ISRP INDEPENDENT SCIENTIFIC REVIEW PANEL

FOR THE NORTHWEST POWER AND CONSERVATION COUNCIL PORTLAND · NWCOUNCIL.ORG/ISRP

Memorandum (ISRP 2023-2) **August 11, 2023**

To: Jeffery Allen, Chair, Northwest Power and Conservation Council

From: Richard Carmichael, ISRP Chair

Subject: Response Review of the Confederated Tribes of the Warm Springs Reservation of Oregon's Project #2007-157-00, *Bull Trout Status and Abundance on Warm Springs Reservation*

Background

On May 24, 2023, the Northwest Power and Conservation Council asked the ISRP to review a response from Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO), regarding Project #2007-157-00, *Bull Trout Status and Abundance on Warm Springs Reservation*. The project is designed to continue long-term status and trends monitoring of bull trout to evaluate the efficacy of potential management treatments, conduct monitoring to determine distribution of bull trout and brook trout on the Warm Springs Reservation, and support bull trout populations by suppressing brook trout populations. The response was submitted to address the ISRP's request for a response on several issues regarding the proponents' proposal associated with the *Resident Fish and Sturgeon Project Review 2019/2020* (See ISRP 2020-4; comments repeated in the ISRP's final report 2020-8, pages 368-376). As part of the Council's recommendation in 2020, the proponents were granted a time extension to address the ISRP's preliminary recommendation for a response. The Council's final recommendation for the project is pending this ISRP review of the response information.

In ISRP's 2020 preliminary review, the ISRP found that there was too little information presented to evaluate the proposed work and asked for a response on the following topics:

1. A summary of insights and conclusions from prior work
2. Goals and SMART objectives for new and ongoing work, and research hypotheses
3. Methods descriptions that align directly with goals and SMART objectives

4. A structured adaptive management framework
5. A description of the monitoring, analyses, and data sharing that will be conducted to accomplish the new objective "to advance the understanding in bull trout ecology in the lower Deschutes Subbasin."

The ISRP's 2020 request for a response regarding item three on methods included a set of five sub-questions (a-e) regarding a proposed action for bull trout translocation/supplementation in Mill Creek. The proponents indicated that they dropped the proposed translocation-supplementation action after the last review because the Lionshead Fire in 2020 severely degraded prospective bull trout habitat in the Mill Creek watershed. However, those ISRP 2020 response request items may apply in the future because the proponents' response indicates that habitat assessments will be conducted to determine the suitability of Mill Creek for bull trout translocation. Our review below includes our final recommendation on the proposal and response and specific ISRP 2023 response comments to the proponents' point-by-point response to our 2020 review.

ISRP Recommendation

Final recommendation: Meets scientific review criteria (conditional)

We thank the CTWSRO for their responses. We recognize the challenges that Covid and staffing levels have created and greatly appreciate the time and effort required to prepare the response, helping us understand the proposal and addressing some of our questions. However, several concerns and issues were not addressed adequately, and some were not addressed at all because of confusion about the ISRP's request. Several conditions need to be met before this proposal can be considered as fully meeting scientific criteria. The ISRP recommends the following conditions be addressed by the proponents in the form of a response letter to the ISRP before the next contract period or before initiating field sampling and the proposed brook trout removal effort. Additional details related to each condition are provided in our comments on the point-by-point response provided below.

Condition 1. Adaptive management process: Question 4 in the ISRP's response request was not addressed. Further information is needed to fully understand how the project evaluates its past actions, assesses monitoring data, and modifies project methods and actions when needed. The proponents should describe their process for project adjustment to adapt their actions and incorporate new information from their monitoring as it becomes available. The plan should explain how project information is used to prioritize actions and make decisions. Are meetings scheduled regularly to evaluate project performance and subsequently adjust the actions? How are the group's decisions documented for future reference?

Condition 2. eDNA methods, analysis, and occupancy modeling: eDNA sampling is a new method that the proponents will use to develop an updated inventory of known bull trout/brook trout ranges by the year 2025. The revised methods align with the objectives more effectively than in the original proposal. However, there are concerns and questions related to the methods and how they address the objectives. Because of the methods' central role in determining bull trout and brook trout distributions and the project's limited experience with the methods, we recommend that the proponents describe the design of the data collection, analysis, modeling, and interpretation in the response letter to the ISRP. It is unclear how eDNA data will be used to determine density. How will the area within each site be incorporated into determining high use areas? What analytical approach will be used to develop the occupancy model needed to determine environmental factors affecting presence and absence of bull trout and brook trout? It is unclear what factors are hypothesized to be important, and where and how needed data will be collected.

The terms *relative density*, *occupancy*, and *presence/absence* are used, seemingly interchangeably, as metrics or objectives of the eDNA study. Estimation of abundance from eDNA results, as implied by the term *relative density*, requires considerable ground-truthing and evaluation of factors that influence species-specific patterns of DNA movement and persistence in the environment (Sepulveda et al. 2021). The ISRP suggests that the proponents limit the objectives of eDNA to occupancy (e.g., presence/absence) to avoid complications of estimation of abundance. These data will be appropriate to populate occupancy models as described in Sepulveda et al. (2021), but the proponents need to describe in detail how they will develop the occupancy model and how they will identify environmental factors affecting occupancy and eDNA detection.

Condition 3. Brook trout reduction: The scientific basis for the implementation objective of a 15% reduction for brook trout suppression is unclear. The proponents need to explain the basis for the 15% value and provide supporting information and documents. The description of the approach should specify the scale of brook trout suppression efforts. What is the treatment area for suppression activities? What is the sampling plan and sampling unit? How will the scale and intensity of suppression efforts be determined from the occupancy modeling results? Post-suppression monitoring is necessary to evaluate whether brook trout populations are reduced to the intended level of abundance and distribution. Describe the plan for post-suppression monitoring to evaluate bull trout response. How will the success of suppression be monitored? Previous efforts to remove brook trout to increase cutthroat trout populations required greater levels of removal than the proponents planned to achieve for several years (Peterson et al. 2004). If off-reservation areas serve as a source of brook trout, will suppression be conducted off-reservation to achieve objectives?

Condition 4. PIT tagging: The proponents should explain why they are PIT tagging bull trout and how their analysis of PIT-tagged bull trout will address their hypotheses about bull trout population responses. The response letter should describe how they will achieve the targeted accuracy and precision identified in the objectives. The approach for analyzing PIT-tagged fish movement data should be described more thoroughly. The proponents should describe how detections at PIT tag detection arrays will be expanded to estimate the total number of bull trout that pass a site and in what direction. The plan should also describe and justify the expected levels of detection probability accuracy and precision.

The methods presented for long-term monitoring are incomplete. The project should describe the sample design and protocols for habitat measurements in the long-term monitoring study and explain how these data will be analyzed and summarized. The methods section should explain how temperature data will be analyzed to assess status and trends relative to bull trout life history requirements or tolerances.

Additional Condition, not needing a response to the ISRP:

Condition 5. Goals and objectives: The ISRP recommends that the goals and objectives be strengthened in the next annual report and workplan.

The ISRP appreciates that the proponents revised the goals and objectives section in their response document, and several of the objectives and associated hypotheses are improved. The goals and objectives can be further strengthened following the ISRP's advice in our comments for Question 2. The implementation objectives described in the response are largely a series of tasks to be completed. They should be revised to provide the quantitative and time-bound criteria for evaluating the actions and directly link the actions to a specific biological objective. Also, there is some confusion about a fourth goal as only three goals are included in the response.

Final Comment:

The ISRP appreciates the proponents' responses to our questions, which address many of our concerns. Given the new approaches being used by the CTWSRO and the complexity of the implementation and analyses, the proponents' efforts to address these conditions and recommendations will strengthen the actions to protect and enhance bull trout populations on the Warm Springs Reservation.

ISRP Comments on CTWSRO 2023 Point-by Point Responses to ISRP 2020 Review Questions

1. ISRP 2020: Provide a more complete description of the insights and conclusions from prior work instead of a summary of sampling accomplishments and data collected.

CTWSRO 2023 Response:

The long term data we have collected has been beneficial for us to understand the trajectory of Bull Trout populations, specifically in Warm Springs River (WSR) and Shitike Creek (SC). Historically our main efforts for understanding and learning about bull trout populations have been from redd counts and snorkeling. These long term results have helped us understand the decline of populations in both streams and the factors that may be leading to those declines. Snorkeling efforts targeting juveniles has shown a steep decline in WSR over the years, and although juvenile bull trout populations in SC look relatively stable, decrease in redd counts show a population likely declining. The cause for these declines is likely due to loss and degradation of habitat. Intense, and expansive wildfires on the reservation, a history of logging, and grazing are all factors that may be leading to habitat degradation. Increased fine sediments in both streams are likely a consequence of said events, as fine sediments increase water quality will decrease as will spawning ground availability and cover for juveniles. Bull trout require complex habitat and logging and grazing may be decreasing the habitat complexity in WSR and SC, less large woody debris, and large woody debris recruitment decrease possible cover for bull trout that also help create habitat heterogeneity. Grazing and wildfires fundamentally change stream characteristics by changing sediment types, filling pools, widening streams and increasing incision which leads to less available habitat for this threatened species.

Another factor leading to the decline in populations, specifically in WSR is likely the lack of connectivity from the mainstem Deschutes River to spawning grounds in WSR the fish weir at the hatchery has seen a drastic decline in bull trout migrating to spawn. An average of less than one fish has been encountered over the last five years leading many to believe the fluvial bull trout in WSR may be extirpated. The cause of this could be due to the weir, as well as a thermal impasse on WSR as temperatures increase in the early summer months and the lack of cover on portions of the WSR this could deter migrating bull trout from moving further upstream. Improving habitat by identifying causes of increased fine sediment, and managing them, increasing habitat complexity in channels, improving connectivity and providing education to the importance of bull trout can help the populations in the Warm Springs Reservation improve.

ISRP 2023 Comments:

The response describes a number of general insights about factors influencing bull trout population trajectories in the project area; however, the proponents need to provide quantitative results to support the conclusions. The project was originally designed to track changes in abundance and distribution in bull trout at various life stages (e.g., redds, adults) over time. The proponents suggest several hypotheses that could explain observed declining

trends either singly or in concert, including logging and fire effects on habitat complexity, and the impact of the hydrosystem on connectivity across the project area. Several of the major factors that might affect abundance and distribution (sediment size, habitat complexity) are not directly addressed by the monitoring data collected by the project.

The proponents need to describe the specific data and results that will help understand why the bull trout populations are declining in the Warm Springs River and Shitike Creek. What are the status and trends in abundance, productivity, and age-structure of the bull trout population? More information, citations, and quantitative results about habitat assessments are needed to support the conclusion that habitat loss and degradation are responsible for bull trout declines. If these factors are being quantified, have existing data been analyzed statistically to determine if there is a relationship between changes in habitat conditions and responses of the bull trout populations?

Lack of connectivity between the Deschutes River and the Warm Springs River is also described as a potential significant limiting factor. Temperature increases resulting in thermal migration barriers in summer and Warm Springs Hatchery Weir effects are stated as potential causes. It is critical to identify the magnitude of these two potential factors because the management actions needed to address them are vastly different. Additional analysis of existing data should be conducted to characterize temperature changes that have occurred over time during the fluvial adult upstream migration time period. Such analysis would provide a better quantitative test of the temperature barrier hypothesis.

Increased sediment load is described as a major contributor to the bull trout decline. The proponents state "Improving habitat by identifying causes of increased sediment, and managing them, increasing habitat complexity in channels, improving connectivity and providing education to the importance of bull trout can help the populations in the Warm Springs Reservation improve." However, the response does not provide goals, objectives, methods, or existing analyses that relate to quantifying and addressing these potential limiting factors.

Previous reviews of the project and responses point out important life history differences in bull trout (e.g., fluvial vs resident forms) and PIT-tag array design to evaluate differences likely to affect distribution and abundance. Those differences are not discussed in the response. Development of eDNA survey methods as proposed are unlikely to provide information on life-history type, but the eDNA methods will augment current snorkeling surveys to document occupancy.

Implicit in the proposal and response is the overarching hypothesis that negative biotic interactions are causing population declines and preventing bull trout from recovering to historical abundance and distribution patterns. Interestingly, little attention is paid to this hypothesis in the response. A more complete and quantitative description of the insights and conclusions from prior work should include this information, particularly if suppression efforts are implemented and monitored.

2. **ISRP 2020: Develop clearly articulated goals and objectives for both ongoing and new work. Follow the proposal preparation guidance to develop SMART biological/physical/social objectives and related implementation objectives that link directly to a specific goal. Similarly, research hypotheses in the form of alternative hypotheses with predictions are needed to facilitate development of methods and data analysis protocols.**

CTWSRO 2023 Response:

Specific Goals 1 – 4 (to be used through the rest of document for clearer organization)

1. *Suppress brook trout populations in The Warm Springs Reservation to decrease competition and hybridization with bull trout.*
2. *Determine distribution of Bull Trout and Brook Trout on the Warm Springs Reservation.*
3. *Continued monitoring/implementation of long term trend information that has been previously collected in order to extend the data set and help inform on the efficacy of treatments to be potentially applied.*

B. Objectives (SMART)

Biological, physical, or social objectives

Specific goals 1 – 4

1. *High use on-reservation brook trout areas will be targeted with appropriate active and passive capture techniques in order to attempt to reduce total brook trout densities by at least 15% by 2025 in order to support bull trout populations.*
2. *Presence/absence surveys will be conducted across all accessible on-reservation stream locations in order to achieve an updated inventory of known bull trout/brook trout ranges by the year 2025.*
3. *Annual collection of PIT tag information, redd surveys in index reaches, and juvenile densities in index reaches will continue to be collected in order to add to long term monitoring information into the year 2025 in an effort to continue to inform management.*

Implementation objectives

1. Distribution study

- *We will review the current distribution estimates based on our long term monitoring.*
- *By 2024 We will use a stratified sampling technique on all water bodies known to contain bull trout, and brook trout, with at least 50 sites to sample. Using environmental DNA (eDNA) we will sample across the reservation. We will sample each site at least four times over six months to account for migration, and movement of species. Along with eDNA samples we will also sample environmental variables with the purpose to determine their effects on detection and occupancy.*
- *We will send the samples back to be analyzed (we will likely be working with rocky mountain research station). After receiving the results we will be able to determine density of species at each site and whether or not they occurred for each sample.*
- *In addition to analyzing presence and absence of species at sites and when they were present or absent at each site during sampling times, we will use an occupancy model to determine factors that may affect presence and absence of species. With the results we will be able to create a distribution map, along with the possible distribution of the species based on measured environmental factors.*

2. Brook Trout Suppression

- *After determining distribution and relative densities of bull and brook trout using eDNA, we will use these results to find locations of the highest densities of brook trout and implement extraction plans. Environmental variables measured with eDNA sampling can also give us insight into some factors that may be affecting brook trout distribution and how to change them in favor of bull trout to put brook trout to a disadvantage.*
- *During Summer months, we will snorkel established reaches on the reservation, to confirm eDNA results.*
- *Identify the most appropriate techniques by the end of the first sampling season and then adjust to the most area specific effective techniques for future efforts. Techniques could be active (hand netting by snorkeling, electrofishing) or passive (box nets, fyke nets, other non-lethal capture methodologies to protect potential bull trout interactions).*

3. Recurring long term monitoring data collection

- *Conduct annual redd surveys in previously established index reaches to inform management of bull trout spawning activities.*
- *Conduct annual snorkel surveys in previously established index reaches to inform management of bull trout juvenile densities. We will also incorporate the results from eDNA to help guide further monitoring efforts, by focusing on high density areas in the reservation and randomly snorkeling reaches to ensure other, less dense regions are responding similarly.*
- *Conduct consistent temperature monitoring activities in previously established locations to continue to inform management.*
- *Conduct annual PIT tagging and PIT tag data monitoring of bull trout in on-reservation locations in order to inform management.*

Research, monitoring, and evaluation:

A. Research Questions

1. Will reducing the population of brook trout on the Warm Springs Reservation have a positive effect on the population of bull trout on the Warm Springs Reservation?

2. Does Mill Creek have appropriate conditions to warrant bull trout supplementation in the future?

B. Alternative Hypotheses

1a. Brook trout have a robust competitive influence on bull trout such that reducing their population will increase the success of the on-reservation bull trout populations.

1b. Bull Trout have more constraining factors on their populations that in aggregate significantly outweigh the effects that brook trout exert on their populations.

2a. Mill Creek has biotic and abiotic conditions that seem to be similar to other local systems and/or non-local systems that support a thriving self-sustaining bull trout populations.

2b. Mill Creek lacks appropriate conditions in order to reasonably assume that a bull trout supplementation effort would yield a thriving self-sustaining population.

C. Specific predictions

1a. We believe that if we reduce brook trout populations it will have a positive impact on bull trout by reducing feeding competition, spawning habitat competition, spawning invalidation (hybridization or brook trout excavating bull trout redds), and direct predation of bull trout by brook trout and we will see a measurable increase in bull trout populations.

1b. The removal of brook trout on-reservation will have a negligible effect on the populations of bull trout and we will need to identify other avenues in order to assist in improving bull trout population status on-reservation.

2a. We believe that Mill Creek, after restoration, is a suitable environment for bull trout and that if we "jump start" the population via re-seeding that a self-sustaining population of residential, fluvial, and/or intermediate life history bull trout are likely to take hold in the upper Warm Springs basin by way of Mill Creek.

2b. Bull Trout will not take a foothold in Mill Creek and we will need to identify what else may be limiting their success with other factors such as lack of feed or lack of marine derived resources.

ISRP 2023 Comments:

The goals and objectives are improved from the original proposal. However, they could be strengthened and connections between goals and objectives could be identified more clearly.

The response indicates that there are 4 goals; only 3 are provided, but perhaps this is a typo. Goals 2 and 3 are objective level statements. The proponents should consider incorporating the goals more like those provided by the ISRP in the preliminary proposal review:

1. Develop a better understanding of the distribution and abundance of brook trout and bull trout and the impacts of brook trout on bull trout.
2. Protect and enhance bull trout populations through brook trout suppression.
3. Provide information to assess status and trends in bull trout populations and their habitats.

The three biological objectives should be strengthened, and to some extent they are not really biological objectives. The first is a quantitative objective, and additional information is needed to support it. It is unclear what high use areas are, or how they will be delineated. Likewise, the proponents should justify the 15% target for brook trout reductions and describe the long-term reduction target needed to achieve desired bull trout abundance and productivity. The proposed 15% reduction in brook trout may not be enough to improve bull trout productivity. Given the rapid immigration of brook trout from downstream segments, coupled with their high reproductive rate, this level of reduction is likely to have little positive effect on bull trout populations. A more effective approach might be to seek total removal in 15% of the stream area, above a barrier or weir that keeps the nonnatives out (see Buktenica et al. 2013 as an example).

The second objective is needed to fully understand the distribution of bull trout and brook trout, and to assess the potential impacts of brook trout on bull trout.

The third objective is an implementation objective to continue monitoring of redds, juvenile abundance, and temperature. It also includes PIT tagging efforts, but it does not identify how PIT tag information will be used. The response does not explain the level of detectability that will be necessary to measure increases or decreases in the bull trout distribution and abundance.

The proponents removed the Mill Creek bull trout translocation and supplementation objectives, so why is Research Question 2, which relates directly to the bull trout translocation/supplementation, included? If there is ongoing consideration of translocation, then all of the issues identified in the preliminary review remain relevant and should be addressed. Many of these issues concern the historical and ecological justification of translocation and establishment of bull trout in Mill Creek. These issues need to be addressed in a comprehensive planning and coordination process conducted prior to a final decision to

begin translocation. If bull trout translocation into Mill Creek is simply being put on hold for the duration of this proposal, these issues need to be addressed before it is reinitiated.

Under the section on Specific Predictions related to the hypotheses, the proponents note that other avenues will need to be identified to assist in improving bull trout population status on the reservation if removing brook trout has a negligible effect on bull trout populations. Some environmental factors that influence bull trout and brook trout may change during the assessment of bull trout responses to reductions in brook trout. Additionally, some factors, such as water temperature, may become more important in the future. For example, annual temperature monitoring at many strategic locations coupled with periodic (e.g., every 3 years) measures of brook trout and bull trout distributions across the basin could help determine the role of temperature and brook trout in bull trout population status. The adaptive management plan for the project should include efforts to understand how changes in important environmental factors influence relationships between bull trout and brook trout.

3. ISRP 2020: Develop adequate method descriptions that align directly with goals and SMART objectives.

CTWSRO 2023 Response:

1. Brook Trout Suppression

Methods:

a. *The field crews will be utilizing hand nets at night while equipped with PPE including gloves, dry suits, wading boots, snorkel masks, snorkels, etc. The brook trout will be captured and put into a sorting bucket for euthanasia. We do not do anything to suspected hybrids other than take a genetic clip and note for suspected hybrid and then release the organism unharmed, action is only taken on clear bull trout/brook trout.*
b. *Methods to determine efficacy of brook trout suppression include hand netting, box netting, capture at previously established weirs (ex: fish hatchery), backpack electrofishing, hook and line, or other appropriate capture techniques that are appropriate for capturing brook trout while simultaneously not harming bull trout.*

Design:

Areas based off of Occupancy and distribution results will guide our sampling efforts, along with snorkel data. Density survey data will be reviewed and analyzed to determine the locations that have historically had the highest brook trout/100m^2 and those areas will be targeted until they are "fished out" and then other locations of historical brook trout high usage will be targeted. In addition to known on-reservation hotspots (primarily in Shitike Creek) we will look to expand our targeting depending on the results of our distribution surveys. If the high lakes, for example, show high brook trout densities then those areas will be looked into for potential brook trout reduction efforts as well.

2. ***Distribution Study***

Methods:

a. Determining bull trout distribution in the Warm Springs Reservation will be done using eDNA surveys. Streams in the reservation are already separated into index reaches, we will randomly sample from at least 50 sites using index reaches as individuals, doing at least four sample at each site, separated temporally throughout a season to ensure the results aren't skewed by migration, or movement. Environmental variables will be measured at the sites to help determine what may affect occupancy and detection of eDNA in the specific sites. The results will then be used to create an occupancy model and provide the current distribution of bull and brook trout in the Warm Springs Reservation.

b. The secondary method and way to ensure eDNA results are accurate for the distribution study will be dry-suit snorkeling. For the snorkeling portion of this dry suits, dive masks, snorkels, wading boots, gloves, dive lights, and other appropriate sampling equipment will be utilized.

Design:

On-reservation waterbodies will be analyzed for currently known presence/absence distribution and that distribution will be appropriately noted and recorded for this study objective. The waterbody catalogue for on-reservation waters will be matched with the currently known distribution of brook trout and bull trout. Waterbody names and sampling site coordinates will be recorded and catalogued to add to surveyed distribution locations. Currently the most appropriate avenue identified is to start in the tributaries of known high access locations like Shitike Creek and then work upstream from their confluence and survey the tributaries to their headwaters. Once this is done then the tributaries of the tributaries, if present, will then be surveyed in order to obtain a holistic distribution dataset for a given small-scale geographic area.

3. Recurring long-term monitoring data collection

Methods:

A. Index Reach Redd Surveys

Spawning ground surveys are conducted in four streams having between two to five index reaches, ranging from 0.4 to 6.4 km. During fall, surveyors, wearing polarized glasses, walk downstream in index reaches recording each bull trout redd by GPS point. Fluvial bull trout redds are typically 50 cm diameter with average substrate 25 mm diameter. Numbers of live adult bull trout (> 300 mm by visual estimate) on spawning grounds were also recorded. Resident bull trout or brook trout redds, impossible to distinguish from each other, were also noted, if observed. These are typically 25 cm diameter. This information is recorded and the locations are flagged to eliminate over counting on subsequent surveys.

B. Juvenile Density Surveys

Snorkel surveys are conducted in four index reaches in Warm Springs River (WSR) and 9 index reaches in Shitike Creek (SC) during summer, targeting juvenile and non-migratory bull trout and brook trout but other fish species are also recorded. Divers use dive lights, starting at the downstream end of the reach moving upstream, according to techniques described by Thurow (1994). Prior to snorkeling index reaches, habitat surveys are conducted to characterize and quantify fish habitat so that fish densities may be calculated.

C. Persistent Temperature Monitoring

Water temperature monitoring sites were established in 1999 to document thermal conditions for migratory, rearing, spawning and holding habitats for bull trout in the Warm Springs River, Shitike Creek, and White Water River. Temperature logging devices were deployed and data are recorded hourly, year-round, by temperature loggers (Hobo Pro V2, Onset Computer Corp., Pocassett, MA). Seven-day average daily maximum water temperatures from sites in the lower reaches, for migration, and on upstream and downstream ends of spawning and rearing index reaches are presented in graphs. The temperature loggers are downloaded on a regular basis and redeployed if the equipment is functioning properly or noted and replaced if they are malfunctioning.

D. Bull Trout PIT Tagging/Movement Monitoring

Bull Trout are captured under ESA Permit TE71541A_3 with rotary screw traps (RSTs) in the Warm Springs River, Beaver Creek, and Shitike Creek (historically) under the Natural Production project 2008-311-00. For specific work under this project bull trout are captured and tagged via hand net snorkeling. These organisms are captured, identified, measured, anesthetized (if applicable), PIT tagged if large enough, kept in a net pen with sufficient velocity refuge to ensure tag retention, and then released after 24 hours. All of this data along with date, time, and coordinates are recorded on a data sheet. CTWSRO operates three dual-reader PIT tag arrays in Shitike Creek and six dual-readers in the Warm Springs River. These locations are maintained, calibrated, downloaded, and the data is logged for migratory behavior study.

Design

A. Index Reach Redd Surveys

The Warm Springs Tribe has conducted bull trout spawning ground surveys under this project since 1998. On an annual basis the spawning ground surveys are done in a multi-pass design methodology in index reaches to determine annual spawning activity. There are two index reaches in WSR, JC, and WWR as well as four index reaches in SC. The index reaches were determined based on historical anecdotal spawning activity observations.

B. Juvenile Density Surveys

Since 1999, relative abundance of juvenile bull and brook trout has been documented by night snorkeling during summer, in index reaches, in WSR and SC. Index reaches in WSR and SC, established in 1999, were surveyed annually to indicate trends in relative abundance. Index reaches were selected in 1998 after extensive surveys located suitable habitat to hold bull trout based on stream temperatures during summer. Habitat criteria used to scale down the survey area was where seven-day average daily maximum water temperature did not exceed 15°C (Fraley and Shepard, 1989; Ratliff and Howell, 1992; Rieman and McIntyre, 1993). In every river kilometer of WSR and SC meeting the stream temperature constraint, a 100-meter long reach that fit the criteria of 'suitable bull trout rearing habitat' was snorkeled at night. Criteria for suitable rearing habitat included temperature, presence of large woody debris, log jams, deep pools and undercut stream banks (Dambacher and Jones, 1997; Goetz, 1989).

C. Persistent Temperature Monitoring

The Warm Springs Tribe established a water temperature monitoring project in 1999 with a multitude of locations throughout the basin that were chosen based on monitoring migration corridors, heavy spawning locations, and locations of significant juvenile rearing. These were placed through the waterbodies, SHC, WSR and WWR for this project, in order to get information on the specific areas, however, they were also placed throughout the system as to get a holistic idea about water temperature fluctuations as you move throughout the system.

D. Bull Trout PIT Tagging/Movement Monitoring

Juvenile bull trout are caught in WSR and SC because of a lack of access to adult organisms, however, adults are captured if they can be. Juveniles will be targeted at night in the most historically dense and suitable (velocity refuge, depth, cold water, substrate, etc.) index reaches in the WSR and SC in order to tag them for migratory study. The PIT tag arrays are full duplex and have been placed at locations in the system that have favorable width, substrate, system location, flows, depth, and accessibility for maintenance. They are also spaced out so that we can be better informed as their movements throughout the entire systems.

Translocation/supplementation of bull trout in Mill Creek

ISRP 2020: There is a substantial need to justify the translocation of bull trout into Mill Creek. Expanded background information, justification, and a benefit-risk assessment are needed. The rationale that has been provided lacks consideration of some very important factors (see the list below). There needs to be better justification because of the uncertainty of whether bull trout ever existed in Mill Creek and the risk of removing adults and juveniles from Shitike Creek. Information on benefits and risks needs to be compiled and considered in a structured decision process such as the Council's three-step hatchery master planning process. Development of sound justification for translocation might best be addressed by making it a SMART biological objective with associated implementation objectives and methods for a benefit-risk assessment. Concerns and important questions to be considered in the structured decision process include:

a. Was Mill Creek part of the historical range of bull trout? Is Mill Creek designated as an independent population or just a production area in the Warm Springs River population and is it identified as critical habitat? If there was historical bull trout production in Mill Creek, was it a large contributor to production and sustainability of the Deschutes Subbasin bull trout populations and the DPS? Is the reintroduction into Mill Creek identified as a high priority action in the Recovery Plan?

b. What are the factors that led to extirpation and have they been improved enough to provide conditions suitable for sustainable natural production and expression of full life history diversity?

c. What is the predicted productivity and diversity impact to the Shitike Creek population resulting from removal of adult and juvenile bull trout? Is the potential production in Mill Creek from transplanted bull trout worth the risk of removing individuals from Shitike Creek?

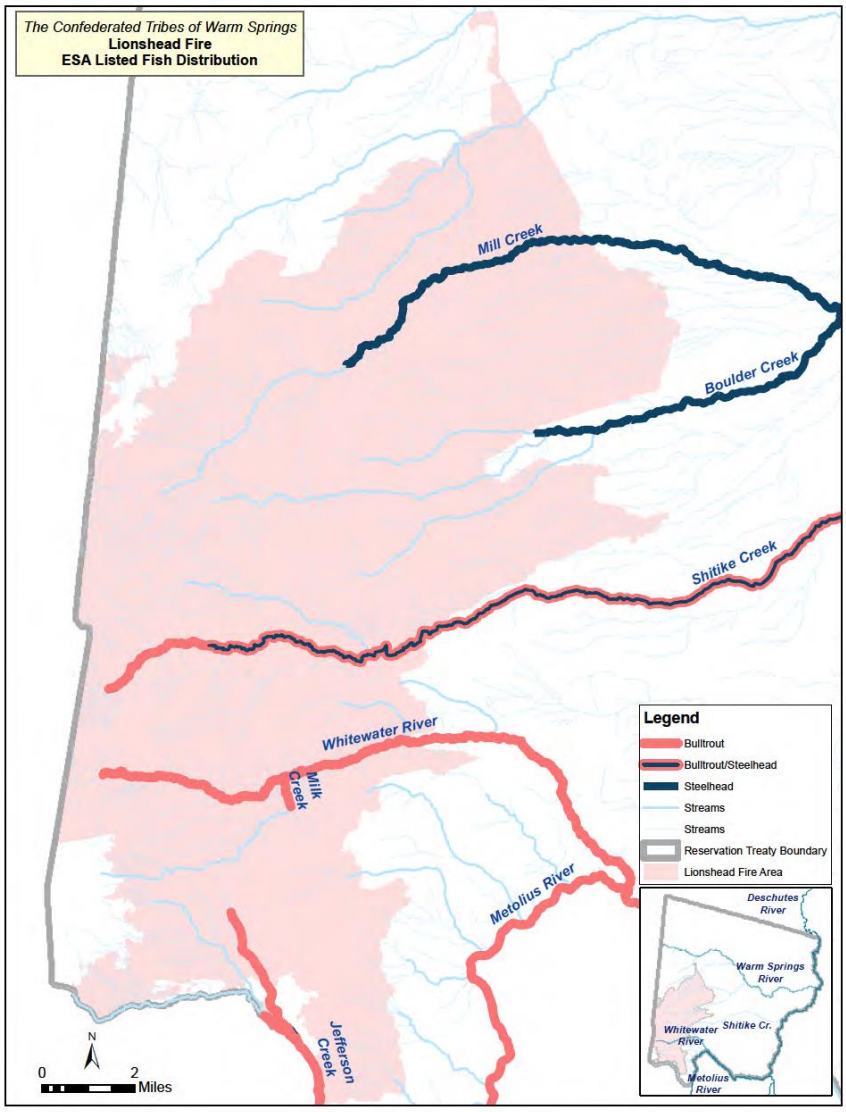
d. No data on the genetic composition of the trout in the Warm Springs River or Shitike Creek are presented, but it is likely that introgression has resulted in fish that range from "pure" brook trout to "pure" bull trout. This issue needs to be addressed.

CTWSRO 2023 Response to Items a-d:

Due to the recent and intense fires in Mill creek, we have halted our plans to supplement the creek with bull trout.

e. **ISRP 2020:** What is the coordination and collaboration process that will be used to gain consensus with co-managers and the Bull Trout Working Group about the proposed translocation?

Figure 1: Lionshead Fire 2020 Upper Mill Creek



ISRP 2023 Comments:

The revised methods align with the objectives more effectively than in the original proposal. However, many concerns and questions remain regarding the methods and how they address the objectives. How will eDNA data be used to determine density? How is the total area within each site incorporated into determination of high use areas? What is the specific analytical approach for developing the occupancy model that will be used to determine factors affecting presence and absence of bull trout and brook trout? It is unclear what the factors are or where and how the data on these factors will be collected. If the project staff does not have the expertise to fit an occupancy model with habitat covariates, they could obtain assistance and guidance from experienced fisheries researchers at, for example, Oregon State University (e.g., Jim Peterson), University of Washington, or University of Idaho.

In the response related to the implementation objective for the Distribution Study, the terms *relative density*, *occupancy*, and *presence/absence* are used, seemingly interchangeably, as metrics or objectives of the eDNA study. Estimation of abundance from eDNA results, as implied by the term *relative density*, requires considerable ground-truthing and evaluation of factors that influence species-specific patterns of DNA movement and persistence in the environment (Sepulveda et al. 2021). We recommend that the proponents limit the objectives of eDNA to occupancy (e.g., presence/absence) to avoid complications of estimation of abundance. Presence/absence data are appropriate for occupancy modeling (Sepulveda et al. 2021), but further clarity on what approach will be used to develop the occupancy model is recommended. Moreover, the proponents should determine what environmental factors affect occupancy and detection probabilities of eDNA.

The proposal indicates that snorkeling may be used as a secondary method to ensure accuracy of eDNA results. If the project already has developed experience in effectively snorkeling for juveniles, then this could be potentially a straightforward way to estimate occupancy, even without analysis of eDNA. For example, one snorkeler would snorkel a segment, recording presence or absence of juvenile bull trout. If they fail to detect any, then a second observer repeats the survey. Occupancy can be estimated from this pattern of presence and absence records, coded as 1 - , 0,1 or 0,0. However, eDNA could help evaluate the rate of false absences (juveniles were present but not detected by snorkeling).

Elements of the distribution study methods also need additional clarification. The methods for brook trout suppression do not describe how the proponents will determine if they have achieved a 15% reduction by 2025. The relationship between sites and index areas is unclear. How many index reaches have been delineated, what is their length and area, and how are the data used to determine high density areas? The proponents should clearly define the environmental factors that will be monitored and the specific sampling and analytical protocols that will be used.

The proponents need to provide additional information to support the implementation objective for brook trout suppression. How will the scale and intensity of suppression efforts be determined by the occupancy modeling effort? Post-suppression monitoring is also necessary to evaluate whether brook trout populations are reduced by 15% relative to current levels (Sinnatamby et al. 2023). How will efficacy of suppression be monitored? Also, it is unclear if off-reservation areas serve as a source of brook trout and if suppression is needed off-reservation to achieve objectives. The proposal indicates that they will consider brook trout reduction efforts in areas associated with high lakes if they have high brook trout densities. The proponents should be aware that headwater lakes are especially problematic sources for

invading brook trout because brook trout move downstream and repeatedly colonize or invade downstream reaches (Adams et al. 2001).

The proposal also indicates that the eDNA sampling may identify environmental variables that may be affecting brook trout distribution and the proponents may try to change them in favor of bull trout and put brook trout at a disadvantage. The ISRP encourages the proponents to incorporate the frameworks for actions to control invasive species that have been developed by Dunham et al (2020) and Dunham et al. (2022), which include shifting habitat conditions to benefit native species and negatively affect invasive species.

The methods presented for long term monitoring are incomplete. Habitat surveys are proposed for the snorkel index areas to quantify habitat and characterize current conditions. The proposal should provide details regarding the habitat variables that will be assessed, sample design and protocols, and approaches for analyzing and summarizing the habitat data. It is unclear why temperature data are important because there is no description of how such data will be analyzed to assess status and trends relative to bull trout life-cycle specific requirements or tolerances.

The approach that will be used to analyze PIT tagged fish movement data should be described more thoroughly. It is not clear if the detections at fixed arrays will be expanded to estimate the total number of bull trout that pass a site and their direction of movement. We recommend expanding the PIT tag arrays to assess bull trout movement and distribution, and indicating the expected level of accuracy and precision of the detection probability. It is also not clear if captured bull trout are being measured for length and weight, and if fish size is a factor in the analysis of movement data; we recommend inclusion of size data in such analyses.

The proponents provided the following response to issues and questions associated with translocation and supplementation in Mill Creek: “Due to the recent and intense fires in Mill Creek, we have halted our plans to supplement the creek with bull trout.” However, research objective 2 indicates that translocation/supplementation is still under consideration. If supplementation is still under consideration, then the proponents should address all of the issues and concerns contained in the preliminary project review response request prior to initiating habitat surveys in Mill Creek for the purpose of assessing suitability for supplementation.

4. **ISRP 2020: Describe a structured adaptive management framework that can guide the project priorities and illustrate how project information is used in decision processes for recovery and habitat restoration.**

5. **ISRP 2020: Describe the monitoring, analyses, and data sharing that will be conducted to accomplish the new objective "to advance the understanding in bull trout ecology in the lower Deschutes Subbasin."**

CTWSRO 2023 Response to Questions 4 and 5:
The translocation of bull trout into Mill Creek will no longer be submitted as a proposed action within the ISRP. The Lionshead fire into 2020, severely degraded prospective bull trout habitat in the Mill Creek watershed. Included is a fire map and a photo of upper Mill Creek for reference.

ISRP 2023 Comments on Response to Questions 4 and 5:

The proponents apparently misunderstood the scope of the ISRP's response request for Questions 4 and 5. The questions apply to all elements of the project, not just the Mill Creek supplementation. The project needs to describe a structured adaptive management framework to guide priorities and show how results are and will be used in management and recovery of bull trout. None of the information in the response describes an adaptive management process or explains how the information to be gathered will guide management decisions. A better connection of the monitoring program, modeling effort, suppression efforts (scale and intensity), post-suppression monitoring, and adaptive alternatives would strengthen the proposal. This information could be summarized in a table as part of a more comprehensive description of the strategic management framework.

The proponents' approach to "advance the understanding in bull trout ecology in the lower Deschutes subbasin" remains vague and unclear because of the uncertainties about methods and analyses we identified for Question 3 and the lack of discussion about how the information will be used in an adaptive management process for Question 4. More thorough responses to Questions 3 and 4 will answer the portion of Question 5 related to monitoring and analyses. Additional details are needed to understand how the proponents intend to share the information to advance the understanding of bull trout ecology.

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