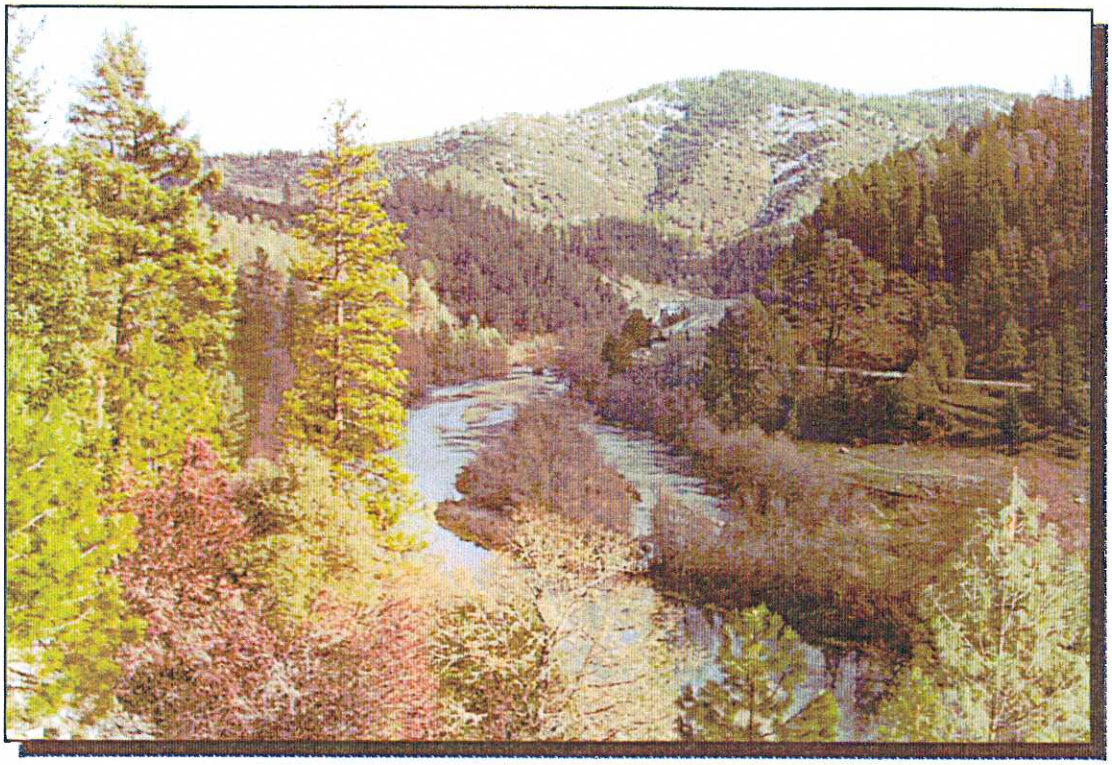
HANDOUT #1

Evaluation of Trinity River Channel Restoration Flow Alternatives



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EXECUTIVE SUMMARY

A number of alternatives for restoring the Trinity River mainstem fishery were evaluated in the Environmental Impact Statement (USFWS et al., 1999). On December 19, 2000, the Secretary of the Interior issued a Record of Dec ision in which the Preferred Alternative (P A) was identified. The PA included:

1. Five annual flow-release regimes from Lewiston Dam depending on the expected basin runoff; critically dry, dry, normal, wet, and extremely wet (PA flow regime),
2. The introduction of gravel-sized sediment suitable for salmonid spawning below Lewiston Dam,
3. Mechanical restoration at 47 identified sites, and
4. Implementation of an adaptive management plan.

A number of entities challenged the ROD, and presented alternative approaches for meeting the restoration goals for the Trinity River. SMUD proposed an Alternate flow regime for each of the water-year classes identified in the PA flow regime. For the critically dry, dry, and normal water years, the Alternate flow regime peak flows were the same as those of the PA flow regime, but the flow volumes were lower due to reduced peak-flow durations. For the wet and extremely wet water-year classes, the Alternate flow regime capped the peak discharges at 6,000 cfs. Mechanically-based alternatives were substituted for higher flows in the PA flow regime, and included:

1. Removal of tributary mouth bars by mechanical means, and return of appropriate-sized gravels to the river
2. Dredging of pools to remove sand,
3. Construction of additional fine sediment-detention structures in Grass Valley Creek and other tributaries that were identified to be producing substantial amounts of fine s ediment,
4. Augmentation of spawning gravels at selected sites, and
5. Development of an analytical basis of design for the mechanical-restoration sites.

Table 1.1 summarizes the characteristics of the two flow regimes (refer to Section 2; Figure 2.1 and 2.2 for the respective hydrographs).

Mussetter Engineering, Inc. (MEI) was retained to review and evaluate the PA flow regime and the Alternate flow regime that was proposed by SMUD. MEI's tasks included evaluating:

- The geomorphological basis of the PA flows,
- Whether the proposed PA flows will in fact meet their intended geomorphological aims, and
- Whether other means of achieving the geomorphological goals were possible.

Our review and analysis of the Preferred Alternative, including the flow regimes for the five water-year classes, augmentation of gravel, and mechanical restoration of 47 sites, as well as the Alternate approach that capped peak flows at 6,000 cfs for the extremely wet and wet years,

and substituted mechanical restoration alternatives for increased peak flows, enabled the following to be concluded:

1. The geomorphological basis of the PA flow regimes is the *Healthy Alluvial River* concept as proposed by McBain and Trush (1997). The concept is based on a number of questionable assumptions, including (1) that the immediate pre-dam river morphology is a reasonable analog for river restoration, even though almost the entire valley bottom and river had been dredged and placer-mined to just before the time that Lewiston Dam was built, (2) that the concept of a healthy alluvial river will provide suitable habitat for fishery restoration, and (3) that a functioning smaller-scale alluvial river can be created downstream of Lewiston Dam with increased flow releases, gravel addition, and isolated channel modifications even though most of the reaches between Dutch Creek and Lewiston Dam are either bedrock-controlled or bedrock-influenced. Because of the geomorphic variability of the individual subreaches, reach-specific flows and actions need to be developed rather than a general prescription as presented in the ROD.
2. The thresholds for meeting the majority of the *Healthy Alluvial River* goals are achieved by flows up to, and including, 6,000 cfs. The remainder of the goals such as removal of tributary mouth deltas and removal of larger trees can be more predictably and efficiently achieved by mechanical means. Reconnection of groundwater with terraces (abandoned floodplains) and deposition of fine sediment on terraces cannot be achieved with flow releases up to 6,000 cfs. However, the linkage between these goals and restoration of the in-channel fishery are not apparent.
3. Hydraulic modeling and sediment-transport analyses confirm the field observations, measurements and conclusions of Wilcock et al. (1995) that flushing of fines from spawning gravels is best achieved by flows up to about 6,000 cfs in the reaches between Indian Creek and Lewiston Dam. Higher peak flows not only transport more spawning gravel into the deep bedrock-controlled pools from which they are not readily re-mobilized, but also reduce the sand-trapping efficiency of the pools.
4. In the extremely wet, wet, and normal water-year classes, the Alternate flow regime provides the minimum peak-flow duration (5 days) of 6,000 cfs to flush the fines from the spawning gravels (Wilcock et al., 1995). Increasing the peak-flow duration for 7 to 10 days would provide a wider margin of confidence. Dredging of pools to remove the sand would further limit the availability of sand within the system.
5. Significant reductions in fine sediment loading from the tributaries to the mainstem could be achieved by improving watershed management (USEPA, 2001), increasing the size of the Hamilton sediment detention ponds on Grass Valley Creek, and constructing sediment detention facilities on other high fine sediment-yielding tributaries (e.g., Hoadley Gulch).
6. Under the Preferred Alternative, gravel augmentation to mitigate the sediment budget deficit between Lewiston Dam and Rush Creek will require from 0 to 90,000 tons per year. On a probability weighted basis the expected annual volume of gravel augmentation will be about 19,000 tons, which represents about 5 10-ton truck loads per day for the entire year. In contrast, the Alternate flow regime would require from 0 to 4,000 tons per year, and an average annual volume of 2,000 tons per year.
7. The volume of augmented gravel, and therefore the costs and logistics of delivery, could be reduced significantly if targeted enhancement of existing spawning beds was practiced (Pasternack, 2003). Monitoring of the spawning beds and direct enhancement of the beds, as required, would provide an immediate benefit to the fish.

8. Mechanical removal of the tributary deltas will provide predictable and quantifiable benefit to the mainstem river in contrast to a flow-dependant approach. Mechanical removal will also permit screening of the delta se diments and return of the gravels to the river.

9. Experimental channel rehabilitation sites along the mainstem Trinity River that were constructed by the USFWS and USBR lacked a basis of design. As a result, periodic monitoring of some of the sites has been unable to generate specific criteria for selection and design of future channel restoration sites. Therefore, selection of the 44 channel-rehabilitation sites in the Preferred Alternative was not based on identified criteria, nor was the proposed treatments at the individual sites. Because of the lack of selection and design criteria, each of the 44 sites is in effect a field-scale experiment without a predictable outcome. At a minimum, selected sites should be subjected to hydraulic modeling and sedimentation analyses that will enable existing and proposed conditions to be evaluated before construction is commenced.