fish like Delta smelt and juvenile Chinook salmon, providing food, shelter, and migratory corridors along the marsh channels and through adjacent open water areas.

Today, the Delta's aquatic landscape is a highly altered system of levees and channels. In addition to native species, it now a supports a prized sport fishery. Approximately 97% of the historic tidal marsh has been lost (SFEI 2016). Small remnant islands of tidal marsh within False River and some of the surrounding channels are all that remain.

Characteristics of a healthy Delta ecosystem, according to the Delta Reform Act, include diverse and biologically appropriate habitats and ecosystem processes, functional corridors for migratory species, and viable populations of native species (California Water Code section 85302[c]).

Objectives of the project include establishing large areas of tidal marsh habitat for fish species of interest.

The preferred design concept would restore lost tidal marsh habitat to benefit a range of species, maintain or enhance habitat for native and recreationally important fish species, and discourage nuisance, invasive aquatic weeds.

Tidal marsh

Tidal marsh is important habitat for both aquatic and terrestrial species. Freshwater emergent vegetation grows in the marshes of this part of the Delta, predominantly consisting of tules (*Schoenoplectus spp.*), bulrushes (*Bolboschoenus spp.*), and cattails (*Typha spp.*). In the adjacent shallows, primary production processes produce dissolved organic matter, phytoplankton, zooplankton (e.g. copepods, cladocerans, mysid shrimp), insects, and detritus. Increasing this primary production, by reintroducing tidal action to Delta landscapes, supports the aquatic food web (Sherman et al. 2017). Native fish, waterfowl, and diverse local wildlife all benefit from the inputs of primary producers in tidal marsh.

The preferred design concept proposes to create approximately 1,370 acres of new tidal marsh, including vegetated (emergent) tidal marsh plain and tidal channels, with smaller areas of adjacent upland habitat. Tidal channels will consist of multiple dendritic dead-end channels ranging in sizes, similar to channels of the historic Delta marshes. Channels will be largest (deepest and widest) where they enter the marsh (e.g., adjacent to False River), and smallest at their termini inside the marsh.

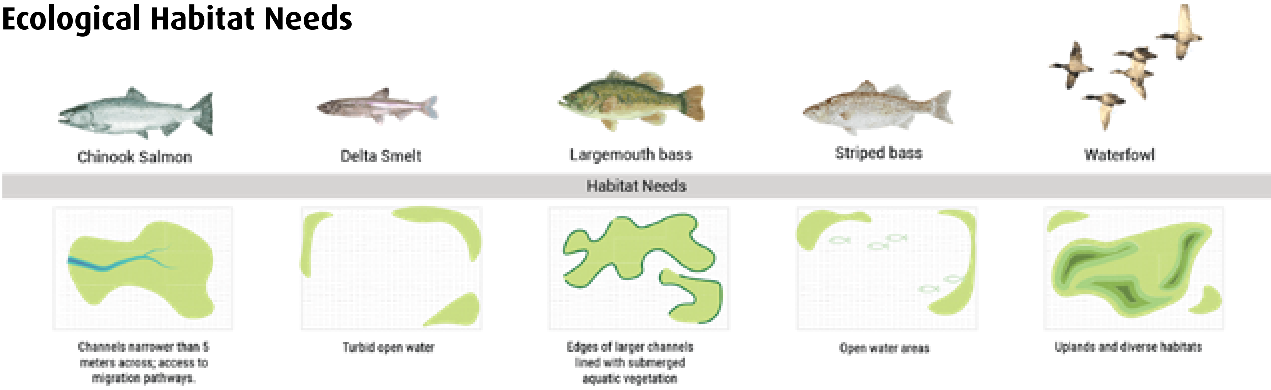
The marsh plain would be integrated with new riparian areas created along higher ground at the edges of major tidal channels to promote habitat diversity. Riparian habitat would consist of cottonwoods (*Populus fremontii*), arroyo willow (*Salix lasiolepis*), black willow (*Salix gooddingii*), box elder (*Acer negundo*), or other native Delta trees and shrubs. Though project planners have not yet developed a revegetation plan, the objective would be to reestablish native tidal marsh and riparian vegetation relying on a combination of natural vegetation colonization processes and planting of native plants. Some level of planting of native plants would be required to minimize the colonization of invasive weeds that may invade suitable unvegetated areas. Any revegetation effort would include a planting design detailing the types and locations of native plant species. The additional acreage and diversity of tidal marsh habitat planned for Franks Tract under this preferred concept would benefit both aquatic and terrestrial organisms.

Habitat for Special Status Native Fish

As noted in the prior section, the shallow-water habitats with dendritic channels and emergent wetland vegetation present in the Delta historically provided refuge and food resources for many native fish species. Current conditions represent a heavily altered ecosystem with reduced habitat and increased abundance of invasive plants and nonnative predatory fish, low food productivity, and continued risk of fish entrainment into the south Delta region (Baxter et al. 2008, Grimaldo et al. 2009). These conditions have led to a less favorable habitat for native species.

The proposed habitat enhancements for Franks Tract focus on two special-status fish species: Delta smelt (*Hypomesus transpacificus*) and Chinook salmon (*Oncorhynchus tshawytscha*). In addition to creating new tidal marsh habitat and associated food web support, planners designed the preferred concept to alter the hydrodynamics of Franks Tract to reduce regional south Delta reverse flow effects. This

Ecological Habitat Needs



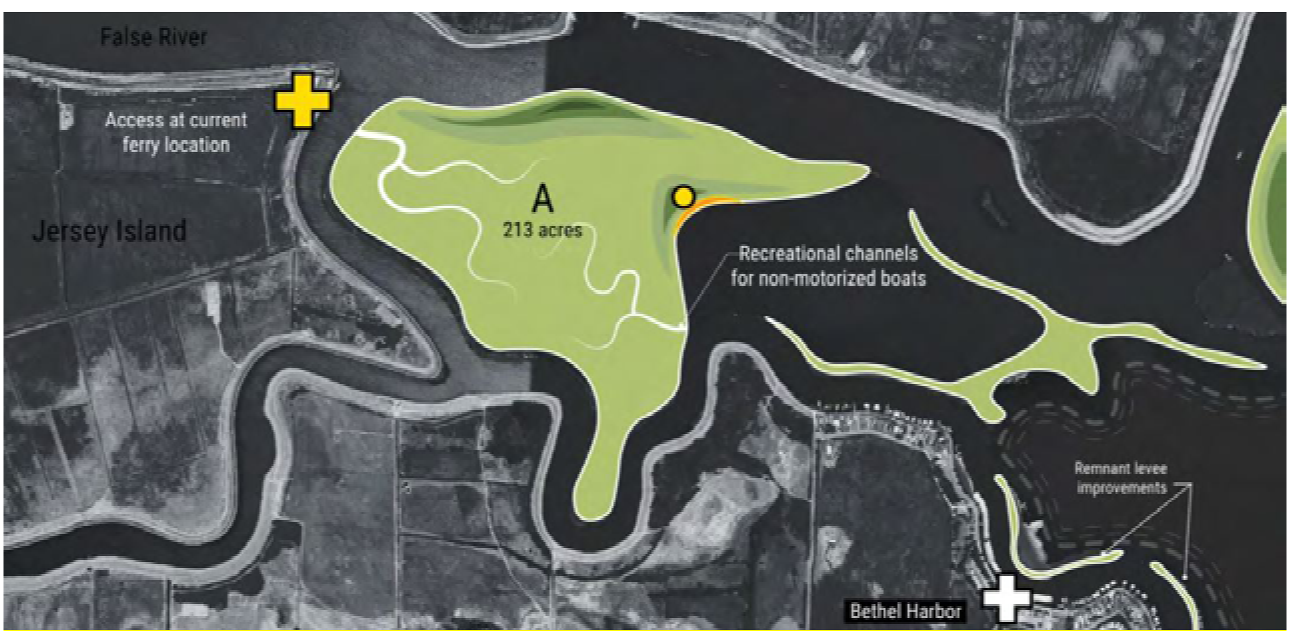
change would reduce the associated risk of special-status fish species entrainment towards the state and federal water projects (pumping facilities) in the south Delta.

Delta smelt is a small fish, endemic to the San Francisco Estuary in California with a typical life cycle of one year, although some adults may live to a second year. Juvenile and adult Delta smelt are a euryhaline species (tolerant of a wide salinity range) that inhabit freshwater portions of the Delta and extend into low salinity portions of Suisun Bay. Adult smelt migrate upstream from the brackish water habitat of the low salinity mixing zone to spawn in freshwater areas. These spawning areas are primarily in the north Delta, but also include Franks Tract, beginning in December to July and August (Sommer and Mejia, 2013). After the eggs hatch, river flows and tides distribute larval smelt downstream into low-salinity habitats of the central Delta where they continue to rear through summer and fall (Moyle, 2002).

Once abundant throughout the Delta, a variety of environmental factors have led to the decline of Delta smelt, including changes in species composition and abundance of zooplankton prey species, increased potential for entrainment into south Delta water diversions, and increased predation by other fish species. Today, Delta smelt are rarely detected in state and federal sampling programs. The decline of the species has led to special-status species listings as endangered under the California Endangered Species Act (CESA) and threatened under the Federal Endangered Species Act (FESA).

Critical habitat was designated for Delta smelt in 1994 and became effective on 18 January 1995. Critical habitat is designated as Suisun Bay and Marsh and the existing contiguous waters contained within the Delta (including Franks Tract), as defined in Section 12220 of the California Water Code.

Creation of Tidal Marsh & Native Fish Habitat at Little Franks Tract



The preferred design concept restores Delta smelt habitat, consistent with goals of the 2016 Delta Smelt Resiliency Strategy and actions outlined in the U.S. Fish and Wildlife Service's 2008 Delta Smelt Biological Opinion, which requires the restoration of 8,000 acres of tidal marsh habitat. The restoration creates 113 acres of tidal marsh habitat in Little Franks Tract and additional tidal marsh in Franks Tract.

Within the tidal marsh landmass in Little Franks Tract, the design incorporates dendritic, tidal marsh channels with connectivity to Piper Slough, False River, and open water habitat in Little Franks Tract. The western portion of Franks Tract, including Little Franks Tract, is expected to offer the best restoration opportunity for improving Delta smelt habitat because it is farthest westward and closest to areas of the estuary that experience fluctuations in salinity. It is also largely separate from areas enhanced for recreationally important nonnative predator fish habitat in Franks Tract.

Riparian willow.

Chinook salmon are an anadromous fish species, spawning in freshwater and spending a portion of their life cycle in the ocean. Chinook salmon spawn upstream of the Delta in cool, clean, and well-oxygenated waters that contain adequately sized spawning gravel, instream cover, and riparian shade. Chinook salmon use the Delta, including Franks Tract, during adult upstream migration, smolt emigration, and juvenile rearing (Moyle, 2002). There are four runs of Chinook salmon within California's Central Valley that vary in migration timing and reproduction behavior, two of which are state and federally listed.

Sacramento River Winter-Run Chinook salmon are listed as endangered and Central Valley Spring-Run Chinook salmon are listed as threatened under FESA and CESA. Designated critical habitat also includes portions of Franks Tract for both special-status Chinook salmon runs. Additionally, essential fish habitat as required by the Magnuson-Stevens Fishery Conservation and Management Act, as amended (16 USC 1801 et seq.) has been designated for all four runs of Chinook salmon. Essential fish habitat includes migration, holding, and rearing habitat in the Delta, including Franks Tract, Sacramento River, and major tributaries.

The preferred design concept would create 760 acres of tidal marsh habitat along the northern part of Franks Tract. Planners placed this northern landmass adjacent to False River with the objective of creating a protected, migratory corridor for Chinook salmon along the northern extent of the Tract. The design provides narrow, tidal marsh channels suitable as refuge and rearing habitat for outmigrating juvenile salmon. It also connects tidal channels and the marsh plain to adjacent open water, potentially increasing marsh-derived primary productivity.

Habitat for Recreationally Important Fish

People come from all around the world to fish Franks Tract for largemouth bass and striped bass. As mentioned in earlier sections on recreation and the local economy the Tract hosts numerous tournaments each year. Restoration designs for Franks Tract aim to not only improve habitat for native fish such as Delta smelt and Chinook salmon, but also maintain habitat for species important to the sport fishery.

Largemouth bass were introduced to California in the late 1800s for their sport fishing appeal. Since their introduction, largemouth bass have expanded their distribution throughout the state and are now abundant everywhere in the Delta. This warm, freshwater species prefers salinities less than three parts per thousand and shallow (generally less than 20 feet deep) open water habitats with little water current (Moyle 2002). This species also favors relatively dense areas of submerged aquatic vegetation, which Franks Tract currently offers (Conrad et al., 2016; Young et al., 2018).

The preferred design concept creates increased areas of shallow, edge habitat along tidal marsh land masses with depths less than 20 feet. Some portion of these shallow, edge habitats will likely be colonized with submerged aquatic vegetation. These edge habitats and vegetation provide largemouth bass with potential spawning habitat and foraging habitat for juveniles. Submerged vegetation supports a variety of aquatic macroinvertebrates (e.g. amphipods) which are an important component in largemouth bass diets (Weinersmith et al. 2019). Anticipated water quality improvements are not likely to substantially influence the presence or health of bass species.

Striped bass is another popular species among anglers within Franks Tract and the Delta. Introduced to the California in 1879, striped bass are now abundant throughout today's altered Delta ecosystem. Juveniles feed along channel edges while adults occupy open water, pelagic habitat. Striped bass are naturally anadromous, regularly moving between marine and freshwater environments, and spending most of their lives in estuarine conditions. Key habitat elements for striped bass include large, cool river environments with enough flow to distribute suspended larvae into the estuary, an open body of water with abundant prey fish, and protected areas for juveniles to grow by feeding on invertebrates (Moyle 2002). Velocity gradients, where there is a change in water velocity into an open water area, were expressed as desirable by the local fishing community. Such velocity gradients occur at several existing confined open water connection points between False River and Franks Tract.

The preferred design concept creates several locations with velocity gradients that are expected to be favorable for striped bass (see p.46). One location is in the north of the Tract, where velocity gradients are maintained at existing connection points. The preferred concept creates additional velocity gradient locations on either side of the central landmass and along the breaks in the eastern most enhanced levee. Planners predict that additional velocity gradients would attract striped bass similar to the existing connection points. The design also includes dredging and deepening of the open water areas expected to support striped bass.

Invasive Aquatic Vegetation

Invasive aquatic vegetation grows both on the surface (floating) and underwater (submerged) in channels and shallow waters throughout the Delta. In addition to being a boating hazard, invasive submerged and floating vegetation are ecologically undesirable for native fish species and can exacerbate algae blooms and other water quality problems by reducing circulation.

Submerged aquatic vegetation (SAV) typically consists of rooted vascular plants within slow-moving or still waters. The depth in which SAV can persist is primarily dependent on how deep sunlight penetrates into the water. The shallow depths of Franks Tract allow for SAV colonization, resulting in dense stands throughout the interior of the Tract. SAV in Franks Tract is dominated by the invasive species Brazilian waterweed (*Egeria densa*), Eurasion watermilfoil (*Myriophyllum spicatum*), water primrose (*Ludwigia spp.*), and coontail (*Ceratophyllum demersum*).

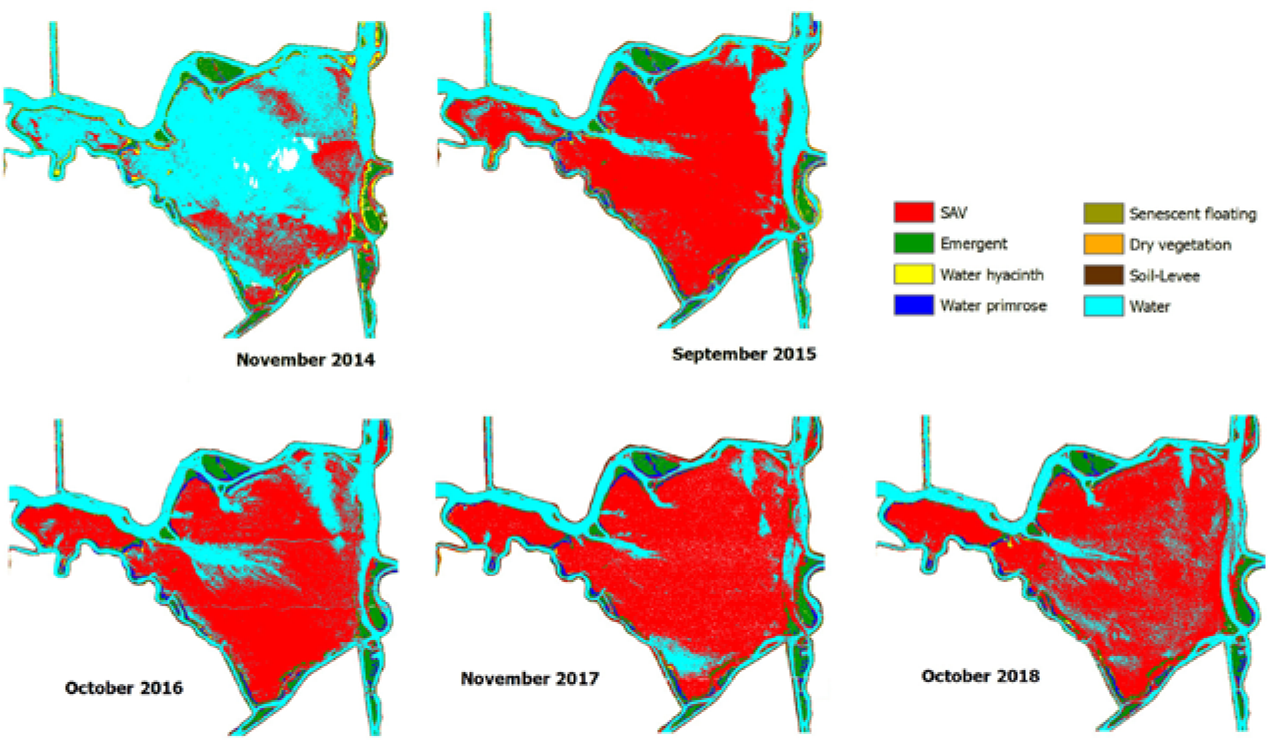
Floating aquatic vegetation (FAV) is non-rooted, free floating plants at the water's surface or within the water column. Wind, currents, and tides can circulate and redistribute these floating mats of vegetation. Within Franks Tract, water hyacinth (*Eichhornia crassipes*) is the most common species of invasive FAV. Dense mats of water hyacinth are especially a nuisance, restricting navigation, presenting boating safety hazards, and clogging waterways and marinas.

Submerged and floating aquatic vegetation covers a large portion of Franks Tract. Research by the Center for Spatial Technologies and Remote Sensing at the University of California, Davis shows trends of increasing densities of aquatic vegetation within the central Delta including Franks Tract (Ustin et al. 2017)

The preferred design concept could reduce the establishment of SAV and FAV in some areas of the project. Creating tidal marsh landmasses, for example, would reduce the total area of open water available for colonization by these aquatic weeds. Deepening portions of the remaining open water would also discourage establishment of rooted SAV.

While the preferred concept seeks to reduce the establishment of invasive aquatic vegetation, some level of continued management is expected to be necessary. The Department of Boating Waterways has been managing aquatic vegetation since 2006. Land use changes embodied in the preferred concept may allow the department to more effectively manage the site for weed control within their existing level of funding, potentially resulting in fewer nuisance weeds. If restoration were to occur, funding for weed management would need to continue.

Infrared Mapping of Submerged Aquatic Vegetation in Franks Tract



Source: Ustin S. L., Khanna S., Lay M., and Shapiro K., 2019.

WATER QUALITY

Overview

Franks Tract plays a central role in the exchange of salt, food, sediment and biota between the west, central, and south Delta. The geometry of Franks Tract contributes to a mixing phenomenon called tidal pumping, a mechanism that traps and disperses saline water and fish from False River into Franks Tract and on to the south Delta (see below).

The Franks Tract region is also a nexus of regulatory control. State Water Quality Control Board Decision D-1641 prescribes water quality standards for agriculture and water exports at locations throughout the Delta, but standards at sites in the vicinity of Franks Tract are frequently the ones that limit the amount of fresh water the state and federal water projects can divert. As sea levels rise, the water cost (associated with upstream reservoir releases) of compliance with Delta standards is expected to increase.

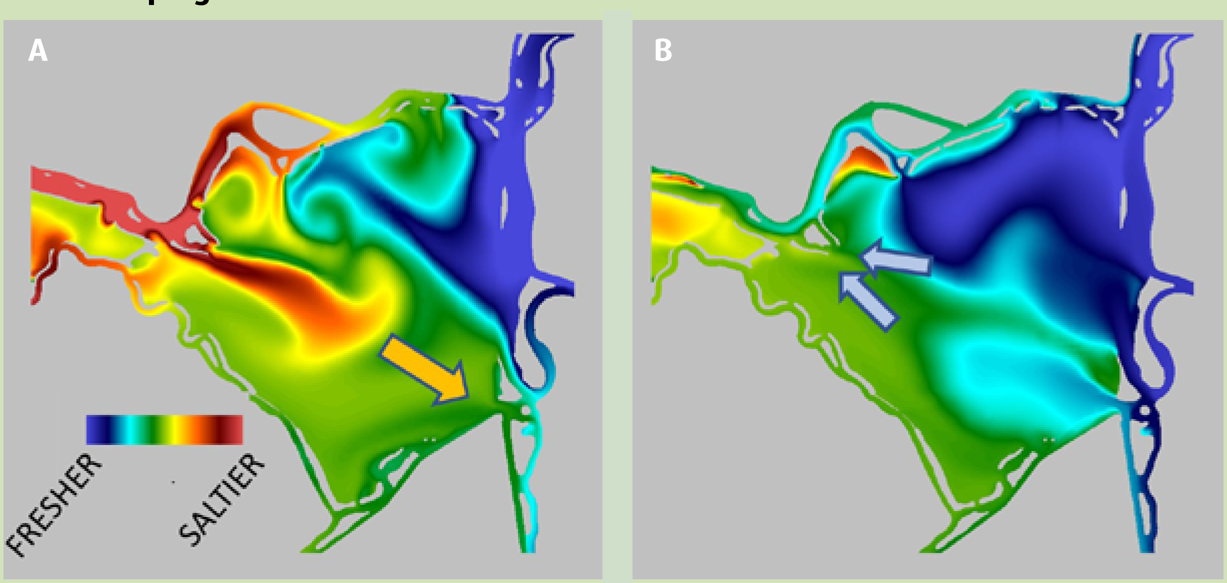
Water quality problems and difficulty meeting standards can increase with drought. Additional management measures are sometimes required to protect the fresh water corridor from salinity intrusion. In 2015, an emergency drought barrier was constructed in west False River to limit salinity transport into Franks Tract and subsequently into the central Delta. The barrier minimized salinity intrusion but was costly. It also negatively affected navigation and recreational uses of the Delta, especially in the vicinity of Franks Tract (see also p.14).

In addition to trapping and transporting salt, tidal pumping at Franks Tract can also entrain state or federally protected fish species towards the south Delta pumping facilities where chances of survival are reduced (see prior section). Presence or salvage of

Why is Franks Tract so Important to Salinity Intrusion?

Franks Tract is important to salinity transport through a mechanism called tidal pumping. Tidal pumping is a phenomenon that occurs when small inlets constrict flow entering an open water body. The figure below uses snapshots from a model simulation to illustrate this phenomenon as it occurs within the current geometry of Franks Tract. In Panel (a) a strong and narrow jet of higher salinity (red) water can be seen entering Franks Tract from False River on a flood tide through an aperture sometimes referred to as "The Nozzle." Salinity in this jet is most influenced by the San Joaquin River at Jersey Point, which in summer is higher than that of Franks Tract. Panel (b) shows the return flow from Franks Tract. It is fresher (blue and green) because the salty jet of water will have mixed with ambient water in Franks Tract and ebb flow draws from a broader area of more diluted water. Even if the volume of flow is the same in both directions, the asymmetry between a salty flood and a fresher ebb adds up and causes a net transport of salt into the central Delta.

Tidal Pumping



protected species at the south Delta pumping facilities can trigger Old and Middle River reverse flow restrictions and curtail pumping. Fish entrainment is thus both a water supply reliability consideration, as well as an ecological consideration for Franks Tract design concepts.

Objectives of the Franks Tract project include improving water quality and supply reliability.

The preferred design concept reduces trapping and transport of salts through Franks Tract, based on hydrodynamic modeling. The project improves water quality in the central Delta and reduces fish entrainment potential from the west. The project could also reduce water release from reservoirs that would otherwise be necessary to improve water quality in the central Delta. The project provides significant drought protection as well, reducing the frequency with which a salinity barrier may be needed.

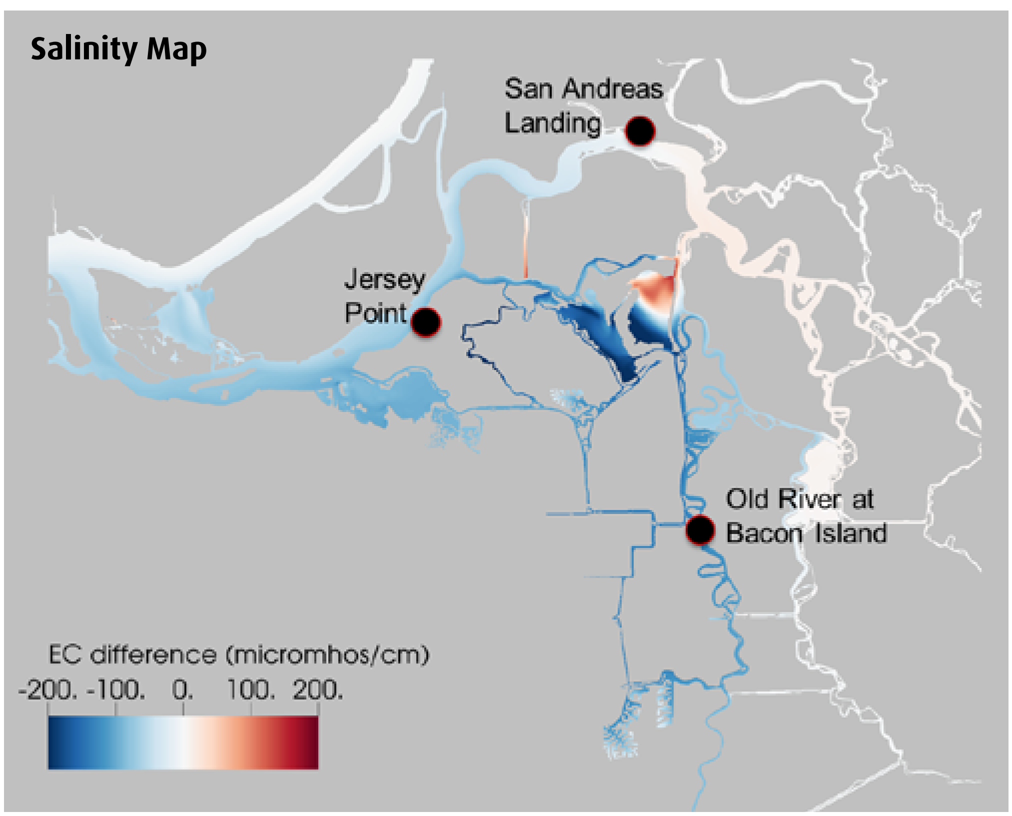
As noted, the Franks Tracts futures project has no influence over water project operations, Delta exports, or proposals for alternative conveyance.

Salinity Control

Salinity intrusion from the Bay usually reaches the western Delta in late summer or fall depending on Delta outflow conditions. Under these conditions, water quality negatively affects beneficial uses of the State's waters (for human uses, agriculture, fish and wildlife habitat, etc.) and plays a controlling role in water project management. Water quality standard locations include the San Joaquin River at Jersey Point and Old River at Bacon Island near Rock Slough where the Contra Costa Water District maintains an intake.

The preferred design, as modeled, would improve regional water quality (salinity) conditions.

The salinity map shown below, is a change map from the Bay-Delta SCHISM model (see Appendix D) that illustrates the projected spatial distribution of salinity difference (Preferred Concept minus No Action alternative) averaged over August 1-14, 2009 using historical hydrology. The year is categorized as Dry. Results are expressed in units of electrical conductivity (or μS/cm, as saltier water conducts electricity better than fresh and conductance is often used as a surrogate measurement for salinity). Areas shown in blue are fresher — reductions in salinity occur around Franks Tract particularly upstream on the Old River system. Few areas are degraded significantly (i.e., by more than 10-20μS/cm).



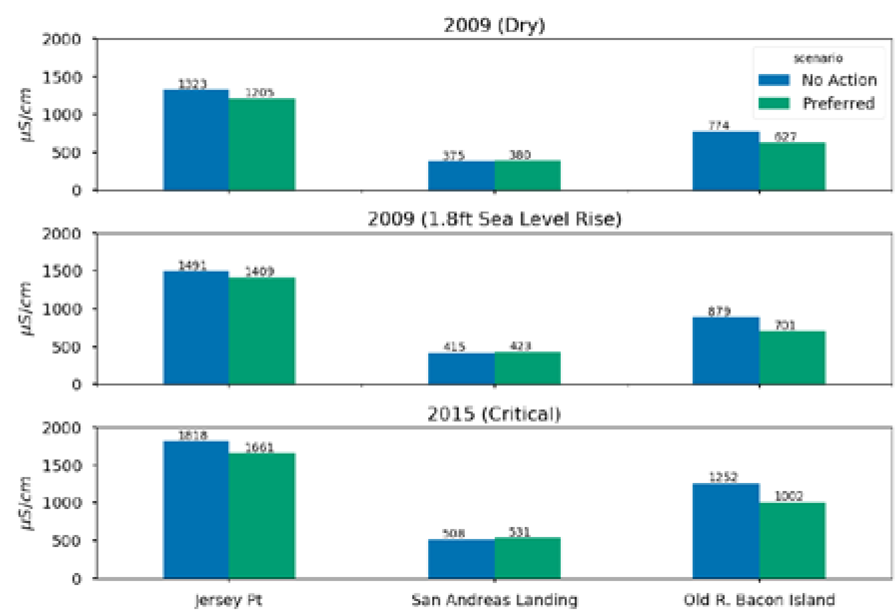
The salinity bar chart, opposite, compares model salinity changes at three locations used as indicators for the structured decision making process (see Section 4, p.25). Several hydrologic scenarios are shown – the 2009 dry year historical hydrology was used as the basis for general salinity assessment and design comparisons. Results are averaged between August 1 and November 30, 2009, a large fraction of the season when salinity is a compliance issue in the region. Some site-specific notes are as follows:

Old River at Bacon Island: The station on Old River at Bacon Island was used as the primary station to determine the effectiveness of the project. It is representative of the region of greatest benefit upstream (south) of Franks Tract, and is also proximate to Rock Slough, a D-1641 compliance point. Old River concentrations are also a predictor of ocean salinity effects farther south near the state and federal water projects. The persistent 150-200µS/cm freshening at this location represents an improvement compared to No Action as great as 20-25 percent.

Jersey Point: Jersey Point, also a D-1641 station, is located on the San Joaquin River downstream of Franks Tract where an agricultural water quality objective often governs water management through August 15. Jersey Point is more indirectly affected by changes in dispersion and tidal energetics in Franks Tract, and it was not known before changes were modeled that this location would be freshened. The projected salinity improvement at Jersey Point is modest in relative terms but nevertheless an important finding because it implies there is no tradeoff between downstream and upstream objectives.

San Andreas Landing: San Andreas Landing is a D-1641 compliance station, but one that has rarely been a compliance limiter under historical conditions. It was included as a precautionary measure — model-

Salinity Bar Chart



Potential Water Project Operations Response to Franks Tract Project

As noted above, the project does not influence water project operations directly. However, the Advisory Committee has requested that the planning team qualitatively consider how water operations may evolve in response to the proposed Franks Tract project and whether there would be any effect on project benefits. In particular, there is interest in how the project would perform with potential Delta Conveyance Project (tunnel) operations to the extent that these operations have been defined.

Any operational adjustment to the Franks Tract project would vary by season, hydrology, water demand and the myriad other factors that influence water project operations. The planning team considered various seasonal and flow scenarios (see Modeling Appendix; in progress) and concluded that changes in water project operations in response to the project are unlikely to significantly offset water quality benefits in the central Delta for most seasons across a range of wet and dry hydrologies. The exception is from August 15 though the fall in drier years, when the project would make maintaining the required salinity in the central Delta achievable with less outflow. Operators could reduce upstream reservoir releases or increase diversions at Clifton Court, keeping Central Delta water quality closer to without project levels. Standards and agreements upstream and downstream of the Franks Tract enhancement project would determine the extent and feasibility of this type of change.

The Delta Conveyance Project (tunnels) introduces effects that are largely independent of the operational changes sketched above. The tunnels do not alter the Delta outflow required to meet managerial requirements nor do they free the agencies from their obligations to do so. The scenario in which Franks Tract and any Delta Conveyance project would most likely have to be considered together is the fall post-August scenario described above. If the tunnels were in place, operators might implement reduced outflow by diverting flow at the tunnel intakes rather than reducing upstream reservoir releases or increasing exports in the south Delta which are the current options.

The water quality study conducted for this project provides qualitative consideration of operational adaptations. Quantifying operational responses more specifically would require more detailed assessment and use of a statewide water operations planning model. The modeling done for this Franks Tract enhancement project is a prerequisite for such an effort and further planning phases.

Photo: Christina Sloop

Emergency drought barrier on False River.
Photo: Christina Sloop

ing performed in prior rounds of restoration designs and in support of the 2015 emergency drought barrier suggested that when tides are strongly deflected at False River, energy can be diverted around Bradford Island and cause San Andreas Landing to be saltier. The preferred design appears to dampen the tides at False River sufficiently enough to not cause this type of salinity response.

Sea level sensitivity: The salinity bar chart on p. 61, compares salinity at the three index stations between the No Action and preferred concept scenarios under a modified scenario with 1.8 feet sea level rise. According to the California Ocean Protection Council (2018), this increment represents a 2040 water level under a high greenhouse gas emissions scenario suitable for use in planning for extremely risk averse land uses. As the table shows, sea level rise results in higher values at all three tabulated stations under both geometries. However, the sea level response at Old River at Bacon Island is muted under the preferred design compared to the No Action. This means that in terms of water quality, the project may serve as adaptation to sea level rise.

Drought Protection and Emergency Barrier Deployment

Protection of water quality becomes an elevated management concern during droughts in the central Delta. Whereas salinity encroachment along the main stem of the Sacramento and San Joaquin Rivers can be reversed with increased upstream releases of water and increased flow or a reduction in south Delta pumping, flow management options are limited during a prolonged and extreme drought. Moreover, if salinity does penetrate the freshwater corridor in high concentration, the effect would be largely irreversible. For this reason, the California Department of Water Resources has constructed a barrier to try to limit the transport of salt under extreme circumstances, most recently on False River in 2015 (see also p. 18). The 2015 False River Emergency Drought Barrier achieved its salinity control purpose, but the temporary rock structure was expensive and negatively affected navigation and recreational uses. More ambiguously, the barrier may have also contributed to nuisance invasive vegetation and bivalve population growth (Kimmerer, 2019).

The preferred concept is estimated to provide a significant fraction of the salinity protection of the 2015 emergency drought barrier, and thus can be expected to narrow the range of hydrologic conditions under which a barrier would have to be constructed. Even in a more significant drought, the monolithic design at False River would likely be unnecessary– any structure could be smaller, less costly, and sited to have smaller impacts to regional navigation.

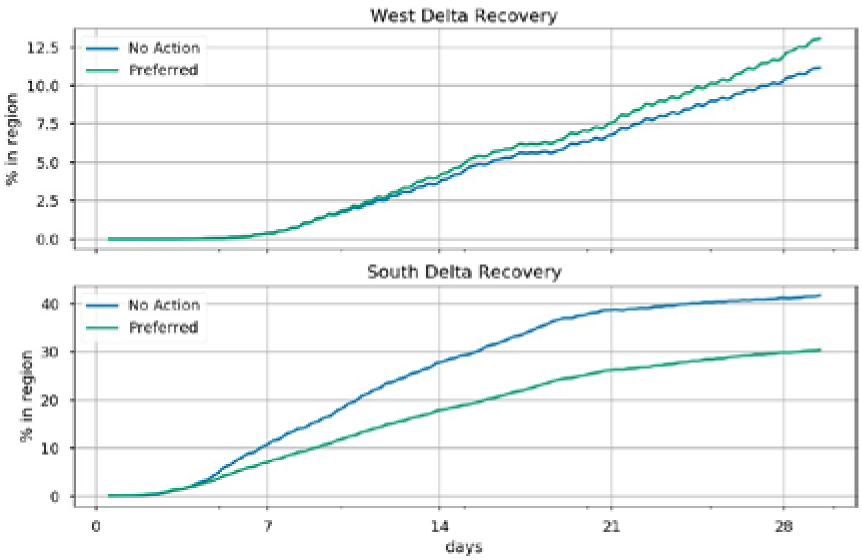
The salinity bar chart on p. 61 depicts the salinities (expressed in units of specific conductivity) resulting from a 2015 simulation under the No Action and preferred concept configurations. Under the preferred concept, salinity at Old River at Bacon Island achieves the basic municipal and industrial criteria of D-1641 (simplified here in terms of conductance as 1000uS/cm) and is 25% lower in concentration than in the No Action without a barrier. With minimal changes, water operations would likely have been able to comply with the regulatory constraints that year, although there would have been little margin for more ambitious targets such as provision of low bromide water for mixing into municipal supplies.

Fish Entrainment and Water Supply Reliability

Entrainment of fish represents not only an ecological risk to listed species, but also a reliability issue for water operations. Under the CDFW (2020) Incidental Take Permit for the State Water Project and federal Biological Opinions by NMFS (2019) and USFWS (2019), presence or salvage of salmon, Delta and longfin smelt and other species at export facilities can trigger Old and Middle River flow restrictions and these limitations are realized through export reductions. Additional entrainment surrogates, such as turbidity triggers, are included for Delta smelt in the permit due to their low population.

Tracking Particles to Simulate Fish Entrainment

March 2015 Release on San Joaquin River near False River



In order to evaluate the effect of the altered flow patterns on entrainment, the planning team performed particle tracking modeling simulations under a variety of hydrologic conditions using three injection sites on the San Joaquin near False River, the mouth of Old River and Turner Cut.

The study does not consider biological behavior but evaluates hydrodynamics that could indicate potential influence on the movement and/or transport of organisms.

The preferred concept reduces potential entrainment influences from the west. The underlying mechanics are the same as those for salinity – the preferred design reduces dispersion from False River to Franks Tract and on to the south Delta.

As shown in the particle tracking chart above, the preferred concept is estimated to reduce potential entrainment influences from west of Franks Tract. For example, in the March 2015 case shown in the chart, the fraction of neutrally buoyant particles injected at Jersey Point that were entrained at the pumping facilities is reduced from slightly over 40 percent to 30 percent. By contrast, potential entrainment influences increase by 3 percent for particles injected on the east side of Franks Tract near the mouth of Old River under similar circumstances, consistent with increases in tidal range of flow at that site. The project has an insignificant effect on potential entrainment influences on Turner Cut, and the specific Franks Tract concepts considered were not particularly influential on particle fate in the western Delta near Suisun.

Particle tracking results do not indicate any reduction in entrainment potential from the Old River/Mokelumne side of Franks Tract.

Particle Tracking Scenarios

30-day Period from	Characteristics of the period	DTO (cfs)	OMR (cfs)
2010-02-24	High outflow, med OMR	21,231	-4,455
2015-02-25	Low outflow, med OMR	5,349	-3,183
2015-05-01	Low outflow, low OMR	5,163	-1,471

FLOOD PROTECTION

Overview

Two kinds of levees surround the open water areas of Franks Tract: abandoned ones that used to protect Franks Tract and Little Franks Tract from flooding but are no longer maintained, and ones maintained for flood protection that are increasing important as the Delta continues to subside and sea levels rise. The existing, remnant levees of Franks Tract and Little Franks Tract, though breached and eroding (see Introduction p. 5), continue to provide critical wave sheltering for the surrounding intact flood protection levees (e.g., the levees surrounding Bethel Island, Webb Tract, Mandeville Island, and other surrounding islands) in use today.

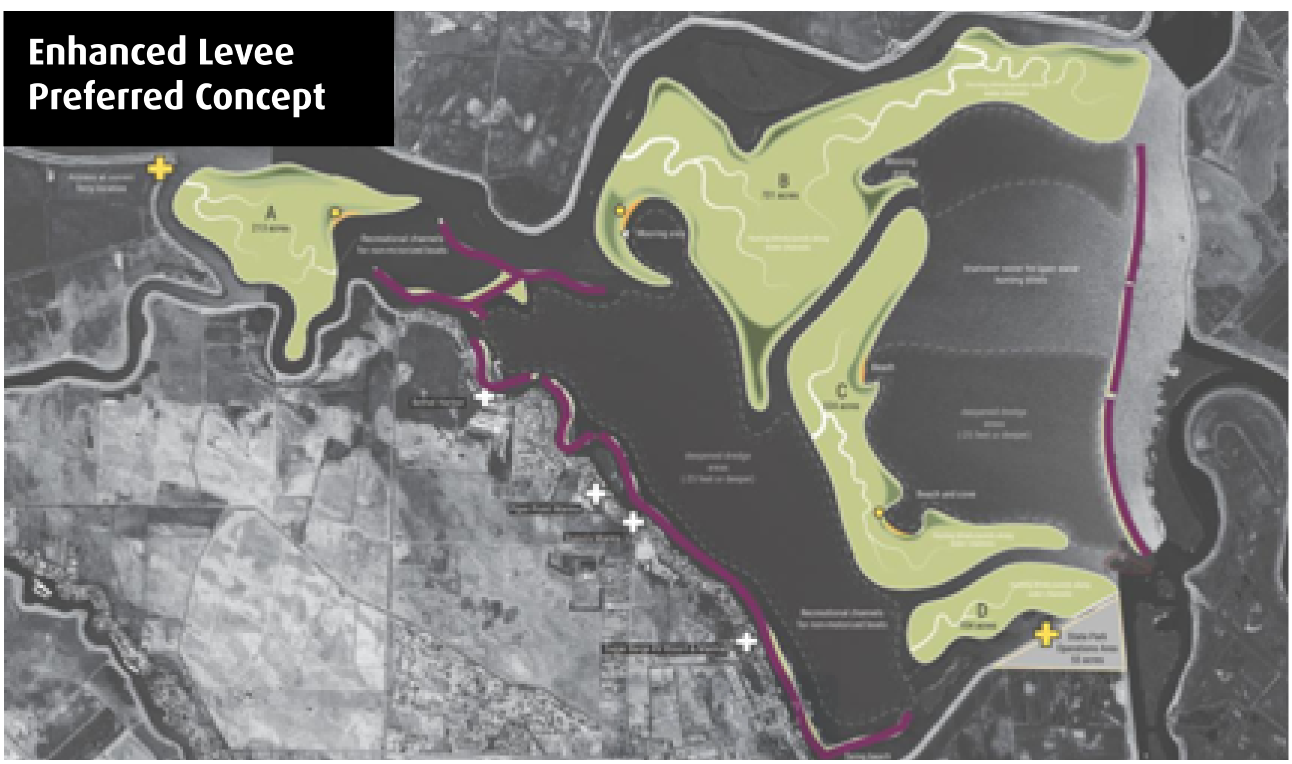
Waves form on Franks Tract during high wind events. The wave-sheltering effect of the remnant levees reduces the risk of wave-induced erosion and overtopping of critical flood protection levees. The Bethel Island Municipal Improvement District and others are interested in project features that enhance the remnant levees in order to reduce required flood protection levee maintenance activities and associated costs.

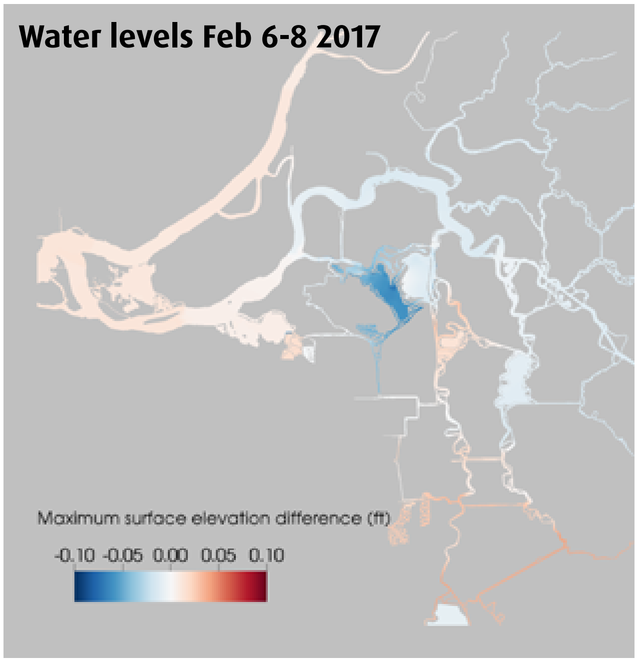
Objectives of the Franks Tract project include improving levels of flood protection, and where possible, avoiding adverse flood impacts. Any project must not worsen flooding during large flood events. If improperly designed, the project could result in higher flood elevations by blocking flow of large runoff events through Franks Tract. Though less likely, the project could also potentially

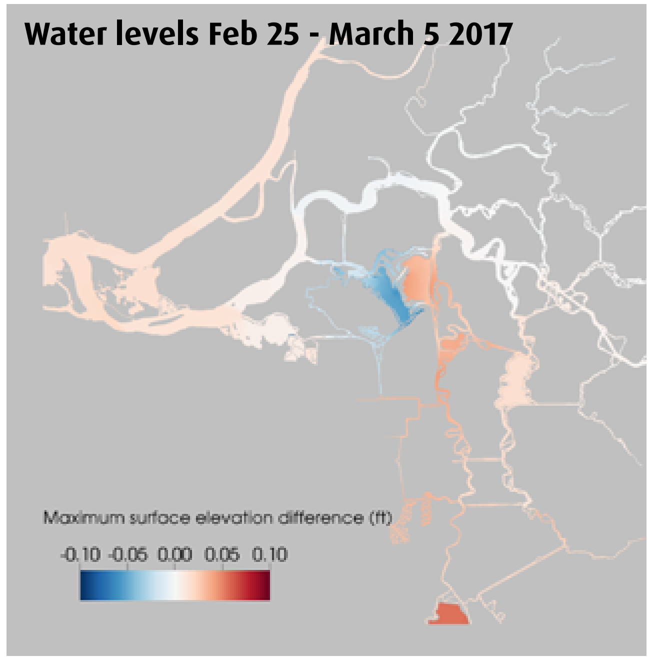
result in higher ocean-driven flood elevations by blocking flow from extreme coastal storm surge events.

The preferred design concept proposes to enhance 12 miles of remnant, sheltering levee around the Tract. The project would raise and widen the remnant levees with dredge or other material, and fill many of the gaps that have eroded in the existing levees over time while retaining key gaps used by boaters.

Flood modeling was conducted on the preferred concept using 2017 flood season data to simulate flood water levels throughout the Delta. Results indicated the preferred concept does not significantly alter flood conveyance or high water levels.







The figures above show plots of the difference in maximum water stage for the preferred concept compared to No Action during the winter 2017 flood season. Changes were less than 0.1 feet everywhere, and mostly less than 0.05 feet. Some areas experience lower peak water levels, some higher. The result that flood conveyance is relatively unaltered generalizes to successive peaks caused by king tides, larger outflows and increased Old and Middle River flows. Subtle differences are apparent based on the watershed origin of the flood waters. The two time periods in Figures 3 and 4 – February 6 through 8 (three days of peak flood levels) and February 25 to March 5 (9 days of high flows on the San Joaquin River), 2017 - show somewhat different results. The latter period resulted in higher differences in the eastern Franks Tract and the south Delta, compared to the early February period. This is believed to be due to high flows in the San Joaquin River.

7 Construction Outlook

Island construction with dredge material. Image courtesy USACE Mobile District, Ship Island Restoration

Rearranging a vast shallow open water area into a new landscape of deeper open water, tidal marshes, new landmasses, navigation channels, recreational beaches, and enhanced remnant levees is an ambitious construction task. The Franks Tract 2020 project conducted an assessment of construction options, reviewing feasibility and engineering constraints, types of onsite fill material, duration of construction, and unit rates for movement of material.

The assessment concludes that the preferred design concept is feasible to construct. About 37 million cubic yards of earth would need to be moved. Planners estimate construction costs of about $560 million. Costs could be lowered by reducing the area of constructed land mass in Franks Tract and Little Franks Tract. The duration of the construction period is estimated at four to nine years minimum.

This assessment builds on and updates methods developed for the 2018 Franks Tract Futures feasibility report. The prior study considered multiple sources of fill material and concluded that using local material dredged from Franks Tract was the least cost alternative; this approach has been integrated into the 2020 effort.

Constructability

Marine Equipment

As there are no roads to Franks Tract, or any access over land to the project area, construction would be accomplished using marine-based construction equipment. Shallow water depths hamper access. Access via navigable water includes False River, West False River, the San Joaquin River, Old River, and Piper Slough. Construction equipment would not make use of Piper Slough, in order to protect access to that waterway by Bethel Island residents and boaters in the area.

Local Fill

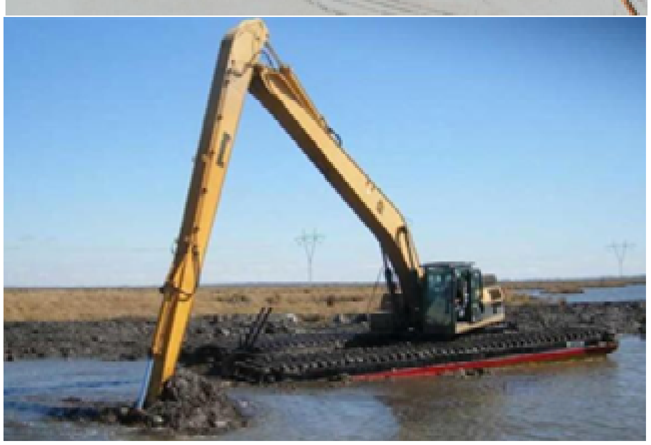
The construction approach is to use local material dredged from within Franks Tract, deepening select areas to create the proposed land masses. Local material dredged from within the Tract is the least cost source of fill and is available in sufficient quantities to construct the preferred concept. This approach achieves the shortest distance between the dredging and placement areas.

Using local material reduces the cost of transportation and handling of material, and energy usage and emissions, compared to other construction methods. Sourcing the material from within the Tract also saves costs, in terms of buying and importing sand, and saves time in the overall construction schedule. As such it is the least cost method.

Based on past land uses, the dredge material is expected to be clean and suitable for use in creating the tidal marsh land masses and other features. Sand is an ideal material for building up the proposed landforms, and the peat content will aid in propagation of marsh habitat.

Building the Land Masses

The planning team envisions using a large cutter suction dredge to remove and place the material to create the new landmasses. This vessel has the ability to dredge to the required depths. This dredge uses a cutter-head attached to the end of a long boom or pipe mounted to the bottom of the vessel (termed a ladder). In terms of equipment, the cutter-head is particularly suited to dredging the material at Franks Tract, which includes poorly graded sand, silty sand, and peat. Most large cutter suction dredges for this type of project work 24 hours per day 7 days per week.



TOP: Cutter suction dredge and floating pipeline. Image courtesy Van Oord. UPPER MIDDLE: Dredge material placement. Image courtesy USACE Mobile District, Building Ship Island. LOWER MIDDLE: Pipeline spread for dredge material placement. BOTTOM: Low ground pressure amphibious excavator.

Construction crews will move material from the dredge vessel to the point of discharge on the new landmasses via a floating pipeline. The discharge end of the pipeline will be mounted on a flat deck barge, which enables the pipeline to be positioned near the material placement site. The dredged sand and peat will be transported in the pipeline in the form of a slurry, which contains about 15 to 35 percent dredge material by weight mixed with water.

A large cutter-suction dredge should have sufficient pump capacity to transport the material over the distances required. In the event that additional pump capacity is required, crews can deploy a booster station. This consists of an additional pump mounted on a floating platform to augment pumping capacity.

In sum, gross placement of material for the landmasses will be via the dredge and mobile discharge point (barge). Once crews have established the basic form of the landmasses, they will use a spread of pipeline segments for additional shaping and placement. Final shaping of the landmasses will be completed using low ground pressure construction equipment (dozers and excavators).

Working on Levees, Channels & Beaches

The preferred design concept calls for upgrading the remnant perimeter levees to a 25-foot-wide crest at an elevation of approximately +9 feet NAVD88, or high enough not to be overtopped during high water but low enough not to obstruct views. Crews will use dredge equipment to pump and discharge construction material along the levee crest where a dozer will push the material out along the levee. An excavator will work to shape the side slopes of the levee and create the final profile. Where the design calls for more detailed material placement, an excavator will pick up and place material from a barge brought in alongside the levee (see photos).

The design also calls for the excavation of marsh channels during final shaping of the landmasses using low ground pressure excavators capable of operating on the material placed for the landmasses and at elevations subject to tidal variation.

The easiest way to construct the through-channels may be to place the gross material for the landmasses first, and subsequently use the dredge or an excavator to cut the through channels. This will allow better control over the location of the channel edge, desired channel dimensions, and creation of the target 4H:1V side slopes. Final grading of the channel side slopes will require an excavator.

Building public use beach areas may require "clean sand." If beach building requirements cannot be met with sand dredged from Franks Tract, it may need to be imported. Local sand may include too much peat or silt, or be too fine or coarse, or the wrong color, for desired beach aesthetics.

Peat Thickness. *Average peat layer thicknesses across Franks Tract. The data derives from borings within Franks Tract (HLA 1990), from adjoining islands and tracts (USGS 1982), and Jersey Island and Bouldin Island quadrangle sheets. The data suggests that the deepest peat deposits exist around the northeast extent of Franks Tract, with layer thicknesses of around 25 feet deep. Going east to west, the thickness of the peat deposits decreases gradually to around 10 feet deep in the center of Franks Tract, down to less than five feet at the transition to Little Franks Tract. By comparison, peat deposits on Sherman Island on the west side of the San Joaquin River are as much as 55 feet deep. Source: Moffat & Nichol 2017.*

Construction Fill Quantities

The estimated volume of material needed to construct the proposed alternative is on the order of 37 million cubic yards (mcy). Dredge volume is the amount of material dredged onsite to build up landmasses and enhance the existing remnant perimeter levees. The planning team calculated volume as the difference between constructed and existing grade, including an allowance for settlement. Constructed grade for the marsh surface generally ranges from 3.5 to 6.5 feet NAVD88, 8 to 11 feet above typical existing grade.

Gross Quantities for Fill Areas for the Preferred Concept

Restoration Quantity	Preferred Concept
Marsh Area (acres)	1,370
Recreational Use (acres)	12
Fill to Grade (CY)	25,834,000
Consolidation (CY)	11,401,000
Total Fill/ Dredging (CY)	**37,235,000**

CY = Cubic Yards

The planning team augmented fill quantities to compensate for consolidation, which will occur during landmass construction. The added weight of the fill causes underlying layers of peat to consolidate, requiring more fill to reach target elevations for marsh. The precise dredge and fill quantities will depend on the finalized concept, detailed design for construction, and geotechnical analysis to confirm the extent of sand and peat within the Tract (see peat contours map above). The preferred concept for landscape redesign at benefits from landmasses being mostly located in areas of shallow peat deposits, which reduces the amount of fill needed to compensate for consolidation.

Schedule

Project construction would likely take 4 to 9 years if allowed year-round, and longer depending on environmental windows protective of fish. The amount of peat involved could present considerable engineering challenges. More detailed analyses could clarify these challenges before construction.

The shortest construction duration assumes work 24 hours per day, 7 days a week. The longer duration estimate assumes construction occurring on weekdays only, with no weekend or nighttime construction. The shortest construction duration may be achievable if noise and visual impacts can be limited to an acceptable level for local communities. Lights would be needed during nighttime construction. A 24-7 approach is the most efficient in terms of the use of the dredge and construction equipment.

Noise associated with construction will primarily be from pumps and conventional diesel-powered equipment. Conventional equipment is currently being modernized, however, allowing options to diesel that could benefit the project. Hybrid construction equipment can run with a smaller engine at a lower rpm. Fully electric systems run on rechargeable lithium-ion batteries. Electric pumps of the size needed for the project are already available on the market. While delivery of electrical power to the site poses a unique challenge, use of hybrid or all-electric equipment would mean a significant reduction in construction noise and particulate emissions.

The schedule will additionally depend on environmental windows protective of fish. In-water work should occur during standard in-water work windows. The in-water work windows are August through November for Delta smelt and July through October for salmonids.

The schedule could also be affected by efforts to minimize impacts on hunting, fishing and other seasonal activities important to local residents and the economy.

Construction Costs

The planning team estimates unit costs for the project on the order of $15.35 to $16.45 (circa 2020) per cubic yard placed. This includes the contractor's mobilization, transfer of the dredge and floating pipeline to the site, contractor's marine equipment, installation of silt curtains for turbidity control for fisheries, construction of the tidal marsh land masses, enhanced remnant perimeter levees, beaches and other public areas; demobilization, and indirect costs, bonding, and insurance.

These unit costs are based on:

- One mobilization and one de-mobilization, i.e. contractor's equipment remains at the construction site from start to completion.
- No standby time is included for settlement of the placed fill. Construction may be scheduled so that settlement of fill material placed for one island can go on while construction continues on other islands.
- All equipment is assumed to be conventional diesel-powered equipment (though cleaner newer hybrid equipment may be preferable if affordable), with the following fuel factors: Diesel ($/Gal): 2.75; Gasoline ($/Gal): 3.10; Electricity ($/kW): 0.087; Offroad ($/Gal): 2.90.
- Costs for permits, engineering, design, and geotechnical exploration are not included.
- Costs for revegetation are not included. Revegetation would rely on a combination of natural vegetation colonization processes and planting of native plants. Adding planting efforts would increase the overall cost estimate.
- Weed abatement efforts would be higher during the initial period of native plant establishment. The incremental costs of initial abatement are not included. Long-term weed abatement costs are discussed in Operations and Maintenance (p.67).
- Dredging and fill operating on a 24 hour per day, 7 day per week schedule. Any limitations on a 24 hour per day, 7 day per week schedule would lengthen the overall construction schedule and increase costs.

A breakdown of costs for the construction activities described above is included in the table opposite.

Construction Activity	Cost Estimate
Dredging operations[1]	$358,426,000
Management of fill to build up levees and create tidal marshes	$147,349,000
Shaping and excavating channels in tidal marshes[2]	$51,619,000
Construction of beaches and public areas (5 beach areas)	$1,970,000

1 - Does not include costs for maintenance dredging. The dredge areas, tidal marshes, and channels are assumed to be self-sustaining and not require maintenance dredging.
2 - Based on excavation of 7,092,000 cubic yards of material. Slope armoring (if any) and revegetation costs are not included.

Construction Impacts

Short term disruptions would occur during construction of the project. Activities such as dredging and land mass shaping would be ongoing over a period of several years with associated noise, navigation re-routings, etc. Staging construction (building one land mass at a time) could minimize impacts but also affect the duration of the project. If a project were to be implemented, further discussion would be needed to determine how to best schedule and sequence any future construction to accommodate existing Franks Tract uses (e.g. localized shutdowns during key hunting or fishing periods, weekend shutdowns, etc.) and how to best mitigate or abate any short term construction related impacts.

Photo: Brett Milligan

Operations & Maintenance

A commitment to operations and maintenance of project features is a key component and cost of its long-term success. Ongoing demands would include maintenance of the proposed recreational facilities, and ongoing aquatic weed management. However, the project also has the potential to reduce other kinds of activities such as periodic deployment of an emergency drought barrier and maintenance of flood protection levees on surrounding islands.

Ongoing activities are envisioned to include maintenance and upkeep of the public access points, docks, camp sites, day-use areas, picnic and beach areas, restroom facilities, and trash receptacles. Costs may include labor for State Parks staff, equipment, boat, supplies, materials, and services. These operations and maintenance costs for new amenities are estimated at approximately $370,000 per year (2020 cost without escalation).

Continued treatment of submerged and floating aquatic vegetation will also be critical to effective site management. The project would not necessarily change the cost of ongoing aquatic weed management. The project would, however, change the types of habitats and water depths at the site, helping weed management dollars go further. The preferred concept will reduce the amount of area at high risk for aquatic weed colonization, therefore, the same level of effort could be applied to the tract with more beneficial results. The current level of effort for weed control at Franks Tract is approximately $4-8 million/year, based on the treatment of approximately 1,000 – 2,000 acres of submerged aquatic vegetation in Franks Tract at a cost estimate of $4,000 per acre (Conrad, 2019 and L. Anderson, personal communication).

The project could also reduce the operation and maintenance costs of deploying emergency drought barriers (see p.18). Salinity improvements with the proposed Franks Tract project will tend to reduce the frequency of conditions likely to result in new barrier deployments. Even a modest reduction in deployment frequency could be significant from a cost and disruption perspective.

Finally, the project will reduce near-term maintenance of flood protection levees. Enhancement of the remnant perimeter levees will provide continued wave sheltering to the nearby flood protection levees serving surrounding communities (e.g., the levees on Bethel Island maintained by the Bethel Island Municipal Improvement District). Consequently, adjacent levee maintenance districts and reclamation districts are expected to benefit from lower levee maintenance

The landscape redesign and enhancement actions developed and selected through the 2019-2020 co-design process described in this report suggest a bold, sustainable change in the heart of the Delta. Stakeholders recognize that any feasible project must achieve multiple benefits to generate sufficient public and financial support for what would be a major construction effort. In addition, any project must ultimately be supported by the local community to move forward.

Key Findings

- *At the highest level for consideration, a redeveloped Franks Tract offers an opportunity for improvements in recreation, navigation, ecology, water quality and other community benefits.*
- *The Project Team, Advisory Committee, Steering Committee and the public agree that Concept B Central Landmass currently offers the best balance and best opportunity to build upon for a reimagined Franks Tract moving forward.*
- *Stakeholder and public preference evolved over the course of this approximately one-year planning effort. For the Advisory Committee and Steering Committee, initial support for the No Action alternative and early versions of Concept C Eastern Landmass shifted to selection of Concept B as the Preferred Concept. Early public preference was overwhelmingly for the No Action alternative; later public preference was for some version of a project at Franks Tract.*
- *There would be unavoidable trade-offs with any project, especially with respect to costs and construction impacts. Both construction and long-term operations and maintenance costs would be much higher for any of the three concepts relative to the No Action alternative. There are, however, opportunities to reduce long-term costs associated with levee maintenance and emergency drought barriers, and the opportunity to achieve more benefits with a fixed budget for aquatic weed removal.*

What's Next?

- Identification of responsible agencies and sources of funding would be necessary next steps if the project is to move forward. Figuring out 'who pays' would need to be aligned with the agencies and organizations with the most to gain.
- Before any project would move forward, a commitment to long-term operations and maintenance funding would need to be put in place. The development of recreational features and uses is dependent on securing a sustained funding source to develop, manage and maintain them. Likewise, the development of ecological and water quality features is dependent on the identification of responsible agencies and sources of funding for construction and ongoing management.
- Since cost remains a high-level feasibility issue, the next phase would explore project refinements to reduce overall costs.
- Stakeholder and public engagement were critical to shaping the final concepts to reflect community values for this phase of planning and will need to be carried into any future work to ensure consistency with project goals and objectives.
- Enhancing recreational opportunities is a must to the local community. A project without a robust recreational component and reliable sources of funding to maintain this component will lose community support.
- Various important finer scale considerations – such as detail for the recreational amenities, revegetation plans, etc. – would need to be explored in any future planning, design and environmental review process.

References

Baxter, R., Breuer R., Brown, L., Chotkowski, M., Feyrer, F., Gingras, M., Herbold, B., Mueller-Solger, A., Nobriga, M., Sommer, T., Souza, K. 2008. Pelagic Organism Decline Progress Report: 2007 Synthesis of Results. Interagency Ecological Program.

California Department of Fish and Wildlife (CDFW). 2018. Franks Tract Futures? Multi-Benefit Synthesis Report.

California Department of Fish and Wildlife, 2020. Incidental Take Permit for Long-Term Operation of the State Water Project in the Sacramento-San Joaquin Delta, Permit Number 2081-2019-066-00.

California Ocean Protection Council. 2018. State of California Sea Level Rise Guidance, 2018 Update.

Conrad, L. 2019. Delta Fishes and Plants in Shallow Water. PowerPoint Presentation. Franks Tract Futures, Bethel Island, CA.

Conrad, L., A.J. Bibian, K.L. Weinersmith, D. De Carion, M.J. Young, P. Crain, E.L. Hestir, M.J. Santos, and A. Sih. 2016. Novel species interactions in a highly modified estuary: association of Largemouth Bass with Brazilian waterweed Egeria densa. Transactions of the American Fisheries Society 145 (2): 249–263. https://doi.org/10.1080/00028487.2015.1114521.

Delta Protection Commission. 2019. Annual Report.

Gregory, R., Failing, L., Harstone, M., Long, G., McDaniels, T., and Ohlson, D. 2012. Structured Decision Making: A Practical Guide to Environmental Management Choices. John Wiley & Sons, Ltd. Publications.

Grimaldo, L. F., Sommer, T., Van Ark, N., Jones, G., Holland, E., Moyle, P. B., others. 2009. Factors affecting fish entrainment into massive water diversions in a tidal freshwater estuary: can fish losses be managed?. North American Journal of Fisheries Management, 29(5), 1253-1270.

Grossman, G.D. 2016. Predation on Fishes in the Sacramento-San Joaquin Delta: Current Knowledge and Future Directions. San Francisco Estuary and Watershed Science, Vol. 14, Issue 2, Article 80. Available: http://dx.doi.org/10.15447/sfews.2016v14iss2art8

Hestir, E., Schoellhamer, D., Greenburg, J., Morgan-King, T., and Ustin, S. 2016. The Effects of Submerged Aquatic Vegetation Expansion on a Declining Turbidity Trend in the Sacramento-San Joaquin River Delta. Estuaries and Coasts 39:1100-1112.

Khanna S., J. Bellvert, J. D. Boyer, K. Shapiro, E. L. Hestir, M. J. Santos, and S. L. Ustin. 2016. High-Resolution Mapping for Determining Long-Term Trends in the Distribution of Floating and Submerged Aquatic Macrophytes in the Delta. Bay-Delta Conference, Sacramento, CA, November 2016.

Kimmerer, W., Wilkerson, F., Downing, B., Dugdale, R., Gross, E. S, Kayfetz, K., et al. (2019). Effects of Drought and the Emergency Drought Barrier on the Ecosystem of the California Delta. San Francisco Estuary and Watershed Science, 17(3). http://dx.doi.org/10.15447/sfews.2019v17iss3art2 Retrieved from https://escholarship.org/uc/item/0b3731ph

Milligan, B. and Polk, A. 2017. Evolving the Evolving: Infrastructure, Place, and Rewilding in the California Delta. Urban Planning (2)4: 93-114.

Moyle, P.B. 2002. Inland fishes of California: revised and expanded. Berkeley: University of California Press.

National Marine Fisheries Service. 2019. Biological Opinion on the Long-Term Operation of the Central Valley Project and the State \(\later Project. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, West Coast Region. October 21, 2019.

Robinson, A.; Safran, S. M.; Beagle, J.; Grenier, J. Letitia; Grossinger, R. M.; Spotswood, E.; Dusterhoff, S. D.; Richey, A. 2016. A Delta Renewed: A Guide to Science-Based Ecological Restoration in the Sacramento-San Joaquin Delta. Delta Landscapes Project. Prepared for the California Department of Fish and Wildlife and Ecosystem Restoration Program. A Report of SFEI-ASC's Resilient Landscapes Program. SFEI Contribution No. 799. San Francisco Estuary Institute - Aquatic Science Center: Richmond, CA.

San Francisco Bay Area Wetlands Ecosystem Goals Project. 2015. The Baylands and Climate Change: What We Can Do Baylands Ecosystem Habitat Foals Science Update 2015. The California Coastal Conservancy.

San Francisco Estuary Institute-Aquatic Science Center (SFEI-ASC). 2014. A Delta Transformed: Ecological Functions, Spatial Metrics, and Landscape Change in the Sacramento-San Joaquin Delta. Prepared for the California Department of Fish and Wildlife and Ecosystem Restoration Program. A Report of SFEI-ASC's Resilient Landscapes Program, Publication #729, San Francisco Estuary Institute-Aquatic Science Center, Richmond, CA.

Sherman, S., R. Hartman, and D. Contreras, editors. 2017. Effects of Tidal Wetland Restoration on Fish: A Suite of Conceptual Models. IEP Technical Report 91. Department of Water Resources, Sacramento, California.

Sloop, C., Jacobs, B., Logsdon, R. and Wilcox, C. 2018. Delta Conservation Framework – A Delta in Common, California Department of Fish and Wildlife, Sacramento, CA.

Sommer, T. and Mejia, F. 2013. A Place to Call Home: Synthesis of Delta Smelt Habitat in the Upper San Francisco Estuary. San Francisco Estuary and Watershed Science 11(2).

U.S. Fish and Wildlife Service. 2019. Biological Opinion for the Reinitiation of Consultation on Coordinated Operations of the Central Valley Project and State Water Project. Service File No. 0BFBDT00-2019-F-0164. United States Fish and Wildlife Service, Pacific, Southwest Region, Sacramento, CA. October 21, 2019. 9

Ustin, S. L., S. Khanna, M. Lay, K. Shapiro, and N. Ghajarnia. 2017. Enhancement of Delta Smelt (Hypomesus transpacifcus) habitat through adaptive management of invasive aquatic weeds in the Sacramento-San Joaquin Delta. California Department of Fish and Wildlife.

Young, M.J., Feyrer, F.V., Colombano, D.D., Conrad, J. L., Sih, A. 2018.Fish-Habitat Relationships Along the Estuarine Gradient of the Sacramento-San Joaquin Delta, California: Implications for Habitat Restoration. Estuaries and Coasts 41:2389-2409. https://doi.org/10.1007/s12237-018-0417-4.

CALIFORNIA DEPARTMENT OF FISH & WILDLIFE

FRANKS TRACT FUTURES

Design-Engagement Appendix

Compiled by

Brett Milligan, Professor of Landscape Architecture and Environmental Design, UC Davis
Alejo Kraus-Polk, Geography PhD candidate, UC Davis
Yiwei Huang, Geography PhD candidate, UC Davis

September 25th, 2020

CONTENTS

DESIGN-ENGAGEMENT METHODS

This section provides a summary of the multiple public and stakeholder engagement methods used in the project and how they were integrated into the design and planning process.

Engagement Methods

Background

The concept of community engagement emerged in landscape architecture and design in the 1960s, and now is becoming a critical element of efforts to improve the built environment (Francis, 1999). It is recognized internationally that to redevelop and preserve culturally or ecologically significant landscape, engaging local communities is a necessity (Déjeant-Pons, 2006). Community engagement ensures that the concerns of community residents are considered in projected plans. Moreover, the process itself strengthens local partnerships and builds social capital among community members (Aboelata, Ersoylu, and Cohen, 2011).

The overall goal of Franks Tract Futures' engagement efforts was to create and facilitate opportunities for stakeholders and members of the public to be integrally involved in the project planning and design process, from beginning to end. All participants in this process co-created and co-designed the knowledge and products that emerged over the year-long project timeline. Co-design generally refers to inclusive and creative design processes that attempt to include all who might be positively, negatively or neutrally affected by a design intervention or change in place. Thus it entails designing with more than designing for those who have a stake in the outcome. In our project, co-design meant that diverse groups and experts, including designers, engineers, scientists, public agency representatives, boaters, fishers, hunters and local residents and business owners (all experts of the landscape in their own distinct way) all worked together to contribute ideas and values driving the design concepts. It also entailed that design concepts were iteratively refined and narrowed down through inclusive rounds of review by these same participants.

Engagement efforts for Franks Tract Futures planning project were based on the outcomes and recommendations of the prior Franks Tract Futures feasibility study, which clearly identified that although the first conceptual designs met state goals of water quality and ecological restoration, they fell far short of meeting acceptance by local and regional communities who would be the most impacted by the project. Based on those findings, the report stated that: "more detailed restoration planning will take into account the social, economic, and recreational interests of the affected local communities and user groups, in keeping with the collaborative principles outlined in the multi-agency Delta Conservation Framework" (50). Based on outreach efforts, it found that stakeholders and the public wanted to be involved in any further planning efforts, from the very beginning, and that process is fully transparent. And for next steps, the report proposed:

> ...developing a variety of scenarios considering both the CDFW restoration design, as well as community and user group alternatives" as well as, "convening of a facilitated advisory group of local community interests (boating, fishing, economic, landowners, and hunting), local government, and other interested stakeholders (Contra Costa Water District, water contractors, other in Delta water users) (50).

Accordingly, this follow-up planning effort was primarily focused on determining if the project could be redesigned so as to benefit local and regional communities (such as through the creation of recreational features and other community desired landscape improvements), and to minimize detrimental impacts of the project to these same communities, while still meeting ecological and water quality goals. The project team pursued this challenge by engaging the public and stakeholders in a variety of ways throughout the design process.

Methods

Franks Tract Futures used multiple modes of engagement to facilitate feedback and co-design activities with diverse stakeholders and the general public. In addition to in-person participation through the advisory committee, steering committee and public meetings, modes of engagement included project website hosting, social media communications, creation of public online map-based surveys, fieldwork, canvassing and interviews. Each of these methods is described and results presented in the following appendix sections.

Public and Advisory Committee meetings

Six meetings were held throughout the project. All meetings were open to the public, with the first and last widely advertised as public meetings In all the meetings held, a workshop time was included to facilitate participation and community feedback.

The first public kickoff meeting was held on July 11th, 2019. The intent of the kickoff meeting was to introduce the public to the project planning and design process and answer and discuss questions from stakeholders. Attended by approximately 150 people, the meeting began with an overview of the project background and an outline of the project approach and planning process. This was followed by a presentation on known stakeholder concerns and desires based on the initial Franks Tract Futures feasibility study. In the end, a breakout workshop session was held, where participants were able to choose specific themes (navigation, water quality, recreation, flood protection, ecology, and local economy), and discuss the existing concerns and individual preferences within that theme. The second public meeting (6/9/20) was conducted as an online webinar in response to COVID-19.

Four joint AC/SC meetings were held throughout the project (7/11/19, 8/29/19, 11/6/19, 3/4/20). All four were preceded by a check-in call with SC members. These joint meetings provided an opportunity for the team to give updates on project status and discuss efforts related to design, modeling, and evaluation criteria. The primary objective of these meetings was to review and receive input on the latest revised design concepts and evaluation methods and criteria.

Outreach methods – web-based and traditional

When combined with traditional outreach methods, open-source software and smartphones can help people organize, facilitate discussion and reach consensus, and promote community changes (Castells and Cardoso, 2006, Apostol et al., 2013). Moreover, through digital media, the community is helping environmental planners and researchers fully understand the relationship between the community and its surrounding physical environment (Ruggeri and Young, 2016).

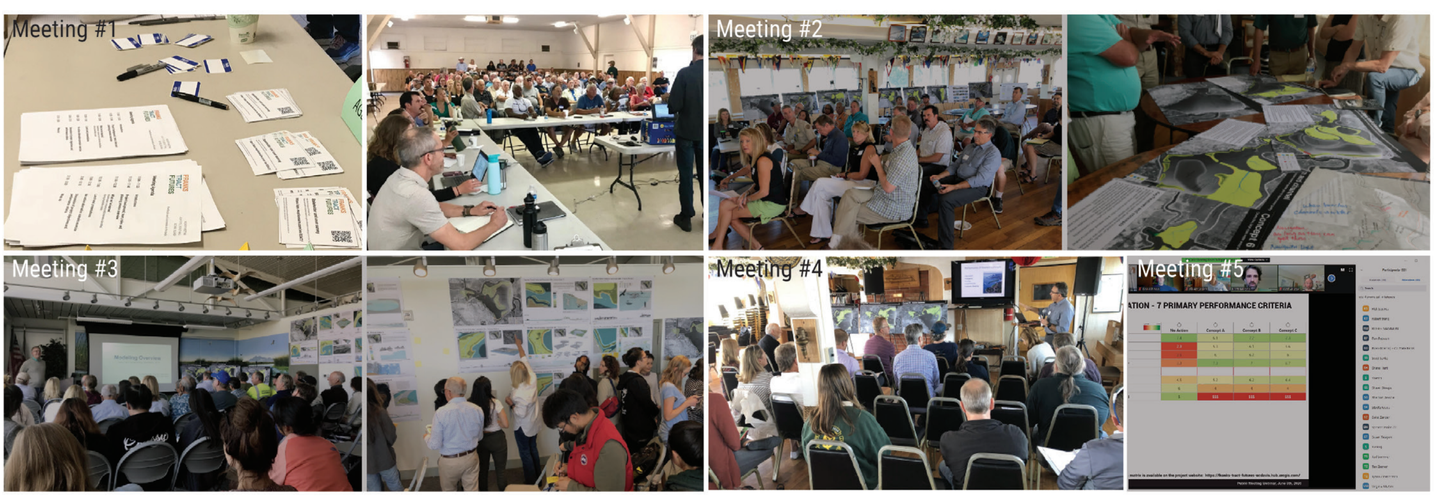


Figure. Six meetings throughout the project.

Formation of Project Advisory and Steering Committees

The advisory committee (AC) was made up of representatives from all known key interests in the Franks Tract area and served as the central forum for deep engagement and evaluation of Franks Tract Futures design concepts. Thus, members had the opportunity to directly participate in and influence the outcomes of the design process by participating throughout the yearlong planning process, including attending and actively participating in all AC meetings, reviewing and commenting on design materials and serving as a liaison to the larger stakeholder community. The advisory committee included local residents and landowners, marina and small business owners, local government representatives and reclamation districts, local hunters, fishers, boaters and recreational advocates.

The steering committee (SC) was comprised of senior representatives from state, regional and local agencies responsible for decision making, funding and implementation, including CA Department of Fish and Wildlife, CA Dept of Water Resources, CA State Parks, the Delta Protection Commission and the Delta Stewardship Council. Their primary responsibilities were to provide overall guidance for the project, attend project AC meetings for technical support, to secure resources as needed, and to make decisions regarding scope, budget and timeline.

Steering Committee

Name	Affiliation
Bill Harrell	California Department of Water Resources (DWR)
Erik Loboschefsky	DWR
Ted Sommer	DWR
Eli Ateljevich	DWR
Jacob McQuirk	DWR
Edward Hard	Division of Boating and Waterways (DBW)
Gina Benigno	California Department of Parks and Recreation(State Parks)
Steve Musillami	State Parks
Jim Micheaels	State Parks
Jennifer Cabrera	State Parks
David Moffat	State Parks
Erik Vink	Delta Protection Commission (DPC)
Karen Kayfetz	Delta Stewardship Council (DSC)
Jeff Henderson	DSC
Louise Conrad	DSC
Mike Roberts	California Natural Resources Agency (CNRA)
Jim Starr	California Department of Fish and Wildlife (CDFW)
Maureen Martin	Contra Costa Water District (CCWD)
Deanna Sereno	CCWD
Brian Holt	East Bay Regional Park District (EBRPD)
Mike Moran	EBRPD

Advisory Committee

Name	Affiliation
Regina Espinosa	Bethel Island Municipal Improvement District (BIMID)
Ryan Hernandez	Contra Costa County Water Agency
Russ Ryan	Metropolitan Water District (MWD)
Brian Sak	San Francisco Public Utilities Commission (SFPUC)
Karen Mann	Save the California Delta Alliance (STCDA)
Jan McCleery	Save the California Delta Alliance (STCDA)
David Gloski	Bethel Island resident
Jamie Bolt	Bethel Harbor
Lenora Clark	STCDA, former commissioner DBW
Chuck Russo	Russo's marina
David Riggs	Sugarbarge RV resort and marina
Kathleen Stein	Bethel Island realtor
Blake Johnson	Engineer RD 2059
Robert Davies	President RD 2059
Bill Jennings	California Sportfishing Protection Alliance
John Francisco	Franks Tract hunter
Andy Rowland	San Joaquin Yacht Club
Mark Whitlock	BIMID, BI Chamber of Commerce, Delta Chamber of Commerce
Joshua Ireland	Bethel Island Resident and Pro Fishermen
Karen + Smith Cunningham	Five Palms Cattle
Paul Seger	Sierra Club, Diablo Water Agency
Katherine Jones Smith	San Joaquin Yacht Club
Jim Cox	California Striped Bass Association Western Delta Chapter
Tyson Zimmerman	Assistant GM, Ironhouse Sanitary District, RD 830 Trustee

Hence, Franks Tract Futures also actively engaged via a public website and online surveys to facilitate the outreach process. The Franks Tract Futures website (https://franks-tract-futures-ucdavis.hub.arcgis.com/) was created to serve as a central hub for broad public involvement and planning information. The site was maintained and updated with new information as it became available (such as meeting notes, presentations, event announcements, etc.). Social media accounts (Twitter, Facebook, Instagram) were created to expand engagement, disseminate information, and provide additional forums for project-related discussion.

Figure. Field work photo

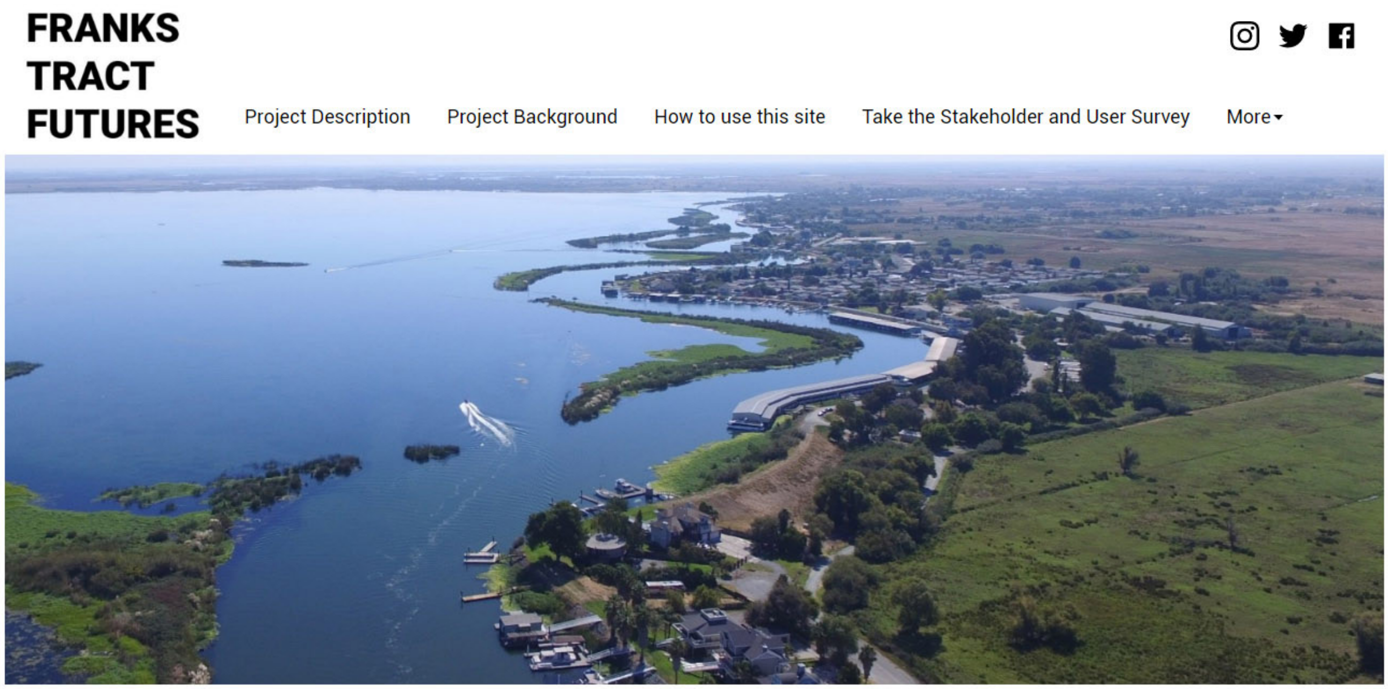


Figure. Project website landing page

Internet accessibility and technology literacy is an issue; thus, the outreach also included traditional methods. For example, paper posters for the kickoff meeting were placed in a variety of establishments, including libraries, community centers, restaurants, chambers of commerce, marinas, bait and tackle, hunting, and boating shops, and gas stations throughout Eastern Contra Costa County and the Western Delta. Newspapers, flyers, and in-person announcements are other traditional methods the team used for community outreach.

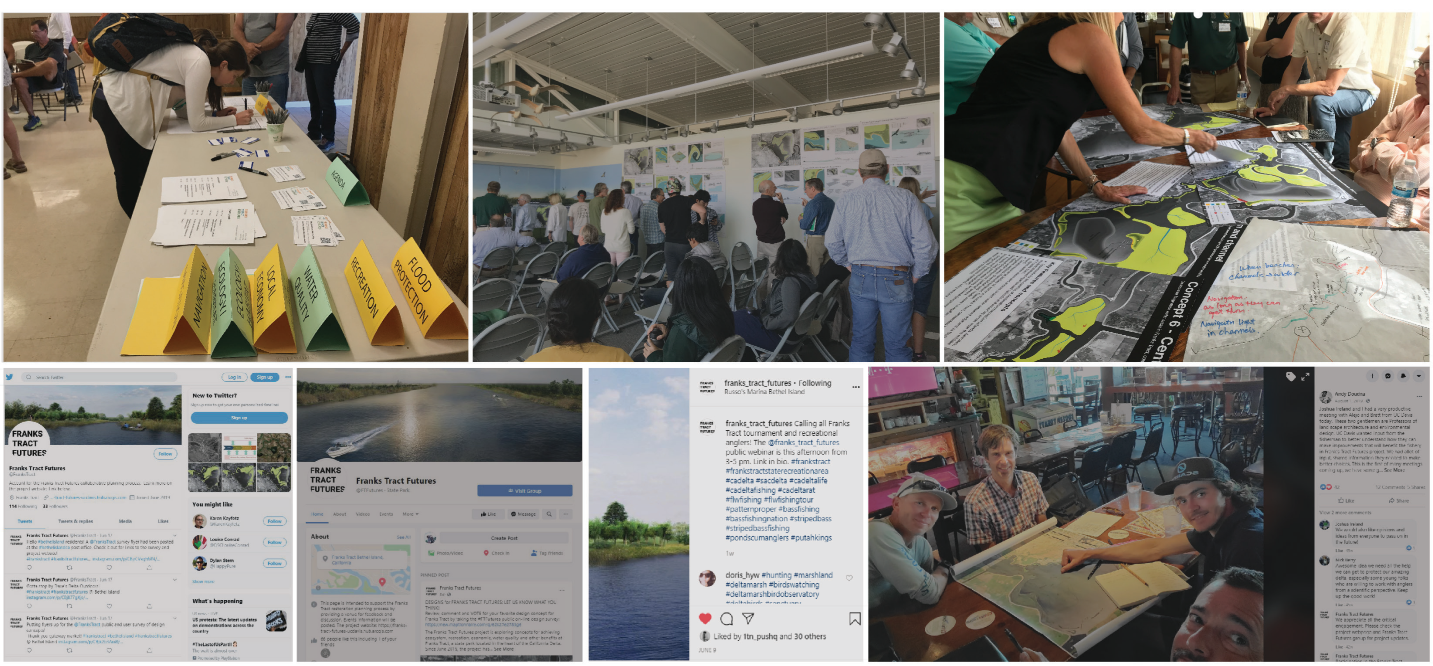


Figure. Various outreach/engagement methods

Sketching and Co-Design

Different visualization tools were used during different phases of the design and engagement process to encourage maximum public input and participation. The core team sought to employ these methods in ways that were sensitive to and cautious about the power dynamics and relationships between designers and community members in the design process.

Figure. Sketching and co-design during 08/29 AC/SC meeting

Draft Plans, tracing papers, markers, and sketching are frequently used to facilitate co-production in workshops. In each workshop, the core team members became facilitator, rather than lead designer. This entailed sketching while listening, attempting to translate to paper some ideas a community member expressed verbally. Many times, the facilitator handed the marker to the participants and invited them to draw directly on the tracing paper. All the tracings and drawings were collected and analyzed to inform revised plans that became a product co-created by many co-authors, consisting of all public participants, researchers, and interested stakeholders.

Geospatial public surveys

Two online public surveys were created and deployed in the planning process to inform the design concepts. Both of these used Maptionnaire, a web-based relatively easy to use, mobile compatible survey platform. This software allows for survey participants to provide map-based, georeferenced and geo-specific information that can be uploaded to GIS platforms for analysis (participatory GIS methods, or PPGIS),

References:

Aboelata, M. J., Ersoylu, L., & Cohen, L. (2011). Community engagement in design and planning. In Making Healthy Places (pp. 287-302). Island Press, Washington, DC.

Déjeant-Pons, M. (2006). The European landscape convention. Landscape Research, 31(4), 363-384.

Francis, M. (1999). Proactive practice: Visionary thought and participatory action in environmental design. Places, 12(2).

Ruggeri, D., & Young, D. (2016). Community in the information age: Exploring the social potential of web-based technologies in landscape architecture and community design. Frontiers of Architectural Research, 5(1), 15-26.

PUBLIC and ADVISORY COMMITTEE MEETINGS

This section contains detailed summaries of each of the project meetings. These were made publicly accessible on the project website shortly after each meeting.

FRANKS TRACT FUTURES PROJECT KICKOFF MEETING
July 11, 2019
11:00-3:30
Scout Hall

Meeting Summary

The intent of the kickoff meeting was to introduce the public to the project planning and design process and answer and discuss questions from stakeholders. Attended by approximately 150 people, the meeting began with an overview of the project background and an outline of the project approach and planning process. This was followed by a presentation on known stakeholder concerns and desires based on the initial Franks Tract Futures feasibility study (Executive Summary, Full Report). It was made clear that the original conceptual design in that report did not meet the project objectives developed during that initial planning effort (and will not be carried forward) and thus a new set of alternatives will be developed that address stakeholder, local community and public interests. This was followed by a Q and A discussion session, during which concerns and questions were raised about the relationship between restoration planning for Franks Tract and water management and planning more generally.

After lunch, an introduction to a new online user and stakeholder survey was provided. This was followed by presentations on aquatic weeds, sea level rise, regional recreation trends, and levees and flood control, which were intended to inform thinking about a no-action alternative, which will be carried through the planning process. These presentations are available on the project website.

In the final part of the meeting, the process for developing project objectives and metrics was presented. Participants divided into small groups to expand upon specific project objectives and performance criteria including, recreation, navigation, local economy, flood protection, water quality, ecology/habitat.

Key questions and takeaways

- How does this project relate to the tunnels, exports, water quality control plans, etc.?
- How will the project modeling, planning, and design take these and other related plans and policies into account?
- How would a potential project affect levee and infrastructural integrity and flood risk of adjacent islands?
- How to best schedule public meetings given diverse schedules and constraints?
- How might the National Heritage Area (NHA) designation influence the project development?
- Stakeholders and public participants want to continue to be involved as the process develops.

Action Items

- Create one-pager outlining the relationship of the project to other Delta-related management and planning initiatives.
- Post steering committee and advisory committee members on project website
- Post meeting materials, notes and presentations on the project website
- Schedule the first advisory committee work meeting

Meeting Minutes

- **Introductions – Brett Milligan Start 11:15**
    - **Welcome!**
        - Full attendance, ~150 attendees

-
    - **Meeting agenda/overview**
    - **Review of practicalities/requested conduct/request for active listening**

- **Project background, planning process overview**
    - **Carl Wilcox - Project background and history**
        - Franks Tract Restoration Feasibility Study came out of Delta Smelt Resiliency Strategy.
        - Steering Committee (SC) consists of interested agency participants. The SC is responsible for guiding the consultant team in conducting the planning process.
        - Advisory Committee (AC) is the central forum for developing project objectives and providing guidance and evaluation of restoration alternatives.
        - Action Item: Post Steering Committee online
        - Audience Q & A:
            - Q: Where did the funding for this project come from?
              A: The initial study was supported by the Delta Smelt Resiliency Strategy. This current project is supported by bond funding from Prop 84.
            - Q: Concern about this being low budget Project.

A: The current budget is for the planning process, not implementation. Concern was voiced that such an expensive and large-scale project would have a low budget planning and design component. The team responded saying that the initial study had a small budget due to the fact that it was about scoping for feasibility rather than developing a full plan. low printing budget meant that few hard copies of the study were printed. The report is available online (Executive Summary, Full Report).

- Q: Do people on the SC own property, recreate, etc. in and around Franks and Little Franks Tract?
  A: The SC was selected to encompass interests in all areas and includes recreationists, as well as property owners and business owners on Bethel Island and adjacent tracts.
- Q: How does the project relate to the Delta Conservation Framework?
- A: The project is closely following the guidelines developed and presented in the framework, based on the acknowledged importance of effective communication, community engagement, and education, making decisions based on science.
- Q: CDFW Fall Midwater Trawl (FMWT) reported zero Delta Smelt. How is the project going to improve Delta Smelt?
  A: Project objectives include improving habitat for native and established non-native fishes. Studies other than FMWT have caught Delta Smelt. The initial feasibility study was supported by the Delta Smelt Resiliency Strategy. However, the project has always been aimed at providing multiple benefits in addition to providing food and habitat for Smelt as well as preventing their entrapment in the South Delta pumps.
- Q: The project could move the “mixing bowl” from its current location at Sherman Island to Franks Tract. Why Franks Tract over other flooded islands?
  A: Franks Tract is the major location for salinity intrusion into the Western Delta. In its current configuration, the Tract provides a shortcut for salty water coming from the bay. Although Franks is flooded it is not as subsided as other islands in the region

- A stakeholder encouraged others to think about amenities and features they want in the Tract and surrounding area.

- It was expressed that the alternative development had to incorporate other projects and policy changes that might influence inflows, outflows, and exports.

- **Influence of new administration/tunnel(s) playing a role in stakeholder opinions?** – This remained a core question throughout the meeting.

A successful salinity intrusion intervention in Franks Tract would help ensure a fresher Western Delta during periods of low Delta inflow, such as during droughts.

The specifics of the revised tunnel plan are unclear and its implementation remains uncertain.

The initial feasibility study concluded that tunnel material is expensive to move to Franks Tract and cheaper options are available. The cheapest being dredge material from within the tract itself, which has the added benefits of deepening parts of the tract to enhance navigability and deter weed growth.

- **Introduction to the ESA Team and overall project approach – John Bourgeois.**
    - **Who will be working on what.**

“You are the project. We are here to back you up. We are here to get a community consensus.” - John Bourgeois

- **Planning process brief overview – Dan Ohlson**
  - **Participatory and Transparent process**
  - **Application of Structured Decision Making (SDM)**
  - Define context: Explore restoration alternatives that can provide multiple benefits.
  - Define objectives, develop alternatives, provide pros and cons of alternatives
  - Audience Q & A:
    - Q: How will this project affect the integrity of the levees?
      A: Flood protection is continued objective.The project is ineffective if the Bethel Island levees fail. Flood protection is a key objective that is aligned with the other objectives related to habitat enhancement and water supply reliability. Neither can be achieved in the absence of flood protection.
    - Q: Has the Environmental Impact Report (EIR) been done for this project?
      A: We are developing a preliminary plan. If a decision were made to implement a project resulting from this planning effort, an EIR would be required.
    - Q: Will there be an independent technical review?
      A: Not at this point, but we will engage with the Delta Stewardship Council and science program about conducting one. Interagency Ecological Program Adaptive Management Integration Team (IAMIT), IEP estuarine ecology team to provide input on ecological benefits of planning alternatives.
    - Q: Is there a relation to damming False River?
      A: False River emergency barrier was an exceptional response to dire drought conditions and was created with the sole purpose of keeping salinity out of the Western Delta. The temporary barrier achieved this goal, but at great expense and was highly problematic for those who live, work and play in the region. The Franks Tract Futures project is seeking a longer-term solution to the salinity intrusion problem that supports other values and provides additional benefits. Based on critiques of the barrier and the process that lead to its installation, the Franks Tract Future project will work towards retaining the navigability of West False River and incorporating public and stakeholder feedback through the entire planning and design process.
    - Q: Will a restoration project allow increased diversions from the Delta.
      A: No, this restoration project is unrelated to any water management planning. However, regarding the tunnels, it is important to note that existing regulatory protections for Delta water quality would remain in place. Currently, diversions from the Delta only occur when strict regulations related to Delta water quality and species protections are met. The reasons more water is not being pumped out of the Delta has more to do with these regulations than the physical capacity. However, another factor which limits exports is the fact that if the pumps run at full throttle they threaten to pull in saltwater, thus undermining the quality of

exports. This constraint will exist to varying degrees whether or not the tunnel is constructed.

- **What we learned – Stakeholder concerns and interests identified during the initial Franks Tract Futures effort – Brett**
  - Navigable water and access
  - Local economy and property values: Values are proportional to the proximity of water
  - Boating - interest in public access and expanded berthing options
  - Aquatic weeds - interest in reducing weeds
  - Tidal wetlands (both a concern, such as navigability and possible amenity, such as diversified hunting, boating and wildlife viewing opportunities)
  - Hunting: State Parks managed. Concern regarding loss of hunting blinds as a result of project/wetlands. However, potential for new hunting land based opportunities, such as exists on Sherman Island.
  - Creating habitat and ecological design: uncertain outcomes, how will outcomes be managed over time
  - Transparency during the planning and design process. Stakeholders want to be involved.

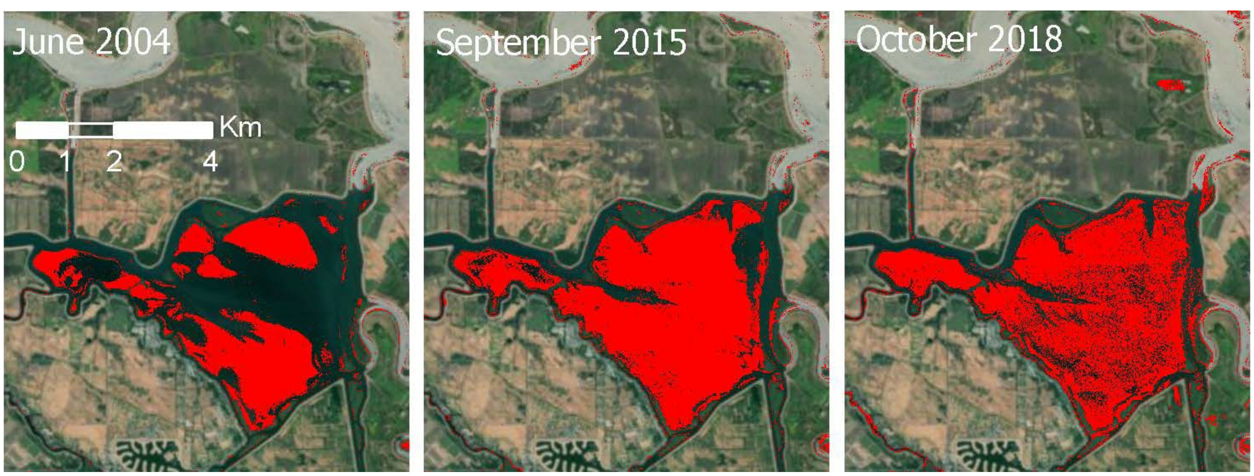
  - **Provisional list of project objectives based on FTF**
    - **Discuss the role of developing new design alternatives based on project objectives**
    - Audience concerns/comments:
      - Concerns about current and high flows in the Franks Tract area. For example, one Piper Slough resident described how one has to be a professional boat driver to dock a boat when the current is fast.
      - Want more beaches, fewer weeds.
      - Striped Bass Association had expressed interest in being involved in conversations but claimed were not invited to future discussions.
      - Concern about FT turning out like Emergency Salinity Barrier, some people that project had significant negative impacts related to increase water velocities, sedimentation, and reduced navigability and associated economic impacts.
      - Concerns about contaminants from San Joaquin River impacting water quality in Franks Tract.
      - Additional comments about water diversions and tunnels diverting water South.
    - Audience Q & A:
      - Q: Given initial strong negative feedback from the community, why is this project still on the table? Is this going to happen, or is it a matter of how? A: There is not a proposed project yet, this is a discussion of what could happen and evaluating potential alternatives to determine if there is a project which can achieve the objectives identified through this planning effort and which would have broad support. In the absence of that support, it is unlikely anything would happen.
      - Q: Although black bass is not native, they provide important recreational values.

A: The plan will not eliminate black bass. It is trying to seek a balance between black bass and other fish species, particularly natives.

- Q: How was this kick-off meeting advertised?
  A: Flyers were put up throughout the region: Bethel Island, Rio Vista, and Oakley. Information was also broadcast via the project website, social media, news media, and spreading the word within the community. A large sign was suggested.

- **Lunch provided**
  - **Online User and Stakeholder Survey: Getting explicit geospatial info/user preferences: Introduction– Alejo**
    - Q.Suggestion: edit survey to allow to check multiple uses rather than a single-use

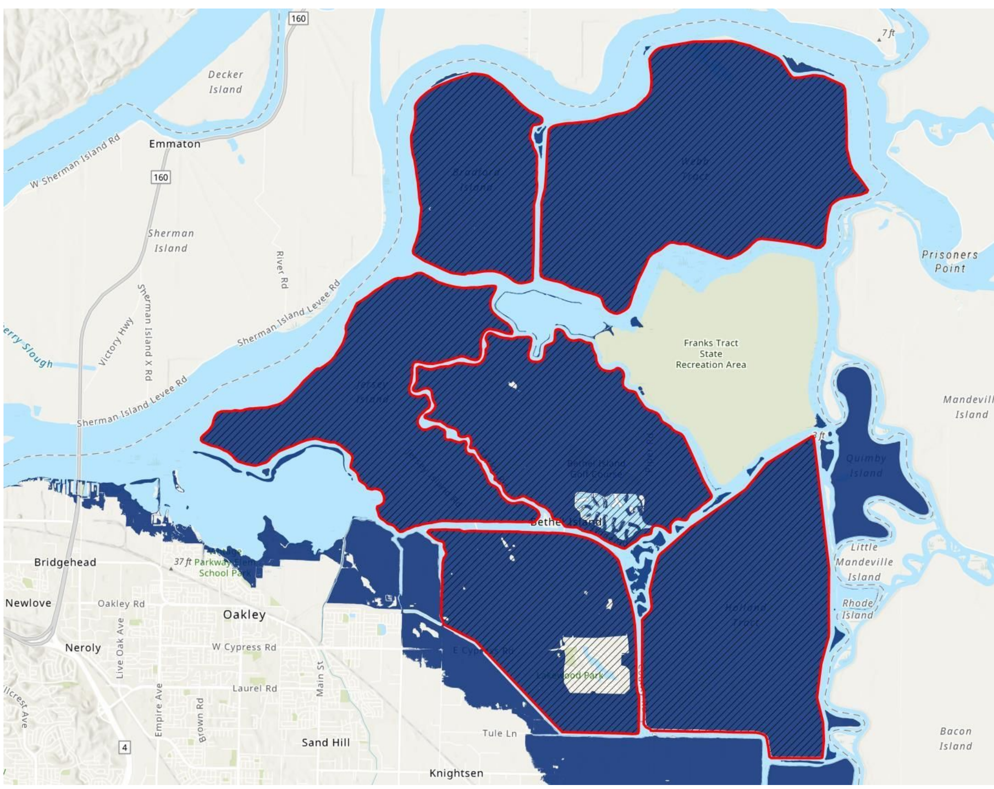
- **What is the Future of Franks Tract without a project? Participatory identification of key drivers and uncertainties of Franks Tract under status quo.**
  - **STATUS AND FUTURE TRENDS IN ECOLOGY AND AQUATIC WEEDS AND FISHERIES: Louise Conrad, Delta Science Program**
    Aquatic weeds
    - Weeds are expensive: State Parks control program uses herbicides in Delta ~$12-13 million/year



- 1k-2k acres treated in Franks Tract for submerged weeds
- Marinas spend $2,600 - $11,500 a year
- Physical removal faces logistical challenges related to disposal, coverage, and inducing spread and is less effective for submerged aquatic vegetation (SAV)
- If we leave Franks Tract alone, we will continue to see weeds, continue widespread herbicide use, the dominance of Largemouth bass and less native fish
- Division of Boating and Waterways is looking for other methods for weed control.

- Concerns about ammonium and nitrogen from effluent - Sacramento Regional Wastewater treatment is moving to tertiary treatment. It is expected to contain significantly lower nitrogen.
- Division of Boating and Waterways goes through a thorough permitting process and monitors water quality.
- Audience comments:
    - Interest in catfish gets youth interested in fishing. (Response: Research show the catfish amount drops from 22% in 1982 to 3% today). Catfish are hardy. Reasons are unknown.
    - Oxygen levels are very low where herbicides are applied

- **CLIMATE CHANGE AND SLR, Heather Dennis Adapting to Rising Tides Program (ART), BCDC – San Francisco Bay Conservation Commission**
    - Salinity intrusion: Existing salinity barrier islands currently exist. However, they are under threat. With a predicted 100-year flood + 12” sea-level rise salinity barrier islands would be flooded
    - Flooding/Levee vulnerability
    - Delta Climate Change Adaptation Strategy in progress
    - Generated flood maps
    - Wetland resiliency and sustainability

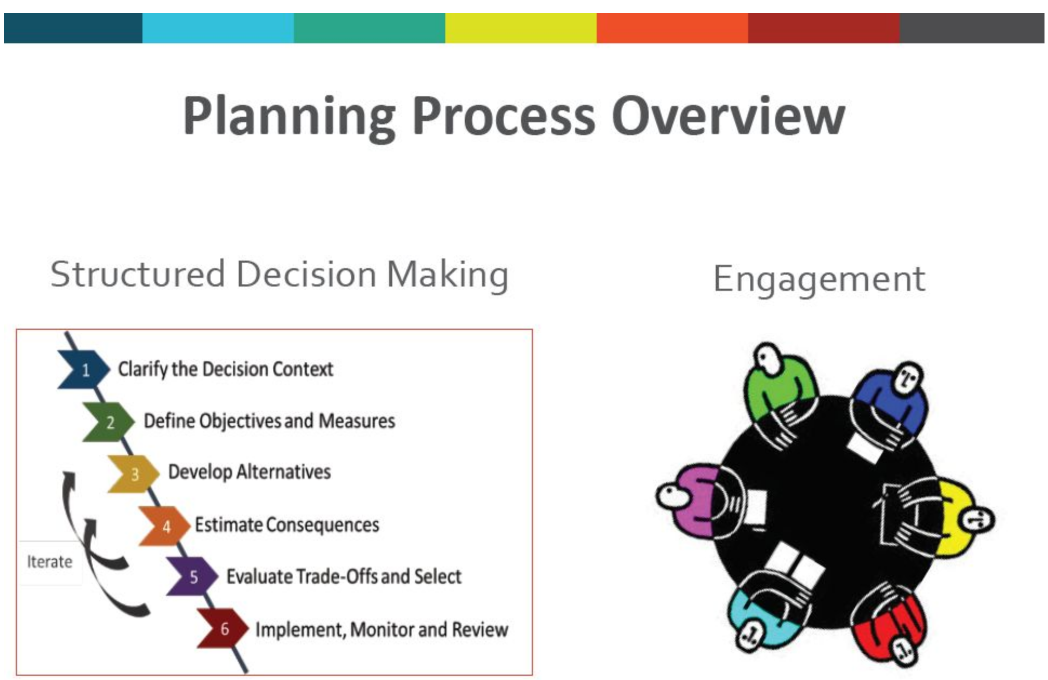


- **EXISTING USES AND TRENDS IN RECREATION AND LOCAL ECONOMY, Mike Moran, East Bay Regional Parks**
    - Stressed that if we don’t do anything, that does not mean change isn’t going to happen: There are many trends and trajectories of change within the current situation in Franks Tract
    - Big Break similar to Franks Tract

            - Amount of recreational use has been much higher than what was anticipated for the area (likely similar to Franks Tract)
        - Delta Protection Commission 2019 report on recreation: Boating = 43%, fishing = 39%, hunting is decreasing.
        - Recreational activity is a strong economic driver (Bass tournaments, etc.)
        - Increasing salinity has a direct impact on boating
            - Additional facilities are required to wash boats for which there are no immediate funding source.
        - Current conditions: Not deep enough for weeds to die back, not shallow enough for food production
        - The Great Delta Trail would provide more recreation opportunities
        - White pelicans and other wildlife are a major attractant
        - Access to places like Franks Tract and Big Break are important for quality of life and quality of community

    - **LEVEES/INVESTMENT, Regina Espinoza, From Bethel Island Municipal Improvement District**
        - Key factors: Wind and wave action are causing levee erosion in places. High tides, large water outflows could overtop levees and compromise levee infrastructure
        - Remnant channel islands are critical to Bethel Island levees.

- **Project objectives and performance criteria - Dan**



    - **Detail of the proposed planning process – how project alternatives will be developed and evaluated, etc.**
    - **Participants broke into small groups organized by project objectives. Define/elaborate on objectives, and suggest performance measure or criteria for how they should be measured. Team members split up to facilitate, focus and**

document small group discussions (i.e. John, Kathleen, Brett, Alejo, Yiwei, Dan, Carl, others)

- **Recreation and Navigation combined**
  - Improvement on Bethel Island
    - There are no public access points on the Island – only private marina access. It might help connect Franks Tract to Bethel Island by providing public access to the water.
  - Natural Heritage Area (NHA) designation
    - NHA could support a series of destinations as well as one or more modes of trails (including a water trail). The expanded NHA boundary includes the entire Delta, but extends down into SF Bay beyond Mare Island, including Carquinez Straights. Federal funding may be possible for projects within that boundary and can be used to match local funding. The new NHA designation may present opportunities.
    - Increased signage would be helpful.
  - One or more island destinations
    - Boat-only destinations are attractive. Angel Island State Park was mentioned as an example. Beaches, day use picnic areas, and perhaps even on-shore camping/tent cabins or houseboat mooring areas were mentioned.
    - Waterskier beach for takeoff and landings, and/or a protected swimming beach for youth.
    - Dredge from creating deeper water on Franks Tract could be used to create this island setting.
    - Discussion about whether the exclusive, privately-owned islands (such as Tinsley) might be good models to figure out what to create.
  - Connections
    - Participants started connecting ideas 1, 2 and 3.
    - Shuttles or water taxis out to a destination, run from one or more marinas, for people who don't have a boat but would like to spend a day, or overnight, on an island.
    - The experiences available could perhaps include some sort of trail and nature interpretive area.
    - 200' wide dike around Little Franks Tract, with a deepened water area in the middle for fishing. Connect it via a historic car ferry or bridge.
  - Navigation
    - Deep water channels.
    - Fast boat navigation.
    - Safe water ski areas.
    - Expressed during the first study.
    - Fast boat channel paralleling the existing slow boat channel against Bethel Island, cut throughs across Franks Tract to other surrounding channels, and provide safe water skiing areas.
  - Little Franks Tract

            - Full levee repair

        - **Local Economy:**
            - Home values are directly linked to proximity to fast water
            - Reduce weeds
            - Reinforce levees
            - Gas tax or other ways of paying for enhancements
            - Waterfront marinas are economic necessity
            - Want entire state of California to pay for it.

        - **Flood Protection:**
            - Contact existing reclamation districts to hear concerns
            - Funding to assist impacts to levees
            - Concern about connecting with Webb Tract
            - Dredging is expensive

        - **Water Quality:** No group formed for this category.

        - **Ecology / Habitat Enhancement:**
            - Tied to everything else (healthy ecology drives good fishing, economy, etc.)
            - Improve the ecology and habitat and other objectives will be met.
            - There's no going backward, let nature takes its course and restore a sustainable delta
            - Minimal intervention is the best, restore freshwater flows and all will get better
            - Weeds are a problem
            - What is the National heritage area designation, how could it help preserve the habitat?

- **Wrap up**
    - **Describe next steps**
        - Series of meetings with the goals for each meeting
        - Team will work on scheduling next public meeting at times that work best for local communities and stakeholders; week day evening is likely preference

FRANKS TRACT FUTURES ADVISORY COMMITTEE MEETING #2

Meeting time: August 29th, 2019 12:00 - 4:00 pm
Meeting Location: San Joaquin Yacht Club, 550 Riverview Pl, Bethel Island, CA 94511

Meeting Summary

The purpose of the second Advisory Committee (AC) meeting was to:

- Review and receive input on the project goals and objectives
- Review and receive input on the No Action alternative scenario
- Share the initial results of the (online) Stakeholder Survey, and
- Conduct a design charrette to receive input on the first round of design concepts.

All the above topics were discussed with attendees. Read-ahead (pre-read) documents were distributed prior to the meeting. All the project documents are working documents and will evolve as the project moves forward. The meeting was attended by approximately 30-35 people, consisting of members of the AC, the Steering Committee (SC), and a few members of the public.

For the design charrette, attendees received an overview of the seven design concepts (referred to as Round 1 concepts; diagrams included in notes below) then were divided into two breakout groups. Each group discussed and evaluated the concepts; producing useful comments for the advancement of the designs. After the discussion, participants filled out written concept evaluation forms. In the final part of the meeting, the groups came back together and participants presented their preferences and concerns for all design concepts, with commonalities and differences noted. The meeting ended with a brief overview of the draft evaluation criteria that will be used to compare alternatives and closing comments from the planning team.

For the next project meeting, a new set of Round 2 concepts will be developed for further consideration based on input on the Round 1 concepts discussed in this meeting, ideas collected from the online survey, and input from technical project team members.

Key takeaways

- The Project goals and objectives will be revised to include written comments received from AC and SC members and comments received during the meeting.
- For the No Action scenario, operations of emergency drought barriers are important; request to provide references for interested stakeholders. The interior of Franks Tract is not considered high-value for boating by many because of shallow conditions.
- Overall, preliminary results from the user survey document a diversity of opinions and values of landscape features - some values being shared, and some of which are contradictory or exclusive of one another. Currently, the Tract is largely homogeneous in terms of features (mostly large open water, similar depths, aquatic vegetation). Thus effective, participatory design might be able to reconcile or accommodate these differences by diversifying the form and structure of Franks and Little Franks Tract.

● There was a diversity of opinion as to what features attendees value in the Round 1 concepts. However, some areas of agreement (some agreement, not everyone) emerged, such as creating at least a moderate-sized open water area near the Bethel Island marinas (locating the marshlands further away) and making sure the navigable channels are large enough for “fast water” boating. It was recognized that the concepts will need to balance a need/desire for wide, deep channels for boating with the need/desire for smaller openings for water quality. Channel width, depth and currents, and sightlines are primary concerns for boaters. In the next steps, more consideration of these factors is desired.
● The team will post the overall planning process and approximate meeting sequence to the project website. The team will also post meeting materials, notes, and presentations to the website.

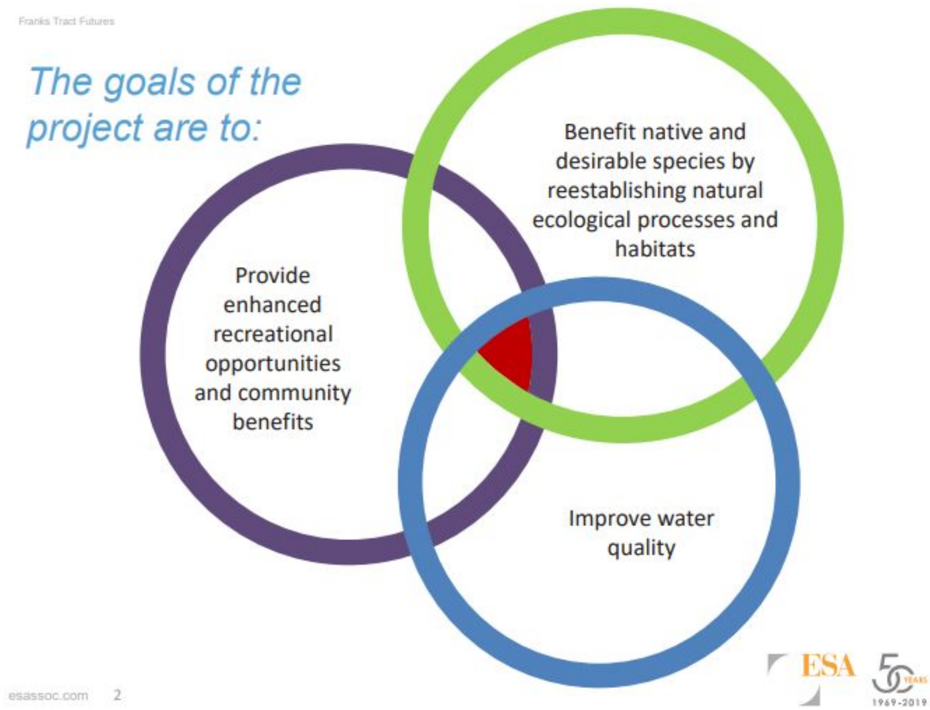
Meeting Notes

Introduction - Brett Milligan, UCD

- overview/introduction; what we want to achieve for the meeting
    - Review of (pre-read) project documents
    - Presentation of preliminary user survey results
    - Presentation of first round of design concepts; design charette
        - where we want to spend most of our time
- Guidelines for productive meetings

Project goals and objectives - Michelle Orr, ESA

- The project will only move forward if all three goals are achieved - the red area of overlap in the Venn diagram below.



- See slides posted to the project website. There are project objectives for Recreation, Navigation, Ecology, Water Quality, Flood Protection, Local Economy, and Financial/Cost
- Michelle presented AC and SC feedback received prior to the meeting (i.e., 'What We've Heard So Far') and proposed revisions. Feedback to clarify the State Parks context, suggested wording to "minimize impacts," requested clarification of fish trade-offs, clarify water supply reliability interests, and more. The next iteration of the goals and objectives document will respond to comments as appropriate.
- Audience Q & A:
    - Q: Use of the term irrigation is too narrow; it should include in-delta municipal and industrial diversions. A: Agree. This was the intent. Will be clarified.
    - Q: What about health hazards? Does that fall into one of those categories? Like risks from mosquitos, etc. A: We will add objectives or other references to mosquitoes and other nuisance and health concerns.
    - Q: Under the water quality, can you add toxic algae issue. A: Yes.
    - Q: Maybe also smell, and visual (aesthetics) concerns. A: Yes.
    - <u>Summary</u>: revise Project goals and objective document to acknowledge local health, aesthetics, and other local concerns.

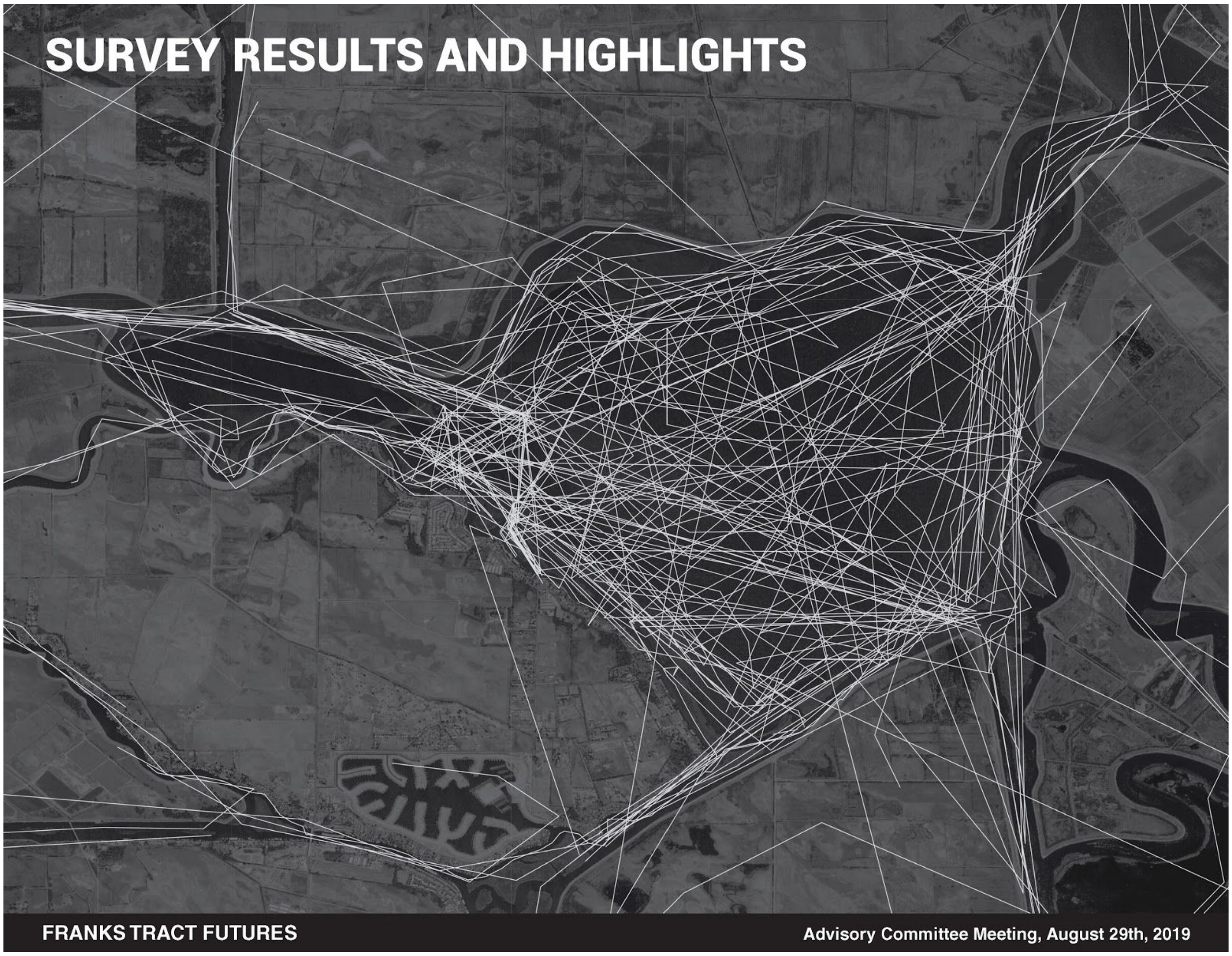
No Action Alternative Scenario Trends - Alejo Kraus-Polk and Brett Milligan

- The Franks Tract project is being planned in the context of changing environmental and human conditions. A summary was presented of key interrelated trends that affect how Franks Tract will likely change in the future under a no-project, i.e. “business as usual” scenario.
- Major drivers of change include regional recreational and navigability, local economy, flooding, fisheries and ecology, aquatic weeds, water quality, water exports, and the effects of climate change. Many of these trends will also apply to proposed with-project scenarios, currently in development.
- Descriptions of No Action Alternative (NAA) scenario trends are a start: we will be expanding on this document (NAA Scenario Trends) as we go forward.
- Document responds to stakeholder requests to situate project within larger Delta context and infrastructure.
- Discuss AC feedback and revisions:
    - Consistency of project language
    - Discuss erosion, fetch and sedimentation
    - More information on duck hunting and boating trends
    - Include general fish decline
    - Address water primrose and other emerging aquatic invasive species, both native and not
    - compare the costs of additional upstream releases and salinity barriers with the FTF project cost
    - More information on largemouth bass and salinity

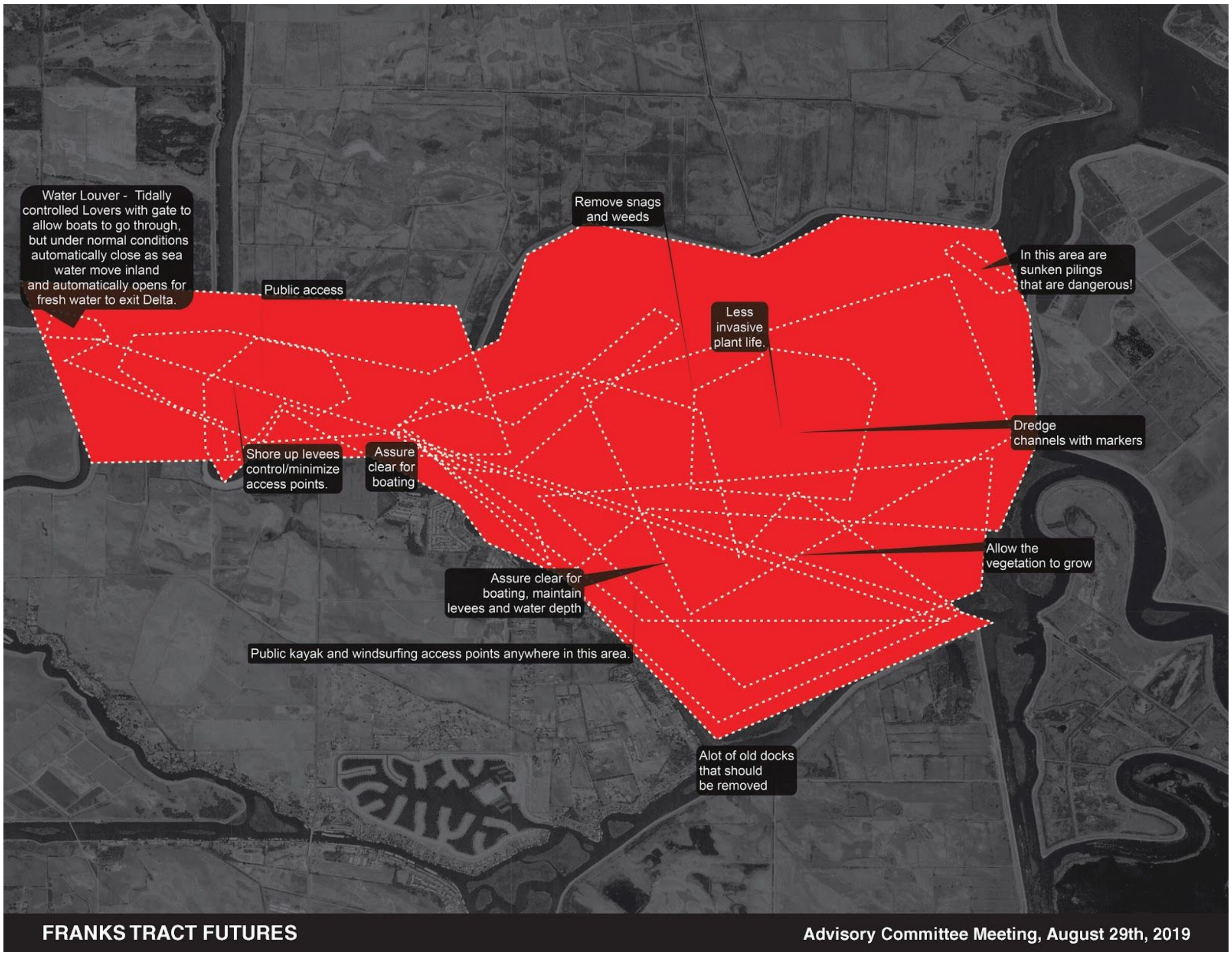
Q&A:

- Q: The bass salinity issue seems not a big issue. Their salt threshold is pretty high. A: Salinity is related to fish sizes as well. The team will consider further categorize sports fish species.
- Q: In terms of the water exports in this No-action scenario, will they increase or decrease? A: We will look at a range of different export scenarios. [Referring to the written language in the report: “Exports are likely to continue to decline, assuming environmental and water quality regulations remain in place. The construction and operation of any new Delta conveyance infrastructure (tunnel) could stabilize but will unlikely reverse this decline.”]
- Q: Seasonality should be considered. A: Well received.
- Q: Concerns regarding False River Dam. A: We need to look into that more closely with DWR. More information can also be found in Emergency Drought Barriers Project Assessment.
- Q: More concerns about salinity barriers and water pumping issues. A: Will address with further research to provide references.
- <u>Summary</u>: the team needs to conduct additional research on salinity barriers for these scenarios and provide references for interested stakeholders.

Presentation of Franks Tract User Survey results/highlights - Alejo Kraus-Polk and Brett Milligan



Crowdsourced boating routes in Franks Tract



Area of Improvement with comments

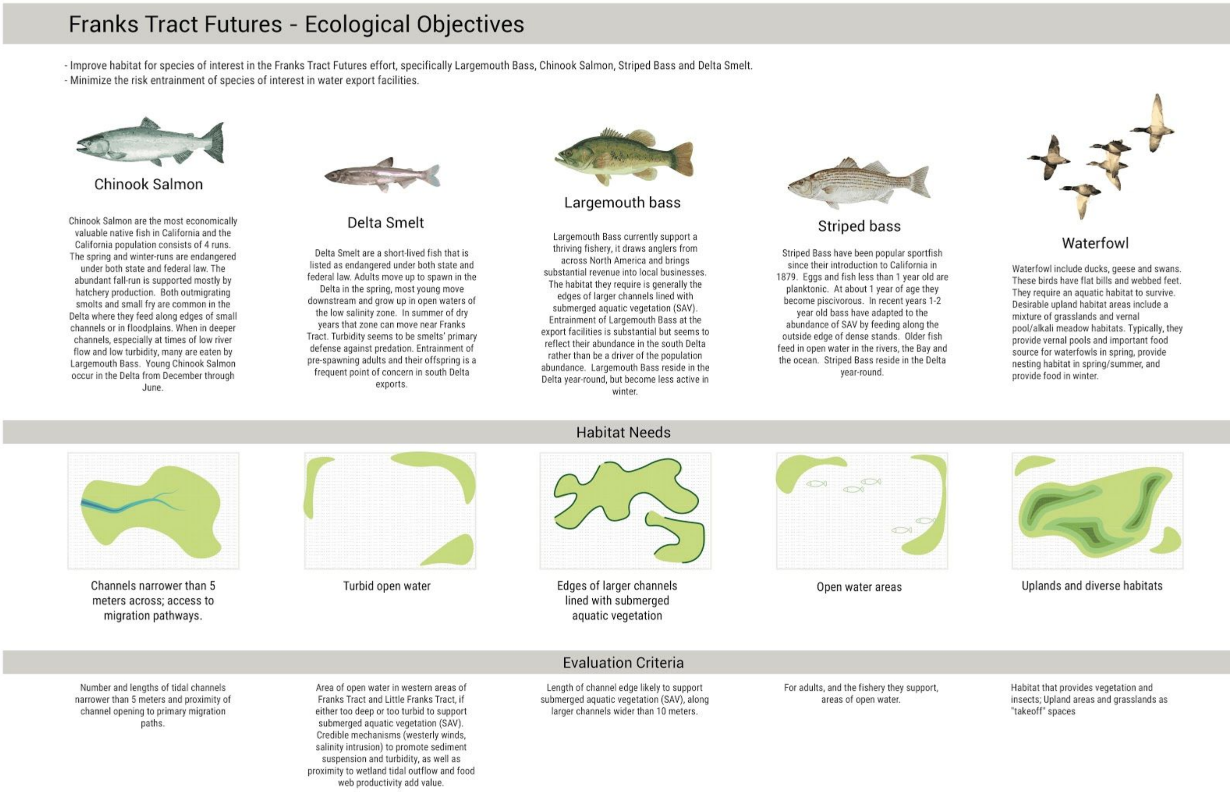
- Overall, preliminary results from this survey (and the earlier feasibility survey) point to a diversity of landscape attributes and features - some of which are predominantly shared, and some of which are contradictory or exclusive of one another - that stakeholders value or don't value. Currently, the Tract is largely homogeneous (mostly large open water, similar depths, aquatic veg). The effective participatory design might be able to reconcile or accommodate these differences by diversifying the form and structure of Franks and Little Franks Tract.
    - Q: The differences between two climate change beliefs - "It's occurring, but the impacts are minor, and we should wait to address them down the line" vs. "Climate change might be happening, but it's not human-caused and any possible impacts are minor"? A: The differences are whether they are human-caused or not.
    - Q: What message does it convey? A: It indicates that responding to climate change now is not a major concern for most people who filled out the survey.
    - Q: Do people put their affiliation while filling the survey? Can you separate responses by their affiliation? A: We can analyze the data by their zip code or user type.
    - Q: With the emergency drought barrier (EDB) in place (2015), concerns with high velocities on Old River at the northeast corner of Franks Tract. If the barrier was built within Franks Tract, how will that impact the water flow in Old River? A: The EDB is an extreme action, the idea is that a project at Franks Tract would minimize the need for or

impact of any future emergency drought response. One attraction of the marsh is to absorb the tidal energy.

    - Q: Where does the money for the project come from? Is it right that no funding has been determined for project implementation? A: This process is funded through bond money coming from prop 84, which in part was intended to support planning in the Delta. There is $1 million allocated to this first year of study. If there is significant support, the final document will be used to seek additional funding for environmental documents and implementation.
    - Q: What is the timeline of the project? Is there a set of documents and deliverables? How is the success of the project defined? A: The current phase of the project is one year long and it's the planning phase. Today we are on Round 1 reviewing preliminary concepts. We will narrow down to 3-4 alternatives in Round 2. The end product is a plan that meets all objectives for Franks Track. The current planning phase does not include the preparation of a CEQA document, permits, final designs, etc.
    - Q: Is there a timeline for future meetings? Can we see more information about funding resources and future schedules? A: Every meeting is spaced about one month or two months. Yes, we can provide information on the website.
    - Q: Two years ago, the project is all about Delta Smelt. Now the smelt is talked less. Why is that? A: The project is evolving and adapting to stakeholder concerns. Thus we currently have three goals (three-legged stool) that take into account additional considerations.
        - Additional answer from the crowd: We are also a state recreation area, so we have to be more inclusive.
    - Q: Who are the water quality benefits for? A: small improvements in salinity water quality will benefit in-Delta diverters and exporters in the South Delta. Other water quality improvements (e.g. algae) will benefit boaters, anglers, residents.

Bruce Herbold's brief impromptu presentation on fish:

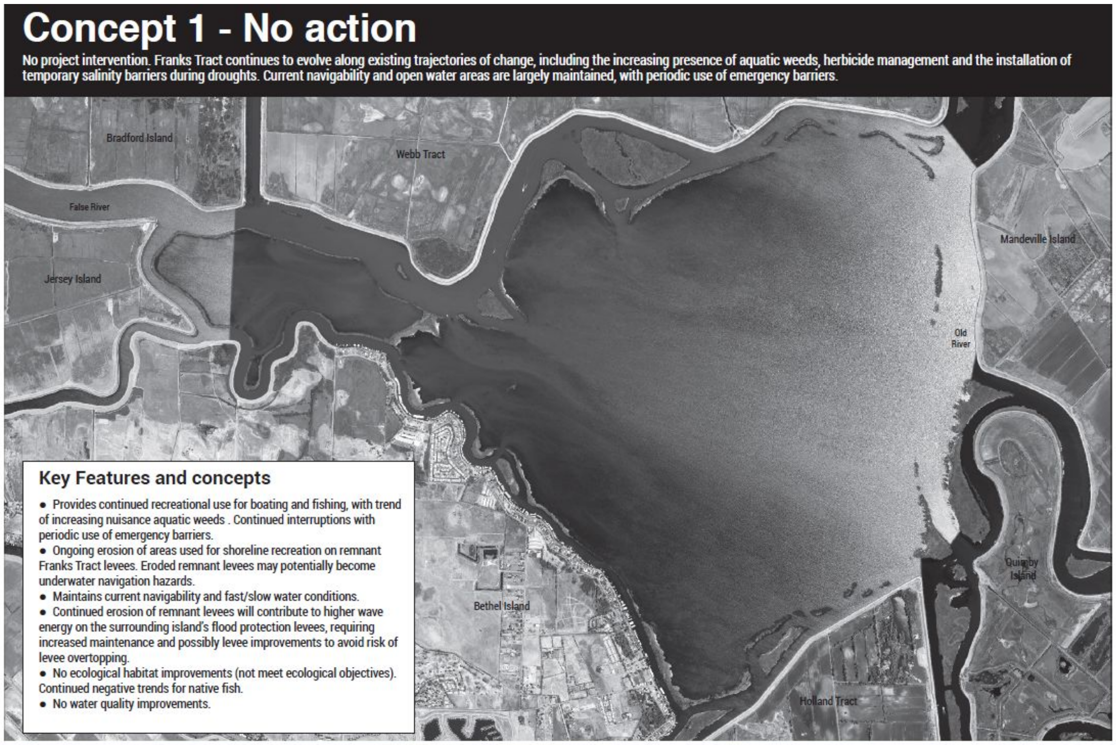
- Coexistence between largemouth bass and salmon is possible.
    - Out migrating salmon come through the tract when the water is colder and the bass are less hungry.
    - Dendritic channels, with many dead ends can help those salmon that linger avoid predation, and possibly fatten up.
    - According to Bruce, largemouth bass could benefit from all projects.
    - Salmon would benefit from Concept 4 given the proximity of channel opening to primary migration path.
        - All concepts could be made better for salmon by increasing the number and length of channels narrower than 5m and their proximity to migration paths.
    - Striped bass benefit from open water - Concept 7 could be good for stripers.
- Direct predation of delta smelt by bass is best avoided by their separation.
    - Concept 7 creates habitat for Delta Smelt, but may also lead to increased entrainment, given the southeastern orientation.
- See the slide below for details on ecological objectives.



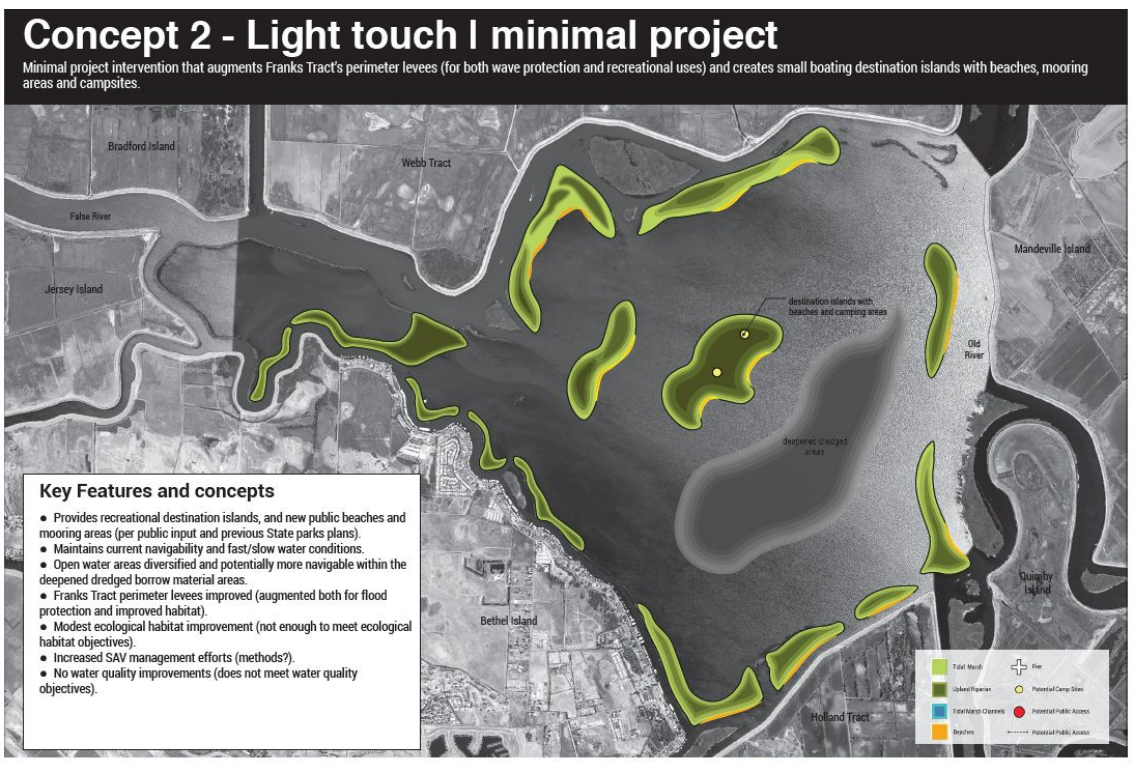
- Short Break -

Presentation of Round 1 design concepts - Brett Milligan

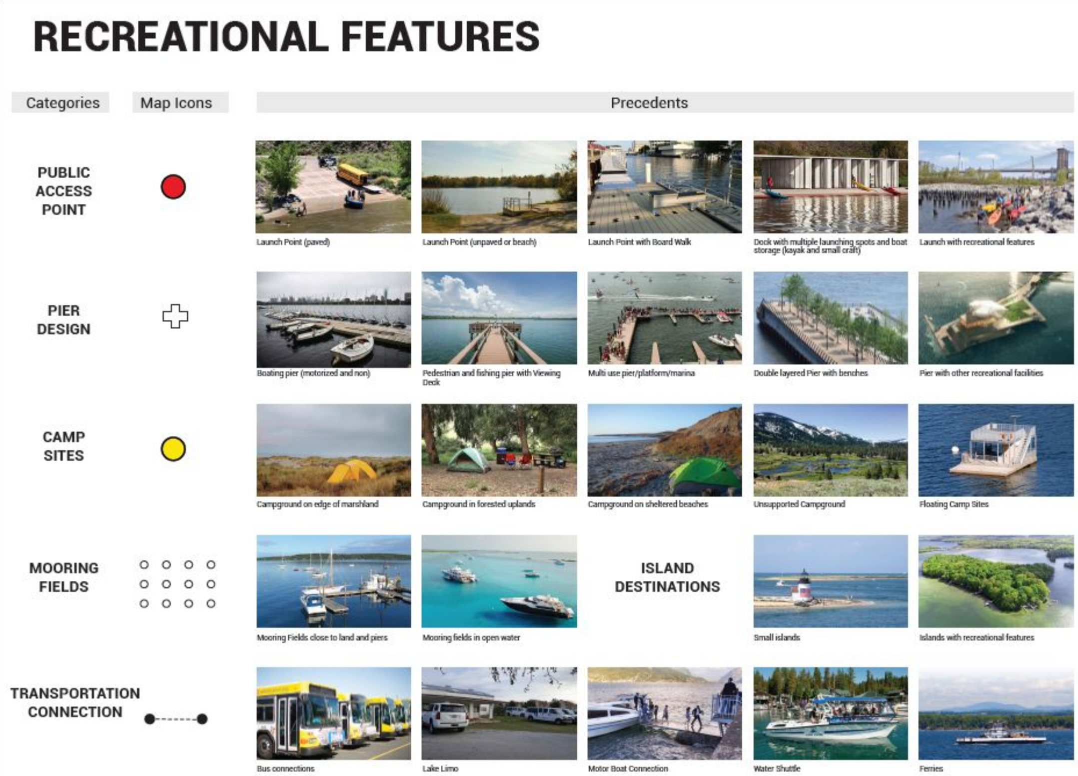
- The seven concepts are listed below:



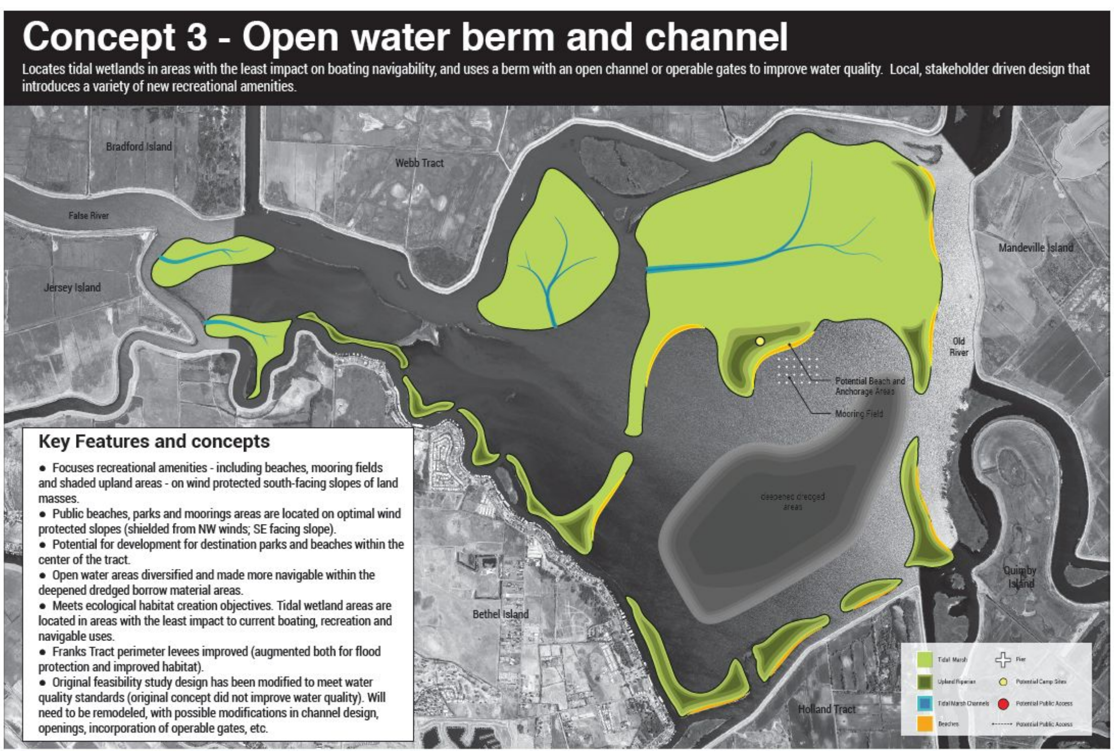
Concept 1: No Action.



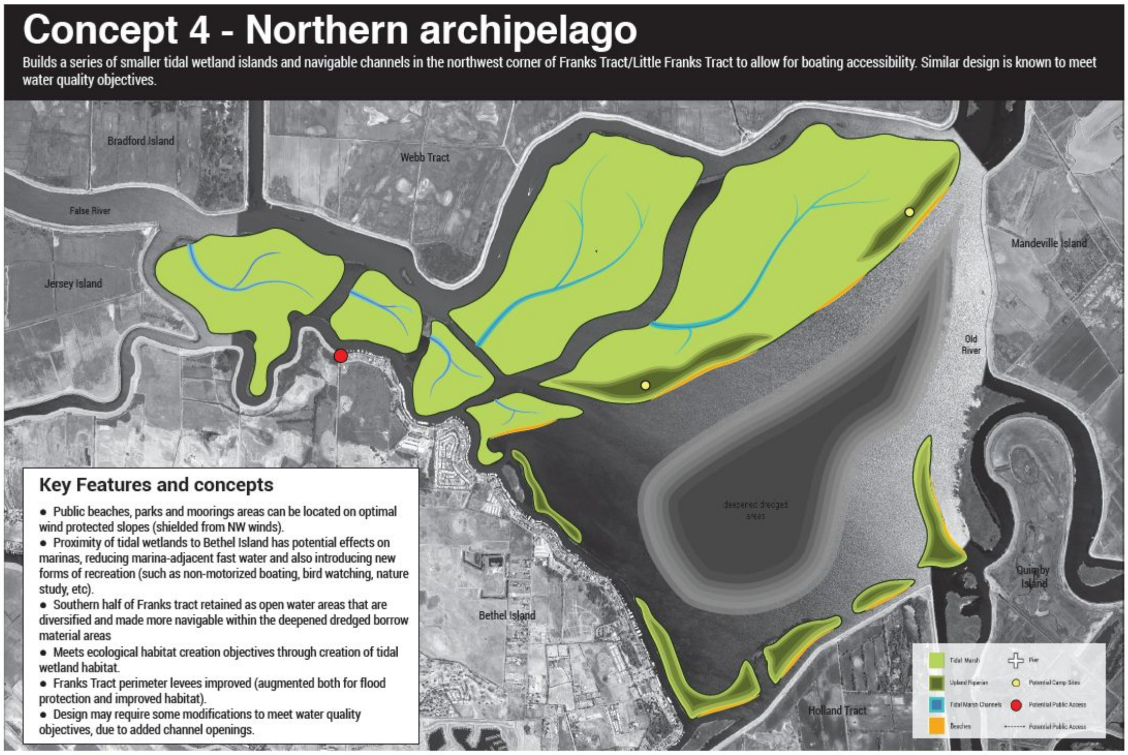
Concept 2: Light touch | Minimal project



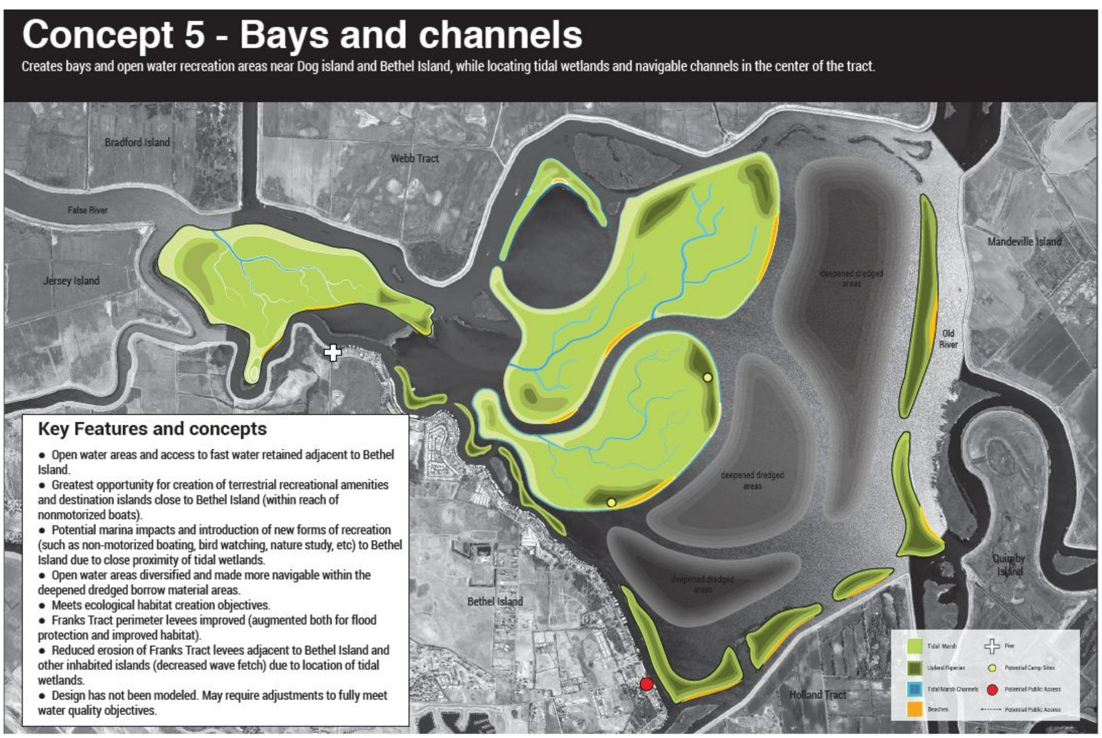
Recreational Design Precedents



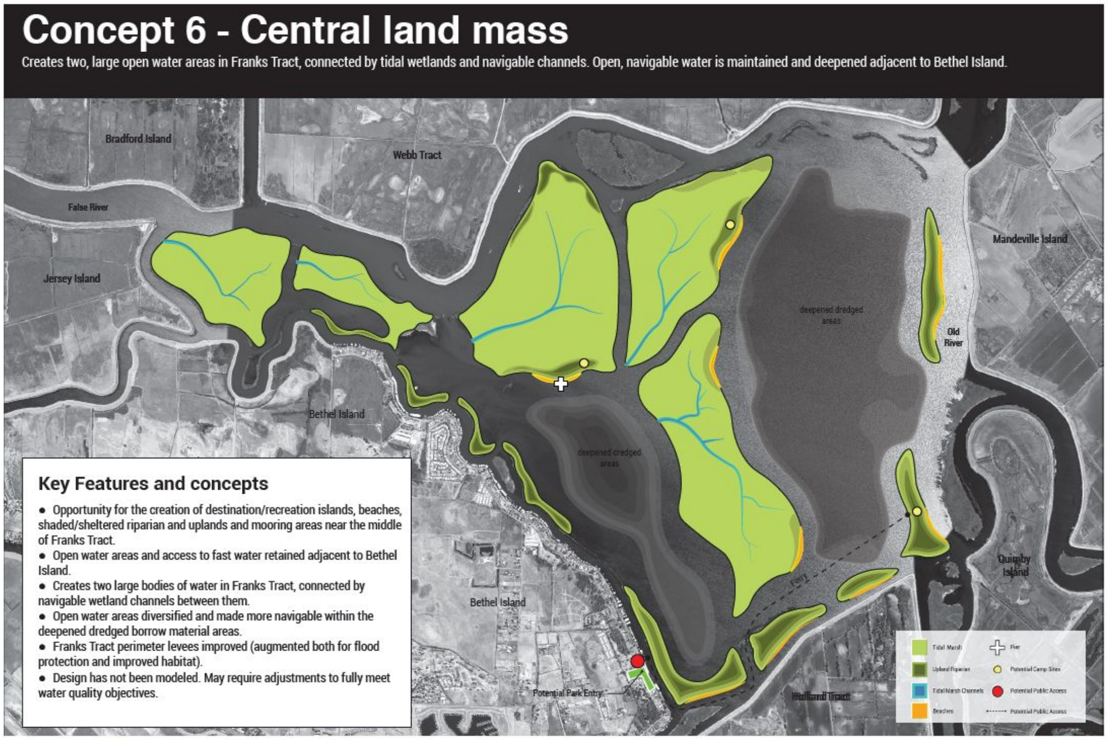
Concept 3: Open water berm and channel



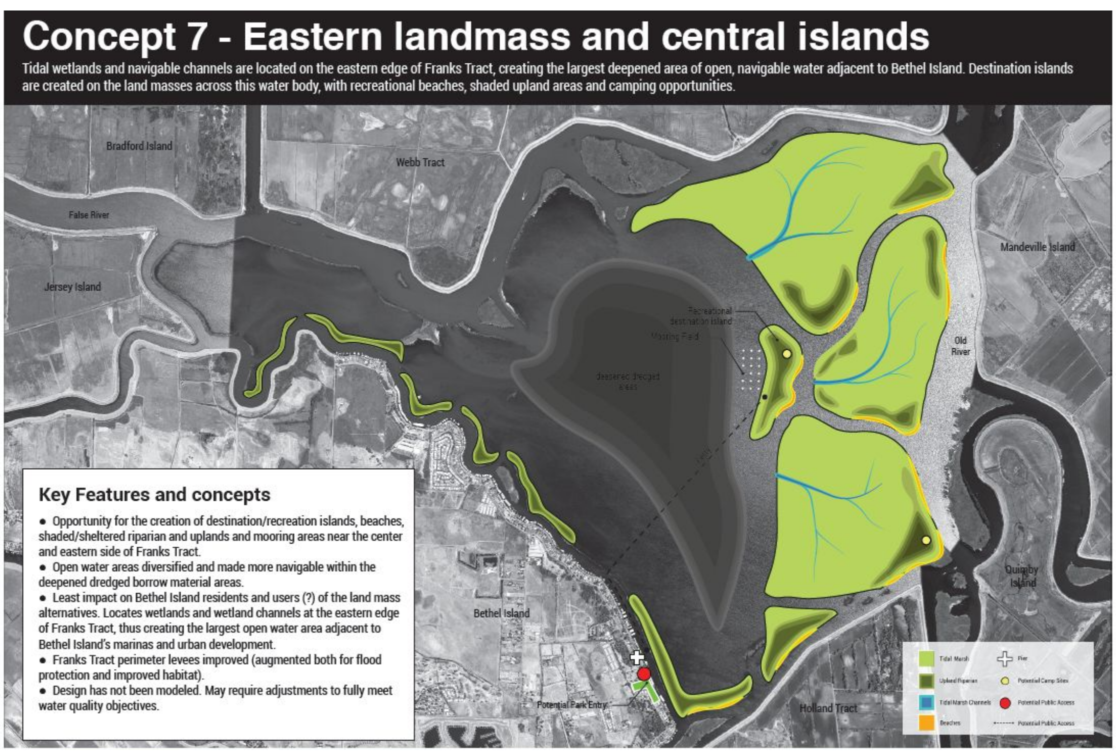
Concept 4: Northern archipelago



Concept 5: Bays and Channels



Concept 6: Central land mass



Concept 7: Eastern landmass and central islands

These concept diagrams are <u>not</u> fixed-plans. They show opportunities and stimulate discussions.

- General comments from attendees
    - Q: Would existing islands remain? A: The concepts show new or modified land masses and assume that existing islands remain. Although, some will likely continue to degrade as they would under a no-action alternative.
    - Q: What do you mean by non-motorized? A: Non-motorized includes all vessels that require human-power, including kayak, canoe, stand up paddleboard, etc.
    - Q: Is there a potential conflict between non-motorized boating and high-speed bass boats? Seems that kayaks and bass boats don't mix. A: Yes, we will consider that as part of channel design.
    - Q: What are the channel widths and depths in the marsh? Can bass boats go up channels? A: Larger channels may be navigable in a shallow hulled bass boat, depending on tides. Smaller channels will not.
    - Q: what's to stop tidal channels from filling with weeds? A: Certain design considerations may reduce aquatic weeds in channels. Maintenance may be required.
    - Q: How would homelessness and squatting be addressed? A: Maintenance, ordinances, enforcement, patrol. State Parks, Contra Costa Marine Patrol, other local entities.
    - Q: Will markers be included as part of signage? A: Yes, this will figure into all alternatives.
    - Q: Will new tidal marsh add navigation time? A: Yes, but may or may not be a big issue depending on the distance added.
    - Q: Could you deepen Old river or the entry of Old river into Franks Tract? A: This can be considered.
    - Q: What size boats are you considering?
    - A: What size boats should we consider?
        - A: Bigger boats currently avoid the tract. However, big boats bring money.
    - Q: How does the proposed project relate to the San Joaquin River restoration efforts to restore salmon runs in the San Joaquin River? A: The habitat enhancements are intended to support salmon migration along the Old River corridor.
    - Q: Could the delta cross channel be closed to protect out-migrating Sacramento River salmon? A: This has been done in the past to reduce entrainment. However, salmon will spread throughout the Delta area and it is impossible to contain them in the Sacramento corridor.

Evaluation criteria and summary table for design concepts - Dan Ohlson

- Dan briefly introduced the Evaluation Criteria sheet as a work in progress. He presented the BLANK summary table to show where we are heading for the next workshop.

Objectives		Evaluation Criteria (EXAMPLES)	Concept 1	Concept 2	Concept 3	....	Concept 7	Concept 8	Concept 9
Recreation									
	Fishing	Area of sportfish habitat (Bass, other?)							
	Motorized Boating	Area of Open Water							
	Non-motorized Boating	Length of Slow Water Channels							
	Waterfowl Hunting	Area of Waterfowl Habitat							
	Shoreline recreation	Number of Amenities							
Navigation									
	Travel time to Location A, B or C	Time / Distance							
	Boating Hazard	Channel velocity? Submerged hazards?							
Ecology									
	Habitat for Species of Interest	Shallow Open Water Habitat							
		Deep Open Water Habitat							
		Length of SAV/Open Water Edge							
		Water Quality (salinity / turbidity?)							
	Conditions for Native Species	Tidal Marsh Area							
		Tidal Channel Length							
	Risk of Entrainment(chinook, DS)	Middle / Old River Flows							
	Conditions for Aquatic Invasive Species	Deep Water, Steep Shoreline							
Water Quality									
	For Human Uses (e.g., agriculture)	Compliance with Water Quality Standards							
	Emergency Drought Protection	Support for Emergency Drought Barrier							
Flood Protection									
	Flood Risk Reduction	Flood Levels ???							
	Sheltered Levee	Length							
Local Economy									
	Projected Income	Dollars							
	Projected Jobs	Number							
Financial									
	Construction Costs	$$							
	Ongoing Maintenance Costs	$$							

Charette with Breakout Groups

- Each participant was provided a response sheet and request to fill in and return at the end of the meeting
- Small Group work (2 groups, randomly divided for AC), including 10 mins silent for people to fill in response sheets.

- **Each group reports back, 10 minutes each.**

- **Group 1 Feedback:**
    - Concept 7 was many people's favorite because it preserves the largest open water area near Bethel Island. Modify LFT to be more like in Concept 5, but without extending land into the bend at Horseshoe Bend (avoid constricting flows in this location). Mooring fields need to be on the lee side of a land mass (sheltered).
    - Concept 5 was also popular if more open water can be provided near Bethel Island. Many participants in Group 1 liked the sheltered open water area in the northwest part of Franks Tract. Smaller boats could moor there, then run to the nearby Bethel Island marinas for lunch or supplies.
    - Concept 4 was considered to have too large an area of marsh, too close to the Bethel Island marinas.
    - A participant with fishing interests likes concept 2 as it has many islands and edges. However, salinity intrusion remains an issue. Perhaps a barrier at Holland Cut or elsewhere could mitigate?
    - An SC member who works with water thinks Concept 3 may be the best option for improving water quality.
    - Concept 5 may work well for habitat reasons.

- **Group 2 Feedback:**
    - Concept 7 and Concept 6 were generally the most preferred.
    - Concept 7 can be enhanced by integrating the features of Little Franks Tract in Concept 6, plus adding a protective marshland on the west side of the proposed mooring field to shelter.
    - Concept 7 has the added benefit of not shunting salty water up the San Joaquin River.

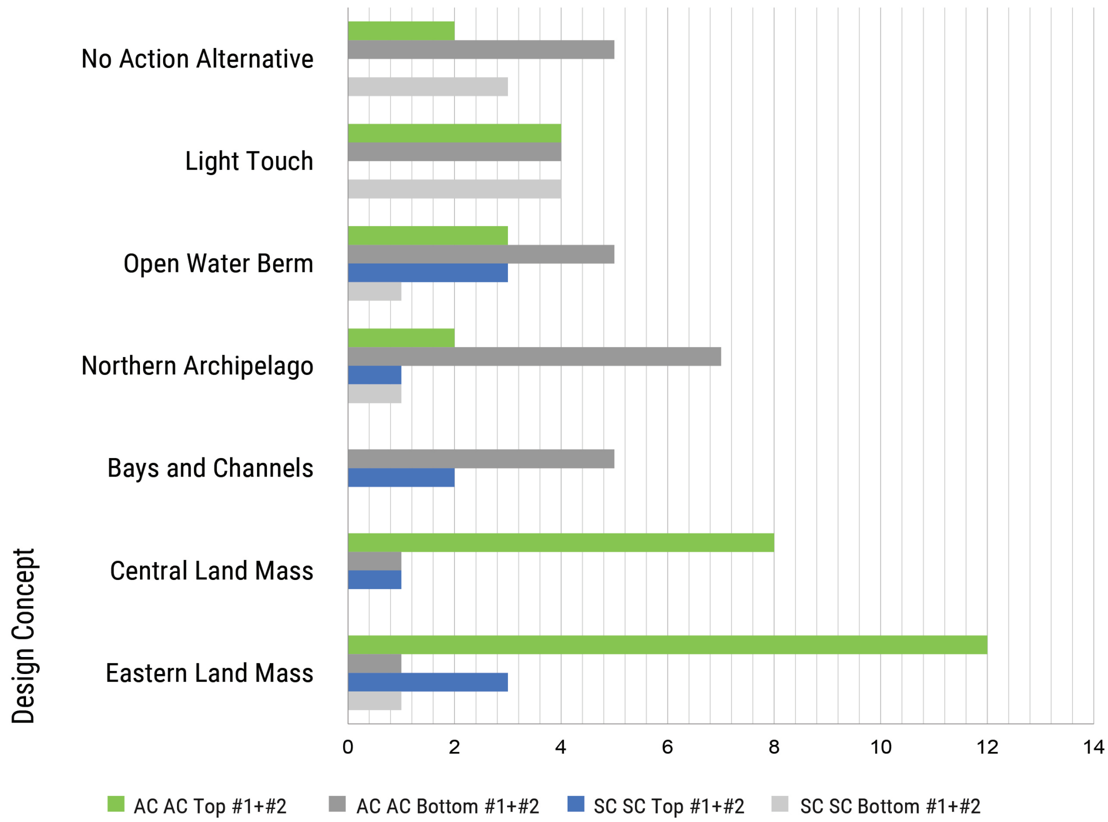
- Concerns with the boating hazards associated with submerged tidal marsh. Channel markers should be included for navigation.
  - Interest in imagery of tidal marsh at low, medium and high tides to assuage concerns that “submerged marsh” will not present a boating hazard
- Deeper water is great.
- Places to stop for 5-30 minutes to “let the kids out to play” would be desirable.
- One community member indicated “No Action Alternative is the worst in terms of navigability”
- Interest in pushing deep water right to the edge of new marshlands to facilitate access.
- In terms of Concept 6, there are also piling issues on the northeast corner of Franks Tract near Old River. So the marshland on the north can be extended to cover that part.
- Concept 5 is too complicated in terms of navigation.
- Concept 4 has too much fill, especially blocking too much view for residents in Bethel Island.
- Concept 3 needs to be altered. The opening is perceived as too small for motorboats. If for salinity concerns, the two marshlands on both sides can be offset.

- Additional feedback from attendees:
  - Would like to see more precedent pictures for marshlands. How high are they? How will they function seasonally? How will they impact residents’ views from Bethel Island?
  - Channel width and depth are primary concerns for boaters
  - Would like to see more pictures showing how the wide channels are between marsh land masses, as well as the narrow channels within the marsh.
  - Beach areas are greatly appreciated.
  - Maintaining facilities can be an issue for the Park (labor-intensive, expensive). May also discuss that in future conversations.
  - There is a dangerous blind corner on the southeast corner (Holland Cut). Needs to be improved by rounding the corner, building marsh in the appropriate places, or restoring remnant levees. It has five navigation routes with high speed.

Wrap up and Next Steps

- Team will work follow-up items on scheduling the next AC meeting at times that work best for participants.

08/29 AC/SC Meeting Design Concepts Ranking results



Top Choices
Advisory Committee
Reasons for Preference

Top Choices				
#1	**Notes**	**#2**	**Notes**	**Reason for preference**
1		**7**		
7		**6**		these two look like they [achieve] all 3 of the goals best. a little bit of something for everyone
7		**3**		
7		**6**		
3		**2**		#4 appears to be the best balance of water quality, recreation, local home owners, and better habitat restoration. I believe all others have significant flaws for at least one party and I would have a tought time supporting.
7	with LFT enhancements from 6	**6**	with slight changes and additions	5 has a good anchorage circle
6		**7**		combination of both
7		**6**		push barrier east. keep traditional traffic flow area in place
1		**7**	with LFT as marsh, turning island/moooring around	better for bass fishing. BI economy + big boat anchorage = more econ benefit for BI

Top Choices
Advisory Committee
Reasons for Preference

Top Choices				
#1	**Notes**	**#2**	**Notes**	**Reason for preference**
7		**6**		
7	with #6 LFT added			boating access
7	move mooring field to other side of island. Add LFT modifications.	**6**		best for boating/nav. and water if you add LFT to #7
2		**4**		Least invasive. provides most fish habitat.
4	modified	**6**		The benefit to salmon and fishes and the creation of wetland marshes
7		**2**		
3	with changes	**2**		

Top Choices
Advisory Committee
Objectives

# 1	# 2	Recreation	Navigation	Ecology	WQ & Reliability	Flood Protection	Local Economy	Financial Cost
1	**7**	Channels are boating hazards and need to be designed eliminating potential accidents. Min width 600'	as above	more studies needed. do no harm	questionable with all concepts	questionable without determining flow and water velocities	#1 protects local business and real estate property	so far undetermined. may be too great
7	**6**	adds beach, camping areas increases sport fish habitat	reopens FT to larger boats	may add native sp. habitat	possibly lower salinities		increases rec. which will increase number of people spending $	
7	**3**	creating landing areas for day boating and sandy beach areas away from channels	increase depth and width of channels. provide marker & lights for submerged tidal marshes	ensure invasive aquatics are managed in the channels				
7	**6**	max beach	wider & marked boating channels					

Top Choices
Advisory Committee
Objectives

# 1	# 2	Recreation	Navigation	Ecology	WQ & Reliability	Flood Protection	Local Economy	Financial Cost
3	2	There are beaches, mooring fields, strong and good navigation routes. If you kept the north boundary of Little Franks you would keep a good place for kayaking close to places where people can get there by car. The beaches need to be for protection of West winds not NorthWest winds. Summer winds are from West. In winter they can come from the north but no one is going to be at a beach.	Deep, wide, known to be safe paths, supporting known high traffic areas.	Seems like it delivers all the acres needed. Little Franks should have a north barrier maintained to improve ecology of that area and for bass fishing and kayaking	Appears to offer as good a protection for Salinity intrusion as any	If this means levee protection it does well, but the north part of Little Franks needs to be kept.	The businesses on BI are protected with good traffic routes and will he helped by the increase in recreation and better navigable sloughs. The homes on BI are not affected by filling in Little Franks and areas close to them.	Not aware of the costs of these alternatives.
7	6	Yes + more beaches	yes with lighting	TBD	TBD	yes - enhanced	yes - with beaches it is enhanced	TBD

Top Choices
Advisory Committee
Objectives

# 1	# 2	Recreation	Navigation	Ecology	WQ & Reliability	Flood Protection	Local Economy	Financial Cost
6	7	LFT could be used for kayaking, canoes, SUPs	leaving area open allows for better flow of traffic			improving the tules in front of bethel harbor + willow west and down by rusty porthole	these plans combined have the least negative impact on business as far as I can see	I think if you combine the two an address the safety issue for navigation safety on the east side.
7	6							
1	7	mooring with beach	#5 is best for bringing big boats into little bay all need wide straight channel from marinas to holland cut	#5 has small improvements for smelt + salmon. good for bass	both are better than NAA rename "salinity control"	NAA may be better for BI flood protection	NAA is best for bass fishing tournaments #5 + 7 may bring big boaters to anchor + vist BI for gas, supplies, restaurants	?
7	6	least impaired	same	?	maybe the same	any help is all good	ok	?
7		everyone can enjoy	safety		I don't care	water can flow out. I am not worried about in-flow	boaters can across Franks Tract	Boater access to marinas + homes
7	6	Navigation and leaving open deep water	much more open deep water	Add trees on the island	if you add little Franks Tract it should help with water	Building up Franks Tract old levee around island	better access to business and recreation spots closer to them	?

Top Choices
Advisory Committee
Objectives

# 1	# 2	Recreation	Navigation	Ecology	WQ & Reliability	Flood Protection	Local Economy	Financial Cost
2	**4**	good habitat restoration	less restrictive	same as recreation	I am most concerned about water quality for Delta area. Not concerned about quality at the pumps. Just pump less	reinforcing levees	more fishing opps	unknown
4	**6**			More protective of salmon	provides salinity benefits			
7	**2**	Potential Park Entry on the Island, Destination Island, beaches, mooring area				The perimeter levees would be improved. Preferred small perimter levee off of Horseshoe Bend. No large land mass off of Horseshoe Bend.	Would create a park on Island, which could boost local economy as well as a destination area, which would mean purchase of supplies, eating at local restaurants, etc.	
3	**2**	open water access, deep water less aquatic weeds, open navigation	The same as recreation	Less weed abatement, positive for fish	not good but may need to compromise		very good for BI economy	A lot more price effective

Top Choices
Steering Committee
Reasons for Preference

#1	Notes	#2	Notes	Reason for preference
6		5		Marsh habitat is more spread throughout system (area of FT); also these have more marsh habitat further west to help achieve WQ objectives ~ and better for salmon
				Haven't really fully absorbed # 4-7 – all have intriguing lay out.
5		7		great for rec. opps. -east rec. use definition/seperation
3		7		Local support for both concepts to achieve project objectives
4		3		Large contigous wetland areas providing east/west pathway to serve fish leaves large water body for boating etc.
7	with c. 6 modifications to LFT	3	with c. 6 modifications to LFT	Seemed to address many objectives

Top Choices
Steering Committee
Objectives

# 1	# 2	Recreation	Navigation	Ecology	WQ & Reliability	Flood Protection	Local Economy	Financial Cost
6	**5**	both seem to provide east-west travel (esp. if southern portion of marsh is truncated) marsh areas may be positive for LMB on margins	see above should widen channels b/w marshes improve design to make SE corner of FT safer	good area of marsh habitat - will also reduce weeds boradly because deep areas marsh habitat is large and contigous	both serve beneficial WQ purposes during drought years	not knowledgable enough to evaluate		should be evaluated
		O&M cost for any recreation use and facilities the project generates need to be considered, planned for.	Will continuing to provide or design for bass or other non-native sport fish habitat be compatible with the initial driver for this project – protecting Delta smelt and other native fish species?	Who will be responsible for the levee improvements? Existing interior levees are remnants – no entity currently responsible for maintaining them as flood protection.				See comments above regarding ongoing O&M of recreation use and facilities and cost of maintaining levees.
5	**7**	more beahces -hunting zones need definition -areas for boat and camping	wider navigational channels needed	little Franks Tidal marsh good			-variable recreational users brings users to Tract 12 months/year	Long term supoort money needed with project

Top Choices
Steering Committee
Objectives

# 1	# 2	Recreation	Navigation	Ecology	WQ & Reliability	Flood Protection	Local Economy	Financial Cost
3	**7**	Camp sites, mooring fields, ferry option	Maintains high speed transportation corridors for bass boats		Creating berms/gates in #3 is interesting option, provides better local environmental/input/understanding of needs for solinity gates		Protects bass fishing/boating options	
4	**3**	Separates non-motorized and motorized users. Leaves open water most like present FT use. Large enough area to accomadate beach and upland use.	Wider channels sufficiently allow direct-ish access to Old + False rivers + holland cut/points of interest	Large, contigous habitat. Can be choreograhped to provide for 4 mentioned target species. Maximize use of LFT for project obj. Keep smelt to West if possible.	hopefully modelling will show these as efficient/sufficient	Large, fetch reducing wetland placements. bolstering FT perimeter levees.	Leaves precious fast open water access. most resemblespresnt open water feel.	Perhaps larger restored areas are more stable than smaller, more easily established and sustaining? Req. less maintenance.
7	**3**	good access for locals	consider nav. aides	maximize dense? for channels for tidal energe and habitat	nav channels width vs. water quality needs modeling		good access to marinas	

Bottom Choices
Advisory Committee
Reasons for Dislike

#1	Notes	#2	Notes	Reason for dislike
4,5,		-		
2	adds little benefit	3	narrow opening in the middle of the tract	
5		6		
1		3		
4		5		Filling in areas closest to homes on Bethel Island. Filling in Franks Tract. The over complication of navigation in the area. Too much change in the area. Lack of good beach areas. Showing a lack of understanding of the local boating, recreation, and homeowner needs.
1		4		I dislike the area (mass) of tidal marsh on the western side affecting property values negatively
4		5		blocks off too much tract
4	too much blockage in NW area	5	too much blockage of main traffic area	
4	marsh wrecks views from BI homes	3	little openings to marinas	
3		2		
4		5		boating access
1		2		I think we need to do something
3	Don't like a lock or gate or channel	6, 7	far to invasive	
1		2		Does not change or improved conditions with fishes or WQ
4		1		The Northern landmass close to the island is a non-start. The do nothing approach.
7		5, 6		The movement of boat flow navigation through the most traveled area of the delta

Bottom Choices
Advisory Committee
Objectives

#1	#2	Recreation	Navigation	Ecology	WQ & Reliability	Flood Protection	Local Economy	Financial Cost
3,4, 5,6	**-**	hazardous boating conditions						
2	**3**	may actually reduce fishing oppurtunities	giving larger boat access will create larger swells making areas not suitable for rec.	restrictions put on non-native sp. during permitting process				
5	**6**		these makes trips cumbersome for transiting FT					
1	**3**							
4	**5**	Lack of beaches, the dangerious set up of waterways for boating with intersections etc. No mooring fields	Reduced navigation ease and actually dangerous improvements, creating narrower channels where more traffic happens.	Have you thought of all the extra levees needed? I think ecology is hurt by these designs. Never mind the people getting hurt.	Not to me to evaluate	If it means more levee protection, this is probably good here there are lots of extra levees to maintain.	Disastrous effect on home values and businesses due to the marina traffic changes.	Not up to me to consider.
1	**4**	negatively affected	negatively affected	TBD	TBD	TBD	flatline	TBD
4	**5**							
4	**5**							
4	**3**	#3 + #4 bad for bass fishermen	both bad	both better for fish	both good	TBD	worse	?

Bottom Choices
Advisory Committee
Objectives

#1	#2	Recreation	Navigation	Ecology	WQ & Reliability	Flood Protection	Local Economy	Financial Cost
3	**2**	NA	minimally impaired	?	?	any is good	?	?
4	**5**		water ways look too narrow		don't care	water out flow	boater access to marinas + homes	
1	**2**	we need more places to anchor-camp and play	too many plants/not dee enough	too many plants under water	need to slow the salt water down	none with plan 1 or 2	same	
3	**6, 7**	# 3 would create a problem with locks and gate	block off so much of tract	6+7 would help habitat but I do not see a project happening of that size	too much emphasis on WQ at pumps - disguised as habitat restoration			
1	**2**			It does help improve the Delta				
4	**1**					The enormous land mass across from Horseshoe Bend, Forcing route close to the island levees to get through to the open water.		
7	**5, 6**	these are 50/50 for recreational access good and bad	horrible for navigation on busiest area	good for ecology	good for water quality	still believe this will increase flood? in the levees	bad for local economy due to navigation access	seem to be the highest of all

Bottom Choices
Steering Committee
Reasons for Dislike

#1	Notes	#2	Notes	Reason for dislike
1		2		not sure that light touch achieves any benefits of discouraging weeds or WQ
2	Concept 2 does not meet the water quality nor the habitat ecological objectives. Don't see making the huge $ investment for a project without achieving these objectives. Habitat and water quality were the original drivers for the project development.	3	Concept 3 – What tidal velocities can be expected in the narrow gap between the two peninsula arms in the center of this concept? Also – does this configuration – expanses of open water on either side of a narrow gap creates a boat traffic hazard spot?	
1		4		Doing nothing isn't really an option to achieve basic objectives. Northern islands block views/economic concerns for BI
2	is not enough to achieve obj.	7	Not bad - love large area but no migratory east/wet fish passage. could be enhanced by more active use of LFT for project obj.	insufficiently addresses obj.
2		1		

Bottom Choices
Steering Committee
Objectives

#1	#2	Recreation	Navigation	Ecology	WQ & Reliability	Flood Protection	Local Economy	Financial Cost
1	2		already impeded by weeds	habitat is dominated by weeds + selected fishes - not diverse enough	temporary drought barriers will continue to be necessary, which is costly and will support continued persistence of weeds			
2	3	How will O&M costs of recreation use and facility improvements be funded?	Does narrow gap with open water expanses on either side create potential boating hazard spot?	Will continuing to provide or design for bass or other non-native sport fish habitat be compatible with the initial driver for this project – protecting Delta smelt and other native fish species?		Who will be responsible for maintaining levee improvements?		
1	4	#1 does not increase benefits for nonmotorred boats, or campsites, access			#1 does not provide WQ/salinity benefits. #4 does		#4 blocks acess to fast water from new Bethel Island	
2	7	Mooring on windward side beaches on fast access boat routes non-motorized rec. problematic	needs wider main channels?	leaves open and deep water guantlet for target native sp. to run	as presented 7 looks to allow salt into FT, though not old River			

FRANKS TRACT FUTURES ADVISORY COMMITTEE MEETING #3

Meeting time: November 6th, 2019 11:00 am - 3:00 pm
Meeting Location: Big Break Visitor Center, 69 Big Break Rd, Oakley, CA 94561

Meeting Summary

The purpose of the third Advisory Committee (AC) meeting was to:

- Review and receive input on the revised design concepts
- Review and receive input on the draft evaluation methods and criteria
- Share the initial results of hydraulic modeling, receive input on the initial recreational features design ideas and marsh aesthetic surveys
- Conduct a design charrette to receive input on the next round of design concepts.

All the above topics were discussed with attendees. Read-ahead documents were distributed prior to the meeting. All the project documents are working documents and will evolve as the project moves forward. The meeting was attended by approximately 50 people, consisting of members of the AC, the Steering Committee (SC), and UC Davis senior landscape architecture students, a few members of the public, and core project team members.

For the design charrette, attendees received an overview of the narrowed down four concepts (referred to as Round 2 concepts; diagrams included in notes below) then were divided into three breakout groups. Each group discussed and evaluated the concepts; producing useful comments for the advancement of the designs. After the discussion, participants filled out written concept evaluation forms. In the final part of the meeting, the groups came back together, and each group summarized their preferences and concerns for all design concepts, with commonalities and differences noted.

For the next project meeting, the four concepts will be carried on with further revisions based on discussions in the meeting, ideas collected from the evaluation sheets, and input from technical project team members.

Key takeaways

- An agreement has emerged on the configuration of Little Franks Tract.
- The channel widths and lengths will need to be adjusted to better achieve water quality objectives.
- Several attendees suggested no additional public access along Bethel Island to avoid competition with existing recreational providers; Public access on other tracts nearby is highly desired.
- The team will post the overall planning process and approximate meeting sequence to the project website, along with meeting materials, notes, and presentations.

Meeting Notes

Introduction - Brett Milligan, UCD

- Overview/introduction; what we want to achieve for the meeting
    - Review of (read-ahead) project documents
    - Guidelines for productive meetings
- Presentation of the feedback summary and working progress after the last meeting
- Presentation of agreed common features in all proposed concepts
- Three concepts were carried out further with the input from AC Meeting #2, which are concept 3, concept 6, and concept 7.
- Audience Q&A and comments:
    - Comment: The northern remnant levees of Little Franks Tract (LFT) is very important as protection against wind and wave fetch. Suggest carrying that over in Concept 2B and 2C.
    - Comment: Concerns regarding the dangerous corner on SE of the Tract near Holland cut. Only Concept 2B mitigates the issues as of now. Suggest considering altering the configurations in Concept A and C.
        - Q: Does the modeling process consider aspects such as tides, sea-level change, etc.? A: Yes.
        - Q: Have you looked at the variations of configurations during hydraulic modeling? A: Yes, we did. Will show it when we present the modeling results.

Evaluation Criteria and Summary Results - Michelle Orr, ESA

- The team is working together on framing the evaluation criteria. It is an ongoing process.
- Metrics as quantitative as possible and assess how the alternatives are meeting the objectives.
- There are seven objectives in total. Evaluation criteria are under development, addressing four objectives, namely Recreation, Navigation, Ecology, and Water Quality and Supply Reliability. Evaluation criteria addressing the remaining three objectives are forthcoming, namely Flood Protection, Local Economy and Community, and Project Cost.
- Ideally, the final goal is to provide scores/ratings (likely 1-10).
- Audience Q&A:
    - Q: Public and local communities are missing from this list. A: We have a category that is Local Economy and Community, which will represent local concerns. The Local Economy and Community criteria depend on evaluations of Recreation and Navigation, so we began with Recreation and Navigation. The Local Economy and Community criteria are not fully developed yet, and we welcome residents to offer ideas in this meeting. Moreover, many local concerns are also integrated into other categories, such as marsh aesthetics, and shoreline treatment, we can look into them today.
    - Q: What about social concerns from local residents? A: We have an economic analyst on the team who will need more tangible ideas and alternatives before he can start to talk to individual community members.
    - Q: Water quality improvement for whom? A: Firstly, for human use, both in-Delta, and exports. Secondly for the larger Delta ecosystems and dependent activities.
    - Q: Will the Delta Community benefit from water quality improvement? The water goes to the Old River and gets pumped. A: The short answer is: there is no way the pumped water quality can be improved without the Franks Tract residents benefiting as well.
    - Comment: property values should be considered.

- Draft evaluation criteria have been developed for:

Recreation – including fishing, waterfowl hunting, motorized boating, non-motorized boating, and shoreline recreation

Recreation – Boating & Shoreline

EVALUATION CRITERIA INFORMATION SHEET

RECREATION – MOTORIZED BOATING, NON-MOTORIZED BOATING, SHORELINE

Objective	Evaluation Criterion	Units	Description
Enhance recreation facilities and opportunities for: • *Motorized boating* • *Non-motorized boating and* • *shoreline recreation* *while minimizing impacts to existing recreational uses*	• Open water for motorized boating, water-skiing /wakeboarding/ sailing	Acres/ Quality	Enhanced or new recreation facilities will provide high-quality spaces for several types of recreation desired by the community and stakeholders including: • Boating areas (motorized/ non-motorized) • Beaches • Day use and overnight areas • Shoreline access
	• Slow water channels for non-motorized boating (miles) and distance from put-in locations	Miles / Quality	
	• Focal point use areas with beaches, day use, and possible camping,	Number/ Quality	
	• Mooring, with destination focal point clusters,	Number/ Quality	
	• Shoreline waterfront access or park space on Bethel Island with associated facilities	Number/ Quality	

Navigation – including travel distance and boater safety

Navigation

EVALUATION CRITERIA INFORMATION SHEET

NAVIGATION – BOATING TRAVEL DISTANCES

Objective	Evaluation Criterion	Units	Description
Minimize impacts to boating travel times between key locations	Travel distances between key locations.	Distance (feet)	Reports the fast water boat distance traveled compared to current conditions as a proxy for travel time.

Ecology – including special status fish species, sportfish habitat, tidal marsh area and invasive species

Ecology – Tidal Marsh

EVALUATION CRITERIA INFORMATION SHEET

ECOLOGY – TIDAL MARSH AND ASSOCIATED HABITATS

Objective	Evaluation Criterion	Units	Description
Benefit a range of native species by establishing large areas of tidal marsh and associated habitats.	Tidal marsh and associated habitats	acres	Reports the area of tidal marsh plain and associated tidal channels and riparian edge.

Objectives	Evaluation Criteria	No Action	Concept 2A	Concept 2B	Concept 2C
Ecology					
Conditions for Native Species	Tidal Marsh Area				
	Tidal Marsh Area (acres)	0	1288	1220	1390

Outstanding Questions?

- Is area of tidal marsh and associated channel and upland habitats a reasonable metric for a range of native species?

Ecology – Special Status Species

Evaluation Criteria Information Sheet

SPECIAL STATUS FISH HABITAT

Objective	Evaluation Criterion	Units	Description
Maintain or enhance habitat for special-status fish species: • Chinook salmon • Delta smelt	Chinook salmon habitat Delta smelt habitat	Length (ft) Acres	Reports the area of high-quality habitat for special-status species based of specific habitat attributes.

Ecology – Aquatic Invasive Species

Evaluation Criteria Information Sheet

AQUATIC INVASIVE SPECIES (AIS)

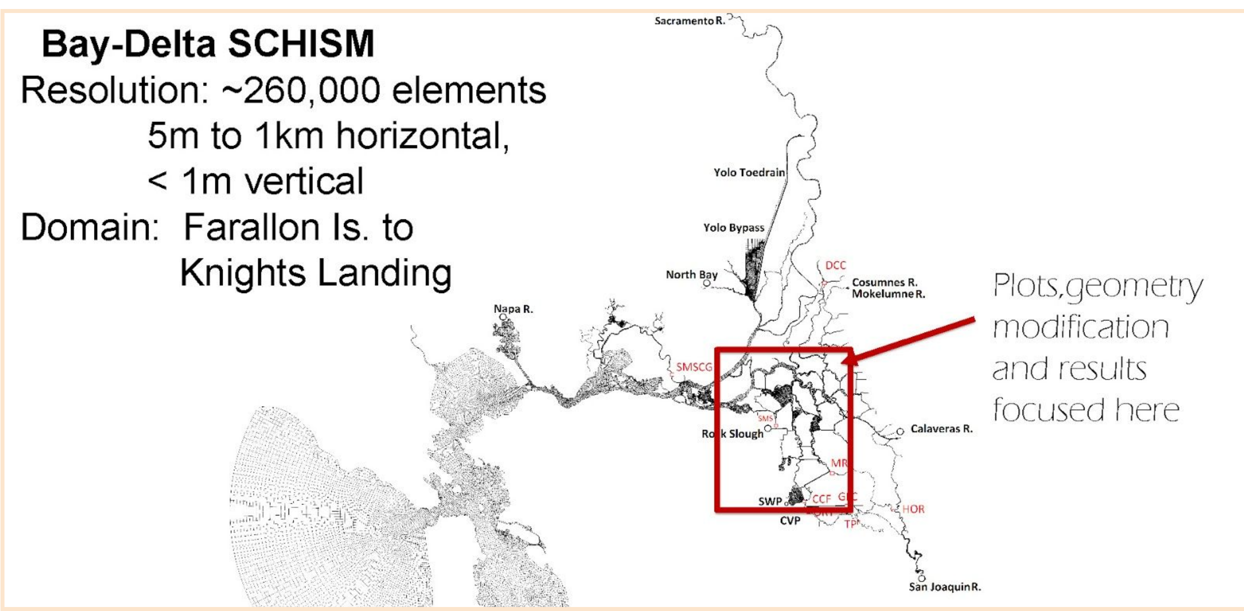
Objective	Evaluation Criterion	Units	Description
Minimize conditions that could result in the spread of undesirable invasive species	Acreage by elevation band and associated level of effort for AIS control	Acres Dollars	Describes the potential for spread of AIS based on the level of effort required for control. Areas requiring more intensive control measures rated as more likely to spread AIS.

- Audience Q&A:
  - Q: Are aquatic weeds part of the consideration process when talking about navigability and travel times? Boats are advised to go fast in locations with submerged aquatic vegetation, to avoid getting stuck and possibly overheating the engine. A: We were using distance at this stage. Travel time will, of course, be dependent on the speed of travel, which depends on the type of boat and other factors. The depth and the presence/absence of aquatic vegetation and their effects on navigation will be noted.
  - Q: For the sportfish habitat, the word says "maintain or enhance" sportfish, yet largemouth bass and striped bass are predators of Delta smelts. A: There are other criteria related to ecology and native fish protection. Those are the trade-offs we would like to discuss with stakeholders and the public.

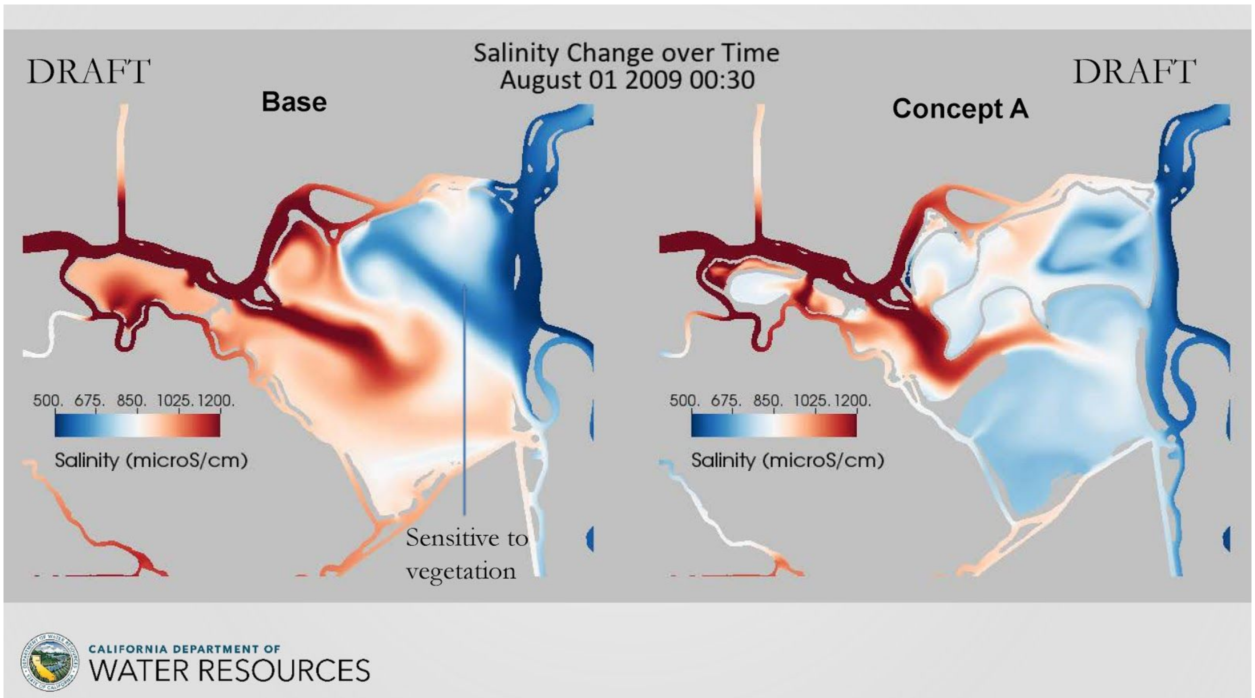
○ Q: Does modeling consider sea-level rise? A: It can in future model runs, but does not currently.

Hydraulic Modeling Result - Eli Ateljevich, California Department of Water Resources

- Presentation of modeling results focuses on the central Delta, but the simulation considers the overall context of the waterway systems in the entire Delta.
- For the through-channels used for navigation, the current channel designs appear too wide in several key locations to provide meaningful water quality benefits.
- Currently, only Concept 2A has been modeled, and it improved the water quality in Franks Tract, but not enough to achieve the objectives related to water quality in the Old River.



- Audience Q&A:
  - Q: Why is Little Franks Tract so fresh? A: It's 800 µS/cm so it's not completely fresh. The color scaling emphasizes salinity differences.
  - Q: What is the current tolerance for drinking water? A: 1000 µS/cm is the general requirement
  - Q: Where does the salinity come from? A: Ocean water and to some extent the San Joaquin River.



- Lunch Break -

Attendees used this time to evaluate recreational feature concepts and discuss with UCD students and to visually rate images of tidal marsh and riparian habitats (participants were provided with evaluation forms that were collected after lunch).

Charrette with Breakout Groups

- Each participant was provided a response sheet and requested to fill in and return at the end of the meeting
- Small-Group work (3 groups, randomly divided) (1 hour)
- Each group reported back, 10 minutes each.
- **Group 1 feedback:**
  - Concept 2A is the most preferred alternative in this group
  - Everyone likes the configuration of Little Franks Tract in Concept 2A, allowing slow water and non-motorized boating. Suggestion for a no-wake zone and addition of a land-based facility (place to get out of your kayak) in LFT.
  - Concern about the beach on the north side of the peninsula, since the wind is coming from the northwest
  - Suggestion to beef up the remnant levees from LFT to the nozzle, as a wave break.
  - Curiosity regarding the modeling of salinity intrusion, some tweaks can be accepted to minimize intrusion.
  - The dangerous corner area at Holland Cut: can we cut through part of the existing marsh or add a small marsh to bump out part of Holland Tract to round up the turning radius?
  - Discussed destination area in the middle of Franks Tract as possibly a great place for fireworks celebrations.

- **Group 2 feedback:**
  - Concept 2B is preferred, with Little Franks design as in Concept 2A.
  - Concept 2B gives us two bodies of water sheltered by the constructed marshes from wind and waves, providing benefits to water-related sports
  - The mooring field in the middle might be better if moved up to the north

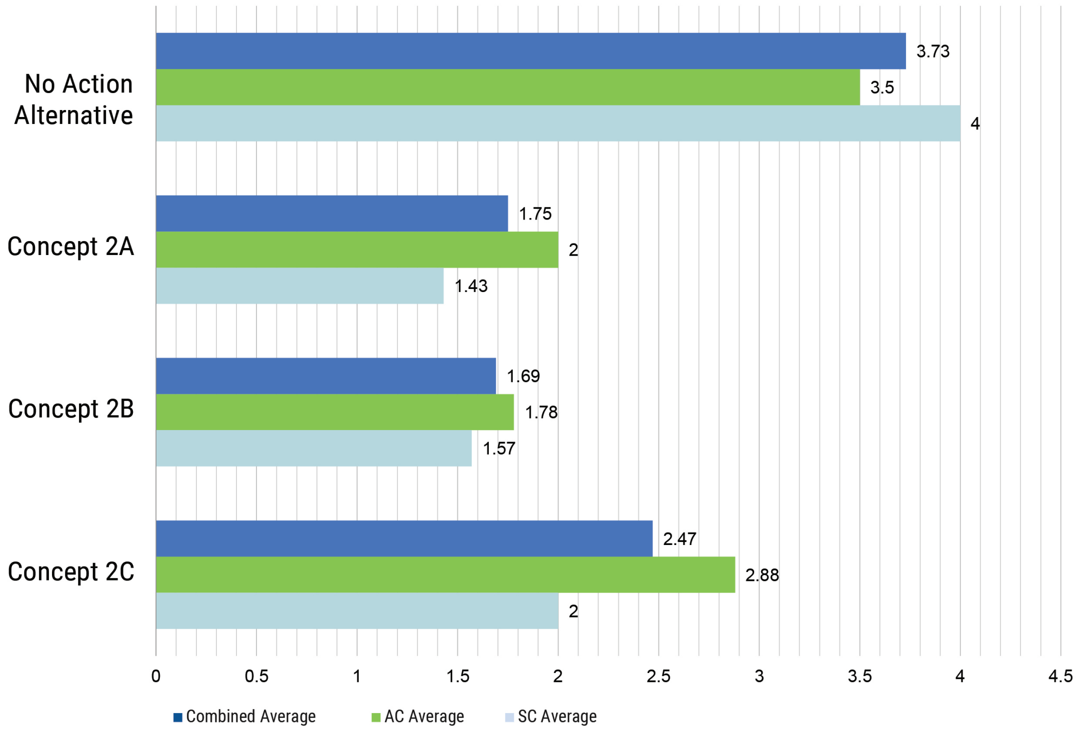
- All residents in the group agree that they would rather not offer free launches on Bethel Island, as only 5 dollars is currently charged for launching a kayak, using bathrooms, and parking a car, which is less than the typical CA state Park rates. Residents also would like to continue providing the services while maintaining this income.
- Currently, the roads are only two-lanes, the current transportation services, and maintenance condition is not prepared to accept larger waves of visitors.
- The proposed beaches will bring economic benefits to the Bethel Island residents.
- Public access possibilities were discussed on adjacent islands (Holland).
- Lack of support for shoreline fishing from Bethel Island. Levees for flood protection only.
- This concept is also the only one that makes the dangerous corner safer.
- There are a couple of other ideas to mitigate the dangerous corner issues (such as making a “J” island).

- **Group 3 feedback:**
  - Prefers the configuration of LFT in Concept 2A.
  - The boaters at this table preferred Concept 2B.
  - The mooring field needs a dock.
  - We need more consideration of velocity through the channels - barriers and boating safety.
  - Request to provide signage for any shallow areas associated with tidal wetlands as needed for navigation.
  - Hunting blinds near shorelines and marsh edges need to be far away from beaches, piers, mooring fields, and other recreational features.
  - Fish go both upstream and downstream, this needs to be considered more fully.

- Other comments:
  - Haven't seen any attempt to separate the boaters (motorized) and paddlers (and other non-motorized).
  - Non-motorized boating in LFT is generally supported

11-06 Meeting AC/SC Meeting Design Concepts Ranking Result

(1 being the most preferred, and 4 being least preferred)



RANK
Steering Committee

No Action		Concept 2A		Concept 2B		Concept 2C	
Rank	**What makes you prefer/not prefer this concept?**	**Rank**	**What makes you prefer/not prefer this concept?**	**Rank**	**What makes you prefer/not prefer this concept?**	**Rank**	**What makes you prefer/not prefer this concept?**
4	existing problems remain. no water supply benefits	2		1		3	
4	status quo while manageable appears to fall short of public needs to create more rec oppurtunities	1	slows water down compared to current nozzle, enhances rec, ecology and WQ	3	does not slow water down aat nozzle, creates two larger deeper water bodies. This could reduce aquatic vegetation	2	does not slow water down compared to current conditions. Enhances rec, ecology and WQ
4		1	Ranked 1 for western design @ LFT	2		1	Ranked 1 for design @ SE Holland cut intersection
4	salinty, weeds, wind waves	3		1	most protective of holland tract, most boatable.	2	
4		1		1		2	
4	No water quality improvements.	1	Potential for salinity barrier function b/t parcels D and E. Variety of beach areas throughout. Creation of mini-harbor at Little Franks Tract.	2	Maintenance of large open water areas adjacent to Bethel Island and toward east end of tract. Variety of beach areas throughout.	3	Could make speed boating on eastern end of tract hazardous. Fewer beach options.
4		1		1		1	

RANK
Advisory Committee

No Action		Concept 2A		Concept 2B		Concept 2C	
Rank	**What makes you prefer/not prefer this concept?**	**Rank**	**What makes you prefer/not prefer this concept?**	**Rank**	**What makes you prefer/not prefer this concept?**	**Rank**	**What makes you prefer/not prefer this concept?**
3	This will be the most popular with locals and fishermen	4	channel too small. not safe	1	this is the best for travel and safety	2	make the turn at Holland more dangerous
4	no change where something needs to be done	2	like the little franks concept	1	prefer a pair of deep water areas over a simgle larger one	3	little franks little intense for non-motorized watercraft. minimal added largemouth habitat.
4	No land-based BI public access or launching or fishing piers	2	No land-based BI public access or launching or fishing piers	1	No land-based BI public access or launching or fishing piers	3	No land-based BI public access or launching or fishing piers
4		1	Little franks is good. 2B is best for other parts	2	Pick 2b but add little franks tract area from 2A combine	3	
		1	Has most of all benefits. Holds well for little franks tract	2		3	
1		4	Transit times w/ finger	2	more open w/ min. land mass	3	equally open
4		2		3	most restricted flows		looks like least impact to water flows
4	FT is degrading and needs help	1	better protection from wind + fetch. more recreation	2	barely ok protection from wind + fetch	3	Too little protection
4	levees need attention	1		2		3	

Steering Committee

What works or doesn't? Please identify which concept (NAA, 2A, 2B, 2C) you are discussing

Recreation	Navigation	Ecology	WQ and Supply Reliability	Flood Protection	Local Economy and Community	Project Cost
2A, 2B, 2C dramatically increase recreation oppurtunities, but will necessitate and increased maintainence cost to continue facility upkeep	time of travel across Franks will be reduced however, more oppurtunities to visit will be created thus reducing travel times.	2A, 2B, 2C seem to reduce open water habitat for waterfowl and creates source of conflict	2B + 2C does not appear to slow water and would like ensure status quo	Flood control only seems to benefit Bethel Island and Islands east of Franks Tract.	Is there currently enough county zoned land at Bethel Island for example to accomadate new businesses to supoprt any alternatives	Dredgeing costs will be huge, park recreation management is currently non-existent in the Delta. Where will $ come from?
Consider adding resources to support operation of recreation features		It would be interesting to see a map showing areas with high quality habitat for special status fish and sportfish.				
I like the idea of the camping sites in 2A-C. I would be nice to have one close enough to shore launch for non-motorized boating to promote eco-tourism, possibly on LFT?	I think 2A could benefit from deepened dredged area between islands B, C, D, and E. This could help with boat navigation (no weeds) and pelagic fishhabitat. All are an improvement	Same as navigation comment above	All are an improvement over NAA.			

Steering Committee
What works or doesn't? Please identify which concept (NAA, 2A, 2B, 2C) you are discussing

Recreation	Navigation	Ecology	WQ and Supply Reliability	Flood Protection	Local Economy and Community	Project Cost
	over NAA.					
2A and 2B provide a variety of beach options	2B creates long stretch of uninterrupted Old River, entry to Franks Tract at 3 fairly narrow points.	2A seems to offer a wide variety of combinations of marsh, upland, and channel environments.	2A offers function similar to salinity gates			
I like that 2A-C have more beaches close to shore, which should improve recreational opportunities.	NAA is the worst from the standpoint of weed issues.	I like the way that 2ABC may make it easier for young Salmon to find their way downstream. Habitat on the N. edge could help guide them westward. I also like the interceptor habitat at the mouth of False River, which should help Smelt avoid entering the main body of the island. Also, these alternaties should reduce invasive weed problems.	NAA wouldn't provide any water quality benefits or drought resiliencey.		2C preserves boating options similar to existing, and would benefit Bethel Island.	
Safety between boaters and swim/paddle	need route for large boats and barges	separate smolts from bass	modifed 2B w/ narrower gap (smaller EDB - emergency drought barrier - still better than West False River EDB)	consider wind and wave run up protection	Bring in day visitors	

Advisory Committee
What works or doesn't? Please identify which concept (NAA, 2A, 2B, 2C) you are discussing

Recreation	Navigation	Ecology	WQ and Supply Reliability	Flood Protection	Local Economy and Community	Project Cost
	Concept 2A works best					
2A gives better recreation oppurtunities and protection	2A clear way through most direct	2A great fish nursery	2A problably the best salinty protection	2A the best levee restoration at LFT	2A levees access to business	?
			2A probably easier to maintain water quality	NAA no restrictions, least likely to overtop local islands		
#2 [2B?] best for navigation	#1 [2A?] works best				#2 [2B?] & #3 [2C?] best for locals	#4 less costly
					2A tolerable for LFT B & C not good for little Franks	
Kayak during tide (high/low) is dangerous. tide too strong. 2B provides two recreational areas. Public parking is needed but not at the North end of Bethel Island Rd.	ok	ok	ok	ok	beaches good for the economy and local businesses	?
				The enhancement of all remnant levees = smiley face	land-based public access + free fishing/launching = unhappy face. go to holland tract	
LFT design best in 2A, then 2B-2C last. 2B adds losts of protected fishing habitat. Water skiers would like 2A and 2C best	2A creates slightly longer routes					
2B is great for rec. and safety. 2C has none and is dangerous. 2A has some rec. but is still dangerous.	2B makes holland corner safe. 2A helps. 2C makes safety worse	2A lots of area for habitat. 2B lots of area for habitat for land and water based.			No shore fishing/public launch. this will not be accepted with locals	

Steering Committee
Input on evaluation criteria and methods

Recreation	Navigation	Ecology	WQ and Supply Reliability	Flood Protection	Local Economy and Community	Project Cost
Good	Good	Did not include migratory waterfowl	Water quality for who? - In delta? South of Delta?	Not sure which area are being protected	include existing zoning that can support the types of recreation desired.	Baseline findings for: law enforcement, recreation, aquatic weed management, ongoing costs?
"Sportfish habitat" seems redundant here and in the Ecology section. Waterfowl hunting: It sounded like folks were concerned about potential conflict between hunting and other recreational uses, is there a way to quantify the potential conflict under the different design scenarios? Is there any opportunity for shoreline access and facilities outside of Bethel Island?	I heard someone say that velocity might not be the best metric. Everyone has to go through FT at high speeds now to stay on plain and avoid navigation hazards. One of the benefits to deepening navigation pathways is that boaters will be able to slow down when navigating through FT.	In addition to marsh area, consider including the amount of marsh edge habitat				

Steering Committee
Input on evaluation criteria and methods

Recreation	**Navigation**	**Ecology**	**WQ and Supply Reliability**	**Flood Protection**	**Local Economy and Community**	**Project Cost**
Priority over existing uses though adding visitors a plus	yes consider boats, paddle, emergency response, construction	put salmonids and delta smelt first	very important & should consider benefit w/ less future EDB costs	Improve wind wave protection (no impact on protection)	consider any lost revenue from loss of bass fishing but don't prioritize bass	must consider water suppl and recreation to raise B/C
		Gelatinouos algae, microcystis. Duck ponds could have fish food benefit too (in marshes)			Aesthetics = sight, smell, trash? @ public access points	
I don’t see anything that mentions camping facilities. Perhaps it is implied in one or more of the criteria? Camping could also benefit eco-tourism with terrestrial birding paths.	Seems appropriate	Seems appropriate	Perhaps a particle tracking model criteria would be appropriate?			
These criteria seem pretty reasonable to me.	These criteria seem pretty reasonable to me.	For Chinook Salmon, consider including potential for alternative to help “guide” fish away from harm’s way. Specifically, having more habitat along the northern edge of the project could help fish moving down the	This look right, assuming there is some sort of water quality measurement (e.g. chloride) that would be the focus of the analysis.	It might be helpful to be clearer on where the flood protection benefit is intended. In the immediate region of the Central Delta? In a broader footprint?	These make sense to me.	Perhaps consider weed treatment costs in the evaluation? The current annual budget for weed treatment is very high!

FRANKS TRACT FUTURES ADVISORY COMMITTEE MEETING #4

Meeting time: March 4th, 2020 10:00 am - 2:00 pm
Meeting Location: San Joaquin Yacht Club, 550 Riverview Pl, Bethel Island, CA 94511

Meeting Summary

The purpose of the fourth Advisory Committee (AC) meeting was to:

- Review and receive input on the revised, 3rd round of design concepts
- Review the performance of the three concepts in meeting the project objectives
- Conduct a design charrette to receive input on the next round of design concepts

All the above topics were covered with attendees. The meeting was attended by approximately 30-35 people, consisting of members of the AC, the Steering Committee (SC), a few members of the public, and core project team members.

For the first half of the meeting, the project team provided an overview of the feedback received from the last meeting and a presentation of how that feedback informed the revisions and updates to the three design concepts. This overview was followed by more detailed presentations of how the designs and the no action alternative meet or don't meet specific project objectives, including recreation, navigation, fisheries and ecology, economy and place, and water quality. These presentations were followed by a design charrette in which all attendees were divided into three breakout groups. Each group discussed and evaluated the Round 3 design concepts, providing constructive comments for further advancement of the design. After the charrette, each group reported back on their findings, summarizing their preferences and concerns for all the concepts, and stating their group's overall preferred design.

Concept 3B (*Central Landmass*) was the preferred concept across all three groups. Additionally, all participants filled out detailed written concept evaluation surveys (both of design and the evaluative criteria) recorded to inform further design revision and the upcoming public meeting. Note that the project documents continue to be working documents and will evolve as the project moves forward.

Key takeaways

- Concept 3B, the Central landmass, emerged as the most widely preferred of the design concepts among meeting participants by a clear margin.
- The 60-80 meter bottom channel width for new fast water channels within Franks Tract (a parameter defined by water quality modeling results) was generally found to be acceptable among the attendees.
- If a public access point for nonmotorized boating is located on the Northern Tip of Holland tract, it should be located on a sheltered Roosevelt Slough location and not directly on Old River, due to safety concerns (strong currents and potential conflicts with motorized boaters).
- The team will post the overall planning process and approximate meeting sequence to the project website, along with meeting materials, notes, and presentations.

Meeting Notes

Introduction and Presentation of Round 3 Concepts - Brett Milligan, UCD

- Overview/introduction; what we want to achieve for the meeting
- Summary of feedback from the last meeting and working progress since then
- Revisions by concept and rationale for revisions
- Explanation of the trade-off of marshland, open hunting blinds, and dredge area locations
- Audience Q&A and comments:
    - Q: Is there a trade-off between deepening waterless maintenance and the weeds/ maintenance needs of shallow water? A: Yes, that is the case. Deepened areas require less weed maintenance.
    - Q: Is the negative 25' (deepened dredge area) number set based on aquatic vegetation requirements rather than boating needs? A: Correct. Mostly for aquatic vegetation requirements but also contributes to a balanced dredge to fill ratio. The areas could be dredged deeper is needed to create fill.
    - Q: Does deep water result in greater salinity intrusion? A: Deepened water in the through channels could have that effect. Deepened water in the large water pools is not likely to have an effect.
    - Q: Will the bottom of dredged area stay -25'? A: Studies from elsewhere in the Delta indicate there will likely be very little sedimentation. The fine sediment tends to wash through the Delta to the Bay.
    - Q: The proposed State Parks public access along Holland Cut in the southeast part is dangerous. Suggest moving it to avoid conflict between motorized and non-motorized boaters. Maybe an inland boating pond. A: Let's discuss more in the break-out session.
    - Q: This is my first time attending these meetings. What is your overall goal for this project? A: We have three goals: ecological, water quality, and recreational opportunities. We are trying to design a desirable project that meets all three goals.

Concept 1 - No action

No project intervention. Franks Tract continues to evolve along existing trajectories of change, including the increasing presence of aquatic weeds, herbicide management and the installation of temporary salinity barriers during droughts. Current navigability and open water areas are largely maintained, with periodic use of emergency barriers.

Concept 3A - Open water berm and channel

Locates tidal wetlands in the Northern half of the tract, and uses a berm with an open channel to improve water quality. Introduces a variety of new recreational amenities, including a mooring field for larger boats accessible from the False River channel.

Concept 3B - Central landmass

Creates two, large open water areas in Franks Tract, connected by tidal wetlands and navigable channels. The Eastern water body features sheltered coves and recreational features, with the marsh land masses helping to reduce prevailing winds. Open, navigable water is maintained and deepened adjacent to Bethel Island.

Concept 3C - Eastern landmass

Tidal wetlands and navigable channels are located on the eastern edge of Franks Tract, creating the largest deepened area of open, navigable water adjacent to Bethel Island. Recreational Destinations are sited across this water body, with beaches, sheltered coves, shaded upland areas and camping opportunities, with public access at the northern tip of Holland Tract.

Project Performance

Introduction and Summary Table - Michelle Orr, ESA

- To review, we have identified in a total of 17 project objectives that reflect stakeholder and public interest in the areas of Recreation, Navigation, Ecology, Water Quality and Supply Reliability, Flood Protection, Local Economy and Community, and Constructability and Costs.
- We've developed evaluation criteria / metrics that are as quantitative as possible and assess how well each alternative meets the objectives. Each alternative will be rated for each objective on a scale of 1-10, distilling key information. The ultimate goal is to help all of us, the project team, stakeholders, and the public understand the pros and cons of each alternative in different categories.
- At the last meeting, we presented the evaluation process and select metrics. We have now updated the metrics for Round 3 and completed most of the ratings.

State Parks Perspective - Steve Musillami, State Parks

- State Parks is excited to see the project happening. Parks have done analyses of different recreational opportunities in the Delta, and Franks Tract has the opportunity to complement what is missing. State Parks is particularly interested to see the activities such as fishing docks, non-motorized boating routes, more beaches while maintaining the opportunities for motorized boats, hunting opportunities, and other popular activities. We can use this as a chance to provide more variety of recreational experiences.

- Audience Q & A
  - Q: Does Parks have money to maintain these recreational sites? What about the homeless issue? A: No, currently we don't. However, if the project goes forward State Parks would secure money for operations and management. If those recreational features are proposed and built, we would need support money for the general operations. Secondly, for the homeless issue. We would only manage and operate functionally if we are equipped with enough staff. Parks make sure it's safe for everyone to use, but if certain activities are found to be damaging, we also have the authority to prevent that behavior. Securing funding is a legislative process that is required for all park units.
  - Q: I see the opportunity to connect Franks Tract with some existing park system, like the Big Break Regional Park, especially for educational purposes. A: There is a potential for that to happen.

Steve Musillami commenting on the round three design concepts

Recreation and Navigation Evaluation – Pete Dangermond and Karin Winters, The Dangermond Group

Recreation

There are several evaluation criteria for recreation:

1. Open water and its shape / configuration.
2. Focal point use areas with mooring area, beaches, day use, and possible camping sites
3. Slow water for non-motorized boating
4. Shoreline waterfront access or park space with associated facilities.

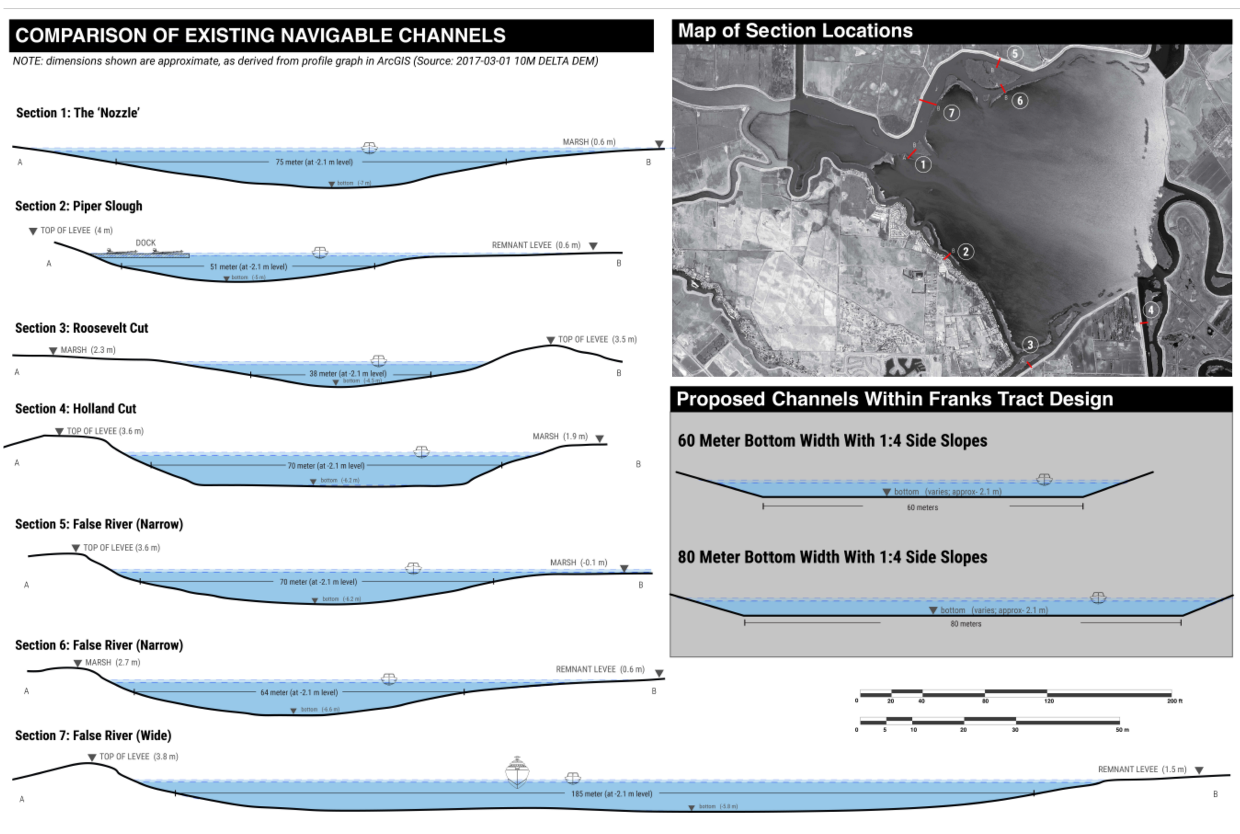
- Many features should be considered independently of the concept in which they are shown because they can be mixed-and-matched.

Navigation

- For navigation, both boating distance and boating safety are evaluated.
- When comparing boating distance to the No-action alternative, Concept 3A, 3B, and 3C are 18%, 8%, and 6% longer on average, respectively. We would love to know if that's within the acceptable range for people who boat?
- Boating safety evaluation criteria include the channel width, channel depth, and channel velocity; minimizing hazardous navigation conflict areas, and potential conflicts or nuisances.

- Audience Q&A for Recreation and Navigation
    - Q: If the channel depth remains unchanged, will it allow weeds to grow? A: The weeds are there now. But if the velocity gets higher, the weeds tend to be less.
    - Q: Why not dig channels deeper? A: The short answer is it will lessen the water quality benefits. We can work with hydraulic modeling together and figure out the best dimension and depth for water channels.

- Q: When considering non-motorized boats, maybe provide refuge or narrow water channels for the designated paddling area, so they do not conflict with fast big boats. A: Well received.
- Q: How would pond-based duck hunting work? A: It could work similarly to the permit system for floating blinds, where hunters put in for a permit and secure access to a pond for the season. Or it could be first-come-first-serve like Sherman Island. However, we have heard that the system has its problems.
- Comment that any ponds for hunting in the new tidal marshes wouldn't conflict with fisheries benefits.
- Marsh-based hunting opportunities are preferred to displacement of open water hunters without providing these marsh-based opportunities.
- Request to consider adding a smaller channel parallel to the fast channels, for non-motorized boaters to use. Discussed that adding a designated non-motorized boating channel would be desirable, but would need to look at potential for high velocities and effects on water quality. Could have channel with a short portage or other type of flow block.
- When locating non-motorized boat launches, consider the effects of wind. Paddling with the wind (east) is fast, paddling against (west) is hard going and tough at the end of the day. Open water can be a refuge against high tidal velocities, but need to consider sheltering from waves.



Comparisons of existing and proposed navigable channel widths

Ecology Evaluation - Kathleen Berridge, ESA

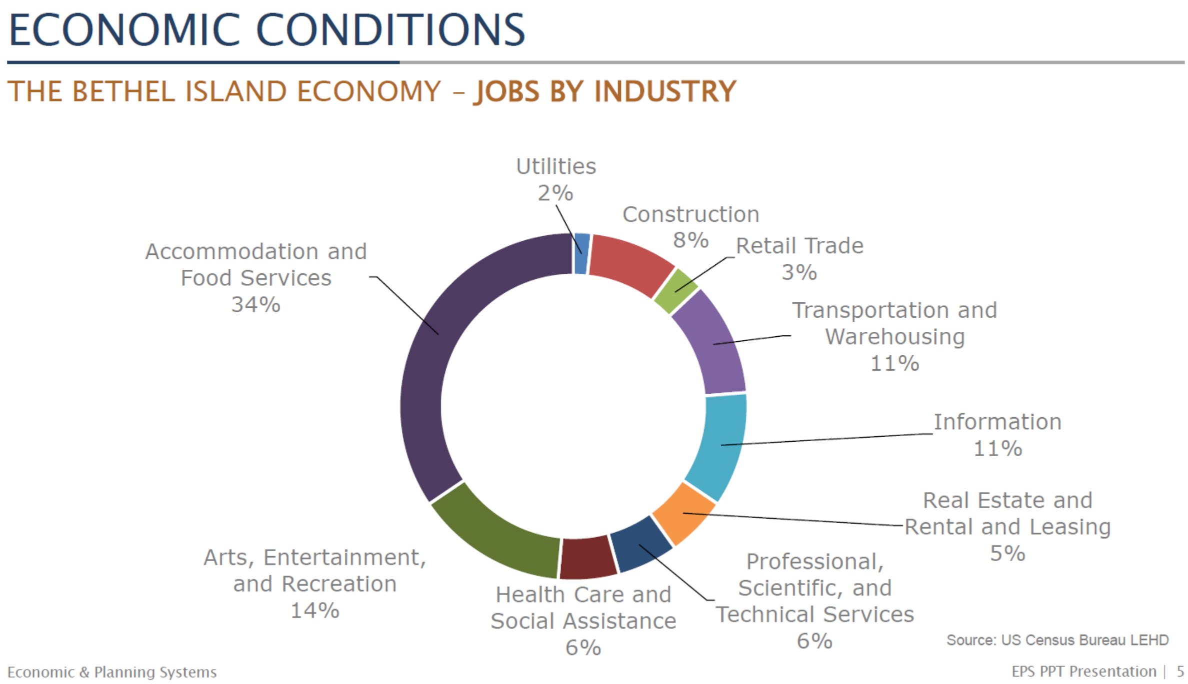
- Several special status species are used for the criteria for fish habitat, including Chinook salmon and Delta smelt.
- Entrainment in the South Delta is also being considered, methods and analysis are in progress.
- Sportfish habitat is also a key criteria, represented by Largemouth bass and Striped bass
- Other ecology evaluation criteria include conditions for native species and conditions for aquatic invasive species (AIS) spread

- Audience Q&A
  - Q: The ratings you showed are higher for the three proposed concepts than for the NAA in terms of sportfish habitat. Why is that, given that there's less open water? A: One criterion for sportfish is the number of nozzles, or seams, in different alternatives. There are more nozzles formed in the proposed concepts. Another impacting factor is the habitat edge, the alternatives would create much more edge habitat along the marsh masses.
  - Q: Is Franks Tract currently or will it be a future migration route for some fishes? A: We foresee that the False River corridor will be used by both juvenile and adult salmon. We will explore this further.

Local Economy and Community Evaluation – Benjamin Sigman, Economic & Planning Systems (EPS)

- We are just starting the local economy and community impacts evaluation, and this meeting comes at a great time.
- We did some background analysis, and found out 50% of jobs on Bethel Island are recreation-related.
- US Census Bureau data indicate a slight gradual decline of the economy on Bethel Island. This is a different trend from the Bay, which has been increasing. There are several aspects we are looking at through our research: historical and current business conditions, possible one-time and ongoing project impacts, real estate value effects, business opportunities, project recommendations, and other considerations.
- Our assessment will be qualitative, based on interviews. We have done some interviews and will continue to do so in the next few months.
- If you are interested in talking with us please reach out: bsigman@epsys.com

- Audience Q&A
  - Q: Are people aware of the economic decline? A: We will be talking to people, so will hear more about how this is perceived. We did find some clues in the physical environment, closed marinas, so I think people are observing it.



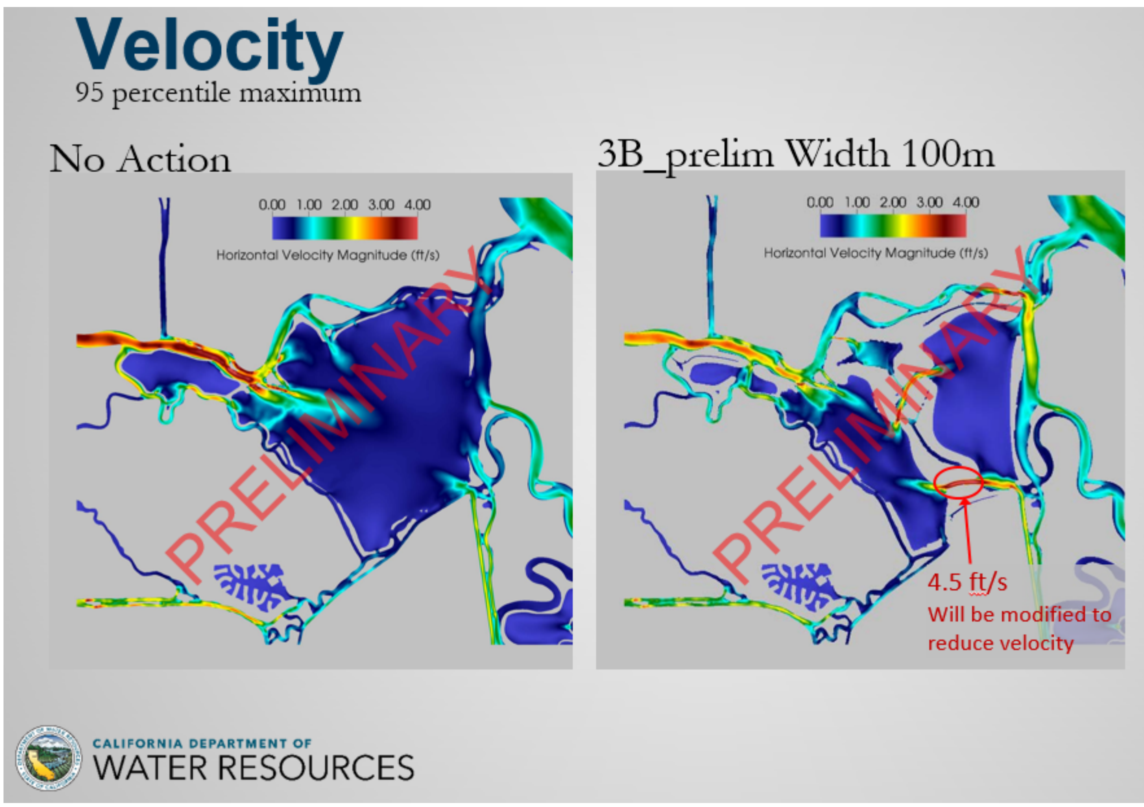
Water Quality and Hydraulic Modeling – Eli Ateljevich, California Department of Water Resources

- Three criteria for water quality and supply reliability:
    1. Water quality related to human uses,
    2. Emergency drought protection,
    3. Supply reliability
- For the water quality related to human uses, summary ratings include:
    - Salinity for 2009 Historical Hydrology (dry) and drought conditions at the following locations. 2009 has been modeled, drought conditions has not yet been modeled.
        - Old River at Bacon Island
        - Emmaton
        - Holland Cut
        - Jersey Point
        - San Andreas Landing
        - Threemile Slough
- All three proposed alternatives meet the salinity objective. Concept B performs the best among the three. A is the next best, and then C. Concept A is relatively insensitive to channel width. Given the time needed for model set up and analysis, modeling was done on preliminary (not exact, but representative) geometry for the Round 3 alternatives.

- Audience Q&A
    - Q: are there any changes in velocities at Franks Tract? A: False River velocities west of the nozzle are high (3-4 ft/s) in the No Action alternative; they decrease slightly in the three concepts. Velocities at Fishermans Cut increase slightly compared to No Action (increase from ~0 to ~0-1 ft/s), though remain many times lower than velocities experienced with the emergency draught barrier. Concept A has higher velocities in Piper Slough. Concepts 3B and 3C have highest velocities in the southeast connecting channels. The southeast connecting channels will be modified / enlarged as needed to

reduce velocities in any concepts carried forward. Velocities would probably not affect navigation. Unless otherwise noted, velocities are the 95-percentile maximum. Peak instantaneous velocities (during the king tide) are slightly higher for all concepts including No Action. These instantaneous velocities would be short-lived but could affect navigation during those times. Will need to look at velocities more.

  - Q: Do the deep borrow area affect velocities? A: not really.
  - Q: do these alternatives achieve DWR water quality objectives? A: Need to stress test the concepts with drought conditions, but generally yes.
  - Q: Can we deepen the channels? A: probably room to have deeper channels and still meet the water quality objectives. We can use modeling to test this in the future.
  - Q: could you narrow the channel at False River to allow for wider channels through Franks Tract? A: It's possible. This is something we could use the modeling to explore.
  - Note that the Round 3 concepts improve water quality during drought conditions, which could make the need for deployment of an emergency drought barrier less likely. DWR to test performance of the concepts once salinity bumps up to levels equivalent to those specified in the Temporary Urgent Change Petition of 2015 to assure human use levels are met.



Implementation and O&M Costs – Michelle Orr, ESA

- Moffatt and Nichol has prepared a preliminary cost estimate for project construction.
- Costs are largely driven by the volume of material dredged and used as marsh fill. Concepts with the largest fill areas are costliest. Of the three project concepts, 3A has the least fill, followed by 3B, then 3C. No Action has no construction cost.
- All concepts except No Action are more expensive than those proposed in the prior (2017) planning study for Franks Tract. Future concept refinements are likely to focus on fill reduction to lower costs.

- Lunch Break -

Attendees used this time to look through the ratings for evaluation criteria, ask additional questions, and spend time examining the three proposed concepts.

Charrette with Breakout Groups

- Each participant was provided a response sheet and requested to fill in and return at the end of the meeting. The results will be presented at the next AC meeting.
- Small-Group work (3 groups, randomly divided) (1 hour)
- Each group reported back, 10 minutes each.

- **Group 1 feedback:**
  - Concept 3B is the most preferred alternative in this group
  - Wondering if the dredge area on the east side can be flipped to the north
  - For the long berm on 3A and 3B, suggest having small openings to create better fish habitat, especially for bass (might affect water quality)
  - Landmass E on the southeast corner can be dangerous for boats traveling from Holland Cut
  - The minimum channel width should be slightly wider than that of Holland Cut, if there is only one through channel (such as Concept 3A)
  - Need to be sure the configuration of Little Franks Tract does not create problems with the Bradford Island ferry landing, in terms of water velocities (needs to be more fully explained in the modeling results; participants were confused about whether or not the project designs would affect water velocities in this area).
  - The east berm on 3A and 3B could be beneficial for the eroded marsh near the mouth of old river, and would provide shelter to the North-South fast water channel on Old River.

- **Group 2 feedback:**
  - Concept 3B is the most preferred alternative in this group
  - For 3A, the marshland in front of Bethel Island is still a visual obstacle for many residents
  - Recommend extending beaches on all concepts and adding shaded, upland trees to segments of the edges. We can never get too many beaches!
  - Both long beaches and segmented beaches are desired
  - Recommend moving the opening on the east side slightly up, to avoid direct water flow to the Old River
  - Suggest adding a shelter for the boats traveling around landmass E
  - Concept 3B is good in all ways. Two small suggestions:
    - extend the beaches.
    - Potentially flip dredge areas on the east side, allowing open hunting blinds stay in the south part
  - For Concept 3C, suggest relocating the non-motorized boat access to the other side of Landmass D.

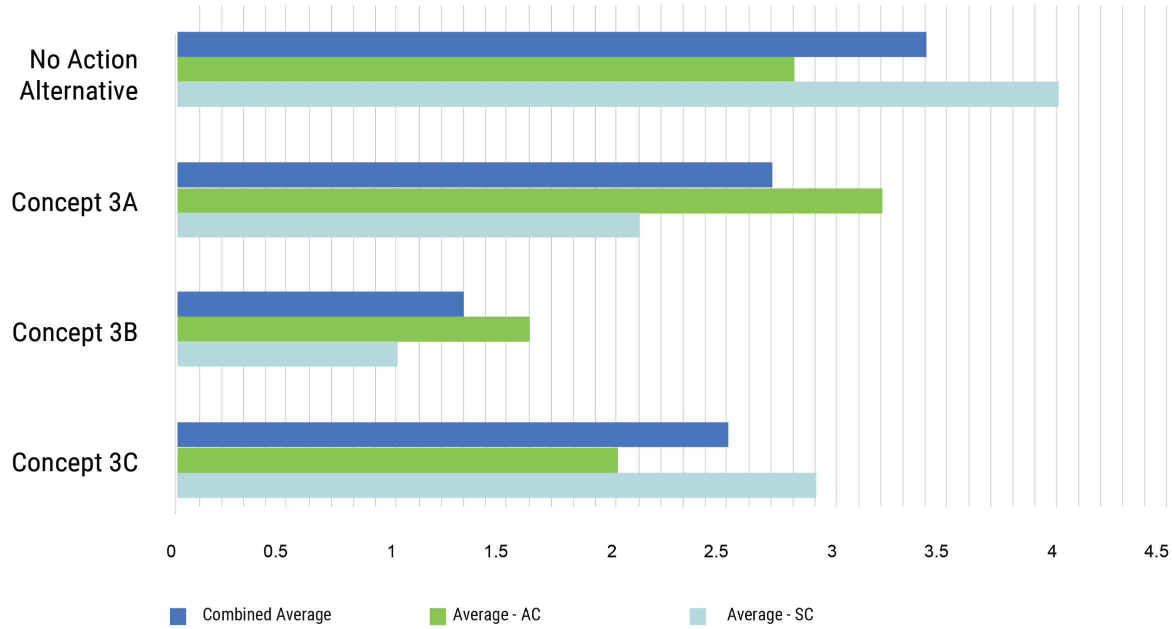
- **Group 3 feedback:**
  - Concept 3B is preferred in this group as well
  - Many comments are similar to the previous two groups
  - For non-motorized boating, nice for kayaks to be able to hug the edge of remnant land between LFT and the nozzle.

- Discussion of the Jersey Island Ferry. What does this look like with respect to the FTF project? Suggestion that the ferry could readily re-occupy the old ferry landing on LFT. Suggestions that local residents could welcome a new source of revenue to help share costs of ferry operation. Ironhouse Sanitary District owns most of Jersey Island and is looking for new land uses, generally support more public use.
- Prefer the channel width to be 100 meters for Concept 3A, since there is only one channel (in comparison to the other two alternatives that have two). Eli responded that Alt A channel could be made wider.
- Concern expressed about an 80 m (at top) channel being wide enough for fast-water traffic.
- Weed control. Hunting requires channels with no weeds. Would need DPW weed control.
- Suggestion to dredge shallow parts of the site in the locations of fast-water channels. More generally, desirable to dredge throughout the tract (1-2 feet deeper) to remove some aquatic vegetation and generate more dredge materials.

- **Closing comments:**
    - Suggestions were offered by Advisory and Steering Committee members as to how to best proceed and approach the next public meeting, including
        - Posting announcements and information in local papers and local social media outlets
        - Explain that this is an exploratory process to look at the potential for multi-beneficial outcomes

03-04 Meeting AC/SC Meeting Design Concepts Ranking Result

(1 being the most preferred, and 4 being least preferred)



Advisory Committee

What works or doesn't? Please identify which concept (NAA, 3A, 3B, 3C) you are discussing

Recreation	Navigation	Ecology	WQ and Supply Reliability	Flood Protection	Local Economy and Community	Project Cost
					3A: blocks a lot of homes water views; 3B: Will bring more creation by far 3C: not much change at all	
			3B works well for addressing these issues by stablishing a green barrier	3A-C all appear to address flood protection		
All work well	NA boating safety		B works well	NA and 4C works well		
Like public launch on Jersery Island	Narrow opening cause boating traffic (3A)		Don't forget aleabloom		C = eliminate public access	
B, C, A	B, C, A	B, C, A	B, C, A	Would requre enhancing the Franks Tract remnant levee to protect BI levee	Boating access to swift waters and beachers = good	
				All alternatives need to be comparable to the no action plan for velocities (or less than the NAA)		Need to look at surrounding islands for impacts/costs (ie: need for additonal rip rap, scour, ferry)

Advisory Committee
What works or doesn't? Please identify which concept (NAA, 3A, 3B, 3C) you are discussing

Recreation	Navigation	Ecology	WQ and Supply Reliability	Flood Protection	Local Economy and Community	Project Cost
	Plan B and C work best with winds					
3A, B and C work in that they all have the potential to add more sport fish habitat. What may happen however, is the reduction in weeds may negatively impact the Largemouth fishery. Addition of non-powered watercraft opportunities is good, but safety is still a concern with higher water velocities.	I'm fine with all concepts in terms of navigation for my type and size boat for the most part. But with the channels created in 3A, B and C, that will allow more large boat access, I'm worried about safety for small boat owners.	In terms of sport fish I don't; expect a noticeable difference regardless of which of the 4 options happens. And I'm not convinces that 3A, B or C will do anything significant for listed native species in the long run. Franks is just a minor piece of the pie within the myriad of the Delta's problems.	All concepts have the potential to change water quality. If the smaller pools are made deep enough, due to either dredging or higher water velocities, they have the potential to stratify. Stratification has its own set of potential issues like the release of nutrients currently bound to sediments which could in turn increase algal blooms (and associated toxin and odor issues).	No comment (not my area of expertise).	NAA, or status quo, is the least likely to boost the local economy or community. Increased recreational opportunities from 3A, B and C do. I think 3C has the most potential due to increase in shoreline fishing.	3A, B and C are all expensive so have to be really sure that goals will be met.
			I was disappointed that my request for varing sea-level rise models were not presented, as I requrested as meeting 3 for salinity and velocity			
Do not impede boat way	same	?	we are fine; what does metropolitan want	NA	Anything add more actions would be good	?

Steering Committee

What works or doesn't? Please identify which concept (NAA, 3A, 3B, 3C) you are discussing

Recreation	Navigation	Ecology	WQ and Supply Reliability	Flood Protection	Local Economy and Community	Project Cost
A, B, C all greatly improve recreation	ABC all have minimal navigation impacts, keep high speed boating away from paddlers;	All have major benefits; Concern with northern salmon corridor: is it a migratory pathway? What is it connected to?	All are major improvements, Could preclude SJR need for future EDB and in the most extreme droughts channel closure could provide additonal benefits	seems to benefit, especially B, as it reduces wind waves	A, B,C; $ goes up	need more info
maximize beaches, possibly separated, with of large/small beaches (b)	keeps easy access to fast/open water, gives 2 sides of big open water (B)	4 big distinct land forms offer habitat/objective flexibitily (B)	top choice is B	decrease fetch while keeping open water	3B keep local large water body minimizing perceived project impact from BI and shore. Bigger state park presence could add $ attraction/benefits	cut/borrow sites are closer to each other
A and B and LFT (all) look great for paddling	B and C better connect Piper homes	A is good in terms of restoration size, less attractor in FT	This is main perspective I used above			
Hunting blinds best in 3A and 3B, boating access seems best in 3B, when considering both motorized and non		3A has the most small channels to get salmon lost in (BAD :()	3A and 3B seem best		3C seems like least benefit	all pretty close - so may as well get it right. Costs less than the EDB over and over. Keep it under $450 million
		consistent use of habitat				

Steering Committee

What works or doesn't? Please identify which concept (NAA, 3A, 3B, 3C) you are discussing

Recreation	Navigation	Ecology	WQ and Supply Reliability	Flood Protection	Local Economy and Community	Project Cost
		-I like 3B because it provides: 1) a reasonable Salmon migration corridor (along the northern edge); 2) habitat in the west that will help limit Smelt movement into the Central Delta, while still enhancing habitat area; 2) spreads habitat over a broader geographic area; and 3) a moderate construction cost.				3C is less attractive because of highest construction cost.
3B: good operations like to "D" island; Locations of beaches and morrings ; better NM boating access	assure varieties of vessels	maximize diversity			emphasis public/private partnerships	maybe also look at Jersey Island, also for DPR operation site. Temp and perm opertation cost critical

Other

What works or doesn't? Please identify which concept (NAA, 3A, 3B, 3C) you are discussing

Recreation	Navigation	Ecology	WQ and Supply Reliability	Flood Protection	Local Economy and Community	Project Cost
I want refuge from wind and current while kayaking in any concept, kayak launch in slow water at tip of Holland Tract 3C			HABs are seem to be increasing, may not be able to predict future blooms based on past blooms			
Multi destination, multi amenities (3B)	refuge for nonmotorized water sports (3B)		All have high flushing velocity; Could accomodates lightly wider channel widths			
3B potential to separate dif users; 3C seems it would be a less usable water body	3A seems like the one "straw" would get connected		Defer to modeling		Max recreation = max econ benefits	
Recreation has more possibilites with all alternatives except for NAA	Navigation is an initial concern for all options, but is not overcomeable.	No action is not a viable option in my opinion. 3A and 3B seem to benefit ecology more, but my opinion is main based on feeback received during meeting today	Same responses as in ecology section	Same as ecology section	Same comments as in ecology section. Having economist present/participation is very interesting	Cost/costructability are what I assume to be the biggest challenge- I don't know how to respond
		What about invasive plants creeping in? Whats the ecological impact on native flora and fauna?	With added activity/recreation, what will it do to water quality? Negatively affect?			

Advisory Committee
Input on Evaluation Criteria and Methods

Recreation	Navigation	Ecology	WQ and Supply Reliability	Flood Protection	Local Economy and Community	Project Cost
	Most important route for navigation and recreation is to Holland Cut: 80%					
			This is an important issue for the region as well as the State	This is important to address climate change and sea level rise		
	Any concept that will consider the state taking over the ferry operation would work, since our cost for O+M on the ferry would be reduced					
Yes, this is my #1	#2	#4				This is new and refreshing, #3
#1	#2	#3	#4	#2+	#1	
access biggest issue	wind and tide effects					

Advisory Committee
Input on Evaluation Criteria and Methods

Recreation	Navigation	Ecology	WQ and Supply Reliability	Flood Protection	Local Economy and Community	Project Cost
I feel all aspects of recreation are equally important. For Fishing, I think the habitat rating criteria outweighs the others listed and should be counted for more. And what is used to do the habitat ratings will be vital. Also, I'm not sure how Quality of Potential Fishing Areas is different from Sportfish Habitat Rating. Under both boating objectives I think safety factor should be added as an evaluation criterion. For the beaches objective I think the linear number of miles or feet of beach is	Looks like my comment above about boating safety may be covered under navigation hazards (as long as it addressed both motorized and non-motorized vessels. "More than existing" as in the table now is not a suitable measure. How much more? More due to number of boats? More due to increased proximity (narrower channels)? Or both? Also, what exactly are the increased hazards for smaller boats that may be fishing or moored due to wakes in an area now made more accessible to bigger boats.	For Special Status Species I don't see how any of this will fly without an objective that at least addresses predation (by sea lions, the tons of cormorants and white pelicans in the area, non-native fishes, etc.). We (anglers) do not want to be blindsided when the resource agencies bring this up during the permitting process. It will come up and you need to be transparent about it. For the Sportfish Objective, Largemouth Bass habitat cannot be evaluated by a simple edge length metric. All edges are not created equally. There should be a way to characterize edge habitat (poor, fair,			The local community, with improvements, has the potential to be negatively impacted by increased traffic, crowded conditions, and potentially increased crime. It's not my area of expertise, and I have no idea what metrics could be used to quantify this, but it would be nice if addressed as nuisances under each of the four scenarios.	
more important than the total number of beaches. Same for shoreline access – "New State Park Facility" doesn't really tell us anything. How many miles or feet of shoreline access will be provided.		good for example) and then determine the amount of each category of edge within each of the 4 options (based on things like velocity, bank slope, vegetation, other cover, etc.).				
		Chinook habitate, delta smelt habitat, dentrainment/?				
yes	?	yes	again, ask metropolitan	N/A	could help	have not heard any $

Steering Committee
Input on Evaluation Criteria and Methods

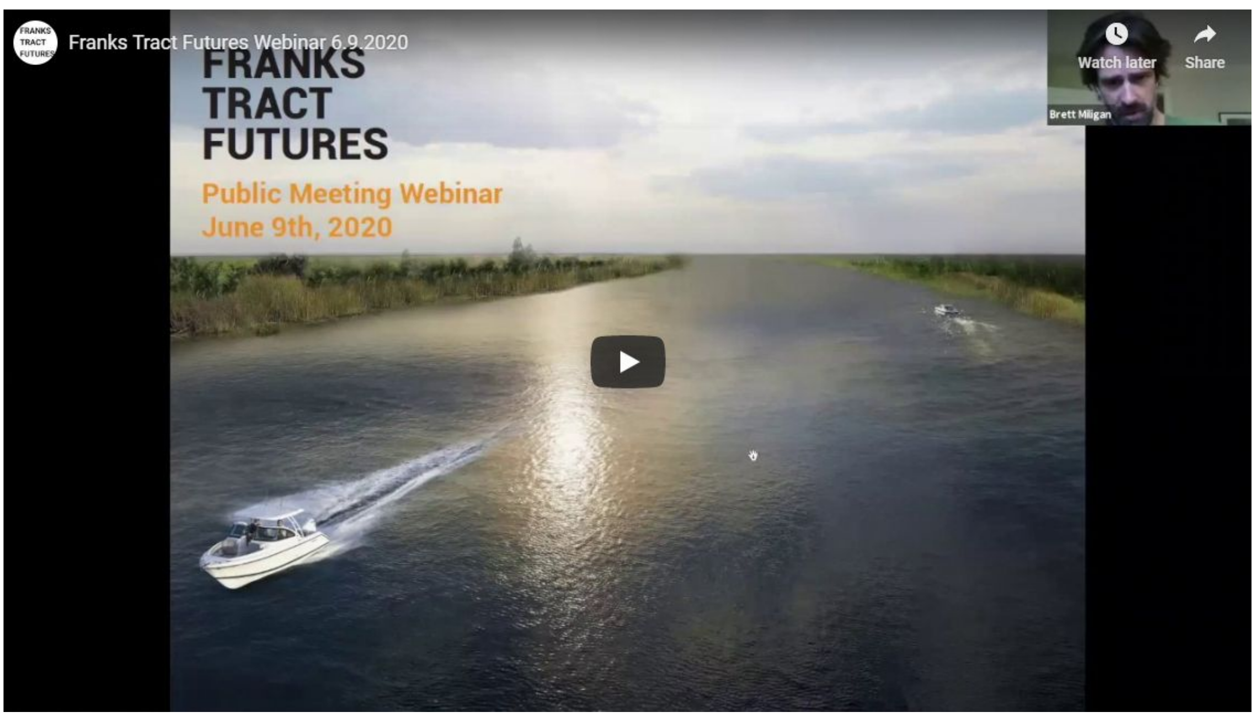
Recreation	Navigation	Ecology	WQ and Supply Reliability	Flood Protection	Local Economy and Community	Project Cost
	Consider emergency response marine patrol/coast guard		Evaluate long-term hydrologic record including 76 drought --> how many EDB installations are not needed?		Delta ag economy and economic beneftis less treatment + more state wide Delta ag production	
					consider traffic, possible travel behavior	
	Add weeds - bad for navigation	Add weeds - they are bad for smelts. * I will send a paper to Kathleen				
		fine but cautious about hydro modeling of salmon				
		I think that targeting Smelt and Salmon is a good metric for this purpose. The additional criteria on AIS, sportfish,and other native species also are high value metrics that address some of the major		This is an extremely important metric, but it isn't clear from the table below how and when this criteria will be quantified.	These criteria all seem very appropriate to address local effects.	
		issues in this region.				
highest priority should go to recreation, boating, fishing, day use and camping		Improve fish habitat				

Steering Committee
Input on Evaluation Criteria and Methods

Recreation	Navigation	Ecology	WQ and Supply Reliability	Flood Protection	Local Economy and Community	Project Cost
Kayak refuge. Easy kayaking paths suitable for education and recreational programs for youth and adults						
number of nozzles might inform fishing potential? Unclear if upland habitat is a big plus for hunting	Good point made about distance vs time, by boat type				Difficult to quantify	
Yes; access to beaches by car or by boat? If by boat- yes, if by car, where from? Jersey island concept?	Yes	Yes	Yes	Yes	Yes	Cost/constructability - I assume to be the most challenging - not sure how to respond, but yes.

FRANKS TRACT FUTURES PUBLIC ONLINE WEBINAR

Meeting time: June 9th, 2020 3:00 - 5:00 pm
Meeting Location: zoom

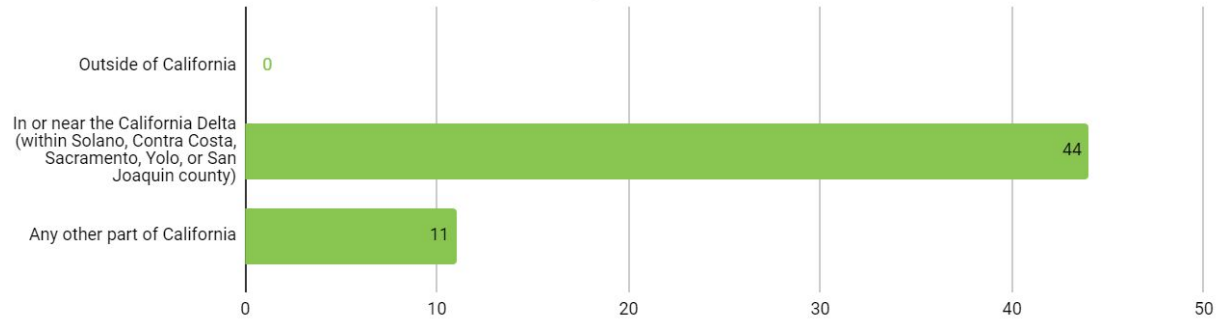


A video recording of the public webinar is available on the project website:
https://franks-tract-futures-ucdavis.hub.arcgis.com/

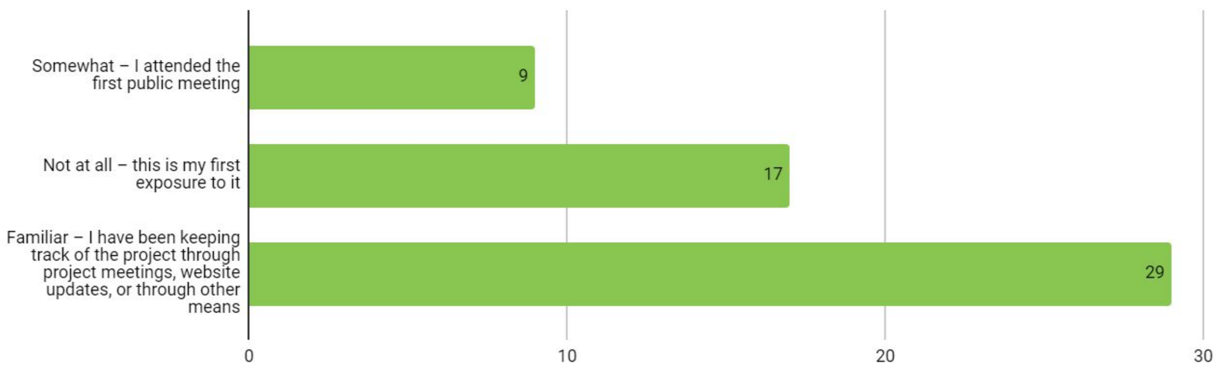
Webinar Poll Results

A live poll was conducted during the webinar. Here are the results of the poll.

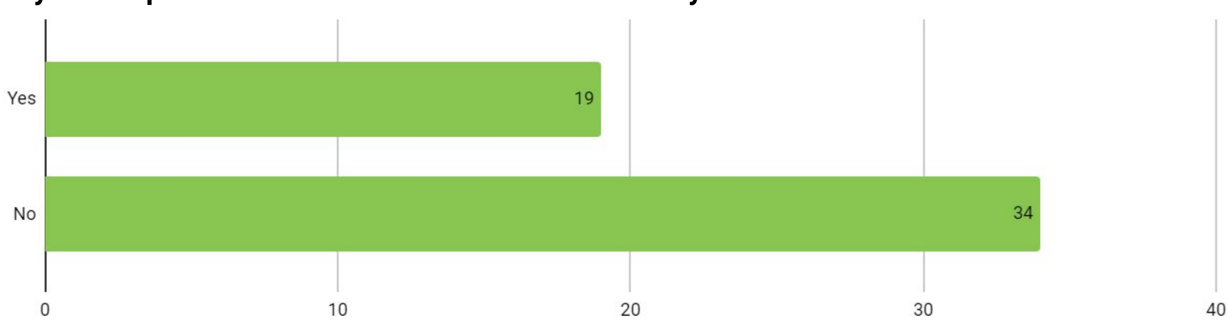
Where do you reside?



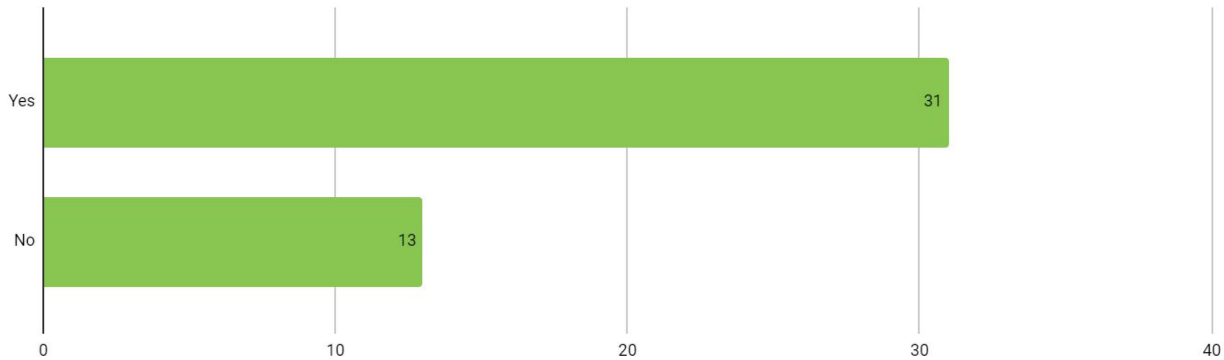
How familiar are you with the Franks Tract Futures Project?



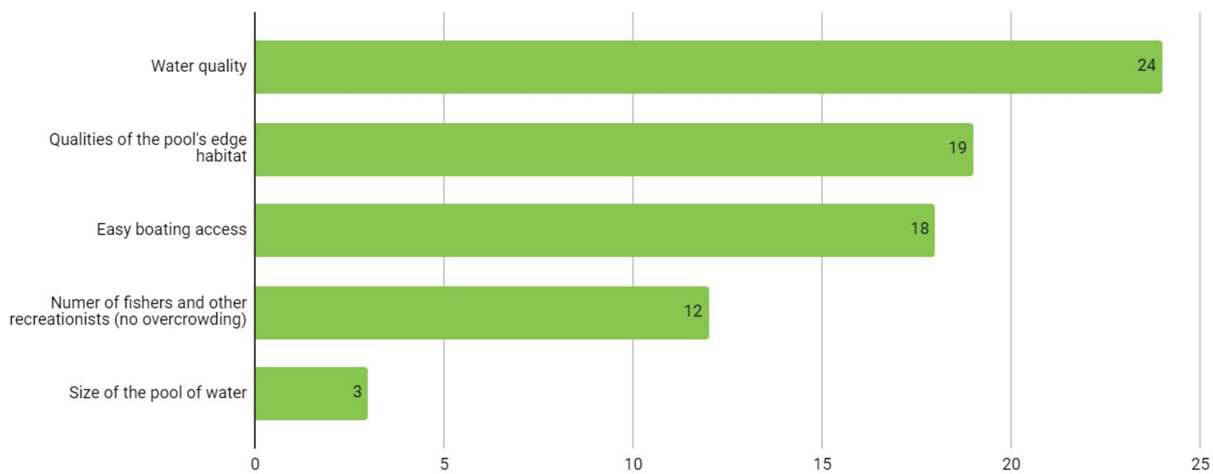
Did you complete the Franks Tract Futures user survey?



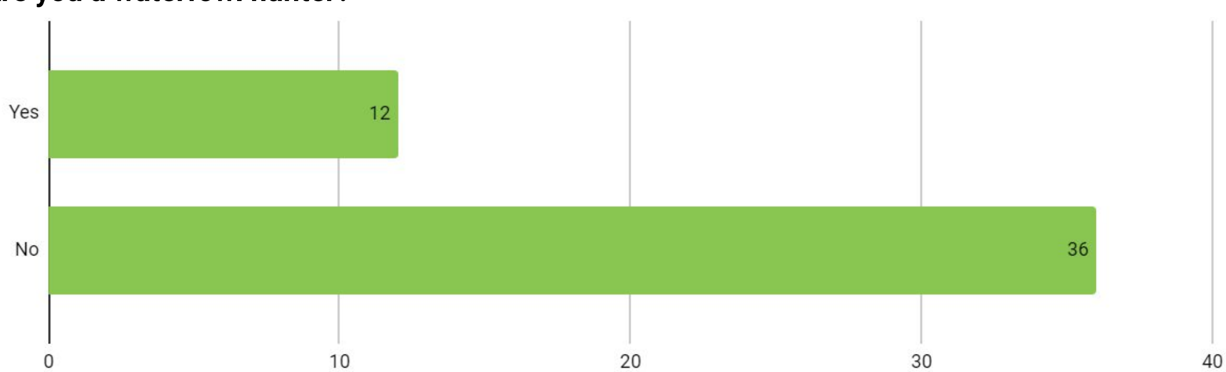
Are you a boater and/or a fisher?



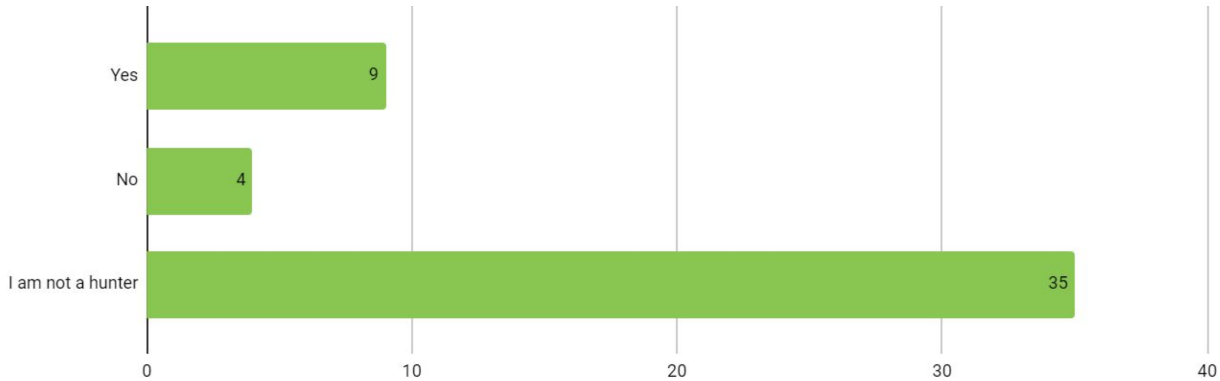
What would you say are the 2 most critical factors for creating high-quality open-water fishing areas?



Are you a waterfowl hunter?

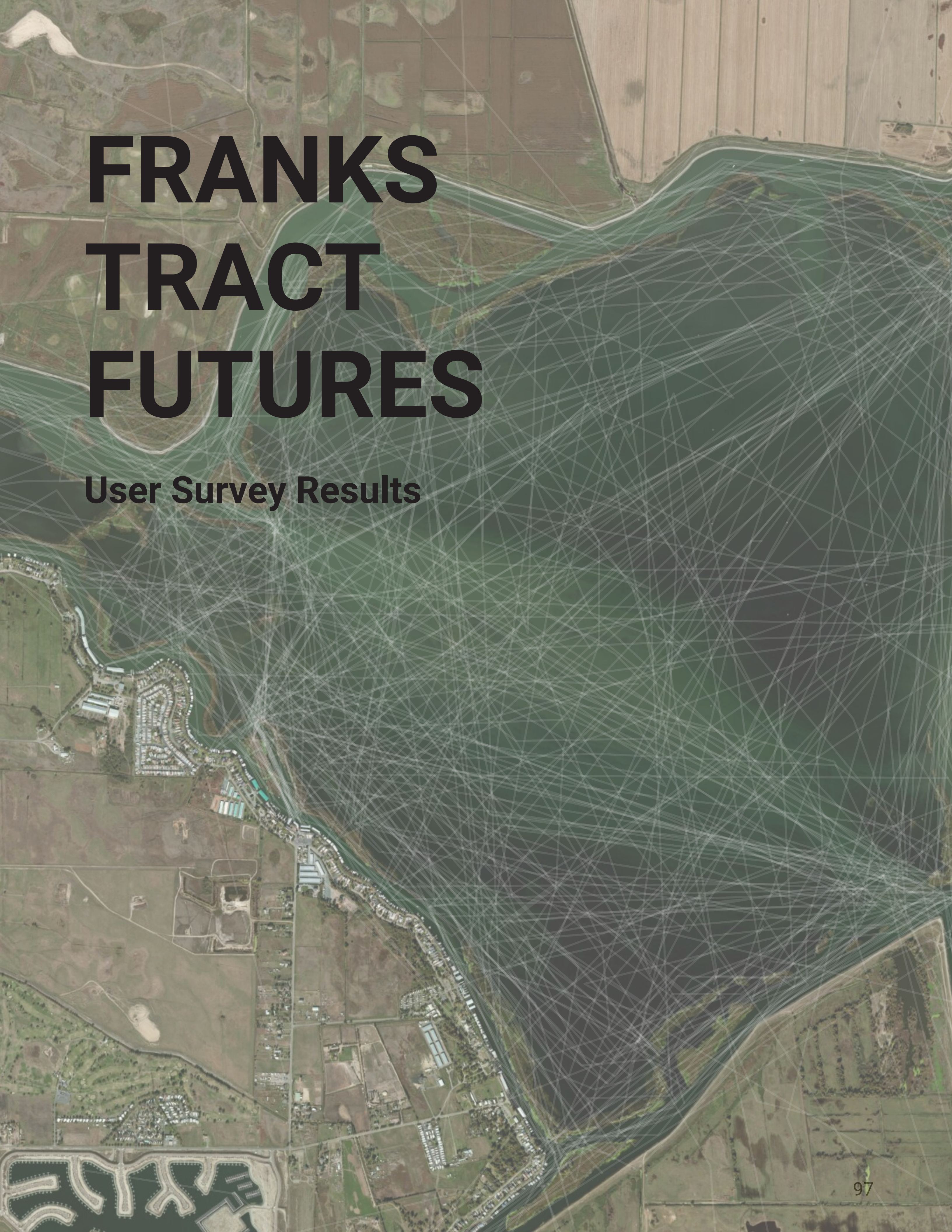


If you are a hunter, would diversifying hunting habitats within Franks Tract - including upland, tidal marsh, ponds, and different depths of open water - be desirable, if access and registration methods remain similar to the current situation?



USER SURVEY

This section contains a description, results and analysis of a map-based survey used to provide a means for geospatially explicit participation.



FRANKS TRACT FUTURES

User Survey Results

Compiled by

Alejo Kraus-Polk
Brett Milligan

January 23rd, 2020

Table Of Contents

Survey Description

Background

A map-based survey was used to provide a means for geospatially explicit participation. Maptionnaire was selected as an easy to use, mobile compatible survey platform. In addition to map-based questions, certain demographic and categorical questions were asked.

Survey results were made available for public viewing and exploration using the ESRI map-viewer on the project website: https://franks-tract-futures-ucdavis.hub.arcgis.com/pages/franks-tract-user-survey-results

Map-based survey research method

Demographic questions were informed by a previous survey conducted as part of the Franks Tract Feasibility study. This initial survey generated useful insights into the demographics and preferences a substantial group of people who live, work, and play in and around Franks and Little Franks Tracts.

Our map-based survey draws from established participatory GIS methods (PPGIS) that have been adapted to the Delta context and specific project questions related to boating, recreation, and restoration.

Survey questions and format

The no longer active survey can be found here: https://app.maptionnaire.com/en/6547/

The survey began with the following description:

> *This anonymous survey is intended to inform a participatory planning process for the proposed multi-benefit restoration project in Franks Tract. By Franks Tract we include little Franks Tract and all adjacent shorelines (such as Bethel Island).*

The first section of the survey asked the following demographic questions:

What is the zipcode of your primary area of residence?

What is your age?

What is your average yearly household income?

Which of the following categories do you identify with? (multiple answers can be given)[1]
- *Recreational angler*
- *Tournament angler*
- *Recreational boater*
- *Nearby resident*
- *Researcher*
- *Law enforcement*
- *Hunter*
- *Other*

Which of the following categories do you most identify with? (please select one)
- *Recreational angler*
- *Tournament angler*

1 This multi-choice question was added once the survey was already underway. The suggestion to add this modified question came from a stakeholder who was encouraging us to consider that many users engage in multiple activities on the Tract and are hesitant to categorize themselves as only one of the supplied categories. We had initially opted for a single answer question to remain consistent with our previous survey.

- *Recreational boater*
- *Business owner*
- *Nearby resident*
- *Researcher*
- *Law enforcement*
- *Hunter*
- *If you don't identify with any of these categories what would you identify as?*

For users who categorized themselves as hunters an additional yes/no question was asked:

Do you think hunting conditions in the tract could be improved?

For those who answered yes to this question and the additional long-response question was asked:

How can hunting conditions be improved?

The following question was asked regarding project familiarity:

How did you hear about the Franks Tract Project?

- *Public meeting notice*
- *Project website*
- *Word of mouth*
- *Social media*
- *News media*
- *State agency*
- *Please specify. If other, please describe.*

The first map-based question concerned recreation. This section of the survey allows participants to drop a pin on a map to indicate places where they recreate or spend time in Franks Tract. When participatns placed a pin the following pop-ip questions were asked:

What activities do you do at this location?

- *Fishing*
- *Boating*
- *Hunting*
- *Kayaking*
- *Canoeing*
- *Jetskiing*
- *Kiteboarding*
- *Picnicking*
- *Other (please specify)*

The second map-based question section concerned berthing and launching. This section of the survey is intended for people who boat on the Tract. These questions were optional. When participants dropped a pin on a berthing place the following long-form question was asked:

Could berthing areas in the tract be improved? If so, how?

When participants dropped a pin on a launching place the following long-form question was asked:

Could launching areas in the tract be improved? If so, how?

The third map-based question concerned boating routes. This question allowed participants to trace regular boating routes across and within the tract and surrounding waterways. When participants completed a boating route they were asked the following pop-up long form question:

Could boating in the tract be improved? If so, how?

The next section of the survey related to preferences for public access. The following yes/no question was asked:

Do you think more public access areas should be created around the tract for recreational use?

Participants who answered yes were asked to drop a pin on desired sites for public access.

When participants dropped a pin they were asked:

What would you like to see here?

After completing the map-based question they were asked:

In general what type of access points are needed?

The next section of the survey concerned areas of improvement. Participants were asked to draw areas of improvement prompted by the question:

Where are the areas in the Tract that most need improvement?

When participants completed their polygons of areas of improvement they were asked:

What improvements can be made here?

They were then asked:

What general improvements could be made?

The next section of the survey concerned areas of potential tidal marsh restoration Participants were asked to draw areas of potential tidal marsh prompted by the following:

As part of project planning the state is looking at the potential creation of tidal marshes for ecological and water quality benefits. If tidal marsh areas are created in the Tract, where would they be best located? Where would they have the least detrimental impacts and greatest amenity value (such as new hunting opportunities, wildlife viewing, non motorized boating, etc.) for how you and others use Franks Tract?

Upon completion of the tidal marsh polygon, participants were asked a slider question where they dragged a dot between 1 - very narrow (1-5 feet) and 10 - very wide (20-50 feet):

How wide would you like potential channels to be?

The final tidal marsh question asked:

How could tidal marsh be designed for recreational uses (I.e., hunting, fishing, kayaking, boating)?

The next section asked participants to rank the following general concerns from 1 (most concerning) to 5 (least concerning).

- *Levee vulnerability and flooding*
- *Water quality (temperature, pollution, salinity)*
- *Aquatic weeds and invasive species*
- *Fisheries decline*
- *Climate change*

Participants were also asked:

What are your other concerns related to Franks Tract?

The final multi-choice question concerned climate change perception:

What is you belief about climate change with respect to Franks Tract?
- *It's definitely occurring, we are presently seeing its impacts, and must address them now.*
- *It's occuring, but the impacts are minor, and we should wait to address them down the line.*
- *Climate change might be happening, but it's not human caused and any possible impacts are minor.*

Participants were thanked and the submission button sent them to the project website: https://franks-tract-futures-ucdavis.hub.arcgis.com

Dissemination

We used various means to disseminate the survey to the various identified user groups including direct emails, canvassing, social media, and the project website.

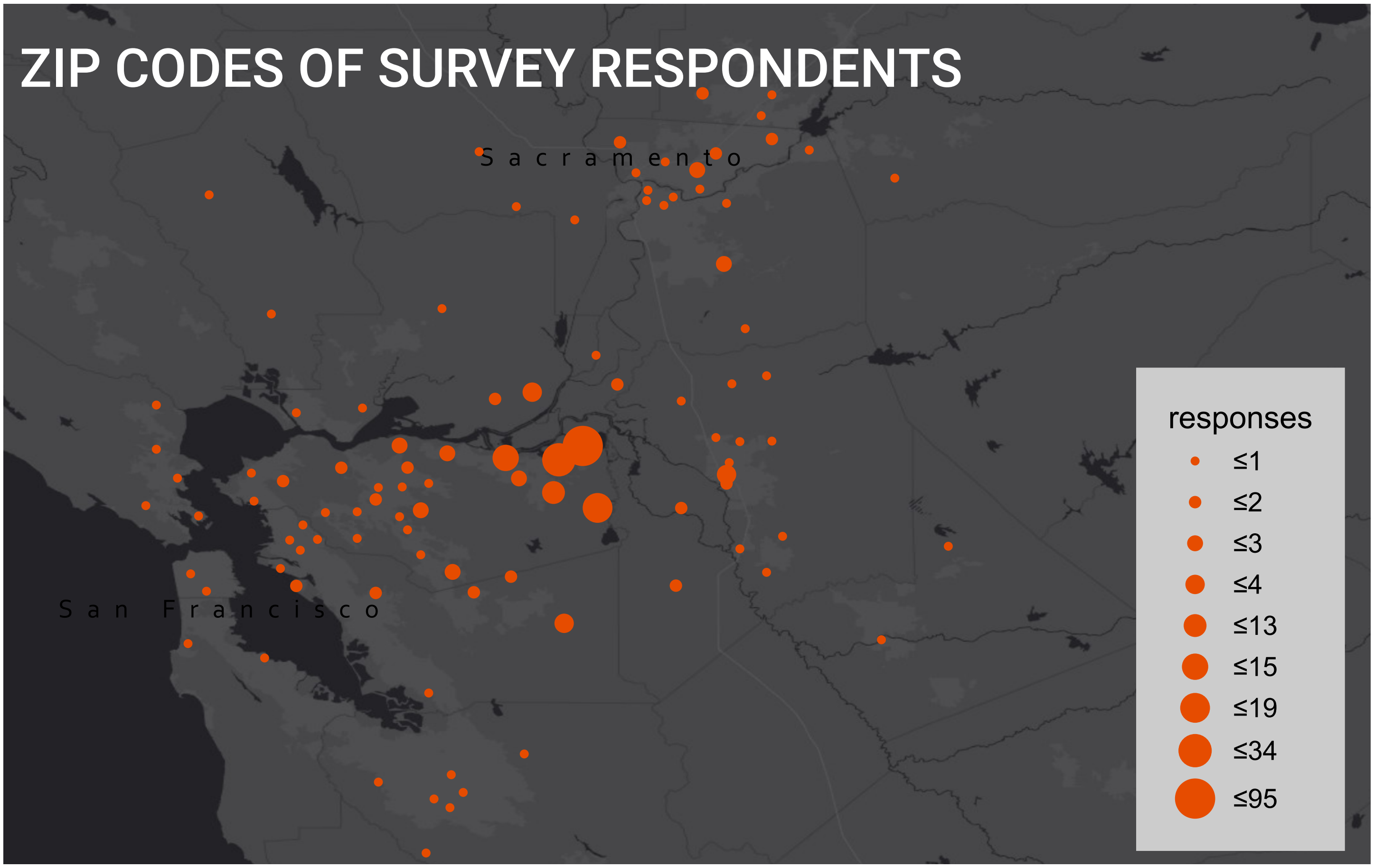
The survey was released immediately prior to the public project kickoff meetings and flyers with a survey link and QR code were made available at that meeting. Several local and regional blogs and news outlets that covered the kickoff meeting included links to the survey.[234] Links to the survey were included in social media posts on the projects' twitter, instagram and facebook accounts.

Targeted dissemination included the following:

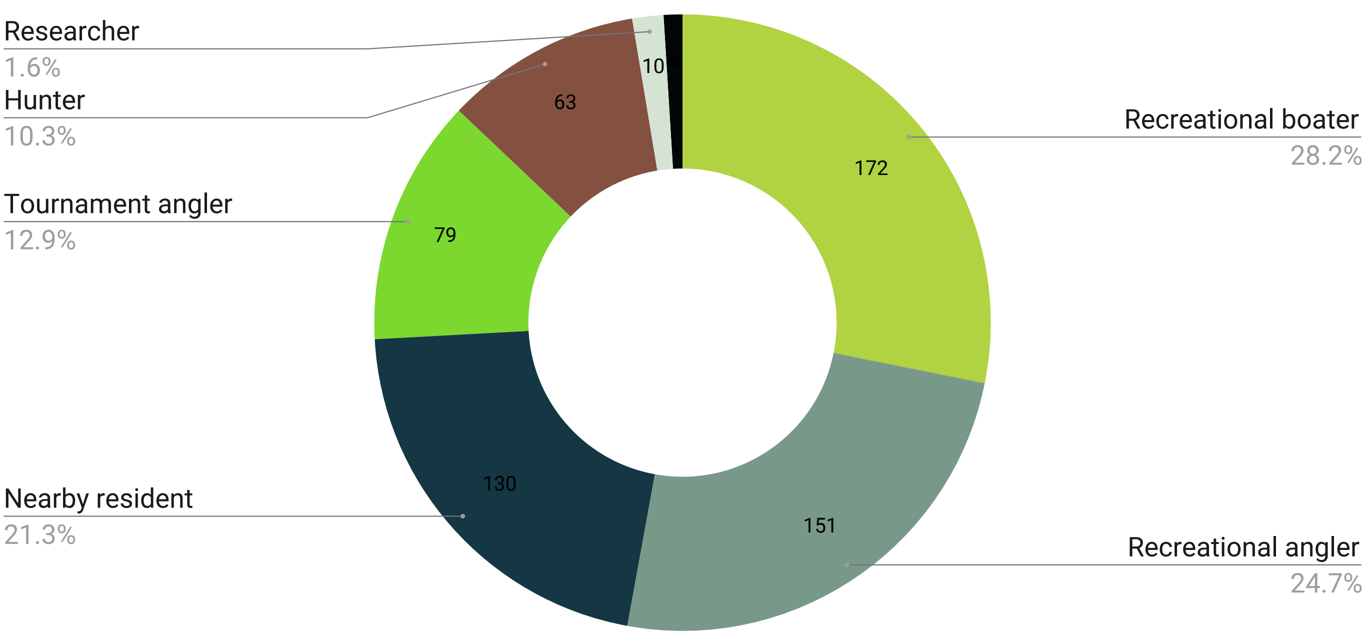
- Hunters
    - We used our contacts at State Parks to email a link and description of the survey directly to Franks tract duck blind permit-holders.
    - A link to survey and project description was also posted to a popular duck hunting forum. See link to thread here: https://www.refugeforums.com/threads/franks-tract-futures.1050501/page-7
- Tournament anglers
    - We reached out directly to members of the Nor-Cal Guides and Sportsmen' Association (NCGASA) Delta Anglers Coalition.
    - Several popular local tournament anglers were reached by way of instagram.
    - Links to the survey were included in the comments to popular Franks Tract tournament fishing youtube videos.
- Sport anglers
    - A link to the survey and project description was posted on the Westernbass forum. See thread: https://www.westernbass.com/forum/restoring-franks-tract-t115992.html
    - We reached out directly to the California Striped Bass Association West Delta chapter.
- Boaters
    - We reached out to the St. Francis Yacht Club.
    - We posted survey links in the comment section of popular youtube videos depicting boating in and around Franks tract.

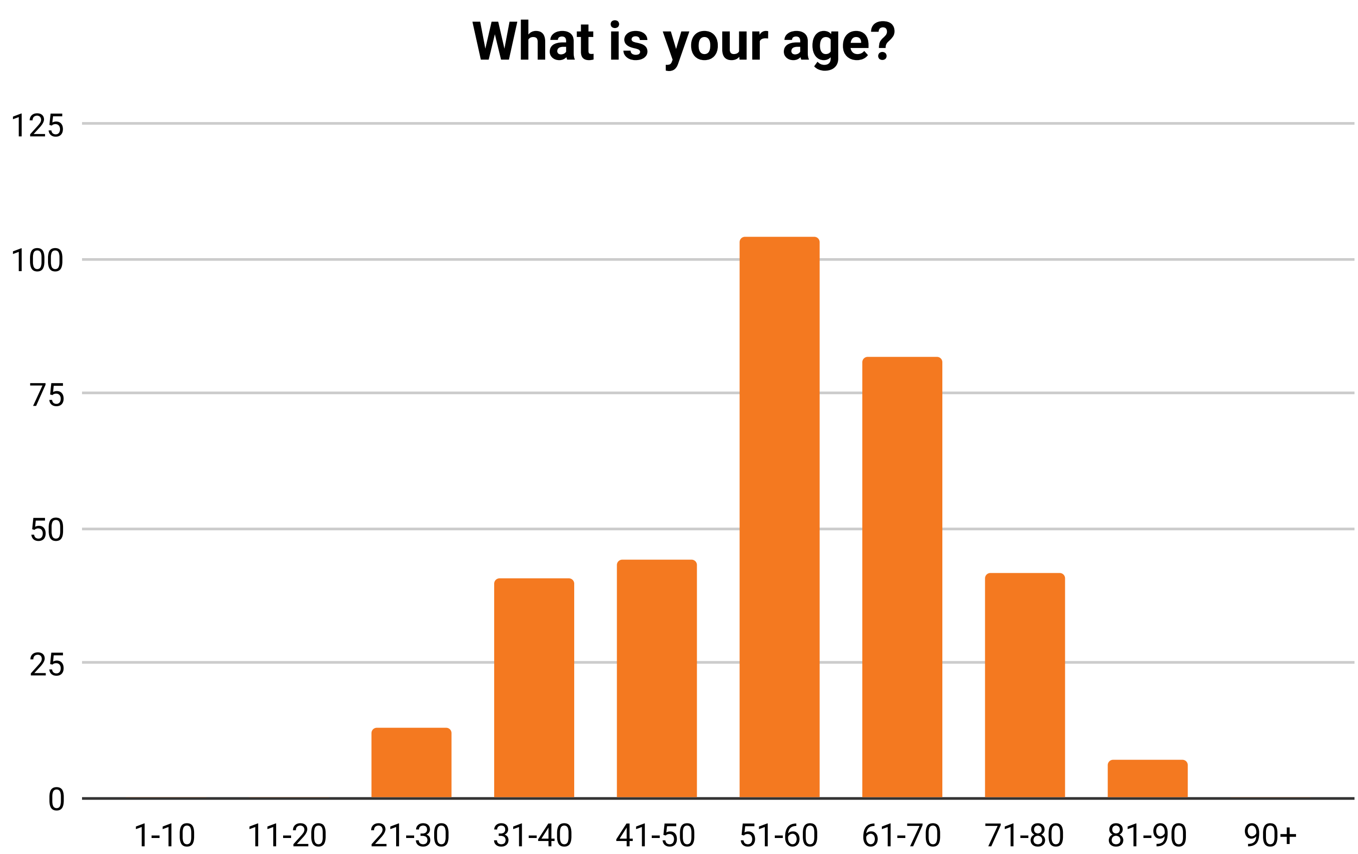
2 https://www.eastbaytimes.com/2019/07/12/state-looks-for-alternates-for-franks-tract-tidal-marshland-restoration/
3 https://www.thepress.net/news/franks-tract-restoration-moves-forward/article_3de54af8-7f12-11e8-81a6-175637c98e5a.html
4 https://nodeltagates.com/2019/07/25/franks-tract-plan-revisited/

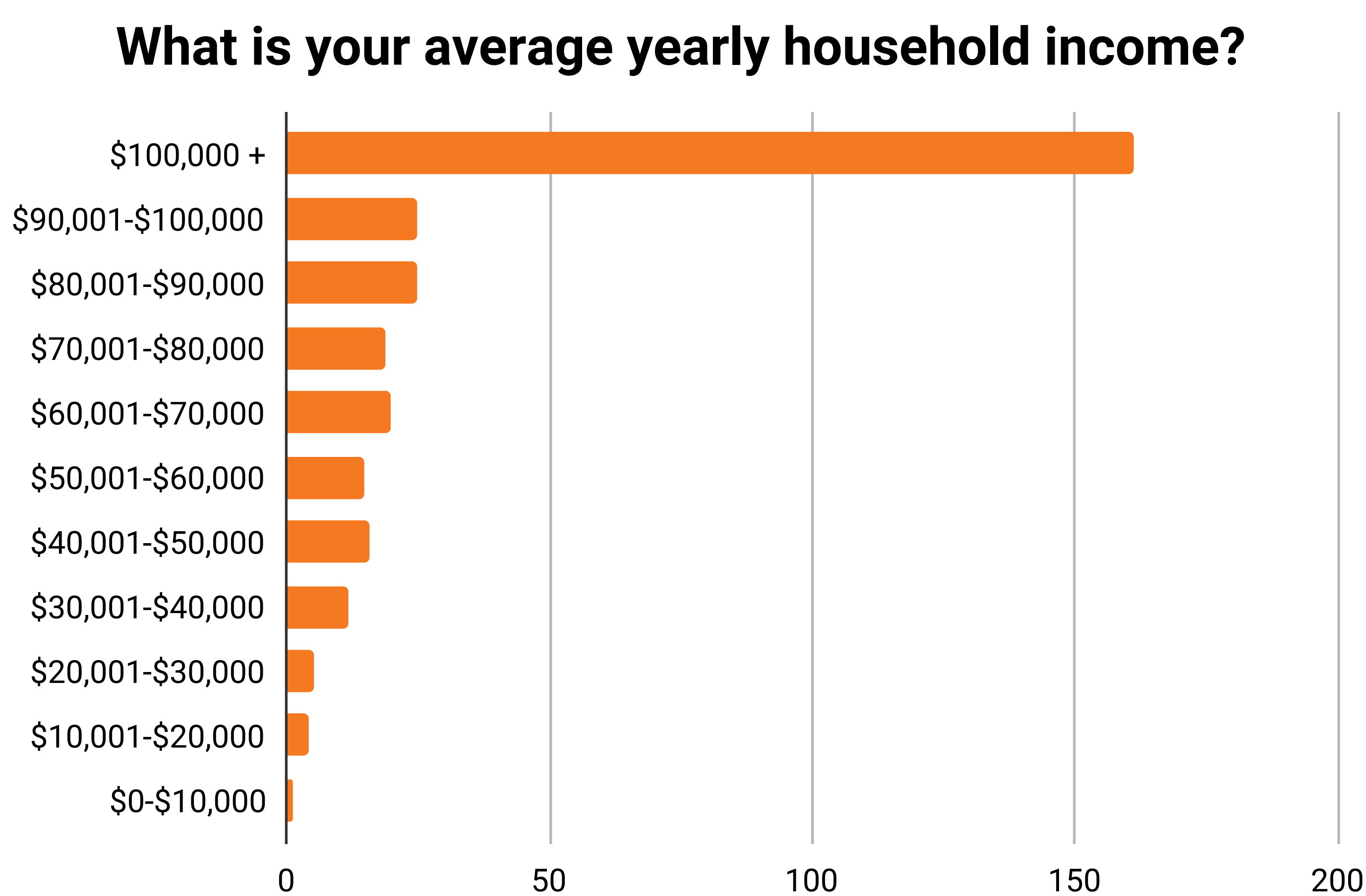
Survey Results



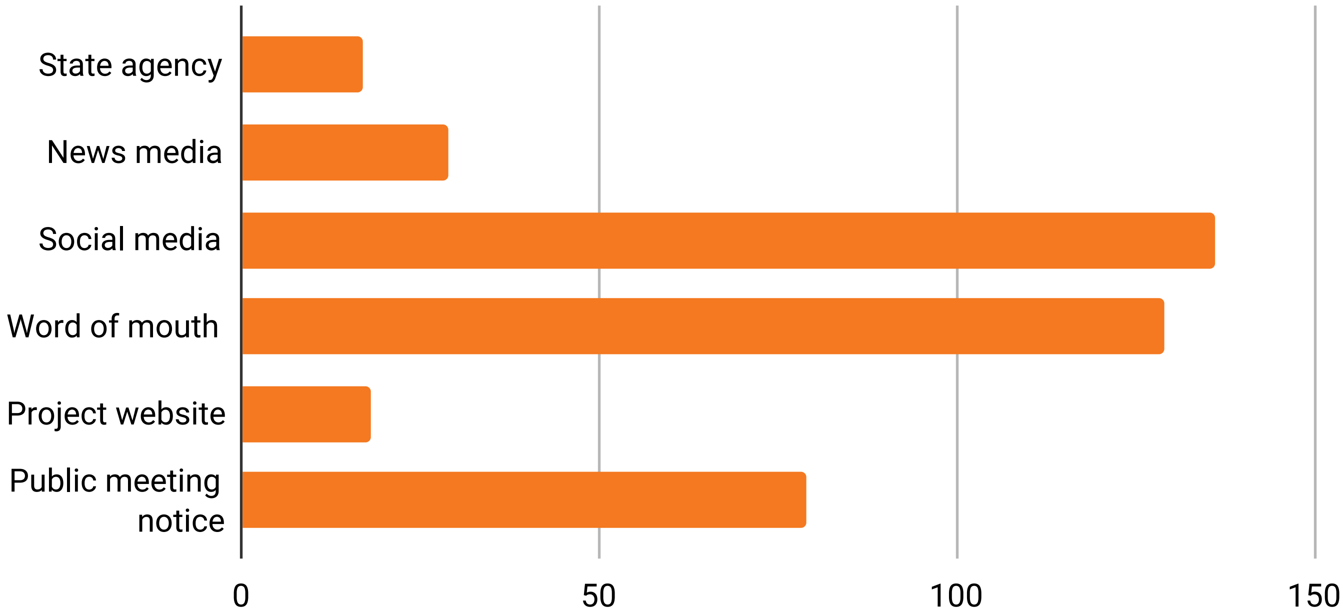
Which of the follow categories do you identify with? (multiple answers can be given)



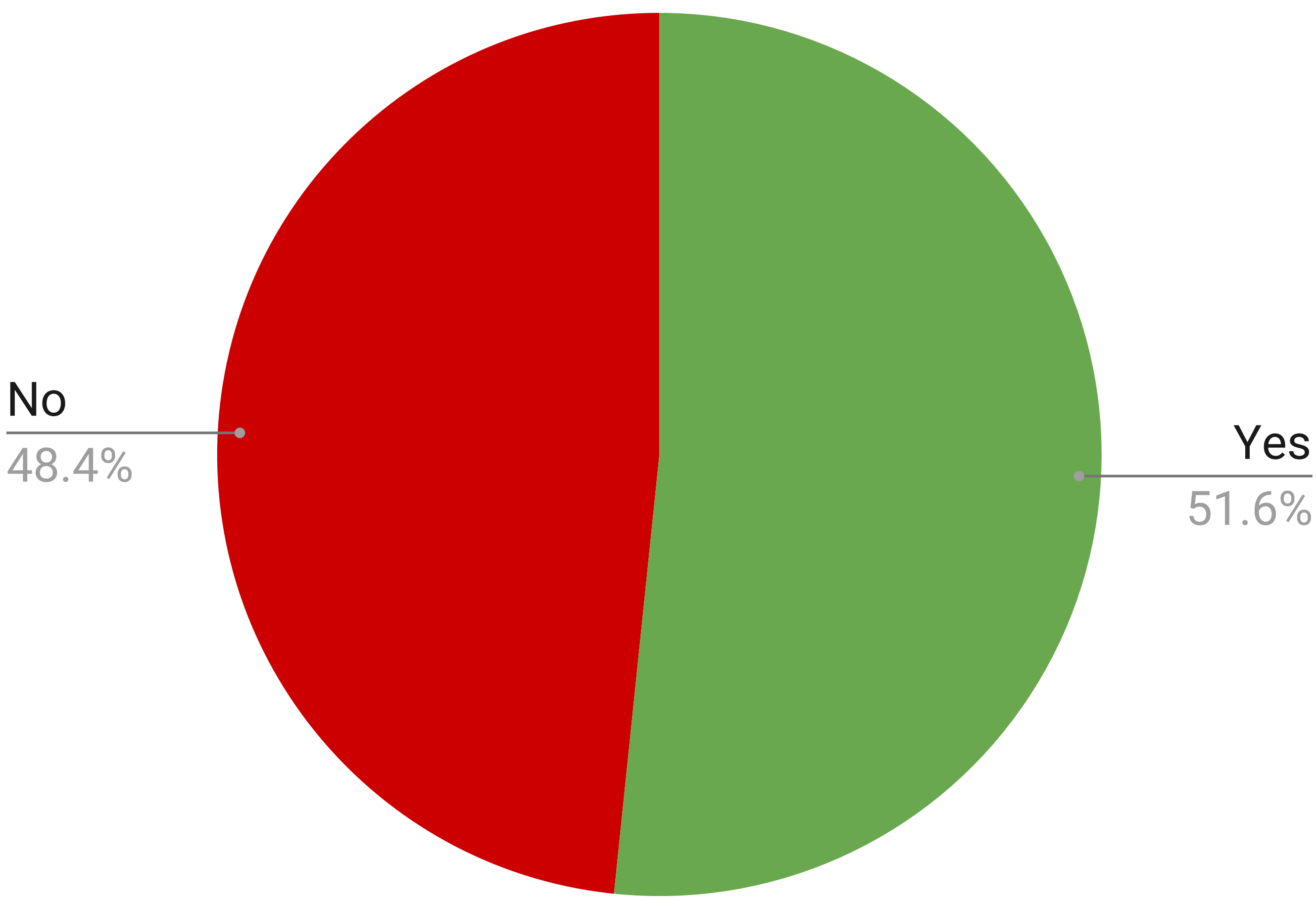

What is your age?
125
100
75
50
25
0
1-10
11-20
21-30
31-40
41-50
51-60
61-70
71-80
81-90
90+


What is your average yearly household income?
$100,000 +
$90,001-$100,000
$80,001-$90,000
$70,001-$80,000
$60,001-$70,000
$50,001-$60,000
$40,001-$50,000
$30,001-$40,000
$20,001-$30,000
$10,001-$20,000
$0-$10,000
0
50
100
150
200

How did you hear about the Franks Tract Project?

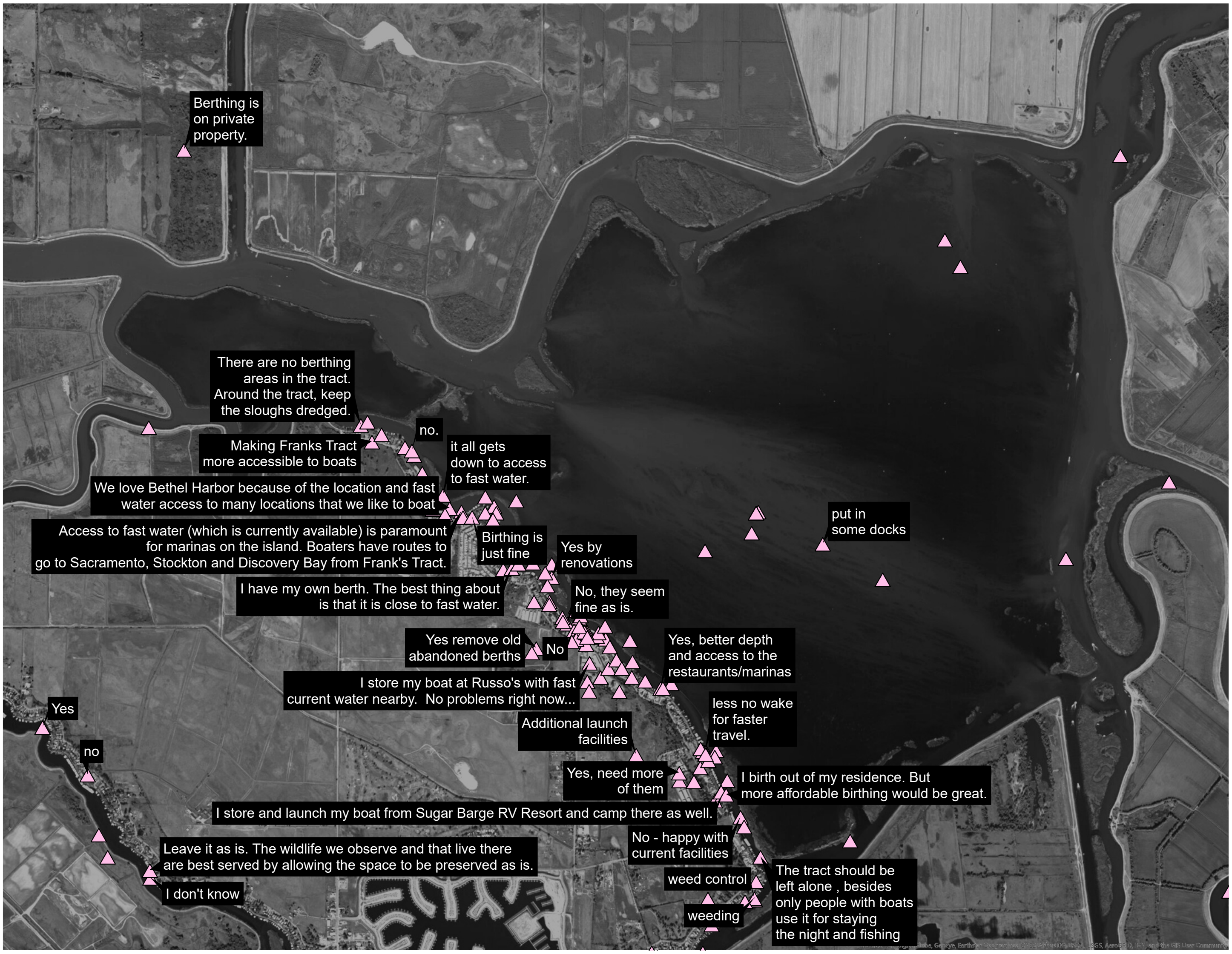


Do you think more public access areas should be created around the tract for recreational use?



Berthing

Where do you berth?



Could berthing areas in the tract be improved? If so, how?

No, they seem fine as is.
it all gets down to access to fast water.
The tract should be left alone , besides only people with boats use it for staying the night and fishing
weed control
Yes by renovations
Access to fast water (which is currently available) is paramount for marinas on the island. Boaters have routes to go to Sacramento, Stockton and Discovery Bay from Frank's Tract.
We love Bethel Harbor because of the location and fast water access to many locations that we like to boat
put in some docks

Could berthing areas in the tract be improved? If so, how?

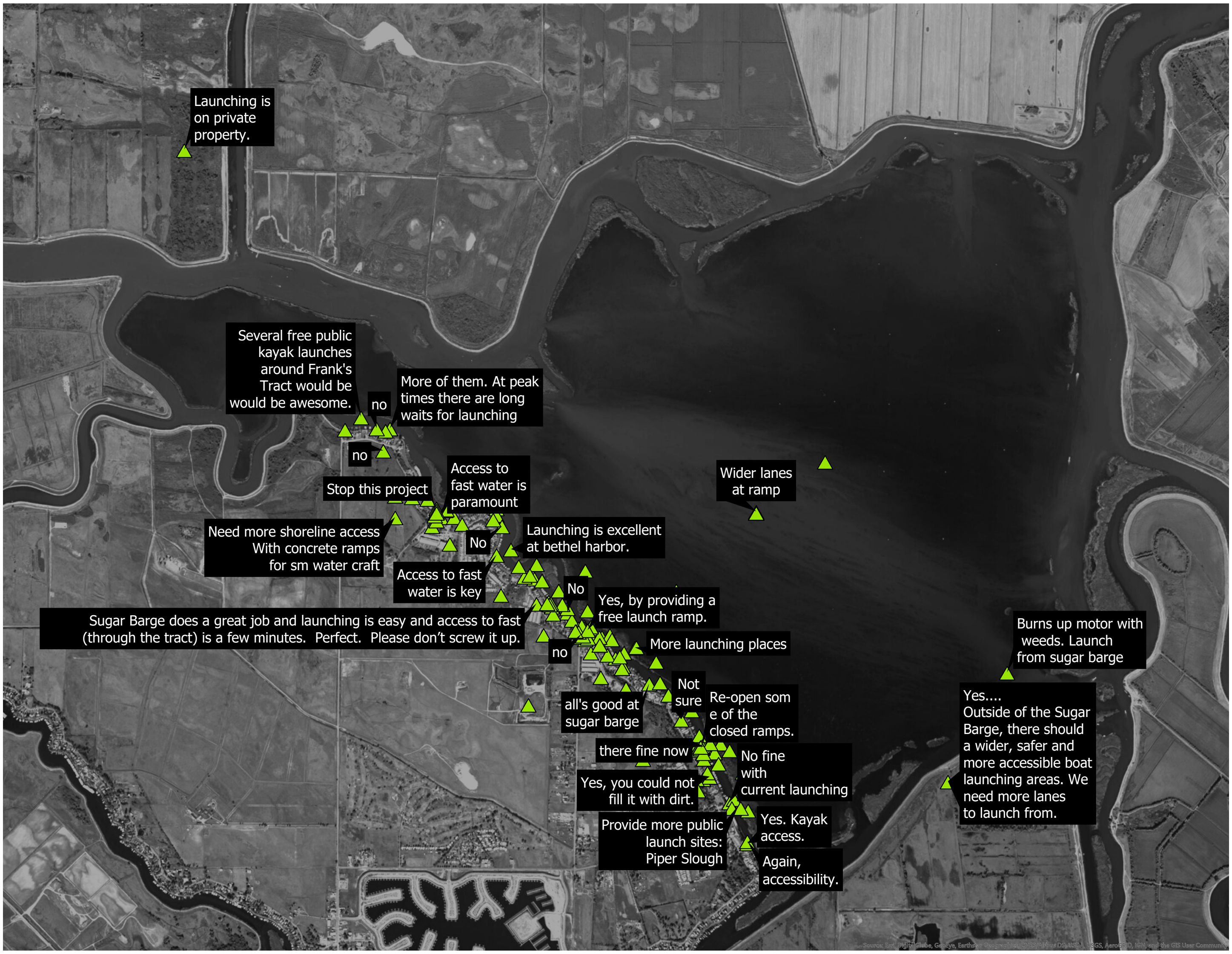
No. There is more than enough berths available on the island. Sadly, too much so that homeless bums have moved in.
By staying the same!
By stopping this worthless project
Maintenance of water hyisant
Removal of weed islands that block slough traffic. Float in and out with tide.
remove the sea weeds
yes, if they cleared out all the invasive vegetation we could have less problems with drag and fouled props
No - happy with current facilities
There are no berthing areas in the tract. Around the tract, keep the sloughs dredged.
No
None needed.
Let the business owners improve it themselves
I don't know
no
weeding
I am happy at Korths Pirates Lair
less no wake for faster travel.
I store my boat at Russo's with fast current water nearby. No problems right now...
bethel harbor is awesom
Leave it as is. The wildlife we observe and that live there are best served by allowing the space to be preserved as is.
I have my own berth. The best thing about is that it is close to fast water.
Leave Frank's tract alone
I store and launch my boat from Sugar Barge RV Resort and camp there as well.
Yes remove old abandoned berths
Yes clear abandoned berths
Yes, need more of them
So many of the marinas around Frank's Tract are in terrible shape. The whole area needs a shot in the arm, and what happens here will be the most important factor.
Dredge more often, they are often too shallow for large boats.
Making Franks Tract more accessible to boats
Dredge the Channels

Could berthing areas in the tract be improved? If so, how?

Additional launch facilities
Additional launch facilities
Already a lot of good ones
Yes, better depth and access to the restaurants/marinas
Better depth and access to Restaurants and marinas
My berth is great!
Better access, gas, stores
I birth out of my residence. But more affordable birthing would be great.
Yes clean up the marinas Franks
i think there fine.
There are plenty of marinas around Bethel close enough to Frank's.
Yes, channels need to be deeper and cleared of vegetation which fouls props and cooling systems on boats.
NA
Better weed control and removal of snags
Weed control
Leave the tract the way it is!!
Birthing is just fine
Yes
Cleaned up.
no.
no
Berthing is on private property.

Launching

Where do you launch?



Could launching areas in the tract be improved? If so, how?
Yes, by providing a free launch ramp.
Access to fast water is key
Access to fast water is paramount
There are no launching areas in the tract , along side on bethel island there is and these marinas need fast water close by to do business or we as home owners pay the price if you only have one way out to fast water every yahoo would go fast in water that is 5 mph and do damage to docks
By not sending more fresh water down south
All of them are from marinas. There are no truly publicly owned launch sites. But since it’s a STATE recreation area, there should be at least one public launch site.
No.
More launching places
A free launch site for small 16’ and under boats on Bethel Island, near Franks tract would increase traffic to local businesses.
No it’s perfect the way it is!
Weed Abatement
Stop this project
Debris removal

Could launching areas in the tract be improved? If so, how?

Remove debris
See prior answer
Launching is excellent at bethel harbor.
Re-open som e of the closed ramps.
Sugar Barge does a great job and launching is easy and access to fast water (through the tract) is a few minutes. Perfect. Please don’t screw it up.
all’s good at sugar barge
Not sure
more launch areas. A public launch area. Restrooms. A tie up area with a pier for a rest and you don’t have to pull the boat out of the water.
More of them. At peak times there are long waits for launching
no
Provide more public launch sites: Piper Slough
No fine with current launching
All good, but there is no launching in the tract...
No
Yes, you could not fill it with dirt.
there fine now
there fine now
None required.
Larger paved parking, larger ramps, more docking space.
Yes, more multiple lanes with long docks
Need more shoreline access With concrete ramps for sm water craft
Yes, there should be better public access for kayaking, paddleboarding, and windsurfing. Access to Franks Tract is pretty limited right now.
More public access for non motorized boating
More public access for non motorized boating. Only private marinas available and can sometimes conflict with power boaters
no
Launch ramp grate is dangerous.
have more launch sites, and improved launch sites
Yes. Kayak access.
Kayak launch.
more free areas
I launch from Russo’s, so I’m happy with the launch area.
Several free public kayak launches around Frank’s Tract would be would be awesome.
Seem good to me as is.
No
Yes.... Outside of the Sugar Barge, there should a wider, safer and more accessible boat launching areas. We need more lanes to launch from.
Wider lanes at ramp
Sugar Barge RV Resort has great facilities. There are several what looks like abandoned docks and slips down from Sugar Barge that are in need of repair.

Could launching areas in the tract be improved? If so, how?

Make a state park on Frank’s with a FREE or low cost launch. It’s $15 to launch anyplace on the Delta. Let’s divert some of the ludicrous funding towards things most citizens of this state can enjoy.
Yes more of them
We need a launching place closer to “fast water.”
More launch sites
Burns up motor with weeds. Launch from sugar barge
Full of weeds
Again, accessibility.
Yes, be sure there is adequate depth leaving the launch ramps
Keep what we have
Plenty of areas to launch now.
They are fine
its good.
I think the current launch ramps are adequate.
NA
Boat at home so don’t use launching. Launch jet ski once a year at Sugar Barge. No problem
Weeds now come up on hoist. Used to be weed free in front of house
By not closing access to Franks Tract
No
install more ramps
no
Launching is on private property.

Boating routes

What are your regular boating routes in and around the Tract?

Could boating in the Tract be improved? If so, how?

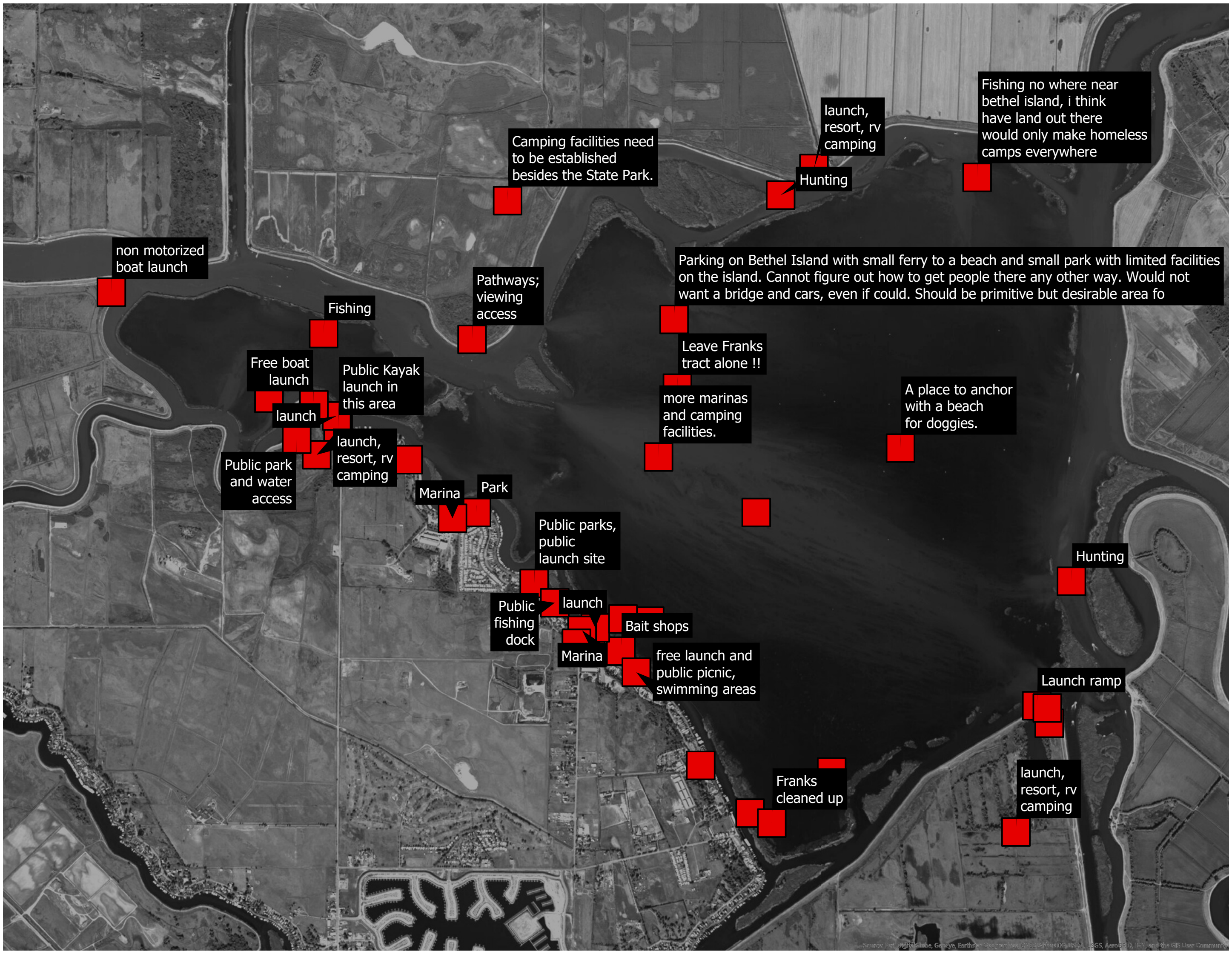
No, boating seems fine as is.
Leave it alone!! Go somewhere else and spend your billions and don’t cut off revenue to our businesses.
No more egeria densa, but now its here and we deal with it at any tide high or low ,
fewer weeds would be nice
No.
While less invasive plant life would be an improvement, access to Fast Water routes is a major attraction for boaters in this area.
dredge and mark s-shaped channel from Middle River to False, and use dredgings to create shallow habit on either side of the channel. This will slow water flow through Franks, and still allow fast boat access, while creating minimal wave action caused by the fast boating.
By it staying the same
Remove hyacinth!!
No. Leave natural area change by mother nature
Leave it open!
Leave it alone!

Could boating in the Tract be improved? If so, how?

Leave it alone!
Remove snags
clear out some of the weeds
no
The main problem is excessive SAV and encroaching FAV (especially water primrose)
Not by pulling more water out the the Delta. Your project is a water grab and we know.
Yes, leave it alone !
There are a few unmarked hazards. Tie a buoy to them or remove them.
Hazards could be well marked.
Cut/dredge a deep channel with markers across and through
Debris/seaweed removal. Shore improvements.
Debris/seaweed removal and general shore improvements.
marking of safe travel areas through tract
Replace the trees that were removed from the levee to the north of the Tract. Apparently they were removed at one time by the Army Corps? (Just repeating what one sailor told me, not verified.) Keep the area clear of aquatic weeds, especially aquarium weeds that are sometimes hard to see.
Fast water is great.....for now.
Common route for fishing, tubing and engine warm-ups.
Some dredging would be good to open channels for crossing the tract.
Leave it as is. Environmentally a great place and a great place for all kinds of fishing for those who fish, as well as those businesses that make a living from the recreational boating and fishing industries.
Elimination/reduction of water hyicynth.
Leave Frank's tract alone
We used to boat across it to get to the restaurants. It's too shallow now so we have to go around.
We used to boat across to get to marinas and restaurants. Now we have to go up Piper Slough.
Identify the hazards in Frank's Tract. There has been some serious accidents due to these hazards that aren't visible, especially during the change of tides,
DREDGE and put the mud and sand into a recreational area like a beach or park....with access to it.
make it deeper
Remove the shoals, bars, submerged obstacles and all weeds. Completely dredge all of Frank's tract SRA.
Reduce weeds
Better water depth and removal of the non native weeds
Remove weeds
Yes, deeper and dredged, weed treatment
Clean up the weeds I would leave the trac alone and just spray the weeds
need to a better job of controlling invasive weeds.
No.
Clear channels of excess vegetation that fouls props and cooling.
Same as others, better management of channels and vegetation.
Clean up weeds in the tract.
Yes, by removing snags.
Eliminate weeds/trees growing up across Franks Tract, like used to happen.
leave alone
leave it alone
Weed control

Public Access

Where are desired sites of public access?



What would you like to see here?

Fishing no where near bethel island, i think have land out there would only make homeless camps everywhere
Leave Franks tract alone !!
Public parks, public launch site
more marinas and camping facilities.
Bait shops
Launch Ramp
Public Kayak launch in this area
Public Kayak launch in this area
launch
launch
Pathways; viewing access
launch, resort, rv camping
launch, resort, rv camping
launch, resort, rv camping

What would you like to see here?

Fishing pier
non motorized boat launch
launch sites
Fishing
free launch and public picnic, swimming areas
A place to anchor with a beach for doggies.
Camping facilities need to be established besides the State Park.
Parking on Bethel Island with small ferry to a beach and small park with limited facilities on the island. Cannot figure out how to get people there any other way. Would not want a bridge and cars, even if could. Should be primitive but desirable area for swimming, SUP and so on, maybe some camping.
Launch ramp
Public dock
Public park and water access
Free boat launch
Franks cleaned up
Park
Public fishing dock
Marina
Marina
Hunting
Hunting

In general what type of access points are needed?

You need fast water access more than not
Boat
Fishing
Easy ac
Better launching facilities. More shore fishing access
Public parks, public launch sites
Launching is somewhat limited to a few locaions. The proposed project would adversely affect all local businesses that depend on receational boating.
Small Parking lot Small kayak launching area
public
A beach and a levee with a public dock to fish from.
marinas, shops, launching ramps.
More launch ramps
Launch ramp
Bait, fuel
Access to beaches
Unsure.

In general what type of access points are needed?

Launch Ramp
FIshing piers, fish cleaning stations
Not sure
public launch, restrooms picnic area
More anywhere assessable
launching/parking
Launch and fuel
day use areas
Fishing pier and viewing areas
Access to walking paths for viewing of wildlife (e.g. small viewing platform along walk ways.
Larger boat ramp with better parking
Fishing access
Camping and launching.
launch, resort, rv camping
Fishing piers
Small craft sunfish laser hobie cats. Windsurfing kiting
Public access areas so that people with non-motorized watercraft can get to Franks Tract more easily.
Kitelaunching
Need general improvements to incentivize businesses as too many marinas, restaurants and shops have closed down. As a recreational boater and someone who loves living on Bethel Island, I would like to put my money back into the local economy, but access and other factors make this difficult for myself and for those that recreate here.
Areas where public can launch non motorized craft; maybe areas for picnicking. No public parks on Franks Tract keeps it from being utilized greatly by non motorized boaters
We use the track to get to other parts of the rivers. Plus the water flow goes through the track.
more ramps
boat launch
Public fishing doc
Kayak / ramp access
More access for non motor boating
Shore access for kayak launching
kayak launch points
Kayak
swimming lagoon and hiking trails
Launch ramps, docks, boating services on Bethel Island.
Shore fishing, including access for those with mobility challenges. Kayak access
Kayak launches
More safe access for kayaking. Right now a lot of areas are either not accessible or the docks are not kayak user friendly. Also power boaters are definitely not looking out for kayaking people. Scary oftentimes.
Not sure if area should be returned as wild wetlands, but if public access is added...interpretive center (histori-cal, habitat info) with public restroom access is always nice.
A place to anchor with a beach for doggies would be great. We used to go to Mildred regularly, but the doggie beach is pretty much gone.

In general what type of access points are needed?

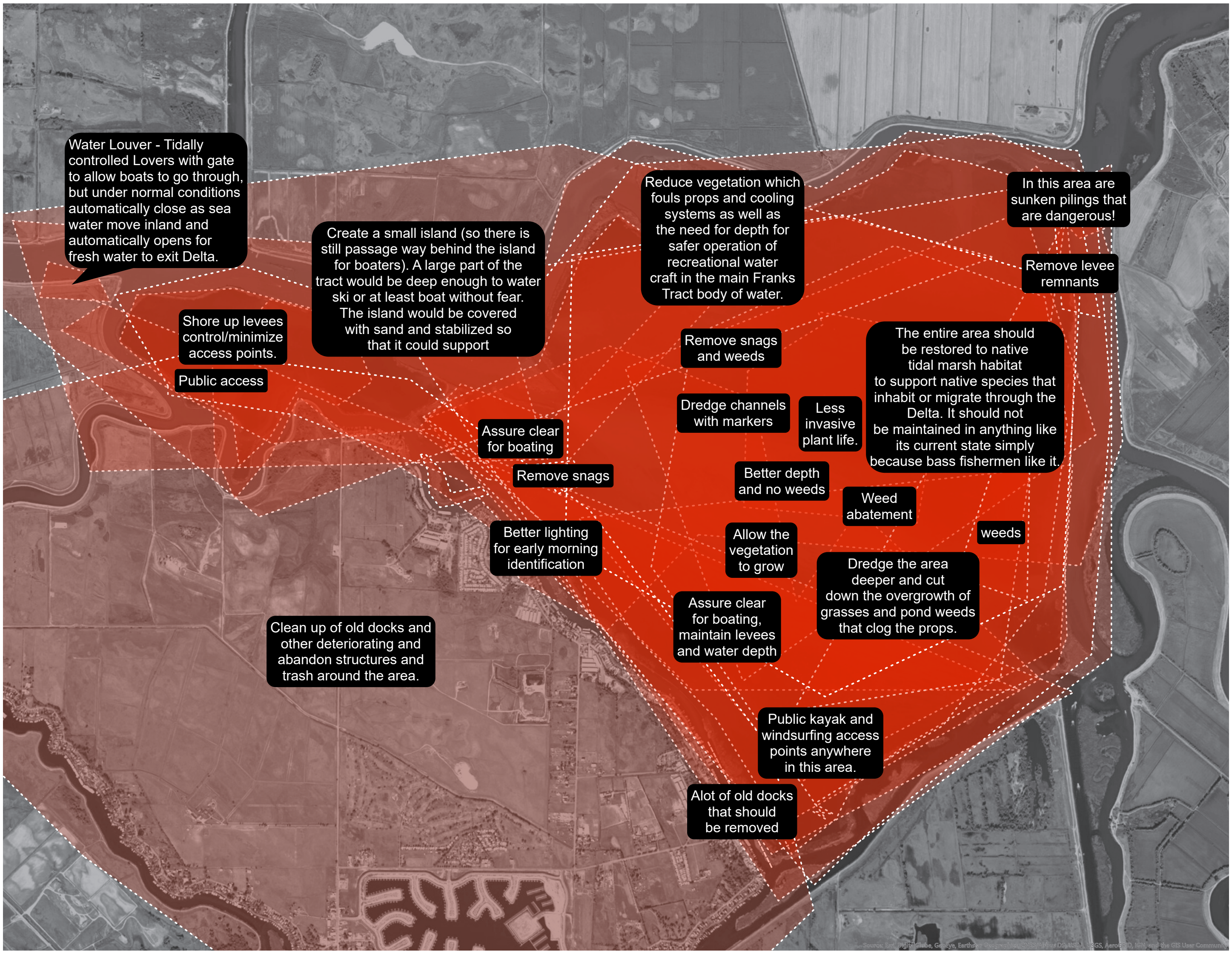
Dredged waterways and roads
Fishing piers and parks
Camping and boating
Near Sugar Barge RV Resort Marina
Similar to the big break public access for kayaks or float tubes
Ramps
More places with easy access and ionic areas
Public lands
In general, the place is underutilized due to no roads and bridges. I think a small ferry or water taxis would be charming and make it a real water experience. Would need something large enough to take in food and equipment. There are no real beaches around here; tiny ski beach has 12 boats on it every weekend!!!
Launch ramps
Places for boats to stop hang out get fuel drinks etc
What?
You need to dredge Frank's Tract
launching, beaches,
Public park, water access
Picnic
More ramps and deeper water
Beaches
Remove weeds.beaches
Dredged and marked access points at least 6 feet to accommodate boats with 3 to 5 foot draft
Boaters are restricted to roadways to launch ramps. And boaters to waterways that are deep enough to avoid going aground.
Not sure
Beaches for boats and swimmers to rest and picnic.
launch and boating service facilities
Levee trails
Wider openings
None that I know of
Public RV campgr
Ramps, more facilities for getting supplies, fuel, food, etc.
Nature park
Bank fishing swimming
Keeping the water ways open & clear to boat from Discovery Bay and surrounding areas.
A pier
Marinas
No dumping anything in the track.
A few sandy beaches
Beaches,
Ramp/ marina, beach
na
Shore hunting access

In general what type of access points are needed?

More launch ramps
small craft launching facilities in the eastern and northern areas would be great so kayakers and canoers and could access these areas without all the boat traffic coming out of sloughs and across the tract. this would greatly increase small craft safety.
water front parks/camping.
Restrooms
more boat ramps

Areas of Improvement

Where are the areas in the Tract that most need improvement?



What improvements could be made here?

Less invasive plant life.
Water Louver - Tidally controlled Lovers with gate to allow boats to go through, but under normal conditions automatically close as sea water move inland and automatically opens for fresh water to exit Delta.
Water Louver - Tidally controlled Lovers with gate to allow boats to go through, but under normal conditions automatically close as sea water move inland and automatically opens for fresh water to exit Delta.
In this area are sunken pilings that are dangerous!
Remove snags and weeds
Alot of old docks that should be removed
Shore up levees control/minimize access points.
Assure clear for boating, maintain levees and water depth
Assure clear for boating
Allow the vegetation to grow
Dredge channels with markers
Public kayak and windsurfing access points anywhere in this area.

What improvements could be made here?

Public access
The entire area should be restored to native tidal marsh habitat to support native species that inhabit or migrate through the Delta. It should not be maintained in anything like its current state simply because bass fishermen like it.
Dredge the area deeper and cut down the overgrowth of grasses and pond weeds that clog the props.
Create a small island (so there is still passage way behind the island for boaters). A large part of the tract would be deep enough to water ski or at least boat without fear. The island would be covered with sand and stabilized so that it could support tourism. One dock or buoys for tying up boats and some commercial boat transport would allow people without boats to enjoy the small island. Some facilities could be available. Very few places on the Delta for people to play without a boat. People drive for hours to get to a beach and this beach would allow swimming. Would need to rope off place to keep boats away from swimming area.
Better depth and no weeds
weeds
Reduce vegetation which fouls props and cooling systems as well as the need for depth for safer operation of recreational water craft in the main Franks Tract body of water.
Clean up of old docks and other deteriorating and abandon structures and trash around the area.
Remove levee remnants
Remove snags
Better lighting for early morning identification

What general improvements could be made?

non-motorized
Fishing piers and boat launches. Picnic and camping
Trails and fishing spots

I think the Tract is fine as is.
We are just fine the way we are. We boat daily, year round
Dredge the sloughs and build up levees around franks tract to protect other islands around bethel island
Dropping. Less weeds
Let it be the ecosystem it was meant to be - it's freshwater is being diverted-STOP THIS DIVERSION It wasn't meant for this pu
Needs to be dredged
Get rid of the weeds
The tract is perfect the way it is. Quit dropping pellets and weed spray could make it better
Quit using Franks Tract as part of the water project
its fine the way it is
Leave the Tract as it is. It is the central hub of the Delta.
It's good the way it is.
dredge frankS tract
Desalinate In L. A. this is the future , raping the delta is insane. L.A. needs to Desalinate but they don't want to because its ugly. Why can't the install Desalination plants on off shore platforms? No improvement is needed. Only the metropolitan water dist. wants to (improve to there advantage) they don't care about us. Tim
create shallow habit, and barrier to storm surge for Bethel Island.

What general improvements could be made?

None
Water Louver - Tidally controlled Lovers with gate to allow boats to go through, but under normal conditions automatically close as sea water move inland and automatically opens for fresh water to exit Delta.
Plant stripers and salmon in franks tract
Check the levees for erosion and stop breaching the levees for waterfront homes
Remove hyacinth!
Support the Delta businesses by not filling in Franks Tract
No approve needed
Control salt water intrusion, enhance NATIVE fish, eliminate introduced and invasive species
Create beaches and areas for overnight anchorage
nothing leave it alone
Better management of invading species.
Better weed control during low tide especially.
Better weed control during low tide.
Clear out sunken pilings
Leave Frank's Track alone.
nothing wrong with the track LEAVE IT ALONE!!!!!
Better wider roads
all sea grass areas
Remove invasive plant species from throughout entire delta. Specifically the Uruguayan primrose which infects both land and water
weeds
Stop spreading herbicides
Boat launches more restaurants
Levees: Reduce areas invaded by Around donax; provide walking access along improved levees; near shoreline- reduce invasive water primrose cover.
The best improvement would be less govt. involvement
No improvements need to be made by people like you. You do not have the Delta's best interests in mind. The best way to keep the Delta healthy is to stop taking water from it.
no improvement no changes needed for stability of fishery
Stop spraying the emergent/submergent vegetation (hydrilla, milfoil, etc.).
Quit spraying poison and herbicides.
Weed cutting and access
General public access to the water.
More open space and less weeds
None, leave the tract alone -
See prior answer.
public access with non motorized launch and restrooms
rebuild little franks levees, stay out of Franks tract, exceptto remove weeds
Increase depth of Frank's Tract.
weed control
Bethel Island
public parks for picnicking etc
Keep the area clear of weeds.

What general improvements could be made?

Redo recreational area
Leave it as is. Government and special interests do not need to waste our money to try to do anything to this area. Where did the idea to mess with it start anyway?
Add 2 or 3 sandy beach islands on the East side of the tract which currently is used the least.
Leave Frank's react alone
More kayaking launch points that are nice and user friendly
would have to go back to the map which showed the project area
Dredged out water ways at Frank's Tract
Tear down old broken socks that have not been maintained. Also, very important the coast guard needs to mark tree stumps and hazards that are permanent and ones that are in a drift for safty
If anything, the creation of a few beach areas would be cool.
crops. It deeper and get rid of the aggressive grasses and water hyacinth that grows everywhere and clogs motors.
All of the abandoned lots need to be cleaned up or put up for sale.
Define improvement? This "study" seems like it has a hidden agenda. If I were a betting man, I would say this study will be used by the CA DFG to "prove" pleasure boaters need to have better/more access to the water on the Delta. What they'll fail to mention is the economic/biological impact this will have. Pleasure boaters do NOT contribute to the local economies the way sport fisherman do. Ever see someone wake boarding the Delta from October through April? As the DFG sprays the Delta in full force, they are killing everything. Somehow this weed killer is completely harmless to fish? I have YET to see a biologist on the Delta. If they actually made it out to the sprayed areas they would see a lack of wildlife in those affected areas. STOP killing the Delta. If you want to make the Delta accessible to all boaters, make a website and have maps of routes and where the best places to ski and berth are. Educate boaters.
Clean water
Better markers (hazards & routes); increase depth in shallow areas
Make the water no less than 10' deep in the entire area.
Make it deeper along with beaches and mooring balls for large boats and docks for smaller boats.
Dredge and remove unwanted plant life
Dredging
Less water weeds
Deeper and no weeds so we can jetski safely!
None
Restore to 1970
Clearing all underwater hazards
Best improvements are to dredge channels and provide a new waterway through Franks Track to avoid boaters having to navigate around it..
Water flow
Better seeding for water weed retardation
I have been on Frank's tract for 45 years. It's always changing. It is what it is,leave it alone.
None needed

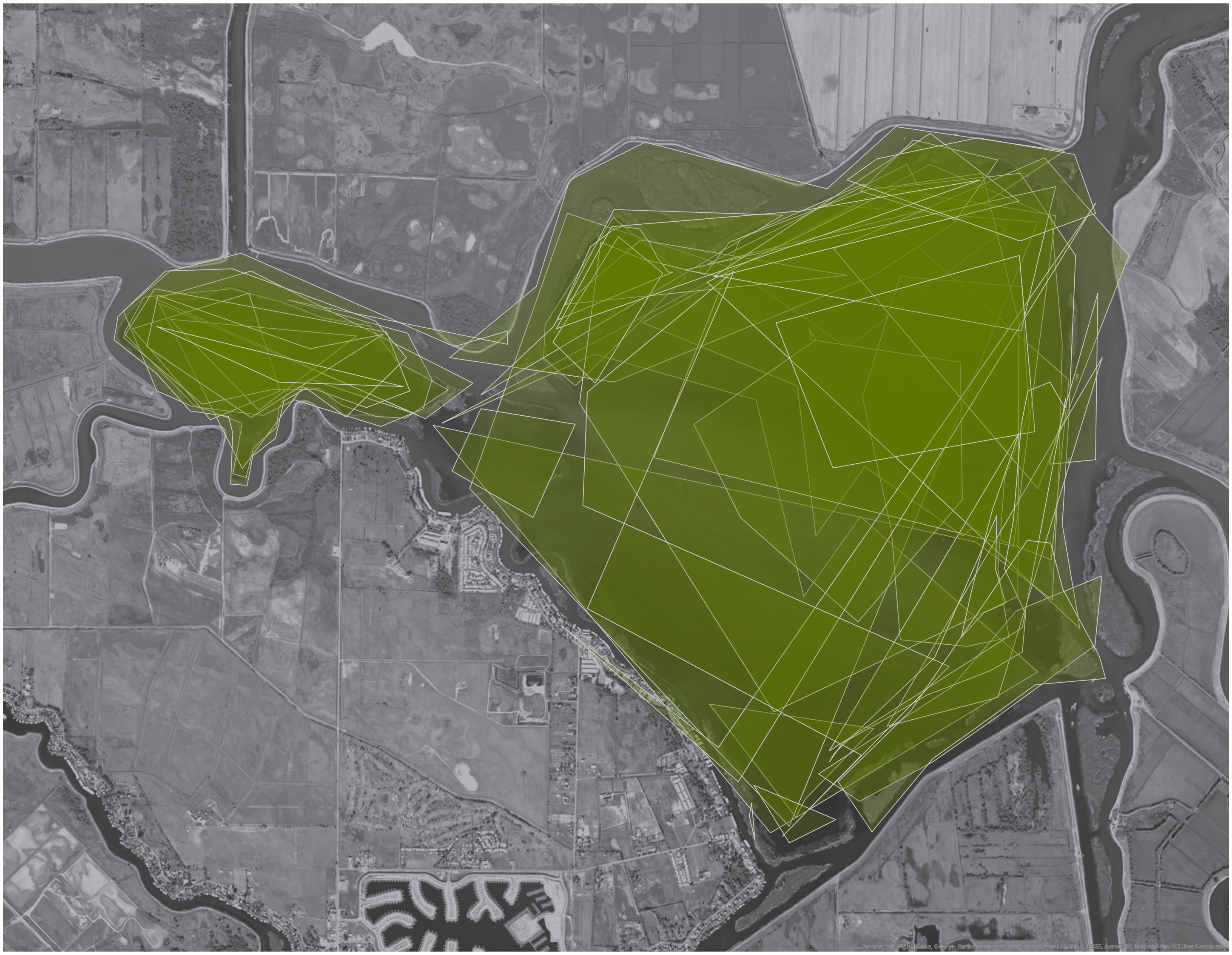
What general improvements could be made?

it would be nice if the state set permanent markers buoys to attach duck blinds. that way they are set where there suppose be and stay there.
Reduce/remove grasses. Invasive weeds
We have no needs for any improvments
None
Clean up weeds to allow unimpeded boating. More facilities for replenishing supplies, fuel ice, etc.
Weed abatement throughout the entire tract
Clean out the invasive plants, dredge, increase water flows
Remove weeds. Leave water open. Do not turn part to muddy swamp
None, it works well the way it is..
General safety. It’s too dangerous with winds and sand bars
hyacinth, debris
LEAVE the Tract ALONE!!!
get rid of the old run down docks.
None need to be improved it is always changing on its own
Sugar barge ramp needs more cleaning/repairs as well as Russos
Leave it as is!
Weed abatement
I would like to see a forest of beneficial non-invasive swamp trees planted that contributes towards erosion control and wildlife sanctuaries like a grove of mangrove trees, bald cypress, river birches along what is left of the former levees.
There are a few navigational hazards that could be marked for safer boating
None the tract is fine the way it is, stop trying to destroy our water
Dont spray aquatic vegetation

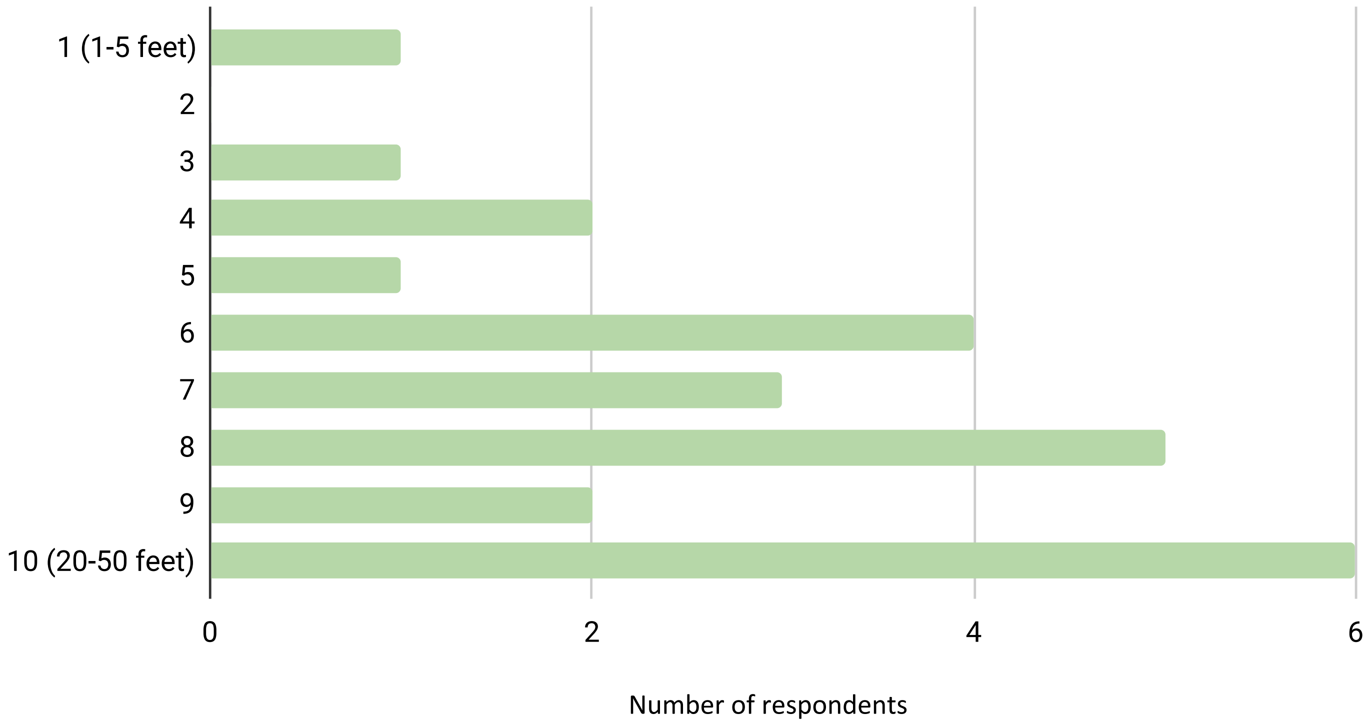
Tidal Marsh

If tidal marsh areas are created in the Tract, where would they be best located?

Where would they have the least detrimental impacts and greatest amenity value (such as new hunting opportunities, wildlife viewing, non motorized boating, etc.) for how you and others use Franks Tract?



How wide would you like potential tidal channels to be?



How could tidal marsh be designed for recreational uses (I.e., hunting, fishing, kayaking, boating)?

As a resident on Piper Slough I think any new tidal marshes should be constructed away from areas where people live, to if nothing else avoid the smell associated with marshes at low tide. As a sport fisherman, marshes should be constructed in areas that are not considered some the best fish habitat in the system (for the species that are commonly targeted by anglers).
Maybe across from sugar barge, would benefit businesses and educate and they would have parking for this type of thing
I think the smell and the bugs will be a big problem. And once the state gets what it wants they won't be back to address the problem
I still can't believe the obvious fix is to stop sending all the deltas freshwater to L.A.
Title marsh areas do not belong with Hunting Boating and kayaking
I am not a marine biologists. But in general tidal habitat restoration should be done with the interests of aquatic specie not the interests of DWR
why not
I don't know. Seems like a good idea but I know nothing about it.
This project is nothing more than a way to prevent salinity into the south delta where fresher water can be exported out of the Delta. Let moe freshwater out of the dams to hold salinity out of the Delta and let nature heal itself. That wouldn't cost $350M and ruin the local economy.
Stay away from Bethel island! Leave the fast water fast!
the map does not work properly.

How could tidal marsh be designed for recreational uses (I.e., hunting, fishing, kayaking, boating)?

Just create shallow habitat, with numerous small channels branching off, some deadending, some connecting with other small channels, just big enough for small boats (12' and under), whether motorized or not. Make these small channels very serpentine so boats are forced to go slow. Have CONSTANT enforcement to keep the homeless bums from moving in. If you do not, the area will be destroyed. If you do not make this part of the plan, the local residents will make sure this plan fails!
By the government not spending money on it
Leave the track alone
No leave it alone No changes needed at present the salt water should be down by Pittsburg. Leave it there. We need the fresh water now and here. What would happen to all the fresh water fish in the area. Bluegill,crappie, catfish, sac river shad, and many more
A tidal marsh isNOT NEEDED! Diverting fresh water to the canals and eventually to So Cal will only harm the Delta and the people who live, work and play there!
Public hunting blinds
I don't support a tidal marsh. You're going to ruin fishing and cut off the river flows if you put in a tidal marsh. This plan is just a cover to pump more Delta water south.
It should NOT be designed. Manmade "improvements" always fail
This is a great idea and should be balanced with recreational baiting access.
None needed.
You have to allow for acess!~
hunting, fishing, kayaking
None
This has nothing to do with use of the track!! its all about pumping our water south and keeping salt out.
Keep it out of EBRPD. Salt intrusion can be stopped by restricting - not increasing the flows to SOCAL desert land. Lets restore the deserts (LA, etc.) to their natural environment!
Against creating marshes
start along farmers field areas not residential homes not such a big swath as proposed Use little Franks Tract for the marsh area
Make is visually appealing and natural looking.
I wouldn't oppose a tidal marsh in areas where boating is not done such as the eastern edge of the tract (while still allowing access to boats where they currently pass.
Leave it alone
I would do nothing, Not going to fight mother nature
It can't, without ruining Franks Tract.
Variable width and lengths: Not for boating uses- only to provide vital habitat.
NO!
Stop trying to take water from the Delta.

How could tidal marsh be designed for recreational uses (I.e., hunting, fishing, kayaking, boating)?

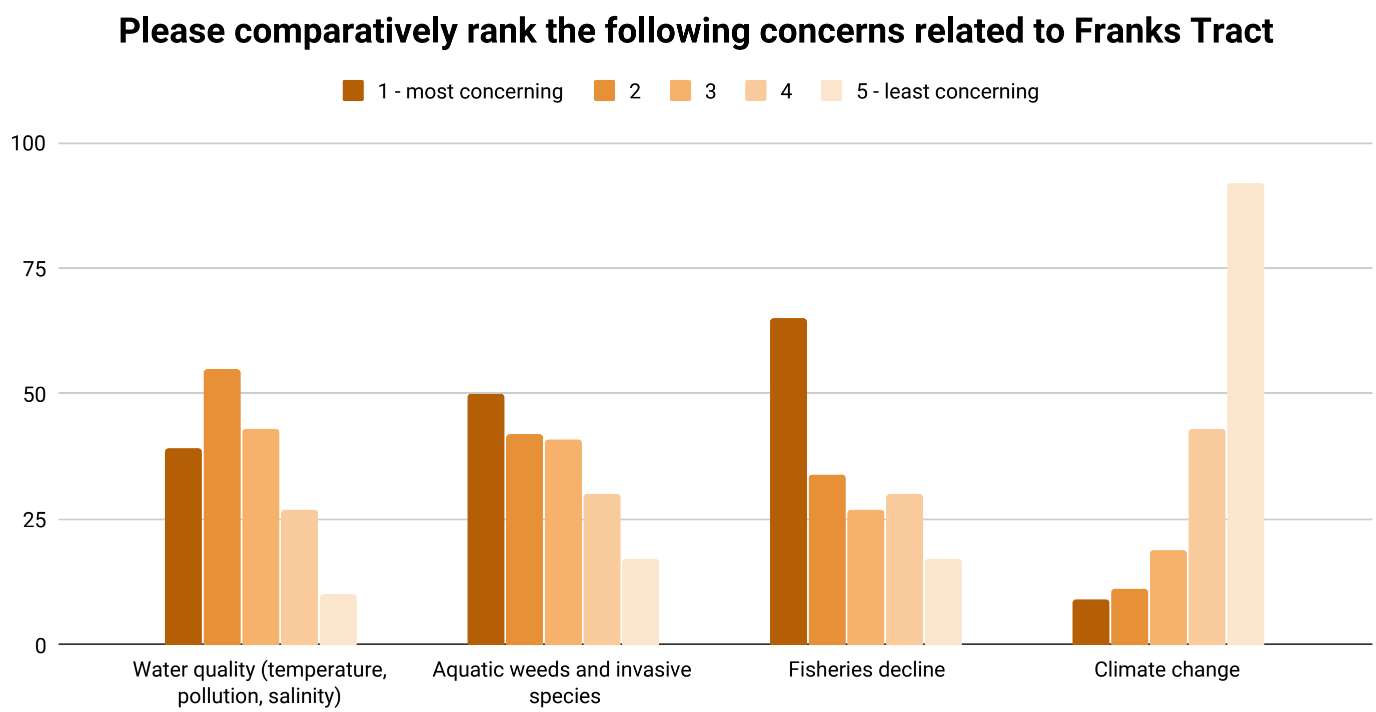
no marshes
No tidal marsh needs to be created
Please spend my tax dollars elsewhere like protecting the sport fishing of black bass and striped bass as well as others. Stop spraying floating vegetation and submerged vegetation. You’re destroying game fish habitat.
Farther west the better.
plenty of cuts through it for shallow boats at low tide
Kitesurfing
Away from Kiting areas
Tidal marshes are unwanted, the state is going to use the tract as a dumpster a marsh is going to bring in mosquitos , and further divert currents
I defer to ecological experts in this area. I am content with any plan that preserves primary and direct boating routes. Ideally, the plan would also encourage small businesses, which has shown to increase a healthier and more vibrant/engaged local community.
Smaller narrow channels but deep to prevent weed growth. Larger channels for powerboaters
no
leave franks tract alone its fine the way it is
Kayak access.
Kayaking
Little Franks Tract would be the ideal
kayaking, bird watching
Middle of the tract. Important to keep perimeter navigable by big boats and deep-draft boats.
stop selling our delta water to southern california.
None. the tidal marshes already exist. Take the money and work on the extremely dangerous homeless situations in our major cities. that would do more to help the human condition, health, and the environment than anything.
Signage
Dont do it
The entirety should be restored to tidal marsh with several meandering sloughs. By providing habitat for native species, as well as a source of food for smaller fish, it will serve to boost the native salmon fishery, native birds, and potentially kayaking and bird watching. Under no circumstances should it be managed for freshwater duck hunting. There are already abundant duck hunting opportunities in the Delta and Suisun Marsh. Maximizing tidal marsh will also help capture carbon and, ideally, allow accretion of land mass to keep pace with rising sea levels.
not sure, because I don’t kayak or boat, but there is a nice wood dock at William Pond Park in Carmichael (people fish here, families visit). Kayak rentals like at Negro Bar State Park? Not sure what kayakers and canoers need to put in and whether the waterways are safe (currents too strong?) for non-motorized use - maybe sailing and stand-up paddle boards?
My question is how will this effect the eco system for the fish
No idea
Kayaking

How could tidal marsh be designed for recreational uses (I.e., hunting, fishing, kayaking, boating)?

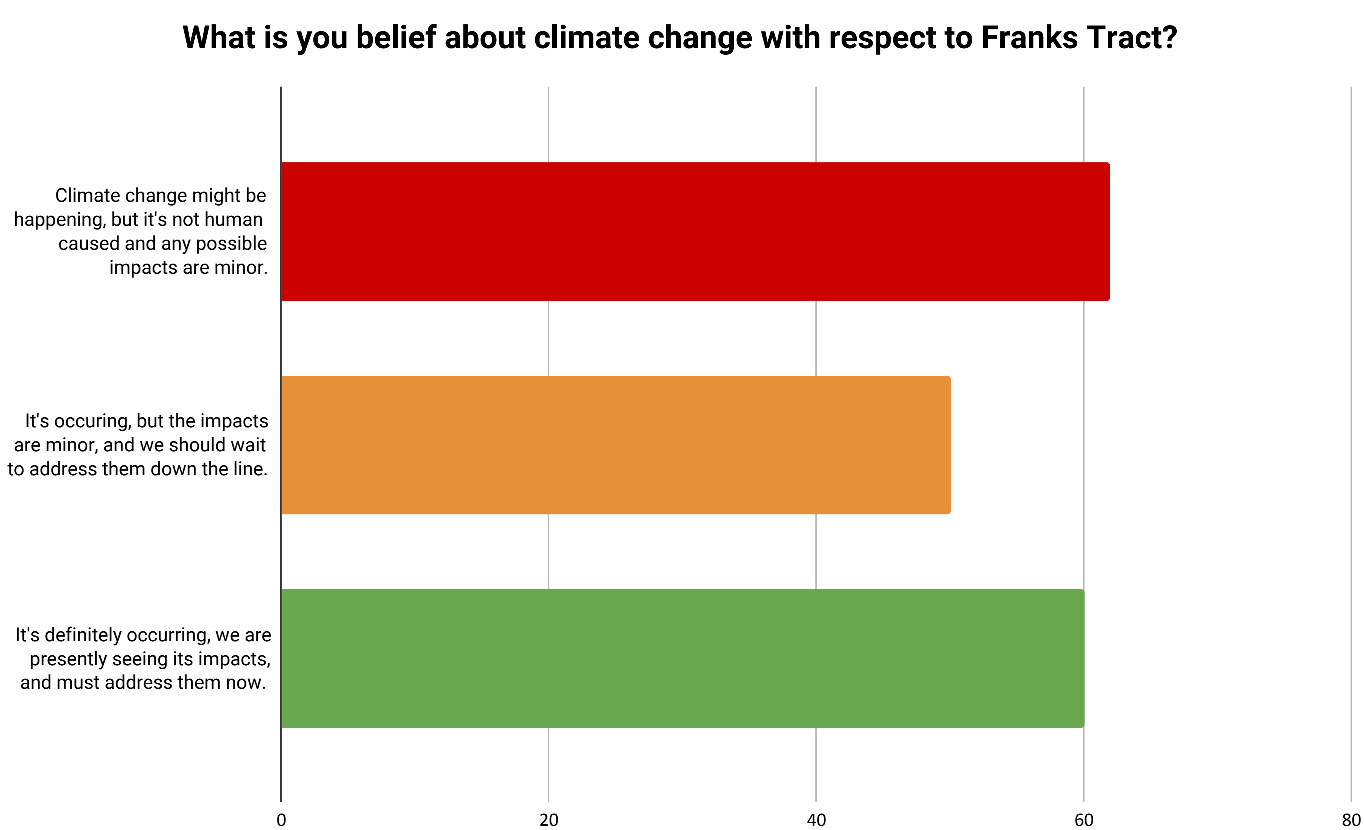
No comment
Please use COMMON SENSE. DO NOT TAKE ANY of the most trafficked areas and close it off. I can already see it " Frank's Tract closed INDEFINITELY due to Marsh Management" If I'm taking time out of my day for this survey, please look at my travel lines and everyone else's. Also, the sun sets in the west incase the people approving this forgot. Don't use the south or north areas for Marsh.
?
I'm worries salmon are get munched in the tract. Making the tract more hospitable for salmon should be a goal. I support some of the restorations of tidal habitat, with a goal of making the habitats more suitable for young salmon. Too many bass too!
I do not know requirements for a tidal marsh...there are many places along old sloughs around Frank's that are shallow and quiet. The area that is deeper, due to reclaiming soil from old track, good for water skiing and fast boating should be visually separated from marsh areas good for kayaking and fishing. This area has a lot of room for all and could be a major draw for outdoor recreating as well as stopping salty intrusion. NOT building the tunnel to SoCal would prevent that also.
Not needed, they are plenty of marsh areas in the surrounding areas
there is plenty of tidal marsh on Sandmound Slough. Frank's Tract needs to be dredged...
Don't do it
land fill
Do not believe tidal marshes would be helpful
Picnicking, wildlife viewing
No use for it
Hunting and fishing
This is a bad idea - franks tract is already teeming with wildlife. It is obviously intended to benefit adjacent water agency land owners and not wildlife or recreational users.
It is and has been fine the way it is
Restore Little FranksTract
Don't fill in Franks Tract. Rather, dredge channels and provide greater water craft access to the waters of the United States and cease causing added restrictions and access to Delta waterways.
Having direct access via levees or electric motorized boats
Leave it alone
Build it in little Franks tract. Leave the tract alone. It will affect all residents, boaters, anglers and hunters if you touch the main tract.
keep the waters clean
Tidal marsh would need to be outside of the floating blind permitted area and closed to hunting. This would create some sanctuary area for the birds to rest and ultimately improve the hunting overall.
I question whether marsh could be established here given the very significant currents generated by the south delta cvp and swp pumps. The currents combined with the grass on the bottom make it very difficult to moor here.
Kayaking passages, beach areas, shade tree areas
We don't need a tidal marsh.
All of the above
Don't destroy Franks Tract

Only old franks track. Do not destroy the current franks track. Not a good plan on any level.
There are no good areas to be drawn. Closing access to fast water would destroy Bethel Island
N/A
little tract....create habitat transition zones. ecotones.
Lower water levels in Frank's Tract
DON'T MAKE ANY CHANGES
anywhere tidal marshes are created would have a positive impact on small craft, fishing, bird watching and waterfowl hunting.
No tidal marshes need to be added it creates its own yearly
I haven't the slightest idea, but I'd visit them.
dont create tidal marshes leave it the way it is
Hunting fishing that's it
We don't need more tidal marshes.
Planting groves of water tolerant trees along the outline of what is left of the former levees will bring more wildlife to the area for migrating animals that need to rest. It would also cool down the water for migrating salmon. It would filter sediments from overflowing into the bay which becomes habitate for microorganisms and crustaceans at the bottom of the food chain that will feed the sport fish giving them better flavor. These trees will provide a place to anchor kayaks and boats during rest breaks.
None
Tidal marsh would ruin the tract for boating and fishing, as well as loss I f business for local marinas.
None leave the text alone
Dont spray herbicides

Rank



Climate Change



Survey Analysis

Regression analysis of the relationship between age, income, location, category and public access/climate change perspective.

Text analysis of long-form responses:

- Could berthing areas in the tract be improved? If so, how?
- Could launching areas in the tract be improved? If so, how?
- In general what type of access points are needed?
- Could boating in the Tract be improved? If so, how?
- What would you like to see here? (public access)
- What improvements could be made here?
- What general improvements could be made?
- How could tidal marsh be designed for recreational uses (I.e., hunting, fishing, kayaking, boating)?
- What are your other concerns related to Franks Tract?

Maps of boating routes by user category.

Regression Analysis | Public Access

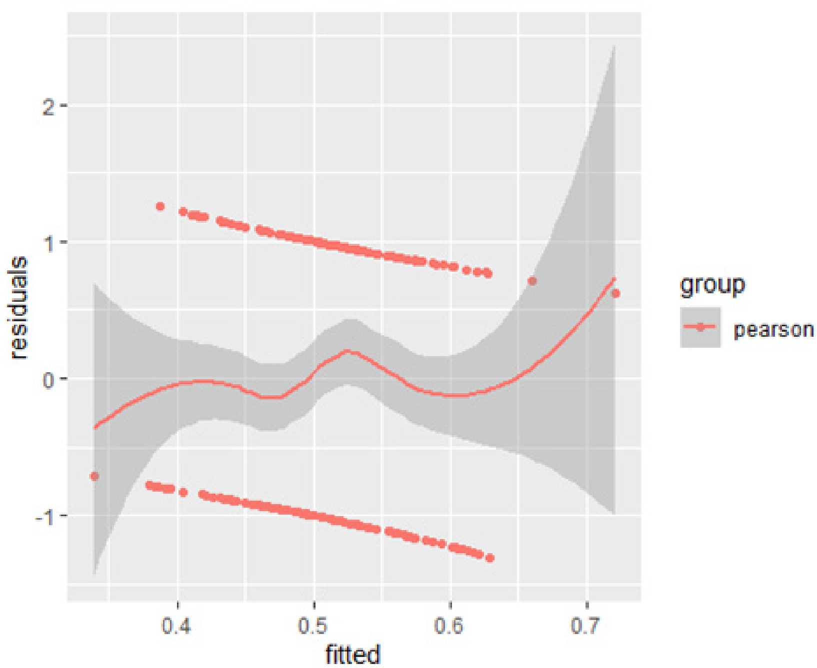
Question: Is distance from the Tract, age class, or average yearly household income a significant indicator of perceptions on public access?

Do you think more public access areas should be created around the Tract for recreational use?

Coefficients:

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.1597188	0.6423368	-0.249	0.804
distance	0.0001344	0.0002140	0.628	0.530
salary	-0.0351046	0.0257734	-1.362	0.173
age	0.0106304	0.0101239	1.050	0.294

Regression analysis indicates that there no significant relationship between a distance from the Tract, age class, or average yearly household income and response to the public access question.



Regression Analysis | Climate Change

Question: Is distance from the Tract, age class, or average yearly household income a significant indicator of climate change beliefs?

What is your belief about climate change with respect to Franks Tract?

- *It's definitely occurring, we are presently seeing its impacts, and must address them now.*
- *It's occuring, but the impacts are minor, and we should wait to address them down the line.*
- *Climate change might be happening, but it's not human caused and any possible impacts are minor.*

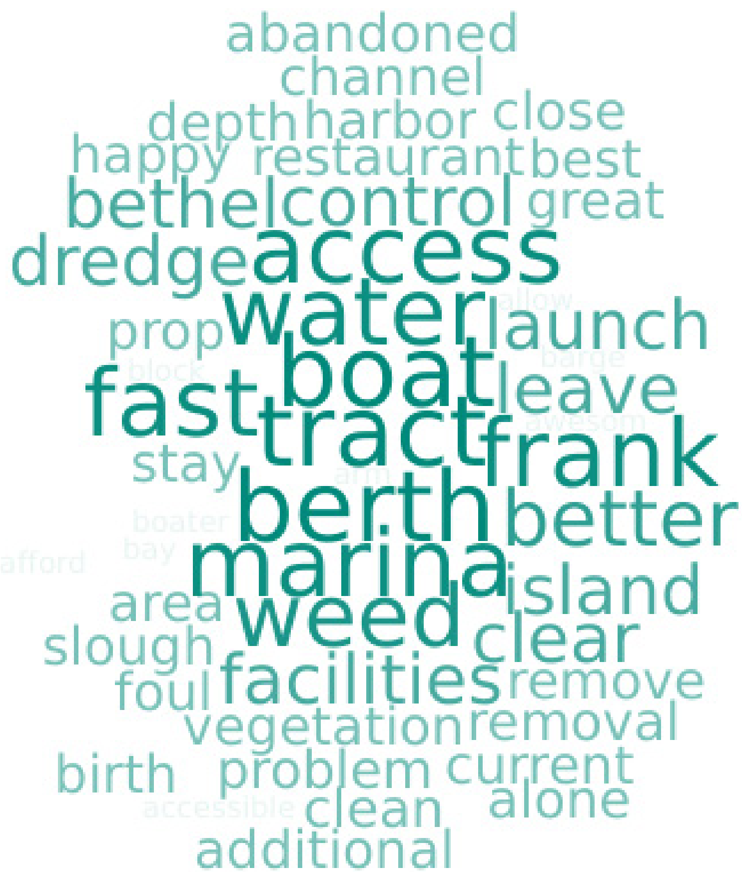
Coefficients:

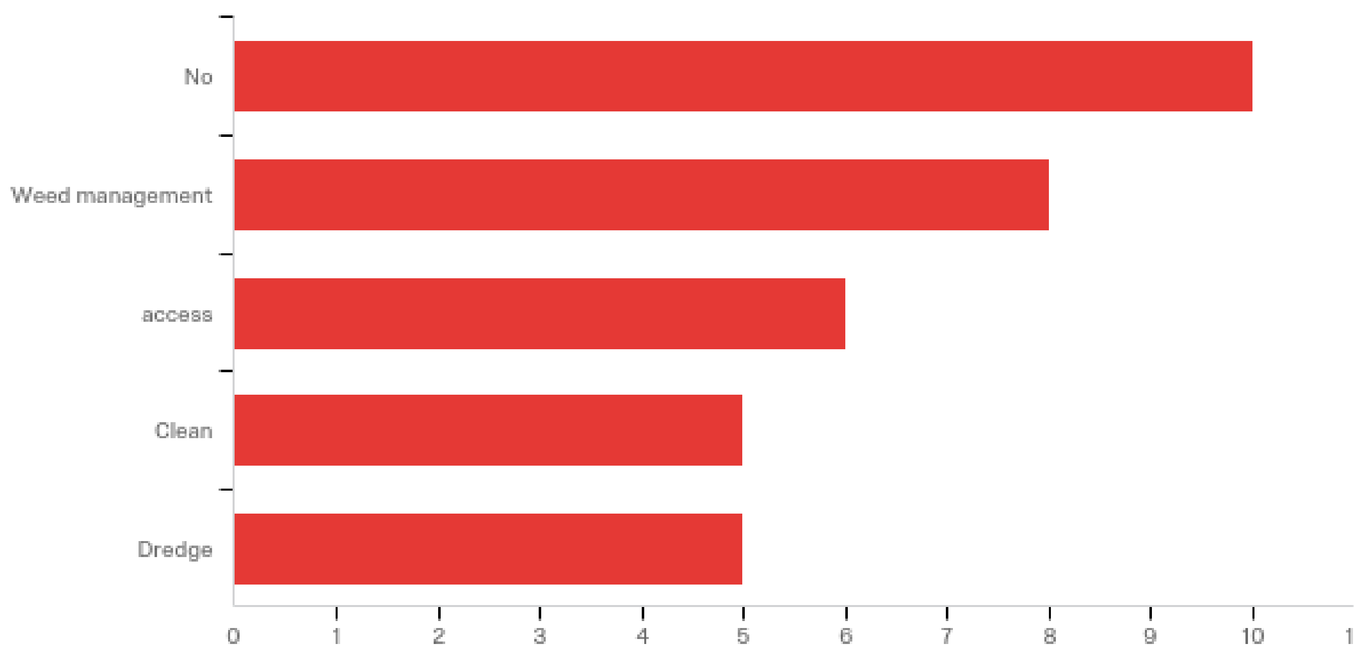
	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.3731385	0.9148241	-0.408	0.683
distance	-0.0005631	0.0010988	-0.512	0.608
salary	0.0163877	0.0334566	0.490	0.624
age	-0.0073281	0.0136789	-0.536	0.592

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1

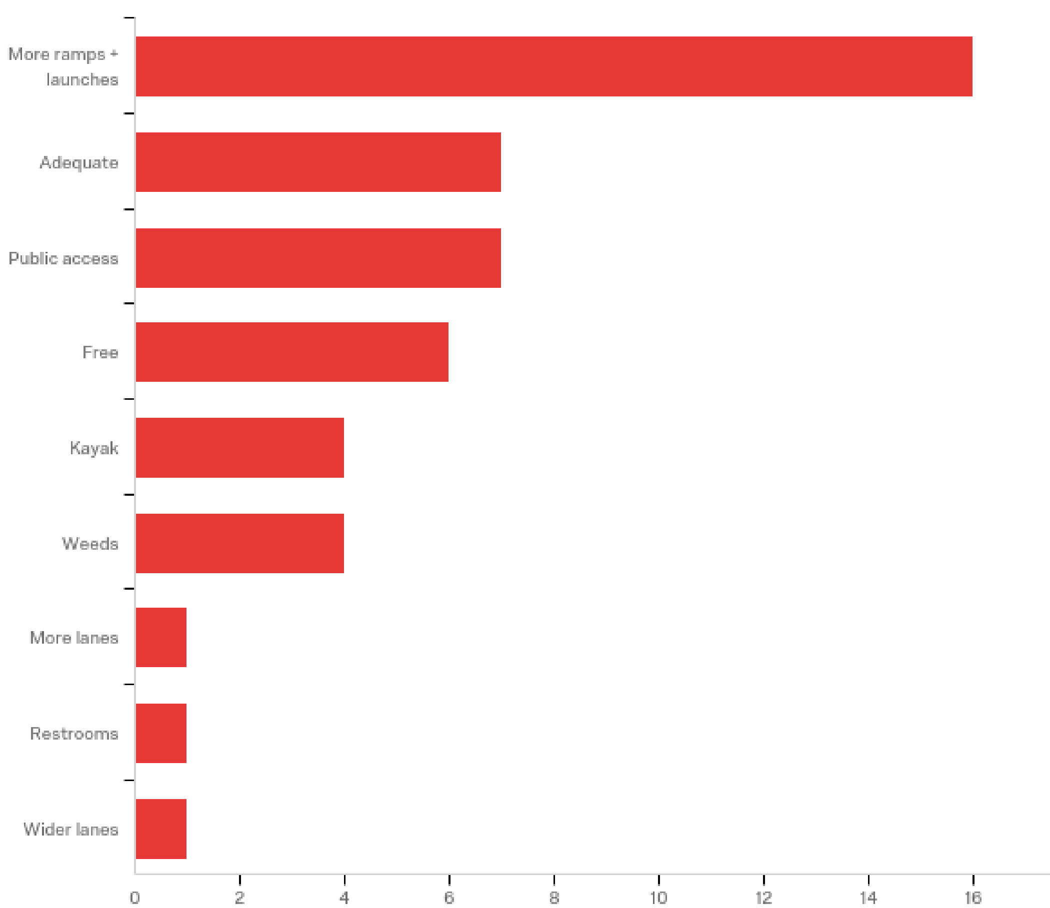
Regression analysis indicates that there no significant relationship between a distance from the Tract, age class, or average yearly household income and response to the climate change beliefs question.

Could berthing areas in the tract be improved? If so, how?

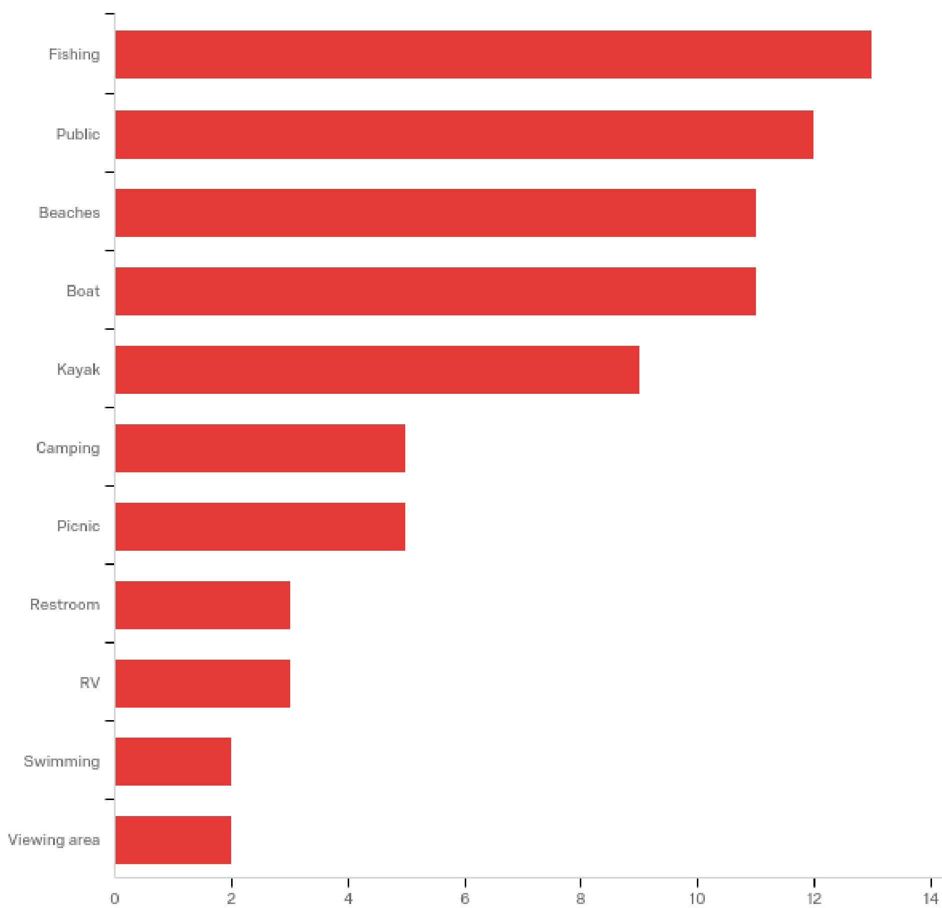




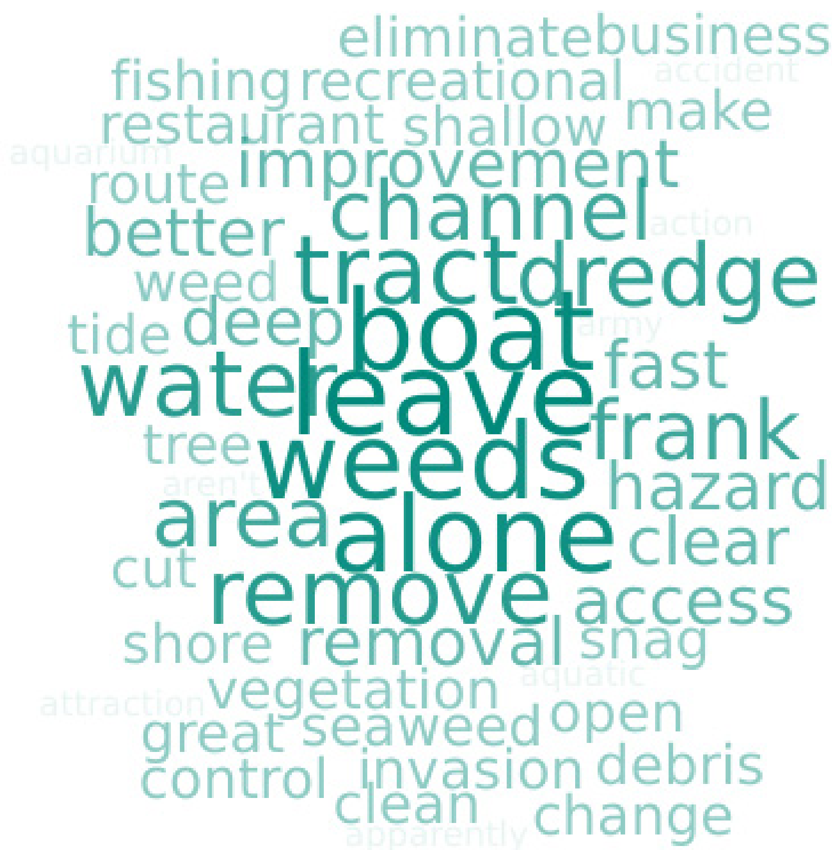
Could launching areas in the tract be improved? If so, how?

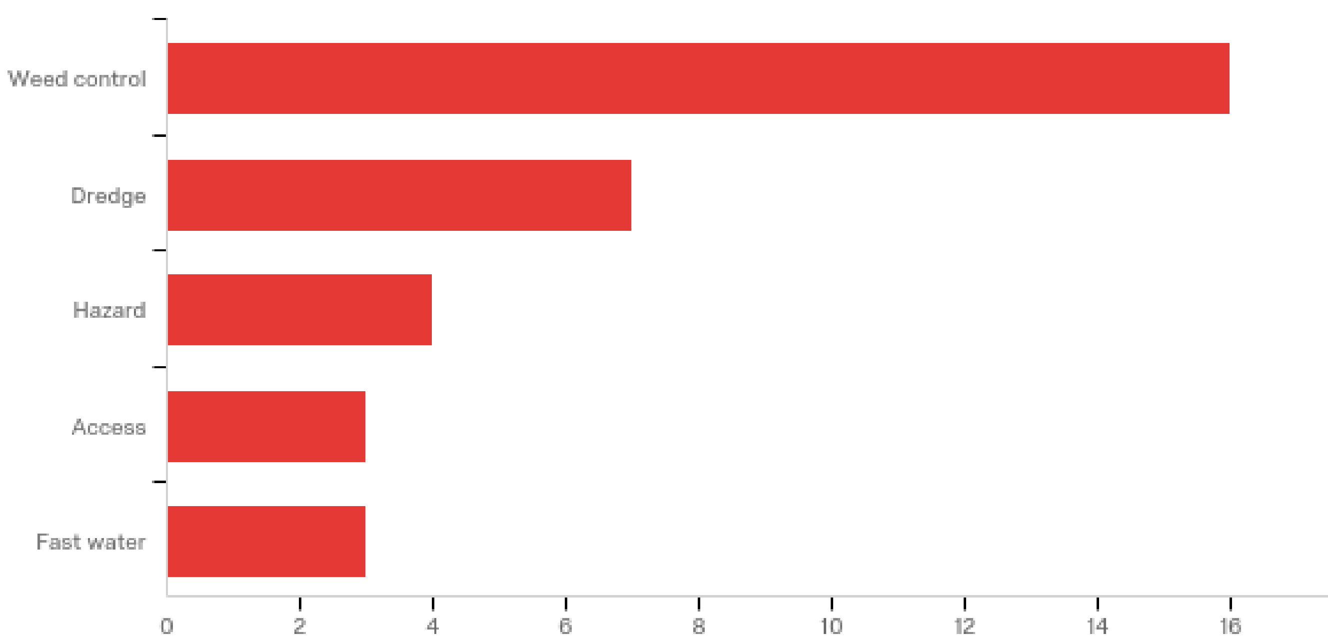


In general what type of access points are needed?

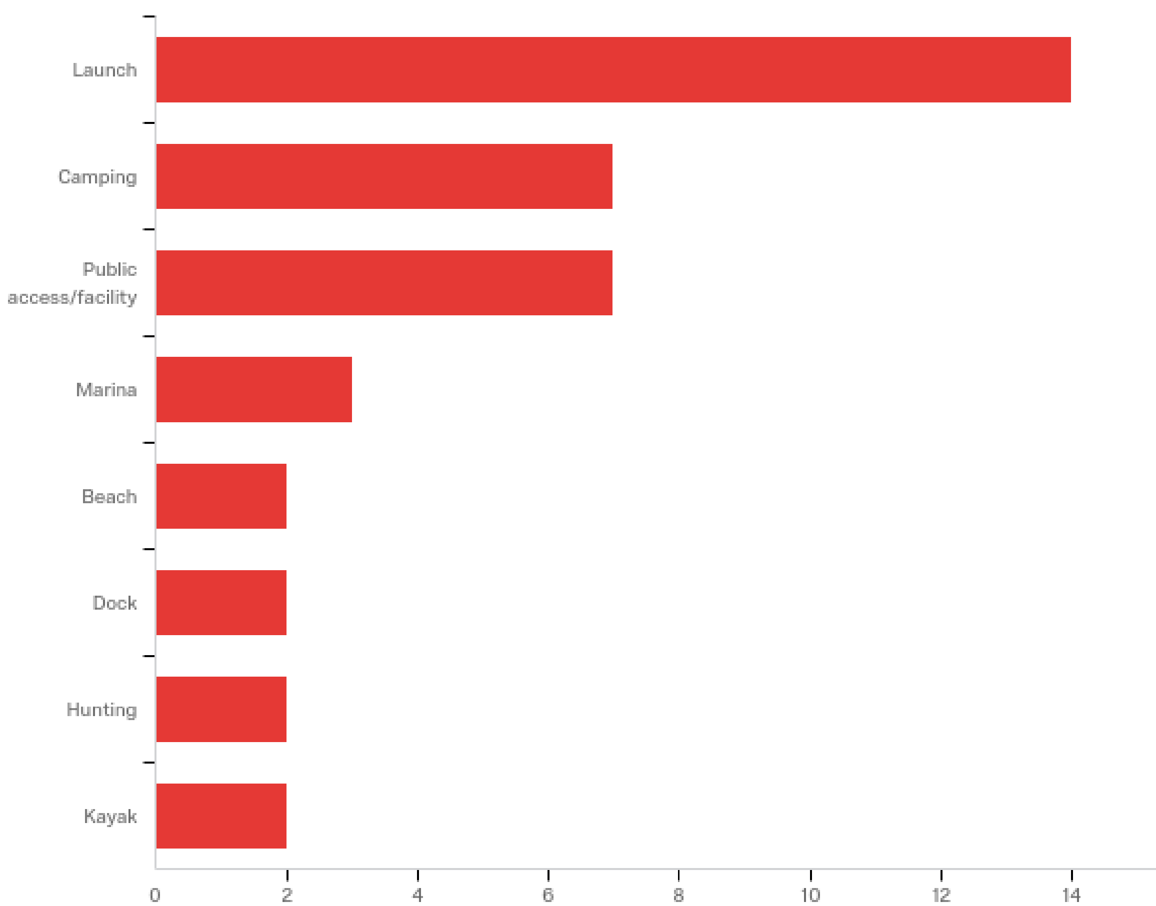


Could boating in the Tract be improved? If so, how?

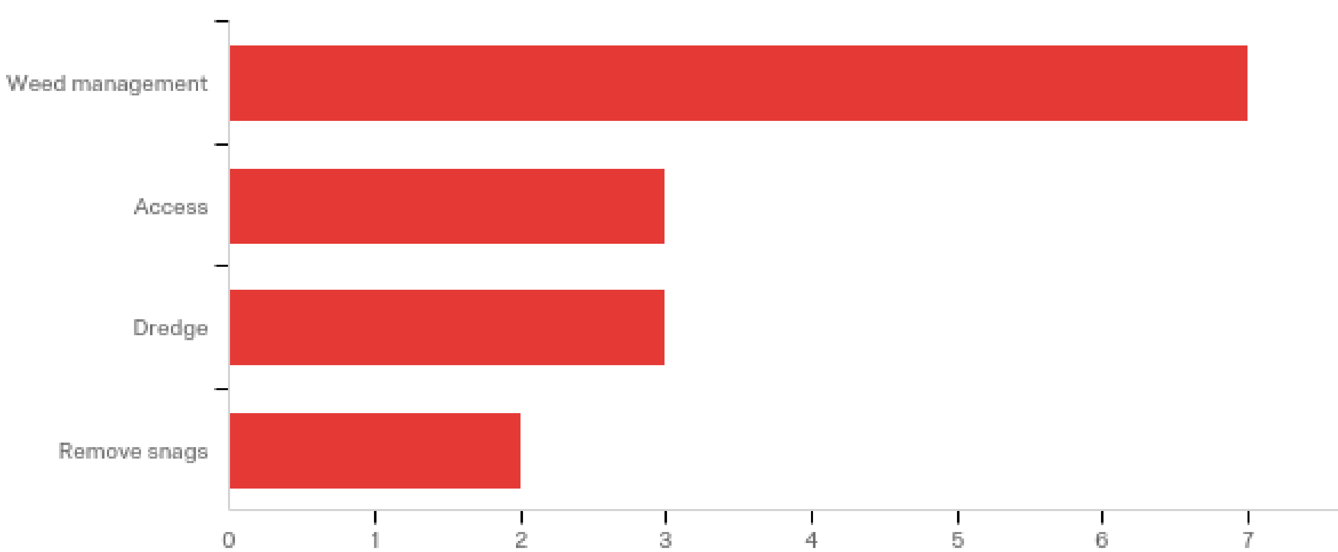




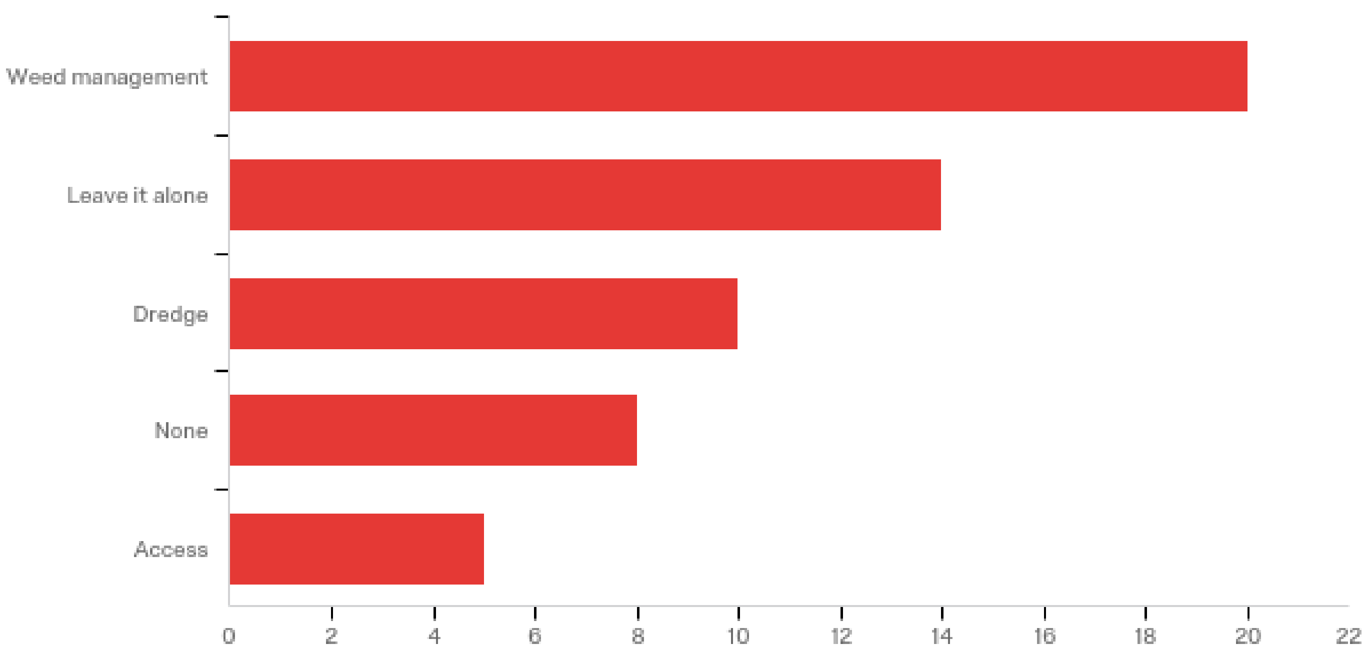
What would you like to see here? (public access)



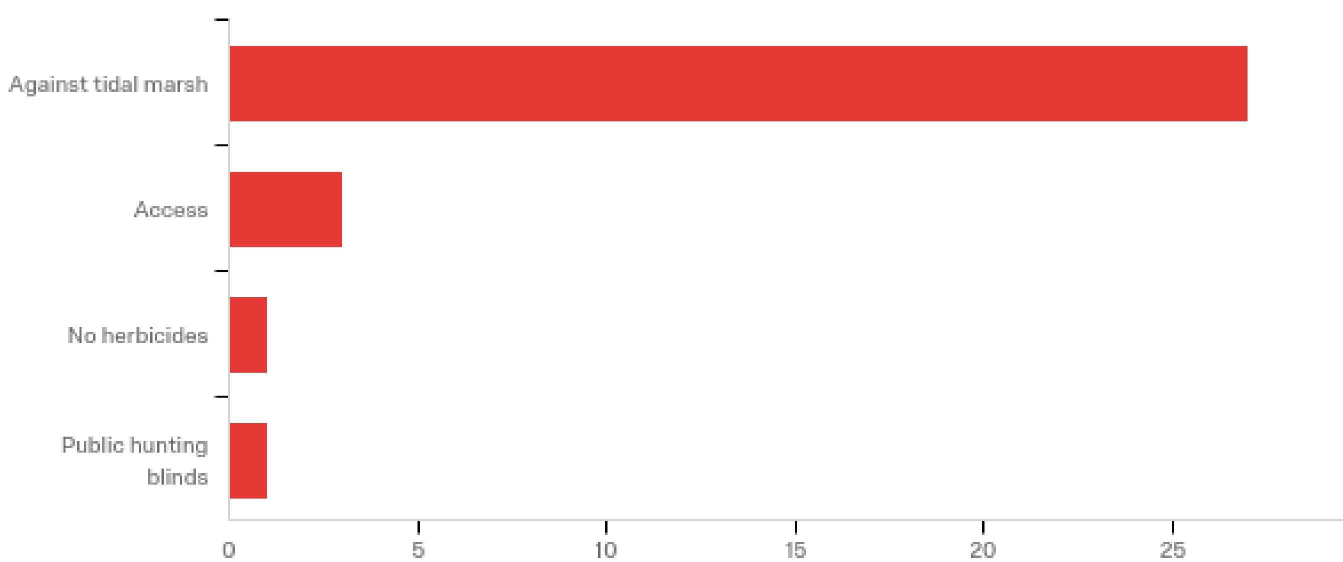
What improvements could be made here?



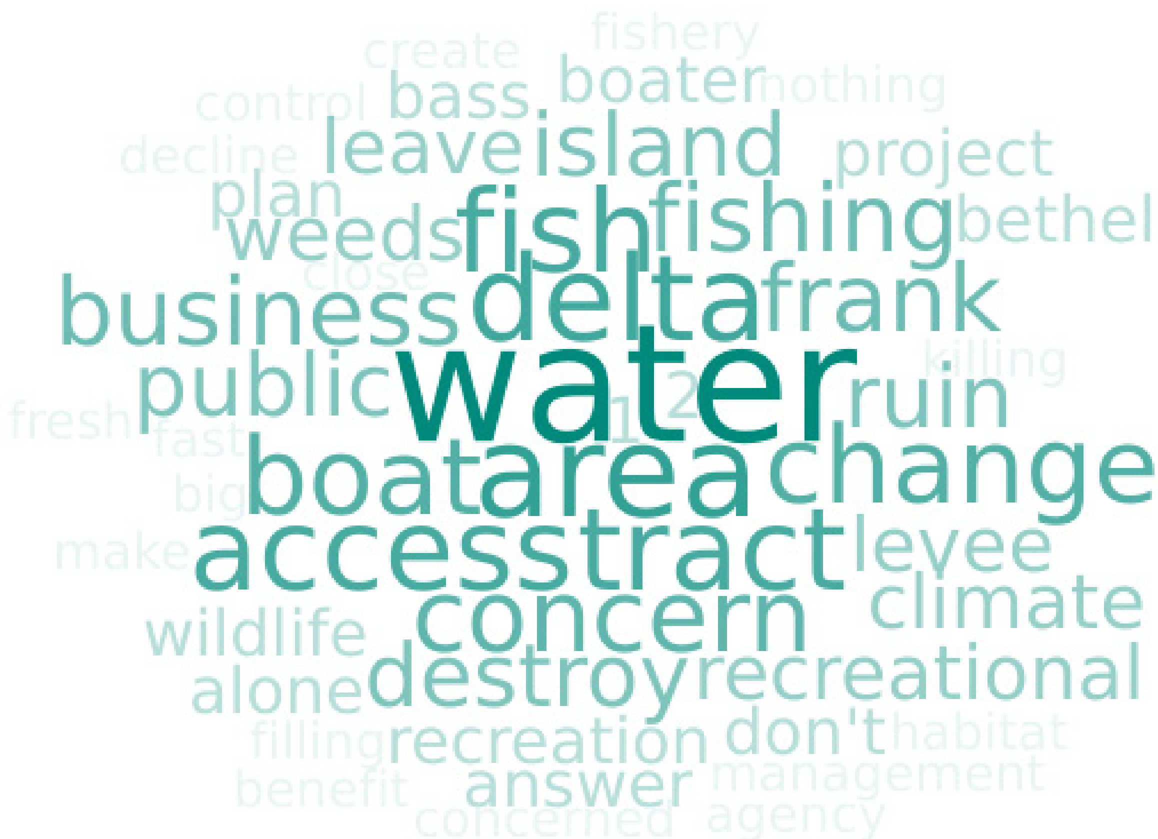
What general improvements could be made?

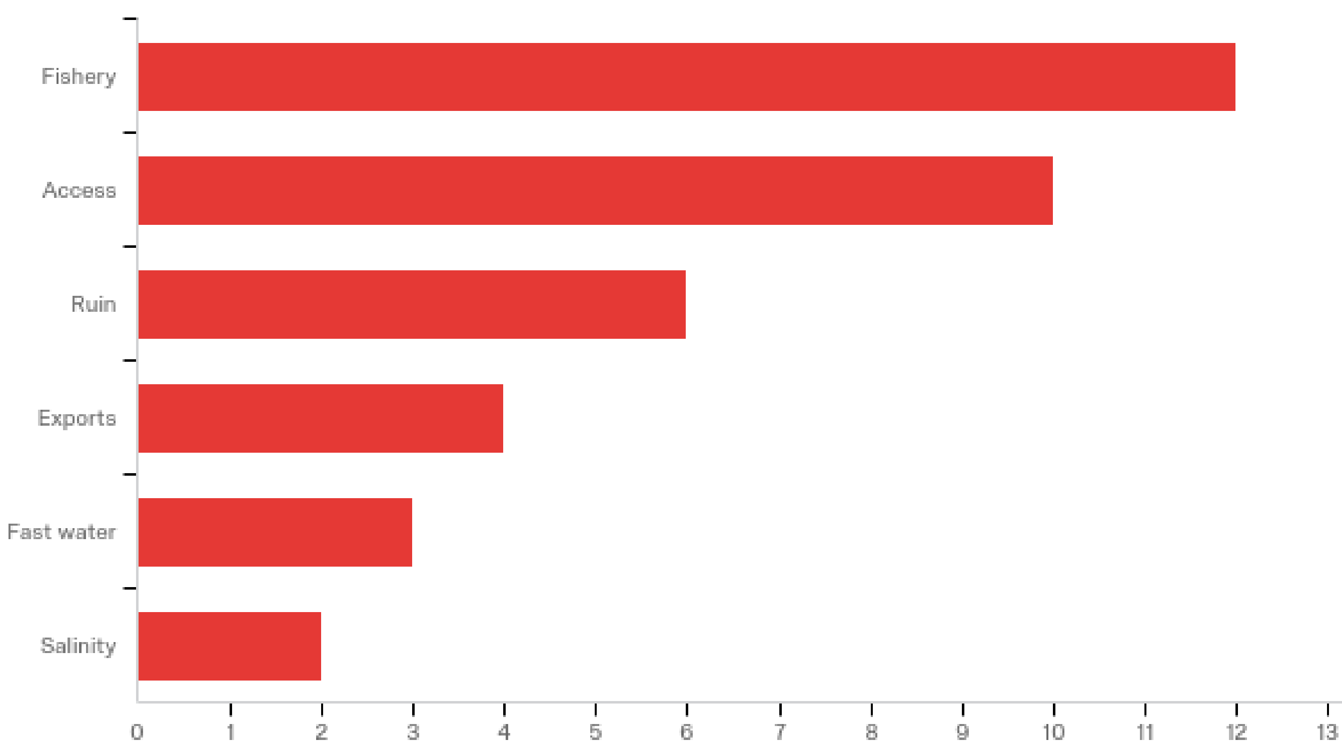


How could tidal marsh be designed for recreational uses (I.e., hunting, fishing, kayaking, boating)?



What are your other concerns related to Franks Tract?





UC DAVIS LANDSCAPE ARCHITECTURE STUDIOS

WATERLAND I

THE WATERLAND I studio occurred between the Franks Tract Feasibility Study and this planning effort , and focused primarily on designing and modeling new forms of land/marsh configurations that could meet the broader range of project goals the feasibility study identified. Work from this studio informed the initial round of design concepts for the Franks Tract Futures followup planning effort.

WATERLAND II

THE WATERLAND II was integrated into Franks Tract Futures planning effort and focused on the design of recreational features within the larger landform strategies being developed by the consultant team. Students explored both the uses, scales and type of features that might be most desirable, as well as their optimal placement within the tract.

The following pages provide documentation of both studios.

WATERLAND STUDIO

Integrative Design Strategies for the Restoration of Franks Tract

UC Davis Advanced Landscape Architecture Studio (LDA 182)
Fall Quarter, 2018

COURSE INSTRUCTOR
Brett Milligan, UC Davis Professor of Landscape Architecture

TEACHING ASSISTANT
Alejo Kraus-Polk, UC Davis Geography PhD Student

UC DAVIS LANDSCAPE ARCHITECTURE STUDENTS
Adams, Isabel
Chue, Marylyn
Chung, Hayley
Cutri, Carolina
Demegillo, Julian
Huang, Bowen
Hui, Kaylin
Hur, Soo Min
Ma, Ka Hei Christie
Madyun, Rasul
McLane, Audrey
Nguyen, Cathy
Reid, Shawn
Tarrant, Belinda
Wong, Melody
Yung, Sum Yee
Zeng, Luyu

ACKNOWLEDGMENTS
We would like to express our gratitude to the people who live, work, and play in and around Franks Tract and Little Franks who shared with the students their passion, perspective and sense of place. Specifically, we thank Scott and Jamie Bolt at Bethel Island Harbor for hosting the students on an overnight field trip.

We are grateful to Eli Ateljevich, Operations Research Specialist at California Department of Water Resources, for his modeling work, reviews, and class presentations.

We would also like to thank the various reviewers who contributed their time and design energies to the studio, including:

Allegra Bukojemsky
John Durand
Peter Moyle
Ted Sommer
Jay Lund
Jamie Bolt
Scott Bolt
Sheryl-Ann Simpson
Emily Schlickman

PREFACE
Senior undergraduate students in the Landscape Architecture program at UC Davis participated in the design of one of the most ambitious restoration projects in the history of the Sacramento San-Joaquin Delta.

This booklet is intended to summarize some of the promising design concepts that were developed in the course and explain the participatory design research process through which they were made.

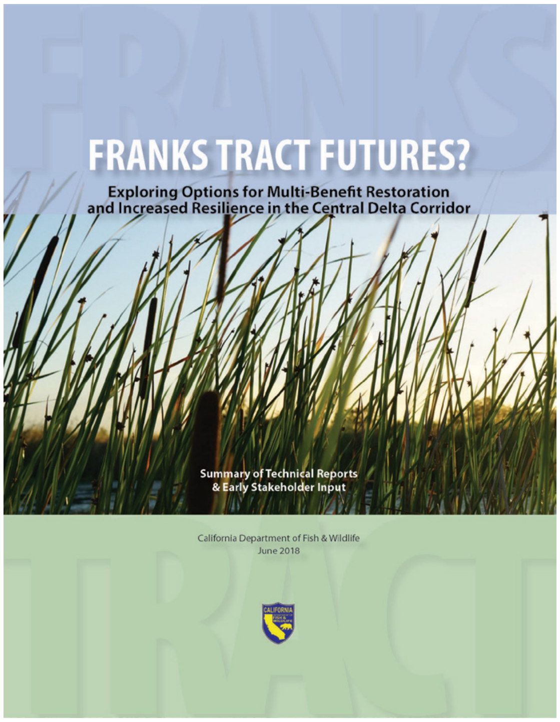
BACKGROUND
The site for the studio is in the heart of the Sacramento-San Joaquin Delta (Delta) at a place called Franks Tract. Franks tract is a unique California State Park that consists of a 3,000 acre tidal lake where many people live, fish, hunt, boat, and recreate. This lake is the result of an infrastructural failure in 1938 when one of the Tract's levees breached and was not repaired.

Much of the Delta - including Franks Tract – historically consisted of a vast complex of tidal marshes and sinuous rivers unique to the entire west coast of the Americas. This Delta changed when these marshes were "reclaimed" in the late 19th to early 20th century to create farmland. Land reclamation was achieved by constructing a network of earthen levees, which allowed the marshes to be drained and productively grazed and farmed. These engineering efforts radically remade the Delta. Over 95% of the former marshes no longer exist, the Delta's ecology has radically changed, and the place is urbanized and experientially very different.

Today, Franks Tract occupies a contested and complicated position in the Delta. It is chock full of introduced fishes and "invasive" plant species, and yet is also ranked as one of the top 10 bass fishing waters in the United States. In 2016 alone, 133 bass tournaments were held in Franks Tract. Marinas, restaurants, service industries and many residents have established themselves around the lake, and have come to cherish and depend on it.

But due to ecological crisis and restoration efforts to address endangered species – such as Salmon and the Delta smelt - the state is exploring design strategies to restore parts of Franks Tract back to tidal marsh. These strategies would transform this watery landscape in ways that would not only affect the ecology of the Tract, but also the socio-cultural, economic and recreational values of this evolving place.

In this studio, students envisioned design concepts for what this future state park might be. They attempted to integrate and reconcile the desires of multiple stakeholders (including residents, park users, business owners and public agencies) through the design of multi-functional landscape features. This research by design process included on-site fieldwork, direct engagement and design workshops with stakeholders and local residents, and a strong emphasis on the modeling, making, and representation of landscape forms.



FRANKS TRACT FUTURES

The California Department of Fish and Wildlife (CDFW), working with other state agencies and experts developed a restoration approach that would restore a portion of Franks Tract to tidal marsh and deepen the remaining flooded acreage. The Franks Tract Futures report summarizes initial exploration into the possibility of restoring and improving Franks Tract in a way that benefits natural resources, water quality, and local communities.

The report found that the strategic creation of wetlands in the Western portion of Franks Tract could have significant ecological and water quality benefits. However, there was significant concern about the impacts of these potential changes amongst those who live, work and play in and around Franks Tract.

In its conclusion, the report lists potential goals for a more detailed restoration plan for Franks Tract. These include:

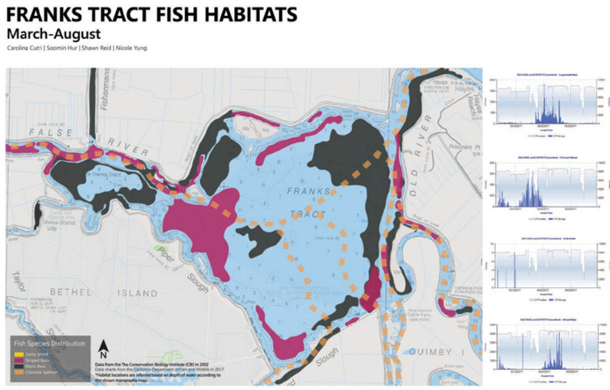
- Achieve habitat enhancement for Delta Smelt and other declining pelagic fish species including striped bass and other native fishes
- Improve water quality in the central and south Delta
- Maintain or improve recreational opportunities in Franks Tract
- Maintain navigational access consistent with habitat and water quality enhancement
- Eliminate or significantly lower need for aquatic weed control in Franks Tract
- Increase resilience of Franks Tract and adjacent areas to effects of climate change

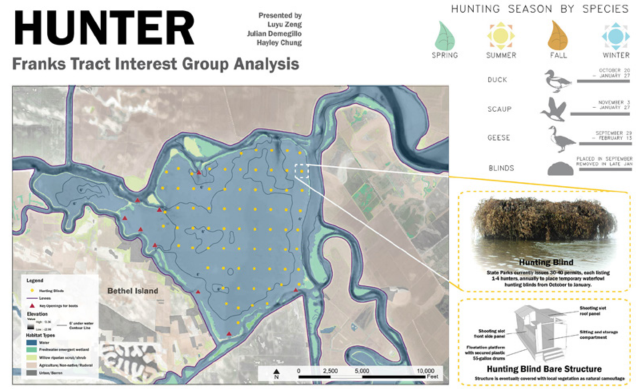
The studio sought to build upon the initial findings from the Futures report developing designs that balanced state objectives and community desires through synergistic, multi-benefit solutions. Additional stakeholder engagement combined with a variety of modeling and prototyping allowed students to generate new knowledge and a broad range of design concepts.

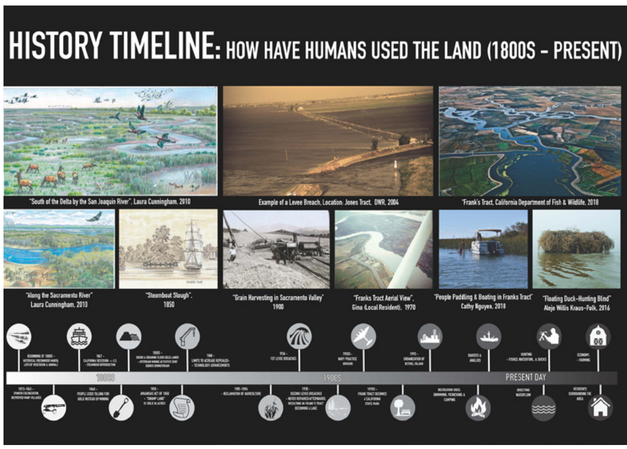
STUDIO FIELD TRIP AND COMMUNITY WORKSHOP

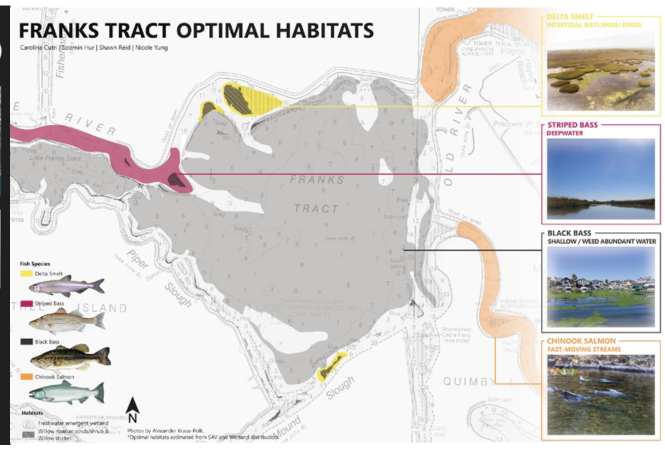
Students had a chance to hear perspectives from local community members first hand during a stakeholder meeting that took place during an overnight field trip to Bethel Island a week after the start of class. For the rest of the quarter, students continued to learn more about the history, ecology, and culture of the Tract, as well as the role it plays in the complex water infrastructure of California.

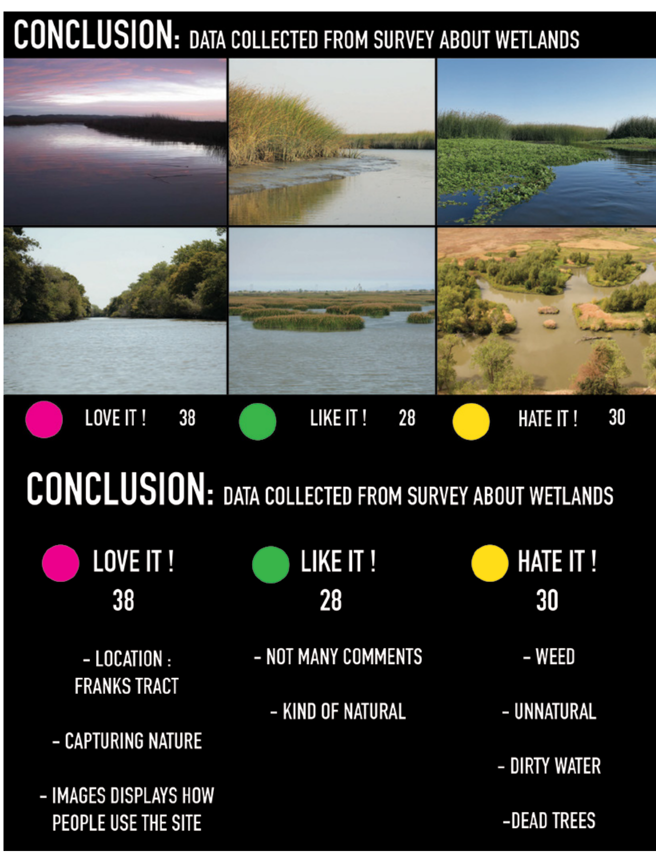
WORKSHOP RESEARCH

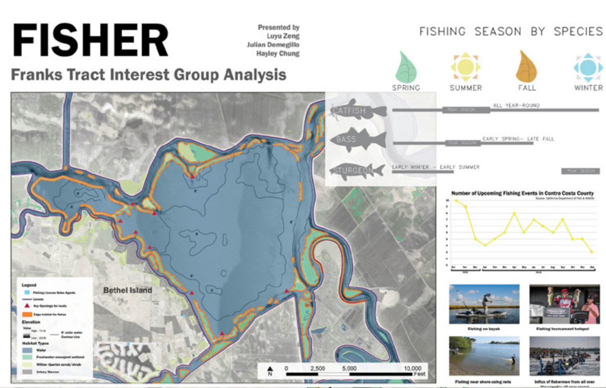


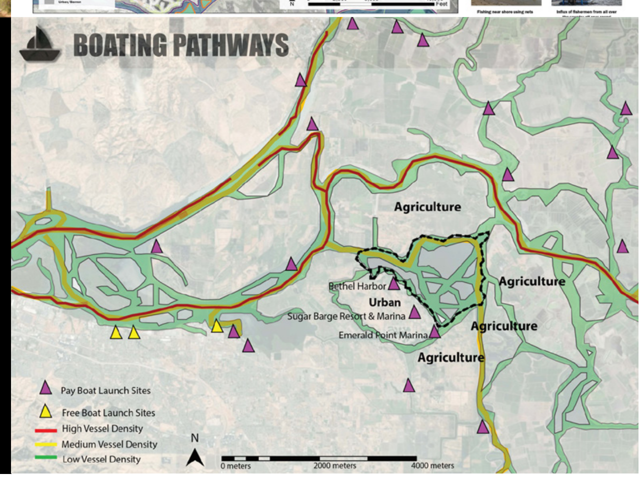












DESIGN PROCESS

Students were tasked with balancing state objectives and stakeholder needs. They developed their designs through a series of four exercises.

Exercise 1
Entailed mapping, diagramming, in-the-field exercises and meeting with stakeholders. Students were required to approach the landscape from the perspective of a particular stakeholder (i.e., hunter, fisher, business owner, resident).

Exercise 2
For this exercise, students created conceptual designs for the integrative social and ecological reclamation of Frank's Tract. Students worked through an iterative research process, learning by testing out different design concepts at various scales by drawing and modeling using both physical and digital media.

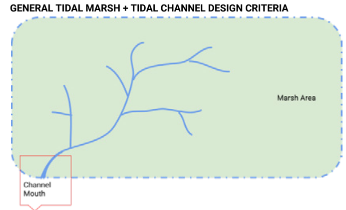
Exercise 3
Students refined their design concept based on feedback received from a series of reviews with technical experts. Based on this exerciser's review (the studio mid-review) selected designs were computationally modeled by Eli Ateljevich to test their water quality performance.

Exercise 4
For the final exercise students designed and detailed a specific feature or cultural amenity within their overall design scheme for Franks Tract. Students also created a set of final set of illustrative drawings of their design presented at the final review

For each exercise, students were provided with set of design parameters. Throughout the design process, students were asked to integrate and reconcile the following performance criteria:

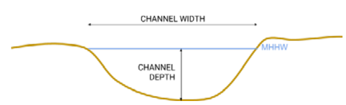
- Sea level rise
- Tidal wetland ecology
- Diverse recreational uses
- Public access
- Aesthetics and user experience (visual, smell, feel, etc.)
- Salmon migration
- Regional economies
- Housing
- Flood control
- Salinity intrusion
- Delta water exports
- Waterway navigability
- Emergency service response times

GENERAL TIDAL MARSH + TIDAL CHANNEL DESIGN CRITERIA



Channel feature	10 acre (marsh area)	100 acres	1,000 acres
Width at mouth	30 ft	60 ft	150 ft
Depth at mouth below MHHW	5 ft	7 ft	10.5 ft
Full channel area*	~.7 acres	~7 acres	~70 acres

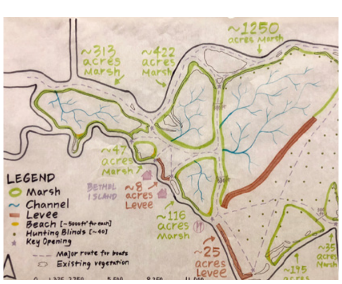
* ratio of channel area to marsh area is ~ 6% - 8.5%

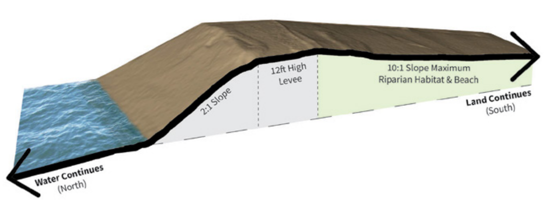


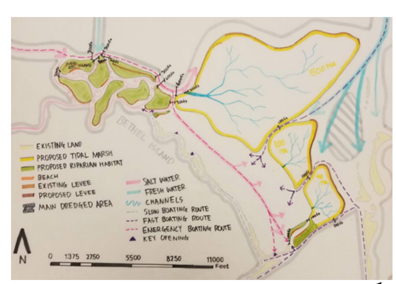
REVIEW PROCESS

Four review sessions throughout the quarter provided opportunities for students to practice there presentations skills and receive feedback from stakeholders, practitioners, and Delta scientists.

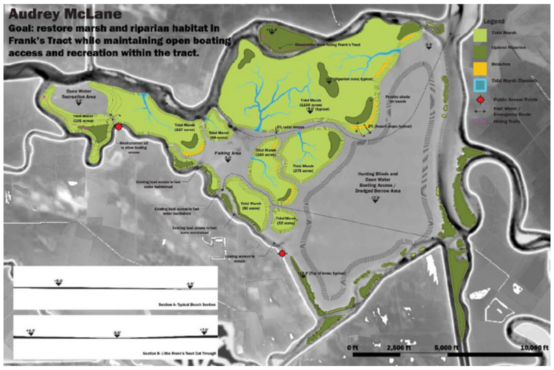
These review sessions served to reveal questions and uncertainties among the reviewers, highlighting areas where additional research is needed.



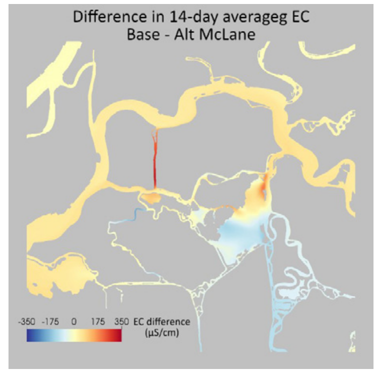




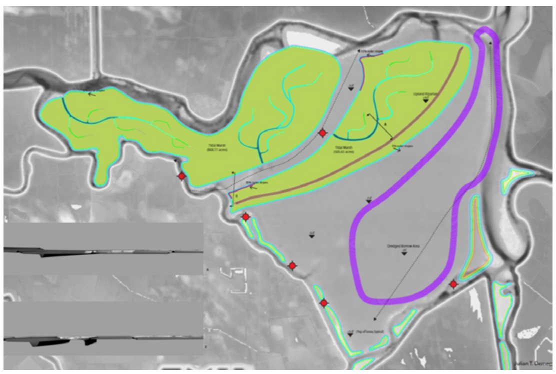
HYDRODYNAMIC MODELING



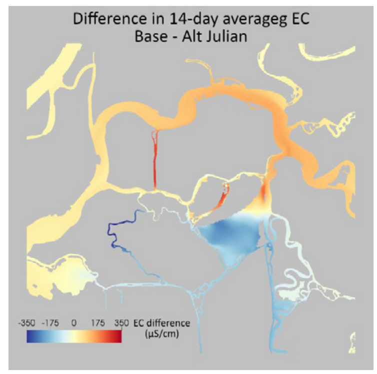
Student's Conceptual Design



Modeled Result



Student's Conceptual Design



Modeled Result

HYDRODYNAMIC MODELING

Two student designs were selected for hydrodynamic modeling by Eli Ateljevich, DWR. Selections were based on expected performance and opportunity to augment the initial modeling conducted as a part of the Franks Tract Futures report. The designs were characterized by three general land massing strategies to address salinity intrusion issues, combined with ecological restoration, local economy and recreational goals.

TYPE 1. FULL BARRIER

These designs are most similar to the CDFW design proposed and modeled in the Franks Tract Futures Report. A full blockage of the Western portion of the Tract meets 100% of the agency requirements related to salinity intrusion prevention.

TYPE 2. SMALL POOL WITH CHANNEL THROUGH ISLANDS

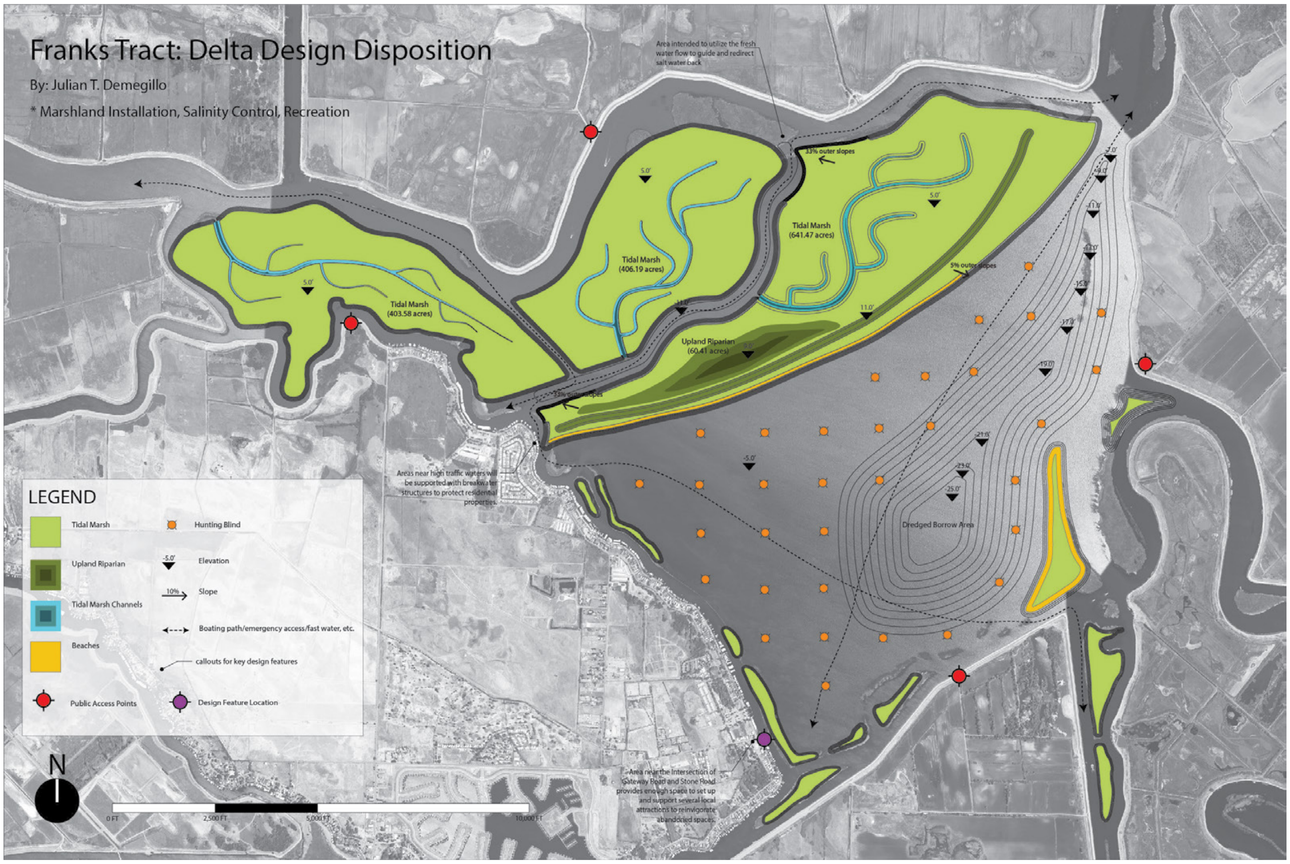
These designs are characterized by a small embayment on the East (i.e., front-side) of Bethel Island. One or more channels allow for navigation into and out of the embayment.

TYPE 3. LARGE POOL WITH BERM

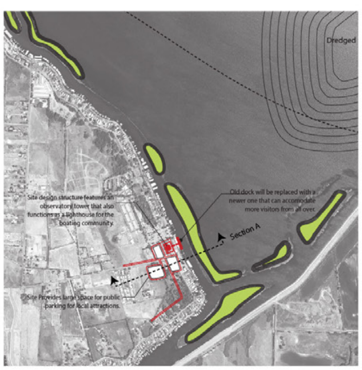
These designs are most similar to the locally proposed alternative developed and modeled as part of the Franks Tract Futures Report. They provide the largest areas of open water on the eastern, urbanized edge of Franks Tract, shifting the barrier land mass closer to the center of the tract.

The following pages document all of the student's final designs, organized according to these three general strategies.

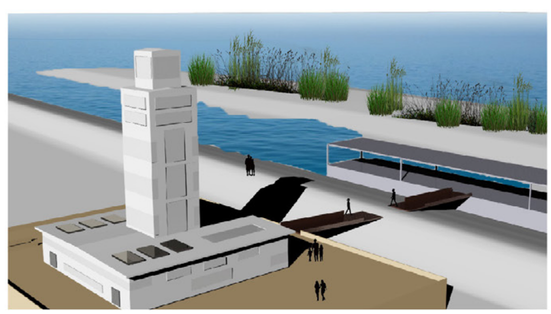
TYPE 1. FULL BARRIER

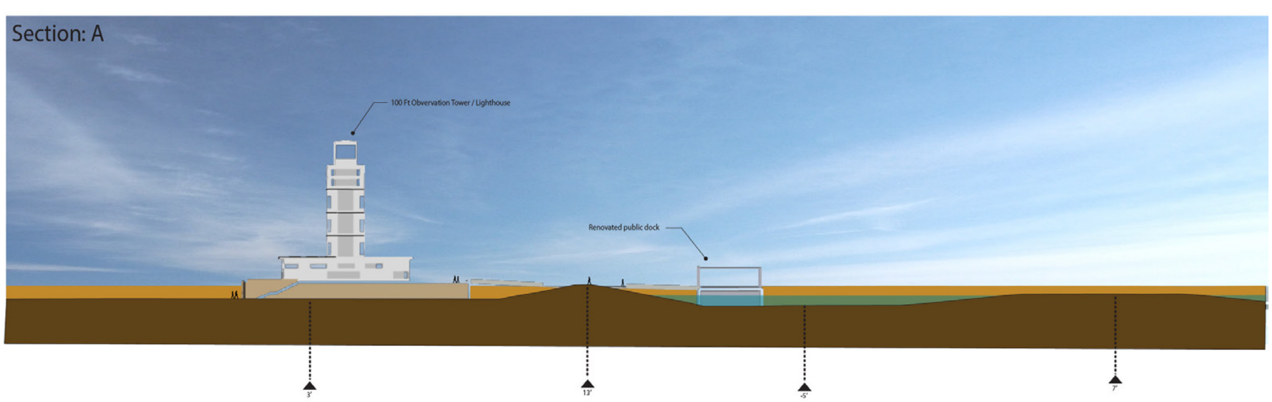


Detail Plan

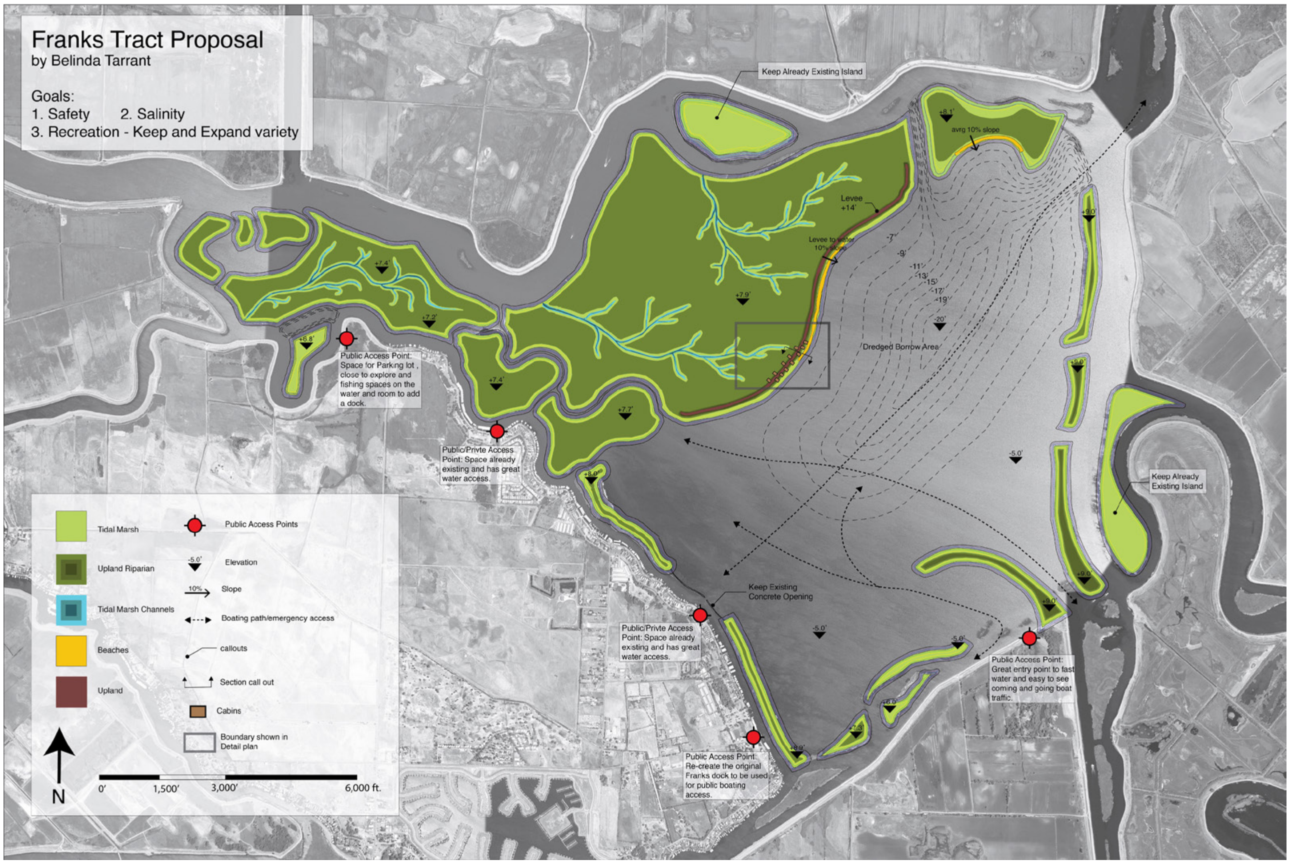


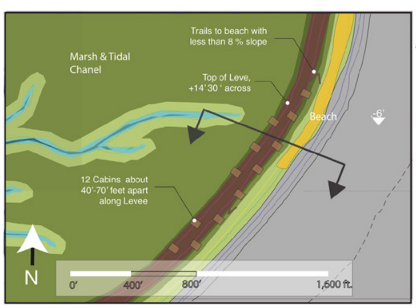
Perspective

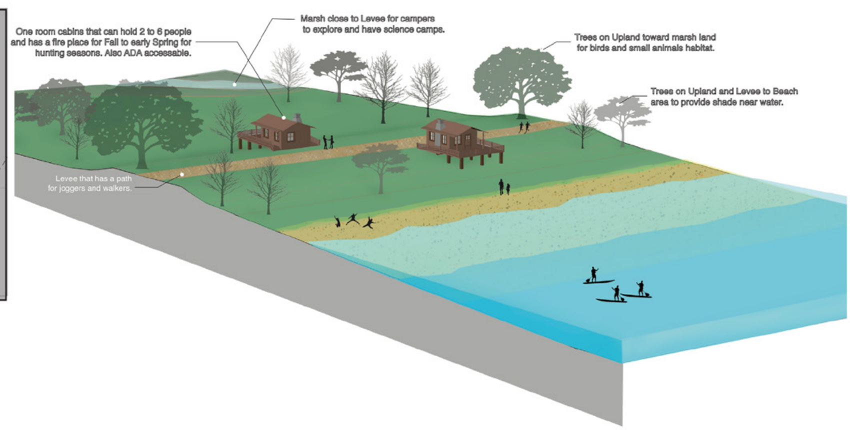


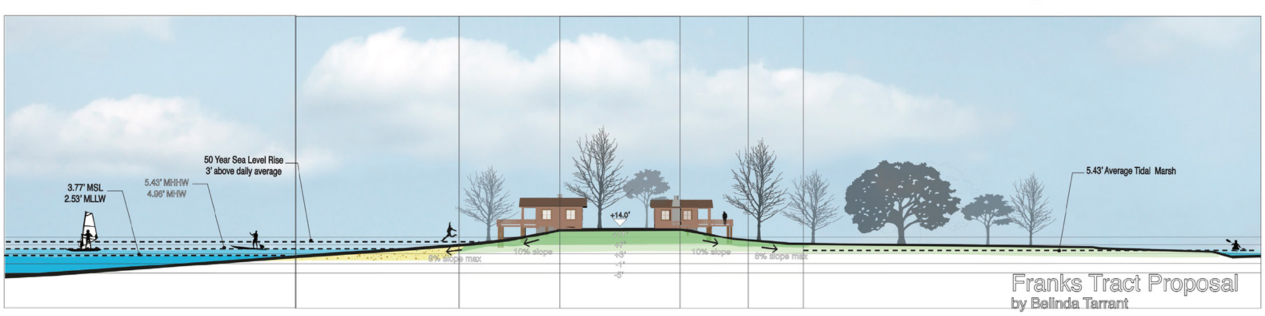


TYPE 1. FULL BARRIER

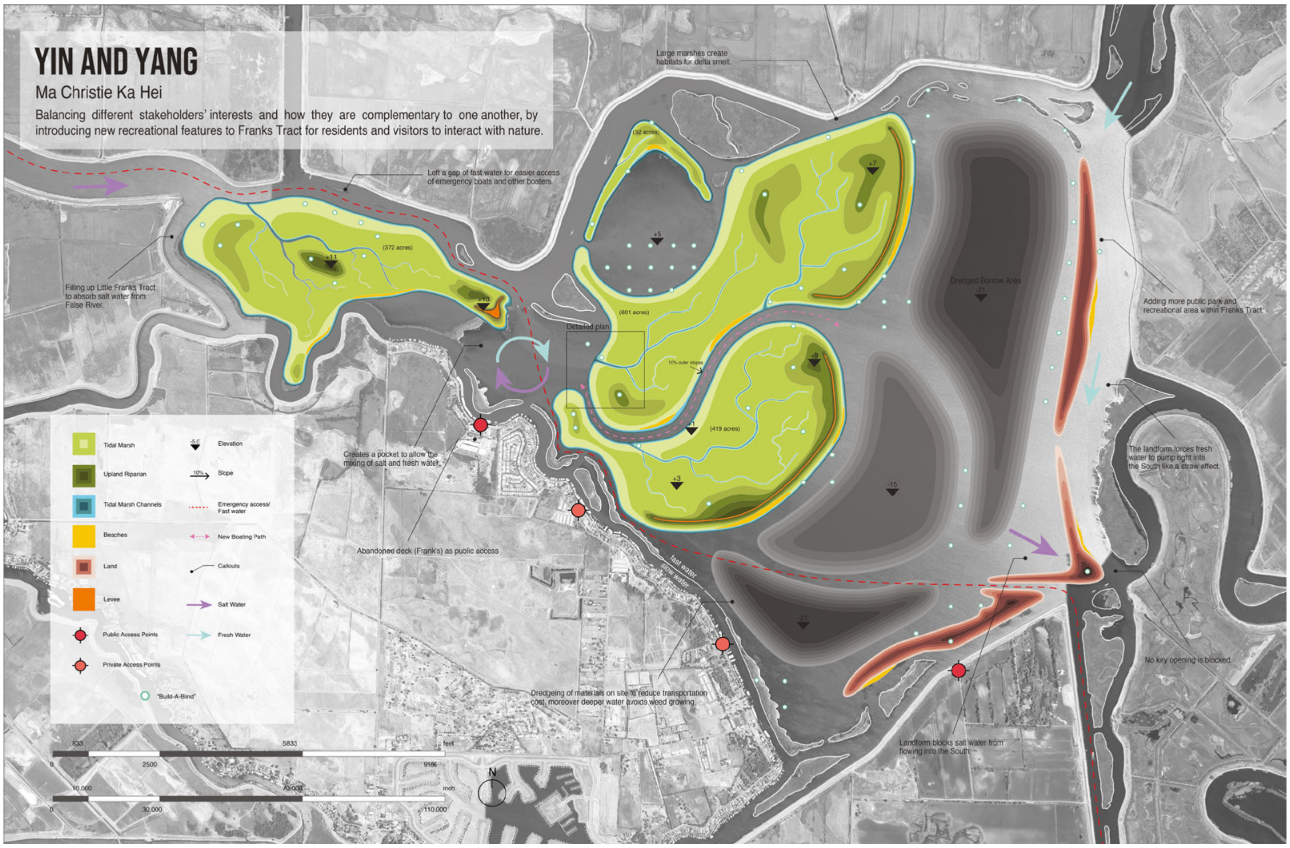


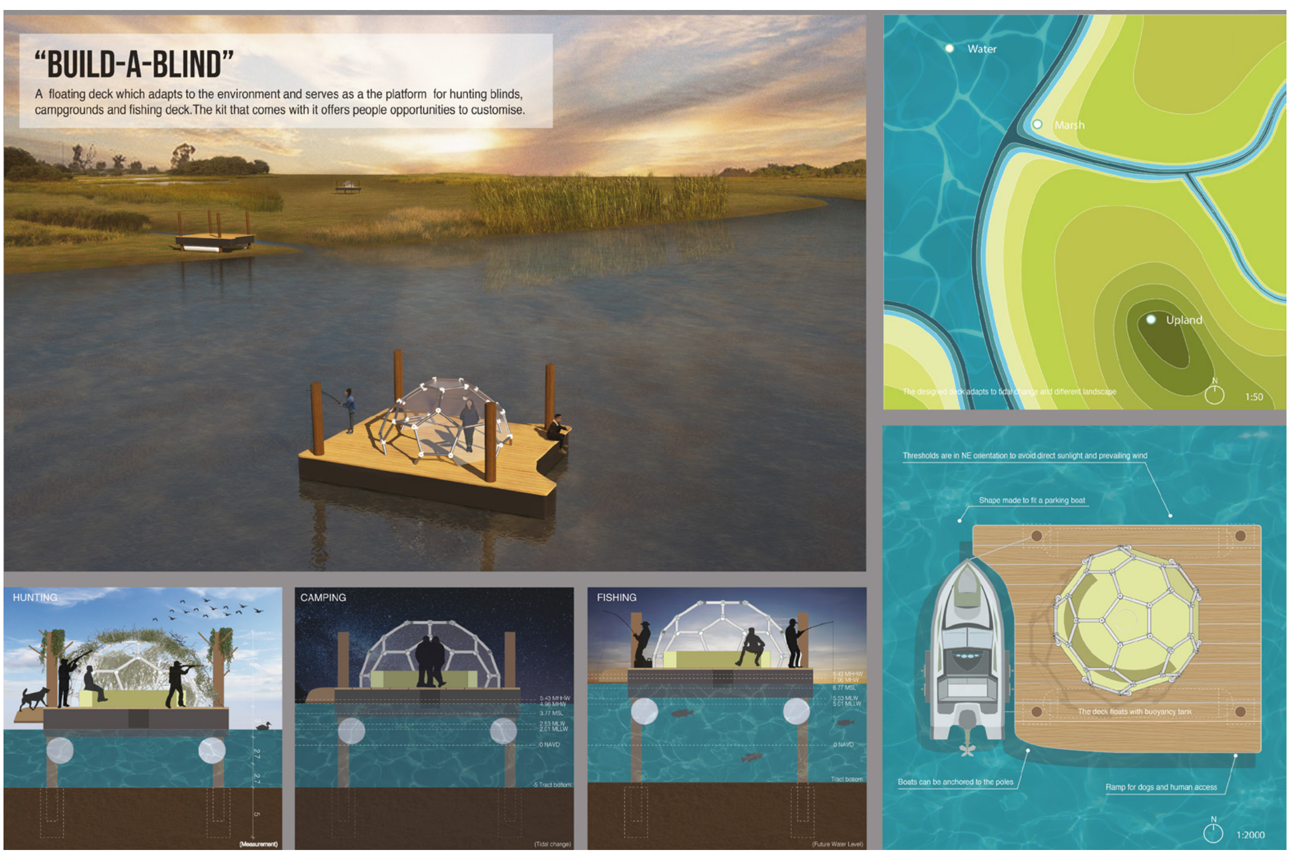




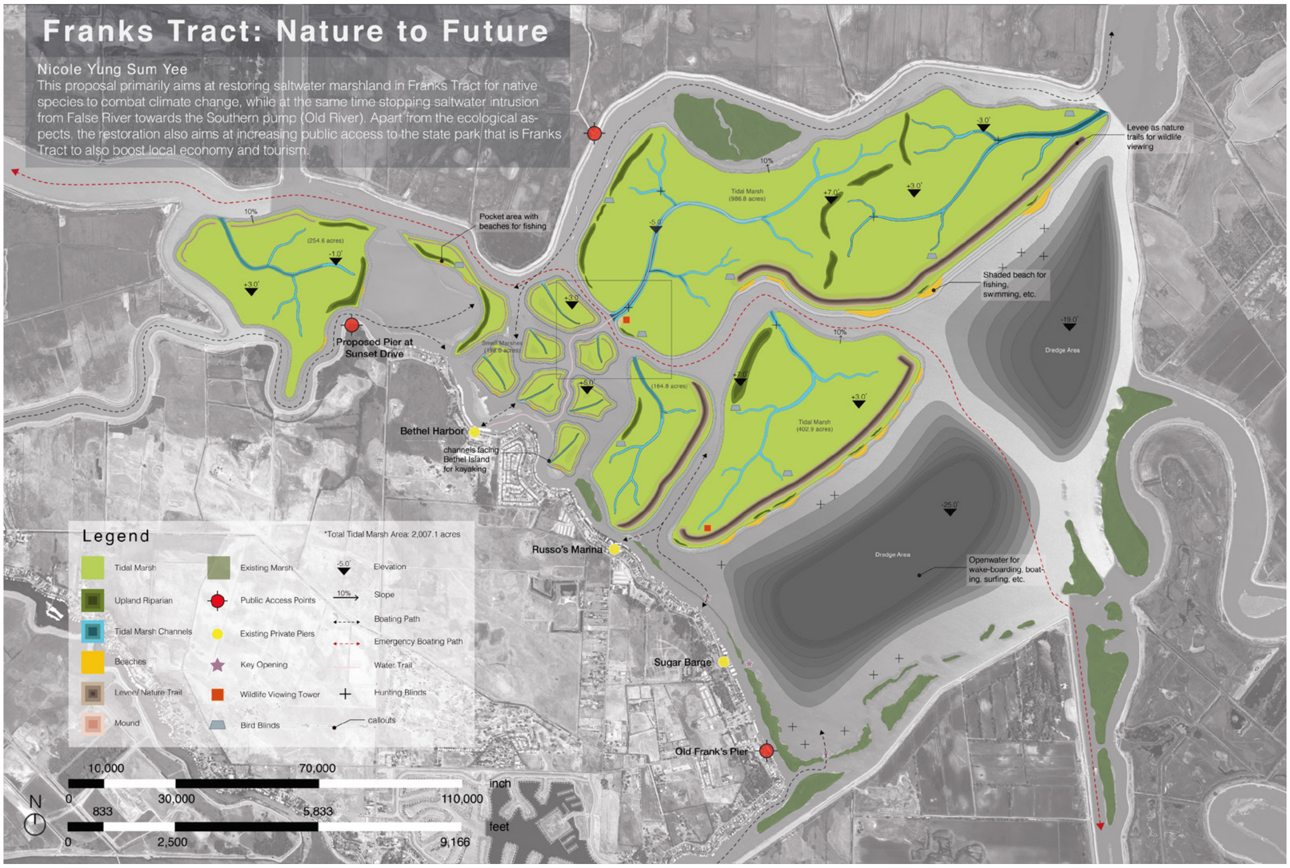


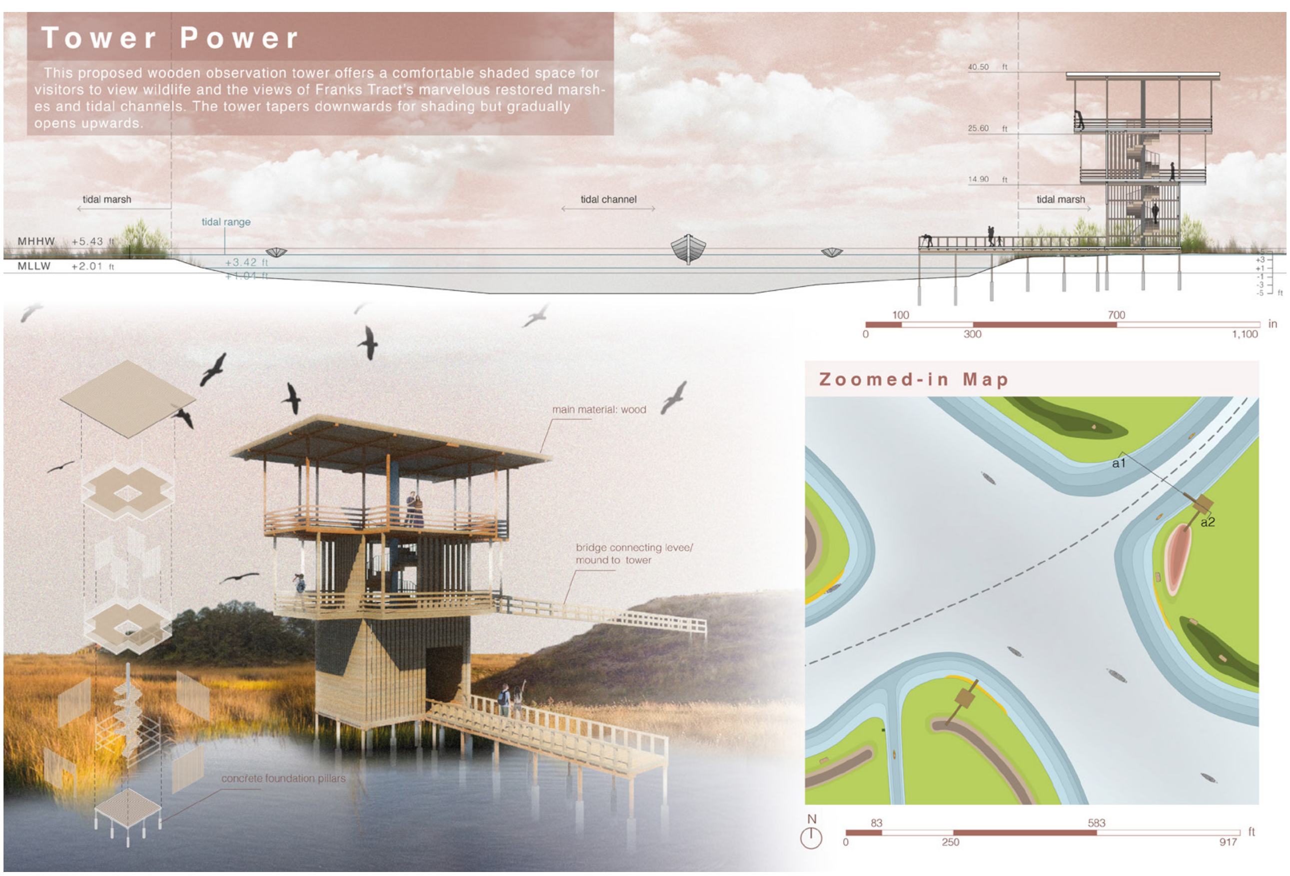
TYPE 2. SMALL POOL WITH CHANNEL THROUGH ISLANDS



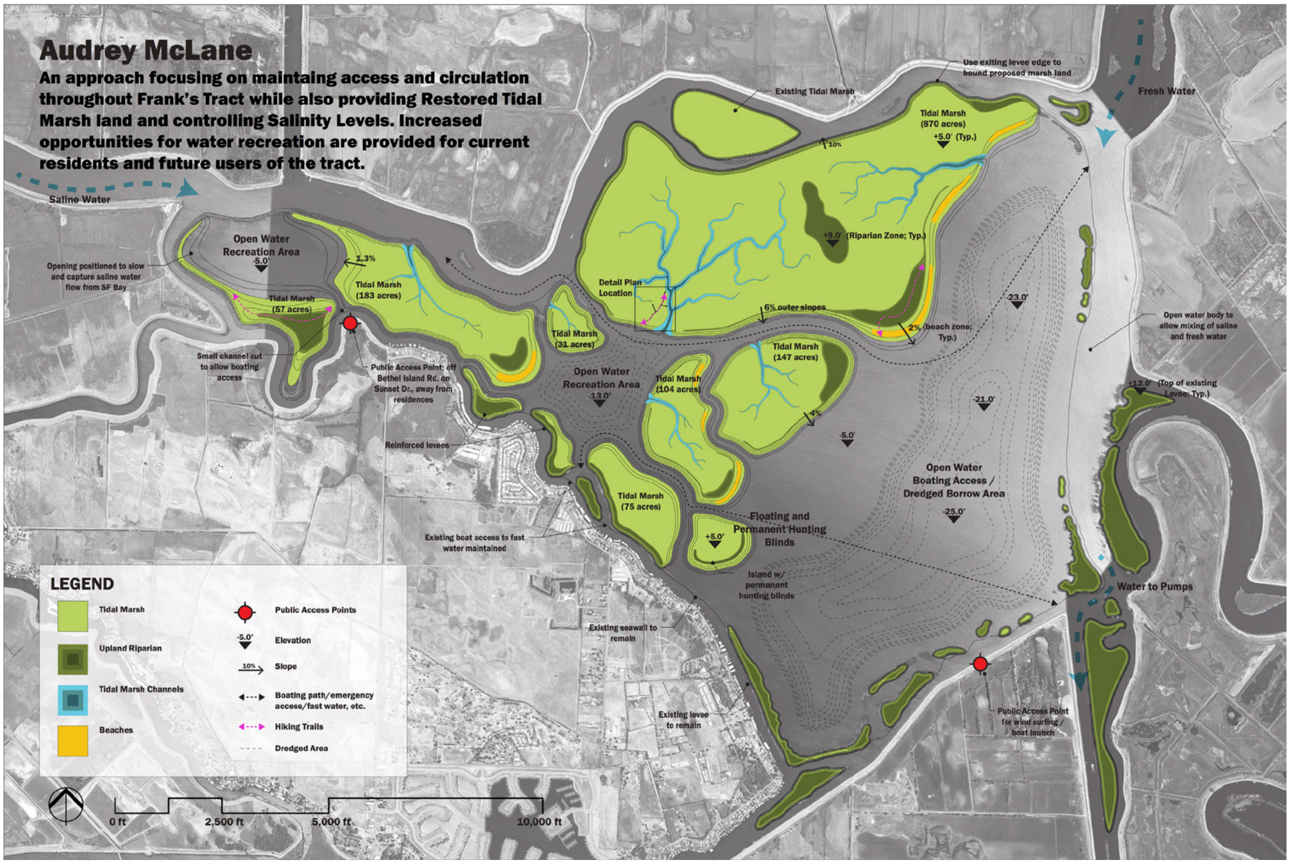


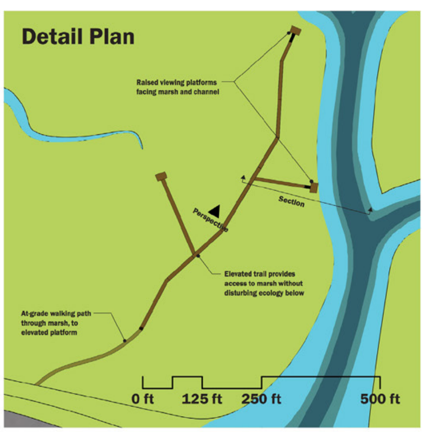
TYPE 2. SMALL POOL WITH CHANNEL THROUGH ISLANDS

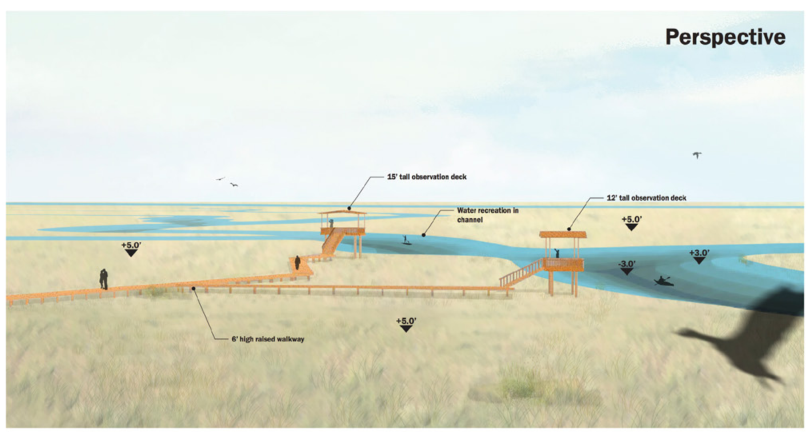




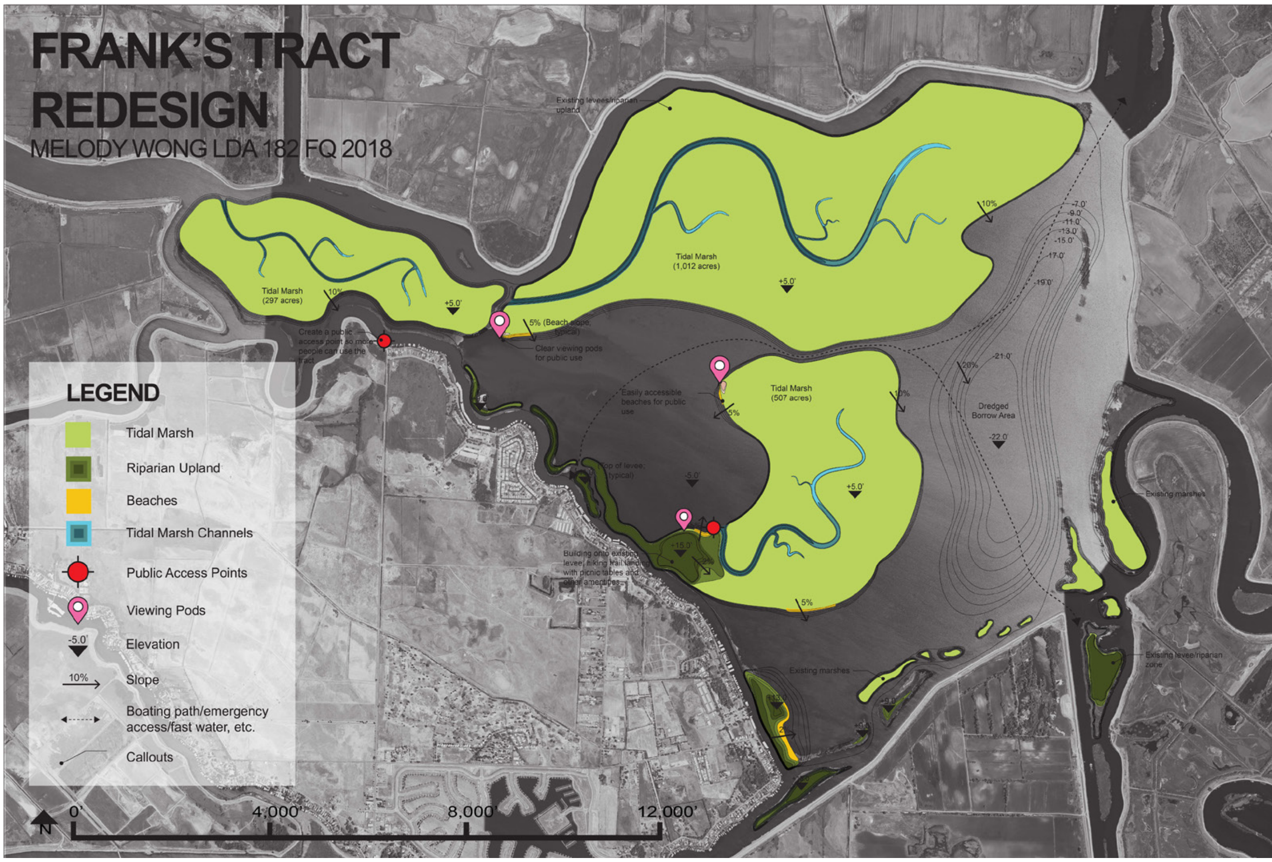
TYPE 2. SMALL POOL WITH CHANNEL THROUGH ISLANDS

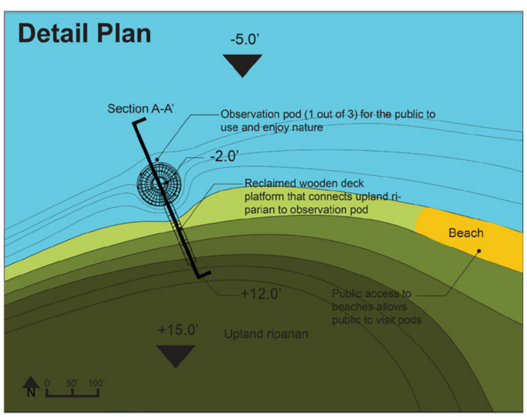


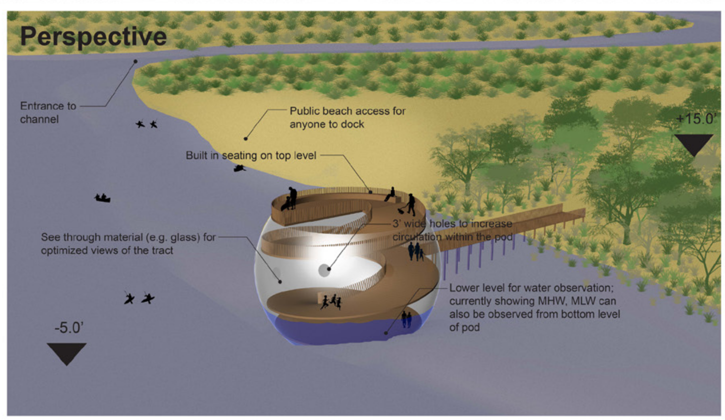


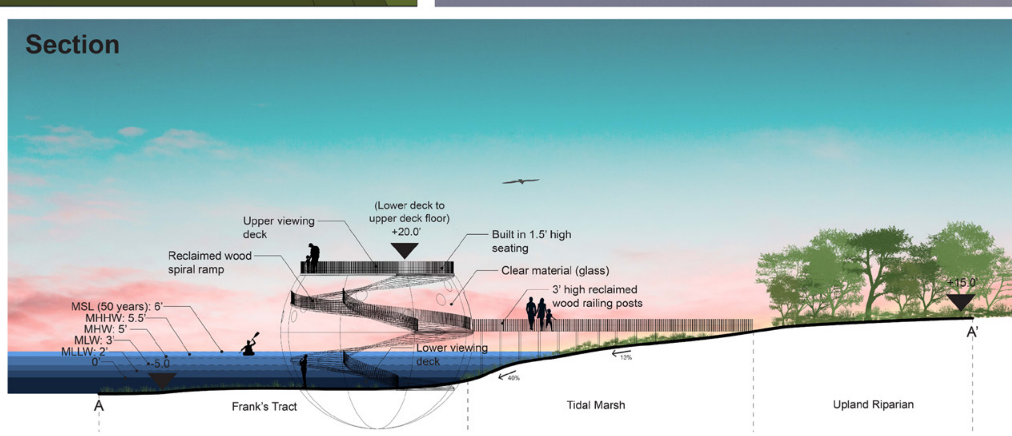


TYPE 2. SMALL POOL WITH CHANNEL THROUGH ISLANDS

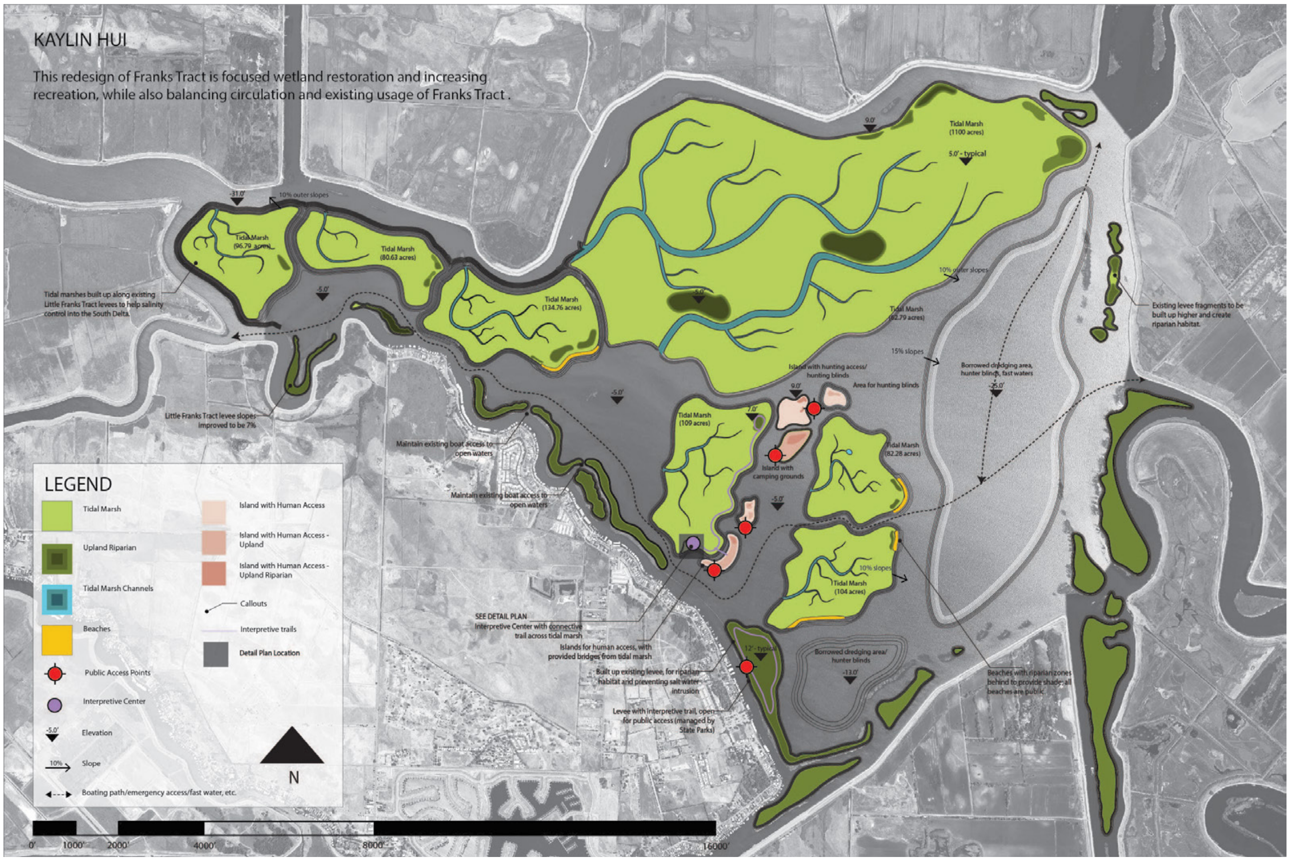


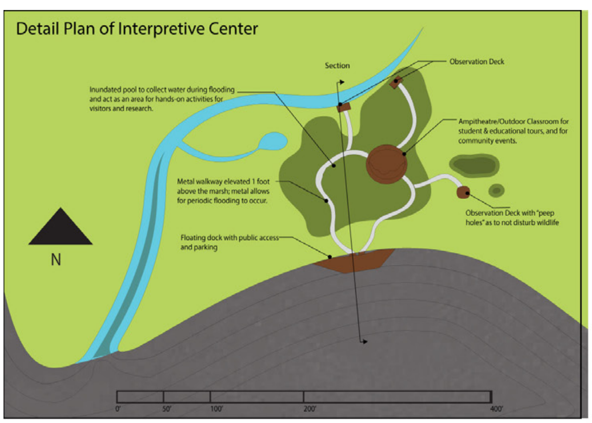


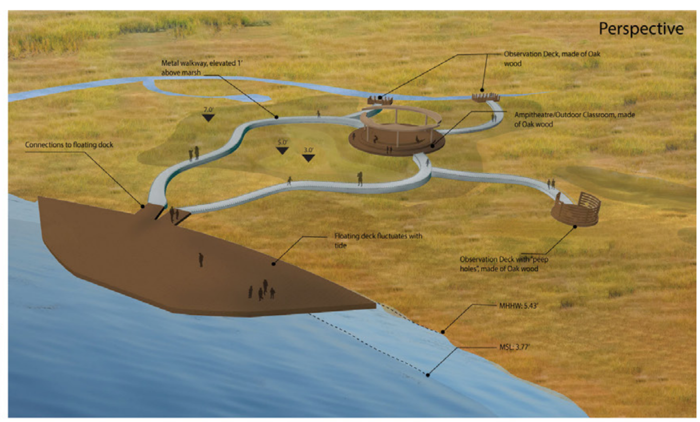




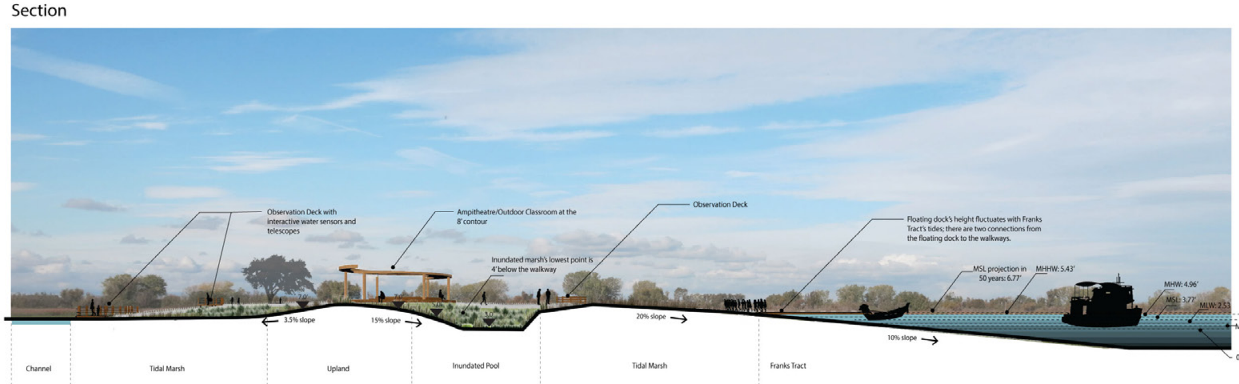
TYPE 2. SMALL POOL WITH CHANNEL THROUGH ISLANDS





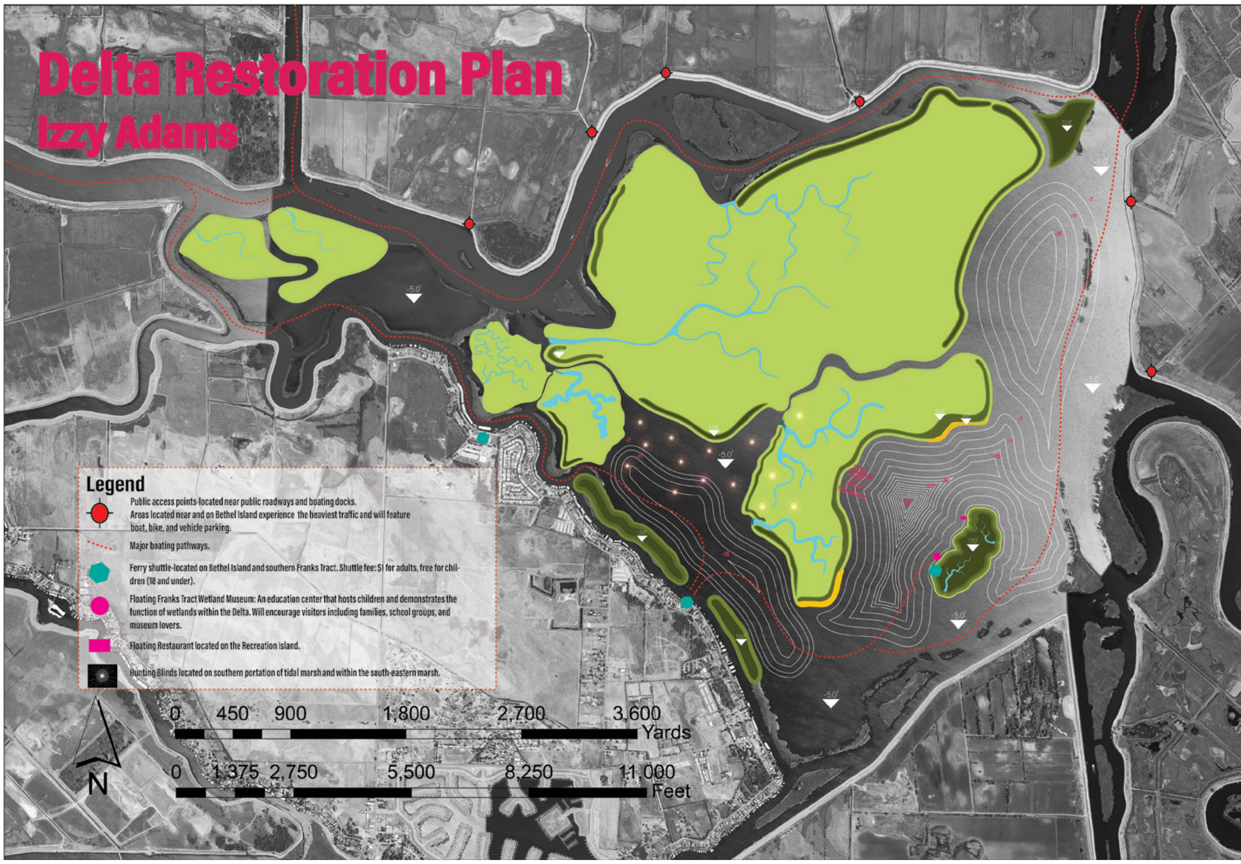


Section

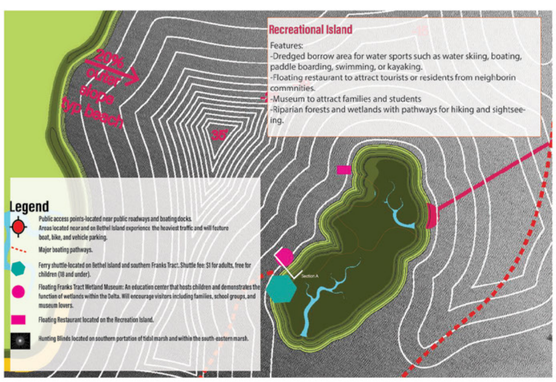


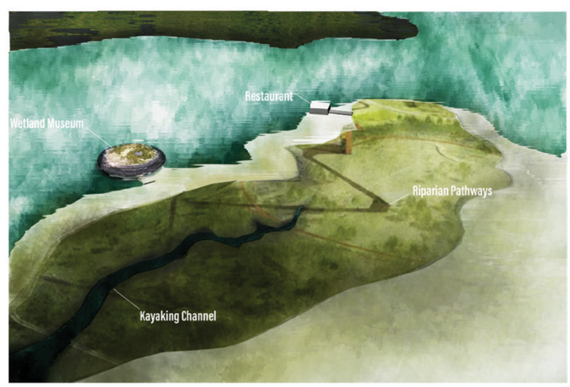
Kaylin Hui

TYPE 2. SMALL POOL WITH CHANNEL THROUGH ISLANDS



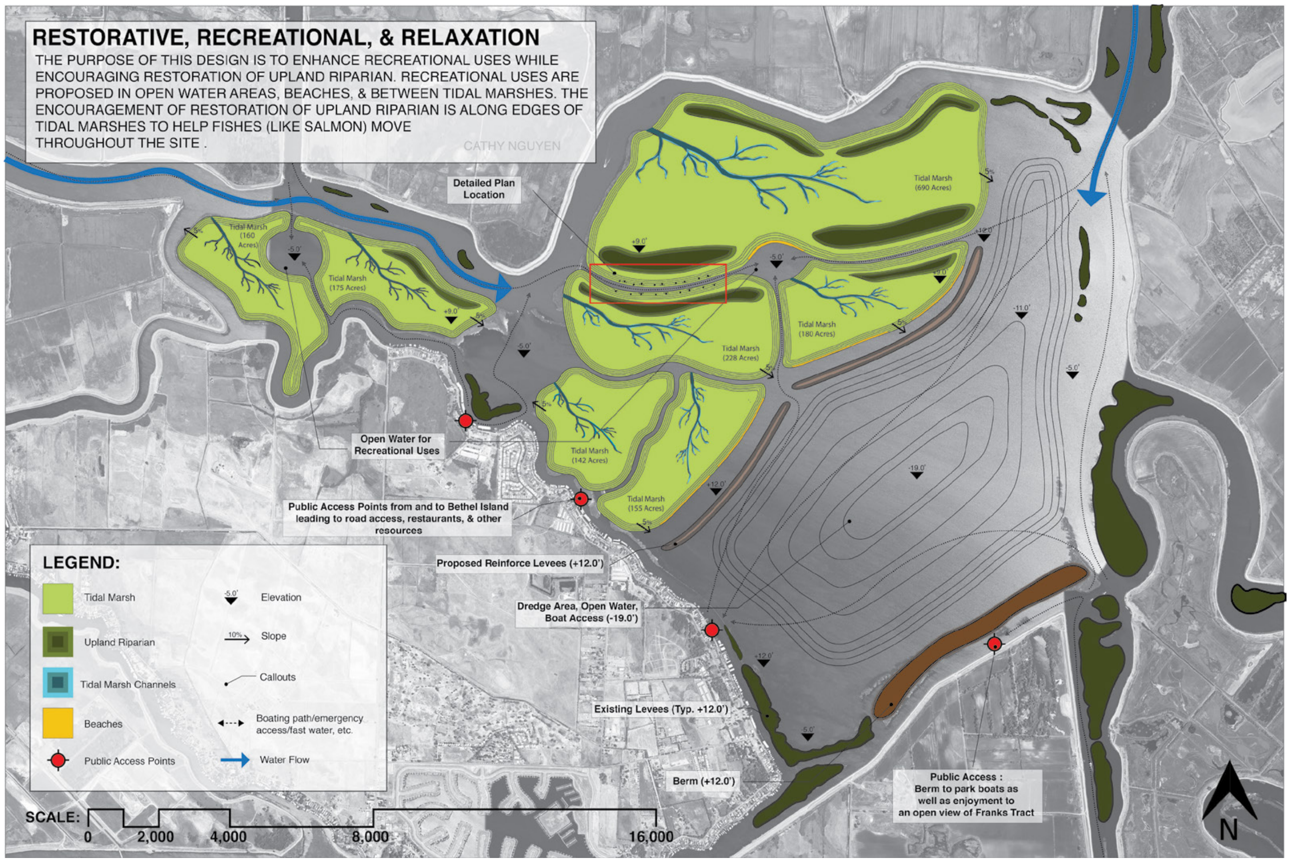
Details

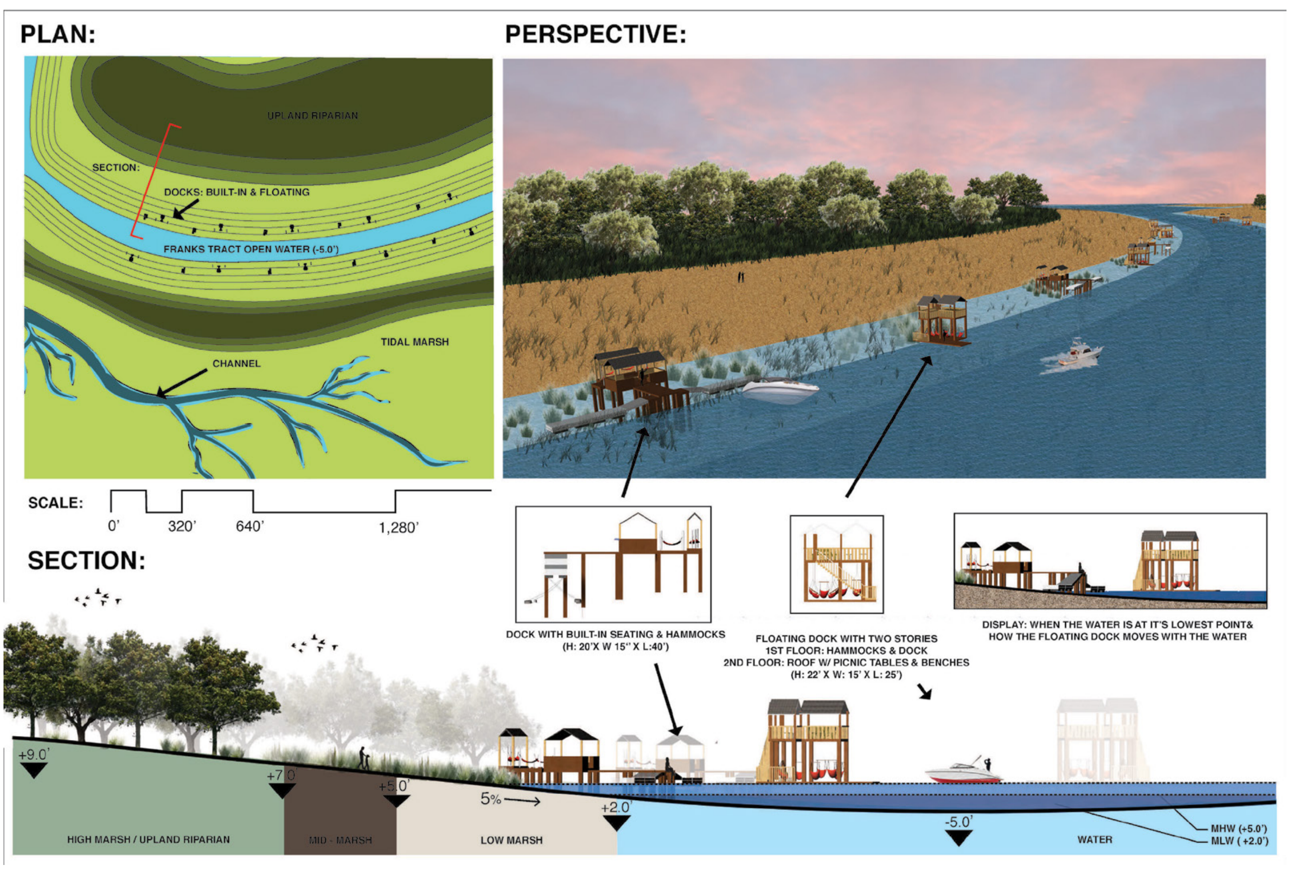




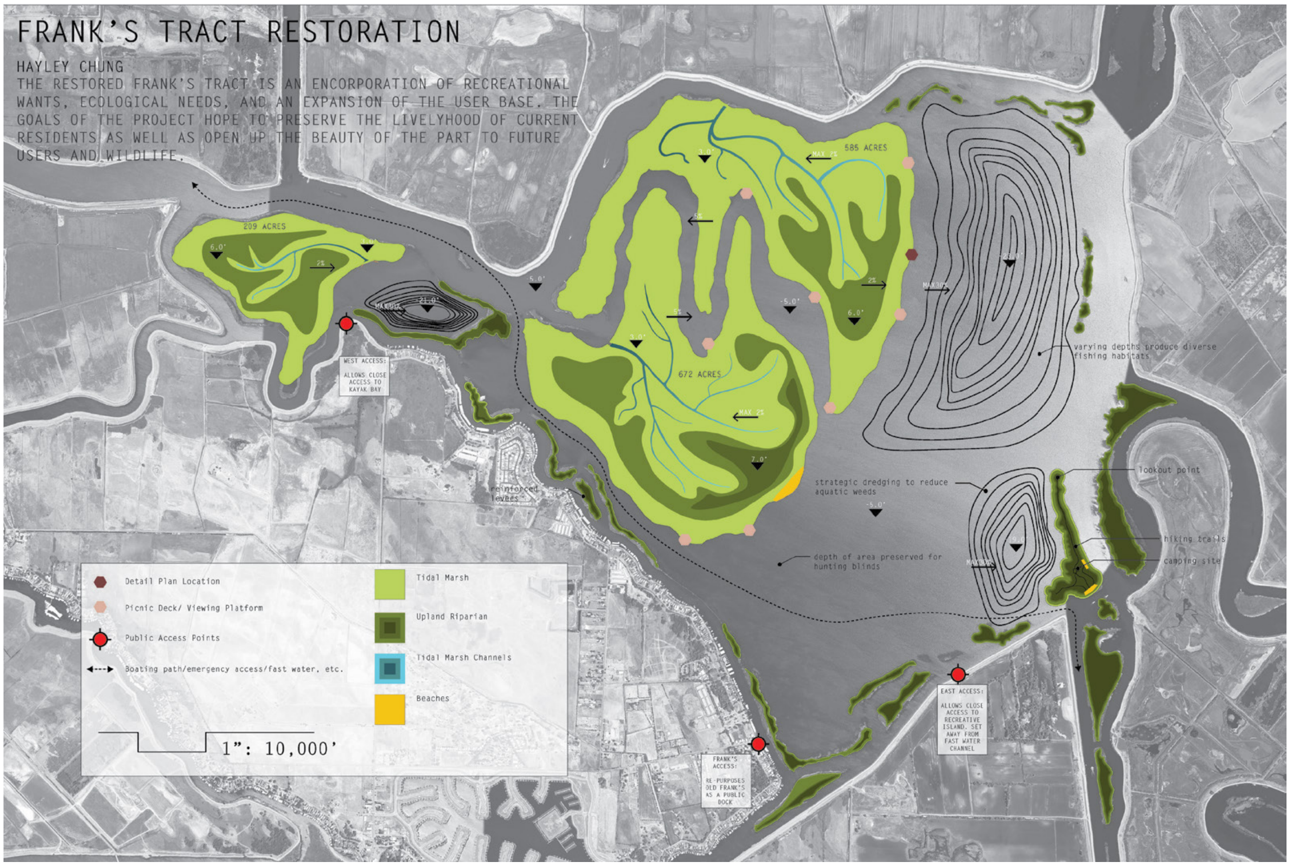
Riparian Wetland Open Water

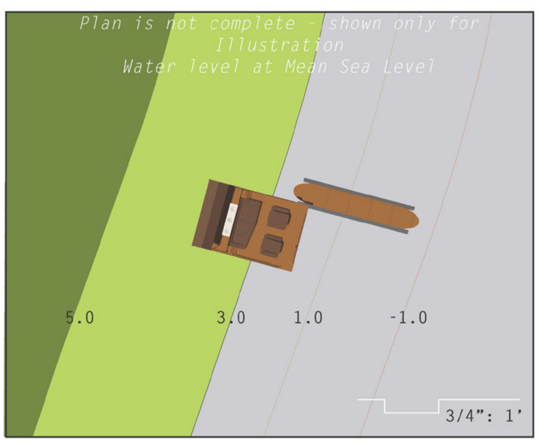
TYPE 2. SMALL POOL WITH CHANNEL THROUGH ISLANDS

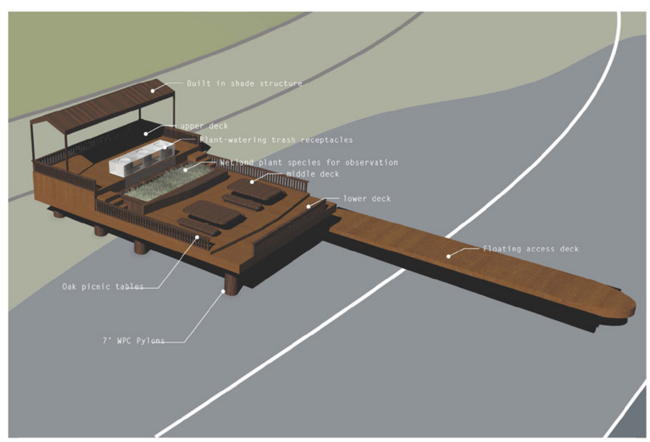


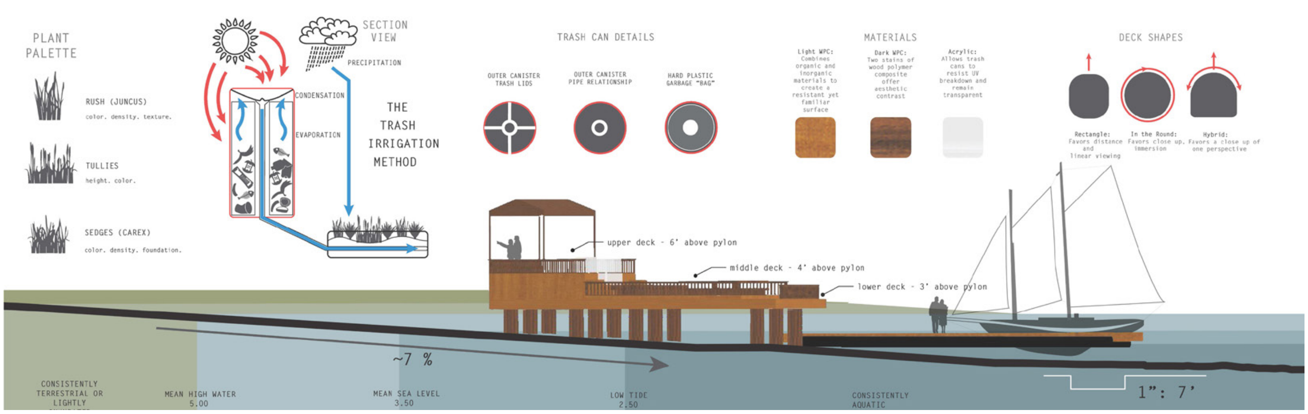


TYPE 2. SMALL POOL WITH CHANNEL THROUGH ISLANDS

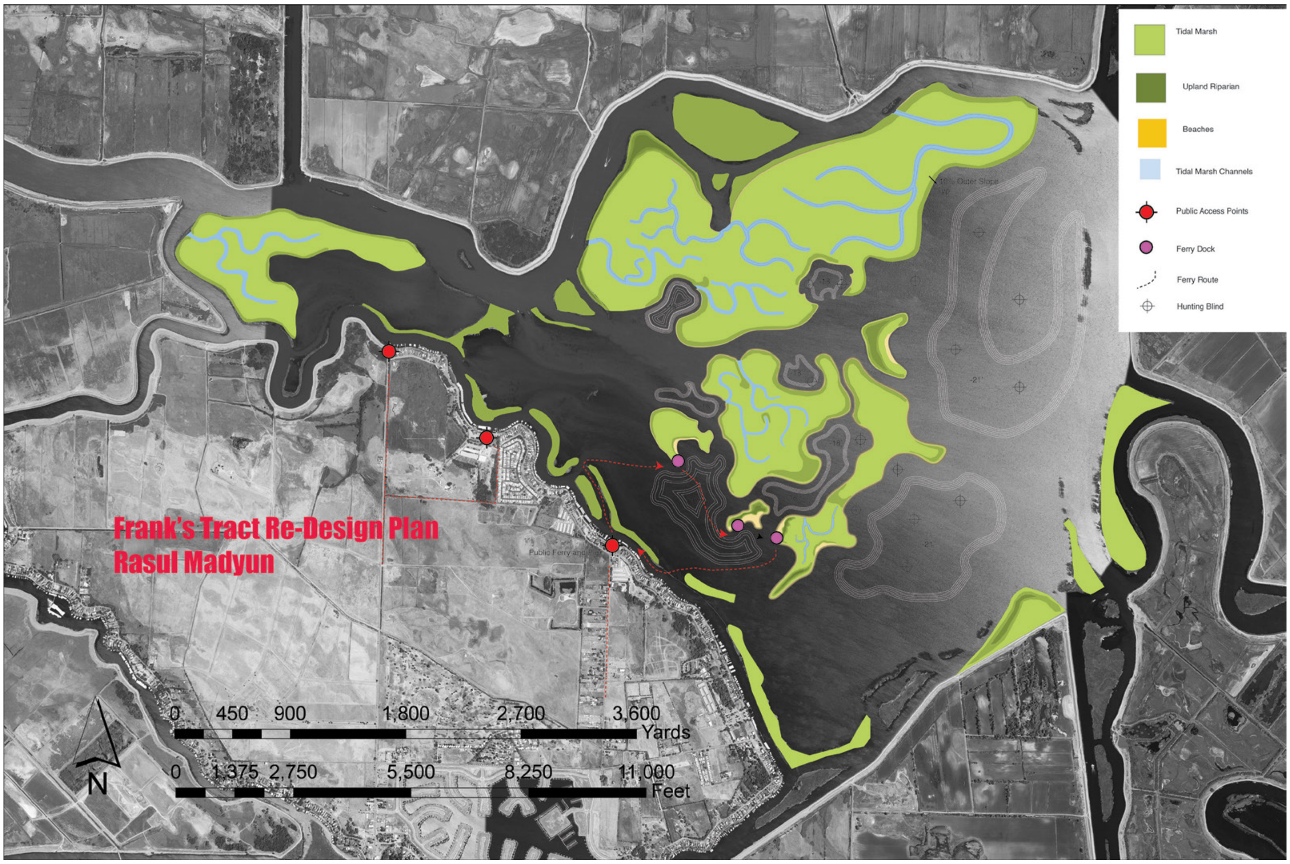




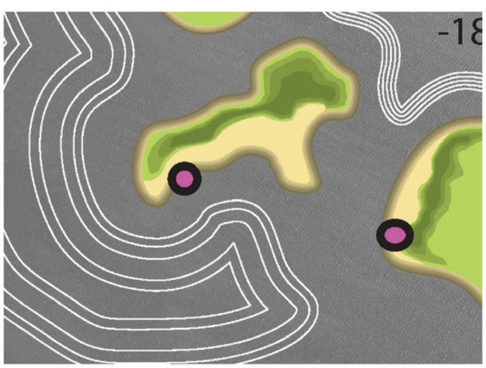


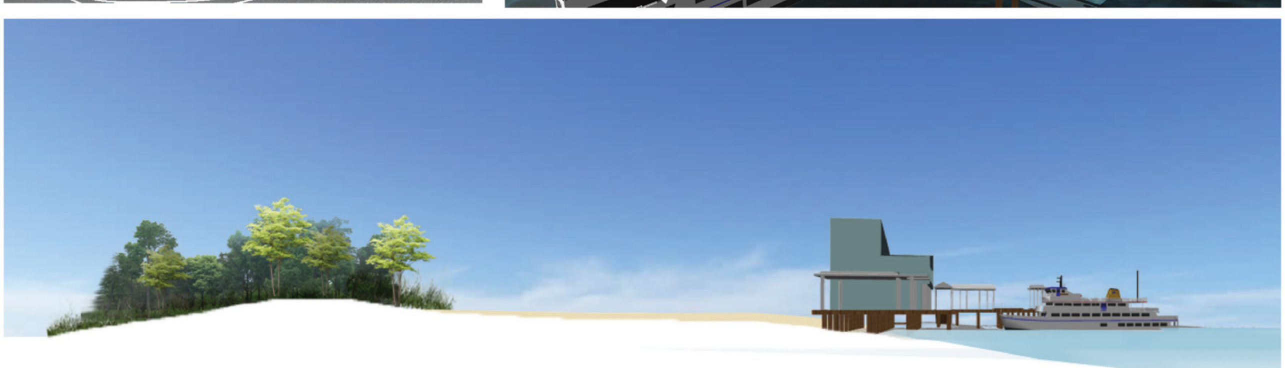


TYPE 2. SMALL POOL WITH CHANNEL THROUGH ISLANDS

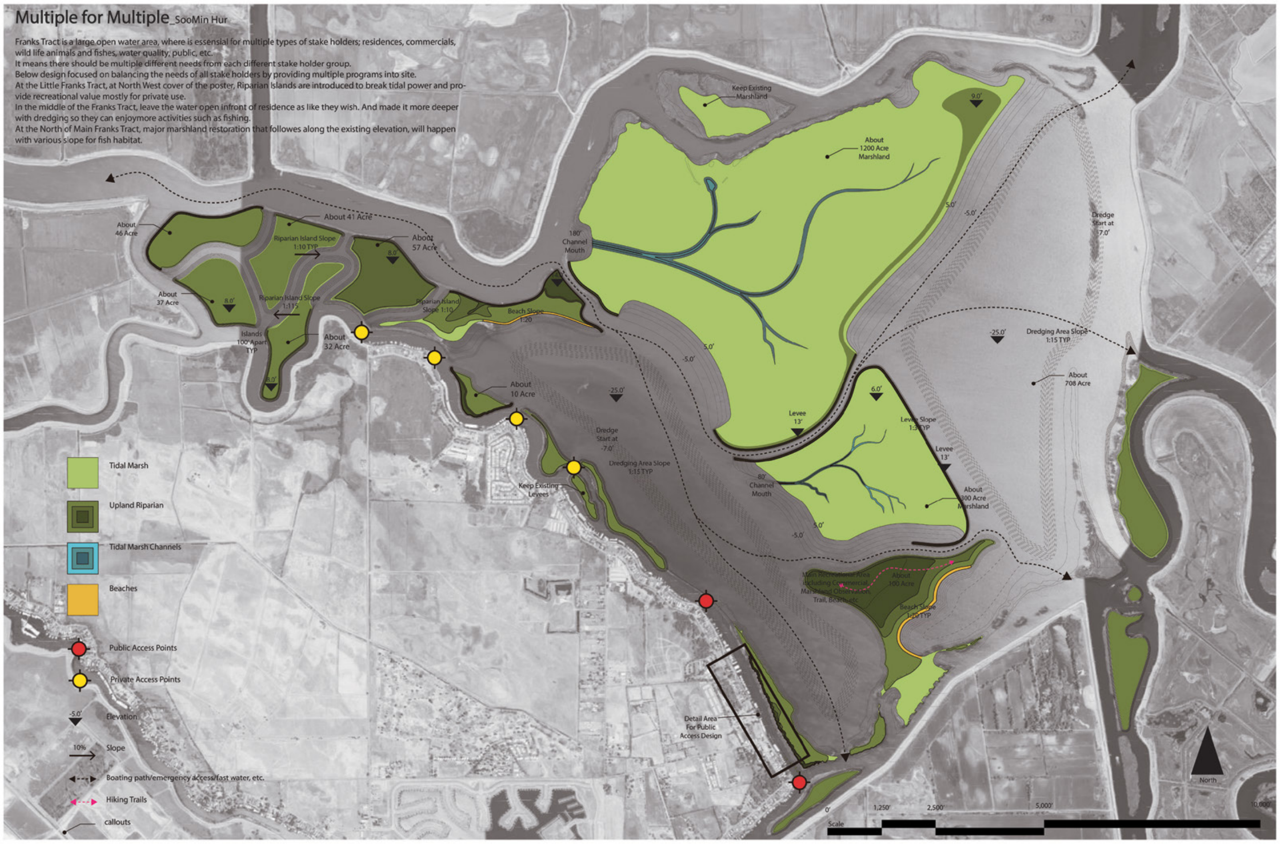


DETAILS



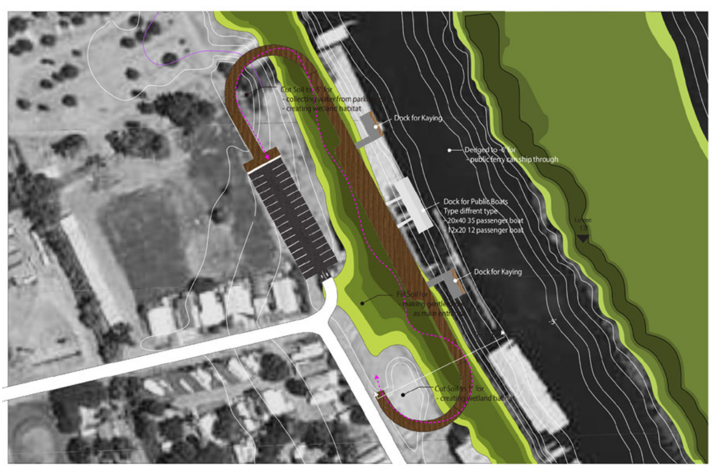


TYPE 3. LARGE POOL WITH BERM



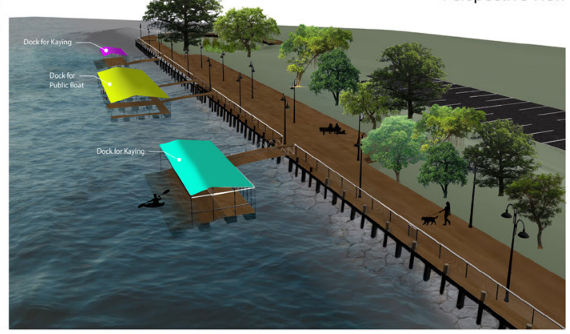
Reconstruct abandoned Franks dock into public access point.

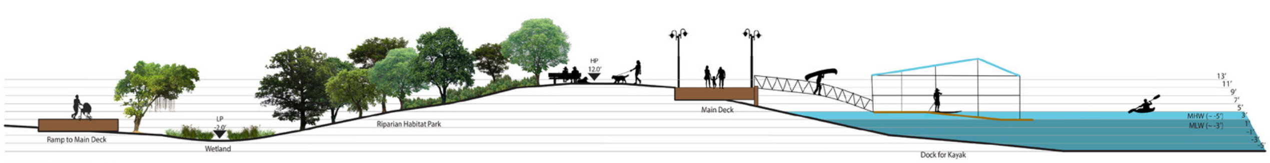
Includig a park with Riparian and wetland habitat public boating dock, kayaking access point along pier.



Detail Plan

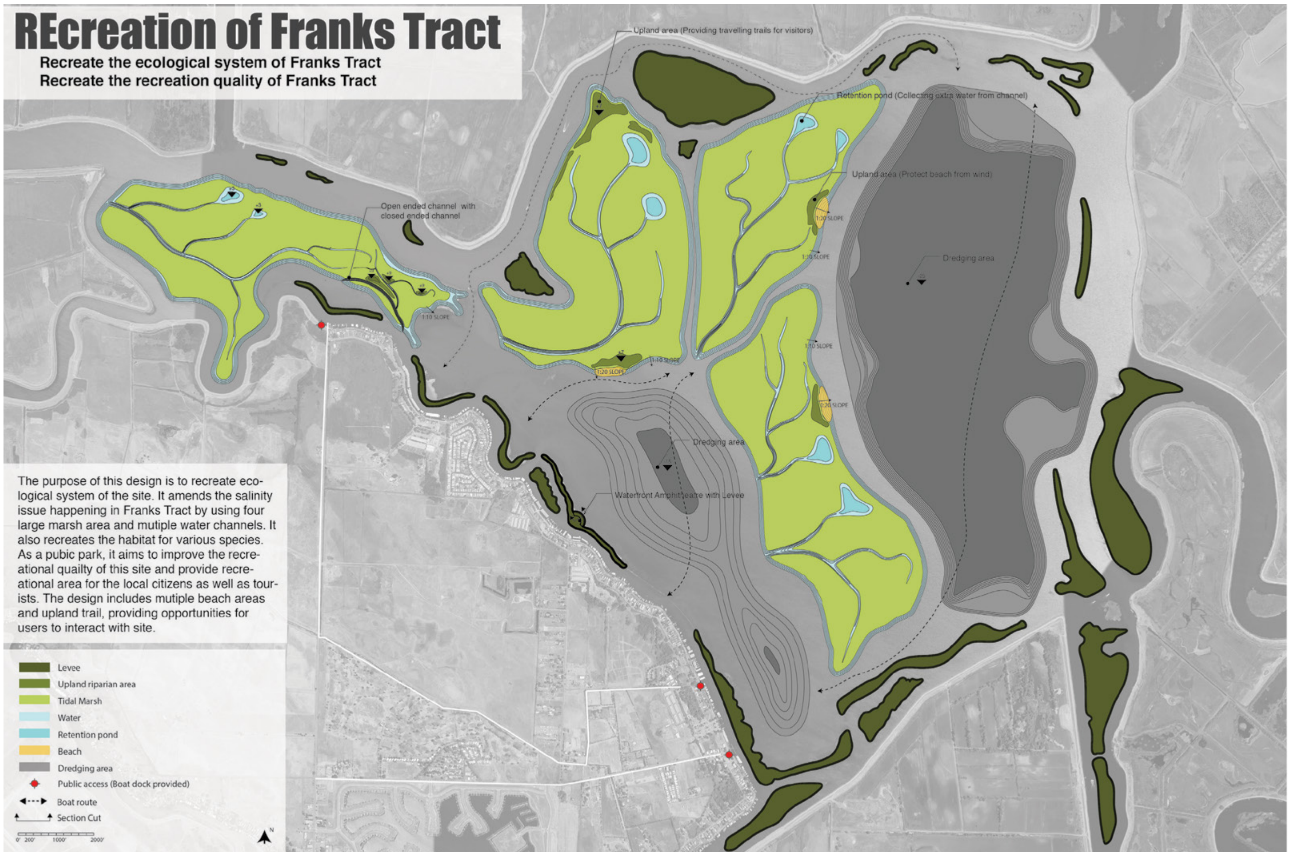
Perspective View





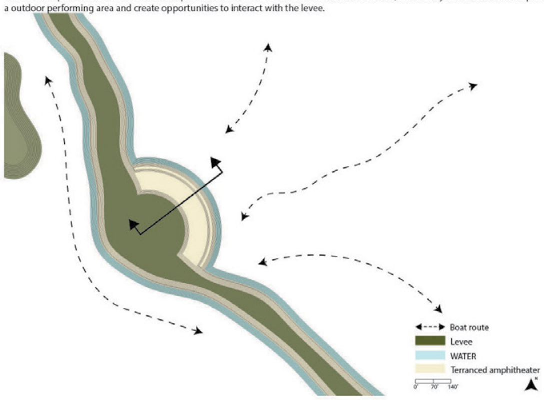
Section 1" = 8'

TYPE 3. LARGE POOL WITH BERM



Detailed Plan

The detailed plan shows the waterfront amphitheater. The Levee is an earth terranced structure, covered by concrete. It aims to provide a outdoor performing area and create opportunities to interact with the levee.

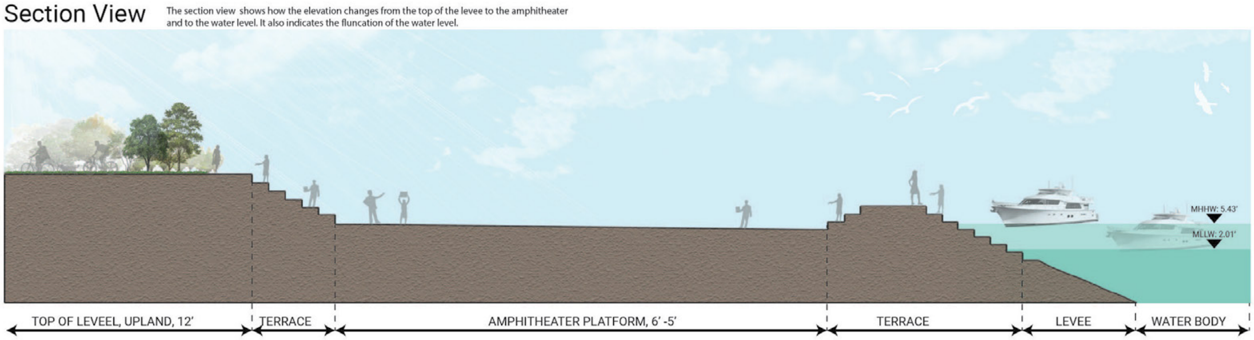


Perspective View on Amphitheater

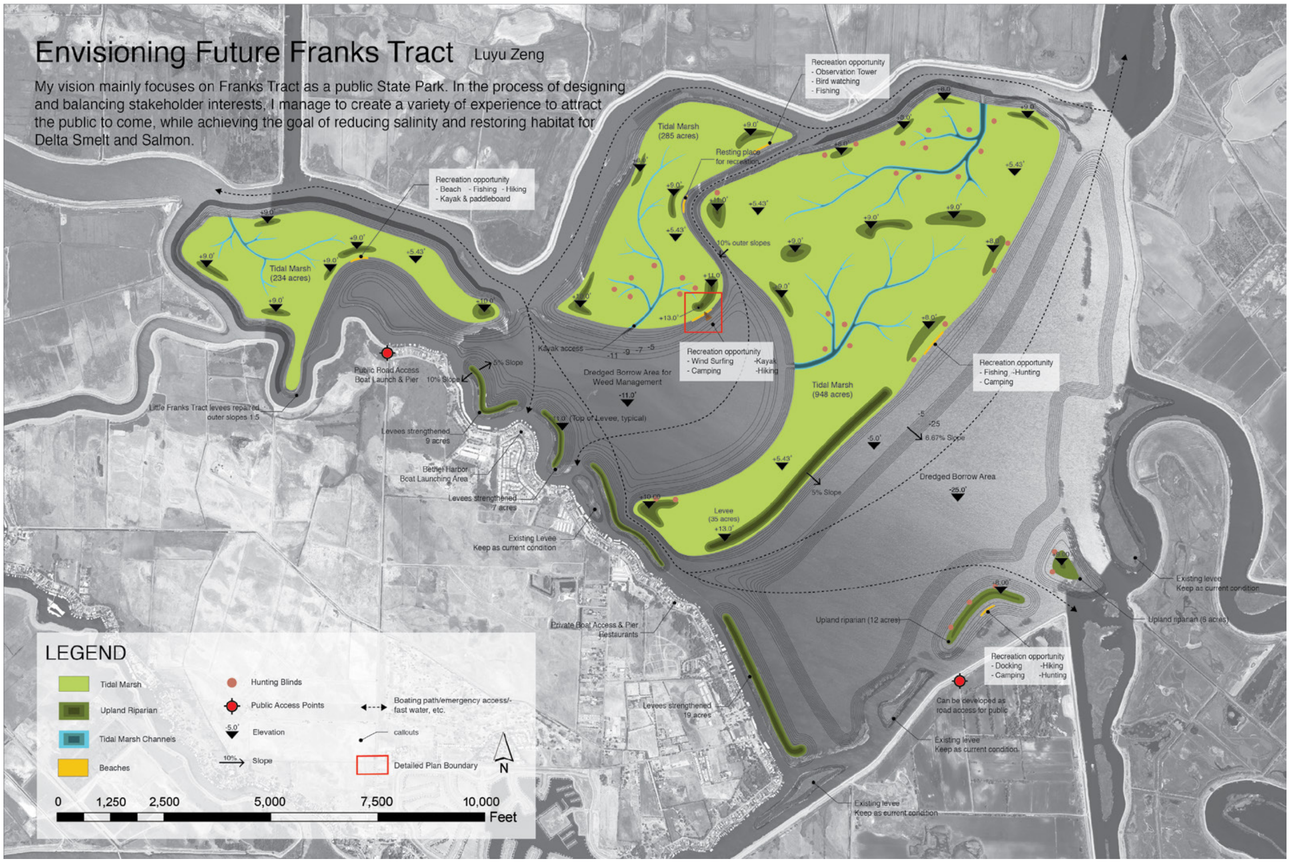
The perspective is created from the angle on the amphitheater. It demonstrates how the amphitheater interact5 with the waterfront as we as the levee. It also shows how people may use this design feature.

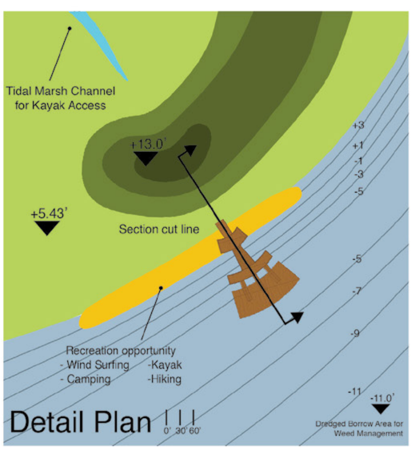
Section View

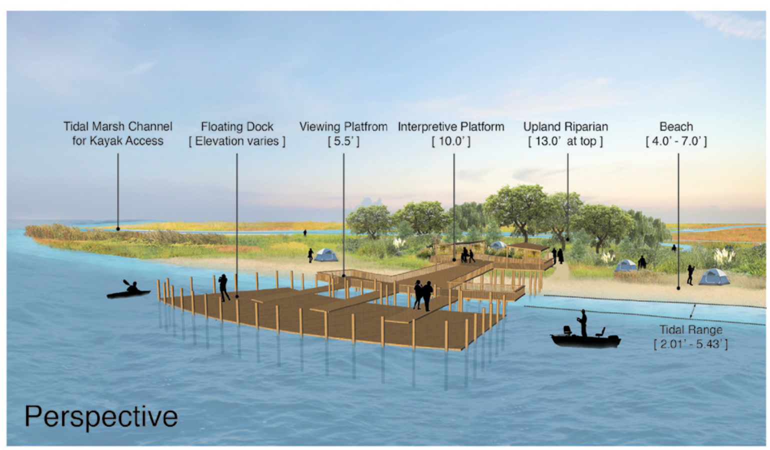
The section view shows how the elevation changes from the top of the levee to the amphitheater and to the water level. It also indicates the fluncation of the water level.

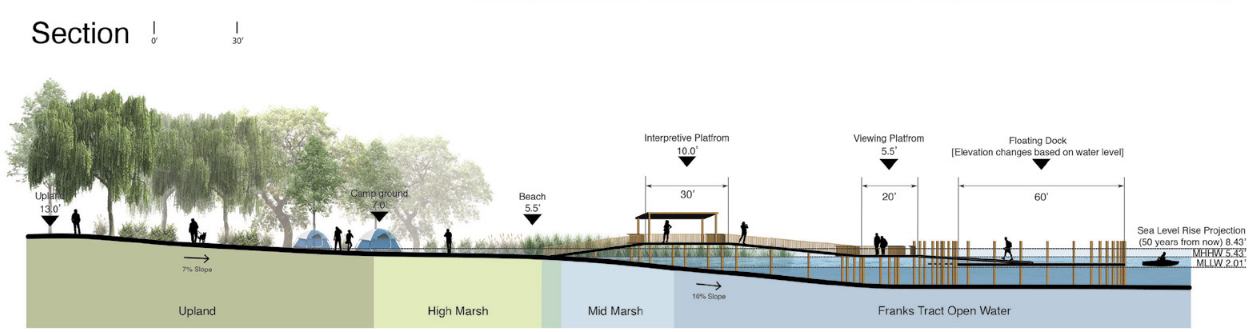


TYPE 3. LARGE POOL WITH BERM

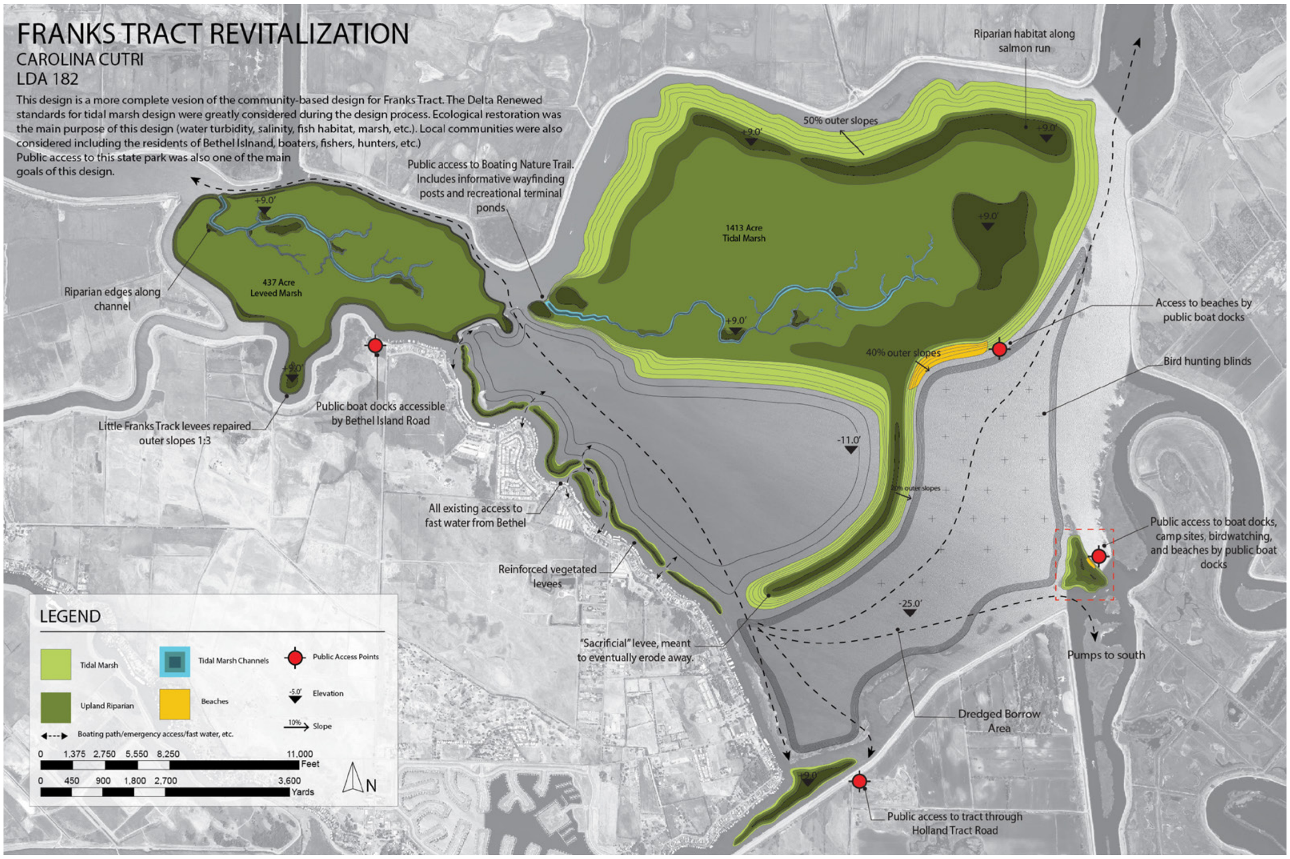


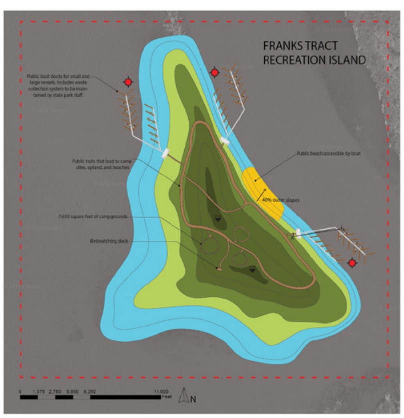


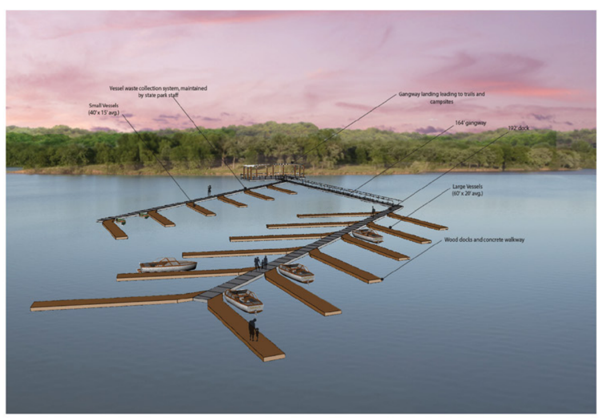




TYPE 3. LARGE POOL WITH BERM







AFTERWORD

The future of Franks Tract remains uncertain, caught up in the larger set of indeterminacies that characterize the Delta more generally. However, this studio has helped expand envisioning and planning of what Franks Tract might be in the future. Student designs provided examples of how the desires of local communities might be integrated and reconciled with the objectives of state agencies, through the design of multi-functional and multi-benefit landscapes and restoration projects.

Furthermore, the studio provided students with invaluable exposure to a design problem of working in contexts of complexity, which will grow more common as localities seek to address ecological harm, and social distrust in landscapes already affected by climate change.

The student designs and the reconciliatory conversations they have initiated will serve as essential openings as the state-led planning process enters into its next phase. Although it may take many years for a project to be constructed in the Tract, the final design may draw inspiration from their creative proposals.

The studio was also useful in identifying the edges of the current knowledge (spanning design, planning, science, and engineering) and identifying where additional research and outreach might be helpful. These questions include:

- What role do marsh aesthetics play in community response to restoration plans? We learned that preferences are strong, but more studies of user preferences towards the look and feel of tidal marshes would be helpful.
- The studio relied on the marsh channel design metrics assembled for the Dutch Slough Restoration Project. Are these reliable? Monitoring the development and performance of those channels could greatly inform designs for Franks Tract.
- How can current and future user publics of the tract be best encouraged to care for it?
- Can State Parks create facilities in and or adjacent to Franks Tract?
- How might exogenous factors (such as sea level rise, changes in flow, permanent island flooding, new invasive species, etc.) effect the longer term viability of a restored Franks Tract?
- What effects - both beneficial and detrimental - will different restoration schemes have on the local economies and regional quality of life?
- How costly is salinity intrusion through Franks Tract? How much are those affected willing to pay to address the issue? Is a more ecological approach more viable than the status quo of a temporary salinity barrier or some other form of “hard infrastructure”?
- Is the Franks Tract restoration concept a viable model elsewhere in the Delta?

FRANKS TRACT FUTURES

WATERLAND II STUDIO

UC Davis advanced landscape architecture studio
Fall 2019

WATERLAND II STUDIO

COURSE INSTRUCTOR

Brett Milligan, UC Davis Professor of Landscape Architecture

TEACHING ASSISTANTS

Yiwei Huang, UC Davis Geography Ph.D. Candidate
Alejo Kraus-Polk, UC Davis Geography Ph.D. Candidate

UC DAVIS LANDSCAPE ARCHITECTURE STUDENTS

Federico Albarracin
Selena Anguiano
Alejandra Batrez Saurez
Juliana Cheplick
Minkyu Cho
Colette Curran
Karina Deleon
Abraham Fong
Sahar Ghulam Mohammed
Canyon Gutierrez
Simon Han
Christopher Huang
Xinjie Jiang
Regina Karimdjanova
Daniel Martinez
Kelly Nishimura
Sonia Shoji-Jeevanjee
Yikai Su
Regina Yang

ACKNOWLEDGMENTS

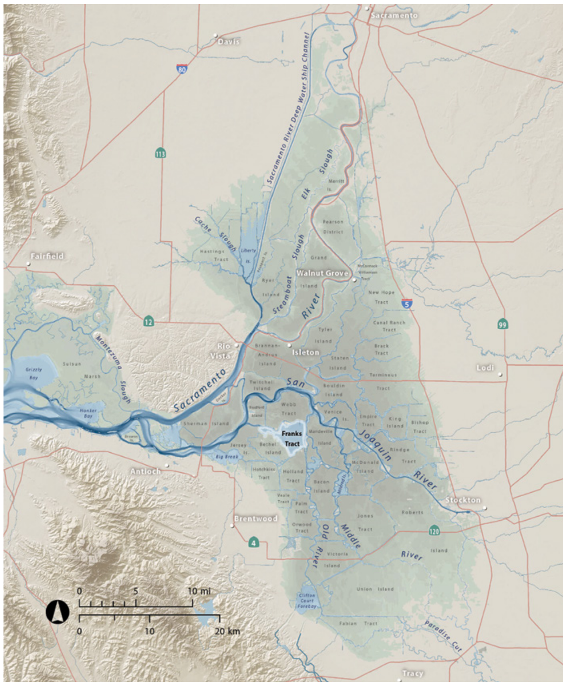
We would like to express our gratitude to the people who live, work, and play in and around Franks Tract and Little Franks who shared with the students their passion, perspective, and sense of place. Specifically, we thank Gina and David Gloski for hosting the students and arranging a boat tour of the Tract. We also thank Ryan Carruthers at the California Department of Fish and Game for arranging a tour of Sherman Island and Gina Benigno at California State Parks for providing a tour of Brannan Island. We thank Michelle Orr at ESA and Carl Wilcox at CDFW for providing support for these field trips.

We are grateful to Eli Ateljevich, Operations Research Specialist at the California Department of Water Resources, for his modeling work, reviews, and class presentations.

We would also like to thank the various reviewers who contributed their time and design energies to the studio, including:
Allegra Bukojemsky
Pete Dangermond, and Karin Winters
Steve Mussalami, Gina Benigno and others at State Parks
Emily Schlickman
Cory Parker

INTRODUCTION

In the fall of 2019, Senior undergraduate students in the Landscape Architecture program at UC Davis participated in a service-learning, real world design project called Franks Tract Futures, a large multi-benefit restoration project in the Sacramento-San Joaquin Delta. This studio was a afollowup effort to the first Waterland studio conducted in 2018. This booklet is intended to summarize some of the exploratory recreational design concepts that were developed in the course and explain the participatory design research process through which they were made.



Franks Tract Location and Surrounding Context (left); Franks Tract Base and Site Boundary (right)

BACKGROUND

The location for the studio is in the heart of the Sacramento-San Joaquin Delta (Delta) at a place called Franks Tract. Franks Tract is a unique California State Park that consists of a 3,500-acre shallow tidal lake where many people live, fish, hunt, boat, and recreate. This lake is the result of an infrastructural failure dating back to 1938 when the Tract's levees breached, flooding what was reclaimed farmland.

Much of the Delta - including Franks Tract – historically consisted of a vast complex of tidal marshes and sinuous rivers unique to the entire west coast of the Americas. All this was changed when these marshes were "reclaimed" in the late 19th to early 20th century to create farmland. This reclaimed land was achieved by constructing a network of earthen levees – large earthen berms - which allowed the marshes to be drained and productively grazed and farmed. These engineering efforts radically remade the Delta. Over 95% of the former marshes no longer exist, the Delta's ecology has radically changed, and the place is urbanized and experientially very different.

Today, Franks Tract occupies a contested and complicated position in the Delta. It is characterized as a dynamic novel ecosystem colonized by introduced fishes and "invasive" plant species and is ranked as one of the top 10 bass fishing waters in the United States. In 2016 alone, 133 bass tournaments were held in Franks Tract. Since the levee breaches, marinas, restaurants, service industries, and many residents have established themselves around this lake, and have come to value and depend on it. But due to ecological crisis and restoration mandates to recover endangered species – such as Salmon and the Delta smelt - the state is exploring design strategies to restore parts of Franks Tract back to tidal marsh, a project call Franks Tract Futures: https://franks-tract-futures-ucdavis.hub.arcgis.com/. These strategies will alter this watery landscape in ways that would not only affect the ecology of the Tract but also its socio-cultural, economic, and recreational qualities.

In this studio, students worked with the Franks Tract Futures team to explore designs for what this state park might be, with these intentional transformations. We attempted to integrate and reconcile the desires of multiple stakeholders (including residents, park users, business owners, and public agencies) based on interpretive fieldwork, stakeholder outreach, and iterative design investigation.

FRANKS TRACT FUTURES

The Franks Tract Futures (FTF) project is exploring options for achieving recreation, ecosystem, water quality and other benefits at Franks Tract. The project is conducting a collaborative planning process initiated by the California Department of Fish and Wildlife (CDFW). The project will work with the local community, local agencies, and interested stakeholders to develop an enhancement plan for Franks Tract using a transparent structured decision -making process.

The FTF project builds on a prior feasibility study (2017-2018), prepared by the CDFW. That study produced a draft plan which is no longer under consideration. The current phase seeks to more fully consider the potential for recreational enhancements and the effects of any action on navigation, flood protection, and the local economy. The planning process is engaging a Steering Committee, Advisory Committee, local communities, and the general public. The FTF plan is being developed in partnership with the Department of Parks and Recreation and the Department of Water Resources (DWR). The FTF plan may inform future updates to the General Plan for the Franks Tract State Recreation Area and will incorporate as appropriate other ongoing planning efforts.

The Waterlands II studio sought to build upon the work of the prior feasibility study as well as the previous Waterlands I studio, this time focusing less on the overall configuration of marshes and landmasses, and more on the details related to recreational features and their relation to the larger landscape and engagement with stakeholders in this process.

Community Engagement process of Waterland Studio I in 2018 (left), and Waterland Studio II in 2019 (right).

STUDIO FIELD TRIPS AND PRECEDENT STUDIES

Brannan Island State Recreation Area

Brannan Island is a State Recreation Area managed by American Land and Leisure, a concessionaire. Brannan Island has a six-lane launch ramp, over 140 campsites, and areas for picnicking and swimming. The studio was given a tour of the area by Gina Benigno at State Parks.

Lower Sherman Island Wildlife Area

Lower Sherman Island Wildlife Area is approximately 3,100 acres of riparian marshland at the confluence of the Sacramento and San Joaquin Rivers. The Wildlife area is accessible only by boat and is used by anglers, wildlife viewers, and hunters. The Studio was given a tour of the unique marsh-based hunting blinds which served as a precedent for similar marsh-based blinds along the proposed Franks Tract marsh channels.

Franks Tract State Recreation Area

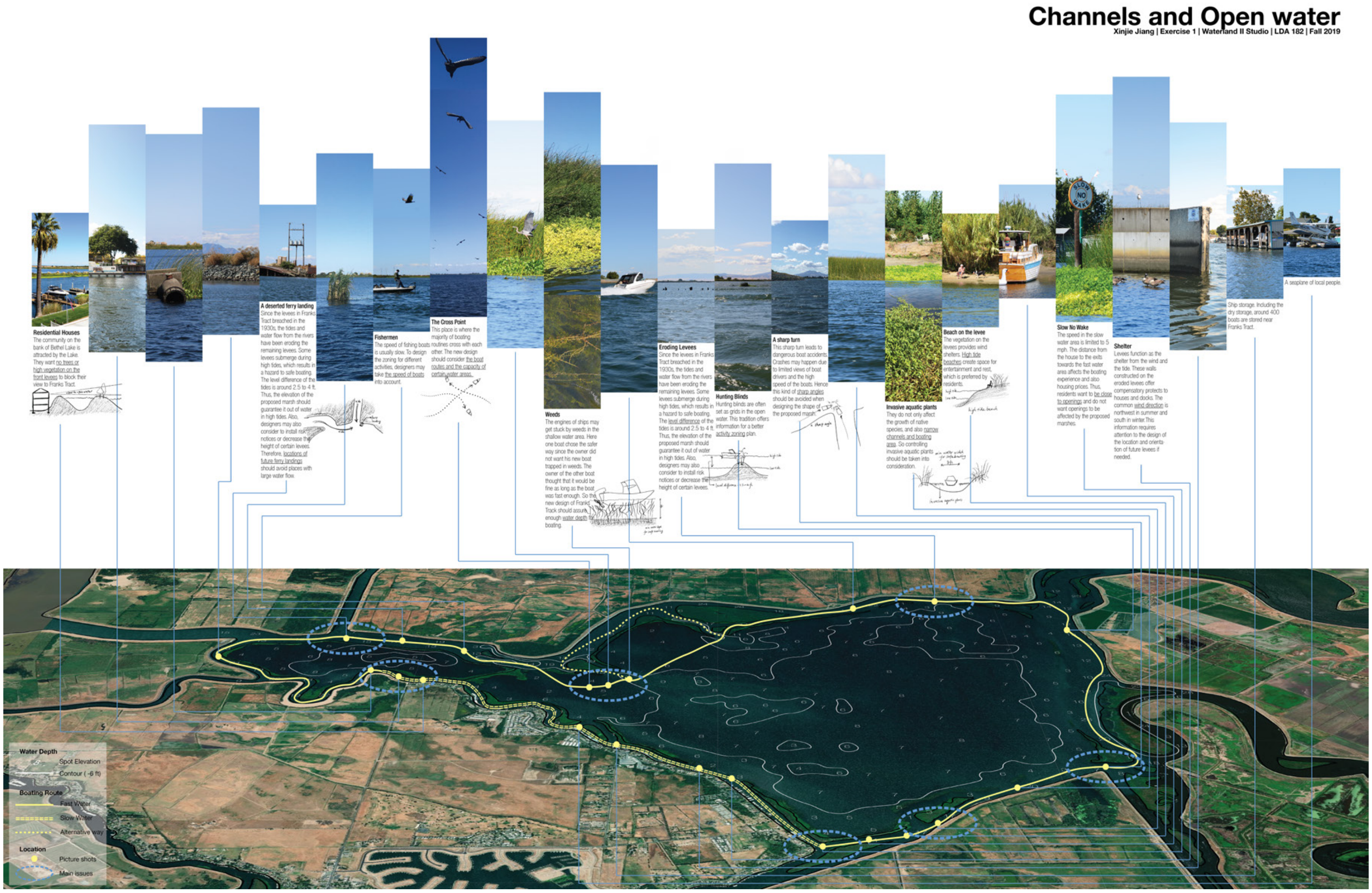
The Studio was given a boat tour of Franks and Little Franks Tract by David Gloski and neighbors. The tour gave students a sense of the scale of Franks Tract as well as the current conditions, aesthetics, and some of the common recreational activities.

Field Trip photos (from L to R, T to D): Franks Tract Dock, Brannan Island, Franks Tract boating, Sherman Island)

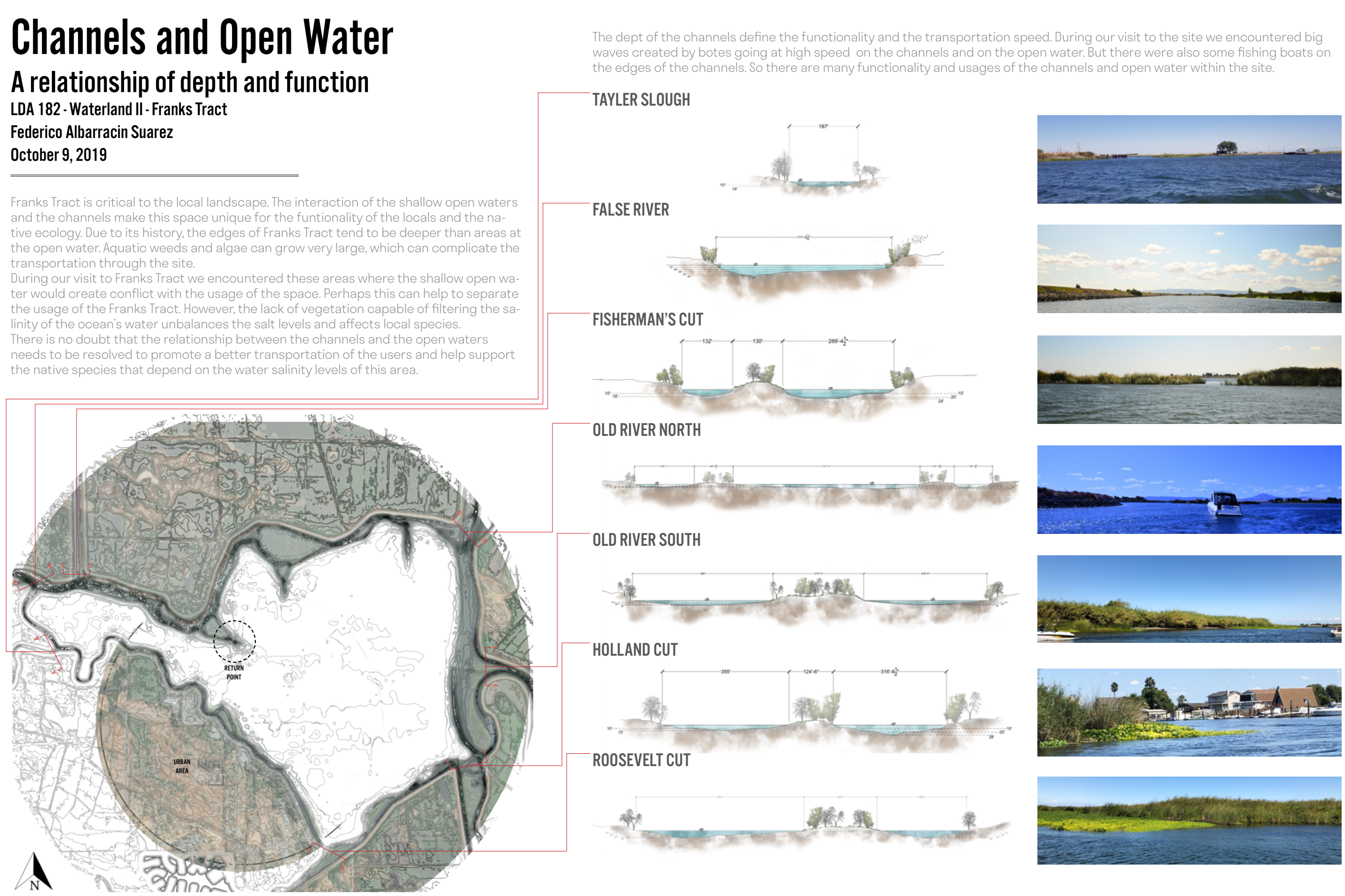
DESIGN PROCESS

Exercise 1: Surveying Experience

Entailed developing direct, embodied experience with Franks Tract as well as nearby landscapes that have qualities of what Franks Tract might become. Using digital photography combined with diagramming, data-scaping, and graphic design, students were tasked with documenting, interpreting, and representing the aesthetic qualities of select landscape phenomena.

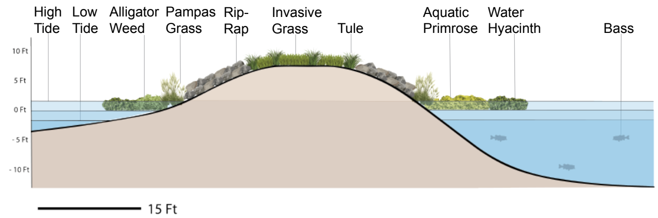


Exercise 1 example. Channels and Open Water Impression. Credit: Xinjie Jiang



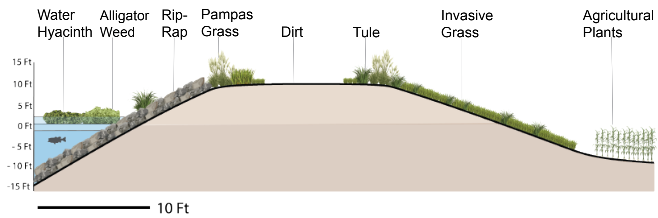
Exercise 1 example. Channels and Open Water Impression. Credit: Federico Albarracin

HISTORIC LEVEE REMNANTS



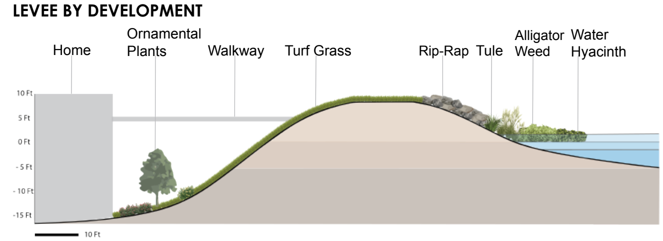
Although the Franks Tract levees were breached in 1938, remnants of the historical inner levees still exist. These levees are mostly home to invasive plants with the exception of a few natives, including tule grass.

LEVEE BY AN AGRICULTURAL FIELD



Most of Franks Tract is surrounded by agricultural fields. The waterside of the levees by the fields mostly consists of rip-rap. While the rip-rap prevents erosion, it is inhospitable to native plants.

LEVEE BY DEVELOPMENT



Many developed areas by Franks Tract exist at a lower level than the water and contain many ornamental and non-native plants. The waterside of these levees often have docks and many invasive plants.

LEGEND

- Levees with Mostly Plants
- Levees with Mostly Rip-Rap
- Levees By Developed Land
- Historical Levee Remnants
- Levees with Both Vegetation and Rip-Rap

BENEFITS OF DELTA NATIVE PLANTS

The Franks Tract levees mostly contain invasive plants and rip-rap, but have the potential to be home to more Delta native plants which would boost biodiversity and enhance recreation. Since levees vary in height and wetness, they have the potential to support diverse vegetation. Including more diverse Delta native vegetation on the levees will provide habitat for endangered wildlife such as ridgeway's rails and salt marsh harvest mice, reduce weeds in the water making it better for boating, create more beaches, and make the water more suitable for native fish including delta smelt and chinook salmon.

SOURCES

https://cawaterlibrary.net/document/improving-habitats-along-delta-levees-a-review-of-past-projects-and-recommended-next-steps/, Google Earth, Waterland II Studio Readings

Exercise 1 example. Franks Tract Levee Vegetation. Credit: Colette Curran

Exercise 1 example. Hunting Blind Impression. Credit: Kelly Nishimura

Exercise 2: Making Terrain

Entailed the exploration of the design and modeling of constructed hardscape features and how they fit into the landscape. Students were divided into three design teams corresponding to the current overall restoration concepts for Franks Tract (from Franks Tract Futures Project).

Exercise 3: Design Integration

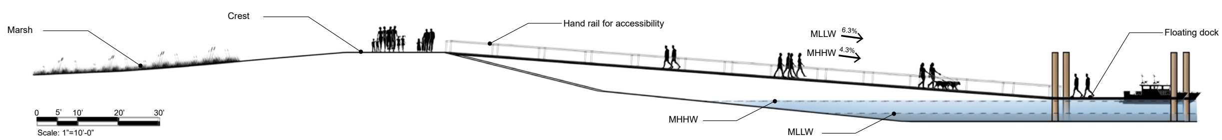
Entailed the continued refinement of the landform and structure design from Exercise 2, focusing on the integration of these features into the overall design of the Tract. At this stage, students received diverse and extensive reviews of their work thus far. Students presented their designs at one of the FranksTract Futures project advisory and steering committee design workshops at the Big Break Visitors center in Antioch. Each committee member was given a survey to rate the designs in terms of location and quality/usability of the designed feature. This sreview was followed by an extensive review of all designs by senior CA state Parks staff.

Public Presentation and Community Feedback during AC/SC Meeting #2 in East Bay Regional Park

Further internal review with recreational experts and State Park representatives

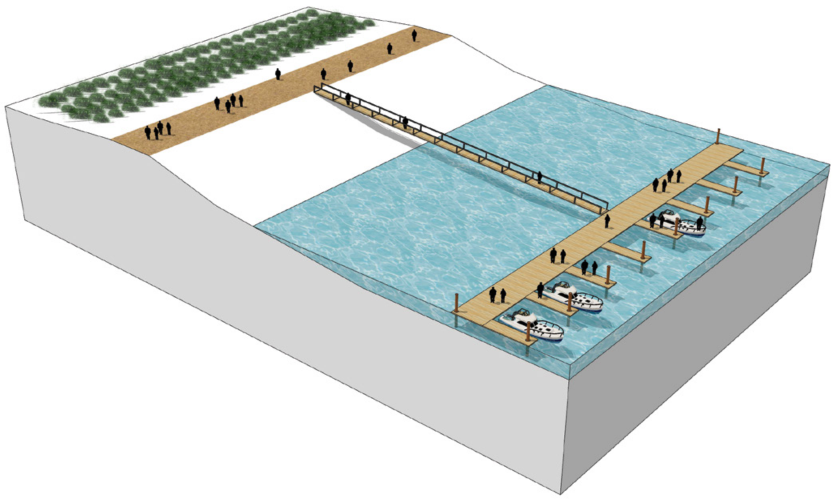
Master Plan

Rendering

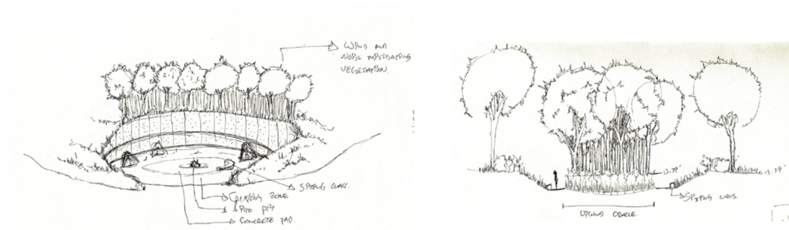


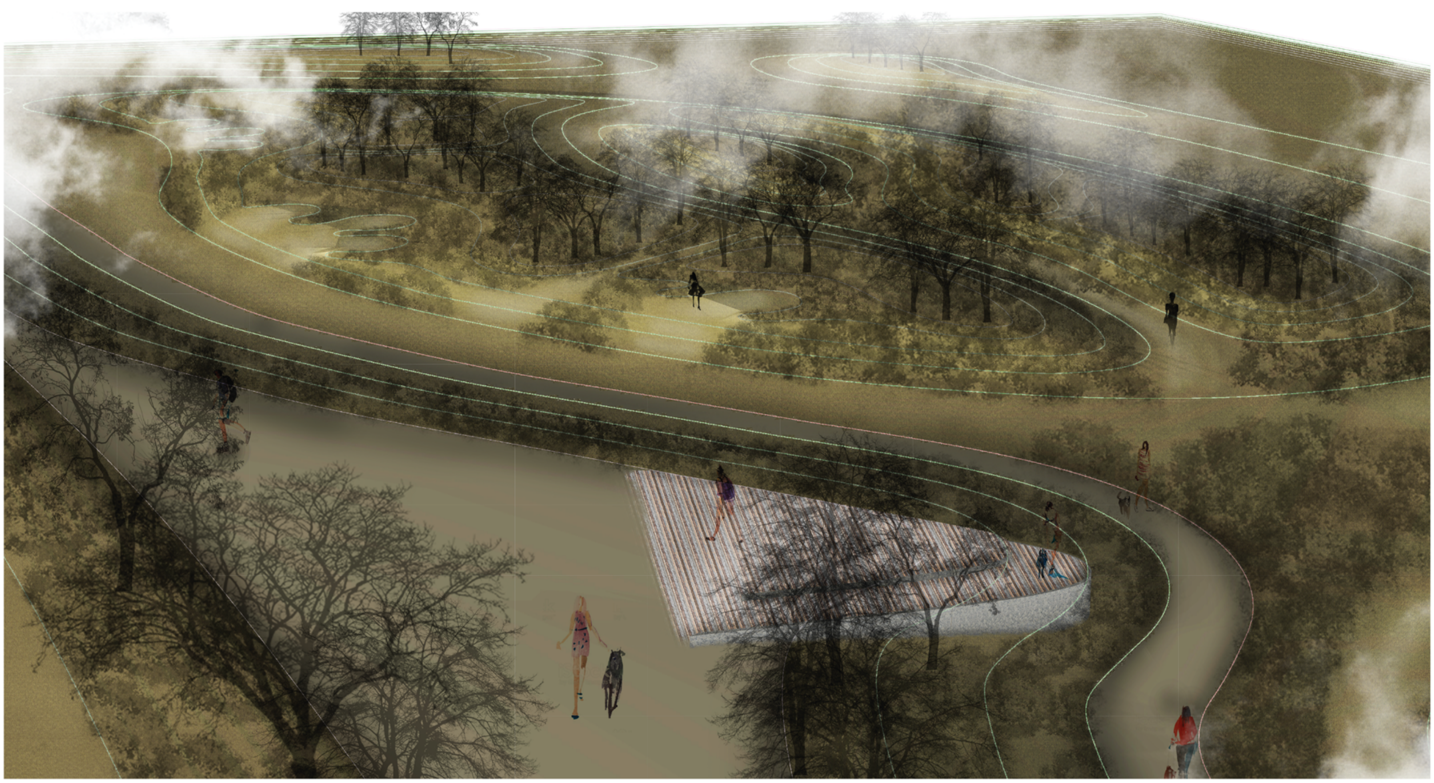
Section

By: Daniel Martinez

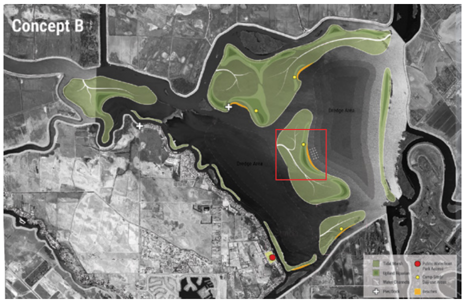


Exercise 2 example. Dock Feature exploration. Credit: Daniel Martinez

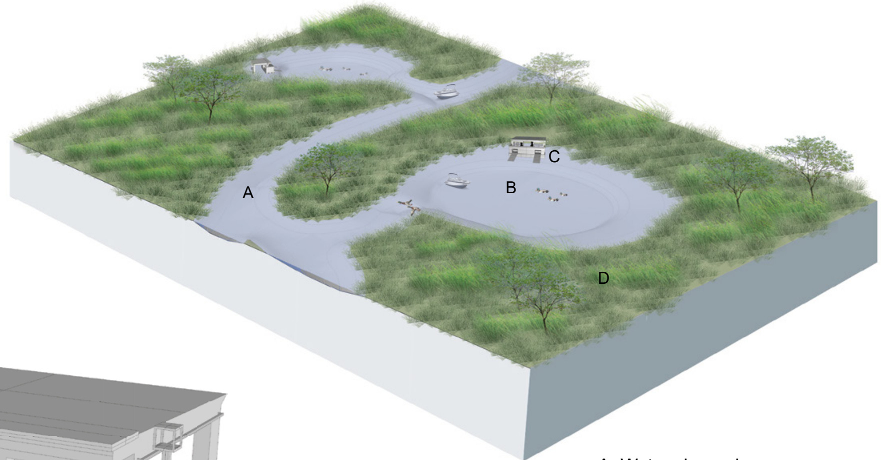




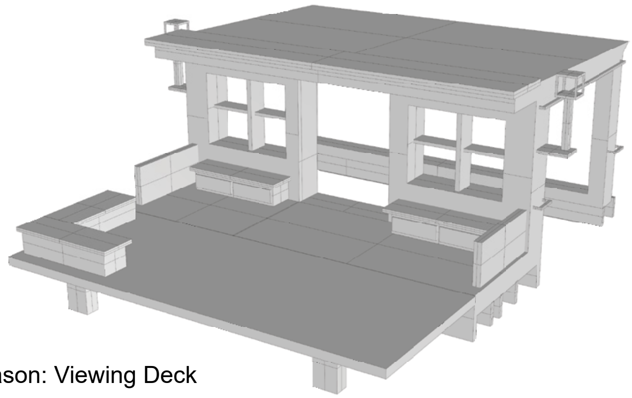
Exercise 2 example. Landscape feature design - upland area. Credit: Federico Albarracin



Context Map



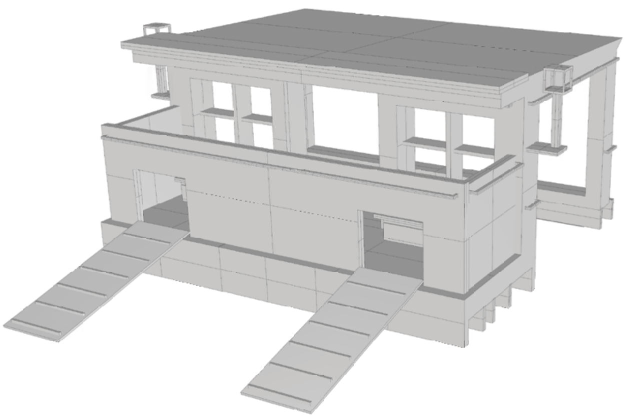
A. Water channel
B. Hunting Pond
C. Hunting Blinds / Viewing Deck
D. Marsh



Off Season: Viewing Deck

Focus Area 4 looks to seamlessly integrate habitat for native fish, recreational destinations, and hunting ponds. The site is identified by its winding water channels, which enhances the heterogenous physical channels that lower predator search efficiency. Likewise, the various secondary channels separate pond hunting from the primary path of boaters and fishers.

The transition from open water hunting to pond hunting gives Frank Tract the opportunity to reinvent their blinds. From a functional blind during the hunting season to a converted viewing deck during the off-season, one blind alone creates new experiences for people of various ages and interests.



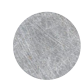
Hunting Season: Hunting Blind

Blind Features

- Boat parking / storage
- Dog doors and ramps
- Benches with storage
- Light fixture
- Structures to attach vegetation
- Extended dock feature
- Mooring posts

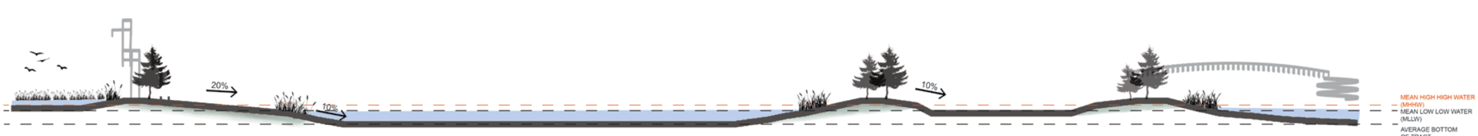
Material for Multi-Use Blind

Wood for Main Structure



Metal for Vegetation Hangers and Light Fixtures

Exercise 2 example. Hunting pond and hunting blind design exploration. Picture Credit: Kelly Nishimura



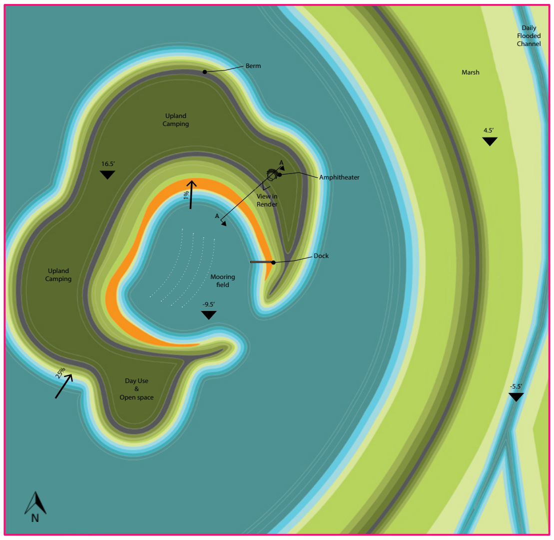
Diagrammatic section drawing showing key flandscape feature and structure.

Minkyu Cho
LDA 182

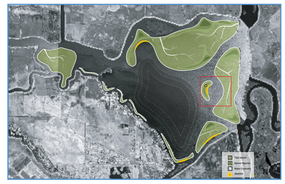
Exercise 2 example. Bridge and Island design exploration. Picture Credit: Minkyu Cho

Franks Tract Futures: Concept 2C Focus Area 4

LDA 182: Waterland Studio
Juliana Cheplick

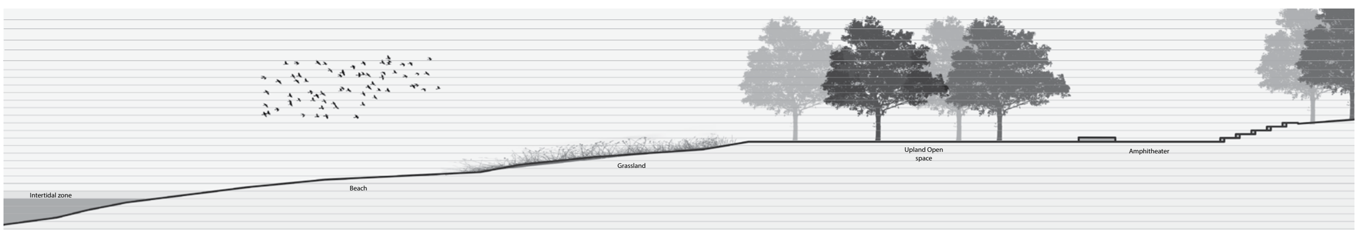


Master Plan


Context Map for Concept C

The Franks Tract Futures project must balance a wide range of values and interests to move forward. Among these are enhancing the recreational value of Frank's Tract. The destination island featured within this concept is intended to concentrate recreational experience here while providing upland habitat for birds, native plants, and insects. The complexity of the landform maximizes beach space, provides diverse areas for camping, and responds to environmental factors such as wind and wave erosion. The amphitheater is carved into the landform and offers flexible programming for performances, teaching, shaded seating, views of the sunset over the cove, and perhaps even a space to gather around a campfire. The intention is to provide users with both a sense of community and oneness with their surroundings.

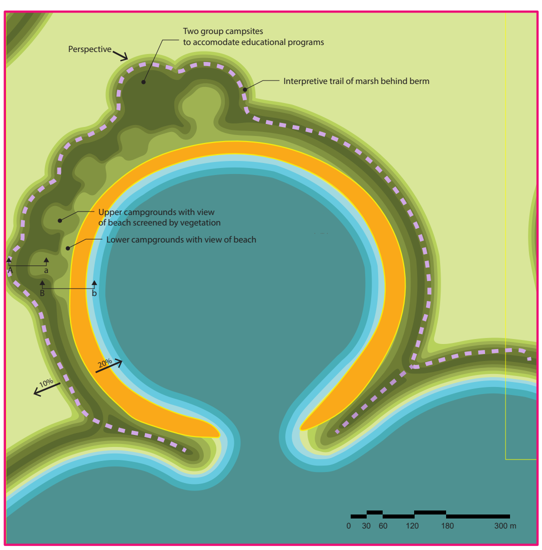

Perspective Render of the Amphitheater



Section A-A

Exercise 3 example. Recreational feature: amphitheater. Credit: Juliana Cheplick

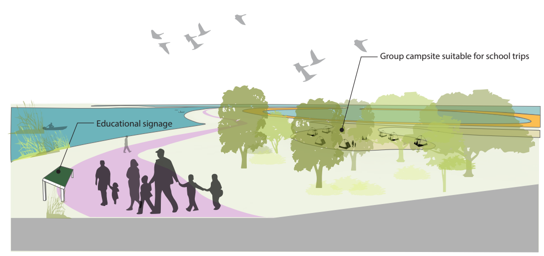
Franks Tract Futures Concept 2A - Focus Area 3



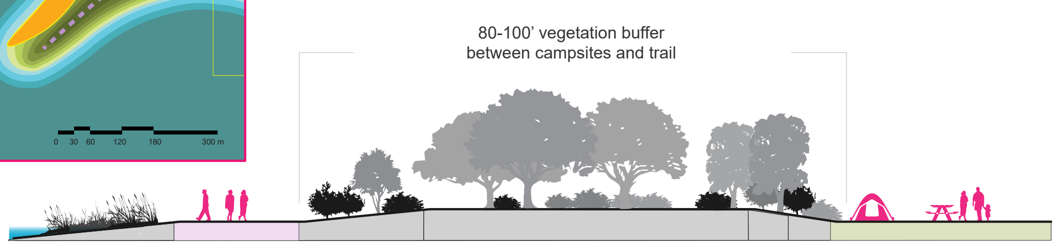
Plan View

This large beach provides a serene, homogenous landscape for campers and day users to walk along and freely choose their favorite spot to spend the day. Boaters can moor their boats or kayaks directly onto the sand.

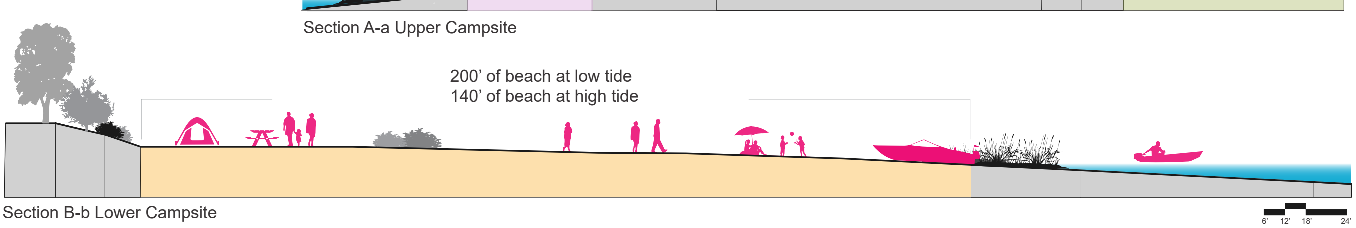
Context Map



Perspective of interpretive trail facing south



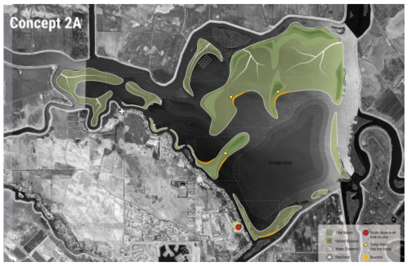
Section A-a Upper Campsite



Section B-b Lower Campsite

Exercise 3 example. Recreational feature: upland and day use area. Credit: Sonia Shoji-Jeevanjee

Concept 2A - Recreational Features Explorations



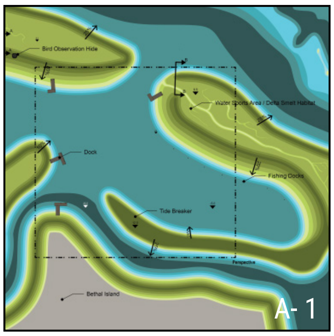
Reviewer Name: ______________________

☐ AC member ☐ SC member ☐ Other Please specify: ____________

General Comments: ______________________

____

* Landform: terrain, earthworks. Rec features: places host recreational activities, includes beaches, docks, piers, hunting blinds, mooring fields, etc.



In general, is this concept working? Yes No

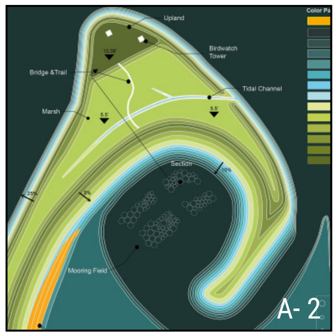
Is the rec feature well-sited? Yes No

Landform support the features? Yes No

How can this concept be improved?

____

____



In general, is this concept working? Yes No

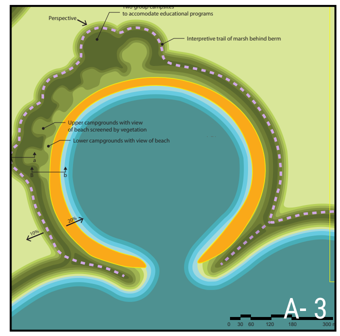
Is the rec feature well-sited? Yes No

Landform support the features? Yes No

How can this concept be improved?

____

____



In general, is this concept working? Yes No

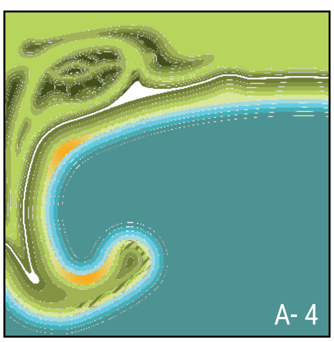
Is the rec feature well-sited? Yes No

Landform support the features? Yes No

How can this concept be improved?

____

____



In general, is this concept working? Yes No

Is the rec feature well-sited? Yes No

Landform support the features? Yes No

How can this concept be improved?

____

____

In general, is this concept working? Yes No

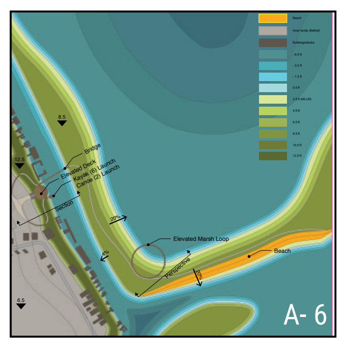
Is the rec feature well-sited? Yes No

Landform support the features? Yes No

How can this concept be improved?

____

____



In general, is this concept working? Yes No

Is the rec feature well-sited? Yes No

Landform support the features? Yes No

How can this concept be improved?

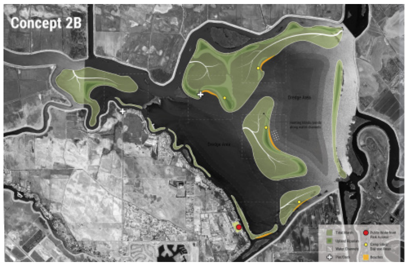
____

____

What are your favorite landforms/features? ______________________

Exciting ideas you would like to highlight? ______________________

Concept 2B - Recreational Features Explorations

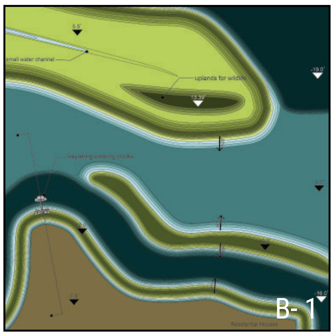


Reviewer Name: ____________________

☐ AC member ☐ SC member ☐ Other Please specify: ____________

General Comments: ____________________

* Landform: terrain, earthworks. Rec features: places host recreational activities, includes beaches, docks, piers, hunting blinds, mooring fields, etc.



In general, is this concept working? Yes No

Is the rec feature well-sited? Yes No

Landform support the features? Yes No

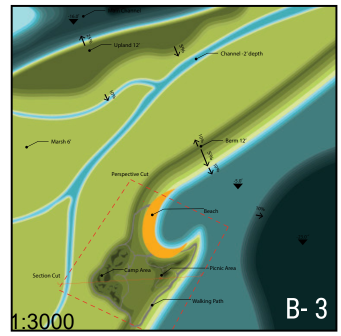
How can this concept be improved?

In general, is this concept working? Yes No

Is the rec feature well-sited? Yes No

Landform support the features? Yes No

How can this concept be improved?

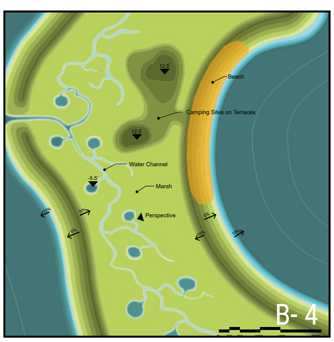


In general, is this concept working? Yes No

Is the rec feature well-sited? Yes No

Landform support the features? Yes No

How can this concept be improved?

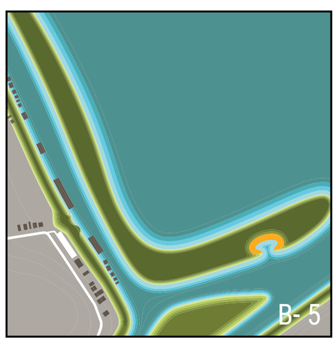


In general, is this concept working? Yes No

Is the rec feature well-sited? Yes No

Landform support the features? Yes No

How can this concept be improved?

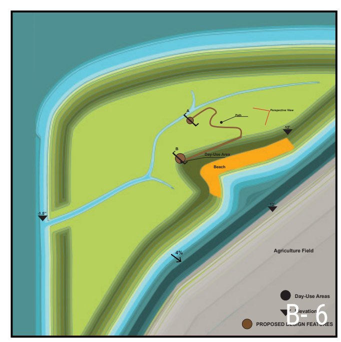


In general, is this concept working? Yes No

Is the rec feature well-sited? Yes No

Landform support the features? Yes No

How can this concept be improved?



In general, is this concept working? Yes No

Is the rec feature well-sited? Yes No

Landform support the features? Yes No

How can this concept be improved?

What are your favorite landforms/features? ____________________

Exciting ideas you would like to highlight? ____________________

Concept 2C - Recreational Features Explorations

Reviewer Name: ______________________________

☐ AC member ☐ SC member ☐ Other Please specify: ____________

General Comments: ______________________________

____

* Landform: terrain, earthworks. Rec features: places host recreational activities, includes beaches, docks, piers, hunting blinds, mooring fields, etc.

In general, is this concept working? Yes No

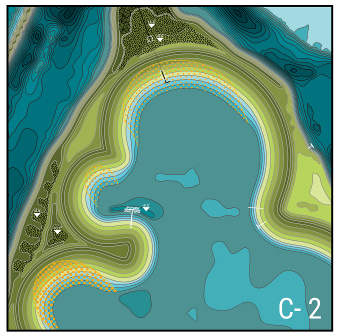
Is the rec feature well-sited? Yes No

Landform support the features? Yes No

How can this concept be improved?

____

____



In general, is this concept working? Yes No

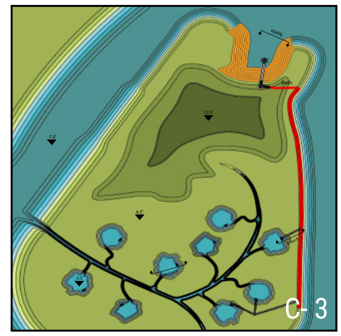
Is the rec feature well-sited? Yes No

Landform support the features? Yes No

How can this concept be improved?

____

____



In general, is this concept working? Yes No

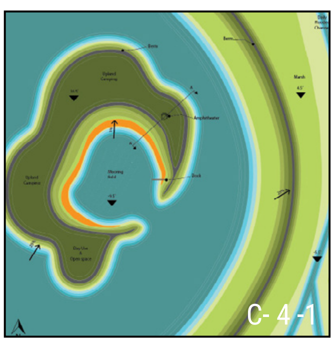
Is the rec feature well-sited? Yes No

Landform support the features? Yes No

How can this concept be improved?

____

____



In general, is this concept working? Yes No

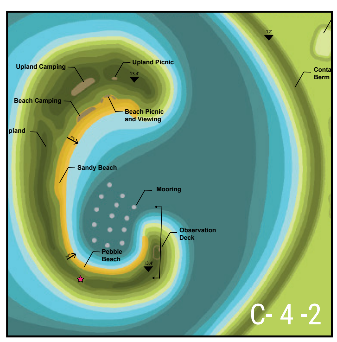
Is the rec feature well-sited? Yes No

Landform support the features? Yes No

How can this concept be improved?

____

____



In general, is this concept working? Yes No

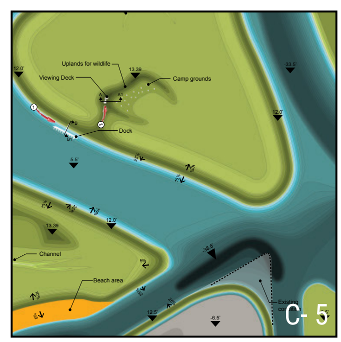
Is the rec feature well-sited? Yes No

Landform support the features? Yes No

How can this concept be improved?

____

____



In general, is this concept working? Yes No

Is the rec feature well-sited? Yes No

Landform support the features? Yes No

How can this concept be improved?

____

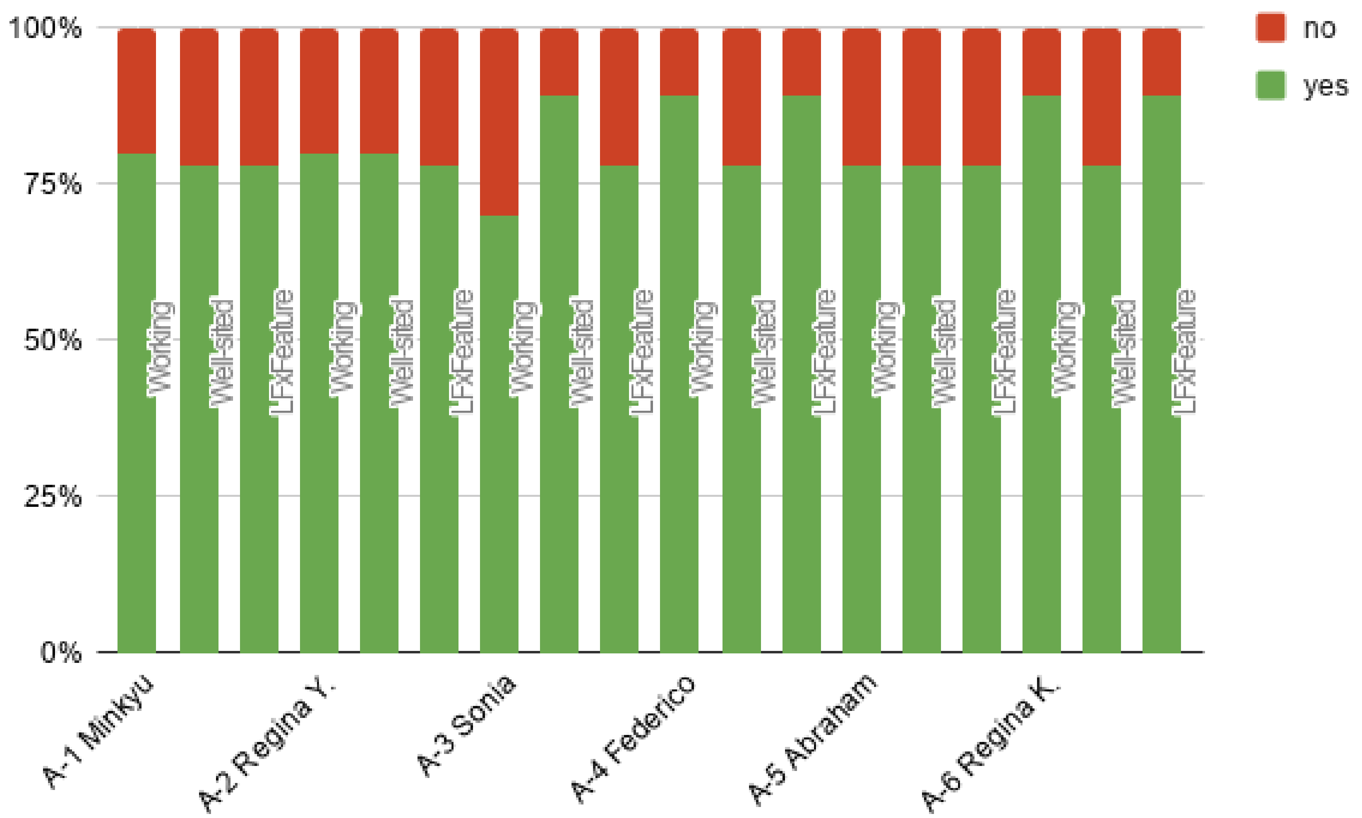
____

What are your favorite landforms/features? ______________________________

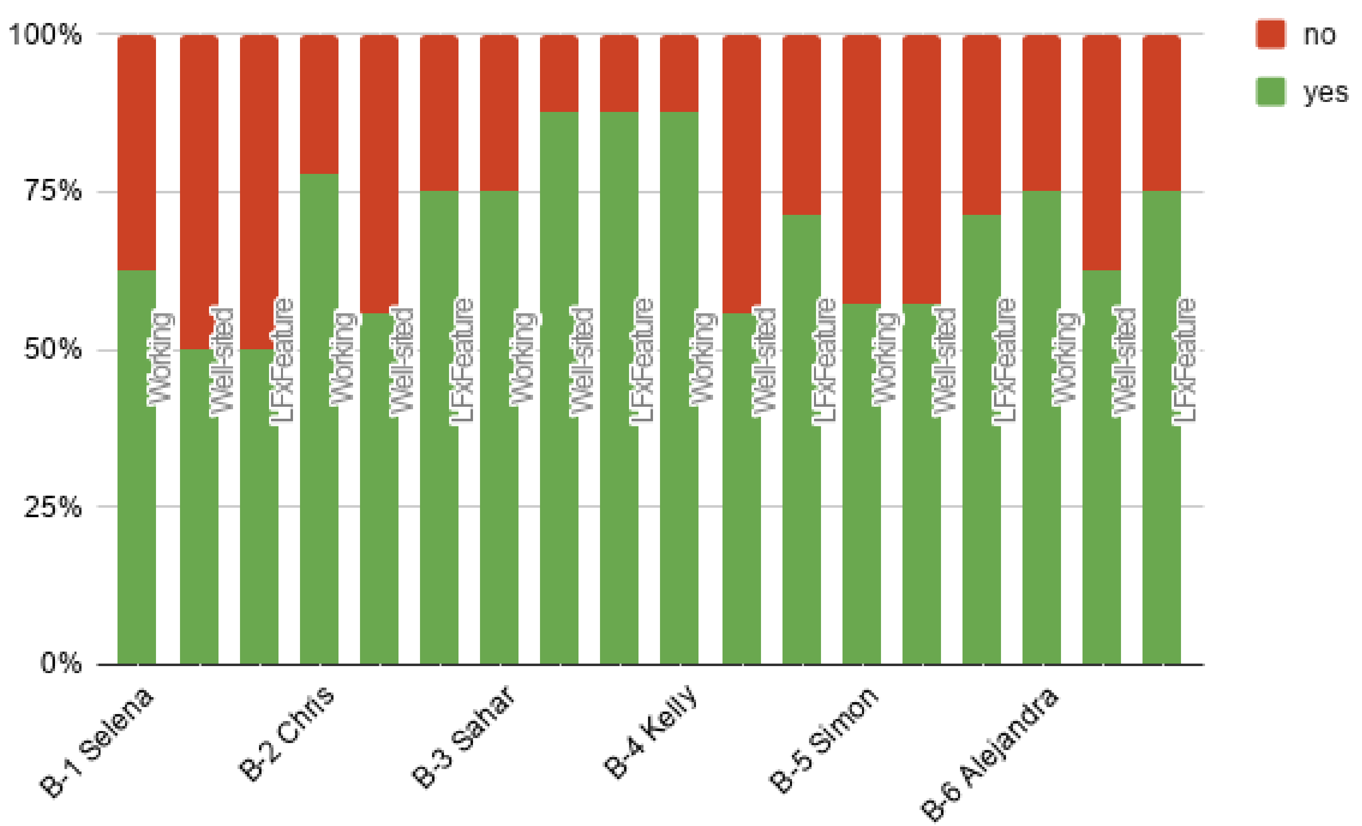
Exciting ideas you would like to highlight? ______________________________

ADVISORY COMMITTEE MEETING #3 RECREATIONAL FEATURES SURVEY RESULTS

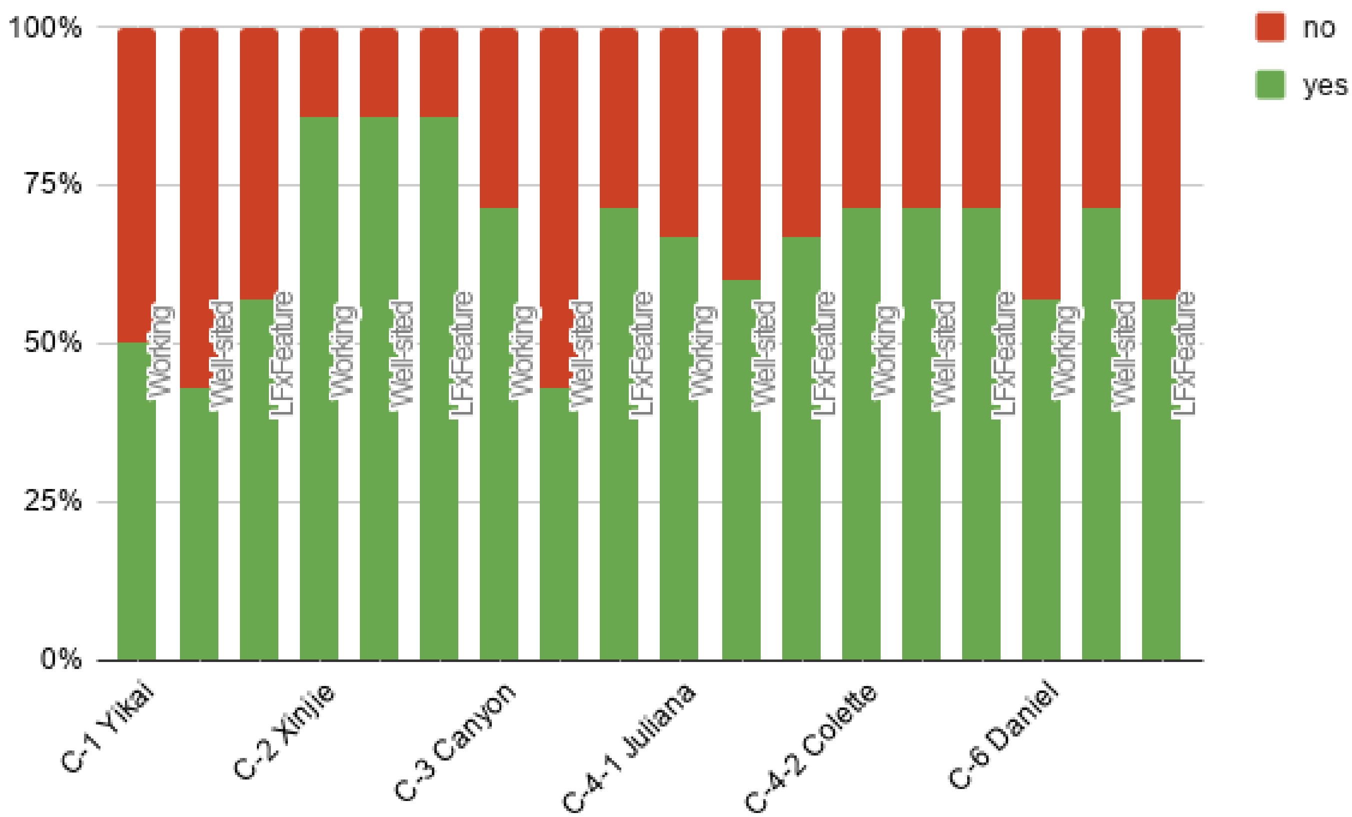
2A Recreational Features Exploration



2B Recreational Features Explorations

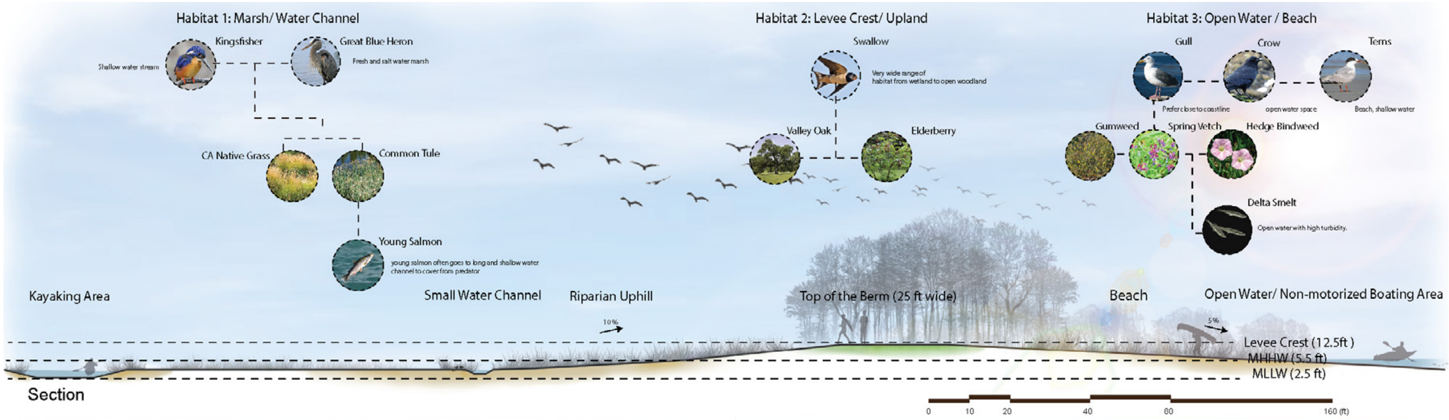


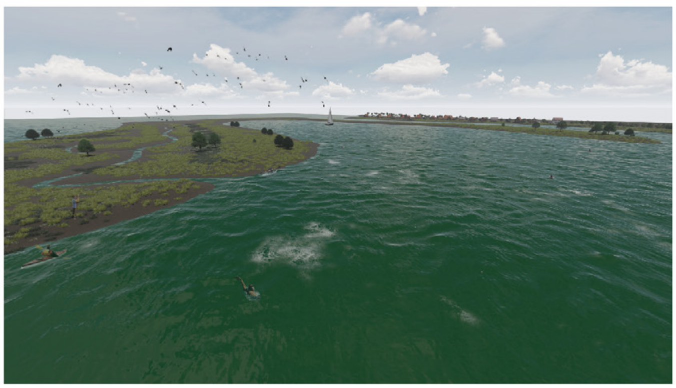
2C Recreational Features Exploration



Exercise 4: Refinement and Representation

Integrating the extensive stakeholder feedback from Exercise 3, students made another round of refinements to their designs and prepared a set of presentation drawings that focused on integration of each group's designs.

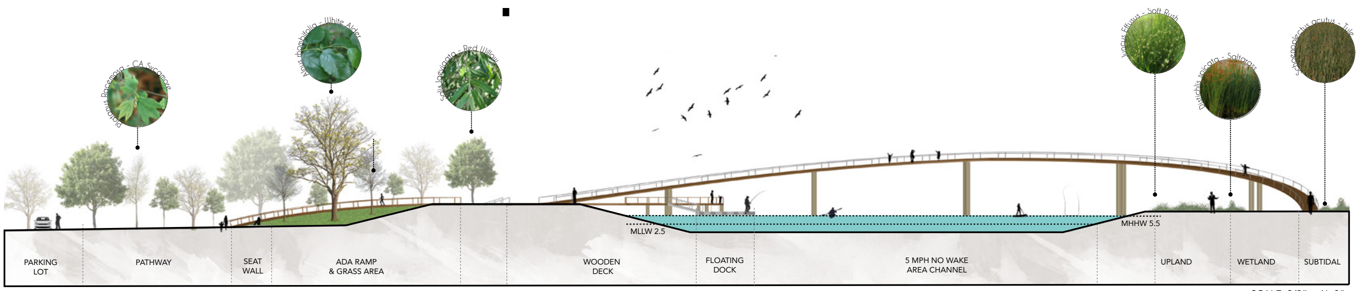




Non-Motorized Boating Area

Bird Observation Structure

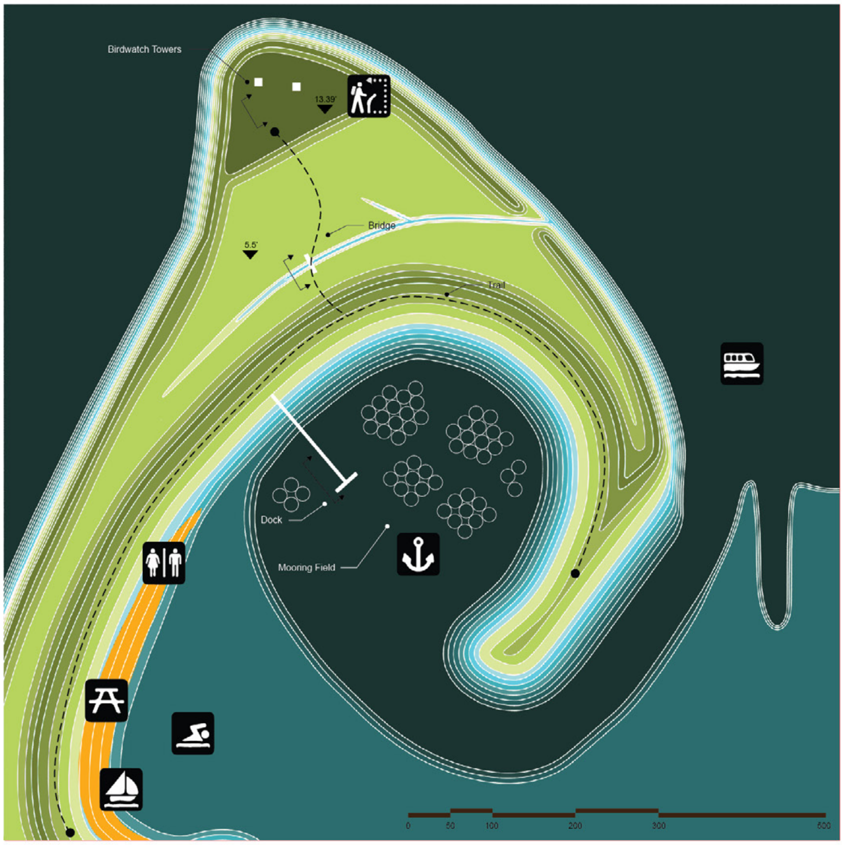
Exercise 4 example. Little Franks Tract New Marsh Idea (Concept A). Credit: Minkyu Cho



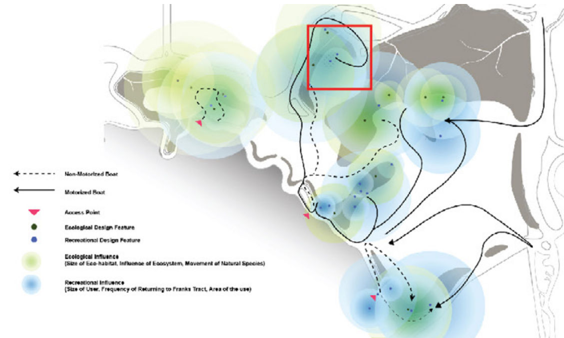
Waterfront Linkage:

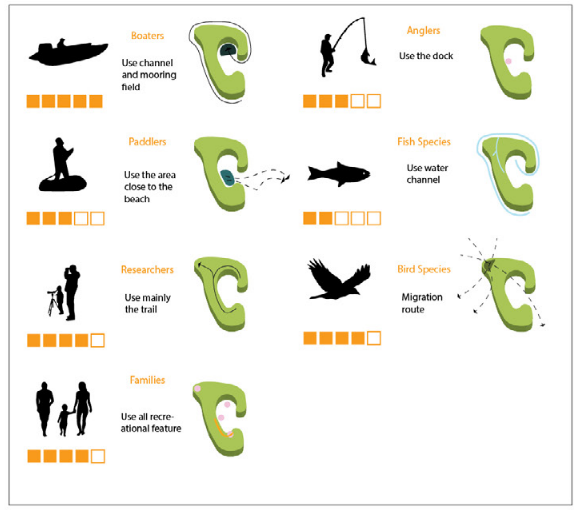
Learning Garden:

Exercise 4 example. Waterfront Bridge Idea (Concept A). Credit: Regina Karimdjanova

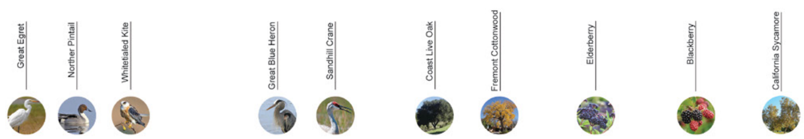


Master Plan

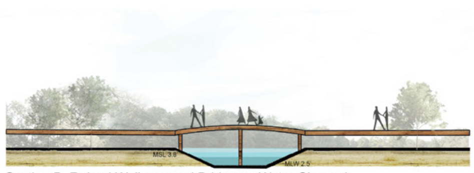

Overall Design



User Group Analysis/diagrams

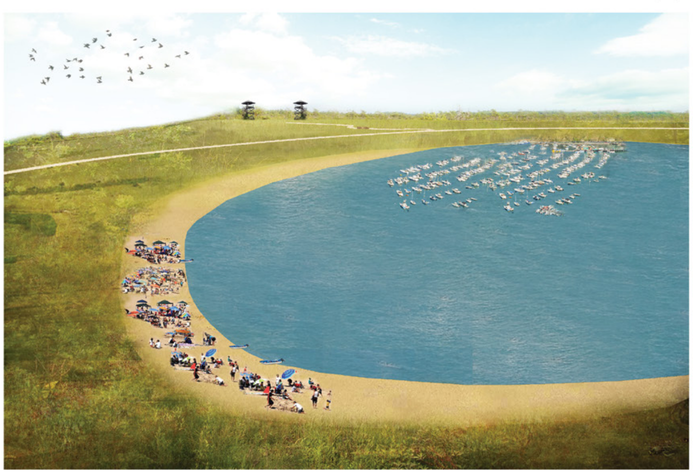


Section A Birdwatch Tower



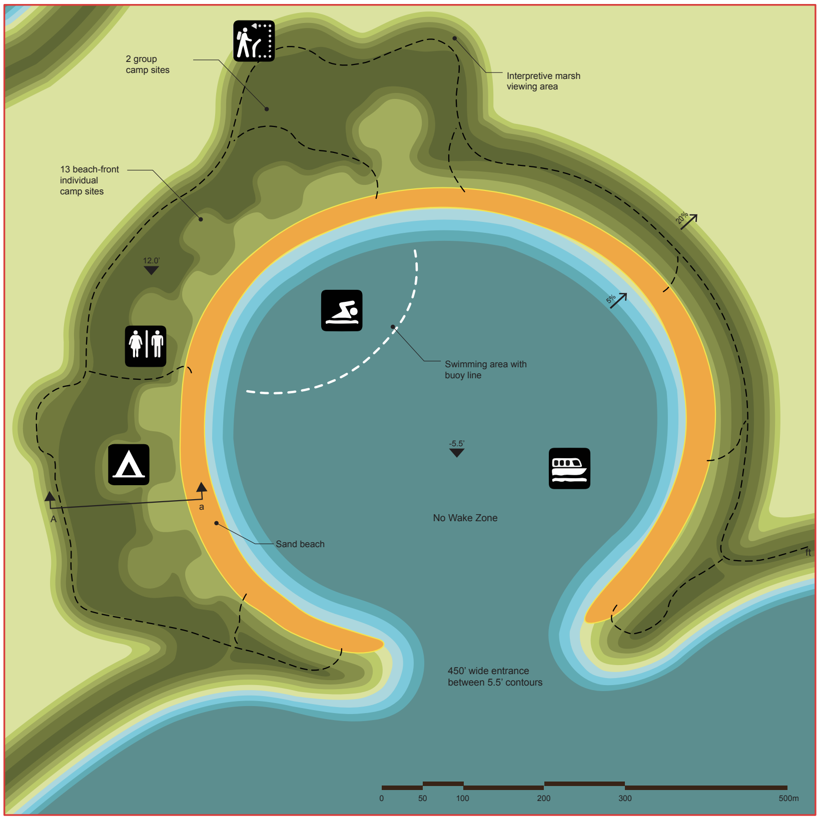
Section B Raised Walkway and Bridge on Water Channel

Section C Dock and Mooring Field

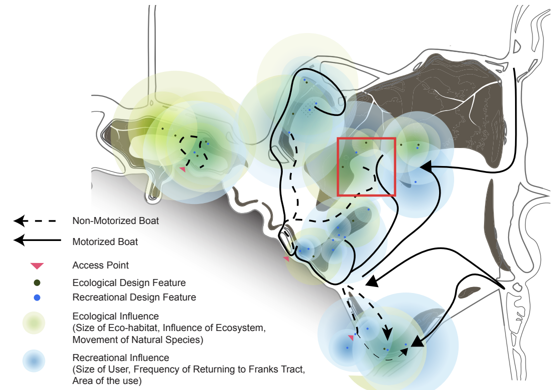

Perspective 1 Beach and Mooring Field


Perspective 2 The Bridge and the Birdtower

Exercise 4 example. Western Cove, Mooring Field, and Beach (Concept A). Credit: Regina Yang



Master Plan



Primary Users

Educators
State parks programs can use the interpretive trail to teach visitors marsh ecology and land history

Boaters
No wake zone prevents speed, but can pull up freely on beach and free anchor near entrance

Campers
Beach front camp sites maintain "private beach feel" due to the upland vegetation screening

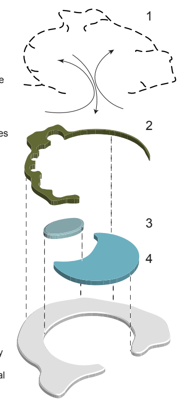
Birds
Upland riparian zones offer rich canopy habitat for birds

Swimmers
Protected from all motorized boats and paddles by a swim buoy line

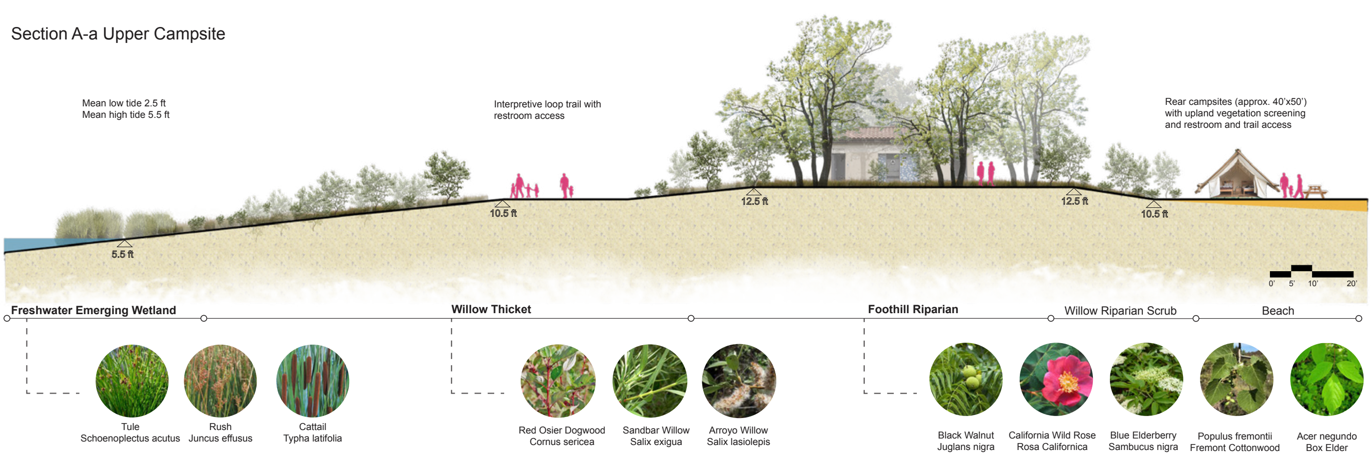
Paddlers
Paddlers can have a no wake zone to safely recreate

Fish
Open shallow waters up to depths of 5' are suitable, but frequently disturbed by boat traffic

Anglers
Shallow waters will likely be inhabited by bass, but traffic from boaters is not optimal



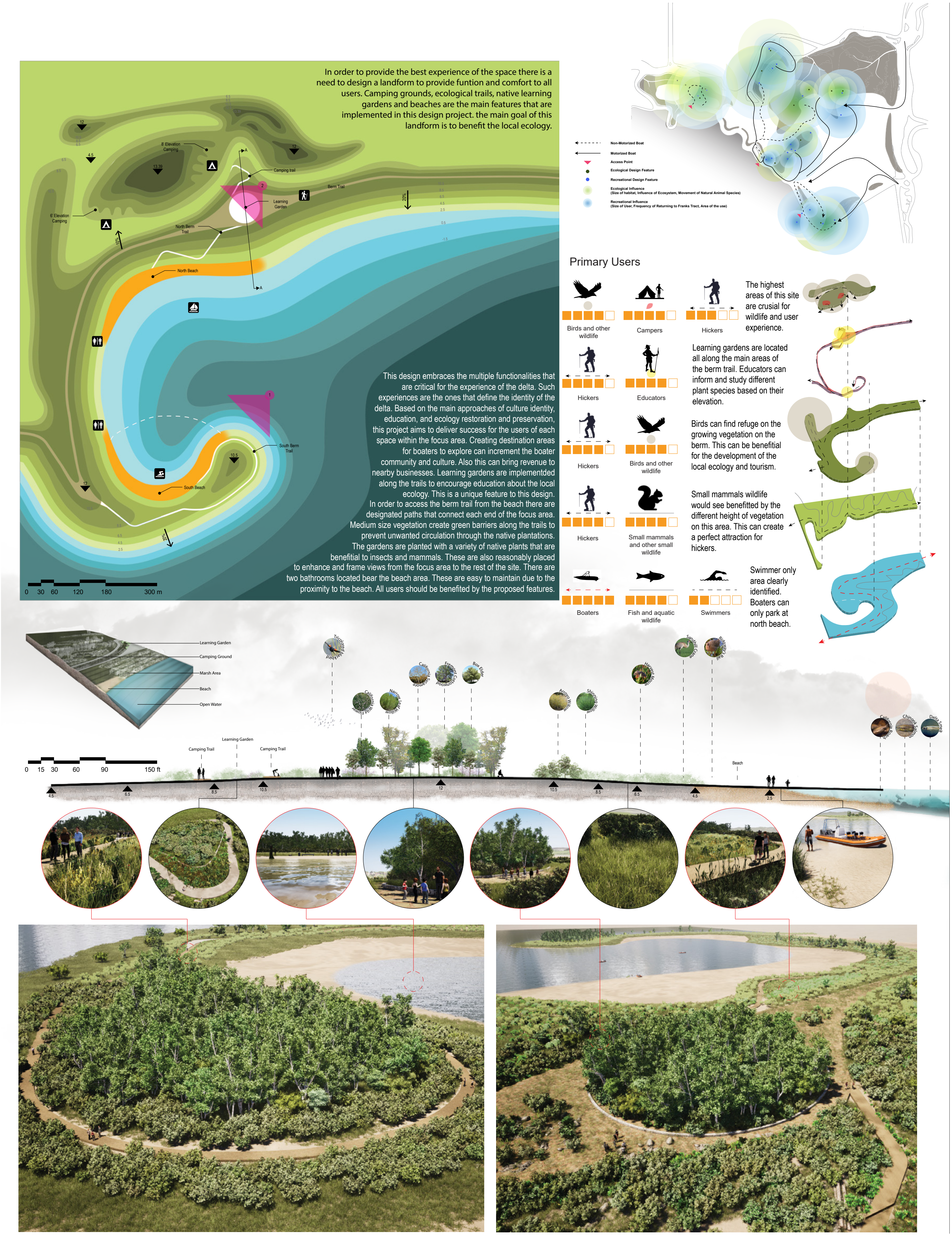
Section A-a Upper Campsite



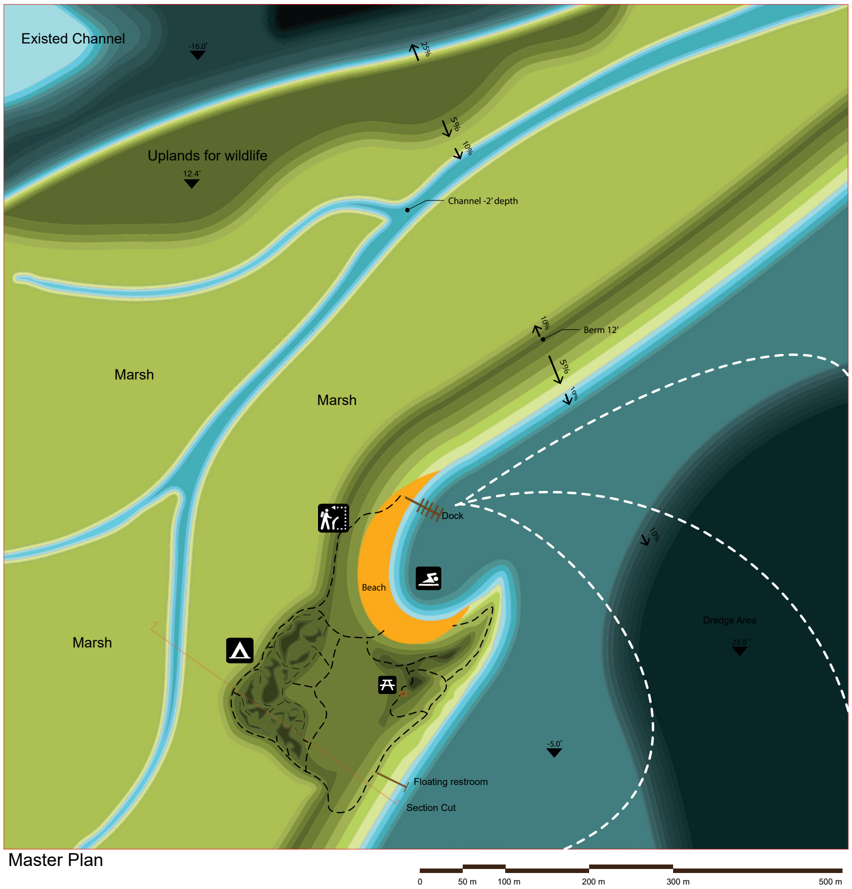

Highlight of trail, view facing southwest to Mt. Diablo


Individual beach campsites

Exercise 4 example. Cove, beach, and upland relationship (Concept A). Credit: Sonia Shoji-Jeevanjee

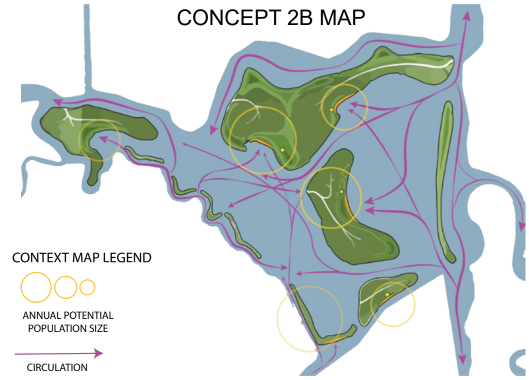


Exercise 4 example. Eastern Cove, beach, and upland idea (Concept A). Credit: Federico Albarracin

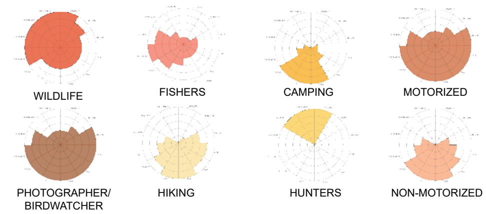


Master Plan

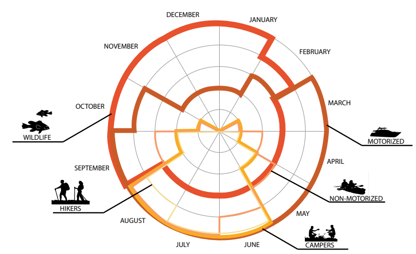
CONCEPT 2B MAP



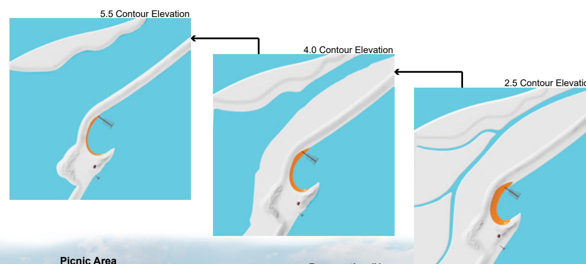
SEASONAL USER DIAGRAM

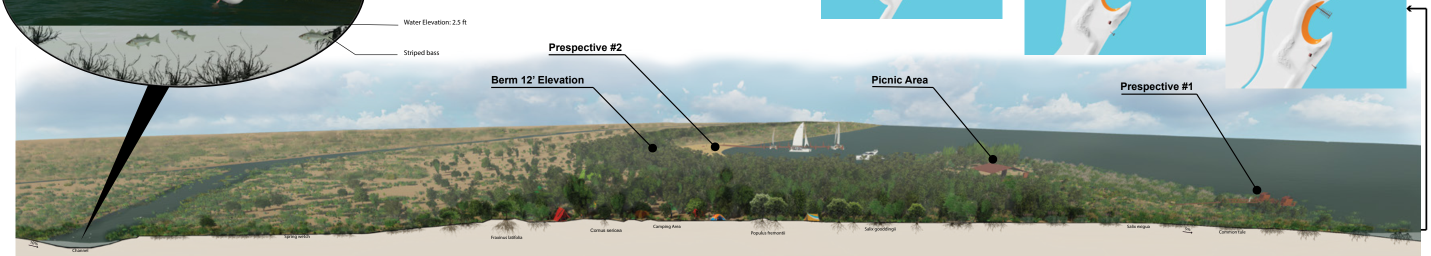


INDIVIDUAL USER DIAGRAM



In this design, wildlife was the most considered; I have tried to minimize the amount of land use by humans, and provide the majority of the land for ecological processes. A central water channel is designed to feed the marshlands-by the natural processes of the tides. This is while the human use areas are designed to be in a higher elevation, away from any frequent flooding. At the human use portion of the land, I tried to maximize the use/activities by designing different sites such as beach, camping ground, picnic area, and hiking trails. Other facilities such as a big dock with multi sizes slip, and floating restrooms (maintenance by boat) were designed and have been considered.





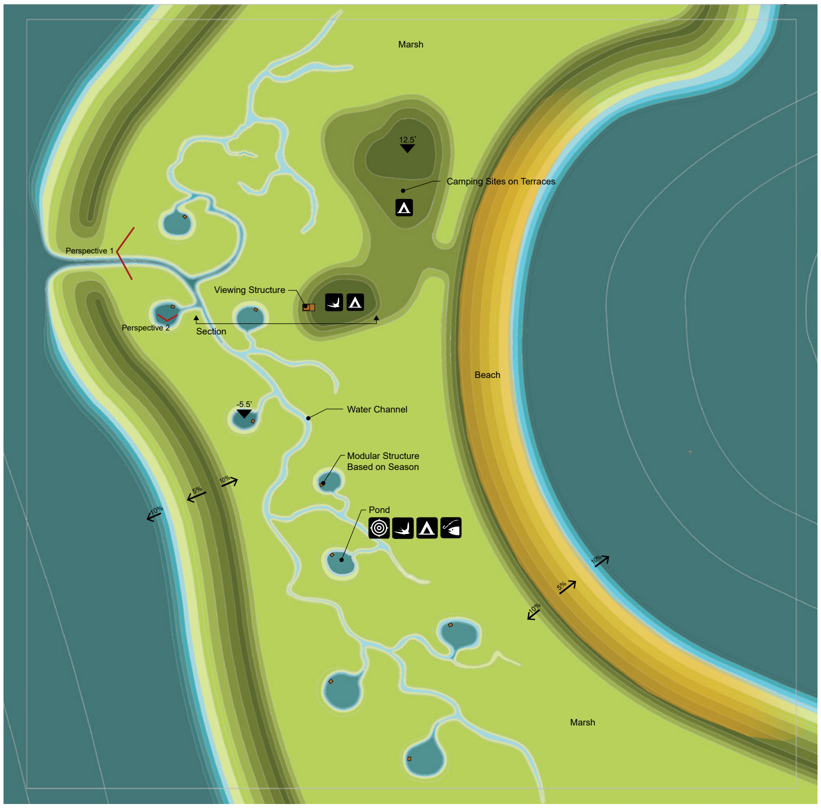
Section-Cut


Perspective #1 : Floating-restrooms draining by boat


Perspective #2 : Plenty of slips for visitors to park their boats safely

By: Sahar Ghulam Mohammad

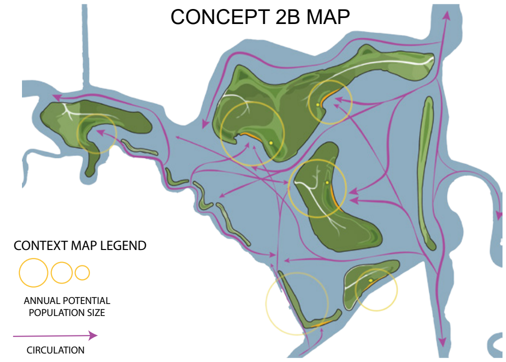
Exercise 4 example. Eastern Cove, beach, and day use area (Concept B). Credit: Sahar Ghulam Mohammad

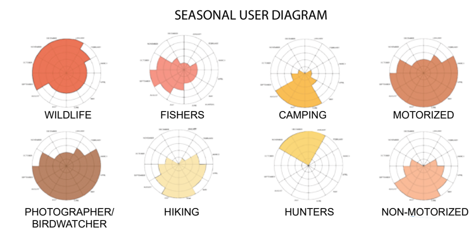


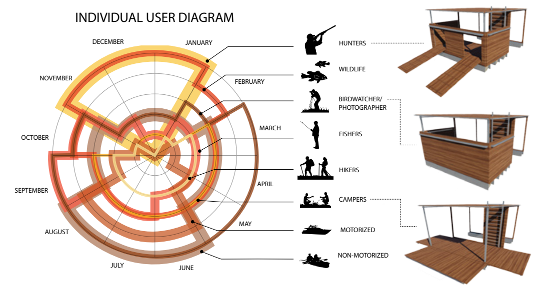
Master Plan

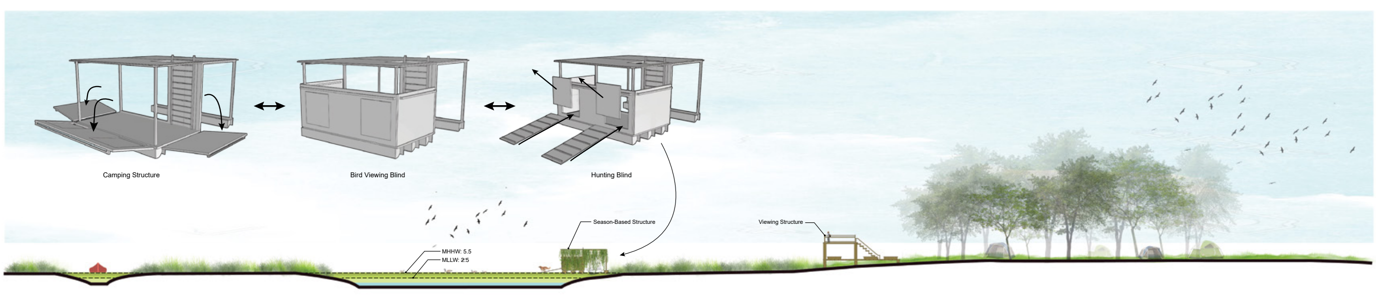
0 50 100 200 300 500

Kelly Mariko Nishimura
LDA 182 | Fall 2019



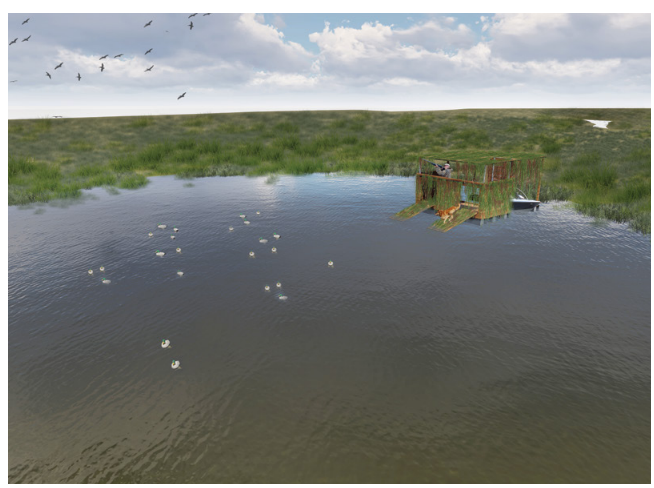






Section: The spatial relationship and topography changes between the water channels, marshland, ponds, and riparian upland.

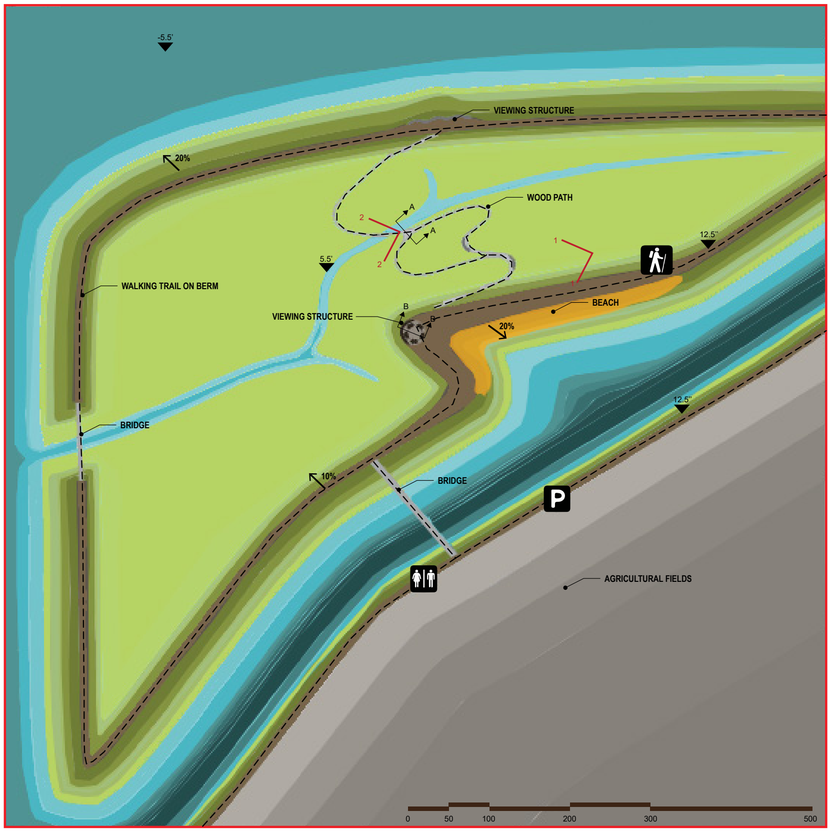
Perspective 1: Aerial view of the water channels, ponds, and riparian upland.



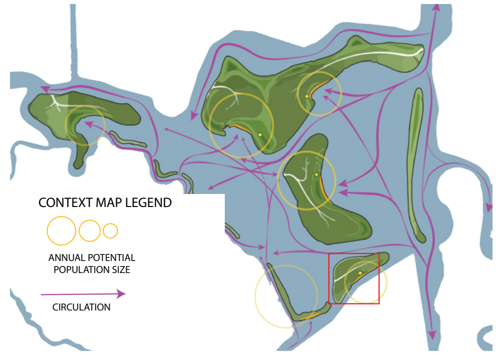
Perspective 2: The spatial relationship between the pond edge and structure during the hunting season.

Kelly Mariko Nishimura
LDA 182 | Fall 2019

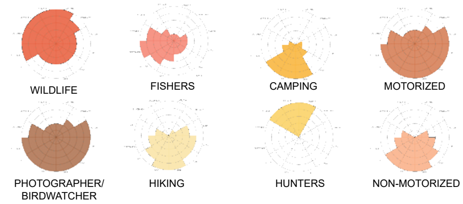
Exercise 4 example. Hunting pond and hunting blind in marsh (Concept B). Credit: Kelly Nishimura



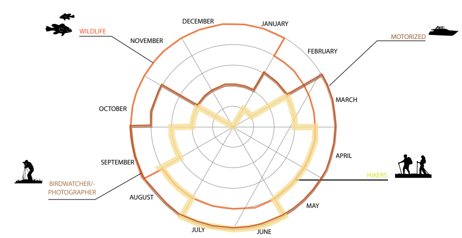
MASTER PLAN



SEASONAL USER DIAGRAM



INDIVIDUAL USER DIAGRAM



Sections

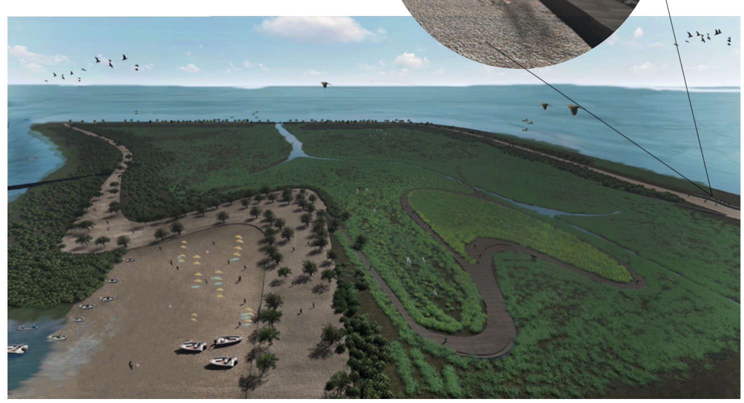
Section B: Viewing Down to Marsh and Walking/Seating Area on Berm

This site is design to incourage humans and nature to interact. Human can **observe Marsh Land and the habitat.** The main design feautures concist of a **Day Use Area** with a **beach** and two **observatory structures which include a path and a viewing point at top of marsh.**. This site provides a great view down to the marsh land and Franks Track. The top of the marsh can also be use as a path so humans can walk and get to know this island. The beach serves as a gathering area where people can pull their boats in and spend the day in the marsh.
The levi closest to the marsh was regraded to allow a 20' wide parking area and a wood bridge that allows visitors to enter the marsh. This will allow more accesability and a space for bathrooms.

Section A: Walk On Trail Into the Marsh Experience

Perspectives

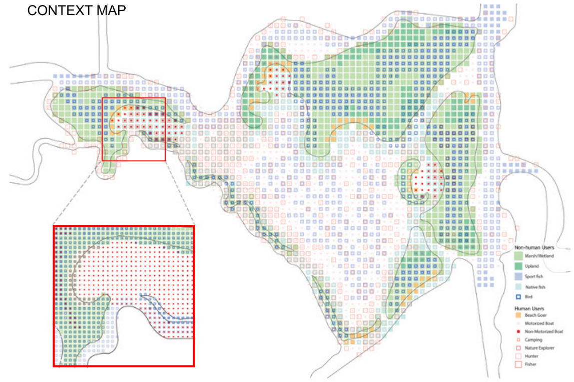
2. Perspective of Marsh Experience
This image shows the wood trail experiece of the marsh by the water channel. This would be the place to observe habitat without disturbing it. It gives a designated area to sumerge yourself and become part of this environment.

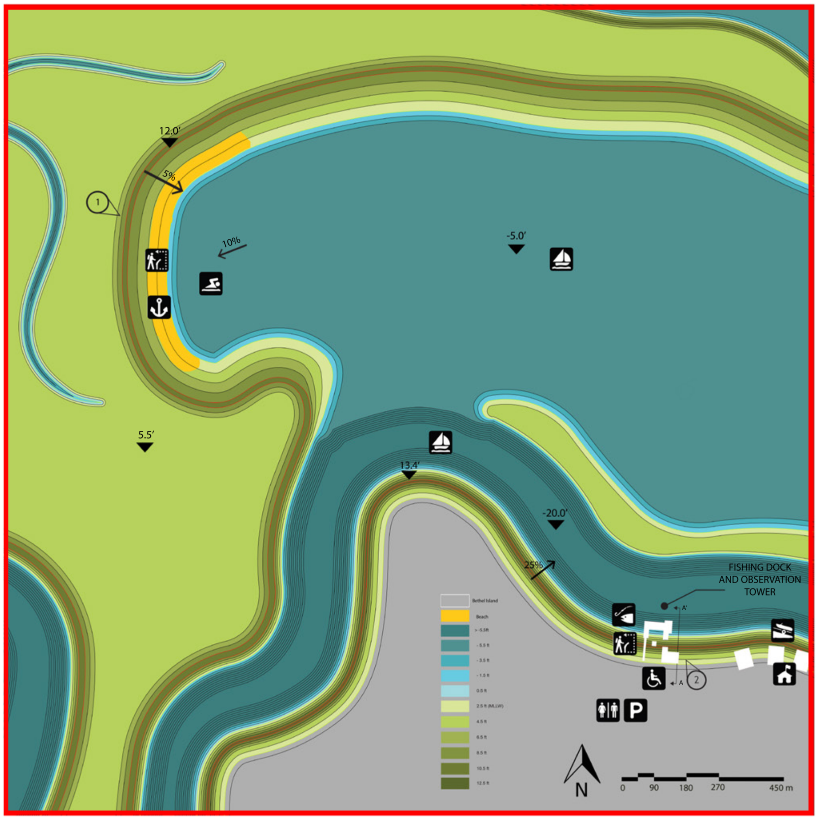


1. Perspective of Marsh Overview
This image informs the overall use of the marsh and the various options users are given, both with recreational and ecological emphasis.
The designed features are a beach, a few observation structures, a walking trail into the marsh and a walking trail with compacted gravel and soil at a higher elevation on the berm.

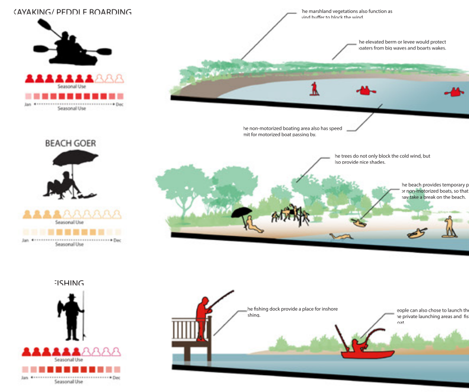
Exercise 4 example. Holland Cut Corner design (Concept B). Credit: Alejandra Batres Suarez

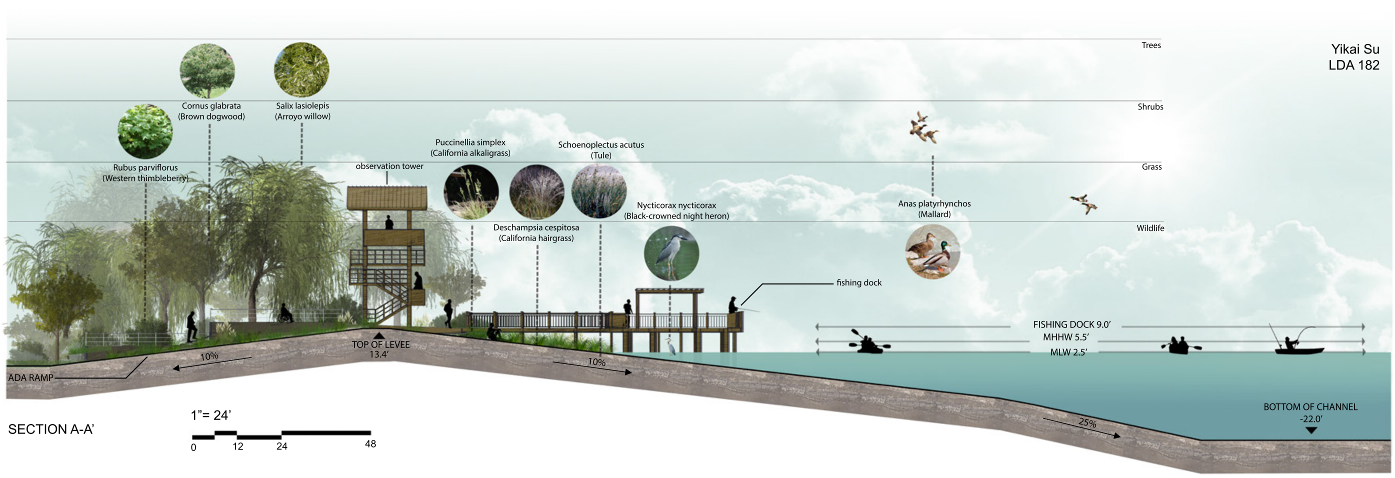
CONTEXT MAP





MASTER PLAN

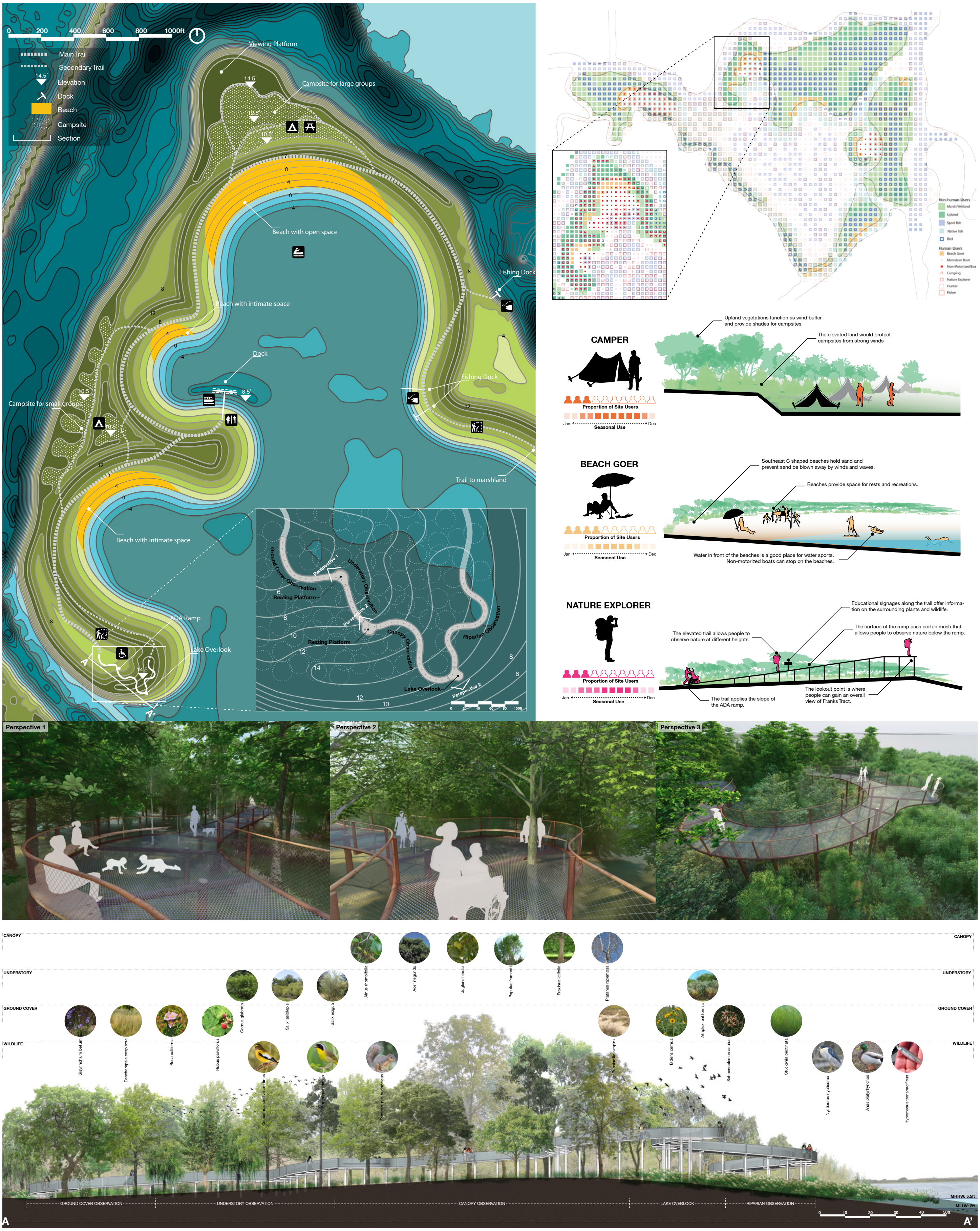




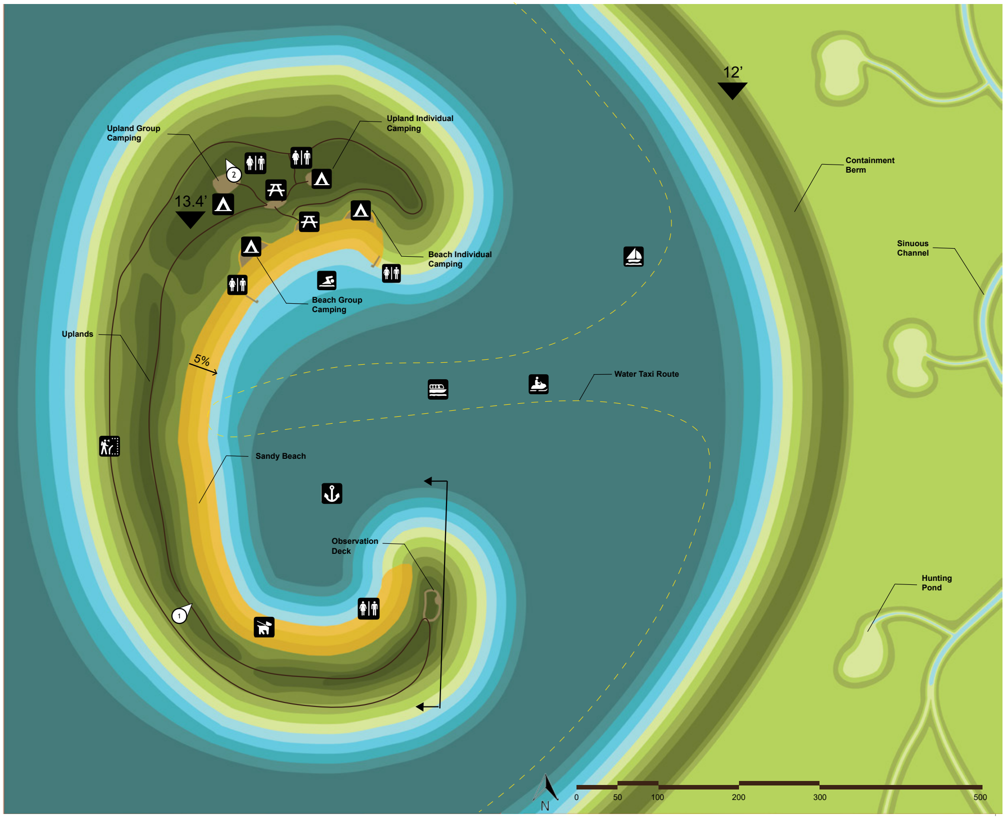
1 Perspective 1 : This perspective is the view from the beach at the tidal marsh looking towards Franks Tract. The beach is only accessible to non-motorized boats, which provides a place for the boaters to rest and gather. It also bring people closer to the tidal marsh so that people can observe, explore, and appreciate the nature.

2 Perspective 2 : This perspective is the view from the levee on Bethel Island looking towards the fishing dock and the observation tower. There are two staris to get on the levee and one stair attaches ADA ramp. The fishing dock has a pavillion, fishi cleaning stations, trash cans, and benches. The observation tower has 3 storys and a height of 38 feet.

Exercise 4 example. Little Franks Tract Dock Idea (Concept C). Credit: Yikai Su

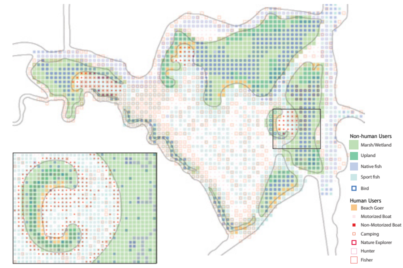


Exercise 4 example. Riparian area and skywalk design (Concept C). Credit: Xinjie Jiang

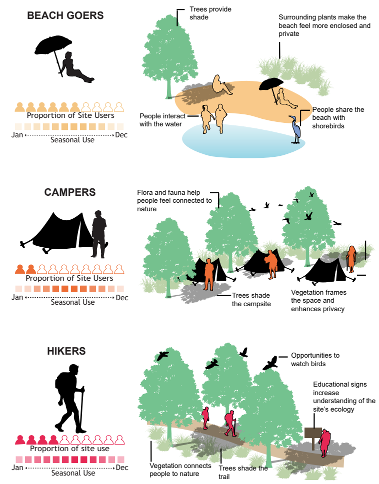


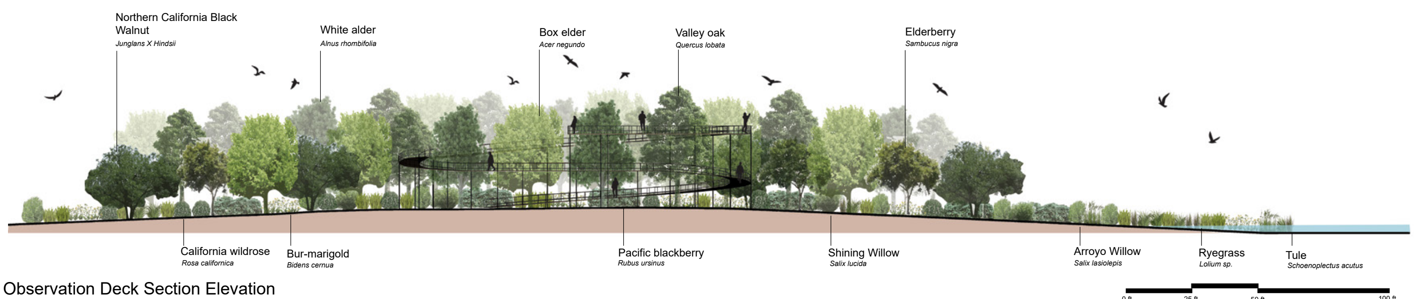
Master Plan

Franks Tract Users



Focus Area 4 Top Users





Observation Deck Section Elevation

An observation deck will allow visitors to gain a unique experience walking through the upland vegetation canopy. Users will enjoy views of Franks Tract and will have the opportunity to observe diverse bird species from the deck. Two interpretive signs, one about upland vegetation and another about birds seen at Frank's Tract, will be added to teach visitors more about the ecology of Frank's Tract and foster a deeper appreciation for the site. The upland vegetation canopy and understory will featur diverse species in order to increase biodiversity. As the land slopes away from the uplands, the landscape will include a variety of Delta native marsh and wetland vegetation.

Destination Island Perspective

The destination island will be a fun place that can be accessed by motor boats and kayaks and will include upland and beach campsites, hiking trails, an observation deck, and a sand beach. This island will also include upland riparian habitat and spaces for Delta native plants including tule grass and elderberry trees. The land across from the destination island will be restored marsh land with a sinuous river and hunting ponds.

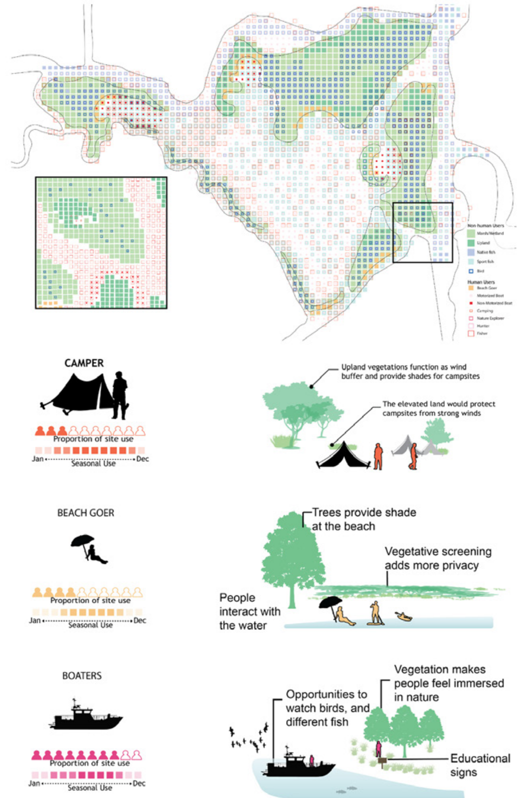
Upland Group Campsite Perspective

The upland campsite will be surrounded by diverse upland vegetation giving the campground a more enclosed feel and will allow people to feel immersed in nature. This upland campground will be intended for group use and will have spaces for groups of tents, picnic tables, and open gathering areas. This rendering also shows a restroom along the trail that connects to the campsite. This trail will lead to an upland common area which will encourage different users to come together.

Exercise 4 example. Beach and upland dayuse area design (Concept C). Credit: Colette Curran

Master Plan

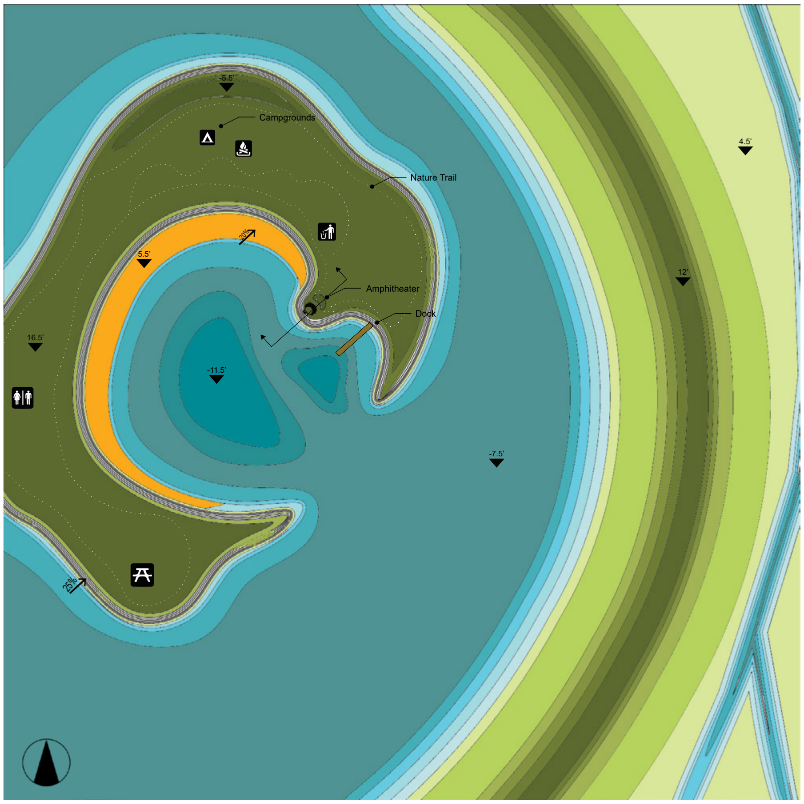
Frank's Tract Users



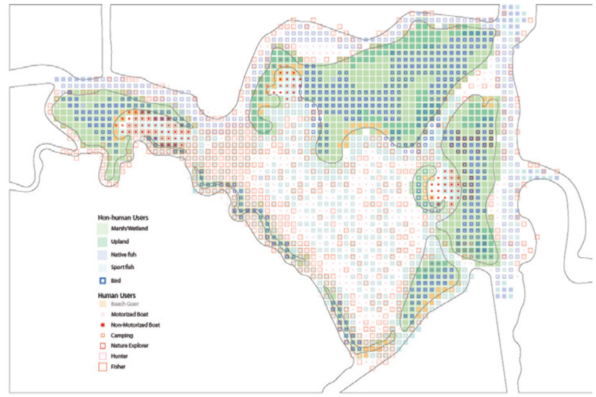
STAGING AREA PERSPECTIVE
This perspective shows the staging area/ Entrance to surrounding sites. This area will provide parking spaces for visitors, two public restrooms, seating spaces with shade. The perspective also shows the access to a boat taxi, the boat taxi will be able to take the visitors to many of the surround sites.

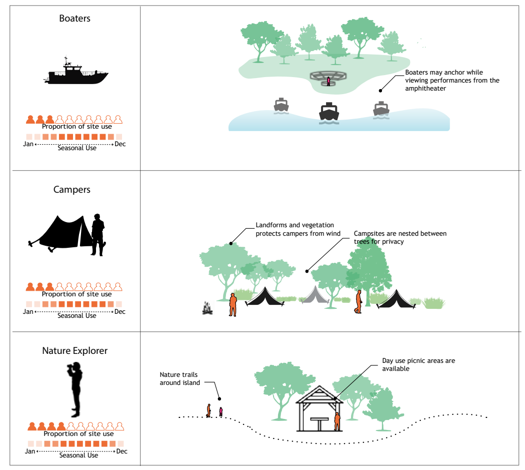
CAMPSITE/BIRD WATCHING UPLAND PERSPECTIVE
This perspective captures how users will be walking throughout the site. The location of the campsite and upland

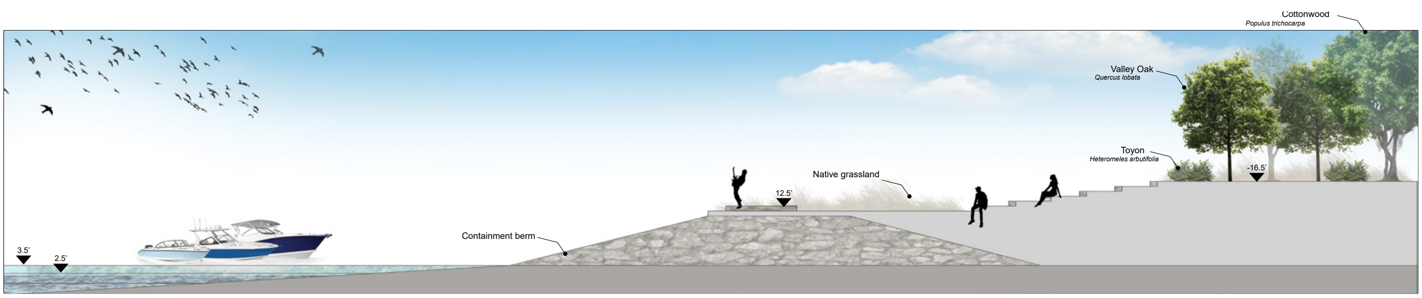
Exercise 4 example. Holland Cut Corner design (Concept C). Credit: Daniel Martinez



Master Plan







Section through containment berm, amphitheater, and upland island with key evelations, tidal fluctuation, and vegetation

Perspective: View of the coastline with beach and amphitheater

Perspective: Amphitheater landside

Exercise 4 example. Amphitheater and upland area (Concept C). Credit: Juliana Cheplick

PROJECT FINDINGS AND QUESTIONS FOR FURTHER DESIGN EXPLORATION

The Waterland II studio used site design research to further understand stakeholder preferences for recreational features (type, location, extent, etc.) with three of the overall design concepts for the tract. The following is a list of findings and questions for further design refinement generated by this effort.

FINDINGS

GENERAL

There is a Delta-wide disconnect between land and water. The Franks Tract Futures project represents an opportunity to reconnect land, water, people, and other living species with the dynamism that has been lost with channelization. As a component of the land-water reconnection could be the creation of opportunities for public access to a dynamic edge and tidal marsh. The former may be possible on Bethel Island or adjacent islands.

- As with other more urbanized park spaces there exists tensions between resident users and "visitors". This tension might be mitigated by creating a common space where residents and visitors can intermingle. Such a space would have to strike a balance of appealing to visitor interests while appealing to a local's sense of place.
- Pete Dangermond (from Dangermond Group) mentioned Cannery row in Monterey. While it is unlikely that Bethel Island could host this kind of hyper-popular mixed retail zone, Cannery row is an example of a place-based feature that attracts tourists (perhaps too many).

Bethel Island and the Delta, in general, have a unique vernacular that was unfamiliar and uncomfortable to some students whose design experience has been primiarly within cities. Reviewers recommended that students avoid, or actively question the urban feel to their design and aesthetically and functionally use materials to achieve a more place-based and place-specific design aesthetic.

PUBLIC ACCESS

As we moved through the design process, Bethel Island residents and business owners expressed concern with public access being located on Bethel Island for two reasons:

- Loss of business for local marinas
- Concerns about undesirable activities and misuse of such facilities

WATER QUALITY

Although water quality is not the main focus of the design process, students do need to make sure their design does not worsen water quality, and should actively adopt vegetation and creative solutions to improve water quality as possible. Some student design modified certain landmasses. We expect that most modification would have a negligible effect on water quality, the major exception being the addition of land to the Northern tip of Holland Tract. This addition, precipitated by a desire to increase the boating safety of the "dangerous corner", appears, according to Eli, the team modeler, to have the potential to increase water quality in Old River and the South Delta. As we understand it the North Holland bump would disrupt the movement of saltier water from Dutch Slough into Old River.

- In addition to supplying water quality benefits and reducing the danger of the "dangerous corner", a North Holland bump has been identified as a site for a potential land base (~45 acres) for a Parks operations facility.

AESTHETICS

Bethel Island residents, especially those on Willow West remain concerned about aesthetic changes related to their viewshed and the odors of created tidal marshland.

- Remnant levees are seen as desirable for wind and wave protection, however, residents wish them to remain clear of taller trees so as to preserve views into Little Franks Tract and across Franks Tract.

- The smells associated with tidal mudflats continue to be a concern of residents, contributing to the desire to site new marshes far from homes.

STATE PARKS

Steve Musillami (senior landscape architect from California State Parks) brought the students mid-term work back to his group which provided extensive comment which he then delivered and discussed during a mid-term review. The key takeaways and questions were:

- There is interest in exploring the constraints and opportunities for siting an approximately 45 acres Parks operation facility on a new landmass created off the Northeast corner of Holland tract.
- Parks emphasized that the level of recreation needs to be considered, as well as maintainability and access by park staff.
- A creative solution to the tricky situation of toilets was to make these facilities accessible by boat. Several students designed such facilities.
- 1 toilet is needed for every 15 campsites according to State code.
- Complicated and multi-layered structures are not necessary if the problem could be solved by simple, easy-achieved design solutions.
- Consideration of circulation was stressed. Parks encouraged students to make loop trails as they have been found to be more desirable.
- Interpretive signage was encouraged.
- Public-private partnerships were presented as viable strategies for providing services and maintaining facilities.
- Parks emphasized the ecological value of hunting and the important role of hunters in preservation efforts.
- ADA accessibility should be considered as a necessary part of any feature and facility design.

RECREATION

Students were encouraged to design for both existing users and activities as well as those that are projected to grow and emerging including:

- Non-motorized boating
- Wakeboarding/surfing
- Birdwatching
- Public Education/citizen science

People seek recreational opportunities that match and complement their lifestyles.

BOATING

Several students explored protected berthing areas located adjacent to major boating pathways. This was desired by several members of the Advisory Committee, especially business owners who saw an opportunity to attract business from owners of larger yachts that currently cannot easily access Bethel Island facilities.

- Steve Musillami pushed back against the calls for mooring fields with an argument that most larger boats currently free anchor in protected areas. A mooring field would require maintenance and if there was a fee, boaters might prefer a free option potentially leading to underuse.
- Gravel or pebble beach is undesirable - harms watercraft as well as difficult and expensive to source.

NAVIGABILITY

While a surprising number of AC members now perceive a no-action alternative as worse for navigability than other design concepts, there remain concerns regarding travel times and hazards associated with the tidal marsh islands.

- Our initial analysis measured distance as a proxy for time. This is a rough approximation and neglects to take into account boating speed, which might be determined by channel width, edge condition, channel depth, and the presence or absence of SAV/FAV.

- There remains concerns that submerged marsh will present a boating hazard. We hope that efforts to visualize designed marshes, including the containment berm might serve to assuage these concerns.

FISHING

The creation of new edge areas will create new fishing opportunities. Opportunities can be diversified by adding heterogeneity to fish and fishing habitats.

HUNTING

Hunting areas have ecological value and hunters are major leaders and partners in conservation efforts in the Delta.

- Due to a lack of common design standards, the students who are working on hunting blinds and hunting ponds gathered specs and parameters from experiences and precedents.
- It is encouraged to creatively use design strategies to activate hunting blinds/ponds after the hunting season.

FLOOD CONTROL

Flood control was not a major component of the studio.

SUMMARY OF DESIGN FINDINGS

- Improvements should be made to the “dangerous corner” that consider:
    - The strong wind comes from northeastern direction
    - Increased water velocity due to channel width
    - Navigability (travel speed and travel direction)
    - Landowner (MWD) (adjacent land ownership)
    - Salinity effects
- Keep mooring fields away from the main navigation channel and consider wind.
    - Concerns related to wake.
- Allow large boat access to mooring field by creating deep water access channel.
- Small beach areas (nooks) for non-motorized boats.
- Shade trees on beaches
- Provide separate areas for swimmers
    - A protective buoy line could be used.
- Consider emergency response times and routes
- Camping and hunting should be separate (in either timing or location).
- Little Franks Tract activities should be limited to non-motorized boating and fishing. Docks are unnecessary as long as small beaches are provided for berthing.

QUESTIONS RAISED FOR FURTHER RESEARCH

1. What kinds of public access and facilities can be created on Bethel Island that will be locally accepted?
    a. How can the concerns of business owners and residents be reconciled with the demand for public access indicated by our survey and prior research?
    b. Would a public park that does not offer services such as boat and kayak launches, and merely serves as a meeting place where people can interact with the water be accepted?
        i. In addition to unsanctioned use, what concerns do people have with the creation of such a park?

ii. How can the issues related to encampments and houselessness be addressed?

2. Are there options for creating public access and facilities on adjacent islands such as Jersey and Holland?
   a. How could the existing Bradford Island ferry site on Jersey be augmented or repurposed to support access to Little Franks Tract?

3. How to design for emerging and prospective users and activities?
   a. How and where to engage new and prospective users?

4. What are the optimal ways of increasing the safety of the dangerous corner?
   a. Feasible?
   b. Effective?
   c. Acceptable?

5. How can we design a DPR operations facility on the Northeast Corner of Holland Tract?
   a. When do we get the landowner (MWD) involved in planning?
      i. What reasons or incentives would MWD have to agree to modifying the footprint of Holland Tract and allowing access, perhaps by both Parks staff and the general public?

6. How best to bring larger boats into Franks Tract and towards Bethel Island businesses?
   a. What might be some unintended consequences of increasing access by large boats?

7. How do marshes, berms, riparian areas and associated facilities respond to sea-level rise?

8. How would bass tournament participants interact with new landmasses and channels.

9. Given the narrowing in on a Little Franks Tract design concept, what level of recreation is expected and should be designed for there?

10. Are island campsites viable given their costs, maintenance requirements and uncertainty regarding their (mis) use?

11. What role could a water taxi play in increasing access to water-based facilities?

MARSH AESTHETICS SURVEY

This section contains a description, results and analysis of a marsh aesthetics survey conducted to better understand aesthetic preferences relevant to the marshlands, tidal channels, and riparian uplands propose

Rationale

The decision to run a survey of marsh aesthetics was prompted by ongoing stakeholder concerns and questions related to the look, feel, and smell of the proposed marshes, channels, and uplands. Our intention with the survey was to develop a better understanding of desirable and undesirable traits, which would inform concept design.

Integration into 3rd Advisory Committee meeting

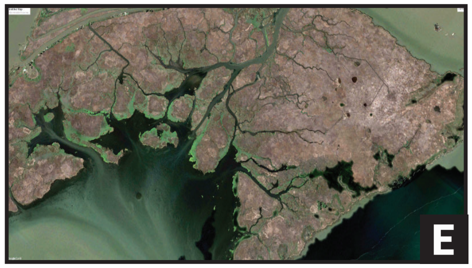
The marsh aesthetics survey was introduced during the 3rd Advisory Committee meeting and made available afterward to those AC and SC members who could not attend or were unable to complete the survey during the meeting.

MARSH AESTHETICS SURVEY

Comparing marsh impressions to inform marsh design   Name:

The goal of this survey is to gather stakeholder preferences regarding the form and appearance of tidal marshes and upland/riparian habitats. Submitting these preferences will help inform the planning of the FTF project.

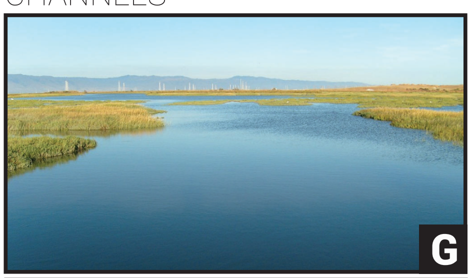
MARSHLAND STRUCTURE

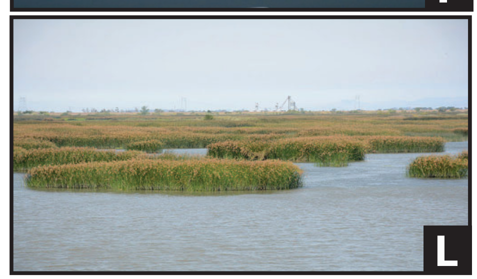


What are your two most preferred images: __ __ Why?

What are your two least preferred images: __ __ Why?

CHANNELS





What are your two most preferred images: __ __ Why?

What are your two least preferred images: __ __ Why?

RIPARIAN & UPLAND AREAS

What are your two most preferred images: __ __ Why?

What are your two least preferred images: __ __ Why?

What image is best in terms of fishing? __ Why?

What image is best in terms of hunting? __ Why?

What image is best in terms of motorized boating? __ Why?

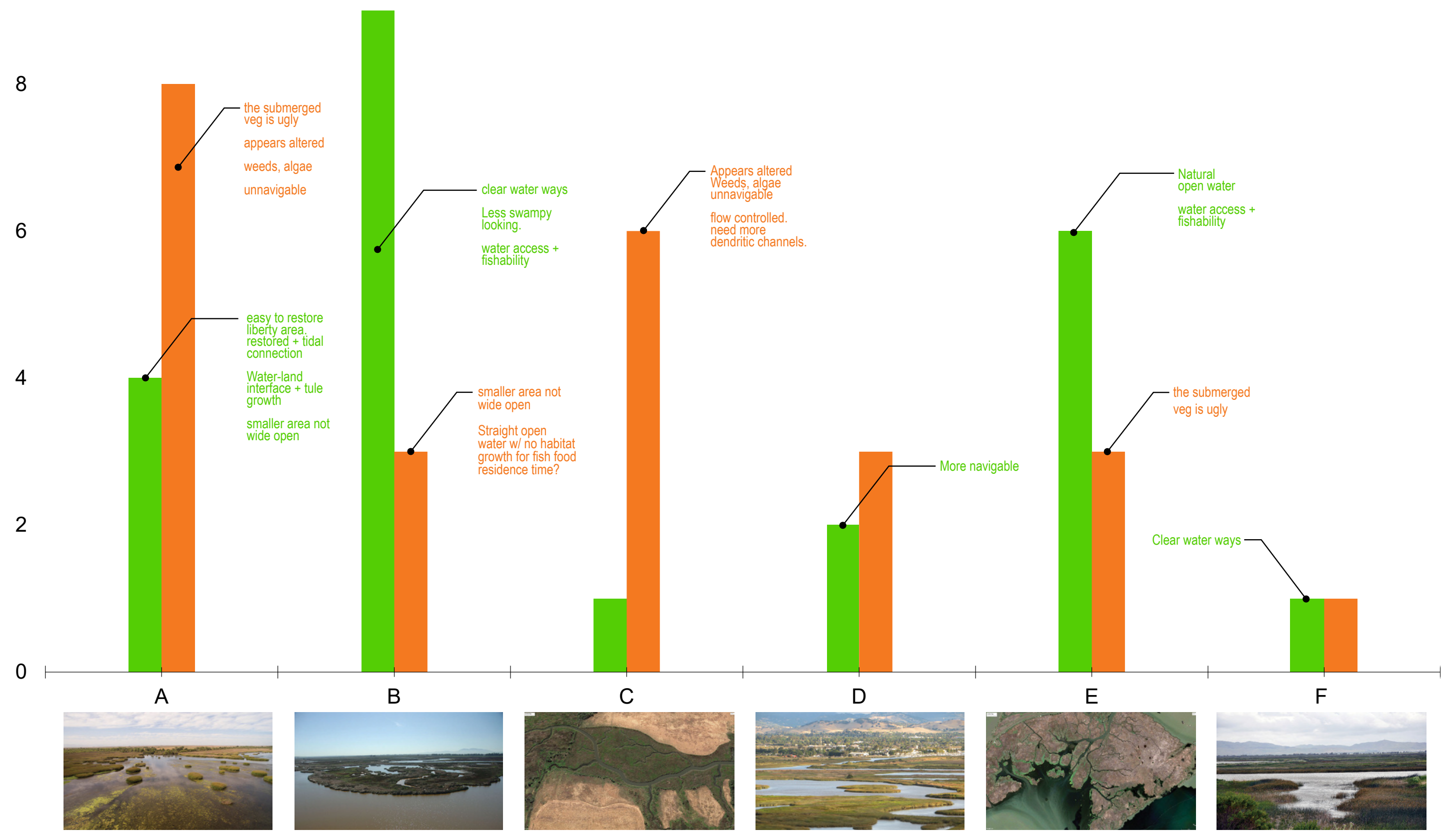
What image is best in terms of non-motorized boating? __ Why?

Please describe the most desirable features in the landscape images:

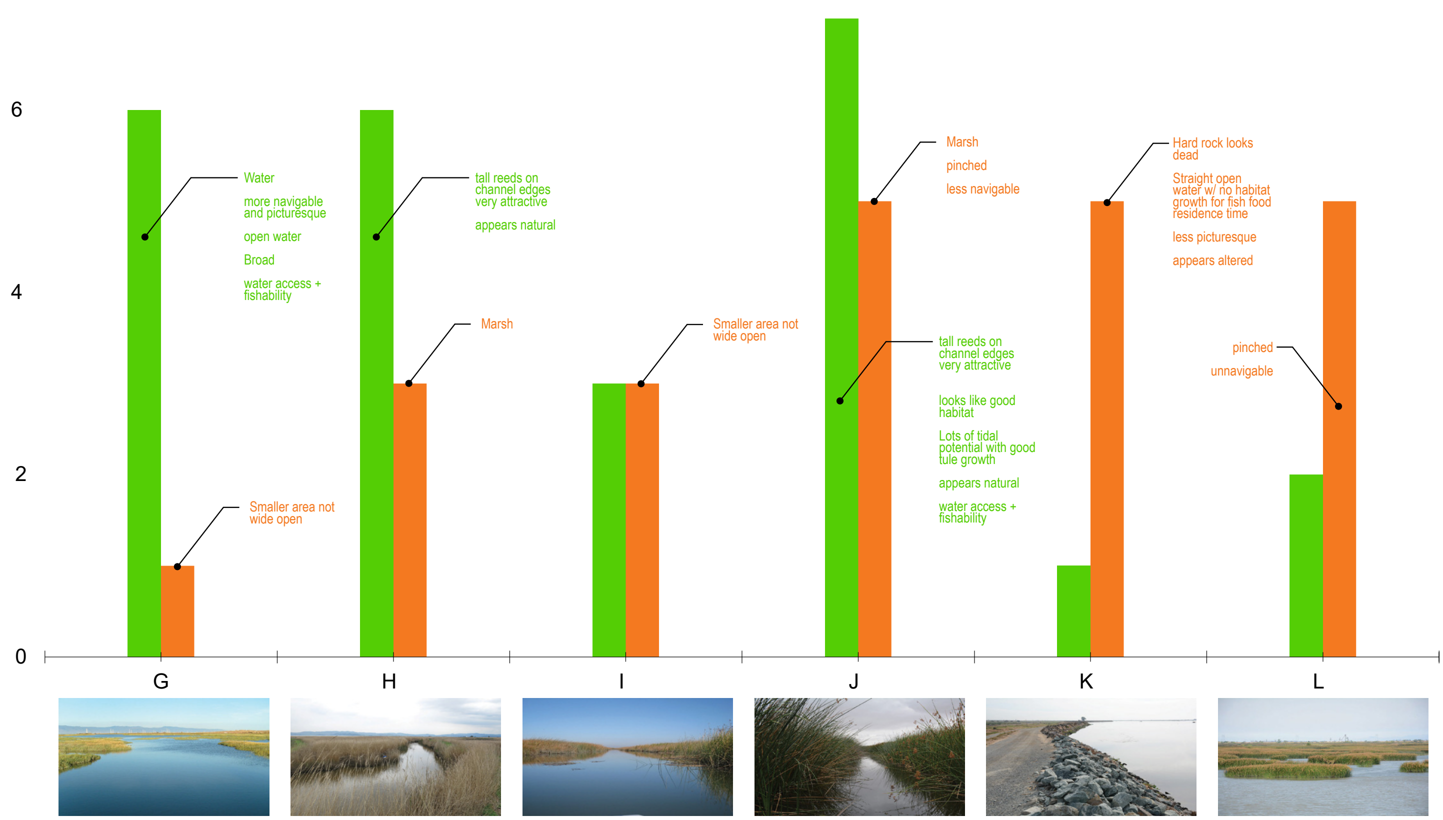
Please describe the most **un**desirable features in the landscape images:

Results

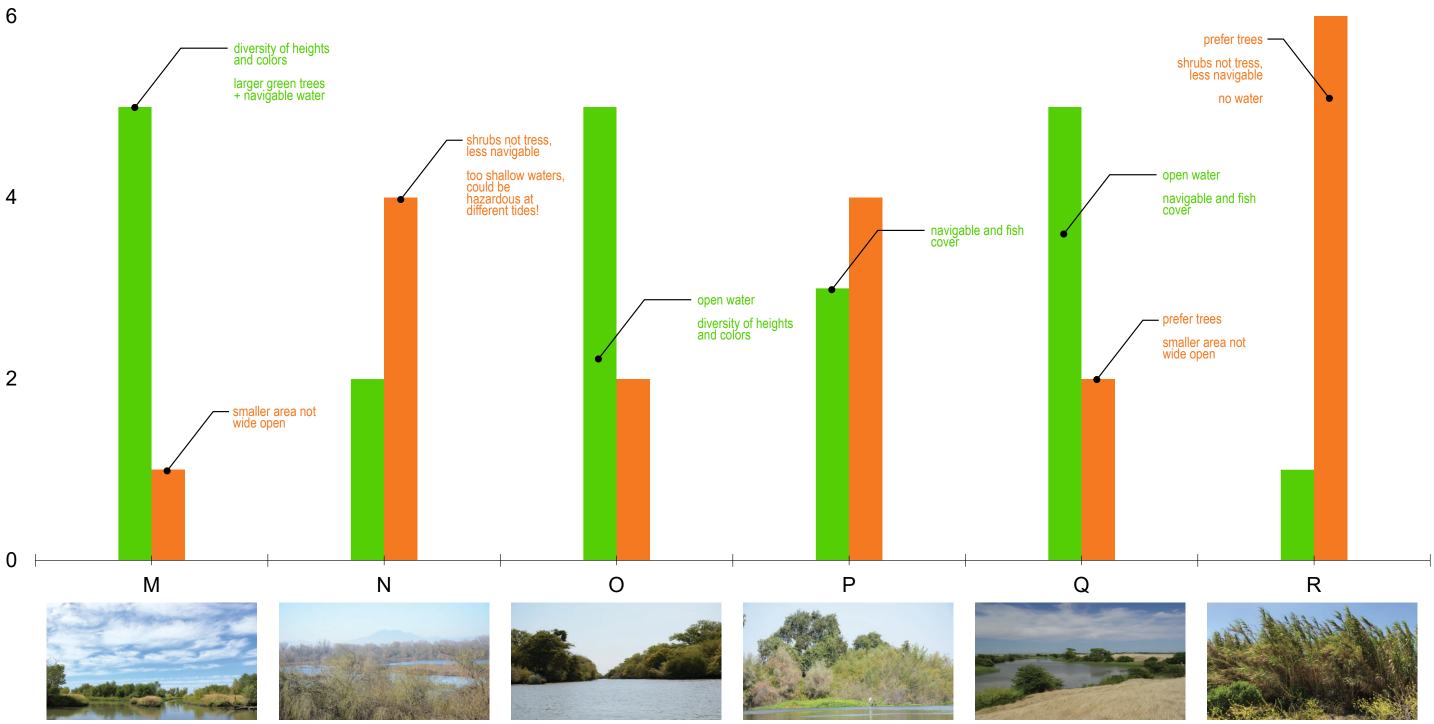
Marshland Structure Survey Results



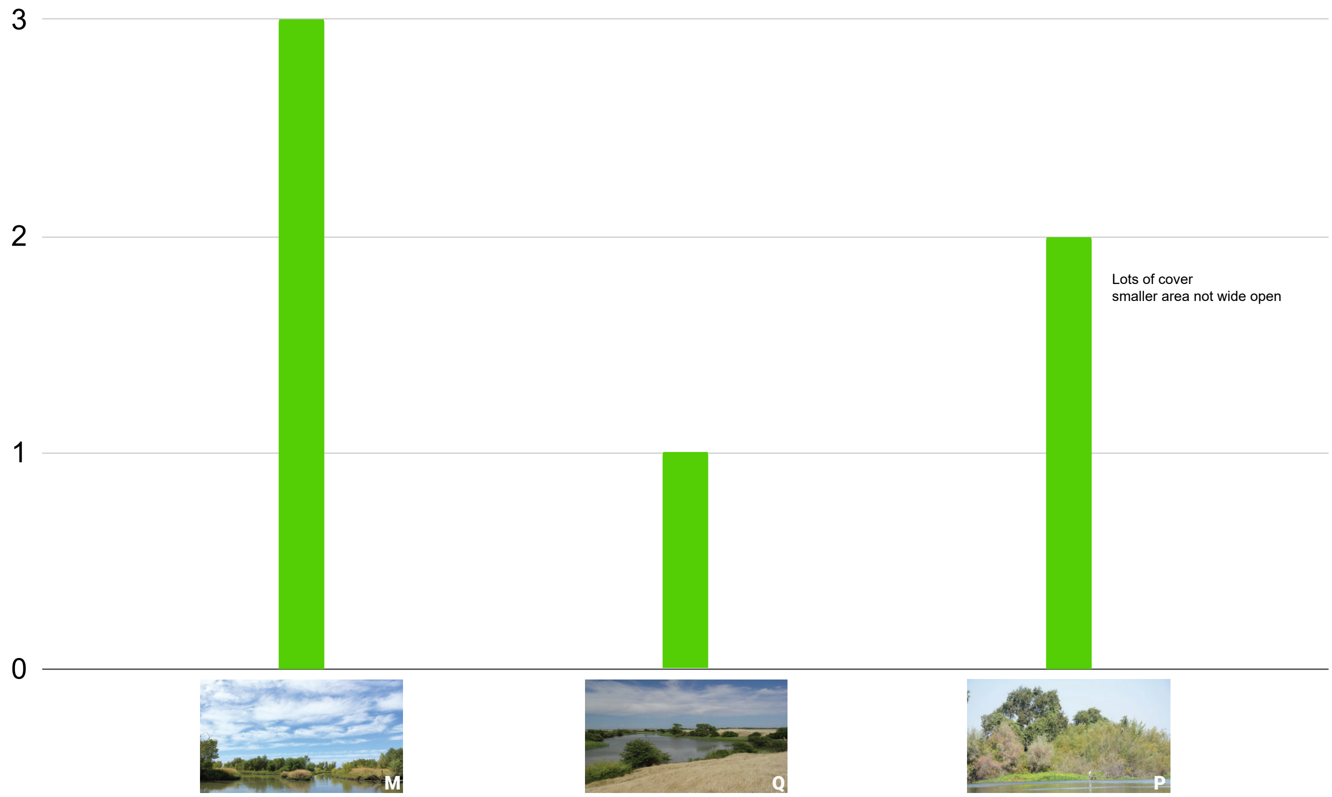
Channel Survey Results



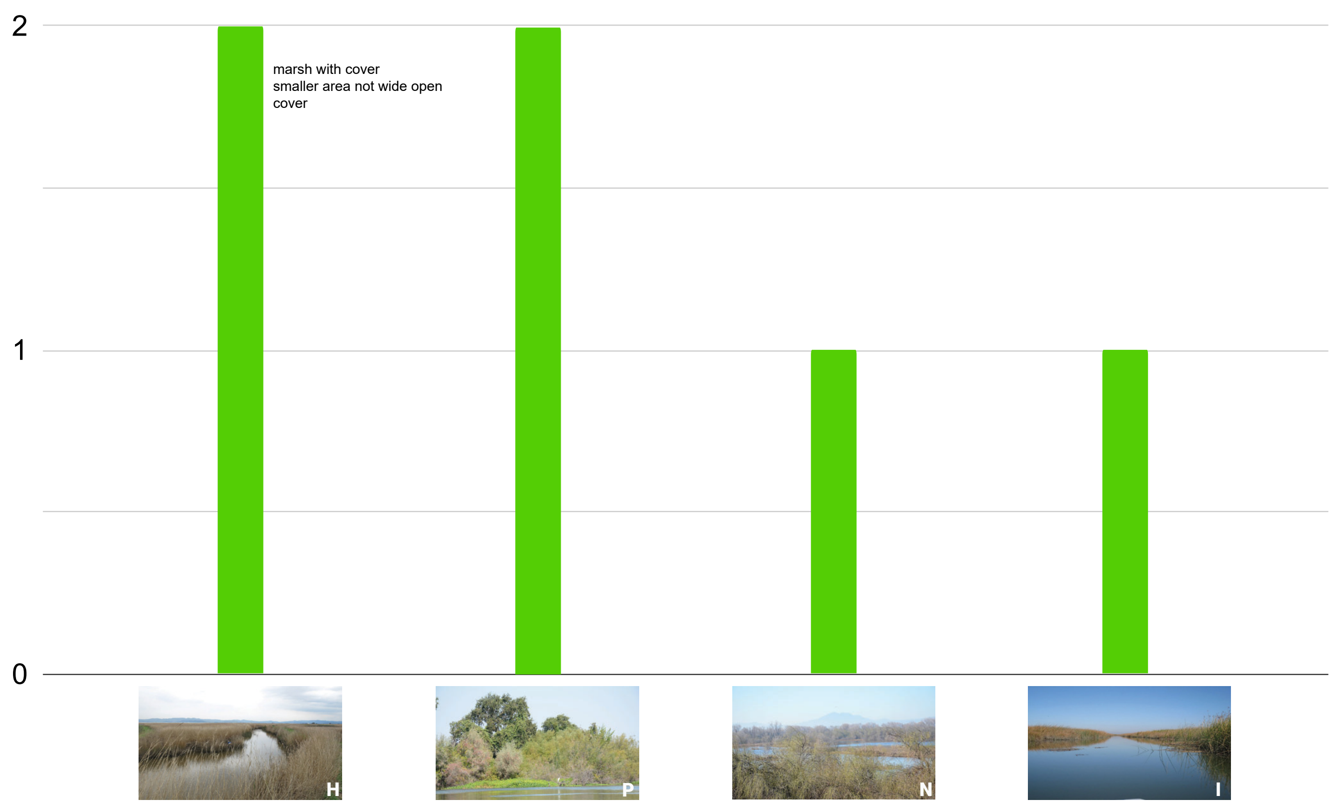
Riparian and Upland Survey Results



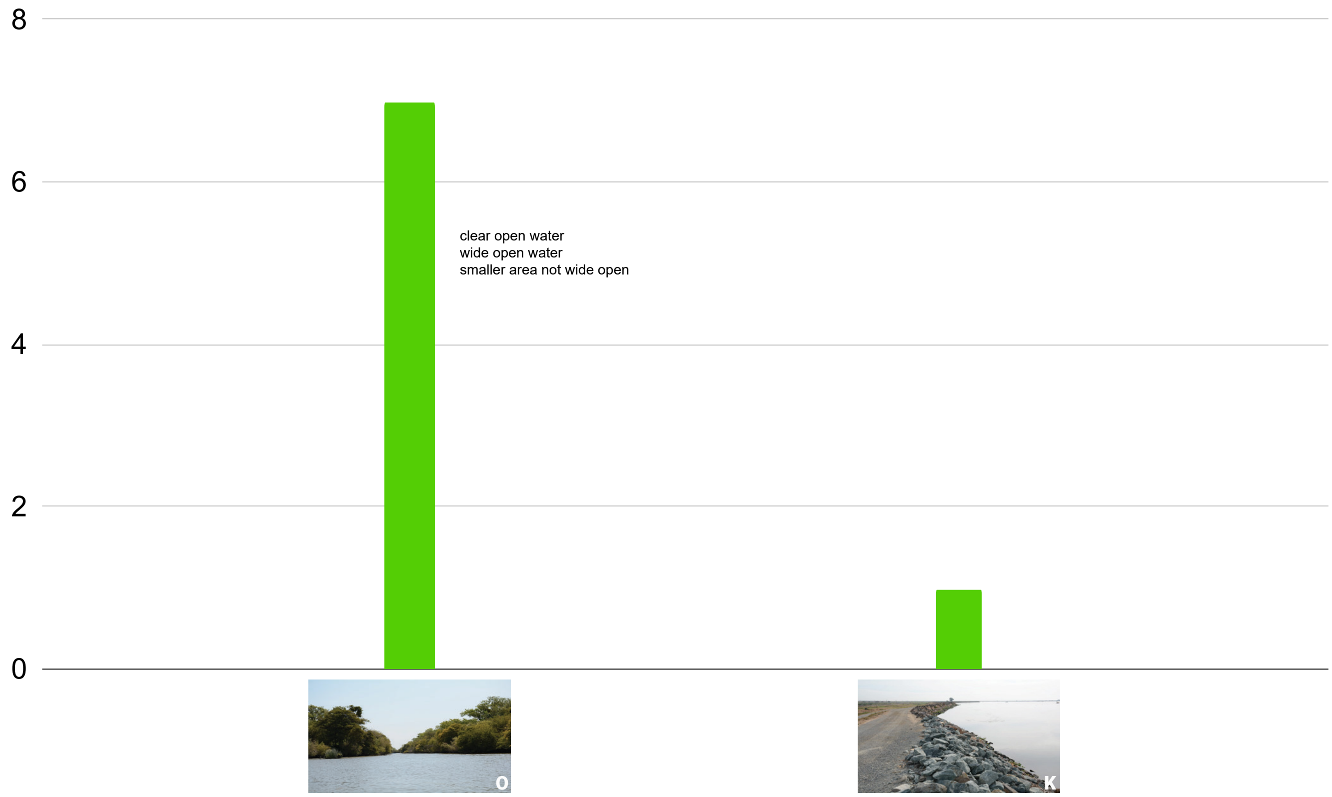
What image is best in terms of fishing?



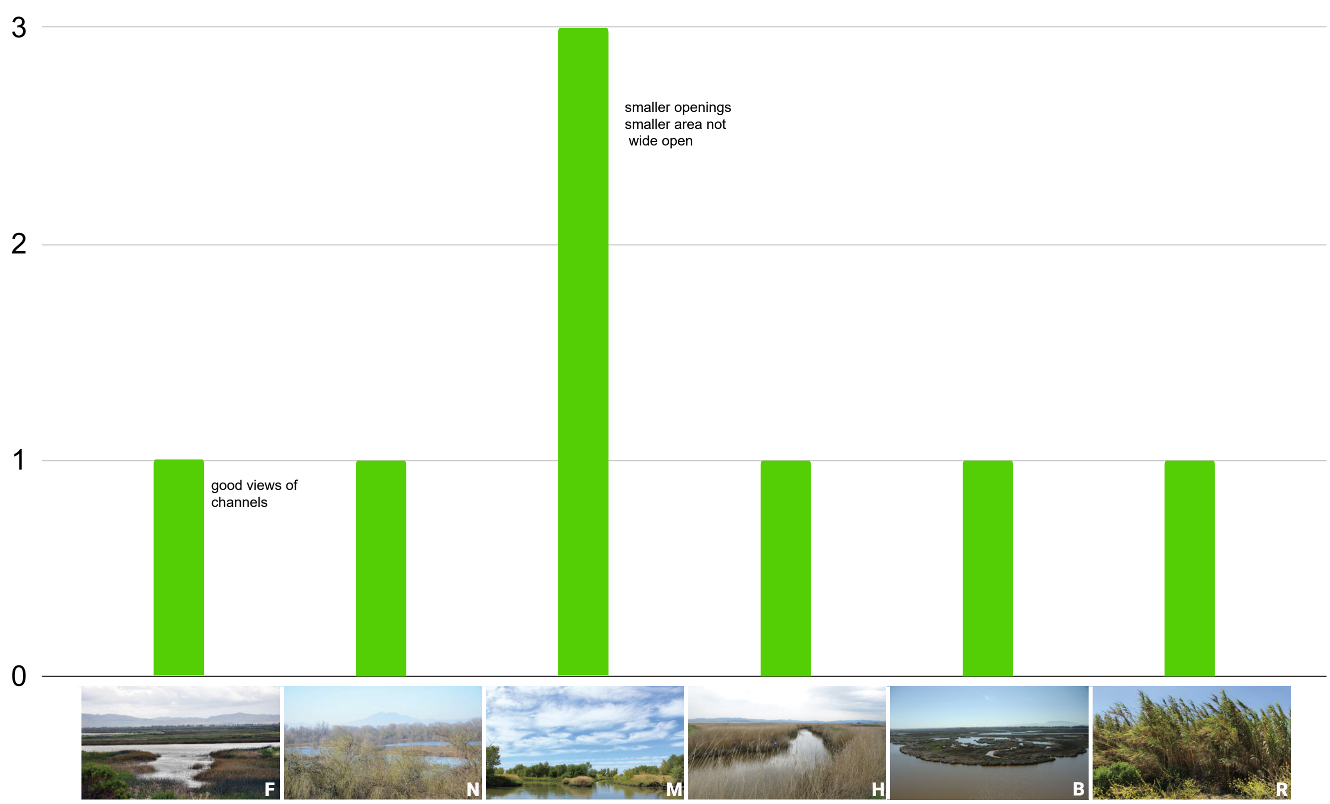
What image is best in terms of hunting?



What image is best in terms of motorized boating?



What image is best in terms of non-motorized boating?



Implications for design

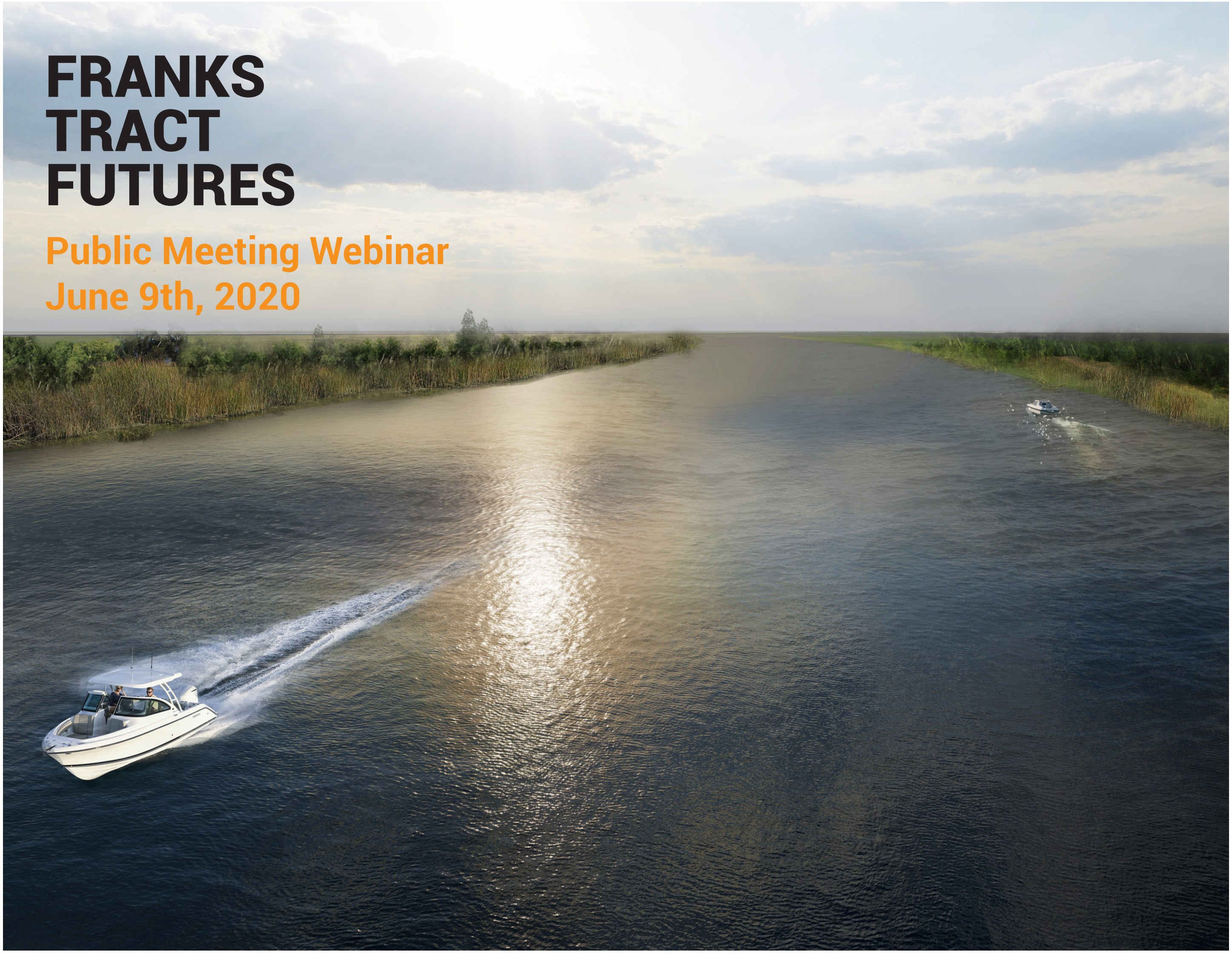
From the survey, we developed the following aesthetic criteria:

- Open water and open water views should be maintained along the Piper Slough side of the Bethel Island shoreline
  - A significant body of open water should be maintained between new tidal marshes and the Bethel Island shoreline
  - No riparian trees on reinforced remnant levees adjacent to Bethel Island, so as to avoid blocking views.
- “Naturalistic” looking landscape features (in contrast to features that look overtly engineered or designed) are preferred for tidal marshes, channels, and upland areas
  - A variety of riparian vegetation and plant communities (including trees) are desirable for marsh and channel edges and levees not directly in front of Bethel Island
- For tidal marshes, large open mudflats are undesirable (should be minimized in design); vegetated surfaces are preferred.
- A diversity of recreational features is preferred, ranging from primitive and more ‘wild’ looking features to larger, more developed areas with docks and restrooms.

PUBLIC MEETING WEBINAR

This section describes the public meeting webinar held in response to COVID 19 restrictions.

Public Meeting Webinar



Link to webinar recording: https://youtu.be/tdI2FPOdRYw

Format/structure

In response to the Coronavirus crisis, the team held our second public meeting as an online webinar. The team used zoom to host the webinar which enabled polling, a chatbox, and a question and answer session. Given the complications of the crisis, the webinar information was disseminated through online outlets and via social media. A recording of the webinar was made available on the homepage of the project website.

The meeting purpose and agenda was as follows:

1. Provide an update of the project planning, design and stakeholder engagement process thus far.
2. Present current design concepts developed through public input, the project's advisory committee, steering committee and consultant team.

3. Provide a tutorial and public release of a web-based survey to view, evaluate and rank the current design concepts and the no action alternative.
4. Provide a forum for public questions, comments and discussion.

There were 129 webinar registrants including team, advisory committee, and steering committee members.

COVID 19 Statement

The Franks Tract Futures process is committed to continued transparency and participation during the Coronavirus crisis.

The project team has several ideas for how to accomplish this in the coming months, including:

- A live stream virtual public meeting, with ample time for question and answer.
- Webinars related to specific project components, such as salinity modeling, recreational enhancements, community concerns, etc.
- Additional use of online engagement tools such as surveys, interactive maps, and forums, and comment boards.
- Enhanced social media presence.

It is our goal to build trust and open communication as the process transitions towards another round of public review and eventual report writing.

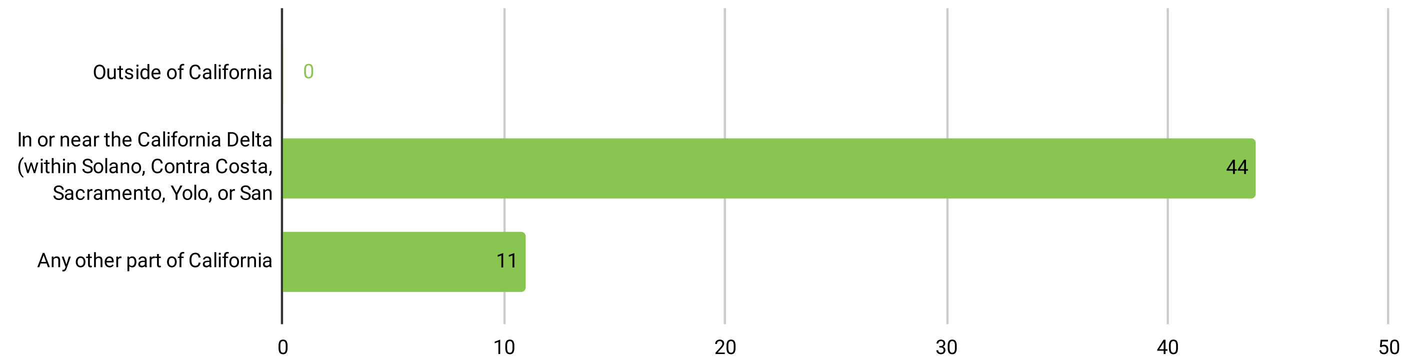
We welcome any additional ideas on how best to engage with the broader Franks Tract community.

Thank you and take care,

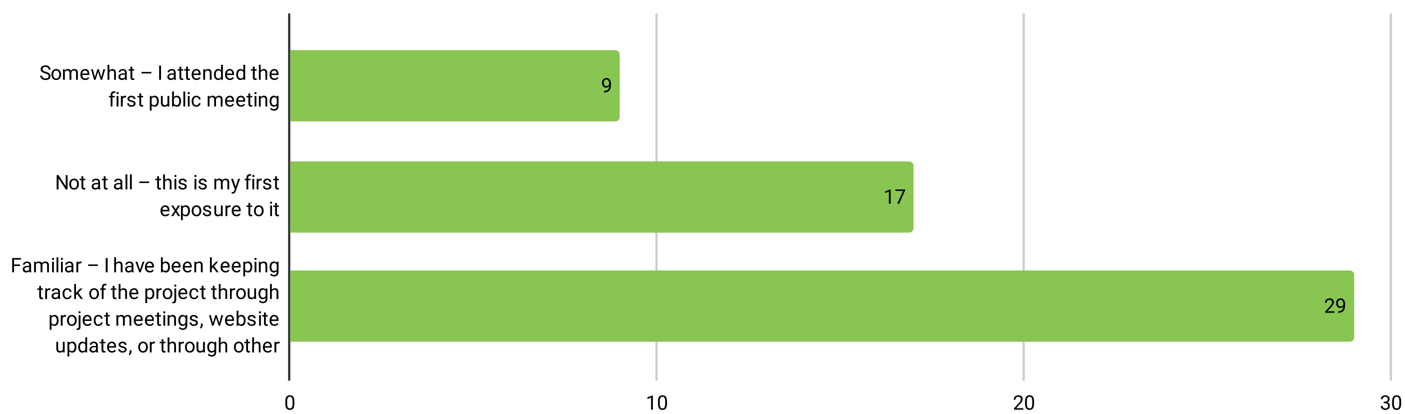
Franks Tract Futures Team

Poll Results

Where do you reside?

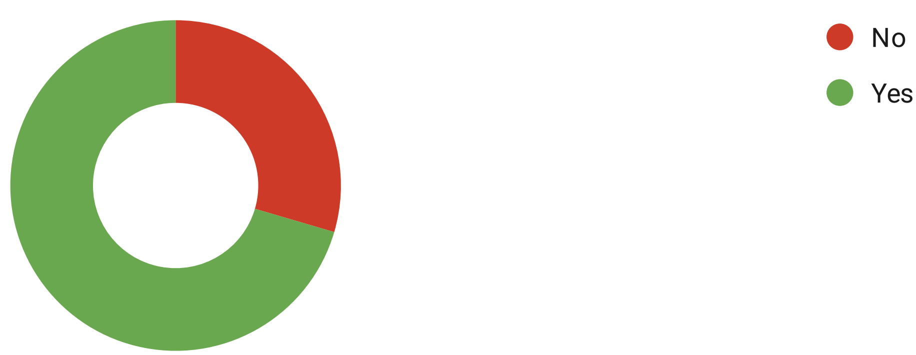


How familiar are you with the Franks Tract Futures Project?

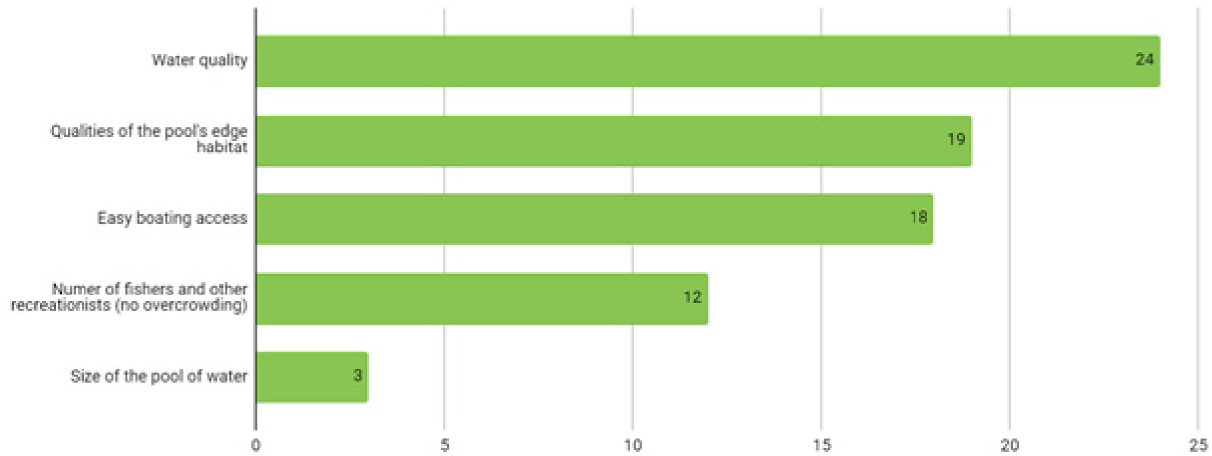


Did you complete the Franks Tract Futures user survey?

Are you a boater and/or a fisher?

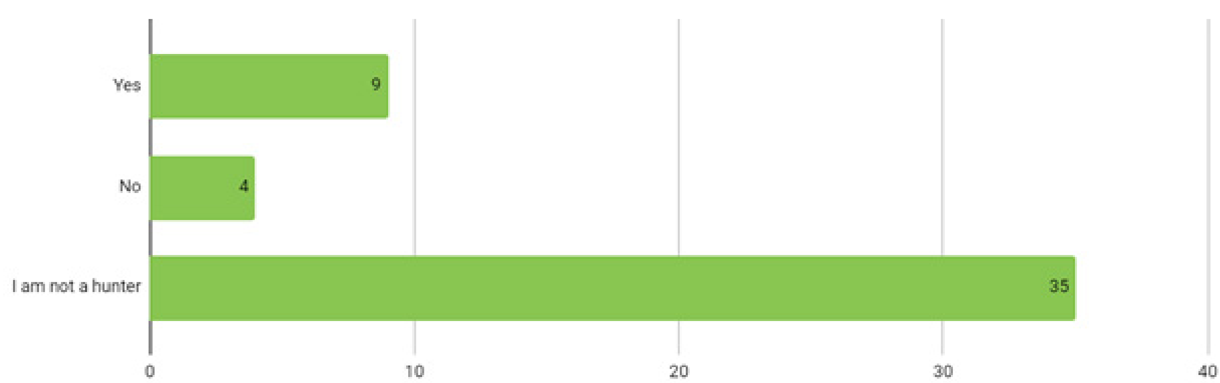


What would you say are the 2 most critical factors for creating high-quality open-water fishing areas?



Are you a waterfowl hunter?

If you are a hunter, would diversifying hunting habitats within Franks Tract - including upland, tidal marsh, ponds, and different depths of open water - be desirable, if access and registration methods remain similar to the current situation?

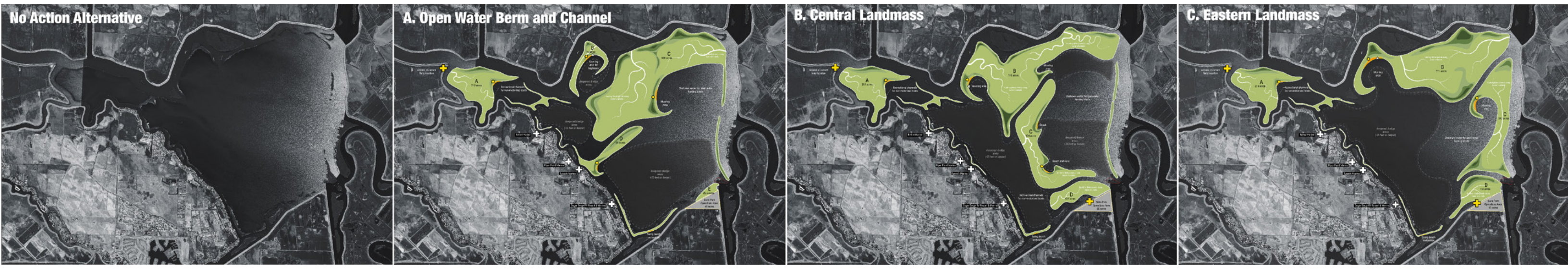


PUBLIC AND STAKEHOLDER DESIGN SURVEY

This section contains description, results and analysis from the final public and stakeholder design survey which was intended to encourage feedback on design concepts and gauge public preferences.

FRANKS TRACT FUTURES

Public and User Survey of Design Concepts



Compiled by

Brett Milligan

Alejo Kraus-Polk
Yiwei Huang

August 10, 2020

Table Of Contents

Survey Description

Background

The public and stakeholder design survey was designed to appeal to those with familiarity with the project as well as those who are new to the project and process. Photographs, rendered images, flyover videos, and links to the previous survey results were embedded within the survey to provide project background and give a better sense of the proposed concepts.

The survey was designed to allow participants to indicate spatially what they like, didn’t like and questions. Subquestions related to location and access were asked in order to more clearly discern the reasons for liking or disliking a feature.

Survey questions and format

The no longer active survey can be found here: https://new.maptionnaire.com/q/62k27e2783g6

The survey began with the following description:

This survey is intended to gather feedback on three design concepts that have been developed with input from the public, including through the previous survey (see results), and the Franks Tract Futures advisory and steering committees. We want to know what you think of the different designs, the no-action alternative, and answer any questions you might have. Before taking this survey, we recommend watching a presentation on all the design concepts and how they were developed (HERE).

At the end of the survey, we will ask you to rank the design concepts. You can return to previous pages and provide additional answers up until clicking “DONE” on the final page.

This was followed by a page detailing how to use the survey:

This map-based survey is similar to the previous user survey and relies on the placement of pins.

To place a pin: click on the appropriate pin (scroll to the bottom of this page), move the pin or the concept map to the location, and click the checkmark button. After answering the follow-up question click “save” and you will be returned to this page to choose another pin or move on.

On the three following pages, there are a series of pins that can be used for providing comments. Use the green “What I Like” pin to mark the location(s) or feature(s) on each concept that you feel are especially positive or appropriate for the site. Clicking on the checkmark will save the location and allow you to answer follow up questions about this spot and write in specific comments. After clicking “Save” you will return to this page and can repeat the process for other locations that you like.

A second pin used the same way, is provided to indicate places that are problematic or features that you don’t think are appropriate. You can place as many of these pins as you like.

If you have questions about a particular spot on one of the concepts, use the yellow “Questions” pin to indicate where you can then enter your question in the pop-up.

You can return to previous pages and provide additional answers until you submit the survey by clicking ‘done’ on the thank you page.

The next section asked for participant information:

Which of the following categories do you most identify with? (multiple answers can be given)

- *Recreational angler*
- *Tournament angler*
- *Recreational boater*
- *Nearby resident*
- *Researcher*
- *Law enforcement*
- *Hunter*
- *Business owner*
- *Public or government representative*
- *Other*

If Other please specify

What is the zipcode of your primary area of residence?

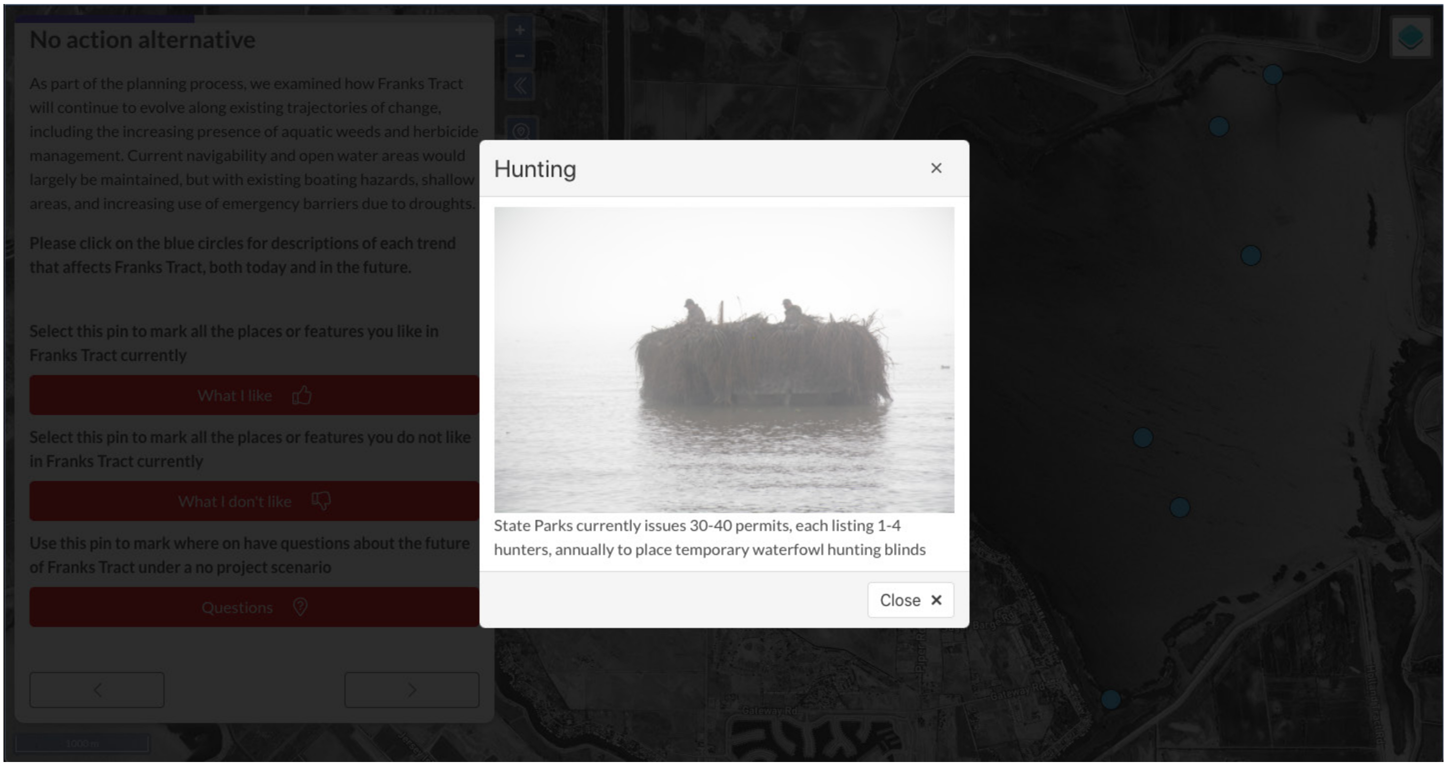
The next sections looked at the no-action alternative, open water berm and channel concept, central landmass concept and eastern landmass concept. For all users were given a brief description of the concept. For the design concepts a flyover video and renderings were included. For all users were prompted to place pins on features they like, disliked and had questions about.

Upon placing the like pin users were prompted to answer the following questions:

Generally, what do you like about this place or feature of the concept? (select all that apply)

- *The location is great!*
- *The feature will be used and valued!*
- *Access is appropriate!*

Other positives (please list)



Upon placing the dislike pin users were prompted to answer the following questions:

Generally, what do you not like about this place or feature of the concept? (select all that apply)

- *The location is problematic*
- *The feature will not be used and is of no value*
- *Access is to this feature is problematic*

Other negatives (please list)

Upon placing the question pin users were prompted with the following:

What is your question

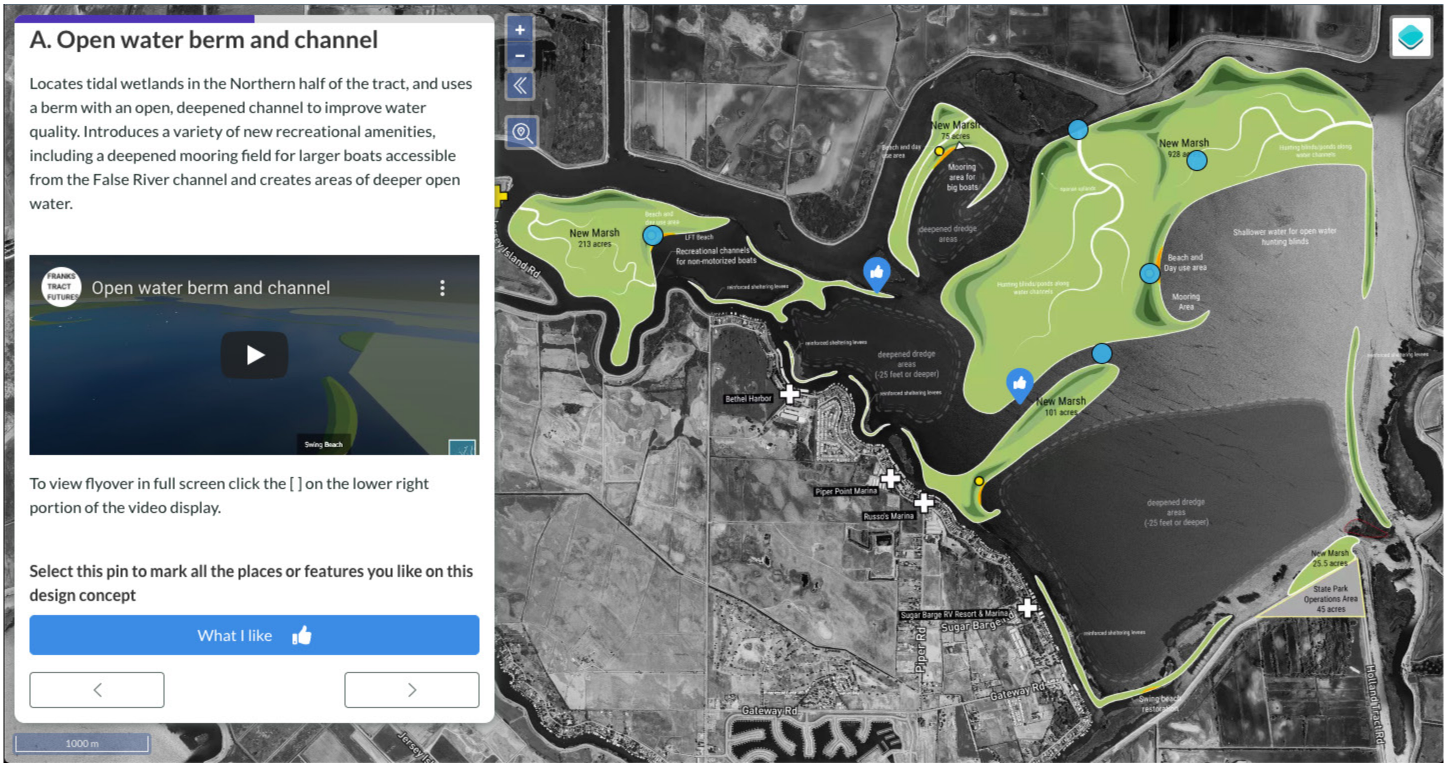
No-action description:

As part of the planning process, we examined how Franks Tract will continue to evolve along existing trajectories of change, including the increasing presence of aquatic weeds and herbicide management. Current navigability and open water areas would largely be maintained, but with existing boating hazards, shallow areas, and increasing use of emergency barriers due to droughts.

Please click on the blue circles for descriptions of each trend that affects Franks Tract, both today and in the future.

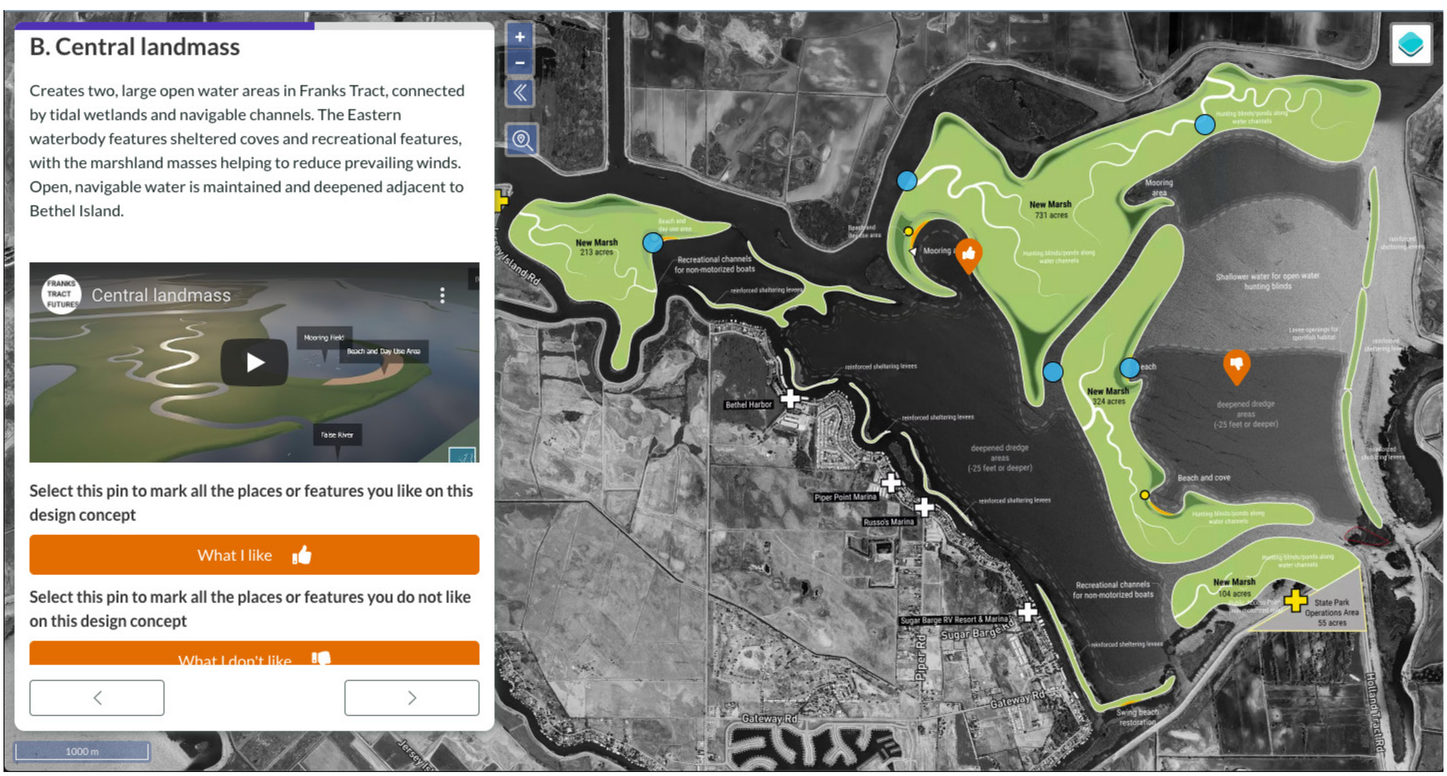
Open water berm and channel description:

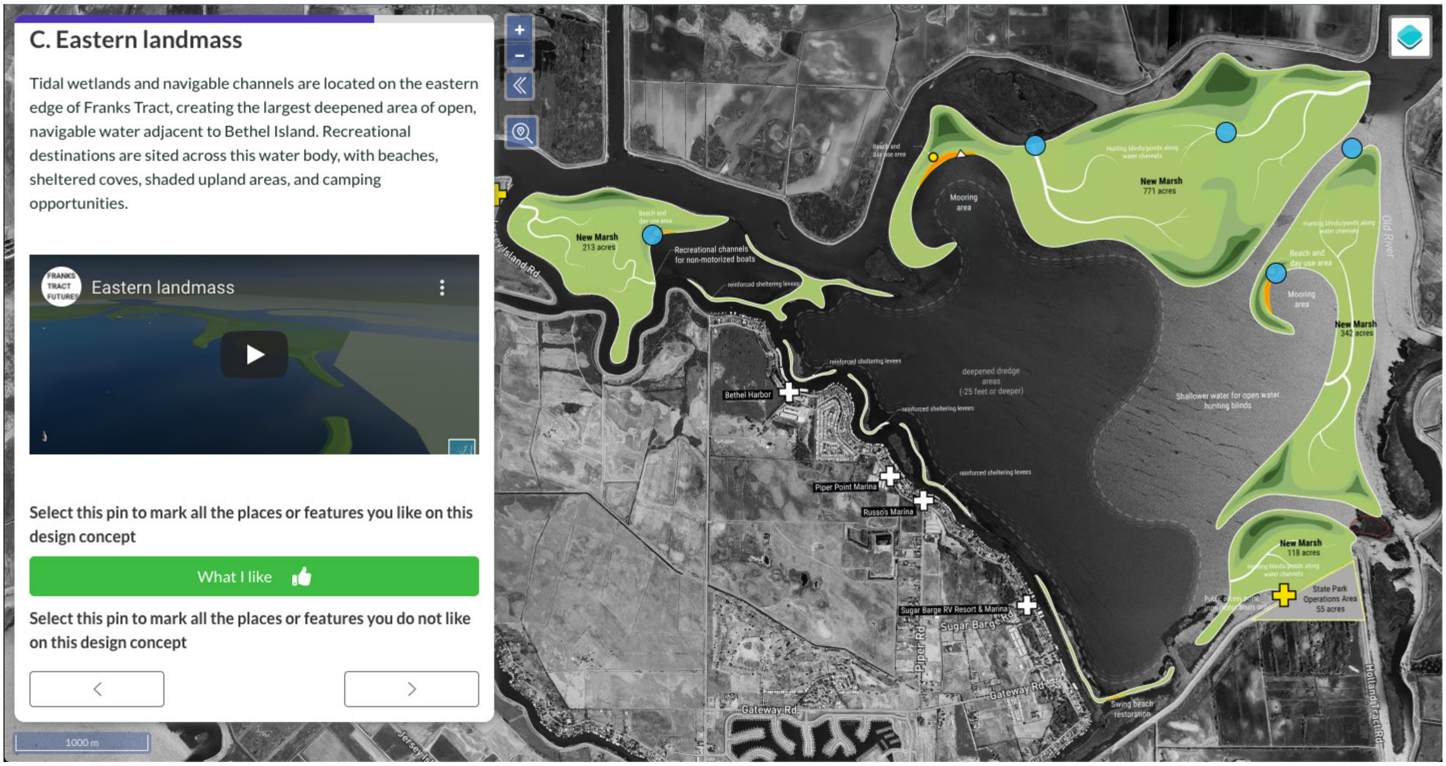
Locates tidal wetlands in the Northern half of the tract, and uses a berm with an open, deepened channel to improve water quality. Introduces a variety of new recreational amenities, including a deepened mooring field for larger boats accessible from the False River channel and creates areas of deeper open water.



Central landmass description:

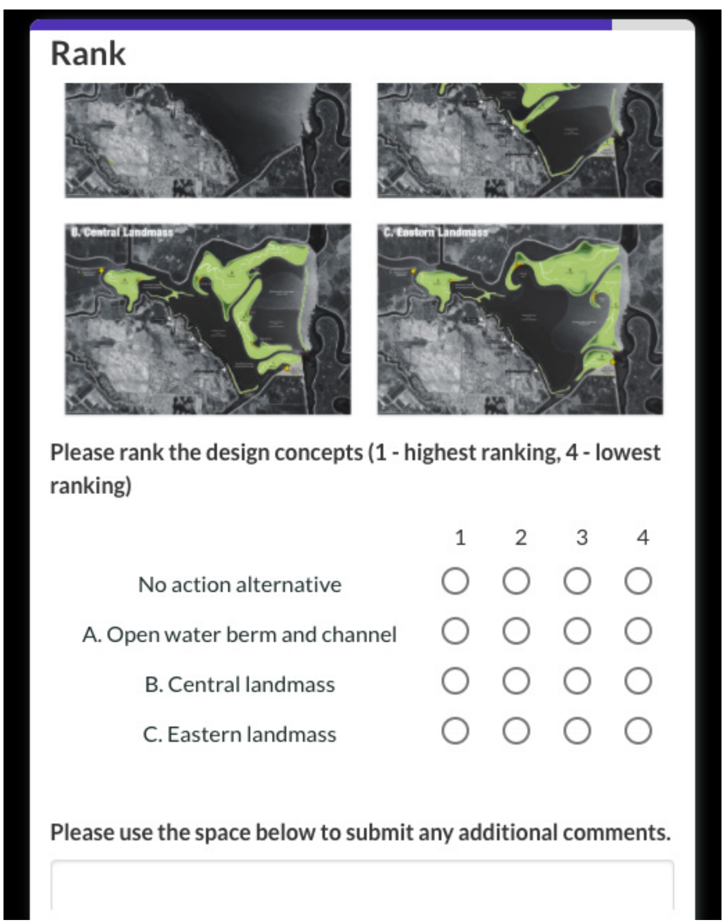
Creates two, large open water areas in Franks Tract, connected by tidal wetlands and navigable channels. The Eastern waterbody features sheltered coves and recreational features, with the marshland masses helping to reduce prevailing winds. Open, navigable water is maintained and deepened adjacent to Bethel Island.





Eastern landmass description:

Tidal wetlands and navigable channels are located on the eastern edge of Franks Tract, creating the largest deepened area of open, navigable water adjacent to Bethel Island. Recreational destinations are sited across this water body, with beaches, sheltered coves, shaded upland areas, and camping opportunities.



Users were then asked to rank the design concepts (1 - highest ranking, 4 - lowest ranking).

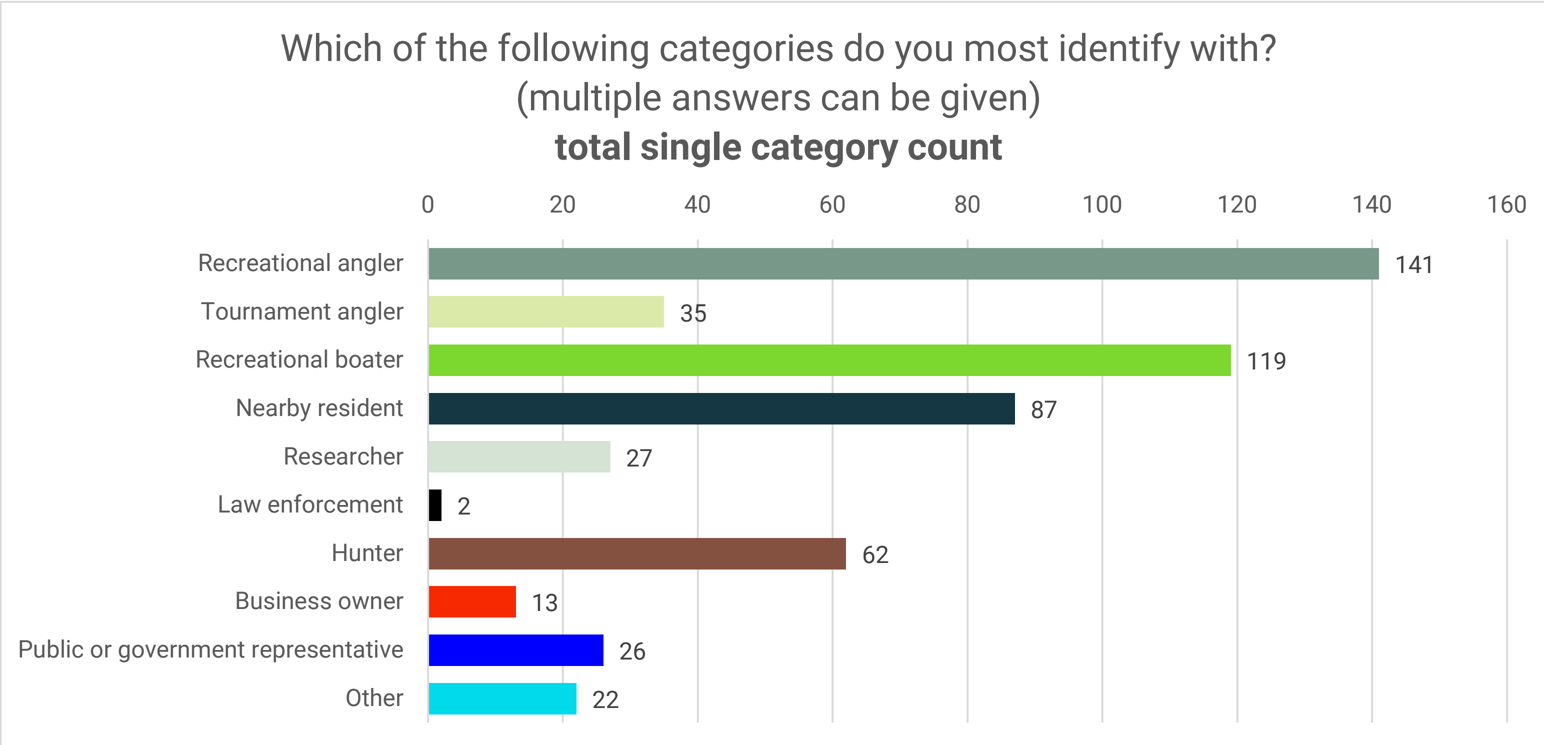
The final page of the survey:

Thank you for taking the time to participate in this survey! Please feel free to review your previous responses using the back button. If you are satisfied with your submissions, click on the DONE button below.

PLEASE click DONE or your answer won't be saved.

If you have any additional questions or comments to share, please contact us at ucdfrankstract@ gmail.com

Results



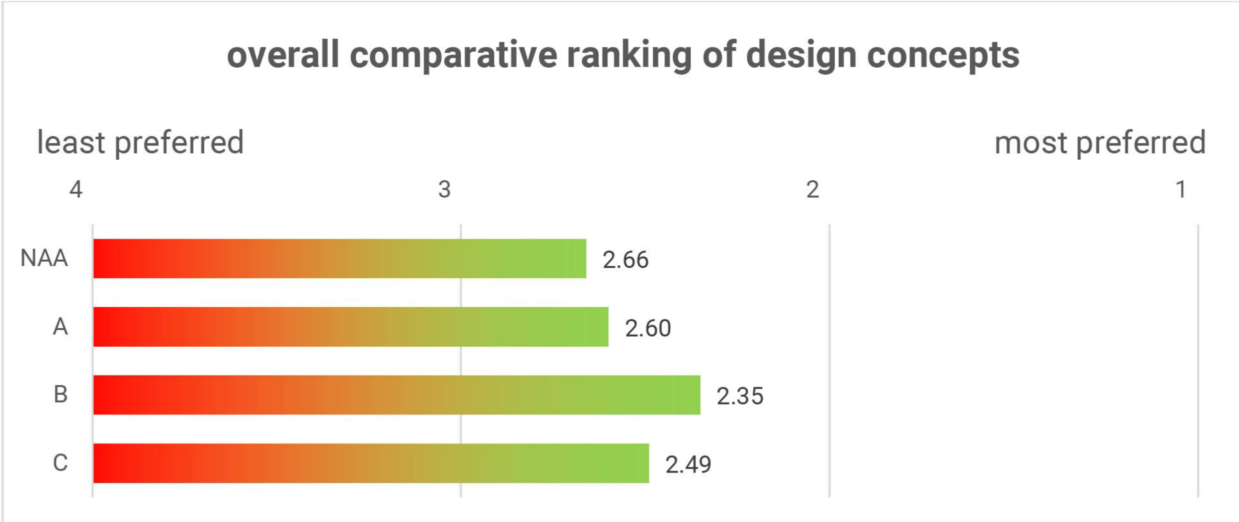
This graph shows the total count of each predefined category. The majority of the respondents indicated that they were either current recreational users, nearby residents or local business owners. A small number of respondents categorized themselves as either researchers or public or government representatives (and many of those also categorized themselves as recreational users - see below).

Users were allowed to pick multiple categories they identify with, which resulted in a plethora of hybrid categories (see below). Therefore, the sum of the category totals (**534**) does not add up to the total number of individual respondents (**278**).


Which of the following categories do you most identify with? (multiple answers can be given)
total hybrid category count
Recreational angler
Recreational boater
Nearby resident
Hunter
Recreational anglerRecreational boaterNearby resident
Other
Recreational boaterNearby resident
Researcher
Recreational anglerRecreational boater
Recreational anglerHunter
Recreational anglerTournament anglerRecreational boater
Recreational anglerTournament angler
Recreational anglerRecreational boaterHunter
Public or government representative
Recreational anglerNearby residentHunter
Recreational anglerTournament anglerHunter
Recreational anglerRecreational boaterNearby residentPublic or...
Recreational anglerTournament anglerRecreational boaterNearby resident
Recreational anglerRecreational boaterNearby residentHunter
Recreational anglerResearcher
Tournament angler
Recreational boaterResearcher
Recreational boaterHunter
Recreational anglerTournament anglerRecreational boaterNearby...
Recreational anglerRecreational boaterNearby residentBusiness owner
Recreational anglerNearby resident
Recreational boaterNearby residentResearcherHunter
Recreational boaterNearby residentBusiness owner
Nearby residentPublic or government representative
ResearcherPublic or government representative
Recreational anglerTournament anglerRecreational boaterNearby...
Recreational anglerTournament anglerRecreational boaterNearby...
Recreational anglerTournament anglerRecreational boaterBusiness owner
Recreational anglerTournament anglerNearby resident
Recreational anglerTournament anglerBusiness owner
Recreational anglerRecreational boaterNearby residentResearcher
Recreational anglerRecreational boaterNearby residentHunterPublic or...
Recreational anglerRecreational boaterResearcherHunter
Recreational anglerRecreational boaterResearcherPublic or government...
Recreational anglerRecreational boaterHunterBusiness owner
Recreational anglerRecreational boaterBusiness owner
Recreational anglerRecreational boaterOther
Recreational anglerNearby residentHunterPublic or government...
Recreational anglerHunterPublic or government representative
Recreational anglerPublic or government representative
Recreational anglerOther
Tournament anglerRecreational boaterNearby residentHunter
Recreational boaterNearby residentResearcherPublic or government...
Recreational boaterNearby residentResearcherPublic or government...
Recreational boaterNearby residentHunter
Recreational boaterNearby residentBusiness ownerOther
Recreational boaterNearby residentPublic or government representative

The chart on the previous page shows the total number of respondents in each unique category including combination/hybrid categories. The sum of the count of category combinations (**278**) represents the total number of respondents to this category question. We included the option to choose multiple categories - consistent with our previous survey - at the request of an advisory committee member who told us that many Franks Tract users engage in and identify with many activities.

While there are many people who selected to affiliate with a single category, there were also many affiliated with particular hybrid categories. As with our previous survey where the same question was asked we find that most users engage with the tract in various capacities. It is interesting to note that all of those who identify as a public or government official identify as well with at least one other category.

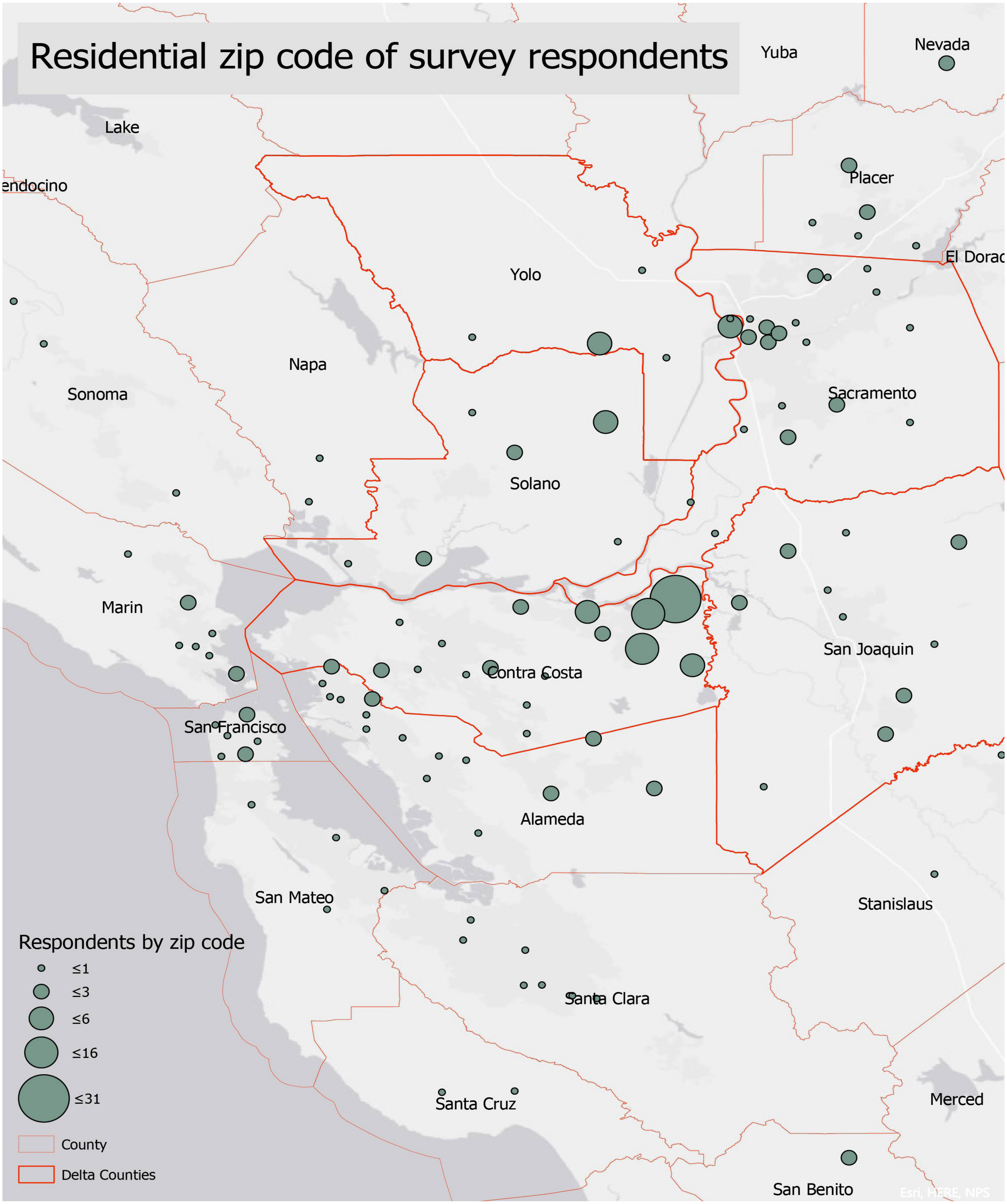


This chart represents the overall comparative ranking for each concept scenario. On average, the NAA (No Action Alternative) was the lowest-ranked, but only by a small margin with Design Concept A. (Open water berm and channel) near, and Design Concept C (Eastern Landmass) slightly more preferred. Currently. Design Concept B (Central Landmass) is the most preferred by survey respondents, which was also the most preferred concept among the Advisory and Steering Committees, but with the committee's Concept B was preferred by a considerably larger majority.

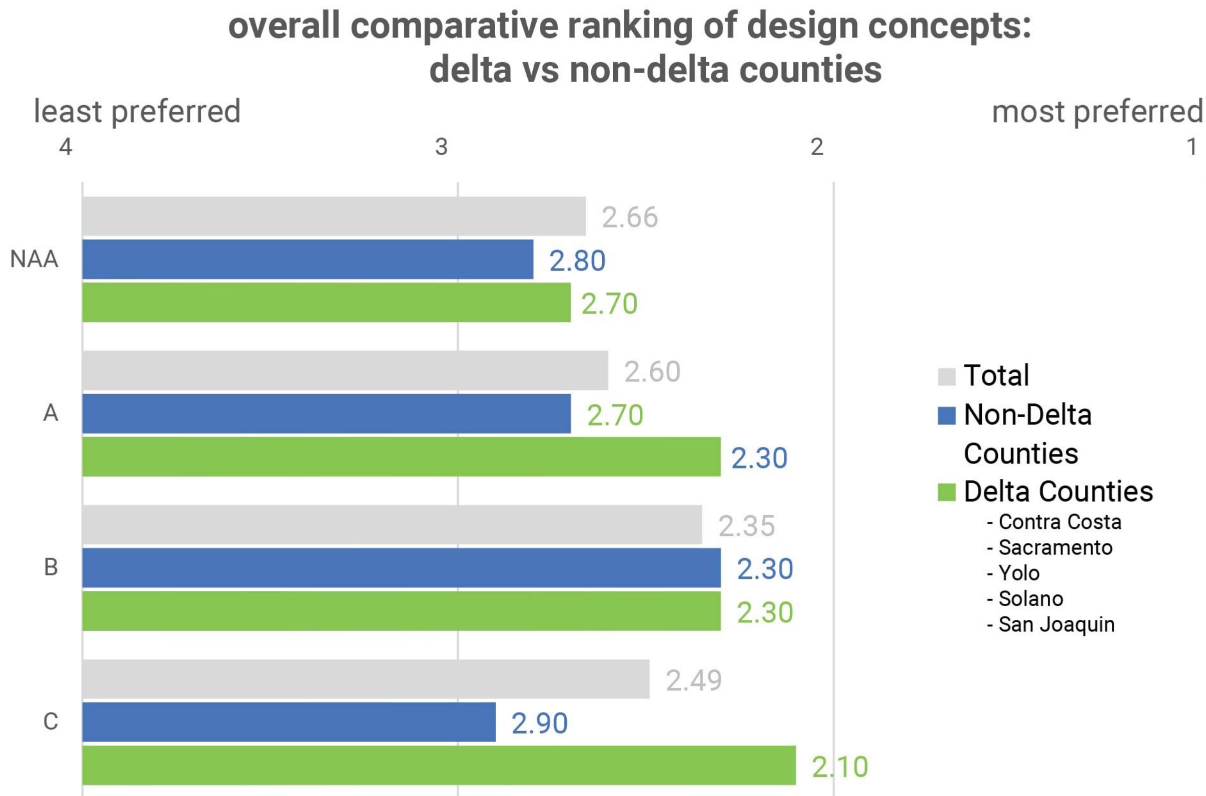
What is notable in the public survey is that there was, on average, similar support across the NAA and concepts A through C. This implies that there was considerably more 'most preferred' voting for the design concepts (collectively) than for the NAA. Specifically, although **36 (39%)** respondents chose the NAA as their most preferred option, over two times as many people **(75)** selected at least one of the three design concepts as their most preferred, suggesting significantly higher preferences overall for the design concepts.

Slightly less than half of all respondents (48%) who ranked the NAA selected the NAA as the least preferred option. Whereas, only 28% of those who ranked concept B selected B as their least preferred, with 38% selecting B as their most preferred.

Approximately 10% more of respondents ranked B as their most preferred than as their least preferred, whereas the opposite was true with the NAA, where 10% more respondents ranked the NAA as their least preferred than as their most preferred.

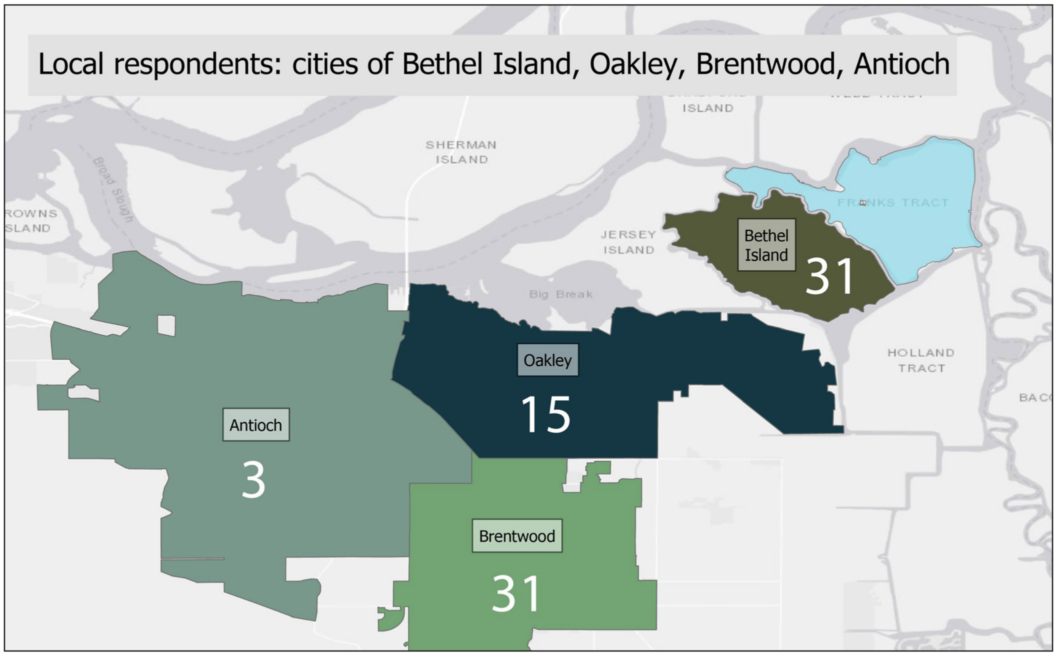


This map shows the count of survey respondents. Delta counties are shown in darker red. Approximately 72% of respondents listed a zip code located within a Delta County. 32% of respondents were from Bethel Island, Brentwood, Oakley, or Antioch, and therefore considered local, based on our designation. Slight differences in overall concept preferences were observed based on geographic proximity of respondents to Franks Tract. These are detailed below.

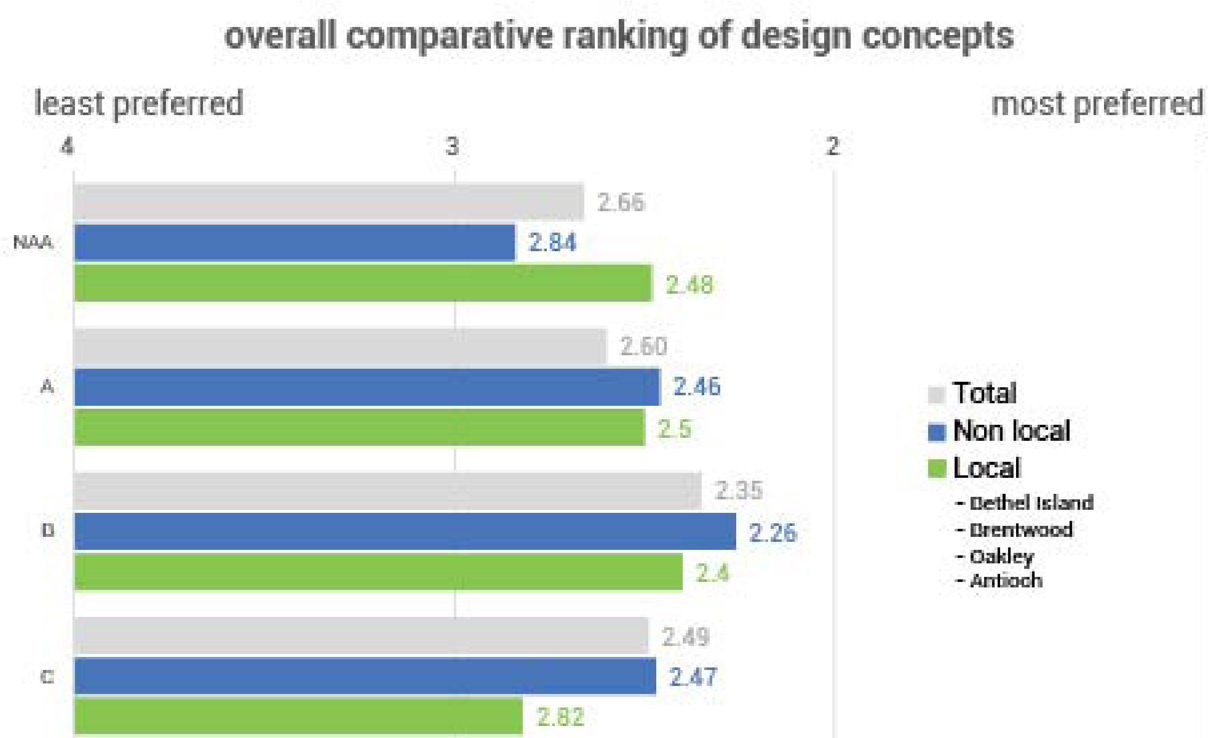


This chart represents the comparative overall ranking for each concept scenario based on the location of the respondent zip code. Responses from Delta Counties (72%) were compared with non-Delta counties (28%). While the differences between the Delta and Non-Delta are small for the NAA to virtually non-existent for Concept B, Concepts A and C are more preferred by respondents for Delta counties.

*We should note that Delta counties are large, and thus proximity to Franks Tract varies greatly amongst those zip codes located within them.



This map shows the response numbers (in white) from the cities of Bethel Island, Oakley, Antioch, Brentwood), which we defined as ‘local’ for the survey analysis. We considered these cities local based on their proximity to Franks Tract and primary access areas. Together these local cities accounted for approximately ⅓ of respondents.



This chart represents the overall comparative ranking for each concept scenario based on the respondent’s zip code location. Local (defined as Bethel Island, Oakley, Antioch, Brentwood) responses (32%) are compared with non-local respondents (68%).

Analysis

Map/concept plan based questions

For the map/concept based questions, we asked survey participants to mark the places and features they liked and disliked on all three design concepts and the no-action alternative. Upon placing a pin, they were asked multiple-choice questions about why they liked or disliked a feature. The choices for the like and dislike were tied to specific locations, feature type, and access. A comment box was provided for a list of other positives for the like pins and other negatives for the dislike pins. For all three concepts and the no action, participants were asked to place a pin where they had questions.

The maps below show the like and dislike responses as well as associated comments, as well as the questions. In total, there are 12 maps, 3 maps (like, dislike, question) for each design concept, and the no action alternative.

General takeaways:

The map-based survey results indicate that respondents provided substantial and detailed consideration (likes and dislikes) of the design concepts. This represents a significant change from the first survey for the initial feasibility study where most respondents provided only negative/dislike comments. Overall, some concerns still remain for a portion of respondents, and there are detailed design questions (such as placement of features, the design of tidal marsh land masses to optimize recreational and ecological benefits) that would need to be worked through, should the FTF project progress forward. Based on results, the potential for a co-designed, multifunctional design concept that is able to preserve and enhance existing desirable features while developing new benefits is becoming more widely embraced.

NO ACTION ALTERNATIVE

PLACES OR FEATURES YOU LIKE

swimming

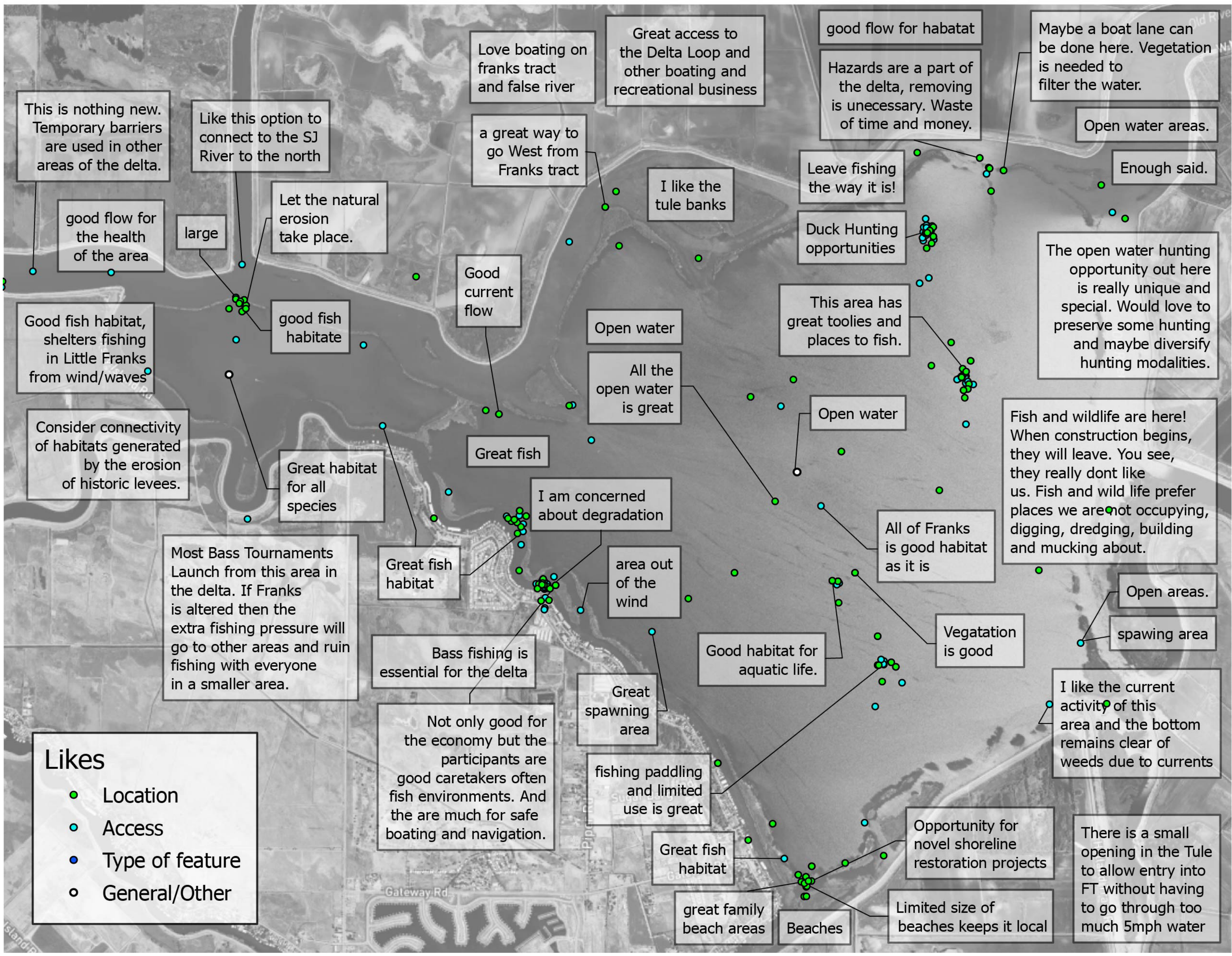
The Trac is great the way it is

Recreational hunting contributes millions of dollars. It should be permitted wherever already legal. No land should be taken out of hunting or altered to the point of non-huntability.

The best waterfowl hunting areas/blinds should be maintained and not converted to other uses/habitats

Open water hunting blinds are a unique opportunity in this place

This is already providing ample hunting opportunity. If this becomes shallow marsh the weeds will shrink the open water and there will be less space for hunters thus reducing capacity and increasing competition.



Bass Tournaments and the postive effects it has for the island

This is a State Recreation Area! Met water dist cant buy it!

Ecologically the no project option is the best option. There is NO PROOF that "tidal marshlands" will be beneficial. None of the Tidal Marshlands to date have had time to prove they are environmentally sound, wildlife studies must be done prior to taking on a project of this size.

No need for land access for recreation, will lead to poaching and littering

Open water and not too deep water is great habitat for waterfowl as is! Not only that many hunters use this area and if its changed or ruined the hunters will be forced to hunt closer together in other regions of the delta causing a less desirable season and more conflicts.

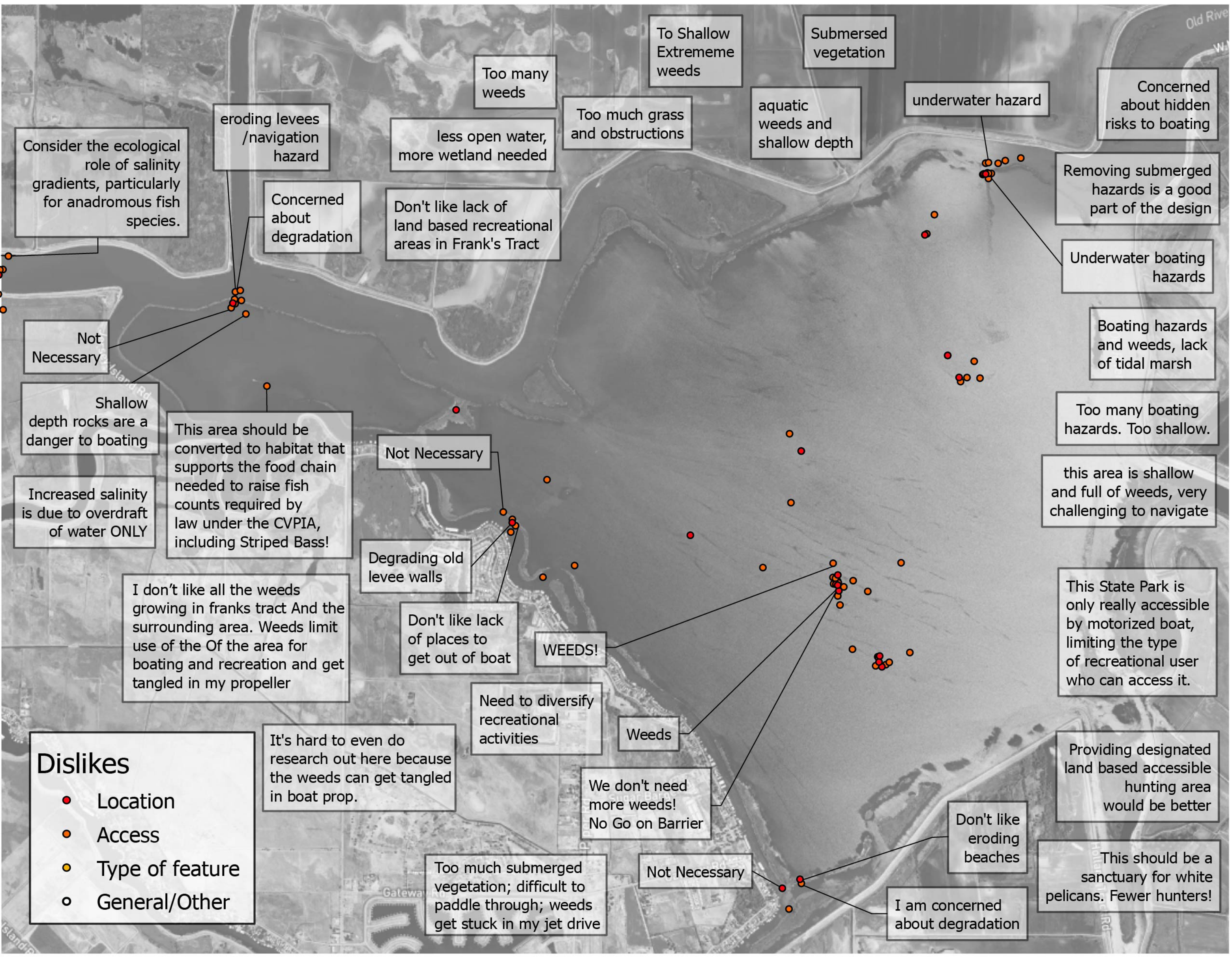
This is ok. There are enough land based recreation opportunities in the area. Adding land access to those without boats/kayaks/etc. will likely increase pollution and fires. s.

NO ACTION ALTERNATIVE

PLACES OR FEATURES YOU DISLIKE

So with regards to the vastness of the open water... It's boring to look at. It's flat open water with a fringe of riprap levees. Would love aesthetic improvements of seeing marshes or even trees on the horizon instead of huge expanse of nothing.

The current. Met Water District, the DWR and the rest of the SWP users were supposed to make efforts to DECREASE RELIANCE on Delta water. The pumps are sucking so hard, so much current is generated by them, its hard to back my boat out of its slip. They dont think we notice, but when the current is going the wrong direction, even though its timed USUALLY with tides, anyone that operates a boat can tell whats happening isnt natural. Getting the boat out isone thing, returning it to a slip when the pumps are working requires good aim, full throttle and a couple words with God when you slam the motors in reverse just before your boat hits the marina dock....



Submerged aquatic vegetation is a nuisance for research, recreation, and native species.

Change is needed. The flooded island is useless. It should be redesigned into the habitat necessary to boost the food chain that supported the once significant fisheries of just 50 years ago.

NO ACTION ALTERNATIVE (NAA)

QUESTIONS?

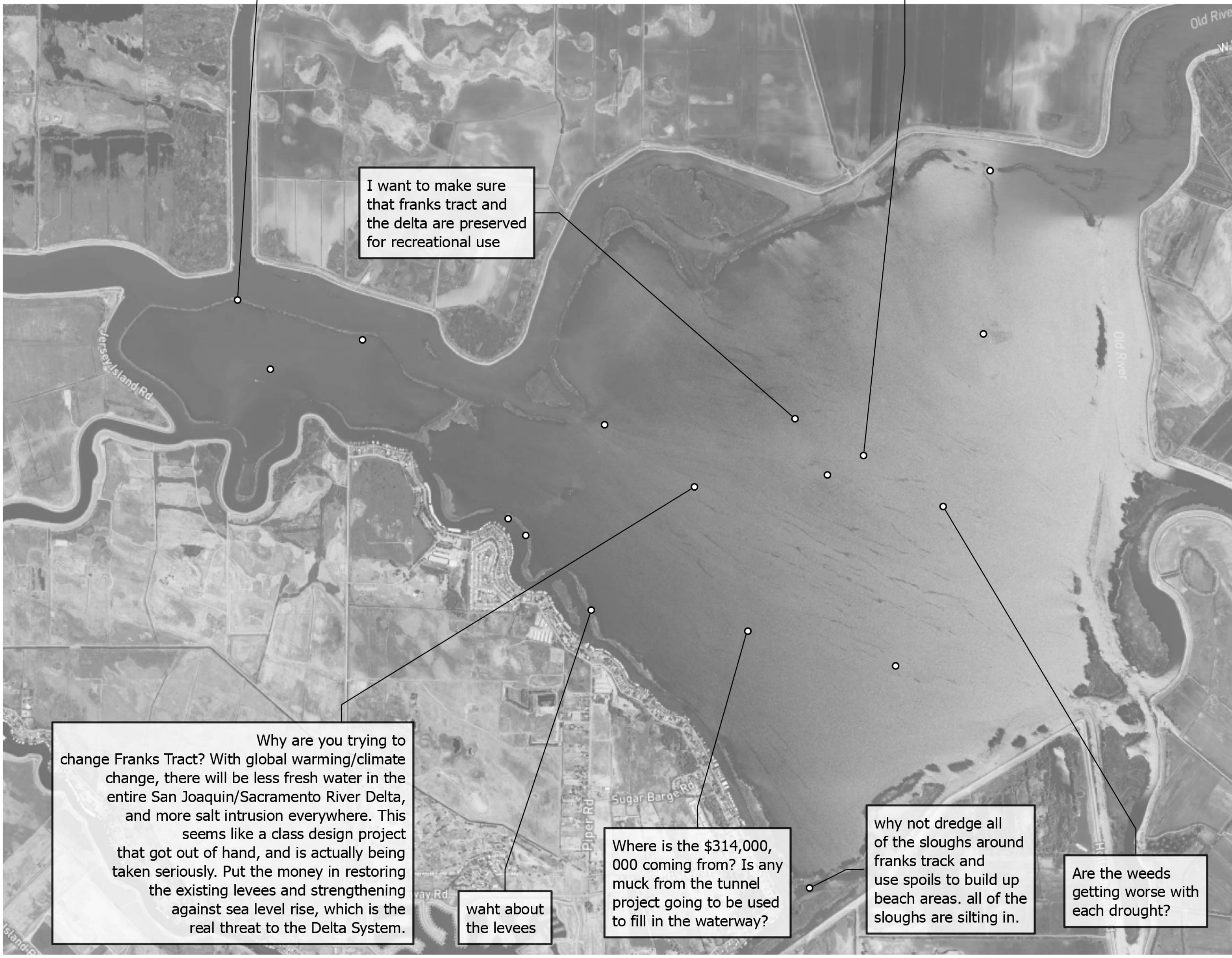
How is this different than what is being proposed? By filling in Franks on one end and making the water deeper on the other side will create navigation issues in of itself. The deeper water will allow swells/bigger waves that will impact the other levees. Then the other new shallower side will become impassable due to the aquatic vegetation. The tract is passable as it is so not a very good argument.

Answer: All the design concepts essential break the Tract into two water bodies, reducing wave action across the tract.

Deeper water is unlikey to produce bigger waves.

I am very concerned about the use of herbicides to control invasive weeds. Herbicides should only be used as a last resort. Actual physical removal is far preferred with no chemicals. Given the massive unemployment in California, the Department should hire people to clear out invasive weeds physically, not chemically.

Answer: That is an intersting proposition but beyond the scope of this project.



I want to make sure that franks tract and the delta are preserved for recreational use

Why are you trying to change Franks Tract? With global warming/climate change, there will be less fresh water in the entire San Joaquin/Sacramento River Delta, and more salt intrusion everywhere. This seems like a class design project that got out of hand, and is actually being taken seriously. Put the money in restoring the existing levees and strengthening against sea level rise, which is the real threat to the Delta System.

Answer: This project is intended to address salinity intrusion and sea level rise, while enhancing recreaition, navigation and overall ecolgoical health or the tract.

waht about the levees

Answer: Certain levees would be broadened depending on the selected concepts.

Where is the $314,000, 000 coming from? Is any muck from the tunnel project going to be used to fill in the waterway?

Answer: Funding would come from beneficiaries including the State.

why not dredge all of the sloughs around franks track and use spoils to build up beach areas. all of the sloughs are silting in.

Answer: Certain sloughs may be dredged during the construction process. However, the most cost-efficient materials are nearest to the proposed features.

Are the weeds getting worse with each drought?

Answer: Yes, and the expectation is that that trend will continue.

No Action Alternative - comment summary

When asked what they like in the Tract currently, respondents commented on fish habitat, fishing quality, bass tournaments, open water, waterfowl habitat, hunting opportunities, “good” vegetation, access and flow.

When asked what they do not like in the Tract, respondents commented on aquatic weeds, shallowness, levee degradation, boating hazards, eroding beaches, the lack of access, dangerous currents, too much open water, salinity intrusion, and a need to diversify recreational opportunities.

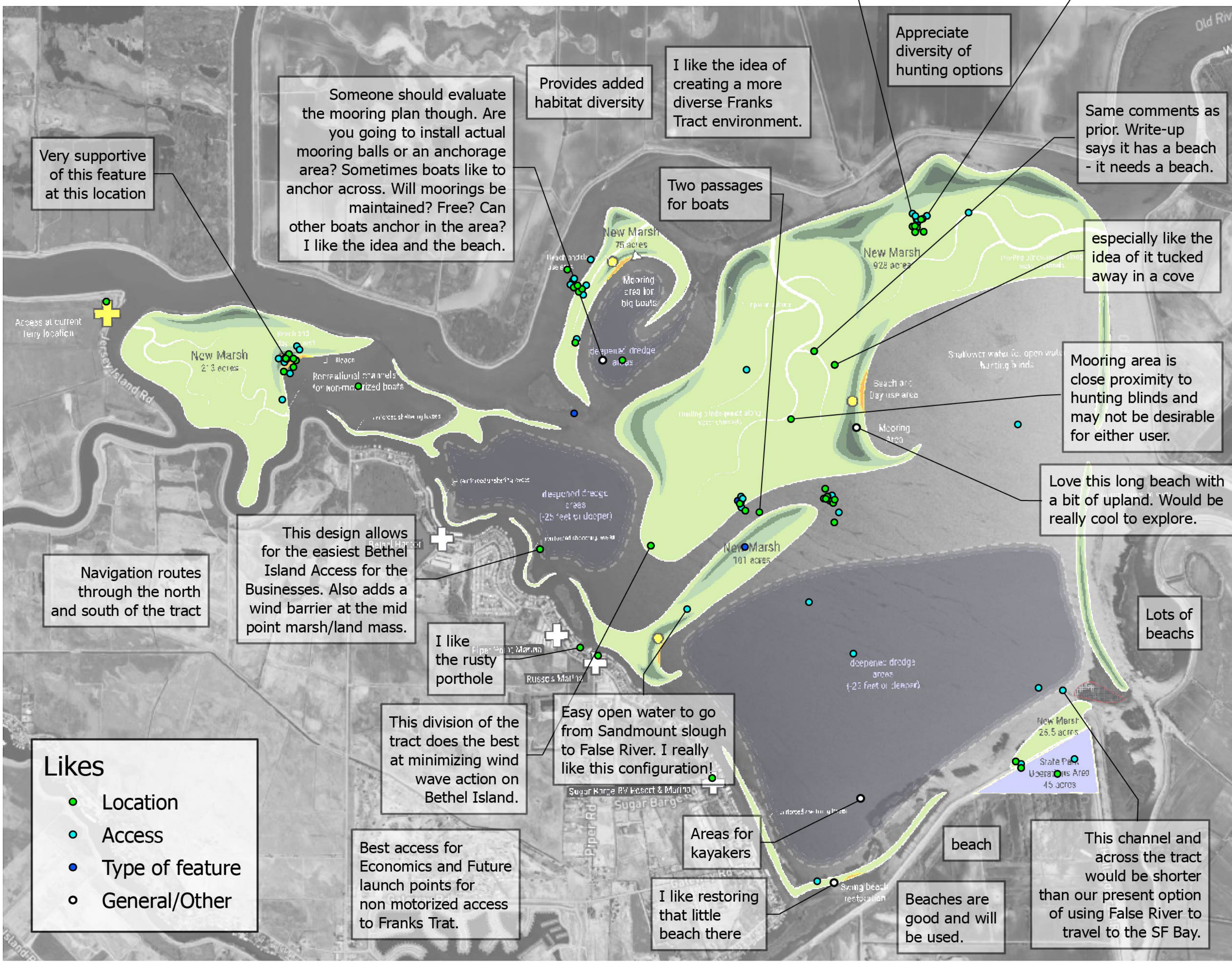
Reading between the two, we find potential conflicts, where others dislike the features that some people like. Examples include open water, which some find attractive, whereas others prefer more marsh and shallowness, which is seen as necessary for good waterfowl habitat, but also creates boating hazards. While there are perhaps instances of direct conflict, there is also the potential to include those polarizing features. The tract is large enough to support a diversity of features, including those where preferences are divided.

CONCEPT A. - OPEN WATER BERM AND CHANNEL

PLACES OR FEATURES YOU LIKE

Love all the tidal marsh, please don't ruin it by just channelizing the marsh. Please consider making this marsh accessible while out of the boating channels within the marsh. Please don't miss on this potentially great hunting marsh

Great tidal marsh opportunities, level out the elevation so it's not so channelized. We as duck hunters need to be able to utilize more than just the inner marsh channels . Please don't ruin what can be a special tidal marsh

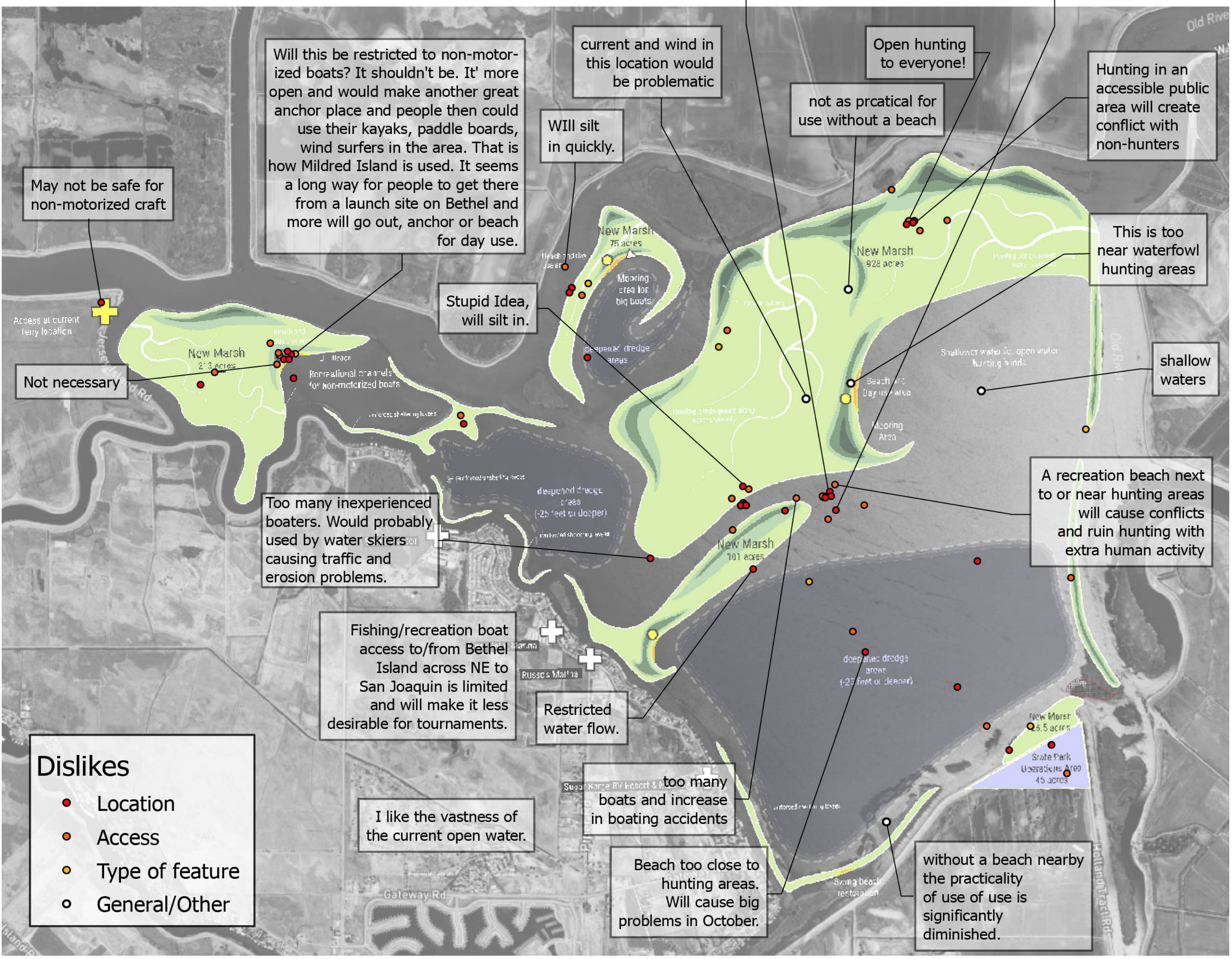


CONCEPT A. - OPEN WATER BERM AND CHANNEL

PLACES OR FEATURES YOU DISLIKE

This appears to force all boats into Franks Tract going through the lower new channel instead of current Old River-to-Sandmound Slough. Seems that will cause congestion and inconvenience for homes on South Bethel, on Sandmound Blvd, and the new Delta Coves. That traffic will be combined with all boats going to/from Bethel-Disco Bay (bass fishing, Wednesday small dinner cruises to Sugarbarge or Rusty P.

Similar to remark about closing off Sandmound Slough, this will now be the primary channel for all traffic from all of BI and Sandmound Blvd going to Old River and Disco Bay boats coming to Bethel. That traffic will be combined with all boats going to/from Bethel-Disco Bay (bass fishing, Wednesday small dinner cruises to Sugarbarge or Rusty P. It will need to be deep and well-dredged and well marked. At high tide, what will differentiate the channel from the marsh?

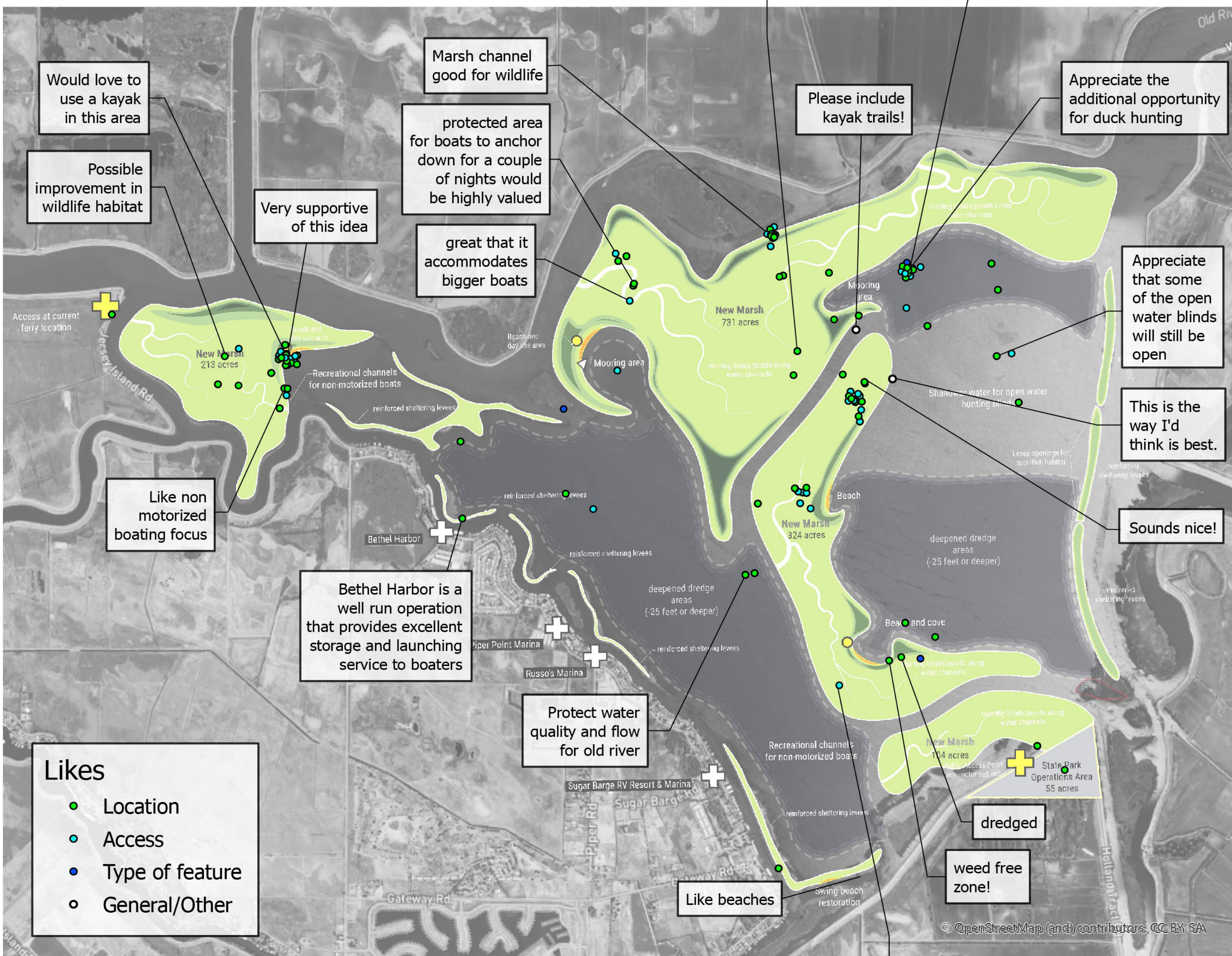


CONCEPT B. - CENTRAL LANDMASS

PLACES OR FEATURES YOU LIKE

Hopefully the tidal marsh is highly boatable IE Liberty island just north of Rio vista. If this is going to be highly channelized tidal marsh I think it will be a hunting waste, we need a low elevation marsh so we can traverse on virtually any tide depth. Please don't ruin this tidal marsh your trying to create.

The addition of marsh hunting blinds would be good if placed in appropriate places identified by hunters. Most of the marsh should be a free roam area however to allow hunters to decide where to hunt.



Would love to use a kayak in this area

Possible improvement in wildlife habitat

Very supportive of this idea

Marsh channel good for wildlife

protected area for boats to anchor down for a couple of nights would be highly valued

great that it accommodates bigger boats

Please include kayak trails!

Appreciate the additional opportunity for duck hunting

Appreciate that some of the open water blinds will still be open

This is the way I'd think is best.

Sounds nice!

Like non motorized boating focus

Bethel Harbor is a well run operation that provides excellent storage and launching service to boaters

Protect water quality and flow for old river

dredged

weed free zone!

Like beaches

I like that you folks spent time and energy on thinking this through. The tidal marshland areas are too large, the boating passageways are narrow, and will clog with boats easily. The fish passage on river is miniscule compared to the waterway heading south east to the SWP. The tidal marsh areas will attract mosquitos, tons of them. Mosquitos are the worst of the disease spreading pests, and you folks want to give them a gigantic platform to attack the East San Francisco Bay area. Sherman Islands' project is already doing a fine job of this. Im sorry, the entire idea here is horrible. Duck hunters will not be able to have more than 4 blinds with this project. Boaters will be easily confused by the crazy passageways youre creating, theyll be aggrivated by boat traffic, and the easy to run aground on. Salinity barriers are going to happen because the DWR cant manage their SWP properly. Rising sea levels will happen. If we were to focus on Desal

CONCEPT B. - CENTRAL LANDMASS

PLACES OR FEATURES YOU DISLIKE

Hunting blinds near/in plain view of a mooring beach?! This will cause conflicts with hunters vs non-hunters especially during the early waterfowl season. There is likely to be boats anchoring in the blind area.

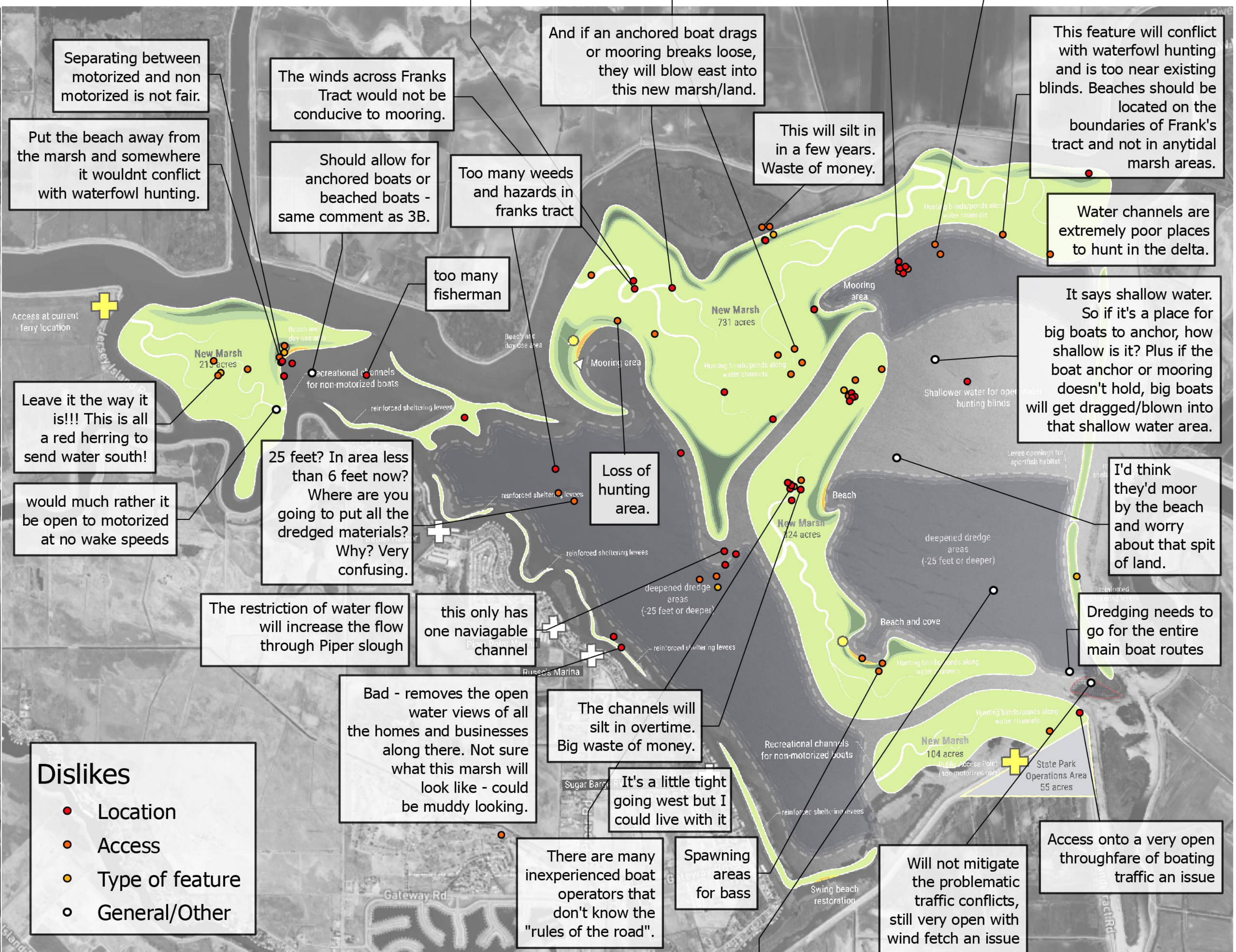
People can moore anywhere in the Delta, creating a space specfic for it is not necessary. Creating places like this leads to another area for those to moore and party, leading to intoxicated boat drivers.

looks like a puzzle

Teeny tiny fish passage, for salmon to figure out. Water passage toward the southern access hole there to the SWP is huge, making this another fish kill

This seems angled wrong. Boats face west typically (nose to the west due to winds) although they do swing.

Building an island/marsh and destroying one of the best fishing areas in the entire delta makes no sense.



Separating between motorized and non motorized is not fair.

Put the beach away from the marsh and somewhere it wouldnt conflict with waterfowl hunting.

The winds across Franks Tract would not be conducive to mooring.

Should allow for anchored boats or beached boats - same comment as 3B.

And if an anchored boat drags or mooring breaks loose, they will blow east into this new marsh/land.

Too many weeds and hazards in franks tract

This will silt in in a few years. Waste of money.

This feature will conflict with waterfowl hunting and is too near existing blinds. Beaches should be located on the boundaries of Frank's tract and not in anytidal marsh areas.

Water channels are extremely poor places to hunt in the delta.

too many fisherman

It says shallow water. So if it's a place for big boats to anchor, how shallow is it? Plus if the boat anchor or mooring doesn't hold, big boats will get dragged/blown into that shallow water area.

Leave it the way it is!!! This is all a red herring to send water south!

would much rather it be open to motorized at no wake speeds

25 feet? In area less than 6 feet now? Where are you going to put all the dredged materials? Why? Very confusing.

Loss of hunting area.

I'd think they'd moor by the beach and worry about that spit of land.

The restriction of water flow will increase the flow through Piper slough

this only has one naviagable channel

Dredging needs to go for the entire main boat routes

Bad - removes the open water views of all the homes and businesses along there. Not sure what this marsh will look like - could be muddy looking.

The channels will silt in overtime. Big waste of money.

It's a little tight going west but I could live with it

There are many inexperienced boat operators that don't know the "rules of the road".

Spawning areas for bass

Will not mitigate the problematic traffic conflicts, still very open with wind fetch an issue

Access onto a very open throughfare of boating traffic an issue

If blinds are to be in this area how will they be accessed at low tides? Additionally the vegetation will take over such as primrose and hyacinth which is of little value to migrating waterfowl and will not be huntable or fishable.

Open the area up to hunting, leasing or draw system for blinds is unfair. Open to all waterfowl hunting will lead to better opportunities.

What purpose does this serve? This will eliminate a bunch of good hunting and fishing areas by making the water too deep.

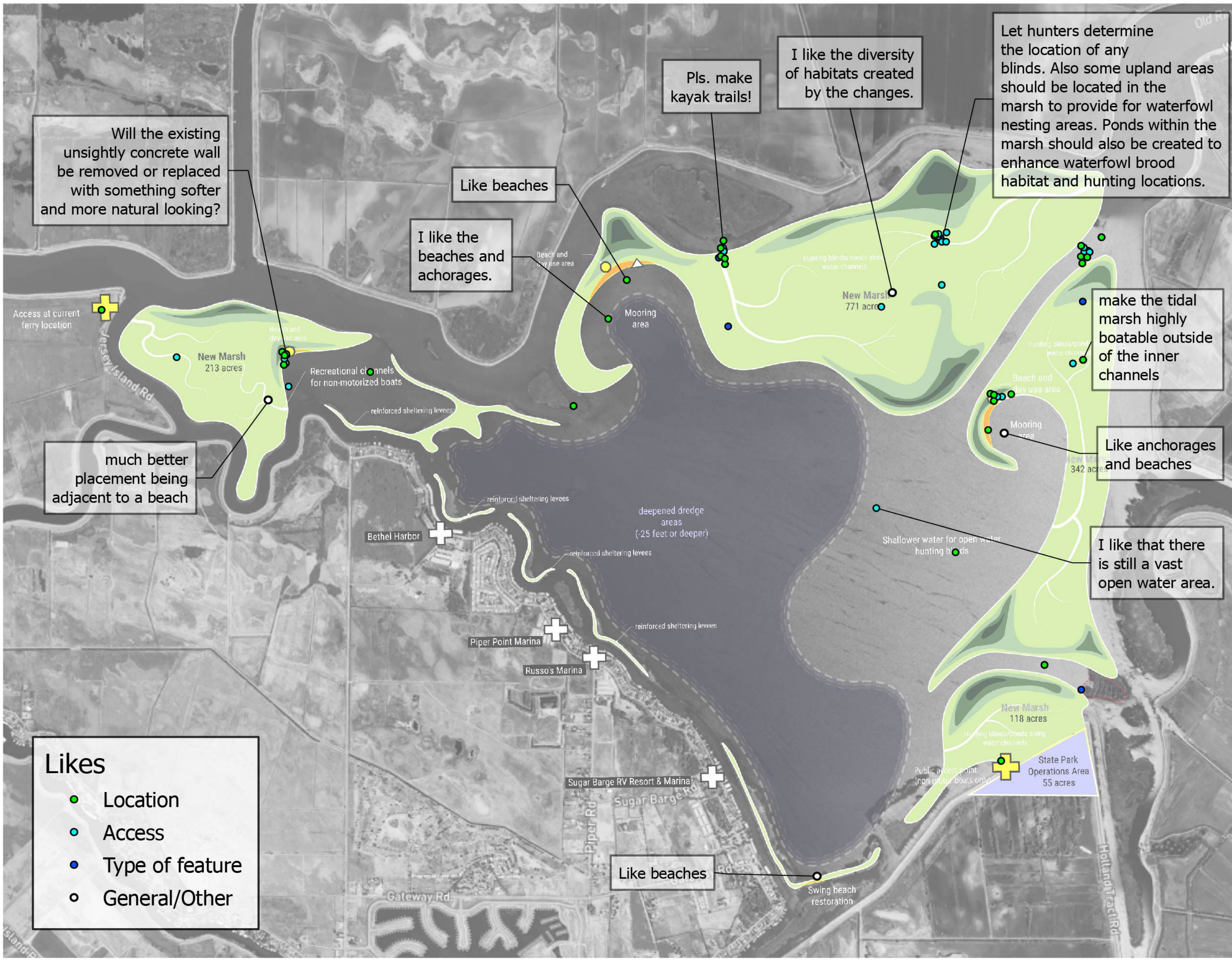
Continued. Desalinization. Remove some sea water, remove its salts and put that in he tap. DELTA WATER reliance must end. Profits on water must be strictly regulated. Fallowing top notch farmlands to rob the water rights is wrong, especially to send that water to irrigate lesser lands.

Hunting could create conflict and danger for boaters and birders

I like the vastness of the open water.

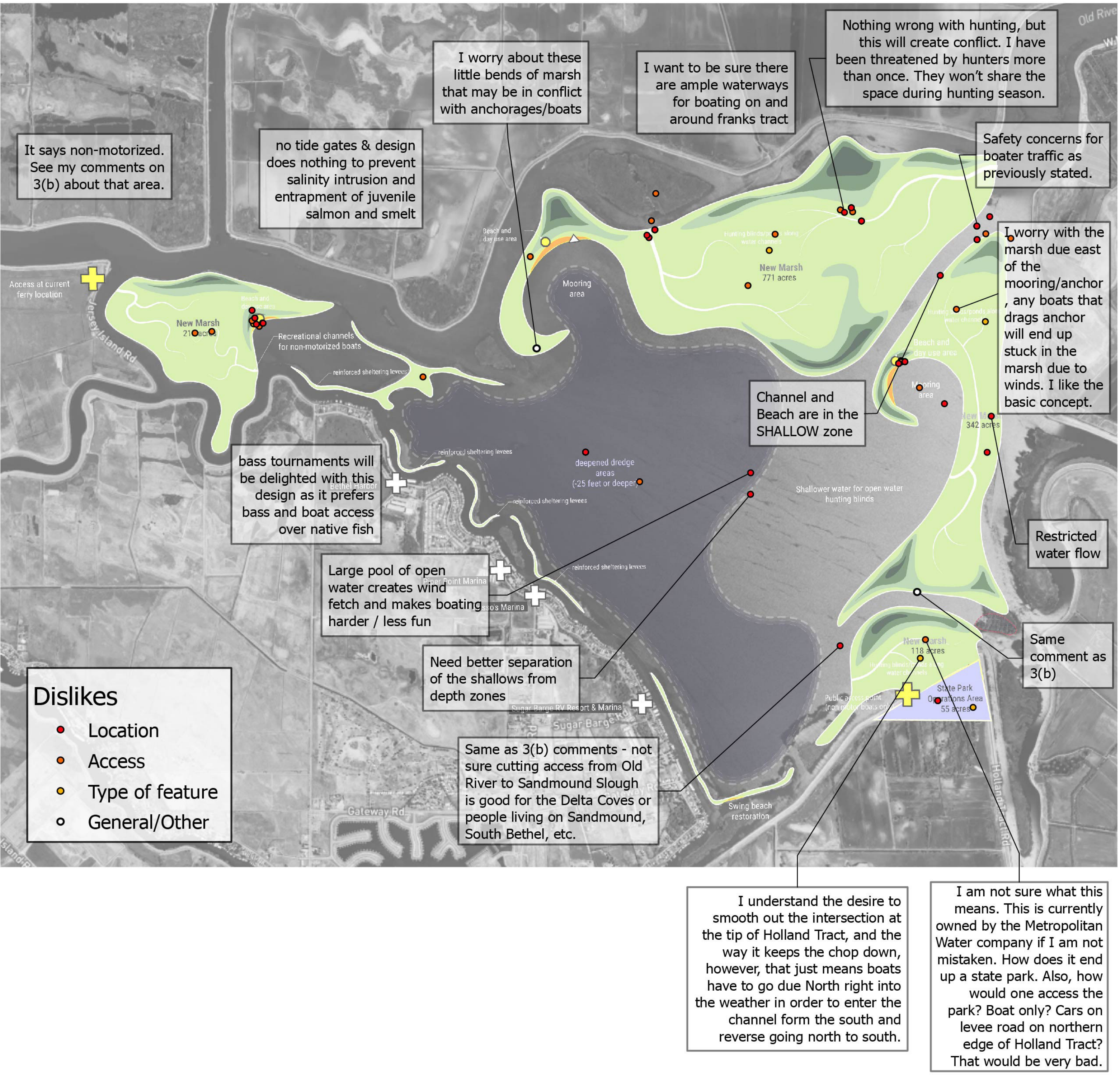
CONCEPT C. - EASTERN LANDMASS

PLACES OR FEATURES YOU LIKE



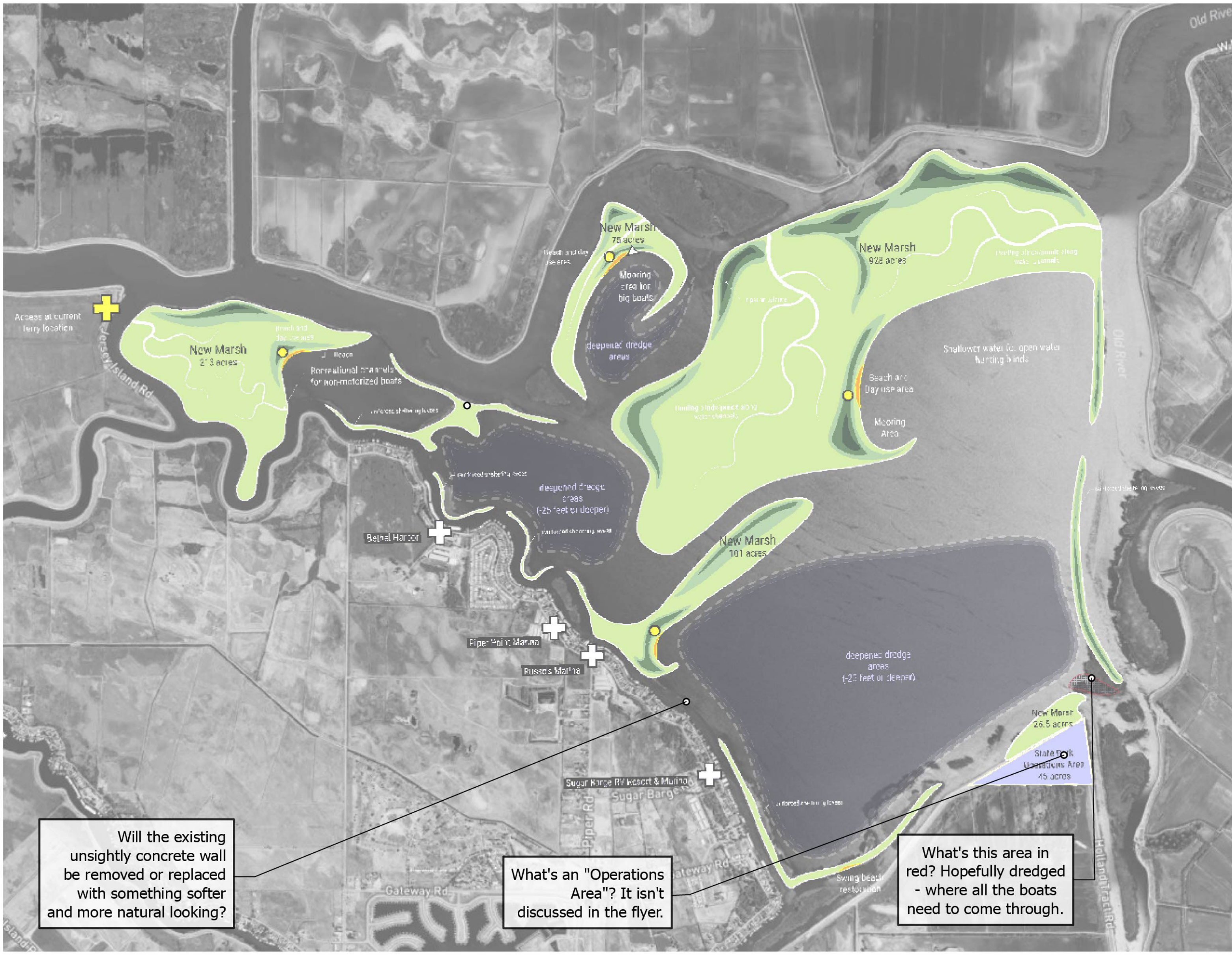
CONCEPT C. - EASTERN LANDMASS

PLACES OR FEATURES YOU DISLIKE



CONCEPT A. - OPEN WATER BERM AND CHANNEL

QUESTIONS?



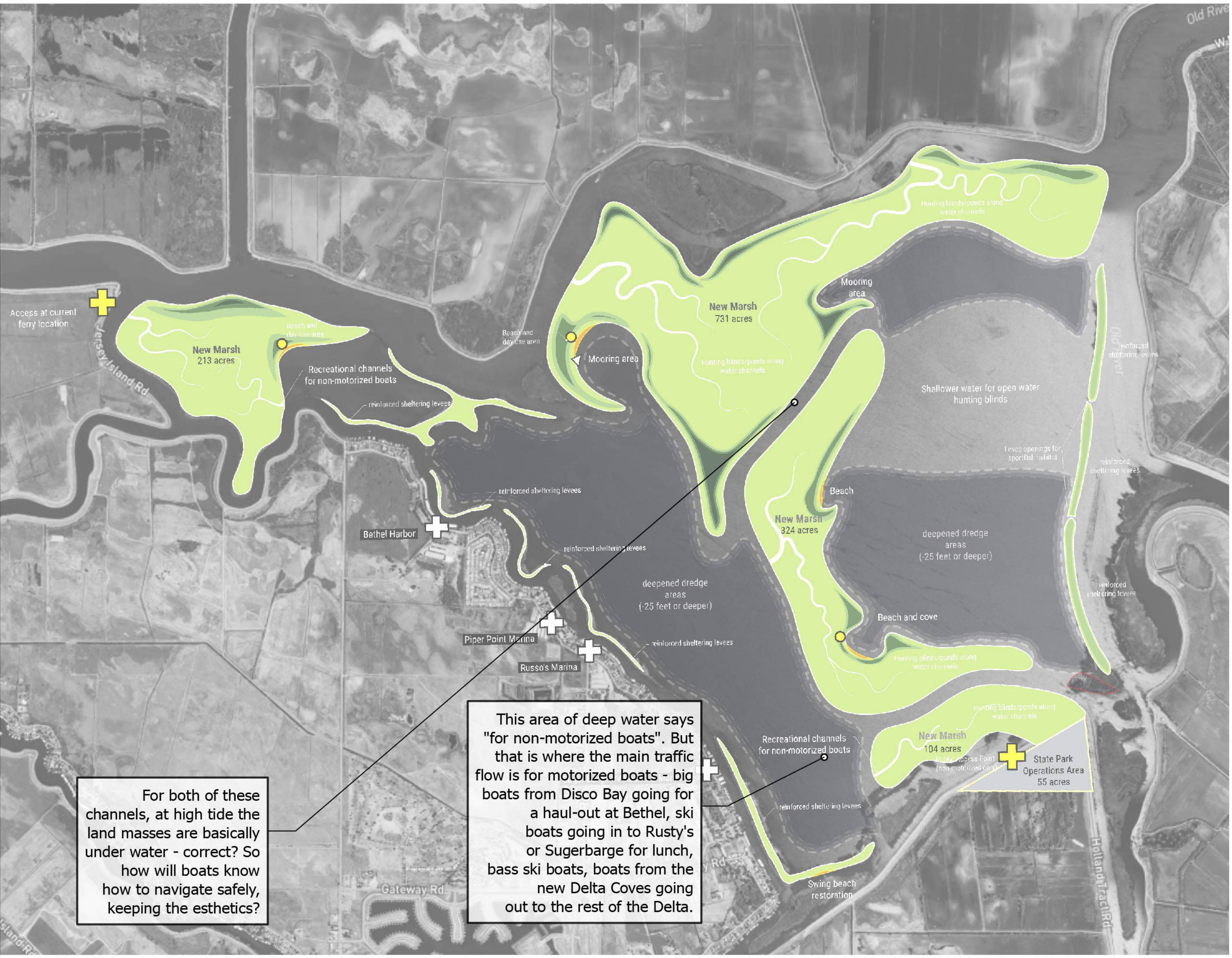
Answer: Currently there is no plan to remove the wave barrier. However, the creation of tidal marsh to the North of the current barrier location would serve a simliar purpose, and offer protection for the adjacent Bethel Island levee.

Answer: The “operations areas” refers to a potential State Parks managed operations facility. The facility could support maintainance, enforcement and management activities in the State Recreation Area.

Answer: Correct. This area in red indicates a portion of existing land that would be dredged to facilitate boat passage.

CONCEPT B. - CENTRAL LANDMASS

QUESTIONS?



For both of these channels, at high tide the land masses are basically under water - correct? So how will boats know how to navigate safely, keeping the esthetics?

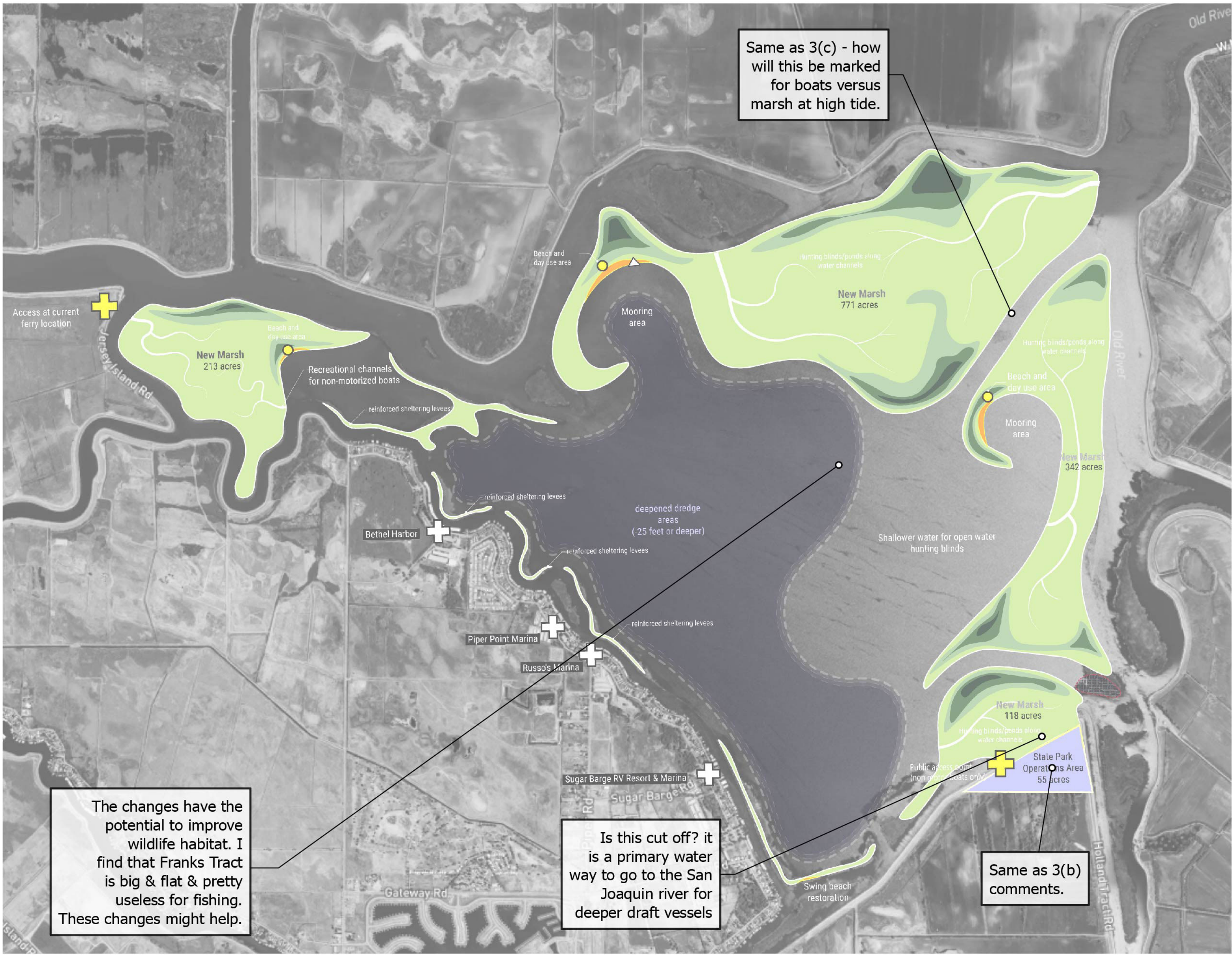
This area of deep water says "for non-motorized boats". But that is where the main traffic flow is for motorized boats - big boats from Disco Bay going for a haul-out at Bethel, ski boats going in to Rusty's or Sugerbarge for lunch, bass ski boats, boats from the new Delta Coves going out to the rest of the Delta.

Answer: No. As designed the tidal marsh land mass and the vegetation that will grow on it will be entirely visible at high tide. The channel will be lined by tule, willow and other Delta vegetation.

Answer: That caption is actually referring to the tidal channel in the newly created marsh to the West. The area of deep water is intended to enhance navigability for motorized boats going to and from the Bethel Island front side and across the Tract.

CONCEPT C. - EASTERN LANDMASS

QUESTIONS?



Answer: Yes. In this concept Sandmound Slough would be cut off. Deeper draft vessels coming from Sheeps Slough would have to go up Old River. Vessel from Sandmound could potentially cut West across the deepened tract.

Overall commonalities and differences across the NAA and design concepts

Supportive comments for the NAA focused on unique features such as open water, spawning areas, fishing, hunting, good flows, and access. Some respondents were concerned that these features might be lost or diminished if a design concept were implemented.

However, there were also supportive comments regarding potential modifications with the design concepts that could enhance these unique existing features, address current concerns, and create new opportunities based on improved navigability, additional features, and the general diversification of the tract.

Common Comments across the three design concepts

Beaches were a common liked feature across the design concepts. However, there were concerns voiced about their proximity to hunting areas and the potential for them to become too popular and thus an attractive nuisance.

There was a recurrent concern voiced regarding the channel widths and navigability in the design concepts. Comments to this effect included concerns with inexperienced boaters, the narrowness of the channels, and the hazard created by adjacent tidal marsh. There were also concerns that channels would silt in over time.

In general, there was widespread support for the proposed modifications to Little Franks Tract, (which were the same across all design concepts). There were concerns raised about the potential exclusion of motorized boats in the area. Some thought this unfair, while others questioned the accessibility of the area for non-motorized boaters. Others were supportive of the idea of a portion of the tract in which motorized boats are excluded.

There were many comments across all concepts related to hunting. Several voiced concerns about the potential eradication of existing hunting opportunities, where others appeared supportive of new marsh-based hunting opportunities, often contingent upon the resolution of access issues, and the inclusion of hunter preferences in the marsh habitat design. There were also concerns about the potential conflict between hunting and other recreational activities, especially where hunting and recreational features might be nearby.

The proposed modification to Holland tip, which varied amongst concepts, drew many comments. Despite considerable efforts made in all the design concepts, with input from the advisory committee, to minimize risks and enhance safety, there remain concerns regarding fetch, wind, navigability, and traffic-related hazards at what we are aware of is a dangerous corner.

Where did comments diverge or become unclear?

Comments diverged regarding the benefits of creating marshlands and dividing the Tract into two separate water bodies. While many supported the idea based on improved navigability, habitat, and recreation, others were concerned about navigation, local businesses, aesthetics, and existing recreational opportunities. Concerns were voiced regarding mosquitoes and the marsh smell, which have been recurrent throughout the process.

Based on respondent comments, what could the next round of planning (should there be one) consider and investigate?

The next round of planning should focus on the following:

- Resolving the issues related to the dangerous corner at Holland Tip
- Including duck hunters, and others in the design and management plans for the proposed marshlands
- Continuing to include stakeholders in discussions related to marsh aesthetics and the experience of boating through a channel between landmasses.
- Discussing conflicts between potential recreational activities and creatively imagining solutions based on the separation of conflicting activities by distancing them either spatially or temporally.
- Developing a clearer design for a State Parks facility somewhere in the vicinity of the Tract. Holland tip has been identified as a potential location, however, there may be others, such as Jersey Island that may warrant consideration as well.
- Building upon the significant consensus regarding the design of Little Franks Tract. Several key issues need to be considered:
    - Non-motorized boating access
    - Possible exclusion of motorized boating
    - Habitat value for smelt and other desirable species
    - Relationship to Jersey Island, Bradford Island, and the existing ferry terminal connecting the two.

RESPONSE TO PUBLIC COMMENTS ON DRAFT REPORT AND APPENDICES

This section contains a summary of the submitted public comments as well as the response.

Response to Public Comments

A public draft of the Franks Tract Futures 2020: Reimagined report was released for public comment on August 12th, 2020. A three week comment period was provided, with comments due on the 2nd of September (comments received after that date were also incorporated). The draft report release and comment period dates were communicated to the public through various announcements, including articles in the East Bay Times and Brentwood press, social media postings, direct email to stakeholder lists, as well as updates from the Delta Protection Commission and CDFW. There were thirteen public comment letters submitted. Each letter was reviewed and responded to, and appropriate changes were made to the final report.

The comments summary and draft response are included in the table below:

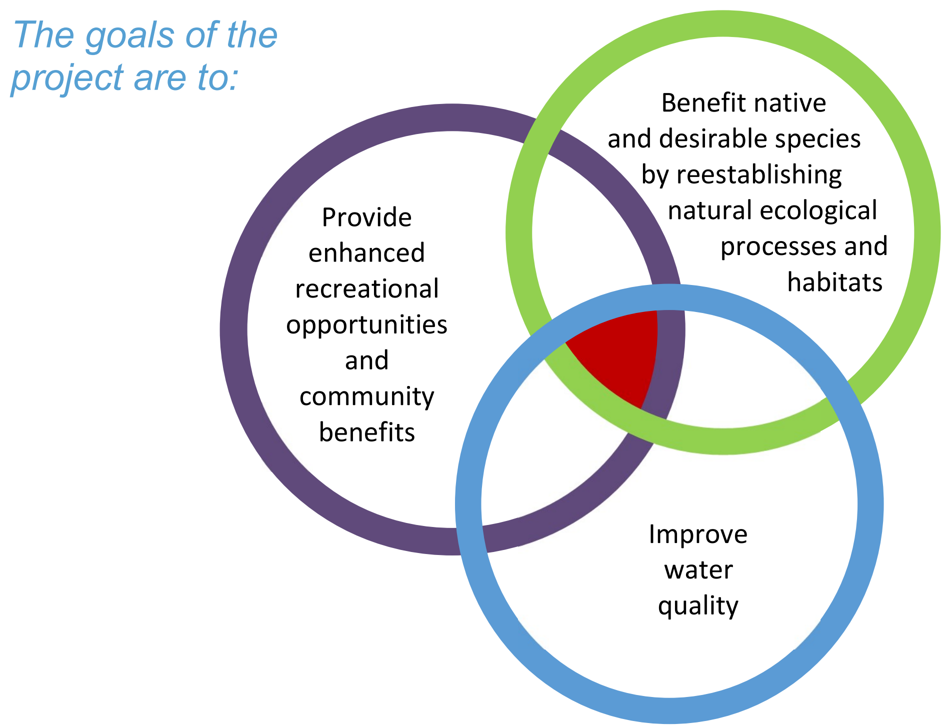
Comments	**Changes to report**
Opposed. Delta needs more freshwater inflow.	Outside of project scope.
Opposed to filling. Damaging to one of the Delta's prime recreation spots. Importance of existing uses to local businesses. Favors dredging the tract, managing invasive plants, and using dredged material to reinforce the levees	Addressed in the executive summary as well as in the new discussion of no action alternative plus in section 5.
Wants public areas for walking, picnics.	Statement added to section 6 preferred alternative
Loves FT the way it is.	
Opposed	
Opposed. "dumping ground for tunnel muck."	Addressed in the executive summary and in section 7 - all infill material will be from onsite dredging.
Need to mitigate for any impacts to the Bethel Island Ferry. Request to purchase the ferry.	Need to mitigate for Bradford Island Ferru is clarified in section 5.
Likes FT the way it is. Considers the project negative for fish and wildlife. Poor use of funds.	Funding information provided in the executive summary.
Opposed to any change.	
Construction period impacts disruptive to ecosystem and possibly navigation. Concerns about boat traffic. SAV important for certain species. Expensive, poor investment.	
Technical difficulties downloading the appendices.	Resolved over email.

Comments	Changes to report
Questions about what flood modeling has been done.	Addressed in updated updated hydrology appendix D.
Costs Planting Concern about Holland Tract facilities Who pays? New Alternative-dredge and improve levees	Refine cost estimate in section 7 include cost of restoration/planting Clarify planting in the preferred alternative ecology section in section 6. Clarify facilities in economics appendix C. Add text to section 8 “Next Steps” section describing the rationale for multi-benefit projects

Franks Tract Futures 2020 - Goals and Objectives

9/20/19

The purpose of the FTF project is to balance three broad goals.



For the project to move forward, it will be important to find a solution that meets all three goals, as shown by the red triangle in the graphic.

Project Objectives

More detailed project objectives are provided below. The objectives reflect input from prior Franks Tract restoration efforts, State Parks' General Plan for the tract, and stakeholder input from the collaborative planning process.

Recreation

- Enhance recreational opportunities for fishing, motorized and non-motorized boating, waterfowl hunting, and shoreline recreation while minimizing impacts to existing recreational uses.

Franks Tract currently supports a variety of recreation uses including a world class bass fishery, waterfowl hunting, various motorized and non-motorized boating activities, and limited shoreline recreation. The objective is to maintain or enhance these existing recreational uses, as much as possible, while creating/expanding opportunities for new types of recreation. Wildlife-oriented recreation, connecting people to the water and proposed wetlands, is inherent in several recreational categories and could consist of building kayak launches, water trails, and wildlife viewing areas. Boating recreation can be enhanced through the creation of boat-in destinations, such as beaches, day-use areas, or overnight boat-in camp sites or overnight anchorages.

Navigation

- Minimize impacts to current boating travel times between key locations.
- Maintain minimum depths for safe navigation around the tract.
- Reduce boating hazards and nuisance conditions.

Franks Tract is heavily used and valued by boaters due to its open fresh water, scenery, fast water channels, and easy access to multiple destinations. Any proposed project would seek to maintain these desirable qualities. Key locations for travel will be determined with input from stakeholders and the public. The project would also seek to maintain minimum depths for safe navigation around the tract and reduce existing hazards and nuisance conditions such as aquatic weeds, submerged hazards left over from flooding of the tract, and areas of periodic high velocities (when the West False River emergency barrier is in place).

Ecology

- Maintain or enhance habitat for fish species of interest, specifically largemouth bass, Chinook salmon, striped bass and delta smelt.
- Minimize the risk of entrainment of special status fish species into Old River and the south Delta.
- Benefit a range of native species by establishing large areas of tidal marsh and associated habitats.
- Minimize conditions that could result in the spread of undesirable invasive species.

Largemouth and striped bass are important sport fish that are included alongside the native Chinook salmon and delta smelt as target fish species for the project. The tract already includes extensive habitat for largemouth and striped bass. The project will seek to create new habitat for Chinook salmon and delta smelt while minimizing impacts to or improving habitat for largemouth and striped bass.

Vegetated tidal marsh and associated tidal channels provide habitat and a source of food production for the target fish species. Some of the food produced on the tract would be exported with the tides to benefit fish in other parts of the Delta.

Non-native invasive species of concern include but aren't limited to invasive vegetation (such as submerged or floating aquatic vegetation aka SAV/FAV), quagga and zebra mussels, Asian clams, and nutria. While bass are non-native to the Delta, they are recreationally important and considered beneficial. They are not included in the category of undesirable non-native species to be minimized.

Water Quality

- Maintain or enhance water quality for human uses such as irrigation and drinking water.
- Improve water supply reliability by reducing entrainment at the South Delta pumps.
- Reduce the disruptions and costs associated with installation of emergency drought barriers

This objective addresses water supply reliability for local, in-delta diversions and for exports by the State Water Project and Central Valley Project at the South Delta pumps and by Contra Costa Water District at their Rock Slough, Old River and Middle River intakes. Hydrodynamic changes associated with the project have the potential to affect salinities on the order of up to 0.5 to parts per thousand (ppt). These changes are small compared to bay and ocean salinities (typically 33 ppt outside the Golden Gate), but can be meaningful for agriculture and drinking water supply. They may also be meaningful for the ecosystem.

A related objective is to reduce the frequency and/or extent of disruption and costs associated with emergency drought barriers such as occurred on West False River in 2015.

Flood Protection

- Improve levels of flood protection, where possible, and avoid any adverse flood impacts.

The project must not result in any increased flood risk for the Delta community. The project will consider risks associated with high water during large runoff events, any increased channel velocities and associated potential for levee scour, and potential wave-induced erosion and overtopping of flood protection levees. Project actions may include fill in and augmentation of remnant levees of Franks Tract to provide wave sheltering for the levees protection the neighboring islands. No improvements to flood protection levees themselves is proposed as part of this project.

Local Economy and Community

- Provide local economic benefits where possible and minimize any disruptions to the local economy.
- Minimize the production of any harmful or nuisance species such as mosquitos and blue-green algae.
- Consider the aesthetics of different land uses (e.g., tidal wetland and open water) and minimize any negative changes.

Franks Tract is one of the most popular and publicly used tracts in the Delta. Service industries have developed around these uses, such as marinas, shops, and restaurants. Real estate prices reflect proximity to water views and water-related activities. Any major changes to Franks Tract are bound to affect current uses and adjacent communities. The project must minimize any disruptions to the local community and will, ideally, provide economic benefits.

Certain types of tidal wetlands produce mosquitos which can in turn be a nuisances and vectors for disease. The project will consult with vector control experts and integrate design approaches (such as avoiding shallow poorly drained areas) that minimize mosquito production. Likewise, the project will look to incorporate features that minimize the production of blue green algae.

Project Cost

- Minimize construction costs within the context of other project objectives.
- Minimize long term costs for ongoing operations and maintenance within the context of other project objectives.

The project will identify construction-phase and ongoing project activities, and associated costs. Ongoing project activities may include operating and maintaining new recreational facilities, safety patrols, and managing for control of nuisance invasive species. Identifying or developing funding for any proposed ongoing activities is recognized a key element to achieving the project objectives.

A guiding principle of the project overall is to seek a balance of benefits across all objectives that will be *sustainable over time* and resilient to potential future changes. In the much-altered, native and non-native ecosystem that is the current Delta, it is still possible to recover some historic, natural form and function such as marsh building and fish food production processes. Vegetated marshes build vertically through plant growth ad accumulation of sediments, and can keep pace with moderate to high rates of sea level rise. Reintroduction of these natural processes can provide resilience to climate change, both sea level rise and potentially more frequent and longer droughts. Likewise, benefits to recreation, the local economy and other project benefits should sustain over time.

Summary Consequence Tables

Attached below are a set of summary Consequence Tables that describe the performance of the ***No Action***, ***Concept A, Concept B*** and ***Concept C*** designs using specific evaluation criteria for each **FTF project objective**.

There are various levels of detail in the following tables, and the full description of analysis methodologies are in the process of being documented into detailed information sheets that will be made available in the coming weeks.

In general, each evaluation criterion is based on physical metrics, modeling outputs or professional judgements of the different design features. To help facilitate integration and overview comparisons, we have attempted to summarize evaluation criteria for each objective into simple 1-10 rating scales.

All consequence tables are color-coded along a scale from Worst (1) to Best (10). The range of scales is based on the full set of alternative concepts that have been evaluated during the iterative planning process. These color codings are intended to quickly highlight where there are potential trade-offs and need for detailed discussions.

1. Overall Summary

This overall summary consequence table presents the draft results rolled up for each of the eight primary project objectives.

Objectives (Worst – Best)	No Action	Concept A	Concept B	Concept C
Navigation	7.4	6.1	7.2	7.3
Recreation	2.3	5.3	6.1	5.6
Local Economy & Community	4.5	5.2	6.2	6.4
Ecology	2.5	6	6.2	6
Water Quality & Supply Reliability	3.3	7.3	7	6.7
Flood Protection	4	7.5	7.5	7.5
Construction Impacts	6	4	4	4
Total Cost: Construction and O&M	$	$$$	$$$	$$$

Key Messages:

- At the highest level for consideration, a redeveloped Franks Tract offers an opportunity for improvements in recreation, ecology, and water quality and potentially other objectives.
- There would be unavoidable trade-offs, especially with respect to costs and construction impacts.
- There are important details and finer scale considerations that should be explored by looking at the more detailed tables below.
- The Project Team, Advisory Committee and Steering Committee agree that Concept B currently offers the best balance and best opportunity to build upon for a reimagined Franks Tract moving forward.

2. Navigation

Objectives

Minimize impacts to current boating travel times between key locations.

Maintain minimum depths for safe navigation around the tract.

Reduce boating hazards and nuisance conditions.

This summary consequence table presents the draft results rolled up for the Navigation objectives. See the next page for more details.

Objectives (Worst – Best)	No Action	Concept A	Concept B	Concept C
Navigation	7.4	6.1	7.2	7.3
Travel Distance	10	6.4	8.4	8.8
Boating Safety	4.7	5.7	6	5.7

Key Messages:

- The current wide-open Franks Tract offers the shortest travel distances in any direction. The next best performance of the other Concepts are in order: Concept C, Concept B and finally Concept A, which would create the largest increase in navigation distances.
- These potential increases in travel distances need to be weighed against the significant opportunity to improve boating safety on Franks Tract through the removal of boating hazards including submerged hazards and dangerous entries into the tract from various directions.
- Finally, it needs to be noted that as with any multi-use recreation area, the potential for increased conflict between fast water navigation and recreation activities could increase.

Navigation – Full Details

Objectives	No Action	Concept A	Concept B	Concept C
Navigation	7.4	6.1	7.2	7.3
Travel Distance	10	6.4	8.4	8.8
Increase in Average Distance (%)	0	18	8	6
Average Distance (feet)	5079	5908	5469	5374
Fisherman's Cut to Holland's Cut	6293	7099	7049	6892
Fisherman's Cut to Roosevelt Cut	6440	8131	6728	6597
Bethel Island Openings to NE	4853	5506	5686	5346
Bethel Island Openings to SE	3902	4122	4158	4127
Bethel Island Openings to SW	3519	4772	3576	3587
Bethel Island Openings to Fisherman's Cut	3595	4775	4136	4121
Boating Safety	4.7	5.7	6	5.7
Channel Criteria	6	4	5	5
Water Velocity (frequency > 3fps)	8	5	6	6
Channel Depth (ft)	2-6	7-8	7-8	7-8
Channel Width (ft)	wide open	400	400	400
Boating Hazards	1	8	8	7
Hazardous Entries Removed (out of 4)	0	3	3	2.5
Submerged Hazards Removed	No	Yes	Yes	Yes
Conflicts with Recreation	7	5	5	5

Worst Best

3. Recreation

Objectives

Enhance recreational opportunities for fishing, motorized and non-motorized boating, waterfowl hunting, and shoreline recreation, and minimize impacts to existing recreational uses.

This summary consequence table presents the draft results rolled up for the Recreation objective. See the next page for more details.

Objectives (Worst – Best)	No Action	Concept A	Concept B	Concept C
Recreation	2.3	5.3	6.1	5.6
Fishing	5.1	6	6.2	6.3
Motorized Boating	2	5	8	5
Non-Motorized Boating	1	5.5	5.5	6
Shoreline Recreation	1	4.5	4.5	5
Waterfowl Hunting				

Key Messages:

- There is a real opportunity to design in a diverse range of recreational opportunities with any of the three new concepts, with Concept B offering the greatest opportunity. New opportunities would include beaches, mooring sites and improved opportunities for motorized boating, non-motorized boating (Little Franks Tract) and shoreline recreation.
- The potential changes to the fishing experience is worthy of close review. The summary rating is based on both sportfish habitat and access to a quality fishing experience. Detailed input is welcomed on each aspect.
- For hunting, the project team was not able to develop a summary rating without further input from the hunting community. The future experience would have both open water and marsh-based blinds and detailed input is requested on how the evolution to this new, more diverse system would work best.

Recreation – Full Details

Objectives	No Action	Concept A	Concept B	Concept C
Recreation	2.3	5.3	6.1	5.6
Fishing	5.1	6	6.2	6.3
Sportfish Habitat	5.4	6.2	6.5	5.8
Fishing Access	4.7	5.8	5.8	6.7
Boat Access Facilities (#)	7	8	8	8
Quality of Potential Fishing Areas	7	7	7	7
Shoreline Fishing (#)	0	1	1	2
Motorized Boating	2	5	8	5
Opportunity (acres open water)	4562	3334	3334	3238
Open Water Configuration	1 Pool / Existing	1 Pool / Improved	2 Pools / Improved	1 Pool / Improved
Beaches (#)	0	4	4	4
Mooring (#)	0	2	1	2
Non-Motorized Boating	1	5.5	5.5	6
Opportunity (miles of marsh channels)	0	3.5	3.5	3.5
Beaches (#)	0	4	4	4
Public Shoreline Facilities (#)	0	1	1	2
Shoreline Recreation	1	4.5	4.5	5
Beaches (#)	0	4	4	4
Public Access Facilities (#)	0	1	1	2
Waterfowl Hunting				
Upland Habitat (acres)	0	248	270	267
Open Water Blinds (#)	54	21	18	21
Marsh-based Blinds (#)	0	39	50	53
Free Roam, Boat-Based	Existing	More than Existing	More than Existing	More than Existing

4. Local Economy and Community

Objectives
Provide local economic benefits where possible and minimize any disruptions to the local economy.
Minimize the production of any harmful or nuisance species such as mosquitos and blue-green algae.
Consider the aesthetics of different land uses (e.g., tidal wetland and open water) and minimize any negative changes.

This summary consequence table presents the draft results rolled up for Local Economy and Community objectives. See the next page for more details.

Objectives (Worst – Best)	No Action	Concept A	Concept B	Concept C
Local Economy & Community	4.5	5.2	6.2	6.4
Business Effects	4.9	5.7	6.7	6.5
Real Estate	4.6	5.4	6.3	6.4
Aesthetics	4	4.7	5.7	6.3

Key Messages:

- The potential for change to the local economy and community on Bethel Island and surrounding areas was of high focus during this period of planning. There is significant interest in maintaining or improving effects on local businesses, real estate and aesthetics. As with other objectives and ratings, detailed input is welcome.
- Starting with aesthetics, there is a desire to maintain the current open water views from Bethel Island, and each alternative concept rates differently in that regard, but all preserve open water adjacent to Bethel Island. The potential to create some naturalistic landform features like tidal wetlands and to reduce the extent of nuisance aquatic weed conditions is a potential benefit of restoration.
- Real estate values are seen to be linked with these aesthetic conditions, as well as being dependent on the overall navigation and recreation opportunity ratings discussed above.
- Similarly, the potential for local economic business effects are also rated as being dependent on the overall navigation and recreation opportunity ratings discussed above.

Local Economy and Community– Full Details

Objectives (Worst – Best)	No Action	Concept A	Concept B	Concept C
Local Economy & Community	4.5	5.2	6.2	6.4
Business Effects	4.9	5.7	6.7	6.5
Navigation	7.4	6.1	7.2	7.3
Recreation	2.3	5.3	6.1	5.6
Real Estate	4.6	5.4	6.3	6.4
Navigation	7.4	6.1	7.2	7.3
Recreation	2.3	5.3	6.1	5.6
Aesthetics	4	4.7	5.7	6.3
Aesthetics	4	4.7	5.7	6.3
Open Views	10	3	5	7
Vegetated / 'Naturalistic' landscape features	1	4	5	5
Nuisance Conditions (AIS)	1	7	7	7

5. Ecology

<u>Objectives</u>

Maintain or enhance habitat for fish species of interest, specifically largemouth bass, Chinook salmon, striped bass and delta smelt.

Minimize the risk of entrainment of special status fish species into Old River and the south Delta.

Benefit a range of native species by establishing large areas of tidal marsh and associated habitats.

Minimize conditions that could result in the spread of undesirable invasive species.

This summary consequence table presents the draft results rolled up for the Ecology objectives. See the next page for more details.

Objectives (Worst – Best)	No Action	Concept A	Concept B	Concept C
Ecology	2.5	6	6.2	6
Special Status Species	2.5	6.8	6.2	6.2
Sportfish Habitat	5.4	6.2	6.5	5.8
Conditions for Native Species	1	4	5	5
Conditions for AIS Spread	1	7	7	7

Key Messages:

- There is a real opportunity to improve the overall ecological conditions with any of the three new concepts.
- The most significant opportunity is to improve the conditions for special status species (Chinook, Delta smelt) and other native species, and to reduce the conditions that support the spread of aquatic invasive species.
- The evaluation of sportfish habitat conditions should be closely reviewed. While the overall ratings for the Concepts compare fairly evenly with the No Action Alternative, there would be a significant shift away from open-water shallow habitat toward more marsh-edge habitat with increased velocity gradients.

Ecology – Full Details

Objectives	No Action	Concept A	Concept B	Concept C
Ecology	2.5	6	6.2	6
Special Status Species	2.5	6.8	6.2	6.2
Chinook: Tidal Marsh Channel Length	0	122746	131058	132348
Chinook: Tidal Channels Connected to Migratory Path	0	3	2	2
Chinook: Habitat Connectivity	0	1003	759	771
Delta Smelt: LFT Open Water Adjacent to Tidal Marsh	0	113	113	113
Delta Smelt: LFT Tidal Marsh	0	233	233	233
Entrainment Risk: Smelt	5	8	8	8
Entrainment Risk: Salmonids	5	5	5	5
Sportfish Habitat	5.4	6.2	6.5	5.8
Largemouth Bass: Edge length	37178	142569	141434	137490
Largemouth Bass: Shallow water	4562	2250	2453	2384
Striped Bass: Open Water Area	4562	3334	3251	3238
Striped Bass: # Velocity Gradients	2	4	5	3
Conditions for Native Species	1	4	5	5
Tidal Marsh Area	0	1227	1311	1323
Conditions for AIS Spread	1	7	7	7
AIS Colonization Risk	4562	3022	3178	3112
Intertidal Marshplain	0	1227	1311	1323
Intertidal Channels	0	98	105	106
Shallow Open Water	4562	2250	2453	2384
Medium Open Water	0	193	185	155
Deep Open Water	0	891	613	699

6. Water Quality and Supply Reliability

Objectives

Maintain or enhance water quality for human uses such as irrigation and drinking water.

Improve water supply reliability by reducing entrainment at the South Delta pumps.

Reduce the disruptions and costs associated with installation of emergency drought barriers.

This summary consequence table presents the draft results rolled up for the Water Quality and Supply Reliability objectives. See the next page for more details.

Objectives (Worst – Best)	No Action	Concept A	Concept B	Concept C
Water Quality & Supply Reliability	3.3	7.3	7	6.7
Water Quality: Human Uses (salinity)	3	8	7	6
Emergency Drought Protection	2	7	7	7
Supply Reliability (entrainment)	5	7	7	7

Key Messages:

- The potential opportunity for improvements in water quality and supply reliability are significant with a reimagined Franks Tract.
- There would be improvements in salinity conditions for water use and consumption under a variety of flow conditions as well as a net reduction in potential fish entrainment, which currently limits the reliability of water operations.
- In addition, the potential future need for construction of a salinity control barrier in False River under severe drought conditions, while not fully eliminated, is projected to be reduced in the future.

Water Quality and Supply Reliability – Full Details

Objectives (Worst – Best)	No Action	Concept A	Concept B	Concept C
Water Quality & Supply Reliability	3.3	7.3	7	6.7
Water Quality: Human Uses (salinity)	3	8	7	6
2009: Salinity at Old River at Bacon Island Station	743	608	615	630
2009: Salinity at Jersey Point	1279	1188	1159	1176
2009: Salinity at San Andreas Landing	373	359	378	371
2015: Salinity at Old River at Bacon Island Station	1411	1132	1169	1203
2015: Salinity at Jersey Point	1982	1801	1793	1796
2015: Salinity at San Andreas Landing	608	577	583	599
Emergency Drought Protection	2	7	7	7
Supply Reliability (entrainment)	5	7	7	7
Smelt	5	8	8	8
Salmonids	5	5	5	5

7. Flood Protection

Objective

Improve levels of flood protection, where possible, and avoid any adverse flood impacts.

This summary consequence table presents the draft results for the Flood Protection objective.

Objectives (Worst – Best)	No Action	Concept A	Concept B	Concept C
Flood Protection	4	7.5	7.5	7.5
Sheltered Levee	3	10	10	10
Flood Risk Reduction	5	5	5	5

Key Messages:

- A reimagined Franks Tract would offer the opportunity to significantly improve the length of sheltered levees all around the tract.
- Based on flood modeling, the preferred concept does not significantly alter flood conveyance or high water levels compared to the No Action alternative. This finding is expected to extend to the other concepts.

8. Construction Impacts

Objective

Minimize or mitigate any construction impacts in both the near and long term.

This summary consequence table presents the draft results for the Construction Impacts objective.

Objectives (Worst – Best)	No Action	Concept A	Concept B	Concept C
Construction Impacts	6	4	4	4
Construction Period Impacts (short term)	10	1	1	1
Drought Barrier Impacts (long term)	2	7	7	7

Key Messages:

- There is no doubt that if a redevelopment project were to proceed, the construction period would have impacts on the local community and use of Franks Tract.
- Activities such as dredging and materials transport would be ongoing over a period of years along with considerations such as noise, navigable route re-routings, etc. There are many ideas under discussion about how to best stage any future construction to accommodate tract uses (e.g., localized shutdowns during key hunting or fishing periods, weekend shutdowns, etc.) and how to best mitigate or abate any construction-related impacts.
- On the benefit side, as discussed above under the water quality benefits above, the potential future need for Emergency Drought Barriers would be reduced along with the associated short-term construction and de-construction impacts.

9. Cost

Objective

Minimize construction costs. Minimize long term costs for ongoing operations and maintenance

This summary consequence table presents the draft results for the Cost objective.

Objectives (Worst – Best)	No Action	Concept A	Concept B	Concept C
Total Cost: Construction and O&M	$	$$$	$$$	$$$
Construction Costs	0	$$$	$$$	$$$
Dredge Volume	0	34831000	37895000	43927000
Operations & Maintenance Costs	$$	$$$	$$$	$$$
Recreation	$	$$$	$$$	$$$
AIS Management	$$	$$	$$	$$
Emergency Drought Barrier	$$$	$$	$$	$$
Levee Maintenance	$$	$	$	$

Key Messages:

- Trade-off considerations are straightforward in terms of cost. While detailed cost estimates are not yet available, there is no doubt that both construction and long-term operations and maintenance costs would be much higher for any of the three Concepts relative to the No Action Alternative.
- There are, however, opportunities to reduce long-term costs associated with levee maintenance and Emergency Drought Barriers, and the opportunity to achieve more benefits with a fixed budget for aquatic weed removal.
- The topic of 'who pays' would need to be aligned with the agencies and organizations with the most to gain. Also, before any project would move forward, a commitment to long-term O&M funding would need to be put in place.
- One of the major considerations for Franks Tract Future is whether the potential increased costs are warranted by the potential for multiple objective project benefits.

Appendix B-3

EVALUATION CRITERIA INFORMATION SHEETS

Table of Contents

EVALUATION CRITERIA INFORMATION SHEET

NAVIGATION – BOATING TRAVEL DISTANCES

Objective	Evaluation Criterion	Units	Description
Minimize impacts to current boating travel distances	Travel distances between key locations.	Distance (feet)	Reports the boat distance traveled compared to current conditions.

Context

Franks Tract is heavily used and valued by boaters due in part to its fast water channels and easy access to multiple destinations. Franks Tract often serves as a by-way to get from one side of the Delta to another, using many different routes to access many different areas. Creating proposed tidal lands within Franks Tract may affect navigation routes. Properly designed fast water channels through the proposed restored land will allow fast water boating to continue across the tract.

Any proposed project would seek to maintain or improve the navigability of Franks Tract.

Description

Key locations for boat travel were determined with input from stakeholders and the public (Figure 1). Key locations are:

- North Bethel Island to south Bethel Island (parallel to Piper Slough) *(1 to 2 on map below).*
- Bethel Island openings to southern corner of Franks Tract (Roosevelt Cut) *(ABCDE to 2)*
- Bethel Island openings to Holland Cut *(ABCDE to 3)*
- Bethel Island openings A, B, C, D, and E to northeast corner of Franks Tract *(ABCDE to 4)*
- Bethel Island openings to Fisherman's Cut *(ABCDE to1)*
- Fisherman's Cut to Holland Cut *(1 to 3)*

Figure 1. Map of Key Travel Locations and boating routes for the No Action Alternative. Boating routes used in the scoring are shown in thicker yellow lines. Crowdsourced boating routes in Franks Tract shown in thin white lines.

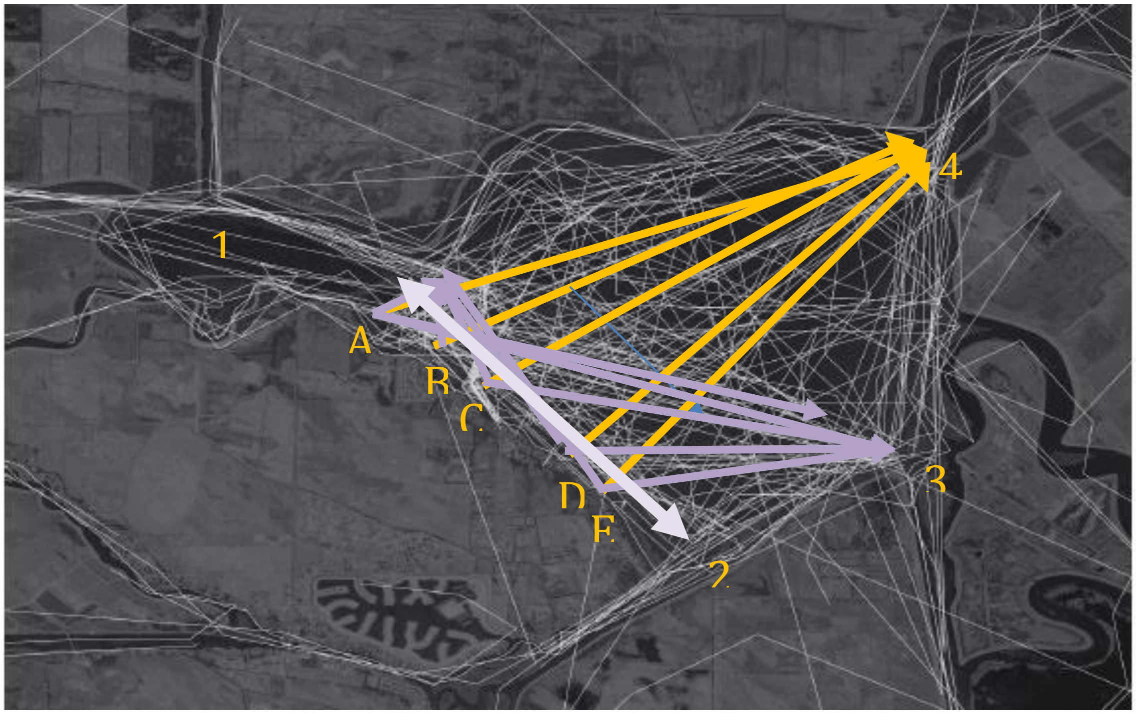


Figure 2. Mapped Travel Lines for the No Action Alternative. Actual Boating routes used in the scoring are shown in each color. See chart for measurements.

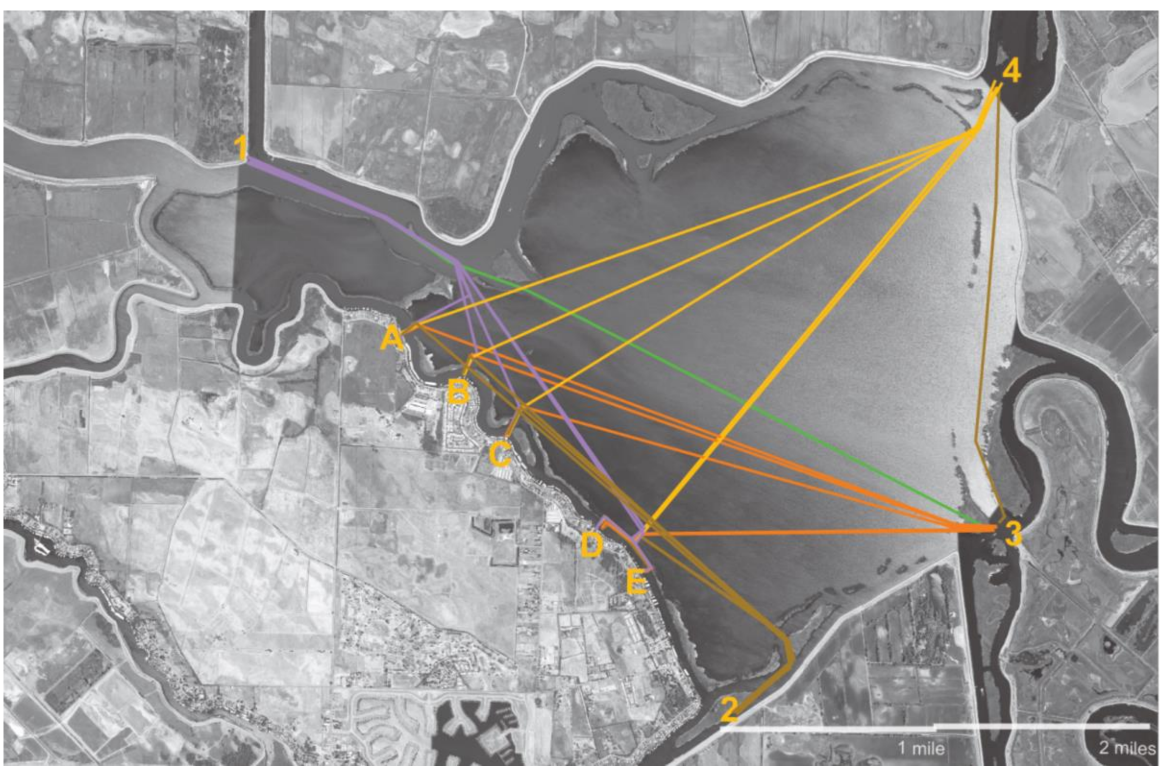
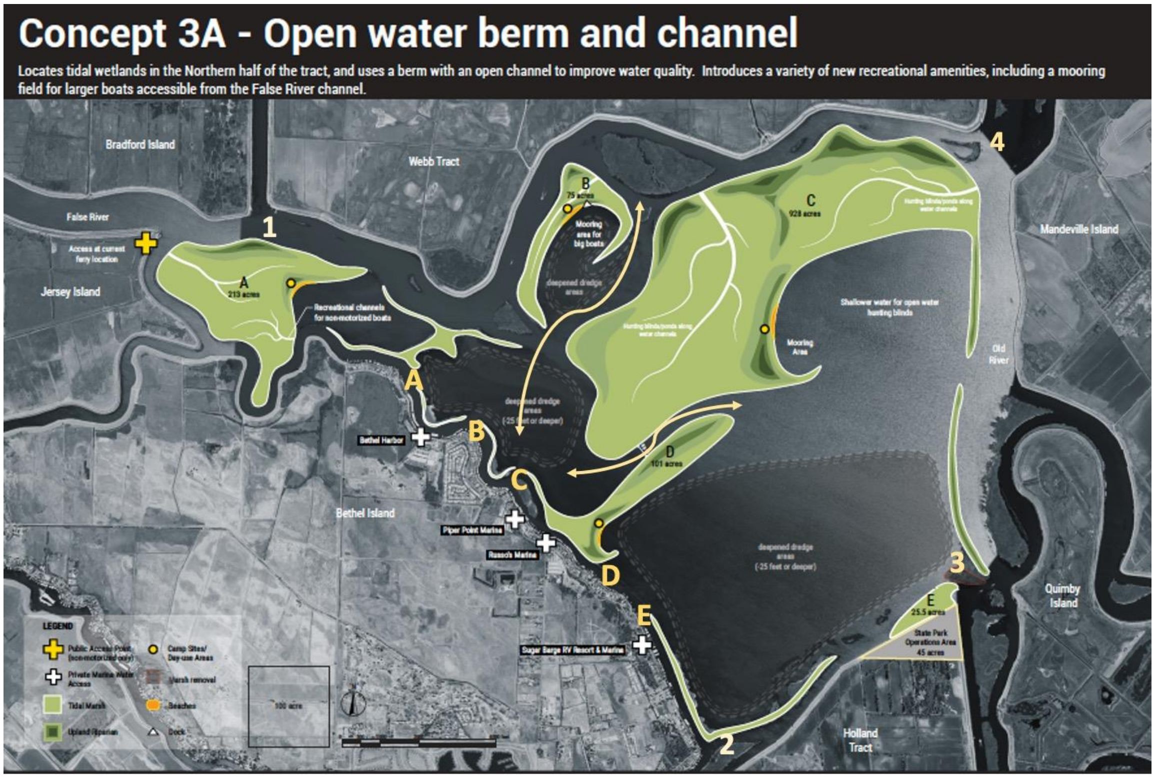


Figure 3: Maps of Navigation Routes for Concept 3A



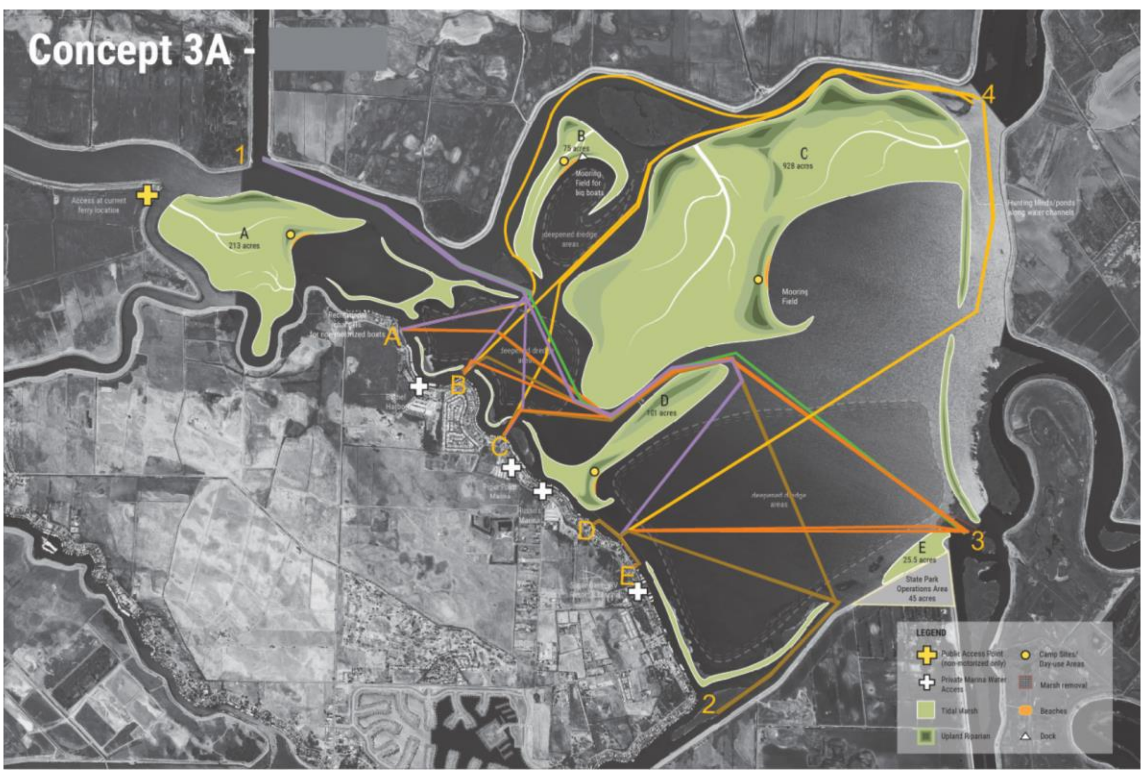
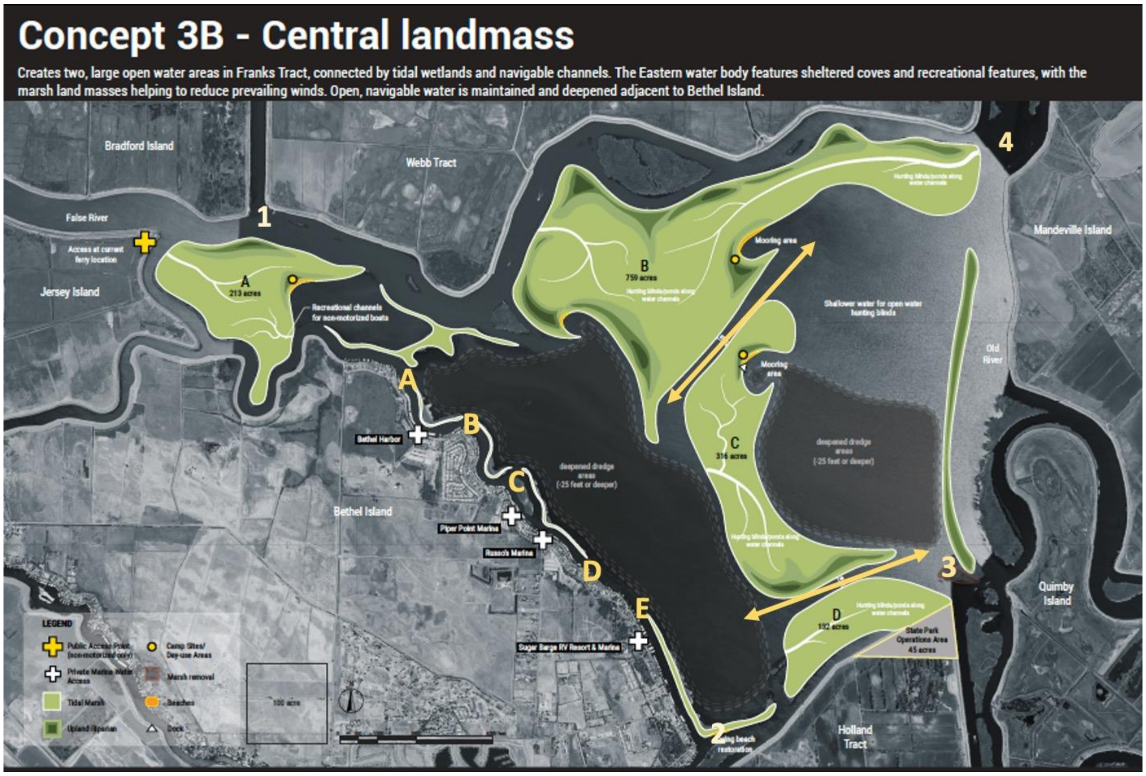


Figure 3: Maps of Navigation Routes for Concept 3B



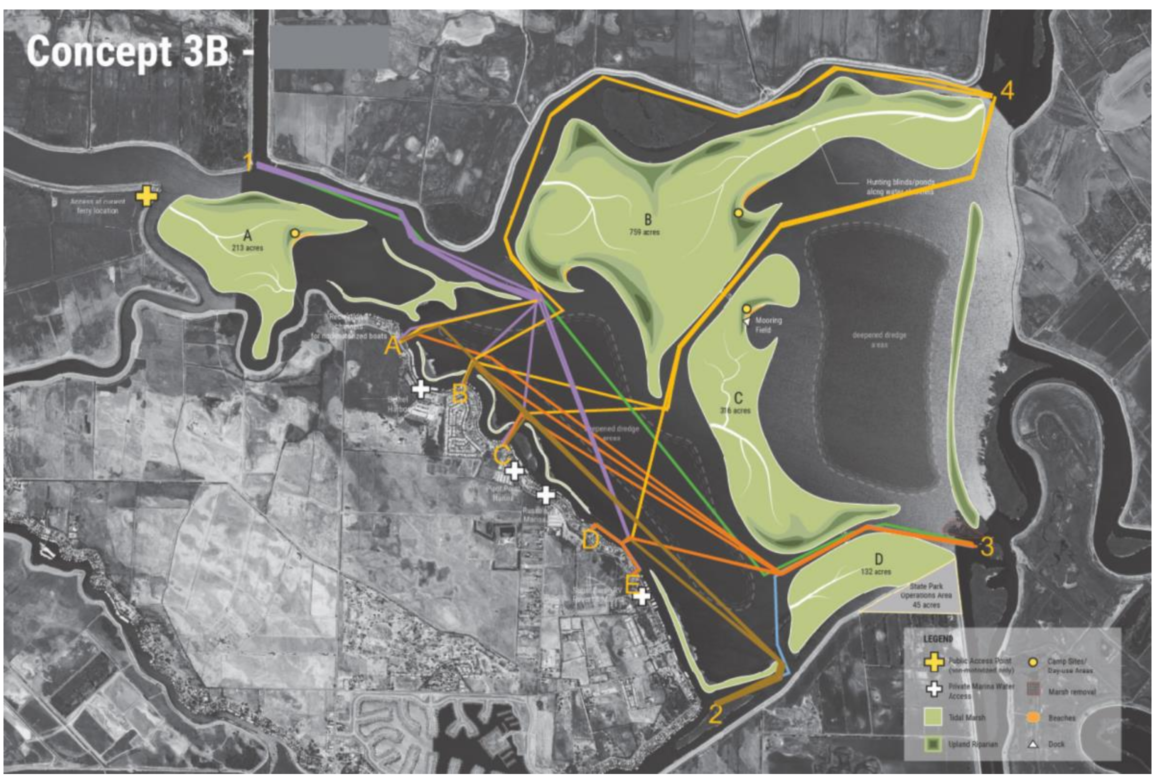
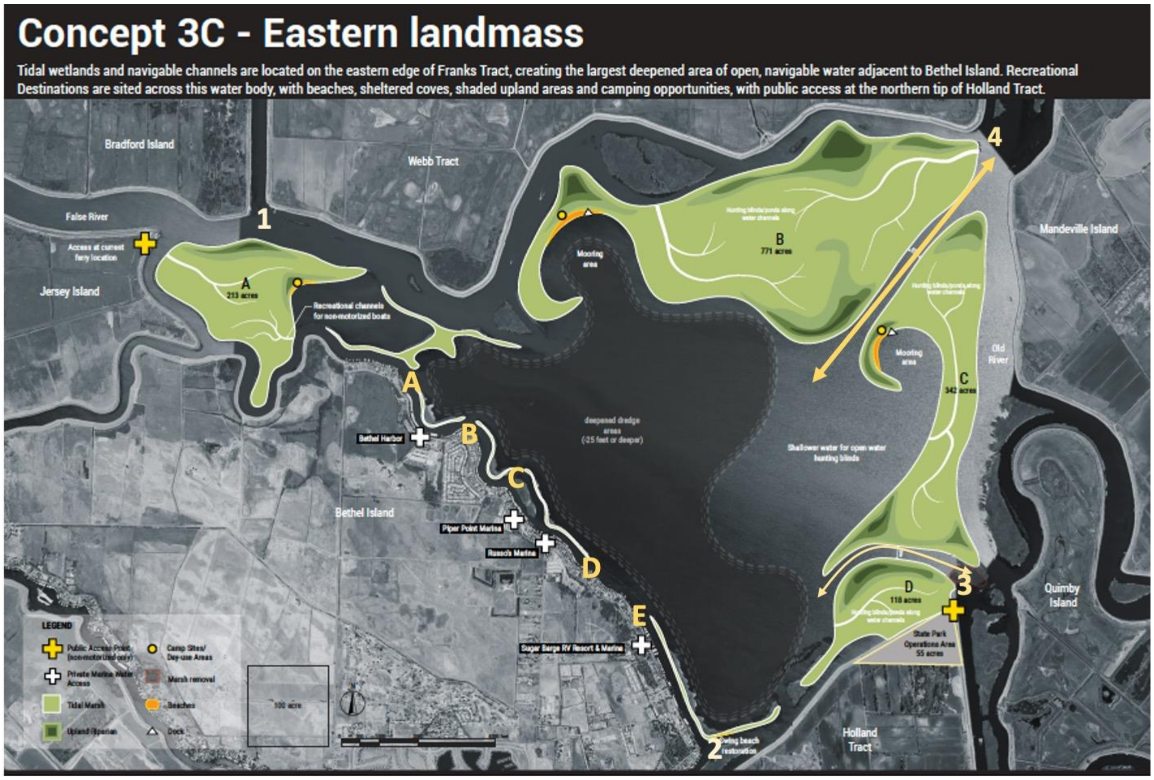
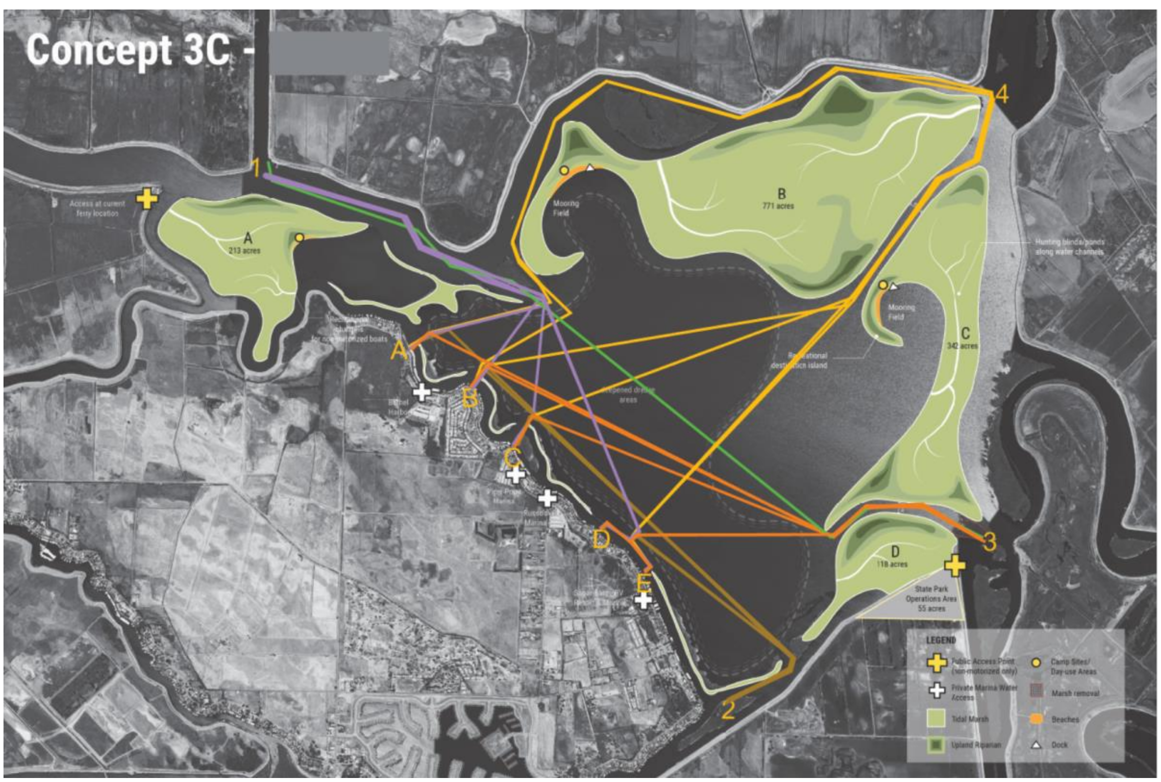


Figure 4: Maps of Navigation Routes for Concept 3C





Methods

For each concept:

1. The boating distance (feet) between key locations is calculated from the maps for all concepts.
2. The rating is calculated on a scale from 1 to 10, with 1 being the worst and 10 being the best, or shortest average distance for all key locations. A rating of 1 is set at a 50% increase in the average distance for all key locations compared to No Action. A rating of 10 is set at no increase in average distance compared to No Action.

Key Assumptions and Uncertainties

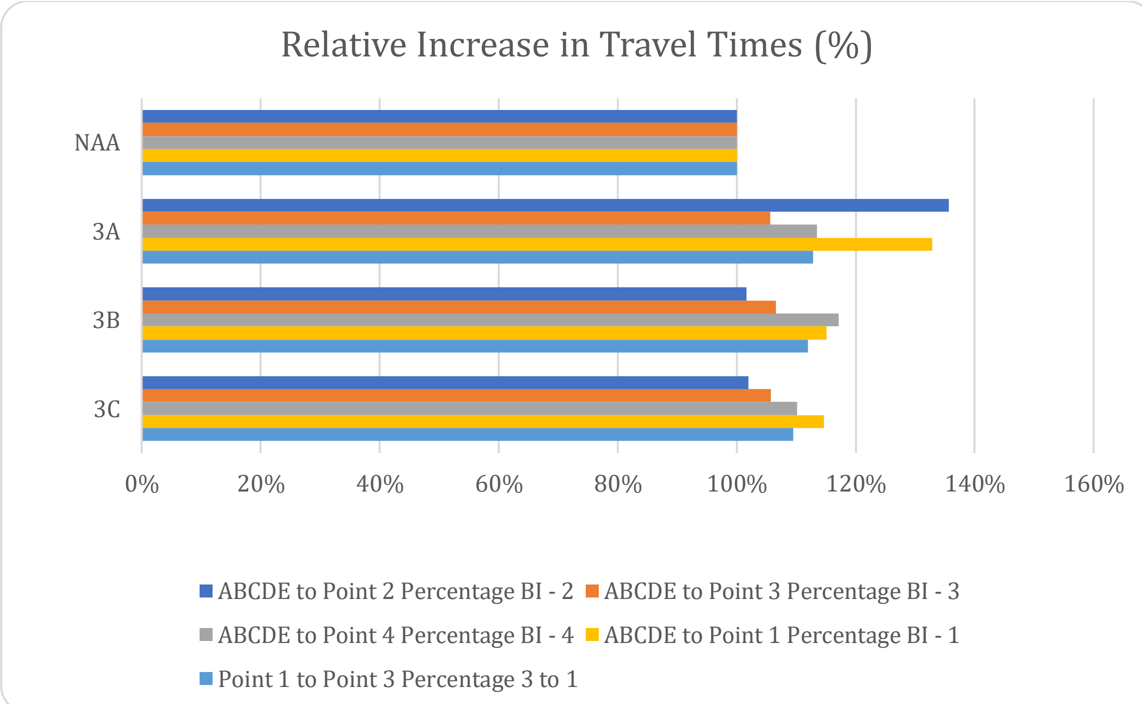
- All boating routes shown are fast water.
- All boating routes will be designed for appropriate safety. Boating conditions are discussed in detail in the Navigation - Boating Safety Evaluation Criteria Information Sheet.
- Fast water navigation routes adjacent to fishing areas, non-motorized boating areas, beach areas, and other slower recreation can minimize the desirability and functionality of non-motorized or landside recreation areas. Fast water routes and recreational features will be located to minimize conflicts with each other. Any effect of navigation on recreational value are described in the corresponding recreation Evaluation Criteria Information Sheet.
- Any proposal will not affect existing navigation of Old River or False River.

Results

Table 1. Boating Travel Distances – For all concepts.

Travel Distance	No Action	Concept 3A	Concept 3B	Concept 3C
Average distance by route (feet)				
Bethel Island openings to Fisherman's Cut (average)(A,B,C,D,E->1)	3,595	4,775	4,136	4,121
Bethel Island openings to SW corner (average) (A,B,C,D,E->2)	3,519	4,772	3,576	3,587
Bethel Island openings to SE corner of Franks Tract (average) (A,B,C,D,E->3)	3,902	4,122	4,158	4,127
Bethel Island openings to NE corner of Franks Tract (average)(A,B,C,D,E->4)	4,853	5,506	5,686	5,346
Fisherman's Cut to Roosevelt Cut (1->2)	6,440	8,131	6,728	6,597
Fisherman's Cut to Holland Cut (1->3)	6,293	7,099	7,049	6,892
Average Distance	5,079	5,908	5,469	5,374
Average % Increase in Distance	0%	18%	8%	6%

Figure 5. Boating Travel Distances – Relative Increase in Travel Times (%)



Ratings

For each concept, ratings were calculated on a scale of 1 to 10, where 10 represented no increase in travel time, and 1 represented a 50% increase. Each numerical increment was decreased from 10 by 1 increment for each 5% increase in travel time, so a 5% increase would receive a rating of 9 and a 20% increase would receive a rating of 6. Any increase of 50% or more would automatically receive a 1.

Table 2. Boating Travel Distances –Ratings (1=lowest; 10=highest)

Rating	**10**	**6.4**	**8.4**	**8.8**

References

Franks Tract Futures User Survey, 2019. UC Davis for CDFW.

EVALUATION CRITERIA INFORMATION SHEET

NAVIGATION – BOATING SAFETY

Objective	Evaluation Criterion	Units	Description
Maintain minimum depths and channel widths for safe navigation around Franks Tract.	Channel Width Channel Depth Channel Velocity	Width/Depth (feet) Velocity (<3 fps)	For any designed channel, reports the channel width and depth compared to generally accepted design standards / reference channels in the Delta and modeled water velocities / currents in the channel.
Remove and reduce boating hazards and conflicts in navigation areas	Minimize hazardous navigation conflict areas	Number of hazards	Minimize navigation hazards in boating channels
Avoid design conflicts between fast water navigation channels and recreation uses	Do fast water channels cut through recreation areas and create potential conflict or nuisance?	Number of conflict/ nuisance locations	Placement of fast water navigation channels adjacent to recreation facilities can create potential conflicts or nuisance.

Context

Franks Tract is heavily used and valued by boaters due in part to its fast water channels and easy access to multiple destinations. Franks Tract is generally now used as a way to get from one side of the Delta to another, using many different routes to access many different areas. Creating proposed tidal lands within Franks Tract may affect navigation routes. Properly designed channels through the proposed restored lands will allow fast water boating to continue across Franks Tract.

Parts of Franks Tract are very shallow. Most of the shallow water areas have become choked with aquatic weed growth. In addition, there are still remnant tree stumps and branches which protrude above water level at low tide, or worse, lie hidden right below the water surface. Boaters who are "in the know" avoid the worst of these areas, but new boaters are often caught unawares. The California Division of Boating and Waterways has programs to minimize and/or remove weed growth, as well as remove boating hazards, but they are rather ineffective for the amount of acreage affected across the Tract.

The original levees that created Franks Tract have eroded over the years and there are numerous breaks allowing boats to enter and pass through the area. The breaks in the levee on the eastern side of Franks Tract are particularly treacherous at times as they are located on the downwind end of Franks Tract, which, during most summer afternoons, gets a strong breeze, creating significant waves. Entering Franks Tract through these breaks directly into the wind and waves is difficult. The entry at the south eastern corner of Franks Tract is particularly treacherous because of the intersection with four other channels.

Franks Tract also has highly desirable fishing, hunting and boating area for reasons other than navigation. In addition, the project proposes to enhance and/or create new recreation areas.

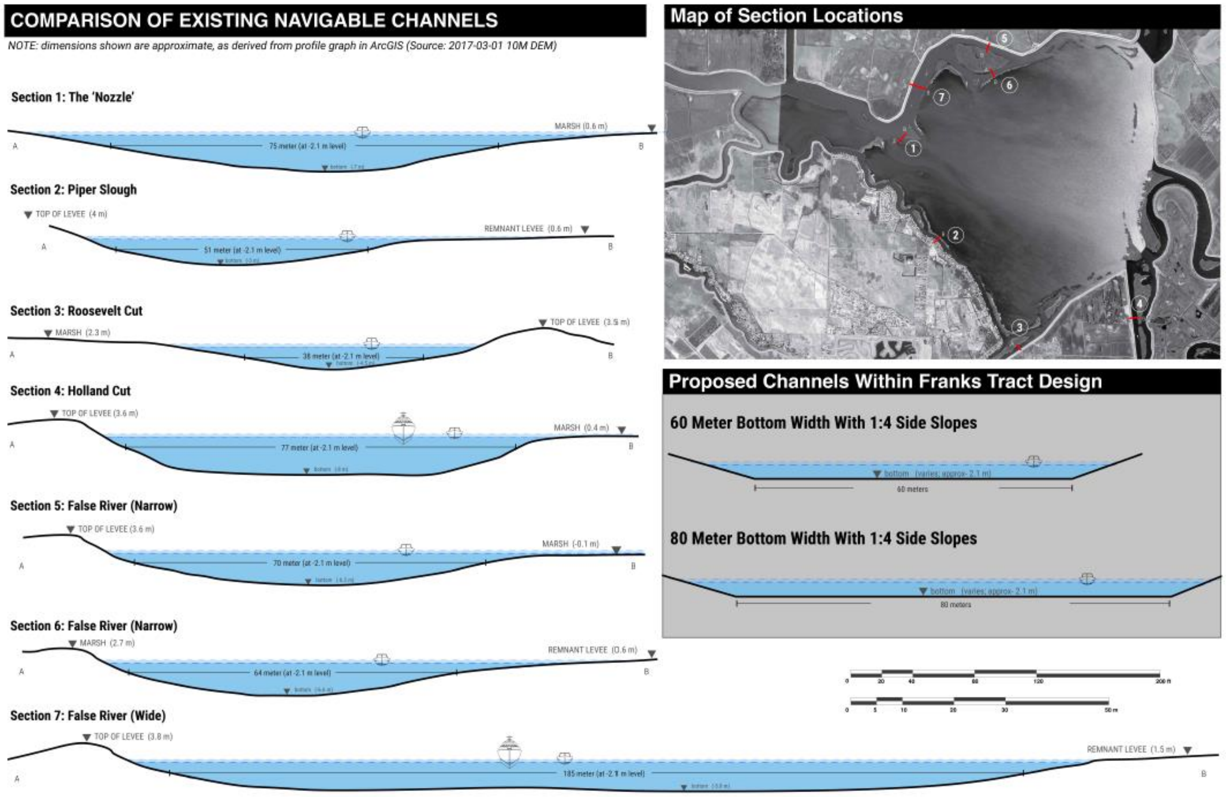
Any proposed project will seek to maintain or improve the navigability of Franks Tract and minimize potential conflicts between navigation and recreation.

Description

Different types of boats use Franks Tract as a navigation route, from large cruising motor boats to bass boats, ski boats, non-motorized kayaks and sail boats. Navigating through Franks Tract is currently open across any route, if you can find a route without the snags, debris, or submerged vegetation that impact a majority of Franks Tract. The fast water routes of False River and Old River have been identified as ones to emulate in designing fast water channels through proposed tidal marsh/upland development.

According to National Oceanic Atmospheric Administration (NOAA), False River has average depths from Old River to Fisherman’s Cut of approximately 8-28 feet, while Old River from Holland Cut to False River has depths of 5-23 feet. Both have widths of 200 – 600 feet. Roosevelt Cut has an average depth of 4 – 10 feet and a width of about 110 feet. Holland Cut averages from 6-25 feet deep and 230 feet wide, excluding the sand bars in the middle. Overall depths across Franks Tract is 6-8 ft, not taking into account the extensive existing debris and submerged vegetation. Figure 1 provides a cross section of typical navigable channels throughout Franks Tract.

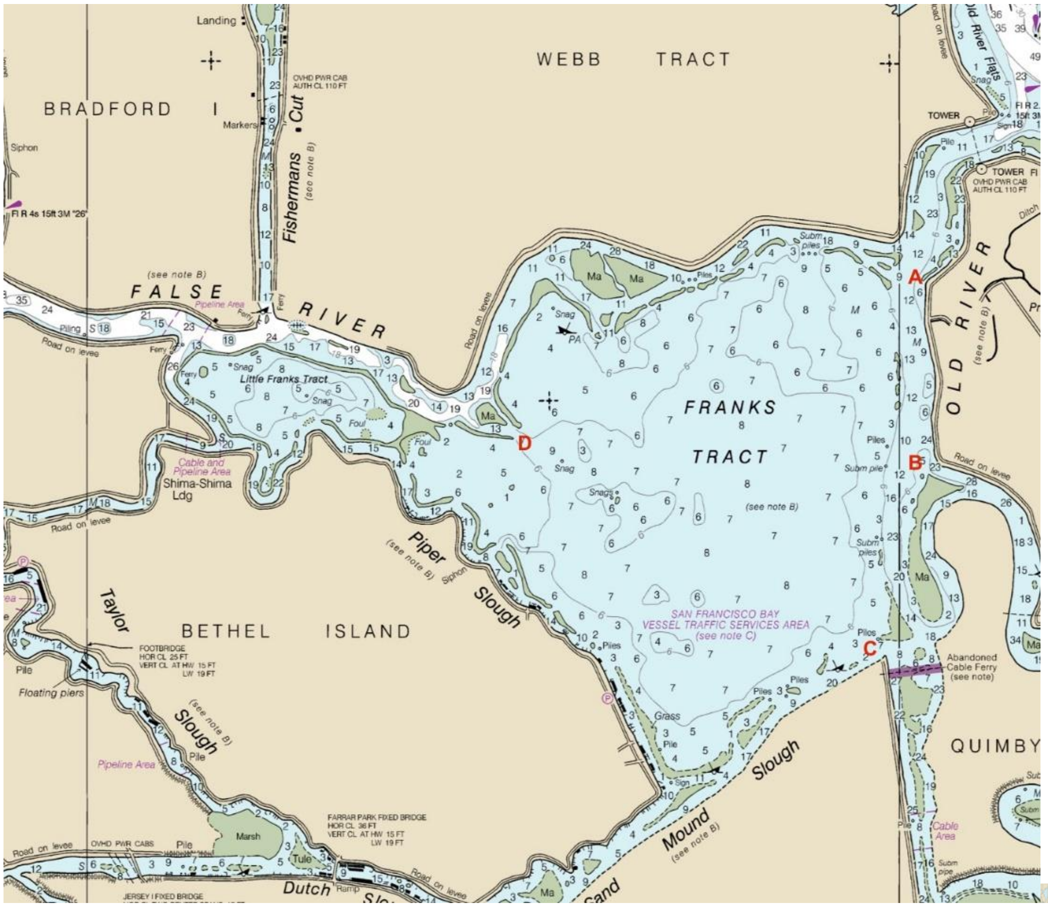
Figure 1: Comparison of Existing Navigable Channels



The existing condition has numerous locations of boating entry from the east into Franks Tract including from Old River on the northeast (A in Figure 2), Old River on the east (B), and Holland Cut on the southeast (C). Local stakeholders have indicated that all are somewhat hazardous due to the long fetch and subsequent high waves at the eastern end. In addition, the entry at the southeast corner of Old River/Holland Cut (C) has impaired visibility and five-point, offset configuration which has been identified as very hazardous. The entry into Franks Tract from the northwest (D) is also somewhat hazardous due to high water velocities and existing levee remnants and snags.

Figure 2. National Oceanic Atmospheric Administration San Joaquin Rivers Map

Letters in RED below correspond with description in text above.



Maintaining navigation and improving recreation are both objectives of the Franks Tract Futures project. The prime recreation in Franks Tract is water based, so done by boat, and there are many types of boating and recreation within the area. Bass boaters in a tournament may zoom from one side to the other, searching out the best fishing spot, or aiming to get their catch in before deadlines. Kayakers may want to paddle slowly and watch birds, or sit in one place and fish. Larger motorcrafts may want to cruise up north to reach other recreation destinations. Potential restored lands may include beaches, where people may want to picnic, swim, or launch wind sails, stand up paddleboards, or water skiing. Allowing for all uses can be done within properly designed and sited areas that minimize adjacent placement of fast water channels with other recreation activities.

Methods

Each concept was rated using the following criteria:

1. Identify any areas of strong, hazardous currents. This will use velocities maps from the hydraulic modeling. Design target is less than 3 feet per second (fps) for motorized

boats and less than 2 fps for non-motorized boats. Some consideration was made of context; for instance,

2. Identify the width of each channel. Widths for fast water channels for motorized boats should be greater than 180 feet on average at low water. Narrower widths for short distances may be possible if necessary for other criteria. Criteria for channel width are based on guidelines developed by the States of California and Ohio.
3. Consider the average depth of each channel. Depths for fast water channels for motorized boats should be greater than 6 feet at low tide with all submerged debris removed. Deeper channels will generally be better (State of Ohio).
4. Identify any hazards at key locations (A,B,C,D on Figure 1) such as channels that enter Franks Tract directly into wind, waves, snags, and blind channels, as well as general hazards to navigation, such as submerged snags, and aquatic weeds.
5. Identify the number of conflicts with recreation areas adjacent to fast water channels.

Key Assumptions and Uncertainties

- Designed channels will have all floating and submerged debris, snags, hazards, and vegetation removed and will be typical of Figure 3 below.
- All designed channels will be properly signed.
- Constructed channels will be oriented to reduce wind wave exposure, as possible.
- Fast water navigation channels adjacent to non-motorized boating areas, beach areas, and other slower recreation can increase potential for conflict between users or may cause fast boat traffic to have to slow due to congestion.

Figure 3: Idealized Cross Section of Typical Through Channel in Concepts 3A, 3B, and 3C

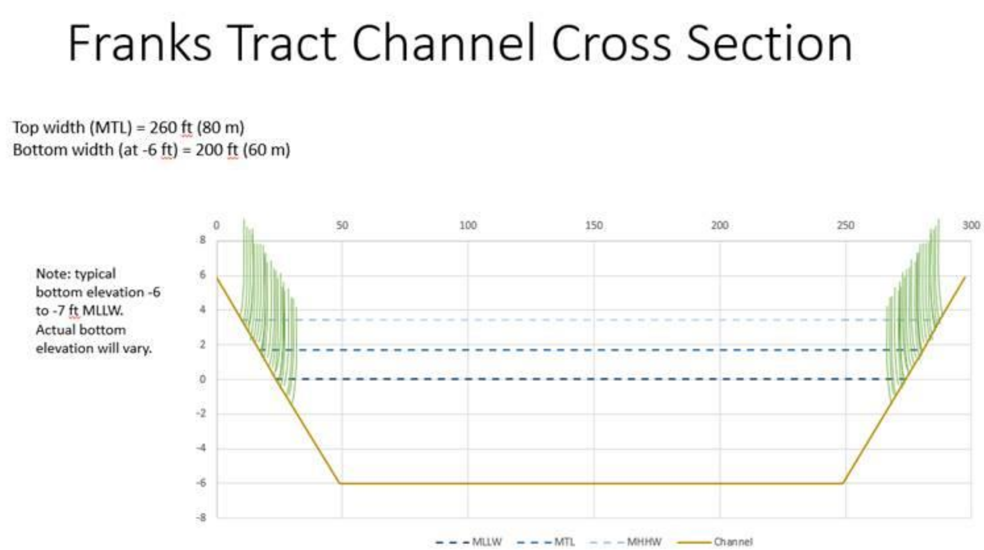
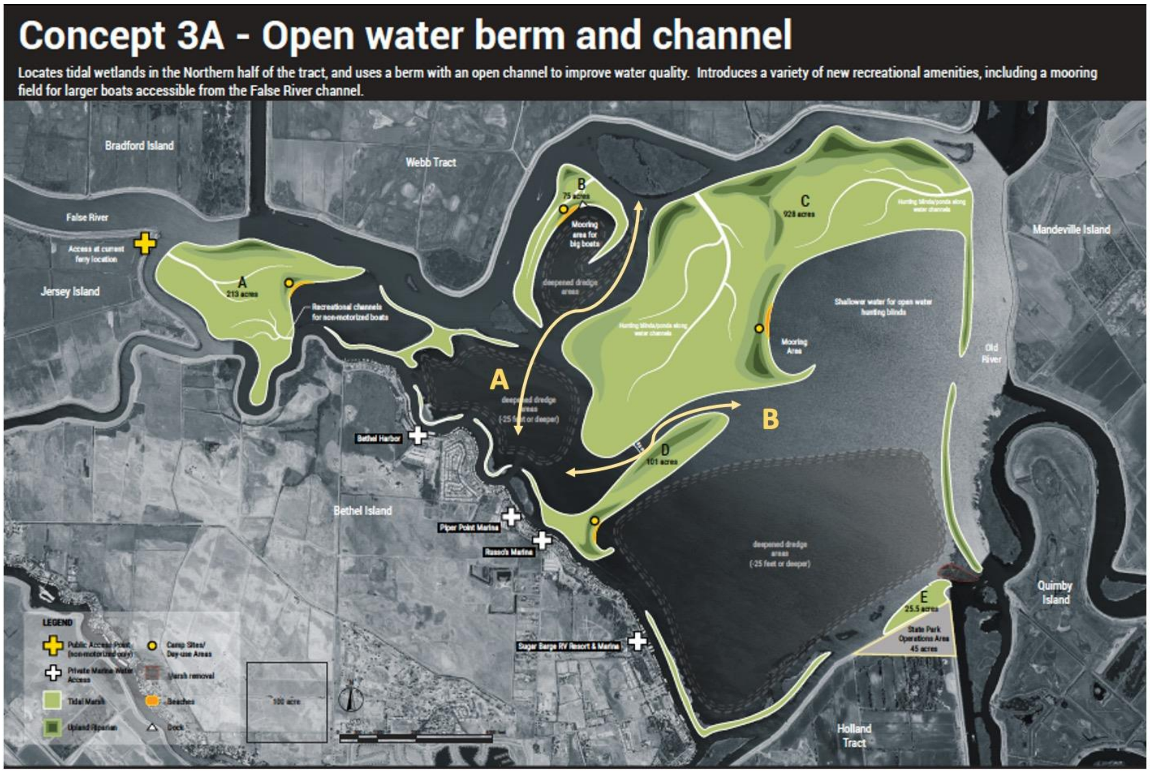
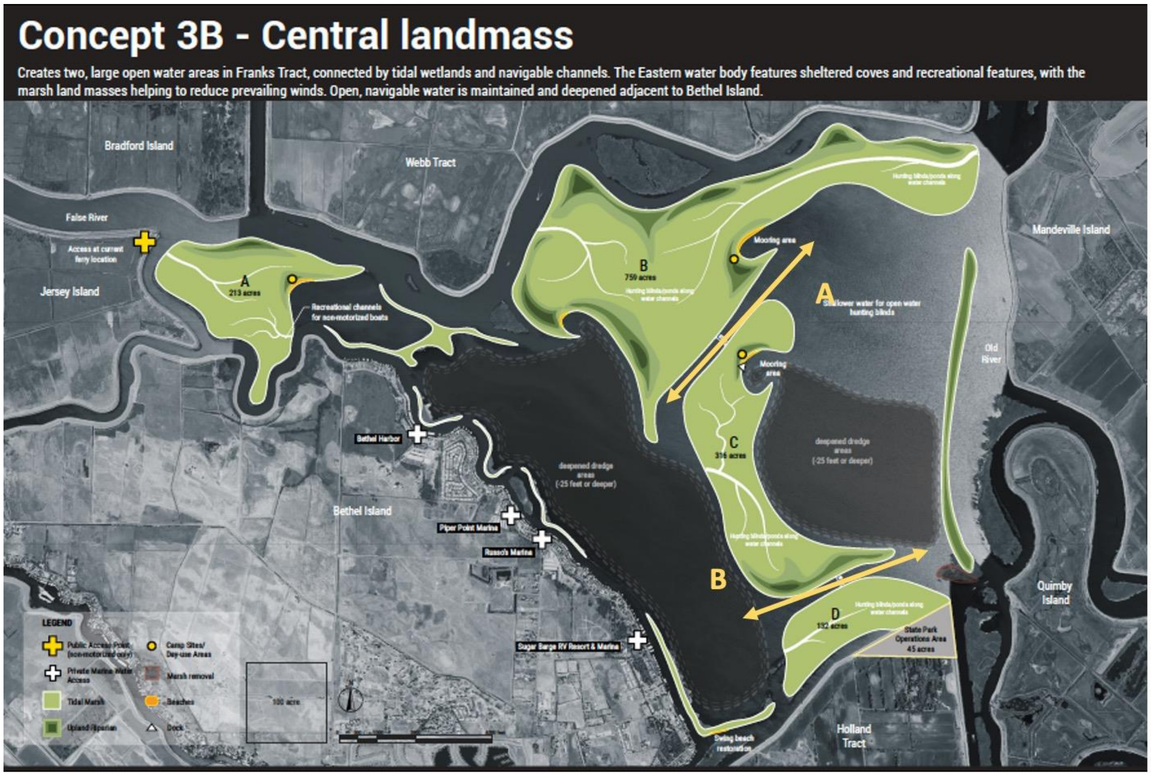


Figure 4: Map of navigation Channels for Concept 3A



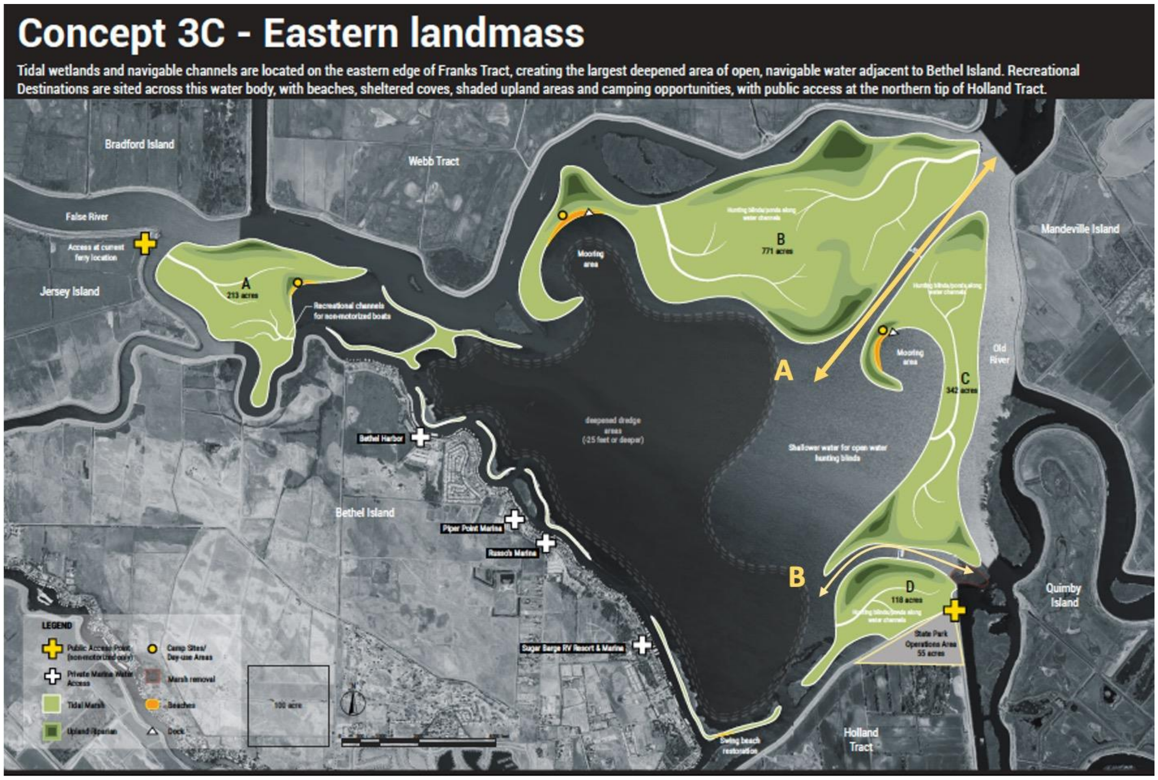
1. Velocity models show that at the 95% flow model, velocities in the Channel B would exceed 3 ft/sec. In addition, velocities in Piper Slough, adjacent to landmass B, would exceed 2.5 ft/sec.
2. Channel B is the only channel to be created in this concept. Widths for this designated fast water channel should be greater than 180 feet on average at low water. Current width is designed at approximately 400 feet.
3. Average depth for fast water channels for motorized boats should be greater than 6 feet at low tide with all submerged debris removed. Current depth is modeled at 7-8 feet.
4. The hazardous entries into the Tract are mostly removed, with the exception of the entry from the northwest. The velocities at the “nozzle” should be measured. Submerged snags and aquatic vegetation are removed from navigable channels and dredged areas.
5. Recreation conflict may exist with boats leaving Piper Slough and the beach on landmass D, as well as with the boats mooring near landmass B and boats navigating through channel A.

Figure 5: Map of navigation Channels for Concept 3B



1. Velocities in both channel A and B do not regularly exceed 3 ft/sec and should allow for safe motorized boating navigation. Velocities may exceed 2 ft/sec on a more regular basis and may not be safe for non-motorized craft. The current design velocities exceed 3 ft/sec at the northeast point of False River into Old River, though since expanding this point would not affect water quality, a wider channel can be designed to slow velocities.
2. Both channel A and B should be created to allow for fast boat traffic. Widths for these designated fast water channel should be greater than 180 feet on average at low water. Current width is designed at approximately 400 feet.
3. Average depth for fast water channels for motorized boats should be greater than 6 feet at low tide with all submerged debris removed. Current depth is modeled at 7-8 feet.
4. The hazardous entries into the Tract are mostly removed, with the exception of the entry from the northwest. The velocities at the “nozzle” should be measured. Submerged snags and aquatic vegetation are removed from navigable channels and dredged areas.
5. Recreation conflict may exist with boats mooring near landmass B and boats navigating through channel A.

Figure 6: Map of navigation Channels for Concept 3C



1. Velocities through Both Channel A and B are shown to be below 3 ft/sec most of the time and should allow for safe motorized boating. These channels may more regularly exceed 2 ft/sec and may not be safe for non-motorized craft.
2. Both Channel A and B should be created to allow for fast boat traffic. Widths for these designated fast water channel should be greater than 180 feet on average at low water. Current width is designed at approximately 400 feet.
3. Average depth for fast water channels for motorized boats should be greater than 6 feet at low tide with all submerged debris removed. Current depth is modeled at 7-8 feet.
4. Two of the hazardous entries into the Tract are removed, with the exception of the entry from the northwest and the northeast at the entry to the Tract from Channel A. The velocities at the “nozzle” should be measured at the northwest, and the landmass should be adjusted to allow a less direct entry from the northeast. Submerged snags and aquatic vegetation are removed from navigable channels and dredged areas.
5. Recreation conflict may exist with boats mooring near landmass C or waterskiiers and wakeboarders taking off from the beach and boats navigating through channel A.

Results

Table 1. Navigation Safety Criteria by Concept

Boating Safety	No Action	Concept 3A	Concept 3B	Concept 3C
Channel Criteria				
Water velocity (frequency greater than 3 feet per second)	8	5	6	6
Channel depth (feet)	2-6	7-8	7-8	7-8
Channel width (feet)	Wide open	400	400	400
Boating Hazards				
Hazardous entries removed (out of 4)	0	3	3	2.5
Submerged hazards removed	No	Yes, in channels and dredged areas	Yes, in channels and dredged areas	Yes, in channels and dredged areas
Conflicts with Recreation				
Potential conflicts	Existing, baseline	More than existing with increased use	More than existing with increased use	More than existing with increased use

Ratings

Based on criteria 1-5 above, ratings are provided for Boating Safety on a scale of 1-10, with 10 being best (safest). Channel Criteria rating is derived from the Average Water Velocity, Channel Depth, and Channel Width criteria. The Boating Hazards rating is derived from the Hazardous Entries Removed and Submerged Hazards Removed Criteria. Design Conflicts is derived from the Potential Conflicts with Recreation.

Table 2 Navigation Safety – Ratings by Concept (1-10 scale, 10 highest)

Navigation Safety Attributes	No Action	Concept 3A	Concept 3B	Concept 3C
Channel Criteria	6	4	5	5
Boating Hazards	1	8	8	7
Conflicts with recreation	7	5	5	5
Overall Rating	4.7	5.7	6	5.7

References

Franks Tract Futures User Survey, 2019. UC Davis for CDFW.

https://charts.noaa.gov/PDFs/18661.pdf

Ohio Boating Facilities Standards and Guidelines, First Edition. Ohio Department of Natural Resources Division of Watercraft Resource Planning Section. October 2003.

Layout, Design and Construction Handbook for Small Craft Boat Launching Facilities. State of California. The Resources Agency. Department of Boating and Waterways. March 1991.

Evaluation Criteria Information Sheet

RECREATION – FISHING

Objective	Evaluation Criterion	Units	Description
Provide and Enhance recreation facilities and opportunities for: • *Fishing* *while minimizing impacts to existing recreational uses*	• Fishing access points/boat launches • Sportfish habitat ○ Largemouth bass ○ Striped bass • Areas for fishing by boat • Access points for fishing by shore	Number / Quality Edge length Number of Velocity Gradients Quality/ number of pools Quality/ number	Enhanced or new recreation facilities will provide high-quality fishing access. Restored and enhanced habitat will benefit fisheries. Tidal wetlands, restored shorelines, and access points will increase access and quality of fishing.

Context

Franks Tract is owned by the California Department of Parks and Recreation and operated as a State Recreation Area (SRA). A General Plan for the Franks Tract State Recreation was prepared and approved by the CA State Park and Recreation Commission in 1988. It describes the resource management policies; proposed uses, facilities, and interpretive programs; and physical, biological, ecological, cultural, aesthetic, and recreational resources. According to the General Plan "Due to the limited land base, lack of public access, exposure to strong winds, and shallow fluctuating water level, recreation use is limited primarily to anglers and waterfowl hunters. Boating occurs primarily in the waterways surrounding the submerged unit", (p.20).

Franks Tract currently supports a wide variety of fishing uses including a world-class bass fishery and many annual bass fishing tournaments (including striped bass, largemouth bass and black bass). Other sports fish caught in Franks Tract include salmon, halibut, catfish, perch, and sunfish/panfish. There is very little shoreline fishing activity as there is limited shoreline access.

Description

Maintaining, improving, and creating recreation areas is a goal of the Franks Tract Futures project. A companion goal is to improve and restore tidal wetland habitat in order to improve the recreational fishery. Both of these goals combined will improve and enhance recreational sport fishing in Franks Tract.

The evaluation criteria described here are for recreational fishing, which considers both sportfish habitat locations and the human dimensions to fishing. Habitat metrics for sportfish are described in the Sportfish Habitat Evaluation Criteria Information Sheet which will be used as input to the overall recreational fishing ratings.

In order to have enhanced fishing recreation at Franks Tract, four criteria are necessary.

1. There must be adequate facilities to access Franks Tract, including marinas, launch ramps, etc. for both motorized and non-motorized craft.
2. There must be sufficient quality habitat for the fish to spawn and grow. Attributes of prime habitat are defined and mapped in the Sportfish Habitat Evaluation Criteria Information Sheet.
3. There must be areas within Franks Tract for both kayak and motorized boat fishing. These areas would include vegetated edges for largemouth bass habitat, open water and water with velocity gradients for striped bass habitat, and calm water to allow for boats to anchor and fish relatively undisturbed. Sportfish angling locations should ideally be sheltered from the disturbances of fast boat traffic, as defined by being located at least 200 feet from a primary navigation channel. Though anglers will go wherever the fish are, sheltered fishing places are more preferred.
4. Access points would provide access for shoreline fishing for those anglers that either prefer land-based fishing or who do not have access to a boat. Piers or other access points should include enough space to not conflict with other types of recreation, and should also include amenities such as fish cleaning stations and restrooms.

Methods

For each concept:

1. Determine the number and quality of access facilities supporting water based recreational/sport fishing.
2. Use calculations of sportfish habitat (largemouth and striped bass) from the Sportfish Habitat Evaluation Criteria.
3. Determine the quality and acreage of the prime fishing areas to allow for relatively undisturbed fishing.
4. Determine the number and quality of shore fishing access points.

Key Assumptions and Uncertainties

- Any enhancements or new recreation facilities will include adequate development costs and ongoing additional operation and maintenance (O&M) funds for State Parks or will identify a long term operator with funding available for ongoing O&M.
- Sportfish angling locations should be sheltered from the disturbances of fast boat traffic, as defined by being located at least 200 feet from a primary navigation channel. This correction has not been made in the ratings, which use the sportfish locations directly. This simplified method is unlikely to affect the overall ratings.
- The benefits of restored tidal wetlands to sportfish is not considered here. In reality, restoration of tidal wetlands will result in improved fisheries for sports fish (as well as native fish).

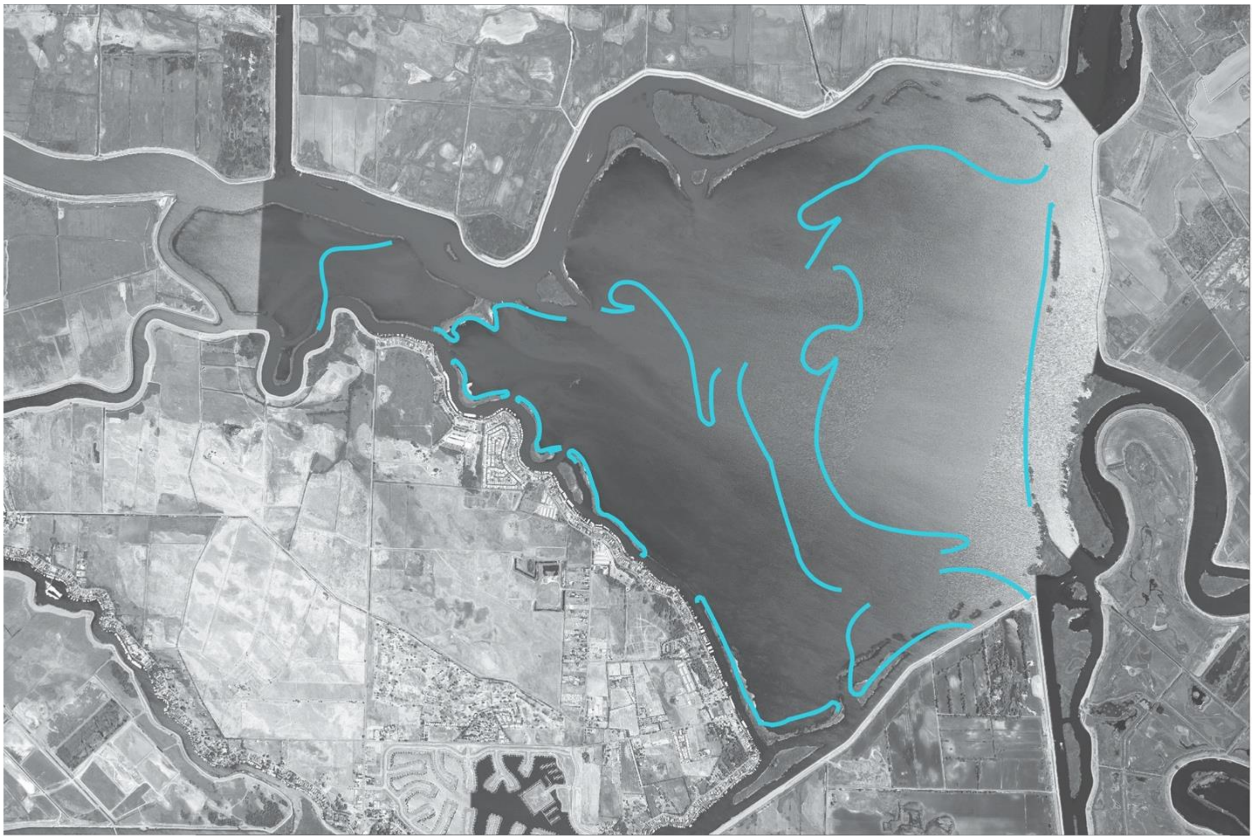
Results/Ratings

1. For all concepts, the existing access facilities at the marinas on Bethel Island and surrounding locales provides most access for both motorized and non-motorized boating. Each of the project concepts also include potential additional public non-motorized access points from Jersey Island and/or Holland Tract which will be beneficial to those who prefer to fish by kayak or other non-motorized craft.
2. The quality of the habitat, and its ability to produce and support the primary fish sought by anglers, is input from the Sportfish Habitat Evaluation Criteria.
3. There should be large areas of fishing habitat locations that are sufficiently undisturbed and away from navigation channels. All concepts include a large amount of shore edge along the outside of Piper Slough, which will be disturbed by navigation channels. Edge fishing within Little Franks Tract will be helpful for anglers utilizing non-motorized craft.

Figure 1: Concept 3A Edge of Open Water and Larger Channels of Largemouth Bass Habitat

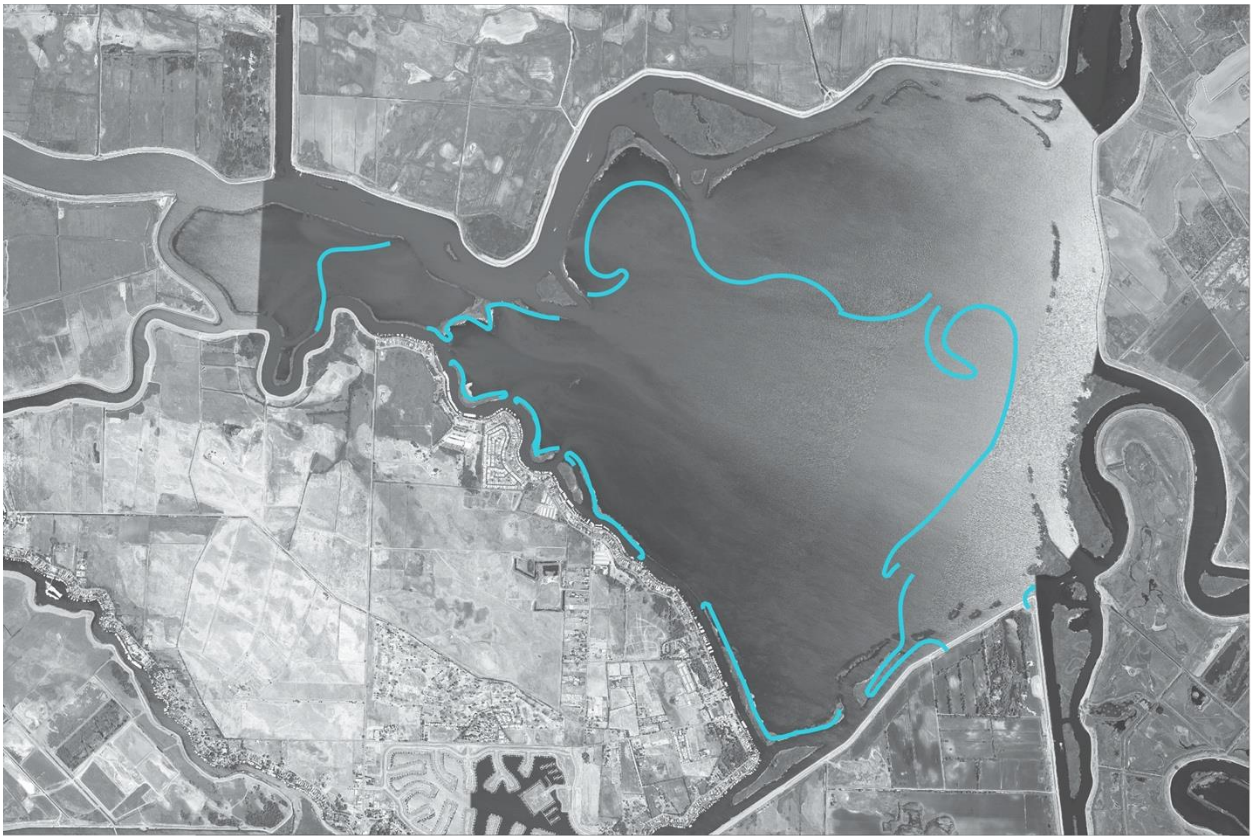
1. Existing access to Franks Tract will remain for motorized and non-motorized boating through private marinas. Non-motorized boating public access may also be provided from Jersey Island.
2. Edges of largemouth bass habitat will be increased over the No Action Alternative. Acres of open water for striped bass will decrease though number of velocity gradients will increase.
3. Edge fishing areas adjacent to active open water and day use areas, in the mooring area, and along fast water channels will be disturbed. Some edge areas around large pool will be higher quality. Large pool area will be usable.
4. There should be additional access points and amenities for fishing by shore. No concepts provide additional shoreline fishing access from Bethel Island. This concept may provide fishing access from Jersey Island if non-motorized access point is constructed.

Figure 2: Concept 3B Edge of Open Water and larger channels of Largemouth Bass Habitat



1. Existing access to Franks Tract will remain for motorized and non-motorized boating through private marinas. Non-motorized boating public access may also be provided from Jersey Island.
2. Edges of largemouth bass habitat will be increased over the No Action Alternative. Acres of open water for striped bass will decrease though number of velocity gradients will increase.
3. Edge fishing along navigation channels and adjacent to mooring and day use areas will be disturbed. Some edge areas around large pool will be higher quality. Large pool area will be usable.
4. There should be additional access points and amenities for fishing by shore. No concepts provide additional shoreline fishing access from Bethel Island. This concept may provide fishing access from Jersey Island if non-motorized access point is constructed

Figure 3: Concept 3C Edge of Open Water and larger channels of Largemouth Bass Habitat



1. Existing access to Franks Tract will remain for motorized and non-motorized boating through private marinas. Non-motorized boating public access may also be provided from Jersey Island and Holland Tract.
2. Edges of Largemouth bass habitat will be increased over the No Action Alternative. Acres of open water for striped bass will decrease though number of velocity gradients will increase
3. Edge fishing along navigation channels and adjacent to mooring and day use areas will be disturbed. Fishing within large pool will be bisected and disturbed by navigation traffic.
4. There should be additional access points and amenities for fishing by shore. No concepts provide additional shoreline fishing access from Bethel Island. This concept may provide fishing access from Jersey Island if non-motorized access point is constructed, as well as from Holland Tract if State Parks is able to build public facilities on that island.

Table 1. Provide and Enhance Fishing Recreation–Performance by Concept

Recreational Fishing	No Action	Concept 3A	Concept 3B	Concept 3C
Sportfish Habitat				
Largemouth bass • Length of shoreline edge(feet)	37,178	142,569	141,434	137,490
• Shallow water (acres)	4,562	2,250	2,453	2,384
Striped bass • Open water (acres)	4,562	3,334	3,251	3,238
• Number of velocity gradients	2	4	5	3
Fishing Access				
Number/Quality of boat access facilities	7 Existing	8 Existing + Jersey Island	8 Existing + Jersey Island	8 Existing + Jersey Island/Holland Tract
Quality of Potential Fishing Areas	7 Large open pool	5 more areas disturbed	5 More areas disturbed	5 More areas disturbed
Number and quality of access for shore fishing	None	1 Jersey Island	1 Jersey Island	2 Jersey Island and State Parks Facility

Table 2. Provide and Enhance Fishing Recreation –Ratings (1=lowest; 10=highest)

Note: Fishing Access rating metric based on boat access facilities, potential fishing areas, and access for shoreline fishing. Sportfish Habitat Rating taken from Sportfish Habitat ECIS

Fishing Attributes	No Action	Concept 3A	Concept 3B	Concept 3C
Fishing Access Rating	**4.7**	**5.8**	**5.8**	**6.7**
Sportfish Habitat Rating	**5.4**	**6.2**	**6.5**	**5.8**
Fishing Recreation Rating (overall)	**5.1**	**6**	**6.2**	**6.3**

References

Franks Tract Users Survey. 2019. By UC Davis for California Department of Fish and Wildlife.

Franks Tract Futures. Evaluation Criteria Information Sheet. Sportfish Habitat. 2020

Mickel, A., D. Rolloff, E. Erickson, G. Shaw. Dept. of Recreation, Parks, & Tourism Administration, California State University, Sacramento. (2017). **Recreational Boating Use of the Sacramento-San Joaquin Delta**. Delta Protection Commission. Retrieved from: http://delta.ca.gov/wp-content/uploads/2016/10/RecBoatingStudy_2017_-Final.pdf (7/16/19)

Milligan, Brett and Alejo Kraus-Polk, **Franks Tract and Little Franks Tract User Survey.** Appendix C of California Department of Fish & Wildlife. Franks Tract Futures. June 2018. Retrieved from: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=158682&inline

State of California – The Resources Agency, Department of Parks and Recreation. General Plan for Brannon Island and Franks Tract State Recreation Areas. February 1988

EVALUATION CRITERIA INFORMATION SHEET

RECREATION - HUNTING

Objective	Evaluation Criterion	Units	Description
Provide and Enhance recreation facilities and opportunities for: • *Hunting* *while minimizing impacts to existing recreational uses*	• Area of "high quality" waterfowl hunting habitat.	Area (acres)	Identify floating and marsh based blind locations. Enhance habitat for prized waterfowl.
	○ Maintain as many open water blinds as possible	Quantity	Water depth is limited to 10 feet max at high tide to be able to safely anchor blinds. *limitation may be subject to change
	• Creation of new In-marsh hunting opportunities: 1. Hunting blinds with ponds 2. Areas of "free roam" hunting	Quantity	Number of blind locations (compared to No Action alternative; expressed as %). Blinds must be spaced a minimum of 400 yards apart per CA State Parks standards) Spacing of blinds is 150-200 yards apart
	• Creation of upland habitats for nesting	Channel length/island perimeter	Boat-based hunting, using boat as blind Lacking in the Delta as a whole.
	• Public safety/ compatibility with other activities		Space between hunting activities and other activities ensures public safety and improves hunting quality

Context

Franks Tract is owned by the California Department of Parks and Recreation (DPR) and operated as a State Recreation Area (SRA). A General Plan for the Franks Tract State Recreation was prepared and approved by the CA State Park and Recreation Commission in 1988. It describes the resource management policies; proposed uses, facilities, and interpretive programs; and physical, biological, ecological, cultural, aesthetic, and recreational resources. Although 40+ years old, the plan's objectives and proposed recreation recommendations remain very relevant to the present project's effort.

There is a long history of hunting in the Franks Tract area. Miwok people hunted for wildfowl as well as small game and deer in the area now known as Franks Tract (DPR, 33). Hunting likely continued prior to reclamation and water-based hunting began shortly after the final unrepaired levee breach. Currently, hunting in Franks Tract is a seasonal activity managed by the DPR using a permit system.

According to the 1988 General Plan:

> *Waterfowl hunting will be permitted to continue in the area currently designated for hunting. During the hunting season when there is a potential for user conflicts, management activities will be altered in the designated area, and the public will be informed of temporary use restrictions for other kinds of recreation (102).*

Project objectives, consistent with the general plan, aim to provide and enhance hunting opportunities while reducing potential conflicts with other objectives and activities.

The California Public Resources Code further stipulates that:

> *The State Park and Recreation Commission shall allow, in accordance with Section 5003.1, waterfowl hunting annually from the opening day of hunting season for ducks or geese, whichever is earlier, to and including the closing day of this season, whichever is later, as established by the Fish and Game Commission, in all of Franks Tract State Recreation Area, except within 200 feet of or on the 330 acre island known as the Little Franks Tract, which is bounded on the south and west by Piper Slough, on the north by False River, and on the east by the open water portion of Franks Tract State Recreation Area.*[1] CA Pub Res Code § 5003.3 (2017)

Description

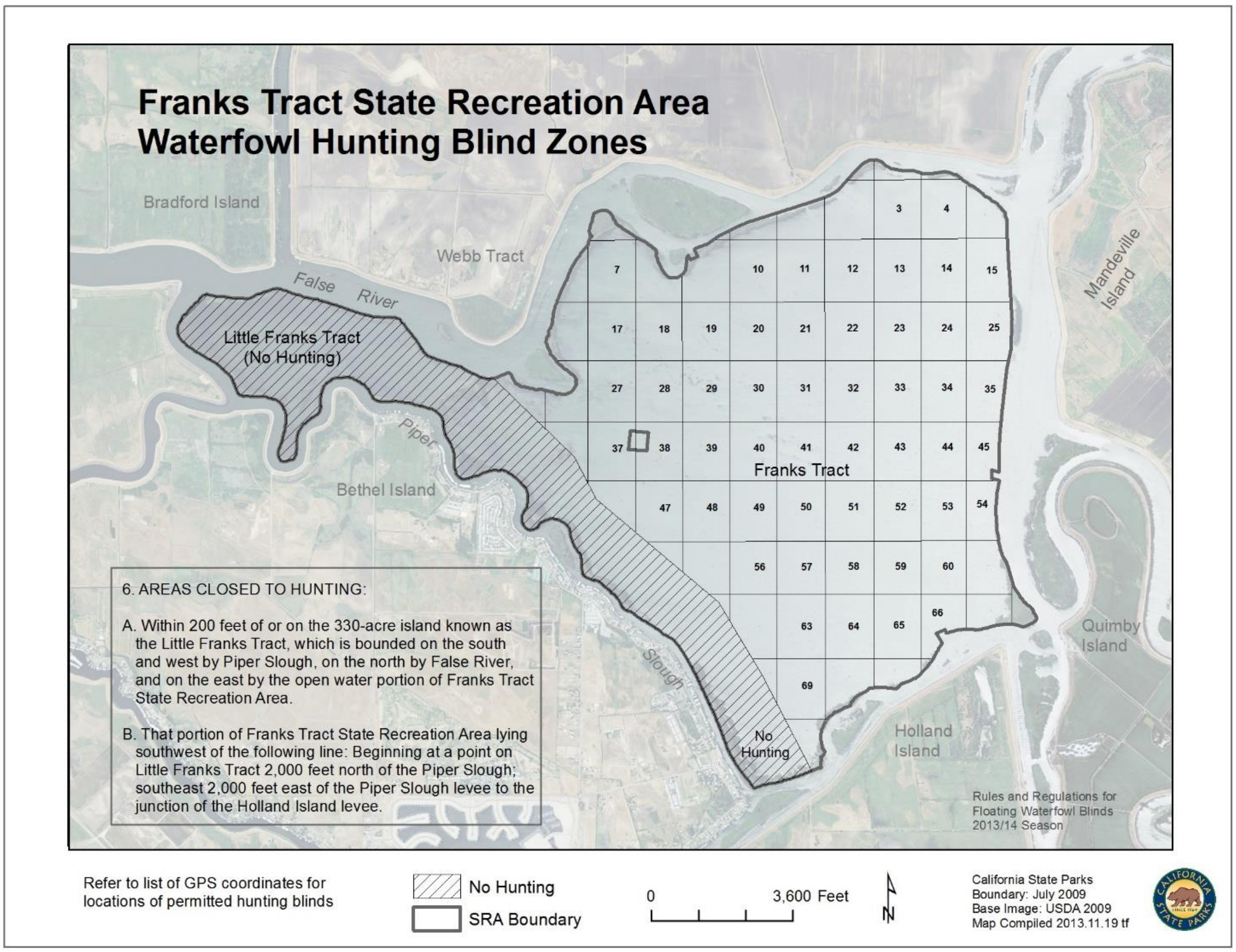
Maintaining, improving, and creating recreation areas is a goal of the Franks Tract Futures project. Hunting is an important recreational activity in Franks Tract as it supports economic activity in the slower season. The Franks Tract SRA hunting program also represents a unique public hunting opportunity for the region. The permit system currently allows hunters to set up

[1] Added by Stats. 1982, Ch. 753, Sec. 1. Effective September 8, 1982.

personal blinds in a designated location. Access to these blind are limited to the permit holder and their affiliates.

Currently, there are 54 available blinds (Figure 1). There are blinds available on the east side of the tract (Blind numbers 15, 25, 35, 45, and 54) but according to a previous Ranger, these sites are less desirable due to tidal action that disrupts decoys. According to this same Ranger, the desired locations have historically been located in the northern and more central zones on the Tract because the ducks usually fly in from the north. The southern zones tend to be less desirable.

Figure 1. Current blind configuration.



The current configuration of blinds follows a grid-like pattern that meets the following criteria:

1. A minimum distance of 400 yards must be maintained between floating blinds.

2. A buffer must be maintained that is delineated by a point on Little Franks Tract 2,000 feet north of the Piper Slough; southeast 2,000 feet east of the Piper Slough levee to the junction of the Holland Island levee.
3. A buffer of 200 feet must be maintained for Little Franks Tract. CA Pub Res Code § 5003.3 (2017)

Based on information from adjacent hunting areas and conversation with recreational hunters and hunting managers, the following criteria should be considered when designing a new layout of floating blinds:

1. Blinds must be spaced greater than 250 yards apart (currently at 400 yards).
2. Floating blinds must be located in areas with water depths less than 10 feet.

   *Ongoing discussions with Parks indicate possible changes in the regulations that could allow for blinds located in deeper water.

3. Hunters own their blinds and are allowed to leave them for the season (as it is now).

The following criteria should be considered when designing a new layout of marsh-based blinds:

1. Marsh-based blinds must be accessible from the water (i.e. by boat).
   a. Channels must be navigable (deep enough and free of submerged aquatic vegetation).
2. Marsh-based blinds should be between 150-200 yards apart.
3. A system must be in place to ensure proper maintenance of blinds.
4. Duck ponds should be more than 50 yards in diameter (50-70 yards as the ideal).
5. Depth of ponds should be between 4-16 inches which is ideal for dabbling ducks such as Wigeon, Teal species, Pintail, Shovelers, and others.
6. Incorporating upland habitat near these ponds should be a consideration as it allows for nesting habitat during the spring.
7. Blinds placed on the edges of marsh should consider conflicts with anglers who may be fishing along the vegetated marsh edge.

Methods

For each alternative, rank according to comparisons using the following criteria:

1. The relative number of hunting locations (including floating and marsh-based blinds).
   a. Two floating blind calculations were done, one assuming no blinds in deep water, the second assuming a change in regulations that allows for deep water blinds.
2. The hunting quality of these floating and marsh-based blinds.
3. The accessibility of these floating and marsh-based blinds.

4. The area available for free roam, boat-based hunting.
5. Ratings would be based on average ranking.

Key Assumptions and Uncertainties

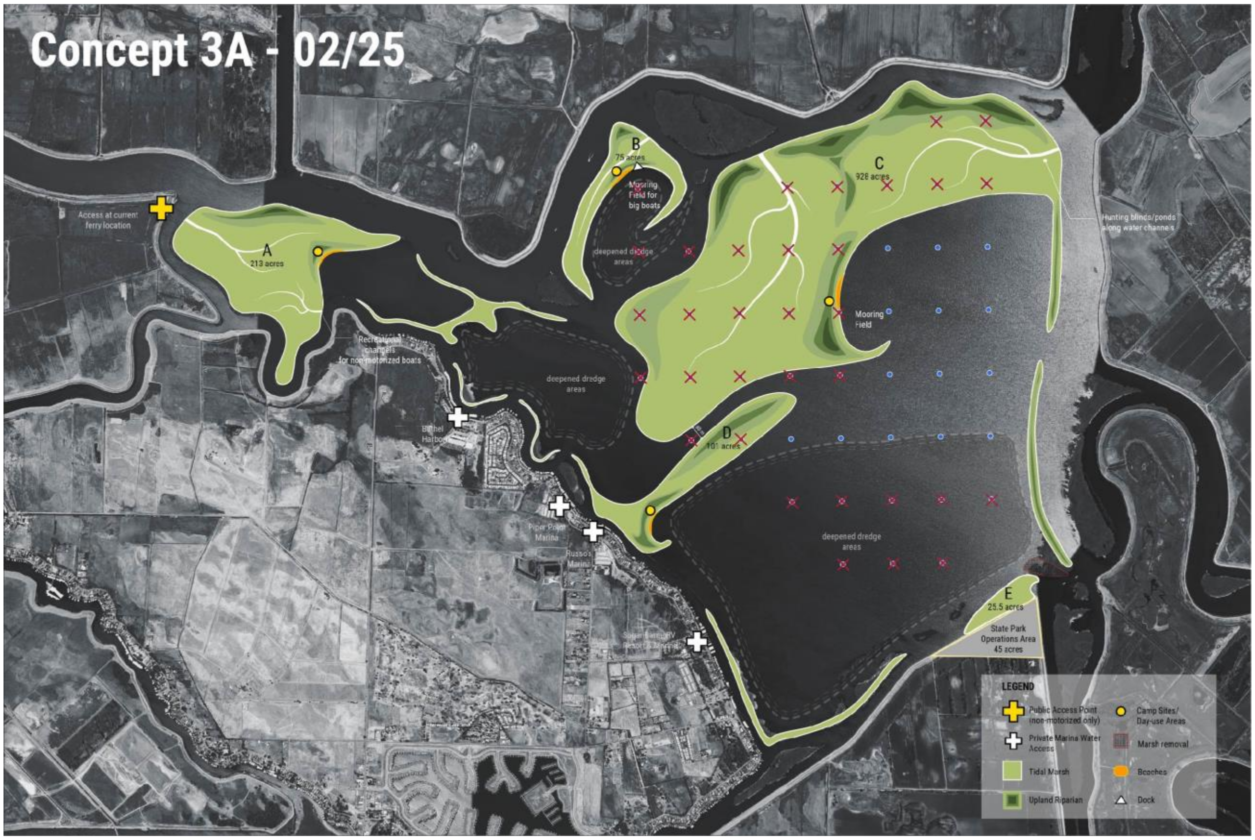
- Continuation of the current open water permitting hunting blind system, to the degree possible, is desired by those who currently participate in it.
- Marsh-based blinds are a desirable feature.
- Diversity and diversification of hunting opportunities (i.e. open-water in contrast to in-marsh; permitted designated locations for hunting blinds in contrast to free range) is desirable.
- Free roam, boat-based hunting will occur within navigable channels and along island edges.
- The occupancy of the current blinds is considerably less than 100%. From preliminary research conducted by UC Davis (limited data), it is estimated there are 47 possible blind permits available. Based on interviews, actual occupancy is estimated to be between 20-28 used blinds per year, approximately half occupancy.
- Maintaining the existing permit system and introducing marsh-based blinds will require the inclusion of additional operation and maintenance funds for CA State Parks or will identify a long term operator with funding available for ongoing operations and maintenance.

Results/Ratings

The following results are based on the current orientation of the 47 blind sites. The blind configuration of the No Action Alternative is shown in Figure 1, above.

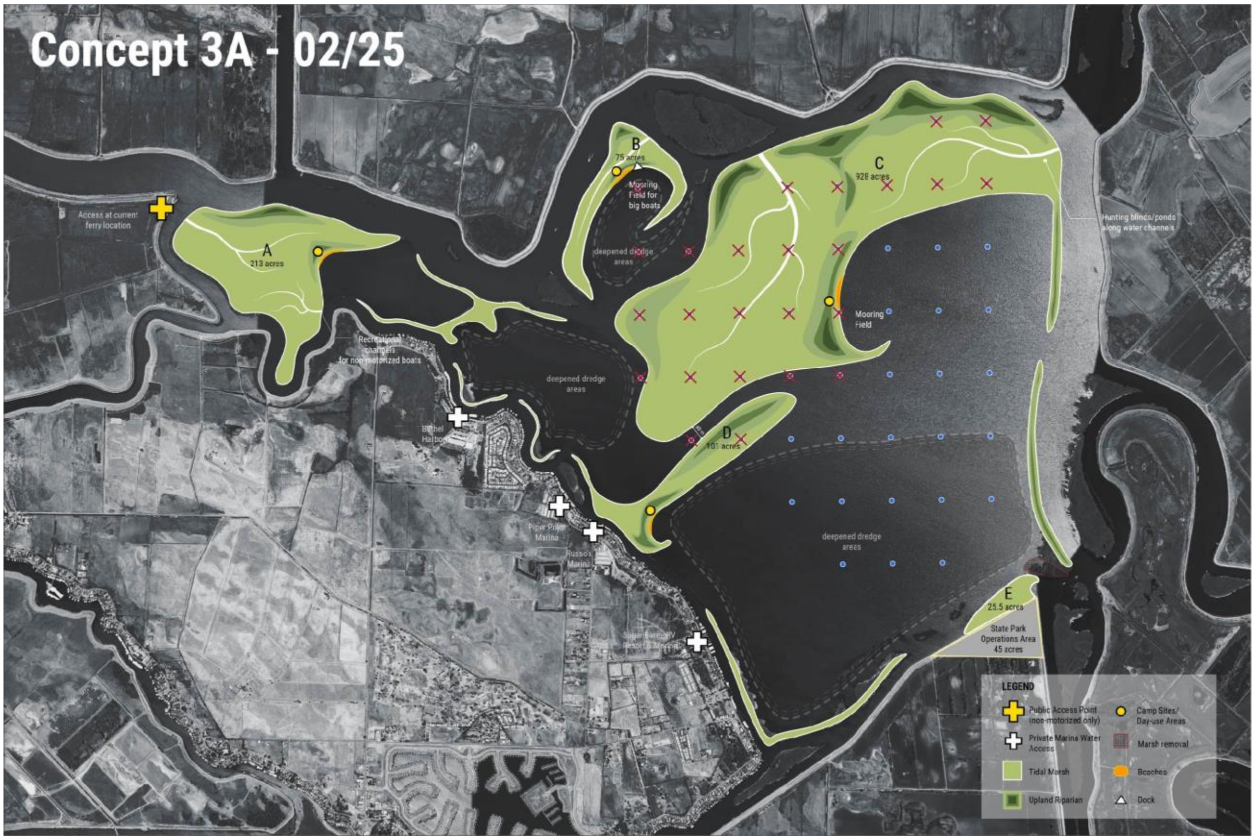
*Note: Currently around 50% of these blind sites are permitted and occupied during the hunting season.

Concept 3A – Only floating blinds mapped. Assume no deep water blinds.



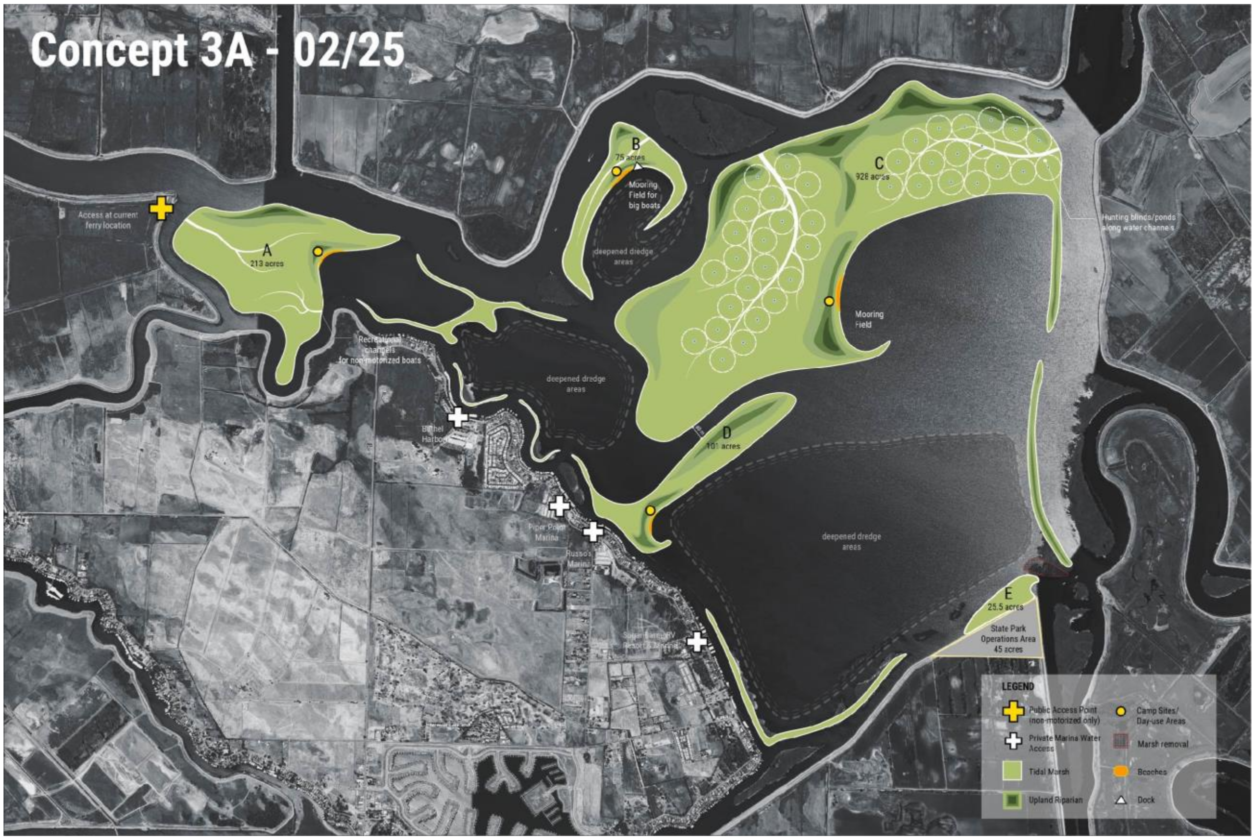
Loss of 33 floating blinds (indicated by red X) due to deepening and new tidal marsh and channel creation.

Concept 3A – Only floating blinds mapped. Assume regulation change and deep water blinds are permitted.



Loss of 25 blinds (indicated by red X).

Concept 3A – Only marsh based blinds mapped.

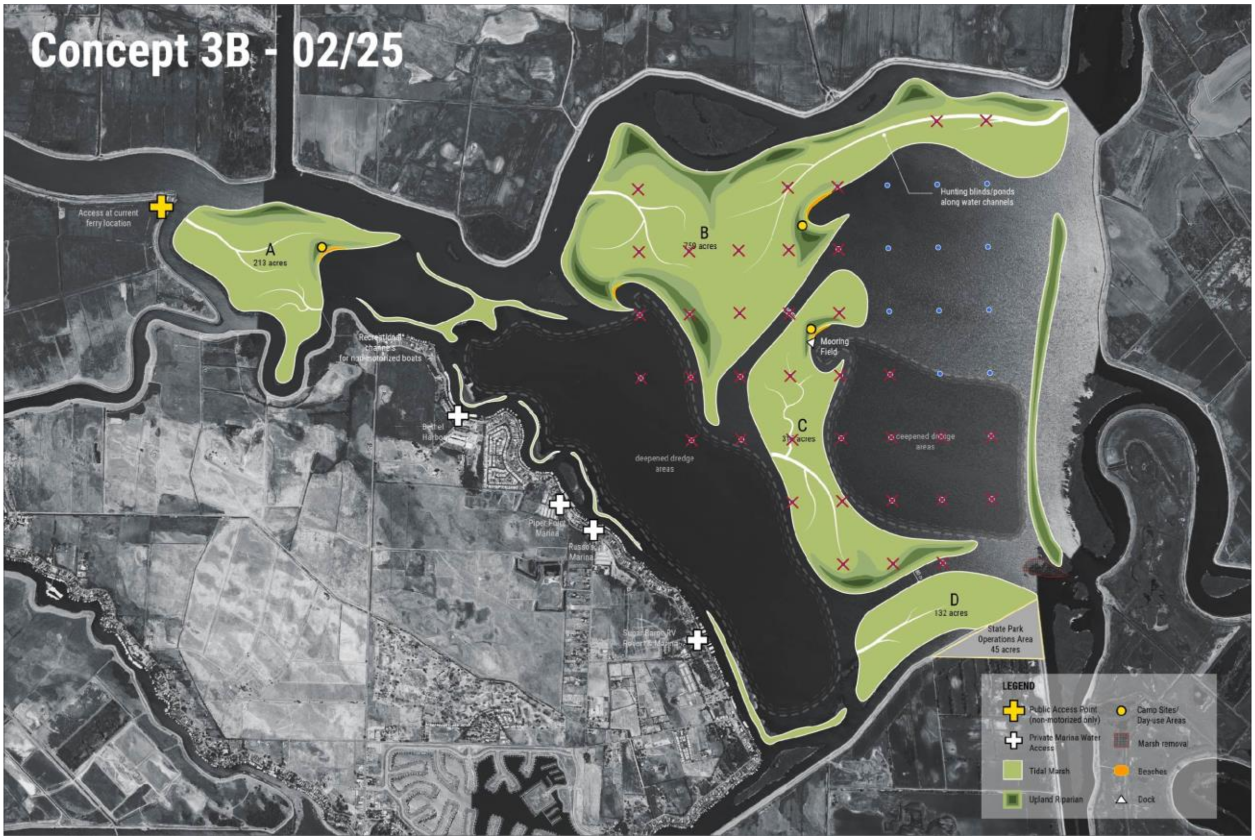


Addition of 39 marsh-based blinds results in a net gain of 17 blinds.

- Loss of **33** water-based blinds due to deepening, marsh and channel creation.
- Assuming deep water blinds (- **25**)
    - Potential for water-based blinds within deepened borrow pits.
- Potential for up to **39** marsh-based blinds within the large northern marsh landmass.
- **Net gain of 6 blind locations assuming no deep water blinds.**
- **Net gain of 14 blind locations assuming deep water.**
- Creation of new marsh and upland habitat (248 acres).
    - Potential creation of designated duck ponds.
- Perimeter and channel length for free range, boat-based hunting:
    - Perimeter = 59,475 feet

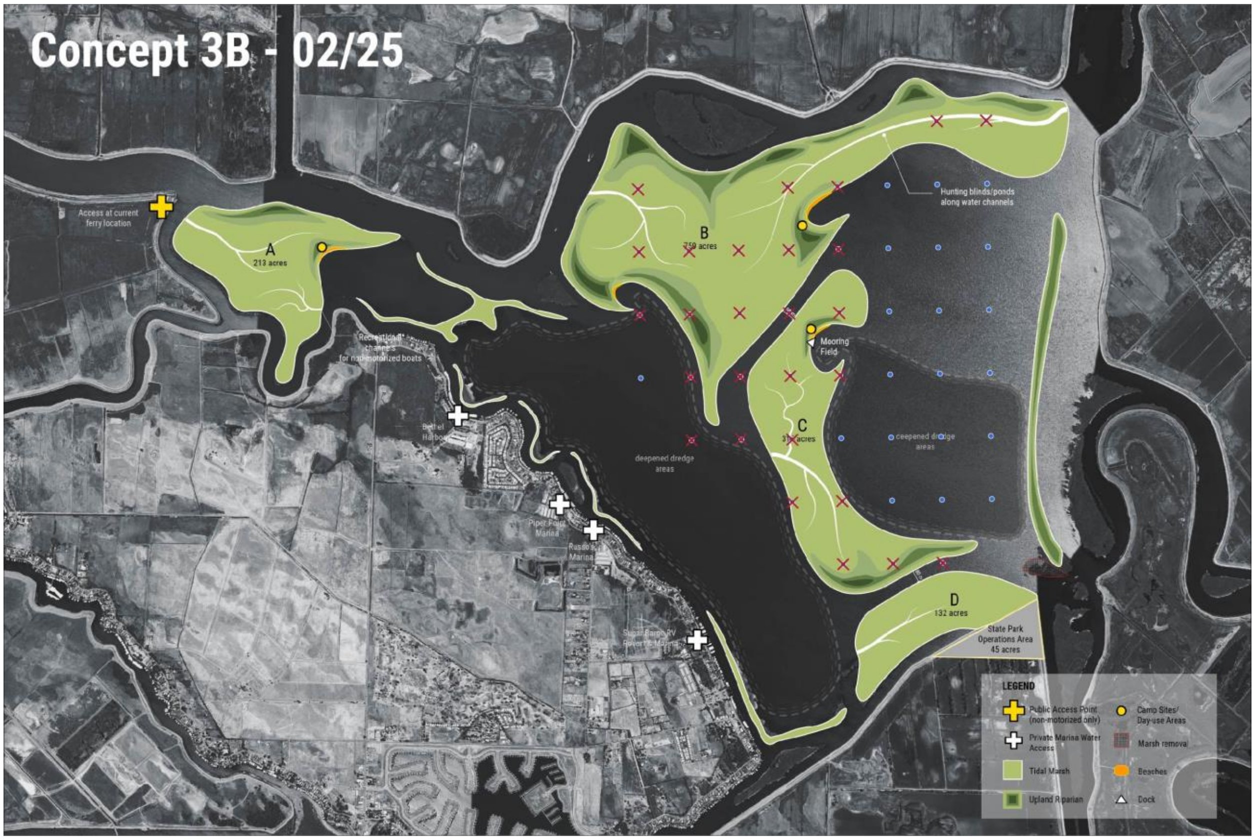
Concept 3A	Loss of open water blinds (no deep)	Loss of open water blinds (with deep)	New marsh-based blinds	**Net gain (+) or loss (-) (no deep)**	**Net gain (+) or loss (-) (with deep)**
	-33	-25	+39	**+6**	**+14**

Concept 3B – Only floating blinds mapped. Assume no deep water blinds.



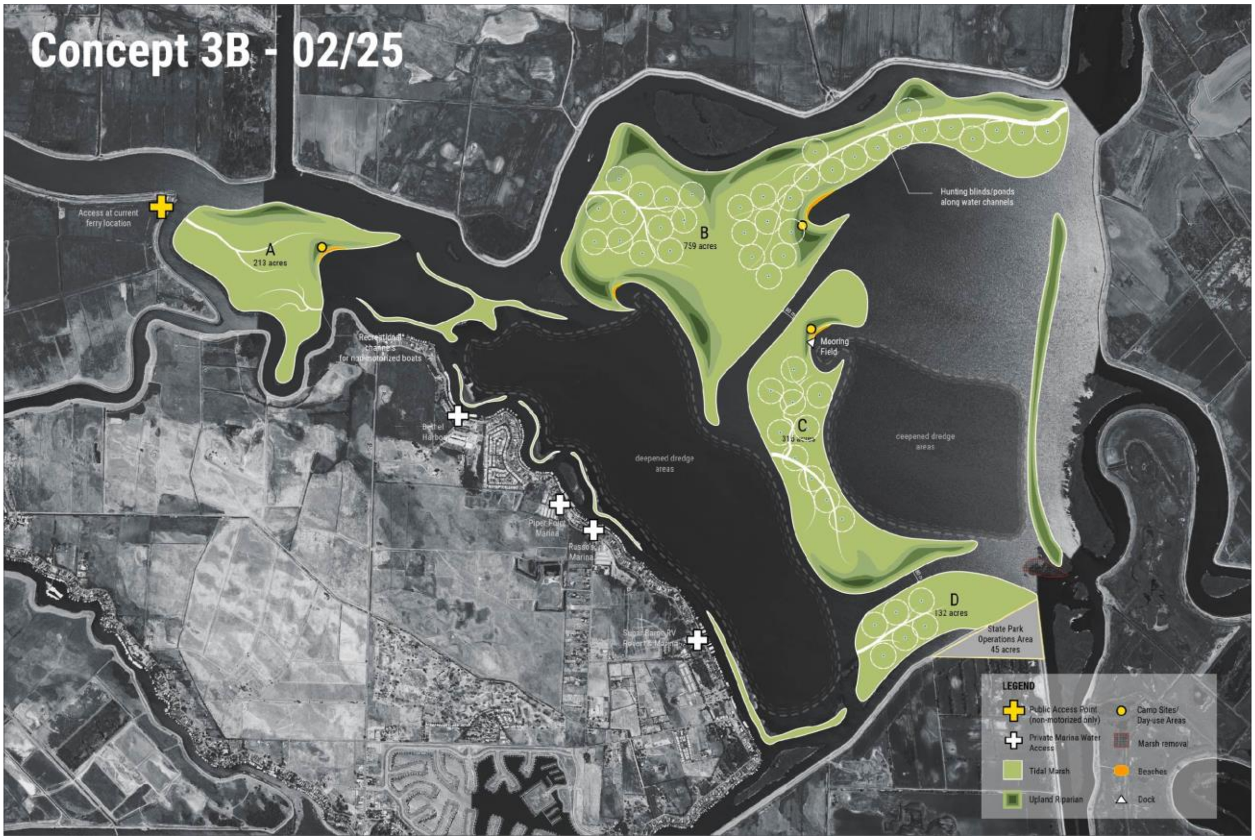
Loss of 36 floating blinds (indicated by red X) due to deepening and new marsh and channel creation.

Concept 3B – Only floating blinds mapped. Assume regulation change and deep water blinds are permitted.



Loss of 29 blinds (indicated by red X).

Concept 3B – Only marsh based blinds mapped.

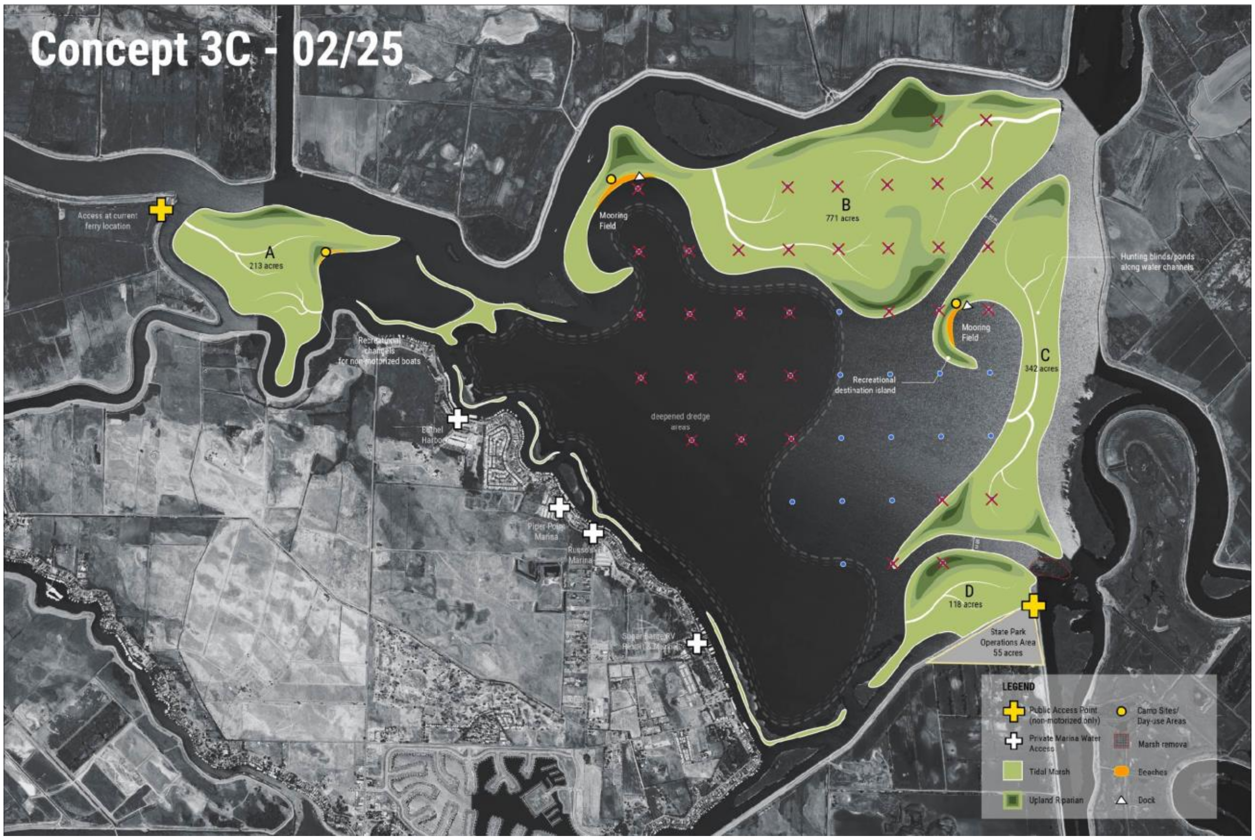


Addition of 50 marsh-based blinds results in a net gain of 37 blinds.

- Loss of **36** water-based blinds due to deepening, marsh and channel creation.
- Assuming deep water blinds (- **29**)
  - Potential for water-based blinds within deepened borrow pits.
- Potential for up to **50** marsh-based blinds within the north, central and southern marsh.
- **Net gain of 14 blind locations.**
- **Net gain of 21 assuming deep water blinds**
- Creation of new marsh and upland habitat (270 acres).
  - Potential creation of designated duck ponds.
- Perimeter and channel length for free range, boat-based hunting:
  - Perimeter = 87,842 feet

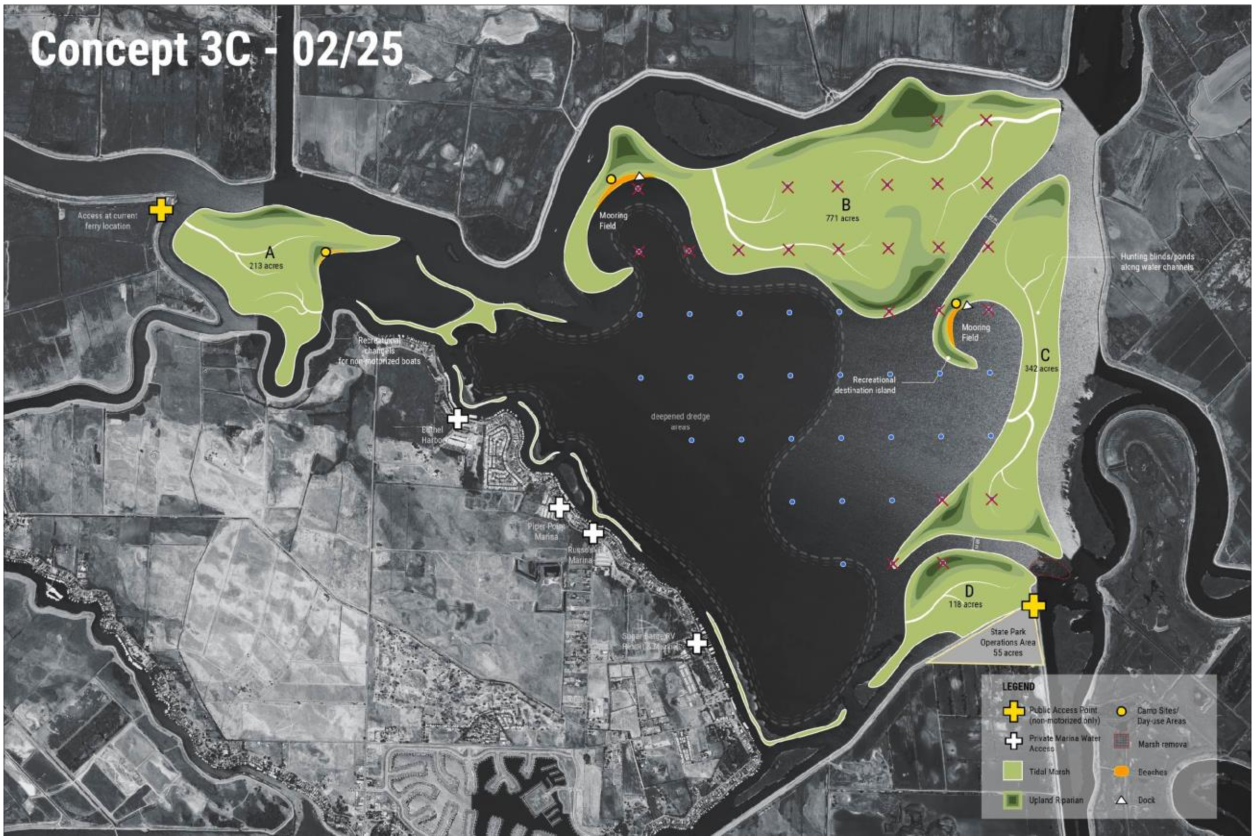
Concept 3B	Loss of open water blinds (no deep)	Loss of open water blinds (with deep)	New marsh-based blinds	**Net gain (+) or loss (-) (no deep)**	**Net gain (+) or loss (-) (with deep)**
	-36	-29	+50	**+14**	**+21**

Concept 3C – Only floating blinds mapped. Assume no deep water blinds.



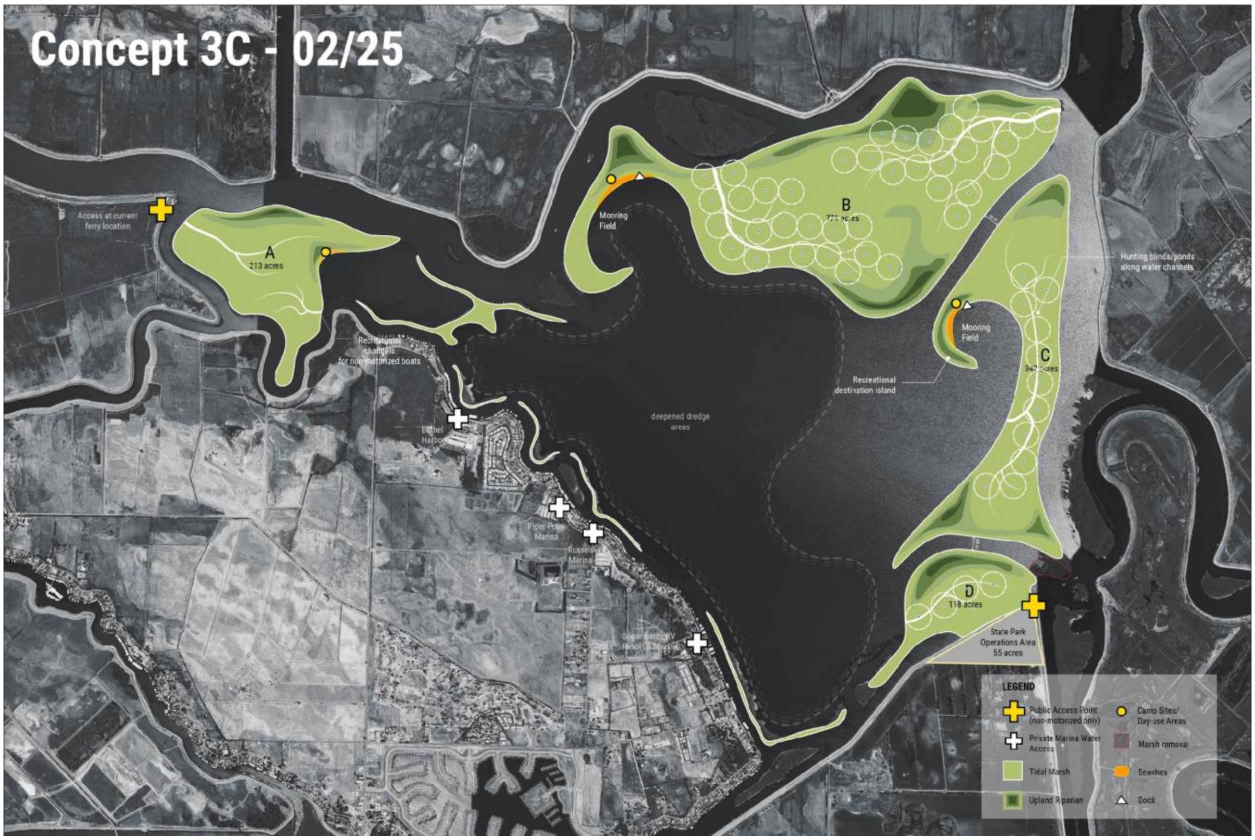
Loss of 33 floating blinds (indicated by red X) due to deepening and new marsh and channel creation.

Concept 3C – Only floating blinds mapped. Assume regulation change and deep water blinds are permitted.



Loss of 23 blinds (indicated by red X).

Concept 3C – Only marsh based blinds mapped.



Addition of 53 marsh-based blinds results in a net gain of 38 blinds.

- Loss of **33** water-based blinds due to deepening, marsh and channel creation.
- Assuming deep water blinds (- **23**)
  - Potential for water-based blinds within deepened borrow pits.
- Potential for up to **53** marsh-based blinds within the north, central and southern marsh.
- **Net gain of 14 blind locations.**
- **Net gain of 21 assuming deep water blinds**
- Creation of new marsh and upland habitat (267 acres)
  - Potential creation of designated duck ponds.
- Perimeter and channel length for free range, boat-based hunting:
  - Perimeter = 65,975 feet
  - Huntable channel length =

Concept 3C	Loss of open water blinds (no deep)	Loss of open water blinds (with deep)	New marsh-based blinds	**Net gain (+) or loss (-) (no deep)**	**Net gain (+) or loss (-) (with deep)**
	-33	-23	+53	**+20**	**+30**

Table 1. Modifications to hunting blinds number and alignment (number of blinds)

Modifications	No Action	3A	3B	3C
Loss of open water blinds	NA	-33	-36	-33
Loss of open water blinds (assuming deep water)	NA	-25	-29	-23
New marsh-based blinds	NA	+39	+50	+53
Net gain (+) or loss (-) (no deep)	**NA**	**+6**	**+14**	**+20**
Net gain (+) or loss (-) (with deep)	**NA**	**+14**	**+21**	**+30**

Table 2. Calculation % table. Provide and Enhance Hunting – Ranking Compared to Existing Conditions, for all Concepts (1-10, 10 = best, 1 = worst)

Percentages are relative to No Action Alternative, except in the case of “New marsh-based blinds”, and “upland habitat” metric, where they are relative to the highest scenario, 3C and 3B respectively. The range is intended to capture both an existing scenario in which there are no blinds in deeper water, as well as one in which regulations and engineered solutions enable deep water blinds.

Modifications	No Action	Concept 3A	Concept 3B	Concept 3C
Loss of open water blinds	0%	-70%	-77%	-70%
Loss of open water blinds (assuming deep water use)	0%	-53%	-62%	-49%
New marsh-based blinds	NA	74%	94%	100%*
Net gain (+) or loss (-) (no deep)	100%	113%	130%	143%
Net gain (+) or loss (-) (with deep)	100%	130%	145%	164%

upland habitat	0%	92%	100%*	99%
Total Average (deep)	**33%**	**61%**	**69%**	**78%**
Total Average (no deep)	**33%**	**52%**	**62%**	**68%**
Average Ranking	**3.3**	**5.2 - 6.1**	**6.2 - 6.9**	**6.8 - 7.8**

* denotes the highest ranked concept. All other concepts, including the No Action alternative are provided a score that is relative to this highest concept.

Table 4. New upland habitat creation (acres)

Modifications	No Action	Concept 3A	Concept 3B	Concept 3C
Upland habitat	NA	248	270	267

References

DPR. 1987. “Franks Tract Recreation Area General Plan.” California Department of Parks and Recreation.

CA Pub Res Code § 5003.3 (2017).

EVALUATION CRITERIA INFORMATION SHEET

RECREATION – MOTORIZED BOATING, NON-MOTORIZED BOATING, SHORELINE

Objective	Evaluation Criterion	Units	Description
Enhance recreation facilities and opportunities for: • *Motorized boating* • *Non-motorized boating and* • *shoreline recreation* *while minimizing impacts to existing recreational uses*	• Open water for motorized boating, water-skiing /wakeboarding/ sailing • Slow water channels for non-motorized boating and distance from put-in locations • Focal point use areas with beaches, day use, and possible camping • Mooring, with destination focal point cluster • Shoreline waterfront access or park space with associated facilities	Acres/ Quality Miles / Quality Number/ Quality Number/ Quality Number/ Quality	Enhanced or new recreation facilities will provide high-quality spaces for several types of recreation desired by the community and stakeholders including: • Boating areas (motorized/ non-motorized) • Beaches • Day use and overnight areas • Shoreline access

Context

Franks Tract is owned by the California Department of Parks and Recreation and operated as a State Recreation Area (SRA). A General Plan for the Franks Tract State Recreation was prepared and approved by the CA State Park and Recreation Commission in 1988. It describes the resource management policies; proposed uses, facilities, and interpretive programs; and physical, biological, ecological, cultural, esthetic, and recreational resources. Although 40+ years old, the plan's objectives and proposed recreation recommendations remain very relevant to the present project's effort.

Franks Tract currently supports a wide variety of recreation uses including a world class bass fishery, waterfowl hunting, various motorized and non-motorized boating activities. In the past it also provided public shoreline recreation, including fishing, walking, and nature viewing. The objective for recreation is to maintain or enhance existing uses, as much possible, while creating or expanding opportunities for new types of recreation.

Wildlife-oriented recreation, connecting people to the water and proposed wetlands, is inherent in several recreational categories and could consist of building kayak launches, wildlife viewing areas, and water trails and day use areas for non-motorized boating, as well as considering non-motorized boating accessibility as part of wetland/habitat design.

Motorized boating recreation can be enhanced through the creation of boat-in destinations, such as beaches, day-use areas, or overnight boat-in campsites or overnight anchorages.

All of these proposed uses are consistent with the overall adopted General Plan for Franks Tract SRA. However, the General Plan has not been updated since 1987, and there is no current effort or funds to do so.

Description

Maintaining, improving, and creating recreation areas is a goal of the Franks Tract Futures project. The prime recreation in Franks Tract is water based and there are different types of boating and recreation within the area. Bass boaters in a tournament may zoom from one side to the other, searching out the best fishing spot, or aiming to get their catch in before deadlines. Kayakers may want to paddle slowly and watch birds or sit in one place and fish. Larger motor craft may want to cruise around or through the Tract to reach other recreation destinations. Overall, the major recreation activities that occur currently, or could occur in the future with properly designed facilities, at Franks Tract include the following:

1. Water sports pools and waterways
2. Beaches
3. Day use facilities
4. Boat mooring area
5. Non-motorized boating
6. Nature study, interpretation, bird watching
7. Boat cruising and/or just boating to somewhere
8. Recreational Sports Fishing
9. Competition fishing tournaments
10 Hunting
11. Historic/cultural tourism

The key element of a water sports pool is simply a large open body of water allowing for a variety of types of boating access. The pool should ideally be somewhat sheltered from waves, due to shorter fetch, and adjacent to a beach or beaches, and a mooring area. The pool should be large enough to allow for fast boats navigating across, water skiing/wakeboarding, as well as have quiet edges for fishing and non-motorized boating.

The Delta has an overall shortage of beaches, as well as places to simply get out of one's boat and walk around. Key characteristics of a good beach are sandy surfaces with a slope that reestablishes itself naturally; adjacent to active water sports pools; sheltered from wind, east or north east exposure to avoid glare off water; safe, close take off/landing spots for waterskiers and wakeboarders; and restrooms and day use facilities.

Day use facilities should be large enough to accommodate multiple users and types of users. Key characteristics and elements include restrooms, shade (either trees and/or shade structures), picnic tables, perhaps barbeque and coal disposal facility, sheltered from wind, and adjacent to beach.

Mooring facilities would allow larger boats that cannot be directly beached on an area to tie off and access beach and/or day use areas. Facilities would only be for larger boats (>20 feet) and would allow for a reservation system. Mooring areas should be protected from wind and waves.

Non-motorized boating facilities could be combined with natural and restored wetlands that include destination areas with beaches, where people may want to picnic, swim, or launch wind sails, stand up paddleboards (SUP), or water skiing. Such a day-use and beach area might also be oriented for non-motorized recreation, providing a focal point for SUP and access to restored tidal lands with slow channels for non-motorized boating and wildlife viewing.

All recreation facilities should be constructed in areas that avoid potential conflicts with fast boats navigating through the Tract. Conflicts between recreation and navigation are discussed in more detail in the Navigation – Boating Safety Evaluation Criteria Information Sheet.

Items 8 and 9 related to fishing and Item 10 Hunting are discussed in separate Fishing and Hunting Evaluation Criteria Information Sheets.

Methods

Each concept was rated using the following criteria:

1. **Open water area**. Configuration and size of open water areas for boating and potential for accommodating multiple types of boating activity.
2. **Slow-water channels**. Miles of slow water channels for non-motorized boating and the distance to put-in access points. Higher ratings for those designs that include non-motorized boating in Little Franks Tract with new launch facilities, accessible narrow channels, destination islands with day-use facilities, and removed from fast water channels.
3. **Beaches**. Number and location of beaches, with a preference for multi-use beaches that allow for day use, sunbathing, swimming, as well as water skiing and wakeboarding launch. Additional preference for provision of a beach at the former location of Swing Beach, on southern Franks Tract near Sand Mound slough.
4. **Mooring areas**. Number and location of mooring harbors, with a preference for mooring adjacent to beaches and multi-use recreation destination areas, protected by wind and waves.

5. **Shoreline Access**. Shoreline access, including areas for shoreline fishing, restrooms, picnic tables, and other day-use facilities.

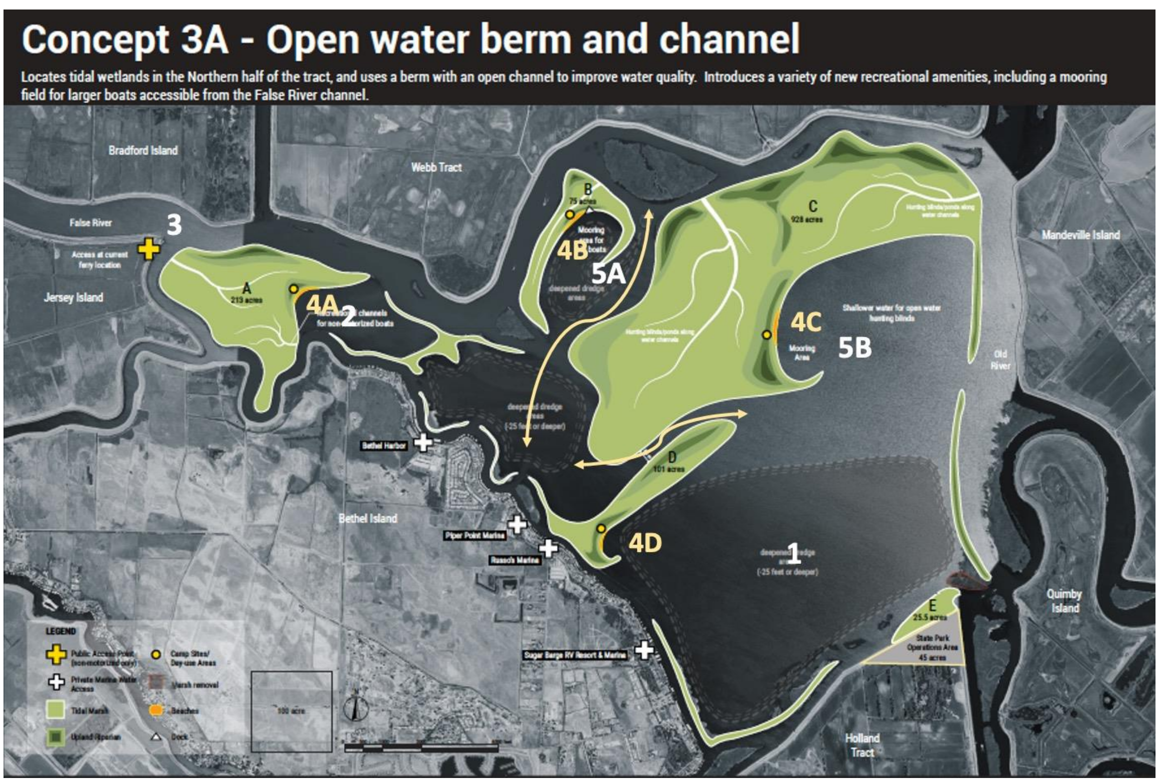
Based on criteria 1-5 above, ratings are provided for motorized boating, non-motorized boating, and shoreline access. Ratings are on a scale of 1-10, with 10 being best.

Key Assumptions and Uncertainties

- Enhancements for focal point use areas (with beaches, day use, and possible camping), shoreline park space, and moorings will be comparable between Project Concepts (Concepts 3A-3C) and will be accessible by multiple user types.
- Day use, beaches, and mooring areas will be located away from fast water navigation channels.
- Mooring areas will be protected from waves.
- Any enhancements or new recreation facilities will need to include adequate development costs and ongoing additional operation and maintenance (O&M) funds for State Parks or identify a long term operator with funding available for ongoing O&M. The ratings assume provision of required development and operations and maintenance funding, though this is acknowledged as a funding uncertainty.

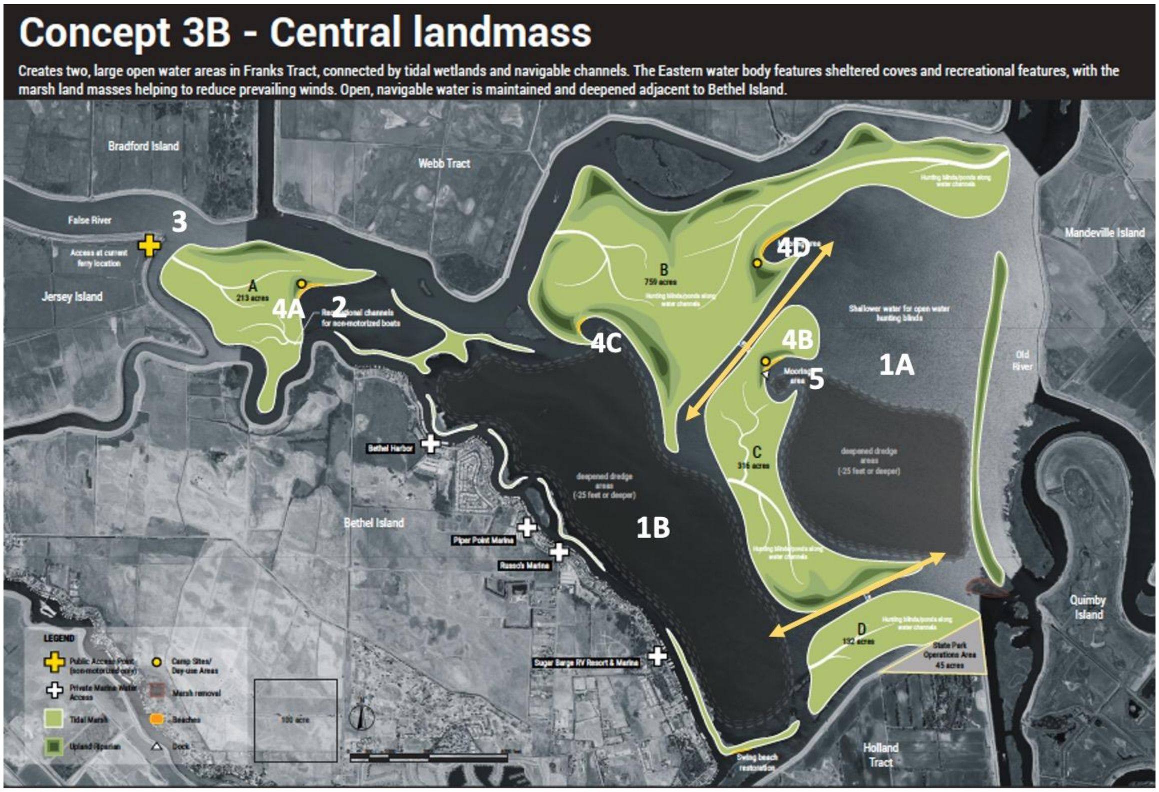
Evaluation Criteria Results

Figure 1. Recreation Enhancements for Concept 3A



1. Open water large and deep enough for multiple types of boating. Pool protected from northwest winds by landmass C and D, though prevailing west winds may create fetch at east side. May be conflicts between navigation and water sports at the west end with boats coming south off of False River into the Tract.
2. Slow water channels within the created tidal wetlands. Has provision for destination area in Little Franks Tract.
3. Public access point for non-motorized boating near Little Franks Tract via existing Bethel Island marinas and potentially at Jersey Point ferry. Public access at Jersey Point is planned to include non-motorized boat launch and public shoreline facilities, such as fishing pier, restrooms, picnic tables, etc.
4. Four new beaches. One beach designated for non-motorized boating within Little Franks Track (4A) and additional beach adjacent to mooring area for large boats (4B). Two beaches (4C, 4D) are fairly well-positioned at the north and west ends of the large pool and can be used by multiple user types. Can use Beach 4D for waterski take-off and landings, though may have some conflict with boats entering and leaving Piper Slough. Beach at 4C may be cut off from main recreation pool due to navigation traffic to and from Old River.
5. Has two areas for mooring, one for larger boats adjacent to False River (5A), and one for medium-sized crafts north of the open water (5B). Both are located in protected coves and are associated with beach/day use area. The mooring area at 5A can be used by very large boats (>30-36’) that can navigate False River but not the rest of the Tract. Mooring area 5B may be cut off from main recreation pool due to navigation traffic to and from Old River.

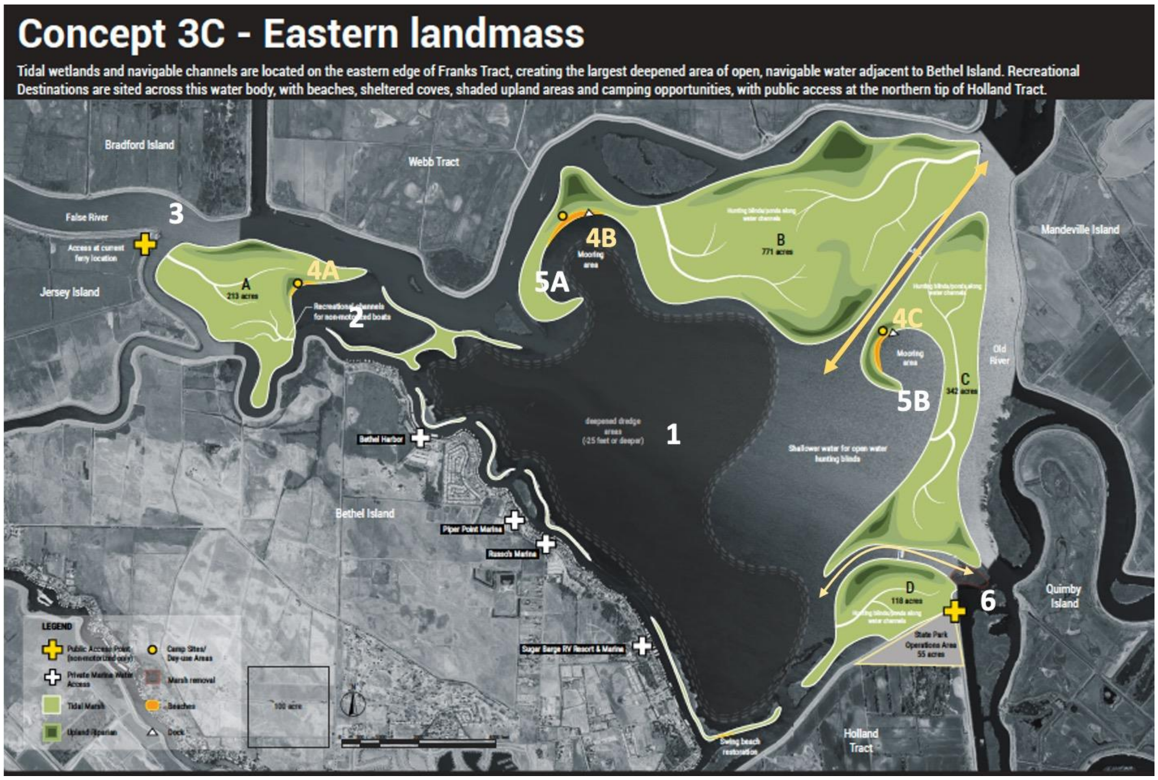
Figure 2. Recreation Enhancements for Concept 3B



1. Open water large enough for multiple types of boating. Two pools provides for more sheltered conditions in each, compared to one large pool (the east side of one large pool would have more waves due to winds and fetch). Pool 1A has little interference between waterskiing, fishing, or other recreation with fast boats going east to west. There is also the ability to have two separate water areas for different types of recreation spread out over the two pools.
2. Slow water channels within the created tidal wetlands. Has provision for destination area in Little Franks Tract.
3. Public access point for non-motorized boating near Little Franks Tract via existing Bethel Island marinas and potentially at Jersey Point ferry. Public access at Jersey Point is planned to include non-motorized boat launch and public shoreline facilities, such as fishing pier, restrooms, picnic tables, etc.
4. Four created beaches. One beach designated for non-motorized boating within Little Franks Track (4A). An additional beach adjacent to mooring area and open water (4B). Remaining Beaches (4C and 4BD) are in protected coves adjacent to open water areas. Ingress and egress from Beach "4D" may require refinement, if this concept is carried forward, to address any navigation safety issues, given the proximity of the beach to the fast water channel; this is assumed to be resolvable with minor revisions that should not affect the overall performance of this concept. Beach 4B provides room for water sports take off and landings.

5. Mooring protected by wind and waves from large pool activity and correctly positioned to avoid afternoon glare. The mooring area is easily accessible for most boats and located in an easily accessible location for all but the largest boats. Mooring should be slightly offset from beach area, but located close to beach to allow for most activities. Mooring could be improved by adding another location that is more sheltered for more passive activities.

Figure 3. Recreation Enhancements for Concept 3C



1. Large pool area for multiple types of boating. The increased recreational use may increase conflicts between multiple user types, as well as with fast boat traffic trying to navigate to or from Old River in the northeast. The larger pool may result in increased wave and wind action.
2. Slow water channels within the created tidal wetlands. Has provision for destination area in Little Franks Tract.
3. Public access point for non-motorized boating near Little Franks Tract via existing Bethel Island marinas and potentially at Jersey Point ferry and State Parks facility on Holland Tract. Public access is proposed to include non-motorized boat launch and public shoreline facilities, such as fishing pier, restrooms, picnic tables, etc.
4. Four created beaches. One beach designated for non-motorized boating within Little Franks Track (4A). Two beaches in protected coves adjacent to open water with mooring

areas for both large and medium boats (4B and 4C). Includes provision for Swing Beach restoration.

5. Has a two areas for mooring, one for larger boats adjacent to False River (5A), and one for medium-sized crafts east of the open water (5B). Both are located in protected coves and are associated with beach/day use areas. Mooring should be slightly offset from beach area. Egress to and from the mooring at 5B may be impacted by wind and waves, and access may be impeded by fast boat traffic through the channel.

Table 1. Provide and Enhance Recreation – Evaluation Criteria

Recreation Enhancements	No Action	Concept 3A	Concept 3B	Concept 3C
Motorized boating				
Open water (acres)	4,562	3,334	3,334	3,238
Configuration of open water	1 pool, largest pool, wind and waves hazards	1 pool, wind and waves hazards, navigation conflicts	2 pools, fewest hazards	1 pool, wind and waves hazards, navigation conflicts
Number of beaches	0	4, one near Bethel Island	4	4
Number of mooring areas	0	2, one for large boats, one for medium sized boats	1, for medium sized boats	2, one for large boats, one for medium sized boats
Non-motorized boating				
Opportunity (Little Franks Tract)	0	3.5	3.5	3.5
Number of beaches	0	4, one near Bethel Island	4	4
Number of public access facilities	0	1, Jersey Point	1, Jersey Point	2, Jersey Point and New State Parks facility
Shoreline recreation				
Number of beaches	0	4, one near Bethel Island	4	4
Number of public access facilities	0	1, Jersey Point	1, Jersey Point	2, Jersey Point and New State Parks facility

Based on evaluation of the above criteria, each concept was ranked against the No Action Alternative. All current project concepts would perform better for recreation over the No Action Alternative.

All project concepts are better than the No Action Alternative in regards to motorized boating, as they all have proposed similar acres of open water, similar beaches, and similar mooring. However, Concept 3B has a better pool design, with two pools allowing for less wind/waves and fewer hazards and conflicts. Concept 3B only has one mooring areas, while concepts 3A and 3C have two, though additional mooring areas could be added to 3B if preferred. The difference in mooring with Concept 3A is the field on the north adjacent to False River would allow for large boats (>30 feet) that cannot navigate through the Tract to have access to the Tract.

All project concepts are similar in regards to non-motorized boating since the current plan is to focus non-motorized boating in Little Franks Tract, and all concepts have the same design. Concept 3C ranks slightly higher as it proposes an additional non-motorized access point through a new proposed State Parks facility Holland Tract.

All project concepts are better than the No Action in terms of shoreline recreation. All concepts have similar beach numbers and quality. Concept 3A and 3B propose one new shoreline facility at Jersey Island, while Concept 3C also proposes an additional facility at Holland Tract.

Ratings

Based on criteria 1-5 above, ratings are provided for Recreation on a scale of 1-10, with 10 being best. Motorized boating rating is based on the open water, beaches, and mooring areas criteria. Non-Motorized boating rating is based on the slow water channels in Little Franks Tract, beaches, and public shoreline criteria. Shoreline recreation rating is based on the beaches, and public shoreline criteria. Overall, Concept 3B provides the best design for recreation.

Table 2. Provide and Enhance Recreation – Ratings by Concept (1-10 scale, 10 highest)

Recreation Enhancements	No Action	Concept 3A	Concept 3B	Concept 3C
Motorized Boating	**2**	**5**	**8**	**5**
Non-motorized Boating	**1**	**5.5**	**5.5**	**6**
Shoreline Recreation	**1**	**4.5**	**4.5**	**5**

References

Mickel, A., D. Rolloff, E. Erickson, G. Shaw. Dept. of Recreation, Parks, & Tourism Administration, California State University, Sacramento. (2017). **Recreational Boating Use of the Sacramento-San Joaquin Delta**. Delta Protection Commission. Retrieved from: http://delta.ca.gov/wp-content/uploads/2016/10/RecBoatingStudy_2017_-Final.pdf (7/16/19)

Milligan, Brett and Alejo Kraus-Polk, **Franks Tract and Little Franks Tract User Survey.** Appendix C of California Department of Fish & Wildlife. Franks Tract Futures. June 2018. Retrieved from: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=158682&inline

State of California – The Resources Agency, Department of Parks and Recreation. General Plan for Brannon Island and Franks Tract State Recreation Areas. February 1988.

EVALUATION CRITERIA INFORMATION SHEET

LOCAL ECONOMY

Objective	Evaluation Criterion	Description
• Improve local economic sustainability.	Business effects Real Estate value	The local economy is largely supported through fishing tournaments and recreation visitors. Evaluation metrics from other resource are frequently referenced to address potential economic features.

Context

The State of California established Franks Tract as a public use area in 1959, and over the decades the 3,500-acre park has become a popular location for water-based recreation. Adjacent to Franks Tract, Bethel Island is a 5.6-square-mile land mass located in the far-east corner of Contra Costa County. Its central-Delta location provides a key access point to the Delta for visitors from the inner Bay Area, and the local economy depends on these visitors. Jobs data show that approximately half of the employment on Bethel Island is directly tied to recreation. The Accommodation and Food Service industry is the most significant employer, followed by the Arts, Entertainment, and Recreation sector. In recent years, available data show that Accommodation and Food Service employment has expanded to meet growing demand, but that Arts, Entertainment, and Recreation employment (e.g., marinas, fishing guide services) has declined. Across all industries, the local Bethel Island economy supports roughly 15 percent fewer jobs than it did about 15 years ago.

Commercial real estate on Bethel Island is primarily composed of retail space – representing 90 percent of the market. The remaining 10 percent of the total commercial square footage is split evenly between office and industrial space. No new buildings or square footage have been added to the market in recent years (available data go back to 2006). Vacancies are limited and with the exception of in early 2020, market rents have been increasing steadily since 2013. Home values on Bethel Island have enjoyed a steady rise since 2010, increasing 144 percent. While nearby communities also have seen rapid price increases during time period, Bethel Island price escalation outpaced Oakley (123 percent growth) and Discovery Bay (106 percent growth). Despite the relative appreciation, Bethel Island home prices remain relatively affordable compared to these neighboring communities.

The project seeks to improve water quality, restore native ecology, and enhance recreation. And with the Bethel Island economy tied to the wellbeing of local environmental conditions and recreational opportunities, specifically factors that influence boating and fishing, it is expected the project will sustain and grow local economic opportunity. The current and ongoing degradation of environmental conditions in Franks Tract is a business risk, with invasive aquatic weeds and elevated salinity events generating the most concern. For local businesses, if the boating and fishing conditions are first-rate, and navigation and access are sustained or improved, the prospects for ongoing local business success are strongest.

Description

The economic assessment relied on an outreach process that engaged a roster of business oriented stakeholders representing various perspectives on economic conditions and potential effects that may occur as a result of Franks Tract Futures. Interviewees include local employers, business leaders, real estate experts, recreation advocates, community group representatives, and other Franks Tract stakeholders. The economic review focuses on the Bethel Island economy, the primary economic geography supporting recreation activities at Franks Tract.

The two primary target objectives are:

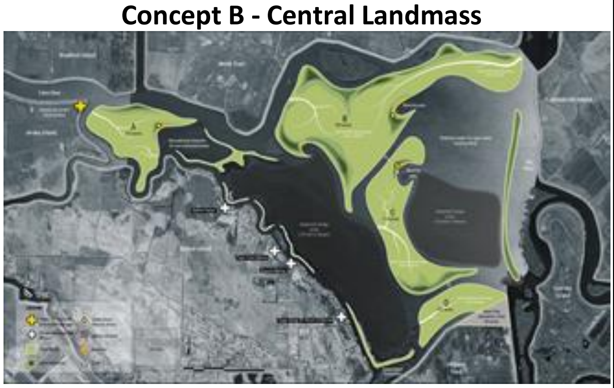
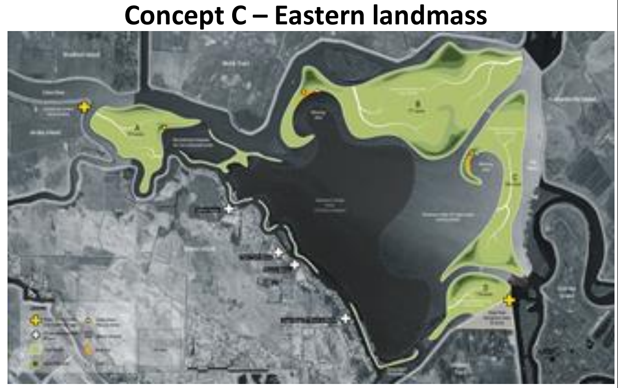
- Business effects
- Real Estate value

Evaluation Criteria

Objective	Criteria
Business effects	• Recreation – improved recreational opportunities. See Recreation ECISs. • Navigation – access to Bethel Island. See Navigation – Boating Routes ECIS. • Environmental quality – related to aquatic weeds and salinity. See AIS ECIS and Water quality ECIS.

Real Estate	• Navigation – access to fast water should be maintained along Bethel Island.
	• Aesthetics
	    ○ Open water and open water views should be maintained along the Piper Slough side of Bethel Island.
	    ○ Minimize riparian vegetation in front of Bethel Island.
	    ○ Create vegetated and 'naturalistic' looking landscape features such as incorporating vegetated marsh surfaces and minimize extent of mudflat.

Evaluation among the concepts

No Action	Concept A – Open water berm and channel
 Recreation: Limited land-based recreational opportunities. Navigation: Good access to Bethel Island, continued challenges from aquatic weeds, shallow water, and in-water hazards. Aesthetics: Open water views in front of Bethel Island.	 Recreation: Additional beaches, mooring areas, and non-motorized boating opportunities. Navigation: Access to Bethel Island partially blocked by peninsula, deepened open water areas to discourage aquatic weeds, removal of in-water hazards. Aesthetics: Peninsula closest to Bethel Island, undesirable views for real estate.
Concept B - Central Landmass	**Concept C – Eastern landmass**
 Recreation: Additional beaches, mooring areas, and non-motorized boating opportunities. Navigation: Ok access to Bethel, deepened open water areas to discourage aquatic weeds, removal of in-water hazards. Aesthetics: Some open water views with marsh in distance.	 Recreation: Additional beaches, mooring areas, and non-motorized boating opportunities. Navigation (access to Bethel Island): Ok access to Bethel, deepened open water areas to discourage aquatic weeds, removal of in-water hazards. Aesthetics: Open water views from Bethel Island, landmass furthest from Bethel Island.

Key Assumptions and Uncertainties

- Short term economic and community impacts are expected during the construction period of any future project. Such short term impacts and long term construction impacts are included in the Constructability, Construction Impacts and Costs ECIS.

Results

Table 1. Local Economy – Metrics and Overall Ratings, for all Concepts

Local Economy	No Action	Concept 3A	Concept 3B	Concept 3C
Business effects	**4.9**	**5.7**	**6.7**	**6.5**
Recreation – overall rating	2.3	5.3	6.1	5.6
Navigation – overall rating	7.4	6.1	7.2	7.3
Real Estate	**4.6**	**5.4**	**6.3**	**6.4**
Navigation – overall rating	7.4	6.1	7.2	7.3
Recreation – overall rating	2.3	5.3	6.1	5.6
Aesthetics – open views, riparian vegetation not in front of Bethel Island	10	3	5	7
Aesthetics - Vegetated marsh surfaces	1	4	5	5
Nuisance conditions (Aquatic invasive vegetation)	1	7	7	7
Overall Rating	**4.5**	**5.2**	**6.2**	**6.4**

Discussion

The project proposed potential change to the local economy and community on Bethel Island and surrounding areas. It is important that any project maintains or improves effects on local businesses, real estate, and aesthetics. Concepts B and C best preserve open water views. The potential to create naturalistic landmass features like tidal wetlands and to reduce the extant of nuisance aquatic weed conditions is a potential benefit of all the concepts over the No Action Alternative. Real estate values are seen to be linked to these aesthetic conditions, as well as being dependent on the overall navigation and recreation opportunities proposed in any design concepts.

References

Economic & Planning Systems, Inc. 2020. Franks Tract Futures Economic Assessment.

EVALUATION CRITERIA INFORMATION SHEET

ECOLOGY – TIDAL MARSH AND ASSOCIATED HABITATS

Objective	Evaluation Criterion	Units	Description
Benefit a range of native species by establishing large areas of tidal marsh and associated habitats.	Tidal marsh and associated habitats	Area (acres)	Reports the area of tidal marsh plain and associated tidal channels and riparian edge.

Context

Approximately 97% of historic tidal marsh has been lost from the Delta (SFEI-ASC, 2016). Tidal marsh is important habitat for both aquatic and terrestrial species, and supports the aquatic food web by producing important phytoplankton and zooplankton. Restoration of tidal habitat is critical to recovery of native and endangered species such as Delta smelt and juvenile salmonids. The Delta Reform Act identifies diverse and biologically appropriate habitats and ecosystem processes, functional corridors for migratory species, and viable populations of native species as characteristics of a healthy Delta ecosystem (California Water Code section 85302[c]).

Description

The total area of tidal marsh is a simple metric to evaluate how much beneficial tidal marsh habitat would be restored. The tidal marsh metric includes vegetated (emergent) tidal marsh plain and tidal channels, with smaller areas of adjacent upland. Tidal marsh supports emergent vegetation consisting of predominately tules (*Schoenoplectus* spp), bulrushes (*Bolboschoenus* spp.), and cattails (*Typha* spp). Tidal channels would be designed to incorporate multiple dendritic dead-end channels ranging in sizes (CDFW, 2018). Channels would range from largest (deepest and widest) where they enter the marsh, for example at False River, to smallest at their termini inside the marsh. Riparian habitat may be installed, or recruit naturally, along the containment berms used to construct the tidal marsh and along major tidal channels (similar to low natural berms). Design criteria are not detailed at this stage of project planning, though it is assumed that at later design stages, and under any selected concept, tidal marsh would be designed to be functional and diverse.

Methods

For each concept:

- The area of tidal marsh, including emergent marsh and tidal channels, is measured from the maps. The metric is calculated as the total of all new land and tidal channel areas for the given concept.

Key Assumptions and Uncertainties

- Tidal marsh is estimated as the area of new land mass assuming only small areas of upland habitat.
- Vegetated marsh elevations may vary from those of natural marshes (which are observed near mean higher high water), identified in design refinements. For modeling, the project assumes a balance between reducing fill use and maximizing natural marsh elevations.
- Additional information on tidal channels is provided in the Ecology – Special Status Species Evaluation Criteria Information Sheet and Ecology – Sportfish Habitat Evaluation Criteria Information Sheet.
- Large contiguous areas of tidal marsh are generally a design objective, along with minimizing marsh distance to nearest neighbor, and maximizing marsh core areas ratio (CDFW, 2018). These design elements would be considered qualitatively during design refinement.

Results/Ratings

Ratings are provided on a 1 to 10 scale with 1 indicating no tidal marsh and 10 indicating the entire Franks Tract and Little Franks Tract interiors are tidal marsh.

Table 1. Tidal Marsh and Associated Habitats Metrics and Ratings

Tidal Marsh	No Action	Concept 3A	Concept 3B	Concept 3C
Tidal marsh area (acres)	0	1,277	1,311	1,323
Overall rating	**1**	**4**	**5**	**5**

References

California Department of Fish and Wildlife (CDFW). 2018. Franks Tract Futures? Multi-Benefit Restoration Synthesis Report. June

San Francisco Estuary Institute-Aquatic Science Center (SFEI-ASC). 2016. A Delta Renewed: A Guide to Science-Based Ecological Restoration in the Sacramento- San Joaquin Delta. Prepared for the California Department of Fish and Wildlife and Ecosystem Restoration Program. A Report of SFEI-ASC's Resilient Landscapes Program, Publication #799, San Francisco Estuary Institute-Aquatic Science Center, Richmond, CA.

EVALUATION CRITERIA INFORMATION SHEET

SPECIAL STATUS FISH HABITAT

Objective	Evaluation Criterion	Units	Description
Enhance habitat for special-status fish species: • Chinook salmon • Delta smelt	Chinook salmon habitat	Length of tidal marsh channel (feet) Number of tidal channels connected to migratory pathway (northern landmass(es)) Habitat connectivity from Old River to False River (acres of northern landmass(es))	Reports the area of high-quality habitat for special-status species based on specific habitat attributes.
	Delta smelt habitat	Little Franks Tract open water adjacent to tidal marsh (acres) Area of tidal marsh in Little Franks Tract (acres)	

Context

The central Delta region, including Franks Tract, serves as a migration corridor and provides habitat for rearing and spawning of several special-status fish species. Historically, the Delta supported a ecosystem characterized by shallow-water habitats with dentritic channels and emergent wetland vegetation which provided refuge and food supply for native fish species, including several special-status species, such Chinook salmon (*Oncorhynchus tshawytscha*) and Delta smelt (*Hypomesus transpacificus*). Currently, many of the habitats within the Delta are considered highly modified and degraded. Factors affecting these species include but are not limited to, adverse water quality conditions, habitat loss, changes to the native food web, the potential for entrainment into the south Delta region as a result of large diversions, and increased predation by nonnative predatory fish species (Baxter et al. 2008, Grimaldo et al. 2009). Potential for entrainment is addressed in the Ecology – Fish Entrainment Evaluation Criteria Information Sheet.

The target species used for the purposes of evaluation include Sacramento River Winter-Run Chinook salmon evolutionarily significant unit (ESU), Central Valley Spring-Run Chinook salmon ESU, Central Valley Fall-/Late Fall-Run Chinook salmon, and Delta smelt, which are species identified for protection under the California Endangered Species Act (CESA) and/or the Federal Endangered Species Act (FESA) (Table 1).

Critical Habitat

Critical habitat is defined in Section 3(5)A of the FESA as the specific portions of the geographic area occupied by the species in which physical or biological features essential to the conservation of the species are found and that may require special management considerations or protection. Specific areas outside of the geographic area occupied by the species may also be included in critical habitat designations upon a determination that such areas are essential for the conservation of the species. The National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) and have designated all or part of the Delta (including Franks Tract) as critical habitat for Central Valley Spring-Run, Sacramento River Winter-Run Chinook salmon, and Delta smelt (Table 1).

Essential Fish Habitat

Public Law 104-297, the Sustainable Fisheries Act of 1996, amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) to establish new requirements for Essential Fish Habitat (EFH) descriptions in Federal Fisheries Management Plans (FMP) and to require Federal agencies to consult with NMFS on activities that may adversely affect EFH. The Magnuson-Stevens Act requires all fishery management councils to amend their FMP to describe and identify EFH for each managed fishery. Portion of the Delta, including Franks Tract, are within designated EFH for Central Valley Fall-/Late Full-Run Chinook salmon, Central Valley Spring-Run Chinook salmon, and Sacramento River Winter-Run Chinook salmon (Table 1).

Table 1. FESA and CESA Listed Species

Species	Status	Distribution
Central Valley Fall-/Late Fall-Run Chinook salmon	SSC, SC, EFH	Sacramento and San Joaquin rivers and their major tributaries, Delta, Suisun Bay; San Francisco Bay, Pacific Ocean

Central Valley Spring-Run Chinook salmon	ST, FT, CH, EFH	Sacramento and Feather river and their major tributaries; Delta, Suisun Bay; Suisun and Napa marshes, San Francisco Bay, Pacific Ocean
Sacramento River Winter-Run Chinook salmon	SE, FE, CH, EFH	Sacramento River; Delta, San Francisco Bay, Pacific Ocean
Delta smelt	SE, FT, CH	Delta, San Francisco Bay

KEY:

SSC = State species of special concern
ST = State threatened species
SE = State endangered species
SC = Federal species of concern
FT = Federal threatened species
FE = Federal endangered species
CH = Critical Habitat
EFH = Essential Fish Habitat

Description

The two primary target species are:

- Chinook salmon
- Delta smelt

Chinook Salmon

Central Valley Fall-/Late Fall-Run Chinook Salmon

Adult Central Valley fall-/ late fall–run Chinook salmon enter the Sacramento and San Joaquin River systems from September through January and spawn from October through February. During spawning, the female digs a redd (gravel nest) and deposits her eggs, which are then fertilized by the male. Newly emerged fry remain in shallow, lower-velocity edgewaters, particularly where debris congregates and provides cover from predators (CDFW 1998).

Juveniles typically rear in freshwater (in their natal streams, the Sacramento River system, and the Sacramento–San Joaquin Delta) for three to six months (Fall-Run) and up to 12 months (Late Fall-Run) before entering the ocean. Juveniles migrate downstream from January through June. Important winter habitat for juvenile Chinook salmon includes flooded bars, side channels, and overbank areas with relatively low water velocities. Juvenile Chinook salmon have been found to rear successfully in floodplain habitat, which routinely floods but is dry at other times. Growth rates appear to be enhanced by the conditions found in floodplain habitat.

Cover structures, space, and food are necessary components for Chinook salmon rearing habitat. Suitable habitat includes areas with instream and overhead cover in the form of undercut banks, downed trees, and large, overhanging tree branches. The organic materials forming fish cover also help provide sources of food, in the form of both aquatic and terrestrial insects.

Juvenile Chinook salmon in the Sacramento River system move out of upstream spawning areas into downstream habitats in response to many factors, including inherited behavior, habitat availability, flow, competition for space and food, and water temperature. Both the number of juveniles that move and the timing of movement are highly variable. Storm events and the resulting high flows appear to trigger movement of substantial numbers of juvenile Chinook salmon to downstream habitats. Fall-Run Chinook salmon emigrate as fry and subyearlings and remain off the California coast during their ocean migration.

Central Valley Fall-/Late Fall Run Chinook salmon are not listed under CESA or FESA, however; however, the Delta is within Essential Fish Habitat (EFH) designations. Designated EFH includes migration, holding, and rearing habitat in the Delta, including Franks Tract.

Spring-Run Chinook Salmon

Central Valley Spring-Run Chinook salmon were historically the second most abundant run of Central Valley Chinook salmon (Fisher 1994). They occupied the headwaters of all major river systems in the Central Valley where there were no natural barriers. Adults returning to spawn ascended the tributaries to the upper Sacramento River, including the Pit, McCloud, and Little Sacramento Rivers. They also occupied Cottonwood, Battle, Antelope, Mill, Deer, Stony, Big Chico, and Butte Creeks and the Feather, Yuba, American, Mokelumne, Stanislaus, Tuolumne, Merced, San Joaquin, and Kings Rivers. Spring-Run Chinook salmon migrated farther into headwater streams where cool, well-oxygenated water is available year-round.

Historical records indicate that adult Spring-Run Chinook salmon enter the mainstem Sacramento River in February and March and continue to their spawning streams, where they then hold in deep, cold pools until they spawn. Spring-Run Chinook salmon are sexually immature during their spawning migration. Some adult Spring-Run Chinook salmon start arriving in the Feather River below the Fish Barrier Dam in June. They remain there until the fish ladder is opened in early September. Spawning and rearing requirements for the species are similar to those identified below for Fall-Run Chinook salmon (see above).

Spawning occurs in gravel beds from late August through October, and emergence takes place in March and April. Spring-Run Chinook salmon appear to emigrate at two different life stages: fry and yearlings. Fry move between February and June, while the yearling Spring-Run emigrate October to March, peaking in November (Moyle et al. 2017). Juveniles display considerable variation in stream residence and migratory behavior. Juvenile Spring-Run Chinook salmon may leave their natal streams as fry soon after emergence or rear for several months to a year before migrating as smolts or yearlings (Yoshiyama et al. 1998). Triggers for downstream movement are similar to those described below for Fall-Run Chinook salmon.

Critical habitat for the Central Valley Spring-Run Chinook salmon was designated on August 12, 2005; a final designation was published on September 2, 2005, with an effective date of January 2, 2006. Critical habitat is designated to include selected waters in the Sacramento River basin from approximately Redding (River Mile 302) to approximately Chipps Island (River Mile 0) at the westward margin of the Delta and includes the Sacramento River.

Spring-Run Chinook salmon are listed as threatened under FESA and CESA. EFH has been identified for Central Valley Spring-Run Chinook salmon ESU. Spring-Run EFH includes migration, holding and rearing habitat in the Delta, Sacramento River, and major tributaries.

Winter-Run Chinook Salmon

Adult Sacramento River Winter-Run Chinook salmon leave the ocean and migrate through the Delta into the Sacramento River system from November through July. Chinook salmon migrate upstream past the Red Bluff Diversion Dam (RBDD) on the Sacramento River from mid-December through July, and most of the spawning population has passed RBDD by late June. Winter-Run Chinook salmon spawn from mid-April through August, and incubation continues through October. The primary spawning grounds in the Sacramento River are above RBDD.

Juvenile Winter-Run Chinook salmon rear and emigrate in the Sacramento River from July through March (Moyle et al. 2017). Juveniles descending the Sacramento River above RBDD from August through October and possibly November are mostly presmolts (smolts are juveniles that are physiologically ready to enter seawater) and probably rear in the Sacramento River below RBDD. Juveniles have been observed in the Delta between October and December, especially during high Sacramento River discharge caused by fall and early-winter storms. Triggers for downstream movement are similar to those described below for Fall-Run Chinook salmon. Winter-Run salmon smolts may migrate through the Delta and bay to the ocean from December through as late as May (Yoshiyama et al. 1998). The Sacramento River channel is the main migration route through the Delta. Adult Winter-Run Chinook salmon spend one to four years in the ocean. About 67 percent of the adult escapement that leaves the ocean to spawn in the Sacramento River consists of 3-year-olds, 25 percent consists of 2-year-olds, and 8 percent consists of 4-year-olds (Hallock and Fisher 1985).

Critical habitat for the Winter-Run Chinook salmon ESU was designated on June 16, 1993 by NMFS with an effective date of July 16, 1993. Critical habitat is designated to include the Sacramento River from Keswick Dam (River Mile 302) to Chipps Island (River Mile 0), including portions of Franks Tract, and all waters westward including the San Francisco Bay north of the Bay Bridge to the Golden Gate Bridge.

Winter-Run Chinook salmon are listed as endangered under FESA and CESA. EFH has been identified for Sacramento River Winter-Run Chinook salmon ESU. Winter-Run EFH includes migration, holding, and rearing habitat in the Delta, Sacramento River, and major tributaries.

Delta Smelt

Delta smelt, endemic to the Sacramento-San Joaquin Delta, was listed as a federal threatened species in 1993. Delta smelt is a euryhaline, tolerant of a wide salinity range, species that spawns in freshwater sloughs and shallow edge-waters of channels of the Sacramento-San Joaquin Delta between February and June. Adult smelt migrate upstream from the brackish water habitat of the mixing zone to spawn in freshwater areas, beginning in December to July and August. After hatching, larvae are transported downstream toward the mixing zone where they mature. The location of the mixing zone varies. When the mixing zone is contained within Suisun Bay, young Delta smelt are dispersed throughout a large expanse of shallow-water and marsh habitat. However, when the mixing zone is located upstream, it becomes confined in deep river channels that have smaller total surface area, fewer shoal areas, and swifter, more turbulent water currents.

Historically, Delta smelt congregated in upper Suisun Bay and Montezuma Slough (mainly during March to mid-June when the Sacramento and San Joaquin river flows are high. It is thought to have occurred from Suisun Bay to the City of Sacramento in the Sacramento River and Mossdale in the San Joaquin River. Spawning has been recorded in Montezuma and Suisun sloughs and their tributaries north of Suisun Bay, in the Sacramento River up to Rio Vista, and in Barker, Lindsey, Cache, Georgiana, Prospect, Beaver, Hog, and Sycamore sloughs.

Critical habitat was designated for this species in 1994 and became effective on 18 January 1995. Critical habitat is designated as Suisun Bay (including the contiguous Grizzly and Honker Bays); the length of Goodyear, Suisun, Cutoff, First Mallard (Spring Branch), and Montezuma sloughs; and the existing contiguous waters contained within the Delta (including Franks Tract), as defined in Section 12220 of the California Water Code.

Delta smelt are designates as endangered under CESA and threatened under FESA.

Methods

Evaluation criteria will be used to report on the quality of habitat for the target species described above for the No Action Alternative and three design concepts (Figure 2). Each criterion is based on the key habitat attributes for each species as follows:

Chinook Salmon

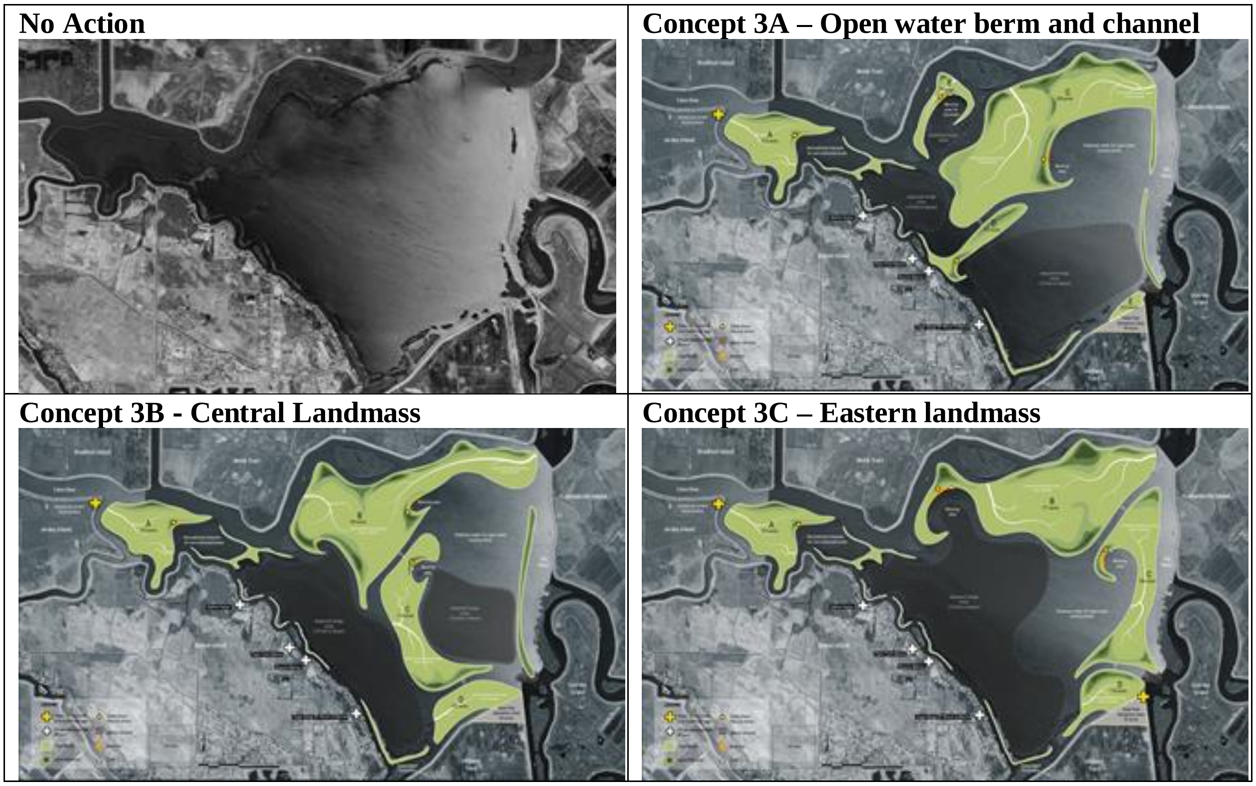
1. Length of tidal marsh channels measured in feet. Narrow channels provide refuge for outmigrating juvenile Chinook salmon. Juveniles use smaller channels for rearing and foraging as they migrate to the ocean through the Delta (CDFW 1998).
2. Access to a potential migratory pathway as shown in Figure 1. A migratory route for Chinook salmon may be along the north of Franks Tract, with salmon moving from Old River along False River towards the San Joaquin River.
3. Number of tidal channels connected to northern tidal marsh land mass along migratory pathway. Tidal marsh channels provide food resources and refugia for outmigrating salmon.

Figure 1. Blue arrows indicate potential directional migration pathway for juvenile Chinook salmon.

Delta Smelt

1. Acres of open water adjacent to tidal marsh in Little Franks Tract in the No Action alternative is 318 acres. Little Franks Tract is the same across all alternative designs with 233 acres of adjacent open water.
2. Open water habitat adjacent tidal marsh in Little Franks Tract to the west of Franks Tract. The western part of Franks Tract experiences fluctuations in salinity with water pushing in from the west. Delta smelt are most likely to occur in these low salinity zones within Franks Tract. All concepts propose 113 acres of open water in Little Franks Tract. Because the No Action Alternative has no tidal marsh, there is no open water adjacent to tidal marsh.

Figure 2. No Action Alternative and 3 design concepts.



Key Assumption and Uncertainties

- Assumes Little Franks Tract provides suitable habitat for Delta smelt in terms of salinity and turbidity.
- This is a very simplified representation of ecological requirements for Chinook salmon and Delta smelt.

Results

Table 2. Special Status Fish Habitat – Metrics and Overall Ratings, for all concepts

Habitat Enhancements	No Action	Concept 3A	Concept 3B	Concept 3C
Chinook salmon				
Length of tidal marsh channels (feet)	0	122,746	131,058	132,348
Habitat connectivity from Old River to False River (acres of northern tidal marsh landmass)	0	1,003	759	771
Number of tidal channels connected to migratory pathway	0	3	2	2
Delta smelt				

Tidal marsh in Little Franks Tract (acres)	0	233	233	233
Open water adjacent to tidal marsh in Little Franks Tract (acres)	0	113	113	113
Overall Rating	**2.5**	**6.8**	**6.2**	**6.2**

Discussion

There are slight nuances between the concepts defining habitat for special-status fish species; however, any selected concept would provide improved habitat for Delta smelt and Chinook salmon over current conditions within Franks Tract (i.e. No Action Alternative). The most substantial habitat improvement is realized through the creation of tidal marsh landmasses with dendritic tidal channels. The creation of new tidal marsh habitat has the potential to provide refuge habitat and increased primary production (i.e., fish food) for outmigrating juvenile Chinook salmon and Delta smelt in various parts of the tract.

References

Baxter, R., Breuer R., Brown, L., Chotkowski, M., Feyrer, F., Gingras, M., Herbold, B., Mueller-Solger, A., Nobriga, M., Sommer, T., Souza, K. 2008. Pelagic Organism Decline Progress Report: 2007 Synthesis of Results. Interagency Ecological Program.

California Department of Fish and Wildlife (CDFW). 1998. A status review of the springrun chinook salmon (*Oncorhynchus tshawytscha*) in the Sacramento River drainage. Report to California Fish and Game Commission. Candidate species status report 98–1.

Fisher, F. 1994. Past and Present Status of Central Valley Chinook Salmon. Conservation Biology, 8(3), 870-873.

Grimaldo, L. F., Sommer, T., Van Ark, N., Jones, G., Holland, E., Moyle, P. B., others. (2009). Factors affecting fish entrainment into massive water diversions in a tidal freshwater estuary: can fish losses be managed?. North American Journal of Fisheries Management, 29(5), 1253-1270.

Hallock, R. and Fisher, F. 1985. Status of Winter-Run Chinook Salmon, *Oncorhnchus tshawytscha*, in the Sacramento River. Anadromous Fish Branch CDFW Office Report.

Moyle, P., R. Lusardi, P. Samuel, and J. Katz. 2017. State of the Salmonids: Status of California's Emblematic Fishes 2017. Center for Watershed Sciences, University of California, Davis and California Trout, San Francisco, CA. 579 pp.

National Marine Fisheries Service. 2016. "California Central Valley Recovery Domain 5-Year Review: Summary and Evaluation of Central Valley Spring-run Chinook Salmon Evolutionarily Significant Unit." 41pp.

Orr, Michelle, and Jessica Olson, ESA-PWA. 2014. Memo to Patty Finfrock, Department of Water Resources. Subject: Dutch Slough Marsh Restoration Project: Task 6.5 Tidal Channel Design.

Williams, J. 2006. “Central Valley Salmon: A Perspective on Chinook and Steelhead in the Central Valley of California.” San Francisco Estuary and Watershed Science 4(3): 416.

Yoshiyama, R., Fisher F., and Moyle, P. 1998. Historical Abundance and Decline of Chinook Salmon in the Central Valley Region of California. North American Journal of Fisheries Management 18(3), 487-521.

EVALUATION CRITERIA INFORMATION SHEET

ECOLOGY - FISH ENTRAINMENT

Objective	Evaluation Criterion	Units	Description
Minimize risk of entrainment of fish species of management concern by modifying hydrodynamic conditions	Reduce transport of particles from locations representative of fish presence to the vicinity of the south Delta pumps	% particles recovered	Reports percentage of particles released from locations of interest recovered at other (desirable and undesirable) locations of interest, as modeled using particle tracking

Context

The hydrodynamics at Franks Tract contribute to mixing of saline water and fish from False River into Franks Tract and on to the central Delta. One consequence of these hydrodynamics is that smelt, salmonids and other state and/or federally protected fish species are pulled towards the south Delta where chances of survival are lower due to entrainment at the south Delta state and federal pumping facilities.

Entrainment of fish into the south Delta represents not only an ecological risk to listed species, but also a reliability issue for water operations. Particle tracking focused on Chinook salmon and Delta smelt because entrainment of these fish can trigger water export reductions under the CDFW (2020) Incidental Take Permit for the State Water Project and federal Biological Opinions by National Marine Fisheries Services and United States Fish and Wildlife Services (2019). For discussion of water supply reliability aspects of fish entrainment, see the Water Quality and Supply Reliability Evaluation Criteria Information Sheet.

Methods

In order to evaluate the effect of the altered geometry on entrainment of two special-status fish species (Delta smelt and Chinook salmon), DWR performed particle tracking modeling simulations on Concept B under a variety of hydrologic conditions using three injection sites: the San Joaquin near False River (near Jersey Point), the mouth of Old River, and Turner Cut (Figure 1, yellow stars). These locations are considered representative of where smelt would enter Franks Tract from the west and outmigrating juvenile salmonids would enter from the east. Particles were injected every 15 minutes through 1 full day to capture a full tidal cycle. Recovery locations were designated as regions in the south Delta and west Delta. The south Delta recovery area includes the State Water Project (SWP) and the Central Valley Water

Project (CVP) export facilities and assumes fish entrainment (Figure 1, red polygon). The west Delta includes anything west of Big Break and assumes fish moved to beneficial rearing habitat and successfully outmigrated (Figure 1, green polygon). Particles were injected every 15 minutes through 1 full day to a capture full tidal cycle and recovered after 28 days, with check in on days 7, 14, and 21. For further detail on hydrodynamic modeling, see Appendix D.

A range of periods representing different flow conditions were simulated (Table 1). Due to practical limitations, modeling was performed for Concept B only. Results from Concept B were extrapolated to Concepts A and C.

Table 1. Model Hydrologic Year-Type and Operational Conditions

30-day Period from	Characteristics of the period	DTO (cfs)	OMR (cfs)
2010-02-24	High outflow, med OMR	21,231	-4,455
2015-02-25	Low outflow, med OMR	5,349	-3,183
2015-05-01	Low outflow, low OMR	5,163	-1,471

DTO = Delta Total Outflow

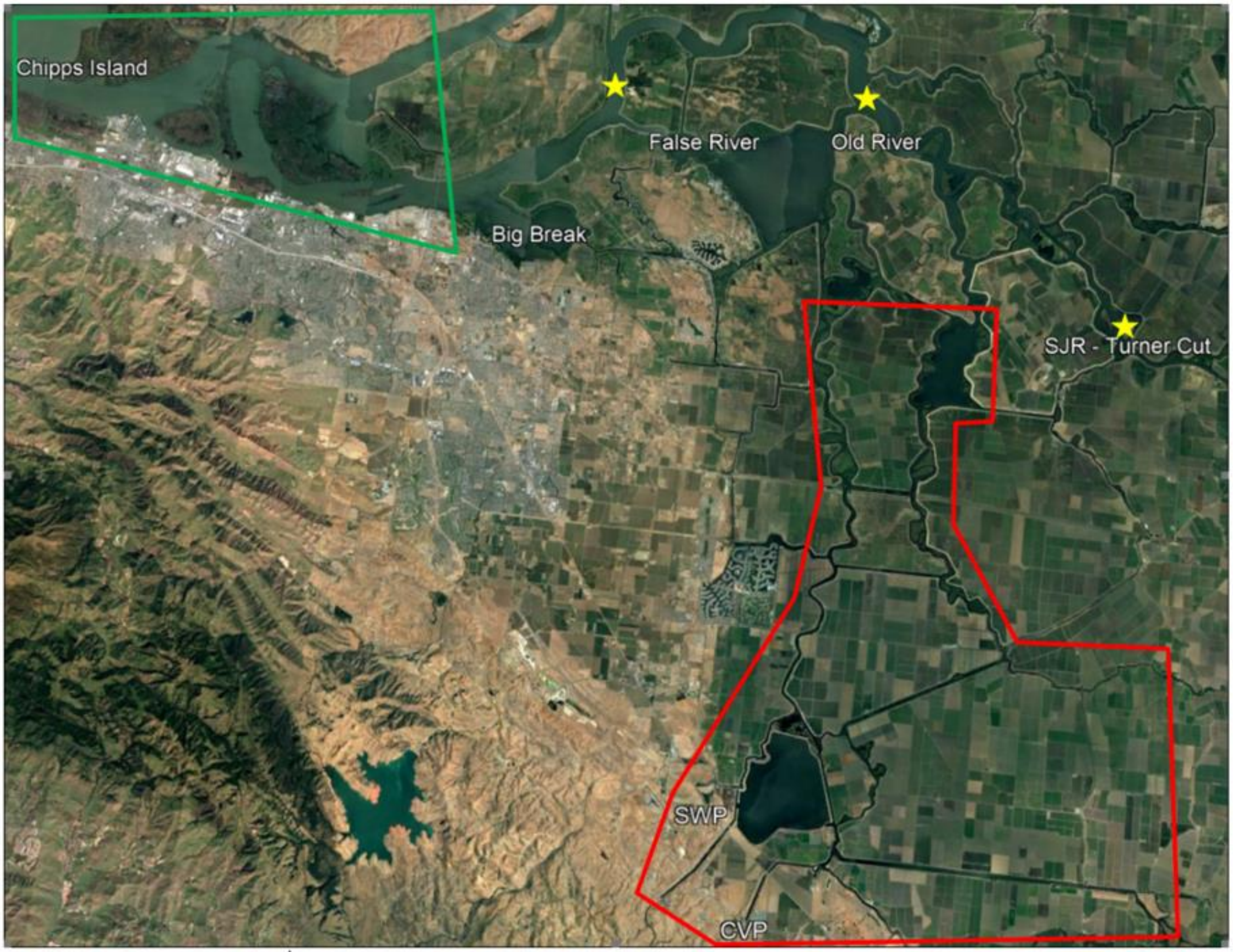
OMR = Old and Middle River

Evaluation Criteria

Entrainment was evaluated by the percentage of particles released from each location recovered at each site at each recovery time period. For each fish species and life stage modeled:

- South Delta: % decrease = benefit
- West Delta: % increase = benefit

Figure 1. Particle injection (☆) and recovery (polygon) locations.



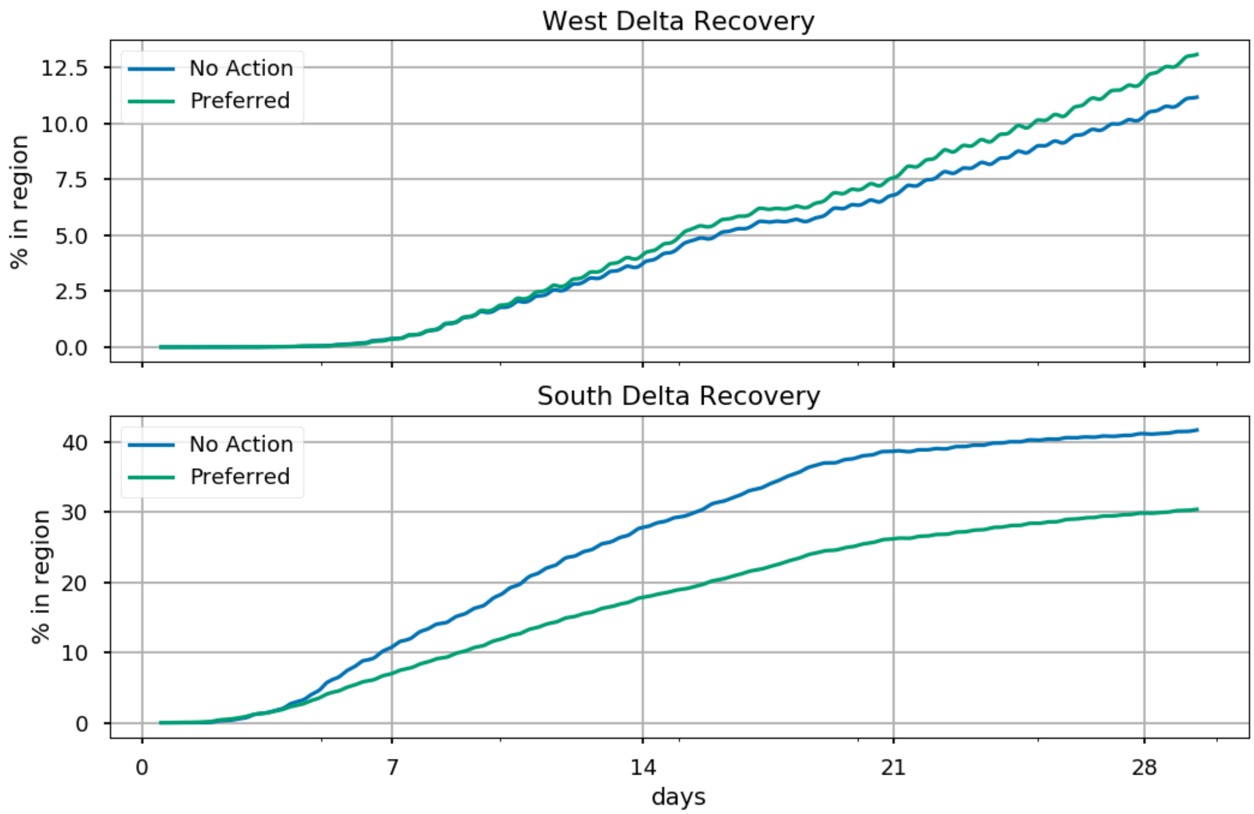
Key Assumptions and Uncertainties

Modeling was performed to evaluate changes in hydrodynamics that could relate to potential transport of organisms (fish). Hydrodynamics influences the transport of early life stage fishes and other organisms to varying degrees based on swimming capabilities, behavioral responses. In general, net movements towards the south would be an adverse response due to increased vulnerability to in Delta and export losses.

Results

Model results for Concept B suggest the configuration of this concept appreciably reduces entrainment from sites west of Franks Tract. For instance, in the lower export March case, the fraction of neutrally buoyant particles injected at Jersey Point entrained at the export facilities drops from slightly over 40% to 30% percent, a 25% reduction (Figure 2, bottom graph). Entrainment goes up slightly (by 3%) for particles injected on the east side of Franks Tract near the mouth of Old River under for the same model run. The project has an insignificant effect on entrainment for particles release at Turner Cut. Model results suggest the concept configuration had a minor effect on percentage of particles recovered in the west Delta near Suisun (Figure 2, top graph).

Figure 2. Particle recovery in the west and south Delta for particles released on the San Joaquin River near Jersey Point for Concept B. Modeled hydrological conditions represent March of 2015.



While Concepts A and C were not modeled, results for these concepts are expected to be similar to those available for Concept B.

Ratings

Table 2. Entrainment – Metrics and Overall Ratings

	No Action	Concept A	Concept B	Concept C
Supply Reliability				
Smelt	5	8	8	8
Salmonids	5	5	5	5
Overall Rating	**5**	**7**	**7**	**7**

EVALUATION CRITERIA INFORMATION SHEET

SPORTFISH HABITAT

Objective	Evaluation Criterion	Units	Description
Maintain or enhance habitat for fish species of interest: • Largemouth bass • Striped bass	Largemouth bass habitat Striped bass habitat	Length of edge habitat (feet) Open water area (acres) Number of velocity gradients (acres)	Reports the area of high-quality habitat for target species based on specific habitat attributes.

Context

The Sacramento-San Joaquin Delta is a highly invaded ecosystem and one cause of invasion was the intentional introduction of non-native fish species for recreational fishing. Recreational sportfishing, primarily focused on largemouth bass (*Micropterus salmoides*) and striped bass (*Morone Saxatilis*), has now become a popular activity and major economic driver for Franks Tract and the neighboring communities. Maintaining bass fishing tournaments and recreational fishing opportunities is important to stakeholders and the local communities, therefore, an interconnected goal of the Franks Tract Futures project is to maintain or enhance habitat for these species of recreational importance.

Description

Largemouth Bass

Largemouth Bass are non-native to California, and were introduced to the Sacramento-San Joaquin Delta (Delta) in the late 1800s for their sport fishing appeal and are now abundant throughout the system. Largemouth bass are a warm, freshwater species that prefer salinities less than 4 parts per thousand. Largemouth bass prefer shallow (generally less than 6 meters deep), littoral (i.e., shoreline) habitats with little water current (Moyle 2002). Preferred habitat for largemouth bass also includes relatively dense areas of submerged aquatic vegetation (Conrad et al. 2016, Young et al. 2018).

Largemouth bass spawning starts in March or April when water temperatures reach 59-60 degrees Fahrenheit (°F) and continues through June in water temperatures up to 75°F. Nests are generally constructed in shallow water, often around 1-meter-deep, in sand, gravel, or debris-littered substrates (Moyle 2002).

Largemouth bass are pursuit and ambush predators that forage during daylight hours but are most active at dusk. In general, juvenile largemouth bass diets consist of zooplankton and insect larvae. As largemouth bass mature, diets shift to larger macroinvertebrates and fish. Adult largemouth bass are primarily piscivorous (i.e., feeding on fish) and consume a wide variety of small-bodied and juvenile fish, including several native, special-status species and other largemouth bass.

Striped Bass

Striped bass is another popular species among anglers within Franks Tract and the larger Delta region. Introduced to the California in 1879, striped bass are now abundant throughout the Bay-Delta watershed.

Striped bass are naturally anadromous, regularly moving between salt and fresh water spending most of the lives in estuarine environments. Key habitat elements for striped bass include a large, cool river with enough flow to distribute suspended larvae into the estuary, an open body of water with abundant prey fish, and a protective estuary for juveniles to grow by feeding on invertebrates (Moyle 2002).

Juveniles feed along channel edges while adults occupy open water, pelagic habitat. Juveniles feed mainly on invertebrates, especially amphipods and copepods, gradually incorporating more fish in their diet as they get larger. Once they become large enough, striped bass are almost entirely piscivorous, and are both voracious and opportunistic.

Striped bass males mature in two to three years, females in four to six years, and spawning usually begins in April; however, the start of spawning season varies based on factors such as temperatures, flow, and salinity. Striped bass spawn in groups, releasing their eggs and milt simultaneously so that the eggs are fertilized as they float. The eggs need to stay suspended in the water column to survive, and therefore hatch quickly (after approximately 48 hours). The larvae are transported by downstream currents. Growth is most rapid in the first four years, but varies with food availability.

Methods

The two primary target species are:

- Largemouth bass
- Striped bass

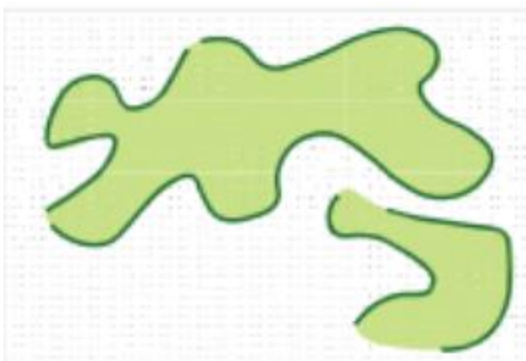
The evaluation criteria described here are for sportfish habitat. There is a related metric included in the Recreation – Fishing Evaluation Criteria Information Sheet that considers both sportfish habitat locations in combination with angler access to these locations.

Evaluation criteria will be used to report on the quality of target sportfish habitat in the No Action Alternative and the three design concepts for Franks Tract. Each criterion is based on the key habitat attributes for each species as follows:

Largemouth Bass

1. Length of edge (nearshore habitat less than 20 feet deep) of open water and larger channels with potential for submerged aquatic vegetation to establish. Calculated as edge of landforms, existing and modified, from design concept maps. See Figure 1 for conceptual example and Figure 3 for measured edges.

   Figure 1. Conceptual drawing of largemouth bass edge habitat.

   Darker green edges indicate shorelines with assumed submerged aquatic vegetation growth.

2. Area of open, shallow water with potential for aquatic weeds to establish. Measured in acres.

Striped Bass

1. Area of open water. Calculates acres of open water at all depths. See Figure 2 for conceptual example and Figure 3 for measured areas in No Action Alternative and three design concepts.

   Figure 2. Conceptual drawing of striped bass open water habitat.

2. Number of velocity gradients/seams. Locations are circled in red in Figure 4. Locations are estimated from the California Department of Water Resources (DWR) hydrodynamic model results and cross-checked with existing striped bass angling hot spots identified in early stakeholder surveys.

Figure 3. Edge habitat for largemouth bass among the No Action alternative and 3 design concepts.

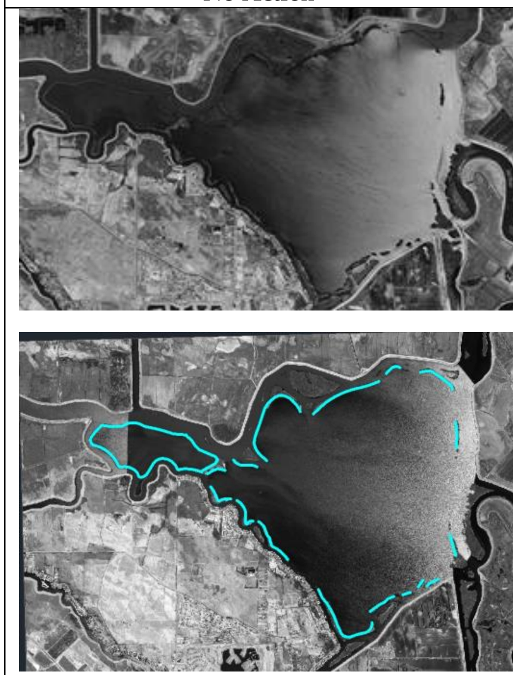
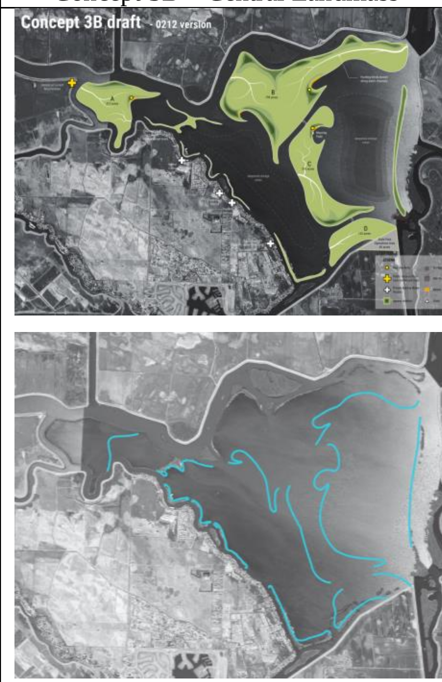
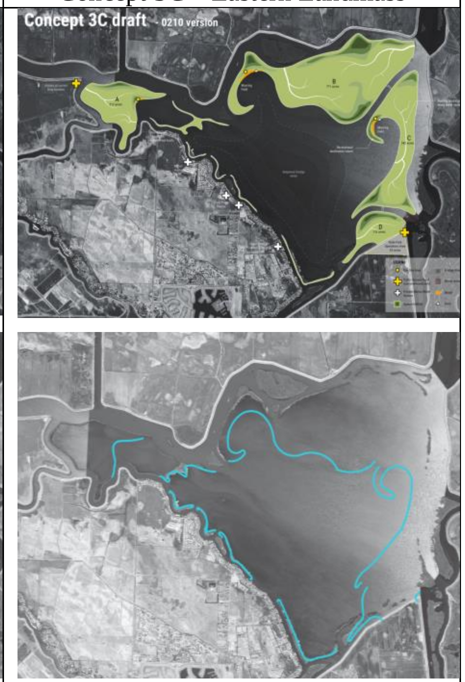
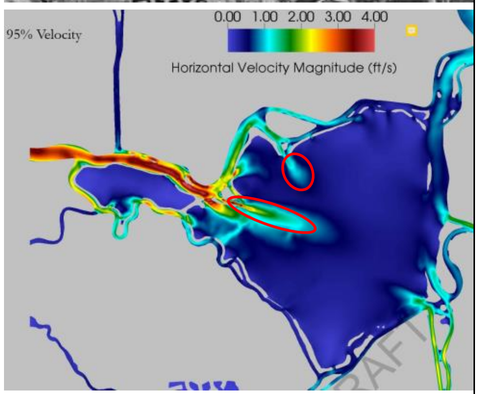
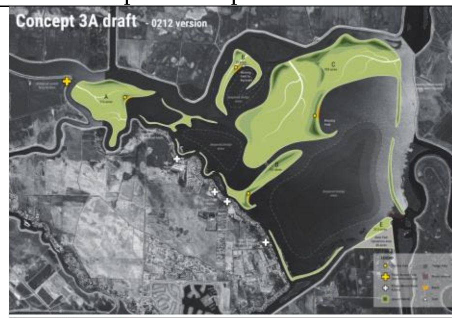
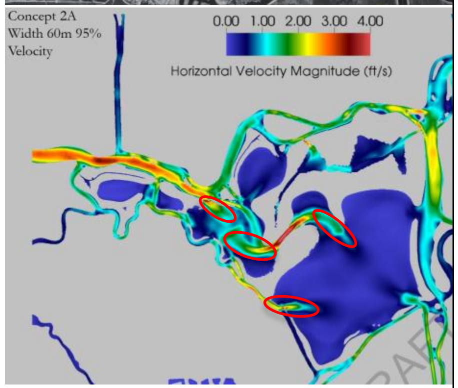
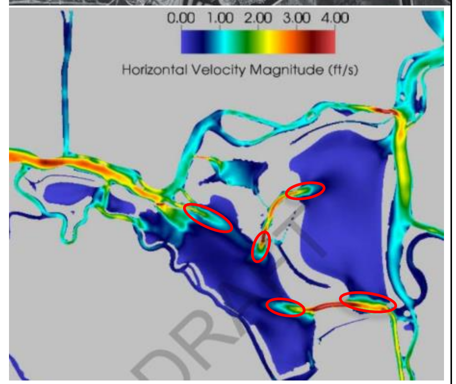
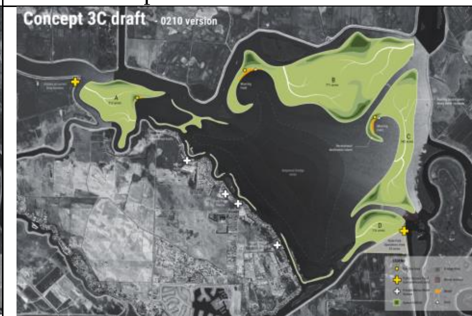
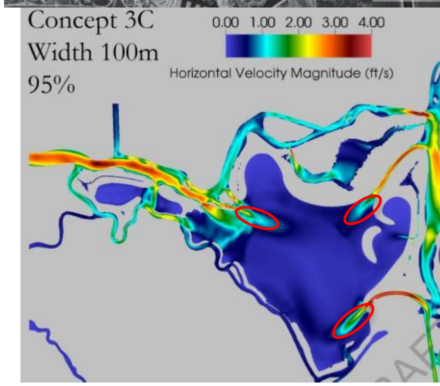
No Action	Concept 3A – Open water berm	Concept 3B – Central Landmass	Concept 3C – Eastern Landmass
			
Measured edge of open water, larger channels, and existing remnant levees are in blue.	Edge not included along peninsula and northern landmass corridor because route proposed rip-rap edges with fast water and potential conflict with boat traffic.	Edge not included along primary navigation routes in the north and south because route proposed rip-rap edges with fast water and potential conflict with boat traffic.	Edge not included along primary navigation routes in the north and south because route proposed rip-rap edges with fast water and potential conflict with boat traffic.

Figure 4. Velocity gradients for striped bass habitat among the No Action alternative and 3 design concepts.

<table>
<tr><th>No Action</th><th>Concept 3A – Open water berm</th><th>Concept 3B – Central Landmass</th><th>Concept 3C – Eastern Landmass</th></tr>
<tr>
<td>

</td>
<td>


</td>
<td>


</td>
<td>


</td>
</tr>
<tr>
<td>Two existing velocity gradients circled in red.</td>
<td>Concept 2A was modeled for velocity. Gradient locations are expected to be similar in design concept 3A. Four velocity gradients identified.</td>
<td>Five velocity gradients identified.</td>
<td>Concept 2C was modeled for velocity. Gradient locations are expected to be similar in design concept 3C. Three velocity gradients identified.</td>
</tr>
</table>

Key Assumption and Uncertainties

- Assumes submerged aquatic vegetation will be present along areas mapped as largemouth bass nearshore habitat.

Results

The overall rating for sport fish habitat averages the ratings of largemouth bass and striped bass habitat.

Table 1. Maintain or Enhance Sportfish Habitat – Measurements of Habitat Attributes Compared to Existing Conditions, for all Concepts

Habitat Attributes	No Action	Concept 3A	Concept 3B	Concept 3C
Largemouth Bass				
Length of shoreline along larger channels with depth less than 20 feet with potential for aquatic weeds to grow (feet)	37,178	142,569	141,434	137,490
Shallow open water (acres)	4,562	2,250	2,453	2,384
Striped Bass				
Open water area (acres)	4,562	3,334	3,251	3,238
Number of velocity gradients	2	4	5	3
Sportfish Habitat Overall Rating	**5.4**	**6.2**	**6.5**	**5.8**

Discussion

All of the proposed design concepts have a higher over all rating than the No Action alternative for sportfish habitat although there are trade-offs with all design concepts. The three concepts increase habitat edge length for largemouth bass habitat; however, they decrease shallow open water area where aquatic weeds have the potential to establish. The three concepts decrease the area of open water habitat for striped bass; however, they create more velocity gradient locations. The three concepts rank similar to each other, with concept 3B having the highest rating by a margin.

References

Conrad, J.L., A.J. Bibian, K.L. Weinersmith, D. De Carion, M.J. Young, P. Crain, E.L. Hestir, M.J. Santos, and A. Sih. 2016. Novel species interactions in a highly modified estuary: association of Largemouth Bass with Brazilian waterweed Egeria densa. *Transactions of the American Fisheries Society* 145 (2): 249–263. https://doi.org/10.1080/00028487.2015.1114521.

Moyle, P.B. 2002. *Inland fishes of California: revised and expanded*. Berkeley: University of California Press.

Young, M.J., Feyrer, F.V., Colombano, D.D., Conrad, J. L., Sih, A. 2018.Fish-Habitat Relationships Along the Estuarine Gradient of the Sacramento-San Joaquin Delta, California: Implications for Habitat Restoration. Estuaries and Coasts 41:2389-2409. https://doi.org/10.1007/s12237-018-0417-4.

Evaluation Criteria Information Sheet

AQUATIC INVASIVE VEGETATION

Objective	Evaluation Criterion	Units	Description
Minimize conditions that could result in the spread of undesirable invasive vegetation.	Habitat type: • Shallow open water (less than 7 feet) • Medium open water (7 to 20 feet) • Deep open water (greater than 20 feet) • Intertidal marsh plain • Intertidal marsh channel	Area (acre)	Reports the area in which invasive aquatic vegetation has the potential to establish.
	"Risk of colonization index"	0-1 index	Index of potential for invasive vegetation to colonize and require management effort

Description

Aquatic weeds in the Delta continue to be a nuisance and difficult to control. Despite efforts to reduce aquatic weeds, the area invaded by aquatic weeds continues to increase (Ustin et al. 2019). Franks Tract supports several species of native and invasive, non-native submerged, floating and emergent type aquatic plants. The relative open water area as well as shallow shorelines provide suitable habitat for both native and non-native aquatic plants. Treatment of invasive submerged aquatic vegetation (SAV) (e.g. *Egeria densa*, *Potamogeton crispus*) and floating aquatic vegetation (FAV) (e.g. *Eichhornia crassipes, Limnobium laevigatum*) is critical to effective management. Treatment of invasive SAV and FAV in and around Franks Tract over the past 5-7 years has resulted in the spread of native SAV and enhanced desirable plant diversity (Caudill et al. 2019). In addition, altering bathymetry or elevations (e.g. more or less tidal marsh or deep water area) can selectively encourage native or invasive plants, and affect the ease of management. Tidal flow velocities can dislodge some species more easily than others. For example, native SAV *Stuckenia pectinata* is typically better anchored than *E. densa*.

The Franks Tract Project proposes deepening large areas that are currently shallow subtidal open water, and filling other shallow subtidal areas to create tidal marsh. Deep open water and tidal marsh areas are much less susceptible to colonization by invasive vegetation than are shallow open water areas. Management of SAV in deep open water and tidal marsh areas is expected to be more effective compared to open water areas, for a given level of management effort. The project includes planting of desirable aquatic vegetation following construction and assumes continued, effective management of invasive vegetation to encourage diversity of native SAV. While the project is supportive of increasing the level and effectiveness of management for invasive vegetation, increased management levels are not assumed in the project performance ratings. The ratings assume the shifts in land use types proposed by the project will make the existing level of management effort more efficient and effective in managing invasive vegetation.

Evaluation Criteria

Ranking of the three concepts (A, B, C) represents an assessment of the balance between land uses (e.g., shallow versus deep open water) with differing likelihood of enabling colonization by invasive aquatic vegetation for a given level of weed management.

Evaluation criteria consist of the following metrics:

- **Area of shallow open water (<7 feet[2]) habitat.** Shallow depths favor SAV establishment and spread due to more light and more dynamic, energy and physical disturbances that can produce and distribute propagules (e.g. plant fragments and asexual reproductive structures). This is true for native and invasive SAVs. Management approaches seek to preferentially target invasive SAV. All open water, regardless of depth, is subject to colonization by FAV, primarily invasive species. Effective management of FAV is generally much less resource intensive than management of invasive SAV.
- **Area of medium open water (7 - 20 feet).** Areas intermediate in depth to shallow and deep open water, with intermediate potential for SAV colonization.
- **Area of deep open water (>20 feet).** Areas that are sufficiently deep will reduce excessive SAV growth by limiting available light.
- **Intertidal marsh plain**. While the marshplain will be at risk of colonization by invasive emergent vegetation (EAV), effective management of invasive emergent vegetation is generally much less resource intensive than management of invasive SAV.
- **Tidal marsh channel**. Channels within the created tidal marsh areas are likely to perform similarly to areas of shallow open water.

While not used directly as evaluation criteria, areas of high tidal velocities and sheltered areas were taken into consideration in the ratings.

Areas of high tidal velocities (i.e. the navigable cross channels). Areas of high tidal velocities will tend to exclude growth of SAV and FAV. SAV and some FAV will not be able to sustain dense populations in areas with high scouring due to dislodging of rooting systems and reduction of suitable, nutrient bearing sediments. Tidal flow velocities can dislodge some species more easily than others. For example, native Sago pondweed (*Stuckenia pectinate*) is typically better

---

[2] Open water depths are given relative to mean lower low water.

anchored than invasive *E. densa*. Areas of high tidal velocities were excluded from the shallow/medium/deep open water areas reported in the metrics.

Sheltered areas. Due to low flow rates and reduced water exchange, SAV and FAV thrive more readily in quiescent (still water) areas such as coves. Tidal marsh channels may, or may not, also be relatively quiescent, depending upon seasonal tidal cycles and resulting inundation velocities. The planning team did not develop a quantitative measure of sheltering, which would have required more detailed assessment. It is assumed that any increased risk of SAV and FAV establishment in sheltered areas created by the concepts will be minor and more than offset by other improvements that would reduce risk.

Methods

Risk of colonization is defined as the likeliness of an area to be colonized by aquatic invasive species (AIS) with ongoing AIS management. Ongoing AIS management is assumed given the existing abundance of invasive plants in and near Franks Tract. Treatment costs generally range from $2,500 to $4,000 per acre per year for SAV and $500 to $1000 per acre per year for FAV and EAV (L. Anderson, personal communication). For any given level of management effort, the weed control outcome can be improved by converting habitat types that are at high risk of colonization by invasive vegetation and expensive to treat (e.g. shallow open water) to types that are less vulnerable and less expensive to treat (e.g., deep open water and intertidal marsh plain).

The ratings reflect these outcomes. Each habitat type was given a “risk of colonization by AIS” index from 0 to 1, with 0 the least risk and 1 the highest. Deep Open Water and Intertidal Marshplain were assigned an index of 0.25. Shallow Open Water and Tidal Marsh Channels were assigned an index of 1. Medium Open Water was assigned a value of 0.75.

Areas were measured for the No Action and three project concepts for use in the evaluation. Based on modeling results, high velocity areas exist at the “nozzle” for No Action and all project concepts. Additionally, the project concepts result in high velocity areas in the navigation through channels. High velocity areas were calculated as through-channel length times width (400 ft at water surface). High velocity areas are subtracted from shallow water areas prior to applying the “risk of colonization by AIS” index.

An overall performance rating was developed on a scale of 1 to 10, with 1 the worst and 10 the best performance with respect to potential colonization by invasive aquatic vegetation.

Assumptions and Uncertainties

- The project assumes management of invasive vegetation at current levels of effort / cost. While the project is supportive of increasing the level of management, increased management levels are not assumed in the project performance ratings.
- The project assumes that management of invasive aquatic plants requires: (1) continuing compliance with current and future Biological Assessment (BA) and Biological Opinion (BO) approved by Federal regulatory services agencies (US Fish and Wildlife Service and NOAA-Fisheries); (2) compliance with approved NPDES permit from the

Central Valley Regional Water Quality Control Board; and (3) is implemented by California State Parks and Recreation/Boating and Waterways Division.

- Access for AIS management. The design will consider access to increase efficiency of aquatic plant management so that crews are not restricted at low tides, or having to operate from land.
- The project will include revegetation efforts to establish native vegetation within the project area.

Results

Table 1. Reduce Aquatic Invasive Species – Measurements of Attributes, all Concepts

Evaluation Criteria	No Action	Concept 3A	Concept 3B	Concept 3C
Land Use Type / Bathymetry				
Shallow open water (less than 7 feet) (acre)	4,562	2,250	2,453	2,384
Medium open water (7 to 20 feet) (acre)	0	193	185	155
Deep open water (greater than 20 feet) (acre)	0	891	613	699
Intertidal marshplain, (acres)	0	1,227	1,311	1,323
Tidal marsh channels, (acres)	0	98	105	106
Weighted Risk of Colonization by AIS				
Acres (weighted on risk)	4,562	2,972	3,078	3,022
Aquatic Invasive Vegetation ratings (overall)	**1**	**7**	**7**	**7**

References

Caudill et al. 2019. Aquatic plant community restoration following the long-term management of invasive *Egeria densa* with fluridone treatments. Management of Biological Invasions 10: 473–485.

Ustin, Susan L., Shruti Khanna, Mui Lay and Kristen Shapiro. 2019. Enhancement of Delta Smelt (Hypomesus transpacificus) habitat through adaptive management of invasive aquatic weeds in the Sacramento-San Joaquin Delta & Suisun. California Department of Water Resources.

Lars Anderson, personal communication. October 2019, April 2020, and September 2020.

Figure 1. Existing Bathymetry at Franks Tract

Source: NOAA 2016. Water depths relative to mean lower low water.

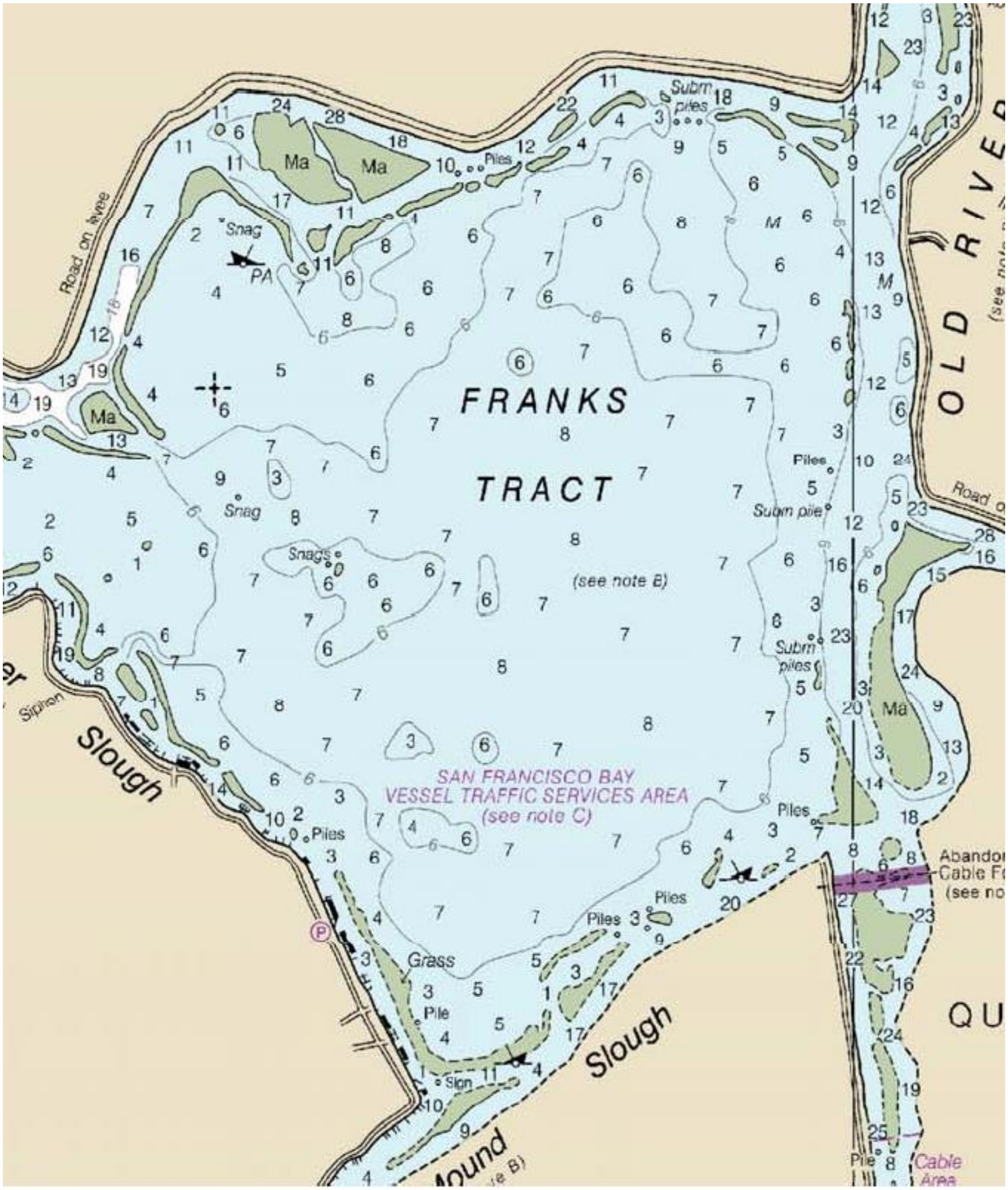


Figure 2. Modeled Velocities for Existing Conditions

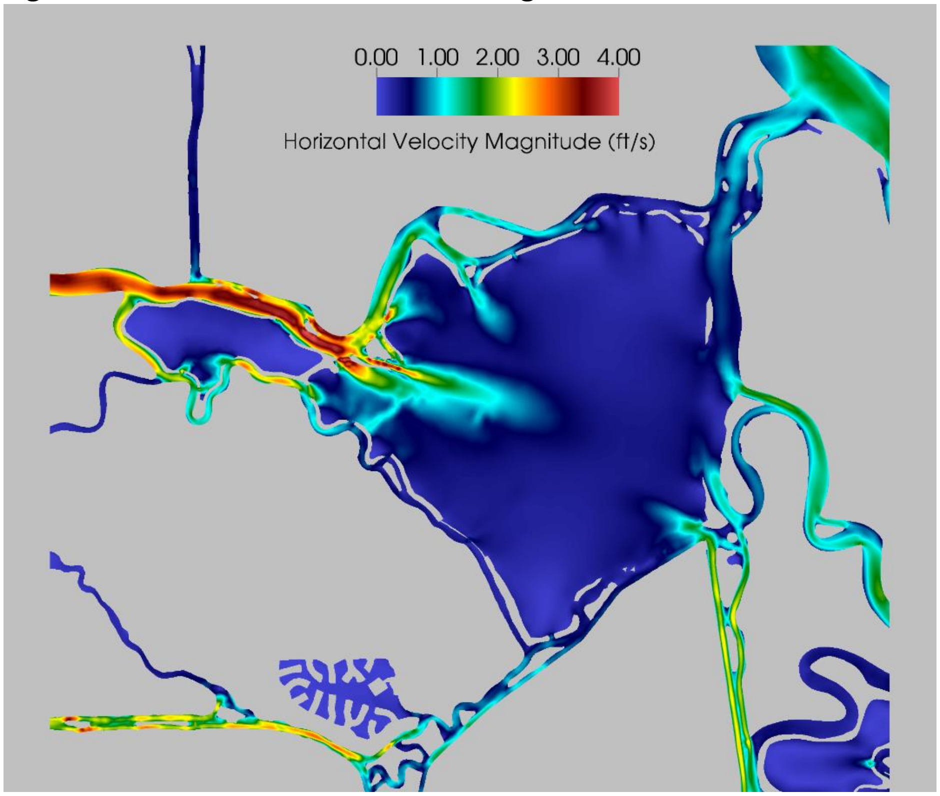
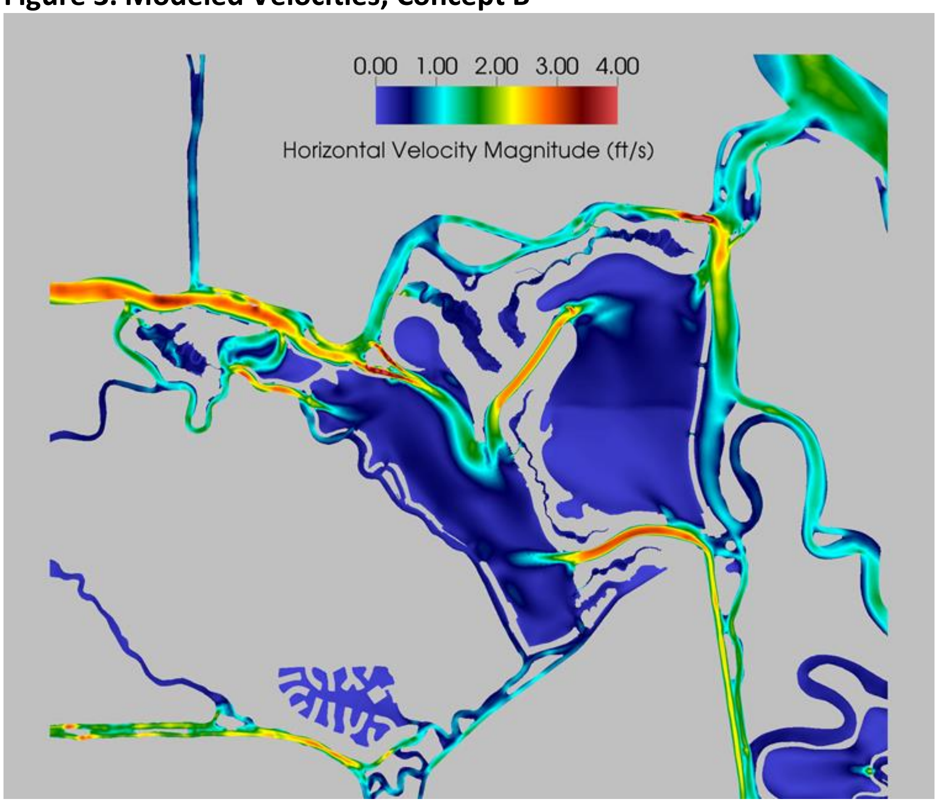


Figure 3. Modeled Velocities, Concept B



EVALUATION CRITERIA INFORMATION SHEET

WATER QUALITY AND SUPPLY RELIABILITY

Objective	Evaluation Criterion	Units	Description
• Maintain or enhance water quality for human uses such as irrigation and drinking water.	Reduce salinity at key water quality stations: • Salinity at Old River at Bacon Island • Salinity at Jersey Point • Salinity at San Andreas Landing	uS/cm	Reports modeled salinity variables using historical hydrologic dry conditions (2009) and drought conditions (2015).
• Improve water supply reliability by reducing entrainment at the south Delta pumps.	Reduce transport of particles from locations representative of fish presence to the vicinity of the south Delta pumps	% particles recovered	Reports percentage of particles released from locations of interest recovered at other (desirable and undesirable) locations of interest, as modeled using particle tracking
• Reduce the disruptions and costs associated with installation of emergency drought barriers.	Reduce salinity at key water quality stations during extreme drought conditions	uS/cm	Reports modeled salinity variables using drought conditions (2015).

Context

The Sacramento-San Joaquin Delta is a major water supply export which provides drinking water for more than 25 million people and irrigation water for over 3 million acres of agriculture[3]. Franks Tract is located in the central Delta and experiences salinity fluctuations as a function of tidal mixing of higher salt content water on the west, freshwater inflows from the Sacramento and San Joaquin rivers, and the hydrodynamic processes in the Delta channels.

[3] Public Policy Institute of California. October 2016. The Sacramento-San Joaquin Delta.

Maintaining freshwater in the central and south Delta for water supply is a management concern, particularly in summer and fall when less freshwater flows into the Delta. It becomes an elevated concern during droughts in the central and south Delta. If salinity does intrude the freshwater areas, the effect would be largely irreversible and has led management agencies to construct barriers to limit the transport of salt under extreme circumstances, such as the Emergency Drought Barrier constructed in False River in 2015. In addition to water quality problems, tidal fluctuations at Franks Tract can also entrain state or federally protected fish species towards the south Delta pumping facilities. Presence or salvage of protected species at the south Delta pumping facilities can trigger Old and Middle River reverse flow restrictions and reduce pumping. Fish entrainment is thus both a water supply reliability consideration, as well as an ecological consideration for Franks Tract.

Primary objectives for this study are to develop concepts that would enhance water quality (salinity) and supply reliability for local, in-delta diversions and for exports by the State Water Project and Central Valley Project in the south Delta. Project objectives also include reducing disruptions and construction costs associated with installation of emergency drought barrier and to improved water supply reliability by reducing potential entrainment at the south Delta pumping facilities.

Methods

Water Quality/Salinity. This objective addresses the quality of water supply for local, in-delta diversions and for exports by the State Water Project (SWP) and Central Valley Project (CVP) at the south Delta pumps and by Contra Costa Water District at their Rock Slough, Old River and Middle River intakes.

During winter and early spring, freshwater inputs are usually above the minimum required to control salinity intrusion. However, during a few months in summer and fall, Delta salinity conditions must be carefully monitored and controlled. Broad-scale salinity control actions are taken in the Delta to manage water quality to comply with objectives and beneficial uses provided by Delta freshwater resources. Water quality improvements, measured by reduced salinity would improve the flexibility of the SWP, CVP, and Contra Costa Water District (CCWD) to meet water quality objectives of the 1995 Delta Water Quality Control Plan (WQCP) for water delivered for municipal, industrial, and agricultural beneficial uses.

The proposed concepts incorporate creation of tidal marsh landmasses that modify local hydrodynamics. The project has explored ways of configuring the land masses so as to reduce salinities in key locations in the central and south Delta. Potential water quality improvements would provide the most benefit during late summer and fall when inflows are low and water demands are high, particularly during critically dry or drought years.

The project conducted hydrodynamic modeling to evaluate the projected spatial distribution of salinity difference averaged over two time periods using dry-season historical hydrology, 2009 and 2015. These years represent dry and critically dry conditions in the Delta, respectively. The modeling compared salinity changes at three water quality compliance monitoring locations; Old River at Bacon Island, Jersey Point, and San Andreas Landing.

[3] Public Policy Institute of California. October 2016. The Sacramento-San Joaquin Delta.

In addition to modeling significant hydrologic years, experiments with channel width of the main navigable channels was modeled to evaluate effects on water quality in each design concept. More details on the salinity modeling methods are described in Appendix D (In progress).

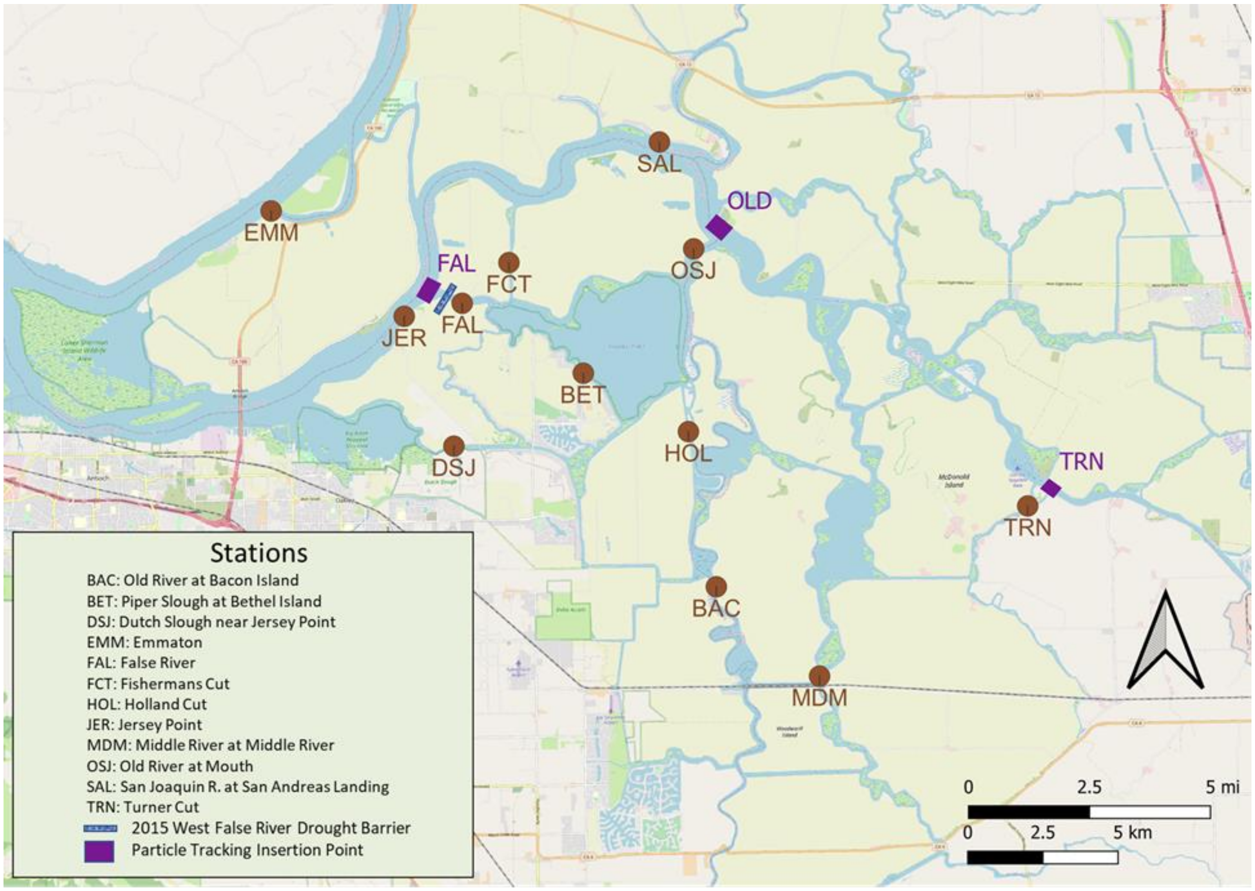
Emergency Drought Protection. Another objective is to reduce the frequency and/or extent of disruption and costs associated with emergency drought barriers (EDB) such as occurred on west False River in 2015. Protection of water quality becomes an elevated management concern during droughts in the central Delta. Whereas salinity encroachment along the main stem of the Sacramento and San Joaquin Rivers can be reversed with upstream releases of water and increased flow or a reduction in south Delta pumping, flow management options are limited during multiple back-to-back years of extreme drought. Moreover, if salinity does intrude the freshwater corridor in high concentration, the effect would be largely irreversible for a period of time. For this reason, in 2015, the California Department of Water Resources constructed an EDB on False River to limit the transport of salt under extreme conditions.

To evaluate the potential need of drought protection infrastructure, such as the 2015 EDB, hydrologic modeling was conducted on the No Action alternative and the design concepts under 2015 (critically dry) water years.

Water Supply Reliability. Another project objective is to reduce the entrainment of fish species at the south Delta pumping facilities. The hydrodynamics at Franks Tract contribute to mixing of saline water and fish from False River into Franks Tract and on to the central Delta. One consequence of these hydrodynamics is that smelt, salmonids and other state and/or federally protected fish species are pulled towards the south Delta. Entrainment of fish at the south Delta pumping facilities represents not only an ecological risk to fish species, but also a reliability issue for water operations. Under the CDFW (2020) Incidental Take Permit for the SWP and federal Biological Opinions by NMFS (2019) and USFWS (2019), presence or salvage of salmon, Delta and longfin smelt and other species at export facilities can trigger Old and Middle River flow restrictions and these limitations are realized through pumping reductions.

To evaluate potential entrainment of fish species, particle tracking modeling was conducted under a variety of hydrologic conditions using three injection sides on the San Joaquin River near False River, the mouth of Old River, and Turner Cut. More details on the particle tracking modeling methods and consideration of the ecological effects of entrainment, see the Ecology – Fish Entrainment Evaluation Criteria Information Sheet and the Modeling Appendix (In progress).

Figure 1. Water Quality Location Map



Results

Salinity and particle tracking results are provided in Table 1. Salinity modeling results indicate hydrodynamic changes associated with a project have the potential to affect salinities on the order of up to 0.5 to parts per thousand (ppt). These changes are small compared to bay and ocean salinities (typically 33 ppt outside the Golden Gate), but can be meaningful for agriculture and drinking water supply. They may also be meaningful for the ecosystem.

Salinities resulting from a 2015 simulation achieve the basic municipal and industrial criteria, resulting in lowered salinities at the three compliance station for all the concepts compared to the No Action alternative.

Particle tracking results indicate a project is likely to reduce the potential entrainment influences from the west of Franks Tract. By contrast, potential entrainment influences increase for particles injected on the east side of Franks Tract near the mouth of Old River under similar circumstances, consistent with increases in tidal range of flow at that site. The project has an insignificant effect on potential entrainment influences on Turner Cut, and the specific Franks Tract concepts considered were not particularly influential on particle fate in the western Delta near Suisun.

Table 1 presents the water quality, emergency drought protection and water supply performance metrics and ratings. Ratings are on a scale of 1 to 10, with 10 the best.

Table 1. Water Quality for Human Use, Emergency Drought Protection and Water Supply Reliability – Metrics and Overall Ratings

Metric	No Action	Concept 3A	Concept 3B	Concept 3C
2009 Historical Hydrology (Dry)				
2009 Salinity at Old River at Bacon Island (uS/cm)	743	608	615	630
2009 Salinity at Jersey Point (uS/cm)	1,279	1,188	1,159	1,176
2009 Salinity at San Andreas Landing (uS/cm)	373	359	378	371
2015 Historical Hydrology (Drought)				
2015 Salinity at Old River at Bacon Island (uS/cm)	1,411	1,132	1,169	1,203
2015 Salinity at Jersey Point (uS/cm)	1,982	1,801	1,793	1,796
2015 Salinity at San Andreas Landing (uS/cm)	608	577	583	599
Water Quality for Human Uses (salinity), Overall Rating (1-10)	**3**	**8**	**7**	**6**
Emergency Drought Protection, Overall Rating (1-10)	**2**	**7**	**7**	**7**
Delta smelt	5	8	8	8
Salmonids	5	5	5	5
Water Supply Reliability (Entrainment), Overall Rating (1-10) [4]	**5**	**7**	**7**	**7**

[4] See Evaluation Criteria Information Sheet for Ecology – Fish Entrainment

EVALUATION CRITERIA INFORMATION SHEET

FLOOD PROTECTION

Objective	Evaluation Criterion	Units	Description
• Improve levees for flood protection where possible, and avoid any adverse flood impacts.	Sheltered Levee Maintenance or Reduction in flood water level	Levee length (ft) Change in water level (ft)	Reports the length of levee sheltered from wave energy traveling from Franks Tract. Change in modeled water surface elevation during flood

Context

The open water areas of Franks Tract and Little Franks Tract are surrounded by remnant constructed levees left over from when these tracts used to be leveed and farmed. From the Franks Tract Futures report (2018):

Humans diked, drained, and reclaimed Franks Tract marshlands between 1902 and 1906. … In February 1937, portions of the levee surrounding Franks Tract gave way, flooding the [Tract]. Local landowners soon reclaimed the Tract, but in February of 1938 the False River levee broke, flooding Franks Tract again. After that, it was never reclaimed. Little Franks Tract survived the 1937 and 1938 floods, but flooded in January 1982 and was also not reclaimed.

The remaining, remnant levees of Franks Tract and Little Franks Tract, though breached, continue to provide critical wave sheltering for the surrounding intact flood protection levees (e.g., the levees surrounding Bethel Island, Webb Tract, Mandeville Island, and other surrounding islands) in use today. Waves form on Franks Tract during high wind events. The wave-sheltering effect of the remnant levees reduces the risk of wave-induced erosion and overtopping of critical flood protection levees. The remnant Franks Tract levees have been eroding over time. The Bethel Island Municipal Improvement District and others are interested in project features that enhance the remnant levees in order to reduce required flood protection levee maintenance activities and associated costs.

Another flood consideration raised by stakeholders is that any project at Franks Tract must not worsen flooding in the vicinity of Franks Tract during large flood events. If improperly designed, the project could result in higher flood elevations by blocking flow of large runoff events through Franks Tract. Though considered less likely, the project could potentially result in higher coastal flood elevations by blocking flow from extreme coastal storm surge events.

Water levels in Franks Tract and the surrounding area are governed by flow from the Delta tributaries and tides from San Francisco Bay. Table 1 summarizes elevation information for the Franks Tract area based on water level information from NOAA (2016), combined with FEMA (2016) data, and flood stage information for Rio Vista from CDEC (2016) and NWS (2016), as reported in FTF 2018.

Table 1. Key Tidal and Flood Elevations for Franks Tract

Datum	Elevation (ft), MLLW	Elevation (ft), NAVD88	Notes
Highest Observed Water Level	7.6	9.6	At SJR between Mokelumne R. and Seven-Mile Slough (J. Dudas, pers.comm.)
Highest Astronomical Tide (HAT)	4.33	6.34	HAT and tidal datums from Three Mile Slough Station (NOAA 2011)
MHHW (Mean Higher High Water)	3.42	5.43	
MHW (Mean High Water)	2.95	4.96	
MSL (Mean Sea Level)	1.76	3.77	
MLW (Mean Low Water)	0.52	2.53	
MLLW (Mean Lower Low Water)	0	2.01	
Tidal Range	3.42	3.42	
Bottom of the tract, typical	-6 to -7	-4 to -5	NOAA 2016 Nautical Chart No. 18661.

Note: Three Mile Slough Station ID 9415193, 1983-2001 epoch. MLLW converted to NAVD by adding 2.01 ft.

Description

The project must not result in any increased flood risk for the Delta community. The evaluation criteria consider risks associated with potential wave-induced erosion and overtopping of flood protection levees and potential for high water during large runoff events.

Evaluation Criteria

Evaluation criteria will be used to report on the amount of flood risk reduction around Franks Tract, focused on the two objectives.

Objective	Criteria
Sheltered Levee	• Length of enhanced sheltering levee (feet)
Flood Risk Maintenance or Reduction	• Maintenance or reduction in flood water level (feet)

Calculations

For each concept the following metrics are calculated:

1. Sheltered Levee: Length of enhanced remnant Franks Tract levee, in feet, that provides protection to neighboring flood levees from the impacts of wave erosion and overtopping.
2. Flood Risk Reduction: Calculated as the modeled change in maximum water surface elevation during the winter 2017 flood season. This metric was modeled by DWR and applied spatially throughout the central and south Delta.

Sheltering Levee

No Action Alternative

No improvements to the remnant levees are proposed for the No Action alternative. The existing remnant levees are projected to continue eroding, providing decreasing levels of sheltering for adjacent flood protection levees. The concrete wave-break wall along the east side of Piper Slough, between approximately Sugar Barge and Russo’s Marina, is counted as a sheltering levee in the No Action concept.

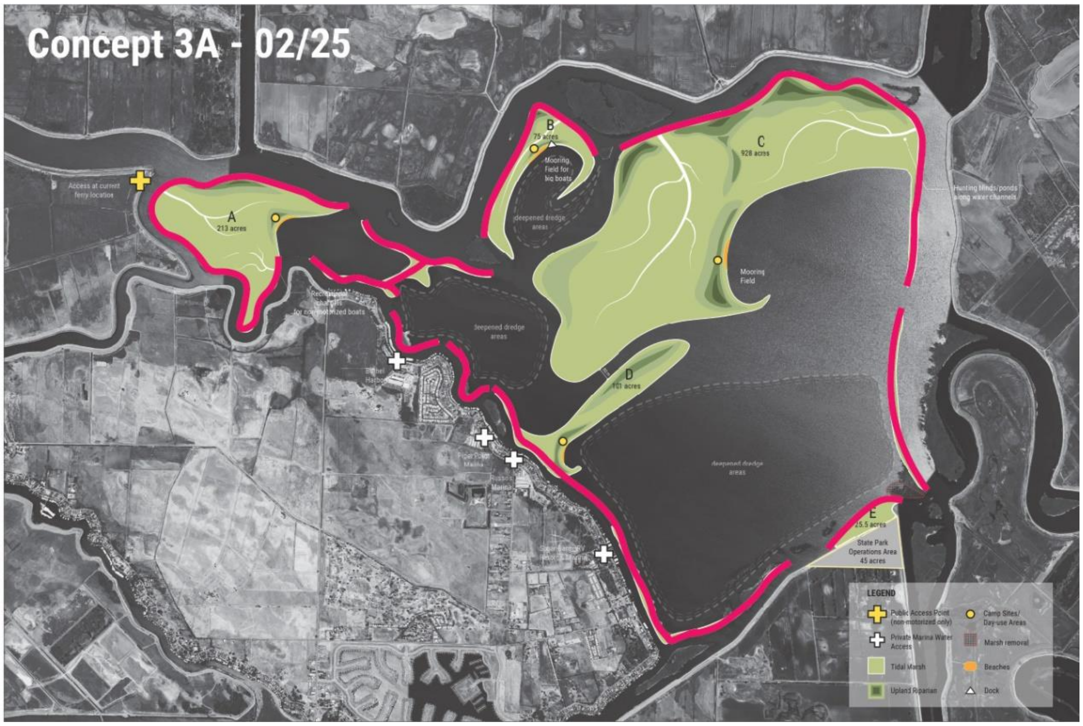
Figure 1 No Action Alternative

Concepts 3A, 3B, and 3C Levee Enhancement

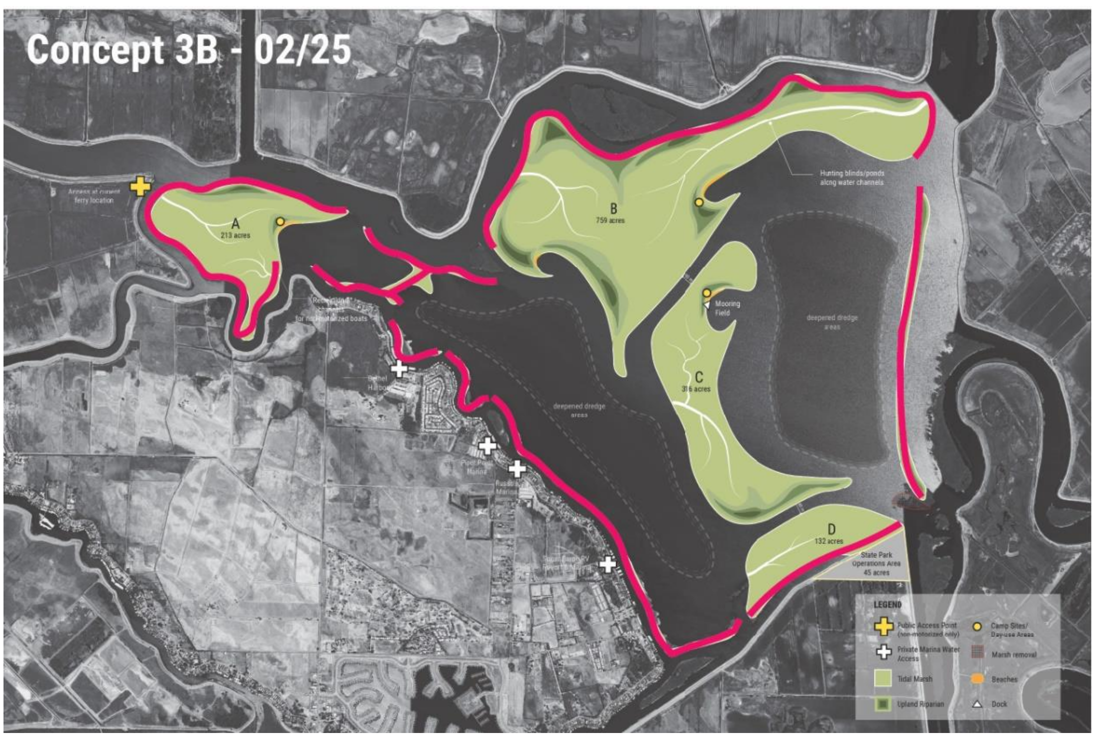
Concepts 3A, 3B, and 3C all include extensive enhancement of the remnant Franks Tract perimeter levees. Dredged or other material will be placed on the levees to raise and widen them, and plug gaps that have eroded in the existing levees over time. The design concepts call for upgrading the remnant perimeter levees to a 25-ft wide crest at an elevation of approximately +9 feet NAVD88, or high enough not to be overtopped during high water but low enough not to obstruct views.

Figure 2. Location of sheltered levee three design concepts. A) Concept 3A, B) Concept 3B, and C) Concept 3C.

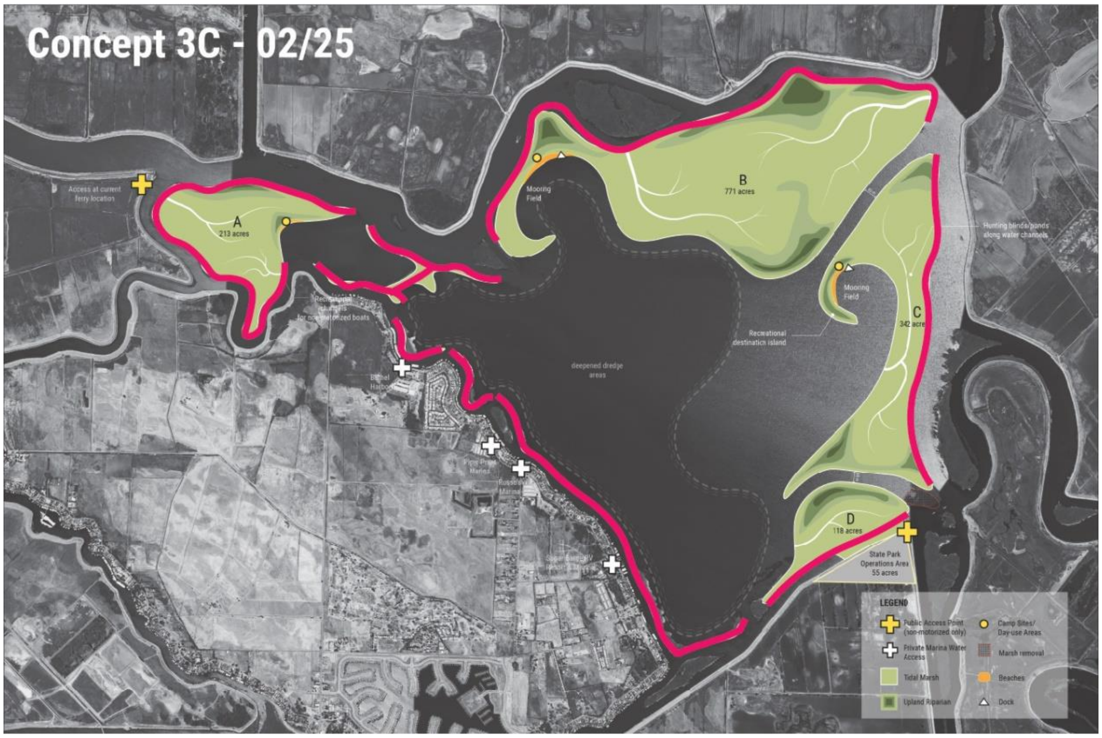
A) Concept A – Open Water berm and channel



B) Concept B – Central Landmass



C) Concept C – Eastern landmass



Flood Risk Maintenance or Reduction

DWR conducted screening-level flood modeling, simulating flood water levels throughout the Delta for the 2017 flood season. The 2017 flood season was selected for modeling as it contained a significant flood event in the central Delta, approximately the sixth largest as measured at San Andreas Landing in the period of record going back to 1955, and occurred relatively recently, with readily-available hydrologic and atmospheric data and current water operations in place. Modeling indicates that the preferred concept (Concept B) does not significantly alter flood conveyance. Figures 3 and 4 show plots of the difference in maximum water stage for Concept B compared to No Action during the winter 2017 flood season. Changes were less than 0.1 feet everywhere, and mostly less than 0.05 feet. Some areas experience lower peak water levels, some higher. The result that flood conveyance is relatively unaltered generalizes to successive peaks caused by king tides, larger outflows and increased Old and Middle River flows. Though Concepts A and C were not modeled, these concepts are expected to perform similarly to Concept B.

Preliminary indications are that changes in water levels of this magnitude are below known thresholds of concern. This initial assessment of significance could change and, if the project is carried forward, the design could readily be refined to further reduce these changes. For example, the constructed project geometry used in the model included extensive high elevation habitat areas adjacent to the tidal marshes. These areas could be selectively lowered to allow additional flood conveyance over the top of the marsh. The potential impacts of flood changes would be fully evaluated during the environmental documentation and permitting phase of project prior to implementation.

Some subtle differences are apparent based on the watershed origin of the flood waters. The two time periods in Figures 3 and 4 – February 6 through 8 (three days of peak flood levels) and February 25 to March 5 (9 days of high flows on the San Joaquin River), 2017 - show somewhat different results. The latter period resulted in higher differences in the eastern Franks Tract and the south Delta, compared to the early February period. This is believed to be due to high flows in the San Joaquin River.

Figure 3. Maximum Difference in Water Levels Between Concept B and No Action, February 6-8, 2017

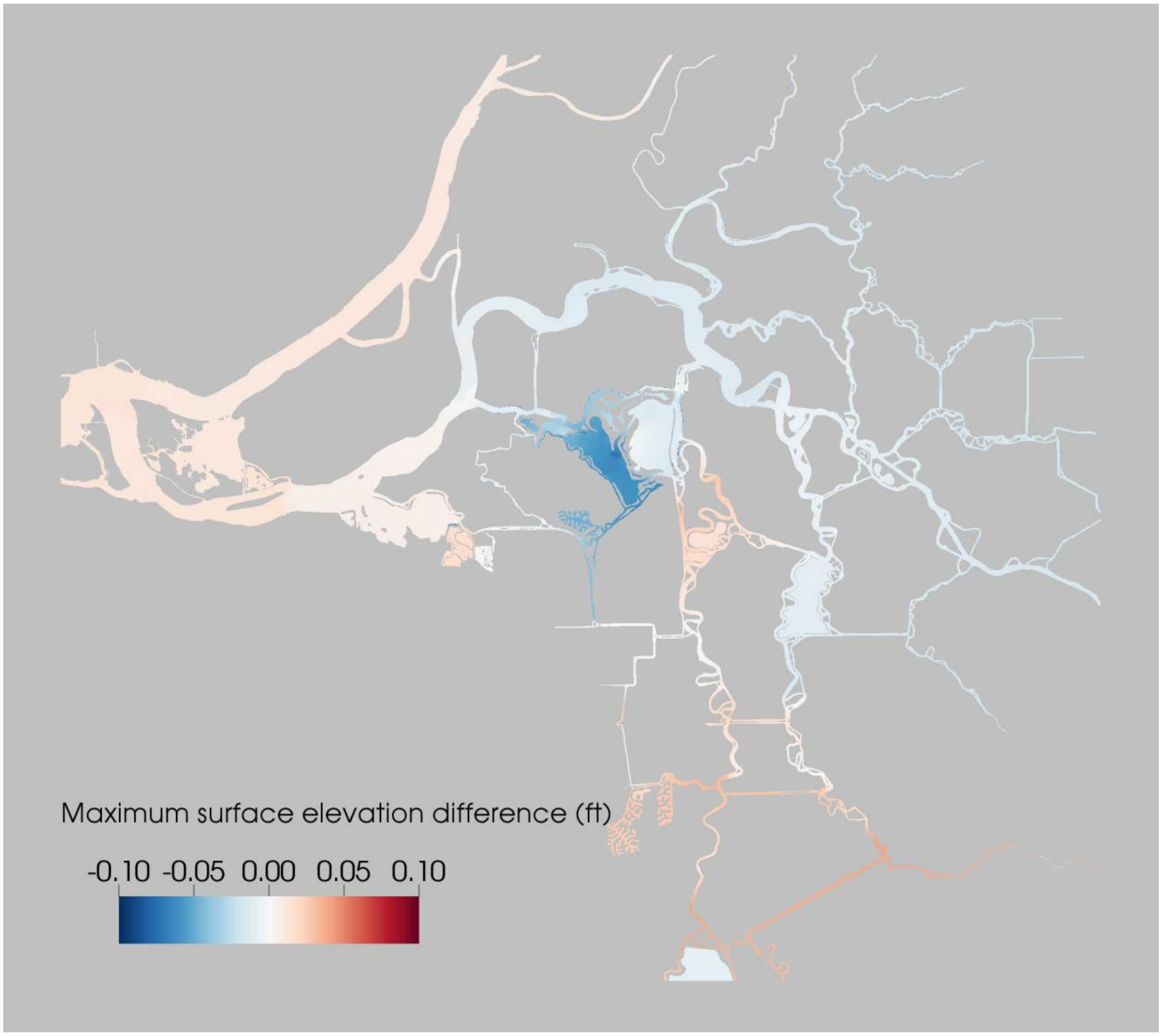
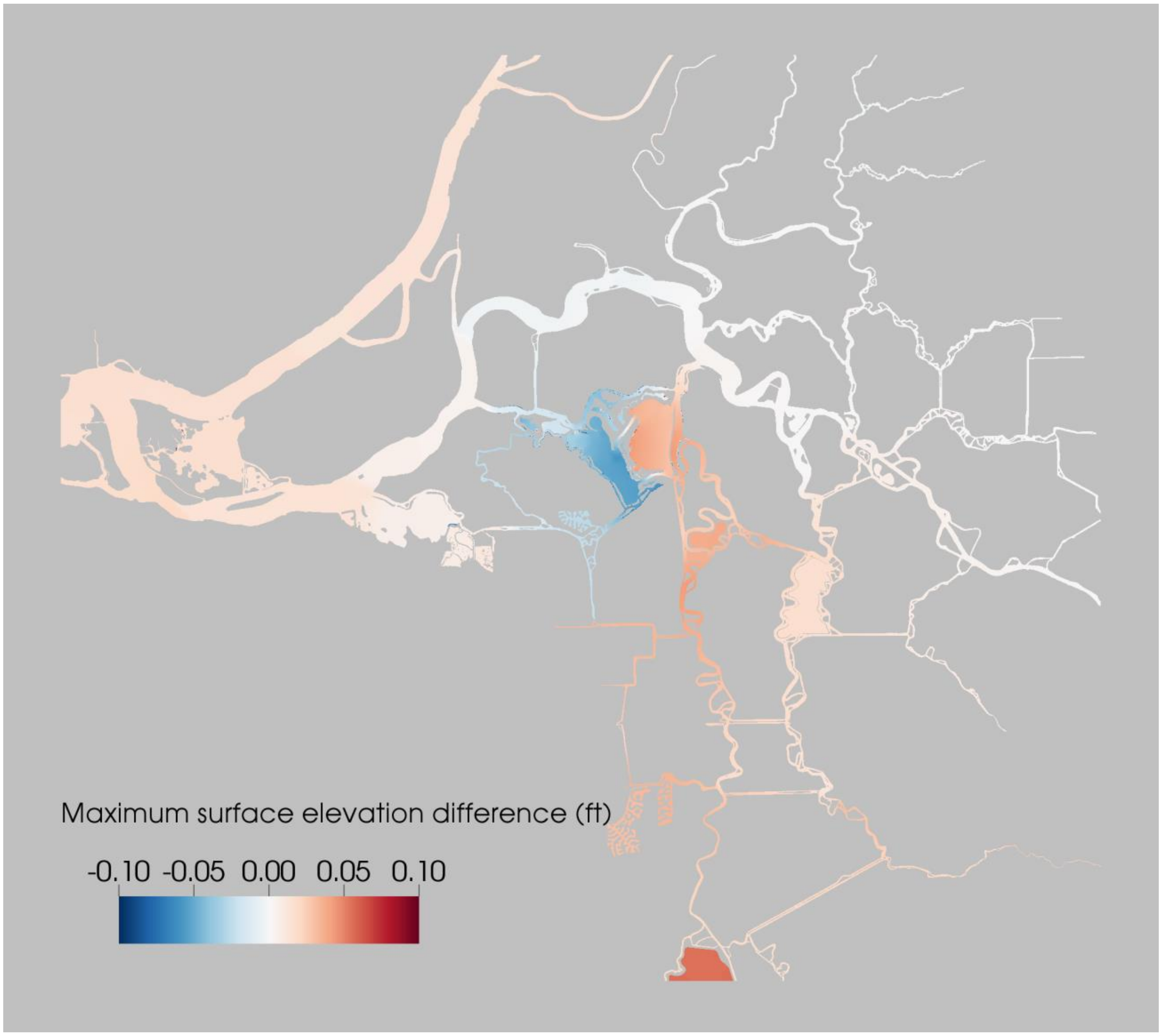


Figure 4. Maximum Difference in Water Levels Between Concept B and No Action, February 25-March 5, 2017



Key Assumptions and Uncertainties

- Any proposed project at Franks Tract must not result in increased flood risk to any of the surrounding communities. This is a standard design constraint that would be evaluated in greater detail and confirmed in any further planning, environmental compliance and design phases of the project.
- Concepts A and C were not modeled and are assumed to perform similarly to Concept B, which was modeled.
- The project concepts will be designed to allow floodwaters to pass over the created marsh surface, and not be overly blocked by high ground features.

- For all concepts, sea-level rise results in higher water levels and generation of larger waves across the tract. Deeper water generally supports generation of larger waves for the same wind conditions and open water area (fetch length). Wave sheltering will be more beneficial for larger waves conditions.

Results

Table 2 presents the flood performance metrics and ratings. Ratings are on a scale of 1 to 10, with 10 the best.

Table 1. Flood Protection – Metrics and Overall Ratings, for all Concepts

Metric/Rating	No Action	Concept 3A	Concept 3B	Concept 3C
Sheltered Levee rating	3	10	10	10
Length of enhanced remnant levee (ft) All concepts include length of existing concrete wave-break wall (3,100 ft)	37,959	65,311	67,188	65,951
Flood Risk Maintenance or Reduction rating	5	5	5	5
Change in peak water surface (ft)	No change from existing	Less than 0.1 feet everywhere, and mostly less than 0.05 feet		
Overall Rating (1-10)	**4**	**7.5**	**7.5**	**7.5**

References

NOAA (2011). *Tides & Currents.* Center for Operational Oceanographic Products and Services (COOPS), 1305 East-West Highway, Silver Spring, MD 20910-3281. Accessed at https://tidesandcurrents.noaa.gov/.

NOAA (2009). Sacramento and San Joaquin Rivers. Nautical Chart No. 18661.

EVALUATION CRITERIA INFORMATION SHEET

CONSTRUCTABILITY, CONSTRUCTION IMPACTS AND COSTS

Objective	Evaluation Criterion	Units	Description
Minimize construction costs and long term costs for ongoing operations and maintenance within the context of other project objectives.	Dredge material volume Relative construction costs Relative cost for ongoing maintenance and management (O&M)	Cubic yards Order of magnitude rating Order of magnitude rating	Reports the amount of fill and source material that will need to be moved to build landmasses. Provides relative comparison between alternatives of construction and O&M costs.
Minimize or mitigate construction impacts in both the near and long term.*	Construction Period Impacts (short term) Drought Barrier Impacts (long term)	Rating Rating	Characterizes level of impact on the local community and use of Franks Tract.

* Minimizing or mitigating construction impacts is not an identified project objective. It was added later for project evaluation.

Context

The potentially large benefits of the Franks Tract project must be weighed against potentially substantial implementation and ongoing management costs. Estimated relative cost differences between concepts are used to identify trade-offs between concepts to aid in concept selection. Stakeholder outreach conducted for the Franks Tract Project finds that identifying sufficient funds for construction is a feasibility issue requiring additional follow up and also finds that sufficient funding for operations and maintenance is critical to the project functioning as intended and avoiding unintended negative outcomes.

Construction feasibility and relative costs for the proposed concepts at Franks Tract were evaluated by Moffatt & Nichol using methods developed and applied by Moffatt & Nichol for previous Franks Tract planning efforts (CDFW 2018 and Moffatt & Nichol 2017).

Methods

For each concept, evaluation criteria were developed as described below.

Dredge volume

Dredge volume is the amount of material (cubic yards) dredged onsite to build up landmasses and enhance the existing remnant perimeter levees. Volume was calculated as the difference between constructed and existing grade, including an allowance for settlement. Constructed grade for the marsh surface generally ranges from 3.5 to 6.5 feet NAVD88.

The table below summarizes the acreage and gross quantities of fill material needed to construct the three concepts.

Table 1: Gross Quantities for Project Fill Areas

Restoration Concept	**3A**	**3B**[5]	**3C**
Marsh Area (AC)	1,485	1,616	1,874
Recreational Use (AC)	12	12	12
Fill (CY)	23,176,000	24,466,000	25,814,000
Consolidation (CY)	11,655,000	13,429,000	18,113,000
Total Fill (CY)	**34,831,000**	**37,895,000**	**43,927,000**
Dredging (CY)	34,831,000	37,895,000	43,927,000

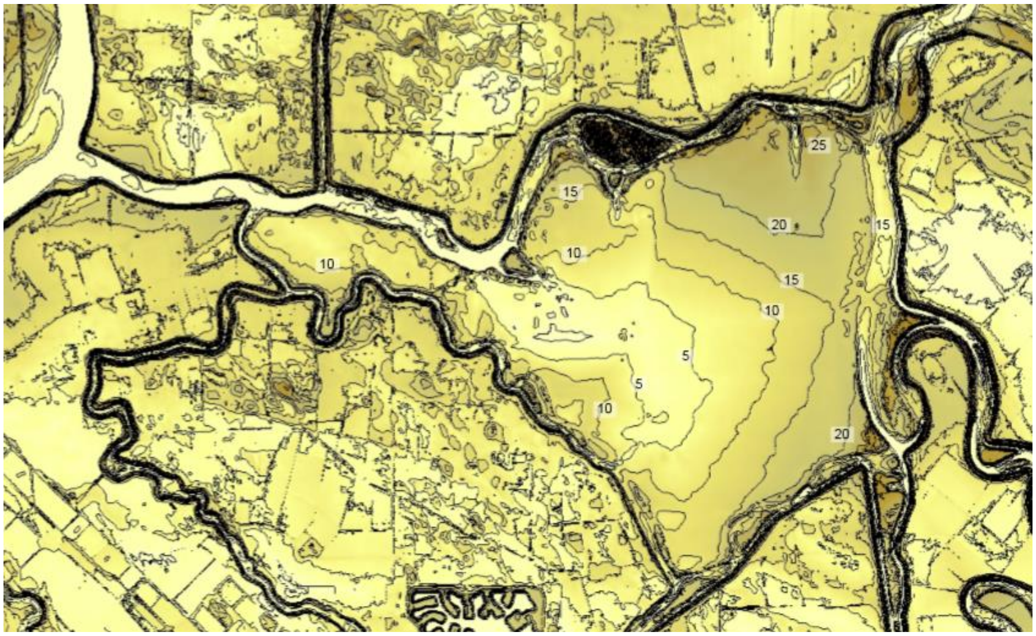
AC = acres; CY = Cubic Yards

Fill quantities have been augmented by additional fill volumes to compensate for consolidation, which occurs when the island features are constructed. The added weight of the fill causes underlying layers of peat to consolidate, requiring more fill to reach target elevations for marsh. The total quantities of material indicated in the table will be obtained by dredging within Franks Tract. The precise dredge and fill quantities will depend on the finalized concept, detailed design for construction, and geotechnical analysis to confirm the extent of sand and peat within the tract (see peat contours shown on Figure 1 below).

Restoration concepts A and B benefit from the respective island locations being mostly in areas of shallow peat deposits, which reduces the amount of fill needed to compensate for consolidation.

[5] Concept B was subsequently revised to become the preferred alternative. These revisions reduced the acreage of land mass and volume of dredge material below those shown here.

Figure 1. Average Peat Layer Thickness at Franks Tract. Source: Moffatt & Nichol 2017.



Relative Construction Costs

As all of the proposed concepts involve large-scale placement of fill material using dredging as the method of fill placement, the overall construction cost largely scales in proportion to the volume of fill material. Relative costs were estimated based on relative fill volume and include consideration of the contractor's mobilization, transfer of the dredge and floating pipeline to the site, contractor's marine equipment, installation of silt curtains, construction of the marsh areas and public areas; demobilization, and indirect costs, bonding, and insurance. Total cost for the preferred concept will be estimated following comparison of concepts and selection of the preferred concept.

Ongoing Operations and Maintenance

The relative costs of operations and maintenance (O&M) are another key cost component. The primary O&M activities are maintenance of the proposed recreational facilities and ongoing aquatic weed management. In addition, the project has the potential to reduce future efforts associated with periodic deployment of an emergency drought barrier and maintenance of flood protection levees on surrounding islands.

1. Recreational facilities ongoing O&M: O&M activities are envisioned to include maintenance and upkeep of the public access points, docks, camp sites, day-use areas, picnic and beach areas, restroom facilities, and trash receptacles. Costs for O&M include labor for State Parks staff, equipment, boat, supplies, materials, and services. O&M costs were estimated at approximately $370k per year (2020 cost without escalation).
2. Aquatic weed management: the ratings assume management of invasive vegetation at current levels of effort/cost conducted at Franks Tract. Design of proposed concepts will reduce the amount of area at high risk for aquatic weed colonization, therefore, the

same level of effort could be applied to the tract with more beneficial results. The current level of effort for weed control at Franks Tract is approximately $4-8 million/year, based on the treatment of approximately 1,000 – 2,000 acres of SAV in Franks Tract at a cost estimate of $4,000 per acre (Conrad, 2019 and L. Anderson, personal communication).

3. Emergency drought barrier: Costs associated with the installation and deconstruction of an emergency drought barrier. DWR deployed an emergency drought barrier in West False River during the 2015 drought to reduce the risk of problematically high salinities reaching the Central Delta and the South Delta pumps. DWR spent approximately $30M on deployment and removal of the 2015 emergency drought barrier. Salinity improvements with the proposed Franks Tract project will tend to reduce the frequency of conditions likely to result in deployment of a future emergency barrier. Even a modest reduction in deployment frequency could be significant from a cost perspective, as well as reducing disruptions to the local community associated with a barrier.
4. Maintenance of flood protection levees: All the proposed concepts include enhancement of the Franks Tract remnant perimeter levees. These enhancements will provide continued wave sheltering to the nearby flood protection levees serving the surrounding communities (e.g., the levees on Bethel Island maintained by the Bethel Island Municipal Improvement District). Consequently, levee maintenance districts are expected to benefit from lower levee maintenance costs compared to the No Action Alternative. (see Evaluation Criteria Information Sheet – Flood Protection).

Construction Impacts

Short term impacts include disruptions associated during the construction of a project. Activities such as dredging and land mass shaping would be ongoing over a period of several years with associated noise, navigation re-routings, etc. If a project were to be implemented, further discussion would be needed to determine how to best schedule and sequence any future construction to accommodate existing Franks Tract uses (e.g. localized shutdowns during key hunting or fishing periods, weekend shutdowns, etc.) and how to best mitigate or abate any short term construction related impacts.

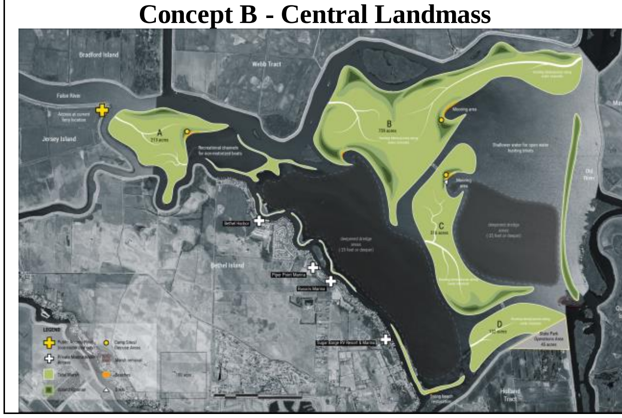
Long term impacts are disruptions that would be expected to occur beyond the construction period of project. The potential future need for salinity control structures, such as the 2015 emergency drought barrier discussed above, would be reduced along with the associated impacts during installation and removal of such a feature.

Figure 1. No Action Alternative and Round 3 design concepts.

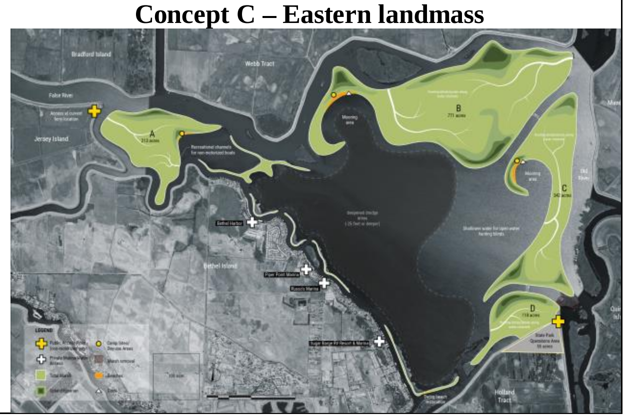
No Action

Concept A – Open water berm and channel

Concept B - Central Landmass



Concept C – Eastern landmass



Assumption and Uncertainties

- Costs of any armoring of constructed slopes (e.g., rip rap) is excluded from the volumes and costs.
- Assumes the same level of effort will be applied to manage invasive aquatic weeds.
- Funding sources have not been identified at this level of planning. Identifying sources of funding would be a focus of any future planning effort.

Results

Table 1 presents the constructability and cost performance metrics and ratings. Ratings are on a scale of 1 to 10, with 10 the best.

Table 1. Flood Protection – Metrics and Overall Ratings, for all Concepts

Metric/Rating	No Action	Concept 3A	Concept 3B	Concept 3C
Dredge volume (cubic yards)	0	34,831,000	37,895,000	43,927,000
Relative Construction Costs	**0**	**$$$**	**$$$**	**$$$**
Relative Operations & Maintenance Cost	**$$**	**$$$**	**$$$**	**$$$**
Annual O&M for recreation elements (i.e. State Parks)	$0	$$$	$$$	$$$

Aquatic invasive vegetation management	$$	$$	$$	$$
Need/cost of Emergency Drought Barrier	$$$ Yes	$$ Less frequent than existing	$$ Less frequent than existing	$$ Less frequent than existing
Levee Maintenance	$$	$	$	$
Construction Impacts	6	4	4	4
Construction Period Impacts (short term)	10	1	1	1
Drought Barrier Impacts (long term)	2	7	7	7
Overall Rating (1-10)	**$**	**$$$**	**$$$**	**$$$**

Discussion

Trade-off considerations are straightforward for costs. While detailed cost estimates are not yet available, there is no doubt that both construction and long-term operations and maintenance costs would be much higher for any of the three Concepts relative to the No Action Alternative. There are, however, are opportunities to reduce long-term costs associated with levee maintenance and an emergency drought barrier, and the opportunity to achieve more benefits with a fixed budget for aquatic weed management.

The topic of 'who pays' would need to be aligned with the agencies and organizations with the most to gain. Also, before any project would move forward, a commitment to long-term O&M funding would need to be put in place. One of the major considerations for Franks Tract Futures is whether the potential increased costs are warranted by the potential for multiple objective project benefits.

References

California Department of Fish and Wildlife. 2018. Franks Tract Futures. Exploring Options for Multi-Benefit Restoration and Increased Resilience in the Central Delta Corridor.

Conrad, Louise. 2019. Delta Fishes and Plants in Shallow Water. Presentation to Franks Tract Futures public meeting #1, July 2019.

Lars Anderson, personal communication. October 2019 and April 2020.

Mofatt & Nichol. 2017. Franks Tract Engineering Feasibility Assessment. Prepared for The Metropolitan Water District Of Southern California. November 15.

The Economics of Land Use

Final Report

Franks Tract Futures Economic Assessment

Prepared for:

Environmental Science Associates and
California Department of Fish and Wildlife

Prepared by:

Economic & Planning Systems, Inc. (EPS)

September 23, 2020

EPS #191019

Economic & Planning Systems, Inc.
One Kaiser Plaza, Suite 1410
Oakland, CA 94612-3604
510.841.9190 tel
510.740.2080 fax

Oakland
Sacramento
Denver
Los Angeles

www.epsys.com

Table of Contents

List of Figures

COVID-19 STATEMENT

Economic & Planning Systems, Inc. (EPS) prepared this Report as the nation and world seek to address the coronavirus pandemic, an unprecedented public health crisis. Research for this Report was completed before the severity of the crisis became apparent. In recent weeks, the economic fallout has been both significant and abrupt. Given that the length and severity of the coronavirus pandemic are still unknown, economic implications will depend fundamentally on how the crisis unfolds over the next three to six months. The current consensus is that negative economic impacts are likely to dissipate, although the exact pace and timeframe for economic recovery remain unclear. The potential implications of the pandemic for the Franks Tract Futures project have not been considered in the findings of this Report.

Acknowledgements

EPS conducted in-person and telephone interviews with business owners, association members, recreation guides and participants, and residents over the course of four weeks. The contributions made by interviewees are central to the findings of this study, and EPS greatly appreciates the interviewee participation, as well as the support and helpful guidance provided by the ESA consultant team and UC Davis researchers.

Chuck Russo
Owner
Russo's Marina

David Gloski
Resident

David Riggs
Owner
Sugar Barge

Jamie Bolt
Owner
Bethel Harbor Marina

Jeff McThorn
Owner
Delta Watercraft

Jim Cox
Representative
California Bass Association

John Francisco
Duck Hunter

Kathleen Stein
Cantwell & Stein
Realtor

Mark Lassagne
Fishing Guide

Mark Whitlock
Former President
Bethel Island Chamber of Commerce

Michael Bacon
Duck Hunter

Raj Sarkaria
Owner
Gateway Gas & Mart

Rick Fuller
Rick Fuller Team
Realtor

Rob Brunham
Owner
Rusty Porthole

Scott Mack
Owner
Bethel Harbor Marina

Tara Donham
Owner
Dave's Delta Outdoors

1. INTRODUCTION AND KEY FINDINGS

Introduction

The California Department of Fish and Wildlife (CDFW) engaged a team, led by Environmental Science Associates (ESA) and supported by UC Davis researchers, to prepare Franks Tract Futures, a planning study to evaluate environmental restoration and recreation enhancement options for Franks Tract. ESA commissioned Economic & Planning Systems, Inc. (EPS) to prepare this Economic Assessment of Franks Tract Futures project alternatives.

The assessment relies on an outreach process that engaged a roster of business-oriented stakeholders representing various perspectives on economic conditions and potential effects that may occur as a result of Franks Tract Futures. Interviewees include local employers, business leaders, real estate experts, recreation advocates, community group representatives, and other Franks Tract stakeholders. The economic review focuses on the Bethel Island economy, the primary economic geography supporting recreation activities at Franks Tract.

Figure 1 Franks Tract and Vicinity

Source: California State Parks

The Economic Assessment is a qualitative review of economic conditions and potential economic impacts from Franks Tract Futures alternatives. While a range of economic data are provided for context, stakeholder comments are the primary resource for the research effort, providing insight on local economic opportunities and constraints, and exploring potential strategies to maximize the economic benefits from restoration and recreation improvements. EPS conducted interviews in person and by telephone, primarily in a one-on-one setting. The interviews provided stakeholders a formal opportunity within the planning process to opine on current economic conditions and potential impacts from Franks Tract Futures.

Based on background information and interview findings, this assessment identifies economic impacts that may be attributable to Franks Tract Futures, including consideration of business effects and real estate value effects. The findings may inform potential project modifications that seek to minimize negative economic impacts or increase positive effects. This introduction summarizes key findings. **Chapter 2** through **Chapter 4** offer detailed discussion of economic trends, interview results, potential project impacts, and recommendations.

About Franks Tract

Heralded as "the Heart of the California Delta," Franks Tract State Recreation Area is known for excellent year-round fishing and seasonal waterfowl hunting. Surrounded by hundreds of miles of rivers and streams, Franks Tract is accessible only by water. Historically, the area was a natural wetland. In the late 19th and early 20th centuries, farming flourished in the Delta as wetlands were "reclaimed" through levee construction. For about 25 years, Franks Tract was farmed for crops and its rich supply of peat.[1] However, after recurring floods in the 1930s, the island became completely submerged. The State of California established Franks Tract as a public use area in 1959, and over the decades, the 3,500-acre park has become a popular location for water-based recreation.[2]

Figure 2 Franks Tract and Bethel Island Facing Westward

Source: California Department of Fish and Wildlife

Key Findings

The economic wellbeing of Bethel Island is reliant on the popularity of outdoor recreation in the central Delta, particularly boating and fishing. Jobs data show that approximately half of the employment on Bethel Island is directly tied to recreation. The Accommodation and Food Service industry is the most significant employer, followed by the Arts,

---

[1] Milligan, Brett and Alejo Kraus-Polk. Human Use of Restored and Naturalized Delta Landscapes. https://watershed.ucdavis.edu/files/biblio/Human%20Use%20Report_%20Appendix.compressed%281%29.pdf

[2] California State Parks, State of California. "Franks Tract SRA." *CA State Parks*, 2020. www.parks.ca.gov/?page_id=490

Entertainment, and Recreation sector. Interviews with local business representatives confirm that spending by visitors attracted to the Island for boating, fishing, and outdoor recreation in the Delta is the lifeblood of the local economy.

Despite the Bay Area's strong recovery from the 2008-9 recession, the Bethel Island economy has not regained the jobs that were lost a decade ago. While the inner Bay Area surged back from the 2008-9 recession over the past decade, with growth fueled by the technology sector, Bethel Island has not enjoyed broad-based economic growth. At the outer edge of Contra Costa County, Bethel Island businesses benefit from proximity to consumers visiting from the urbanized Bay Area but is not a traditional business location. In recent years, available data show that Accommodation and Food Service employment has expanded to meet growing demand, but that Arts, Entertainment, and Recreation employment (e.g., marinas, fishing guide services) has declined. Across all industries, the local Bethel Island economy supports roughly 15 percent fewer jobs than it did about 15 years ago.

While the local economy has contracted, some local businesses on Bethel Island are thriving today. The 2008-9 recession and its aftermath eliminated some marginal businesses and forced others to streamline operations with leaner staffing. However, with the strength of the Bay Area economy, several local businesses are succeeding in niche segments of the recreation market. A number of marinas interviewed reported successful business models that focus on unique customer groups. While available jobs data depict a contracting local economy, some strategic and well-positioned recreation businesses are prospering.

The popularity of largemouth bass fishing tournaments has been a boon for Bethel Island. While participation in fishing is waning nationally and in California, largemouth bass fishing has continued to grow in popularity. A longtime favorite target of recreational anglers, interest and participation in the sport has ballooned as competitive bass fishing has grown across the United States. Today, bass fishing professionals are winning unprecedented sums and attracting fan followings. The Delta is regarded as one of the five best fishing destinations in the nation, and largemouth bass are the target species for most anglers. With various Delta tournaments now occurring weekly during fishing season, Franks Tract has become a central hub for this activity. Interviews with marina operators and local retailers confirm the increased importance of bass fishing to the local economy.

The key objectives of Franks Tract Futures are in line with local business goals and economic development. The project seeks to improve water quality, restore native ecology, and enhance recreation. And with the Bethel Island economy tied to the wellbeing of local environmental conditions and recreational opportunities, specifically factors that influence boating and fishing, most interviewees expect the project will sustain and grow local economic opportunity. The current and ongoing degradation of environmental conditions in Franks Tract is a business risk, with invasive aquatic weeds and elevated salinity events generating the most concern. For local businesses, if the boating and fishing conditions are first-rate, and navigation and access are sustained or improved, the prospects for ongoing local business success are strongest.

Recreational improvements will increase the attractiveness and draw of Franks Tract for leisure activity, and businesses likely will benefit from new visitors. Franks Tract Futures envisions significant enhancements to the existing State Recreation Area. The recreation concepts feature day use areas with picnic areas and restrooms, overnight camping, mooring fields for day and overnight use, docks, beaches, and enhanced public access. With few exceptions, interviewees reported that these recreational improvements, in combination with successful environmental restoration and improved navigation, have potential to increase visitation and economic activity on Bethel Island.

Boat navigation through Franks Tract should be prioritized to ensure the success of the Project. While interviewees generally were pleased that Franks Tract Futures alternatives appear likely to improve navigation, stakeholders stressed that easy access to Bethel Island across Franks Tract is essential to the local economy. Bethel Island's historical success as a recreation economy is largely due to its central location within the Delta and convenient access to major waterways. For boaters driving in from the Bay Area, it is among the best launch locations for trips into the heart of the Delta. If navigation through Franks Tract is compromised, this competitive advantage that Bethel Island enjoys could be reduced or eliminated.

New recreational amenities should not compete with existing businesses. While interviewees report that many long-time local businesses have established niche services and unique customer segments, these businesses remain exposed to increased competition. Even the strongest local businesses need to compete intensely for visitor dollars to survive. A common theme in the interviews was that while new competition is expected to result from growth induced by the project, public services introduced by the project should not compete directly with private business. For example, marina stakeholders object to inclusion of a public boat launch (motorized or non-motorized) as part of the Franks Tract Future project. Particularly if launching is provided at below-market rates, the addition of new launch facilities will reduce the potential economic benefit of the Franks Tract Futures project for local businesses.

Operations and maintenance of the Franks Tract Futures project is critical to its success. Numerous interviewees cited concerns about planning for the long-term operation and maintenance of Franks Tract. Currently, there are no commitments concerning management strategy or funding sources. Stakeholders commented that the success of the project hinges on implementation. If the project is developed successfully but poorly managed, there could be negative impacts. If the project is well run and maintained to high standard, with sufficient safety services, public information, and capacity control, the benefits could be significant. Interviewees stress the importance of addressing operations and management issues during the current planning project as an important step to winning public support for the project.

Careful attention must be paid to mitigating business impacts during construction. Though construction period impacts are not a focus of the Economic Assessment, interviewees did express concern about inhibited business activity, disturbed fisheries, displaced bird populations, compromised navigation, and other issues that could result during project development. Despite an understanding that some one-time construction impacts will be unavoidable, interviewees emphasized the importance of developing strategies to minimize recreation and business impacts from construction to the extent practicable.

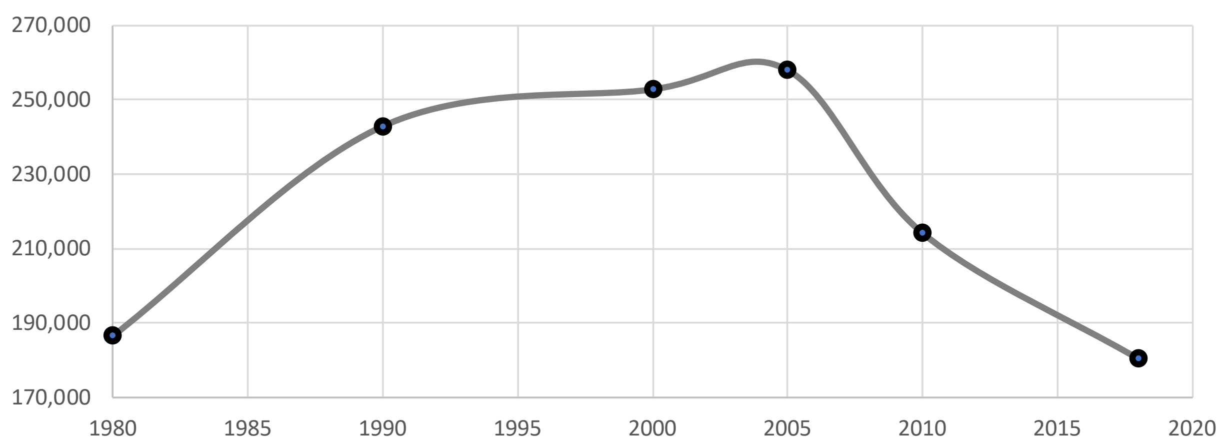
2. EXISTING CONDITIONS

Runoff from the Sierra Nevada and southern Cascades mountain ranges feeds the south-flowing Sacramento River and north-flowing San Joaquin River, and their convergence forms the largest estuary on the West Coast: the Sacramento-San Joaquin Delta.[3] The Delta supports a complex and crucial natural ecosystem, as well as a diverse agricultural and recreational economy and important water, transportation, and energy infrastructure. The majority of the Delta's land area is farmed.[4] Its 700+ miles of channels supply water to two-thirds of the state's population and millions of acres of farmland across the state, and support world-class boating, fishing, and hunting.[5]

Franks Tract Recreation

Franks Tract is well known for its water-oriented recreational opportunities. Their prominence and popularity, however, has fluctuated over the decades, responding to changes in underlying water ecology, weather patterns, and recreational preferences. During the 1990s and 2000s, fishing in Franks Tract was at its prime, and fishermen report that it has not been as good since. More broadly, vessel registration and fishing license data show an overall decline in fishing and boating statewide. But the growing popularity of largemouth bass fishing and bass fishing tournaments in particular has been a boon to the local economy serving Franks Tract. Franks Tract remains popular for boating and fishing, despite some of the broader trends in recreation.

Figure 3 Total Vessel Registration Near the Delta*



**Includes Counties within about 75 miles of the Delta*
Source: State of California Department of Motor Vehicles, 2019

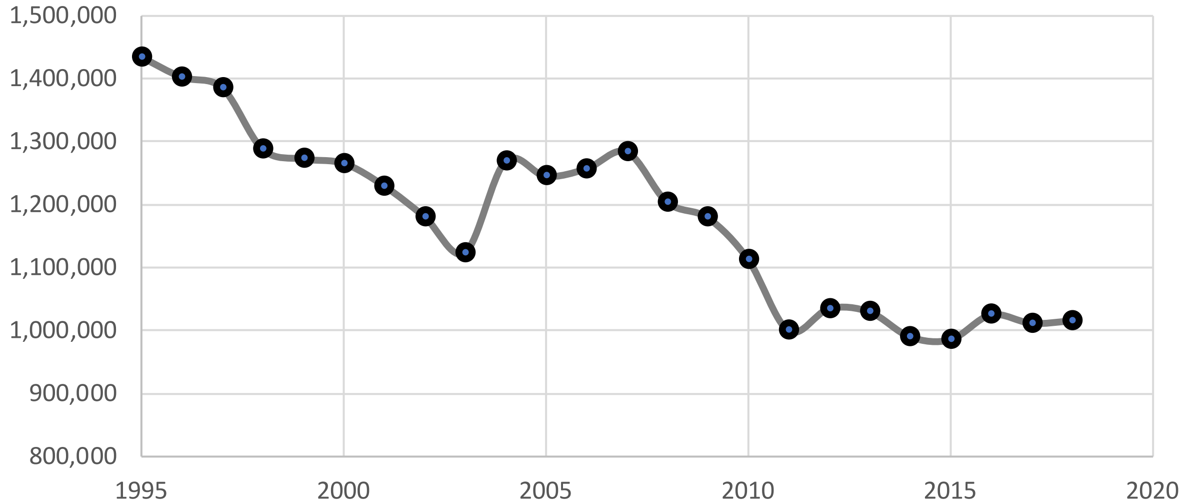
---

[3] "Sacramento-San Joaquin Delta." *Water Education Foundation*, 2020, www.watereducation.org/aquapedia/sacramento-san-joaquin-delta.

[4] "About the Delta." *University of California, Agriculture and Natural Resources*, ucanr.edu/sites/deltacrops/About_the_Delta/.

[5] California, State of. "The Delta." *Department of Water Resources*, water.ca.gov/Water-Basics/The-Delta.

Figure 4 Resident Sport Fishing Licenses in California



Source: California Department of Fish and Wildlife

Fishing Tournaments

A 2018 headline in the New York Times decreed "This is the most Lucrative Moment in History to Catch Bass." According to the most recent National Survey of Fishing, Hunting and Wildlife-Associated Recreation, bass are the most popular fishing target in America. Capitalizing on the popularity of the sport, bass fishing tournament circuits have expanded dramatically, and prize payouts at the biggest tournaments can reach six figures. Like other professional sports, there is significant social media buzz around the top contestants. In the Delta, several tournaments have been established to satisfy popular demand. Notable tournaments launch from Franks Tract, along with Stockton and the west Delta. When major tournaments began coming to the Delta, visiting anglers were impressed by the size of the bass relative to other areas of the country.[6]

Among the biggest tournaments hosted at Franks Tract each year is the FLW tournament, drawing in 120 to 180 boats and around 300 people. This tournament, unlike others, does not institute an "off limits period," meaning fishermen can go out a week before the event starts to practice. According to interviewees, it is common for participants to spend $50 a day on fuel, $75 a night on accommodations, and $60 a day on food. Over a weeklong practice period, and another five days of tournament time, more than a half a million dollars in economic activity can be generated. This spending estimate is comparable to data reported by a 2019 study of the Rio Vista Bass Derby that found the four-day event generated more than $440,000 in direct economic impact locally.[7]

In addition to major multi-day tournaments, Franks Tract also hosts several smaller one-day events that typically draw 100 boats (about 200 anglers). During March, April, and May, there are tournament events every weekend. Interviewees point out that in addition to the economic

[6] Personal communication with EPS.

[7] Mickel, Dr. Amy, et al. Recreation & Tourism in the Delta A Study of Preferences for Activities and Facilities, Information Sources, and Economic Contributions of Delta Events. 2019.

spending attributable to tournaments, participants are familiarized with the Delta and often come back to fish recreationally, further increasing the economic significance of these events.

Duck Hunting

Though visitation is relatively modest compared to fishing trips, duck hunting is another popular activity in Franks Tract. As compared with other hunting areas in the Delta and Northern California, Franks Tract is unique in that it has a state-run permit program for hunting blinds. This program assures organized use and accountability of hunters within the recreation area, with a grid system used to assign specific coordinates for each hunting blind. According to hunters, the permits typically don't all sell out (currently there are enough designated locations), but some of the spots are not worth hunting. During a typically season, hunters make several expenditures in the local economy, including dry storage for boats and blinds ($500), boat slip, fuel, and ongoing maintenance (~$500). In addition, a $350 permit fee is payed to the state. For those currently hunting in the area, Franks Tract is uniquely attractive because of the designated sites a hunter may use for the entire season. Private clubs are an alternative but are dramatically more expensive. Interviewees also note that Franks Tract is convenient to neighboring communities, with most hunters living locally.

Boating and Marinas

Boating is the predominant activity in the area. It is popular in its own right, and also as a supporting activity for fishing and hunting trips. Boating in Franks Tract and in the Delta has experienced cycles of rise and decline, responding to broader economic influences. Before the 2008 financial crisis, there were several boat dealerships in the area, but they have since closed. Most of the marinas on Bethel Island survived the last recession, and interviewees indicate those that failed were struggling for multiple reasons. The most significant marina businesses are family-run enterprises that have been around for generations. These facilities have scaled back staffing during more challenging times, but as of the interview period (March 2020), the Bethel Island marinas have had several good years for business.

Marinas and other interviewees familiar with boating trends note that, in addition to macro-economic trends, boating popularity fluctuates to some degree with the price of fuel. Despite the modest ebb and flow of gas prices, overall boating activity around Bethel Island has been fairly steady. A bigger concern among the marina owners and others interviewed is that boating and outdoor recreation generally is not being passed on to younger generations the way it once was.

Bethel Island is a key gateway for boaters from the Bay Area coming to the Delta. The major marinas tend to have a niche market segment, a group of customers they strategically cater to. Bethel Harbor attracts boaters coming from Marin, San Francisco, and the Peninsula who launch for trips to Tinsley Island, a Saint Francis Yacht Club retreat. Russo's Marina caters to anglers and is host to much of the tournament activity on Franks Tract. Sugar Barge Resort is known for its restaurant and event facility, camping grounds, boat rentals, and marina service. Despite the wide range of marina offerings and Bay Area population nearby, boating activity is highly seasonal, with Memorial Day to Labor Day revenue generation sustaining business viability.

Bethel Island Economic Overview

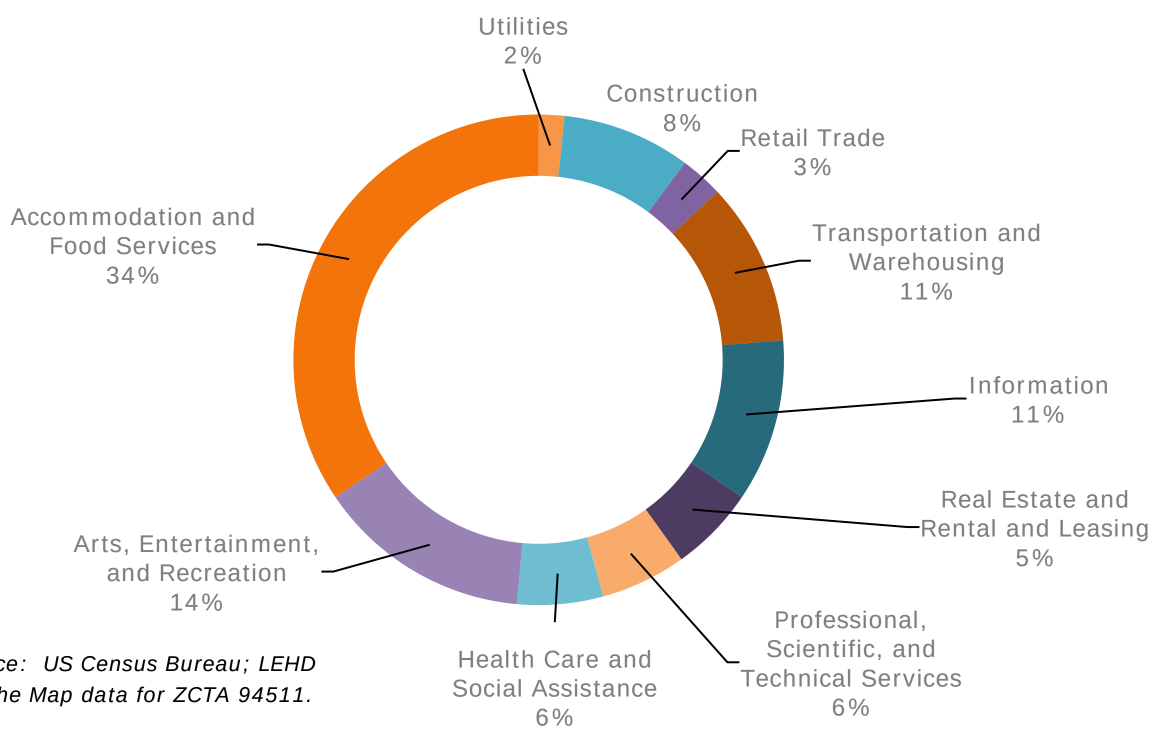
Bethel Island is a 5.6-square-mile land mass located in the far-east corner of Contra Costa County. Its central-Delta location provides a key access point to the Delta for visitors from the inner Bay Area, and the local economy depends on these visitors. The local population is only about 2,000 residents, down by nearly 8 percent since 2000.[8] The Island population is older than California as a whole, with a median age of 53.5, compared to 36.5 statewide. Median household income has declined over the years, from roughly $45,000 in 2000 to $39,000 in 2017.

Local Economy

The Bethel Island economy is driven by the recreational opportunities in Franks Tract and the Delta. The Island's marinas, with associated services such as maintenance, storage, and rentals, are the largest employers.[9] According to interviewees, these jobs are primarily full time, and many are held by long-time local residents.

The importance of recreation-related business is apparent in the jobs data available for Bethel Island. According to employment data available from the Census Bureau, nearly half of Bethel Island jobs are within either the Accommodation and Food Services industry (34 percent) or Arts, Entertainment, and Recreation industry (14 percent). **Figure 5** presents the distribution of employment on Bethel Island, including recreation-related and other industries.

Figure 5 The Bethel Island Economy—Jobs by Industry (2017)



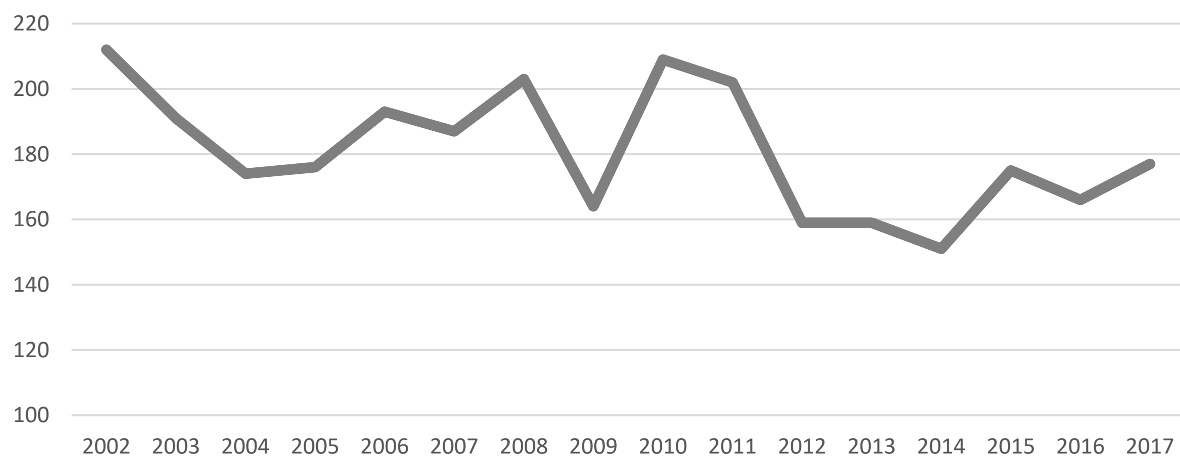
Source: US Census Bureau; LEHD On The Map data for ZCTA 94511.

[8] 2018 American Community Survey 5-Year Estimate (Table B01003).

[9] InfoUSA Businesses 2016.

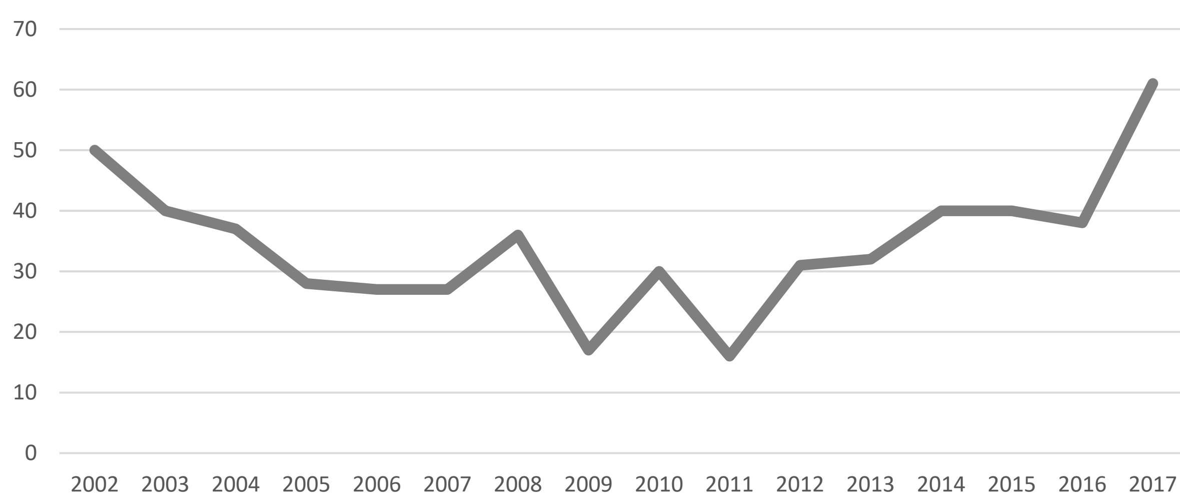
The number of jobs on Bethel Island has fluctuated since the early 2000s but is down from levels seen then and in 2010 and 2011. After recovering from the 2008 financial crisis, job counts on the Island are back to where they were around 2005, as shown in **Figure 6**. This trend reflects countervailing forces. While Accommodation and Food Services jobs have been on the rise since 2011, Arts, Entertainment, and Recreation jobs have been declining since 2003. **Figure 7** and **Figure 8** detail employment trends in these industry sectors.

Figure 6 The Bethel Island Economy—Total Jobs Trend



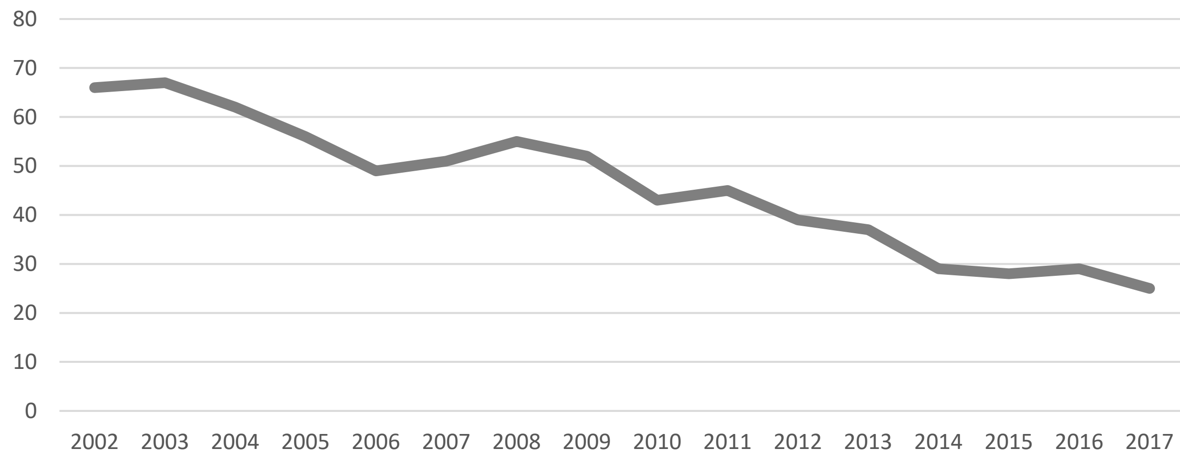
Source: US Census Bureau; LEHD On The Map data for ZCTA 94511.

Figure 7 The Bethel Island Economy—Accommodation and Food Service Jobs Trend



Source: US Census Bureau; LEHD On The Map data for ZCTA 94511.

Figure 8 The Bethel Island Economy—Arts, Entertainment, and Recreation Jobs Trend

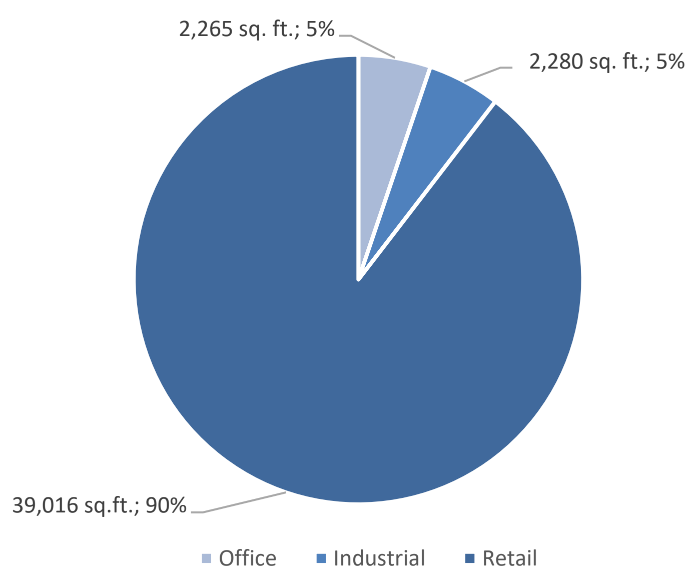


Source: US Census Bureau; LEHD On The Map data for ZCTA 94511.

Local Real Estate Market

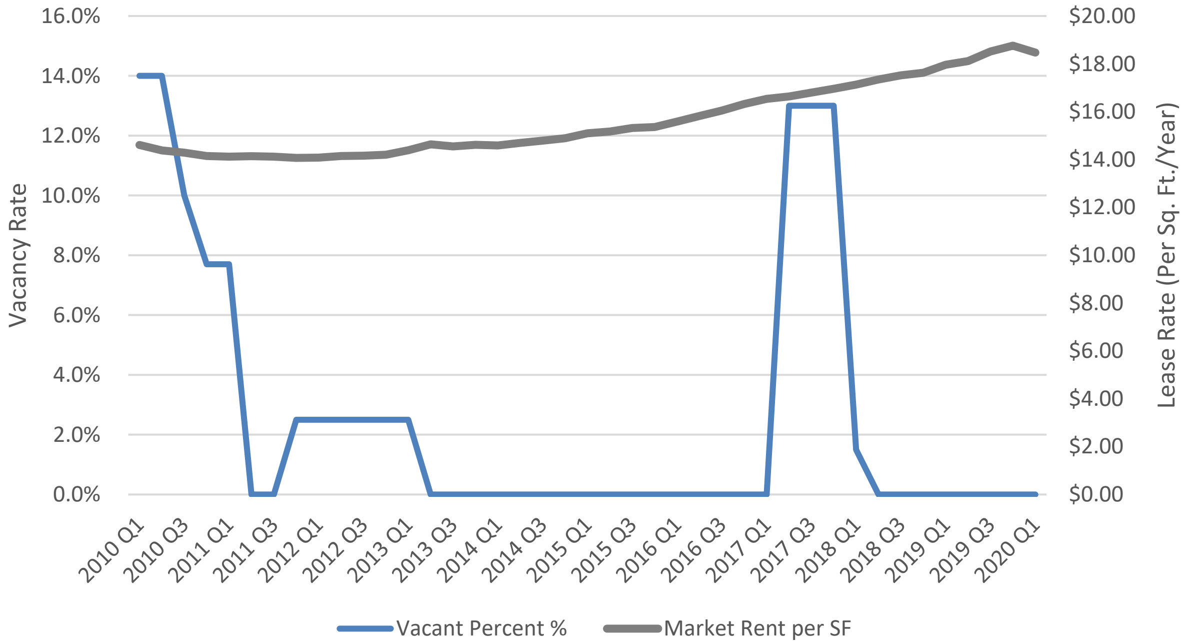
Commercial real estate on Bethel Island is primarily composed of retail space—representing 90 percent of the market. The remaining 10 percent of the total commercial square footage is split evenly between office and industrial space. No new buildings or square footage have been added to the market in recent years (available data go back to 2006). Vacancies are limited, and with the exception of in early 2020, market rents have been increasing steadily since 2013.

Figure 9 Bethel Island Commercial Real Estate Breakdown 2020 (Square Feet) *



**As of Q1 2020.*
Source: CoStar Group.

Figure 10 Commercial Vacancy Rate and Market Rent per Square Foot



Source: CoStar Group.

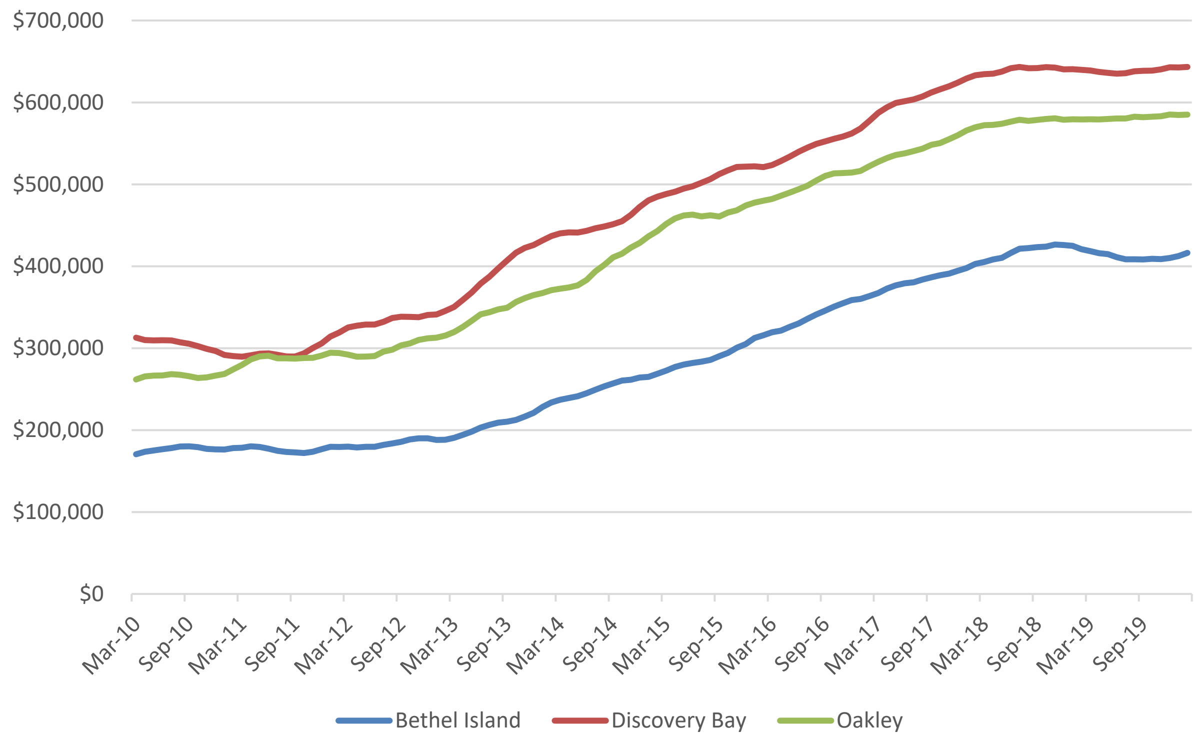
Home values on Bethel Island have enjoyed a steady rise since 2010, increasing 144 percent. While nearby communities also have seen rapid price increases during this time period, Bethel Island's price escalation outpaced Oakley (123 percent growth) and Discovery Bay (106 percent growth). Despite the relative appreciation, Bethel Island's home prices remain relatively affordable compared to these neighboring communities. **Figure 11** illustrates the home value trend on Bethel Island compared to these nearby communities.

Most of Bethel Island's housing stock was built during the mid to late 1900s. The Delta Coves development project on the south shore, however, is delivering new housing units to market. The Delta Coves concept was originally conceived in the 1970s, and after decades of planning, financing, and refinancing (including bankruptcy delays a decade ago), the project celebrated its grand opening in September 2019. Homebuilders are now selling luxury waterfront residences, all with individual, private boat docks. In total, the project includes 494 homes. Housing sizes range from 1,800 to 4,000 square feet and prices range from $700,000 to $1.1 million. With these higher price points, Delta Coves is raising the Island's overall median home prices.[10] Residents and businesses interviewed generally embraced the project, both for the significant investment in the community and for the added consumer spending potential new residents likely will bring to the Island. At least two interviewees cited Delta Coves as a key reason they chose to bring their business to the Island.

---

[10] Brown, Aly. "Delta Coves Housing Development on Bethel Island to Open This Spring." *Thepress.net*, 4 Jan. 2019, www.thepress.net/news/delta-coves-housing-development-on-bethel-island-to-open-this/article_e67b2cdc-f97e-11e8-8457-ff54a980378d.html.

Figure 11 Home Values Comparison: Bethel Island, Discovery Bay, Oakley



Source: Zillow Home Value Index.

Bethel Island Economic Drivers

Conversations with interviewees identified several themes regarding Bethel Island's current economic conditions and priorities. These themes emerged as major drivers affecting economic sustainability. The economic drivers identified below provide a framework for understanding the local economy and are lenses for assessment of potential economic impacts of Franks Tract Futures alternatives:

- **Recreation:** Recreation is the cornerstone of the Bethel Island economy. Economic success revolves around local access to high-quality recreation. Consumer activity generated by the recreation resource sustains the local marinas, restaurants, and retail shops directly, and other support services and businesses indirectly.

- **Environmental Quality:** The recreation economy depends on environmental quality, and water quality most importantly. The majority of interviewees commented on the struggle with invasive weeds and concerns about water quality impacts attributable to water export activity. Interviewees also generally agreed that environmental quality has been in decline, which has affected recreation. This trend is a threat to the long-term viability of the economy on Bethel Island.

- **Access and Navigation:** Bethel Island provides easy access to the central Delta for Bay Area and other visitors. From Bethel Island, boaters navigate to destinations throughout the primary and secondary zones of the Delta. This easy access attracts visitors to Bethel Island, supports spending at local businesses, and enhances property values. However, Franks Tract has become increasingly difficult to navigate because of shallow water, weeds, and other obstacles.

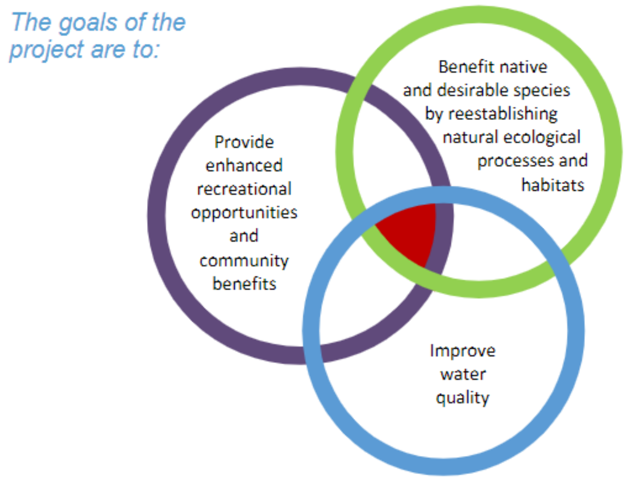
- **Business Community:** Businesses on Bethel Island are working together to advocate for Franks Tract and the Delta. There is a realization among business owners that collective action is needed to avoid further deterioration of environmental quality and the local economy. Rather than viewing other businesses strictly as competitors, there is a collegial attitude on the Island that supports shared successes.

- **Market Perception:** The Bethel Island business community acknowledges that the Delta remains somewhat undiscovered and that the natural beauty and recreational opportunities are not well marketed. While there is some concern that increased consumer awareness of Franks Tract and economic growth could erode the tightknit community and the rustic character that makes Bethel Island so special, there was a general consensus among interviewees that the economy will benefit from investment, along with marketing and branding to leverage that investment.

3. Economic Impact Assessment

Franks Tract Futures is a collaborative planning process initiated by the CDFW. The planning process entails working with the local community, local agencies, and interested stakeholders in developing a detailed habitat and recreation enhancement plan for Franks Tract. Consultants, academics, and government researchers are developing and evaluating alternative project designs.

The desired outcome of the planning process is that the final plan achieves biological and water quality objectives and addresses local concerns related to recreation, navigation, flood protection, and local economic sustainability. The planning process already has yielded preliminary, alternative approaches to restoration and enhancement. It is anticipated that the final plan will inform California State Park's Franks Tract State Recreation Area Management Plan and will integrate with other ongoing Delta-related planning efforts.



After incorporating multiple rounds of feedback from stakeholders and hydrodynamic modeling analyses prepared by the California Department of Water Resources, the ESA consultant team released three revised design concepts at a public Advisory Committee meeting on March 4, 2020. The current Franks Tract Futures alternative concepts feature:

- Day use area, including picnic tables, restrooms, trash receptacles;
- Overnight camping, near day use areas;
- Mooring fields for day use and overnights;
- Docks for small, medium, and large boats; and
- Enhanced public access point that offers a non-motorized boat launch, parking, and restrooms.[11]

The concepts also propose to include a California State Parks operations facilities on Holland Tract, to support management of the enhanced state-run recreation area. This facility would be

[11] This feature is only offered in Concept C; however, it could be added to any of the other concepts if desired.

for State Parks Operations and Maintenance and would not compete with existing facilities provided by Bethel Island businesses.

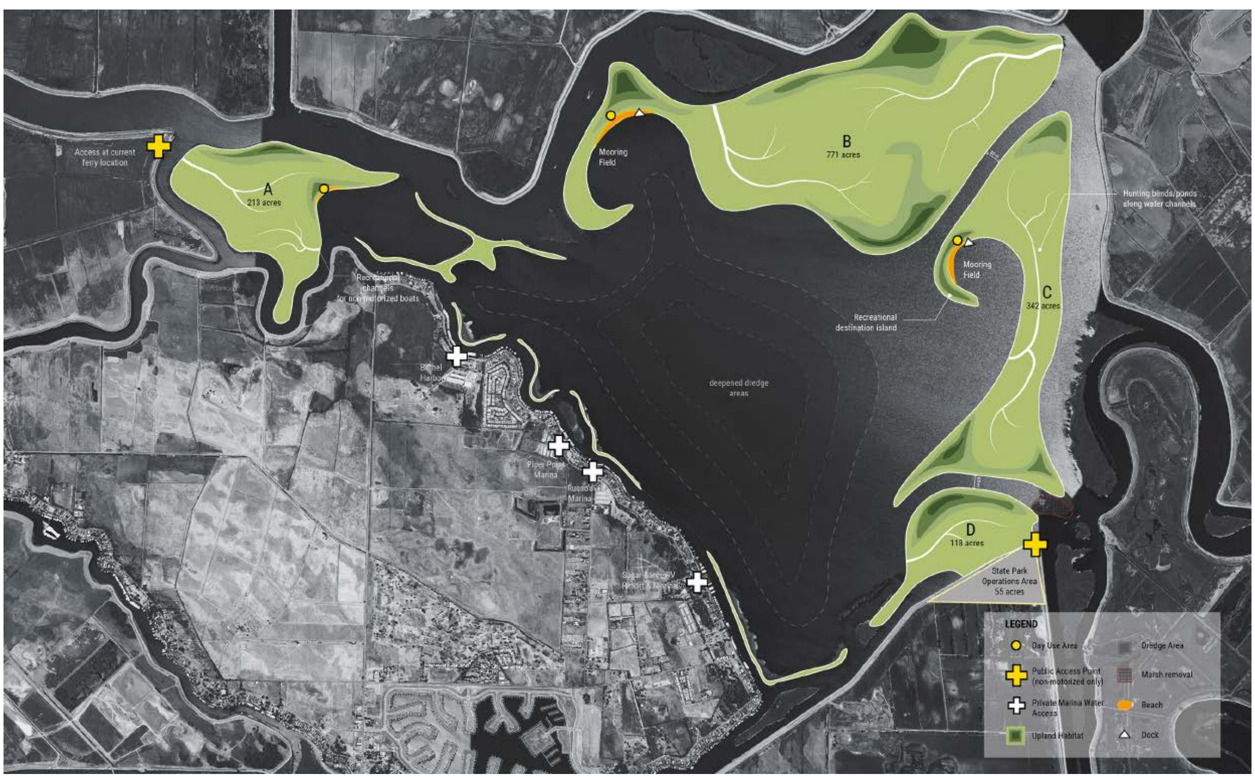
Figure 12 through **Figure 14** below present the Franks Tract alternatives shared by EPS with stakeholders as part of the Economic Assessment interviews.[12]

Figure 12 Concept A Illustration

12 Franks Tract planning alternatives, dated February 12, 2020.

Figure 13 Concept B Illustration

Figure 14 Concept C Illustration



Economic Impact Assessment Interview Approach

The economic impact findings discussed below reflect local stakeholder interviews. EPS has synthesized the range of potential economic impacts cited. The interviews sought to identify positive or negative effects that may be attributable to the Franks Tract alternatives, including consideration of potential business effects and property value effects. Interview responses are kept anonymous. This chapter organizes stakeholder input based on salient business themes—the "economic drivers" discussed above.

The interviews conducted capture the diversity of business activity within the Bethel Island economy. Based on the job mix on the Island, EPS established goals concerning the range of businesses to be interviewed. In large part, these goals were met, with the interview process yielding productive conversations with representatives from the major business and recreation categories present on Bethel Island. **Table 1** summarizes the interviews conducted, organized by business or recreation type.

Table 1 Interviews Conducted by Business or Recreation Type

Associations	Bethel Island Chamber of Commerce; California Bass Association
Boat Repair	Delta Watercraft
Fishing Guide	Mark Lassagne
Hunters	John Francisco; Michael Bacon
Marinas	Bethel Harbor; Russo's Marina; Sugar Barge Resort & Marina
Real Estate	Cantwell & Stein; Rick Fuller Team
Restaurant	Rusty Porthole
Retailers	Dave's Delta Outdoors; Gateway Gas & Mart

EPS presented interviewees with current Franks Tract alternative plans (shown on previous pages), asked a series of questions about business conditions and potential project impacts, and solicited general feedback on the designs.[13] Specifically, the following questions among others were presented, as appropriate:

- Could the restoration/recreation plan for Franks Tract be good for business?
- Could the project increase customer volume, spending, or other business factors?
- Could the project enable new lines of business?
- Could the restoration/recreation plan for Franks Tract be bad for business?
- How might the project have a negative effect on business factors?
- Do you have a preference for one of the alternatives over the others? Why?

[13] The interview guide used is provided as an appendix to this report. Interviewers relied on the guide but also tailored discussion topics and questions based on the interviewees' interests and knowledge.

The reactions provided were synthesized and organized into two overarching categories, business impacts and real estate impacts, with business impacts broken out by economic driver, including:

- Recreation
- Environmental Quality
- Access and Navigation
- Business Community
- Marketing and Branding

The following section details the key findings of the economic impact assessment. While the assessment focuses on potential impacts from the built-out and stabilized project, it is notable that many interviewees also expressed concern about economic impacts during the construction phase of the project. An additional, future research evaluation could consider potential economic mitigations to minimize or avoid business impacts during the construction period.

Business Impacts

Recreation

Interviewees report that the Franks Tract Futures project has the potential to be highly beneficial for recreation and the economy on Bethel Island. For boating in particular, the project introduces significant opportunities, by improving water quality and increasing access (discussed below), but perhaps more importantly by re-establishing Franks Tract as a compelling destination recreation area within the Delta. Boaters, including power boaters, sailors, and paddlers, seek outings that are structured around a place to go, and the Franks Tract Futures project could become a must-visit point of interest for various types of boating trips throughout the Delta. However, while project planners have incorporated more opportunities for non-motorized boating in Franks Tract, interviewees expressed concern that winds and conflict with power boat activity are likely to limit the potential for non-motorized boating. Nonetheless, increased boating and visitor activity at Franks Tract likely will have positive effects on the local economy, with additional trips generating new spending at marinas, local restaurants, markets, gas stations, repair, rental shops, and other businesses.

There were mixed reactions to the introduction of camping to the area. Some interviewees saw new camping facilities as a way to support the other increased recreational opportunities, attractive to boaters and fishermen. However, some interviewees expressed concern that campgrounds could be overrun by transient populations. This concern points to the importance of effective long-term ongoing management of the Franks Tract project, as elaborated on at the end of this section.

Franks Tract alternatives, as currently designed, would reduce the number of hunting blind permit sites in Franks Tract. Interviewees report the northern band of the tract is the best area to hunt because of a flyway there, so preserving sites in this area is important to hunters. In addition, hunters expressed concern that the project could displace duck populations, at least during construction, and hunting and camping so close could be problematic. Though it appears the project might have a negative impact on hunting in Franks Tract, the numbers of hunters active in the Tract is minor compared with boating and fishing, and the hunters interviewed reported relatively limited spending within the Bethel Island economy. So, while reductions in hunting seem likely based on current planning alternatives, the negative economic impact of this reduction likely is relatively minor.

Another consistent comment from business interviewees was that the Franks Tract Futures project should not compete directly with local business. The most frequently cited concern was that a State Parks facility that offers a public boat launch could have a negative effect on Bethel Island marinas. The launch business, including non-motorized launching, is an important source of revenue for these businesses. If the state were to introduce a new launching facility that provides access to Franks Tract, even if it is located off of Bethel Island, it could have a detrimental effect on Bethel Island marinas and a ripple effect on other Island businesses.

Finally, interviewees stressed the importance of management planning and operations within the Franks Tract project itself. A well-run recreation area at Franks Tract has the potential to be a benefit for local business, but without the proper planning and management, supported by reliable funding resources, there is some potential for negative economic impacts. Stakeholders repeatedly emphasized the importance of formalizing management plans and funding as soon as possible. There were mixed reactions to the area being run by State Parks. While some interviewees were supportive, others were concerned that project management could fall short, resulting in consequences for Franks Tract and the Bethel Island economy.

Environmental Quality

Achieving improved water quality is a principle goal of the Franks Tract Futures project. Many interviewees acknowledged and embraced this goal and reported that improved water quality, as related to decreased aquatic weeds and reduced herbicide use, likely would increase recreation potential and have positive impacts for local businesses. Interviewees generally concurred that recent trends in environmental quality at Franks Tract and the Delta more broadly have been detrimental to recreation.

The most commonly mentioned environmental concern was the dramatic increase in invasive weeds. Water hyacinth (an invasive non-aquatic species that floats on the surface) and other invasive plants make boating navigation challenging and limit swimming opportunities. While the state has taken actions to reduce these plants in the Delta, such as spraying herbicides, interviewees report that control measures may harm fish populations and fishing. The possibility that the water depths achieved by the Franks Tract Futures project could reduce invasive weeds was viewed as a significant positive for the area, including for recreation and related businesses.

The project goal of improving water quality by reducing salinity also was viewed as a positive, particularly if future water export activities are likely to increase saltwater intrusion in Franks Tract. Interviewees expressed concern that if no action is taken, Franks Tract could deteriorate further, becoming what one respondent referred to as a “mud hole.” Interviewees reported that brackish water is significantly less desirable for recreation, primarily because of its odor. The consensus among respondents was that maintaining Franks Tract as a freshwater resource will be critical to sustaining recreation and related businesses.

Access and Navigation

While the Franks Tract alternatives have the potential to alter boating navigation patterns within the Tract, interviewees report that current navigability is impaired and that improvement is needed. Water weeds inhibit navigation and deter boaters from cutting across the Tract.

Respondents suggest that increasingly boaters are avoiding Franks Tract because they do not want to take the time to go around weedy areas. Instead, these would-be visitors opt to go somewhere else. It was a key concern among interviewees that conditions in Franks Tract could degrade further, to a point that makes it nearly inaccessible. Most interviewees were supportive of dredging the Tract to improve navigation channels and to limit invasive weed growth. Providing better access to marinas from the major entrance points around Franks Tract is desirable, with improved and maintained access through Piper Slough identified as particularly critical.

Some interviewees were concerned that dredging could disrupt fish populations but most believed the disruption would be temporary. However, if fishing is negatively affected, interviewees expressed concern that fishing activity would be displaced to other locations in the Delta. Any decrease in fishing from Bethel Island would cause a negative economic impact for marinas and the broader local economy. One interviewee noted that “if you take bass fishing away, there will be 100 boats that go to Franks Tract a year instead of 10,000.”

Business Community

Cohesion within the business community on Bethel Island is a positive attribute of the local economic fabric that may be leveraged to increase benefits from the Franks Tract Futures. Interviewees indicated that local business owners largely consider other owners colleagues, not strictly competitors. Marina owners interviewed described a collaborative environment in which their businesses coordinate on local issues and initiatives. These business ties and the combined depth of knowledge in the business community offer an invaluable resource for ongoing planning for Franks Tract. With few exceptions, interviewees acknowledged that a significant public investment in Franks Tract likely would be beneficial to the community broadly, and none of the alternatives clearly creates disproportionate impacts on any particular business type or location on Bethel Island. The well-distributed potential benefits of Franks Tract Futures support continued business collaboration. However, one important stakeholder expressed that Franks Tract is working well today, and the project would introduce unnecessary downside business risk for that enterprise.

Market Perception

Bethel Island enjoys a rural-yet-connected charm that appeals to visitors and residents alike. An interviewee commented that “you can feel like you’re in the middle of nowhere but still have access to marinas and restaurants.” Some commented that a project that stimulates too much visitation growth could jeopardize the rural charm that makes the Island so special. While there is local desire for economic development, stakeholders worry about compromising the Island’s uniqueness. The Franks Tracts alternatives will undoubtedly increase awareness of the area, and likely visitation, which will increase the importance of local planning for growth. Interviewees expressed a desire to carefully plan for growth to avoid unintended consequences that could result from project success.

Real Estate Value Impacts

Economic research reveals that real estate with scenic views, nearby open spaces, and recreational opportunities achieves a price premium in the market. There is a substantial body of literature dating back to the 1970s that measures the economic value of views, parks, and open space through the examination of property value patterns, using statistical methods to isolate the value-specific property attributes. There have been hundreds of published studies that rely on “hedonic price models” to estimate the benefits of environmental amenities.

Hedonic property value studies infer the value of open space by estimating the market value of a property based on its characteristics. Evidence suggests that a view can add significantly to the value of residential properties, though most studies treat scenic views fairly generically (e.g., an ocean, lake, or mountain view). Recent studies have attempted to value views with more precision using Geographic Information System (GIS) and other data sources. Though a technical evaluation of real estate value impacts is beyond the scope of this Economic Assessment, it is clear from a cursory literature review that water views can generate a significant value premium for residential property.

Residential and commercial properties on the northeast shore of Bethel Island enjoy expansive views of Franks Tract. Vegetation at the edge of Piper Slough interrupts the view slightly, but beyond that, one can see the vast waterbody and distant horizon. The photograph below, taken from Sugar Barge Resort, illustrates the impressiveness of the current view of Franks Tract from Bethel Island.


Photo credit: EPS

In Economic Assessment interviews with realtors and waterfront property owners, the EPS team asked pointed questions about the real estate market and valuation factors, including access and scenic views. Interviewees commented that real estate values on Bethel Island revolve around the water. According to local experts, boat access to fast water and scenic views of open water are key determinants of residential real estate value on the Island. Accordingly, home prices on the northeast side of Bethel Island enjoy a premium over other locations.

The northeast side of Bethel Island offers the best water access. Despite offering direct water access, invasive weeds along Taylor Slough result in lower property value premiums on the west side of the Island. The challenge of navigating through the weeds, along a route that already is a good distance from Franks Tract and the greater Delta, reduces the value of this waterfront location.

The northeast side of Bethel Island also is considered to offer the best views. While the west side of the Island has sunset views, Taylor Slough is a less attractive water body and westward horizon views are partially obstructed by utility lines, which undermine values. Interviewees expressed that the market prefers the open, natural views of Franks Tract. On the northeast side of the Island, homeowners enjoy the sunrises, as well as moonlight reflecting on Franks Tract’s 3,000+ acres of open water.

For one interviewee, it appears straightforward that the Franks Tract Futures project would have a negative impact on shoreline home values. However, other local experts indicated that the planning concepts that maintain a significant open water body off the shoreline of Bethel Island would limit property value impacts. There was general consensus among interviewees that Concept A, with land mass sited near Bethel Island, likely would have the most significant negative effect on views and property values.

Despite the potential for viewshed impacts, if boating navigation improves dramatically as a result of the project, that could have a positive, offsetting effect on property values. With the Franks Tract Futures project, better access to the Delta, improved water quality, and enhanced recreation could positively effect marina property values and residential values, even if the views are marginally diminished. Assuming the project is well constructed and maintained, several interviewees saw potential positive effects on real estate value from additional visitors, increased investment, and improved demand. Similar to Delta Coves, the Franks Tract project could be an important market signal that Bethel Island and the Delta are on an upward trajectory, a factor that positively influences real estate pricing.

4. PROJECT RECOMMENDATIONS

Interviewees viewed current Franks Tract Futures planning concepts as much improved from previous versions. Interviewees generally spoke highly of the revised island configurations and appreciated that access to Franks Tract through False River is maintained in each alternative. Mooring fields were viewed to be highly positive, serving as a draw for boats into Franks Tract. In addition, most interviewees supported the concept of concentrating wetland creation in the northeast area of the Tract, the least used area.

Interview respondents commonly preferred Concept B. Stakeholders were partial to the navigation pattern in this concept, which is largely consistent with current usage. Concept C also received support. Interviewees appreciated the deep cove design of the mooring field and the alignment of the channel. Concept A was the least preferred project alternative. Critiques included that navigability would be problematic, particularly for those boating between Franks Tract and Discovery Bay. Concept A also may to have the greatest potential to harm property values on the Bethel Island shoreline, owing to wetland land masses near Bethel Island.

During the interviews process, stakeholders made several recommendations for the Franks Tract Futures project, including comments concerning design, planning, and implementation.

Design Recommendations

- Increase the number and/or size of beaches.
- Enlarge inlet features on the islands.
- Augment the capacity of the mooring fields.
- Add additional “nozzle” features that create fishing hotspots.

Planning and Implementation

- Develop a robust management plan, governance structure, and secure funding sources.
- Conduct economic development planning to strategically increase economic benefit.
- Evaluate and implement best practices to mitigate construction period impacts.
- Consider urban planning that clarifies development goals and parameters, and streamlines project approval processes.
- Evaluate infrastructure and public service evaluations that clarify Bethel Island’s capacity for new investment and growth spurred by the project.
- Identify and implement marketing and branding strategies to promote new recreational opportunities and amenities, increasing visitation and economic benefits of the project.

APPENDIX A:
INTERVIEW GUIDE

Franks Tract Futures

Interview Guide

EPS #191019

The Economics of Land Use

Economic & Planning Systems, Inc.
One Kaiser Plaza, Suite 1410
Oakland, CA 94612-3604
510.841.9190 tel
510.740.2080 fax

Oakland
Sacramento
Denver
Los Angeles

www.epsys.com

Business Types

- Marinas
- Fishing Guides
- Hunting Guides
- Boat Maintenance and Storage
- Restaurants
- Boat Repair Businesses
- Bait and Tackle Stores
- Real Estate Brokers
- Business Associations
- Retailers
- Boat & RV Rental

Current Business Conditions

1. Please describe your business.
    - What are the revenue-generating operations of the business?
    - What are the characteristics of your customers (e.g., type of customer, age, demographic, place of residence)?
    - How many employees on average?
    - What occupations are employed?
    - How long have you been in business?
    - What are the essential drivers of business success?
2. Have business conditions evolved over time?
    - Is the business stable, growing, or contracting?
    - What local and/or broader trends or business factors are affecting growth?
3. How important is location to the success of the business?
    - What makes Bethel Island a good location for business?
    - Is proximity to Franks Tract important? If so, why?

- Have you always operated in this location? If not, where were you before?
- Do you have other locations? If so, how does business performance compare?

Project Introduction and Initial Reactions

4. Are you familiar with ongoing planning for environmental restoration and recreation within Franks Tract?
    - If so, do you anticipate that may affect your business?
    - Has the planning had an effect on your business strategy?

**** <u>EPS INTRODUCES THE THREE CURRENT RESTORATION/RECREATION PLANNING OPTIONS</u> ****

5. What are your initial reactions to the different project alternatives?
    - Could the restoration/recreation plan for Franks Tract be good for business?
    - Could the project increase customer volume, spending, or other business factors?
    - Could the project enable new lines of business?
    - Could the restoration/recreation plan for Franks Tract be bad for business?
    - How might the project have a negative effect on business factors?
    - Do you have a preference for one of the alternatives over the others? Why?

Project Recommendations and Other Considerations

6. Are there potential opportunities to change the project to be better for business?
    - Do you have suggestions for changes to the plan alternatives that might increase business success? Are there opportunities that are being overlooked?
    - What would be a best-case scenario for your business with the project, as designed or with modifications?
7. Are there opportunities to change the project to avoid negative outcomes?
    - Are there aspects of the alternatives that should be adjusted to avoid business losses? What features of the plan have the greatest potential to harm business?
    - What would be a worst-case scenario for your business with the project, as designed or with modifications?
8. What other business considerations are relevant to planning for restoration and recreation at Franks Tract?

Hydrodynamic Modeling in Support of Franks Tract Futures Restoration Project Design and Stakeholder Outreach

Eli Ateljevich PE, Ph.D.
Kijin Nam PE, Ph.D.
Bay-Delta Office
Delta Modeling Section
California Department of Water Resources

September 2020

State of California
Gavin C. Newsom, Governor

The Natural Resources Agency
Wade Crowfoot, Secretary for Resources

Department of Water Resources
Karla Nemeth, Director

Cindy Messer
Chief Deputy Director

Michelle Banonis
Assistant Chief Deputy Director

Ted Craddock
Deputy Director

Taryn Ravazzini
Deputy Director

Gary Lippner
Deputy Director

Kristopher Tjernell
Deputy Director

Kathie Kishaba
Deputy Director

Michael Day
Deputy Director

Erin Mellon
Assistant Director,
Public Affairs

Kasey Shimke
Assistant Director,
Legislation

Spencer Kenner
Chief Counsel

MODELLING SUPPORT OFFICE
Tara Smith, Chief

This report was prepared under the supervision of

Nicky Sandhu ....Supervising Engineer, Water Resources
Tara Smith ....Principle Engineer, Water Resources

by

Eli Ateljevich………………………………………………………. Senior Engineer, Water Resources
Kijin Nam……………………………………………………… Senior Engineer, Water Resources

with assistance from

Rueen-Fang Wang...…Engineer, Water Resources

Table of Contents

Tables

Figures

Acronyms and Abbreviations

CDEC	California Data Exchange Center
CDFW	California Department of Fish and Wildlife
cfs	cubic feet per second
cm	centimeters
CTD	conductivity-temperature-depth
CVP	Central Valley Project
D-1641	California State Water Resources Control Board Decision 1641
Delta	Sacramento-San Joaquin Delta
DWR	California Department of Water Resources
EC	electric conductivity (used often for specific conductance)
EDB	West False River emergency drought barrier
ESA	Environmental Science Associates
ft/s	feet per second
NAVD88	North American Vertical Datum of 1988
NOAA	National Oceanic and Atmospheric Administration
RMA	Resource Management Associates
SAV	submerged aquatic vegetation
SCHISM	Semi-implicit Cross-scale Hydroscience Integrated System Model
SWP	California State Water Project
TAF	Thousand acre-feet
µS/cm	micro-Siemens per centimeter, unit of specific conductance
USGS	U.S. Geological Survey

Chapter 1. Project Description and Methods

1.1 Summary

This appendix summarizes 3-D hydrodynamics modeling performed by the Bay-Delta Office of the California Department of Water Resources (DWR) for the California Department of Fish and Wildlife (CDFW), in support of the Franks Tract Futures restoration project structured decision-making process and stakeholder outreach. This document is intended as an appendix to the Franks Tract Futures 2020 Reimagined main document, hereafter referred to simply as the “main document”.

The modeling work reported includes:

1. Comparison of the water quality (salinity) benefits and velocity impacts of the three major landscape concepts and No Action alternative.
2. Hydrodynamic support advancing designs through the stakeholder outreach process, including revision of the model mesh as landforms change; identification of sensitive design parameters such as the sizing of channels; and verification of drought performance.
3. More detailed modeling of the Preferred Concept, including velocity impacts, Dry and Critical year salinity performance, sea level rise vulnerability, flood conveyance and entrainment.

The main conclusions of model simulations of project impacts are:

1. All the restoration design variants improve water quality in the region around Franks Tract and in water quality compliance locations, particularly the Central Delta. Concept B, which evolved into the **preferred concept** for the project as outlined in the main document.
2. The designs all incorporate one or more channels between landmasses in the middle of Franks Tract to facilitate navigation between the east and west. The width and depth of this channel is an important parameter, delineating a tradeoff between salinity performance and navigability (width, depth and velocity).
3. The preferred alternative performs well across a number most criteria established for the project, including:
    a. water quality improvement. The preferred alternative reduces salinity significantly in Dry years, particularly in the Central Delta.
    b. drought protection is estimated to satisfy some requirements in a severe drought and reduce necessity of a drought barrier
    c. sea level rise resiliency: in a sensitivity test with 1.8 feet of sea level rise the salinity protection benefits of the project (in relative terms) were as good or better than under current conditions.
    d. flood conveyance. The proposed project contains numerous enhancements to the current levee system. In addition to these measures, studies using the 2017 flood as a model indicate little or no negative change in maximum flood stage.
    e. velocity in navigation channels: All the variants of the proposed project include channels for navigation between landforms separating open water on the west near

False River and the east near Old River. Sizing of these channels in early iterations was restricted to increase salinity blockage; subsequent modeling flagged this as a potential navigation problem. The preferred alternative successfully alleviates this problem with increased depth and width while maintaining much of the original salinity benefit. Concept C, though not taken through as rigorous a redesign, responds to the same measures. Concept A is more uncertain and would have to be carefully configured and tested – besides generating a high velocity through its connecting channel Concept A also elevates velocity in Piper Slough.

f. entrainment potential: Using passive particles to identify entrainment potential from currents, entrainment from the west Delta towards the South Delta and export facilities goes down. Entrainment from particle release points to the east goes up by a more modest amount.

The model was not extensively recalibrated compared to the work in the Franks Tract area reported in DWR (2017), although there were small changes in the mesh and parameters. Time permitting, the final draft of this document will be updated not only to revise 2009 results from that document but also to give examples illustrating regional performance of the model for flow and salinity in 2015 and for flood levels in 2017.

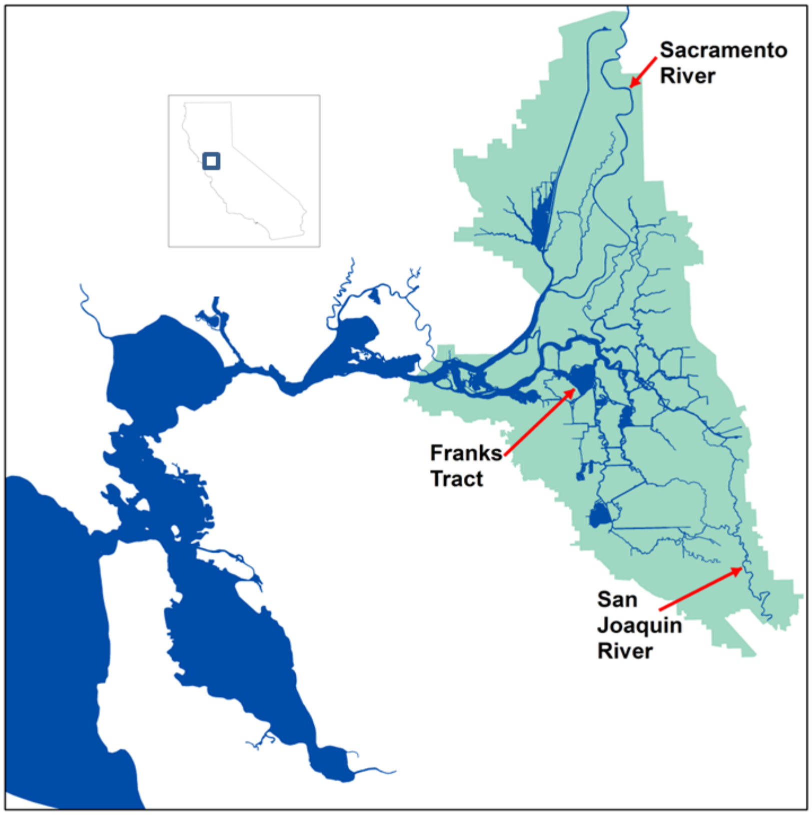
1.2 Site Characterization

Franks Tract is a flooded island located near the confluence of the Sacramento and San Joaquin rivers (Figure 1). Just to the northwest lies Little Franks Tract, a smaller flooded island adjacent to Franks Tract, which is also included in the restoration designs.

Figure 2 shows the existing bathymetry in Franks Tract and Little Franks Tract, and some of the physical features around them. Levees, in many cases deteriorated, remain along much of the perimeter, with numerous breaches leading to the interior of the tract. The island is shallow, generally less than 8 feet deep. Local mean sea level is approximately 3.75 feet NAVD88 (North American Vertical Datum of 1988). The tidal range is approximately 3.5 feet. The channels and remnant channels at its perimeter are deeper. Several of the perimeter breaches are scoured.

Labels have been added to a few frequently discussed features. The *nozzles* are places water enters the tract from False River through relatively narrow breaches. The water enters as a jet, like a firehose discharging into a swimming pool. The *2015 drought barrier site* is the location of the False River Emergency Drought Barrier (EDB), a structure placed in 2015 under the extreme drought. It produced changes that are the closest historical analog available to the present project. *OSJ* is the USGS monitoring station Old River at Franks Tract, which lies on a short reach of Old River between Franks Tract and the San Joaquin River. It is included because it is ubiquitous in discussions of Franks Tract dynamics. Finally, research for this report revealed a naming ambiguity in the northern channel. Some maps refer to “False River” and others to “Washington Cut.” In this report, it is referred to as False River.

Figure 1 Franks Tract Location in the Sacramento-San Joaquin Delta



Franks Tract is heavily vegetated. The vegetation has been noted to increase in recent years. Figure 3 is a map of the Normalized Difference Vegetation Index from 2015. The index has been binned to highlight the presences/absence of submerged species. The year 2004 was originally chosen as a model of typical patterns, because it has a starker contrast between the main channel through the vegetation and the vegetation canopy. But monitoring and accounts from the authors (Khanna pers. comm. 2017) suggest that the new, denser vegetation with a vague main channel has recurred.

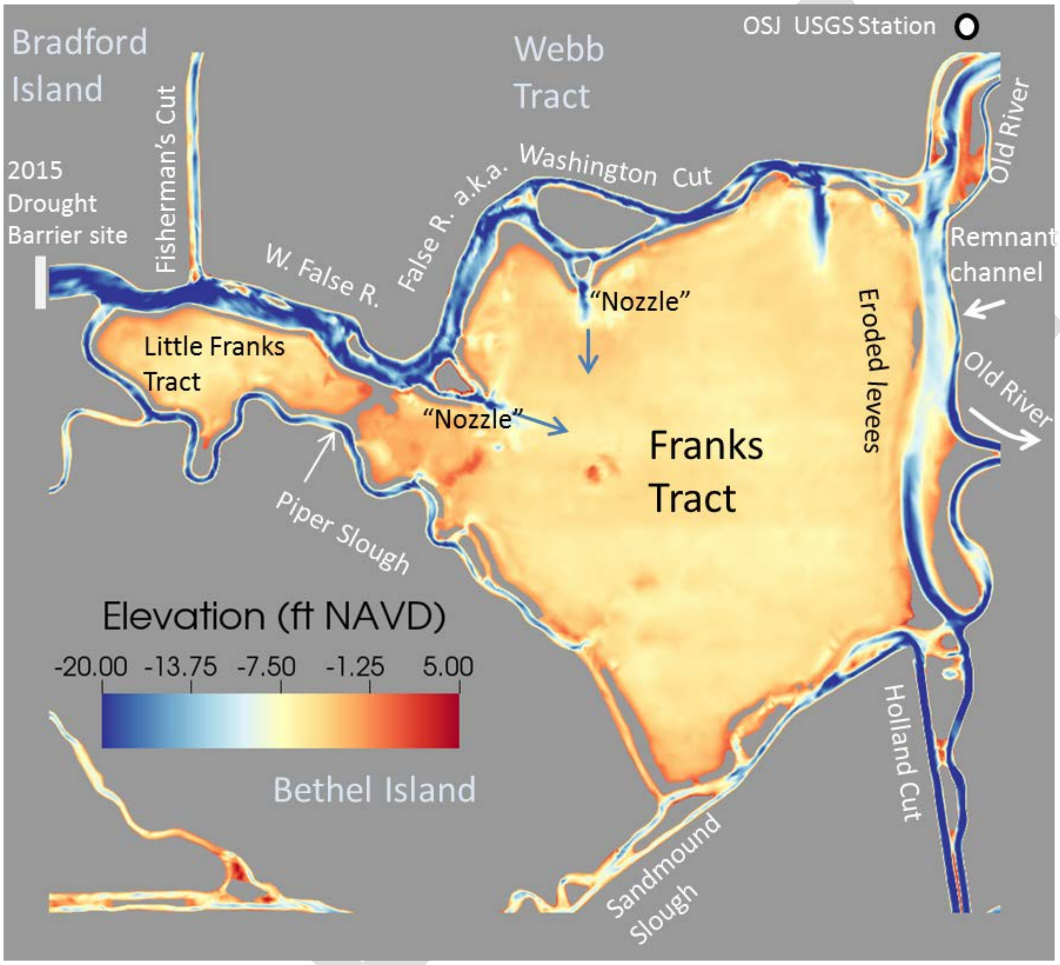
1.3 Landscape Conceptual Designs, Versioning and Bathymetry

Development of Surfaces

Variations of the project were based on three landscape Concepts. A more complete narration of the evolution of these designs is covered extensively in Section 5 of the main report. Here the focus is on two topics that are more the purview of modeling: realization of the Concepts as design surfaces and a nomenclature for the main versions that were modeled.

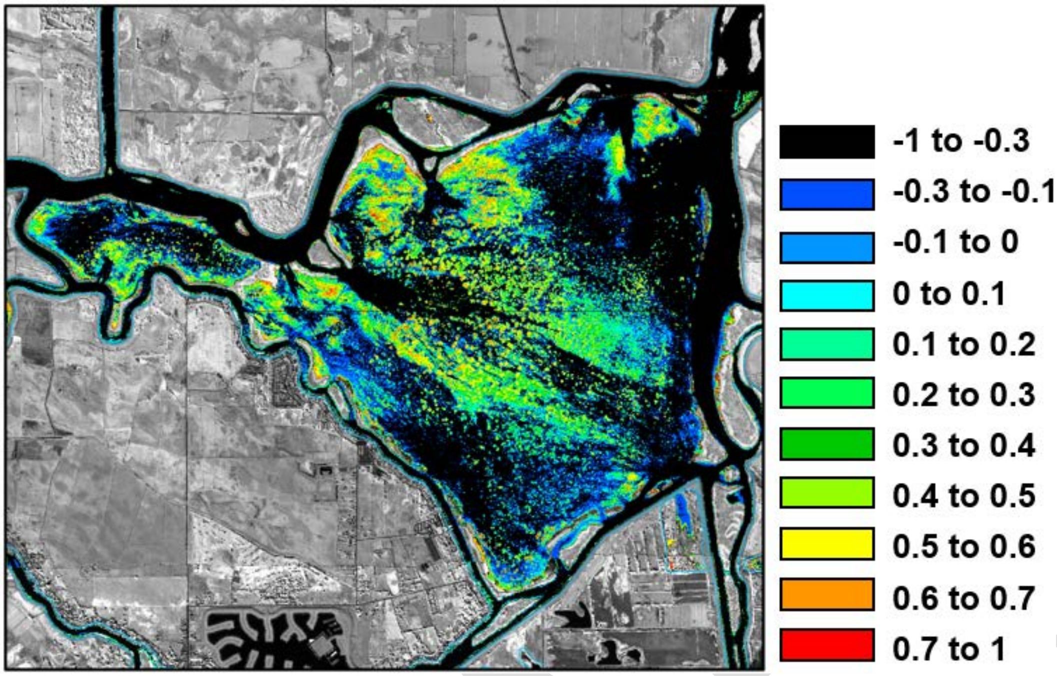
Stakeholder interaction in the design process was iterative. Successive restoration design surfaces were conceived using Adobe Illustrator by UC Davis Department of Landscape Architecture and developed further by Environmental Science Associates (ESA) using AutoCAD software, finally reconciled with natural bathymetry by DWR using Geographical Information Systems technology. Major redesigns took 7-10 days to implement. Rapid experiments concerning channel configurations (such as the experiments with channel depth and width for velocity) were in most case carried out with simpler tools to manipulate the surfaces such as scripts written in the Python programming language and associated libraries.

Figure 2 Franks Tract Bathymetry and some Physical Features



Note: NAVD = North American Vertical Datum, OSJ = California Data Exchange Code for Old River at Franks Tract, USGS = U.S. Geological Survey

Figure 3 September 2015 Binned Normalized Difference Vegetation Index



Source: Ustin et al. 2016.
Note: Higher values suggest higher density of vegetation.

Versions Modeled

Each Concept A-C evolved at a different rate and to a different extent during the stakeholder engagement process. At certain points in the study, designs were frozen to maintain a stable basis of comparison within each individual experiment but were advanced between rounds. The following is a rough description of important versions as they were used in modeling analysis. A more extensive description of the evolution is given in Section 5 of the main report:

No Action: The No Action case was based on the standard Bay-Delta SCHISM mesh 90e, which is the version commonly used for regulatory studies in 2019-2012. For the final round of modeling involving just the Preferred Concept, the No Action case was revised to include soon-to-be-completed components of the Dutch Slough Tidal Restoration Project or "No Action with Dutch Slough".

Concept A: Concept A is the western landmass alternative. Concept A was not elaborated after Round 2, which added a common Little Franks Tract design that ended up being shared by all the Round 2 Concepts A-C. Width experiments and salinity results were based on the Round 2 design, ultimately in its 100m (330 ft) wide variant. The Concept A design width was less resolved than the Round 3 in connecting channels, and this tends to bias maximum velocities upward.

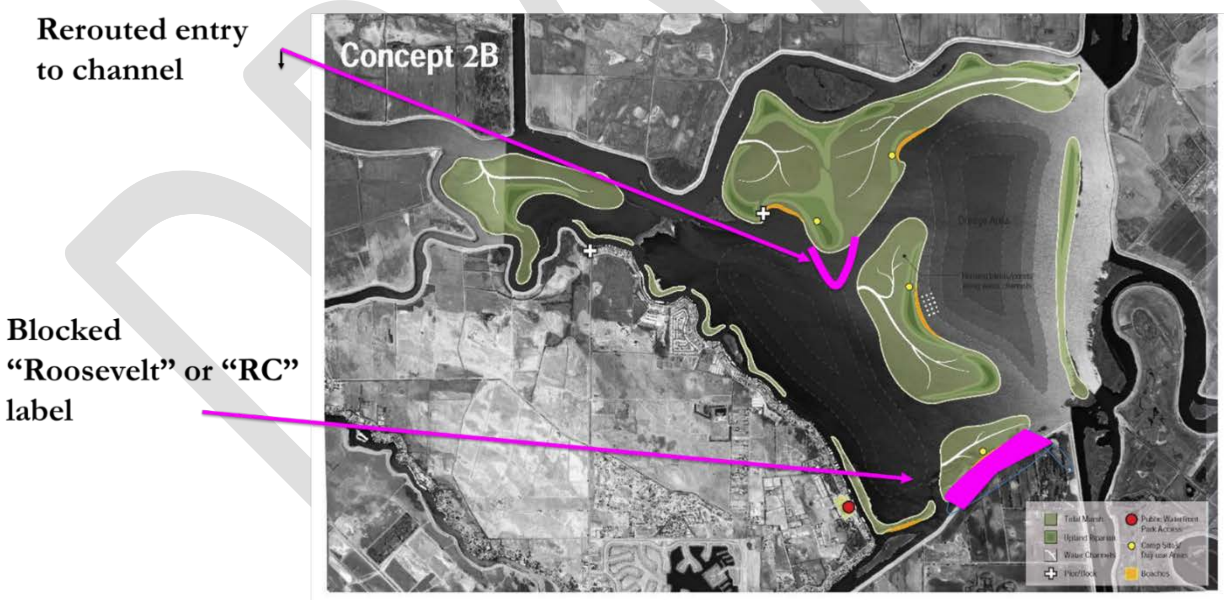
Concept B: Concept B is the central landmass alternative and evolved into the Preferred Alternative. The width experiments were performed based on Round 2 designs, including the common Little Franks Tract design from that round. Subsequently, two modifications were added based on navigation safety and salinity performance – a peninsula "guarding" the west entrance of the northeast connecting channel and a rerouting of Roosevelt Slough (Figure 4). This modified design is labeled “3B Preliminary” and was studied at a width of 100m. It had some liabilities in terms of velocity in the connecting channels, and the design was advanced one more time into the Preferred Alternative.

Preferred Alternative: The Preferred Alternative is an extension of Concept B with recreational and navigational improvements. The connecting channels in this design are very well resolved, typically 10 elements across. The mesh for the final comparisons (velocity, drought, sea level rise, etc.) also included Dutch Slough Restoration area.

Concept C: Concept C is the eastern landmass alternative. The original Round 2 version was used for salinity screening and width experiments. That version of Concept C performed considerably worse in terms of salinity (Table 1), so much so that the eastern part of the design was significantly reworked and labeled Round 3C. The width of that design is 60m (200 ft) and its resolution is adequate but the modeling for this design was not as refined as Concept B.

The project bathymetry comes from the maps prepared by Wang and Ateljevich (2012), with a few regions updated by the preparation of new 2-meter maps. This map collated numerous collections; the majority of points in Franks Tract are attributed to a National Oceanic and Atmospheric Administration (NOAA) survey done in 1992. Surfaces for the Dutch Slough Restoration Area were provided by ESA, who were also partners on the present project.

Figure 4: Modifications to Concept B Mesh Based on Salinity Performance and Navigation.



1.4 Model Description

The model used in this study is Bay-Delta SCHISM, which is based on the Semi-Implicit Cross-scale Hydroscience Integrated System Model (SCHISM, Zhang et al. 2016), which in turn is derived from the semi-implicit Eulerian-Lagrangian finite-element (SELFE) model (Zhang and Baptista 2008). SCHISM is an open-source community-supported modeling system, whose origins were to serve as a second-generation model (following ELCIRC, a Eulerian–Lagrangian algorithm used to solve shallow water equations) for use in the Columbia River estuary by the Center for Coastal Margin Observation and Prediction (CMOP). The model has subsequently been enhanced by the Virginia Institute of Marine Sciences and used in basins throughout the world in applications as diverse as reservoir temperature, estuarine transport of salinity, morphology, and near-coast tsunami response. The model has participated in numerous regional benchmarks and is slated for incorporation in the NOAA national water model. A list of peer-reviews papers is maintained on the model website (http://ccrm.vims.edu/schismweb). The larger SCHISM suite includes modules for sediment transport, ecology/biology, wind-wave interaction, ice, oil spill, and marsh evolution, listed approximately in order from greatest to least maturity.

The SCHISM hydrodynamic algorithm is based on mixed triangular-quadrangular unstructured grids in the horizontal and a flexible coordinate system in the vertical (localized sigma coordinates with shaved cells, or LSC^2, Zhang et al. 2015). The modeling system utilizes a semi-implicit finite-element/finite-volume method together with a Eulerian-Lagrangian method (ELM) for momentum advection to solve the Reynolds-averaged Navier-Stokes and transport equations at ocean to creek scales. It has both a hydrostatic and non-hydrostatic option, but as explained in MacWilliams et al. (2016) non-hydrostatic modeling is highly specialized and only achievable at small scales – not feasible at field scale over the Bay-Delta.

The formulation of the core SCHISM hydrodynamic module is based on the 3-D hydrostatic Reynolds-averaged shallow water equations, including mass conservation, horizontal momentum conservation and salinity transport:

$$\nabla \cdot \boldsymbol{u} + \frac{\partial w}{\partial z} = 0 \tag{1}$$

$$\frac{D\mathbf{u}}{Dt} = -f\mathbf{k} \times \mathbf{u} - \frac{\mathbf{1}}{\rho_0} \nabla p_A - \frac{g}{\rho_0} \int_z^{\eta} \nabla \rho \, d\xi - g \nabla \eta + \frac{\boldsymbol{\partial}}{\boldsymbol{\partial z}}\left(\nu \frac{\boldsymbol{\partial u}}{\boldsymbol{\partial z}}\right) + \nabla \cdot (\mu \nabla \boldsymbol{u}) \tag{2}$$

$$\frac{DS}{Dt} = \frac{\boldsymbol{\partial}}{\boldsymbol{\partial z}}\left(\kappa \frac{\boldsymbol{\partial u}}{\boldsymbol{\partial z}}\right) \tag{3}$$

Where

η is the elevation of the water surface,
vector **u** represents the (x,y) directional components of velocity,
w is vertical velocity,
S is salinity,

g is gravity,
f is the Coriolis force,
k is the unit vector in the vertical direction,
ρ_0 is a reference density for water,
∇p_A is atmospheric pressure,
$\rho(x,t)$ is density,
ξ is a dummy variable for integration,
μ is horizontal diffusivity,
ν is vertical eddy viscosity, and
κ is vertical eddy diffusivity.

Both the formulation and algorithm in SCHISM share many points in common with other 3-D models used in the estuary, including the use of an unstructured geometry, implicit treatment of certain destabilizing terms, and a splitting that features the efficient cointegration of mass conservation (equation 1) in vertically integrated form along with vertically integrated momentum conservation (equation 2). Technically, SCHISM departs from many of the other most common models in its use of a finite element method (FEM) representation of some of these steps. Because of the use of FEM, SCHISM is able to use a terrain-conforming vertical mesh and is more robust to skew mesh element shape so the grid can follow internal channels without requiring very high resolution. On the other hand, the FEM formulation does not promise local (i.e., per-element) mass conservation as do finite volume representations.

As with most well-resolved applications in the estuary, horizontal momentum diffusion was neglected (μ=0 m^2/s) in this study. The elimination of horizontal viscosity is justified on the assumption that a well-resolved horizontal grid captures mixing because the largest scales of circulation and a modest amount of numerical diffusion is sufficient to model horizontal mixing at smaller scales.

Boundary conditions for the water column are given by wind stresses at the free surface and shear at the bed. For wind, the boundary condition is

$$\nu \frac{\partial u}{\partial z} = \tau_w, \text{ at } z = \eta \tag{4}$$

using the wind stress (τ_w) formulation from Large and Pond (1981). The boundary condition at the bed ($z = -h$) is

$$\nu \frac{\partial u}{\partial z} = \tau_b, \text{ at } z = -h \tag{5}$$

with bottom stress (τ_b) derived from a quadratic formulation based on the velocity ($\boldsymbol{u}_b$) evaluated at the top of the bottom computational cell and is

$$\tau_b = C_D|\boldsymbol{u}_b|\boldsymbol{u}_b \tag{6}$$

The drag coefficient (C_D) of roughness is calculated dynamically from a roughness parameter by using standard boundary layer assumptions as described in Zhang (2008). The values of roughness used here vary from 0.1 millimeter in shallow areas to 10 millimeters at depth.

The turbulent eddy viscosity (ν) and eddy diffusivity (κ) is generated by using an independent set of turbulence closure equations, specifically the k-ε 2.5 equation closure with a background eddy viscosity of 0.00001 m^2s^{-1}. The closure is implemented in SCHISM by using the Generic Length Scale approach of Umlauf and Burchard (2003).

Entrainment is studied using a particle streamlines of neutrally buoyant particles. For purposes of this study, the equations of motion for each particle are accordingly advection with flow with a small amount of added diffusion.

$$\frac{d\boldsymbol{x_i}}{dt} = \boldsymbol{u}(\boldsymbol{x_i}, t) + \varepsilon d\boldsymbol{W_t} \tag{7}$$

where $\boldsymbol{x_i}$ is the position of the i'th particle and $\boldsymbol{u}(\boldsymbol{x_i}, t)$ is its 3-D velocity at time t. This formulation includes a uniform background diffusion parameter in the vertical direction, but not in the horizontal. The diffusion ε parameter is chosen to provide some minimum background diffusivity while still emphasizing mean flow processes. The chosen value (1e-6 m^2s^{-1}) is so low as to be essentially "turned" off except for a close-to-molecular level that helps with behavior near the bed. It is smaller than the spatially variable parameter that would be used to link the formulation with the SCHISM transport equation for dissolved species. No behavior is assumed – particle work presented here should not be confused with either a life cycle approach or agent/behavior model

1.5 Discretization

The Franks Tract modeling is embedded within a larger domain encompassing the entire San Francisco Bay-Delta. The model domain spans from the Farallon Islands off the coast, to Vernalis on the San Joaquin River and Knights Landing on the Sacramento River. Horizontal resolution over the full domain varies from 4 meters in a small number of narrow small channels to 2 kilometers on the near coast. The most current version (version control label: v90e_franksrestore) of the mesh used as the No Action case for the study has 252,000 triangular and quadratic elements; in the comparisons with the Preferred Alternative, the base discretization was increased to 292,000 elements in order to incorporate the Dutch Slough restoration area (Figure 8) and a small number of adjoining areas. The Franks Tract portion of the base mesh is shown in Figure 6 and the Preferred Alternative mesh is shown in Figure 7. Resolution is 6 meters to 70 meters in Franks Tract, with higher resolution concentrated near inlets. The restoration landforms include elements at higher resolution (elements 4 meters wide) than the base case within the channels on the marsh plain.

Figure 5 Full Bay-Delta SCHISM mesh, version 90e.

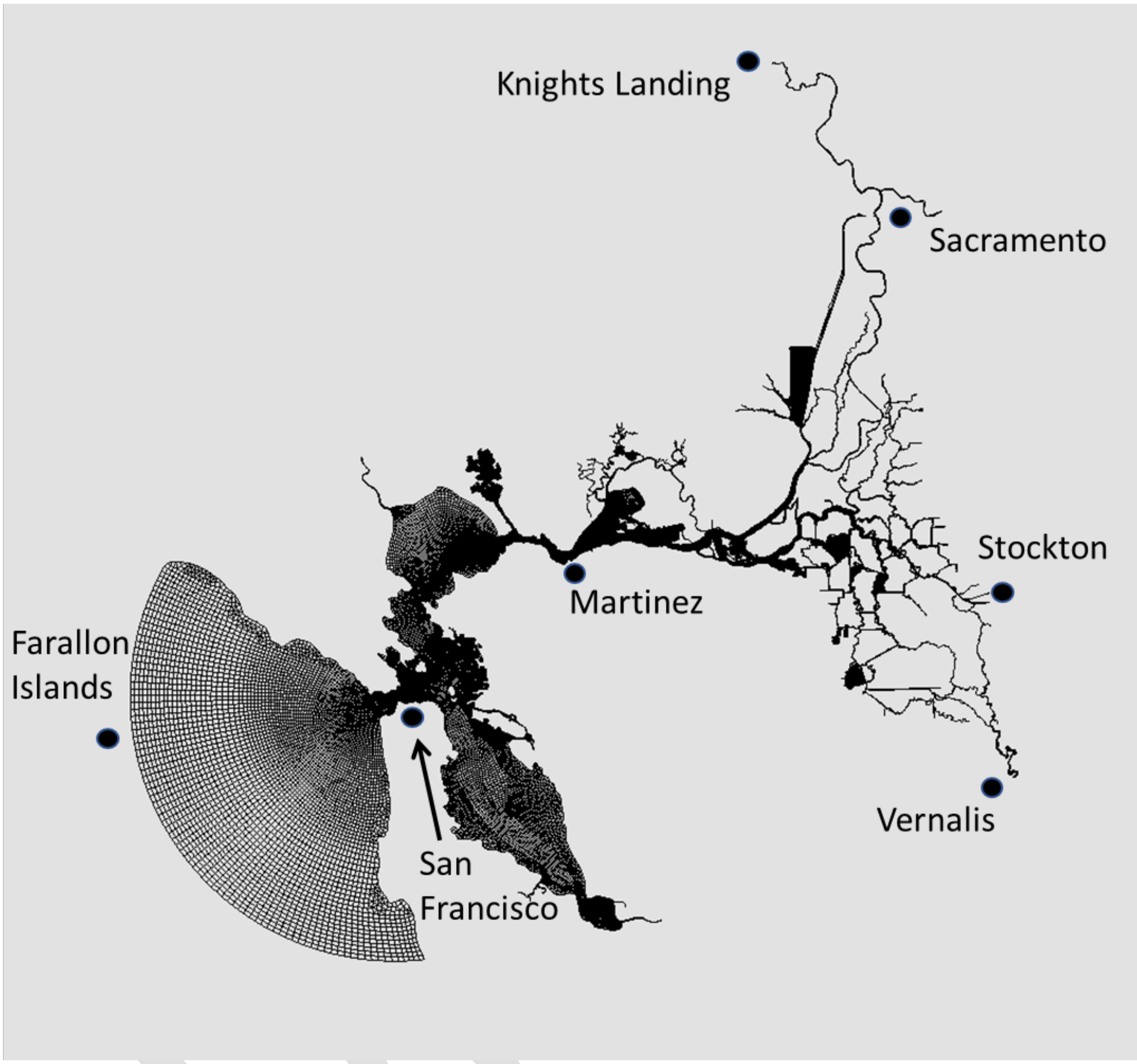
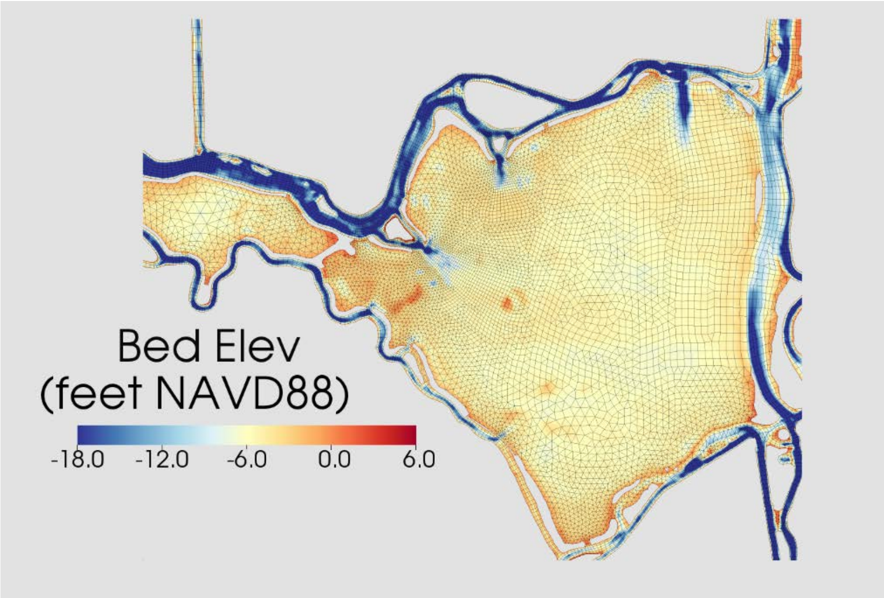
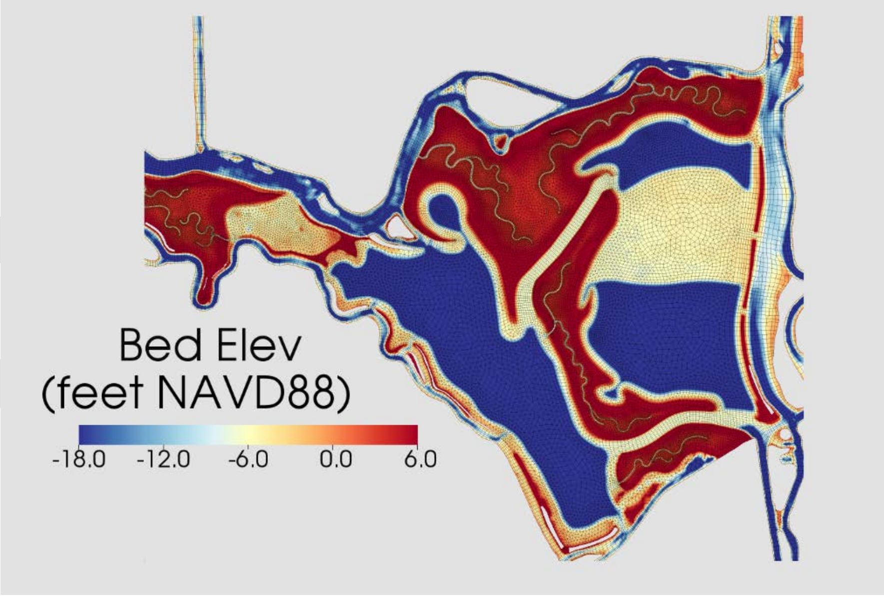


Figure 6 Franks Tract Portion of the Full Bay-Delta Mesh as used for the Base Geometry



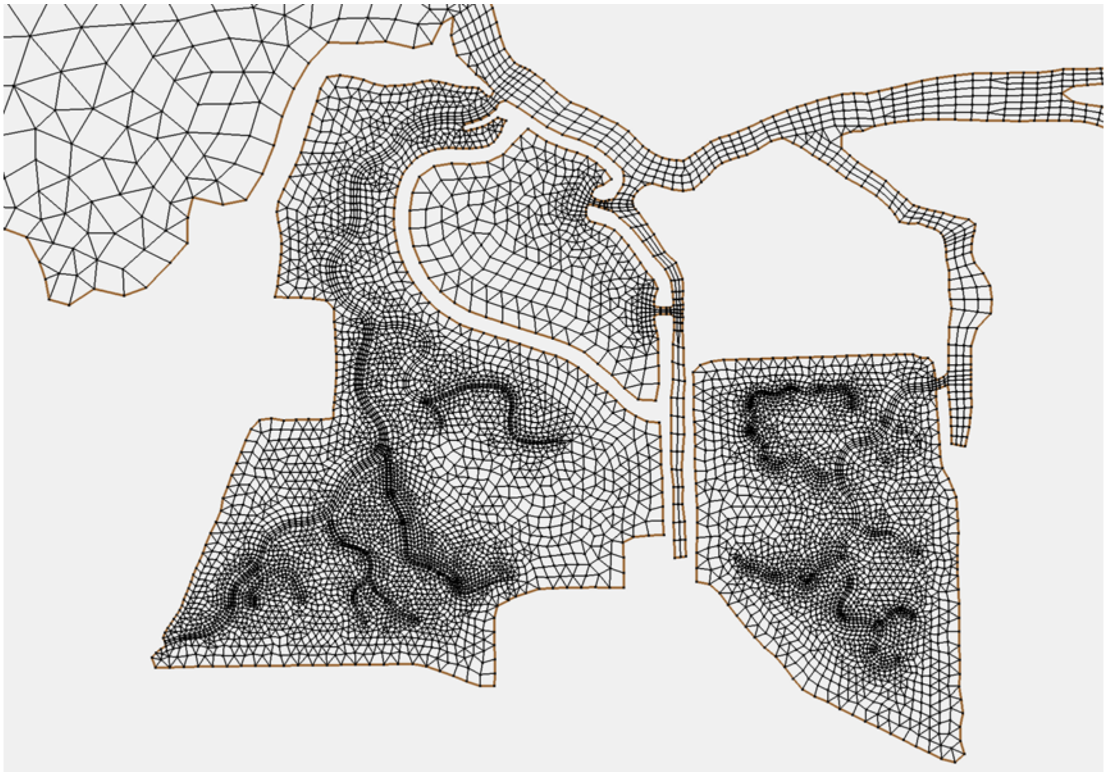
Note: The top elevation has been truncated at 6 feet NAVD88 to elicit contrasts.

Figure 7 Mesh and bathymetry for the Preferred Concept of the restoration study



Note: The color scale has been truncated at 6 feet NAVD88 to elicit contrasts. Portions of the main berm are as high as 11 feet.

Figure 8 Dutch Slough Restoration Site, Emerson and Gilbert Tracts, incorporated in No Action scenario for the final round of studies on the Preferred Alternative.



Note: Higher order channels are resolved, down to a width of approximately 6 meters.

In the vertical, the model employs an adaptive, terrain conforming LSC2 (Zhang et al 2015) mesh ranging from 23 vertical levels in deep areas near the coast to a single (2-D) layer at the upstream reaches of the Sacramento and San Joaquin rivers. Within Franks Tract, there are 9 levels covering the approximate depth of 2 meters. Without vegetation or wind, dynamics in Franks Tract are overwhelmingly 2-D, but wind and vegetation create strong stratification dynamics, a point described by the authors in Zhang et al (2019), Lucas (2005), Jones (2008) and others. A well-resolved vertical mesh is needed either to resolve the wind boundary layer or to independently resolve the regions above and below the canopy. The use of an LSC2 vertical grid represents a change from the original reporting of the application in Ateljevich (2014) when a 23-level terrain conforming "S" grid (Song 1994) was used everywhere.

A model time step was 90 seconds for the work presented in this document.

1.6 Model Inputs

Like any physically based flow models applied on an estuary, SCHISM requires an initial condition, bathymetry, as well as tidal and flow boundary data at the edge of the domain. As implemented, the model also requires wind and pressure fields, agricultural sources of mass and tracer concentration, gate and hydraulic structure timing, and in the case of SAV, vegetation parameters.

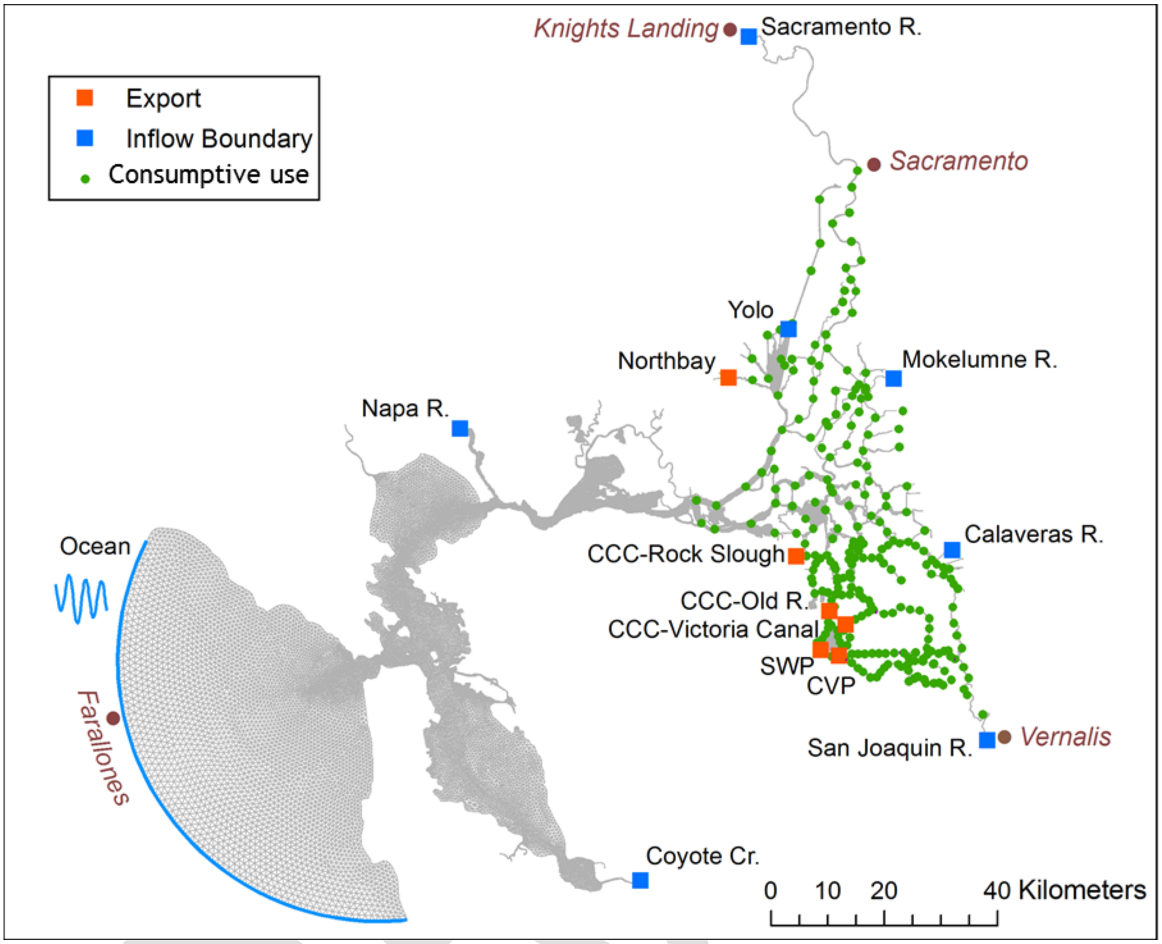
The nominal start date for all the work presented in this report is February 10, 2009, when the U.S. Geological Survey (USGS) Polaris cruise data (Schraga and Cloern 2017) were available to initialize salinity in the model by using conductivity-temperature-depth (CTD) vertical profiles or casts. For this project, which begins when the Delta is fresh, the simplest initialization practices were used: ocean salinity beyond the Golden Gate; Polaris CTD cast data in the bays for salinity, interpolating along the cruise route and vertically, and then extrapolating constant values laterally from the transect. A constant salinity value of 0.15 parts per thousand (equivalent to 300 µS/cm specific conductance) in the Delta represents fresh conditions. Water levels are initialized with a fixed elevation of 0.97 meter NAVD88 everywhere, and velocities are "cold started" from zero. To avoid misinterpretation of startup transients, there is no report for the first two weeks of hydrodynamic output, or the first three months of salinity or temperature.

The hydrodynamic forcing for the simulations comes from 2009 and 2010, 2015 and 2017. Boundary conditions were implemented mostly in accordance with the practices described in Ateljevich et al. (2014), including upstream inflows from USGS gauges, pumping volumes from water project operators, and tide data along the near coast. The boundary data requirements are illustrated in Figure 9.

The modeling work presented in this report includes the major hydraulic structures in the Delta, including Delta Cross Channel, Montezuma Slough Salinity Control Structure, and South Delta agricultural barriers. Sample timing for most of the configurable gates is shown in Figure 10 for 2009. Clifton Court radial gates are modeled using a radial gate rating; details concerning the Clifton Court radial gate rating process as well as Harvey O. Banks Pumping Plant pumping data can be found in Ateljevich et al. (2015) and Shu and Ateljevich (2017), which elaborate on issues described by Smith (2011) and MacWilliams and Gross (2013). Unfortunately, improvement is limited in 2009 because of missing data. Suisun Marsh Salinity Control Structure data was obtained from DWR Suisun Marsh Division logs at the California Natural Resources Agency Open Data Portal and data for the Delta Cross Channel was obtained by logs published by the United States Bureau of Reclamation.

SCHISM also requires atmospheric forcing, including wind and air pressure as a minimum; other variables, such as air temperature, radiation, and specific humidity, are required for modeling temperature. One notable change in the modeling inputs since Ateljevich et al. (2014) is wind, which was formally based on climate reanalysis and weather products, but is now interpolated from 69 field stations operated by NOAA, Weatherflow, National Estuarine Research Reserve (NERR), California Irrigation Management Information System (CIMIS), Meteorological Terminal Aviation Routine (METAR) airports, DWR, and Bay Area Air Quality Management District (BAAQMD). One BAAQMD station

Figure 9 Flow, Water Level and Consumptive Use Inputs to Bay-Delta SCHISM



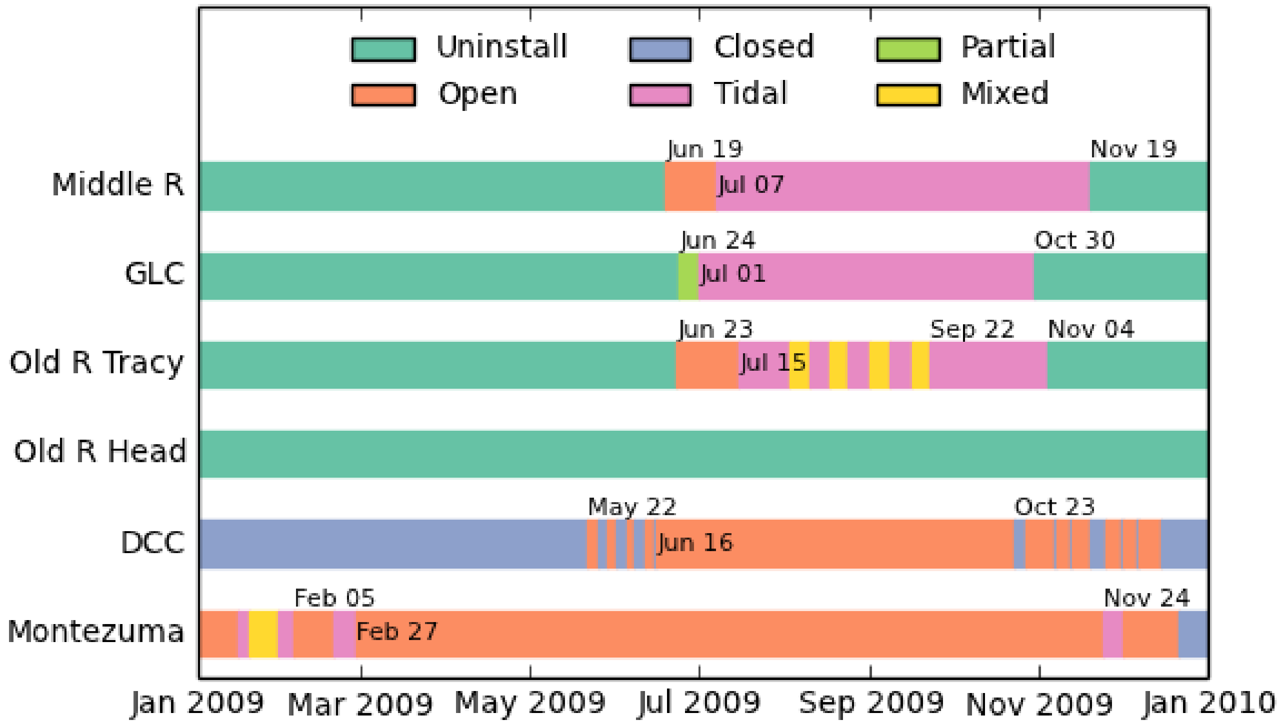
with a long historical wind record is situated on Bethel Island near Franks Tract. A newer DWR station was installed directly in Franks Tract (California Data Exchange Center [CDEC] code: FRK) in 2016.

Lastly, the model inputs for the present study used the Delta Channel Depletion (DCD, DWR 2019) and Suisun Marsh Channel Depletion Models (SMCD, DWR 2020) to estimate channel depletions due to evapotranspiration and other consumptive use.

1.7 Periods Modeled

Several years had to be simulated in order to assess typical dry, extreme drought and flood conditions. The main water quality comparisons for Dry year salinity were carried out in 2009, with the main reporting period being August 1-14 (for salinity change maps) or the average from August 1 – December 1 for longer term averaging. This period represents peak salinity and a time of regulatory vigil. Drought modeling was carried out using a 2015 hydrology, tide and atmospheric forcing, but omitting the 2015 Emergency Drought Barrier for the restoration cases. Results were aggregated over August 1-14. Flood simulations were conducted over the hydrographic peak of 2017.

Figure 10 Delta Hydraulic Structure Operations for 2009

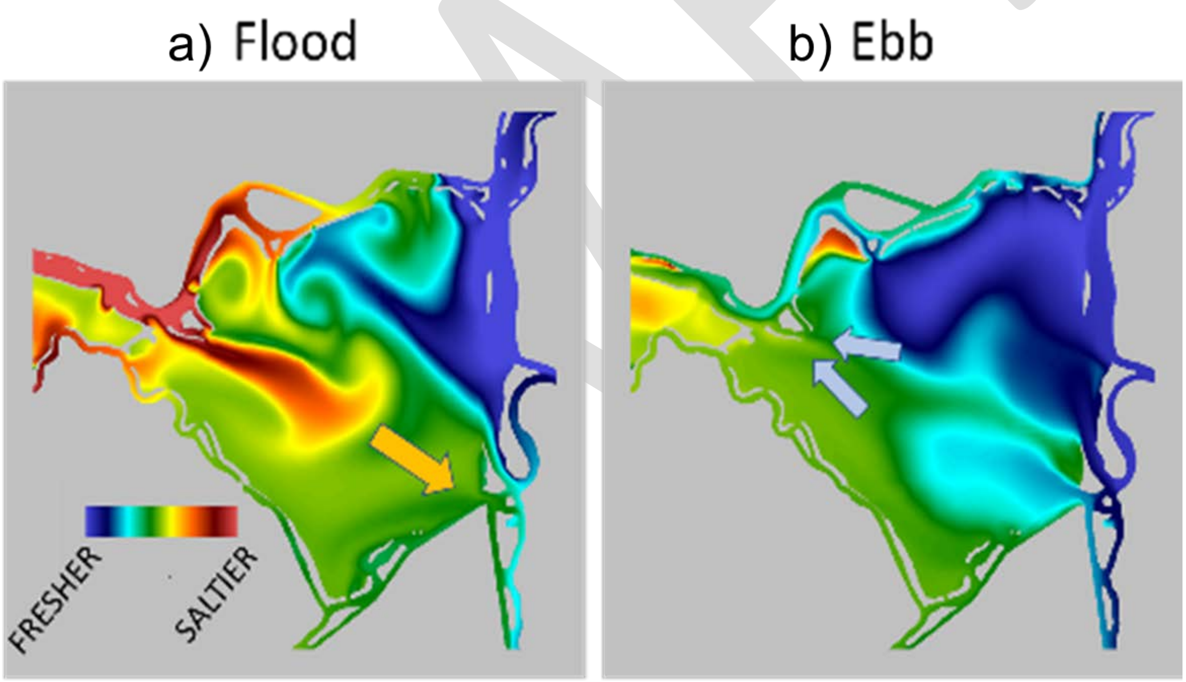


Chapter 2. Salinity Impacts

2.1 How Franks Tract Affects Delta Salinity

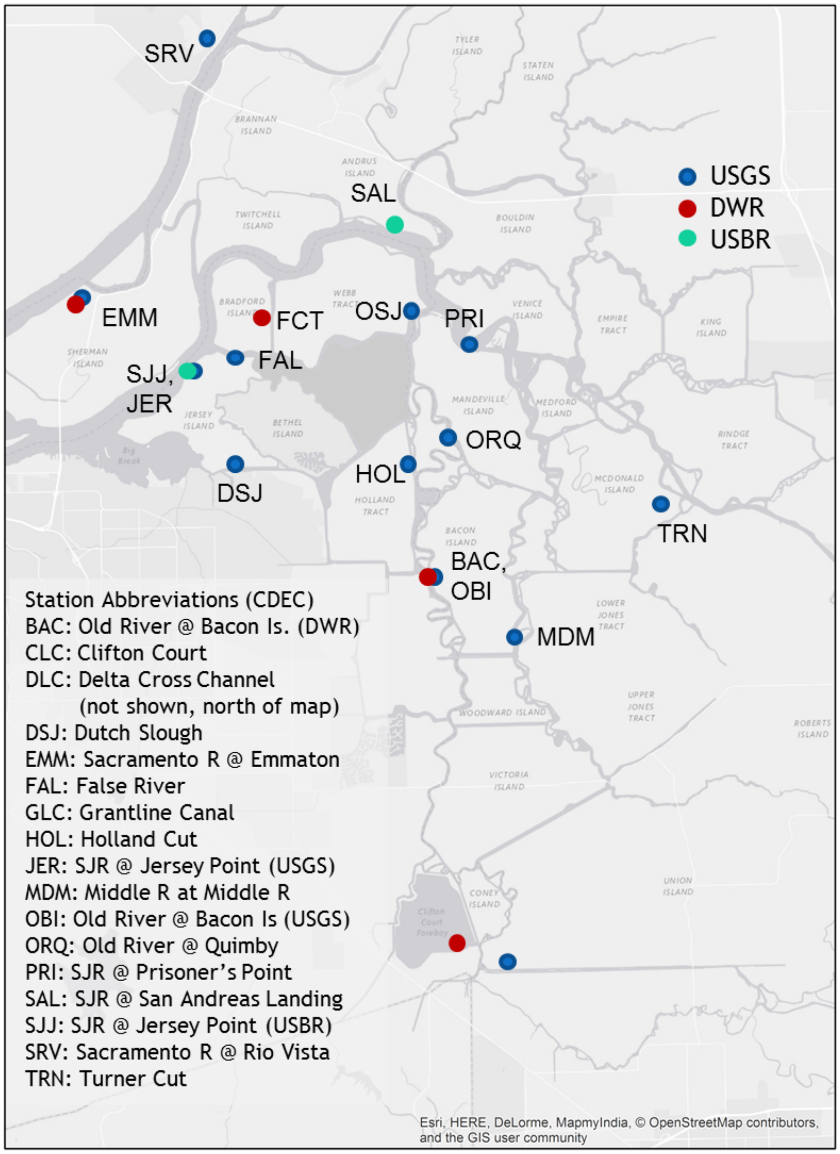
Franks Tract is important to salinity transport through a mechanism called tidal pumping. Tidal pumping is a phenomenon that occurs when small inlets constrict flow entering an open water body. Figure 11 uses snapshots from a model simulation to illustrate this phenomenon as it occurs within the current geometry of Franks Tract. In Panel (a) a strong and narrow jet of higher salinity (red) water can be seen entering Franks Tract from False River on a flood tide through an aperture sometimes referred to as “The Nozzle.” Salinity in this jet is most influenced by the San Joaquin River at Jersey Point, which in summer is higher than that of Franks Tract. Panel (b) shows the return flow from Franks Tract. It is fresher (blue and green) because the salty jet of water will have mixed with ambient water in Franks Tract and ebb flow draws from a broader area of more diluted water. Even if the volume of flow is the same in both directions, the asymmetry between a salty flood and a fresher ebb adds up and causes a net transport of salt into the central Delta.

Figure 11 Illustration of Tidal Pumping of Salinity.



All the restoration design concepts investigated in this study intercept or reduce tidal pumping from False River, an important mechanism of salinity intrusion into the mid-Delta described in the water quality section of the main report. As a result, salinity is reduced regionally.

Figure 12 Stations Referred to in Description of Water Level, Flow and Salinity Impacts



Note: CDEC = California Data Exchange Center, DWR = California Department of Water Resources, USBR = U.S. Bureau of Reclamation, USGS = U.S. Geological Survey

2.2 Dry Year Salinity Comparisons Between Restoration Designs

Calendar 2009 (straddling Water Years 2009-2010) was used as the scenario for comparing salinity performance between restoration designs, as 2009 was a dry year with sufficiently high salinity to comprise a compliance concern for compliance with D-1641. Comparisons presented here include spatial maps as well as some comparisons at specific stations – the stations referred to in the text of this appendix are shown in the map in Figure 12.

Figure 13 through Figure 15 shows a set of salinity change maps from the most advanced designs of Concept A-C comparing each of the alternatives assessed relative to the No Action case. The changes are expressed in units of microSiemens/cm (uS/cm), which are a unit of specific conductance – salinity conducts electricity more than fresh water and this phenomenon is exploited in the measurement of salinity concentrations. Many of the most limiting regulations in this region are written in terms of conductance, and most measurements in other units originate in conductance and converted.

Although perhaps hard to make out at this scale, Concept B is slightly more efficient at repelling salinity. The spatial extent of improvement is very similar between the landmass concepts and few or no areas are degraded significantly. The improvement seaward of the project is comparable in absolute magnitude to that in some places in the Central or South Delta, but much smaller in relative magnitude because this area is naturally more saline. Nevertheless, any improvement in the Western Delta is important in that it signals there is no tradeoff between compliance considerations upstream and downstream of the restoration site, an issue that arose in some modeling for the predecessor Franks Tract design reported in DWR (2017).

Figure 13 Maps of salinity change of the most advanced design for Concept A (Round 2) to No Action averaged over August-November 2009.

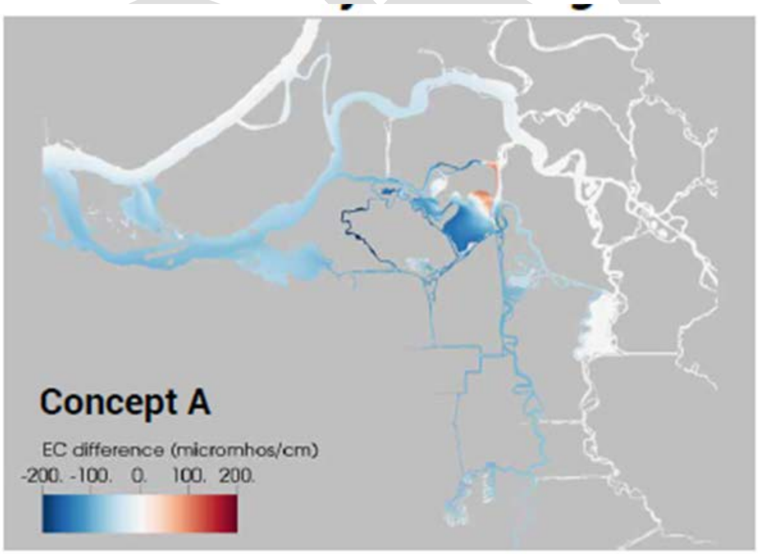


Figure 14 Maps of salinity change of the most advanced design for Concept B (Preferred Concept) to No Action averaged over August-November 2009.

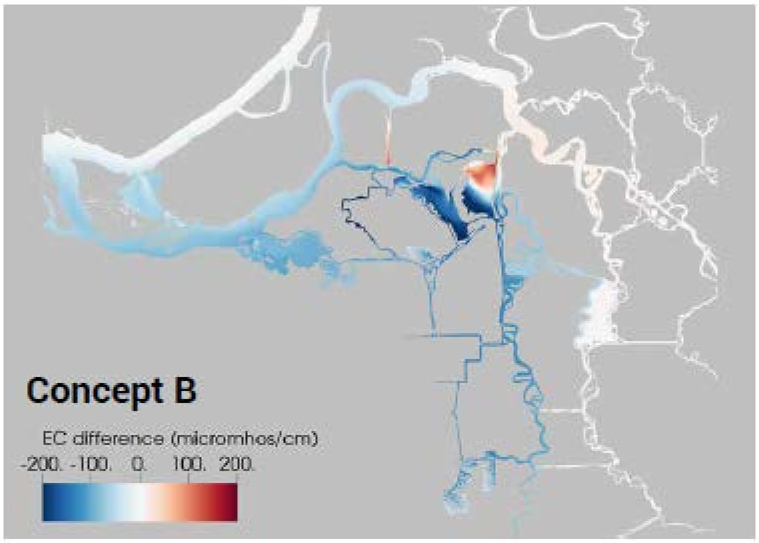


Figure 15 Maps of salinity change of the most advanced design for Concept C (Round 3 preliminary) compared to No Action averaged over August-November 2009.

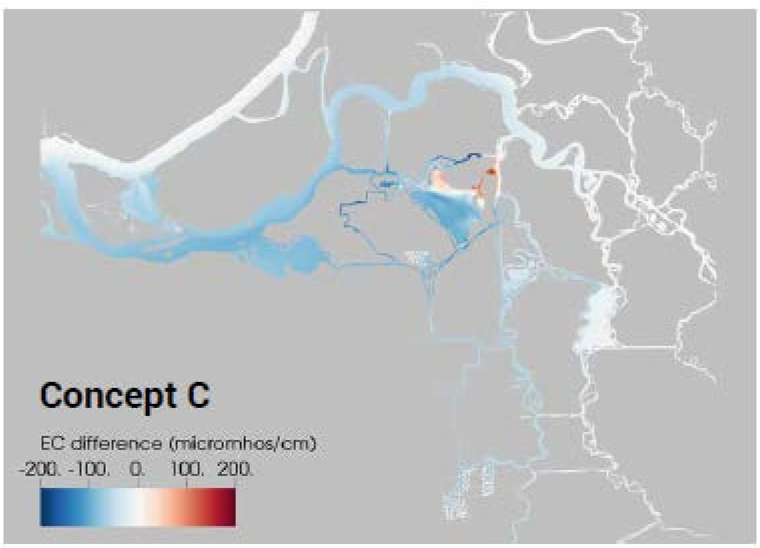


Figure 16: Salinity change in units of specific conductance relative to No Action of different Concepts and width variations at three stations of importance for regional salinity management.

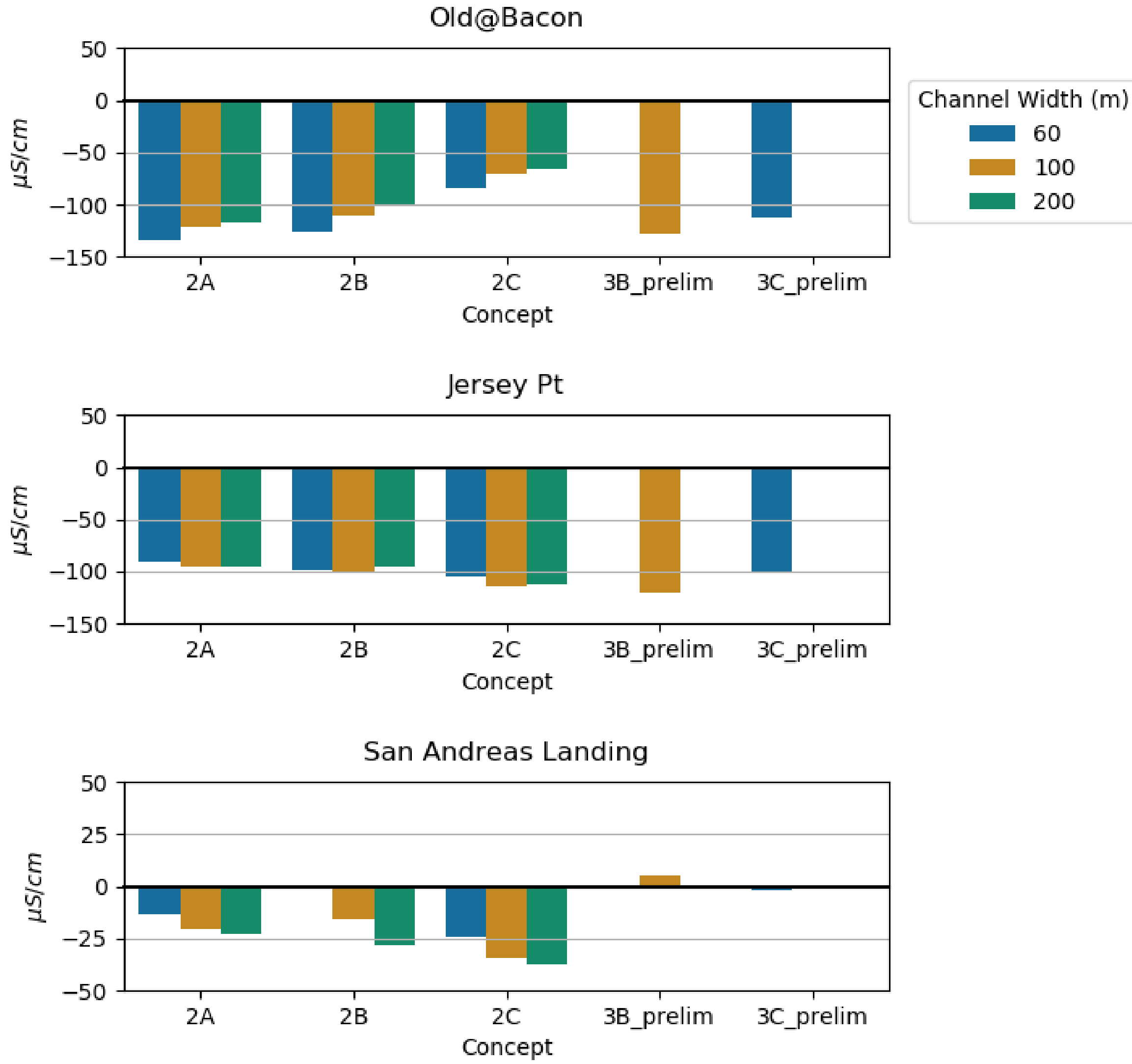


Table 1 Absolute salinity (conductance in units of uS/cm) of design concepts and width variations. The No Action case is given in absolute magnitude and the project variations are given relative to No Action.

Concept	Width (m)	Jersey Pt	San Andreas	Old@Bacon
No Action		1279	373	743
2A	60	-90	-14	**-135**
2A	100	-95	-20	-121
2A	200	-96	-23	-117
2B	60	-98	1	**-126**
2B	100	-102	-16	-111
2B	200	-96	-28	-100
2C	60	-105	-24	-84
2C	100	-114	-35	-70
2C	200	-113	-38	-66
3B_prelim	100	-120	5	**-128**
3C_prelim	60	-102	-2	-113

Contrasts in salinity between designs are easier to visualize quantitatively using the bar chart in Figure 16 and the corresponding tabulated values in Table 1. The figure and table show modeled August-November average salinity at three locations (averaged over August 1 – November 30, 2009) that are important for salinity compliance and comparison as described in the next paragraph. The comparison includes the three Round 2 designs, each with a variety of three channel widths. Also included are two elaborated (preliminary Round 3) revisions to Concepts B and C. Alternatives that performed well are highlighted in bold. The Preferred Concept is not included in this table because it was modeled with the soon-to-be-complete Dutch Slough Restoration Area and is comparable to the No Action scenario that also includes this feature. For details on its performance, which tallies with the other 100m wide options, see the bar chart in Figure 17which also contains sea level rise and drought results discussed in the next sections.

The locations in the table are as follows:

- **Old River at Bacon Island:** Old River at Bacon Island was the main indicator of the effectiveness of the project. It is representative of the region of greatest benefit upstream of Franks Tract, and is also proximate to the Rock Slough, a D-1641 compliance point. Old River concentrations are also a sentinel of ocean salinity effects farther south near the state and federal water projects. The persistent 150-200µS/cm freshening here represents an improvement as great as 20-25%.
- **Jersey Point:** Jersey Point is a D-1641 station located downstream of the restoration site where an agricultural objective often constrains water management through August 15. Jersey Point is more indirectly affected by changes in dispersion and tidal energetics in Franks Tract, and it was not known a priori that this location would be freshened. The projected salinity improvement at

Jersey Point is modest in relative terms but is nevertheless a significant finding because it implies there is no tradeoff between downstream and upstream objectives.

- **San Andreas Landing:** San Andreas Landing is a D-1641 compliance station, but one that has rarely been a compliance limiter under historical conditions. It was included as a precautionary measure -- modeling performed in prior rounds of restoration designs and in support of the 2015 Emergency Drought Barrier suggested that when tides are strongly deflected at False River, energy can be diverted around Bradford Island and cause San Andreas Landing to be saltier. The preferred design is apparently sufficiently damped at False River not to excite this response.

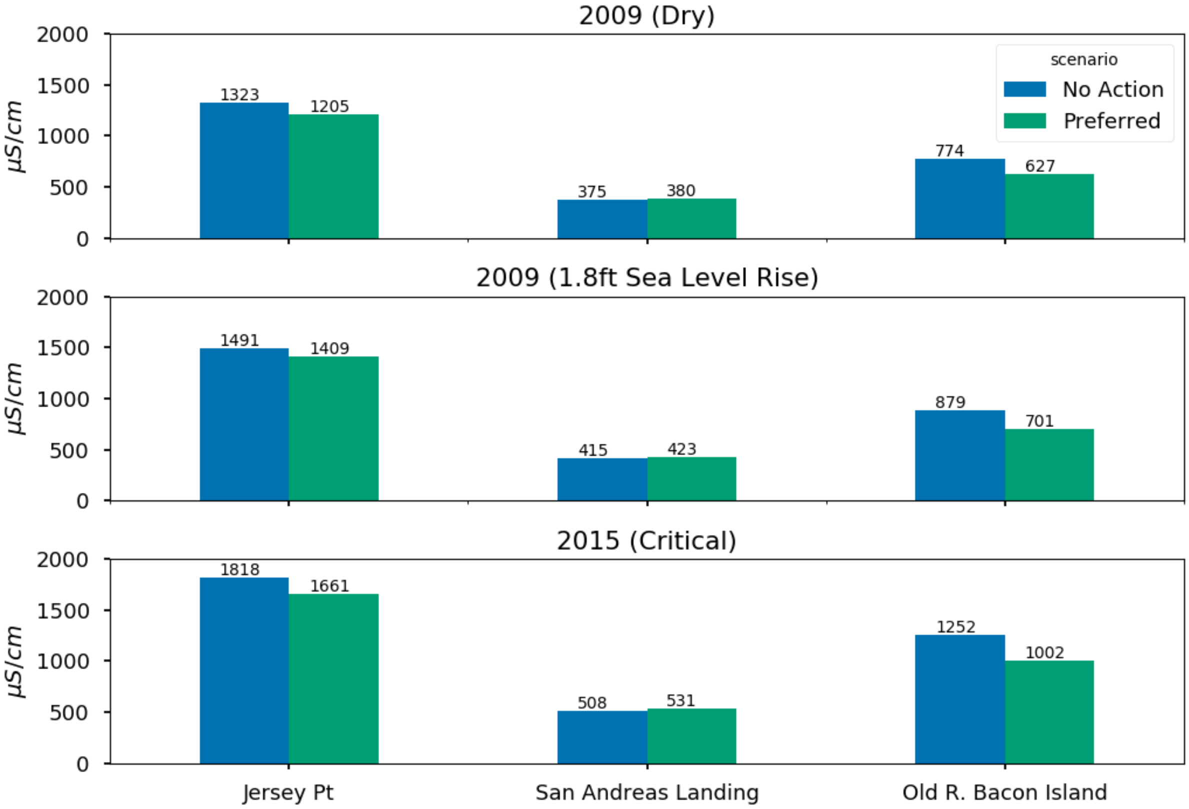
Figure 16 and Table 1 illustrate how geographical details at multiple scales influence the salinity results. At the landscape scale, the basic placement of landforms (A-B-C) determine flow and circulation patterns within Franks Tract. Placement of the landforms also alters the way tides propagate through the region around Franks Tract. Depending on the location of the main landmass, the *tidal prism* of the project – the volume of open water and marsh that is filled or drained each tide cycle – is hydraulically more attached either to the west side (Concept C) or to east side (Concept A) of Franks Tract. Filling and draining of tidal prism are an energy sink. Concept C, which has its landmass on the east and presents most of its open water area to the west, tends to dissipate tides at a point farther west in the system near False River, and as a result this case exhibits the least salinity intrusion along the San Joaquin around Bradford Island -- even though the regional performance and effect on tidal pumping of this alternative is otherwise unremarkable.

At a more intermediate scale, the configuration – width, depth and sinuosity -- of the crossover channels between landforms is also important to salinity performance. If conveyance is low (smaller width or depth), the project reduces tidal pumping and its performance on salinity and entrainment metrics improves. The price to be paid for narrower channels, however, is higher velocities, a point quantified in the next section. As shown in Figure 16, the difference in salinity improvement between the 60m and 100m wide variants of Concept A or Concept B can be as great as the difference between the landforms themselves. Ultimately, it appears that 100m is a good compromise width as the velocity in the 60m variants is hard to bring below 3ft/s criterion.

Finally, some design considerations that affect salinity performance defy categorization – these changes were discovered by inspection of animations. The two most important were:

- the introduction of a peninsula in concept B to shield the western entrance of the crossover channel and prevent the saline jet from shooting straight from the Nozzle into the channel; and
- the closing of Roosevelt Slough in favor of the more curved crossover channel in Concepts B and C. The hydrodynamic purpose of this action is to force saline flood tides from Sandmound Slough to mix into Franks Tract farther west, where they don't have as big an effect on Holland Cut. The idea was vetted independently by some boaters as a way of smoothing out a sharp blind corner.

Figure 17: Performance of the Preferred Alternative based on Concept B relative to No Action with Dutch Slough for the 2009 Dry Year (top), a 2009 case with 1.8ft of sea level rise (middle) and a 2015 simulation under extreme drought hydrology (bottom). The 2015 No Action case does not incorporate the historical emergency drought barrier.



2.3 Sea Level Rise

For the Preferred Alternative, the change in salinity performance of the project was quantified under 1.8ft of Sea Level Rise using 2009 as the study period. This level of sea level rise which was chosen for consistency with other DWR environmental documentation and because according to California Ocean Protection Council. 2018, this increment represents an extreme risk averse 2040 water level under high emissions.

Sea level rise was modeled using a simple increment to the ocean boundary mean tide with no change in amplitudes or offshore subtidal oscillations. The mesh was not modified to accommodate newly inundated area; the domain includes some tidal prism in upland areas that are inundated under sea level rise, but the study did not take on further transformative change such as island overtopping and inundation or operational response. Within the Franks Tract restoration area, accretion to the marshplains was assumed to keep pace with the sea level rise but outside the Franks Tract region bed elevations were left at baseline levels.

The middle row of Figure 17 shows salinity in the 2009 scenario at the three index stations for the No

Action and Preferred Alternative scenarios under the modified sea level rise scenario. As the table shows, sea level rise results in higher salinity at all three tabulated stations under both the No Action and Preferred Concept geometries. However, the sea level response at Old River at Bacon Island relative to Jersey Point is muted under the Preferred Concept design when compared to the No Action case. This means that in terms of water quality, the project may be categorized as a sea level rise accommodation measure.

2.4 Extreme Drought

In addition to the Dry year salinity experiments, DWR also performed simulations across designs to look at salinity protection during a more extreme drought. For this set of experiments, a historical 2015 hydrology was used. Sacramento Regional SAN flows were omitted, creating a slightly saltier than historical scenario. The designs tested were the most evolved of each of the concepts after Round 2: Concept 2A, Concept 3B Preliminary and Concept 3C Preliminary, each with 100m width channels and bed dredged to -2m NAVD88. Besides the No Action case, the comparison also contains a case that includes the 2015 Emergency Drought Barrier. Table 2 shows August 2015 averaged salinity and indicates that while the design concepts do not achieve the same salinity protection as the EDB they do achieve a significant fraction of those gains. Salinities are attained that would be enough to approach water quality standards in the Central Delta where water quality is most vulnerable and consequential (1000uS/cm is a reasonable approximation of many of the interior Delta standards for water supply in the Central and South Delta). The level of protection would be high enough to avoid a barrier in a fraction of critical years; even when a barrier is necessary it would likely be a much less invasive structure. The Preferred Concept is also included in the table but note that the basis of comparison for the Preferred Concept is the No Action variant with Dutch Slough, which has slightly higher salinity. With that caveat, the preferred option is the top performer in terms of protection at Old River at Bacon Island.

Table 2: Salinity performance of the design concepts relative to the No Action case in the 2015 extreme drought scenario. The Preferred Concept includes Dutch Slough and should be compared to the No Action case with Dutch Slough. Others are comparable to No Action.

Scenario	Jersey Pt	San Andreas Landing	Old R Bacon Is
No Action (w/o Dutch), uS/cm	1982	608	1411
2015 Drought Barrier, uS/cm	1903	747	885
Concept A (A2), uS/cm	1801	577	1133
Concept B (3 prelim), uS/cm	1792	583	1169
Concept C (3 prelim), uS/cm	1796	599	1203
No Action (w/Dutch), uS/cm	2066	635	1490
Preferred Concept, uS/cm	1877	655	1170

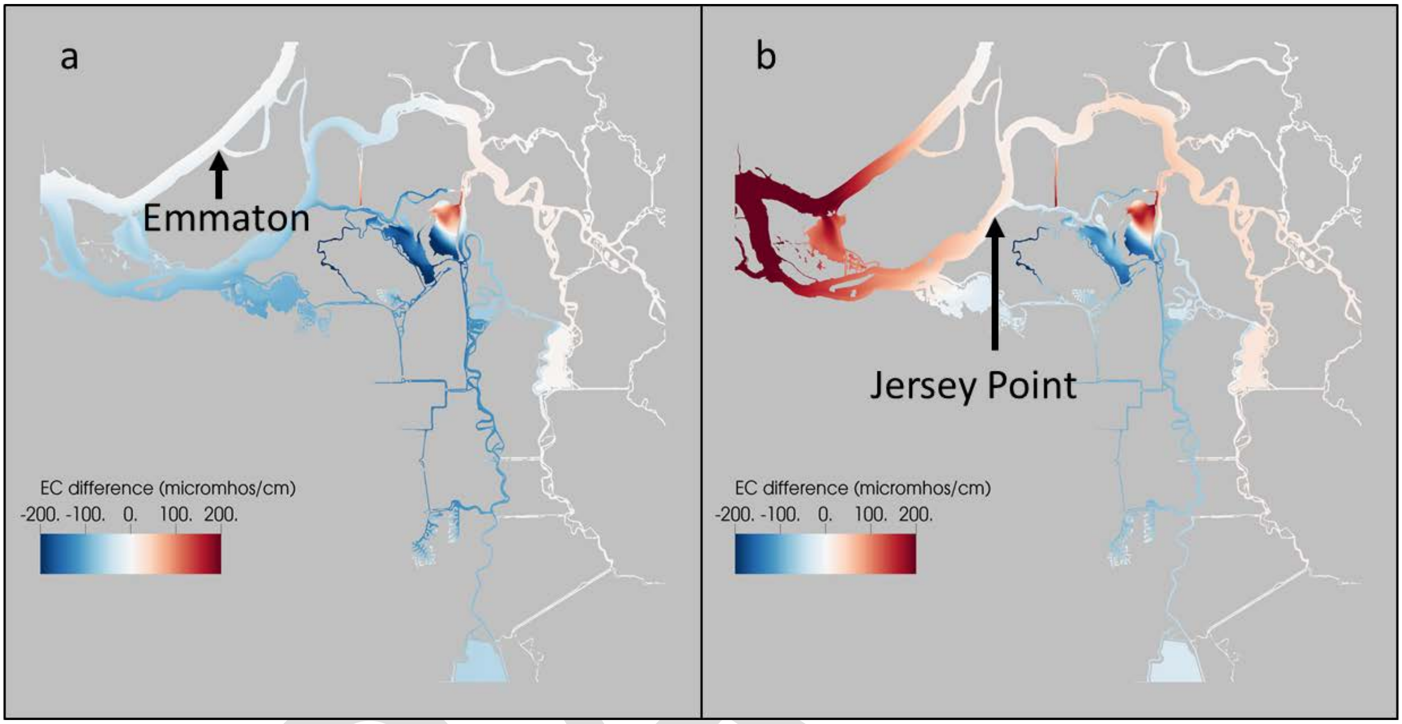
2.5 Potential Operation Response and Relationship to Delta Conveyance Project

The Franks Tract Futures report raises the question of how water operations might potentially evolve in in response to the proposed Franks Tract project and whether operational changes would affect benefits. Evaluating a full response is a difficult task in its full complexity. Water quality saving in one season tend to add up and lead to opportunities in other seasons and across the state, so that a more substantial answer would require a systemwide planning model – the more detailed hydrodynamic modeling described here is a prerequisite to this undertaking but not a substitute for it.

Operational adjustment to the Franks Tract project would vary by season, hydrology, water demand and the myriad other factors that influence water project operations. During typical spring high flow scenarios, or surplus conditions, water quality compliance concerns are usually centered seaward of the Delta and Franks Tract project has minimal impact on operations or on water quality arising from ocean salinity intrusion. Some concerns in the South Delta originate on the San Joaquin and little impact was seen in the project this far away from Franks Tract. Water quality in the Central Delta would be expected to be good in spring except in critical years. This is also the case during in Fall in wetter years when stringent X2 requirements push salinity downstream of Collinsville.

One bookend case to consider is mid-late summer (earlier in critical years), when salinity encroaches farther east and water project operations are limited by the D-1641 agricultural standards at Emmaton and Jersey Point monitoring stations, both of which are located upstream of the confluence but downstream of the project site. As shown in Figure 18 (a), Emmaton is mostly unaffected by the Franks Tract project, so there is no operational response implied by the results here. Jersey Point is modestly freshened. This means that water managers could potentially "roll back" the salinity improvement until Jersey Point is back to historical levels, recouping released water as exports and effectively converting a portion of the water quality benefit into a water quantity benefit. The maximum adjustment under such a scenario is shown for 2009 in Figure 18, where Figure 18 (a) represents the original water quality response and Figure 18 (b) shows the same scenario but with Jersey Point benefit brought to zero change (white) with added exports. The exports yield 29.9 TAF, accumulated at 247 cfs from June 15 to August 15 (the June 15-July 15 and July 15-August 15 periods were tuned separately, but resulted in roughly the same adjustment). As shown in Figure 18 (b), the response erodes some of the Central Delta benefits, with the average difference at Old River at Bacon Island during August 1-14 reduced by 35uS/cm or 30.5%. Some areas downstream of the project are degraded rather than improved under this scenario, but by an amount that is small compared to their typical summer magnitudes – thus, even though this is a conspicuous part of the plot as rendered, it is not a large relative impact.

Figure 18: Maximum possible operational response based on no impact at Jersey Point (indicated by white). a) System response to the project assuming flows are held constant. b) System response if the improvement at Jersey Point is "rolled" back to be neutral (white).



Finally, the geography of compliance shifts after August 15 when the D-1641 agricultural standards end for the year. After this date the likely water quality limiter is either Fall X2 habitat requirements near Collinsville (in wetter years) or municipal requirements in the Central Delta (in drier years). In the former case (Fall X2), the Central Delta will be relatively fresh, and the question of operational response based on salinity will be moot. In the case where the Central Delta is the controlling consideration, the possibility to pivot from a water quality to water quantity benefit will exist. Standards and agreements upstream and downstream of the project would determine the extent and feasibility of such an adjustment. Determining more precisely how economies in one season or region might offer flexibility in a neighboring season or region would require a statewide planning model.

Chapter 3: Velocity, Flow and Flood Impacts

3.1 Velocity

Water Velocity affects the navigability of channels and the stability of the restoration design in terms of morphology and plant colonization. Velocity considerations also lead to a tradeoff with salinity -- the smaller the *crossover channels* (Figure19) are between the west and east side of the main landmasses the better salinity intrusion is controlled, but the higher the peak velocities are for boating. The tradeoff occurs within a range of channel widths and depths that is relevant for navigation, roughly 60m – 200m wide. Note that in this Appendix, widths are assessed at the foot of levees so the apparent width for boating includes some of the levee slope and is larger.

The 2009 simulation was used for investigating velocity – tidal velocities dominate this analysis, so provided strong tides are represented, the choice of period and mean flow is of low importance to the result. The four panels of Figure 20 show extreme (95-percentile) values of velocity magnitude for the most advanced version of each Concept A-C calculated over August 1-14, 2009:

- Concept A: Round 2 (100m width),
- Concept B: Preferred Concept (100m width)
- Concept C: Preliminary Round 3 Variant (60m width)

The units of Figure 20 are in ft/s for better agreement with the structured decision-making criteria in the body of the report. The figure indicates that the main area of concern relative to the No Action case are the crossover channels between the two sides of the main landmass of each design. For some designs, the 95-percentile crossover channel velocity was likely to exceed 3ft/s at the locations shown by arrows. This velocity was treated as the threshold for navigation safety, although it is widely acknowledged that safe velocities are context dependent. Besides reaching this threshold in the crossover channels the Concept A 95% velocity magnitude in Piper Slough reaches 2.5ft/s – this is below the threshold of concern but was considered worth bringing into the discussion because of the residential nature of the channel. Only the Preferred Alternative had velocities below the threshold, and this is because it received further attention both in the channel configuration and in the modeling.

Just as these velocity maps of Figure 20 draw attention to velocity for navigation, Figure 16 from the previous Chapter indicates that the range of widths between 60-200m is one in which most of the significant tradeoff occurs with salinity. The crux of the of the hydrodynamic design is to strike a compromise between these goals. After Round 2, the project switched from 60m to 100m as a standard width. In addition, a second round of tests were performed on depth using the Round 3 Preliminary version of Concept B, which was the worst performer on velocity at that point in the study. Results indicated an inverse but not particularly linear relationship between depth and peak velocity, with not a lot of benefit in the range of modest dredging that would be most cost effective. Additionally, the results indicated some dependency on lateral resolution of the model, with better resolution yielding smaller peaks. In the final design, a very lightly dredged with maximum elevation -2m (-6.88ft) NAVD 88 bed was chosen because it produced satisfactory velocities below 3ft/s for the Preferred Concept. Given that mean low water occurs at 2ft NAVD, this translates to a mean low-low water depth of about 3m or 9ft.

Salinity benefits degrade modestly with increased depth so that if the channel were naturally eroded somewhat the project would still have salinity benefits. This point would merit further story if the project goes forward with a specific design.

Figure 19: Locations of the crossover channels cited in the report that join the west and east sides of the project.

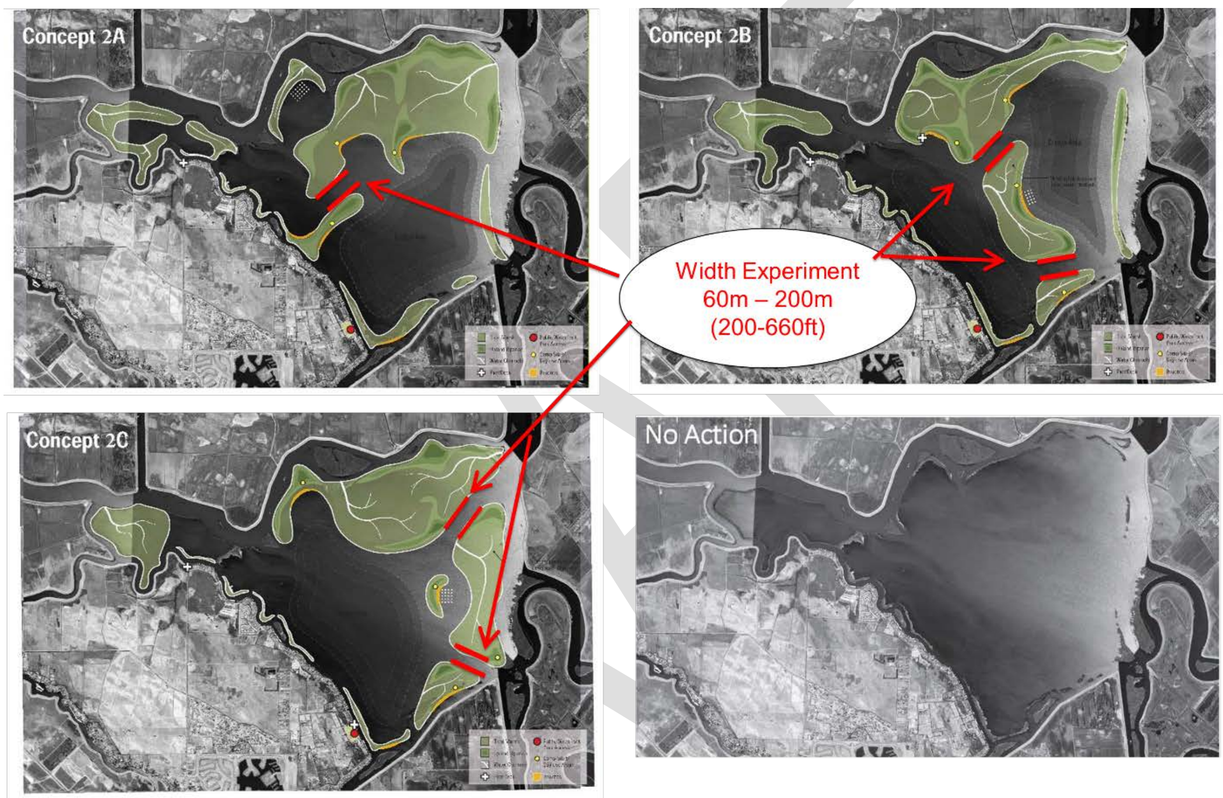
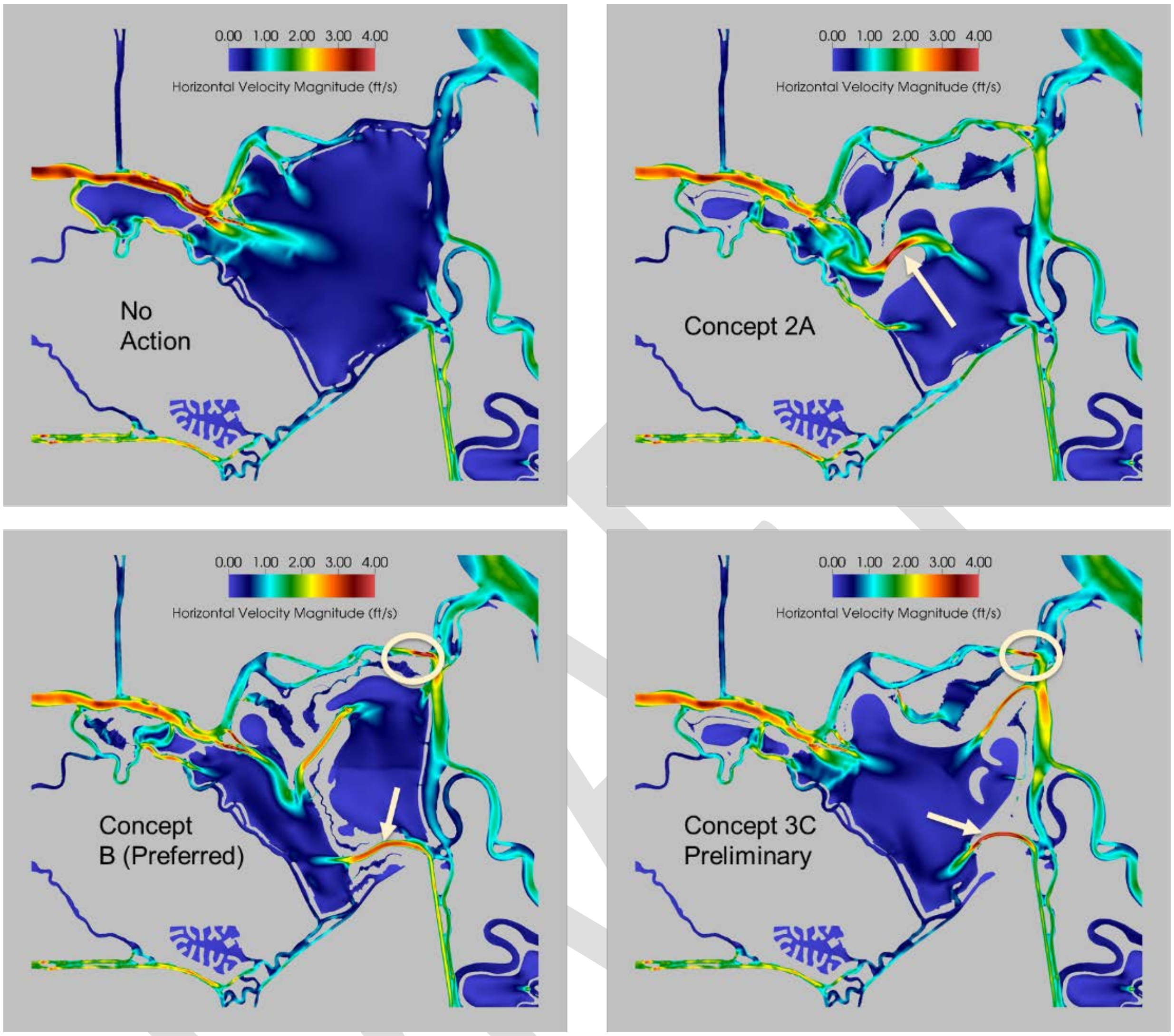


Figure 20 Depth averaged velocity in the Franks Tract region under the No Action alternative and the most advanced design for each of the landscape concepts.



3.2 Flow

Flow or discharge was not incorporated directly in the structured decision-making ratings, but nevertheless tidal and net (tidally averaged) flows are important indications of system change.

Figure 21 shows changes in the region between the Preferred Concept and No Action scenarios in tidal range (difference between peak flood and peak ebb discharge) and net flow magnitude (arrows in the net flow plot are the prevailing flow direction), both averaged over April–November 2009 which is a period when tidal fluctuations are approximately stationary. The plot is comparable to Figure 21 in DWR (2017) and provides a basis for comparing the current Franks Tract Futures project to its predecessor. By comparison, the changes under the current project are more muted. The two apparently large changes at False River and Fishermans Cut are in fact large in part because they are measured relative to small baselines – the actual velocities are not large in absolute terms, a point that will be addressed next in the context of Fishermans Cut.

Figure 21: Changes in tidal range of flow (left) and net (flow) averaged over April-November, 2009. See notes in the text about the apparently large changes at Fishermans Cut and False River

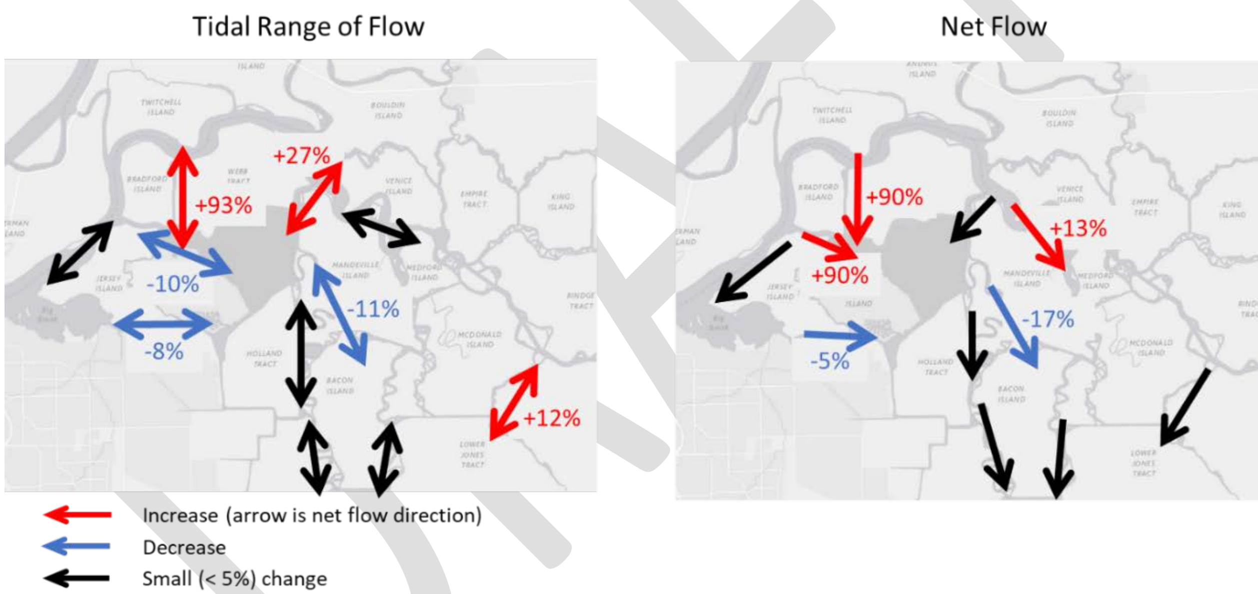
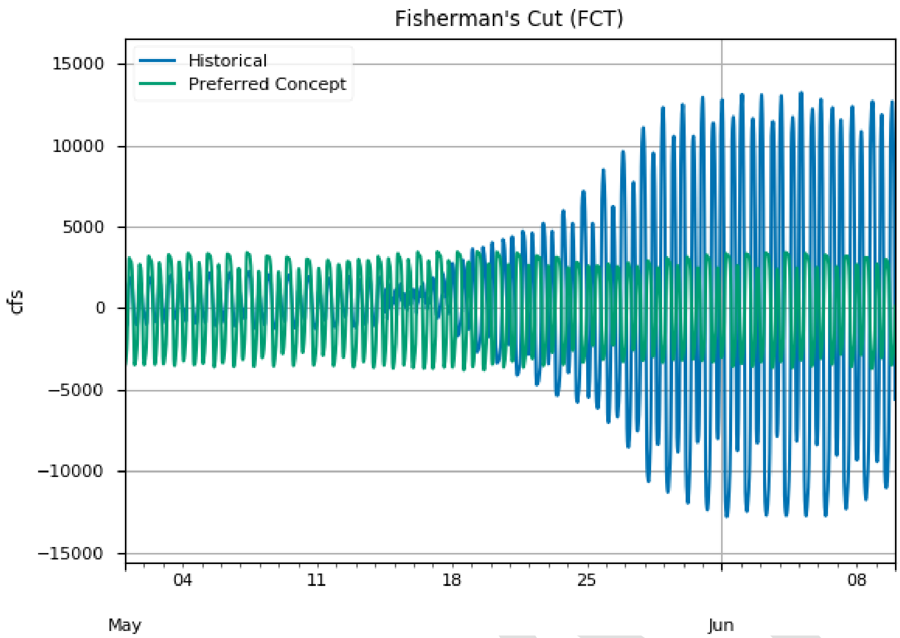


Figure 22: Discharge at Fishermans Cut in 2015 during a period that straddles the installation of the 2015 West False River Barrier in the historical case. The Preferred Concept includes no barrier.



Fishermans Cut is a channel that received scrutiny in the stakeholder feedback process because it experienced large flow changes under the 2015 West False River Emergency Drought Barrier. The design Concepts from this project increase velocities in Fishermans Cut by a much smaller amount than in 2015. Figure 22 shows time series from two 2015 simulations, one with the (historical) emergency barrier and one with the (hypothetical) Preferred Concept. The plot straddles the installation of the barrier in time, so that the early part of the historical configuration series shows the quiescent tidal flows in Fishermans Cut under current geometry and the latter part of the historical series shows the vigorous tides that occurred with the emergency barrier. With these flows serving as bookends, it is clear the Preferred Concept flow magnitudes fall on the gentler side of the range. Based on modeling of a variety of restoration designs and tidal barriers that DWR has modeled, velocity impacts on Fishermans Cut are lower when the main landform or barrier is positioned east of Fishermans Cut rather than west as was the case in 2015.

3.3 Flood Conveyance and Water Levels

For the preferred alternative, DWR conducted screening-level flood modeling, simulating flood water levels throughout the Delta for the 2017 flood season. Flows on the Sacramento at Rio Vista and for Old and Middle River combined flow are shown for reference in Figure 23. The 2017 season was selected as the subject year for modeling as it contained a significant flood event in the central Delta, approximately the sixth largest as measured at San Andreas Landing in the period of record going back to 1955, and occurred relatively recently, with readily-available hydrologic and atmospheric data and modern water operations in place. Clifton Court Forebay and SWP pumping was shut down between mid-March and mid-April, eliminating its role in alleviating flood flows.

Figure 23: Flows on the Sacramento River at Rio Vista (top) and Old and Middle Rivers combined (bottom) during the 2017 Flood Evaluation

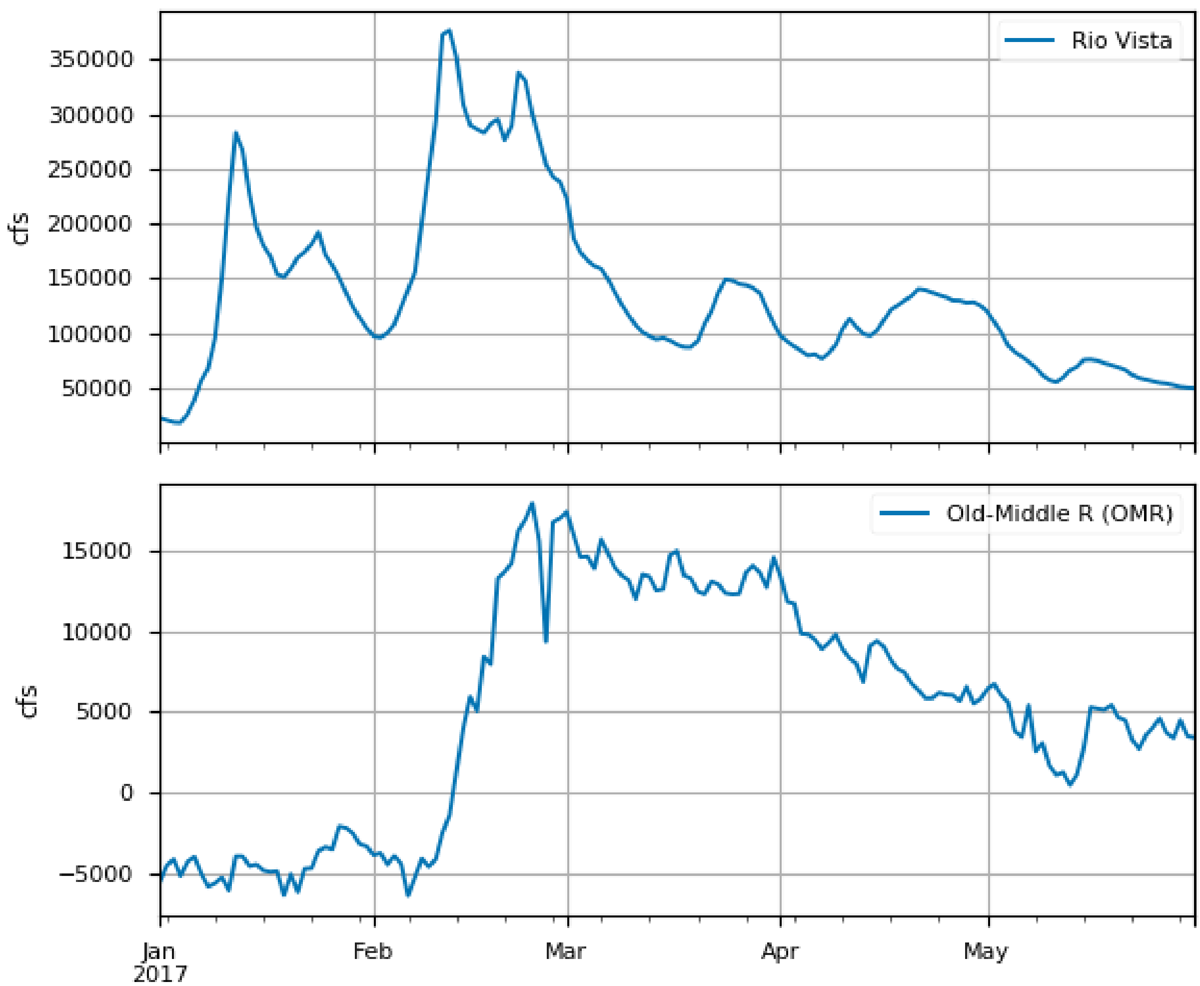


Figure 24: Difference in peak flood stage in 2017 during a) February 6-8 and b) February 25-March 5, between the Preferred Concept and No Action with Dutch Slough Restoration cases.

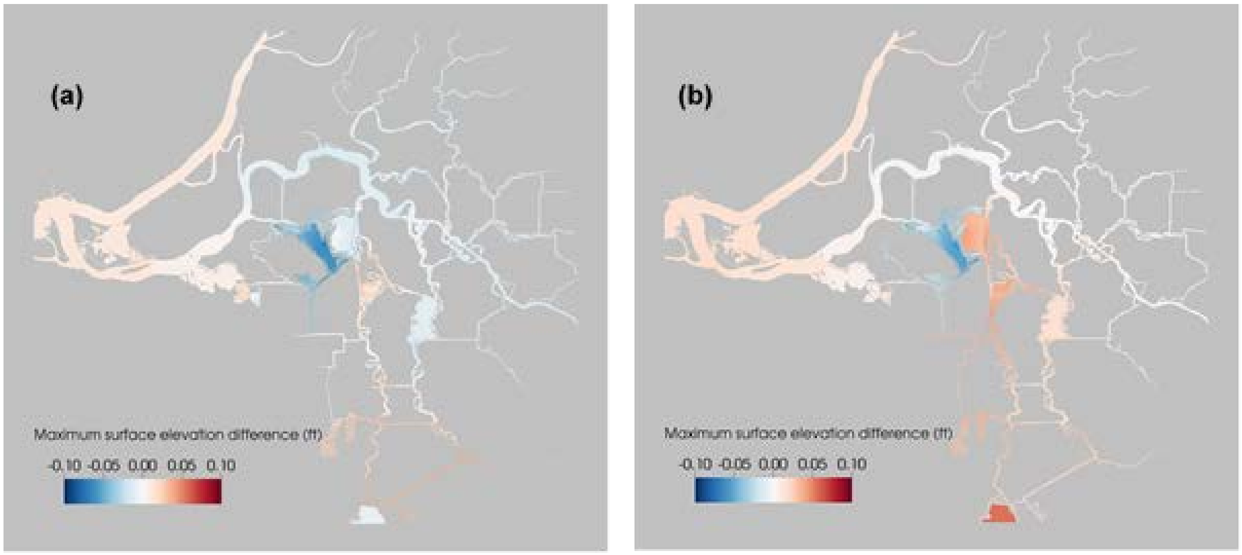
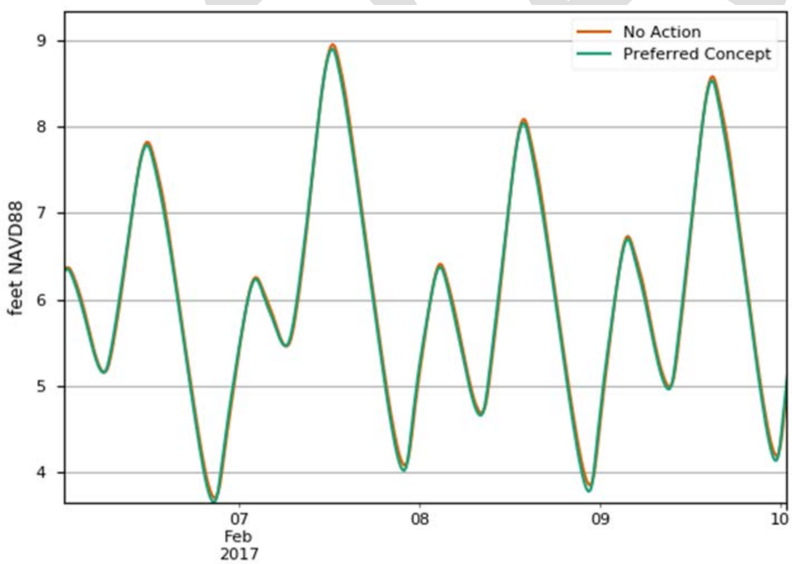


Figure 25 Time series of water levels at Piper Slough (DWR NCRO station B95058, CDEC ID BET) during the peak 2017 period in February for the Preferred Concept and No Action With Dutch Slough cases. Note that the differences are small, and the No Action series can only be seen at a few peaks.



Changes to water levels caused by the project were minimal -- less than 0.1 feet everywhere, and mostly less than 0.05 feet. The changes were also a mix of increases and decreases, and in that regard results for the two periods exhibit somewhat different behavior. The latter period (b) resulted in higher positive differences in the eastern Franks Tract and the south Delta, compared to the early February period (a).

This is believed to be due to high flows in the San Joaquin River. These small variations notwithstanding, the result that flood stage is relatively unaltered generalizes to successive peaks caused by king tides, larger outflows on the Sacramento River and increased Old and Middle River flows, all of which can play a role in local water levels.

Though Concepts A and C were not modeled for flood performance, these concepts are expected to perform similarly to Concept B. Preliminary indications based on spot checking are that changes in water levels are below known thresholds of concern. This initial assessment of significance could change particularly if a modified proposal were taken forward, and in this case the design could readily be refined to address any conveyance problems. For example, the constructed project geometry used in the model included extensive high elevation habitat areas adjacent to the tidal marshes. These areas could be selectively lowered to allow additional flood conveyance over the top of the marsh when water levels get to extreme flood levels. The potential impacts of flood changes would be more fully evaluated during the environmental documentation and permitting phase of project prior to implementation.

Chapter 4. Particle Tracking and Entrainment

Besides affecting salinity, the combination of inflows, channel geometry, tides exports and diversions affect the movement of fish towards the south Delta and export facilities. This entrainment of fish into the south Delta represents not only an ecological risk to listed species, but also a reliability issue for water operations.

Particle tracking studies using neutrally buoyant particles under mean velocity (and a very small vertical random diffusion) were conducted in order provide an indicator of entrainment potential due to velocity alone. DWR conducted particle modeling for the Preferred Concept only. A range of periods representing different flow conditions were simulated (Table 1). Behavior and biological signals were ignored, an assumption that becomes increasingly tenuous as the size and maturity of the subject fishes increase. Particle tracking focused on Chinook salmon and Delta smelt because entrainment of these fish can trigger water export reductions under the CDFW (2020) Incidental Take Permit for the State Water Project and federal Biological Opinions by National Marine Fisheries Services and United States Fish and Wildlife Services (2019). For discussion of water supply reliability aspects of fish entrainment and some of the biological motives for the design, see the Water Quality and Supply Reliability Evaluation Criteria Information Sheet of the main report.

Particle tracking simulations were based on three injection sites: San Joaquin River near False River (close to Jersey Point), San Joaquin at the mouth of Old River and San Joaquin at Turner Cut (Figure 26, yellow stars). These locations are considered representative of where smelt would enter Franks Tract from the west and where outmigrating juvenile salmonids would enter the system from the east. Particles were injected every 6 minutes through 1 full tidal day to capture a full tidal cycle. Spatially, the insertions of particles were randomly distributed over a rectangle of several hundred meters at each site as depicted in the insets of Figure 26 and were vertically distributed randomly within the top two-thirds of the water column. Particles were tracked for 28 days with residency/recovery in the recovery regions checked over time. Two recovery regions were designated in the south Delta and west Delta. The south Delta recovery area includes the State Water Project (SWP) and the Central Valley Water Project (CVP) export facilities and represents likely fish entrainment (Figure 1, red polygon). The west Delta includes anything west of Big Break and assumes successful movement to beneficial rearing habitat and outmigration (Figure 1, green polygon). Velocity data for particle tracking were interpolated linear over six-minute velocity output from the hydrodynamic model.

Table 3. Model Hydrologic Year-Type and Operational Conditions

30-day Period From	Characteristics	Outflow (NDOI, cfs)	Old-Middle R Flow (OMR, cfs)
2010-02-24	High outflow, med OMR	21,230	-4,455
2015-02-25	Low outflow, med OMR	5,350	-3,183
2015-05-01	Low outflow, low OMR	5,160	-1,470

Source: CDEC (DTO code for outflow, OMR code for Old-Middle River flow)

Particle counts over time in each of the two recovery zones for all the scenarios are given in Figure 27 to Figure 35. The results suggest the Preferred Concept (B) appreciably reduces entrainment from sites west of Franks Tract. For instance, in the lower export March case, the fraction of neutrally buoyant particles injected at Jersey Point entrained at the export facilities drops from slightly over 40% to 30% percent, reduction (Figure 30, bottom graph). Entrainment goes up slightly (by 3%) for particles injected on the east side of Franks Tract near the mouth of Old River under for the same model run. The project had a small effect on particles injected at Turner Cut except in May 2015 (Figure 33) when there is a 5% increase, suggesting that a tradeoff between San Joaquin species and Sacramento species may exist as described in DWR (2017) but that it is a smaller issue with the current configuration.

Figure 26: Particle study injection locations, indicated by stars and shown further in the insets, which give the exact horizontal extent. The green and red polygons represent the recovery locations where particle residence was counted over time.

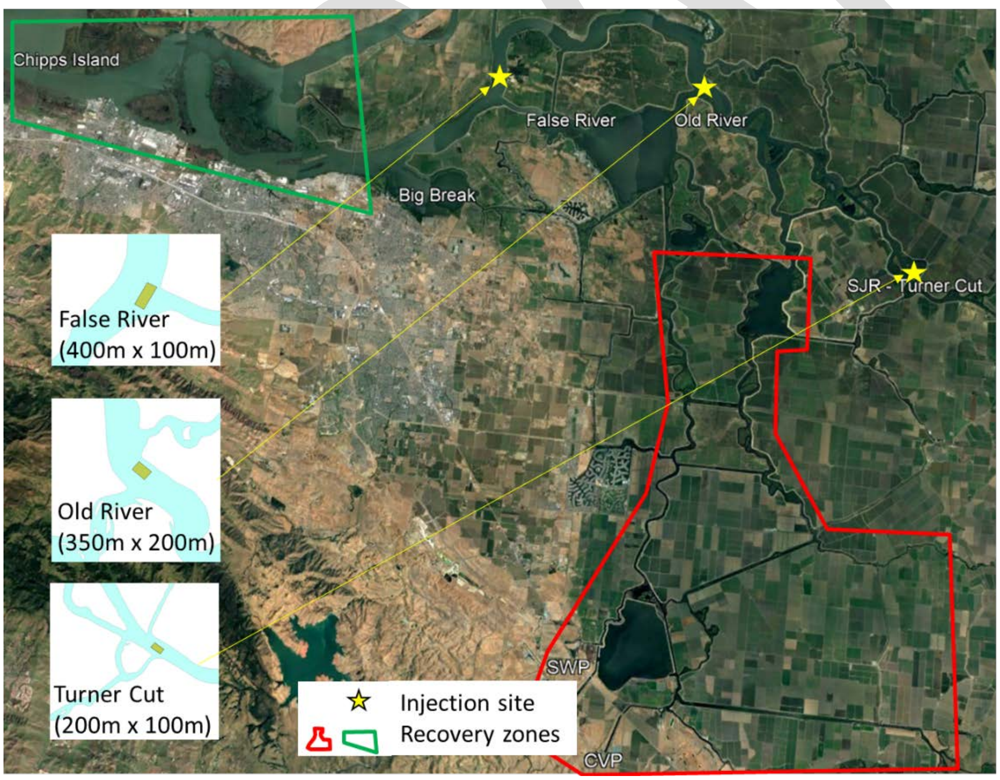


Figure 27: Particle recovery as a fraction of particles released in the West Delta (top) and South Delta (bottom) polygons over time for the March 2010 release near False River.

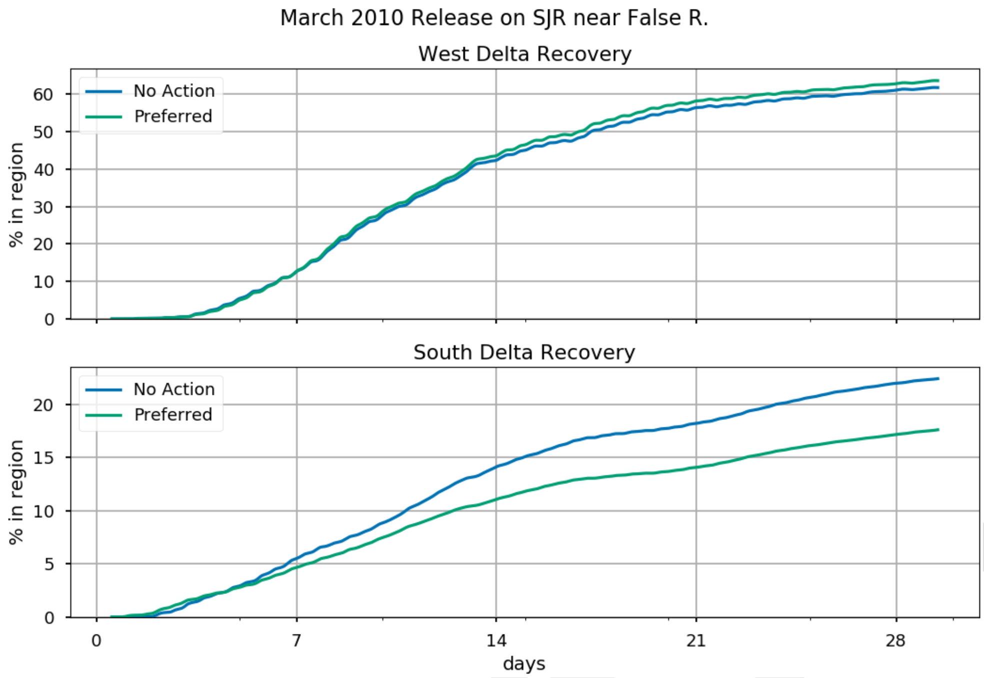


Figure 28: Particle recovery as a fraction of particles released in the West Delta (top) and South Delta (bottom) polygons over time for the March 2010 release near Old River.

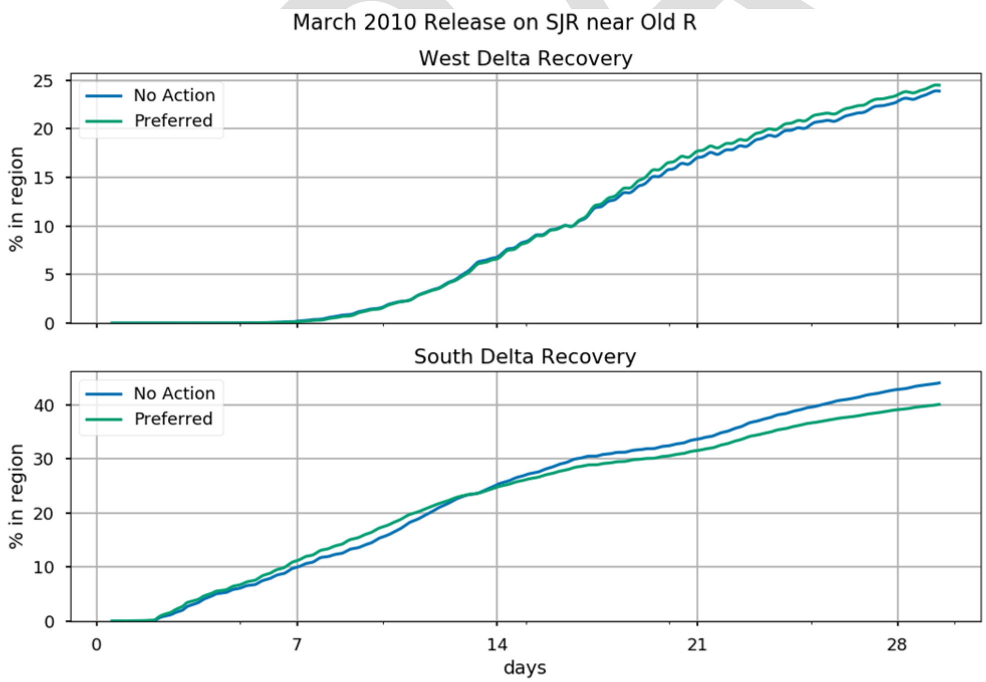


Figure 29: Particle recovery as a fraction of particles released in the West Delta (top) and South Delta (bottom) polygons over time for the March 2010 release near Turner Cut.

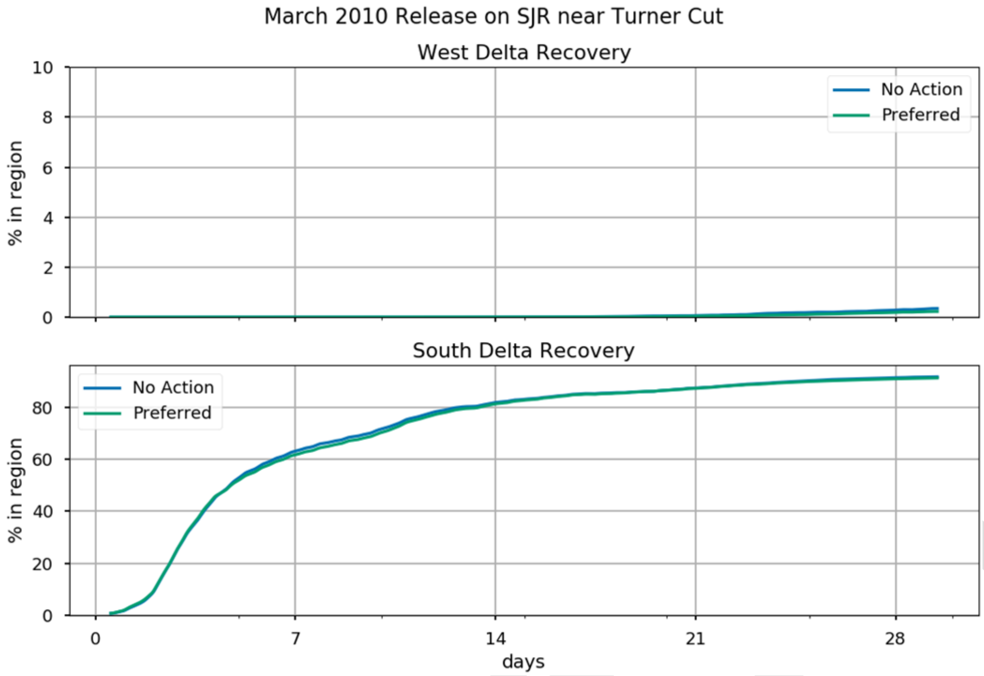


Figure 30: Particle recovery as a fraction of particles released in the West Delta (top) and South Delta (bottom) polygons over time for the March 2015 release near False River.

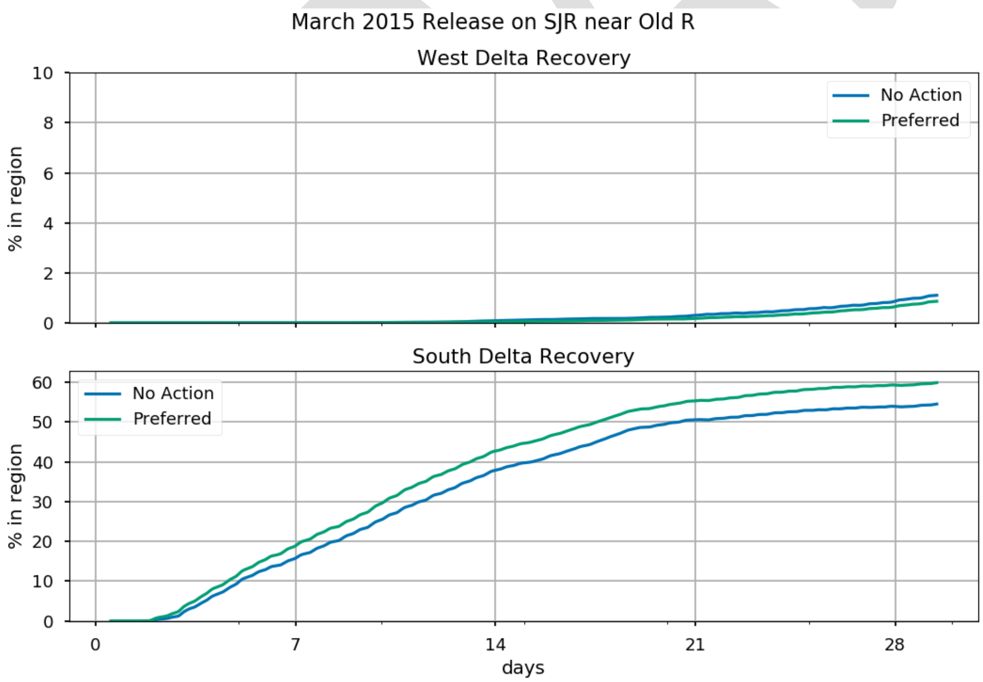


Figure 31: Particle recovery as a fraction of particles released in the West Delta (top) and South Delta (bottom) polygons over time for the March 2015 release near Old River.

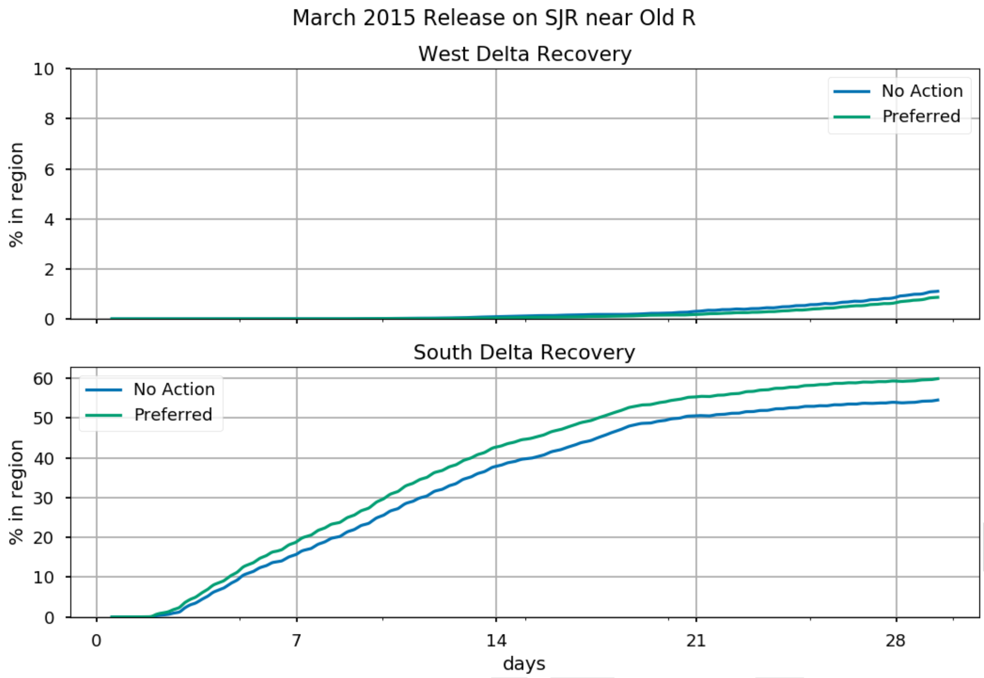


Figure 32: Particle recovery as a fraction of particles released in the West Delta (top) and South Delta (bottom) polygons over time for the March 2015 release near Turner Cut.

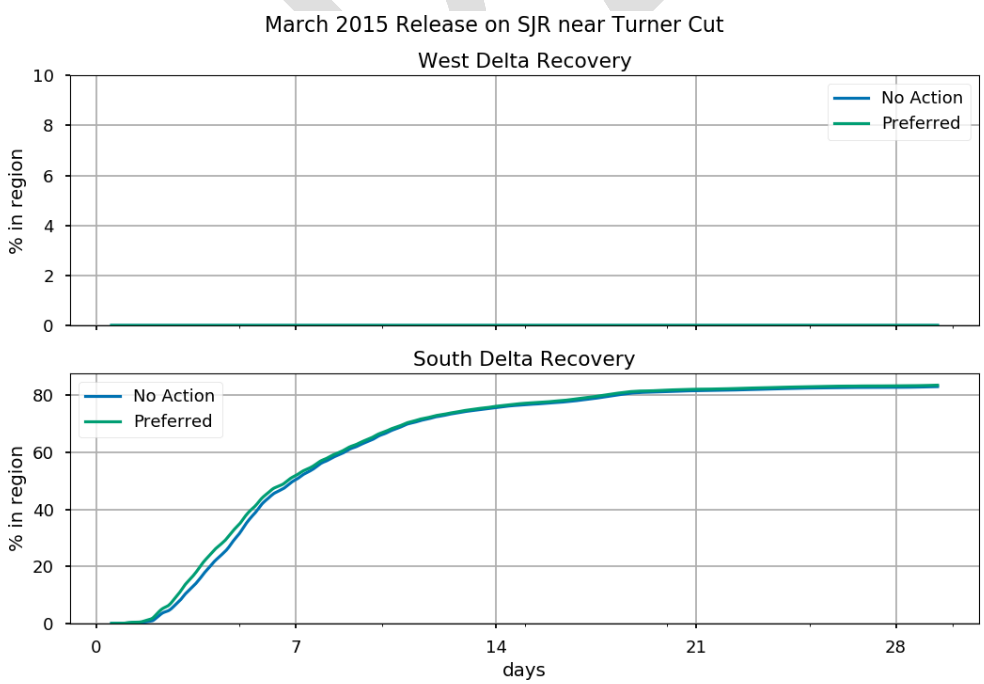


Figure 33: Particle recovery as a fraction of particles released in the West Delta (top) and South Delta (bottom) polygons over time for the May 2015 release near False River.

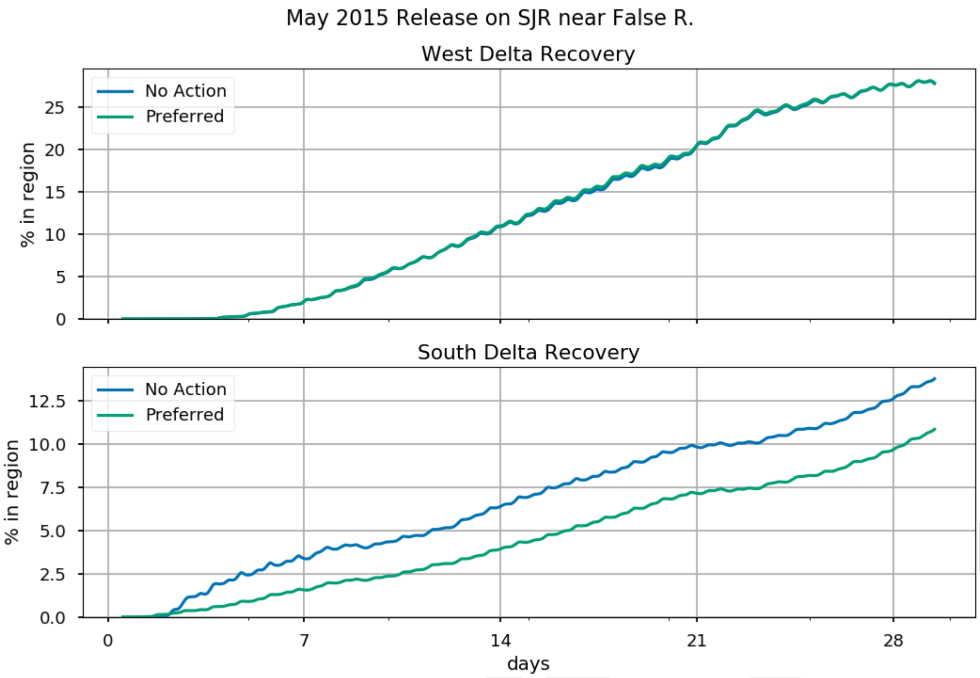


Figure 34: Particle recovery as a fraction of particles released in the West Delta (top) and South Delta (bottom) polygons over time for the May 2015 release near Old River.

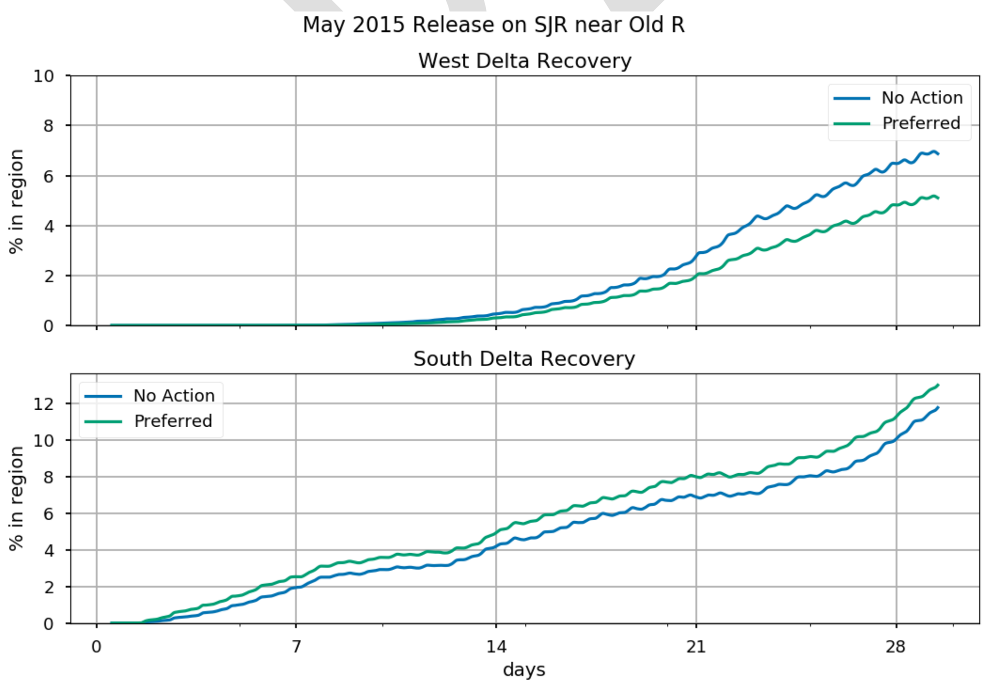
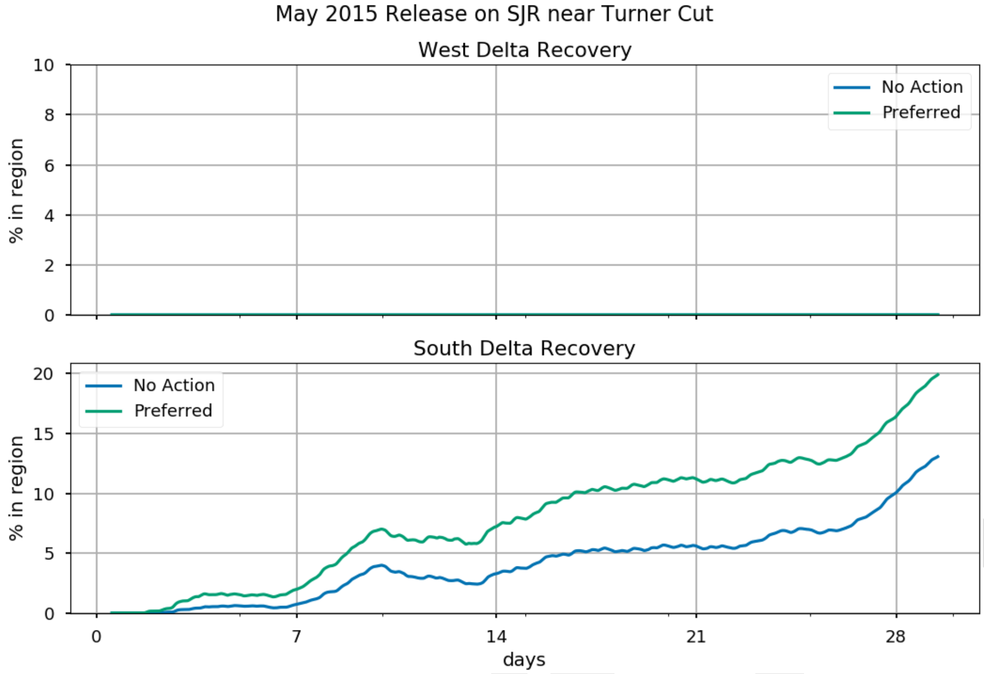


Figure 35: Particle recovery as a fraction of particles released in the West Delta (top) and South Delta (bottom) polygons over time for the May 2015 release near Turner Cut.



Chapter 5. References

Ateljevich E, Nam K, Zhang Y, Wang R, Shu Q. 2014. “Bay-Delta SELFE calibration overview.” In: Methodology for Flow and Salinity Estimates in the Sacramento-San Joaquin Delta and Suisun Marsh. 35th Annual Progress Report to the State Water Resources Control Board. Chapter 7. Sacramento (CA): Bay-Delta Office. Delta Modeling Section. California Department of Water Resources.

Ateljevich E, Tu M-Y, Le, K. 2015. “Calculation Clifton Court Forebay inflow and re-rating the forebay gates.” In: Methodology for Flow and Salinity Estimates in the Sacramento-San Joaquin Delta and Suisun Marsh. 36th Annual Progress Report to the State Water Resources Control Board. Chapter 6. Sacramento (CA): Delta Modeling Section. California Department of Water Resources.

Chao, Y., Farrara, J.D., Bjorkstedt, E., Chai, F., Chavez, F., Rudnick, D., Enright, W., Fisher, J.L., Peterson, W.T., Welch, G.F., Davis, C.O., Dugdale, R.C., Wilkerson, F.P., Zhang, H., Zhang, Y., Ateljevich, E. 2017. The origins of the anomalous warming in the California coastal ocean and San Francisco Bay during 2014-2016, J. Geophysical Research-Oceans. DOI: 10.1002/2017JC013120

California Department of Water Resources. 2019. Efficacy Report: 2015 Emergency Drought Barrier (EDB) Project.

California Department of Water Resources. 2017. Hydrodynamic Modeling in Support of Franks Tract Restoration Feasibility Study, Delta Resiliency Strategy. Prepared for California Department of Fish and Wildlife.

California Department of Water Resources. 2016, Water Data Library data available on the World Wide Web (WDL), accessed June 2016, at: http://www.water.ca.gov/waterdatalibrary/.

California Department of Water Resources. 2017, California Data Exchange Center data available on the World Wide Web (CDEC), accessed June 2016, at: http://cdec.water.ca.gov.

Jones, N. L, Thompson, J. K, & Monismith, S. G. (2008). A Note on the Effect of Wind Waves on Vertical Mixing in Franks Tract, Sacramento–San Joaquin Delta, California. San Francisco Estuary and Watershed Science, 6(2). doi:https://doi.org/10.15447/sfews.2008v6iss2art4

Kimmerer WJ, Nobriga ML. 2008. Investigating Particle Transport and Fate in the Sacramento-San Joaquin Delta Using a Particle-Tracking Model, San Francisco Estuary and Watershed Science: 6(11). Journal on the World Wide Web, at https://escholarship.org/uc/item/547917gn, accessed November 1, 2017.

Large WG, Pond S. 1981. Open Ocean Momentum Flux Measurements in Moderate to Strong Winds, Journal of Physical Oceanography:11(3), pp. 324-336.

Lucas LV, Stewart AR (2005) Transport, transformation and effects of selenium and carbon in the delta of the Sacramento-San Joaquin Rivers: implications for ecosystem restoration. Final Report. Project No. ERP-01-C07. California Bay Delta Authority, Sacramento

MacWilliams, Michael L.; Ateljevich, Eli S.; Monismith, Stephen G.; & Enright, Chris. (2016). An Overview of Multi-Dimensional Models of the Sacramento–San Joaquin Delta. San Francisco Estuary and Watershed Science, 14(4). jmie_sfews_33445. Retrieved from: http://escholarship.org/uc/item/31r7x1js

MacWilliams, Michael L.; & Gross, Edward S. (2013). Hydrodynamic Simulation of Circulation and Residence Time in Clifton Court Forebay. San Francisco Estuary and Watershed Science, 11(2). jmie_sfews_11167. Retrieved from: http://escholarship.org/uc/item/4q82g2bz National Oceanic and Atmospheric Administration. 2016.

Moffatt & Nichol. 2017. *Franks Tract Engineering Feasibility Assessment.* Walnut Creek [CA]: Prepared by: Moffatt & Nichol. Prepared for: Metropolitan Water District of Southern California. 78 pp.

National Oceanic and Atmospheric Administration Tides and Current Data available on the World Wide Web, accessed June 2016 at URL https://tidesandcurrents.noaa.gov/.

Research Management Associates. 2005. Flooded islands pre-feasibility study RMA delta model calibration report. Technical report, Prepared For: California Department of Water Resources for Submittal to California Bay-Delta Authority.

Sandhu N, Suits B, Ateljevich E, Zhong L, Kadir, T. 2016. "On Estimating Net Delta Outflow (NDO): Approaches to estimating NDO in the Sacramento-San Joaquin Delta." DWR.

Schraga T, Cloern J. 2017.Water Quality Measurements in San Francisco Bay by the U.S.Geological Survey, 1969-2015. Scientific Data 4:170098 doi:10.1038/sdata.2017.98.

Shu Q, Ateljevich E. 2017. Clifton Court Forebay Transit Time Modeling Analysis. DWR report prepared for the National Marine Fisheries Service.

Smith, P. 2011. Notes on Estimating Flow through the Clifton Court Forebay Radial Gates. Memo from P. Smith, USGS to Katherine Kelly, DWR Bay-Delta Office.

Song Y and Haidvogel DB. 1994. "A semi-implicit ocean circulation model using a generalized topography-following coordinate." Journal of Computational Physics. 115(1). pp. 228-244.

Umlauf L and Burchard H. 2003. "A generic length-scale equation for geophysical turbulence models." Journal of Marine Research. 61(2)6. pp. 235–265.

U.S. Geological Survey. 2016, National Water Information System data available on the World Wide Web (NWIS), accessed June 2016, at URL http://waterdata.usgs.gov/nwis/.

Ustin, S, Khanna S, Bellvert J, Boyer JD, Shapiro K. 2016. Impact of drought on Submerged Aquatic Vegetation (SAV) and Floating Aquatic Vegetation (FAV) using AVIRIS-NG airborne imagery. California Department of Fish and Wildlife.

Wang R, Ateljevich E. 2012. A Continuous Surface Elevation Map for Modeling (Chapter 6). In Methodology for Flow and Salinity Estimates in the Sacramento-San Joaquin Delta and Suisun Mars, 23rd Annual Progress Report to the State Water Resources Control Board. California Department of Water Resources, Bay-Delta Office, Delta Modeling Section.

Zhang Y, Ateljevich E, Yu HS, Wu CH, Yu J. 2015. "A new vertical coordinate system for a 3D unstructured-grid model." Ocean Modelling. 85. pp. 16-31.

Zhang Y, Baptista AM. 2008. "SELFE: A semi-implicit Eulerian-Lagrangian finite-element model for cross-scale ocean circulation." Ocean Modelling. 21(3-4). pp. 71-96.

Zhang, Y.J., Gerdts, N., Ateljevich, E. Nam, K. 2019. Simulating vegetation effects on flows in 3D using an unstructured grid model: model development and validation. Ocean Dynamics 70, 213–230 (2020). https://doi.org/10.1007/s10236-019-01333-8

Zhang Y, Ye F, Stanev EV, Grashorn S. 2016. "Seamless cross-scale modeling with SCHISM. Ocean Modelling." 102. pp. 64-81.

DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA