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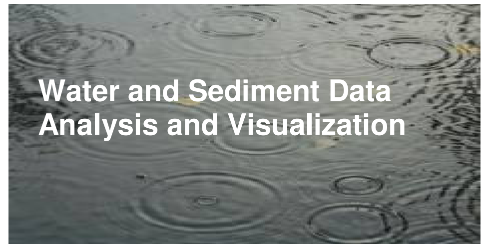

Feb. 3, 2018

Cal Fire Timber Harvest Review Team
6105 Airport R.
Redding, CA 96002

Subject: THP 2-17-070 SHA "Artemis"

Dear Timber Harvest Review Team,

Thank you for the opportunity to comment on THP 02-17-070 SHA. Please consider these comments in your evaluation of the THP and post them as part of the official public record in the Cal Fire THP Library for download.

I conducted research as a mathematical statistician, more functionally as a statistical hydrologist, for the Pacific Southwest Research Station (PSW) from 1984 through 2007 where I worked on a team whose focus was understanding the effects of forest management on hillslope processes, fishery resources, and downstream environments. During my employ with PSW, I authored or co-authored approximately 40 journal and conference papers. I was deeply involved in research at the Caspar Creek Experimental Watersheds, where I developed and implemented methodologies for sampling and analyzing data from multiple watershed studies, including analysis of cumulative watershed effects (CWEs). Since retiring from PSW, I have worked continuously as an independent consultant and one of my clients has been the Battle Creek Alliance (BCA). In 2009, BCA began collecting an extensive data set (over 8000 samples to date) including water temperature and turbidity from about a dozen sites in the Battle Creek watershed. I've written reports for BCA on the water temperature data through May of 2016 and the turbidity data through March 2015. These reports are on the Library page of the BCA web site (http://www.thebattlecreekalliance.org/library.html). In this letter I'll touch briefly on the relevance of those reports to this THP. For any references cited below, refer to the reports.

THP 02-17-070 SHA (hereafter referred to as "the" THP) is located in the Digger Creek watershed not far above the portion that burned severely in the September 2012 Ponderosa Fire. The proposed THP drains to and is in close proximity to BCA's site DC, which is located roughly 0.6 mi upstream of the fire boundary. Their site DCH is located 4.8 mi downstream of DC and roughly 0.7 mi downstream of the fire boundary. Approximately 16% of the DC watershed and 28% of the DCH watershed have been logged since 1998. The difference is due to pre-fire clearcutting and post-fire salvage logging that affected about 4000 acres of watershed between the two sites. Comparison of measurements at the DC and DCH sites permits an evaluation of the impacts of these disturbances in the intervening area.

The THP states that (1) there are no continuing significant adverse impacts from past land use activities that may add to the impacts of the proposed project, and (2) there are no reasonably potential significant effects in combination with past, present, and reasonably foreseeable future projects. There certainly are past and reasonable foreseeable projects in the area, so the validity of the negative declarations of cumulative impacts thus hinges on the assumption that the impacts of the projects, when taken together, are not significant. To my knowledge "significant" is not well-defined, so a great deal of subjectivity is apparently involved. However, there is a abundant evidence, both in the literature and in this watershed, that clearcutting and salvage logging generally do impact both turbidity and water temperature. The BCA data sets show very clearly that the combination of wildfire and salvage logging have had major impacts and that the water quality downstream from the project area (measured at DCH) is severely impaired, especially with regard to water temperatures and salmonid tolerances. Although, SPI didn't create a perfect experiment for separating the effects of wildfire and salvage logging, the reports make a strong case that salvage logging was a substantial factor in raising turbidity; there is also evidence, backed by well-understood physical processes, suggesting that it raised summer water temperatures above and beyond the fire's influence.

Should wildfire effects be exempt from cumulative impacts considerations, and if so, is it reasonable to attribute all observed adverse effects to the fire in service of avoiding a serious cumulative impacts assessment? If protection of water quality is the objective, it should not matter whether current impairments have been caused by land use activity or a natural disturbance. Recognizing the current highly impaired condition, no project should be approved that could reasonably add to those effects. While it is difficult to quantify, there can be little doubt that more clearcutting will add to those effects.

Water temperature

The data collected by BCA show that summer water temperatures were strongly affected by the combination of fire and salvage logging in Digger Creek. Maximum summer water temperatures at DC and DCH followed similar trends prior to disturbance. After some clearcutting in the summer of 2012, DCH summer temperatures began to rise, while those at DC continued to decline. After severe wildfire and salvage logging eliminated nearly all vegetation and shading of intermittent and perennial streams, maximum water temperatures in DCH were 8-10°C higher than in DC and clearly inhospitable (MWMT>20°C) for steelhead and chinook migration or holding during the summer months. Temperatures high enough to eliminate all salmonids (>22-24°C) are now common during the summer in lower Digger Creek as well as in nearby Rock Creek, Canyon Creek, and the South Fork of Battle Creek. All of these overheated streams create a cumulative impact on the main stem of Battle Creek.

Harvesting with riparian buffers should moderate stream temperature increases and changes to riparian microclimate, but substantial warming has nevertheless been observed in many studies of harvesting near streams with both unthinned and partial retention buffers (Moore et al., 2005). Forest harvesting increases advection and sensible heat exchange from clearings to the riparian zone, and conduction between stream water and nearby soils or substrates also may be an important factor (Johnson and Jones, 2000). The magnitude of stream temperature change and the degree of influence on riparian microclimate are typically reduced as buffer width increases (Moore et al., 2005). Thus the relatively narrow buffers designed to limit sediment delivery on less-than-30% slopes in this THP do not offer optimal protection against changes in water temperature.

WLPZ zones in the THP require only 50% retention of under and overstory cover on Class 1 streams, 50% of total canopy on Class 2 streams, and 50% of the understory vegetation on Class 3 streams. While this affords some protection for maintenance of water temperature, any harvesting in the WLPZ will increase solar radiation, and may increase exposure in the riparian zone to warm air advected from clearings. The expected result is higher summertime air, soil, and stream temperatures (Moore et al., 2005).

Turbidity

Processes linking clearcutting to surface erosion and changes in turbidity include (1) destruction of herbaceous cover, (2) exposure of bare soils to raindrop impacts, (2) compaction and destruction of soil structure, (3) reduced infiltration, (4) delayed revegetation from herbicides, (5) increased overland flow leading to sheet erosion, rilling and gullying, (6) delivery of augmented overland and subsurface flows to erodible road cutbanks, (7) erosion of roadside ditches from increased surface runoff, (8) reduced evapotranspiration augmenting subsurface flows, (9) erosion of subsurface pipes, (10) loss of soil cohesion due to reduction in the subsurface root network, (11) increased blowdown and rootwad upheaval in the WLPZ (12) heavy logging equipment and increased truck traffic, especially during wet conditions, (13) expansion of the road network to facilitate timber access and hauling, (14) mass wasting of roads and hillslopes due to augmented pore water pressures, (15) culvert failures due to increased debris-laden runoff. No amount of care in executing a THP can eliminate all these processes. The data suggest that past salvage logging as well as clearcutting, which has become routine practice in the area, has impacted turbidity in Digger Creek and other Battle Creek tributaries.

My turbidity report presents the evidence for the influence of salvage logging on SPI lands in Battle Creek and it need not be repeated here. The effects in Digger Creek were not as dramatic as in some other subwatersheds. During the post-fire period at the DC site, mean turbidity trended downward above the fire zone at DC (a sign of recovery from earlier disturbance), while mean turbidity trended flat below the fire at DCH. The proportion of extremely high turbidity measurements (>7.4 times predicted) was greatest following completion of salvage logging. There were no such extreme observations prior to the fire.

There is evidence that clearcutting prior to the fire also raised turbidity, though not nearly to the levels reached after the fire and salvage logging. During the pre-fire period, there were no statistically significant declines in turbidity, while 5 Battle Creek subwatersheds that experienced clearcut logging (including DCH), all increased significantly ($p<0.004$).

The THP permits all timber operations to be conducted during the winter period, Nov 15 to Apr 01. These operations include logging, site prep, road and landing construction, road abandonment, and truck traffic. Carrying out these activities during the rainy season will increase the likelihood of turbidity impacts.

Miscellaneous

Section II – Plan of Timber Operations lists the average slope gradients of each evenage regeneration unit. Listed slope gradients vary from 3% to 23%, placing all units in a Low EHR class, therefore exempt from the 20-acre size for ground-based harvesting. These slope gradients appear to be at odds with the CGS Memorandum of Nov. 20, 2017, which states that most slopes in the THP are between 25 and 35%, with maximum slopes of about 75%.

Closing Comments

The THP does not mention prior disturbances in the Digger Creek watershed including the Ponderosa Fire, subsequent salvage logging of most of the burned area, and earlier clearcutting (THP's 2-06-173TEH, 2-03-158TEH, 2-04-181TEH and 2-10-003TEH) all of which is plainly visible on the 2017 Google Earth image as predominantly unvegetated bare ground. It is remarkable that many of these cutblocks are more than 8 years old and still have barely any regeneration. Clearly, recovery is very slow and past timber operations have left a strong imprint on this watershed. It is my considered opinion that the proposed THP will add to the existing cumulative impacts that have already done significant damage to water quality (esp. temperatures) in lower Digger Creek as well as the surrounding tributaries that flow into the lower North and South Forks of Battle Creek, affecting all points downstream.

Sincerely,

Jack Lewis

Jack Lewis
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