

Process and Assumptions for Developing Recommended Habitat Restoration Objectives: Rounded To Nearest 50 Acres SAIC Work Product

Overarching Assumptions:

- 1) Habitats need to be restored and enhanced in all ROAs to address the needs of all life stages of the covered fish species.
- 2) The type and magnitude of covered fish species responses to a particular type and extent of restoration action is highly uncertain and cannot be ascertained at this time as well as the relative responses of covered fish species to restorations located in different portions of the Delta and Suisun Marsh. Consequently, anticipated magnitude of biological responses of covered fish species is not a factor in determining the location and extent of habitat recommended for restoration. Rather, the low end of restoration objectives serve as starting points for implementing habitat restorations as adaptive management experiments for the purpose of evaluating the effectiveness of each restored habitat type within each ROA for achieving desired covered fish species responses. If the type and magnitude of responses is desirable, additional habitat may be restored above the low end objective. If the response is not favorable, additional habitat restoration may be discontinued and funds reobligated to more effective measures through the adaptive management process. The high end restoration objectives represent the likely maximum extent of restoration that could be implemented based on site constraints (e.g., land surface elevations).

FLOODPLAIN RESTORATION AND ENHANCEMENT

1. Yolo Bypass/Cache Slough Complex ROA

Yolo Bypass (enhancement)

Low end: 1,000 cfs flow into bypass = 19,450 acres – 1,250 acres of tidal marsh on Little Holland Tract = 18,200

High end: 5,000 cfs flow into bypass = 30,450 acres – 1,250 acres of tidal marsh on Little Holland Tract = 29,200

DWSC bypass (restoration)

Low end: Assume no floodplain bypass because no flood control nexus = 0 acres

High end: Assume 3,000 foot wide bypass x 4.3 miles of bypass at elevation above tidal marsh elevation = 1,550 acres

2. South Delta ROA (restoration)

Assume that either Old River or Middle River, not both, would be restored as floodplain, depending on conveyance. Assume low end is the smallest of Old and Middle River corridors and high end is the largest of the Old and Middle River corridors plus the sum of high end for all other corridors

Federal levees

Lower SJR (Mossdale downstream)

Low end: Assume no floodplain bypass because no flood control nexus = 0 acres

High end: 1,000 foot setback (500 feet each side) x 12 miles of bypass at elevation above tidal marsh elevation = 1,450 acres new floodplain

Non-federal levees

Old River:

Low end: 500 foot setback (250 feet each side) x 13.2 miles of bypass at elevation above tidal marsh elevation = 800 acres new floodplain

High end: 1,000 foot setback (500 feet each side) x 13.2 miles = 1,600 acres new floodplain

Middle River:

Low end: 500 foot setback (250 feet each side) x 12 miles = 300 acres new floodplain

High end: 1,000 foot setback (500 feet each side) x 5 miles = 600 acres new floodplain

3. San Joaquin River ROA (restoration)

Federal levees

Upper SJR (Vernalis-Mossdale)

Low end: Assume no floodplain bypass because no flood control nexus = 0 acres

High end: 25 percent of extent of unleveed 100 year floodplain = 19,600 acres x 0.25 = 4,900

TIDAL MARSH RESTORATION

Approach: initially restore tidal marsh as large scale experiments to assess development of functions and fish response. If marsh develops functions and fish respond, continue with marsh restoration beyond low end restoration targets. If marsh does not function as expected, conduct investigations to determine causes and adjust restoration designs and management to improve functions. If fish do not respond and marsh is functioning properly, may not do additional restoration and use remaining funds for other actions.

1. Yolo Bypass/Cache Slough ROA

Deep Water Ship Channel Bypass:

Low end: Assume no floodplain bypass = 0 acres

High end: all sea level rise, tidal, and subtidal acres with target of 70% developing as tidal marsh =

- 2,250 total
- At least 1,600 = intertidal marsh
- Up to 650 = subtidal

Cache Slough Complex, Lower Yolo Bypass, and Prospect Island

Low end: all acres in very high and high implementability categories (from HO#3 11/21/08 SC meeting) with a target of 80% as tidal marsh and sea level rise accommodation thru 2100 =

- 14,500 total
- At least 11,600 = intertidal marsh and sea level rise accommodation
- Up to 2,900ac = subtidal

High end = all sea level rise, tidal, and subtidal 1 acres plus subtidal 2 acres for Prospect Island (from HO#2 11/21/08 SC meeting) with target of 80% as tidal marsh and sea level rise accommodation thru 2100 =

- 23,650 total
- At least 18,900 = intertidal marsh and sea level rise accommodation
- Up to 4,750 = subtidal

2. Cosumnes/Mokelumne ROA

Low end: all of the high implementability category (from HO#3 11/21/08 SC meeting) with a target of 80% as tidal marsh and sea level rise accommodation thru 2100 =

- 1,450 total
- At least 1,150 = intertidal marsh and sea level rise accommodation
- Up to 300 acres = subtidal

High end = all sea level rise, tidal, and subtidal 1 acres (from HO#2 11/21/08 SC meeting) with target of 80% as tidal marsh and sea level rise accommodation thru 2100 =

- 5,350 acres total
- At least 4,300 = intertidal marsh and sea level rise accommodation
- Up to 1,050 = subtidal

3. East Delta ROA

Low end: 30% of sea level rise, tidal, and subtidal 1 acres (from HO#2 11/21/08 SC meeting) to account for poor tidal connectivity with target of 80% as tidal marsh and sea level rise accommodation thru 2100 =

- 1,600 acres total
- At least 1,300 = intertidal marsh and sea level rise accommodation
- Up to 300 = subtidal

High end = all sea level rise, tidal, and subtidal 1 acres with target of 80% as tidal marsh and sea level rise accommodation thru 2100 =

- 5,400 acres total
- At least 4,300 = intertidal marsh and sea level rise accommodation
- Up to 1,100 = subtidal

4. South Delta ROA

Assume low end is lowest of the 2 scenarios and high end is the highest of the 2 scenarios

Low end: 30% of sea level rise, tidal, and subtidal 1 acres (from HO#2 11/21/08 SC meeting) to account for poor tidal connectivity with target of 80% as tidal marsh and sea level rise accommodation thru 2100 =

Scenario 1 = Upper Roberts Island and Union Island if Old River is not isolated

- 6,850 acres total
- At least 5,500 = intertidal marsh and sea level rise accommodation
- Up to 1,350 = subtidal

Scenario 2 = Upper Roberts Island and Fabian Tract if Old River is isolated

- 4,550 acres total
- At least 3,650 = intertidal marsh and sea level rise accommodation
- Up to 900 = subtidal

High end = all sea level rise, tidal, and subtidal 1 acres (from HO#2 11/21/08 SC meeting) with target of 80% as tidal marsh and sea level rise accommodation thru 2100 =

Scenario 1 = Upper Roberts Island and Union Island if Old River is not isolated

- 22,850 acres total
- At least 18,300 = intertidal marsh and sea level rise accommodation
- Up to 4,550 = subtidal

Scenario 2 = Upper Roberts Island and Fabian Tract if Old River is isolated

- 15,250 acres total
- At least 12,200 = intertidal marsh and sea level rise accommodation
- Up to 3,050 = subtidal

5. West Delta ROA

Low end: all public lands within evaluated land units with assumption that 80% can be developed as tidal marsh and sea level rise accommodation thru 2100 =

- 3,100 acres total
- At least 2,450 = intertidal marsh and sea level rise accommodation
- Up to 650 = subtidal

High end: all lands within evaluated land units with assumption that 80% can be developed as tidal marsh and sea level rise accommodation thru 2100 =

- 4,850 acres total
- At least 3,900 = intertidal marsh and sea level rise accommodation
- Up to 950 = subtidal

6. Suisun Marsh ROA

Low end: 0 acres assuming up to 9,000 acres are restored under the Suisun Marsh Plan

High end = all sea level rise, tidal, and subtidal 1 acres (from HO#2 11/21/08 SC meeting) minus 9,000 acres to be restored under the Suisun Marsh Plan with assumption that 80% can be developed as tidal marsh and sea level rise accommodation thru 2100 =

- 43,900 acres total
- At least 31,100 = intertidal marsh and sea level rise accommodation
- Up to 8,800 = subtidal

CHANNEL MARGIN HABITAT RESTORATION

1. **Sutter Slough and Steamboat Slough**—total = 26 miles, 10 miles of 52 miles of channel bank currently supports riparian vegetation (20 percent)

Approach: initially restore channel margin as experiments to assess development of functions and juvenile salmonid response. If enhancements develop functions and fish respond, continue with channel margin restoration beyond low end restoration targets. If channel margin improvements do not function as expected, conduct investigations to determine causes and adjust restoration designs and management to improve functions. If fish do not respond and enhanced habitat is functioning properly, may not do additional enhancement and use remaining funds other actions.

Low end—enhance at least 20 percent of channel banks to improve SRA cover and hydrodynamic conditions (e.g., channel geometry improvements) for juvenile salmonids = 11 miles

High end— enhance up to 60 percent of channel banks to improve SRA cover and hydrodynamic conditions (e.g., channel geometry improvements) for juvenile salmonids = 31 miles: high end capped at 60 percent to account for existing channel margin that is in good condition or for which improvements may not be practicable.

2. **San Joaquin River ROA**

Vernalis to Mossdale—total channel = 13.5 miles = 26 miles of channel bank

Low end—enhance at least 20 percent of channel banks to improve SRA cover and hydrodynamic conditions (e.g., channel geometry improvements) for juvenile salmonids = 6 miles

High end— enhance up to 60 percent of channel banks to improve SRA cover and hydrodynamic conditions (e.g., channel geometry improvements) for juvenile salmonids = 15 miles: high end capped at 60 percent to account for existing channel margin that is in good condition or for which improvements may not be practicable.

RIPARIAN HABITAT RESTORATION

Four types of riparian habitat restoration actions nested under other conservation measures:

1. *Channel margin restoration that also restores riparian habitat*—assumes 50 foot band of vegetation is restored along levees restored for channel margin as described under that section.
2. *Riparian habitat restored on BDCP levees built for tidal marsh and floodplain restoration*—assumes mean 50 foot width of new levees can support riparian vegetation
3. *Restored tidal marsh fringe riparian restoration*—assumes natural establishment of riparian vegetation within the elevation zone 0-3 feet above restored tidal marsh zone (corresponds to sea level rise accommodation zone)

Low end = 40 percent of high end estimates for riparian restoration target described below for each ROA (40 percent corresponds to the mean proportion of total low end targets for marsh restoration to high end targets for marsh restoration described above)

High end = 60 percent of the total extent of sea level rise accommodation (+3 feet above tidal zone) within each ROA (with exceptions as noted below for each ROA), assuming that up to 40 percent of sea level rise accommodation will not develop as riparian habitat to account for poor soil and hydrologic conditions that may be present in some locations.

4. *Riparian habitat restored on restored floodplains*—For joint floodplain habitat/flood control projects, assume floodplains are designed to allow woody riparian habitat to develop on up to 20 percent of floodplain surface. For non-joint flood control/floodplain restoration projects (Old or Middle River), assume up to 80 percent may support riparian vegetation.

1. Yolo Bypass/Cache Slough ROA

Riparian levee restoration

Low end = 0 acres, no new levees built

High end = 20.5 miles of new levee (DWSC and levee on Little Egbert) x 50 feet = 100 acres

Tidal Marsh Fringe Riparian restoration

Low end = 1,200 acres

High end = all sea level rise accommodation except for Little Holland Tract which is in the floodway and can't support riparian = 3,000 acres

Riparian floodplain restoration

Low end: Assume no floodplain bypass because no flood control nexus = 0 acres

High end: Assume 3,000 foot wide bypass x 4.3 miles of bypass at elevation above tidal marsh elevation = 1,550 acres x 0.2 assumed riparian establishment area = 300 acres riparian

2. Cosumenes/Mokelumne ROA

Riparian levee restoration

None

Tidal Marsh Fringe Riparian restoration

Low end = 200 acres

High end = all sea level rise accommodation = 550 acres

3. East Delta ROA

Riparian levee restoration

Low end = 0 acres, no new levees built

High end = 4 miles of new levee x 50 feet = <50 acres

Tidal Marsh Fringe Riparian restoration

Low end = 350 acres

High end = all sea level rise accommodation except assume 50 percent of sea level rise accommodation acres on Shin Kee and Rio Blanco Tracts is graded to fill subsided areas and is not available for riparian restoration = 900 acres

4. South Delta ROA

Riparian channel margin restoration

Low end = 26 miles of channel bank x 50 feet x 20 percent = 50 acres

High end = 26 miles of channel bank x 50 feet x 60 percent = 100 acres

Riparian levee restoration

Low end = 7 miles of new levee x 50 feet = 50 acres

High end = 12 miles of new levee x 50 feet = 50 acres

Tidal Marsh Fringe Riparian restoration

Low end =

Scenario 1 (Upper Roberts and Union Island in South Delta ROA) = 1,650 acres

Scenario 2 (Upper Roberts and Fabian Tract in South Delta ROA) = 1,750 acres

High end = all sea level rise accommodation except assume 50 percent of sea level rise accommodation acres is graded to fill subsided areas and is not available for riparian restoration

Scenario 1 (Upper Roberts and Union Island in South Delta ROA) = 4,100 acres

Scenario 2 (Upper Roberts and Fabian Tract in South Delta ROA) = 4,350 acres

Riparian floodplain restoration

Assume low end is smallest of Old and Middle River floodplain restoration and high end is highest of Old and Middle River floodplain restoration

Old River:

Low end: 500 foot setback (250 feet each side) x 13.2 miles of bypass at elevation above tidal marsh elevation = 800 acres new floodplain x 0.8 assumed riparian establishment area = 650 acres riparian

High end: 1,000 foot setback (500 feet each side) x 13.2 miles = 1,600 acres new floodplain x 0.8 assumed riparian establishment area = 1,300 acres riparian

Middle River:

Low end: 500 foot setback (250 feet each side) x 12 miles = 300 acres new floodplain x 0.8 assumed riparian establishment area = 250 acres riparian

High end: 1,000 foot setback (500 feet each side) x 5 miles = 600 acres new floodplain x 0.8 assumed riparian establishment area = 500 acres riparian

Lower SJR (Mossdale downstream):

Low end: Assume no floodplain bypass because no flood control nexus = 0 acres

High end: 1,000 foot setback (500 feet each side) x 12 miles of bypass at elevation above tidal marsh elevation = 1,450 acres new floodplain x 0.2 assumed riparian establishment area = 300 acres riparian

5. West Delta ROA

Riparian levee restoration

Low end = 12 miles of new levee x 50 feet = 50 acres

High end = 20 miles of new levee x 50 feet = 100 acres

Tidal Marsh Fringe Riparian restoration

No riparian restored because all suitable elevations assumed to be graded to create marsh.

6. Suisun Marsh ROA

No riparian assumed to establish because of salinity.

7. San Joaquin River ROA

Upper SJR (Vernalis-Mossdale)

Low end: Assume no floodplain bypass because no flood control nexus = 0 acres

High end: 25 percent of extent of unleveed 100 year floodplain = 19,600 acres x 0.25 = 4,900 x 0.2 assumed riparian establishment area = 1,000 acres riparian

8. Steamboat and Sutter Sloughs

Low end = 52 miles of channel bank x 50 feet x 20 percent = 50 acres

High end = 52 miles of channel bank x 50 feet x 60 percent = 200 acres