Review of the USFS September 2019 Aquatic Resource Report (AR) for the Foothills Landscape Project (FLP)

Aquatic information is also provided in the FLP Climate Report and the FLP Soils Report. I am also offering comments to these documents, and incorporate them herein without reiteration.

The following review summarizes my concerns.

I request that the AR be revised to evaluate impacts by the 6th level HUC, and a confidence interval be provided for assumed parameters.

The following comments refer to the USFS Watershed Condition Classification Technical Guide.[[1]](#footnote-1)

“Definition: response channel reaches: Low gradient (in general, less than 3 percent) transport-limited channels in which significant morphologic adjustment occurs in response to increased sediment supply… Response reaches are evaluated because they are the most susceptible to change from disturbance.” pg 20 The AR vaguely assumes that stream sediment as a result of the FLP will quickly go away and therefore is not a concern. However, the sediment will settle somewhere downstream where velocities are reduced. I request that the AR be revised with estimates of mass sediment release per year and the impact to response reaches.

The Aquatic Biota Condition Indicator reviews whether all native aquatic communities and life histories appropriate to the site and watershed are present and self-maintaining. Pg 21 The AR focuses predominantly on threatened and endangered species. I request that the effect of the FLP on the aquatic biota condition indicator be predicted.

“Any road segment that, during a high runoff event, has a continuous surface flow path between the road prism and a natural stream channel is a hydrologically connected road segment…Roads affect watershed condition because more sediment is contributed to streams from roads and road construction than any other land management activity. Roads directly alter natural sediment and hydrologic regimes by changing streamflow patterns and amounts, sediment loading, transport, deposition, channel morphology and stability, and water quality and riparian conditions within a watershed…Road-related mass soil movements can continue for decades after roads have been constructed, and long-term slope failures frequently occur after road construction and timber harvest” Pg 27 The AR discounted sediment contribution to the aquatic resources. I request that the AR be revised to quantify the range of possible sediment delivery specifically by roads and stream crossings built as part of FLP.

“Forests should switch to the Wildfire Effects attribute if more than 50 percent of the watershed is affected by a significant wildfire. If less than 50 percent of the watershed is affected by a significant wildfire, switching to this attribute may still be appropriate and should be determined by the forest on a case-by-case basis. In the wake of a significant wildfire, only the Wildfire Effects attribute correctly characterizes the state of the watershed with respect to watershed condition.” Pg 31…”the effects of fire are increased soil water and overland flow that result in accelerated erosion by a variety of surface and mass movement processes.” Pg 32 An extensive, high-severity wildfire can destroy the vegetation and litter layer in a watershed and detrimentally alter physical properties of the soil, including infiltration and percolation capacities. These cumulative fire effects can change the watershed condition from good to poor, resulting in unacceptable increases to overland flow, erosion, and soil loss. Pg 33 I request that the AR be revised to quantify increased sediment, nutrient, and peak flows to streams affected by the 2016 wildfires.

Forest cover is designated as Good/Functioning Properly if “less than 5 percent of NFS land in the watershed contains cut-over, denuded, or deforested forest land from any human or natural disturbance.” Pg 34 I request that the AR be revised to report the current and forest cover by watershed on NFS land due to the FLP, addressing cut-over, denuded, or deforested forest land from any human or natural disturbance.

A Good/Functioning Properly is defined as “ (less than 10 percent) or no populations of terrestrial invasive species infest the watershed that could necessitate removal treatments to protect, soil, native vegetation, or other water resources. Those that occur are small in extent and scattered in nature. The rate of spread and/or potential for impact on watershed resources is minimal or unlikely.” Pg 38 I request that the AR be revised to quantify the current terrestrial invasive species and their potential changes due to FLP that could impact watershed resources.

The AR assumed potential riparian corridor activity (pg 20) of canopy gap creation in mesic hardwoods on 2,250 acres and pine plantation maintenance on 1,060 acres. The AR assumes that stream impact from these two activities would be minimal but does not substantiate the assumption. I believes that sediment release to, and heating of, the stream could be profound and that performing these actions in the SMZ violates the purpose for the SMZ. I request that no mesic hardwood gap be created in stream management zones (SMZ), and the SMZ be increased substantially above the proposed 100 feet for all timber removal in SMZ.

The minimum riparian corridors in Appendix C of the LMRP for the CNF) are 125’ for 11-45% slopes, and 150’ for >45%. The AR only addresses a 100’ corridor, which is only for <10% slope. I request that all SMZ extents be increased to LMRP recommendations or more for slopes >10%

The AR (pg 20) assumes that timber removal would not be completed on steep slopes, but the FLP does not commit to complete avoidance of steep slopes. Harvests are planned on slopes exceeding 35%, and such slopes comprise a great portion of the FLP area. The AR should include the evaluation on steep slopes. I request that the AR be revised to address steep slopes.

The AR (pg 21) includes 55 acres of wildlife opening maintenance in the SMZ, which includes mowing, disking, prescribed burning, herbicide, mechanical planting, and application of fertilizer and lime. The AR admits that this opening maintenance would increase sediment and heat in the stream. I believes that permanent wildlife openings in the SMZ are a violation of the purpose of the SMZ and request that all wildlife openings in the SMZ be left fallow and allowed to revert naturally to forest. This action would not significantly restrict the diversity of wildlife openings because they could be located in mesic habitats that extend outside of the SMZ.

I am pleased that Aquatic Organism Passage projects (removing and/or replacing existing barriers to aquatic species passage) and adding woody debris for fish habitat are included in the FLP.

The AR (pg 24) states “most activities would occur in upland habitats that are not directly connected to riparian corridors and therefore would not pose a significant risk or effecting (sic) aquatic resources.” This assumption is not supported in the AR, and I’s review of AR references indicate that upland timber removal and roads, especially on steep slopes, can significantly increase sediment loading to streams. I request that the AR be revised to address upland sediment delivery, especially during extreme rain events which are expected to be more severe and frequent due to climate change.

Many of AR references do not support the AR’s assumption that timbering in the upland and SMZ do not increase sediment and heat load to the stream.

The Clinton, Vose, Fowler study area had <20% slope. Unusually warm and dry weather existed for most of the logging period, which likely reduced runoff, erosion, and sediment.[[2]](#footnote-2)

The road sampler design in the Riedel and Vose study was only sufficient for collecting the beginning runoff flow. Higher erosion rates generally occur later in a rain event after the ground is saturated. The study did not quantify the rain events sampled. No mention of sampling extreme storm events, which is when higher erosion occurs, was made.[[3]](#footnote-3)

The Swank, Vose, Elliott study found large increases in sediment yield at the Coweeta Hydrologic Station immediately after road construction due to two major storm events. “Subsequently, during logging, sediment yield from roads was greatly reduced and insignificant when logging activities were completed. In contrast, cumulative increases in sediment yield were observed downstream over the next 15 years which illustrate the lag between pulsed sediment inputs to a stream and the routing of sediments through a stream system.”[[4]](#footnote-4)

Dissmeyer reported “The long-term sediment yield data illustrate a lag or delay between pulsed sediment inputs to a stream and the routing of sediments through the stream channels. In the absence of significant additional sources of sediment to streams on the watershed, annual sediment yield at the base of the watershed was still substantially above predisturbance levels at least 15 years later. Thus, there appears to be a continual release of sediment from upstream storage that was primarily deposited from road crossings of streams during exceptionally severe storms.”[[5]](#footnote-5)

The AR did not address ephemeral streams. I request that the AR be revised to include the 25 foot SMZ for ephemeral streams as noted in Appendix C of the LRMP, and to address impacts to ephemeral streams.

The AR focused on endangered species and did not address objective 26.2 in the LRMP: Biota (including nonnative species) and/or habitat improvement needs. I request that the AR be revised to evaluate the FLP impact on all stream biota, including but not limited to benthic organisms.

VanDusen, Huckins, Flaspohler reported “Nine Michigan headwater streams where the adjacent forest had undergone selection logging in the previous 2 to 30 years were modeled. Brook trout density and biomass were substantially lower in streams bordering more recently logged forests. Streams in recently logged stands had substrates with higher fine sediment content and lower overall habitat quality as estimated by a multimetric habitat index.”[[6]](#footnote-6) I request that the AR be revised to thoroughly evaluate impact of the FLP to trout (a stated USFS goal for the AR due to public comments received).

Standard FW-069 in the LRMP gives highest priority for watershed improvement to locations with known occurrence of federally-listed aquatic species on National Forest land or within three stream miles below the farthest downstream location of National Forest ownership. The AR only considered one stream mile below the National Forest. I request that the AR be revised to evaluate three miles downstream.

The AR does not address impacts on designated and recommended wild, scenic, and recreational river segments as shown in “Table 3-1 Management Prescription Acreage” of the LRMP. I request that the AR be revised to address impacts from the FLP project on current and proposed wild, scenic, and recreational river segments.

Table 3-4 of the FEIS states that 56% of the CNF has a severe erosion hazard, 35% is steeper than 60%, and 10% has a severe landslide hazard. I request that the AR be revised to include calculated erosion rates for the FLP project.

The AR references a paper by Edwards and Williard[[7]](#footnote-7) as showing that BMPs adequately reduce sediment delivery to aquatic resources.

It is only a review of three earlier studies by others, none of which had been performed in the Southern Appalachians. For the one study in a mountainous area that showed >90% reduction in sediment with BMPs “precipitation over the next several years was well below average”. The other reported good sediment reduction was in the coastal plain, which is not applicable to the Foothills due to extremely different topography and soils.

“Sediment and nutrient reductions were based on in-stream water-column loadings because, presently, there are no published studies/measurements that have measured and compared hillside delivery of sediment or nutrients from harvesting with and without BMPs…Some eroded sediment originating from management activities may be stored on the hillside or in the channel during at least the time in which monitoring was performed. If the area of storage was a riparian buffer and if storage is permanent, then the attribution of the reduction of the constituent delivery is fully appropriate in the calculation of the BMP efﬁciency. If storage was not by the riparian buffer or it was not permanent, attributing the entire efﬁciency value to the BMPs is not fully appropriate. Because substantial amounts of sediment delivered to a stream channel can be stored for decades and perhaps longer before being ﬂushed from the watershed (Trimble 1981, Reid 1982), sediment efﬁciencies may be greatly overestimated in some situations…Sediment BMP efﬁciencies also may be overestimated or underestimated because of the types of ﬂow conditions that occur during monitoring. Most suspended sediment exports occur during large or intense storm events (Beasley 1979, Edwards and Owens 1991), which occur infrequently and randomly… Road or culvert washouts are not uncommon because of a lack of maintenance and can lead to large and chronic loadings of sediment and nutrients to waterbodies. In this type of situation, water quality protection from high BMP effectiveness and efﬁciencies in the short term could be more than negated by the effects of BMP failure in the long-term.”

The third study considered by Edwards and Williard was by Arthur et.al. 1998 [[8]](#footnote-8) (on the Cumberland Plateau, a different physiographic region) of clearcut on a 45% slope had BMP sediment removal effectiveness of 53% during harvest, 34% 17 months later, and 2%, 53%, -94% (sediment increased with BMP over control), and 78% for each year subsequently. The low removal values were discounted by Edwards and Williard; they provide no scientifically defensible reason to ignore the data. Arthur et.al. found that streamflow increased by 123 percent) on the BMP watershed during the first 17 months after cutting and by 138 percent on the Non‐BMP watershed. Water yields remained significantly elevated compared to the uncut watershed 8 years after harvesting. Suspended sediment flux was 14 and 30 times higher on the BMP and Non‐BMP Watersheds, respectively, than on the uncut watershed during treatment, and 4 and 6.5 times higher in the 17 months after treatment was complete. Clearcutting resulted in increased concentrations of nitrate, and other nutrients compared to the uncut watershed, and concentrations were highest on the non‐BMP watershed.

I request that the AR be revised to address all of the above information in the Edwards and Elliott paper.

The AR on pg 10 states “In a forested watershed in the southeastern United States, Van Lear et al. (1995) estimated that over 80% of all sources of sediment were associated with unpaved roads. Unpaved Forest Service and non-Forest Service roads in the Foothills landscape are likely sources of sediment to streams, primarily from segments located in the riparian corridors…unpaved road conditions range from deeply rutted, fully native surfacing with little gravel embedded to full aggregate surfacing with proper drainage. Periodic road maintenance is sometimes inadequate to correct drainage problems.”[[9]](#footnote-9) I request that the AR be revised to address sedimentation from roads (including extreme rain events) constructed as part of the FLP.

The following comments refer to the 2017 FLP Restoration Plan:[[10]](#footnote-10)

Table 13 shows sediment delivery ratings for roads located within the FLP at 14 miles high, 127 miles moderate, 102 miles low, and 18 miles unrated. “The Foothills Landscape has 119 roads that are within this 300-footstream buffer totaling 75 miles. This would be approximately 28% of the total road length within 300 feet of a stream channel in the Foothills Landscape. Most of the 305(b) and 303(d) listed streams within the Foothills Landscape have road segments encroaching the 300ft stream buffer possibly contributing to the impaired function.” Pg 66[[11]](#footnote-11) “Stream fords may be improved. Fords that are heavily used and show evidence of sediment movement in the stream, increased bank erosion, and directed runoffon the approach would be consideredfor improvements. This would include reducing the slope of the approach to the channel and installation of gravel or rock to harden the surface and reduce impacts to the soil and water resources. Existing roadbeds that parallel streams may be pave/chip seal or rocked. Roads may be outslope road surface (3% to 5%) and eliminating inboard ditches where possible to minimize drainage issues. Road widths may be narrowed where safe to do so to reduce the potential sediment delivery to stream channels.Stream crossings may have rolling dips constructed or maintained. Landslides that are delivering sediment to streams or pose a safety risk may be stabilized.” Pg 67 Seasonal closures or decommissioning of roads in the SMZ were identified as a high priority on pg 68. I request that the AR be revised to commit to and quantify stream improvements from improvement, seasonal closure, and decommissioning of roads in the SMZ.

1. Watershed Condition Classification Technical Guide, USFS FS-978 July 2011 https://www.fs.fed.us/biology/resources/pubs/watershed/maps/watershed\_classification\_guide2011FS978.pdf [↑](#footnote-ref-1)
2. Clinton, Barton D.; Vose, James M.; Fowler, Dick L. 2010. Flat Branch monitoring project: stream water temperature and sediment responses to forest cutting in the riparian zone. Res. Pap. SRS–51. Asheville, NC: USFS Southern Research Station. [↑](#footnote-ref-2)
3. Riedel, M.S. and J.M. Vose. 2002. Forest road erosion, sediment transport and model validation in the southern Appalachians. In Proc. Second Federal Interagency Hydrologic Modeling Conference, Las Vegas, Nevada. [↑](#footnote-ref-3)
4. Swank, W.T., J.M. Vose, and K.J. Elliot. Long-term hydrologic and water quality responses following commercial clearcutting of mixed hardwoods on a southern Appalachian catchment. Forest Ecology and Management 143 (2001) [↑](#footnote-ref-4)
5. Dissmeyer, George E., ed. 2000. Drinking water from forests and grasslands: a synthesis of the scientific literature. Gen. Tech. Rep. SRS–39. USDA Forest Service, Southern Research Station. Pg 122 [↑](#footnote-ref-5)
6. Peter J. VanDusen, Casey J. F. Huckins & David J. Flaspohler (2005) Associations among Selection Logging History, Brook Trout, Macroinvertebrates, and Habitat in Northern Michigan Headwater Streams, Transactions of the American Fisheries Society, 134:3, 762-774, DOI: [10.1577/T03-228.1](https://doi.org/10.1577/T03-228.1) [↑](#footnote-ref-6)
7. Edwards P, Williard K. “Efﬁciencies of Forestry Best Management Practices for Reducing Sediment and Nutrient Losses in the Eastern United States” Journal of Forestry • July/August 2010 [↑](#footnote-ref-7)
8. ARTHUR, M.A., G.B. COLTHARP, AND D.L. BROWN. 1998. Effects of best management practices on forest streamwater quality in eastern Kentucky. J. Am. Water Resour. Assoc. 34: 481–495. [↑](#footnote-ref-8)
9. [↑](#footnote-ref-9)
10. RESTORATION PLAN FOR THE FOOTHILLS LANDSCAPE PROJECT USFS October 30, 2017 [↑](#footnote-ref-10)
11. [↑](#footnote-ref-11)