How Does Clearcutting Impact Water?

- **Increased erosion leading to sedimentation, nutrient loading, and decreased storage capacity**
- **Water yield changes:**
  - **§ Increased high flows from storms and spring run-off**
  - **§ Decreased low flows in summer, negatively affecting riparian & aquatic habitat**

What the experts say:

Bates and Henry conducted a 15-year study "on the effects of clearcutting in Colorado snow-zone watersheds. Their results were similar to many other studies, from the Paulini brothers [in 1607] to the present—cutting increases peak flows and increases sedimentation [in] watersheds." (Euphrat,14)

"[Study of harvest method and amount of bare ground] suggests that, per unit of ground, the potential for stream channel effects from surface soil erosion is greater on clearcuts." (Euphrat, 100)

"analysis of residuals from the rainfall-runoff relationship for large storms in the Middle and South Forks of the Mokelumne indicates that runoff is getting greater over time, with a significance at the 99% level or higher…These data indicate that, over time, these streams are increasing their total flows per storm by many percent…Timber harvesting affects runoff by its reduction of vegetation cover and subsequent impacts on the snow pack. It may be fair to say that more recent timber harvesting, affecting annually and cumulatively greater and greater areas, combined with roads, skid trails, and tree removal, is creating progressively greater runoffs from large storms, with the largest storms displaying the greatest increase of runoff." (Euphrat, 56)

"The impacts of high flow volume include:

- River basin and shoreline scouring
- Sediment transport to Pardee Reservoir, displacing water supply storage and adversely impacting water quality (turbidity, copper compounds)
- Increased plant by product (nitrogen and phosphorus) volumes entering Pardee Reservoir, accelerating eutrophication
- Higher water temperatures in flows to Pardee, compromising programs to enhance fish habitat conditions in Pardee, Camanche, and the Lower Mokelumne River." (EBMUD, 11)

What is notable, however, is the increased spread (heteroscedasticity) of the data; lows are lower and highs are higher… the streams are producing both more water in wet years, and less water in dry years. Interestingly, this effect of timber harvesting was a principal argument for conservation at the turn of the century, and a reason for which the reservation of forest area was justified by the fledgling Forest Service." (Euphrat, 45-47)

"The lowering of the lowest weekly flows, significant on Forest Creek at the 95% level, and on the South Fork at the 99.99% level, is important in terms of the riparian and aquatic habitats available in the streams of the lower Mokelumne watersheds. For fish and other aquatic species, decreased low-flows reduce available living area and increase temperatures through lack of dilution. For riparian species, low-flows change

habitat close to stream channels and allow more species that cannot tolerate perennial flooding to live adjacent to the stream. For people and animals, it restricts the amount of water available for consumption and lowers its quality, through heat and associated eutrophication." (Euphrat,60) …. Small streams appear to be most affected by and the least able to recover from this phenomenon. (Euphrat, 101)…."Observation of stream channels, as was conducted in the watershed survey, suggested that low summer flows in smaller channels are more discontinuous now than under original conditions…It appeared that a small stream, unprotected, would rapidly move from perennial to ephemeral, or from Class I to Class III under California Department of Forestry definitions." (Euphrat,60-61)

"Low flows are becoming lower, leading to elevated water temperatures… Compound effects on Forest Creek and parts of the Middle Fork are also significantly changing the shape of the stream channel and its banks….Significant effect: Elimination of anadromous fishery; severe reduction of local cold water fishery." (Euphrat, 95)

"…Poor timberland management and maintenance practices could send sediments and nutrients to the lower river, harming water quality and fish." (EBMUD, 2)

"Logging activities pose a potential threat to surface water quality because it promotes erosional transport of sediment into the waterbodies as well as animal wastes. Increased sedimentation and turbidity impedes the effectiveness of disinfection processes." (Tetra Tech, 5-9)

"As we appreciate the suite of impacts that affect the land, recall that one set of impacts may begin before a previous set has finished, and that road systems and large tree removal are essentially permanent changes. Recall also that water-driven sediment transport tends to occur watershed-wide at virtually a single instant; the largest storms will entrain most of the material that can move.." (Euphrat, 24-25)

"Cumulative watershed impacts are the result of disturbance, first, and the interplay of sediment and water, second." (Euphrat, 26)

Recommendations to SPI in the Foster Wheeler report

"Over time, develop a monitoring plan that integrates implementation monitoring, effectiveness monitoring, and adaptive management… This monitoring plan can also address any potential future issues related to use of the clearcut silvicultural system. There are two items resulting from this assessment that could be addressed in a monitoring plan. These items are:

- The use of the clearcut silvicultural method would likely result in greater water runoff from individual timber harvest units. … there is some potential for increased sediment delivery from some units either to roads or across WLPZs.[water lake protection zones]
- …there is some potential for localized increases in mass wasting when the clearcut silvicultural treatment is used in areas of steepest slopes. (Foster Wheeler, 111)

Sources cited:

- East Bay Municipal Utility District. "Protecting the Mokelumne River: A District's Response to the Proposed Divestiture of PG&E's Mokelumne River Project." Available through the East Bay Municipal Utility District website
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- Foster Wheeler Environmental Corporation. *Watershed Assessment Upper Mokelumne River, Volume I—Watershed Assessment;* Prepared for Sierra Pacific Industries. August 2000
- Tetra Tech, Inc. *UPPER MOKELUMNE RIVER SANITARY SURVEY*, Final REPORT. Prepared for Calaveras County Water District and Calaveras Public Utilities District. December 2000.

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