Question

To what extent does 100% buffer differ in 7-day daily maximum and over time, versus FP treatment?

o Is there a relationship between buffer length and temperature response?

o Do these results inform Ecology water quality standards? If so, how? If not, why?

Suspended sediment export results are confusing when viewed solely as effects of harvest treatments. You briefly touched on this in your presentation, but could you expand on the role of roads in sediment delivery at reference sites? Since roads are likely to be the dominant source of non-landslide sediment delivery, was the study effective in teasing out treatment differences even though the reference also contained forest roads? Would references without roads show differences among buffer treatments? Since the goal is to learn about treatment effectiveness, I'm concerned that sediment-delivering roads masked the treatment effect. Please address this.

Was there any statistically significant data showing length of harvested stream reach before significant increase in stream temperature during the early part of the 5-8 year canopy closure window of risk due to loss of shade?

Of the stream segments with elevated water temperature prior to canopy closure, how far downstream in the forested areas before the increased temperature had equalized to its normal expectation for that elevation?

o And/or, what were the temperature changes from the bottom of the treatment area and the TYPE F break point – how much of that change does the science/literature attribute to normal elevation temperature normalization?

For each REF, 100% and FP treatment (F/N break), how often (during each day throughout the year) does the temperature (7day max; 7day min; diurnal) exceed pre-harvest levels and by how much?

How has the annual temperature regime changed from pre- to post-harvest at the F/N break (e.g., temperature duration curves or temperature frequency histograms)? These findings are relevant for assessing biological consequences.

For the extended monitoring from Phase 2, please provide the same analyses above.

What is FP RMZ buffer effectiveness relative to FFR target at F/N break and downstream?

What is FP PIP buffer effectiveness relative to FFR target at F/N break and downstream?

What is target for recovery and where in Np or downstream does it apply?

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

What is the role of probability of detection in your conclusions?

P(capture) of Giant Salamanders changed in FP buffer treatment? (e.g. mix of buffer/non-buffer areas.)

Could/should Torrent Salamanders be habitat health indicators/surrogates for other amphibians?

What is the role of PIP buffers to provide habitat for amphibians and what is effectiveness of PIP buffers to maintain amphibian populations?

“Viability” was equated with “density” at the monitored sites. What other metrics could be used?
CI of statistical difference between reference and others? Looks like a significant difference in LWD.

Variance in each data point? Why is the variance in the reference site so large?

To the extent there were positive outcomes of RMZ blow-down during the study period, is there any biological reason that a LWD Placement Strategy couldn’t replicate, speed, or improve upon natural LWD recruitment processes?
How was the 10 cm number arrived at to characterize “large” instream wood?

What does available information tell us about how the instream wood will function over time as a function of size? E.g. what do we know about the relative proportion of large/small wood in an undisturbed basin? (Do we know what we are shooting for in terms of functionality/outcomes with relation to wood amount and relative sizes?)

What is the ecological significance of measuring the degree of stream channel "obstruction"? i.e. is there a working hypothesis around obstruction/no obstruction as a way to stratify the data? (or is this simply an amphibian detection issue?).

Which specific rules are directly being tested for effectiveness?

How does this study address the effectiveness to achieve the relevant functional objectives and performance targets related to those specific rules? Each section should address effectiveness to achieve the relevant functional objectives and performance targets that are related to the rules. For each variable to Address L-1 Question: "Will the rules produce forest conditions and processes that achieve resource objectives as measured by the performance targets, while taking into account the natural spatial and temporal variability inherent in forest ecosystems?"

(YOY)/Age-(0) aren't feeding. How did you calculate growth rate?
PIT tag data used for growth?
Why did excluding study sites where cutthroat was not the uppermost salmonid (or uppermost fish, for that matter) improve the study?

Analyses of fish abundance, body size, and habitat characteristics without any controls for treatment-effect boldly violates the broader study design because results could vary randomly or as a treatment-effect, but the distinction would not be detected without replication. If treatment has a significant effect, what is to be learned that is not confounded by treatment effects?

Can you describe expected stand development differences between treatments as a result of varied tree-mortality among buffers?

Is stand modeling appropriate for these narrow, wind-affected stands?

How do you see the variability in stand age influencing the variability in stand structural responses to treatments?

What are the study implications for the establishment/re-establishment of riparian stands?

How did the 2007 storm affect each study site and what was the relative differences of storm impacts among treatments prior to the harvest years?

How effective are PIP buffers in providing the functions intended by the FFR?

−What is PIP buffer potential to provide LW over long-term?
−What is FP RMZ potential to provide LW over long-term?

What is effectiveness of ELZ and FP buffers to minimize slash relative to FFR target/functions?

- Is slash in clear-cut reaches an effectiveness concern or mitigation for lost cover?
- I got lost in the pros and cons of logging slash in/over the Np streams – is it a net positive, negative, or no significant affect?

I got confused by the pros and cons of extra LWD/logging slash after harvest relative to the “wetted” portion of the RMZ – net positive, negative, or no significant differences?

What is FP RMZ buffer effectiveness relative to FFR target, both within Np stream and downstream?

Please have presenters mention derivations from the study design.
Can you please document your results in terms of the Schedule L-1 performance targets?

The SFL template proposal for Np would replace the rule 50’ rule buffers (on parts of the stream reach) with 25’ buffers <u>full length</u>. For each of the studied attributes, what’s the best professional judgement of where a full length 25’ buffer would fall relative to the three management scenarios?
How is it possible to have a “dry portion” of a perennial stream? This is a serious question - help me explain this to my SFLO peers who use this seemingly obvious “DUH” question to <u>not believe</u> in the validity of Forest and Fish “science”. Alternatively, did the study areas have any/many intermittently dry Np portions and were there any significantly different findings between the three study scenarios in the dry portions?

Will you discuss in the upcoming summary of findings whether or not the statistically significant observations translate into actual loss or enhancement of particular stream functions? Long term(?), or short term(?) and if short term for about how long?

Did any of the research capture any data/observations on birds, or other non-amphibian critter differences between the 3 scenarios?
After considering and integrating the results from each chapter, what is the overall effectiveness of the FP rules in meeting resource objectives and performance measures?

What is the overall effectiveness of the FP rules over time?

What is the applicability of the study findings to headwater streams on FFR lands?

If resource objectives and performance targets are not currently being met, what does the study tell us about how long it will take to achieve them?

Response

Over the short-term, there was no difference based on the GLMM analysis. Will include that analysis in the report of the extended data.

The GLMM analysis of July-August 7 day average daily maximum temperature showed no difference between the 100% and FP treatments when measured at either the Buffer Treatment or the F/N break locations. If the question is 'Does temperature response decrease as the stream flows through a buffered reach?", the answer is "sometimes" but the relationship is not consistent across all sites. See the bottom panel for each **Figure/site**

Yes. See **Draft Chapter 7 Findings Report** recently sent to the SAGs for review.

The study did not detect differences in suspended sediment export attributable to the buffer treatments. Typically, suspended sediment is largely transported during high flow events. In this case, not all high flow events transported sediment in all streams. In addition, at some sites high transport events occurred before harvest and the reference sites exhibited sediment transport events similar in magnitude to any event in one or more of that block's treatment sites. Put another way, sediment export was variable among sites but was not clearly related to the buffer treatment and the export rates were similar to those reported in the literature for this type of lithology. I cannot say what the results would have been if we had roadless references. I can say that there was no clear relationship between the WARSEM calculation of sediment deliver to the stream and our instream measurement of suspended sediment export.

In the first two years post-harvest? No. See **Appendix 7-E**. In **Figure 7-E-2**, bottom panel, site WIL1-100% shows > 3 degree C increase at the PIP that decreases moving downstream. Site OLYM-100% shows a non-significant change at the PIP. It varies by site. We have not analyzed the post year 3 through 8 data, except to calculate the

We were able to measure stream temperature downstream within an unharvested forest at only a few sites for reasons explained in **Chapter 7**. These distances were approximately 100 m and in nearly all cases water temperature (mean monthly temperature response) was still significantly elevated. I cannot say how much further downstream before there would have been no detectable change after harvest. FYI, these temperature

Although stream temperature does, in general, increase as it flows downstream, none of the temperature or temperature changes after harvest need to be adjusted for elevation because elevation did not change. All temperature changes are based on comparison of post-harvest with pre-harvest temperature, not comparisons

I need more information regarding the question. For example, there is only one daily statistic (i.e. min, mean, max) per day so I cannot analyze patterns in these 'during each day'. **Section 7-10.2.1**, including **Figures 7-4 and 7-5** demonstrate convincingly there was no change in the REF sites during the study and the graphs in Appendix

I will provide temperature duration curves and tables describing the distribution statistics in the report we are completing in the current biennium (extended study period, in development)

See above.

See **Chapter 7 Findings Report**

The water is very shallow at the PIP and sensors were often exposed to the air in the summer. The result is that we could not calculate the temperature response at all PIPs so an analysis similar to that done at the Buffer Treatment and F/N break locations was not done. The one FP site with PIP data showed no significant change

The primary target for gauging the success of the prescriptions is the Water Quality Standards for temperature and antidegradation protection (including **WAC 173-201A-200(1)(a)-(c); WAC 173-201A-300-320; WAC 173-201A 510(3); WAC 173-201A 600(1)(a))**. These standards apply to all surface waters of the state including those

see attached word doc **"Response to Policy regarding Discharge"**

Detection probability allows us to adjust raw counts for the probability of detecting individuals under a variety of conditions. This gives us less biased estimates of true abundance/density through time and space. See **Section 15-8**: "N-mixture models (Royle 2004) are an alternative to traditional mark-recapture and removal sampling and have been utilized to estimate amphibian abundance and density in several studies (McKenny et al. 2006; Chelgren et al. 2011; Price et al. 2011; McIntyre et al. 2012). Occupancy, density and abundance estimates adjusted for detection can be used to confidently compare populations through time and space (MacKenzie and Kendall 2002; Mazerolle et al. 2007; Guillera-Arroita et al. 2014)." **Section 15-10.3:** "We note that our estimated
- P(capture) is the probability of capture. We did not compare the probability of capture between treatments, we did, however, see a difference in the capture probabilities of giant salamanders between buffered and unbuffered RMZs of buffer treatment streams: "Overall, we did observe differences in mean detection based on model terms we included in our detection probability estimates. For example, mean giant salamander detection probability is nearly two times greater in the buffered versus reference reaches along first-order streams, and nearly three times greater along second-order streams (**Table 15-15**). Parameter estimates from the N-mixture models for all species are included in **Appendix 15-C**" (**Section 15-9.2.2.a Detection Plots**).
- If the reviewer is inquiring about the change in estimated giant salamander density in the FP treatment, we discuss this in **Section 15-10.2.3** (Giant Salamanders). We conclude that "Our result suggests that giant salamander populations are limited by multiple factors, that may be acting individually or in combination,

This question is outside the scope of the study. However, based upon our findings to date (through 2 years post-harvest), and the variable responses among amphibian taxa included in the study (positive response for tailed frogs for some life stages and treatments, lack of response for torrent salamanders, and negative response of giant salamanders in the FP treatment) we would have to include that the response (or lack thereof) for torrent salamanders does not reflect the potential for response for other taxa. Ultimately, this question cannot be answered without examining the similarity of response, or not, between torrent salamanders and other stream-associated amphibians, probably on a spatial scale other than basin-wide treatment effects (e.g., buffered v. unbuffered RMZ). Finally, their greater abundance in contrast to other stream-associated amphibians would

This question is outside of the scope of the study (which was to evaluate basin-wide response to a variety of treatments); however, we do have data for animals that were detected within and outside of what would be stand alone PIP buffers (56' radius buffer) on uppermost points of perennial flow (PIPs) that may be able to address this question, at least in part. However, our sample size for stand-alone buffered PIPs is relatively

see attached word doc **"Response to Policy regarding Amphibian Viability"**

It is not entirely clear what is being referred to in this question. The only slide I can locate in the wood loading presentation that includes confidence intervals for large wood is slide 4 "Results: Large Wood Density." In this case, yes, there is a statistically significant difference between the within-treatment pre- to post-harvest change in the reference and the change in the three riparian buffer treatments (buffer treatments all differ from the

Again, it is not clear exactly which slide or figure is being referred to here; however, the large variance (CI) reflects the large variation among reference sites. Remember also that these data reflect the large windthrow

Outside scope of current study. Our study does not directly evaluate the pros and cons of RMZ blowdown.

10 cm is the cutoff for large wood in a majority of the literature, and is also consistent with the definition used by Schuett-Hames and colleagues in the BCIF study

Small wood has been very infrequently measured; so the relative proportion of large to small is largely unknown for most basins. We do know that the residence time for smaller wood is substantially less than that for larger wood as a result of decay and transport out of the system, at the same time small wood is more likely to remain for longer times in smaller streams, which lack the fluvial power to transport them. "The functions provided by wood depend upon the characteristics of the wood and the stream channel (Gomi et al. 2001; Maxa 2009). While most studies have focused on LW, small wood (SW, i.e., ≤10 cm diameter) can be abundant in small streams where transport is limited by channel size and stream power (Bilby and Ward 1989; Maxa 2009). Small wood may play a short-term functional role in smaller stream channels by storing sediment and influencing channel morphology (Gomi et al. 2001; Maxa 2009). For example, Jackson and Sturm (2002) found that SW and organic debris were major step-forming elements in non-fish-bearing streams in the Pacific Northwest. However,

The primary reason for including sampling in obstructed reaches was an amphibian detection issue. These reaches cannot be effectively sampled with the same "light-touch" sampling methodology we used in unobstructed reaches. To adequately sample these reaches we had to carefully remove downed wood from the sample reach and employ a block-net sample method, whereby all stream substrates are removed from a sample plot and animals are counted. It was necessary to sample these reaches since we had no way of knowing how animal density may differ in obstructed reaches, and the proportion of stream length obstructed was a function of treatment. (see **Section 15-8.2.2.**)

Obstructed channels do differ substantially from unobstructed ones. At least in the two years following harvest these reaches were composed of a dense wood matrix that trapped fine sediments, leaf litter and other organic

There are no performance targets specific to wood loading in Type N Waters. However, we address the functional objective "to develop riparian conditions that provide complex habitats for recruiting large woody debris and litter." The study reduces uncertainty for instream wood through an evaluation of in-channel wood loading in the two years following harvest. Perhaps the response over a greater period than the two years post-

In the **Findings Report** we list the resource objectives, performance targets and functional objectives for each response metric, when they exist.

See **Chapter 16**, **section 16-6.2.5** for a detailed description of the analytical methods for assessing fish growth.

Yes… of individual fish captured on more than one occasion.

Cutthroat trout tend to be poor competitors with some other salmonids (e.g. coho) and the authors felt that it was best to focus on sites where the competition between different species of salmonids would not be a confounding issue. In addition… cutthroat trout represent the salmonid species found at the upstream extent of

The original intent of the Type N Study was to include an evaluation of fish response in the stream segments immediately downstream from timber harvests treated with current Washington Forest Practices buffers (FP treatment), more extensive buffers (100% treatment), or no buffers (0% treatment), relative to unharvested reference sites. For a variety of reasons, however, 11 of the 17 Type N sites included in the final study design were dropped from the fish component of the study. Due to a resulting lack of replication, an evaluation of fish response to upstream timber harvest and different riparian buffer prescriptions, as originally intended, was not

Stand development differences related to mortality are covered in Chapter 5- Discussion section 5-10.2. Change in Riparian B**uffer Stands, which states** " Patchy mortality in the riparian buffers caused substantial plot-scale variation in stand structure (reduced density and basal area) that sets the stage for divergent patterns of stand development in the future. Approximately 75% of RMZ buffer plots and 40% of PIP plots in the FPB and 100% treatments had densities exceeding 120 trees/acre (296.5 trees/ha) two years after harvest. These densities are typical of second-growth riparian stands in western Oregon and Washington (Pollock and Beechie 2014). No future harvest is expected in the FPB and 100% treatment buffers, thus they are expected to develop as even-age stands, self-thinning to lower densities during the stem exclusion stage of development (Liquori 2000; Pollock and Beechie 2014).The trajectories for the remaining 25% of RMZ plots and 60% of PIP plots with densities <120 trees/acre (296.5 trees/ha) are uncertain. It is likely some will deviate from the conventional model and develop along an alternative open canopy pathway (Donato et al. 2012). Stands at the lower end of the range, as low as 40 trees/acre (138.8 trees/ha), are at densities similar to those created by two-age shelterwood harvest strategies applied to upland stands (Curtis et al. 2004). There is no requirement for landowners to plant trees following wind disturbance in the riparian buffers, so natural successional processes will determine whether conifers reestablish. Stands affected by wind disturbance are characterized by spatial heterogeneity, with clumps of trees intermixed with gaps, the latter characterized by increased light and nutrient availability where rates of regeneration may be enhanced (Edmonds et al. 2005). Gaps created by windthrow are characterized by pits and mounds of exposed soil, and abundant down wood, which provide suitable sites for tree regeneration (Edmonds et al. 2005). These stands should be expected to develop into multi-aged conifer stands if natural conifer regeneration is successful (Agee 1993). Regeneration may be dominated by shade-tolerant species such as western hemlock in cooler, moister locations (Lutz and Halpern 2006). Although initially open in structure, multi-age stands should provide shade and wood-recruitment potential over the long term as the understory cohort develops. However, conifer regeneration may not be successful if there is not an adequate source of seeds (Beach and Halpern 2001) or if understory shrub cover is dense. If broadleaf tree regeneration occurs, a multi-age stand of mixed composition may result, with gaps filled by an understory of broadleaf trees such as red alder in moist locations, which can increase aquatic productivity by providing litter inputs high in nitrogen. Shrubs may dominate in situations where there is an existing shrub understory and a conifer seed source is lacking. In these cases, an open stand condition may persist for

We have not done stand modeling with these data sets. However a number of other studies have used existing stand growth and yield models to simulate stand development and mortality (as does the DNR DFC model). A limitation of this approach is that modeled mortality rates are typically based only on mortality from suppression/competition, which does not address agents such as windthrow that are important (and highly

We did not examine the effect of variability in stand age on stand structural response. All of the treatment sites were young second-growth stands in the stem exclusion stage of stand development and there was not a great difference in age. Wind mortality had the greatest effect on stand structure response. As secondary factors, it seems likely that differences in stand structure (such as density, relative density) and species composition would have a greater effect on stand structure responses than small differences in age in these young second-growth

Unclear if this question is referring to reforestation following harvest, or regeneration after disturbances such as wind? In either case, the two-year post-harvest timeframe study does not address establishment or re-establishment of riparian stands. This question will be addressed in the analysis of regeneration data in the eight-

The effects of the 2007 storm on riparian stands are covered in **Chapter 5, section 5-9.1.2 Pre-harvest mortality rates** which states " During the pre-harvest period, 838 of 9,938 total live trees died (8.4%). Annual mortality rates pre-harvest (2007 – 2008) varied substantially among sites (**Appendix Table 5-A-6**). In RMZs, annual mortality rates ranged from 0 – 39.8% of live stems (average of 8.6%) and from 0 – 38.9% of live basal area (average of 8.0%). Mean annual mortality rates in PIPs were somewhat higher and more variable, ranging from 0 – 50.9% of live stems (average of 12.1%) and from 0 – 46.1% of live basal area (average of 11.2%). Among RMZs, the vast majority of sites experienced little (<10%/yr.) or no mortality (Figure 5-2). Within PIPs, a greater proportion of sites (35%) experienced moderate rates of mortality (> 10 – 20%/yr. for both stems and basal area). Few sites had mortality rates >20%/yr. for either mortality metric. Among geographic locations, mortality in % of basal area/yr. was notably higher in the two coastal blocks (means of 21.5% in Willapa 1 and 9.7% in Willapa 2; **Figure 5-3**). To summarize, the hurricane-force winds in the Dec. 2007 storm caused extensive mortality and tree fall in the coastal block

This is outside the scope of the study. The study was designed to address basin-wide response under existing rules, compared with rule alternatives. We do have data that may be able to address this question for some response metrics, but not others. However, to date, most data are not presented as the response of PIPs versus

Implications for future LW recruitment are covered in Chapter 6- Discussion section 6-9.2. Potential Long-Term Effects, which states " We used the concepts from the simulation models developed by Spies and colleagues (1988) and Bragg (2000) to predict future wood loading in our study sites over time based on differences in disturbance and buffer treatments. Overall, the models indicate that the highest cumulative wood inputs over time are expected in unharvested stands with episodic disturbance, lower inputs are expected in unharvested stands with chronic mortality, and the lowest inputs are expected when trees are removed during periodic harvest (Bragg 2000). For FPB and 100% treatments with minimal tree mortality in the riparian buffers, there was little LW recruitment during the first two post-harvest years. In the absence of episodic disturbance, chronic mortality should provide limited wood recruitment over the next few decades. We expect that wood load would remain relatively stable for several decades as the limited input offsets depletion by decay and transport, followed by a gradual increase over time as the trees in the riparian buffer grow and stands pass through the stem-exclusion phase of development (Spies et al. 1988; Bragg 2000). In FPB and 100% treatments with greater tree mortality due to windthrow, tree fall during the first two post-harvest years provided a pulse of wood to adjacent streams, which could prove beneficial for streams with low wood loading due to past harvest or debris flow disturbance. In these cases, simulation models indicate that the pattern of wood input will depend on the magnitude of the disturbance. Where the disturbance fells most trees simultaneously, we expect a pronounced oscillation in wood load over time, with high input during or immediately after the disturbance and little additional wood recruitment for many years as the new stand becomes established. Where the disturbance is less severe, felling some trees but leaving many standing, the initial wood loading is

This question was asked as a part of the riparian veg presentation but it is better addressed with the results from the wood loading component of the study.

Our study does not specifically address effectiveness of ELZ-only reaches. However, the 0% treatment is comprised completely of ELZ-only reaches, and we did compare wood loading between wood-obstructed and unobstructed stream reaches (the propensity of which is related to treatment, with the greatest occurrence in the 0% treatment). We do draw some overarching conclusions related to wood load and function, and also to the effectiveness of the ELZ-only reaches to limit slash in Type N streams: "Jackson and colleagues (2001) found that maintaining a riparian buffer along headwater streams limited recruitment of logging debris to the stream following timber harvest. Maxa (2009) and Schuett-Hames and colleagues (2012) also observed lower levels of wood in Type N streams with 50-ft (15.2-m) buffers compared to channels with adjacent clearcuts. While we also

This question was asked as a part of the riparian veg presentation but it is better addressed with the results from the wood loading component of the study.

I think what the reviewer is asking is what the tradeoff is between potential concerns and potential benefits of slash in clearcut reaches:

- On one hand, slash mitigates for potential loss of shade from trees (i.e., provides cover). Wood in these reaches can also contribute to sediment storage (preventing downstream transport of sediment to Type F Waters), and step and pool formation, as well as dissipate energy and provide bank stability.
- On the other hand, these areas are comprised of dense wood matrices filled with fines and organic debris and some studies have concluded a negative association between instream biota (i.e., amphibians) and sediment. "Several possible causes for negative impacts of fine sediment on stream-associated amphibians have been proposed, including elimination of critical microhabitats through the filling of interstitial spaces (Corn and Bury 1989; Welsh and Ollivier 1998), impaired respiration from the clogging of gills of aquatic amphibians (Kelsey 1995), and, for Coastal Tailed Frog larvae, limited ability to adhere to rocks and feed (Bury and Corn 1988)." (see **Section 15-10.5**)

We did find that some amphibians utilized these areas in the two years post-harvest, sometimes in remarkably high densities (see **Section 15-10.2.4**). However, we do not know what the long-term impacts will be. "...understanding the scale of potential timber harvest impacts on stream-associated amphibian populations at our study sites will require study over a longer temporal scale ...We recommend future investigations at the same study sites after at least one generational turnover to better understand the long-term consequences of timber harvest with our riparian buffer configurations. Only longer-term study of the impacts of clearcut timber

We do not attempt to summarize the "pros" and "cons" per se, but rather to elucidate the differences between streams with more and less logging slash. In short, we did not observe a difference in the proportion of "dry" stream length between treatments in the post-harvest period (see **Chapter 11, Section 11-6.1.3**). We did, however, see a difference in the wetted stream width, where the within-treatment difference in the pre- to post-harvest change was less in the 0% treatment that in the other treatments, including the reference. "Our findings

We do this in the **Findings Report** when relavant resource objectives or performance targets are available. For the most part we do not do this for the downstream reach, with the exception of water temperature (for which we discuss response in the 100 m downstream from treatment when possible) and for fish (however, we cannot draw conclusions about treatment performance for limitations that are also discussed in the **Final Report** and in

We describe deviations from they study design for metrics in the **Final Report** and in the **Findings Report to**

We do this in the **Findings Report** when performance targets exist for the response.

This question is really outside the scope of this study. The treatment being asked to consider was not a treatment included in the study design so any discussion would be speculation. We recommend that if this is a question Policy would like to discuss, the discussion would be best had by study PIs and Policy members and any other stakeholders interested in informing that discussion.

Yes, there were intermittent reaches of streams in Hard Rock Study sites (e.g., reaches that are below the uppermost point of perennial flow (PIP) but that go seasonally dry (or subsurface)). However, we did not evaluate differences in responses between reaches within study streams, rather our study evaluated basin-wide responses. There is a proposal for a project to conduct a study on intermittent stream reaches in the CMER Work Plan. Existing data from the current Hard Rock Study study could be used to explore differences in reaches that are intermittently dry versus those that flow year round, however, we are unlikely to be able to address

In the **Findings Report** we discuss results in terms of Resource Objectives, Performance Targets, and Critical Questions (when appropriate). We also discuss short-term nature of this study versus potential responses over time (longer-term). In the **Final Report**, we discuss longer-term implications of our findings, but this is done in the context of relevant literature, not as related to our own study findings which are restricted to two years post-

The only biota included in the study were amphibians, macroinvertebrates and fish. Each are addressed in their own section. Fish could not address treatment effects due to limited sample size and lack of replication

Overall, save the changes in temperature, the FP buffers seem to be reasonably effective in maintaining instream biota, the question is whether that effectiveness translates into the long-term (more than two years; response through 8 years post-harvest will address this in part). Of note, these streams happened to be unusually cool compared to other similar non-fish-streams in western Washington. As a result, some question remains as to whether the biotic response would have differed for warmer streams, where the temperature

This study only answers the short-term response through two years post-harvest. Longer-term response will be addressed in the next report (through 8 years). Even longer study beyond 8 years may be necessary to truly

We address this in the **Findings Report**. In general, findings can be translated to small non-fish-bearing streams on hard rock (competent) lithologies on managed lands throughout western Washington and the south Cascades. These streams are also very cool relative to a random sample of headwater streams from the same geographical area (i.e., Extensive Study), so this should be taken into consideration when interpreting a response

This is outside the scope of the current study (see response to line 51). We cannot specutlate beyond the two-year study period, but results through 8 years post-harvest are in development and will inform this question.

Chapter	**PI**
Temp	Bill Ehinger
Temp	Bill Ehinger
Temp	Bill Ehinger
Sediment	Bill Ehinger
Temp	Bill Ehinger
Temp	Bill Ehinger
Temp	Bill Ehinger
Temp	Bill Ehinger
Temp	Bill Ehinger
Temp	Bill Ehinger
Temp	Bill Ehinger
Temp	Bill Ehinger
Temp	Bill Ehinger
Discharge	Greg Stewart

Amphibians	Aimee McIntyre
Amphibians	Aimee McIntyre
Amphibians	Aimee McIntyre
Amphibians	Aimee McIntyre
Amphibians	Aimee McIntyre
Wood	Aimee McIntyre
Wood	Aimee McIntyre
Wood	Aimee McIntyre
Wood	Aimee McIntyre

Wood	Aimee McIntyre
Wood	Aimee McIntyre
Wood	Aimee McIntyre
Misc/all	Misc/all
Fish	Jason Walter
Fish	Jason Walter
Fish	Jason Walter
Fish	Jason Walter

Riparian Veg	Dave Schuett-Hames
Riparian Veg	Dave Schuett-Hames
Riparian Veg	Dave Schuett-Hames
Riparian Veg	Dave Schuett-Hames
Riparian Veg	Dave Schuett-Hames
Riparian Veg	Misc/all

Wood	Dave Schuett-Hames
Wood	Aimee McIntyre
Wood	Aimee McIntyre

Wood	Aimee McIntyre
Riparian Veg	Misc/all
Misc/all	Misc/all
Misc/all	Misc/all
Misc/all	Misc/all
Misc/all	Misc/all
Misc/all	Misc/all
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