



Working List of Potential Habitat Expansion Actions

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. Nothing precludes other actions, not currently included in the list, from being considered.

Reference* Number	Description of Action	Target Life Stage(s)	Stream	Source	Reference Cited in Source	Notes	Contribution to HET (H/L)
Northern Sierra Nevada Spring-Run Salmon Diversity Group							
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	PG&E/CalTrout Prioritized Actions List	AFRP Restoration Plan (USFWS 2001)	Economic feasibility and level of local/political support for flow supplementation are unknown. Additionally, the benefit of flow supplementation to maintenance of spatial separation is unclear.	L
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	NMFS Recovery Plan Co-Manager Review Draft	U.S. Forest Service Long-Term Anadromous Fish Conservation Strategy	Questionable match (fire) and additional information needed (meadows).	L
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	NMFS Recovery Plan Co-Manager Review Draft	http://www.delta.dfg.ca.gov/afpr/	The Edwards Dam Ladder construction project was completed in October 2007. Juvenile bypass facilities are still needed as of October 2008.	L
NS-76	Install Juvenile Bypass at the Edwards Dam Ladder.	Juvenile Emigration	Antelope Creek	Questionnaire	USFWS Final Restoration Plan for the Anadromous Fish Restoration Program (2001)	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.	L
NS-77	Conduct Antelope Creek valley floor channel analysis and implement recommended actions.	Adult Immigration, Juvenile Emigration	Antelope Creek	Questionnaire	USFWS Final Restoration Plan for the Anadromous Fish Restoration Program (2001)		L
NS-78	Reduce sources of chronic road related erosion of sediment.	All	Antelope Creek	Comment Form		On-going activity.	L
NS-5	Improve passage conditions at Paynes crossing to allow upstream passage during low flows.	Adult Immigration, Adult Holding	Antelope Creek	NMFS Recovery Plan Co-Manager Review Draft; Questionnaire	Summary of Threats and Recovery Actions for Spring-Run and Winter-Run Chinook Salmon (Notes from the Sacramento Salmon and Steelhead Recovery Workshop, May 22, 2007)	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.	L
NS-6	Identify gravel starved areas in Antelope Creek and implement gravel additions.	Spawning	Antelope Creek	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Issue? USFS favors correcting undersized culverts to improve natural bedload instead.	L
NS-7	Build sediment retention structures; fortify streambanks with native vegetation.	Spawning, Egg Incubation	Antelope Creek	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Issue?	L

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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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Issue?	L
NS-9	Implement projects to increase floodplain habitat availability to improve habitat conditions for juvenile rearing.	Summer/Winter Rearing	Antelope Creek	NMFS Recovery Plan Co-Manager Review Draft	Summary of Threats and Recovery Actions for Spring-Run and Winter-Run Chinook Salmon (Notes from the Sacramento Salmon and Steelhead Recovery Workshop, May 22, 2007)	Additional information needed.	L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Additional information needed.	L
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	HEA Steering Committee	No reference cited	Fish passage evaluation has not been done for this site. Additional information needed.	L
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	NMFS Recovery Plan Co-Manager Review Draft	http://www.delta.dfg.ca.gov/afpr/		L
NS-14	Implement Iron Canyon Fish Ladder Rehabilitation Project.	Adult Immigration	Big Chico Creek	PG&E/CalTrout Prioritized Actions List; Questionnaires	AFRP Restoration Plan (USFWS 2001)	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.	H
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	PG&E/CalTrout Prioritized Actions List	AFRP Restoration Plan (USFWS 2001)	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.	L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited		L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Additional information needed.	L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Additional information needed.	L

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NS-21	Implement projects to increase floodplain habitat availability to improve habitat conditions for juvenile rearing.	Summer/Winter Rearing	Big Chico Creek	NMFS Recovery Plan Co-Manager Review Draft	Summary of Threats and Recovery Actions for Spring-Run and Winter-Run Chinook Salmon (Notes from the Sacramento Salmon and Steelhead Recovery Workshop, May 22, 2007)	Additional information needed.	L
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	PG&E/CalTrout Prioritized Actions List	AFRP Restoration Plan (USFWS 2001)	Additional information needed.	L
NS-23	Purchase existing water rights from willing sellers.	All	Butte Creek	PG&E/CalTrout Prioritized Actions List	AFRP Restoration Plan (USFWS 2001)	All Lower Butte Creek actions need to be investigated to determine if the actions were carried out in previous restoration activities.	L
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	NMFS Recovery Plan Co-Manager Review Draft	U.S. Forest Service Long-Term Anadromous Fish Conservation Strategy	Questionable match (fire) and additional information needed (meadows).	L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited		L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Identified in CVPIA Long-Term Plan.	L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited		L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited		L
NS-30	Promote or create riparian buffer strips between the Butte Creek channel and adjacent land uses.	Juvenile Emigration, Summer/Winter Rearing	Butte Creek	PG&E/CalTrout Prioritized Actions List	No reference cited		L
NS-31	Implement projects that consolidate and screen existing diversions where feasible.	All	Butte Creek	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Additional information needed.	L

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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	HEA Steering Committee	No reference cited	An earthquake retrofit is necessary and might be an opportunity to increase storage to benefit fisheries flows. This would primarily benefit steelhead.	L
NS-34	Construct fish ladder at upper Deer Creek falls.	Adult Immigration	Deer Creek	PG&E/CalTrout Prioritized Actions List	Spring-run chinook salmon recovery brainstorming session (11/8/05)	Habitat for spring-run limiting.	L
NS-79	Provide functional fish ladder at Lower Deer Creek falls.	Adult Immigration	Deer Creek	Comment form	No reference cited	USFS supports DFG efforts to correct the ladder.	L
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	PG&E/CalTrout Prioritized Actions List	AFRP Restoration Plan (USFWS 2001)	Water exchange program is being funded through the 4-Pumps mitigation program.	L
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	NMFS Recovery Plan Co-Manager Review Draft	http://www.delta.dfg.ca.gov/afpr/	Check status of DCID exchange agreement.	L
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	NMFS Recovery Plan Co-Manager Review Draft	Summary of Threats and Recovery Actions for Spring-Run and Winter-Run Chinook Salmon (Notes from the Sacramento Salmon and Steelhead Recovery Workshop, May 22, 2007)	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.	L
NS-37 b	Install state-of-the-art fish ladder at Stanford-Vina Dam.	Adult Immigration	Deer Creek	NMFS Recovery Plan Co-Manager Review Draft	See NS-37 a	See NS-37 a.	L
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	NMFS Recovery Plan Co-Manager Review Draft	See NS-37 a	See NS-37 a.	L
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	NMFS Recovery Plan Co-Manager Review Draft	See NS-37 a	See NS-37 a.	L

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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	NMFS Recovery Plan Co-Manager Review Draft	Deer Creek Watershed Existing Conditions Report and U.S. Forest Service Long-Term Anadromous Fish Conservation Strategy	Questionable match (fire) and additional information needed (meadows).	L
NS-80	Reduce sources of chronic road related erosion of sediment	All	Deer Creek	Comment form	No reference cited	On-going activity.	L
NS-40	Build sediment retention structures; fortify streambanks with native vegetation.	Spawning, Egg Incubation	Deer Creek	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Issue?	L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Issue? HWY 32 culvert managed by CALTRANS (need to be included).	L
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	PG&E/CalTrout Prioritized Actions List; Questionnaire	Collaborative Group 2006, Draft Lower Deer Creek Ecosystem Restoration and Flood Management Technical Memorandum by Mark R. Tompkins and G.M. Kondolf (2008), AFRP Restoration Plan (USEWS 2001)	The Deer Creek Watershed Conservancy completed a floodplain feasibility study. The study developed two action alternatives.	L
NS-45	Identify and implement projects designed to improve downstream passage conditions for juveniles.	Juvenile Emigration	Deer Creek	NMFS Recovery Plan Co-Manager Review Draft	No reference cited		L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited		L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited		L
NS-90	Implement a trap-and-haul project on the North Fork Feather River.	All	Feather River	Comment form	No reference cited		H
NS-91	Implement a trap-and-haul project on the Middle Fork Feather River.	All	Feather River	Comment form	No reference cited		H

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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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited		L
NS-51	Purchase TNC's Mill Creek Water Rights to provide additional stream flows for spring-run Chinook and steelhead.	All	Mill Creek	PG&E/CalTrout Prioritized Actions List; Questionnaire	AFRP Restoration Plan (USFWS 2001)	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.	L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited		L
NS-81	Reduce sources of chronic road related erosion of sediment.	All	Mill Creek	Comment form	No reference cited	On-going activity.	L
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	NMFS Recovery Plan Co-Manager Review Draft	U.S. Forest Service Long-Term Anadromous Fish Conservation Strategy		L
NS-55	Work with State and Federal water acquisition programs to develop dedicated instream water (Orange Cove water right purchase); participate in the lower Mill Creek Watershed Restoration	All	Mill Creek	NMFS Recovery Plan Co-Manager Review Draft	http://www.delta.dfg.ca.gov/afrp/		H
NS-56	Build sediment retention structures; fortify streambanks with native vegetation.	Spawning, Egg Incubation	Mill Creek	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Issue?	L
NS-57	Implement projects to increase floodplain habitat availability to improve habitat conditions for juvenile rearing.	Summer/Winter Rearing	Mill Creek	NMFS Recovery Plan Co-Manager Review Draft	Summary of Threats and Recovery Actions for Spring-Run and Winter-Run Chinook Salmon (Notes from the Sacramento Salmon and Steelhead Recovery Workshop, May 22, 2007)	Issue?	L
NS-58	Identify and implement projects designed to improve downstream passage conditions for juveniles.	Juvenile Emigration	Mill Creek	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Issue?	L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Issue?	L
NS-60	Establish, restore, and maintain riparian habitat along the lower reaches of Mill Creek.	Juvenile Emigration, Summer/Winter Rearing	Mill Creek	PG&E/CalTrout Prioritized Actions List	AFRP Restoration Plan (USFWS 2001)	Issue? Past AFRP project.	L

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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	PG&E/CalTrout Prioritized Actions List	Spring-run chinook salmon recovery brainstorming session (11/8/05)	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.	H
NS-64	Modify the fish ladders at Daguerre Point Dam to provide full fish passage.	Adult Immigration	Yuba River	NMFS Recovery Plan Co-Manager Review Draft; Questionnaire	Daguerre Point Dam Fish Passage Improvement Project 2002 Fisheries Study	No preferred alternative selected yet.	L
NS-65	Facilitate passage of juvenile salmonids by modifying the dam face of Daguerre Point Dam.	Juvenile Emigration	Yuba River	PG&E/CalTrout Prioritized Actions List	AFRP Restoration Plan (USFWS 2001)	No preferred alternative selected yet.	L
NS-67a	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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	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.	H
NS-94 a	Implement a trap-and-haul program around Englebright Dam for the North Yuba River above New Bullards Bar Reservoir.	All	Yuba River		No reference cited.		H
NS-94 b	Implement a trap-and-haul program around Englebright Dam for the North Yuba River below New Bullards Bar Reservoir.	All	Yuba River		No reference cited.		H
NS-94 c	Implement a trap-and-haul program around Englebright Dam for the Middle Yuba River in combination with increased flow releases.	All	Yuba River		No reference cited.		H
NS-69	Improve efficiency of screening devices at Brophy-South Yuba water diversion and other unscreened diversions.	Juvenile Emigration	Yuba River	PG&E/CalTrout Prioritized Actions List	AFRP Restoration Plan (USFWS 2001)	Required under Yuba River Accord and BO.	L
NS-83	Restore backwater, side-channel, and riparian/floodplain habitat in the Lower Yuba River.	Juvenile Emigration, Summer/Winter Rearing	Yuba River	Questionnaire	No reference cited	Project will build on current AFRP-funded pilot project and complements Narrows Gravel Rehabilitation Project (NS-86).	L
NS-84 a	Rehabilitate Yuba River Narrows spawning habitat.	Spawning	Yuba River	Questionnaires	SHIRA-based river analysis (Pasternack 2009) and Draft Implementation Plan for Lower Yuba River Anadromous Fish Restoration	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.	H
NS-84 b	Rehabilitate Yuba River Narrows spawning habitat with possible segregation weir approximately 6 miles below Englebright Dam.	Spawning	Yuba River	Questionnaire	Draft Implementation Plan for Lower Yuba River Anadromous Fish Restoration	FWS and DFG do not currently support using a segregation weir.	H
NS-89	Implement Deer Creek Salmon and Steelhead Spawning Habitat Expansion Project.	Spawning	Deer Creek/ Yuba River	Questionnaire	No reference cited	Restore habitat via gravel augmentation, barrier removal, invasive species removal, and riparian revegetation. Project enhances mitigation requirements.	L

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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	Questionnaire	AFRP Restoration Plan (USFWS 2001)	Funds continued operation and maintenance of flow gauges that lose funding in 2010.	L
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	Comment Form	No reference cited.	Action may be ineligible under HEA Section 3.2 because required under OCAP BO.	H
Basalt and Porous Lava Spring-Run Chinook Salmon Diversity Group							
B-1	Implement Phase 1(b) of the package of passage, screening, and flow actions defined for 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	PG&E/CalTrout Prioritized Actions List	Battle Creek Restoration Plan (Kier and Associates 1999).	Action may be ineligible under HEA Section 3.2 because required under OCAP BO. Federal Stimulus Funding may also be available.	L
B-2	Implement Phase 2 of the package of passage, screening, and flow actions defined for 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	PG&E/CalTrout Prioritized Actions List	Battle Creek Restoration Plan (Kier and Associates 1999).	Action may be ineligible under HEA Section 3.2 because required under OCAP BO.	H
B-4	Develop and implement pulse flow schedules during peak migration periods for years with low water availability.	Adult Immigration	Battle Creek	NMFS Recovery Plan Co-Manager Review Draft	No reference cited		L
B-9	Modernize/upgrade PG&E facilities to reduce the potential for flow fluctuations and outages.	All	Battle Creek	NMFS Recovery Plan Co-Manager Review Draft	No reference cited		L
B-12	Develop and increase application of alternative diversion technologies that eliminate entrainment.	Juvenile Emigration	Battle Creek	NMFS Recovery Plan Co-Manager Review Draft	No reference cited		L

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B-15	<p>Conduct feasibility studies for allowing spring-run Chinook salmon access to habitat above Shasta Dam, including assessing habitat suitability and passage logistics (i.e., getting immigrating adults above the dam and emigrating juveniles below it). If the feasibility studies suggest that fish passage can be successful, then design and conduct an experimental fish passage program evaluating adult distribution, survival, spawning, and production in habitats above Shasta Dam.</p> <p>If the experimental fish passage program demonstrates that passage above Shasta dam can substantively contribute to the long-term viability of the ESU, then develop and implement long-term fish passage programs. Implement an annual trap-and-haul operation, if warranted.</p>	Adult Immigration, Adult Holding, Spawning	Sacramento River	NMFS Recovery Plan Co-Manager Review Draft	No reference cited.	Action may be ineligible under HEA Section 3.2 because required under OCAP BO.	H
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Benefits steelhead but not spring-run.	L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	The Recovery Plan mentions this action in reference to the juveniles produced in the Sacramento River. La Barranca floodplain project needs funding for construction.	L
B-20	Restore the current Lake Red Bluff footprint to riparian habitat.	All	Upper Sacramento River	NMFS Recovery Plan Co-Manager Review Draft	No reference cited		L
Northwestern California Spring-Run Chinook Salmon Diversity Group							
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Issue?	L
NWC-2	Develop and implement a spawning gravel augmentation plan.	Spawning	Beegum Creek	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Issue?	L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited		L
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	PG&E/CalTrout Prioritized Actions List	Collaborative Group 2006	Issue w/ kayakers, lower priority	L

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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	Questionnaires	Graham Matthews and Associates 2007, North State Resources 2008, and additional references provided in Questionnaire	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. Gravel augmentation required under OCAP BO.	H
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	Questionnaire	North State Resources 2008 and additional references provided in Questionnaire	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 under OCAP BO.	L
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	NMFS Recovery Plan Co-Manager Review Draft	Summary of Threats and Recovery Actions for Spring-Run and Winter-Run Chinook Salmon (Notes from the Sacramento Salmon and Steelhead Recovery Workshop, May 22, 2007)	Include only wildlife and revegetation actions (lower priority) since other issues being implemented.	L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Feasibility concerns due to flow, mine contamination, upstream passage barriers, gravel availability, and trap-and-haul limitations	H
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Lower priority since most feasible projects already completed. Parks is pursuing funding for inventory.	L
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	NMFS Recovery Plan Co-Manager Review Draft	Summary of Threats and Recovery Actions for Spring-Run and Winter-Run Chinook Salmon (Notes from the Sacramento Salmon and Steelhead Recovery Workshop, May 22, 2007)	This action, while on Cottonwood Creek, is mentioned in the Recovery Plan as benefiting Beegum Creek. Some AFRP projects are in place.	L
NWC-18 b	Implement non-native plant (e.g. Arundo) eradication plan.	Juvenile Emigration, Summer/Winter Rearing	Cottonwood Creek	NMFS Recovery Plan Co-Manager Review Draft	See NWC-18 a.	See NWC-18 a.	L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	This action, while on Cottonwood Creek, is mentioned in the Recovery Plan as benefiting Beegum Creek. AFRP needs funding for sediment budget study.	L

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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	Source	Reference Cited in Source	Notes	Contribution to HET (H/L)
Sacramento River Basinwide							
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	NMFS Recovery Plan Co-Manager Review Draft	http://www.nature.org/wherework/northamerica/states/california/	Worth considering after assessing current carrying capacity of Sacramento River mainstem habitats.	L
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	NMFS Recovery Plan Co-Manager Review Draft	http://www.nature.org/wherework/northamerica/states/california/	Worth considering after assessing current carrying capacity of Sacramento River mainstem habitats.	L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Worth considering after assessing current carrying capacity of Sacramento River mainstem habitats.	L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	See SBW-3 a.	L
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	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	See SBW-3 a. May potentially be addressed under OCAP BO.	L
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	NMFS Recovery Plan Co-Manager Review Draft	http://www.nature.org/wherework/northamerica/states/california/	Worth considering after assessing current carrying capacity of Sacramento River mainstem habitats.	L
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	NMFS Recovery Plan Co-Manager Review Draft	http://www.nature.org/wherework/northamerica/states/california/	Worth considering after assessing current carrying capacity of Sacramento River mainstem habitats.	L
SBW-7	Implement projects that consolidate and screen existing diversions where feasible.	Juvenile Emigration	Sacramento River	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	May potentially be addressed under OCAP BO.	L
SBW-11	Develop and increase application of alternative diversion technologies that eliminate <u>entrainment</u> .	Juvenile Emigration	Sacramento River	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	Worth considering after assessing current carrying capacity of Sacramento River <u>mainstem habitats</u> .	L
SBW-14	Implement projects that acquire strategic floodplain easements to re-establish floodplain connectivity in areas constricted by levees.	Summer/Winter Rearing	Sacramento River	NMFS Recovery Plan Co-Manager Review Draft	No reference cited	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.	L

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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	Source	Reference Cited in Source	Notes	Contribution to HET (H/L)
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 <u>enhance nutrient input</u> .	All	Upper /Middle Sacramento River	PG&E/CalTrout Prioritized Actions List	AFRP Restoration Plan (USFWS 2001)	Worth considering after assessing current carrying capacity of Sacramento River mainstem habitats.	L
SBW-19	Operate segregation weir at ACID to separate fall-run and spring-run on mainstem.	Spawning	Upper Sacramento River	Comment form	No reference cited	DFG previously stated that they would not support this type of action.	H

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