

## Response to Policy regarding Discharge

Q. Water yield (base) has been demonstrated to increase in literature. You presented a different perspective with your interpretations; why?

I hope everyone understood that total water yield did increase at all six treatment sites in response to harvest. Specific discharge (discharge per unit area,  $\text{m}^3/\text{ha}$  or  $\text{mm}$ ) increased by 1% and 26% in the sites where with 100% of the stream channel was buffered; 44% and 65% in the FP sites, and 55% and 54% in the sites with no buffer (Table 8-4 on page 8-20). Total water yield changed in response to buffer treatment type and the proportion of the basin that was harvested. One change that I did highlight, and that we did not necessarily expect, were the decreased base-flows observed in the 100% sites. It may be that the base-flow response is what you are referring to.

If your question is why we observed decreased base-flow in the 100% sites but not the FP or 0%; the answer is that we can't be sure, but summertime flow reduction in sites with more riparian trees may reflect increased evapotranspiration in the riparian zone following harvest. A recent study showed that groundwater evapotranspiration (ET) can be spatially restricted to riparian areas and account for 6 – 18% of the total ET in a headwater basin (Tsang et al., 2014). Thus, it is possible that riparian plants were light-limited prior to harvest and that the increased light availability associated with adjacent harvest increased ET enough to decrease streamflow during relatively dry periods (discussed on page 8-27).

If your question is why we observed base flow decreases that seem to contrast with some of the previous literature, the answer is that the literature is not consistent on the topic of seasonal response and we are using methods that make it easier to identify base-flow decreases. While many studies have reported increased low flow water yield or an increase in the number of “low flow” days following harvest (Harr et al., 1982; Harris, 1977; Hubbart et al., 2007), other researchers have reported reduced summer base-flows (Harr, 1980) or increased low flow for a period of time followed by decreases (Hicks et al., 1991; Keppeler and Ziemer, 1990). While the direction of change in annual water yield is fairly easy to predict, seasonal responses are hard to generalize and vary with a number of factors including the type of vegetation, geology, and hydrologic regime (Brown et al., 2005; Jones and Post, 2004; Moore and Wondzell, 2005). In addition, our analytical methodologies continue to improve. Many older studies used an ANOVA or ANCOVA approach to look for change, which is unlikely to be as powerful as the methods we used, e.g., seasonal regression models advocated by Watson and colleagues (2001) especially when paired with the frequency pairing approach advocated by Alila and colleagues (Alila et al., 2010; Alila et al., 2009; Green and Alila, 2012; Kuras et al., 2012).

I hope that helps. Please feel free to follow-up if you'd like additional information.

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