Response to ISRP Preliminary Report

Project ID: 33009
Sponsor: IDFG
Project Title: Improve Yellowstone Cutthroat Trout Recruitment and Survival in the South Fork of the Snake River

Reviewers would like a better description of the proposed tributary diversion inventory

To date, we have screened the three main tributary diversions in the SF system; however, we have not addressed the small ditches that remain in lower Rainey Creek, as well as the ditches in smaller tributaries such as Pritchard Creek, Indian Creek, and Granite Creek. To elaborate on the intent of the task identified in the proposal, it can be broken down into four components. First, we need to identify where diversions exist on these tributaries. For example, we currently know that Indian Creek supports some fluvial cutthroat spawning, but we do not know how many small diversions exist on the stream. Second, we will estimate the relative juvenile production potential for the tributaries based on the connectivity and the quantity and quality of habitat. We will corroborate findings with broad electrofishing surveys. Third, we will then evaluate the size and shape of the diversion, and conduct periodic electrofishing surveys in the ditches during peak outmigration to assess the degree of entrainment losses. We propose to use density of juveniles in the ditch compared to density of juveniles in the main tributary as an index of the degree of entrainment. Finally, we will prioritize the diversions based on the location, design, and "entrainment index" of the diversions in relation to the production potential of the tributaries. This will be in the form of a cost-benefit prioritization list (expense of screening the diversion to approximate number of outmigrants saved).

Does objective 3 (determining the relationship between flows and cutthroat and rainbow trout recruitment and survival) have real potential to achieve the goal of the project (increasing juvenile cutthroat recruitment and decreasing juvenile rainbow recruitment), or would efforts be better spent in tributaries.

We believe that flow manipulation has the *potential* to be an effective and efficient method of controlling rainbow trout. We agree the tributaries are the first priority. Our efforts to date reflect our belief that the most significant and immediate gains in minimizing hybridization will be through control of escapement in the tributaries. Unfortunately, as evidenced by Henderson's telemetry study, a large percentage (23/30) of the rainbow and hybrid trout spawn in the mainstem, and will be unaffected by the tributary weirs. Although there is substantial overlap between rainbow and cutthroat trout spawning, rainbow trout generally spawn earlier than cutthroat trout, and prior to the ascending hydrograph limb (see Figure 1). We've hypothesized that rainbow trout recruitment might be related to either sudden increases in flow (washing out redds) or decreases in flow (dessicating redds) and that the increase in the rainbow

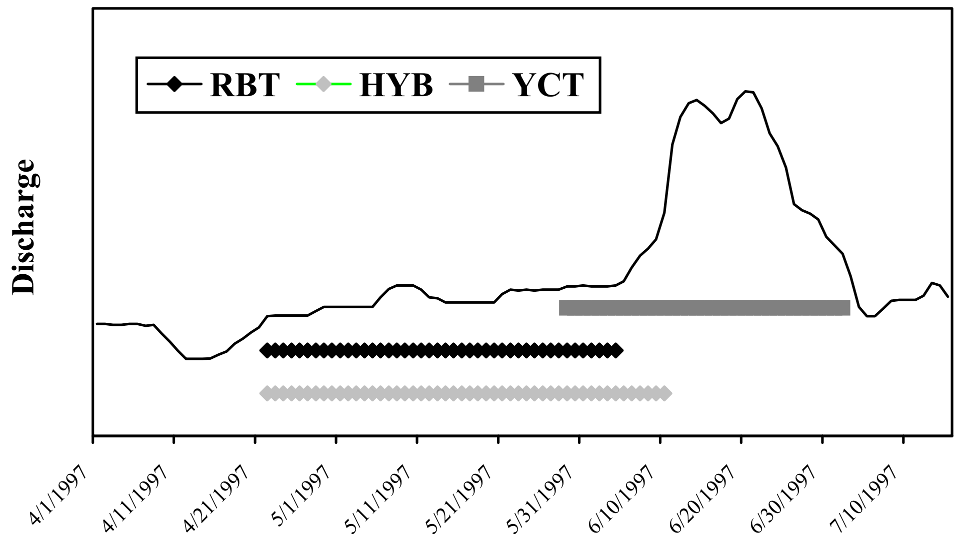

Figure 1. Spawn timing of cutthroat, rainbow and hybrid trout in the South Fork Snake River, Idaho in 1997.

trout population in recent years might be related to a change in water management and/or water abundance.

Task 3a focuses on developing a year-class strength database. We have historically used abundance of age-1 fish as the dependent variable in flow-recruitment relationships (for both rainbow and cutthroat trout). Unfortunately, age-1 abundance is difficult to assess, and year-class strength data would be improved by estimating abundance of age-classes in subsequent years. This has not been done historically because of the difficulty in accurately aging cutthroat trout with scales. We believe that with improvements in otolith analysis equipment (fiber optic lighting) we have the ability to accurately develop age-based catch curves that will reflect weak and strong year-classes. Our intent is to develop a comprehensive year-class strength database that will be a more useful dependent variable with which to evaluate flow regimes. If flow patterns are identified that can be related to weak year-classes of rainbow trout, we may be able to recommend seasonal flows to efficiently control the rainbow trout population.

Task 3b focuses on using radiotelemetry on juvenile cutthroat trout to identify important ovewintering areas in the lower South Fork. The Biologically Based System Management (BBSM) model being developed by the Bureau of Reclamation and the University of Montana's Flathead Biological Station greatly enhances the value of the juvenile radiotelemetry work. The BBSM model uses remote sensing imagery and Acoustic Doppler Velocity Profiler data to model hydrogeomorphic dynamics as they relate to river flows. From a fish habitat perspective, the model can relate discharge to a wide array of habitat characteristics (depth, velocity, mainstem habitat, secondary channel habitat, and areas of upwelling). Combined with radiotelemetry, we believe this model has the potential to provide insight to important overwintering areas for fish. For example, we currently assume that low velocity marginal areas are important for juvenile overwinter survival. Our flow recommendations are consequently based on the relationship between amount of low velocity habitat and discharge. However, if combined with juvenile telemetry data, the BBSM model can potentially demonstrate whether other factors, such as temperature and upwellings are more important predictors of telemetered fish movements and overwinter survival.

In summary, we recognize the potential limitations of the proposal to optimize flows to increase cutthroat recruitment and achieve weak rainbow trout age-classes. However, task 3a is not labor intensive or expensive. We have equipment to analyze otoliths, and collection of samples can be done in conjunction with other objectives. Regardless of whether or not flow manipulation proves to be a practical alternative, the development of a more reliable age-class database will be well worth the expenditures. On it's own, Task 3b is arguably of limited value. However, current development of the BBSM model and associated habitat information provides an opportunity to use telemetry to develop new insights to juvenile fish movement and overwintering habitat.

Would data generated in objective 4 provide justification for various management actions. In detail, what are the management options for reducing impacts of the Great Feeder.

Although the radio telemetry of adult cutthroat trout is probably not the most effective method of quantifying entrainment, we believe that a better understanding of spawning ecology and migrations of the lower river (below Heise) fish is critical to understanding the role of entrainment in limiting that population. Moore's reward tagging study in the early 1980's suggested that Burns Creek is an important spawning area for lower river cutthroat trout. If extensive upstream migrations of adults and subsequent downstream migrations of juveniles are typical of the lower river population, we believe the numerous diversions (particularly the Great Feeder) are far more likely to be having a significant population impact. Because juvenile trout typically migrate downstream in proximity to the shoreline, we can hypothesize that a diversion such as the Great Feeder, could conceivably capture a very large percentage of the juveniles migrating along the associated bank. Conversely, if radiotelemetry demonstrates lower river cutthroat trout primarily spawn in the mainstem without migrating long distances, entrainment of the juvenile downstream migrants may not have the same impact on recruitment. One rapidly evolving alternative to radiotelemetry in identifying life history patterns, streams of origin, and spawning migrations of migratory fish is otolith microchemistry. We will investigate the potential of using this method as an alternative or supplement to telemetry.

A secondary benefit to providing life history and spawning migration information, the telemetry data will help quantify entrainment related mortality (as well as side-channel stranding mortality) of adult cutthroat trout. Although we believe we can accurately estimate entrainment of age-0 and age-1 fish to the larger diversions with a screw trap, trapping larger fish in the diversions is far more difficult. Though problematic, the use of telemetry to estimate entrainment mortality on larger fish may be the only available method.

If the data collected through diversion trapping and telemetry combined with population modeling indicate that entrainment is suppressing the lower river cutthroat population, we will evaluate the most cost-effective alternative for screening. Several alternatives exist including electrical barriers, screens, strobe lights, bubble curtains, and infrasonic and ultrasonic sound. The most promising technologies in terms of efficacy and cost-effectiveness currently appear to be strobe lights and electrical barriers. Strobe lights have effectively moved fish several meters, even in fairly high velocity water, thereby deterring them from areas of entrainment. However, they are less effective in daylight than at night and their utility in the South Fork diversions may depend on the proportion of entrainment that currently occurs at night.

Obviously, implementation of a screening or avoidance device will be extremely costly. For this reason, we believe a much better understanding of the factors limiting the lower river cutthroat population, the mechanisms of entrainment, and the expected benefit of diversion screening are the necessary first steps to improving the fishery.

Explain the contradiction between the previous statements suggesting there is no relationship between winter flows and juvenile trout densities and the project proposal, which hypothesize that low winter flows affect recruitment and survival of cutthroat trout.

We acknowledge the appearance of a contradiction between the statements made in the winter of 2000-01 and this proposal, which focuses on improving recruitment in part by assessing the impacts of winter flows. In actuality, we don't believe those statements do contradict this proposal. The statements made last year were primarily meant to refer to the cutthroat density estimates in the river *above Heise*. By all accounts, this should have been clarified at the time. We contend that factors such as entrainment and stranding may not affect the upper river population but could have very significant impacts on the lower river population. Unfortunately, we have a much more limited data set of juvenile and/or adult densities in the lower river electrofishing sites (Twin Bridges and Lorenzo) than at the upper river site (Conant). Given the limitations of the data set, we would not likely be able to identify a relationship between flows and juvenile densities the following year unless it was glaring. In this proposal, we have deliberately limited speculation of the relationship between flows and overwinter survival to the lower river population.

That stated, our focus on overwinter mortality in the lower river in this proposal should not be interpreted as a contention on our part that low flows *don't* affect recruitment in the upper river. We have stated that given the lack of a clear relationship between flows and juvenile abundance, the fishery can likely withstand a winter with low flows. Our contention that the fishery has maintained stability despite some low winter flows in years past is correct. This would be expected given the longevity and low mortality of Yellowstone cutthroat trout (i.e., weak year-classes wouldn't impact the fishery if surrounded by adjacent stronger year-classes). For this reason we contend that anglers are more likely to detect an impact to the population in the face of successive years of low winter flows. We also recognize that our inability to define the relationship between flows and juvenile density in the past does not mean a relationship doesn't exist. We've relied primarily on age-1 population estimates to assess overwinter juvenile survival. As outlined in Objective 3 (task 3a) we expect otolith analysis will allow us to more accurately assess strength of various year-classes.

Can/should IDFG work with local landowners to stock Yellowstone cutthroat or sterile rainbow trout in private ponds adjacent to the South Fork to minimize the risk of rainbow hybridization?

Yes. IDFG has long recognized the potential risks of stocking non-native fish in private ponds adjacent to streams where native species conservation is a concern. Historically, stocking of any private pond required a permit from IDFG. Issuance of the permit has been contingent on an inspection of the pond by an IDFG officer to verify that the outlet and inlet (if necessary) are screened. Unfortunately, the criteria for screening have been poorly defined and the long-term integrity of the screens has not been well monitored.

IDFG has recently acknowledged the need for improved safeguards against the potential escape and interbreeding of private pond fish with native stocks. Our policy is now to only allow sterile rainbow trout or native species to be stocked in ponds adjacent to streams or lakes where escapement could result in interbreeding with wild fish populations. In the case of the South Fork, only certified disease free Yellowstone cutthroat or sterile triploid rainbow trout may now be used. (Permits are valid for 5-years, therefore there will be a "phasing-out" period where previously permitted pond owners will be able to operate under the stipulations of their existing permits).

This effectively addresses pond owners who abide by the legal fish stocking process and adhere to the IDFG policy of stocking only permitted fish. Recognizing that there are pond owners who do not follow the legal procedures (partly through ignorance), IDFG is currently developing a brochure to facilitate the permitting process so that it is not a major deterrent to pond owners and to increase public understanding of the potential risks of private pond stocking.