

Aquatic Management Indicator Species El Dorado Project No. 184

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by

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Trout

The Federal Energy Regulatory Committee (FERC) is in the process of deciding whether it will issue a new license for the continued operation of the El Dorado Hydroelectric Project (No. 184), and, if so, what conditions it will impose in that license issued. In connection with this decision, the Forest Service has developed 4(e) conditions based on the Land and Resource Management Plans (as amended) for the Eldorado National Forest and Lake Tahoe Basin Management Unit. The Forest Service's proposed action is to issue the project conditions described in the document entitled *Forest Service Preliminary Terms and Conditions Provided Under 18 CFR § 4.34 (b) b(1) In Connection With the Application for Relicensing of the El Dorado Hydroelectric Project (FERC No. 184)* (May 1, 2003) which shall be included in any new license the Federal Energy Regulatory Committee may issue for the continued operation of the El Dorado project.

This document analyzes the potential effects of the Forest Service Terms and Conditions (USDA 2003a) developed in connection with the proposed relicensing for the El Dorado Hydroelectric Project upon Forest Service aquatic management indicator species on the Eldorado National Forest and Lake Tahoe Basin Management Unit (LTBMU). The Eldorado National Forest Land and Resource Management Plan (USDA 1989) designated "trout" as being aquatic management indicator species. The Land and Resource Management Plan Lake Tahoe Basin Management Unit (USDA 1988) designated rainbow, brook, and Lahontan cutthroat trout as being aquatic management indicator species. Rainbow, brown, lake, brook, and Lahontan cutthroat trout have been observed during surveys for this relicensing project (EID 2002 and FERC 2003). Lake trout is not found in streams, but in Caples and Silver Lake, where it has been planted. Thirteen streams were identified for fisheries surveys in the project with three required years of fish population data collected from 18 of 19 primary electrofishing sites (EID 2002).

Trout have historically been moved, transplanted, and stocked in many streams and lakes of the Sierra Nevada Mountains throughout the 20th century, although many streams have naturally reproducing trout. It is unknown to what extent the existing naturally reproducing rainbow trout in the Sierra Nevada are of native genetic stock, unaffected by hatchery introductions. The Sierra Nevada Forest Plan Amendment Record of Decision (USDAa 2000) emphasizes native species, such as rainbow trout and Lahontan cutthroat trout, for primary consideration with management activities. All five species of trout were considered for management as management indicator species, but for sustaining trout habitat, rainbow trout is the preferred species on the Eldorado NF, and both rainbow trout and Lahontan cutthroat trout are preferred on the Lake Tahoe Basin Management Unit (LTBMU). Historically in the Sierras rainbow trout did not exist above 6,000 feet elevation.

Habitat quality by capability level for trout is defined in USDA (1981) by the following factors: stream depth, stream width, water velocity, water temperature, percent stream shaded, riparian vegetation, instream cover, aquatic insects, streambed sediments, pool/riffle ratio, spawning site availability, and channel stability. These habitat qualities will be addressed below in considering applicable effects of the Forest Service terms and conditions of the project.

Effects of the Forest Service Preliminary Terms and Conditions of Project 184

There are approximately ? miles of perennial streams with rainbow trout, ? miles of brown trout, ? miles of brook trout, and 1.25 miles of Lahontan cutthroat trout in project affects streams, rivers, and lakes. These streams and rivers include: the South Fork American River, the Silver Fork American River, Echo Creek, Caples Creek, Oyster Creek, Pyramid Creek, Carpenter Creek, No-Name Creek, Alder Creek, Mill Creek, Bull Creek, Ogilby Creek, and Esmeralda Creek. Project reservoirs include: Lake Aloha, Caples Lake, Echo Lake, and Silver Lake. Lahontan cutthroat trout was observed incidentally in the 1999 and 2000 surveys of Echo Creek. Lake trout exists in Caples and Silver Lakes.

In Alder Creek, the native fish populations are unique in the Sierra Nevada (8,800 fish per mile). Alder Creek serves as significant nursery for the SFAR. This creek is highly important biologically, so flows were prescribed to attempt to maintain the unique fish populations.

Direct and Indirect Effects

The Forest Service Terms and Conditions (USDA 2003a) will be analyzed for effects on trout in the following discussions. Any conditions not mentioned below are perceived as having no effects on trout.

Condition No. 31 – Minimum Streamflows

During the development of the proposed conditions, one of the tenets regarding aquatic ecosystems was that the native aquatic biota were best adapted to the natural flow regime on the historical scale of the species. All of the flow related measures incorporated in the conditions were designed to mimic the pattern of the natural hydrograph within the constraints of operating a hydropower project and under the different types of water years. Proposed streamflows for project-affected stream reaches on the Eldorado National Forest that may provide suitable habitat for trout are expected to benefit this species where they are present.

Throughout the history of the project, flows have been reduced as the result of diversions, with the seasonality of flow variation being altered due to storage. These flow changes have, in many cases, adversely affected the quality and quantity of aquatic habitat and the ecological requirements for the native fauna. Minimum flows in the proposed conditions would mimic the natural hydrograph to the extent possible and, in most cases provide more flow during times of the year when higher flow would be expected. These proposed minimum flows by water year for each project-affected river and stream are printed in USDA (2003a) and FERC (2003). In most streams and rivers, the proposed minimum flows are the same or an increase from the existing minimum flows. Overall, the recommended streamflow regime is intended to restore annual and seasonal variation, timing, and magnitude to the regulated hydrograph of the project-affected stream channels.

The 80 to 100 percent weighted usable area (WUA) curves of the fisheries PHABSIM results (TRPA 2000) were emphasized to designate beneficial streamflows for maintaining sufficient fish habitat for all life stages during critical months (March-October). Eighty percent is known in the scientific community as a good rule of thumb WUA percent that ensures the overall protection of the ecosystem. In the above normal and below normal water years this WUA was used in Caples Creek (5 cfs), Silver Fork American River (8 cfs), South Fork American River (110 cfs), Echo Creek, (6 cfs), and Alder Creek (25 cfs). Deviations from this were needed in Pyramid Creek, Silver Fork American below Silver Lake Dam, and South Fork American at Kyburz, as detailed in the three paragraphs below. In the dry and critically dry years, in many streams the natural flow was used as a minimum flow, except on Caples Creek and South Fork American River below Kyburz. The flows prescribed during the dry and critically dry years were flows that the project could provide during that time period, and are consistent with the natural flow regime of an unimpaired hydrograph in which the native aquatic species evolved.

Eighty percent of WUA for Pyramid Creek (16 cfs) was noticeably high when compared with both the unimpaired hydrograph and existing Project minimum streamflows. It was determined that these results may be inaccurate, possibly because the channel is bedrock-controlled with large rock and boulder crevices, which would allow existence of pool habitat over a wide range of flow regimes. A minimum streamflow of 16 cfs appeared unreasonable in this reach, since it was determined that this reach was not

contributing significantly as a nursery to the South Fork American River, as there were only 6.4 lbs/acre rainbow trout in the lower section of Pyramid Creek, and even less brown trout in the upper section. Mimicking the unimpaired hydrograph was chosen as an alternative in this reach.

The 80 percent optimum adult rainbow trout WUA for the Silver Fork American River below Silver Lake Dam reach is 8 cfs. A flow of 8 cfs would not necessarily yield significantly more potential habitat in this short reach of stream. Additionally, when weighed against the potential negative impacts of additional mid/late summer releases from Silver Lake prior to Labor Day a decision was made to reduce the recommendation to the amount historically released (USGS gage records) to 4 cfs or natural flow. One hundred percent WUA was used in the South Fork American River at Kyburz during spring runoff months (May/June) in normal water years, when higher flows would be reasonable. In the August/September months 80 percent WUA would not be attainable without reducing lake levels during the recreation season, and providing consumptive water. A 65 cfs minimum streamflow in August and a 50 cfs minimum streamflow in September would: (1) mimic unimpaired hydrograph, (2) take life stages of foothill yellow-legged frogs downstream into account, and (3) allow fish to use the fish ladder at the Kyburz Diversion Dam.

One deviation from the natural hydrograph with the new proposed flows, which may be detrimental to rainbow trout, but is beneficial for brown trout spawning, is the fall flow releases necessary out of Silver and Caples Lakes in order to comply with dam safety requirements and generate hydropower. Normally, the fall flows would consist of intermittent pulses from fall rainstorms with more steady rains usually beginning in November. The proposed flows would be more constant and steady for a longer period of time than under a natural hydrograph. Since these fall flows are an advantage by improving habitat for non-native brown trout spawning, this may result with interspecies competition with native rainbow trout. These proposed flows would also be an unnatural steady increase in flow for macroinvertebrates, which are food for trout and may cause them to drift, creating a less stable environment for these biota in the stream substrates. These drifting macroinvertebrates may also provide more food for trout during these release flow months.

Water temperatures are not expected to change significantly from existing temperatures by the recommended flows. Continued monitoring of water temperatures and fish populations will help ensure that trout are not being affected by high temperatures during the summer months.

Condition No. 32 – Ramping Rates

It is estimated that ramping rates should be gradual enough to reduce the shock of cooler water temperatures and higher flows upon trout (Table 1). This is the consensus of agency fish biologists who have experience in the project area; the ramping rates are the same as current ramping rates, and biologists have not noted any adverse effects from the current ramping rates. The objective is to minimize Project-caused flow fluctuations uncharacteristic of the natural hydrograph to protect the life stages of all aquatic biota including trout. Continued trout monitoring would help ensure that any future changes in trout populations are documented and the latest scientific information would be used to improve any habitat degradation through adaptive management measures included in the proposed conditions.

Table 1. Ramping rates of Lake Aloha, Caples Lake, and Silver Lake with change in water level of the stream and flow range.

Lake Aloha:

Change in Water Level of Stream (feet/hour)	Flow Range (cfs)
0.5	1-75
1.0	75-175
1.5	above 175

Caples Lake and Silver Lake:

Change in Water Level of Stream (feet/hour)	Flow Range (cfs)
1.0	1-75
0.5	75-175
0.55	above 175

Condition No. 33 – Operation and maintenance of Lake Aloha

It has been identified that Lake Aloha spills may be allowing non-native brook trout in Lake Aloha to invade the mountain yellow-legged frog ponds below the dam. Mountain yellow-legged frogs are a Forest Service Sensitive species which have priority for protection over non-native species (USDA 2000a). Actions in this proposed conditions would require these brook trout to be removed from the ponds in a timely manner, which would help reduce impacts to these sensitive frog populations. This removal would probably occur by gill-netting, and brook trout that are removed from these ponds would not survive. It is not expected that more than a dozen brook trout would be affected.

Condition No. 34 – Caples Lake Releases and Flow Limitations

The intent of introducing pulse flow events to the Caples Creek natural channel is to: (a) more closely mimic the timing and duration of peak flows that would occur under an unimpaired hydrograph; (b) initiate transport of bedload material, which would assist in improving habitat conditions for aquatic species; (c) facilitate flooding of the stream side riparian community at the appropriate time of the year; and (d) aide in control of spills into the spillway channel. The macroinvertebrate community is impaired in Caples Creek, as described in Ecorp (2002). This would help improve the substrate condition over time for the benthic macroinvertebrates, which are food for trout. These pulse flows would occur during spring runoff at a rate that would be consistent with the unimpaired hydrograph and is not expected to detrimentally impact trout. Spawning gravels for rainbow trout may be disturbed during the channel forming periods over a few days time. The viability of the trout populations in the stream are not expected to be affected adversely. Historically, trout were not present above 6,000 feet elevation in the Sierras and have been introduced there. Caples Creek is above this elevation.

Condition No. 35 – Oyster Creek Stabilization

Leakage flow coming out of the Silver Lake Dam produces a perennial streamflow that has created an incised and eroded downstream channel, where the channel leaves bedrock control and flows through highly erosive soils. Channel condition in Oyster Creek is relatively poor, with incised, unstable streambanks. A plan would be created to help restore this channel, thus improve habitat downstream. This would be beneficial in the long-term for the fisheries.

Condition No. 36 - Esmeralda Creek Restoration

Though specific plans have not been developed for this condition, these actions are expected to provide benefits to aquatic species by restoring the creek channel to its original location. Through agency review of the plan, protection measures will be put in place to survey prior to the activity to ensure trout are not being affected.

Condition No. 37 – Monitoring Program

Condition No. 38 – Ecological Resources Adaptive Management

Condition No. 42 – Water Temperature

The monitoring program covers monitoring to be conducted during implementation of the new license. The methods and frequency of monitoring have been designed to measure the response of aquatic resources to adjustments in streamflow and other conditions. The adaptive management program includes monitoring the new flow conditions to be changed with this license renewal and their effects on water quality, macroinvertebrates, fish, and water temperatures. The monitoring results provide benefits to the species by helping to increase our knowledge of their range and habitat conditions.

The monitoring results would be evaluated to ascertain condition of trout. Under the proposed streamflows, future fish populations must maintain numbers similar to the mean trout populations of the 1998-2002 surveys (USDA 2003b), and not be reduced by more than 20 percent (Table 2). Macroinvertebrate indices (metrics) in Project-affected stream reaches should be comparable to reference reaches located within and outside the South Fork American River (SFAR) drainage and the Truckee River. FS and CDFG will develop numerical objectives based on the collection and review of additional macroinvertebrate data. Both of these conditions would ensure viable rainbow trout populations in all project-affected reaches by sustaining their populations. Macroinvertebrate monitoring would ensure adequate food supplies, an indicator of adequate habitat condition to sustain trout.

Table 2. Biomass indices for rainbow trout (mean of 1998-2002 surveys) with which future surveys should not decline by more than 20% at each of six sites.

EID Site	Location	Biomass Indices (lbs/surface acre)
EC-1	Lower Echo Creek	11.8
PY-1	Lower Pyramid	6.5
CA-3	Caples Creek Below Kirkwood	9.1
SV-4	Silver Fork American River @ Forgotten Flat	19.7
AR-1	Lower Alder Creek	74.6
SO-2	SFAR below Carpenter Cr	33.9

Condition No. 39 – Mitigation for Entrainment

The screening of Carpenter and Alder Creeks for fish entrainment would protect the native trout in those high reproducing streams. Then trout would not be recruited out of the watershed emigrating down the canal, where there would be less chance of survival. Populations are expected to be maintained, if not improved, by installing these CDFG-approved screening devices.

Condition No. 46 – Implementation Plan

Condition No. 49 – Review of Recreation Developments

Condition No. 50 – Specific Recreation Conditions

Condition No. 51 – Operation and Maintenance of Recreational Facilities

The Caples Lake boat launching ramp is a new development proposed to be constructed. Best management practices (USDA 2000b) would be applied to protect water quality in the lake during construction. The numbers of fisherman boating in the lake may increase due to easier access from this ramp. An increase in fishing pressure may result in the lake and general vicinity over time, which may reduce fish numbers. The lake is currently stocked with brown, brook, and lake trout by CDFG, therefore populations would be maintained through stocking.

Construction activities are limited to upgrading and expansion of recreation facilities, campgrounds, and associated access roads and parking areas. These activities would occur within the boundaries of established recreation facilities and not in the streamcourses. There are a few acres proposed for treatment of surface materials that have been previously impacted and are currently contributing sediment to water resources. The proposed treatments will have a positive effect on water quality, and it is expected that the treatments would reduce the potential for expansion of impacts to riparian and lake shore areas from undirected vehicular use.

Routine maintenance of project facilities, including the El Dorado Canal, the existing diversion dams, weir structures, and the addition of fish screening on Alder Creek and Carpenter Creek may necessitate the use of heavy equipment near streamcourses. Through agency review of the plan and applying best management practices (USDA 2000b), protection measures will be put in place prior to the activities to

ensure trout are not being affected. As stated in the proposed conditions, the Forest Service must be consulted before commencing any new construction or maintenance activities, and the Forest Service may require that a Biological Evaluation be prepared and that mitigation measures be implemented to protect sensitive species.

Condition No. 52 – Target Lake Levels and Minimum Pool

The target lake levels of Caples and Silver Lakes would provide summer long high water levels for recreation and for increased fish habitat. Increased recreation would also increase fishing pressure, yet provide more lake habitat for trout to disperse into. These lakes are stocked by CDFG, therefore the fish populations are maintained.

Indirect effects from keeping Caples and Silver Lake levels high until the fall are caused by the higher steady flow releases necessary during that time to reduce lake levels for dam safety and to generate hydropower. Fall flow releases tend to enhance brown trout spawning success, favoring that species over native rainbow trout. Oyster Creek appears to be a nursery for brown trout. It is unknown whether this enhancement of brown trout creates competition with rainbow trout.

Cumulative Effects

The original creation of this hydropower project added to the cumulative effects for trout. The following have most likely occurred. On dammed systems peak flood flows are decreased and year-round flows are typically lower. This affects the natural movement of substrates, including gravel recruitment for spawning. Lower flows may increase water temperature affecting trout in the low-elevation areas of the project. Water diversions on the tributaries of the South Fork American River have been unscreened causing fish to emigrate down the canal, most likely lost to the native gene pool of that stream. Reservoirs and many high mountain lakes have been historically planted with fish. The presence of non-native, planted trout in the project-affected waters probably native rainbow trout populations.

Roads, including skid roads, are considered the principal cause of accelerated erosion in forests throughout the western United States (USDA 2000a). The original construction and existence of roads may have led to stream habitat degradation by sedimentation and easier access by the public. Dispersed recreation activities near some stream locations have compacted and denuded some streambanks, removing riparian vegetation and increasing the chances of sediment runoff. Easier access for the public also increases fishing pressure on the local trout populations. The level of use across the forest is expected to continue and increase over time as the human population continues to increase.

Summary

The cumulative effects to native trout caused by the original creation of this hydropower project probably caused the biggest change in the project area historically. Brown trout have been enhanced and sustained by the fall reservoir releases. The proposed FS terms and conditions would continue to maintain the brown trout populations in the upper reaches of the project through enhanced fall flows caused by releasing water from the reservoirs to generate power and meet dam safety requirements. Flow recommendations are expected to maintain, if not improve, trout populations overall. Alder and Carpenter Creeks will have screens at the diversion canal to maintain trout in the creeks. Monitoring trout populations and habitat quality, as well as adaptive management, would ensure that trout populations remain stable.

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