RESILIENCE THROUGH
RESTORATION

RECLAMATION DISTRICT NO. 1601
TWITCHELL ISLAND
SAN JOAQUIN RIVER SETBACK LEVEE PROJECT
TWITCHELL ISLAND BASICS

- Nearly 12 miles of levee
- Storm drainage facilities
- Protects over 3,600 acres
  - Farmland and grazing
  - Residential properties
  - Natural gas wells
  - DWR Flood emergency warehouse
  - Subsidence reversal projects, including East End Habitat project
PROBLEMS / CHALLENGES

- Heavy winds and wave run-up
- Lack of adequate freeboard
- Over-steepened waterside slopes
- Lack of notable waterside habitat and "fish friendly levees" in the region
MULTI-BENEFIT PROJECT OBJECTIVES

- To accomplish landside levee improvements that:
  - Increase the levee’s resistance to erosion
  - Provide better overall levee stability
  - Provide additional freeboard

- To provide diverse waterside habitat along this stretch of the San Joaquin River
EXISTING SETBACK LEVEE

- 3,000’ of setback levee just upstream of Threemile Slough
- Barrier islands with continuous back channel
- Construction:
  - Landside Berm in 1989
  - Setback Levee in 1995
  - Waterside habitat enhancement in 1999
EXISTING SETBACK LEVEE
PROJECT OVERVIEW
SETBACK LEVEE DESIGN

- **Phase 1: landside toe berm foundation**
  - Consolidate and strengthen the deep peat soils on the landside of existing levee
  - 8’ thick berm constructed incrementally in maximum 3’ lifts

- **Phase 2: setback levee**
  - Minimum 20’ wide crown width
  - 2h:1v waterside slope; 3h:1v landside slope
  - 4.7’ of freeboard above 100-year base flood elevation for wave run-up
SETBACK LEVEE DESIGN

SETBACK LEVEE (PHASE 2)

TOE BERM (PHASE 1)

EXISTING GROUND

BFE
WATERSIDE HABITAT DESIGN SUMMARY

- **Diverse range of channel margin habitat and SRA habitats**
  - “Fish friendly levees” that provide Delta-specific rearing and outmigration habitat for juvenile salmonids
  - Provides sandy or muddy substrate at a range of elevations
    - Includes tidally submerged or shallow benches to seasonally-inundated riparian habitat
  - High diversity in structure, topography, vegetation, and hydrology
    - Shallower depths and slower velocities than that in the adjacent channel

- **Continuous corridor of riparian and upland scrub habitats**
  - Diversity of botanical species and canopy structures
Option 1 – Barrier Islands and Tidal Back Channel
- Similar to existing levee setback site
- Series of barrier islands separated by a continuous back channel that fills and partially drains with the tides

Option 2 – Wide Islands with Discontinuous Back Channels
- Similar to Option 1
- Series of barrier islands separated by tidal back channels that drain completely at low tide

Option 3 – Beach Slope with Tule Band

Option 4 – Undulating Bench with Scalloped Bankline
- A non-linear shoreline that varies sinuously with tide levels
- Creates optimal variability in water depth, inundation duration and frequency

Option 5 – Back Bays between Rock Hardpoints
- Rock hardpoints to break long-fetch waves with protected water and marsh in between
- Greatest variation in non-linear shoreline
WATERSIDE HABITAT DESIGN OPTION 1
BARRIER ISLANDS AND TIDAL BACK CHANNEL
WATERSIDE HABITAT DESIGN OPTION 1
BARRIER ISLANDS AND TIDAL BACK CHANNEL (HIGH TIDE)
WATERSIDE HABITAT DESIGN OPTION 2
WIDE ISLANDS WITH DISCONTINUOUS BACK CHANNELS
WATERSIDE HABITAT DESIGN OPTION 2
WIDE ISLANDS WITH DISCONTINUOUS BACK CHANNELS (HIGH TIDE)
WATERSIDE HABITAT DESIGN OPTION 2
WIDE ISLANDS WITH DISCONTINUOUS BACK CHANNELS (LOW TIDE)
WATERSIDE HABITAT DESIGN OPTION 3
BEACH SLOPE WITH TULE BAND

NOTE: 'RSP = ROCK SLOPE PROTECTION'.

KSN INC.
WATERSIDE HABITAT DESIGN OPTION 3
BEACH SLOPE WITH TULE BAND (HIGH TIDE)
WATERSIDE HABITAT DESIGN OPTION 3
BEACH SLOPE WITH TULE BAND (LOW TIDE)
WATERSIDE HABITAT DESIGN OPTION 4
UNDULATING BENCH WITH SCALLOPED BANKLINE
WATERSIDE HABITAT DESIGN OPTION 4
UNDULATING BENCH WITH SCALLOPED BANKLINE (HIGH TIDE)
WATERSIDE HABITAT DESIGN OPTION 4
UNDULATING BENCH WITH SCALLOPED BANKLINE (LOW TIDE)
WATERSIDE HABITAT DESIGN OPTION 5
BACK BAYS BETWEEN ROCK HARDPOINTS

NOTE: 'RSP = ROCK SLOPE PROTECTION'. REMOVED RSP ON EXISTING BANKS BETWEEN HARDPOINTS.
WATERSIDE HABITAT DESIGN OPTION 5
BACK BAYS BETWEEN ROCK HARDPOINTS (HIGH TIDE)
PROJECT COST

- Overall project budget: $100 million
  - Toe Berm: $60 million
  - Setback Levee: $30 million
  - Waterside Habitat: $10 million
- Separated into ten separate reaches/ phases for funding purposes
- Expected to be fully constructed in 10 to 15 years, depending on funding