Methods for SIT Model Floodplain Habitat Analyses for the Rivers and Bypasses Included in the RoC on LTO Analyses (name of each river or bypass is linked to the SIT GitHub site with information on the floodplain habitat analysis of that river or bypass)

Sacramento River

The entire area of potential juvenile Chinook salmon rearing habitat, including the 253.3 miles of Sacramento River channel and its floodplain, was modeled using the Central Valley Floodplain Evaluation and Delineation (CVFED) HEC-RAS hydraulic model, refined for use in the NOAA-NMFS Winter Run Chinook Salmon life cycle model. The surface area of the active river channel was subtracted from total inundated area to estimate the inundated floodplain area. Using CalSim II estimates of Sacramento River flow, the CVFED model maps the area inundated at each flow and provides fine-scale, spatially explicit estimates of flow velocity, depth and roughness for the entire inundated area. The model sums the surface areas of all locations (cells) possessing high quality velocity and depth conditions for rearing Chinook salmon juveniles, as defined in Table 1.

Table 1. Habitat variables influencing capacity for each habitat type.

Habitat	Variable	Habitat*	Variable range
Mainstem	Velocity	High	<= 0.15 m/s
		Low	> 0.15 m/s
	Depth	High	> 0.2 m, <= 1 m
		Low	<= 0.2 m, > 1 m
	Roughness	High	> 0.04
		Low	<= 0.04

*Ranges of high and low habitat quality were based on published studies of habitat use by Chinook salmon fry across their range.

The rearing habitat surface areas were estimated for the four major CVPIA reaches of the Sacramento River, described as follows (the CalSim II node used to model flow for the reach is given in parentheses):

- Upper Sacramento River (CalSim Node = C104). Keswick Dam to Red Bluff, 59.3 miles.
- Upper-mid Sacramento River (CalSim Node = C115). Red Bluff to Wilkins Slough, 122.3 miles.
- Lower-mid Sacramento River (CalSim Node = C134 and Node C160). Wilkins Slough to the American River confluence, 58.0 miles.
- Lower Sacramento River (CalSim Node = C166). American River confluence to Freeport, 13.7 miles.

Note that these reaches are different than those that were used for the Sacramento River CVFED modeling, which are: Keswick Dam to Battle Creek (28.9 miles), Battle Creek to the Feather River confluence (186.5 miles), and the Feather River confluence to Freeport (33.9 miles [or 33.4?]). The rearing habitat surface area results from the modeling for these three reaches were scaled using the proportional overlap (in river miles) between them and the CVPIA reaches. For example, the results for the first CVPIA reach, Keswick Dam to Red Bluff (59.3 miles), were computed as the sum of the results from the first modeling reach, Keswick Dam to Battle Creek (28.9 miles), and 0.163 times the results from the second modeling reach, Battle Creek to the Feather River confluence (186.5 miles). The results for the Battle Creek to the Feather River confluence are multiplied by 0.163 because 0.163 is the channel distance from Keswick to Red Bluff minus the channel from Keswick to Battle Creek (59.3-28.9 = 30.4) divided by the distance from Battle Creek to the Feather River confluence, 186.5.

American River

The entire area of potential juvenile Chinook salmon rearing habitat, including the 22.81 miles of the lower American River channel and its floodplain, was modeled using the CVFED HEC-RAS hydraulic model. The active channel surface area of 670.2 acres, estimated through remote sensing analysis, was subtracted from total inundated area to estimate the inundated floodplain area. Juvenile Chinook salmon rearing habitat quality was not determined for the modeled area, so the surface area of high quality habitat was assumed to be 27 percent of the total inundated area, based on results from the San Joaquin River, reported in SJRRP (2012).

Stanislaus River

The entire area of potential juvenile Chinook salmon rearing habitat, including the 60.31 miles of lower Stanislaus River channel and its floodplain, was modeled using the SRH-2D hydraulic model. The active channel area of 409.1 acres, estimated through remote sensing analysis, was subtracted from total inundated area to estimate the inundated floodplain area. Juvenile Chinook salmon rearing habitat quality was not determined for the modeled area, so the surface area of high quality habitat was assumed to be 27 percent of the total inundated area, based on results from the San Joaquin River, reported in SJRRP (2012).

San Joaquin River

The entire area of potential juvenile Chinook salmon rearing habitat in the San Joaquin River, including the 45.68 miles of river channel and its floodplain, was modeled using Central Valley Floodplain Evaluation and Delineation (CVFED) HEC-RAS hydraulic model (for Combined Upper and Lower San Joaquin River). The active channel area of 534.2 acres, estimated through remote sensing analysis, was subtracted from total inundated area to estimate inundated floodplain area. Juvenile Chinook salmon rearing habitat quality was not determined for the modeled area, so the surface area of high quality habitat was assumed to be 27 percent of the total inundated area, based on results from a San Joaquin River Restoration Program study SJRRP (2012).

Yolo Bypass

The entire area of potential juvenile Chinook salmon rearing habitat within the Yolo Bypass; including stream channels, ponds, canals, and ditches, and the floodplain; was modeled using the Central Valley Floodplain Evaluation and Delineation (CVFED) HEC-RAS hydraulic model, refined for use in the NOAA-NMFS Winter Run Chinook Salmon life cycle model. The surface areas of the stream channels, ponds, canals and ditches was subtracted from total inundated area to estimate the inundated floodplain area. Using CalSim II estimates of Yolo Bypass flow, the CVFED model maps the area inundated at each flow and provides fine-scale, spatially explicit estimates of flow velocity, depth and roughness for the entire inundated area. The model sums the surface areas of all locations (cells) possessing high quality velocity and depth conditions for rearing Chinook salmon juveniles, as defined in Table 1.

Table 1. Habitat variables influencing capacity for each habitat type.

Habitat	Variable	Habitat*	Variable range
Mainstem	Velocity	High	<= 0.15 m/s
		Low	> 0.15 m/s
	Depth	High	> 0.2 m, <= 1 m
		Low	<= 0.2 m, > 1 m
	Roughness	High	> 0.04
		Low	<= 0.04

*Ranges of high and low habitat quality were based on published studies of habitat use by Chinook salmon fry across their range.

The rearing habitat surface areas were estimated for two major reaches of the Yolo Bypass: Fremont Weir to the Sacramento Weir, and the Yolo Bypass downstream of the Sacramento Weir. The CalSim II nodes used to represent flow in these two reaches are D160 and C157, respectively.

Sutter Bypass

The entire area of potential juvenile Chinook salmon rearing habitat within the Sutter Bypass; including stream channels, basins, ponds, canals, and ditches, and the floodplain; was modeled using the Central Valley Floodplain Evaluation and Delineation (CVFED) HEC-RAS hydraulic model, refined for use in the NOAA-NMFS Winter Run Chinook Salmon life cycle model. The surface areas of the stream channels, basins, ponds, canals and ditches was subtracted from total inundated area to estimate the inundated floodplain area. Using CalSim II estimates of Sutter Bypass flow, the CVFED model maps the area inundated at each flow and provides fine-scale, spatially explicit estimates of flow velocity, depth and roughness for the entire inundated area. The model sums the surface areas of all locations (cells) possessing high quality velocity and depth conditions for rearing Chinook salmon juveniles, as defined in Table 1.

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	Roughness	High	> 0.04
		Low	<= 0.04

*Ranges of high and low habitat quality were based on published studies of habitat use by Chinook salmon fry across their range.

The rearing habitat surface areas were estimated for four major reaches of the Sutter Bypass: upstream of Moulton Weir, Moulton Weir to Colusa Weir, Colusa Weir to Tisdale Weir, and downstream of Tisdale Weir. The CalSim II nodes used to represent flow in these four reaches are D117, C135, C136A, and C137, respectively.