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Comments: Note: Quotations from the document are indicated with single quotation marks throughout these comments.
General Comments
Thank you for the opportunity to comment on the draft EA for the proposed Twisp Restoration project. To summarize, I generally support Alternative 2. With one notable exception, there are many good elements within the plan pertaining to hydrologic function and aquatic resources (my areas of expertise), all of which will be addressed below. However, the document is generally weak in the comparison of effects between the alternatives. This deficiency makes it difficult for interested laypersons to come to an accurate assessment of the environmental effects of the two alternatives.
It is time to update the language characterizing environmental effects to reflect current realities For example, the magnitude of the effects of climate change on expected environmental outcomes of the alternatives, (e.g., longer, hotter, drier fires seasons supporting increasingly extreme megafires) should be realistically described. The terms low, high, short term, long term, etc. are very vague and not all that useful for the purposes of comparing alternatives.
Although quantifying things like sediment inputs is beyond the realistic capabilities of the preparers, estimated ranges or order of magnitude should be discussed. The BMP's associated with various activities will be very effective for minimizing sediment inputs and aquatic ecosystem effects related to the proposed activities. Thus, these 'short term' effects are relatively negligible, but there is little context provided for comparing alternatives; negligible effects (that I understand must be mentioned) are likely to seem more significant than they are. The duration and magnitude of effects should be better described. Within the discussion of Alternative 1 it is stated 'Alternative 1 would not add to cumulative soil effects unless, or until, fires outside of the normal range of variability occur.' This is very misleading and can lead to the false hope that no action is the better alternative. There should be a discussion of the meaning of the term 'normal range of variability' and the relationship between recent fires and fire behavior trends and the 'normal' range referred to. It seems to me that the only 'normal' fires during fire season these days are those that are quickly extinguished and thus prevented from developing behavior outside the normal range of variability. This proposal is presented as having a 30-year implementation timeline. The occurrence of fire within the project area is a matter of when, not if. The environmental outcomes of the changing forest conditions and the range of likely fire behavior, scale and intensity within that 30-year time frame associated with each of the alternatives should be thoroughly described.

Summary of elements of Alternative 2 to support

Hydrologic function:
*Road decommissioning
*Culvert replacement and AOPs
*Armoring of stream crossings
*Road maintenance.
*Fuel reduction

Aquatic resources:
*Road decommissioning
*Culvert replacement
*Campground removal

Forest Plan amendments pertaining to hydrologic function and aquatic resources:
*Mixed conifer old growth

*Deer winter range cover
*Mountain goat habitat
*Stands over 80 years old
*Fuelwood gathering

Specific Comments
Roads
It is appalling that the USFS does not have funding to regularly maintain the roads on the national forests, but clearly that is not the fault of the Methow Valley Ranger District.
Obviously, periodic log hauling during wet conditions has the potential to damage road surfaces and accelerate the delivery of sediment to the stream systems, and road maintenance is particularly important in these circumstances. However, normal traffic on unmaintained roads will have the same effect over a longer period of time. At a certain level, chronic sediment inputs are more damaging to the aquatic ecosystems than infrequent, higher inputs. Furthermore, surface erosion, which is the common means by which roads contribute sediments to streams, generally results in a positive-feedback loop, with the development of rills leading to gullying, etc., accelerating sediment delivery. This makes deferred maintenance particularly problematic, and should be discussed in the EA.
It is not clear why road maintenance will contribute sediment to streams, as stated, even in the short term. Grading and gravel placement should not deliver sediment. Road ditch maintenance could conceivably create a very small amount of surface erosion below the lowest ditch relief culvert along the approach to the stream crossing. This would be negligible compared to the 'no action' erosion from unmaintained road surfaces. Ditches should be graveled within the same approaches to stream crossings that the road is graveled, which would eliminate the potential for maintenance to deliver fine sediment to streams. The document states that rock armoring of stream crossings will be conducted where sediment surveys indicate elevated levels of sediment in the stream. Considering the lack of post-project planned maintenance, this seems like a backward-looking criterion. For instance, if an area undergoes increased traffic in the future, more road surface damage and erosion can be expected. All stream crossings where the approach is sloping toward the stream should be graveled to prevent the development of accelerating surface erosion delivering sediment to the streams.
The replacement of undersized culverts is important to avoiding the larger-scale sediment inputs associated with plugging and failure leading to road washouts during high flow events. This should be contrasted with the small amount of input when BMP's are employed during culvert replacement. As recent post-fire hydrologic effects have shown, rainfall on scorched, hydrophobic soils has led to debris flows that caused significant road washouts and stream crossing failures many orders of magnitude greater than the culvert replacement activities conducted using BMP's.
Environmental Impacts
Soil erosion:
Alternative 1:
*Some mention of the magnitude of increased erosional processes should be discussed in this section. Rates of surface erosion following severe wildfire should be mentioned. And, 'mass wasting' is too general a term. This should explicitly refer to both hillslope mass wasting, but also debris flows which can travel long distances down stream channels in confined valley bottoms, with severe effects to the stream/riparian systems.
*In general, the discussion of soil erosion resulting from Alternative 1 is lacking. As already noted, fire occurrence outside the normal range of variability is not a matter of when, not if. How likely is it to occur within the project area during the proposed implementation period? Ahistoric fuel loading and the science on climate change makes it clear that increasingly severe fire behavior is what the future holds. This reality is the driving force and rationale for most of this plan and absolutely should be made clear in this document. Distinguish between the fire behaviors under the two alternatives and the resulting effects.

Alternative. 2:
*It would be helpful to identify the fraction of the area within the project area that could be subject to having bare soil exposed, particularly at any given time within the implementation period. I think that would help provide

badly needed context.
*There is no mention of the effects to the soil of pile burning. That discussion should include an indication of the cumulative area affected at any given time and duration of effects.
*The discussion on the effects on plant nutrients is well done.

Hydrologic Function
Alternative 1:
*Paragraph 1: 'Taking no management action would result in no increased project-related sediment, surface erosion and water quality.' This statement ignores the 'no action' effects of road-associated erosion. Surface erosion is generally an accelerating process (progressive particle detachment leading to rilling, then gullying, etc.), which is why road maintenance is so important. 'No action' is not neutral in regard to erosion.
*'Sediment production from wildfire would be higher than the current condition and what would be expected to occur from Alternative 2' There is no discussion of the magnitude of the difference. This is not a trivial distinction: there are multiple orders of magnitude differences, the erosional mechanisms and the environmental outcomes are distinctly different.
*Road density: The discussion is good, except it lacks describing the increased risk of post-fire debris flows associated with Alternative 1, which also create increased risk of blowouts at stream crossings
*I generally agree with Summary.

Fish Distribution
Culvert replacement, as proposed, will provide significant benefits.

Fish Habitat Viability
'Ongoing cattle grazing increases the sediment levels in the Twisp River, Buttermilk Creek, Little Bridge Creek and Poorman Creek. As a result of these habitat deficiencies, overall fish habitat viability in the project area is considered functioning at risk…'
P. 56 'Grazing impact to stream sediment levels in the Twisp River watershed were concluded to be insignificant based on the Little Bridge-Lookout Mountain allotment Management Plan Renewal Biological Assessment (USDA 2011b)… Grazing will not be discussed further, due to allotments being within compliance with the AMPs..'
Note the discrepancy between the two quotes. Which is it? At the very least, the biological assessment is an old study. It also appears to ignore the existence of severe localized impacts to easily accessed riparian areas that can result from grazing and trampling. Or, perhaps, it averages these in with the lengths of channel that are not accessible to cattle, effectively hiding the problem. These problems should be addressed. Good grazing management would involve fencing such areas and providing off-channel water sources.
Road's End Campground removal
Based on the description of the value of the adjacent aquatic habitat, removal of the campground is justified will address the issues described.

Cumulative effects:
Road removal, road maintenance, campground removal and culvert replacements are all beneficial to the aquatic resources.

Aquatic Resources and Proposed Treatments
The discussion of aquatic restoration activities related to large woody debris densities (EA) and proposed treatment descriptions (Appendix A) contain fallacies that could undermine the effectiveness of the wood enhancement treatments being proposed. There are also important omissions that should be addressed so that this document provides the information needed to properly assess the proposed actions. These fallacies and omissions are discussed below.
Wood Density
Fallacy: Stream cleaning in the early 1970's is the reason for low wood densities.

P. 61 'Instream wood levels within key fish streams are mostly well below desired conditions due to past and present management actions including removal of wood from the Twisp River by the Army Corps of Engineers following the 1972 flood and past riparian logging.'

This is an inadequate explanation for current conditions. The wood removal mentioned occurred nearly 50 years ago - long enough for adequate wood recruitment and the regeneration and growth of young mature cottonwoods (the dominant riparian species) to occur.

The protocol for determining the adequacy of large woody debris (i.e., fewer than 565 6"+ diameter pieces per mile is both inefficient and deeply flawed. The most important metric is the number of key pieces - those that are inherently too large to be moved more that short distances under bankfull flow conditions. Those are literally 'key' to the accumulation and persistence of natural log jams. In the absence of such key pieces, smaller woody debris is readily transported out of the reach. Hence the need for removal of woody debris at the dams in the Columbia. Note that mature cottonwoods lining banks naturally provide large quantities of material ranging up to branches that would be categorized as large woody debris by the current protocol.

The size of key pieces is a function of channel size, therefore protocol the surveying 'large' woody debris should be scaled to channel size. WDFW's Stream Habitat Restoration Guidelines (2012) identifies key pieces as those having a diameter of at least 0.6 of bankfull depth. In unconstrained alluvial channels, the source key pieces is primarily bank erosion; such pieces cannot be delivered into a reach by smaller channels. Under the dominant high flow regimes, the transport of key pieces is restricted to relatively short distances. Frequently, when large trees topple into wide channels under high flow conditions, the tops simply rotate downstream, but move no further because the rootball holds enough rock and soil to act as an anchor. On a channel the size of the Twisp River, counting pieces with 15"+ diameter would be a much better indicator of wood supply, by identifying quantity the material that can provide the key and secondary pieces needed for the formation of natural wood accumulations.

Large wood is primarily recruited through bank erosion; when associated with channel migration, the low floodplain development occurs opposite to the eroding bankline, providing the substrate needed for riparian regeneration and future wood supply. Unnatural channel stability is the primary reason for the lack of wood recruitment and lack of riparian regeneration. I am confident that the woody surveys that have been conducted show greater accumulations in and near areas where there is active channel migration.

Omission

No mention is given of recent and ongoing management actions that reduce large wood inputs to stream systems. Those seem much more relevant to aquatic resources restoration.

Omission

The 2017 and 2020 Yakama Nation habitat surveys cited on page 60.

Fallacy

'Roads paralleling the Twisp River on both sides limit the amount of instream wood generated by fire because road-stream crossings act as barriers to downstream transport and accumulation of wood (Flanagan 2004) into larger source streams like the Twisp River.' Roads paralleling the river limit channel migration and floodplain access, thereby greatly restricting wood recruitment into the channel and precluding riparian regeneration that will provide the future wood supply. Stream crossings do limit the downstream transport of wood that is shorter than the span, but streams do not significantly move wood that is longer than bankfull width, so the smaller tributaries would contribute medium - small sized material. The lack of wood is a function of the lack of key pieces to anchor persistent wood accumulations.

Fallacy

'Few areas have higher concentrations of wood and habitat that functions well, while most areas have low wood quantities and low habitat complexity. Additional wood will recruit into these streams and habitat complexity will increase over time, but it will take several decades or more for natural recruitment to supply the desired amount of wood loading.' There are multiple problems with this assertion. First, is there any indication that wood loading is increasing? As noted, it has been several decades since the major human-caused disturbance of wood removal. What distinguishes the 'few areas with higher concentrations of wood and habitat that functions well'? My educated guess is that these are the areas where channel migration is still occurring. Channel migration is the primary mechanism in alluvial streams for both large wood recruitment and the riparian regeneration needed for the future supply of wood. If this mechanism is left unaddressed, wood loading will not increase. In the long term, as existing riparian vegetation ages and dies without a corresponding amount of riparian regeneration to replace it, wood supply to the stream system will continue to decline.

Alternative 2 Wood Density

The 100-year flood design criterion for engineered logjams (ELJs) is in no way related to aquatic habitat restoration. Rather, it is a requirement by the state legislature for relieving fish recovery entities of legal liability in the case that ELJ failure results in property damage. Installation of such structures has often been at odds with the recovery of stream processes that create aquatic habitat. There is no indication of how this design criterion will be met, and no mention of the use of large rock to provide structural stability. If large rock will be used, this should be mentioned and justified. Furthermore, there is no discussion of the significant amount of disturbance associated with the installation of ELJs.

ELJ's designed to be stable during a 100-year flood event do not mimic natural wood jams. In alluvial systems, the only elements within the stream corridor that are stable under extreme flood conditions are bedrock outcrops and ledges; in other words, geologic controls. That is how the effects of these proposed engineered structures should be understood. If anchored with boulders, the wood represents a temporary feature, while the concentration of large rock represents a permanent hard spot in the system. Placed in series along banklines, these represent long term bank hardening. Used in this manner, these treatments do not represent restoration and are only appropriate in areas where infrastructure protection is given priority over ecosystem functioning.

In reaches where channel migration is still acceptable, ELJs can be used to re-start channel migration where it is lacking, or increase floodplain connectivity or side channel activation. But, they should absolutely not be installed in series; that would amount to unnecessarily locking the channel in place and cause long term loss of wood recruitment, riparian regeneration and channel complexity.

Key pieces - those large enough to become stable at high flows and anchor wood accumulations - are usually the missing element in these stream systems. Mobile debris is not lacking; cottonwood gallery forests are an abundant source of medium and small debris. It is not efficient to add those smaller size classes of material Adding key pieces in locations where they can be mobilized by high flows should be considered. This would promote the development of naturally functioning wood structures and would be far more cost-effective, and likely have greater environmental benefit, than constructing engineered log jams.

Large Wood Placement (Appendix A)

The decision criteria for large wood placement is inadequate. The only actual criterion provided is the number of pieces per mile greater than 6" in diameter. This is not enough information - particularly on the scale of one-mile segments - to identify the need for specific engineered wood enhancement treatments. Washington Department of Natural Resources' (DNR) TFW Monitoring Program Manual for the Large Woody Debris Survey (1999) describes two levels of survey procedures. Level One, in addition to counting LWD pieces, includes identification by category (i.e., rootwads and small, medium and large logs). Counting of LWD pieces should be conducted at the 100-meter segment scale to be consistent with Fox and Bolton (2007), as cited. Additionally, Fox and Bolton identified LWD volumes and numbers of key pieces as metrics. These metrics are very important to understanding the amount of woody debris in a channel segment and should be included in the analysis. For example, Fox and Bolton cites a minimum volume of 10.5 cubic meters for key pieces in a channel the size of the Twisp River. One such minimum-sized key piece provides the volumetric equivalent of 669 pieces of the smallest size of material classified as 'large' woody debris. Where a Level One survey identifies locations with apparent deficiencies in the number of LWD pieces, simple augmentation of unanchored wood could be considered. However, a Level Two survey should be required prior to proposing engineer log jams (ELJs). This would provide the information needed to justify engineered treatments in the stream corridor.

'Specific locations to be considered include below the mouths of tributaries, floodplains (especially those with multiple braided channels), river or stream segment flowing through broad valley floors, below or within deep pools, and at the heads of islands.'

This enumeration of locations to be considered, is not a criterion, and is particularly problematic. With the exception of the reference to 'below the mouths of tributaries' this a description of the most complex, highest-functioning part of the stream system; the part that is doing fine and should be left to do so; the least disturbed, most pristine part of the channel system. These remaining, high-functioning parts of the stream system are rare and precious and should be protected. Think of these as being the aquatic equivalent of the last little patches of healthy old growth within a particular ecosystem. Every proposed treatment in these areas should be carefully scrutinized to ensure that it will promote habitat-forming stream processes. I cannot emphasize enough that the installation of ELJ's in high-functioning streams is not only wasteful of fish recovery funds but has the potential to degrade or arrest the stream processes that create high quality fish habitat. This is not theoretical speculation; I have seen it happen on multiple occasions and it is outrageous.

As described above, within naturally-functioning unconstrained stream reaches the use of ELJs should be very limited and targeted toward promoting natural processes. Series of ELJs installed in bank lines should be restricted to locations where infrastructure protection has priority over habitat-forming stream processes.

Omission

No maps or data are provided delineating the channel reaches that are considered to fall within the decision criteria for large wood placement.

Elements that should be addressed or improved within the plan:

Aquatic resources

*The effects of the absence of channel migration as an importance disturbance mechanism affecting the riparian plant communities in the river corridor is lacking from the discussion. This is particularly an issue where old cottonwood gallery forests are senescing. The widespread lack of recruitment of young cohorts of cottonwoods threaten cottonwood-dominated riparian systems.

*Similarly, importance of floodplain connectivity as another important factor in riparian health and regeneration is not addressed

*Riparian regeneration and the existing age structure and patchiness of floodplain vegetation should be discussed.

Roads

*P. 56 'Rock armoring is proposed as a treatment at up to 54 stream crossings on log haul routes.' Road drainage/ditch relief is not discussed.

*Road surfaces and ditches in the approaches from the lowest ditch relief structures and across all stream crossings should be properly surfaced with crushed rock. Armoring road surfaces only where streams are measurably showing elevated fine sediment levels is problematic. First is the measurement of a highly variable element of the stream system (i.e., fine sediment concentrations) and what is considered 'elevated'. The other is that it is a backward-looking criterion, failing to consider that increased use of unmaintained roads will increase sediment delivery to streams. It seems reasonable to proactively anticipate increases in traffic as recreational and other uses occur and act to prevent elevated sediment delivery.