ProjectID: 33008

Assessing effects of Columbia River Basin anadromous fish flow management on the aquatic ecology of the Henry's Fork watershed
Sponsor: HFF
Province: Upper Snake
Subbasin: Upper Snake
FY03 Request: $211,596
5YR Estimate: $618,280
Short Description: This multi-partner project will assess the effects of the Columbia River Basin hydroelectric operations on aquatic ecology of the Upper Snake River Subbasin, specifically the Henry's Fork watershed.
Response Needed? Yes
ISRP Preliminary Recommendation and Comments:
Response needed. The proposal and presentation dwelled on a description of how "low" flow in both winter and summer may be impacting fish resources but did not adequately convey basic hydrologic information.

How does the current hydrograph differ from the historic? - Benjamin and Van Kirk 1999 (Benjamin, L and R.W. Van Kirk. 1999. Assessing instream flows and reservoir operations on an eastern Idaho river. Journal of the American Water Resources Association 35:898-909), assessed instream flows and reservoir operations below Island Park Reservoir on the Henry's Fork. They identified the differences between unregulated and regulated hydrographs, unregulated was defined as the flow regime that would occur if the dam were not in place and regulated was that flow regime that exists due to regulation by operation of the dam (see Figure).

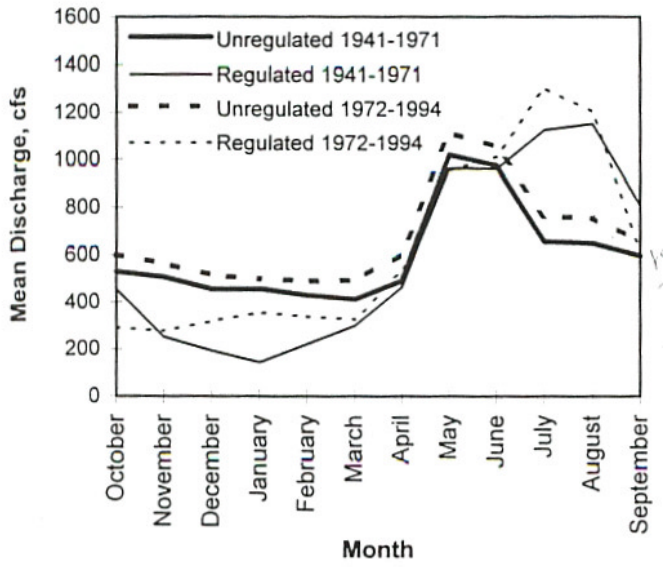

Figure 2. Mean Monthly Unregulated and Regulated Discharge at Island Park Dam for the Periods 1941-1971 and 1972-1994.

The focal point of water management decisions in the Upper Henry's Fork watershed is Island Park Dam. Although storage water rights in Island Park are held by irrigators in the watershed, the reservoir is managed as part of the US Bureau of Reclamation's Minidoka Project, which provides irrigation water to agricultural lands above Twin Falls.

Traditional operation of Island Park Reservoir has targeted fill on 1 April, the start of irrigation season in the Twin Falls area. Prior to the 1970's reservoir fill was usually achieved by reducing outflow to near zero on November 15, the legally designated start of the storage season. Outflows were usually increased to accommodate flood control needs when contents approached capacity, usually in February or March. Since 1972, operational practice has been to commence storage on October 1 to provide higher average winter flows for hydroelectric power generation. This change was formalized in 1984. Under these operations, winter outflows are determined on October 1 by subtracting the daily storage required to achieve reservoir fill on April 1 from estimated daily reservoir inflow, however the 1984 agreement allows for fill to be achieved by May 1. Outflows are usually adjusted later in winter when estimates of snowpack are available. Flow management issues became more complicated in 1994 when a hydroelectric power generation plant was retrofitted to the dam.

Results of Benjamin and Van Kirk's (1999) Indicators of Hydrologic Alteration (IHA) analyses showed that regulation of the Henry's Fork by Island Park Dam has decreased the magnitude of low flow events, increased the magnitude of high flow events, decreased flow predictability, and increased interannual flow variation. These impacts are different from those observed on other rivers, where regulation has been shown to increase low flows, increase predictability, decrease variability, and decrease high flow events. Regulation at Island Par Reservoir has transformed the groundwater driven characteristics of the Henry's Fork into a flow regime more typical of a snowmelt –driven system.

The largest relative differences in discharge and variability between the regulated and previously unregulated hydrologic regimes of the Henry's Fork occur during winter. This is consistent with biological evidence identifying winter flow below Island Park Dam as the critical limitation in managing fish and wildlife populations. Further down the river, summer flow regimes are additionally altered (lowered) during the summer due to irrigation water removal.

<u>Virtually no detail is provided on the anadromous fish flow "loss" of water (its relative magnitude, timing, etc.) and that information, the apparent keystone of the project, is needed</u>

Since 1993, in response to provisions in Biological Opinions for listed anadromous fish, the Bureau of Reclamation has provided up to 427,000 acre-feet of water from the Minidoka project for flow augmentation in the lower Snake and Columbia Rivers. Water has been provided from Bureau of Reclamation uncontracted reservoir space, natural flow rights the Bureau of Reclamation has acquired from willing sellers, and rental of water from Idaho rental pools.

Prior to flow augmentation, flow management below Island Park Dam was complex, interannual variation was great, and flow predictability was low (Benjamin and Van Kirk 1999). Because of the complexity of the entire system, the annual variation between water years, and the variation in timing of water releases for salmon flow augmentation, the Bureau of Reclamation cannot predict when augmented flows will be needed, from what source they will be taken (i.e., Island Park or Palisades Reservoirs), or the magnitude of flow needed. For example, during wet years salmon augmentation flows are generally needed during fall, and during dry years salmon augmentation flows are generally needed during spring (pers. Comm.. Michael Buse, Bureau of Reclamation). As such, developing a "typical" hydrograph for salmon flow augmentation for the Henry's Fork, or other river in the upper system, is difficult.

When water is allocated for augmentation the location from which it is taken is decided by BOR. Since their strategy is to keep water as high up in the system as possible and since reservoirs in the Henry's Fork are among the highest in the system, in past years augmentation flows have not been taken from those reservoirs. Augmentation flows are routinely taken from Palisades reservoir (which is as high in the system as Island Park but has a greater probability of filling). However, the Henry's Fork may be affected by augmentation flows in the following way. If Palisades does not fill the year following withdrawal of augmentation flows, some of the water from Island Park Reservoir can be used to supply downstream users with water that normally would have come from Palisades. Although because of other issues such as uncontracted reservoir space, water transfers, and rental of water from Idaho rental pools it is difficult to

assess exactly what water from the Henry's Fork replaces augmentation water, IDWR has said that when any water is spilled past Milner there is a potential effect on the Henry's Fork.

In general, augmentation flows are less of an issue in the basin than is irrigation. However, effects on flow are cumulative and therefore, the replacement of augmentation flows by water from the Henry's Fork has the potential to further impact an already impacted system. Further, timing of augmented flows in the already stressed Henry's Fork can have impacts not foreseen. Since it is almost impossible to define which Henry's Fork water replaces augmentation flow water, we propose that by monitoring annual flow regimes and assessing the effects on fish populations within the Henry's Fork, the effects of additional withdrawls of Henry's Fork water can be assessed.

For example, during water year 2001, 40% (54,000 ac·ft) of the water in Island Park Dam was traded or otherwise allocated to water users downstream from the mouth of the Henry's Fork (this water did not replace augmentation water but was used because Palisades did not fill, as would happen if augmentation flows were being replaced). Removal of this water resulted in higher summer flows (than otherwise would have occurred) but also caused severe drawdowns of Island Park Reservoir and Henry's Lake to supply irrigation needs that normally would have been met with the water that was sent downstream. This further results in lower winter flows as that storage water was replaced. Water managers suspect that the same scenario could occur during water year 2002.

The irrigation storage season is 1 October to 1 April. Therefore, replacement of 40% (54,000 ac·ft) of Island Park's capacity would result in a decreased flow in the river of 150 cfs over the 182-day winter storage season. During this past winter, discharge below Island Park dam got down to 80 cfs. This means that loss of this water caused nearly a 2/3 reduction in flows from Island Park Dam over this past winter (if that 54,000 ac·ft were not used, outflow from Island Park Dam would have been 230 cfs).

Since 40% of the water in Island Park Dam could not be used by the Fremont-Madison Irrigation District (as it was sent downstream), they had to supply irrigation water to their district from other sources, which included Henry's Lake. Therefore, Henry's Lake also had to be refilled which resulted in a flow of ~2 cfs in Henry's Lake Outlet as opposed to the 10 – 30 which has been typical of the last few years.

Data from this project will provide information as to the effect that flow reductions, such as those outlined above, have on fisheries resources in the Henry's Fork river. This information will apply, although will not be limited, to water withdrawals for augmentation flows for salmon.

<u>What kind of management recommendations might result from this project and how might they be implemented?</u>

Recommendations might include suggestions such as when to replace storage water (i.e., timing changes of reservoir fill or release based on water year types). For example, if we know that we have to store 108,000 ac·ft (which includes replacement of augmentation water and irrigation water) and inflow is expected at 450 cfs (which is the case in a typical year), outflow from Island Park Dam could be held at 150 cfs over the course of the storage season. However, if our research shows that high late winter flows are critical to juvenile or adult trout, we may recommend that managers release 75 cfs over the first half of the storage season and 225 cfs over the latter part of the storage season. In the Henry's Fork, managers are already asking us for this input (i.e. we have the opportunity to shape winter flows within the constraints of filling the reservoirs) and although we have some data that indicates when high flows would benefit juvenile trout we have no similar data for adult trout.

Other recommendations might include suggestions as to utilization of water-bank water (uncontracted reservoir space). Since water users downstream from the confluence of the Henry's Fork and the South Fork are able to lease water-bank water it is possible to release this water from either reservoir. If our studies show that low summer flows are critical to juvenile or adult fish it may be possible to release additional water from Island Park dam instead of Palisades. Or, maybe additional releases will only be needed in the Henry's Fork during a certain portion of the summer. Therefore it may be possible to release a large portion of water required from the Henry's Fork during that time, with releases from Palisades being reduced during that period. BOR's willingness to do this would probably be less enthusiastic than

their willingness to shape winter flows given the above management strategy. However, it is certain that if we do not know the effects of various flows we will not attempt to acquire them.

All management suggestions could be implemented by BOR by changes in management of water within the Minidoka system. Additionally, results could be used by the Idaho Department of Fish and Game to assess beneficial flows for fish and wildlife at various locations within the Henry's Fork.

As with Benjamin and Van Kirk's (1999) study, this proposal will increase the knowledge base accessible to all parties with an interest in water management on the Henry's Fork and other systems in the Columbia River Drainage. Quantifying and correlating effects of flow on aquatic resources make the information understandable, relevant, and comparable to other stakeholders in the system. The information will help water managers and decision makers understand the quantitative flow requirements required for aquatic resources. This information and methodology can be used to assess other river systems or reaches across the Columbia River Drainage.