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Comments: Dear responsible official

The watershed analysis that is needed to change this project from a bonanza dream for timber harvesters and real estate developers - at the expense of fish, wildlife recreation and the natural environment - is responsible planning and detailed analysis of the factors involved in forest recovery in the wake of serious disturbances that have resulted from past management errors and climate change. There have been many excellent examples of watershed analysis created in the 53 years since the historic Water Resources Act of 1971, Chapter 90.54 of the Revised Code of Washington, which required the state to recognize and protect all public uses of Washington's waterways, including fish and wildlife habitat, recreation, navigation, aesthetics, and water quality, much has been learned but it appears that the USFS or the consultants who created these documents did not read those reports.

The most fundamental principles involved in the operation of watersheds involve developing an understanding of the interrelationships between precipitation, soil type and depth, site aspect, surface temperature and vegetation (land cover) and the timing and extent of streamflow. In the simplest possible terms, streamflow is the sum of precipitation that falls in the basin minus runoff, evaporation, consumptive uses (and out of basin transfers) and minus evapotranspiration from the vegetation. In such analysis irrigation is a consumptive use and contributes little to groundwater recharge

It is apparent from this aerial, that aspect is a critical limiting factor in this region. But an ownership overlay and a series of historical photos or maps would be needed to determine whether or not human activity was a major component in the unforested areas.

Some of that work is already complete: Land ownership maps have been created and now management history needs to be researched to understand why the landscape is as it is.

Soil type and depth in this region are important because on most slopes, bedrock is close to the surface. The relationship between stream flow and evapotranspiration is tied to what plants are involved. Evapotranspiration from conifer forests in late summer and fall will be very different from what you will measure in fields of alfalfa.

In the absence of significant land cover, precipitation goes directly to soil without interception by plants, and does not evaporate from leaves or needles. Snow that reaches the ground is not protected by shade and sublimates or melts in sunshine. In a mature tree, like the ones that are extremely vulnerable to harvest under this Midnight Project proposal, you can expect each tree to provide as much as a full acre of upward facing needles to intercept rainfall or snowfall. This is seen as a negative contributor to water availability by those who argue that net water delivered from the watershed increases if trees are removed, but that oversimplification is basically one dimensional and ignores the factors that actually matter in most situations. Denuded slopes result in rapid melting of snowpack and peak flows in spring and early summer. This graph appears to reflect the impact of wildfire removing canopy and allowing sunlight earlier access to the winter's snow. This is NOT part of the desired future condition, if the availability of streamflow for fish, or diversions for irrigation, livestock and human uses in summer is a concern

The problem described above results in early season flooding and water lost from the basin that would have been retained under "natural" conditions and retaining as much of that water as possible could and should be among the goals and the results of planning and management activities.

This deficit becomes crucial in late summer, when the drainage begins to run dry.

You will note that there is essentially no year-to-year fluctuation in stream flow on the Twisp River once low flow conditions arrive in early September and these conditions last until winter weather returns. This obviously has been a disaster for fish attempting to use this river.

The Yakima Nation has done an EXCELLENT restoration analysis on this basin, focused on restoring fish habitat and several runs of ESA listed and commercially important fish.

Timing of discharges is critical to providing fish with access to habitat in the upper reaches and historically, overallocated water rights (primary to irrigators) has dewatered reaches to the point where fish access was blocked. In the early 1990s - in the wake of SCOTUS decision that found that water quantity was a component of water quality and thus had to be considered under NEPA and protected under CWA - we spent years developing tools for watershed analysis and legislation that attempted to ensure adequate water in the streams to provide access for fish. The Tribes care about this because they are entitled under treaties, access to the fish. But water quantity is only one part of the problem. Water temperature and dissolved Oxygen are also critical. The biological oxygen demand of cowshit in the streams can be catastrophic for fish swimming upstream and as a result of this, irrigators' withdrawals and forest canopy removal to support grazing is difficult to reconcile with fish habitat protection. This graph of seasonal discharges does not consider water temperature impact of opening the forest canopy that is proposed by USFS in this massive timber removal project.

There is another important aspect to surface temperature: trees are doing far more than providing shade.

Sunlight hitting the needles of conifers triggers evapotranspiration and the evaporation of water by transpiration cools the needle and forest and reduces

the temperature. Under many situations, this process, combined with black body radiation to the sky actually cools the surface below the dewpoint and extracts moisture from the atmosphere.

But the most important factor is that the evapotranspiration begins when sunlight hits the trees in the morning and runs throughout the day.

The graph shows the early September hydrograph in exquisite detail, clearly showing the contribution of evapotranspiration to streamflow in late summer, at the USGS stream gage near Twisp on the Twisp River. Look closely at the timestamp and the vertical line that indicates time of day.

From the edges of the fungal mats around their rootlets to the tips of their needles, trees are pumping vast amounts of water and lifting the water level in the soil. This rise in the water table can be measured directly in the depth of streams, which in the absence of snowmelt or rainfall, peak in midmorning. As a direct result of this water consuming activity by trees and their fungal allies, water is retained in the soil beneath the forest and there are many chemical processes essential to the functioning of the forest occur in the duff of the forest floor that are dependent on both the water and the temperature. Opening the canopy and reducing forest cover raises the temperature of the soil and threatens many of those ongoing processes.

Another predictable consequence of reduced vegetative cover is increased water temperature. But many of the

consequences of vast areas of forest removal proposed in the scoping documents are in fact impossible to predict. Detailed climate datasets are available from NOAA but the closest complete coverage is from Fairchild AF base outside of Spokane. Datasets that accurately address temps, humidity, cloud cover, dew point, precipitation and snow cover are needed. and to date I have not seen them collected.

I have found detailed weather data to be extremely useful in predicting the impact of weather on vegetation.

There is lots of data already on the water temperature issue, which is of critical importance to fish
<https://srp.rco.wa.gov/project/290/13292>

"The Pacific Watershed Institute (PWI) completed an assessment of the Twisp River Watershed to aid in the development of a salmonid protection and restoration strategy with prioritized restoration activities. The assessment includes analyzing what changes in geomorphic, hydrologic and biological elements would aid reconstruction of watershed function. The goal of the assessment was to identify and prioritize key habitat areas and watershed processes for protection and restoration.

The Twisp River is a major tributary to the Methow River, and it supports 20-30% of the endangered Spring Chinook population in the Methow. It also supports endangered summer steelhead, and cutthroat trout and is a stronghold for bulltrout. The lower Twisp was listed as water quality impaired for temperature and instream flow. Past assessment and restoration activities in the Chewuch Watershed generated community and agency support for similar focused efforts in other sub-watersheds.

The community and Methow Limiting Factors Analysis had identified the Twisp River watershed as a high priority area. Although the Okanogan National Forest completed a watershed analysis of part of the Twisp Watershed, it did not completely cover private lands in the lower mainstem and tributaries where agricultural and developmental pressures are affecting aquatic habitat conditions. The outcomes and benefits of this assessment, based on protocols successfully applied in the Chewuch, are integrated, appropriate, and effective restoration strategies and priorities for the entire watershed."

LST - land surface temperature - is also extremely important.

The brownish areas in these seas of overheated yellow all appear to be forests, cooling themselves.

<https://climatedataguide.ucar.edu/climate-data/prism-high-resolution-spatial-climate-data-united-states-maxmin-temp-dewpoint>

NCAR Climate Data Guide states that the degree of uncertainty is high enough in the west and on complex landscapes that assumptions must be ground truthed

"Mean absolute errors in the PRISM annual precipitation normals have been published regionally (Daly et al. 2008). They range from 5% in the eastern US to 10% in the West. Temperature errors range from 0.5°C in the east to 1.0°C in the West. Increased terrain complexity and sparser data availability contribute to higher uncertainty in the West. These normals guide the development of other climate datasets by providing the expected spatial patterns of climatic variables under average conditions for the CAI analysis. PRISM daily (1981-present) and monthly (1895-present) time series datasets are developed using this technique, which means that uncertainties in the normals propagate into these products.

It is difficult to estimate the uncertainty of the time series datasets with any degree of certainty, given the wide temporal variations in data density and complexity of the climatic fields (especially precipitation)." Therefore consider it crucial that assumptions about impacts of these treatments be tested and validated prior to implementation on a wide scale.

The promises of increased water availability and increased timber output and some sort of a goldilocks zone with a few widely spaced trees in the name of reducing fuel loading and protecting homes are totally unsubstantiated by landscape level experimental data, and making management decisions that would apply untested methods that appear to contradict what is known about the behavior of water in watersheds to a 25,000 HA drainage based on an analysis that does not consider a wide range of outputs is both contrary to common sense and contrary to NEPA

This map and its explanation (clipped from ?Midnight Restoration Project ?supporting Information-Updated May 2, 2023 by Margaret M Trebon) echoes Peter Arnett's classic line, that he apparently invented, or at least that no ranking military man ever said on record, "We had to destroy the village to save it."

The arrogance of the assumptions expressed in this graphic below, from the same document, is simply astonishing.

Environmental law in the US lacks an effective implementation of Precautionary Principle but an analysis that consider the best available science has been standard for a very long time and this approach - superimposing assumptions about what forest type is "suitable" and presuming that one can anticipate climate change adaptations that will be required at a landscape level, and that the most appropriate solution to these problems involves a return to logging practices so remarkably similar to that they would probably be nearly indistinguishable to an unformed observer from those practiced in the 1970s - the very practices that created a vast range of problems for species throughout the region including those that are now listed under ESA - appears to this reviewer to be every bit as arrogant and as ill advised as assuming that climate change was not occurring.

Thank you for your time.

Joe Breskin, Veteran of the Timber Wars, The Chelan Agreement, TFW, and GMA