Clear-cut logging offers a great deal more opportunity for surface erosion and a higher likelihood of landsliding because of loss of root strength (Ziemer, **1981)** and changes in hillslope drainage. Spacek (1997) noted that slope failures in clear-cut areas may contribute a significant portion of sediment to streams during large storm events and cited a study Aerial Reconnaissance Evaluation of 1996: Storm Effects on Upland Mountainous Watersheds of Oregon and Southwest Washington (PWA, 1996c). Much of the logging currently conducted in the Gualala River basin is selective harvest that poses substantially less erosion risk (CFL, 1997). Although widespread timber harvest has taken place in the North Fork Garcia River, the use of selective harvest and road improvements have prevented additional major incursions of sediment (Hagans and Higgins, 1996).

The California Forest Practice rules allow timber harvest in riparian zones that may not be sufficient to allow recovery of coho salmon and steelhead (Spence et al, 1996). While at least 50% canopy must be maintained under the rules, only 25% of that must be conifers. In order to bring temperatures down to the range optimal for salmonids, a secondary over-story of conifers is needed (Spence et al, 1996).

Water Temperature: Although the Gualala River is not currently listed as impaired with regard to water temperature, available data suggests that temperatures are much higher than optimal for salmon and steelhead. The Oregon Department of Environmental Quality (ODEQ, 1995) states that optimal temperatures for rearing coho salmon is between 11.8-14.60 C (53-580 F). Juvenile coho salmon cease growth at 20.30 C (690 F) and their upper lethal limit is 250 C (770 F). Temperature data from Fuller Creek, Buckeye Creek, Rockpile Creek and the Wheatfield Fork of the Gualala River all exceeded optimal.

Doug Simmonds monitored both the North Fork and South Fork of Fuller Creek in 1997 (Figures 16 and 17) using automated temperature sensing devices provided by the NCRWQCB. The probes were placed in a shaded portion of the stream in flowing water, as opposed to pools which may stratify. The North Fork attained a maximum water temperature of 740 F while the South Fork water temperature reached as high as 760 F. Both creeks were over 700 F for at least some portion of the day during most of June and July. While Fuller Creek still supports steelhead trout (Cox, 1989, 1995), it is still too warm at present to be suitable for coho salmon.

Temperature data from Gualala Redwoods was available in the NCRWQCB files for Rockpile Creek at two locations and Buckeye Creek at three locations. Rockpile Creek reached a maximum of approximately 740 F in the middle reach of the stream while the maximum temperature of the lower reach was a degree cooler (730 F). Both these stream reaches exceeded stressful temperatures for salmonids for several days in June and July of 1995. Temperature sensors in Buckeye Creek showed a similar trend toward cooling in lower reaches. Maximum water temperatures in 1995 were 760 F in the upper reach, 750 F in the middle reach and 730 F in the lower reach.

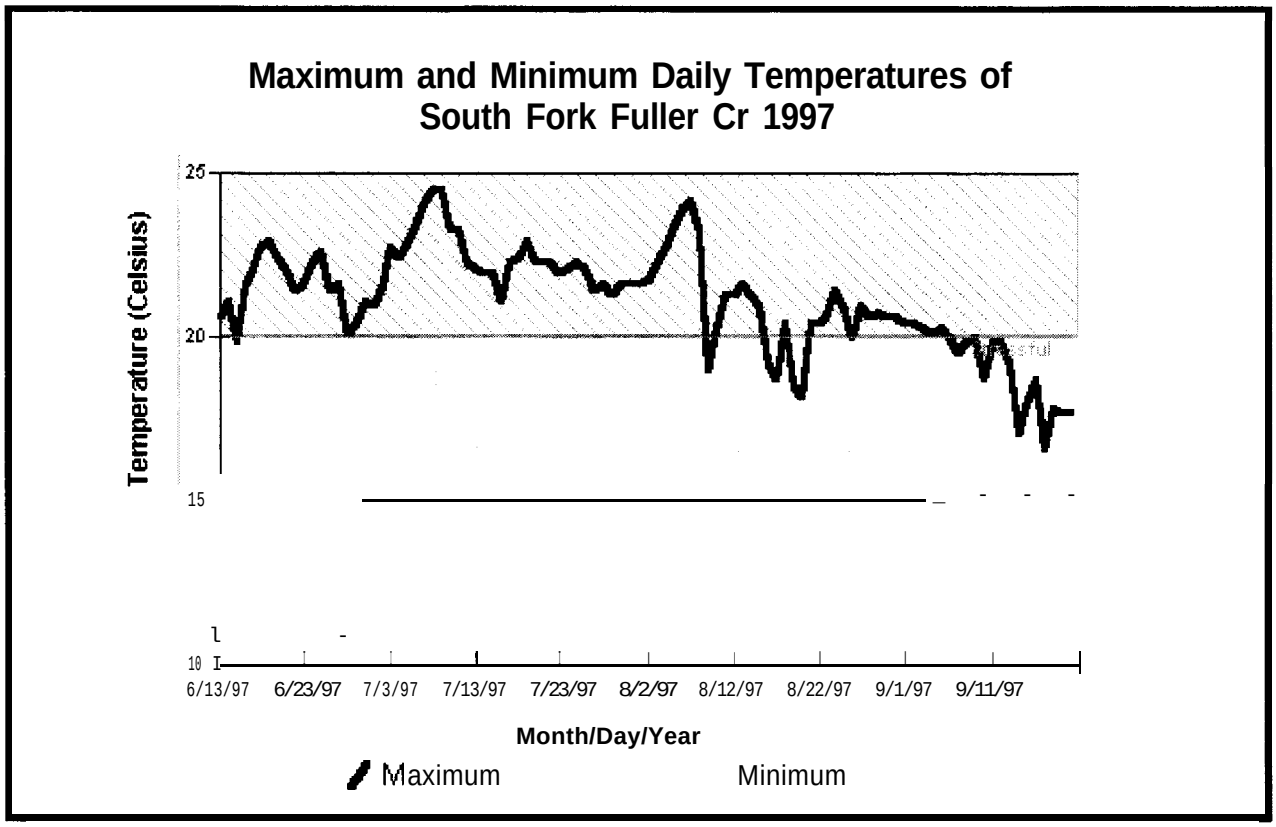

Figure 16A. Temperature graph from Hobotemp placed in S.F. Fuller From Doug Simmonds.

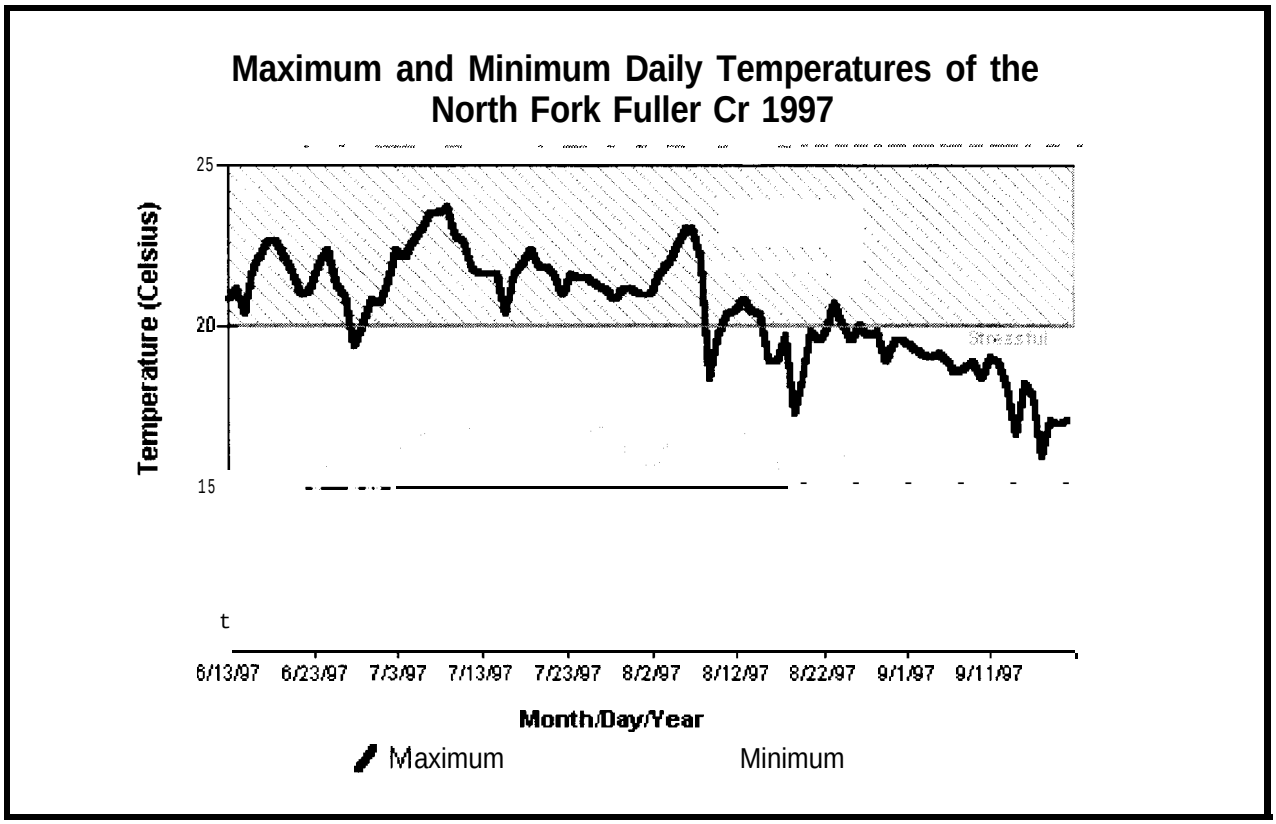

Figure 17. Water temperature from Hobotemp placed in N.F. Fuller Creek by Doug Simmonak

The highest water temperatures discovered during this project were collected by Doug Simmonds in the Wheatfield Fork of the Gualala just above Fuller Creek. The maximum water temperature recorded in 1997 was 83^0 F, which is lethal for salmonids. Water temperatures exceeded 800 F during several intervals in June, July and early August. Klein (1997), in comments on the draft of this report, noted that the Wheatfield Fork of the Gualala runs through sparsely vegetated earthflow terrain which may contribute naturally to its warming.

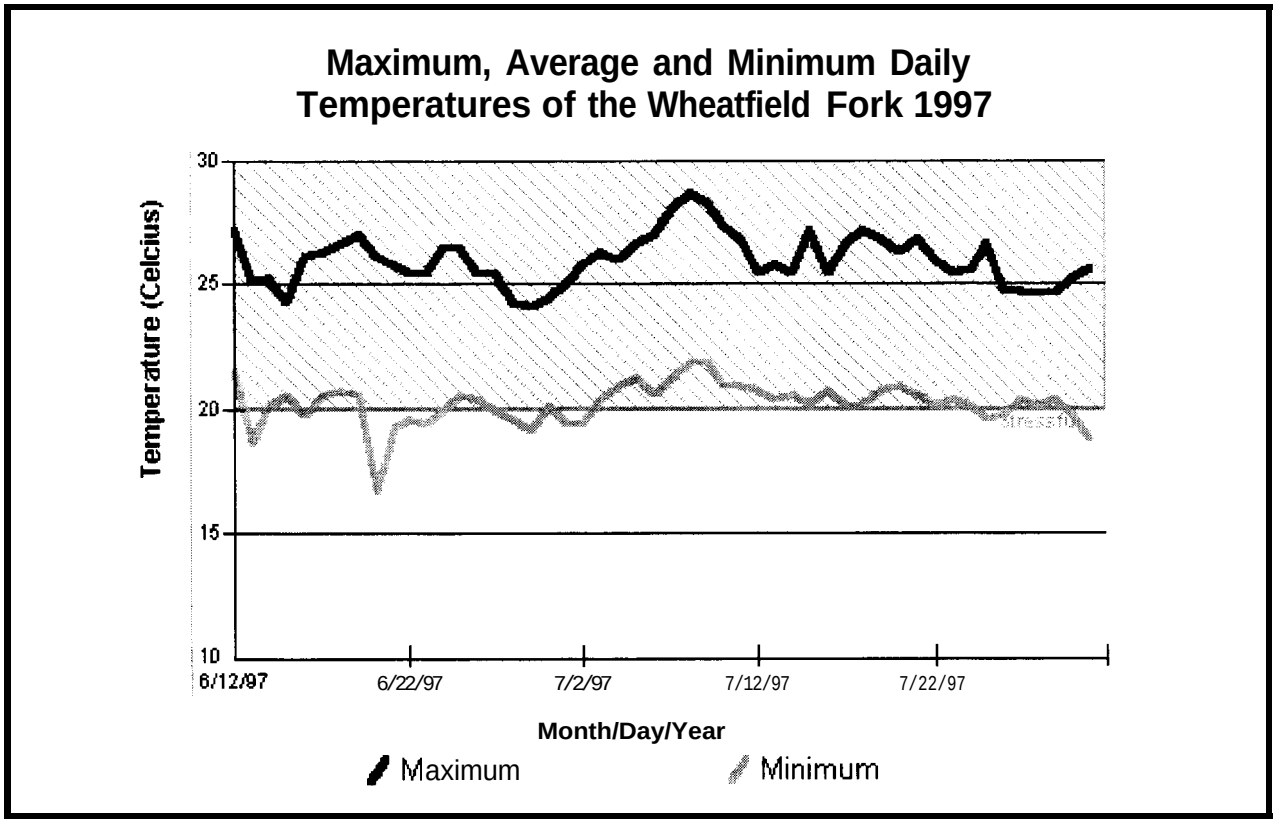

Figure 18. *Water temperature of Wheatfield Fork Gualala River as recorded by a Hobotemp placed by Doug Simmonds.*

TMDL: Water pollution has been successfully abated in the eastern United States through use of regulatory mechanism under the Clean Water Act known as Total Maximum Daily Loads (TMDL). Recently a lawsuit was brought against the U.S. Environmental Protection Agency (EPA) and the California State Water Resources Control Board for failure to enforce statutes of the Clean Water Act. Numerous northern California rivers had been recognized as impaired but no deadlines had been set to abate sources of pollution to these water bodies. The action was settled out of court when the EPA and SWRCB set a timeline for implementation of TMDL standards. The first watershed that must come into compliance is the Garcia River and a draft Garcia River Water Quality Attainment Stratew for Sediment (Mangelesdorf, in press). The Gualala River must have an attainment strategy by 200 1.