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April 13, 2007

Mr. William Snyder
Northern Region Headquarters
California Department of Forestry and Fire Protection
135 Ridgeway Avenue
Santa Rosa, CA 95401

Re: Comments on THP 1-04-260 MEN - Robinson Creek Calwater Planning Watershed, Dry Creek, North Fork Gualala River.

Dear Mr. Snyder,

I have reviewed Timber Harvest Plan 1-04-260 MEN and related documents on behalf of the Friends of the Gualala River and provide comments below on cumulative watershed effects and potential impacts to coho salmon (Oncorhynchus kisutch) and steelhead trout (Oncorhynchus mykiss). In addition to the THP, I have read relevant sections of the Coastal Ridges, LLC (2006) *Option A Sustained Yield Plan*, California Department of Fish and Game comments on the THP (CDFG, 2006), and California Department of Forestry (CDF, 1995) *Review Guidelines for Option A Timber Harvest Plans.*

I have been a consulting fisheries biologist with an office in Arcata, California since 1989. My other previous work in the Gualala River basin includes the *Gualala River Watershed Literature Search and Assimilation* (Higgins, 1997), which I compiled for the Redwood Coast Land Conservancy, and the KRIS Gualala database project (IFR, 2003) that was funded by CDF as part of the North Coast Watershed Assessment Program (NCWAP). Charts and maps presented below come from these products which have been made available in electronic form to CDF staff with my previous comments. I wish to incorporate these by reference into the record similar, previous comments on other Gualala River watershed timber harvests and vineyard conversions. Please let me know if you would like me to retransmit copies for your files.

- Artesia Timberland Conversion Permit (TCP) 02-506 and Timber Harvest Plan (THP) 1-01-171 SON near Annapolis on Patchet Creek, a tributary to the Wheatfield Fork Gualala (Higgins, 2003a),
- Seaview TCP 02-524 and THP1-01-223 SON in the upper South Fork Gualala River basin (Higgins, 2003b),
- Hanson/Whistler Timberland Conversion Permit TCP 04-530 and THP 1-04-030 SON in the Little Creek watershed, a lower tributary to Buckeye Creek (Higgins, 2004), and
- Negative Declaration for Martin TCP 04-531 and THP 1-04-059), which is also in the Little Creek watershed.

THP 1-04-260 MEN uses data selectively and tries to present a case that there are no cumulative effects, but it actually documents conditions within the THP boundaries, the adjacent watershed area and in the stream channel of Dry Creek that show the opposite. The plan claims it will fully mitigate all potential effects, but Dunne et al. (2001) point out that such mitigations cannot prevent downstream damage when too great a watershed area is disturbed in too short a period.

The Coastal Ridges, LLC (2006) *Option 10 Plan* does not deal credibly with potential restraints on timber harvest from other forest values as required by Section 913.11(a)(1) of the California Forest Practices Act (CFPA) and does not meet the requirement of the California Environmental Quality Act (CEQA) for use of "best available scientific data." THP 1-04-260 MEN will add to impairment of water quality, cause further loss of fish habitat and be counter-productive for recovery of coho salmon and steelhead trout; therefore, it should be denied at this time and allowed at a later date when "cold water" beneficial uses of Dry Creek and the North Fork Gualala River have been restored.

Cumulative Watershed Effects

THP 1-04-260 makes a rhetorical case that there is no advanced cumulative effects in the Robinson Creek Calwater, but then describes conditions that in fact reflect substantial impairment of hydrologic function and aquatic habitat. Timber harvest and road building within Dry Creek and the Robinson Creek Calwater Planning Watershed have been intensive historically and recently. Lower Dry Creek and the North Fork Gualala and its other tributaries are extremely aggraded as a result of the wave of sediment as a result of recent land management. The mainstem North Fork is shallow and warm and tributaries lose surface flow in late summer because their beds as a result of significant sediment over-supply. My prior comments also present evidence that similar problems with cumulative watershed effects related to timber harvest and stream channel aggradation occur in Buckeye Creek, Rockpile Creek, Wheatfield Fork and the South Fork Gualala River watersheds. THP 1-04-260 MEN and *CR Option 10 Plan* also fail to consider impacts from this harvest to recovery of water quality in the Gualala River basin as a whole.

Dry Creek Sub-Basin Affected by THP 1-04-260

THP 1-04-260 MEN does not adequately define the Dry Creek tributary where the harvest is to take place, which makes it difficult to understand potential cumulative watershed effects in stream channels. In fact the timber harvest encompasses an entire third order tributary of upper Dry Creek (Figure 1). The timber harvest plan map in Figure 1 is based on the original filing in 1998 by Pioneer Resources and THP data are those used by NCWAP (CA RA, 2003). Although this THP did not go forward as scheduled, CDF change scene detection data (Fischer, 2003), based on Landsat imagery from 1994 and 1998, show substantial reduction in canopy cover in adjacent basins where no THP's were filed between 1991-2001 (see Watershed Conditions discussion below).

The Dry Creek tributary where the harvest is to take place is third order stream, according to the Strahler (1957) method (Figure 2). The steepness of the watershed is reflected in the stream gradient (Figure 3), which shows that stream channels are mostly source and transport reaches, while low gradient response reaches suitable for coho salmon are downstream (Lunetta et al., 1997). Any sediment yield from THP 1-04-260 MEN can be expected to be flushed rapidly from the steep channels within this watershed and delivered to already heavily impacted reaches of lower Dry Creek. The adjacent un-named third order tributary to Dry Creek to the east has similar channel gradient and has had significant timber harvest on potential land slide zones and over an extensive area of the watershed. The THP documents a major inner gorge landslide where upper Dry Creek becomes fourth order below the convergence of the tributary slated for harvest and the adjacent previously impacted tributary. Damage at this location is consistent with rapid delivery of sediment during and increased peak discharge during the January 1997 storm event (Dunne et al., 2001). Stream channel condition and water quality impairment in lower Dry Creek demonstrated below are likely a result of these previous land use activities. THP 1-04-260 MEN and Coastal Ridges (2006) *Option 10 Plan* need to provide better maps and descriptions of the hydrology and stream channel conditions.

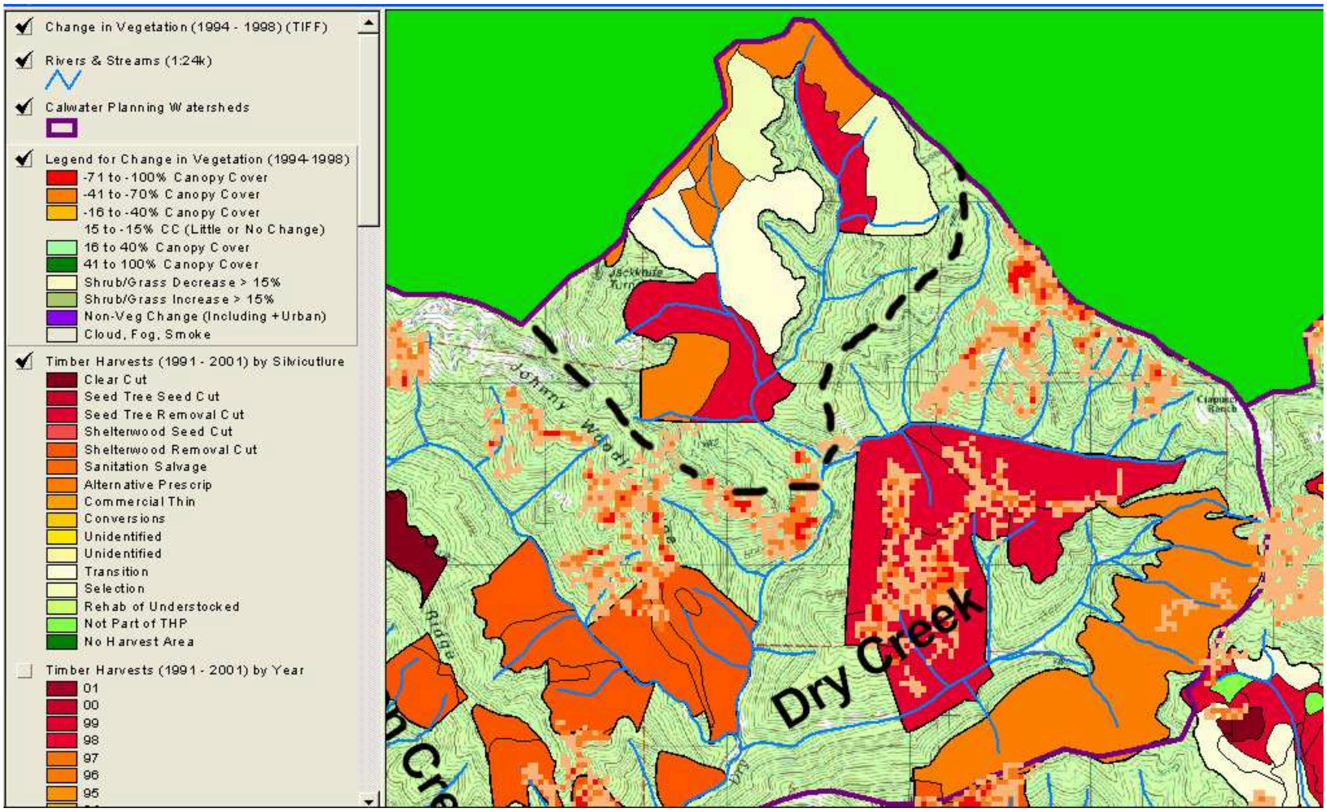

Figure 1. The headwater third order tributary of Dry Creek affected by THP 1-04-260 MEN is outlined above with a black-dashed line. THP and Landsat 1994-1998 change scene data from CDF. Map image from KRIS Gualala Map project.

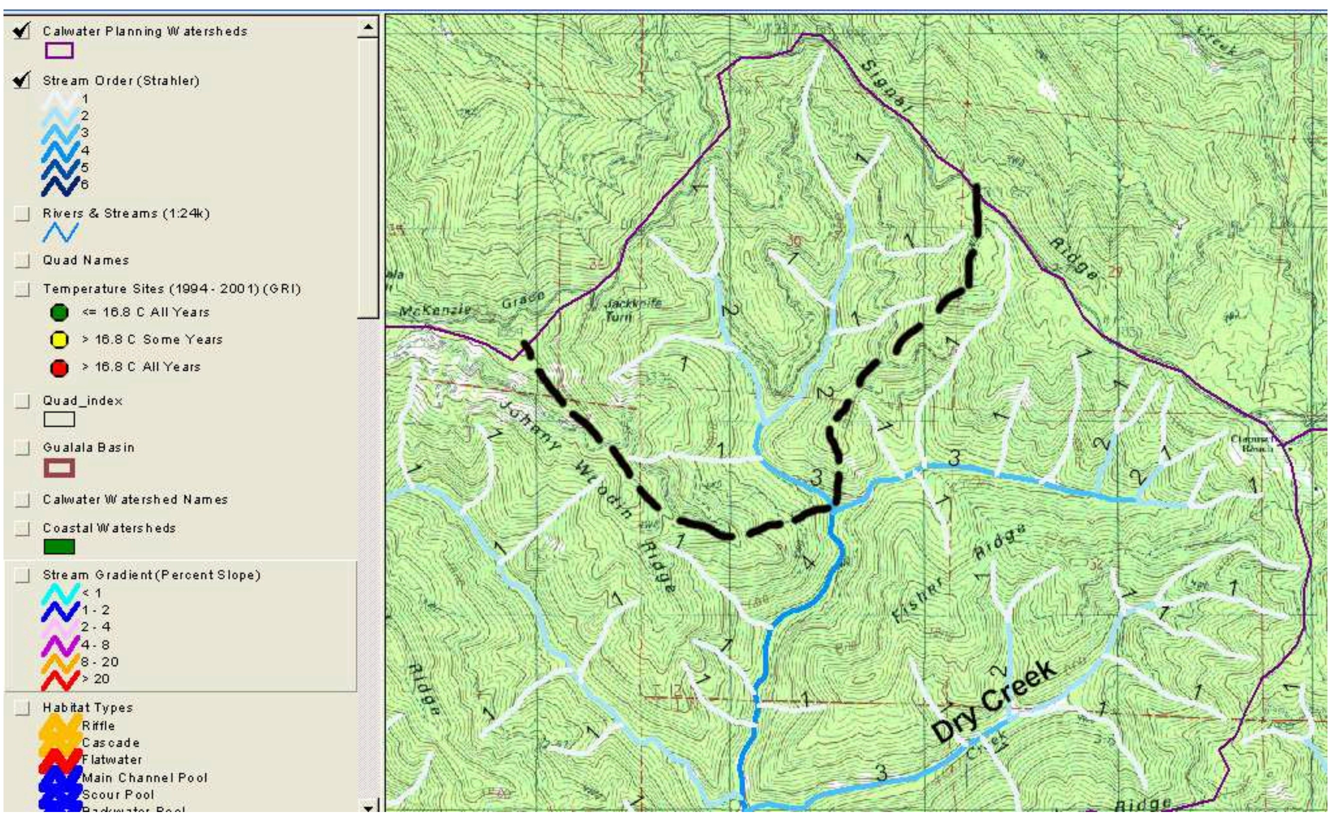

Figure 2. Strahler (1957) stream orders are displayed as numbers next to streams in the headwaters of North Fork Dry Creek, showing the third order status of the effected tributary (outlined in black) and the adjacent tributary. From KRIS Gualala Map project.

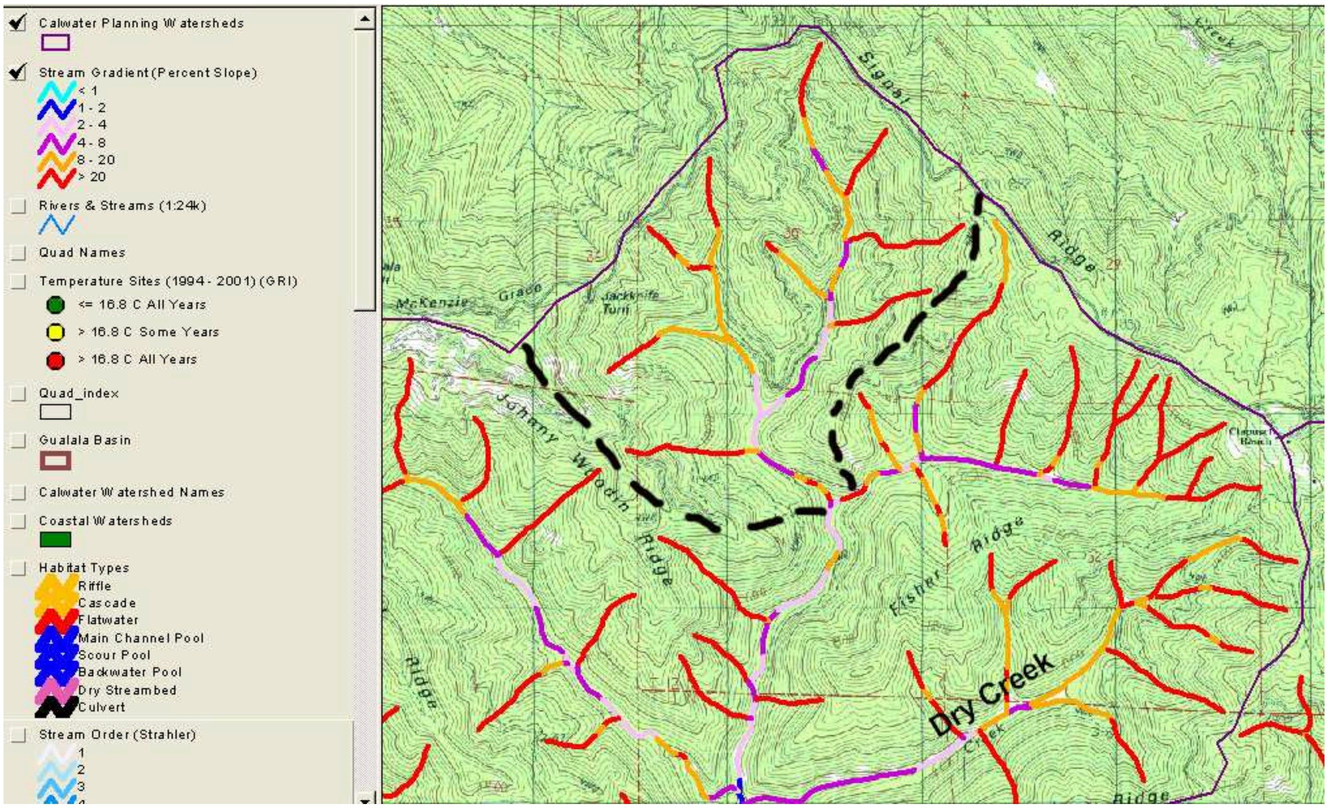

Figure 3. The majority of the stream channels in the third order Dry Creek tributary affected by THP 1-04-260 MEN are high energy. Headwaters have a gradient of greater than 20% (source reaches) and below them are 4-20% gradient channels that are transport reaches. There are only two response reaches of less than 4% gradient, where sediment storage might occur. Note that the adjacent third order Dry Creek tributary to the east has even more supply reaches. From KRIS Gualala Map project.

Stream Channel Conditions of Dry Creek, North Fork Gualala River and Other NF Tributaries

Data from CDFG 2001 habitat typing surveys and other data collected as part of the NCWAP watershed assessment (CA RA, 2003) show major problems with sediment and temperature pollution of Dry Creek, the North Fork Gualala River, and its other tributaries. The NCWAP report did not use standard scientific references for characterizing aquatic habitat conditions (IFR, 2003) and; therefore, failed to reach appropriate conclusions regarding fish habitat and water quality impairment and linkage to recent upland management.

<u>Pool Frequency</u>: Coho salmon juveniles prefer pool habitat formed by large wood (Reeves et al., 1988), and yearling and older age steelhead juveniles also reside in pools (Barnhart, 1986). Murphy et al. (1984) found that natural pool frequencies in unmanaged streams ranged between 39-67%. Peterson et al. (1992) used 50% pool frequency by length as a reference for good salmonid habitat and recognized streams with less than 38% as impaired. CDFG habitat typing surveys of the North Fork Gualala River basin (Figure 4) show Dry Creek to have a pool frequency of 25% and McGann Creek, also within the Robinson Creek Calwater, to have less than 10% pools.

Increased sediment supply can cause loss of pool frequency and depth (Montgomery and Buffington, 1993), particularly in low gradient response reaches, such as the mainstem North Fork Gualala River and flat reaches within lower Dry Creek. Reeves et al. (1993) found that pools diminished in Oregon coastal streams as the extent of timber harvest increased; basins with less than 25% of their watershed area harvested over 30 years had 10-47% more pools per 100 m than did streams in high harvest basins (>25%).

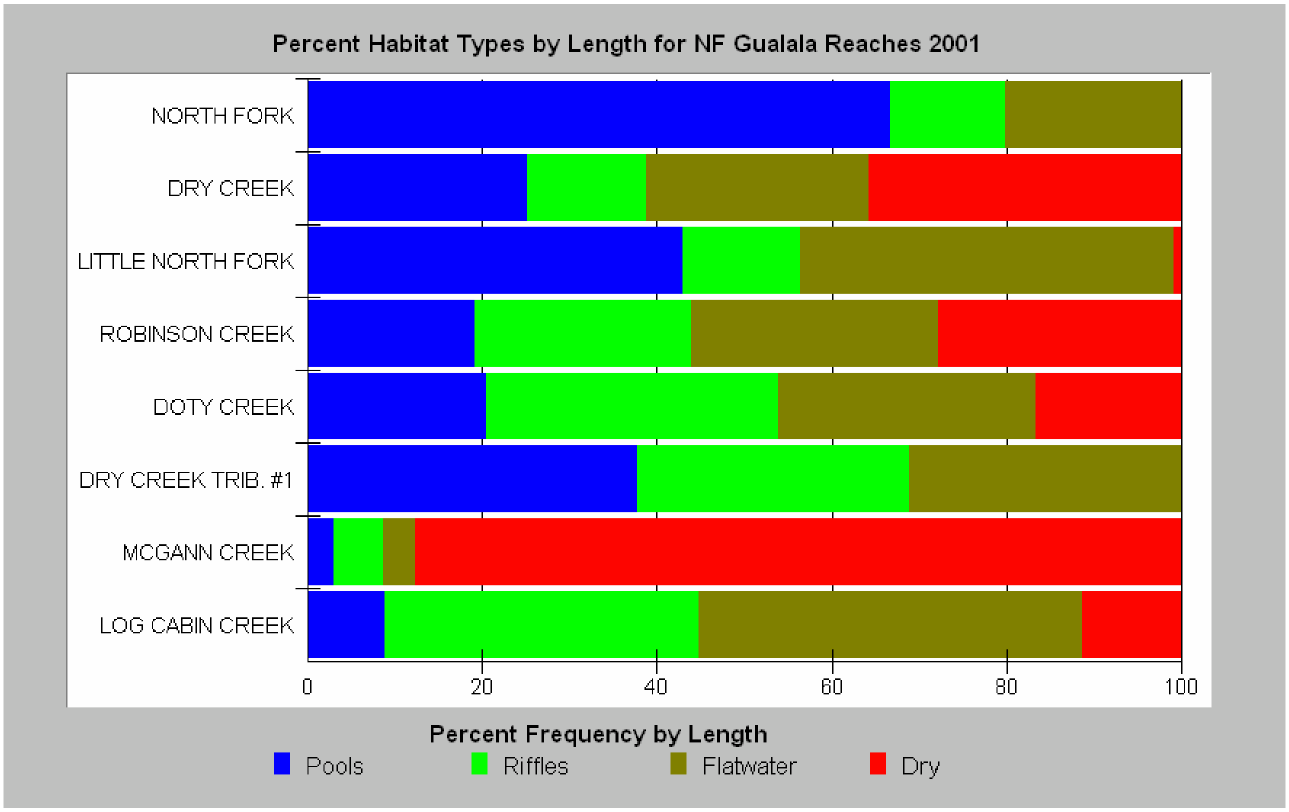

Figure 4. Habitat surveys of the NF Gualala River and its tributaries show low pool frequencies and a high percentage of dry reaches. Data from CDFG (CA RA, 2003) and chart from KRIS Gualala.

Pool Depth: Greater pool depth provides more cover and rearing space for juvenile salmonids and better shelter for migrating or spawning adults (Spence et al., 1996). Pool depths of three feet or one meter are commonly used as a reference for fully functional salmonid habitat (Overton et al., 1993; USFS, 1998; Bauer and Ralph, 1999; Brown et al., 1994). Pools within Dry Creek and NF Gualala River tributaries are almost all less than three feet (Figure 5) as a result of aggradation and are, consequently, very poor salmonid rearing habitat. The section below on Fish Status/Trends documents loss pools, pool depth and carrying capacity for salmonids in the Little North Gualala River watershed, which is adjacent to Robinson Creek Calwater to the west. The NCWAP watershed assessment (CA RA, 2003) noted that "pool depth and shelter are the most limiting factors" for the North Fork Gualala River watershed. THP 1-04-260 MEN also notes that the mainstem Dry Creek has few deep pools.

Dry Reaches: When streams are massively aggraded, they lose surface flow in late summer and early fall. This not only represents a substantial direct loss of habitat for salmonid juvenile rearing, but also prevents juvenile and adult migration. Habitat typing results from the North Fork Gualala River and its tributaries (CA RA, 2003) show that extensive reaches of Robinson Creek, Dry Creek and McGann Gulch lacked surface flow at the time of the survey (Figure 6). All three of these tributaries are within the Robinson Creek Calwater Planning Watershed and the dry reaches conform to low gradient channels that would have formerly been those preferred by coho salmon for spawning and rearing. Figure 7 shows the stream gradient of the North Fork Gualala River, lower Dry and Robinson Creeks and McGann Gulch. Reaches colored in light blue and dark blue indicate a gradient of 1-2%, and would have been optimal for coho (Groot and Margolis, 1991). Coastal Ridges, LLC (2006) and reviewing agencies fail to note that extensive reaches of North Gualala River tributaries, including Dry Creek, currently lack surface flow in late summer and fall because of severe aggradation, yet many of these reaches once supported standing crops of coho and steelhead. No further hydrologic alteration of the Gualala River basin should be allowed until sediment has been flushed from the system and surface flows restored in formerly productive reaches and tributaries.

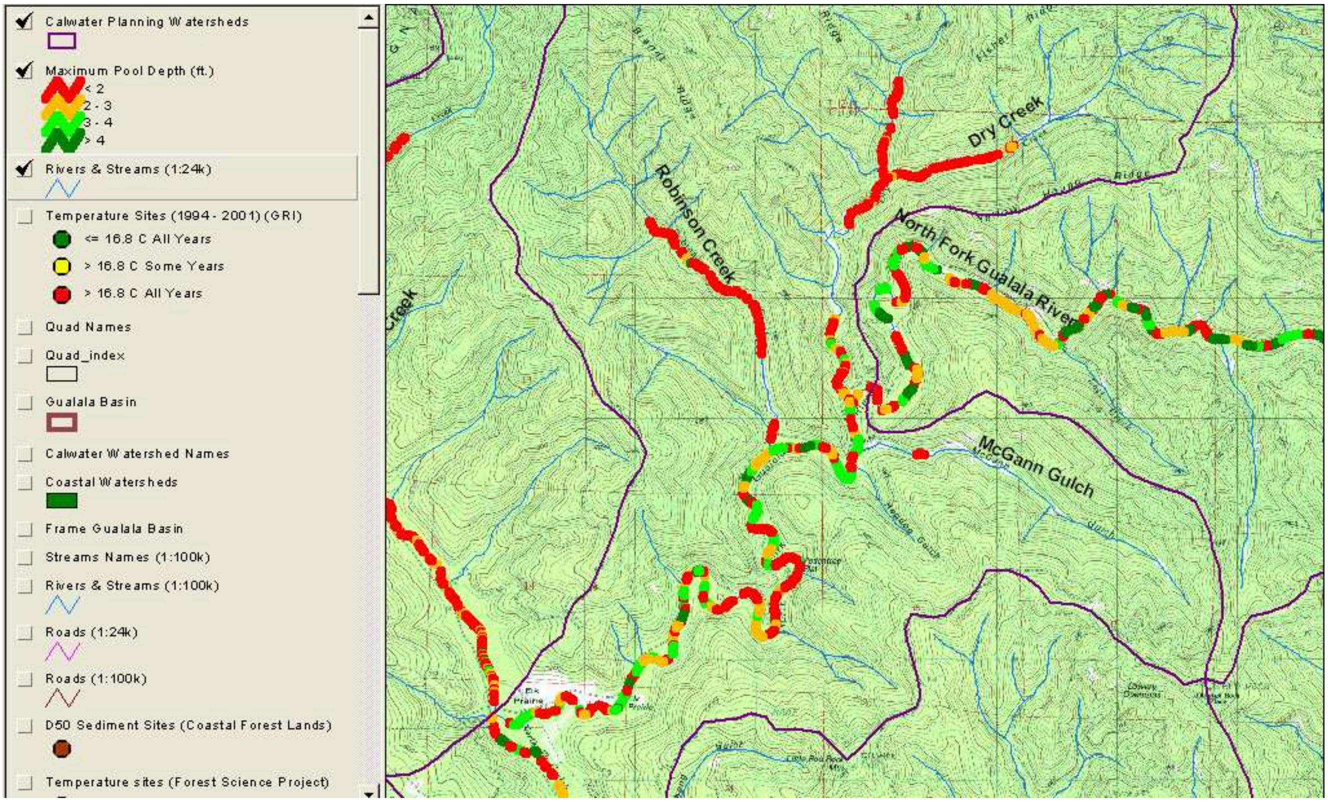

Figure 5. Pool depth in tributaries of the North Fork Gualala within the Robinson Creek Calwater Planning watershed are mostly less than three feet, including lower Dry Creek, providing little suitable habitat for coho juveniles. Data from CDFG 2001 surveys. Map from KRIS Gualala.

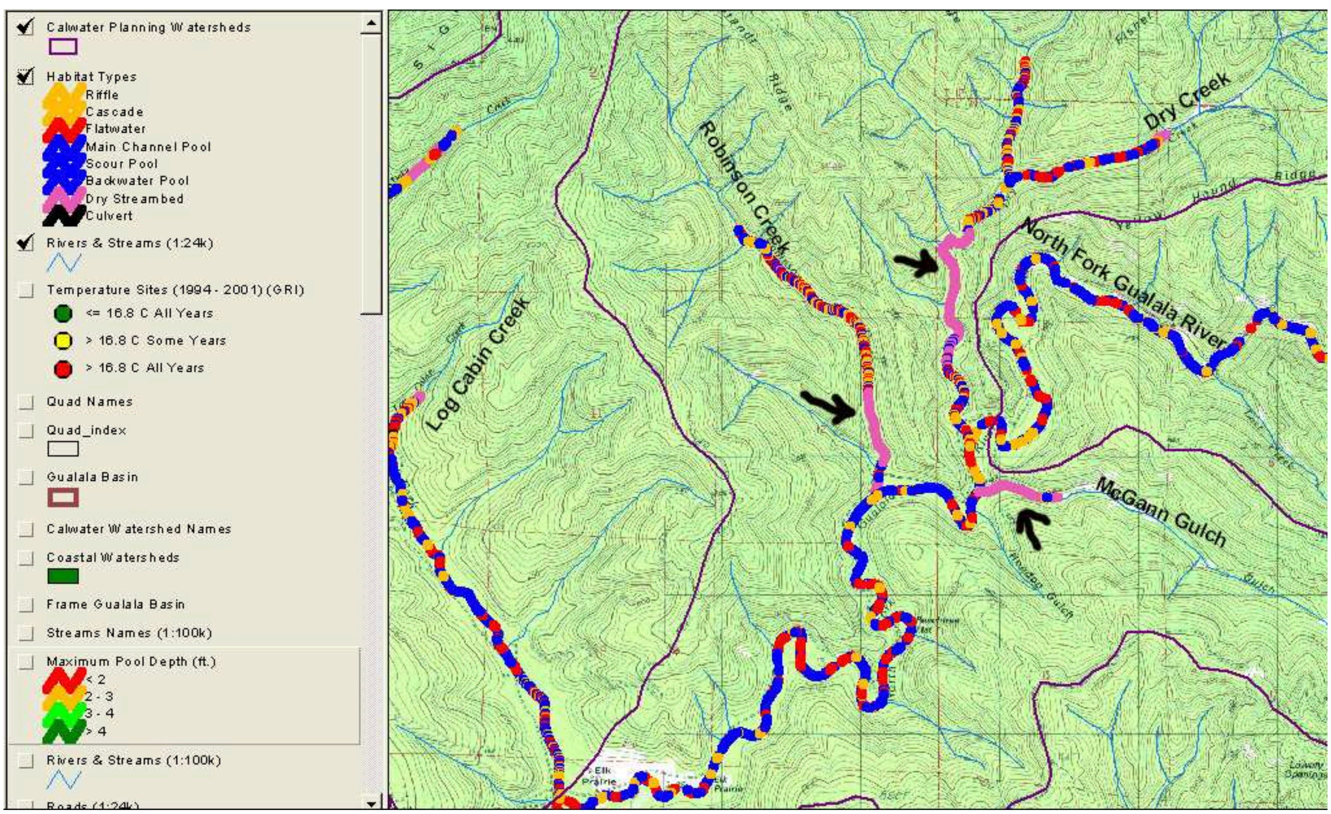

Figure 6. Black arrows point out that lower reaches of Robinson Creek, Dry Creek and McGann Gulch within the Robinson Creek Calwater are all so aggraded that they lacked surface flow at the time they were surveyed by CDFG in 2001. Map image from KRIS Gualala Map Project.

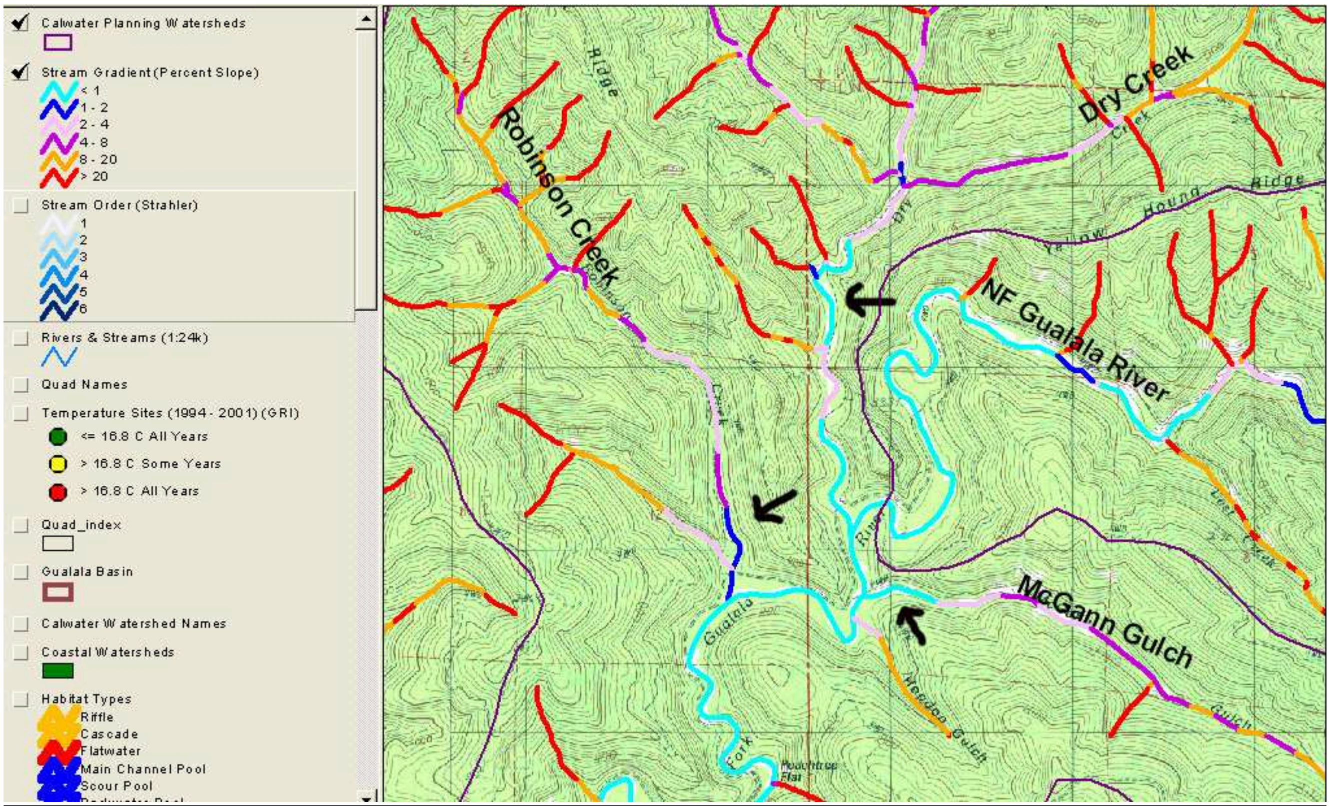

Figure 7. This map image of the North Fork Gualala River and its tributaries show that the mainstem has less than a 1% gradient and is almost all optimal for coho salmon, while reaches of suitable gradient in tributaries are near their convergence with the mainstem. Black arrows show reaches with coho-suitable gradient that were dry during CDFG habitat surveys in 2001. Map from KRIS Gualala.

<u>Median Particle Size (D50)</u>: Knopp (1993) studied 60 northwestern California streams and found a relationship between the median particle size (D50) of a stream bed and watershed conditions. Control watersheds, or those that had recovered from disturbance, had a D50 of 52-88 mm. Values of less than 38 mm were correlated with recent, intensive watershed management. Reduced median particle size often indicates increased fine sediment contributions (Montgomery and Buffington, 1993) and increases likelihood of bedload mobility that can cause egg and alevin mortality (Nawa et al., 1990).

Gualala Redwoods, Inc collected D50 data in the North Fork Gualala watershed (Figure 8) and provided it for use in the NCWAP watershed assessment (CA RA, 2003). The radical change in median particle size at location #211 near the mouth of Dry Creek is indicative of waves of sediment moving down the creek, likely as a result of debris torrents on highly erodible upland areas or as a result of high peak flows. The D50 went from 30 mm at this location in 1997, indicative of very high and recent sediment supply, to 86 mm in 1999 and then back to 45 mm in 2001. The D50 for two of three cross sections at the upstream location provided by GRI (Dry #212) is higher than optimal for salmonid spawning (110 mm and 96 mm). Larger particle size distribution can be indicative of increased shear stress associated with increased peak discharge (Montgomery and Buffington, 1993). Other locations measured by GRI in the mainstem North Fork, Robinson Creek and the Little North Fork Gualala River all had very small D50 sizes in the range recognized by Knopp (1993) as associated with intensive watershed management. This is indicative of major problems for salmonid spawning and egg and alevin survival.

THP 1-04-260 MEN provides charts of cross sections for Dry Creek based on data from Gualala Redwoods, Inc for the same locations where the D50 was measured (P. 127). The charts show major channel migration with the deepest portion of the channel (thalweg) migrating laterally from year to

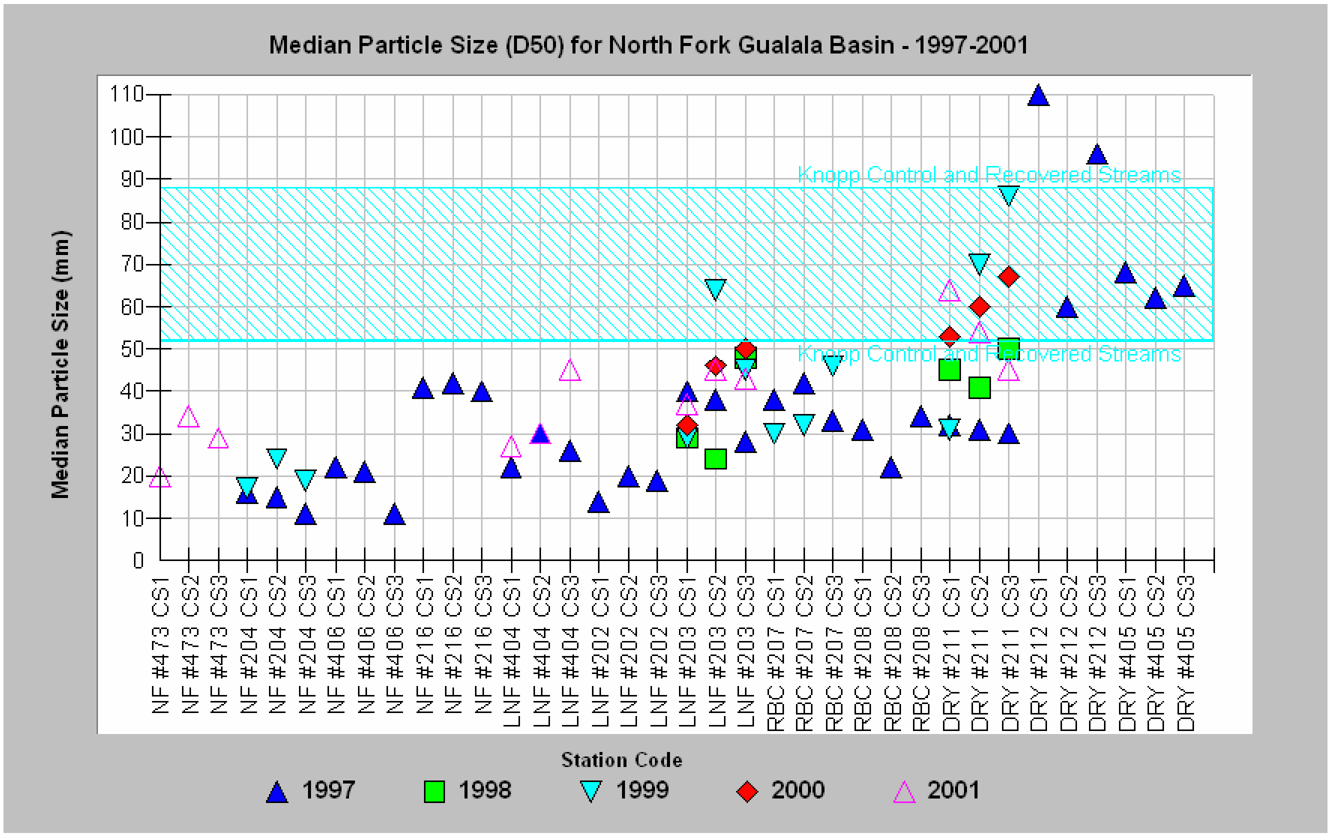

Figure 8. Measurements of median particle size at Dry Creek (DRY) cross sections (CS) from 1997 to 2001 show highly variable D50 at CS 211 near the mouth of the stream, which is indicative of recent waves of sediment pulsing through this reach. D50 at two of three cross sections in upper Dry Creek (CS 212) are higher than optimal for salmonid use, which could be as a result of elevated peak discharge.

year. Units on these charts are not supplied and there is no associated narrative, but assuming the Y-axis is in feet not meters, bed elevation is changing between four and six feet. Since coho salmon and steelhead redds are generally less than two feet deep (Groot and Margolis, 1991), the cross section data indicates that eggs and alevin in lower Dry Creek would be scoured with the bed and washed downstream or buried so deeply that they would not likely emerge.

Fine Sediment in Spawning Gravels: Small sediment particles less than 0.85 mm are known to infiltrate salmon and steelhead nests, which are excavated in the stream bed gravels, greatly decreasing survival due to smothering of the eggs (McNeil and Ahnell, 1964). McHenry et al. (1994) found that, when fine sediment (<0.85 mm) comprised 13% or greater of the substrate inside redds, it caused the mortality of steelhead and coho salmon eggs. The Gualala River TMDL (CSWRCB, 2001) set 14% as a target for fine sediment in accordance with this knowledge of potential harm to salmonid spawning. Gualala Redwoods Inc. collected fine sediment data in North Fork Gualala River tributaries from 1992 to 1997 at a time when the watershed was undergoing rapid timber harvest and a substantial increase in its road network (see CWE discussions below). Gravel grab samples showed a sharp increase in fine sediment less than 0.85 mm (Figure 9), from 10-12% of the stream bed to as high as 28% in the Little North Fork. McGann Gulch had levels of fine sediment indicative of impairment ranging from 19-26%, indicating waves of fine sediment in transport. Data is only supplied for one reach within Dry Creek (CS #211) and values show moderate impairment (15-17%) in all years except 1997, when fine sediment decreased to 12%. Although sorting after the January 1997 storm created conditions with low fine sediment in Dry Creek at CS 211, GRI quit providing this data so longer term trends are unknown.

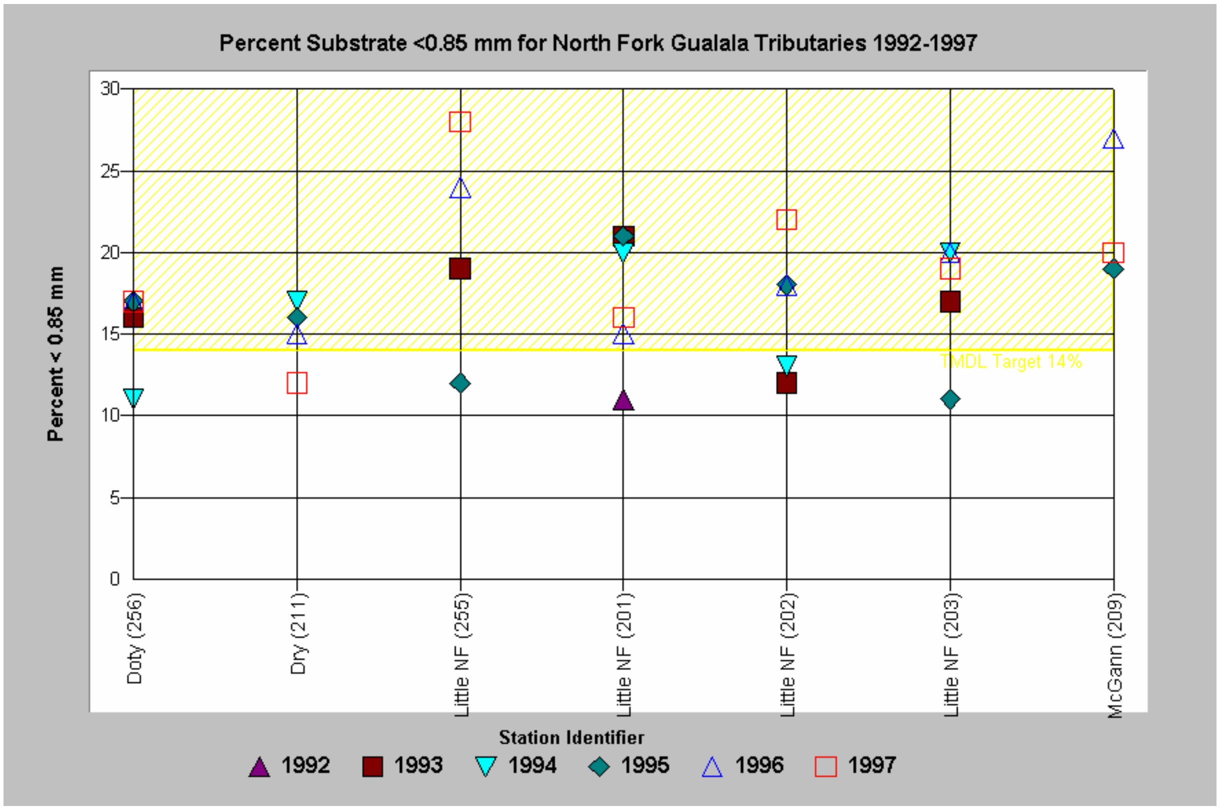

Figure 9. Fine sediment less than 0.85 mm exceeded levels recognized to be harmful to salmonid egg survival and the TMDL recognized threshold of 14% in Doty and Dry creeks, McGann Gulch and the Little North Fork Gualala River, with mostly increasing trends during the period of record. Data from Gualala Redwoods, Inc and chart from KRIS Gualala.

Water Temperature and Riparian Conditions The North Fork Gualala River is recognized as sediment impaired (NCRWQCB, 2005), but it is also temperature impaired with regard to its ability to support coho salmon juvenile rearing. Stream channel aggradation in the North Fork Gualala and its tributaries has increased width and decreased depth, which leads to increased heat exchange with the atmosphere and contributes to temperature pollution (Poole and Berman, 2000). Logging of riparian zones also has contributed to lack of stream shade and stream warming in the North Fork Gualala River basin. Extremely high bedload movement or increased flood flows related to watershed disturbance may cause scour of stream channels and loss of riparian vegetation (Montgomery and Dietrich, 1993), which contributes to stream warming. Studies are needed to assess the degree to which channel scour contributes to thermal pollution in the Dry Creek watershed.

Temperature: Coho juveniles are only found in northwestern California streams where the maximum floating weekly average water temperature is less than 16.8 Celsius (C) (Welsh et al., 2001; Hines and Ambrose, 1998). Optimal growth for steelhead also occurs in this range (Sullivan et al., 2001). The mainstem North Fork Gualala River harbored coho salmon (Park and Pool, 1964) and; therefore, once met this criterion. Temperature data collected as part of the NCWAP Gualala River watershed assessment (CA RA, 2003) and by GRI for the North Fork Gualala and tributaries (Figure 10) shows conditions too warm to support coho salmon in the mainstem and lower Dry Creek. Although the *Option 10 Plan* (CR LLC, 2006) and THP 1-04-260 MEN recognize appropriate values for optimal temperatures for coho salmon, they fail to properly characterize available water temperature data. Robinson Creek, McGann Gulch and the Little North Fork in the adjacent Calwater are cool enough to support coho, but too aggraded to provide habitat.

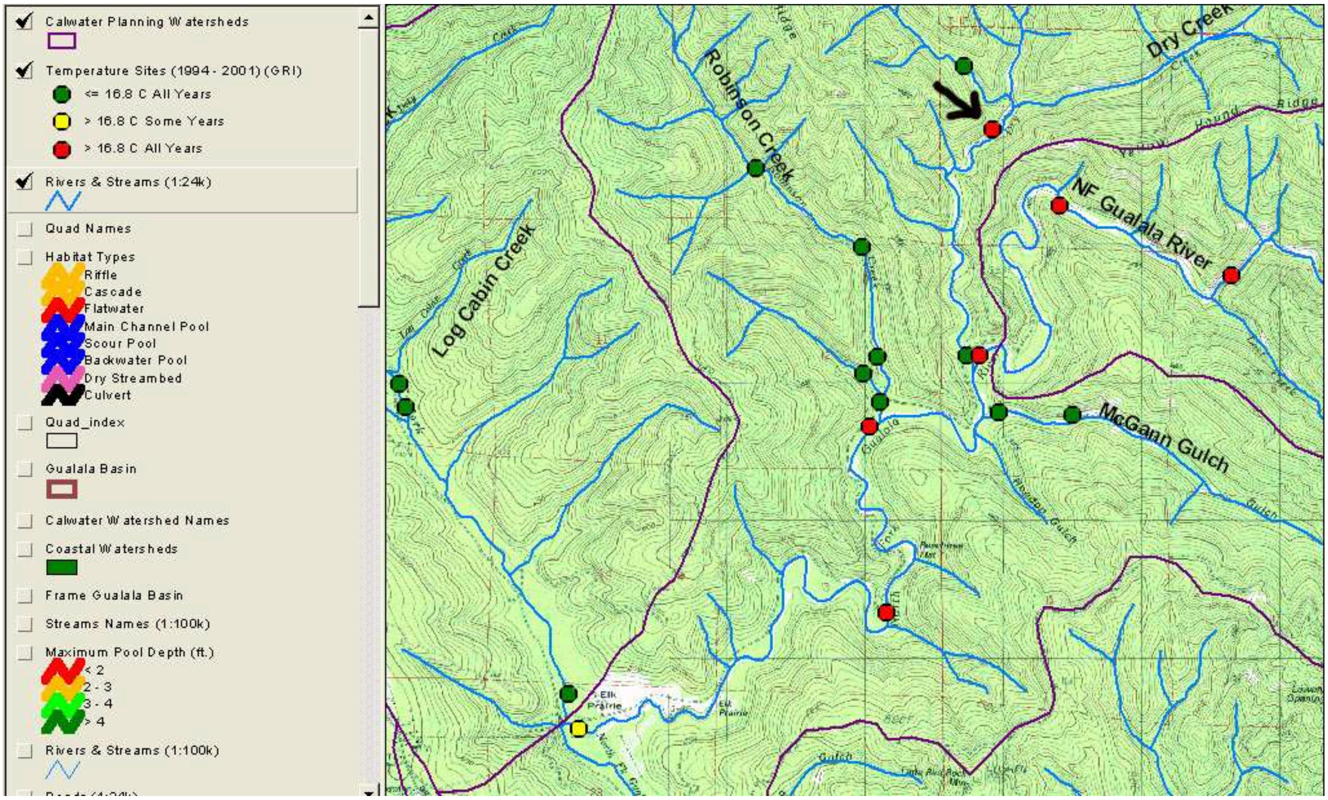

Figure 10. Water temperatures within North Fork Gualala River tributaries are generally cool enough to support coho salmon juveniles, but the mainstem is too warm for them. An exception is the middle reach of Dry Creek (black arrow), where temperatures exceeded habitable for coho. Data from CARA (2003) and map from KRIS Gualala Map Project.

The U.S. EPA (2003) points out that well distributed cool water sources must be maintained when larger rivers to which they are tributary are out of the normal range of variability with regard to temperature and likely to remain so for at least a decade. Land use with the potential to elevate tributary water temperatures should not be allowed until the North Fork Gualala River temperatures regimes are once again capable of supporting coho salmon. Brosofske et al. (1999) note that timber harvest in the riparian zones of headwater streams can affect ground water temperature, which in turn affects the temperature of surface flows.

Riparian Conditions: CDFG (2004) recognizes 80% shade canopy as optimal for preventing direct exposure of streams to sunlight and maintaining cool water temperatures for salmonids. A functional riparian zone, however, extends further from the stream and has several other important functions, such as large wood supply and as a buffer to sediment input from inner gorge landslides. Spence et al. (1996) recognized the distance equal to the potential height of riparian trees (one site potential tree height) as a minimum buffer for Pacific salmon streams. FEMAT (1993) extended that zone of influence to two site potential tree heights or to the top of any inner gorge areas on federal forest lands. Riparian conditions in these comments are also assessed using Landsat-based vegetation type and tree size within 90 meters of streams (Warbington et al., 1998) and change scene detection (Fischer, 2003) that uses 1994 and 1998 Landsat images to discern where riparian logging may have occurred.

NCWAP habitat typing (CA RA, 2003) measured stream canopy of North Fork Gualala River tributaries and Dry Creek reaches had only 60-70% canopy closure (Figure 11). Prior to disturbance the Dry Creek watershed would have had a canopy of almost all giant redwoods, but currently only about 30-35% of shade is provided by conifers. This exemplifies profound riparian alteration as a result of stream side logging and possibly episodes of stream channel scour.

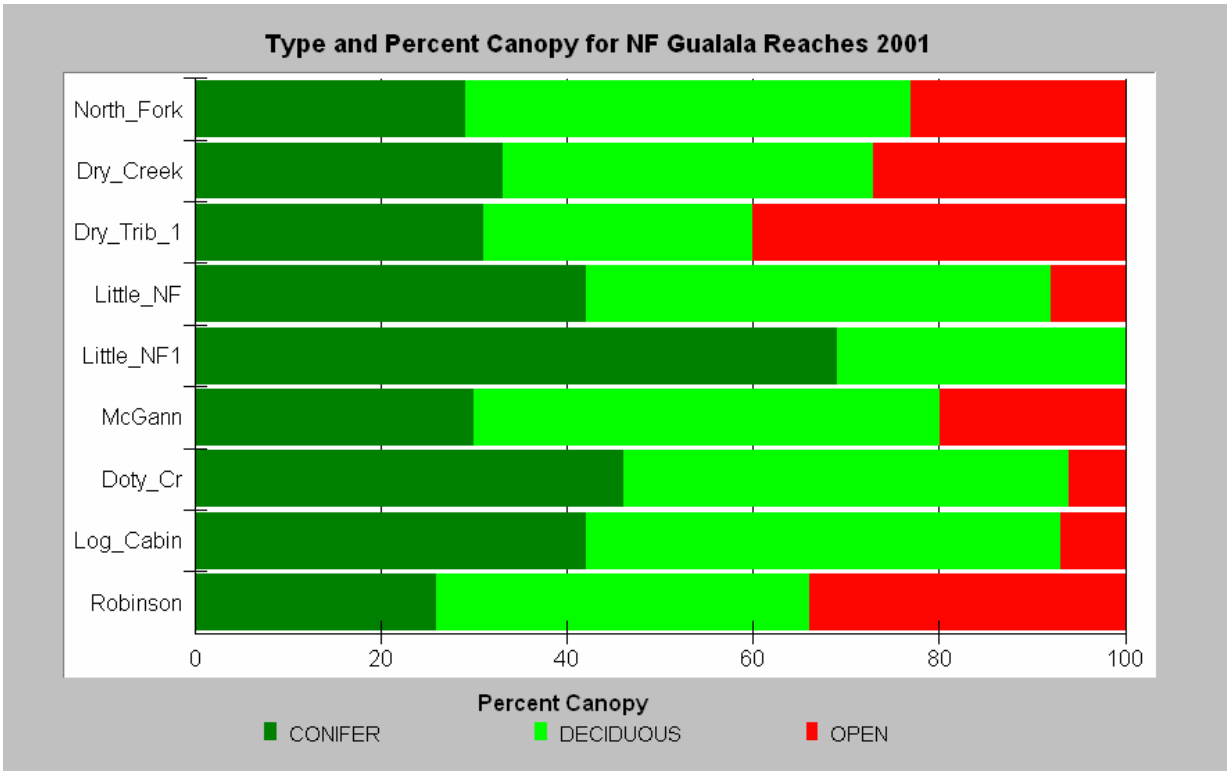

Figure 11. Canopy conditions for the North Fork Gualala shows that Dry Creek's canopy is in early seral conditions with 25-40% of the channel length lacking shade and only 25-35% comprised of coniferous trees. Data from CA RA (2003). Chart from KRIS Gualala.

Vegetation type and tree diameter data based on 1994 Landsat imagery (Warbington et al., 1998) was used to analyze the seral stage of forests within 90 meters of either side of North Fork Gualala River tributaries. The 90 meter (292.5 ft.) distance is a conservative approximation of two site potential tree heights in this redwood ecosystem where individual trees may have approached 300 ft. The one hectare resolution of Landsat imagery may miss individual large trees, but these data provide a good reconnaissance tool for understanding the seral stage of the upper North Fork Dry Creek riparian zone.

Results from the Robinson Creek Calwater Planning watershed show that there are almost no trees over 40" in diameter at breast height (dbh), approximately 1% of trees are 30-40" dbh and that more than 51% of trees are less than 20" in diameter (Figure 12). The largest component of riparian trees are between 20-30", which is still early seral conditions given the original site potential of several feet in diameter in the coastal redwood belt. These same data are displayed in map form as Figure 9 and show that the upper North Fork tributary within THP 1-04-260 MEN is similar to those in the Robinson Creek Calwater. Larger trees seem to predominate on the south side of streams, likely reflecting a bias for their protection during THP reviews to maintain stream shade. This pattern of harvest, however, has allowed long-term depletion of the near stream large wood supply.

CDF (Fischer, 2003) also supplies data that use 1994 and 1998 Landsat images to compare landscape conditions. Figure 13 shows the headwaters of the upper North Fork Dry Creek and surrounding streams within the upper Robinson Creek Calwater. Substantial riparian canopy decrease between 1994-1998 is evident in lower Dry Creek and tributaries adjacent to the proposed THP.

Small diameter trees may also be associated with alder dominated riparian zones (Figure 14). "Dry Creek, Robinson Creek, the central and higher reaches of the NF Gualala, the lower reaches of Bear and Stewart Creeks are high priorities for riparian restoration" (CA RA, 2003).

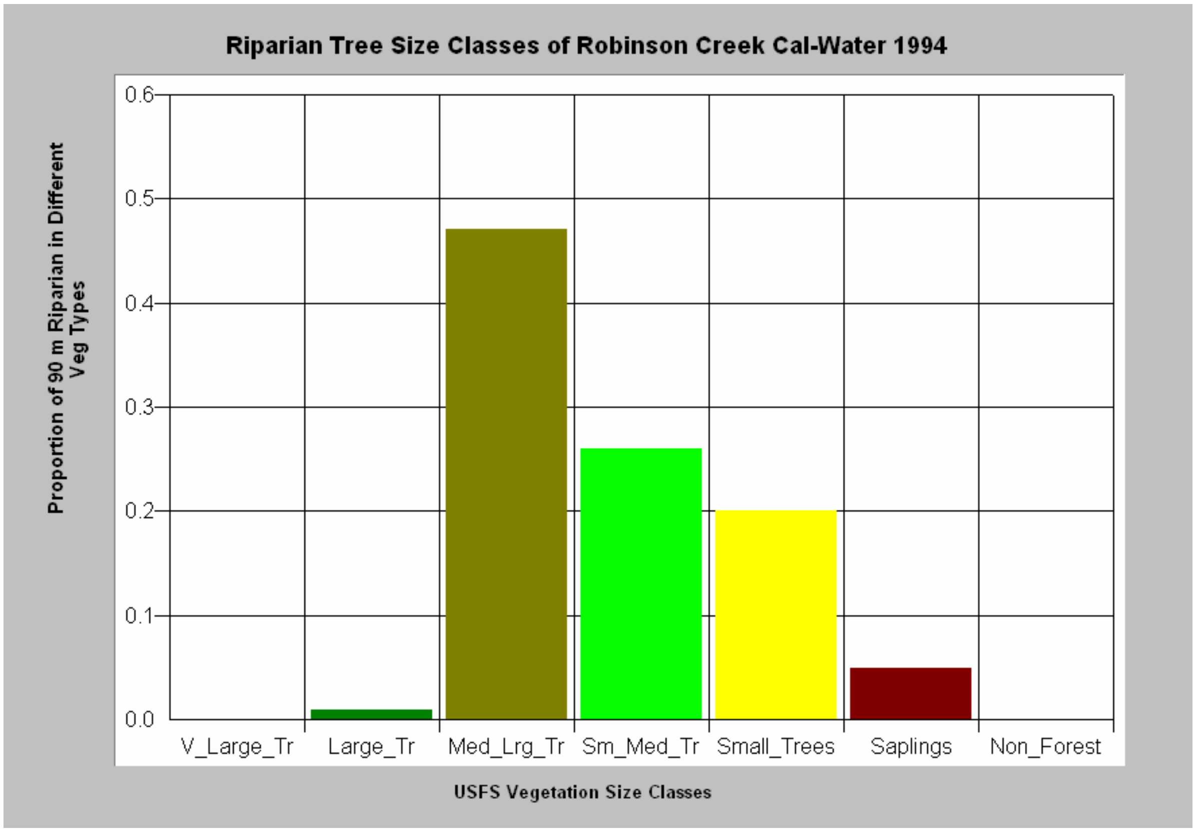

Figure 12. This bar chart shows vegetation and timber types of the riparian zone of the Robinson Creek Calwater planning watershed with no large or very large trees and 51% below 20" dbh. Data from CDF and chart from KRIS Gualala.

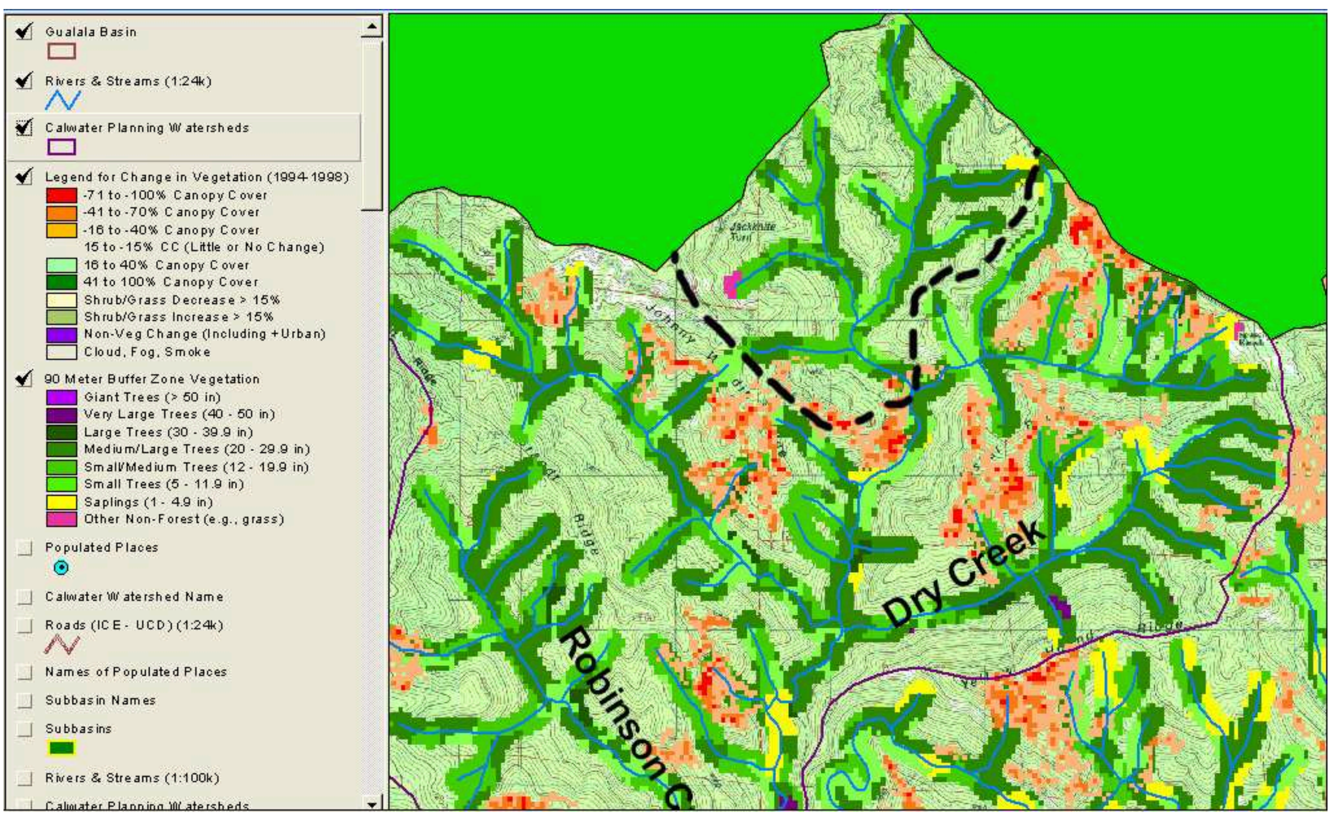

Figure 13. The riparian zone within 90 meters of Dry Creek shows very few mature conifers (>40" dbh) and only about half the trees of greater than 20" dbh. Change scene detection indicates that extensive logging took place within 90 m of streams and in adjacent areas between 1994-1998.

Figure 14. The photo at left shows the channel of the North Fork Gualala River just upstream of its convergence with the Little North Fork. The stream channel shows major signs of excess bedload with no pools in sight and smaller median particle size characteristic of aggraded streams. The riparian zone provides good cover for the stream, but is comprised of mostly alders, which do not provide long lasting habitat forming elements when contributed to streams. Photo by Dave Hope, NCRWQCB from KRIS Gualala (www.krisweb.com).

Large Wood in Streams and Potential for Recruitment

Large trees which fall into coastal streams play a dominant role in forming pools, metering sediment, trapping spawning gravels and creating a more complex stream environment. Redwoods are particularly valuable because a large tree may not decay for several hundred years (Kelly et al., 1995). Fir and spruce trees last for several decades while alder and hardwood species rot within a few years of being recruited into the stream (Cedarholm et al., 1997). The NCWAP watershed assessment (CA RA, 2003) did an inventory of large woody debris (LWD) and concluded that large wood in streams is deficient in most areas of the North Fork Gualala River basin. THP 1-04-260 MEN made the following observation regarding large wood in Dry Creek and potential recruitment:

> "Overall, LWD is lacking within the sections of Dry Creek this THP encompasses. Large events wash what little is in the creek downstream, and, little LWD enters the system, as there are not a lot of large trees along the streamside."

Elsewhere in THP 1-04-260 MEN the lower mainstem of Dry Creek is described with observations on LWD availability:

> "It appears that much of the large woody debris was removed or washed out following the original logging. Because there is a lot of rock that is not easily mobilized and a lack of large woody debris to help form plunge pools, it will take a long time for Dry Creek to develop much structure in the way of large or even medium sized pools."

Map images presented above show considerable evidence of riparian harvest in the North Fork Gualala River basin as recently as 1998 that would substantially reduce large wood recruitment potential. Pacific Watershed Associates (1998) found that timber harvest on steep, unstable areas of Bear Creek in Humboldt County increased landsliding, but slides contained little large wood. Sediment from debris torrents, instead of being caught up behind numerous large wood jams, had a runout distance that extended all the way to the conjunction of Bear Creek and the Eel River.

California Department of Fish and Game (2006) comments on THP 1-04-260 MEN stress the importance of headwater tributaries as sources of sediment and large wood:

> "Steep, intermittent streams store sediment and wood and are sources of these materials to permanently flowing streams (Benda et al., 2005). Therefore, protection of intermittent streams and their origins such as bedrock hollows and swales is important for providing habitat for

> species unique to small stream riparian areas, and maintaining the landslide- and flood-derived supplies of large woody material throughout the landscape."

The depauperate condition of riparian zones in the North Fork Gualala River due to recent logging has caused a gap in large wood availability that will take 50-100 years to recover (Bisson et al., 1987). No activity that decreases large wood recruitment should be allowed at this time. Coastal Ridges *Option 10 Plan* needs to address the issue of large wood supply in Dry Creek and in the North Fork Gualala River basin.

Upland Conditions: Risk of Degradation of Aquatic Habitat

The Coastal Ridges (2006) *Option 10 Plan* does not acknowledge the major problems in the Gualala River sediment supply as described in the Gualala River TMDL (CSWRCB, 2001) nor potential contributions of THP 1-04-260 MEN to existing problems:

> "Natural sediment yield accounts for approximately 1/3 of the total sediment delivery in the Gualala watershed while human-caused sediment delivery accounts for 2/3 of the sediment delivery in the watershed, or 200% of the natural load. The analysis shows that road-related processes are the dominant source of sediment delivery in the watershed."

THP 1-04-260 MEN tries to ascribe most sediment contributions to "natural" events and post WW II logging. In fact the relationship of land use activity and the corollary tributary impairment are similar to patterns in other scientific study results in northwestern California and throughout the Pacific Northwest.

<u>Timber Harvest:</u> Ligon et al. (1999) and Dunne et al. (2001) recognized that a critical shortcoming of the California Forest Practice Rules (CFPR) was the lack of prudent limit or threshold for timber harvest to avoid cumulative watershed effects. Reeves et al. (1992) studied eight Oregon Coastal basins that were less than 25% timber harvested and compared them to adjacent watersheds with greater harvest levels. They found that streams draining watersheds cut in over 25% of their area within a 30 year period were usually dominated by one Pacific salmon species, while basins with less disturbance maintained several species. Reeves et al. (1992) traced the root cause to channel simplification associated with pool filling and large wood depletion.

The NCWAP watershed assessment (CA RA, 2001) used timber harvest data from 1991-2001 provided by CDF. Figure 15 shows the percent area of Gualala Basin Calwater Planning Watersheds permitted for timber harvests and the extent of cumulative effects can be gauged using the reference line based on Reeves et al. (1993). Basins with very high timber harvest permitting are Red Rock Creek (79%), Lower Rockpile (56%), Stewart Creek (52%), Big Pepperwood (47%), Robinson Creek (42%) and Doty Creek (41%). Values are sums without subtraction for overlapping THPs. As in the case of THP 1-04-260 THP, not all those listed have been harvested. However, Figure 1 shows that some areas not scheduled for harvest according to CDF THP data had substantial reduction in canopy between 1994 and 1998, when examined using CDF (Fischer, 2003) interpreted Landsat imagery. The combined THP and change scene data (Figure 16) make it appear that approximately 50% of the Dry Creek basin proper has been harvest since 1991, well over the prudent risk threshold for cumulative effects described by Reeves et al. (1993).

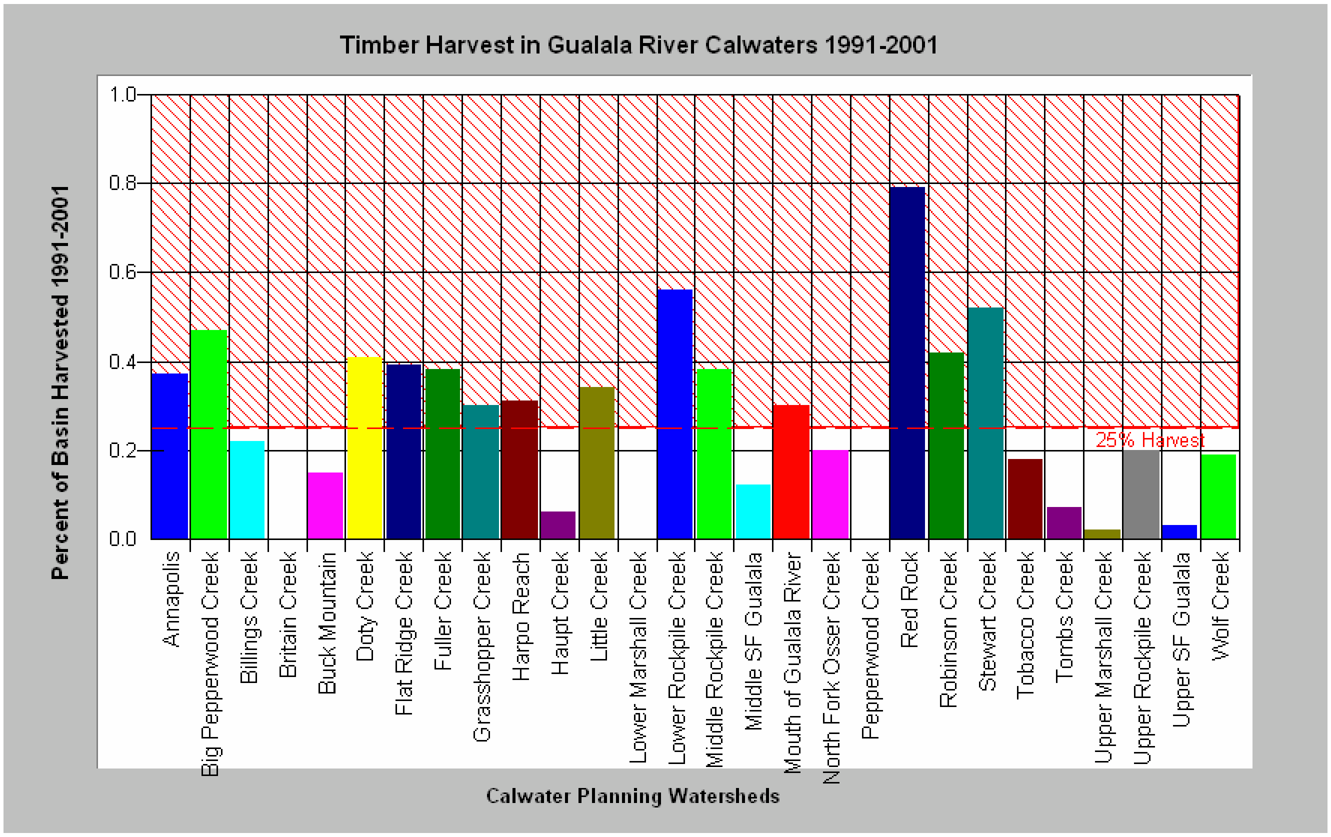

Figure 15. Timber harvests in Gualala River sub-basins according to CDF data. Reference standard of 25% harvest is based on Reeves et al. (1993). Chart from KRIS Gualala.

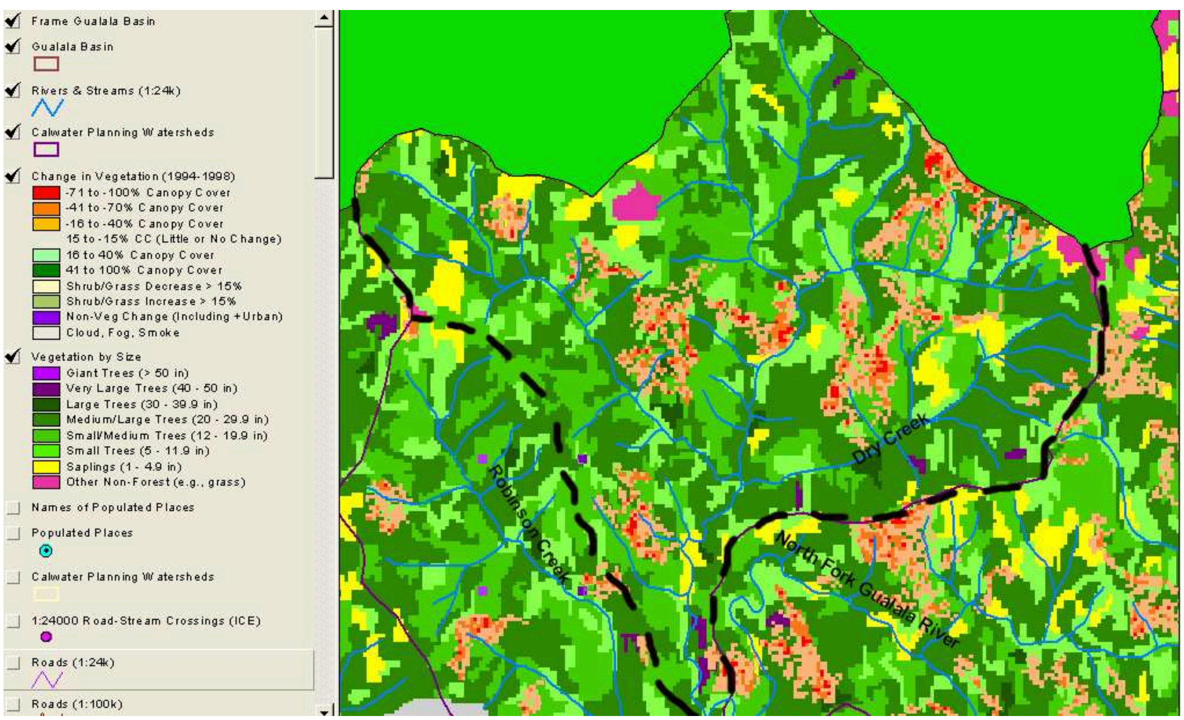

Figure 16. This map image shows Landsat-derived vegetation type and tree size displayed with 1994-1998 change scene detection, also based on Landsat images. These show that the Dry Creek watershed overall (black outline) is 30-40% small trees characteristic of early seral conditions due to logging within the 30 years prior or recently disturbed according to Landsat change scene data. Data from the USFS Spatial Analysis Lab, Sacramento, CA and CDF. From KRIS Gualala Map Project.

Changes in Peak Flow: Leopold and McBain (1995) noted that wide spread compaction related to timber harvest in the Garcia River basin elevated winter runoff. Spence et al. (1996) cited studies by McCammon (1993) and Satterland and Adams (1992) showing increased peak flows resulting from alteration of 15-30% of a watershed's vegetation and concluded "that no more than 15-20% of a watershed should be in a hydrologically immature state at any given time." USFS Landsat derived vegetation data in combination with change scene detection for the whole Dry Creek watershed (Figure 16) shows a predominance of trees less than 20" dbh and extensive areas of decreased canopy from 1994-1998. Early seral stage trees and decreased canopy are indicative of recent timber harvests and represent a level of disturbance of at least 30-40% over approximately the last 30 years. The Dry Creek watershed is, therefore, at very high risk of increased peak flows and THP 1-04-260 MEN would add to this risk.

Kamman (2003) noted the importance of infiltration in wild land hydrology and ground water recharge. Head water springs may be an important source of water during low flows of summer. THP 1-04-260 MEN mentions many locations where roads intercept spring sources. Activities around headwater springs with heavy equipment are likely to disrupt groundwater recharge and natural connections between spring areas and streams below. Cold water base flows in summer are critical to the maintenance of steelhead trout and their further disruption will make the eventual recovery of coho salmon less likely.

Road Densities, Near-Stream Roads and Road Stream Crossings: The NCWAP watershed assessment (CA RA, 2003) noted that the North Fork Gualala River watershed had the highest road density in the Gualala River Basin. The Gualala River TMDL (CSWRCB, 2001) found that sediment contribution from roads in the North Fork Gualala were the highest in the Gualala watershed (Figure 17). Roads can contribute sediment through chronic surface erosion, but mass wasting triggered by roads is a much greater source. Hagans et al. (1986) estimated that 50 to 80% of the sediment that enters northwestern California streams stems from road-related erosion. THP 1-04-260 MEN and Coastal Ridges (2006) *Option 10 Plan* do not deal credibly with road related cumulative effects potential, with no mention of prudent risk limits on road density to maintain hydrologic integrity.

Cedarholm et. al. (1981) found that road densities greater 4.2 miles of road per square mile (mi^2) of watershed yielded sediment levels 260% to 430% higher and increased fine sediment in salmon spawning gravels by 2.6 - 4.3 times over background levels. U.S. Forest Service (1996) studies in the interior Columbia River basin found that bull trout were not found in basins with road densities greater than 1.7 mi/mi^2. They ranked risk road density of greater than 4.7 mi/mi^2 as extremely high (Figure 18). National Marine Fisheries Service (1996) guidelines for salmon habitat characterize watersheds with road densities greater than 3 mi/mi^2 as "not properly functioning" while "properly functioning condition" was defined as less than or equal to 2 mi/mi^2 with no or few stream aide roads.

Road density in the Robinson Creek Calwater is 6.45 mi/mi^2 (Figure 19) and adjacent sub-basins have even greater cumulative effects risk with 7.08 and 7.7 mi/mi^2 in the Stewart Creek and Doty Creek Calwaters, respectively. The road densities estimates are conservative because electronic road maps on which they are based do not include temporary roads, abandoned roads, skid roads or landings.

Jones and Grant (1996) point out that watershed hydrology can recovery rather quickly from timber effects, but that hydrologic perturbations from road networks can persist for decades. They point out that interception of ground water flows by roads causes increased peak discharge and lower groundwater recharge. When 25% of the area of a watersheds under study was impacted by timber harvest and roads, flow increases of 50% resulted (Jones and Grant, 1996).

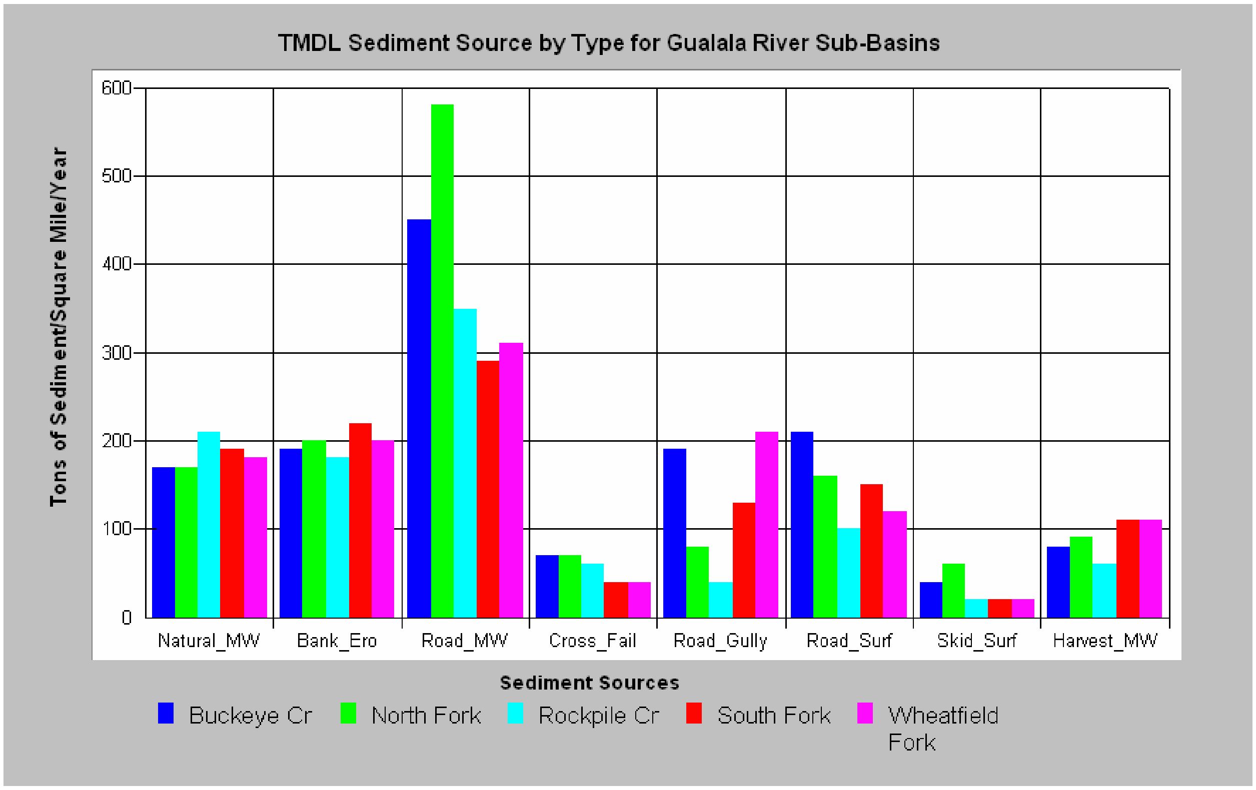

Figure 17. Gualala River TMDL estimates of sediment yield by source and sub-basin show that the North Fork Gualala has very high contributions related to roads. Data from CSWRCB (2001). Chart from KRIS Gualala.

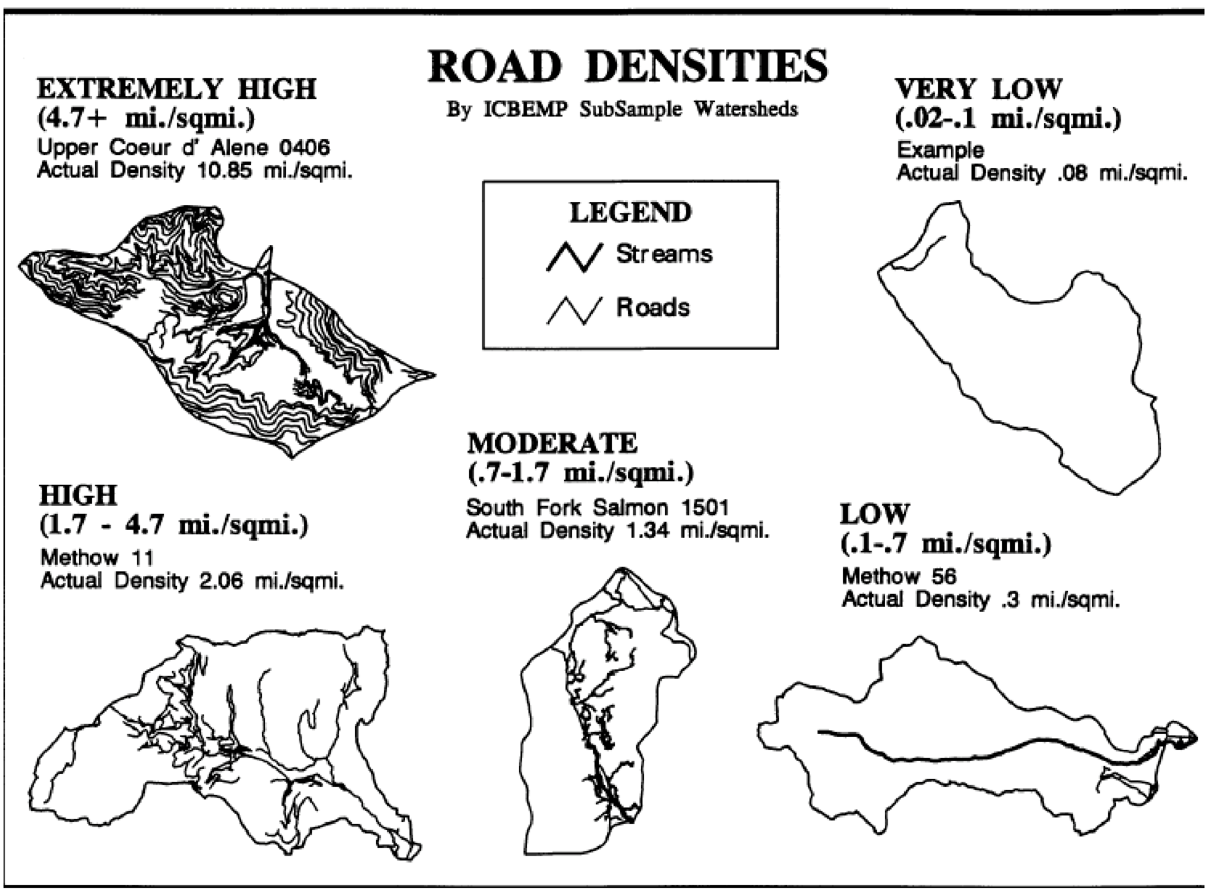

Figure 18. Road density categories from the USFS (1996) rating cumulative effects risk.

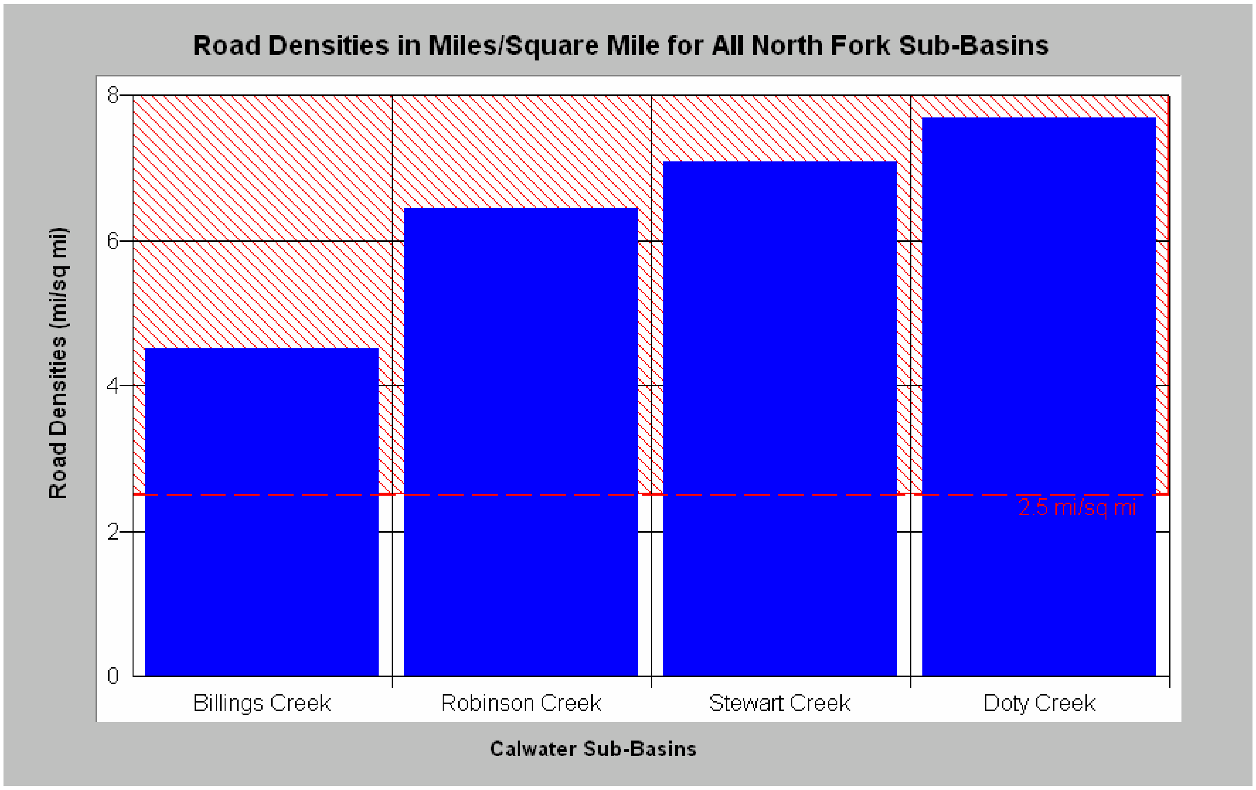

Figure 19. Road density on miles of road per square mile of watershed for the North Fork Gualala River basin showing that the Robinson Creek Calwater has over 6 mi/mi^2 of roads. Reference from NMFS (1996), data from CDF, and chart from KRIS Gualala.

Roads constructed near streams or that cross streams pose the greatest risk of sediment yield and Armentrout et al. (1999) recommended less than 2 stream crossings per mile to limit cumulative effects risk from multiple crossing failures. Both U.S. Geologic Survey 1:24000 hydrology and roads based on data from CDF are under-representative; therefore, road stream crossings estimates are very conservative. Figure 20 shows road-stream crossings and roads within the upper Dry Creek watershed proposed for harvest in THP 1-04-260 MEN. A shallow landslide stability model (Dietrich et al., 1998) map was created by IFR (2003) to assist in the NCWAP watershed assessment and landscape stability is discussed further below. Depressions in the landscape as shown as high risk zones sometimes have streams on USGS 1:24000 topo maps, but it is likely that Class II streams are unmapped but present in these locations. This is an indication of under-representation of stream crossings as well.

The description of mitigations needed at over 30 crossings in THP 1-04-260 MEN includes comments indicative of significant erosion and hydrologic disruption from the existing road system:

- The outlet has back cut some.
- The outside of the road has developed a nick point.
- Existing seasonal road crosses bank seep…..From the end of the down spout where the water hits below, there is a drop of six feet.
- The pipe was poorly installed and is a shotgun pipe with a downspout hanging off the end of the pipe. Replace with 60 feet of 30 inch pipe and install at channel grade.
- Dig a waterhole on the inside edge of the road that is 15 to 20 feet wide and 50-60 feet long. This may fill up with water because it appears there is a high water table in this area because of bank seepage and aquatic vegetation.

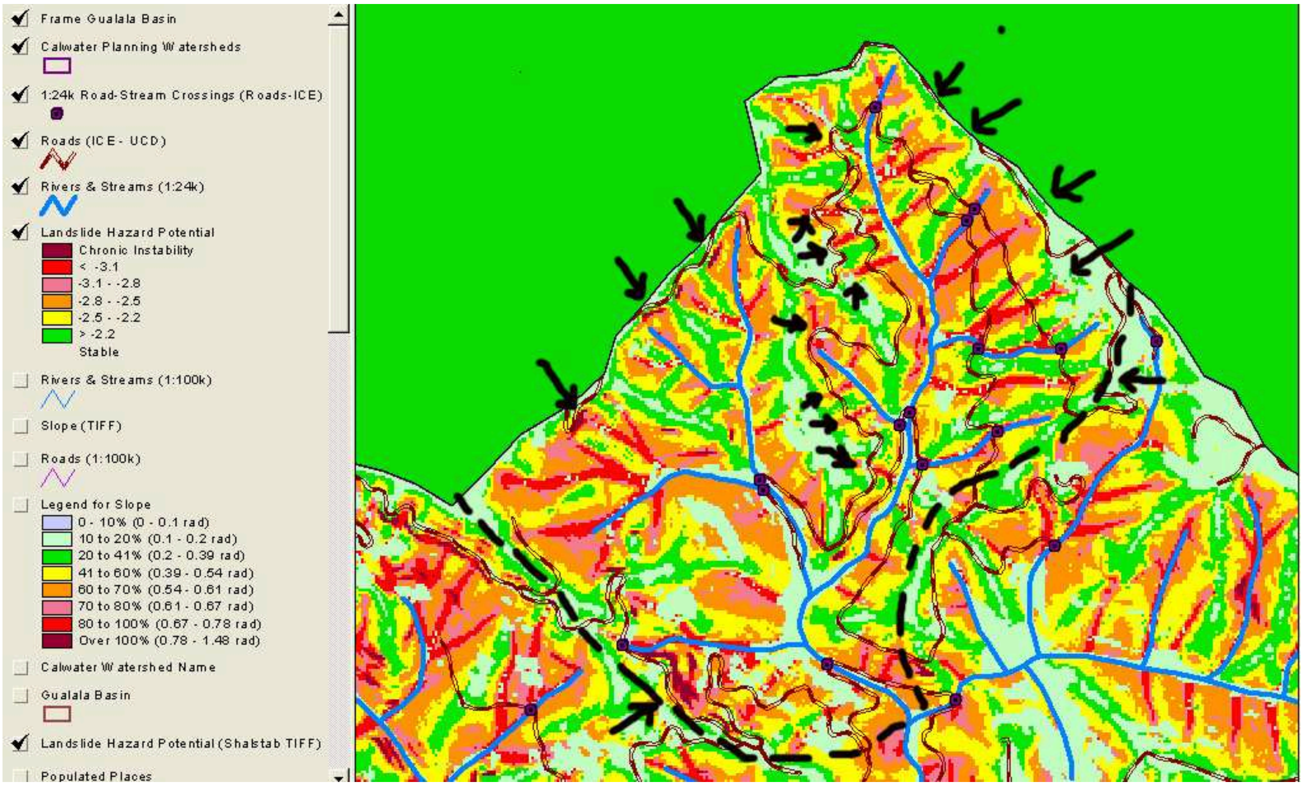

Figure 20. This map shows risk of shallow landslides, roads, and road-stream crossings in upper Dry Creek. Arrows indicate where roads cross high risk landslide zones. High risk zones are depressions often have mapped streams on 1:24000 USGS hydrology, but others do not. This suggests that streams are likely under-represented on USGS topos. Road data from CDF and SHALSTAB and crossing data by IFR. From KRIS Gualala Map Project.

- The gully cut by the diversion (through the landing) is an average of 15 feet deep and varies in width from 10 to 30 feet. It is approximately 100 feet long.
- New road cut off old road so a portion of the new road needs to be constructed leading into and out of a Class II watercourse.
- Water has flowed over the outside edge of the road and caused some fill to wash out."

The gully erosion and downcutting described above demonstrates considerable sediment yield from the existing road system. The roads are located at mid-slope and are significantly disrupting hydrology. In THP 1-04-260 MEN it states that "perennial springs protected per 916.3(d) which are identified and mapped will have a 25' Equipment Limitation Zone (ELZ) with 50% total canopy retention within the 50 feet." In fact the bullet points above demonstrate that roads have been constructed at major spring sources. The 60' long pipe described above is being used because spring flow was being captured by the road and diverted down the road bed. The suggested "waterhole" sounds like it could pose a high risk of a major torrent because its placement above the road could cause the prism to fail. Mid-slope roads in this watershed should be recontoured and abandoned, not re-activated as suggested in THP 1-04-260 MEN. All logging in this basin should be done from ridge top roads with full suspension cable operations.

Activities on Potentially Unstable Areas

The North Fork Gualala River watershed, including Robinson Creek Calwater and Dry Creek, has a major amount of steep, unstable terrain (CA RA, 2003; CSWRCB, 2001). The amount of sediment yield from timber harvest and road building can vary greatly depending on the geology and slope of the watershed area where activities take place (Dunne et al., 2001). USGS orthophotos can be used to do reconnaissance of watershed conditions in the third order tributary of upper Dry Creek to the east of the one affected by THP 1-04-260 MEN (Figure 21). The landscape is extremely steep (Figure 22) and, although road networks are not extensive, cable skid trails associated with mostly clear cut inner gorge slopes and headwalls are apparent. The SHALSTAB model (Dietrich et al., 1998) was used by the Institute for Fisheries Resources (2003) based on 10 meter digital electronic elevation data provided by CDF FRAP. SHALSTAB combines flow accumulation with slope steepness in a map that shows areas at high risk of slope failure as those with negative log rhythm values. Values from -2.8 to -3.1 represent high and very high risk and values less than -3.1 are areas of chronic instability. Although SHALSTAB cannot be used alone for regulation of timber harvest, it is a good screen for understanding cumulative effects risk. Figure 22 shows the same area as Figure 21 and patterns of disturbance associated with logging overlap substantially with SHALSTAB high risk zones.

The January 1997 storm caused 437 miles of stream channel scour on the Klamath National Forest (KNF) (de la Fuente and Elder, 1998) with many debris torrents triggered by road failure. Kier Associates (2005) found a high relationship between SHALSTAB high risk zones and subsequent slope failures in the lower Scott River watershed within the KNF: "A computer analysis showed that 80% (231 of 290) of active landslides intersect with 7% of the part of the landscape marked as very high in risk (log(qt)<-3.1)." The high degree of disturbance in the third order Dry Creek watershed adjacent to THP 1-04-260 MEN in the early 1990's is consistent with elevated sediment and water yield during December 1996 and January 1997. Unfortunately, the NCWAP watershed assessment (CA RA, 2003) failed to study relationships between disturbance of unstable areas, subsequent landsliding and effects on downstream channels so it provides no information on this hypothesis.

Figure 20 shows numerous associations of roads and high risk landslide areas within the THP 1-04-260 MEN. California Geologic Service (CGS) landslide risk maps made for the NCWAP watershed assessment (CA RA, 2003) show very high erosion potential for the area covered by the THP and operations are planned on slopes of 50-80%. THP 1-04-260 MEN mentions that timber harvest buffers above landslides may be as low as 20 feet and that logging on active slides will take place, if approved by a geologist. CGS (2006) did not address all the potential landslide risk areas shown in Figure 20 in its comments. The Coastal Ridges (2006) *Option 10 Plan* needs to discuss cumulative risk and damage of disturbance of steep slopes in the adjacent tributary of Dry Creek by previous THPs to meet requirements of CEQA.

<u>Existing Evidence of Advanced Cumulative Effects</u>: Dunne et al. (2001) describe cumulative effects potential as follows:

> "Generally speaking, the larger the proportion of the land surface that is disturbed at any time, and the larger the proportion of the land that is sensitive to severe disturbance, the larger is the downstream impact. These land-surface and channel changes can: increase runoff, degrade water quality, and alter channel and riparian conditions to make them less favorable for a large number of species that are valued by society. The impacts are typically most severe along channels immediately downstream of land surface disturbances and at the junctions of tributaries, where the effects of disturbances on many upstream sites can interact."

THP 1-04-260 MEN has a description of a major landslide just downstream of the convergence of the third order tributary where logging will take place and the one adjacent to the east:

> "There is a large somewhat active slide downstream near the center of Section 31 on the west side of the large tributary locally referred to as the North Fork Dry Creek. This slide is on an inner gorge slope with a fairly steep stream gradient below. The author first noticed the slide

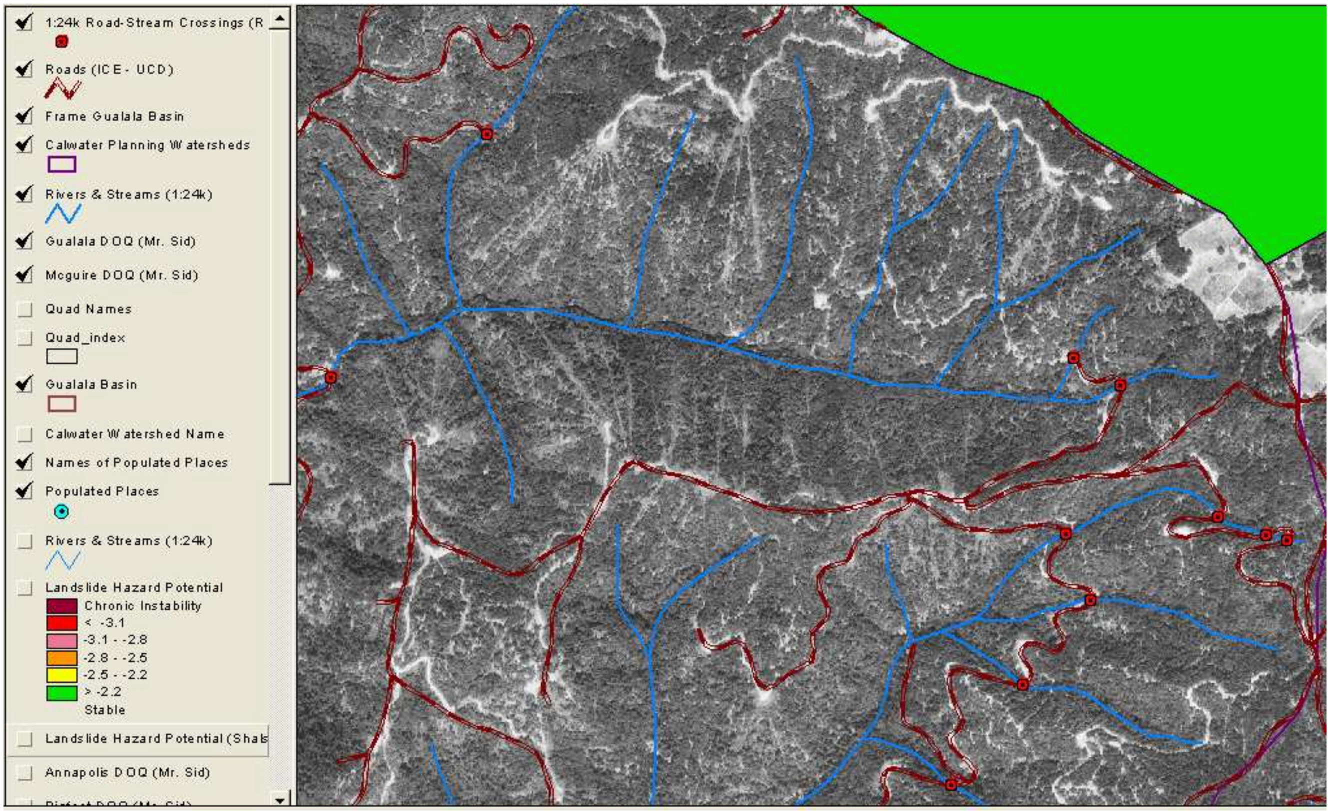

Figure 21. USGS 1996 orthophoto shows watershed conditions in the third order basin east of the one affected by THP 1-04-260 MEN, including roads, road-stream crossings and USGS 1:24000 streams. Note that many roads and skid trails are not included in electronic CDF road data.

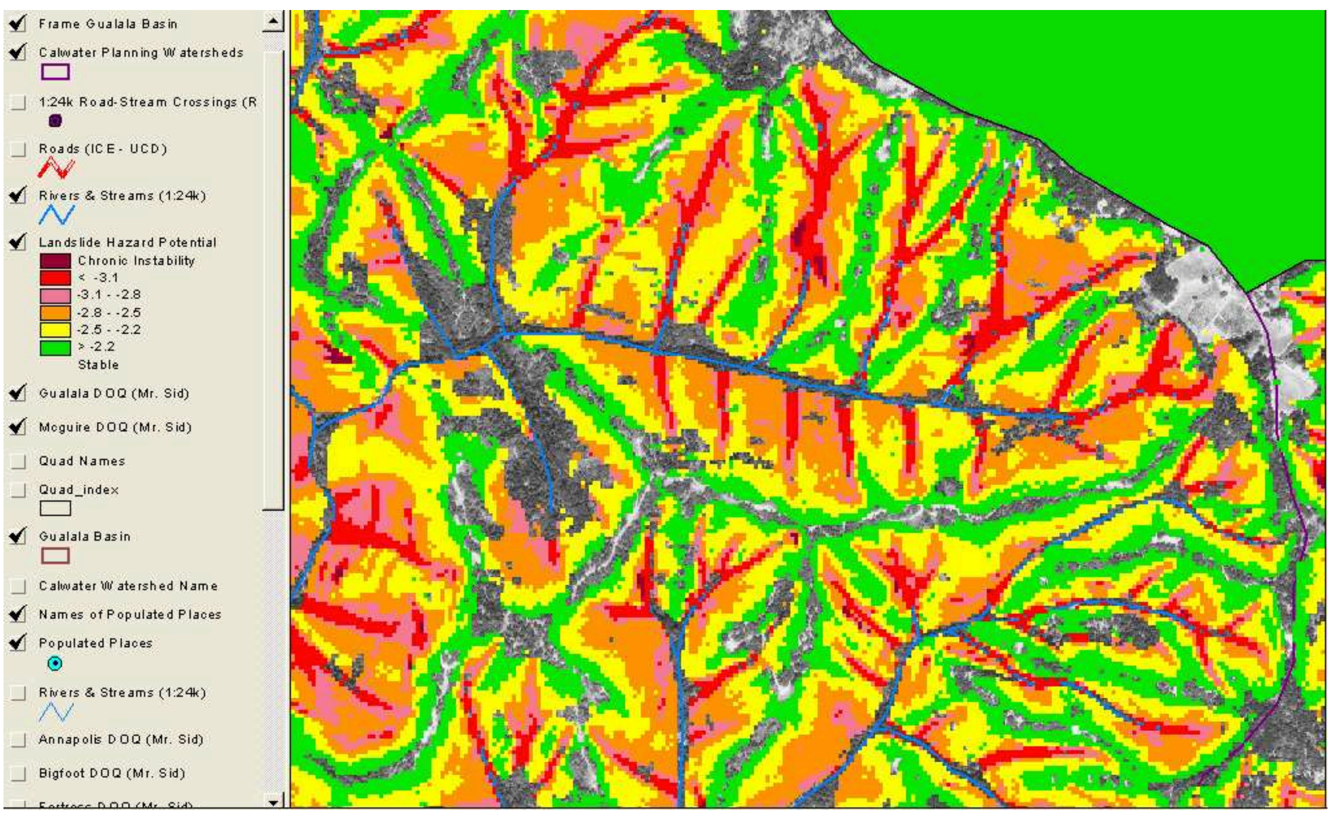

Figure 22. The SHALSTAB model run for the same geographic location as Figure 21 shows that many areas disturbed by logging and skid trails are high risk zones for shallow debris torrents. SHALSTAB by IFR based on 10m DEM from CDF. KRIS Gualala Map project.

> after heavy rains in 1996. The majority of the fines that entered the watercourse from this slide appear to have washed downstream. Short term sediment input is still expected from the slide."

The slide location is just below the tributary junction where Dunne et al. (2001) predict cumulative effects would occur. THP 1-04-260 MEN does not mention any other land use adjacent to or on the area of the landslide, but change scene detection indicates recent timber harvesting on inner gorge slopes near the center of Section 31 (Figure 23). Similarly, the SHALSTAB model for this location shows high risk in the area of timber harvest and also shows a road leading across the top of the high-risk zones in the inner gorge of Dry Creek (Figure 24). THP 1-04-260 MEN claims that landslides are due to natural geologic processes, but a more thorough analysis is needed in the Coastal Ridges (2006) *Option 10 Plan* to meet CEQA requirements on this issue.

Fish Status/Trends and THP1-04-260 MEN

THP 1-04-260 MEN states that "there are 75 miles of silver salmon habitat and 178 miles of steelhead habitat" in the Gualala River watershed and specifically recognizes that coho salmon were present in the North Fork Gualala River in the 1960's according to CDFG surveys (Parker and Pool, 1964). THP 1-04-260 MEN states that the North Fork Gualala River, Robinson Creek, Dry Creek, McGann Gulch, and Hoodoo Gulch in the vicinity of the THP "are low gradient storage reaches that provide spawning habitat for salmonids. Upslope they are fed by high gradient Class II and III water courses that provide the majority of sediment in the system." In fact habitat data from CDFG (CA RA, 2003) shows that low gradient reaches of tributaries of the North Fork Gualala River are unsuitable for coho spawning and rearing because the stream bed is highly unstable and surface flow is lost during summer and early fall.

The true status and habitat requirements of coho salmon and steelhead in the Gualala River are ignored by THP 1-04-260 MEN and Coastal Ridges' *Option 10 Plan*, with neither mentioning recent coho status reviews from the California Department of Fish and Game (2002) and the National Marine Fisheries Service (2001). CDFG (2002) acknowledges that coho in the Gualala basin are "extirpated or nearly so." THP 1-04-260 MEN relies on old Gualala Redwoods THP fisheries sections that make their status within the North Fork Gualala River watershed unclear.

Rieman et al. (1993) characterize a salmonid population as at moderate risk of extinction when:

> "Fine sediments, stream temperatures, or the availability of suitable habitats have been altered and will not recover to pre-disturbance conditions within one generation (5 years). Survival or growth rates have been reduced from those in undisturbed habitats. The population is reduced in size but no long-term trend in abundance exists."

The conditions described above fairly characterize the Gualala River and its steelhead population, while the coho population would merit a high risk classification according to Rieman et al. (1993) criteria:

> "Frequent flood or drought producing highly variable and unpredictable flows, scour events, debris torrents, or high probability of catastrophic fire through a major part of the watershed. Channel simplified providing little hydraulic complexity. Population survival and recruitment respond sharply to annual environmental events. Year class failures common."

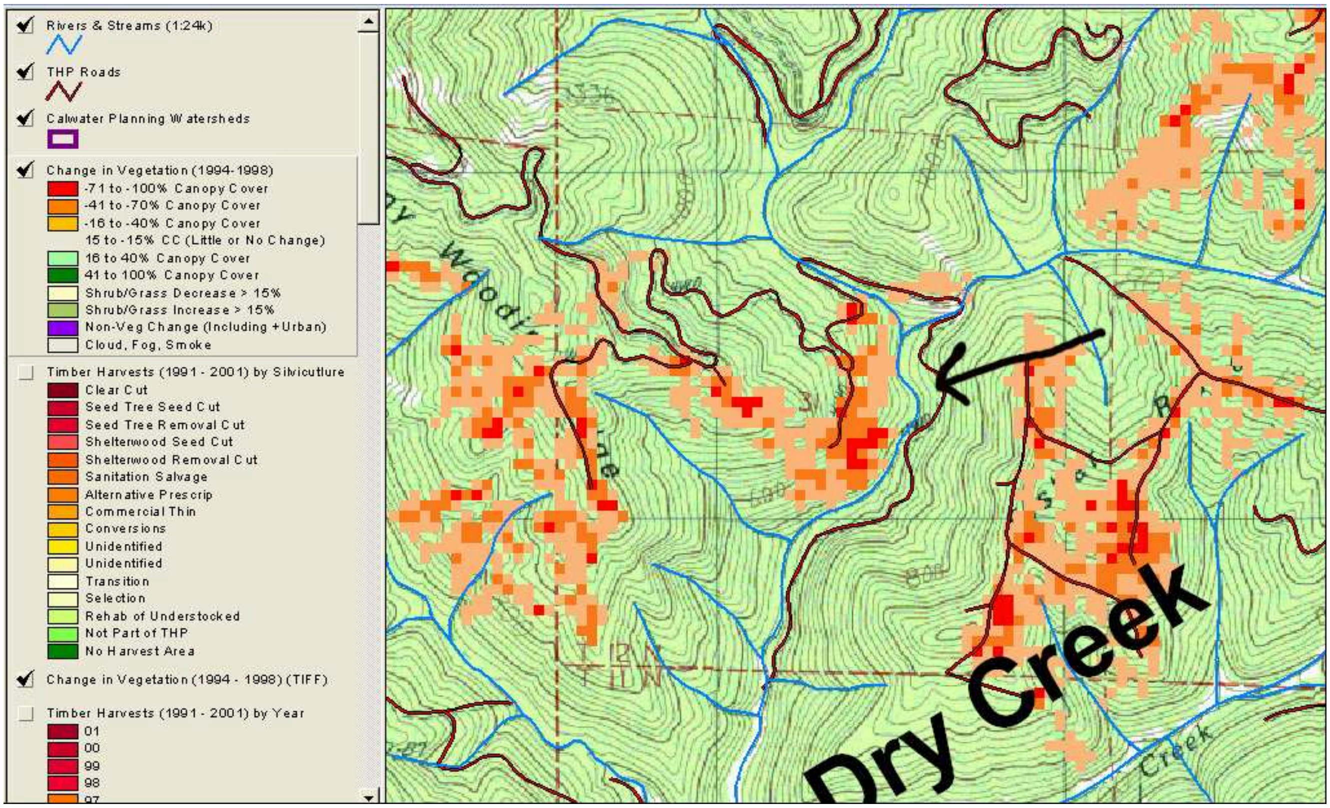

Figure 23. The black arrow points out the Dry Creek reach at the center of Section 31 where THP 1-04-260 describes a large landslide as occurring. CDF change scene detection using 1994 and 1998 Landsat imagery shows substantial canopy reduction (Fischer, 2003). KRIS Gualala Map Project.

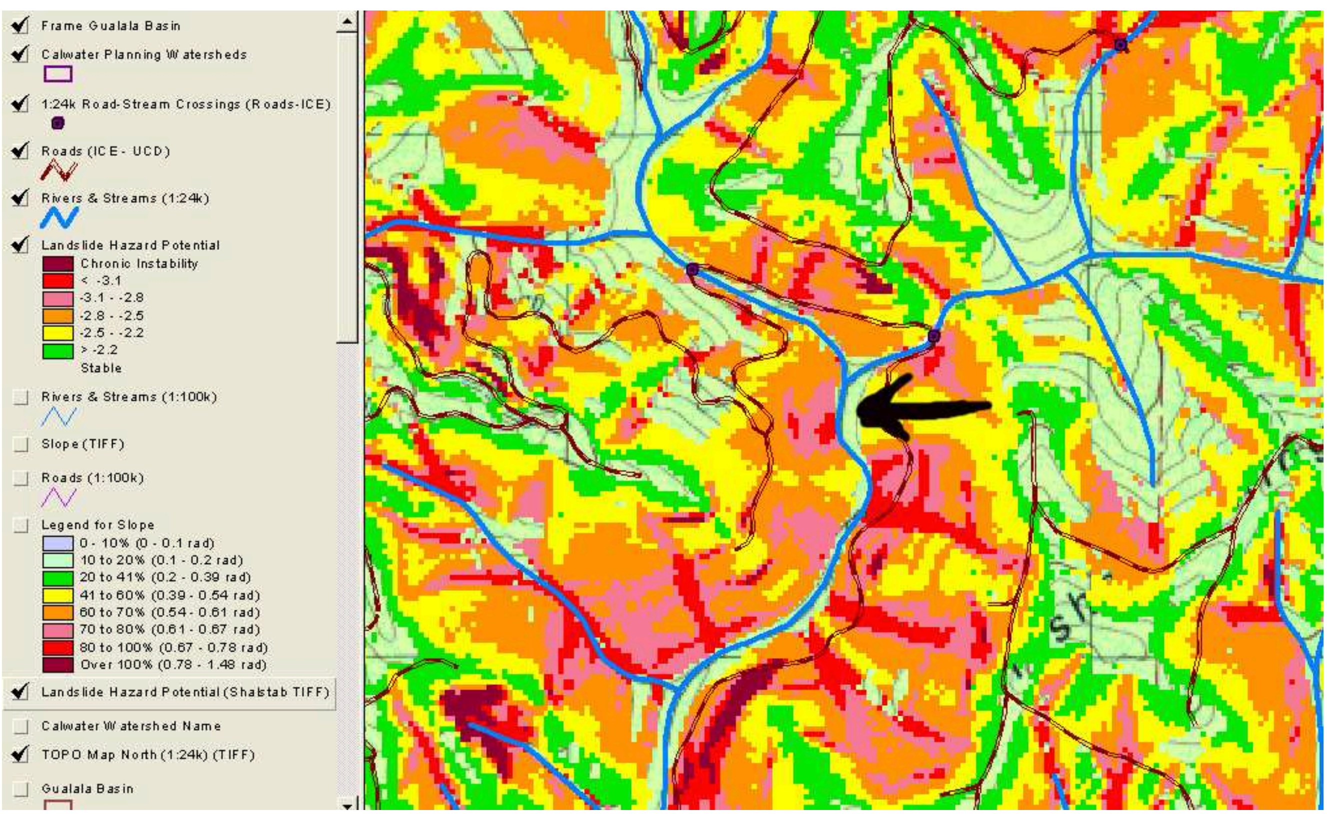

Figure 24. SHALSTAB model run for the area of the convergence of third order Dry Creek headwaters show high risk areas along the inner gorge in the vicinity of the landslide described in the THP (black arrow). Note the road location above the unstable area just downstream of the convergence.

THP 1-04-260 MEN reports planting of the Little North Fork Gualala and other tributaries North Fork tributaries with coho salmon juveniles from 1995-1998. Although the THP notes that no coho juveniles were found in dive surveys in subsequent years in the Little North Fork, it fails to draw appropriate conclusions. In fact 6,000 yearling coho were planted from 1995-1998 and at a weight of six to the pound, which is a large size that usually relates to a high return rate. With the expected survival of smolt to adult of 5% (Groot and Margolis, 1991), means that approximately 300 adult coho salmon should have returned. The occurrence of coho juveniles in 2002 noted in THP 1-04-260 MEN does not establish that coho populations are stable or healthy:

> "In September 2002, coho salmon young-of-the-year were observed in Dry Creek, a tributary to the North Fork during a snorkel survey, and at two sites on the Little North Fork and Doty Creek during electrofishing. Coho young-of-the-year were also present in McGann Gulch."

In fact, absence of coho in most years is indicative of year class failures and confirms the high risk of extinction this species in the Gualala River as noted by CDFG (2002). Ocean conditions have been favorable since 1995 as a result of a switch in the Pacific decadal oscillation cycle (Collison et al., 2003), which should have made ocean survival of smolts released from 1995-1998 high; therefore, freshwater habitat conditions are implicated. While THP 1-04-260 and the Option 10 Plan (CR LLC, 2006) both list appropriate temperature requirements for coho salmon, they do not point out that they are not being met in lower Dry Creek, below where THP 1-04-260 MEN is to take place, and downstream in the lower North Fork Gualala. The high fine sediment levels, small particle size distribution and related bed load mobility, lack of pools and warm water temperatures combined to prevent the survival of juvenile coho and re-establishment of coho salmon in the North Fork Gualala River basin.

There are little data available for tracking adult or juvenile salmonid populations in Dry Creek, but there are electrofishing data from the Little North Fork Gualala River, which is in the Doty Creek Calwater immediately to the west of the Robinson Creek Calwater. The Little North Fork watershed has been extensively clear cut since 1988 and road networks have been expanded. Long-term electrofishing data collected by CDFG in the lower Little North Fork (Figure 24) show samples dominated by steelhead young of the year but with yearling and two year old fish present. Coho salmon young of the year were sampled only in 1988. The standing crop of steelhead juveniles has decreased in number and density, particularly since 1992. This is not consistent with flow and water years, as 1992 was at the end of a five year drought and years since 1995 have been wet. Wet years should have increased available habitat and standing crops.

IFR (2003) obtained habitat typing data for the North Fork Gualala and Little North Fork collected in 1994 by Entrix, Inc.(1995) that was used for comparison with similar CDFG data collected in 2001 (CA RA, 2003) (Figure 26). The number of pools deeper than three feet deep decreased in both the Little North Fork and North Fork Gualala. The North Fork shows the most significant change in terms of loss of fish habitat, with the disappearance of 22 fewer pools deeper than four feet and six fewer pools between 3-4 feet in depth. The loss of pools in the Little North Fork Gualala River is consistent with high sediment delivery between 1994 and 2001 and reduced standing crop of salmonid juveniles. Although channel processes within Dry Creek are different than those of the Little North Fork because of differences in channel gradient and confinement, high sediment yield, peak flows and resulting channel changes have likely similarly decreased salmonid carrying capacity in Dry Creek. The widespread problems with high rates of timber harvest and extensive road networks throughout the Gualala River watershed have lead to a press disturbance (Collison et al., 2003) resulting in no coho being found in over 100 miles of stream surveys by CDFG in 2001 (CA RA, 2003).

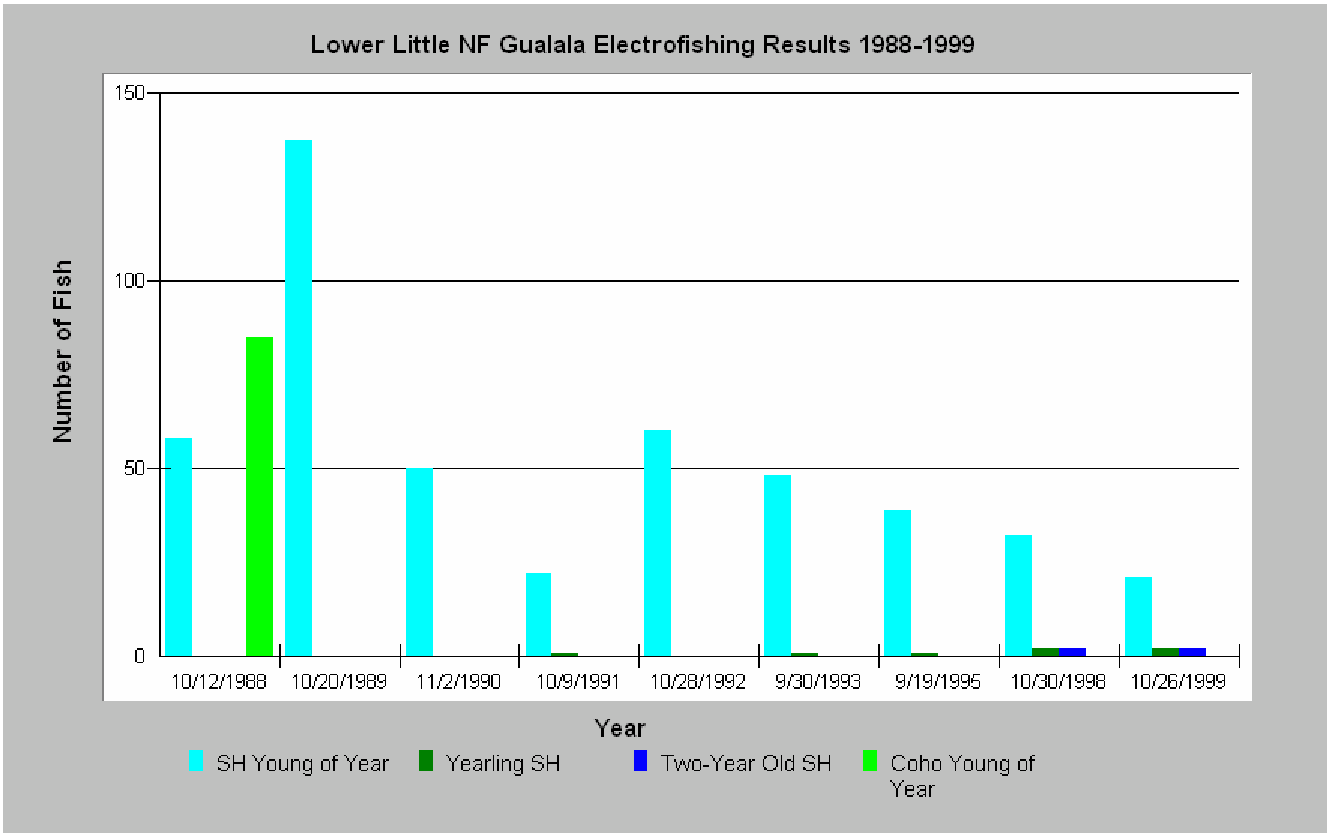

Figure 25. CDFG electrofishing results showing coho juveniles absent except in 1988 and a diminishing standing crop of steelhead from 1988 to 1999. Data from CDFG chart from KRIS Gualala.

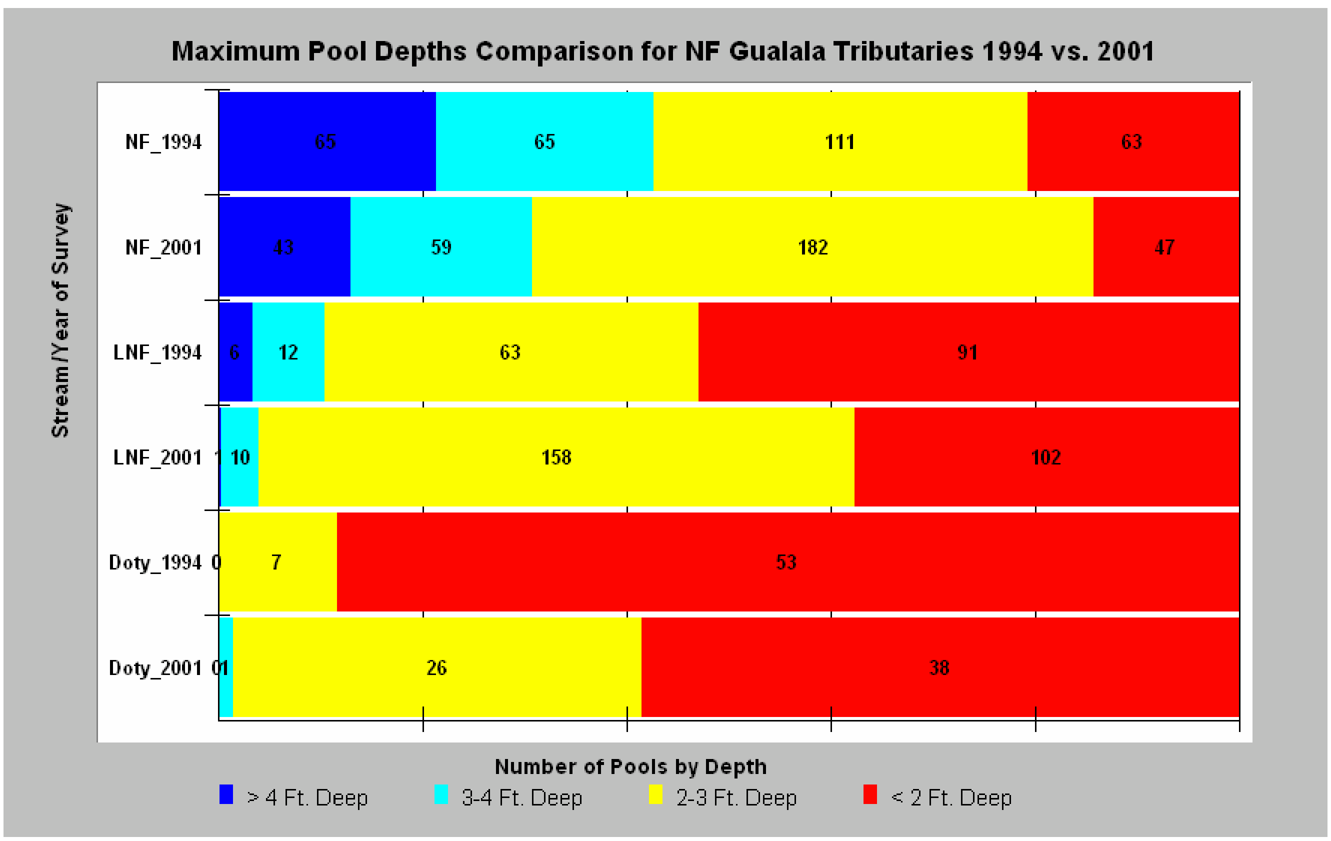

Figure 26. Pool depth data from habitat typing surveys by Entrix (1995) and CDFG (CA RA, 2003) show a loss of deeper pools favored by salmonids between 1994 and 2001. Chart from KRIS Gualala.

Coastal Ridges (2006) Option 10 Plan must more realistically characterize the threat of loss of coho salmon from the Gualala River basin and the potential THP 1-04-260 MEN adds to that risk or decreases chances for successful restoration of coho salmon.

Conclusion

The *Review Guidelines for Option A Timber Harvest Plans* (CDF, 1995) states that *"*in order to meet the requirements of sections 913.11(a) (1) and (2) it is necessary to establish a link between the analyses of other forest values and the analysis of timber growth." In fact THP 1-04-260 MEN and the *Option 10 Plan* (CR LLC, 2006) both lack any clear description of the degree of impairment of watershed function and water quality related to early seral conditions in surrounding watersheds (CDFG, 2006). Dunne et al. (2001) point out that CWE must be managed by minimizing risk:

> "Inevitably, the institutional aspects involve decisions about how much environmental and other risks are acceptable in a project. Before the institutional evaluation can be made, however, the risks of CWEs need to be identified in some transparent manner."

The lack of provision of sufficient information on which to judge impacts of THP 1-04-260 MEN fails this test of transparency and the *Option 10 Plan* (CR, LLC, 2006); therefore fails to meet requirements of CEQA for cumulative watershed effects.

The evidence presented above shows conclusively that there are advanced cumulative effects problems in the North Fork Gualala River and its tributaries, including Dry Creek where this timber harvest is to take place.

- Stream bed gravel is small and likely too mobile for successful salmonid spawning.
- Fine sediment in stream gravels is high enough at many locations to cause total mortality of coho and steelhead eggs and alevin.
- Low gradient reaches of Dry Creek, Robinson Creek and McGann Gulch suitable for coho salmon spawning and rearing are so aggraded that they lose surface flow in summer and fall.
- Pool frequency is low and pool depth too shallow to support coho salmon in all North Fork Gualala River tributaries.
- Although mainstem North Fork Gualala River pools are deep enough for juvenile coho salmon, water temperatures are too warm to support them.

The loss of year coho salmon classes, evidenced by their absence in North Fork Gualala fish samples in most years, indicates that the species is on the verge of extinction. Habitat and fisheries data from the Little North Fork provides evidence that habitat loss due to high sediment yield is also impacting steelhead.

Any sediment caused by THP 1-04-260 MEN in the steep third order tributary of upper Dry Creek will transported rapidly downstream to lower Dry Creek and the North Fork Gualala River, further degrading water quality and preventing salmon and steelhead recovery. The THP and the NCWAP watershed assessment (CA RA, 2003) both acknowledge that there is a shortage of big wood to force pool scour in the North Fork and its tributaries. Despite the call in the NCWAP report (CA RA, 2003) for riparian protection, this THP plans to harvest large trees in Class II and III riparian zones and on or adjacent to active landslides that are important areas for large wood recruitment.

Dunne et al. (2001) recommended use of GIS tools, including SHALSTAB (Dietrich et al., 1998), to analyze potential impacts from timber harvest and to help prevent cumulative watershed effects. The watershed, aquatic, fisheries and GIS data in the KRIS Gualala project (IFR, 2003) provide such tools, but CDF staff and other agencies reviewing THP's still do not seem to have the capability to use them. The THP and review team instead continue to rely on statements and recommendations supplied in the NCWAP watershed assessment (CA RA, 2003) that are not supported by data (i.e. riparian conditions appear to be improving).

Although I have little expertise in modeling forest growth, the fact that Coastal Ridges, LLC (2006) is using a proprietary model and not providing auditable raw data means that it does not meet standards of scientific transparency (Collison et al., 2003). CDF should be requiring that the Coastal Ridges' model and raw data be provided to reviewing agencies.

Watershed disturbance levels in the North Fork Gualala River watershed, Robinson Creek Calwater and Dry Creek watershed are well above disturbance rates known to cause cumulative watershed effects (Cedarholm et al., 1981; Reeves et al., 1993; Spence et al., 1996). Coho salmon evolved in the redwood forests of the Gualala River basin where cold water temperatures were maintained by giant old growth trees, deep pools formed around fallen trees, and spawning gravels had low fine sediment levels as a result of the hydrologic function of an intact watershed. Kauffman et al. (1997) point out that riparian areas, watersheds, streams and fish populations cannot be recovered unless anthropogenic sources of stress are reduced. Coho salmon in the Gualala River basin cannot be restored unless the vegetative and hydrologic characteristics more closely approach their historic range of variability, which currently requires watershed rest.

Because of impaired water quality and the extreme risk of coho salmon extinction in the North Fork Gualala River basin, no timber harvest activities such as proposed in THP 1-04-260 MEN should be allowed until aquatic habitat conditions and the coho population have shown recovery trends.

Sincerely,

Patrick Higgins

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