



**Working List of Potential Habitat Expansion Actions and Evaluation of Significant Factors**

The following non-prioritized list of actions has been compiled by the HEA Steering Committee based on the potential of the actions to help satisfy requirements of the Habitat Expansion Agreement. The working list is pre-decisional and does not necessarily represent actions that will be selected by the HEA Steering Committee to include in the Draft Habitat Expansion Plan. The Steering Committee has developed an approach for applying the HEA criteria to the list of actions utilizing 10 significant factors. Each potential action was assigned a yes (Y) or no (N) designation or a high (H), medium (M), or low (L) designation for each of the 10 factors.

Reference Number	Description of Action	Target Life Stage(s)	Stream	Notes	Deal Killers (1)	HET Measurability (2)	HET Contribution (3)	Outside of Deer, Mill, Butte (4)	Outside of Northern Sierra Diversity Group (5)	Segregate Spring and Fall Runs (6)	Time to Implement (7)	Category (8)	Volitional Passage* (9)	Supporting Questionnaire / Comment** (10)
<b>Northern Sierra Nevada Spring-Run Salmon Diversity Group</b>														
NS-1	Supplement flows in Antelope Creek with water acquired from willing sellers consistent with applicable guidelines or negotiate agreements to allow passage of juvenile and adult spring-run Chinook salmon and steelhead.	All	Antelope Creek	Economic feasibility and level of local/political support for flow supplementation are unknown. Additionally, the benefit of flow supplementation for maintenance of spatial separation is unclear.	N	M	L	Y	N	Y	Y	Enhancement		Y
NS-2	Enhance watershed resiliency by identifying and implementing projects that would reduce the potential for, and magnitude of a catastrophic wildfire, restore meadows to potentially increase summer flows and reduce local water temperatures, or increase riparian shade.	All	Antelope Creek	Questionable match (fire) and additional information needed (meadows).	N	L	L	Y	N	N	N	Enhancement		Y
NS-3	Conduct fish passage evaluation at all agricultural diversions to determine if they meet NMFS' fish passage criteria. Design and install state-of-the-art fish passage facilities at diversions that currently do not meet the passage criteria.	Adult Immigration	Antelope Creek	The Edwards Dam Ladder construction project was completed in October 2007. Juvenile bypass facilities are still needed.	N	M	L	Y	N	Y	N	Enhancement		
NS-76	Install Juvenile Bypass at the Edwards Dam Ladder.	Juvenile Emigration	Antelope Creek	AFRP funded a feasibility study, environmental documentation, permits, and design for a solution at this site in 2008. Implementation can begin in 2010 but funding needed.	N	M	L	Y	N	N	Y	Enhancement		Y
NS-77	Conduct Antelope Creek valley floor channel analysis and implement recommended actions.	Adult Immigration, Juvenile Emigration	Antelope Creek		N	L	L	Y	N	?	N	Enhancement		Y
NS-78	Reduce sources of chronic road related erosion of sediment.	All	Antelope Creek	On-going activity.	N	L	L	Y	N	N	Y	Enhancement		Y

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Habitat Expansion Agreement for Central Valley Spring-Run Chinook Salmon and California Central Valley Steelhead



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NS-5	Improve passage conditions at Paynes crossing to allow upstream passage during low flows.	Adult Immigration, Adult Holding	Antelope Creek	Also referred to as Tehama Wildlife Area crossing. AFRP is currently funding a fish passage feasibility study at this site, but as of October 2008 funding has not been identified for construction.	N	H	L	Y	N	Y	Y	Enhancement		Y
NS-6	Identify gravel starved areas in Antelope Creek and implement gravel additions.	Spawning	Antelope Creek	Issue? USFS favors correcting undersized culverts to improve natural bedload instead.	N	L	L	Y	N	N	Y	Enhancement		
NS-7	Build sediment retention structures; fortify streambanks with native vegetation.	Spawning, Egg Incubation	Antelope Creek	Issue?	N	L	L	Y	N	N	Y	Enhancement		
NS-8	Implement bank revetment removal programs and projects and breach or remove abandoned levees during set-back levee projects.	Summer/Winter Rearing, Juvenile Emigration	Antelope Creek	Issue?	N	L	L	Y	N	N	N	Enhancement		
NS-9	Implement projects to increase floodplain habitat availability to improve habitat conditions for juvenile rearing.	Summer/Winter Rearing	Antelope Creek	Additional information needed.	N	L	L	Y	N	N	N	Expansion	Y	
NS-10	Implement projects that cooperatively work with landowners to modify existing diversions so that fish do not become entrained in agricultural fields.	Juvenile Emigration	Antelope Creek	Additional information needed.	N	L	L	Y	N	N	N	Enhancement		
NS-12	Remove the partial barrier (old agricultural dam) approximately 0.4 river miles downstream of Higgins Hole, located on private property.	Adult Immigration	Big Chico Creek	Fish passage evaluation has not been done for this site. Additional information needed.	N	L	L	Y	N	Y	N	Enhancement		Y
NS-13	Conduct Fish Passage evaluation at all dams and diversions to determine if they meet NMFS fish passage criteria. Design and install state-of-the-art fish passage facilities at diversions (1-mile dam, 5-mile dam) that currently do not meet the passage criteria.	Adult Immigration	Big Chico Creek		N	M	L	Y	N	N	Y	Enhancement		Y
NS-14	Implement Iron Canyon Fish Ladder Rehabilitation Project.	Adult Immigration	Big Chico Creek	City of Chico intends to adopt a Mitigated Negative Declaration for the project. Final report on the repair and construction is complete. CEQA complete and permitting is underway.	N	H	H	Y	N	Y	Y	Enhancement		Y

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NS-16	Protect spring-run Chinook salmon summer holding pools in Big Chico Creek by obtaining from willing sellers titles or conservation easements on lands adjacent to the pools.	Adult Holding	Big Chico Creek	Benefit of this action would depend on the implementation of the Iron Canyon Fish Ladder project. Cost would be dependent on the landowners' willingness to sell. Additional information needed.	N	L	L	Y	N	Y	Y	Enhancement		Y
NS-17	Enhance watershed resiliency by identifying and implementing projects that would reduce the potential for, and magnitude of a catastrophic wildfire, restore meadows to potentially increase summer flows and reduce local water temperatures, or increase riparian shade.	All	Big Chico Creek		N	L	L	Y	N	N	N	Enhancement		
NS-19	Identify stream reaches that have been most altered by anthropogenic factors and reconstruct a natural channel geometry scaled to current channel forming flows.	All	Big Chico Creek	Additional information needed.	N	L	L	Y	N	N	N	Enhancement		
NS-20	Eliminate sources of chronic sediment delivery from roads and other near stream development by out-sloping roads, constructing diversion prevention dips, replacing under-sized culverts and applying other storm proofing guidelines.	Egg Incubation	Big Chico Creek	Additional information needed.	N	L	L	Y	N	N	Y	Enhancement		
NS-21	Implement projects to increase floodplain habitat availability to improve habitat conditions for juvenile rearing.	Summer/Winter Rearing	Big Chico Creek	Additional information needed.	N	L	L	Y	N	N	N	Expansion	Y	
NS-22	Cooperate with local landowners to encourage revegetation of denuded stream reaches; and establish, restore, and maintain riparian habitat on Big Chico Creek.	Juvenile Emigration, Summer/Winter Rearing	Big Chico Creek	Additional information needed.	N	L	L	Y	N	N	Y	Enhancement		
NS-23	Purchase existing water rights from willing sellers.	All	Butte Creek	All Lower Butte Creek actions need to be investigated to determine if the actions were carried out in previous restoration activities.	N	M	L	N	N	Y	Y	Enhancement		Y
NS-24	Enhance watershed resiliency by identifying and implementing projects that would reduce the potential for, and magnitude of a catastrophic wildfire, restore meadows to potentially increase summer flows and reduce local water temperatures, or increase riparian shade.	All	Butte Creek	Questionable match (fire) and additional information needed (meadows).	N	L	L	N	N	N	N	Enhancement		Y

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NS-26	Identify gravel starved areas in Butte Creek and implement gravel additions. Develop a spawning gravel budget and implement an augmentation plan and use flow management to optimize spawning weighted usable area in consideration of hydrologic limitations and other species (e.g., steelhead) and life stage requirements.	Spawning	Butte Creek		N	L	L	N	N	N	Y	Enhancement		
NS-27	Develop sustainable instream flow criteria for spawning and incubation periods and implement flow ramping protocols to protect all life stages of spring-run Chinook salmon.	All	Butte Creek	Identified in CVPIA Long-Term Plan.	N	L	L	N	N	Y	Y	Enhancement		Y
NS-28	Reduce the number of temporary passage impediments installed to create swimming holes in Butte Creek near Chico; conduct associated public outreach projects.	Adult Immigration	Butte Creek		Maybe	M	L	N	N	?	N	Enhancement		
NS-29	Identify stream reaches that have been most altered by anthropogenic factors and reconstruct a natural channel geometry scaled to current channel forming flows.	All	Butte Creek		N	L	L	N	N	N	N	Enhancement		
NS-30	Promote or create riparian buffer strips between the Butte Creek channel and adjacent land uses.	Juvenile Emigration, Summer/Winter Rearing	Butte Creek		N	L	L	N	N	N	Y	Enhancement		
NS-31	Implement projects that consolidate and screen existing diversions where feasible.	All	Butte Creek	Additional information needed.	N	L	L	N	N	N	N	Enhancement		Y
NS-32	Retrofit Magalia Dam on Little Butte Creek in order to provide for more storage to use for fisheries flows.	All	Little Butte Creek	An earthquake retrofit is necessary and might be an opportunity to increase storage to benefit fisheries flows. This would primarily benefit steelhead.	N	M	L	N	N	N	N	Enhancement		
NS-34	Construct fish ladder at Upper Deer Creek falls.	Adult Immigration	Deer Creek	Habitat for spring-run is limited.	Maybe	H	L	N	N	Y	N	Expansion	Y	
NS-79	Provide functional fish ladder at Lower Deer Creek falls.	Adult Immigration	Deer Creek	USFS supports DFG efforts to correct the ladder.	N	M	L	N	N	Y	N	Enhancement		Y
NS-35	Acquire water from willing sellers consistent with applicable guidelines or negotiate agreements to supplement instream flows in the lower ten miles of Deer Creek to ensure passage of adult and juvenile spring-run Chinook salmon and steelhead over three diversion dams.	Adult Immigration, Juvenile Emigration	Deer Creek	Water exchange program is being funded through the 4-Pumps mitigation program.	N	M	L	N	N	Y	Y	Enhancement		Y

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NS-36	Implement water exchange agreement with the Deer Creek Irrigation Company and the Stanford-Vina Irrigation District and dedicate fish passage flows.	Adult Immigration, Adult Holding	Deer Creek	Check status of DCID exchange agreement.	N	M	L	N	N	Y	Y	Enhancement		Y
NS-37 a	Permit and construct a state-of-the-art fish ladder that meets NMFS' adult fish passage criteria and install a new apron at the Cone-Kimball Diversion.	Adult Immigration	Deer Creek	Project to improve fish passage at Stanford-Vina Dam is being considered as part of Deer Creek Floodplain Study as of Oct 2008; projects to improve fish passage at DCID and Cone-Kimball diversion dams are being discussed between Deer Creek Watershed Conservancy and irrigation districts as of Oct 2008. Identified in CVPIA Long-Term Plan.	N	M	L	N	N	Y	Y	Enhancement		Y
NS-37 b	Install state-of-the-art fish ladder at Stanford-Vina Dam.	Adult Immigration	Deer Creek	See NS-37 a.	N	M	L	N	N	Y	Y	Enhancement		Y
NS-37 c	Design and install state-of-the-art fish passage facilities at diversions that currently do not meet the passage criteria. Study feasibility of consolidating diversion points to minimize the number of diversions on Deer Creek. Based on this study, consolidate diversions where feasible.	Adult Immigration	Deer Creek	See NS-37 a.	N	L	L	N	N	Y	N	Enhancement		Y
NS-37 d	Conduct a study designed to determine adult fish passage flows at critical riffles and fish ladders; recommend and implement actions to acquire the flows indicated for passage.	Adult Immigration	Deer Creek	See NS-37 a.	N	L	L	N	N	N	Y	Enhancement		Y
NS-38	Enhance watershed resiliency by identifying and implementing projects that would reduce the potential for, and magnitude of a catastrophic wildfire, restore meadows (Deer Creek meadows, Childs meadows, Gurnsey Creek, and North Fork Deer Creek) to potentially increase summer flows and reduce local water temperatures, or increase riparian shade.	All	Deer Creek	Questionable match (fire) and additional information needed (meadows).	N	L	L	N	N	N	N	Enhancement		Y
NS-80	Reduce sources of chronic road related erosion of sediment	All	Deer Creek	On-going activity.	N	L	L	N	N	N	Y	Enhancement		Y
NS-40	Build sediment retention structures; fortify streambanks with native vegetation.	Spawning, Egg Incubation	Deer Creek	Issue?	N	L	L	N	N	N	Y	Enhancement		

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NS-41	Identify gravel starved areas in Deer Creek and implement gravel additions. Re-design highway 32 culvert crossing at Calf Creek to allow for unimpeded bedload transport. Conduct a spawning gravel augmentation feasibility study to increase available spawning habitat. Implement spawning gravel augmentation projects if the feasibility study determines that such projects will not cause adverse ecological impacts.	Spawning	Deer Creek	Issue? HWY 32 culvert managed by CALTRANS (need to be included).	N	L	L	N	N	?	N	Enhancement		
NS-44	Implement all or portions of the Deer Creek floodplain feasibility study, which can include (1) purchasing conservation easements, (2) moderate levee setbacks on both banks between Red Bridge and Stanford Vina Ranch Irrigation Company (SVRIC) dam, (3) replace current SVRIC dam with a seasonal dam, and (4) rebuild/expand Red Bridge.	Summer/Winter Rearing	Deer Creek	The Deer Creek Watershed Conservancy completed a floodplain feasibility study. The study developed two action alternatives.	N	L	L	N	N	N	Y	Expansion	Y	Y
NS-45	Identify and implement projects designed to improve downstream passage conditions for juveniles.	Juvenile Emigration	Deer Creek		N	L	L	N	N	N	N	Enhancement		Y
NS-46	Identify stream reaches that have been most altered by anthropogenic factors and reconstruct a natural channel geometry scaled to current channel forming flows.	All	Deer Creek		N	L	L	N	N	N	N	Enhancement		Y
NS-47	Design and install state-of-the-art fish screens at diversions that currently do not meet the NMFS fish screen criteria.	Juvenile Emigration	Feather River		N	L	L	Y	N	N	Y	Enhancement		
NS-90	Implement a trap-and-haul project on the North Fork Feather River.	All	Feather River		Maybe	H	H	Y	N	Y	N	Expansion	N	
NS-91	Implement a trap-and-haul project on the Middle Fork Feather River.	All	Feather River		Maybe	H	H	Y	N	Y	N	Expansion	N	
NS-49	Identify stream reaches that have been most altered by anthropogenic factors and reconstruct a natural channel geometry scaled to current channel forming flows.	All	Feather/Yuba Rivers		N	L	L	Y	N	N	N	Enhancement		
NS-51	Purchase TNC's Mill Creek Water Rights to provide additional stream flows for spring-run Chinook and steelhead.	All	Mill Creek	Project provides 18 cfs or nearly 10% of Mill Creek base flow. Delta 4-pumps pays for pumping costs associated with Ground Water Exchange Program. TNC purchased with intent to sell. Identified in CVPIA Long-Term Plan.	N	M	H	N	N	Y	Y	Enhancement		Y

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NS-52 b	Conduct fish passage evaluation at all agricultural diversions to determine if they meet NMFS' fish passage criteria, and design and install state-of-the-art fish passage facilities at diversions that currently do not meet the passage criteria.	Adult Immigration	Mill Creek	Issue?	N	M	L	N	N	Y	Y	Enhancement		
NS-81	Reduce sources of chronic road related erosion of sediment.	All	Mill Creek	On-going activity.	N	L	L	N	N	N	Y	Enhancement		Y
NS-54	Restore meadows and reduce stream channel incisement and bank erosion by modifying grazing practices and excluding cattle from nearshore zones, and reduce the potential for, and magnitude of a catastrophic wildfire.	Spawning, Egg Incubation	Mill Creek		N	L	L	N	N	N	N	Enhancement		Y
NS-55	Work with State and Federal water acquisition programs to develop dedicated instream water; participate in the lower Mill Creek Watershed Restoration Project.	All	Mill Creek		N	M	H	N	N	Y	Y	Enhancement		Y
NS-56	Build sediment retention structures; fortify streambanks with native vegetation.	Spawning, Egg Incubation	Mill Creek	Issue?	N	L	L	N	N	N	Y	Enhancement		
NS-57	Implement projects to increase floodplain habitat availability to improve habitat conditions for juvenile rearing.	Summer/Winter Rearing	Mill Creek	Issue?	N	L	L	N	N	N	N	Expansion	Y	
NS-58	Identify and implement projects designed to improve downstream passage conditions for juveniles.	Juvenile Emigration	Mill Creek	Issue?	N	L	L	N	N	N	N	Enhancement		
NS-59	Identify stream reaches that have been most altered by anthropogenic factors and reconstruct a natural channel geometry scaled to current channel forming flows.	All	Mill Creek	Issue?	N	L	L	N	N	N	N	Enhancement		
NS-60	Establish, restore, and maintain riparian habitat along the lower reaches of Mill Creek.	Juvenile Emigration, Summer/Winter Rearing	Mill Creek	Issue? Past AFRP project.	N	L	L	N	N	N	N	Enhancement		
NS-63	Construct improved fish passage facilities at Daguerre Point Dam to provide for segregation of adult spring-run and fall-run chinook salmon.	Spawning, Egg Incubation	Yuba River	It is difficult to determine how segregation would contribute to the HEA threshold. Impact to migrating steelhead is also a concern. No preferred alternative selected yet.	Maybe	H	H	Y	N	Y	N	Enhancement		Y
NS-64	Modify the fish ladders at Daguerre Point Dam to provide full fish passage.	Adult Immigration	Yuba River	No preferred alternative selected yet.	Maybe	L	L	Y	N	N	N	Enhancement		Y
NS-65	Facilitate passage of juvenile salmonids by modifying the dam face of Daguerre Point Dam.	Juvenile Emigration	Yuba River	No preferred alternative selected yet.	Maybe	L	L	Y	N	N	N	Enhancement		Y

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NS-67 a	Implement actions to enhance habitat conditions and improve access within the area above Englebright Dam, including increasing minimum flows, providing passage at Our House, New Bullards Bar, and Log Cabin dams, and assessing feasibility of passage improvement at natural barriers.	All	Yuba River	PG&E and NID are currently relicensing projects in the upper Yuba watershed; anadromous salmonid issues in the upper watershed are generally being handled outside of FERC relicensing.	Maybe	M	H	Y	N	Y	N	Enhancement		Y
NS-67 b	Fish Passage into Upper Yuba Watershed. Design and conduct an experimental fish passage program to evaluate adult distribution, survival, spawning, and production in habitats above Englebright Dam. If the experimental fish passage program demonstrates that passage above Englebright Dam can substantively contribute to the Long-Term viability of the ESU, then develop and implement Long-Term fish passage programs.	Adult Immigration and Juvenile Emigration	Yuba River	Potential project based on alternative selected under NMFS Fish Passage Evaluation which is not yet completed. HEA could be used for the first period of project implementation.	Maybe	M	H	Y	N	Y	N	Expansion	Maybe	Y
NS-94 a	Implement a trap-and-haul program on the North Yuba River above New Bullards Bar Reservoir.	All	Yuba River		Maybe	H	H	Y	N	Y	N	Expansion	N	
NS-94 b	Implement a trap-and-haul program on the North Yuba River below New Bullards Bar.	All	Yuba River		Maybe	H	H	Y	N	Y	N	Expansion	N	
NS-94 c	Implement a trap-and-haul program on the Middle Yuba River in combination with increased flow releases.	All	Yuba River		Maybe	H	H	Y	N	Y	N	Expansion	N	
NS-69	Improve efficiency of screening devices at Brophy-South Yuba water diversion and other unscreened diversions.	Juvenile Emigration	Yuba River	Required under Yuba River Accord and BO.	Maybe	L	L	Y	N	N	Y	Enhancement		Y
NS-83	Restore backwater, side-channel, and riparian/floodplain habitat in the Lower Yuba River.	Juvenile Emigration, Summer/Winter Rearing	Yuba River	Project will build on current AFRP-funded pilot project and complements Narrows Gravel Rehabilitation Project (NS-86).	N	L	L	Y	N	N	Y	Expansion	Y	Y
NS-84 a	Rehabilitate Yuba River Narrows spawning habitat.	Spawning	Yuba River	Rehabilitates habitat and supplies 100 tons of gravel that is then maintained under the Corps requirements. Pilot project completed in 2007. Requires injection of 54,000 cubic yards of gravel.	Maybe	M	H	Y	N	N	N	Enhancement		Y
NS-84 b	Rehabilitate Yuba River Narrows spawning habitat with possible segregation weir approximately 6 miles below Englebright Dam.	Spawning	Yuba River	FWS and DFG do not currently support using a segregation weir.	Maybe	H	H	Y	N	Y	Y	Enhancement		Y

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NS-89	Implement Deer Creek Salmon and Steelhead Spawning Habitat Expansion Project.	Spawning	Deer Creek/ Yuba River	Restore habitat via gravel augmentation, barrier removal, invasive species removal, and riparian revegetation. Project enhances mitigation requirements.	N	M	L	Y	N	?	Y	Enhancement		Y
NS-85	Operate and maintain real-time flow and temperature monitoring gages on Big Chico, Butte, Deer, and Mill Creeks (with possible expansion to Antelope Creek).	All	Big Chico, Butte, Deer, and Mill creeks	Funds would continue operation and maintenance of flow gages that lose funding in 2010.	N	L	L	Y	N	N	Y	Enhancement		Y
NS-92	Increase instream flow in key tributaries (acquisitions, leases, transfers, banking, water use efficiency improvements, etc.).	Adult Immigration and Juvenile Emigration	Antelope, Mill, Deer, Paynes, Cow, Bear, and Butte creeks	Proposes utilizing skills and roles of several groups to put together non-regulatory packages that coordinate different tools to assure flows for spring-run and steelhead.	N	M	H	N	N	Y	Y	Enhancement		Y
NS-93	Evaluate and implement fish passage upstream of Folsom Lake into the Middle Fork (and possibly North Fork) of the American River.	All	American River	Required under OCAP BO.	Y	M	H	Y	N	Y	N	Expansion	N	Y
<b>Basalt and Porous Lava Spring-Run Chinook Salmon Diversity Group</b>														
B-1	Implement Phase 1(b) of the Battle Creek Restoration Project as defined by the Memorandum of Understanding (i.e., tailrace connector between Inskip Powerhouse and Coleman Canal on the South Fork Battle Creek).	Adult Immigration	Battle Creek	Estimated cost \$26 million but has matching funds; required under OCAP BO.	Y	L	L	Y	Y	N	Y	Enhancement		Y
B-2	Implement Phase 2 of the Battle Creek Restoration project, as defined by the Memorandum of Understanding (i.e., removal of Coleman Diversion Dam, South Diversion Dam, Soap Creek Feeder, and Lower Ripley Creek Feeder; fish ladder and screen construction at Inskip Diversion Dam; tailrace connector between South Powerhouse and Inskip Canal; and streamflow increases in South Fork Battle Creek).	All	Battle Creek	Estimated cost \$47 million but has matching funds. Provides access to 16.3 miles of prime habitat. Required under OCAP BO.	Y	H	H	Y	Y	Y	Y	Expansion	Y	Y
B-4	Develop and implement pulse flow schedules during peak migration periods for years with low water availability.	Adult Immigration	Battle Creek		N	L	L	Y	Y	Y	Y	Enhancement		Y
B-9	Modernize/upgrade PG&E facilities to reduce the potential for flow fluctuations and outages.	All	Battle Creek		N	L	L	Y	Y	N	Y	Enhancement		

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B-12	Develop and increase application of alternative diversion technologies that eliminate entrainment.	Juvenile Emigration	Battle Creek		N	L	L	Y	Y	N	N	Enhancement		
B-15	Conduct feasibility studies for spring-run Chinook salmon access to habitat above Shasta Dam, including assessing habitat suitability and passage logistics for adults and juvenile. If the feasibility studies support fish passage then design and conduct an experimental fish passage program to evaluate adult distribution, survival, spawning, and production in habitats above Shasta Dam. If the experimental fish passage program substantively contributes to the Long-Term viability of the ESU, then develop and implement a Long-Term fish passage program (annual trap-and-haul operation, if warranted).	Adult Immigration, Adult Holding, Spawning	Sacramento River	Required under OCAP BO.	Y	H	H	Y	Y	Y	N	Expansion	N	Y
B-18	Conduct periodic (e.g., every 5 years) spawning gravel assessments in the upper Sacramento River (i.e., above RBDD) and implement gravel augmentation projects, as necessary.	Spawning	Sacramento River	Benefits steelhead but not spring-run.	Maybe	M	L	Y	Y	N	N	Enhancement		
B-19	Modify gravel pits and mounds to ensure full drainage of these features to allow flooding while preventing stranding and warm water predator habitat.	Juvenile Emigration, Summer/Winter Rearing	Upper Sacramento River	The Recovery Plan mentions this action in reference to the juveniles produced in the Sacramento River. La BARRANCA floodplain project needs funding for construction.	N	L	L	Y	Y	N	Y	Enhancement		Y
B-20	Restore the current Lake Red Bluff footprint to riparian habitat.	All	Upper Sacramento River	The Recovery Plan mentions this action in reference to the juveniles produced in the Sacramento River.	Maybe	L	L	Y	Y	N	N	Enhancement		
<b>Northwestern California Spring-Run Chinook Salmon Diversity Group</b>														
NWC-1	Enhance watershed resiliency by identifying and implementing projects that would reduce the potential for, and magnitude of a catastrophic wildfire, restore meadows to potentially increase summer flows and reduce local water temperatures, or increase riparian shade.	All	Beegum Creek	Issue?	N	L	L	Y	Y	N	N	Enhancement		
NWC-2	Develop and implement a spawning gravel augmentation plan.	Spawning	Beegum Creek	Issue?	N	M	L	Y	Y	N	Y	Enhancement		
NWC-3	Eliminate sources of chronic sediment delivery from roads and other near stream development by out-sloping roads, constructing diversion prevention dips, replacing under-sized culverts and applying other storm proofing guidelines.	Spawning, Egg Incubation	Beegum Creek		N	L	L	Y	Y	N	Y	Enhancement		

\*Only applies to Expansion Actions.  
 \*\*Only noted when response received.

Habitat Expansion Agreement for Central Valley Spring-Run Chinook Salmon and California Central Valley Steelhead



Reference Number	Description of Action	Target Life Stage(s)	Stream	Notes	Deal Killers (1)	HET Measurability (2)	HET Contribution (3)	Outside of Deer, Mill, Butte (4)	Outside of Northern Sierra Diversity Group (5)	Segregate Spring and Fall Runs (6)	Time to Implement (7)	Category (8)	Volitional Passage* (9)	Supporting Questionnaire / Comment** (10)
NWC-5	Inject LWD and boulders in the canyon reach of Clear Creek to induce gravel deposition to support pocket spawning by salmonids.	Spawning	Clear Creek	Issue w/ kayakers, lower priority	N	L	L	Y	Y	Y	Y	Enhancement		Y
NWC-6	Clear Creek gravel supplementation in the reach where spring-run Chinook and steelhead spawn by placing gravel directly into four new sites and supplementing existing sites with "injected" gravel.	Spawning	Clear Creek	This would not be self-sustaining. It would need to be redone periodically but works synergistically with NWC-8 and NWC-20. Potential/perfect substrate estimated to support 5,264 spring-run and 12,816 steelhead. Possible conflict with gravel augmentation requirement in OCAP BO.	Maybe	M	H	Y	Y	Y	Y	Enhancement		Y
NWC-8	Reactivate natural geomorphic processes by providing high flows to move gravel downstream and clean fine sediment from spawning areas.	Spawning, Egg Incubation	Clear Creek	This action would primarily include paying for monitoring and forfeited power generation. Works synergistically with NWC-6 and NWC-20. EWP funding suspended. Required under OCAP BO.	Y	L	L	Y	Y	Y	Y	Enhancement		Y
NWC-25	Developing long-term spawning gravel supply by processing gold mine tailings on DFG and BLM properties adjacent to Clear Creek.	Spawning	Clear Creek	Provides Long-Term and inexpensive supply of spawning gravel, prevents entrainment of mercury, and creates functional floodplain in tailing area. CVPIA funded and completed feasibility study. Gravel augmentation required in OCAP BO.	Maybe	L	L	Y	Y	Y	Y	Enhancement		Y
NWC-9	Enhance watershed resiliency by identifying and implementing projects that would reduce the potential for, and magnitude of a catastrophic wildfire, restore meadows to potentially increase summer flows and reduce local water temperatures, or increase riparian shade.	All	Clear Creek	Include only wildlife and revegetation actions (lower priority) since other issues being implemented.	N	L	L	Y	Y	N	N	Enhancement		Y
NWC-10	Conduct a passage feasibility study, including an assessment of potential habitat above Whiskeytown Dam. If the action is feasible and passage above Whiskeytown Dam can substantively contribute to the Long-Term viability of the ESU, then develop and implement a Long-Term fish passage program.	Adult Immigration, Adult Holding, Spawning	Clear Creek	Feasibility concerns due to flow, mine contamination, upstream passage barriers, gravel availability, and trap-and-haul limitations.	Maybe	H	H	Y	Y	Y	N	Expansion	Maybe	
NWC-13	Eliminate sources of chronic sediment delivery from roads and other near stream development by out-sloping roads, constructing diversion prevention dips, replacing under-sized culverts and applying other storm proofing guidelines.	Spawning, Egg Incubation	Clear Creek	Lower priority since most feasible projects already completed. Parks is pursuing funding for inventory.	N	L	L	Y	Y	N	Y	Enhancement		Y

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Habitat Expansion Agreement for Central Valley Spring-Run Chinook Salmon and California Central Valley Steelhead



Reference Number	Description of Action	Target Life Stage(s)	Stream	Notes	Deal Killers (1)	HET Measurability (2)	HET Contribution (3)	Outside of Deer, Mill, Butte (4)	Outside of Northern Sierra Diversity Group (5)	Segregate Spring and Fall Runs (6)	Time to Implement (7)	Category (8)	Volitional Passage* (9)	Supporting Questionnaire / Comment** (10)
NWC-18 a	Protect/enhance existing riparian habitat and corridors and establish and restore additional riparian habitat where needed.	Juvenile Emigration, Summer/Winter Rearing	Cottonwood Creek	This action, while on Cottonwood Creek, is mentioned in the Recovery Plan as benefiting Beegum Creek. Some AFRP projects are in place.	N	L	L	Y	Y	N	Y	Enhancement		Y
NWC-18 b	Implement non-native plant (e.g. Arundo) eradication plan.	Juvenile Emigration, Summer/Winter Rearing	Cottonwood Creek	See NWC-18 a.	N	L	L	Y	Y	N	Y	Enhancement		Y
NWC-19	Re-establish natural channel morphology by: (1) applying NMFS gravel mining criteria to all gravel mining projects; and (2) integrating natural morphological features and functions into bank protection and other stream side development projects.	All	Cottonwood Creek	This action, while on Cottonwood Creek, is mentioned in the Recovery Plan as benefiting Beegum Creek. AFRP needs funding for sediment budget study.	N	L	L	Y	Y	N	Y	Enhancement		Y
<b>Sacramento River Basinwide</b>														
SBW-1 a	Implement bank revetment removal programs and projects and breach or remove abandoned levees during set-back levee projects.	Juvenile Emigration, Summer/Winter Rearing	Upper and Middle Sacramento River	Worth considering after assessing current carrying capacity of Sacramento River mainstem habitats.	N	L	L	Y	Y	N	N	Enhancement		
SBW-1 b	Restore a continuous 100-mile stretch of ecologically viable riparian habitat to flood-prone lands along the river between Red Bluff and Colusa.	Juvenile Emigration, Summer/Winter Rearing	Upper and Middle Sacramento River	Worth considering after assessing current carrying capacity of Sacramento River mainstem habitats.	N	L	L	Y	Y	N	N	Enhancement		
SBW-3 a	Promote native riparian (e.g., willows) species through eradication of non-native species (e.g., Arundo, tamarisk).	Juvenile Emigration, Summer/Winter Rearing	Lower Sacramento River	Worth considering after assessing current carrying capacity of Sacramento River mainstem habitats.	N	L	L	Y	Y	N	N	Enhancement		
SBW-3 b	Modify vegetation maintenance practices to encourage riparian growth and establish a native vegetated corridor in currently unvegetated/leveed reaches of the lower Sacramento River especially between Colusa and Verona.	Juvenile Emigration, Summer/Winter Rearing	Lower Sacramento River	See SBW-3 a.	N	L	L	Y	Y	N	N	Enhancement		
SBW-3 c	Restore a continuous 85-mile stretch of riparian habitat of an appropriate width to maintain ecologically viable function to flood-prone lands along both banks of the river between Colusa and Sacramento.	Juvenile Emigration, Summer/Winter Rearing	Lower Sacramento River	See SBW-3 a. Floodplain restoration required in either Yolo Bypass or Lower Sacramento River in OCAP BO.	Maybe	L	L	Y	Y	N	N	Enhancement		
SBW-4 a	Modify vegetation maintenance practices to encourage riparian growth and establish a native vegetated corridor in currently unvegetated/leveed reaches of the middle Sacramento River.	Juvenile Emigration, Summer/Winter Rearing	Middle Sacramento River	Worth considering after assessing current carrying capacity of Sacramento River mainstem habitats.	N	L	L	Y	Y	N	Y	Enhancement		

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Habitat Expansion Agreement for Central Valley Spring-Run Chinook Salmon and California Central Valley Steelhead



Reference Number	Description of Action	Target Life Stage(s)	Stream	Notes	Deal Killers (1)	HET Measurability (2)	HET Contribution (3)	Outside of Deer, Mill, Butte (4)	Outside of Northern Sierra Diversity Group (5)	Segregate Spring and Fall Runs (6)	Time to Implement (7)	Category (8)	Volitional Passage* (9)	Supporting Questionnaire / Comment** (10)
SBW-4 b	Create and restore side-channel habitats to increase the quantity and quality of off-channel rearing (and spawning) areas.	Juvenile Emigration, Summer/Winter Rearing	Middle Sacramento River	Worth considering after assessing current carrying capacity of Sacramento River mainstem habitats.	N	L	L	Y	Y	N	Y	Enhancement		
SBW-7	Implement projects that consolidate and screen existing diversions where feasible.	Juvenile Emigration	Sacramento River	Worth considering after assessing current carrying capacity of Sacramento River mainstem habitats. USBR required to fund priority diversions identified in the Anadromous Fish Screen Program under the OCAP BO.	Maybe	L	L	Y	Y	N	Y	Enhancement		
SBW-11	Develop and increase application of alternative diversion technologies that eliminate entrainment.	Juvenile Emigration	Sacramento River	Worth considering after assessing current carrying capacity of Sacramento River mainstem habitats.	N	L	L	Y	Y	N	N	Enhancement		
SBW-14	Implement projects that acquire strategic floodplain easements to re-establish floodplain connectivity in areas constricted by levees.	Summer/Winter Rearing	Sacramento River	The Recovery Plan mentions this action in reference to the juveniles produced in the Sacramento River. Worth considering after assessing current carrying capacity of Sacramento River mainstem habitat.	N	L	L	Y	Y	N	Y	Enhancement		
SBW-18	Pursue opportunities, consistent with efforts conducted pursuant to Senate Bill 1086 (SB 1086), to create a 50,000-acre meander belt from Keswick Dam to Colusa to recruit gravel and large woody debris, to moderate temperatures and to enhance nutrient input.	All	Upper /Middle Sacramento River	Worth considering after assessing current carrying capacity of Sacramento River mainstem habitats.	N	L	L	Y	Y	N	Y	Enhancement		
SBW-19	Operate segregation weir at ACID to separate fall-run and spring-run on mainstem.	Spawning	Upper Sacramento River	DFG previously stated that they would not support this type of action.	Maybe	M	H	Y	Y	Y	Y	Enhancement		Y
SBW-21	Implement projects that improve fish passage between the Sacramento River and flood bypasses.	Adult Immigration	Sacramento River	Clear Creek Tech Team suggested moving Clear Creek action to Sacramento River action.	N	L	H	Y	Y	N	Y	Enhancement		

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