PROJECT: 21-1126 M, Winter Steelhead Escapement Analysis

Sponsor: Fish & Wildlife Dept of Program: SALMON ST PROJ Status: Application Resubmitted

MEETING: LE Review

Shared: 4/16/2021

Topics	Comments
Lead Entity Comments	
Questions For Applicant	
	Have you considered developing an observer efficiency model to support redd count data? This could also support improved abundance estimates.
	Reply: The project team has spent considerable time thinking about redds to fish expansion factors. The 1.62 factor used currently is of unknown accuracy in the lower Columbia region, and has no measure of precision. It is planned that the tool will be built in a way that can facilitate inputting year and population-specific estimates of fish per redd where available, to facilitate more unbiased fish/redd expansion factors, inclusive of uncertainty. This project will not, itself, develop new estimates of redds/fish. Developing such estimates involves very different data types and would require additional resources beyond those proposed for funding herein.
	Is the data available to estimate the abundance per brood year for all seventeen steelhead populations? This would support not just abundance information but productivity assessment, another VSP parameter.
	Reply: Spawning ground surveys are currently completed by WDFW for all winter-run populations except 1) those above dams where estimates are obtained through trap counts, 2) the lower NF Lewis, where PacificCorp implements monitoring, 3) Salmon Creek, which is a stabilizing population and WDFW has not had sufficient funding to survey, and 4) the White Salmon river, where WDFW has not had funding to survey after dam removal (but some surveys are conducted by Yakama Nation and volunteers). Age composition data are collected in a few ways for Lower Columbia steelhead: fish ladder traps, weirs, seining (summer steelhead only), and spawning ground carcass recovery. These data are entered into agency-wide databases annually and are available for productivity analyses like those described. Together, abundance estimates and age composition could enable estimation of productivity. However, this proposal does not include funding for such an analysis. WDFW intends instead to accomplish estimation of productivity via Integrated Population Model (IPM) development for Lower Columbia steelhead (Scheuerell et al. 2020). This would be a separate project that would use escapement estimates generated from this proposal in conjunction with the described age data. This future IPM project is not yet funded and could potentially be the source of a future proposal to this forum as suggested by Tracy Hillman during our oral presentation. Scheuerell et al. 2020 link: https://besjournals.onlinelibrary.wiley.com/doi/10.1111/1365-2664.13789
	Could this project inform monitoring programs elsewhere in the state?

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	Reply: The statistical tool being developed to generate robust spawner estimates from redd counts is designed for use throughout western Washington. While the focus of this proposal is on improving Lower Columbia estimates, project proponents have already contacted WDFW staff, co-managers, and other collaborators throughout the state with the intent of soliciting their input in an advisory capacity to ensure that the product produced is usable elsewhere. Additionally, the tool being developed will produce natural origin spawner abundance estimates that will be directly used by the hatchery reporting tool (Project 20-1165). The project team is in communication with the project team for 20-1165
	Can you provide an example of what types of data collection changes could potentially result from this project?
	Reply: Developing a flexible and robust way to analyze spawning ground survey data collected with a diverse variety of spatial study designs (i.e., opportunistic survey reaches, design-based survey reaches) and temporal study designs (i.e., weekly, every-other-week, peak-of-season only) will allow for generation of unbiased redd expansions regardless of the study design implemented. This is a key requirement for project success so that it won't just improve future estimates, but also enable us to bias-correct past estimates and estimate uncertainty associated with them. Moving forward, the model can be used to evaluate the benefits/costs of alternative temporal and spatial designs for future spawning ground survey data collection, although our proposal does not include explicit funding for such an exercise at this time.
	Why is a new model necessary for steelhead, versus reusing models built for other species?
	Reply: Abundance estimation for species in the lower Columbia either doesn't involve redd expansion (e.g., many Chinook, Chum, and some coho estimates based on mark-recapture), or, the redd survey study designs are more consistent and robust (e.g., many coho surveys with GRTS designs) and therefore don't require as sophisticated methods to develop unbiased estimates. Due to the diverse historical spatial and temporal designs used for steelhead, new methods are required relative to those in use for other species in order to develop unbiased redd expansions for steelhead. Estimates for other species that use redds, while currently believed to be unbiased, may still benefit from the new model developed herein for steelhead.
General Comments	
	There's been a need for this work for a long time.
	Reply: We agree and we appreciate the support.

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Sponsor: Fish & Wildlife Dept of Program: SALMON ST PROJ Status: Application Resubmitted

MEETING: Initial Review

Shared: 6/7/2021

Review Status: Needs more information

Considerations:

Topics	Comments
Review Panel Comments - Initial	
Questions (response required)	
	As we understand it, during spawning-ground surveys, investigators counted redds within non-random index areas bimonthly from February through June. Redd counts were then extrapolated to un-surveyed areas and the total number of redds was multiplied by a fish/redd ratio of 1.62 to estimate escapement. Has there been or will there be any thought to evaluating the accuracy of the fish/redd ratio, the redd/female ratio, and correcting for observer bias during redd counts?
	Reply: Yes, we have devoted considerable thought to approaches to estimating the fish/redd ratios. The fish/redd ratios required for unbiased abundance estimation actually represent a combination of variables: 1) the observer efficiency (is the ratio of redds counted to actual redds available to be counted), 2) the sex ratio (only females construct redds), and 3) the actual average number of redds constructed by each female. In practice it may be difficult to disentangle these variables, and varying environmental conditions during surveys, variable habitat, and variable sex ratios among populations may lead to variability in space and time. In our experience the best way to estimate this parameter is by using paired methods (coupled redd-expansions with census weirs, or mark-recapture). The census/mark recapture methods directly estimate abundance which can then be divided by the redd expansion to estimate fish/redd. We have made considerable progress to develop new estimates of fish/redd in Lower Cowlitz tributaries, and other locations, however, more of this work is needed in the future to build a model that can reasonably predict redds/fish in unmonitored years/locations, since conducting mark-recapture or census methods is not practical in all years/locations. These types of studies are quite expensive and are beyond the scope of this project. Instead, we have chosen a stepwise approach to improving the rigor of steelhead escapement estimates: 1) improve and standardize the expansion of redd counts, 2) in separate projects develop improved estimates of fish/redd that will be combined with improved redd expansions to yield improved escapement estimates. At this time, we already have several years of improved redds/fish estimates that we plan to use in conjunction with redd expansions from this project to improve escapement estimates. We also plan to continue studies over time to improve redds/fish ratios.
	The proposal indicates that there are over two decades of abundance data; however, the statistical tool will be used to correct biases in data from at least 2013 to present. Please explain why the tool will not be used to correct abundance estimates prior to 2013.

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	Reply: Data collected prior to 2013 are stored in a variety of formats. Data collected since 2013 are stored in a single consistent cloud-based PostgreSQL relational database. The 2013 through present data are therefore ready for analysis. It is our hope and intent that the historical data could be entered into PostgreSQL databases to facilitate analysis in the future, but this data/conversion/entry task is beyond our current scope and budget.
	We appreciate that the statistical tool will be developed in R and the code will be made available on GitHub. Will the tool link with the database that is being developed to store and calculate hatchery and escapement metrics (Project 20-1165)? Will there be coordination between this project and the database development project?
	Reply: Our intention is not to directly “link” the outputs of this project with Project 20-1165 currently. Instead, this project will produce estimates that go into Coordinated Assessments, SCORE, and SPI (a newer replacement for SCORE that is under development). Project 20-1165 draws it’s data directly from these locations, so in one sense, this project would be plugging it’s results directly into the “pipeline” for Project 20-1165. There is coordination between the two projects and some overlap in staffing. The aim is to implement the two projects in a coordinated manner, so the results of this project are immediately usable by Project 20-1165 and other status assessments that depend on adult abundance.
	Will there be any effort to connect the results of this analysis to existing spawning habitat capacity?
Improvements to Make Project Technically Sound (response required)	
	The proposed work should provide unbiased abundance estimates with statistical levels of precision. In addition, redd counts provide information on spatial structure. If there is data available on the age structure of returning adults that can be used to link returning adults to specific brood years, then you use these data to estimate productivity (recruits/spawner). This would provide another VSP parameter.
	Reply: We agree that abundance estimates are an important component of additional VSP parameters (i.e., productivity). We believe the best available methods for generating productivity estimates are via integrated population models (e.g., Buhle et al. 2018), which propagate uncertainty much better than traditional brood tables. Our longer term plans include broadly developing IPMs for all populations and species in the lower Columbia, but that work is outside the scope of this current proposal.
	Please provide more detail on the budget as it relates to the scope of work and analysis tasks.

	Reply: We've had informal conversations with several potential contractors about the project, re: interest and availability. We do have a similar situation, hiring a contractor for model development, under another funding source. In that instance yes, the contract included tasks and deliverables with individual cost estimates, and I expect that will also be the case here. We anticipate the project will include the following steps similar to other projects cited. 1) Assemble a Technical team (members from WDFW, NOAA, Universities, co-managers, etc) 2) Technical team selects a contractor 3) Contractor develops model & works with WDFW data and staff 4) Technical team reviews contractors product. Provides feedback to contractor and revisions are done if needed. 5) Contractor "finishes" including retrospective analysis, posting to GitHub, and publication However, because the funding hasn't been secured, we haven't chosen a specific contractor yet so we're unable to assign cost estimates at this time to each step.
General Comments (response not required)	
	The monitoring panel appreciates the fact that the project sponsor is working with researchers in other regions in developing statistical tools to improve abundance estimates.
	The monitoring panel believes that accurate and precise data are needed to make management decisions, address recovery goals, and support restoration efforts. Knowing the limitations of existing data and developing statistical tools that hopefully correct those limitations is important and supported by the monitoring panel. That said, the monitoring panel encourages project sponsors to develop robust design-based methods for collecting unbiased and precise data. Developing statistical tools to correct for poorly collected data should not be a priority. Nevertheless, the monitoring panel understands that the proposed project will not only correct biases in existing data but will also provide guidance on collecting more reliable data in the future. In addition, the monitoring panel understands that the project sponsor has worked collaboratively with researchers in other regions and the proposed statistical approach considers what others are doing and hopefully the approach can be used by researchers in other regions. As proposed, the project fills a demonstrated need and is likely to be successful.
	Reply: We appreciate the monitoring panel's thoughtful assessment of our project. We agree that the best monitoring programs are design-based. Within our abilities we endeavor to implement design-based monitoring when possible. On the other hand, monitoring is inherently a "long game" with data collected over many decades. Inevitably, the science of study designs itself evolves, as does the quality of analytical methods available. Despite changes and improvements over time, there is a great need to maintain unbiased/valid time series of abundance that are comparable over time for the purpose of trend analysis. For this reason, our interest was not only in developing an approach that would improve estimates going forward, but also one that could be flexibly applied to past datasets and remain robust to the assumptions implied by their study designs. We believe the approach proposed accomplishes this.