To: Howard Haemmerle
From: Bill Ehinger
RE: Hard Rock Study Chapter 7 Findings Report
Cc: Mark Hicks, Hans Berge, Aimee McIntyre, Dave Schuett-Hames, Reed Ojala-Barbour, Tim Quinn
Date: 16 May 2018

Below is a more detailed response the comments received than was possible in the spreadsheet matrix. I encourage Policy to consider a conversation with the PIs about the Hard Rock Study results. Often, seemingly simple, questions can require very long, detailed answers to present the entire picture.

1. Many comments (ID# 8, 9, and 10) referred to the approved Hard Rock final report or did not pertain to Chapter 7 (ID# 4 and 14). I ignored these per instructions.
2. ID# 5 ("*How similar is study physical setting (geology, topography, elevation, weather, basin size) to the range of physiographic conditions where BMP is typically applied (spatial context)?*") This was addressed to the extent possible in the 2005 site selection report. A more precise answer will require substantial additional effort that is outside the scope of the Findings Report.
3. ID# 7 ("*How similar is study treatment (size, density, structure, age composition) to real-world application of rule or BMP (BMP context)?")* This will require substantial additional effort that is outside the scope of the Findings Report.
4. ID# 3 (*"For each REF, 100% and FP treatment site, how often does the temperature (7day max; 7day min; diurnal) exceed pre-harvest levels and by how much?"*) This level of detail isn't appropriate for the Findings Report. Plus processing daily temperature data over 11 sites for 9 years post-harvest will require substantial effort (365 days x 9 years x 11 sites x 3 variables).
5. ID# 13 (*"…I am now requesting such, not just for stream temperature and cover (Chapter 7) but also for stand structure (Chapter 5) and wood recruitment (Chapter 6) "*) This level of detail is not appropriate for the Findings Report. FYI, these data are shown in graphical form in the Chapter 7 Appendices.
6. ID# 11 ("*Just my opinion, but having only 3 or 4 sites per treatment (beyond the references) places the Hard Rock study into the category of multiple "case studies", and I think that the implication of these small numbers of sites needs to be clearly conveyed to TFW Policy and the Forest Practices Board."*)
    a. The Hard Rock Study Plan was reviewed by ISPR as was every chapter of the final report. In addition, we worked closely with several industry and state agency scientists and statisticians when writing the study plan and analyzing the data. The total number of independent experts probably exceeded 30 individuals from a wide range of scientific fields, including statisticians, and employers. None of them expressed this opinion.
    b. The commenter assumes that three to four replicates of each experimental buffer treatment (as well as six reference sites) is small, when in fact it is more than most field studies. Jeremy Groom's work in western Oregon and the Bull Trout Study in eastern Washington had more replication, but these were reach-scale studies with all the associated limitations.

c. The most serious implication of low replication is low power to detect changes. That we did detect treatment effects (changes in stream temperature) in the buffer treatment sites that were overwhelmingly positive in direction while the reference sites showed no change, demonstrates that the study had sufficient statistical power.

7. ID# 12 (*"My biggest concerns associated with the overall Type N findings report and what's already shown in these three chapters is a bit of inconsistency and also lack of strong emphasis in discussing the limitations or level of inference of the Hard Rock study….* ") This seems to be related to #11. As discussed above, this is a BACI study with sufficient statistical power to detect changes in shade and stream temperature. The limitations of this study are discussed in section 4.B of the Findings Report. FWIW, the results are remarkably similar to other studies in the direction and magnitude of the change in stream temperature and shade (see Discussion section Chapter 7).