Project Review Comments

PROJECT: 21-1063 R, SW WA Nutrient Enhancement Coalition- Support

Sponsor: Lower Columbia FEG Program: SALMON ST PROJ Status: Application Resubmitted

MEETING: Initial Review

Shared: 4/2/2021

Review Status: Needs more information

Considerations: Budget concern, Other

Topics	Comments
Review Status - Initial	
	The sponsor is returning to SRFB 2 years early for additional funding for the next 4-year phase of this project. Due to COVID-19 the sponsor was unable to use there normal Department of Corrections crews in 2019-2020 for much of their carcass prep and hauling. They used their entire 4 year budget as they needed to use staff time to replace the DOC crew. Therefore, they are returning for additional funding 2-3 years early. In 2019, this project made it to clear primarily because of the low cost of a moderately beneficial project. Research around the PNW finds that nutrient enhancement with carcasses and analogs has short term benefits to primary productivity and without continuous application, the benefit to salmonid growth and productivity may be limited.
Review Panel Comments - Initial	
Questions (response required)	
	The budget projections are for using staff labor in replacement of DOC crew labor for all 4 years dues to COVID. What is the likelihood of being able to use DOC crews in the future and how would that change the budget?
	Reply: The potential to work with DOC is looking much better for 2021 compared to last year and recent updates lead us to be hopeful that we'll have access to DOC crews at least in time for the 2021 nutrient enhancement season. We received a signed contract with DOC on March 22, 2021 and on March 26, 2021 LCFEG received an email from Sgt Mark Francis with Larch Corrections Center stating, "The DOC is putting a plan in place to begin allowing our crews to go out and work in our communities." We also anticipate having 2 Veterans Conservation Corps interns. Consequently, we plan to reduce our budget request to reflect this new information (see updated cost estimate in the attachments).
	Is there any information available to suggest that nutrients are a primary factor limiting salmonid survival or capacity in the five local watersheds?

	Reply: Healthy stream habitat is a primary factor limiting salmonid recovery and we know that, ecologically, nutrient dynamics are a key influence on stream productivity and, consequently, on stream health. The 2018 LCFRB evaluation criteria document notes, “The Recovery Plan and other documents identify marine-derived nutrients as an important element in maintaining stream ecosystem conditions needed by fish.” The question remains whether nutrient deficiency on its own is a major limiting factor in salmonid survival. We do know that influxes of marine-derived nutrients (MDN) via the “anadromous nutrient pump” pathway have been part of these freshwater systems for millennia and that because of declines in runs MDN are far below what was historically typical. Additionally, it’s well established that lack of floodplain connectivity, a chronic problem facing streams and rivers in our region, hinders nutrient exchange between streams and vegetation, further affecting overall productivity of many stream reaches. From our perspective, the “nutrient enhancement” work we do is less about causing chemical changes in the water than about supplementing these streams with fish carcasses that are an important food source for juvenile salmonids and the organisms they feed upon. These primary and secondary trophic boosts are arguably the most important benefit of this program. Nutrient enhancement provides food to the young fish that are hopefully benefitting from more process-based watershed and habitat improvements. The main focus of fish habitat restoration tends to be on hydrology and geomorphology with less attention being paid to biology and in particular food web dynamics. As Bilby et al. (1998) noted, “Habitat restoration should include not only measures to ensure the protection and enhancement of physical attributes of a stream but should also consider the nutritional health of the system.” According to the stream evolution triangle, “Recognition of biology as a driver leads to improved understanding of reach-scale morphology and the dynamic response mechanisms responsible for stream evolution and adjustment following natural or anthropogenic disturbance.” (Castro and Thorne 2019). The importance of biology as a process driver goes beyond riparian vegetation and species like beaver that have well known effects on biogeomorphic and fluvial processes but includes “the presence, abundance, and health of benthic life.” There is ample evidence that nutrient enhancement through carcass additions benefits local benthic abundance and diversity. Lastly, to risk belaboring the point, while habitat diversity is a key Ecosystem Diagnosis and Treatment (EDT) attribute for assessing the “benefit to fish” value of restoration work, “food” is another important level 3 attribute. Defined as “the effect of the amount, diversity, and availability of food that can support the focus species” it is influenced primarily by benthos diversity/production and secondarily by riparian function and salmon carcasses (see Table 1, Application of the EDT Model to Lower Columbia Recovery Planning 2004).
	Is there any data to suggest a correlation between nutrient supplementation and increased juvenile survival or adult returns in these SW Washington streams over the past 20 years of nutrient enhancement activities?
	Reply: Yes! Let’s start with quoting an excerpt from Chapter 3 of the Lower Columbia Salmon Recovery & Subbasin Plan (2004, p3-72): “…recent scientific evidence has shown that adult salmon carcasses provide a significant source of nutrients delivered from marine to freshwater ecosystems (Kline et al. 1993, Bilby et al. 1996, Cederholm et al. 1999). Not only do the carcasses form

	the basis of a nutrient pathway via primary production, but flesh and eggs are directly consumed by aquatic insects (Wipfli et al. 1999) and by rearing fish (Bilby et al. 1996). This biological feedback loop benefits future salmon production. The chronic depression of salmon biomass to freshwater ecosystems may be contributing to reduced carrying capacity for salmon (Cederholm et al. 1999, Knudsen 2002). Probably the most important implication for Pacific salmon is that the production relationship (returning adults per spawner) is influenced not only by the number of eggs deposited in the gravel, but also by the amount of biomass delivered and retained in the watershed (Cederholm et al. 1999). The carrying capacity for freshwater production depends on both the physical space available and the amount of nutrients provided to the system." From Roni et al. (2002): "Artificially increasing nutrient availability by adding carcasses of hatchery salmon to streams is currently common in much of the Pacific Northwest. Biological responses to this method have also been documented. Elevated primary production and density of invertebrates have been associated with carcass additions (Wipfli et al. 1999). The addition of coho salmon carcasses to a small stream in southwestern Washington doubled the growth rate of juvenile coho salmon at this site compared with a nearby stream reach with a low density of carcasses (Bilby et al. 1998). Response by the juvenile fish in this experiment was largely from direct consumption of the carcass flesh and eggs rather than elevated nutrient levels." From Wipfli et al. (2004): "This study illustrates that marine subsidies from salmon spawners and salmon analogs increase condition, production, and lipid concentrations of resident and anadromous salmonids. Larger and more lipid-rich fish may subsequently have higher survival and reproduction, thereby elevating freshwater and marine salmonid production." This is an assumption, we realize, and not a research finding but it highlights the linkages, which has been observed elsewhere, between well fed, larger juveniles and increased survival and even reproduction. From Kohler et al. (2012): "Marine-derived nutrients in the form of spawning salmon represent important subsidies to freshwater ecosystems and may fuel trophic level production and affect the growth, condition, and survival of stream- and lake-rearing juvenile salmonids (Bilby et al. 1996; Wipfli et al. 2003; Hyatt et al. 2004; Lang et al. 2006). In the presence of salmon eggs and carcass flesh, the majority of stream-dwelling salmonid stomach contents are composed of these materials. We observed dramatic increases in stomach fullness and salmonid growth rates in both years after SCA [salmon carcass analog] treatments." From Benjamin et al. (2020): "…juvenile salmon grew larger and experienced improved freshwater and smolt survival, which translated to a greater number of adults returning to spawn." The authors of this paper also point out, as many papers on nutrient enhancement do, that "once additions ceased, salmon abundance returned to pretreatment levels, which, based on our model, is owing to a combination of instream and out-of-basin factors." We can only present the evidence for the benefits of nutrient enhancement and leave it to the reviewers to determine if continued investment in nutrient enhancement is worthwhile in the context of other limiting factors (and limited dollars). We see it as being loosely analogous to social services programs. You can invest in building safe housing, good schools, nice parks, and other infrastructure but the benefits will be attenuated if you don't also feed the people.
	Can the sponsor discuss how long this nutrient enhancement program may need to go

	on in relation to adequate level of natural spawners returning to these watersheds to provide the nutrients of the placed carcasses?
	Reply: We recognize that nutrient enhancement will likely be necessary until at least population recovery goals are met and for most runs that is not going to happen anytime soon. The answer to this question ("what is an adequate level of natural spawners?") is an important topic and as the region approaches recovery levels it will need further analysis and discussion. We definitely don't feel we have sufficient information to answer it at this point.
General Comments (response not required)	
	The sponsor is returning to SRFB 2 years early for additional funding for the next 4-year phase of this project. Due to COVID-19 the sponsor was unable to use there normal Department of Corrections crews in 2019-2020 for much of their carcass prep and hauling. They used their entire 4 year budget as they needed to use staff time to replace the DOC crew. Therefore they are returning for additional funding 2-3 years early. In 2019, this project made it to clear primarily because of the low cost of a moderately beneficial project. Research around the PNW finds that nutrient enhancement with carcasses and analogs has short term benefits to primary productivity and without continuous application, the benefit to salmonid growth and productivity may be limited.

PROJECT: 21-1063 R, SW WA Nutrient Enhancement Coalition- Support

Sponsor: Lower Columbia FEG Program: SALMON ST PROJ Status: Application Resubmitted

MEETING: LE Review

Shared: 4/15/2021

Topics	Comments
Lead Entity Comments	
Questions For Applicant	
	Explain why there is a cost difference between the 2019 project and this proposal, especially the large increase in LCFEG staff time since the 2019 project. Have alternative approaches to this cost increase been considered, like contracting out some staff time to work crews or working with more volunteers?
	Reply: When we developed the 2019 NE project, the COVID-19 pandemic was not in the forecast or on anyone's radar yet. This pandemic forced us to devote more staff time and labor towards completing NE project activities in 2020. We also lost access to our DOC crew and a handful of volunteers during this ordeal. The DOC crew plays an important role in the NE project, and they help with all the heavy lifting and dirty jobs like prepping the carcasses (cutting tails), cleaning up, securing loads, carcass placement, etc. Unfortunately, last year, all of these activities fell on LCFEG's staff shoulders, including a large returning run of coho. Our hands were full last NE season, and we were shorthanded, but we managed to pull together and get the work done. Due to the potential closure of Larch Mountain DOC, the odds of us having labor this cheap and cost effective or slim to none moving forward. We are asking for more funding, to continue working on the NE project and to balance out future unexpected expense increases that our organization will likely be facing. Instead of ending up in a situation where we had to return to SRFB and ask for a budget increase, we decided to submit another project proposal to cover increased staff time dedicated to the project. If we can avoid it, we would rather not end up in another situation like last year (2020), which is why we are asking for more funding so early. LCFEG is specialized in this type of work, and we feel that our staff should be on the ground managing NE operations especially, while we have volunteers working out in the field with us (SAFETY FIRST!). We have a great safety record with this project and would like for that trend to continue.
	Does the proposed budget include the cost for carcass analogs?
	Reply: No, the proposed budget does not include the cost for implementing carcass analogs into this project.
	What time of year do you do this work?
	Reply: Nutrient enhancement activity (carcass placement) occurs during fall and winter. There is an optional opportunity to extended enhancement timeframe out through late spring using salmon carcass analogs (SCAs) as a supplemental source of MDN. At the moment, this is just an conceptual idea that we have been considering for a few years. We have not implemented this concept yet, but would like our stakeholders to think critically about considering this activity in the near future to combat the trends of global warming (declines in fish returns = reduced presence of MDN in rearing habitat, natal streams, and rivers - Juvenile fish and other organisms in these ecosystems that are DIRECT consumers of the MDN supplied by salmon carcasses go unnourished).
	Additional details on site selection criteria are necessary: how does carcass placement

	site selection consider primary limiting factors to targeted salmonid populations? Is nutrient deficiency a known primary limiting factor in the target areas?
	Reply: Step one of the NE placement site selection process entails us studying the LCFRB's SALMONPORT webpage. It is a great resource to find reach information and provides other great information about restoration needs and values. We also looked at the Habitat Strategy map to find out which areas were in most need of this type of restoration(nutrient enhancement). Typically, when we are planning for the project, we search for reaches and opportunities that are connected to Teir 1 habitat. Lack of food availability or diminished presence of nutrients isn't always the primary limiting factor of all target areas, but we believe that pairing NE activities (upstream and downstream) with previously implemented restoration projects (i.e., large wood) is vital and should considered when making a selection. The intentional act of placing carcasses helps close the very large gap in the anadromous salmonid's lifecycles. NE also supports future generations of salmonids who are direct consumers of this resource (carcasses) and that rely heavily on this food source (carcasses) to be present during the rearing stages of their life(very important stage of their lifecycles) .
	Generally, this type of proposal is for a four year period. Why are you requesting funds so soon after your previous funding award? How did you develop your current budget?
	Reply: We are requesting funds this grant round because the COVID-19 pandemic cut off our access to the DOC crew, who typically makes up a large amount of manpower for NE. This event was unexpected and we ended up having to dedicate more staff time to the project to get the job done. We developed our previous budget using information and lessons learned from past NE projects, but nothing that we had seen in the past could have prepared us for COVID-19. In a normal year, the numbers rarely fluctuate. We have also received word through our local newspaper (The Columbian) that Larch Mountain DOC may be closing. Please follow the link below for context... https://www.columbian.com/news/2021/jun/20/changes-loom-for-larch-state-department-of-corrections-proposes-closing-unit/
	How do you identify your carcass release locations and prioritization? Do you consider primary limiting factors to targeted populations in the prioritization? What is the longevity of the benefits of carcass placement?

	Reply: One of the first things we evaluate before we select a carcass placement location is direct access to the stream or river via a crossing (e.g., bridge, culvert, pullout, etc.). After we make that selection, we examine the location further by then looking at some of the instream natural features (e.g., riffles, pools, boulders, wood, etc.). This evaluation process helps us determine what the site response will be (carcasses are retained vs. carcasses mobilize). FYI, it's good to have a combination of both, it's a natural process for carcass to mobilize and deposit MDN at every stop. We do consider the primary limiting factors, that's why we look into the Reach information Index for each subbasin as part of our selection process. As far as longevity of the benefits, we don't really know. NE hasn't been studied thoroughly. The benefits of carcass placement can be identified through many of the organisms that make up each ecosystem (e.g., healthy riparian buffers, bug life, macroinvertebrates, direct food source for juvenile salmonids (eggs & flesh), etc.). Salmon are a keystone species that contributes a lot to the ecosystem and future generations of salmonids.
	There is concern that higher costs associated with working during the Covid pandemic are driving up the project costs for many years, even though pandemic conditions are likely to improve.
	Reply: The cost associated with this project reflects the ongoing trends from the past year (2020). After everything gets back to how things were pre COVID-19, we can and will make adjustments to the cost estimate. We don't want to cut ourselves short and not be able to hold up our end. This project brings a lot to the table and has for many years, while still only asking for a small amount of money (<200k) to complete the activities. We have gained a lot of ground with this project and connected with many individual across multiple communities that see our vision and respect our efforts. I don't want to see this all go up in smoke and we loose all that we have built through this program because we asked for a slight increase during an ongoing pandemic.
	After scientific study, we are not seeing the expected long-term benefits of nutrient enhancement. Although it's not harming anything, we would want to see marked benefit for the cost even though there's a benefit of engaging with volunteers.
	Reply: Presumably you're referring to the one limited study completed in our region a few years back – why does that work override the other numerous studies that show increases in juvenile fish growth and survival from nutrient subsidies? We're not yet seeing "expected long-term benefits" (in terms of higher adult returns) from instream habitat work either and that is a great deal more expensive, although with enough time we can hopefully anticipate positive effects. All of these things that we do to benefit salmon in their freshwater habitat are modeled after nature's design. We do them not just because we have scientific/statistical evidence that they create more fish but because we know they work by virtue of evolutionary design, and it's at least one set of factors we can control. We build log jams, we plant trees, we enhance side channels, we connect floodplains, we place fish carcasses because this is what Mother Nature designed and humans altered and we're now trying to correct. Nutrient enhancement replaces a natural process that humanity has nearly eliminated and we know anecdotally and empirically that it helps juvenile fish by providing a direct food source. We find it hard to understand why work that mimics this critical ecological function is on the funding chopping block, although we do understand the increasing pressure funding agencies face to connect restoration dollars to increased returns.
	Question on proposed distribution of Lower Lewis, as there's naturally a high volume of carcasses in that area. Would want a better understanding of what the plan is here.

	Reply: The plan for the East Fork Lewis and the North Fork Lewis is to divide the carcasses between the two subbasins. If the lower North Fork Lewis River naturally has a high volume of natural spawner carcasses, we note the anomaly and move more hatchery carcasses over to the East Fork Lewis. Two critical components of the NE project are to examine sites and make field observations, post, and pre-carcass placement. These conclusions help steer the project year in year out and direct the focus of our activities.
	Concern of using habitat restoration dollars for work that we have found does not provide long term benefit to habitat restoration.
	Reply: We assume the comment means to express concern about the lack of long term benefits to salmon not habitat restoration itself. We hope we've addressed this concern sufficiently in the response to TAC comments. Short term though the effects may be (at least in the sense that activities have to be continued indefinitely), feeding fish and helping them grow bigger and healthier is still an important part of salmon recovery that complements process-based restoration efforts.