Potter Valley Project
Collect-and-Transport Option for Fish Passage at Scott Dam

Informational Document Prepared by Pacific Gas and Electric Company and Cardno for the Ad Hoc Committee Fish Passage Working Group

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This document outlines a conceptual collect-and-transport (C&T) program for achieving fish passage at Scott Dam located on the main stem Eel River. The information was developed by PG&E and Cardno to provide input to the Fish Passage Working Group during the evaluation of passage options at Scott Dam.

Summary

A well designed and adaptively managed collect-and-transport program is a potentially viable approach to safe, timely, reliable and effective upstream and downstream passage at Scott Dam for Chinook salmon, steelhead, and lamprey in the Eel River. Such a program can meet National Marine Fisheries Service (NMFS) guidance for fish passage and offers some potential advantages relative to other fish passage approaches for this specific site. The existing Van Arsdale Fisheries Station could facilitate collection of upstream migrants. Implementation of C&T can be deployed relatively quickly with modest cost and immediately provide information on the productivity potential of the upstream habitat. C&T would provide access to all available habitat upstream of Scott Dam. The program would use lessons learned from the numerous existing C&T programs to develop an effective science-based design.

Program Description

- Scott Dam. The Potter Valley Project's existing 130-foot tall Scott Dam on the main stem Eel River creates an impassable barrier to upstream migration of adult Chinook salmon, steelhead, and lamprey to historic spawning habitat. Lake Pillsbury and Scott Dam also create an impediment to downstream migration for juvenile Chinook salmon, steelhead and lamprey and adult steelhead kelts if upstream passage of adults was provided in the future (Figure 1).
- Upstream Passage. A C&H program could utilize the project's existing Van Arsdale Fisheries Station located at Cape Horn Dam approximately 12 miles downstream of Scott Dam as the capture point for upstream migrants. As is currently the case at the Fisheries Station, upstream migrants would be identified and counted, and some migrants would be allowed to continue their migration into the reach of the main stem Eel River between Cape Horn Dam and Scott Dam for spawning in that reach as well as its tributary streams. The existing Fisheries Station facilities (Figure 2) could be modified, as necessary, to ensure safe and effective holding and transfer of upstream migrants to tanks, which would be used daily during the migration period to transport migrants to the main stem Eel River and Rice Fork above Scott Dam via truck (using existing roads) and a reservoir barge. The release method (e.g., temperature acclimation) and location(s) would be selected to maximize safety and effectiveness for the migrants, and to optimize their access into the main stem Eel River and Rice Fork.
- Downstream Passage. Capture of downstream migrants would be accomplished primarily by use of one or possibly two passive floating surface collector(s) located in Lake Pillsbury where the main stem Eel River and/or the Rice Fork enter the reservoir. Selecting the priority location would be based on considerations such as amount of available upstream habitat. The decision of whether to deploy a second passive floating surface collector would be based on the demonstrated effectiveness of the first collector. There is also the potential for volitional downstream passage from the Rice Fork due to its close proximity to the dam and the water surface in the reservoir typically being above the spill crest during the majority of the out-migration period. The close

proximity to the dam would minimize exposure of juveniles to the reservoir, and downstream migration could potentially be accomplished by utilizing spill flows at the dam's spillway or by installing a bypass conduit. The passive floating surface collector(s) would be fitted with floating guide nets reaching from the water surface to the lake-bottom and adjoining shoreline that guide downstream migrants to the collector, as well as separate and protect the out migrants from predation by pikeminnow and bass in Lake Pillsbury (Figures 1 and 3). Once guided to the passive floating surface collector by the guide nets and the natural flow of the river into the lake, the downstream migrants would be collected daily during the downstream migration period and transported by barge and truck to release location(s) downstream of Scott Dam and possibly downstream of Cape Horn Dam to take advantage of the regulated hydrograph, which closely mimics the natural hydrograph in shape, magnitude, and timing. The release method and location(s) would be selected to maximize safety and effectiveness for the migrants (e.g., safe resting pool, appropriate water temperature). Fish identification, inspection, tagging/marking, and counting could be included in the downstream transportation process. The tagging/marking could be used to identify subsequent upstream migrants as originating from the spawning areas above Scott Dam versus those originating between Cape Horn Dam and Scott Dam. All capture and transportation system components would be designed and operated to maximize the safety and effectiveness of downstream migration.

- Period of Operation. The C&T program would operate daily during the entire period of upstream and downstream migration of the target species (e.g., October through June). During January through April, the C&T program would be providing simultaneous up and downstream passage, as appropriate. The passive floating surface collector(s) and guide nets could be left in place year-round or more likely removed during the non-migration period (July through September), which also coincides with the primary recreation period for Lake Pillsbury.
- Measurable Objectives, Success Metrics, and Adaptive Management. The C&T program would include identification of measurable objectives and success metrics. It would be implemented using adaptive management principles, with continual evaluation of its effectiveness in its early years of operation and adjustment as necessary to guide development of an effective long-term passage program that provides safe, effective, reliable and timely passage. The relatively minimal need for investment in costly infrastructure could allow for rapid program implementation and evaluation of such issues as effectiveness of upstream habitat (accessibility and productivity), volitional movement, and survivorship of downstream juvenile migrants in the reservoir and the Eel River.

Potential Advantages of C&T Relative to Other Potential Fish Passage Approaches

- Rapid Program Implementation. The C&T program could be operating in a couple of years in comparison to programs that involve permitting and construction of major new facilities such as a fish ladder (likely 10 years or more); major modification or decommissioning of Scott Dam (likely requiring 15 years or more); major modification to current water diversions to the Russian River (potentially tied-up in litigation for 10 years or more); or modification of off-project facilities such Coyote Valley Dam at Lake Mendocino (likely to take several decades).
- Short-term or Long-term Fish Passage Opportunity. The C&T program could be implemented as either a short-term fish passage solution while volitional solutions are evaluated and potentially implemented, or a long-term solution if the C&T program proves highly successful.
- Uses Existing Infrastructure. The C&T program could optimize use of existing infrastructure (e.g., Van Arsdale Fisheries Station, roads, boat ramps, and boat docks) and avoid the significant environmental and operational impacts of in-stream construction that would be required by most other approaches to fish passage. No new roads or significant excavation is required.

- Demonstrated Effectiveness. Numerous C&T programs have been deployed in the Pacific Northwest with extensive lessons learned related to enhancing their effectiveness. Recently, C&T programs have been proposed on the Yuba River (North Yuba River above New Bullards Bar Dam) and the McCloud and Upper Sacramento rivers upstream of Shasta Dam. In 2005, NMFS prescribed a C&T program for the Feather River between Oroville Dam and Lake Almanor, which has not been implemented pending approval of potential alternative off-site mitigation. Lessons learned from successful C&T programs (e.g., Baker River Hydroelectric Project, Mud Mountain Dam, and others) and recommendations for assuring effectiveness (Lusardi and Moyle 2017) could be incorporated in the Scott Dam C&T program.
- Relatively Low Cost. While a detailed cost estimate of the C&T program has not been developed, its capital cost is roughly estimated to be in the $10 million to $15 million range with annual operating costs in the $300,000 to $400,000 range. These costs are many times less than the cost of a potential fish ladder or dam breaching or removal, which may be closer in cost to $50 million to $100 million or more.
- Compatible with Water Surface Fluctuations in Lake Pillsbury. Both the upstream and downstream migration functions of the C&T program are compatible with, and unaffected by, the typical 26-foot fluctuation of the water surface in Lake Pillsbury during the upstream migration period and the fluctuation of the water surface during the downstream migration period (Figure 4). Note in Figure 4 that during much of the downstream migration period, February/March through June, the water surface elevation at Scott Dam is at or near the spill crest.
- Compatible with Storm Flows in the Main Stem Eel River. Because the C&T program does not require any permanent in-stream structures, it would be completely compatible with fluctuating and periodically high flows in the main stem Eel River. Debris management would be the primary concern, and can be mitigated through use of a debris boom located upstream of the passive floating surface collector.
- Reduced Predation of Out Migrants. A key component of the C&T program would be separation and protection of juvenile downstream migrants from predation by pikeminnow and bass in Lake Pillsbury. This is accomplished by locating the collection point in the mouth of the main stem Eel River and separating this area from the rest of the reservoir by use of the guide nets. The same could occur in the Rice Fork. Due to proximity of the Rice Fork to Scott Dam, collection of out migrants may not be necessary for the Rice Fork. Some pikeminnow may be present upstream of the surface collector(s) and guide nets; however, the predation opportunity at the surface collectors would likely be less than if the out migrants had to traverse the reservoir to reach an outlet at the dam. This, however, has not been tested. Cold water conditions and turbidity in the reservoir during the out-migration period may minimize predation.
- Minimal Disruption to Recreation use of Lake Pillsbury. The C&H program is fully compatible with continued use of Lake Pillsbury for lake-based recreation and would not disrupt any recreation activities during the primary recreation period of July through September.
- No Disruption of Flow Releases from Scott Dam or Flow Diversions to East Branch Russian River at Van Arsdale. The C&T program is fully compatible with current and potentially altered flow releases of stored water at Lake Pillsbury and water diversions to the Russian River at Van Arsdale.
- No Disturbance of Lake Pillsbury Sediments. The C&T program would not disturb any sediments currently retained by Scott Dam, avoiding any environmental impacts that would accompany such disturbance.
- No Disturbance of Scott Dam or Abutments. The C&T program would not disturb Scott Dam or its abutments, thereby avoiding any impact on dam function or safety.
- Creation of Local Jobs. Operation of the collection and transportation facilities and equipment would create good paying jobs that could be targeted for tribal members or local residents.

Other Considerations

- Migration Periods. Existing data on migratory periods is available for Chinook salmon, steelhead, and lamprey from previous studies (e.g., October to June), but operations would be managed adaptively for actual migrations.
- NMFS Fish Passage Guidance. A general discussion of C&T designs and the role of C&T in California salmon introductions is provided on the following NMFS website: http://www.westcoast.fisheries.noaa.gov/fish_passage/about_dams_and_fish/ca_fish_passage_faq.html. The Scott Dam C&T program would be consistent with this guidance. Two California C&T introductions are currently in the planning stages (North Yuba River, Shasta Dam).
- Effectiveness of C&T. The NMFS West Coast Region website identifies 19 projects across the Pacific Northwest with successful results (http://www.westcoast.fisheries.noaa.gov/fish_passage/about_dams_and_fish/ca_fish_passage_faq.html). Other literature (NWPCC 2016; Lusardi and Moyle 2017) provides examples of C&T systems and issues that must be addressed to obtain successful results. All lessons learned and applicable recommendations would be applied to the Scott Dam C&T program.
- Distance and Duration of Transport. The relatively short transport distance and daily operation of the program during the migratory period coupled with a high level of care in handling before, during, and after transport would be used to minimize stress and the potential for delayed mortality.
- Upstream Habitat. Response of adults and juveniles to habitat upstream of Lake Pillsbury could be monitored and evaluated. Natural fish passage barriers, such as Bloody Rock roughs, located on the main stem Eel River approximately 10 miles upstream of Lake Pillsbury's high water level (Figure 5) may limit access to portions of the watershed, and seasonally available habitat (dry in the summer and wet in the winter/spring) may or may not provide productive habitat (e.g., some Rice Fork tributaries).
- Stream Flows. The C&T program would be compatible with and fully utilize the natural stream flows upstream of Lake Pillsbury and the regulated stream flows in the main stem Eel River downstream, which, particularly below Cape Horn Dam, closely match the natural hydrograph in shape, magnitude, and timing.
- Source Stock Protection. The C&T program would use wild rather than hatchery adults and juveniles with appropriate protocols for protecting and enhancing the source stock (close monitoring of the source stock and potential supplementation with genetically appropriate fish).
- Comprehensive Conservation Strategy. The C&T program would be part of, and fully compatible with, the ongoing comprehensive conservation strategy for restoration of anadromous fisheries in the Eel River as identified in the Eel River Forum's May 2016 "The Eel River Action Plan."
- Experimental Program with Adaptive Management. Initially, the C&T program would be conducted as an experimental program in an adaptive management framework where monitoring is in place in both donor and recipient rivers. This experimental approach would include using fish of known identity to determine success over the entire life cycle of the species (see Lusardi and Moyle 2017). The results the initial experimental program can help guide the success of the long-term program.
- Addressing Potential Challenges. The program would include clearly defined objectives and measurable success metrics, and address habitat issues such as suitable water temperature (currently and under climate change), genetics protocols, capture and transport facilities that minimize stress, effective collection of juveniles, survival and replacement rates, potential conflicts with existing runs of salmon, and comprehensive management of the target species (see Lusardi and Moyle 2017).

References

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NMFS. 2018. California Fish Passage: Frequently Asked Questions. Retrieved from http://www.westcoast.fisheries.noaa.gov/fish_passage/about_dams_and_fish/ca_fish_passage_faq.html

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Eel River Forum. May 2016. The Eel River Action Plan. A Compilation of Information and Recommended Actions. Prepared for the Eel River Forum. Prepared by Eel River Forum Members. Final Report.

USBR. 2017. Environmental Assessment: Shasta Dam Fish Passage Evaluation Preliminary Draft. U. S. Bureau of Reclamation, Mid Pacific Region.

Figures

Figure 1. Scott Dam and Lake Pillsbury (the bottom image shows potential locations of floating surface collectors on the Eel River and Rice Fork arms of the reservoir).

Figure 2. Van Arsdale Fisheries Station.

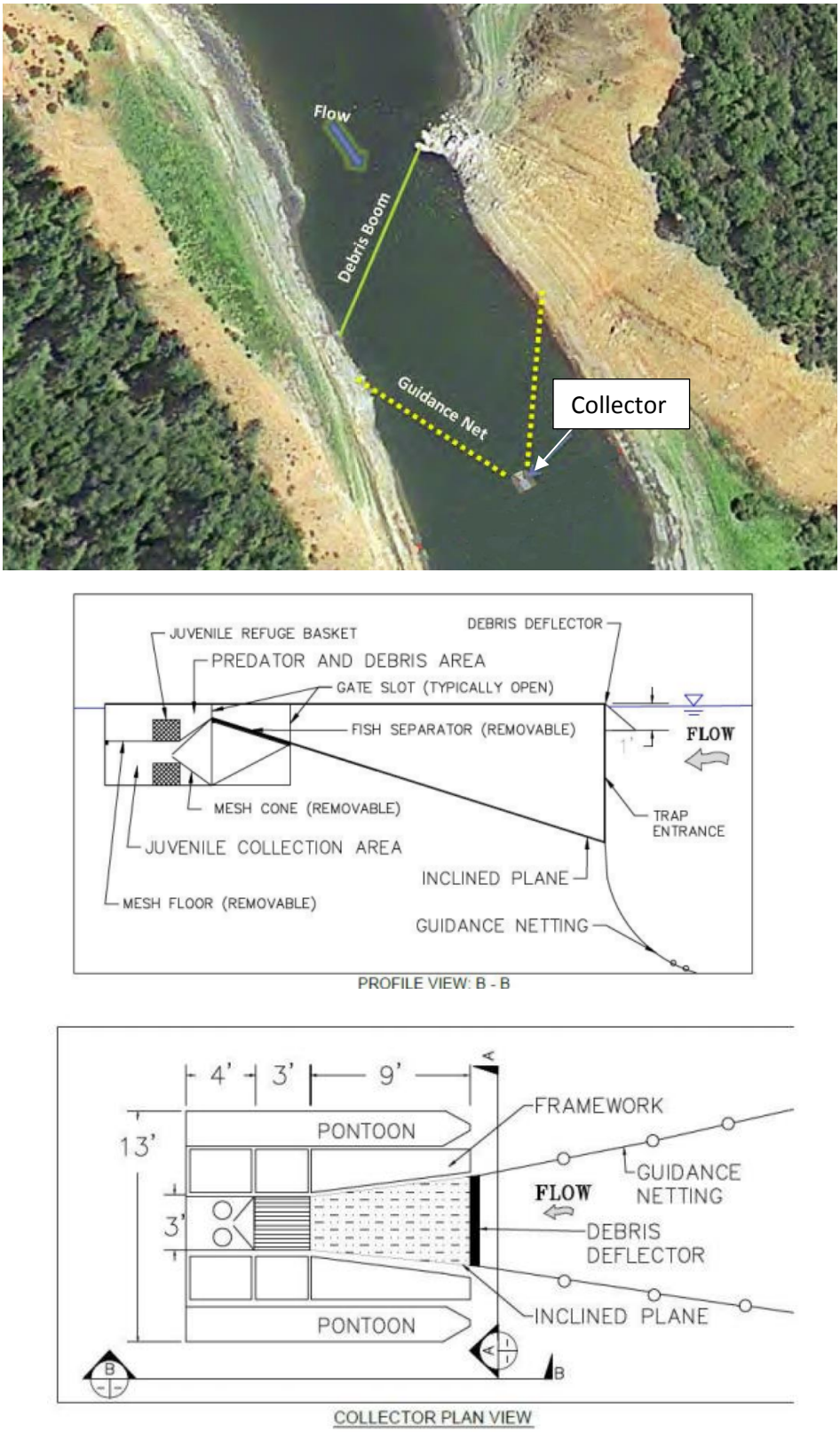

Figure 3. Example Passive Floating Surface Collector and Guide Nets. Plan and Profile Views (USBR 2016).

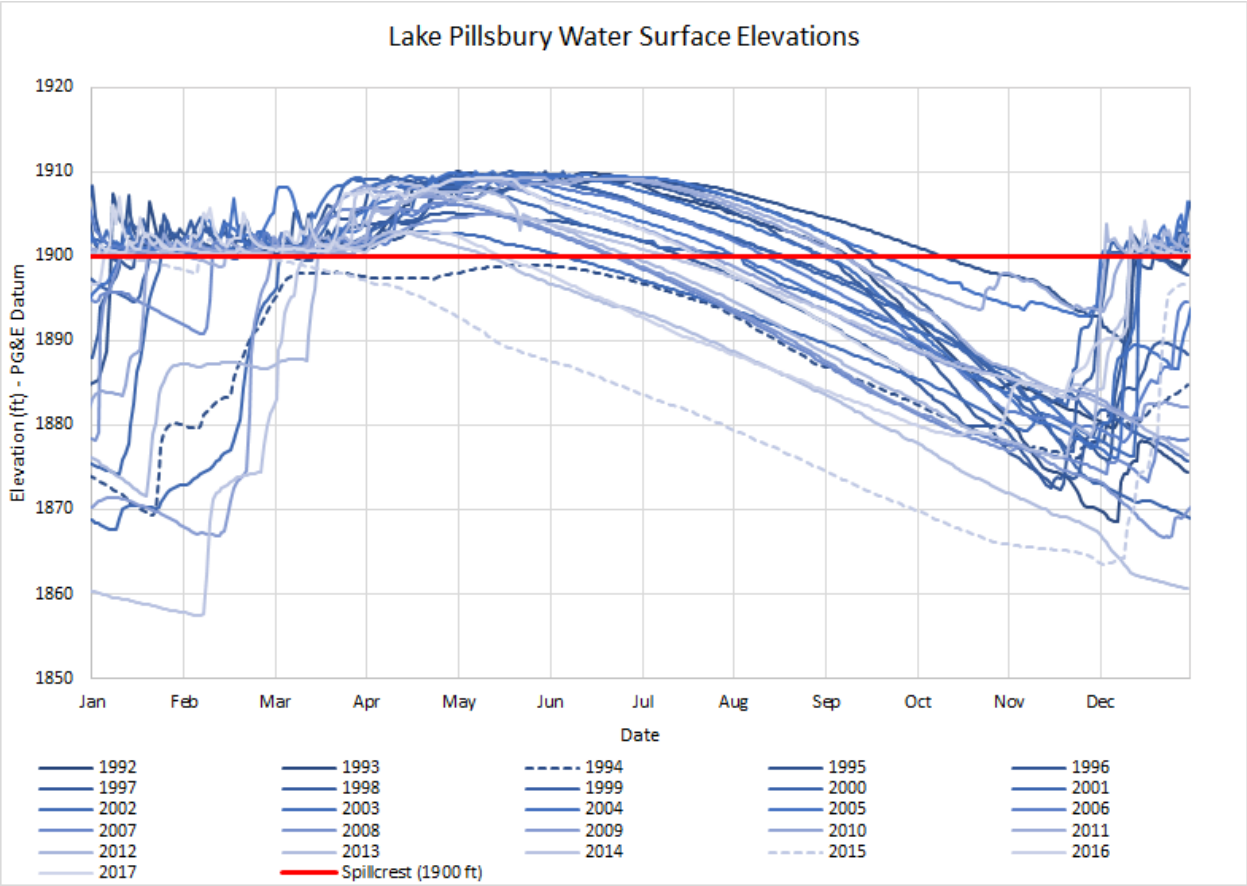

Figure 4. Lake Pillsbury Historical Water Surface Elevations in Relation to the Scott Dam Spillcrest at 1,900 ft (PG&E datum).

Bloody Rock Roughs, looking upstream; 20 February 2016; 11.50 cubic m/s, or 400 cfs (Photo: Erik Kenas)

Figure 5. Bloody Rock rough potential upstream fish passage barrier in the main stem Eel River 10 miles upstream of Lake Pillsbury (Cooper 2017).