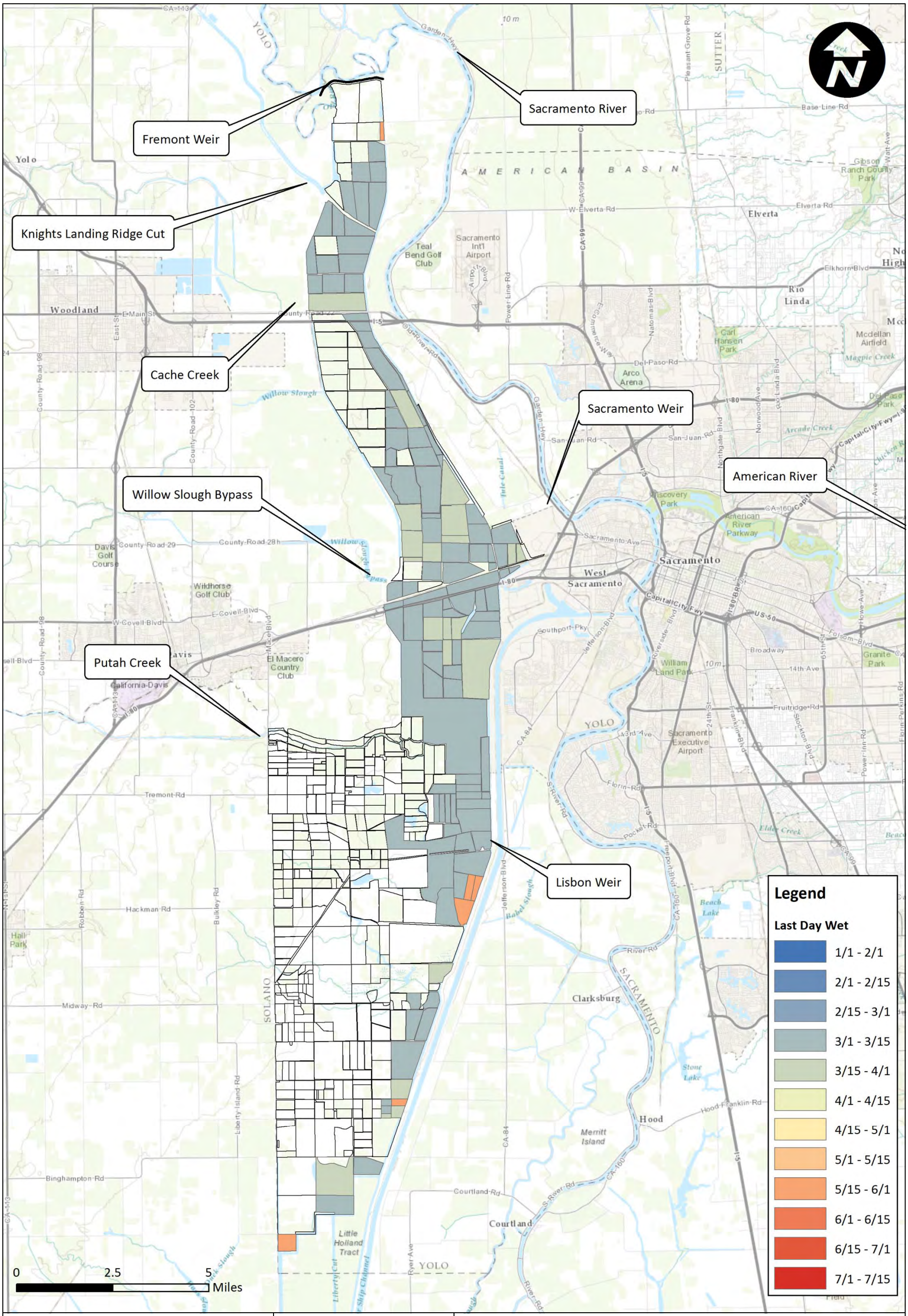
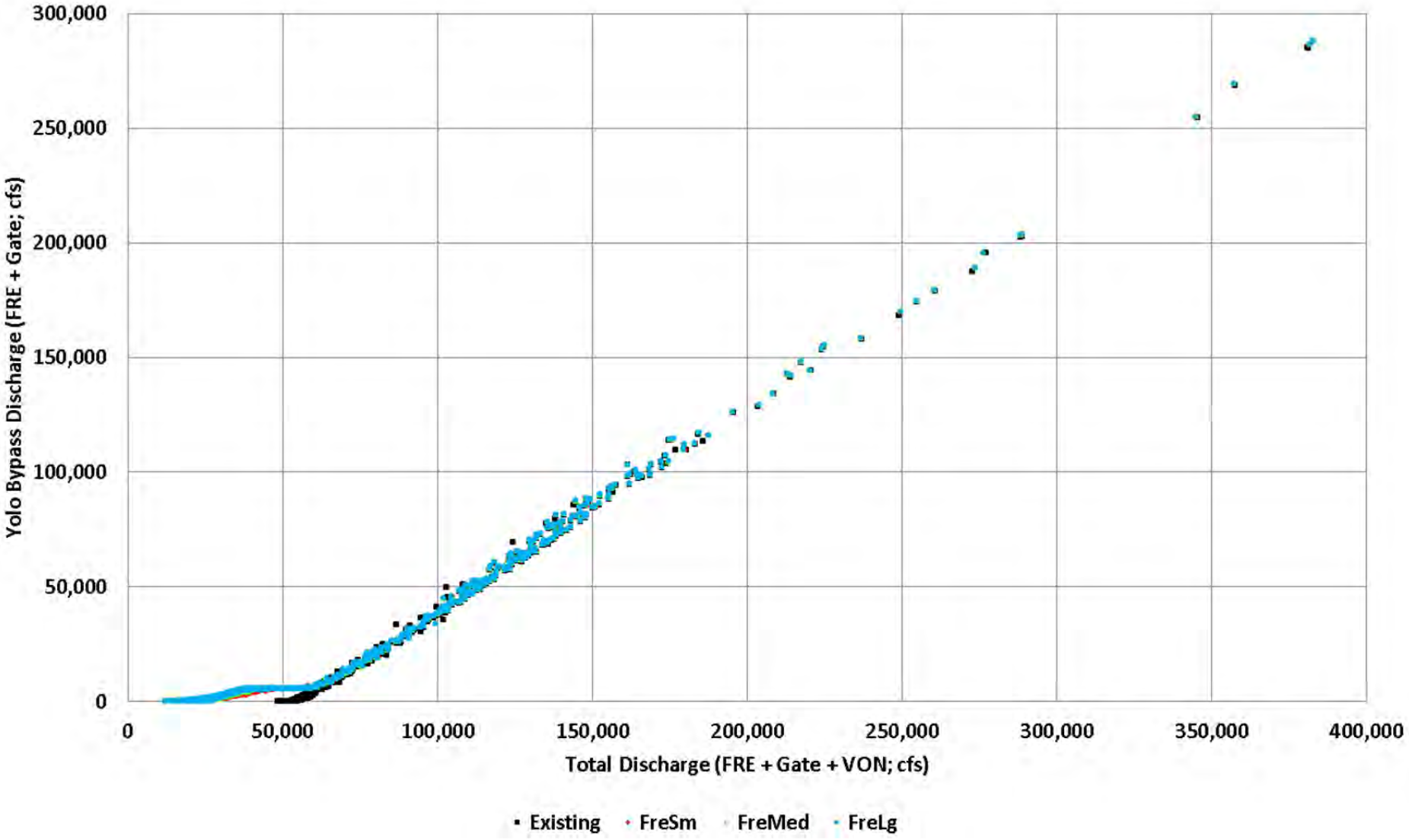



Notes:

*Yolo Bypass Salmonid Habitat Restoration and Fish Passage*

**Last Day Wet SacW 4/30 Closure 2001**

Prepared for DWR | Created By: RDJ | **Figure 7-21**

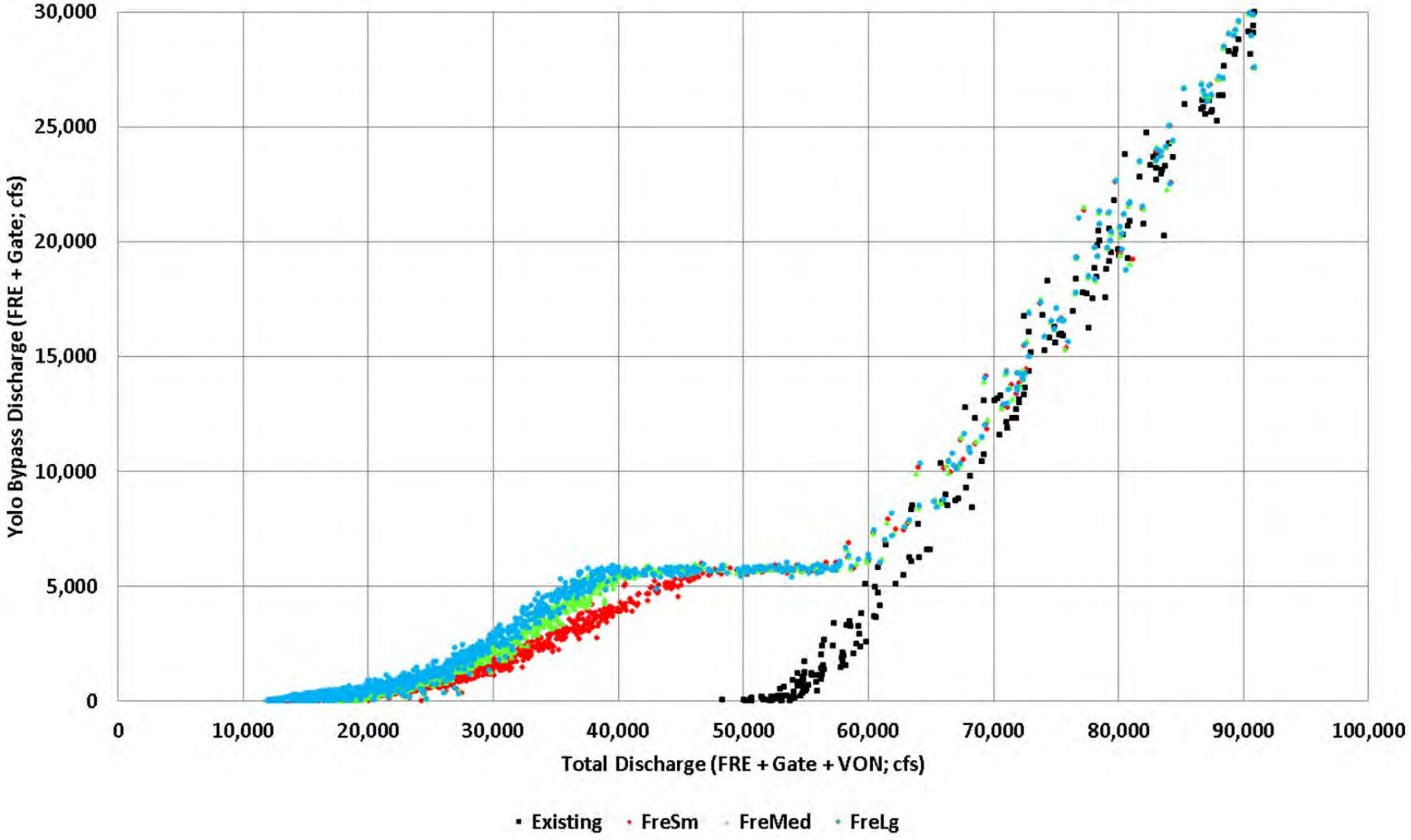



Notes: Flow entering the Yolo Bypass vs total discharge going into the bypass or down the Sacramento River.

*Yolo Bypass Salmonid Habitat Restoration and Fish Passage*

**Flow Rating Curves for Fremont Weir**

| Prepared for DWR | Created By: RDJ | **Figure 7-22** |
|---|---|---|

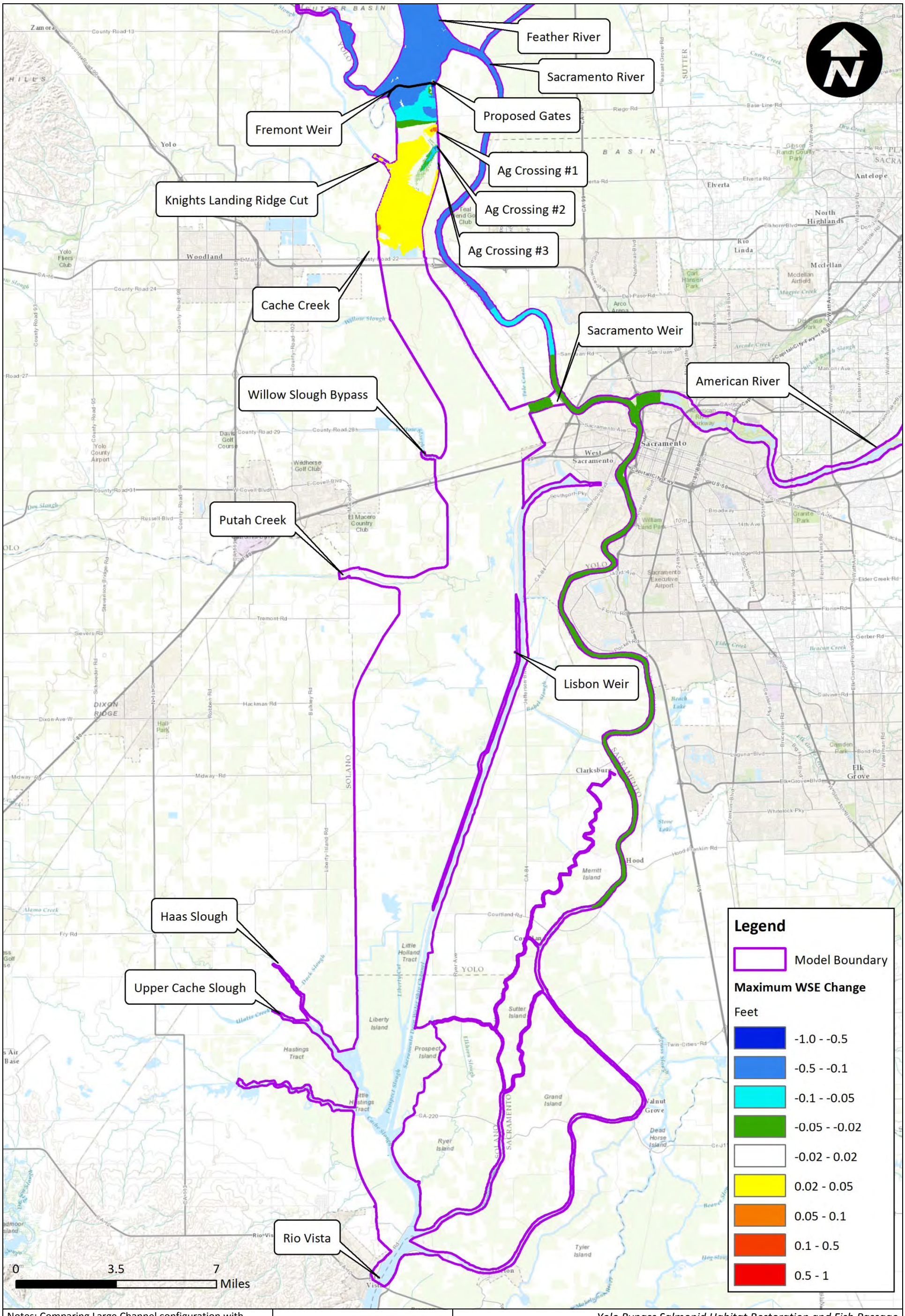



Notes: Flow entering the Yolo Bypass vs total discharge going into the bypass or down the Sacramento River.

*Yolo Bypass Salmonid Habitat Restoration and Fish Passage*

**Flow Rating Curves for Fremont Weir Zoomed**

Prepared for DWR | Created By: RDJ | **Figure 7-23**

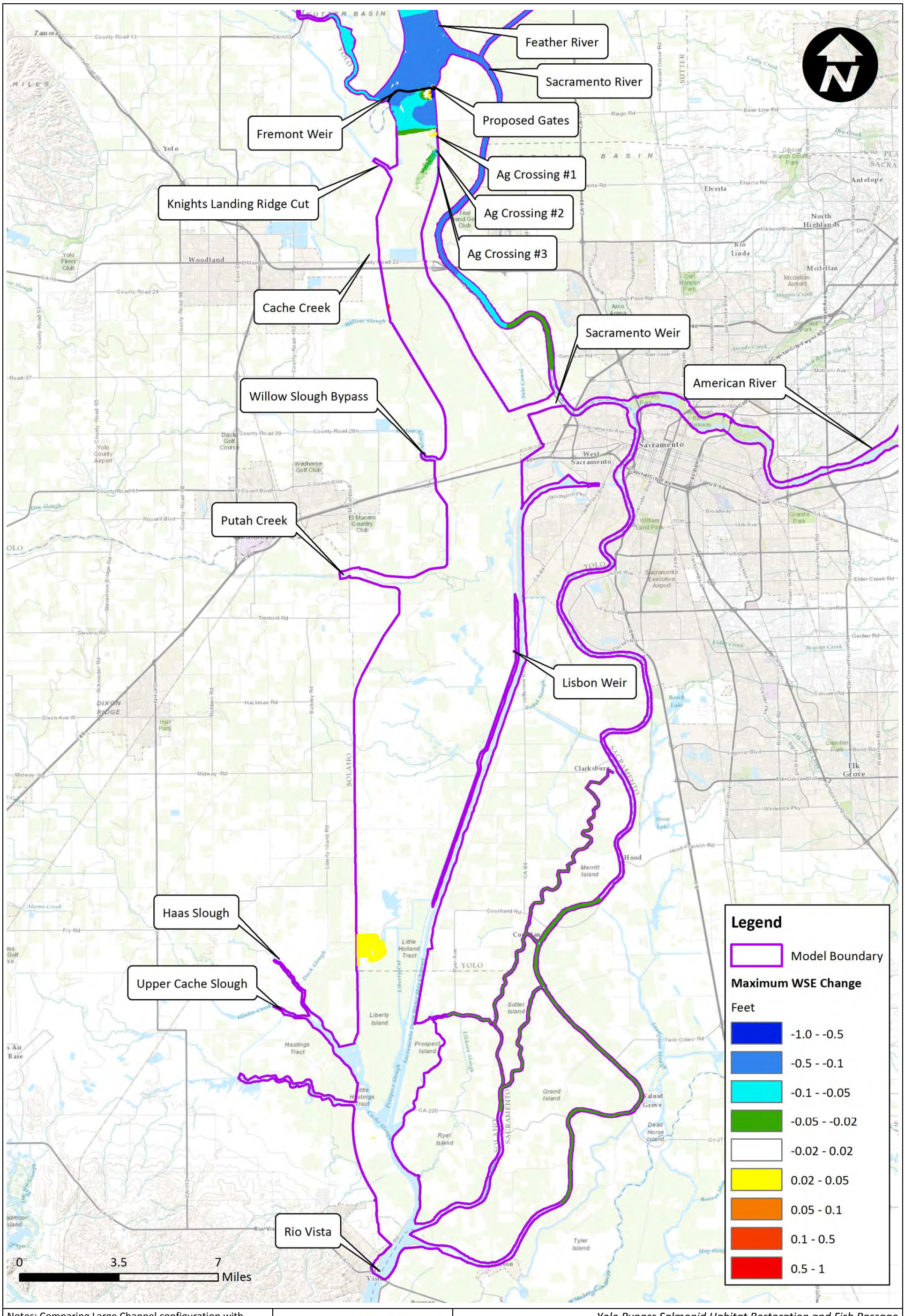



Notes: Comparing Large Channel configuration with existing conditions. Positive values indicate increases in maximum water surface elevations.

*Yolo Bypass Salmonid Habitat Restoration and Fish Passage*

**Change in Maximum WSE for Large Channel 1997**

Prepared for DWR | Created By: RDJ | **Figure 7-24**

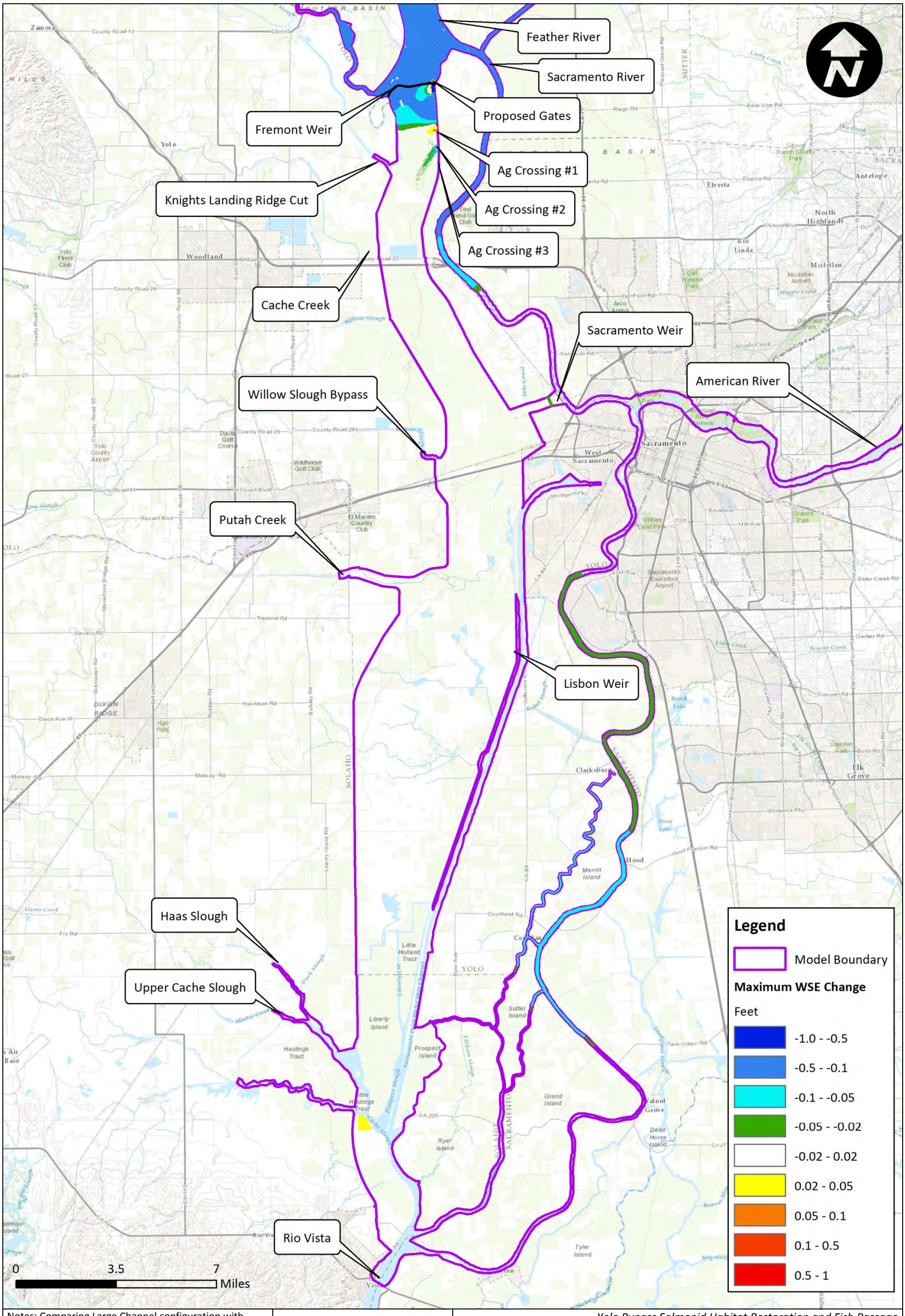



Notes: Comparing Large Channel configuration with existing conditions. Positive values indicate increases in maximum water surface elevations.

*Yolo Bypass Salmonid Habitat Restoration and Fish Passage*

**Change in Maximum WSE for Large Channel 1998**

Prepared for DWR | Created By: RDJ | **Figure 7-25**




Notes: Comparing Large Channel configuration with existing conditions. Positive values indicate increases in maximum water surface elevations.

*Yolo Bypass Salmonid Habitat Restoration and Fish Passage*

**Change in Maximum WSE for Large Channel 2006**

Prepared for DWR | Created By: RDJ | **Figure 7-26**

# 8.0 Sensitivity Analyses

Two sensitivity analyses were performed to determine the impact of changes upon model results. The concern has been raised that the proposed project will inundate the Bypass later in the year thus delaying the planting of crops and negatively impacting yields. The first sensitivity analysis evaluates whether removal or changes to structures within the Bypass could reduce drainage time for the Bypass. The second sensitivity analysis evaluates the effect that increases and decreases in inflow discharges have upon model results.

## 8.1 Drain Time Sensitivity (Sensitivity to Lisbon Weir and Ag Crossing Removal)

There are five structures included in the model along the Tule Canal/Toe Drain: three agricultural crossings on the northern end, Swanston Ranch check dam, and Lisbon Weir. A sensitivity analysis was performed to evaluate the reduction in drainage times if all of the structures were removed. The upstream and downstream cross-section geometries were interpolated to provide the geometry for the channel sections replacing the structures. While complete removal of the structures is not practical, this analysis without structures provides an estimate of the maximum decrease in drain time that could be achieved and gives some insight of potential decrease in drain time that could be achieved by modifying the structures.

The five Toe Drain/Tule Canal structures were removed for existing and all alternate configurations simulations for the 2001 and 2011 water years. The wet area through time and LDW post-processing results were compared to the original results for each simulation.

The comparison of wet area through time for the simulations with and without structures for the 2001 and 2011 water years is shown in Figure 8-1 and Figure 8-2. The results are nearly identical and it is often impossible to differentiate between them.

The impacts on LDW for the FreLg configuration for the 2001 and 2011 water years are shown in Figure 8-3and Figure 8-4. Light to dark blue colors indicate decreases to the LDW compared to the original structure configuration. Yellow to red represent increases to LDW values with dark red representing fields that became wet but were dry during the original simulation.

For the 2001 simulation 5 field units had an earlier LDW, 7 field units had a later LDW, and 438 field units showed no change. For the 2011 simulation 11 field units had an earlier LDW, 12 had a later LDW, and 427 field units showed no change. The unexpected later LDW values occurred because the model setup created small changes to drainage changing the timing of when the wet/dry threshold was crossed.

The results suggest that the structures included in the sensitivity analysis do not significantly affect drainage time in the Bypass. Comparing the WSEs upstream and downstream of the Lisbon Weir for the existing conditions 2011 simulations, as shown in Figure 8-5, suggests that the Lisbon Weir effectively increases WSEs at lower discharges but has no significant

difference if the water levels rise above 8 feet (NAVD88), which is approximately 3 feet below the adjacent floodplain.

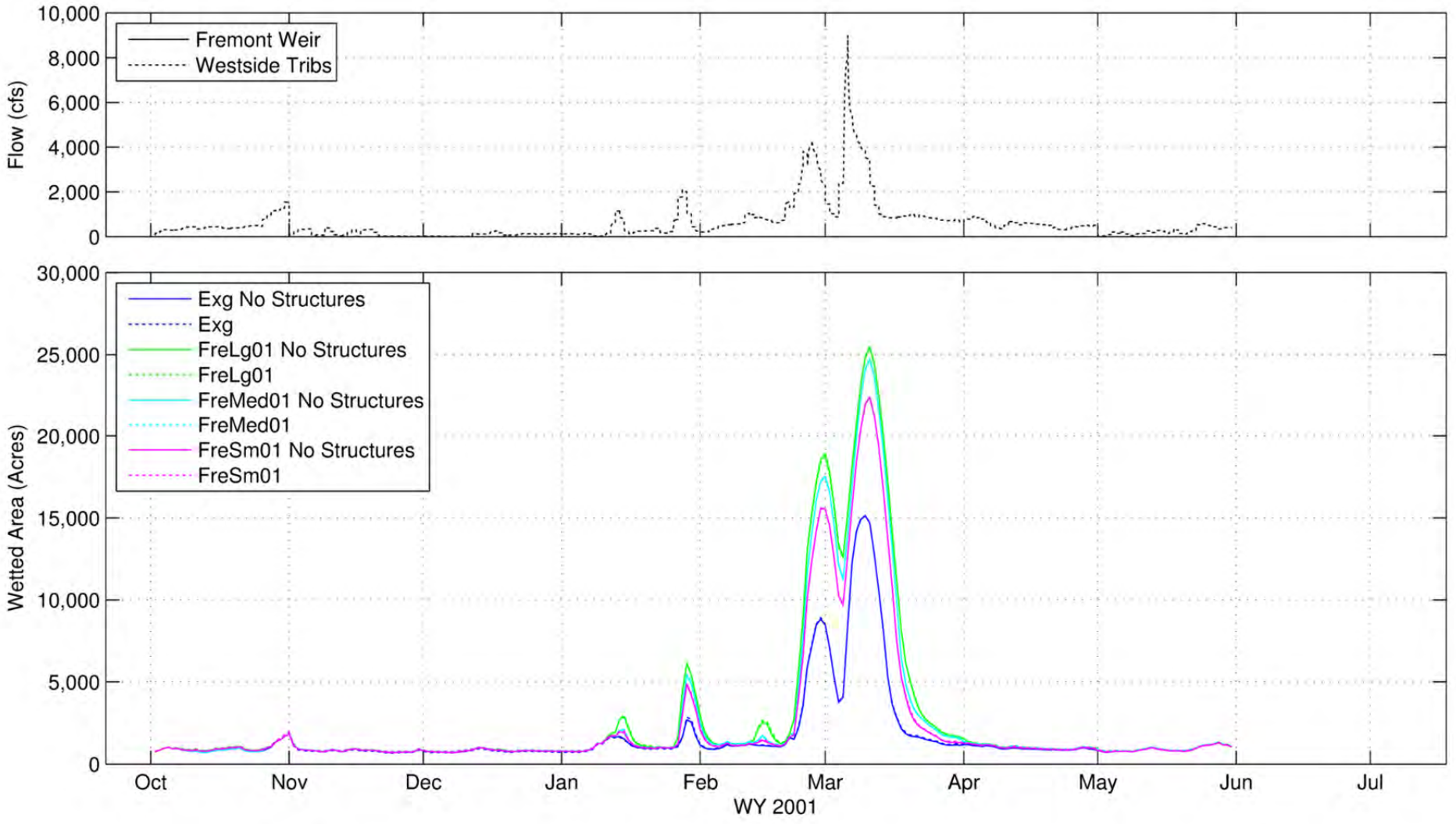
The project alternatives modeled included changing the agricultural crossings to railcar bridges increasing conveyance at these locations. A separate simulation was run using the large channel configuration for the 2011 water year that has Swanston Ranch check dam and Lisbon Weir removed but keeps the proposed railcar bridges. The wetted area through time results shown in Figure 8-6 illustrate that the railcar crossings have a negligible effect upon wetted area within the Bypass.

## 8.2 Sensitivity to Changes in Inflow Hydrographs

To assess the sensitivity of the results to inflow changes, simulations with increases and decreases of 10 percent for all boundary inflows were evaluated for the 2001 and 2011 water years under existing conditions. Water year 2001 represents a dry period when Fremont Weir did not overtop and inflows to the Yolo Bypass are limited to the Westside tributaries. As such, changes in Yolo Bypass inundation are directly linked to changes in the Westside tributary inflows. Water year 2011 is a wet year when there were significant contributions from Fremont Weir.

A comparison of the change in wetted area through time due to increases or decreases in inflow discharges is shown in Figure 8-7 and Figure 8-8. During low flow periods (e.g., when contributions are limited to the westside tributaries), there is a small change in inundation (i.e., ± 500 acres below 5,000 acres and ± 1,000 acres above 5,000 acres) because the flows are contained in the channels. The change in inundation area during very high flow periods is small because so much of the floodplain is already inundated. The most notable changes occur when the flows are too large to be contained in the channel but not large enough to fill a majority of the Bypass. The event between December and January in the 2011 water year illustrates the large effect that a 10 percent change can make on inundation, with increases and decreases of up to 10,000 acres.

The effect of a 10 percent increase or decrease on LDW for the 2001 and 2011 water years is shown in Figures 8-9 to 8-12. In these figures, light to dark blue symbolizes earlier LDW and yellow to red symbolizes later LDW values. Dark blue indicates fields that had been inundated during the original run but remained dry for the sensitivity run. Bright red indicates fields that were dry during the original run but became wet during the sensitivity run. The LDW for a significant number of fields is impacted but nearly all of the LDW values change by less than one week.

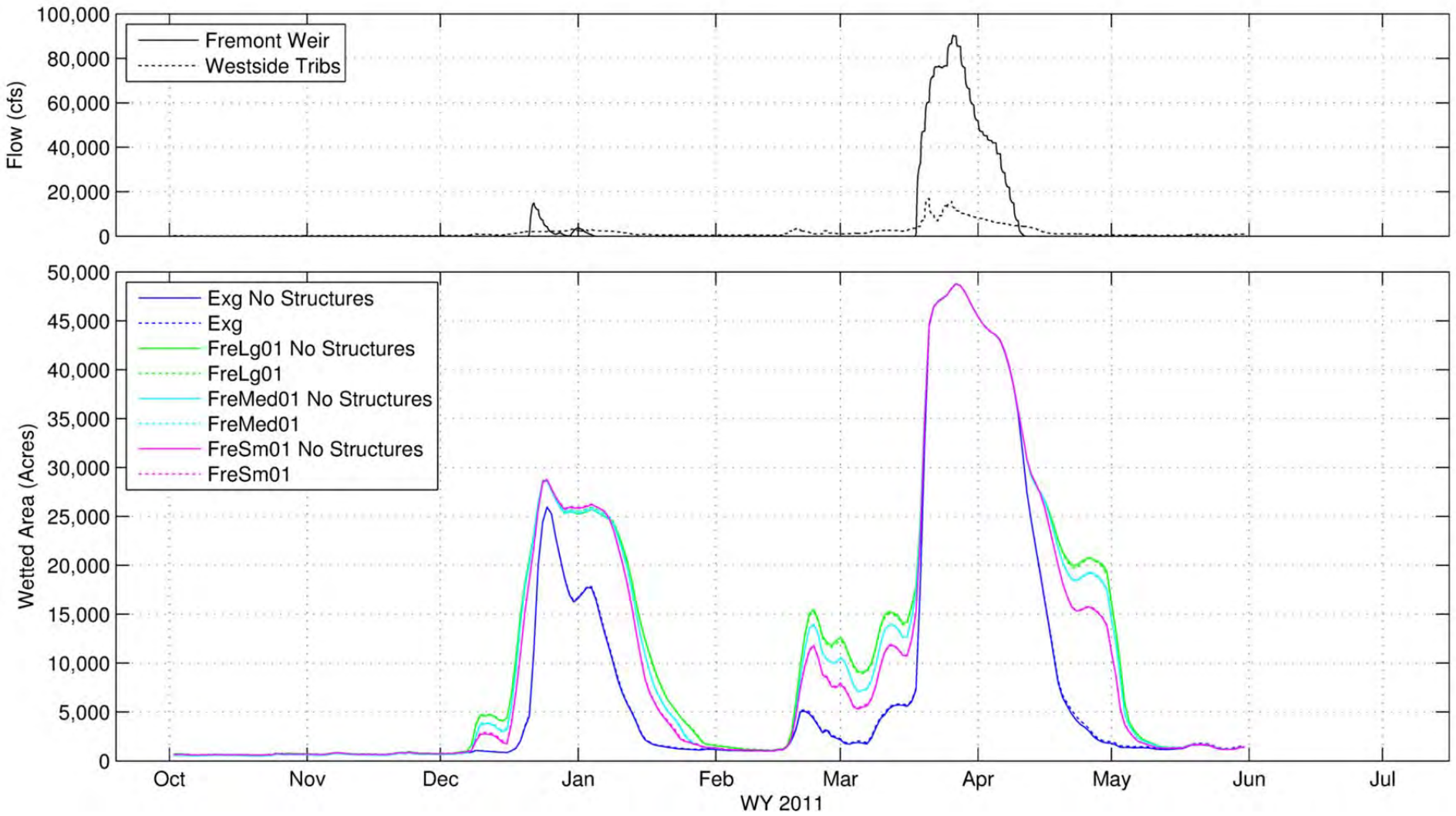



Notes: Simulations without structures do not include Lisbon Weir, Swanston Ranch Weir, and the three Agriculture crossings in the northern end of the bypass.

*Yolo Bypass Salmonid Habitat Restoration and Fish Passage*

**Sensitivity Analysis Structures and Drainage 2001**

| Prepared for DWR | Created By: RDJ | **Figure 8-1** |
|---|---|---|

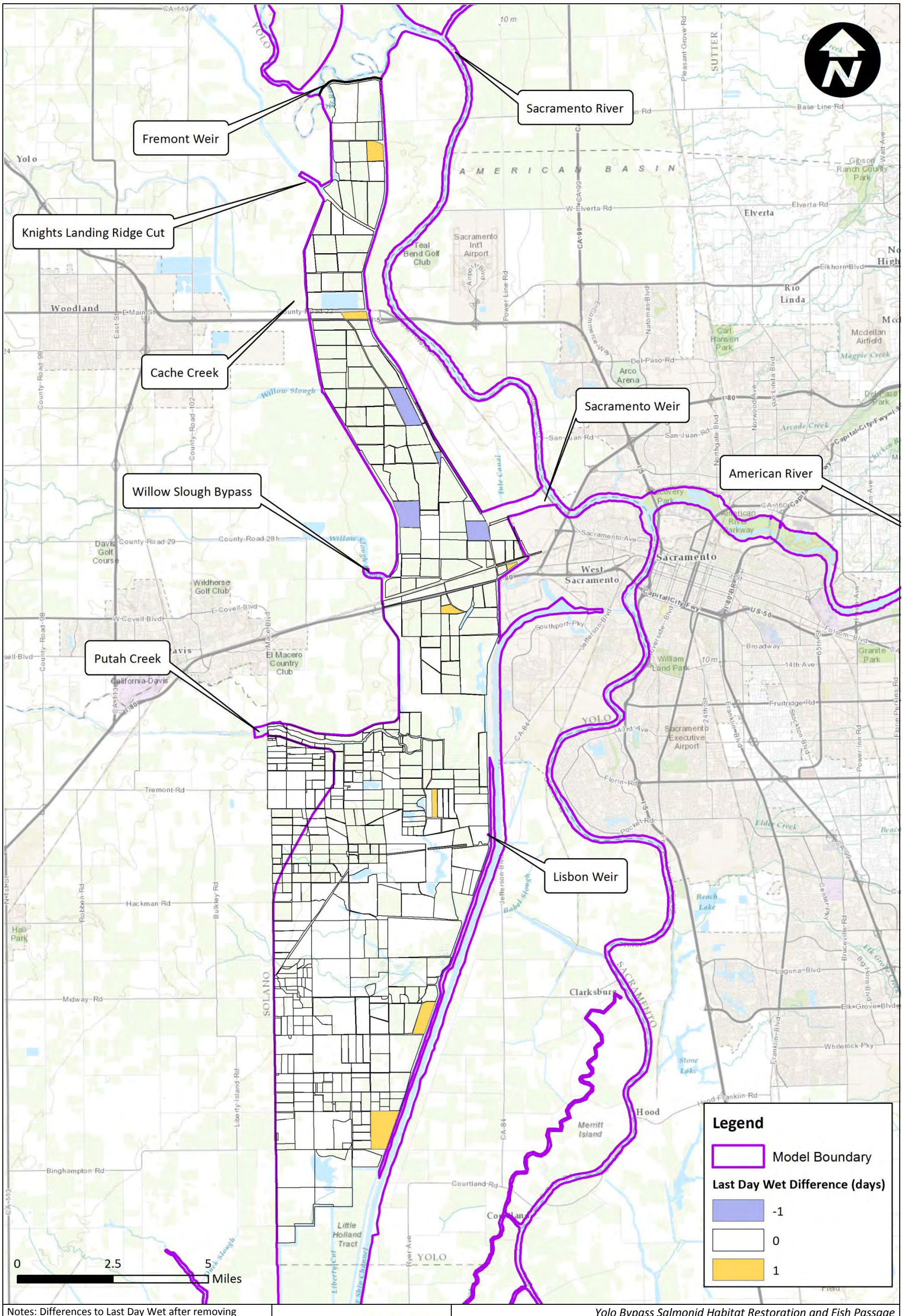



Notes: Simulations without structures do not include Lisbon Weir, Swanston Ranch Weir, and the three Agriculture crossings in the northern end of the bypass.

*Yolo Bypass Salmonid Habitat Restoration and Fish Passage*

**Sensitivity Analysis Structures and Drainage 2011**

| Prepared for DWR | Created By: RDJ | **Figure 8-2** |
|---|---|---|

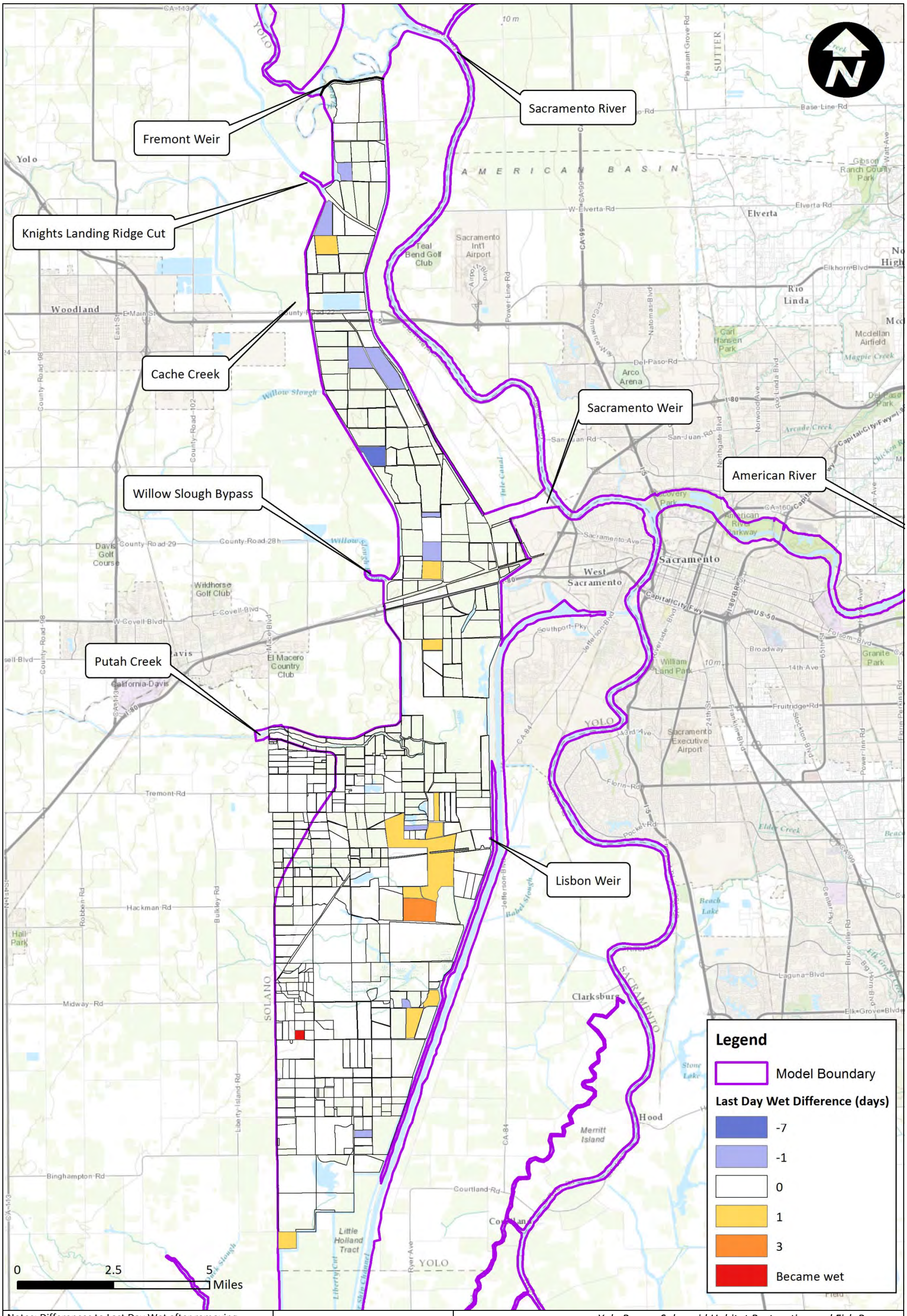



Notes: Differences to Last Day Wet after removing structures from the Yolo Bypass. Negative values indicate earlier Last Day Wet.

*Yolo Bypass Salmonid Habitat Restoration and Fish Passage*

**FreLg LDW Diff Sensitivity Drain Structures WY 2001**

Prepared for DWR | Created By: RDJ | **Figure 8-3**

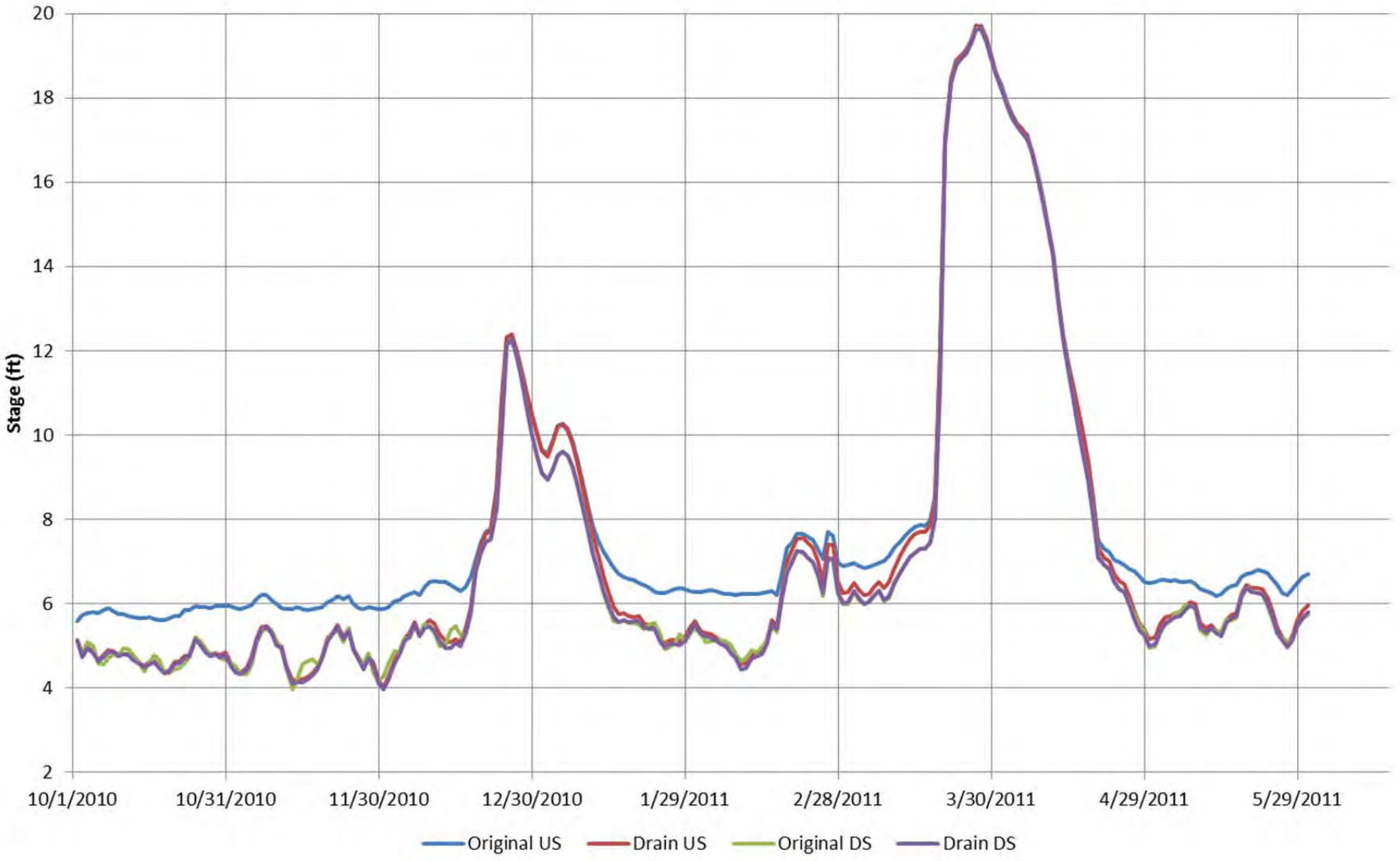



Notes: Differences to Last Day Wet after removing structures from the Yolo Bypass. Negative values indicate earlier Last Day Wet.

*Yolo Bypass Salmonid Habitat Restoration and Fish Passage*

**FreLg LDW Diff Sensitivity Drain Structures WY 2011**

Prepared for DWR | Created By: RDJ | **Figure 8-4**

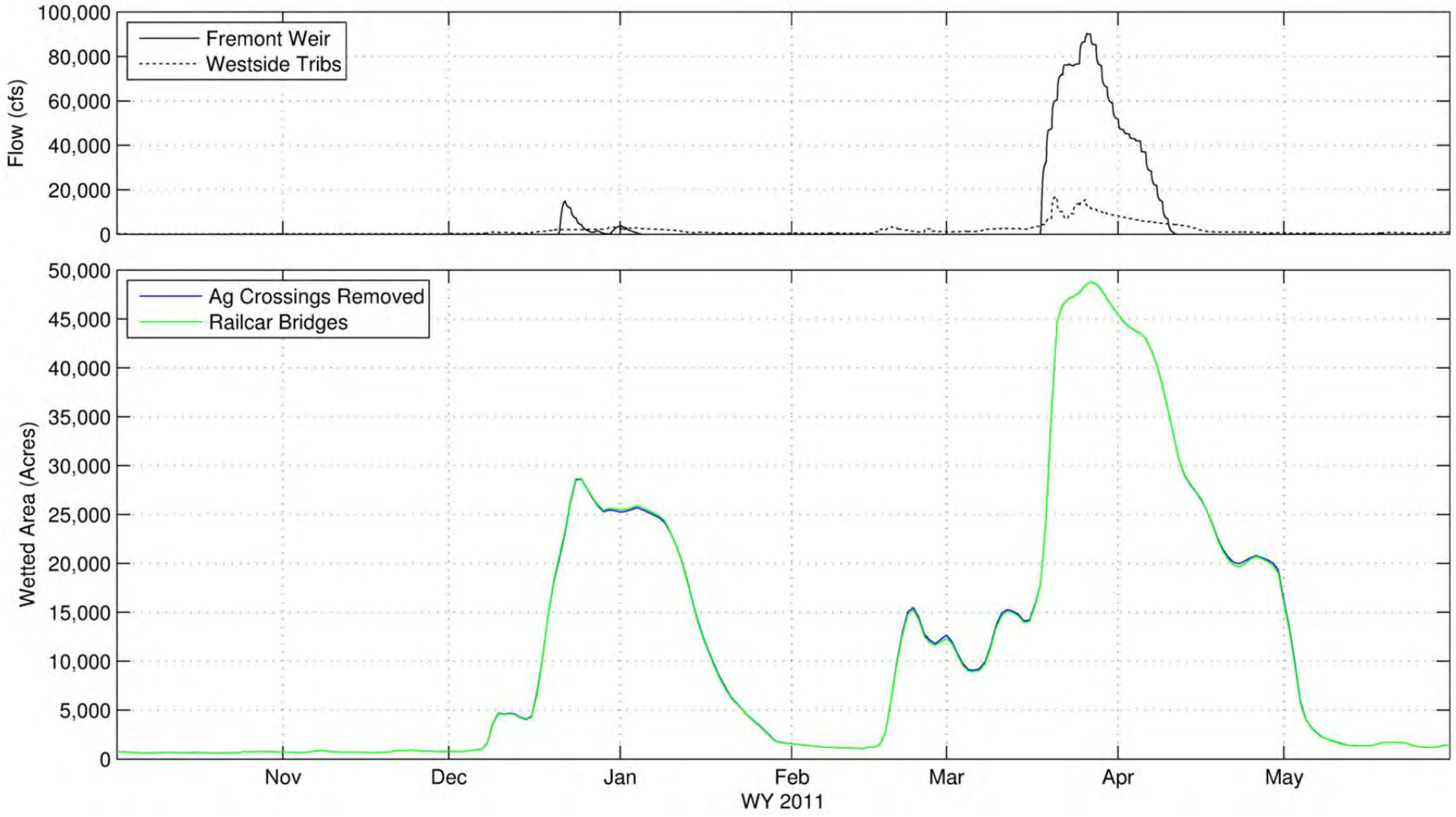



Notes: Water surface elevations measured upstream and downstream of Lisbon Weir existing conditions and with Yolo Bypass structures removed.

*Yolo Bypass Salmonid Habitat Restoration and Fish Passage*

**Exg Stage US/DS of Lisbon Weir Sensitivity Drain**

Prepared for DWR | Created By: RDJ | **Figure 8-5**

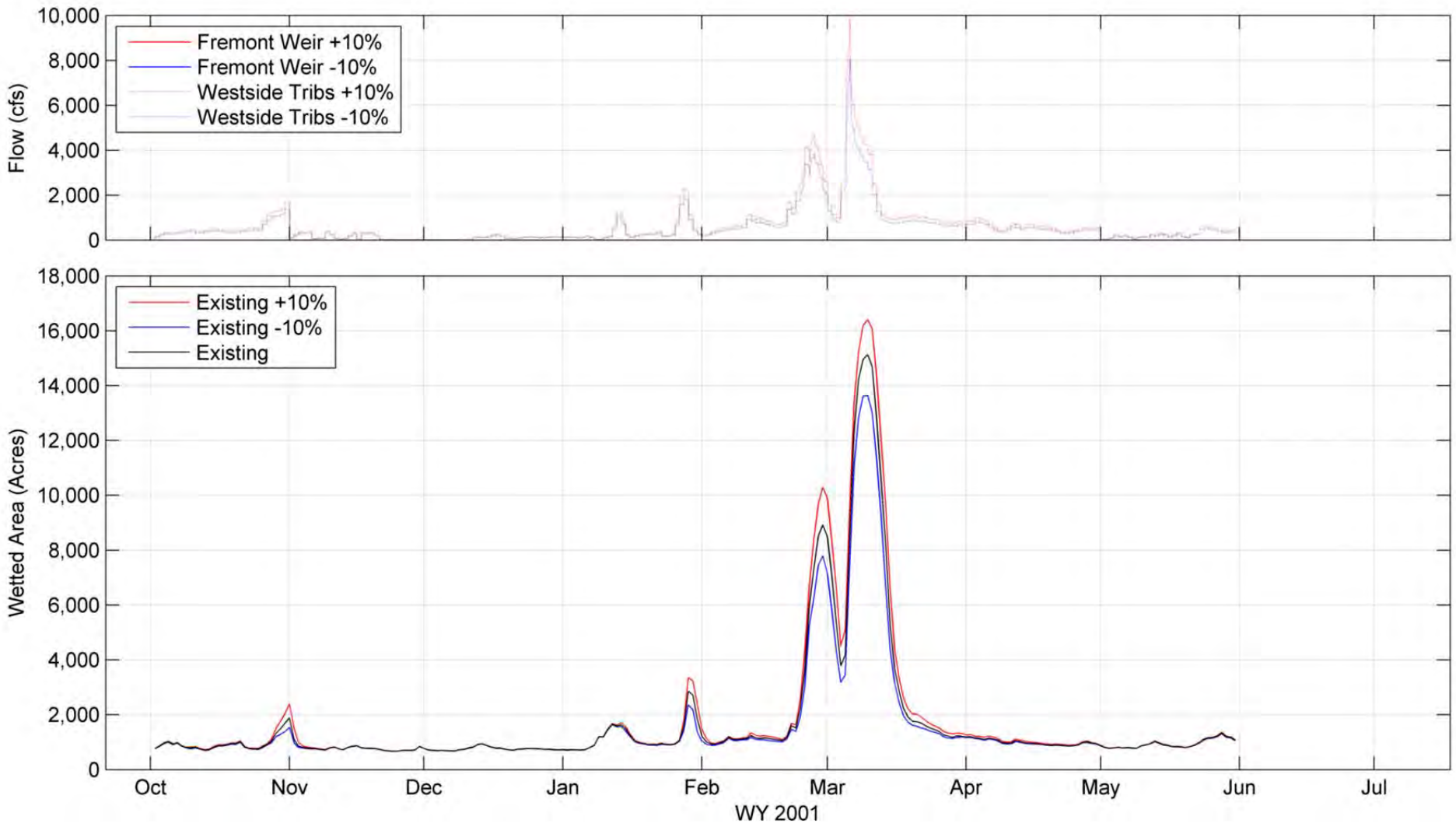



Notes: The large channel configuration was used for these sensitivity runs.

*Yolo Bypass Salmonid Habitat Restoration and Fish Passage*

**FreLg Wet Area Sensitivity to Railcar Bridges 2011**

| Prepared for DWR | Created By: RDJ | **Figure 8-6** |
|---|---|---|

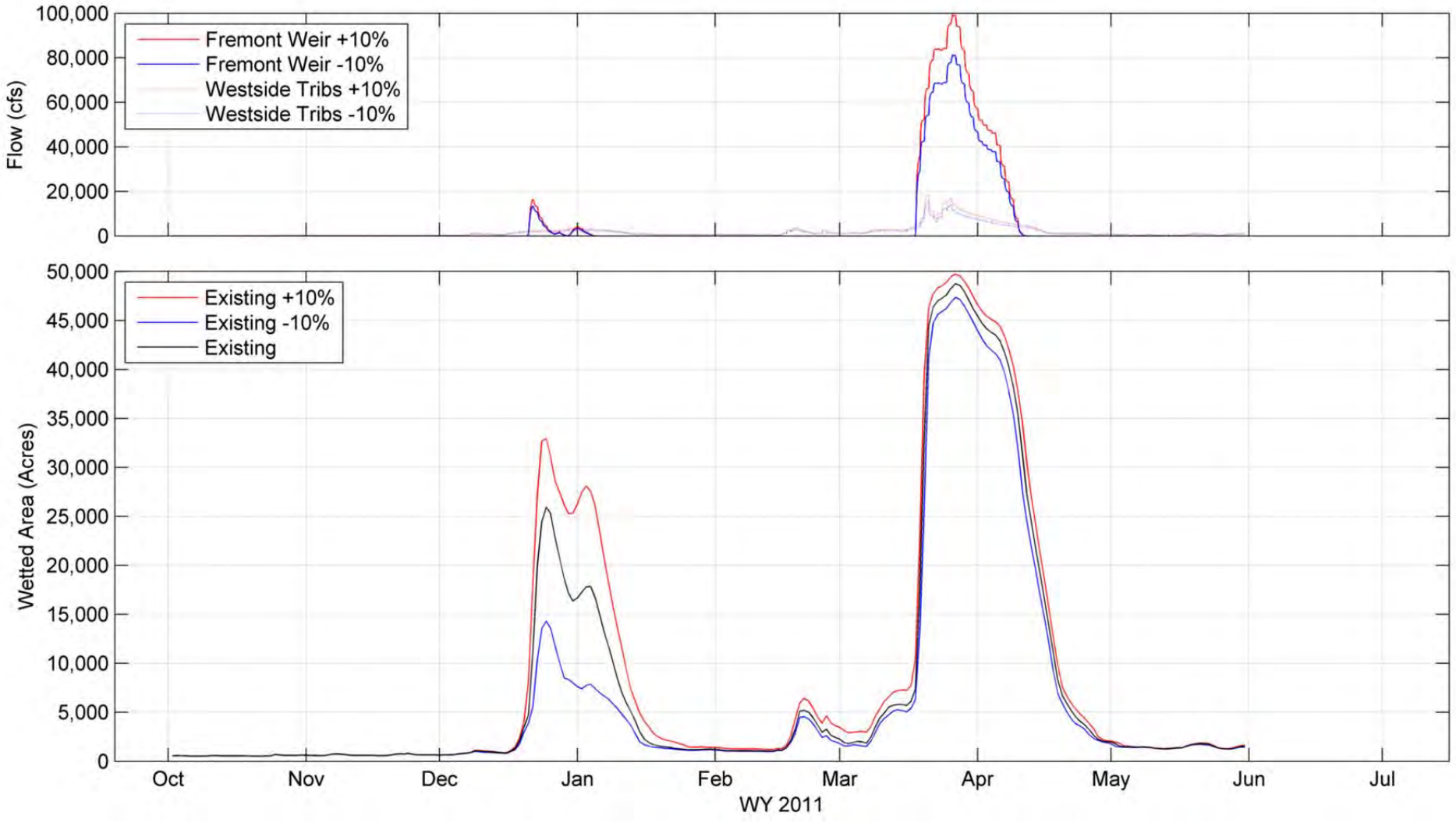



Notes: Simulations were run increasing and decreasing all of the inflow boundary conditions 10%. The Fremont Weir did not overtop in 2001.

*Yolo Bypass Salmonid Habitat Restoration and Fish Passage*

**Exg Sensitivity Analysis Wetted Area Flows 2001**

| Prepared for DWR | Created By: RDJ | **Figure 8-7** |
|---|---|---|

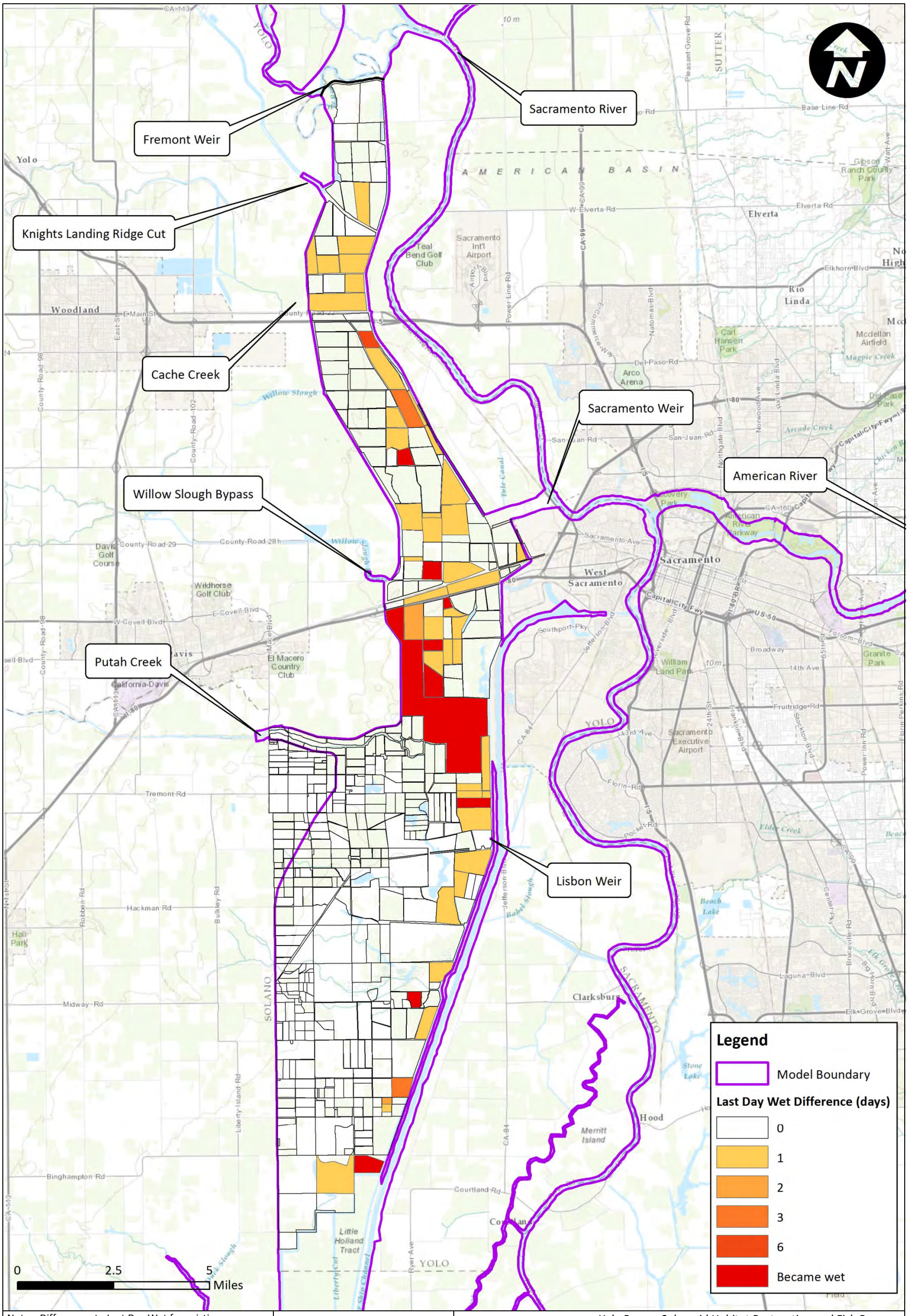



Notes: Simulations were run increasing and decreasing all of the inflow boundary conditions 10%.

*Yolo Bypass Salmonid Habitat Restoration and Fish Passage*

**Exg Sensitivity Analysis Wetted Area Flows 2011**

| Prepared for DWR | Created By: RDJ | **Figure 8–8** |
|---|---|---|

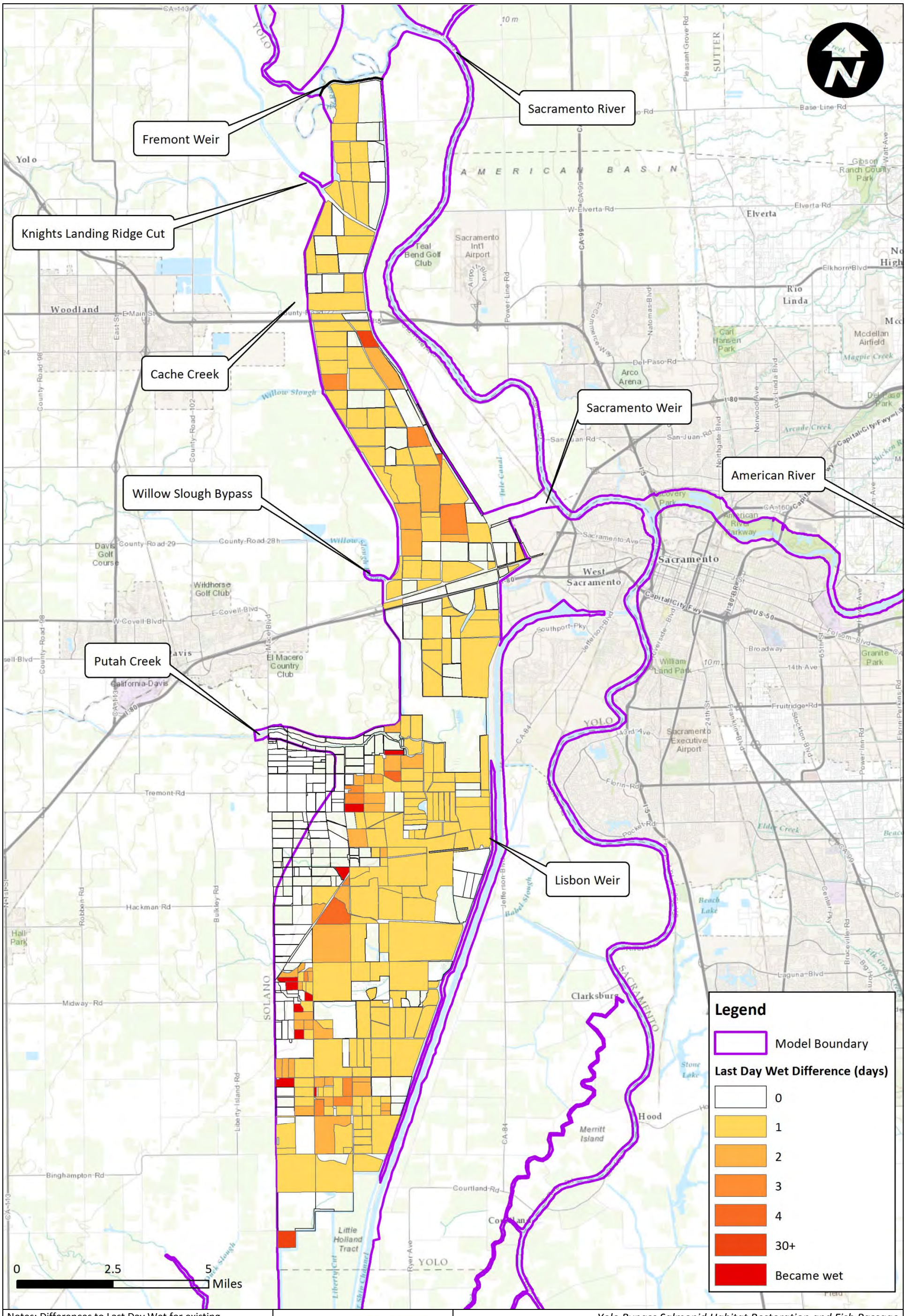



Notes: Differences to Last Day Wet for existing conditions when increasing inflows 10%. Positive values indicate later Last Day Wet.

*Yolo Bypass Salmonid Habitat Restoration and Fish Passage*

**Existing LDW Sensitivity to 10% Increase in Flow WY 2001**

Prepared for DWR | Created By: RDJ | **Figure 8-9**




Notes: Differences to Last Day Wet for existing conditions when increasing inflows 10%. Positive values indicate later Last Day Wet.

*Yolo Bypass Salmonid Habitat Restoration and Fish Passage*

**Existing LDW Sensitivity to 10% Increase in Flow WY 2011**

Prepared for DWR | Created By: RDJ | **Figure 8-10**