I am a professional freshwater ecologist with nearly 30 years of experience conducting and publishing studies of streams and rivers, including assessing their responses to the impacts of land management and habitat restoration efforts. Moreover, in the past 17 years I have conducted and published numerous studies focused on these topics in the Salmon River country, including within the East Fork of the South Fork Salmon River drainage. I also have particular expertise regarding all of the endangered fishes in the proposed project area.

I have reviewed the Supplemental Draft Environmental Impact Statement (hereafter SDEIS) for the proposed Stibnite Gold Project to the extent possible given the short turn around demanded by this deadline. I feel that the deadline for comments should have been extended, especially given the circumstances and the length and complexity of the SDEIS. Indeed, if afforded a more reasonable amount of time, I could provide a more substantive critique. With that said, I have identified several substantial concerns that I do not feel have been adequately addressed in the SDEIS, which I raise in turn below. I will also point out that I submitted virtually these same comments on the DEIS in fall of 2020, but from my review I do not see new evidence in the SDEIS that these comments have been given any serious consideration. Therefore, I respectfully resubmit them here. I do not see how the EIS process can presume to have accomplished a "hard look" based upon the "best available science" if these kinds of comments are not addressed. Without such a hard look, from my professional perspective any decisions would be arbitrary and not informed by the best science.

1) The project is billed as a "restoration" project. Yet, more than half of the footprint of the mining would occur in previously undisturbed habitat. To ensure viable and resilient fish habitat in the East Fork of the South Fork the approach generally considered among natural resource managers to be most effective (and that has been appreciated as such for decades; e.g., Doppelt et al. 1993) is to "protect the best and restore the rest." With this in mind, the USFS should have evaluated an alternative that would have minimized the mining activity and infrastructure footprint to only the previously disturbed area.
2) Even given the alternatives that were treated, the SDEIS does not appear to me to include adequate analyses of all of the alternatives or comparisons across those alternatives. Alternatives 3 and 4 are given only cursory treatment. That is likely an issue across the board for the different components of the SDEIS. It certainly is an issue with respect to stream-riparian habitat and fishes, not to mention the potential for extended downstream impacts, which leads me to my next concern.
3) I do not think the SDEIS does an adequate job of assessing (for any of the alternatives) the potential impact of extended downstream and network-wide effects on water quality or populations of endangered fishes. For example, there does not seem to me to be adequate evaluation of the possibilities, however low in probability they might be, of unintentional major contaminant spills. These impacts (e.g., of a major diesel fuel spill) could extend downstream throughout the S. Fork Salmon, but well downstream as well. This is an example of one key weakness of the assessment, overall. It is focused only on the spatial scale of the project itself. The potential for extended impacts beyond the spatial footprint of the project itself are substantial, especially when it comes to migratory species of animals like endangered bull trout, Chinook salmon, and steelhead. Such extended footprints are well documented for mobile animals like these, including within the "riverscapes" of this region. It is a substantial oversight

to not address them here, an oversight that flies in the face of what is well known regarding the life cycles and behaviors of these animals.

4) Another key oversight in the SDEIS is the lack of any acknowledgement of the high likelihood of synergistic impacts of this project with other stressors on stream-riparian and other resources. For example, the SDEIS includes acknowledged critical habitat reductions for endangered bull trout and Chinook salmon on the order of 20% or greater within the project area for the first two alternatives. What is not assessed is the possibility for impacts on critical habitat outside the project area (e.g., through unanticipated impacts like those I mentioned above), or the likelihood of impacts on habitat that interact with other stressors. Within the drainage, synergistic impacts include the potential for the effects of added mining, infrastructure development (e.g., road building), and intensified human presence and activities to combine to amplify or change the impacts of such processes on endangered fishes. Of course, these include the potential for interactions with changing climate, which was essentially ignored by the SDEIS. For example, negative impacts of project operations on water temperature and critical habitat for ESA listed species could be exacerbated by shifts in temperature and especially precipitation and flow regimes over the coming decades. Moreover, within the South Fork Salmon these changes are likely to be accompanied by additional increases in wildfire and associated disturbances like landslides and debris flows, as are already characteristic of the area. For example, the loss of critical headwater stream habitat for bull trout could be amplified under scenarios that already involve shrinking habitat for this species. These include not only the prospect for changes in stream temperature and habitat connectivity, but also the spread of invasive species like nonnative brook trout, which are present in the area but have remained at low abundance thus far. Most obviously, the already historic low returns of Chinook salmon to the drainage may place the populations in the area at amplified risk of local extinction in the face of this project's associated risks, particularly when combined with those processes already at work. Such combined or synergistic impacts are extensively documented in the ecological science literature, and all of the processes I mentioned here have been studied in the region as well but (importantly) not addressed in the SDEIS (see next comment). Incidentally, the SDEIS refers to Chinook salmon and steelhead as "ESA Threatened, stable and found throughout subbasin," and bull trout as "ESA Threatened-South Fork Salmon River core area is increasing in population size." The first claim seems entirely unfounded. From an ecological standpoint, there is nothing "stable" about the extremely low numbers of adult Chinook salmon returns to the area. The second claim is, unless I missed it somewhere in the voluminous document, unsubstantiated.

5) Finally, as I mentioned above, the DEIS seems to have overlooked a number of forms of relevant scientific evidence—relevant not only because of the topics of the work, but also because the science was conducted within the project area or within habitats immediately adjacent to the project area (making their findings highly applicable to the project area context). A cursory examination of the SDEIS and the works referenced (which, as mentioned above, was all that was possible given the short timeline imposed) reveals numerous oversights along these lines. A number of these overlooked studies are peer reviewed and published, so should have easily been evaluated as part of this assessment. In addition, a number of these address the very topics I raised above (e.g., land use impacts, climate change scenarios, wildfire effects, debris flows, network-scale interactions, endangered fishes, the potential for synergistic effects).

Others include long-term monitoring of stream-riparian organisms and habitats conducted in cooperation with the USFS, both in the S. Fork drainage and in the adjacent Big Creek drainage. I have listed a few of these below. Though only the tip of the iceberg for an area like this one which has such an extensive history of scientific studies, they are a sample of the locally relevant science that was apparently not brought to bear in the context of the EIS process and evaluation of alternatives thus far.

List of some recent relevant citations apparently not considered in the context of the SDEIS:

Peer-reviewed, published studies -

Adams, S. B., Frissell, C. A., & Rieman, B. E. (2002). Changes in distribution of nonnative brook trout in an Idaho drainage over two decades. *Transactions of the American Fisheries Society*, *131*(3), 561-568.

Arkle, R. S., Pilliod, D. S., & Strickler, K. (2010). Fire, flow and dynamic equilibrium in stream macroinvertebrate communities. *Freshwater Biology*, *55*(2), 299-314.

Davis, J. M., Baxter, C. V., Minshall, G. W., Olson, N. F., Tang, C., & Crosby, B. T. (2013). Climate-induced shift in hydrological regime alters basal resource dynamics in a wilderness river ecosystem. *Freshwater Biology*, *58*(2), 306-319.

Davis, J. M., Baxter, C. V., Rosi-Marshall, E. J., Pierce, J. L., & Crosby, B. T. (2013). Anticipating stream ecosystem responses to climate change: toward predictions that incorporate effects via land–water linkages. *Ecosystems*, *16*(5), 909-922.

Doppelt, R., Scurlock, M., Frissell, C., & Karr, J. R. (1993). Entering the watershed: a new approach to save America's river ecosystems. Island Press.

Harris, H. E., Baxter, C. V., & Davis, J. M. (2015). Debris flows amplify effects of wildfire on magnitude and composition of tributary subsidies to mainstem habitats. *Freshwater Science*, *34*(4), 1457-1467.

Harris, H. E., Baxter, C. V., & Davis, J. M. (2018). Wildfire and debris flows affect prey subsidies with implications for riparian and riverine predators. *Aquatic Sciences*, *80*(4), 37.

Malison, R. L., & Baxter, C. V. (2010). Effects of wildfire of varying severity on benthic stream insect assemblages and emergence. *Journal of the North American Benthological Society*, *29*(4), 1324-1338.

Rugenski, A. T., & Minshall, G. W. (2014). Climate-moderated responses to wildfire by macroinvertebrates and basal food resources in montane wilderness streams. *Ecosphere*, *5*(3), 1-24.

Robinson, C. T., Uehlinger, U., & Minshall, G. W. (2005). Functional characteristics of wilderness streams twenty years following wildfire. *Western North American Naturalist*, 1-10.

Tang, C., Crosby, B. T., Wheaton, J. M., & Piechota, T. C. (2012). Assessing streamflow sensitivity to temperature increases in the Salmon River Basin, Idaho. *Global and Planetary Change*, *88*, 32-44.

Tonina, D., McKean, J. A., Isaak, D., Benjankar, R. M., Tang, C., & Chen, Q. (2022). Climate Change Shrinks and Fragments Salmon Habitats in a Snow-Dependent Region. Geophysical Research Letters, 49(12), e2022GL098552.

Thurow, R. F., Copeland, T., & Oldemeyer, B. N. (2020). Wild salmon and the shifting baseline syndrome: application of archival and contemporary redd counts to estimate historical Chinook salmon (Oncorhynchus tshawytscha) production potential in the central Idaho wilderness. *Canadian Journal of Fisheries and Aquatic Sciences*, *77*(4), 651-665.

Verkaik, I., Vila-Escale, M., Rieradevall, M., Baxter, C. V., Lake, P. S., Minshall, G. W., ... & Prat, N. (2015). Stream macroinvertebrate community responses to fire: are they the same in different fire-prone biogeographic regions?. *Freshwater Science*, *34*(4), 1527-1541.

Reports for the USFS associated with monitoring of streams in the S. Fork Salmon drainage -

1994 Minshall, G. Wayne, Robinson, Christopher T. and Todd V. Royer. Biomonitoring Results from Wilderness Streams in Idaho. Assessment of Short- and Mid-term Effects of Wildfire on Habitat Structure in Streams of the Payette National Forest. Annual Report, June. 32pp.

1994 Royer, Todd V., Robinson, Christopher T. and G. Wayne Minshall. Catchment Analysis of Selected Streams in the Payette National Forest Prepared for: USDA Intermountain Forest and Range Experimental Station, Boise, Idaho. 42pp.

1992 Minshall, G.W., Dey, P.D., Koetsier, P. and C.T. Robinson. Effects of Fire on Wilderness Stream Ecosystems in the Frank Church – River of no Return Wilderness Report of 1991 Studies. Final Report to the Payette National Forest, February. 60pp.

1995 Anderson, D., Dauber, F., Ede, D., Faurot, D., Jeffries, S., Kennell, D., Martin, K., Vershoor, R., Winfrey, J. and P. Withen. Chicken Post-fire Landscape Assessment. Working Draft. McCall Ranger District and Krassel Ranger District, Payette National Forest, February.

1997 Royer, Todd V., Minshall, G. Wayne and Kate E. Bowman. Assessment of Habitat and Biota in Tributaries of Big Creek and the South Fork Salmon River, Payette National Forest. Prepared for: Payette National Forest, USDA Forest Service, McCall, Idaho. 46pp.

1998 Bowman, Kathryn E., Royer, Todd V. and G. Wayne Minshall. Monitoring the range of ecological variability in burned and unburned streams of the Frank Church 'River of No Return' Wilderness during 1997. Prepared for: Payette National Forest, USDA Forest Service, McCall, Idaho. 30pp.*

2000 Bowman, Kathryn E. and G. Wayne Minshall. Assessment of Short- and Mid-term Effects of Wildfire on Habitat Structure in Streams of the Payette National Forest. Prepared for: Payette National Forest, USDA Forest Service, McCall, Idaho. 41pp.