

## Mitigation Objectives for the Leavenworth National Fish Hatchery Complex DRAFT- January 2006

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### Introduction

The hatcheries of the Leavenworth National Fish Hatchery Complex, consisting of Leavenworth NFH, Entiat NFH and Winthrop NFH began operations in 1938, 1940 and 1940, respectively. The US Bureau of Reclamation built the hatcheries, but the Bureau of Fisheries (now the US Fish and Wildlife Service) funded and operated them until 1993 when Reclamation began directly reimbursing the FWS for their operation. The impetus for their construction was to perpetuate the anadromous fish runs that were displaced from the natural spawning areas above the Grand Coulee Dam. The hatcheries were authorized under the Mitchell Act (52 Stat. 345, May, 1938) amended by the Act of August 8, 1946(60 Stat. 932). The adult salmon and steelhead runs were first intercepted at Rock Island Dam beginning in 1939 and continuing through the returns in 1943 as part of the Grand Coulee Fish Maintenance Project (GCFMP). The initial program consisted of direct outplants of adult fish to specific stream areas and beginning in 1940, hatchery production. Fish production has been continuous since 1940.

The mitigation objectives commonly associated with the GCFMP are:

- 1) *“to bring by stream rehabilitation and supplemental planting the fish populations in the 677 miles of tributary streams below Grand Coulee and Rock Island Dam up to figures commensurate with the earlier undisturbed conditions and with the natural food supply in these streams.”*
- 2) *“to produce in addition, by combination of artificial spawning, hatching, feeding, rearing and planting in these streams, a supplemental downstream migration equivalent to that normally produced by the 1,140 miles of streams and tributaries above Grand Coulee Dam.”*

The source of these general objectives has sometimes been attributed to an early U.S. Fish and Wildlife Service report (Fish and Hanavan, 948) or perhaps earlier documents. The lack of specific adult mitigation objectives has made it difficult to identify if the appropriate and full level of mitigation is being accomplished by the Leavenworth NFH Complex. The lack of specific objectives also makes it difficult to identify proper performance measures. This paper is intended as an effort to identify if any specific adult return goals were developed at the time the Grand Coulee Project was initiated. I accomplished this by examining files at the Leavenworth NFH Complex and those at the Mid Columbia River Fishery Resource Office. These files included various reports and communications between personnel working on the Grand Coulee Dam issue in the 1930's and later. The Bureau of Reclamation also assisted the effort by providing key historical documents from Reclamation archives.

## Early History

Building a dam at the Grand Coulee site was first seriously considered in 1918 as a result of a newspaper article by Rufus Woods (publisher of the Wenatchee World). Debates on what type of dam should be built were frequent between 1918 and the early 1930's. In 1932, the Army Corps of Engineers published a plan for the Columbia River called the "308 Report" after House Document No. 308 of 1926 authorizing the Corps to prepare development plans for the Columbia and numerous other basins. This report identified a potential dam site at Grand Coulee.

Preliminary work on Grand Coulee Dam actually began in 1933. A low dam at the site was to be built by the State of Washington. In November 1933, it became a Reclamation project and in 1935, the administration decided to build a high dam. Grand Coulee Dam (and other dams) were authorized by Congress in the Rivers and Harbors Act of 1935. This funding authorization also resulted in some of the early work planning on what to do about the anadromous fish passing the site, but fish at Grand Coulee were not specifically addressed in the Act.

As noted previously, the legislation authorizing the hatcheries was the Mitchell Act (52 Stat.345, May 11, 1938) amended by the Act of August 8, 1946(60 Stat.932). No specific mention of the Leavenworth NFH Complex mitigation or production objectives is present in the Mitchell Act language. The Mitchell Act (Public Law 75-502) authorizes the Secretary of Interior to carry on activities for the conservation of fishery resources in the Columbia River Basin. It specifically directs establishment of salmon hatcheries, conduct of engineering and biological surveys and experiments, and installations of fish protective devices. It authorizes agreements with state fishery agencies and construction of facilities on state owned lands.

Numerous correspondences and reports in the 1930's and 1940's provide insight as to the intent of those specifically working on anadromous fish issues and the potential loss of salmon runs above Grand Coulee Dam. The following statements illustrate the concern of the Bureau of Reclamation and fishery agencies as they relate to this dam, existing tributary habitat and the displacement of anadromous fish runs. The underlining is mine to illustrate what I believe are key concepts.

"The question of handling migratory fish in the Columbia River looms large in that it appears impracticable to build suitable facilities to permit fish to go above the dam. This problem does not enter for the immediate present, but a solution must be found before the dam is built above the foundation stage." [Bureau of Reclamation 1934].

"An incidental, but important problem with the damming of the Columbia River, is the care of migratory fish. It is generally conceded that the operation of the fishway or hoist devices for transporting fish to upriver spawning beds is not practical at Grand Coulee Dam, due to its height. Other means must therefore be provided for preserving the salmon that reach the dam." [Bureau of Reclamation 1935].

"So it appears without doubt or question that natural propagation and rearing on the available tributaries cannot be relied upon for any considerable assistance."

“Expressed in terms of fish, this means a vastly number of fish than these four streams ever produced must now be propagated and reared to their migratory age.” [ Bureau of Reclamation 1937a].

“The State will through its Department of Game and Department of Fisheries carry on all means of protection of the continued propagation of fish life in the Columbia River against the obstacle thereto by reason of the construction of the Grand Coulee dam to its ultimate length.” Also “whereas the United States desires to cooperate in making provision, if and when deemed necessary, and if economically practicable, for the migration of fish life in said stream.” [Bureau of Reclamation 1937b].

“It is known that sockeye (or blueback) runs now inhabit the Wenatchee and Okanogan rivers. It is not known however, whether Lake Wenatchee and the Okanogan lakes will provide sufficient space and food for the production of nine times the number of fish of this species now produced in this area.”

“It is possible that with the careful administration of the project the runs can be maintained at their present size or even increased. The means for accomplishing this are the facilities provided for rearing the young fish to a size approaching the migratory stage.” [ Chapman 1944].

## **Brennan Report**

Reclamation funded the State of Washington to work with the US Bureau of Fisheries to conduct a biological investigation and file a report with recommendations, based on its findings. The issue to be addressed was the perpetuation of the upper Columbia River salmon and steelhead runs to be stopped from their migration by Grand Coulee Dam. As a result the “Report of the Preliminary Investigations Into the Possible Methods of Preserving the Columbia River Salmon and Steelhead at the Grand Coulee Dam,” was developed (WDF 1938). This also became known as the Brennan Report. The report outlined an approach for saving the runs to be blocked by Grand Coulee Dam by transplanting the runs to the tributary streams below the dam site and above Rock Island Dam ( Wenatchee River, Entiat River, Methow River and Okanogan River).

Among other topics, the report identified trapping all the salmon and steelhead adults at Rock Island Dam and transporting them to holding areas in the tributaries. Adults would be spawned to provide eggs for incubation and rearing in four fish hatcheries, one in each tributary. A hatchery was earlier considered for the mainstem below Grand Coulee but no sufficient site was found except for in the tributaries, based on cost and site considerations. The hatcheries would spawn all the adults being held and release juveniles back into each tributary.

The report states, “his brought up the problem of attempting to produce from 677 miles of lower tributaries all the fish that it would naturally support, and above this to also produce the amount of fish from these lower streams that the 1,100 miles of river above Grand Coulee should support. Obviously it is a manifest impossibility to do this by allowing the fish to spawn naturally because such factors as food, predators and spatial requirements limit the natural production of any stream. Instead of a natural crop of young fish from these four tributaries, it becomes necessary to produce an intensified crop far in excess of that which could be expected naturally” (WDF 1938).

The number of fish to be reared at the four hatcheries was based on the maximum number of fish expected to return to Rock Island Dam. Hatchery capacity recommendations were based on the take of 21.5 million sockeye(blueback) eggs, 14 million steelhead eggs and 41 million chinook eggs, for a total of 76.5 million eggs.

We found one response letter from Reclamation back to Brennan (Director of the Washington Department of Fisheries) that gives some indication of the initial reaction to the Brennan Report.

“In discussing your report of January 1938, subject as above, several persons have expressed surprise that the Grand Coulee Dam should be responsible to the extent implied by the report for assuming the obligation of perpetuating the run of Columbia River salmon.”[Bureau of

The Secretary of Interior soon appointed a Board of Consultants to review the Brennan Report and to recommend a plan of procedure to be followed in the fish control program.

### **Board of Consultants Report**

The Board of Consultants was a “disinterested” group appointed by the Secretary of Interior which included R. D. Calkins, Professor of Economics, U.C. Berkeley; W.F. Durand, Professor of Mechanical Engineering, Stanford University; and Dr. Willis H. Rich, Professor of Biology, Stanford University. Their report was submitted in two sections on February 8 and March 7, 1939 (Calkins et al. 1939a, 1939b). The document is known as “Report of the Board of Consultants on the Fish Problems of the Upper Columbia River.”<sup>3</sup> The Board of Consultants report included most of the features of the Brennan Report and appears to be the initial source of the exact language for the two general GCFMP objectives noted earlier in our document.

The Board of Consultants examined all aspects of the Brennan Report, but spent considerable effort in calculating runs sizes at Rock Island Dam and commercial harvests in the lower Columbia River. Their reason for doing so was to compare the costs of the proposed fish program versus its benefits, primarily to the commercial fisheries. The basis of their calculations was perpetuating the salmon and steelhead runs that existed at the time at Rock Island Dam and estimating the catch these runs produced before reaching Rock Island. They provided this indication of their thought process, “The actual value of the fish trapped at Rock Island will lie, however, not in any direct quotable value per fish handled in a given run, but rather in the value of the number of fish of the next generation which may be looked for in the return migration from the sea, as resulting from the handling of the run as proposed in the plan.”

They made a considerable effort to base the estimated value of the GCFMP on the runs occurring at the time and their commercial importance. Following is a much simplified example of the procedure they developed which was considered by them to be, reasonably accurate. They utilized data from the Brennan report, plus some of their own analysis.

- 1) They took the number of fish(chinook, sockeye and steelhead) counted at Rock Island Dam over the past six years(1933-1938) as determined by the studies conducted because of Grand Coulee Dam. The average was 28,000, influenced by the large return in 1933. The last five years average was 24,000.
- 2) Of the fish appearing at Rock Island the Department of Fisheries had estimated that 5-10% spawned in the four tributaries between Rock Island and Grand Coulee Dam, while 85-90% passed beyond the latter site for spawning in the upper river.
- 3) These estimates place the number of fish going past Grand Coulee at 20,000-25,000.
- 4) Recognizing that fish arriving at Rock Island were those remaining after harvests in the lower

river an extensive effort was made to account for this harvest. The average escapement of 8,100 chinook at Rock Island is adjusted by an 40,500 estimated take in the lower Columbia River commercial fisheries. Similar escapement and harvest was 17,700 and 62,000 sockeye and for steelhead 2,200 and 3,300 (mostly sport harvest), respectively. Thus they estimated the total value of the GCFMP as the benefit provided by a return from the ocean of 48,600 chinook, 79,700 sockeye and 5,500 steelhead. Coho salmon were ignored apparently out of deference to low numbers (mean = 66, range 0-188) at Rock Island from 1933-1937. The expectation of the Board of Consultants was that GCFMP perpetuation of a run of 28,000 fish at Rock Island Dam would provide the reproductive potential and commercial value of returning 133,800 fish to the Columbia River in the next generation.

Several reports reviewed (Mullan et al. 1992, Scholz et al 1985) indicate that the adult counts at Rock Island Dam may not completely account for all the fish that reached the dam or were destined to go above Grand Coulee. In 1933 and 1934 counting began after the spring chinook and steelhead migratory period was well underway, then concluded before the end of the late arriving fall chinook and steelhead. As a result any adult and juvenile losses likely associated with Rock Island Dam and Bonneville Dam construction and operation had not been included.

The Board of Consultants acknowledged that due to lack of data they could not account for the impact of the ocean troll fisheries, recreational sport fishing catch or tribal subsistence catches in their estimates of chinook, sockeye and steelhead destined for above Grand Coulee Dam.

Based on all the information available I believe that the adult numbers developed by the Board of Consultants should be considered a minimum value.

I could find no agreement on a mitigation responsibility for the full potential capacity production of the habitat above Grand Coulee. As noted earlier, there does seem to be a general acceptance of the need to perpetuate the runs as they existed in the 1933-1938 period. The Board of Consultants made several references to the sizing of the programs and the scope of the mitigation program which support their adult goals and recommendations.

The Board of Consultants (1939b) state, "This plan is designed to transfer the runs from above Grand Coulee Dam to the four tributaries immediately below and expand the resulting enlarged run in those streams to the full limit they will support, and beyond, insofar as fingerlings may be reared in hatcheries for planting prior to their seaward migration. The plan and its requisite facilities are proposed in substitution for the natural spawning facilities above the dam, which provide for the present run and which with proper recognition, support potentially larger runs."

The Board of Consultants (1939b) also reasoned that mitigating for the total run existing at Rock Island Dam, including those destined for streams below Grand Coulee Dam were in their words "a makeweight against claims for damage or compensation due to potential future increment in the runs attributable to the fish, which in the absence of Grand Coulee Dam, would normally spawn in the Upper Columbia waters.

In reference to the purpose of artificial propagation they stated, "its success is to be measured by the total production of fish of commercial size, rather than by the difference between this and results of natural production. It is primarily for this latter purpose that artificial propagation

would be applied to the present problem.” Clearly the Board of Consultants recognized the link to commercial fisheries. The two key species in the commercial harvest were summer chinook and sockeye. The consultants went so far as to be concerned that a reduction in harvest which would send populations above the capacity of tributary streams, should be outside the responsibility of the Columbia Basin Project and that tributary habitat rehabilitation was necessary in the streams, but also not the responsibility of the Grand Coulee Project. The consultants considered hatchery production effort to be experimental in nature and if it did not work it shouldn’t continue indefinitely, mainly based on negative economic costs compared to the known benefits of the project to agriculture and hydropower production.

The Board of Consultants recognized that recreational fishing did occur above Grand Coulee Dam and recommended that a trout hatchery be built to maintain those benefits. They did not acknowledge the need to account for the tribal fisheries above or below Grand Coulee other than to note that a tribal fishery captured fish at Celilo Falls and recreational and tribal members took fish at Kettle Falls (Ortolano et al. 2000). They also failed to recognize any benefits to maintaining specific fish populations, wild fish or other issues that are often the focus of current anadromous fish management efforts.

The Board of Consultants also made a recommendation as to who should operate the hatchery program. Originally it was anticipated that the State of Washington would run the facilities. The Board of Consultants and others recognized that Oregon would have a vital interest due to its commercial fisheries in the lower Columbia River. It was felt that dual control of the facilities would be less efficient than having a single, unbiased managing entity. They suggested that the US Bureau of Sport Fisheries with its federal role and expertise would be the best choice, especially since the money to operate the facilities would come from federal funds. Shortly thereafter the Department of Interior agreed with their recommendation and made that decision.

As the Board of Consultants correctly noted, the main cause of the decline of anadromous runs in the Upper Columbia River above the Grand Coulee Dam site prior to construction of the dam was probably related to commercial fishing in the lower Columbia River. Some hydroelectric development of the Spokane River drainage had also occurred, and impacted a major production area for summer chinook and steelhead. The habitat areas elsewhere in these upper river basins (above Grand Coulee) were mostly pristine due to the lateness of non Indian settlement in this area. As noted earlier, the Board of Consultants did not feel that the Reclamation had any responsibility for the full mitigation of runs sizes at Grand Coulee Dam beyond those numbers existing at Rock Island Dam during the 1933-1938 period.

## **Summary Assessment**

It seems clear from a review of reports and communications during the 1934-1949 period that the intent of the program was to perpetuate, and to a lesser degree increase the runs of salmon and steelhead that existed above Grand Coulee Dam, just prior to the final blockage at the dam site. The primary purpose for the salvage of these runs was to preserve the economic benefits of the

commercial harvest in the lower Columbia River.

The means to perpetuate these runs would be through the initial four year collection of the runs (including the remaining runs in the Wenatchee, Entiat, Methow and Okanogan rivers) at Rock Island Dam and transfer of these homogenized runs to the four tributaries for natural spawning and hatchery production from four hatcheries. The attempt to rebuild the naturally spawning runs in the tributaries was to be done over the four years of adult collections at Rock Island Dam accompanied by an hatchery program for the same period and for an undefined period in the future( because of its experimental nature). It was recognized that the tributary habitat could not support all the production transplanted from above Grand Coulee Dam.

Several reports were generated to outline the program, the Board of Consultants provided the final review and recommendations to the Interior Department. They identified three species to be mitigated, chinook, sockeye (blueback) and steelhead. Coho, the other salmon that was still present in the Upper Columbia was not included because of its scarcity at the time. It was calculated that 85%-90% of the runs of the three species occurring at Rock Island Dam during the 1933-1938 period were destined for above Grand Coulee Dam. They noted that the run sizes seen at Rock Island Dam had been greatly reduced by commercial fisheries in the lower Columbia River before they reached Rock Island Dam. Using the best information at the time they estimated perpetuating a combined run of 28,000 fish of the three species at Rock Island Dam would produce a run value in the next generation of 48,600 chinook, 79,700 sockeye and 5,500 steelhead to the Columbia River (presumably escapement to Rock Island and harvest). They placed great importance on the numbers of fish expected to contribute to the commercial harvest by using that as the basis for determining if there was sufficient economic value in the runs to justify the expense of the mitigation program. The GCFMP effort they were recommending was in many ways an experimental approach on a scale not previously attempted.

They acknowledged some of the other harvest(tribal and sport) that was know to occur, but did not have data to make specific estimates for those catches. They specifically rejected the idea that the GCFMP should be responsible for perpetuating runs beyond those estimated to be occurring at the time Grand Coulee was under construction.

The Board of Consultants Report appears to have been viewed favorably by Reclamation, the Bureau of Fisheries and ultimately the Secretary of Interior. I could find no rejection of the GCFMP objectives, benefit calculations or adult mitigation expectations by Reclamation or the Secretary of Interior. Several other recommendations were questioned and altered. The primary change in the plan was due to the fact that the hatcheries were not ready to begin operations in 1939 and the adults had to be relocated and planted in the tributaries. As the hatcheries became operational adults were utilized for hatchery spawning. The hatchery on the Okanogan River was never built. The US Fish and Wildlife Service was directed to operate the three hatchery facilities and conduct the relocation of the runs to the four tributaries.

As a result of this review I believe that at the time the hatcheries were constructed the appropriate mitigation objective for the Leavenworth NFH Complex was considered to be

28,000 returning adults, of three species (8,100 chinook, 17,700 sockeye and 2,200 steelhead), destined for the Wenatchee, Entiat, Methow and Okanogan rivers, measured at Rock Island Dam. There is the further expectation that the reproductive potential of these fish should equate to sustaining runs entering the Columbia River of 48,600 chinook, 79,700 sockeye and 5,500 steelhead.

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**Addendum:**

Steve Grabowski of the U.S. Bureau of Reclamation provided the following information to the FWS Hatchery Review Team on Friday, April 21, 2006 as a follow-up to his oral presentation to the Team on historic documents and agreements relating to the fishery mitigation program for Grand Coulee Dam. These are estimated fish numbers prior to Grand Coulee construction including estimated take (harvest) below Rock Island Dam broken down by species.

	Adults to Rock Island	Estimated take in lower Col.	Total to river
Sockeye	17,700	62,000	79,700
Chinook	8,100	40,500	48,600
Steelhead	2,200	3,300	5,500
Totals	28,000	105,800	133,800