

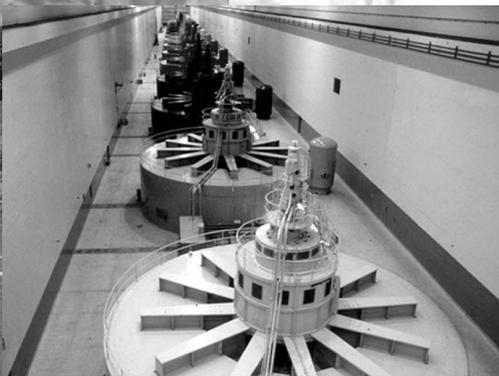


US Army Corps
of Engineers®
Portland District

Salmon Recovery through John Day Reservoir

John Day Drawdown Phase I Study

Economic Analysis Technical Appendix Flood Control Section



September 2000

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Section 1. Introduction

This technical appendix section documents the results of the Flood Control Economics evaluation for the John Day Drawdown Phase I Study. This Phase I Study is a reconnaissance-level evaluation of the potential consequences and benefits of the proposed drawdown of the John Day Reservoir. This technical appendix section supplements the main report, which describes more fully the alternatives, purpose, scope, objectives, assumptions, and constraints of the study.

Section 2. Background of the Project

In 1991, the National Marine Fisheries Service (NMFS) proposed that Snake River wild sockeye, spring/summer chinook, and fall chinook salmon be granted “endangered” or “threatened” status under provisions of the Endangered Species Act. Natural resource agencies believe that the drawdown of the 76-mile John Day Reservoir may provide substantial improvements in migration and rearing conditions for juveniles by increasing river velocity, reducing water temperature and dissolved gas, and restoring riverine habitat. It is also speculated that drawdown may improve spawning conditions for adult fall chinook by restoring spawning habitat and the natural flow regimes needed for successful incubation and emergence.

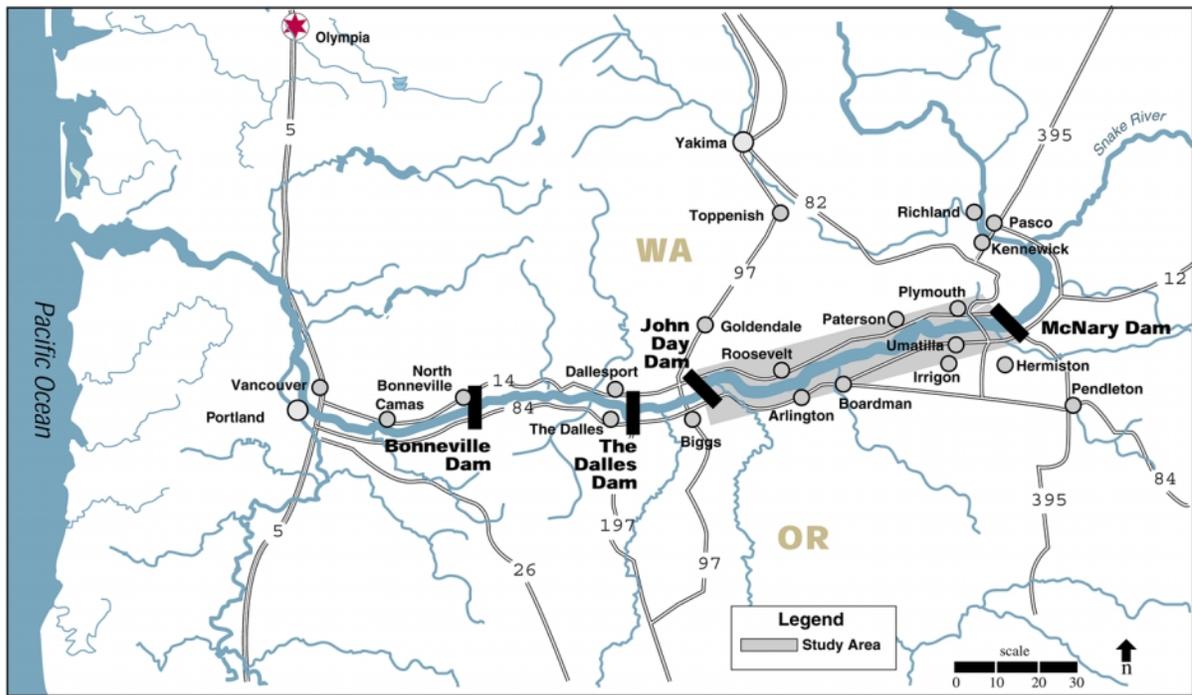
As a result, the NMFS Reasonable and Prudent Alternative Action #5 of its’ Biological Opinion on Operation of the Federal Columbia River Power System (FCRPS), and subsequent reports recommended that USACE investigate the feasibility of lowering John Day Reservoir. In compliance with appropriation conditions, only two alternatives were to be evaluated: reduction of the current water surface elevation 265 National Geodetic Vertical Datum¹ (NGVD) to the level of the spillway crest that would vary between elevations 217 and 230, or reduction to natural river level elevation 165. Both alternatives were proposed by NMFS. These two alternatives were then expanded to consider each alternative with 500,000 acre-feet of flood storage and without such storage. Flood storage and hydropower are the current approved authorizations for the John Day project.

Section 3. Description of the Study Area

The Columbia River originates in Canada and flows for 300 miles through eastern Washington to Oregon and continues west to the Pacific Ocean, as shown in Figure 1. The adjoining region is mostly open country, with widely scattered population centers. The climate of the region is semiarid. Agriculture, open space, and large farms are prevalent. Lands adjacent to the reservoir are used to grow grains and other crops. The reach of the Columbia River under consideration in this report extends from John Day Lock and Dam at river mile (RM) 215.6, to McNary Lock and Dam RM 291. The body of water impounded by John Day Dam, Lake Umatilla, is referred to as the John Day Reservoir throughout this report. The John Day is the second longest reservoir on the Columbia River, extending 76 miles upstream to McNary Dam.

¹ All elevations referred to in this Phase I Study are referenced in feet to the National Geodetic Vertical Datum.

Figure 1: John Day Drawdown Phase I Study Area



John Day Dam and Reservoir are part of the Columbia-Snake Inland Waterway. This shallow-draft navigation channel extends 465 miles from the Pacific Ocean at the mouth of the Columbia River to Lewiston, Idaho. The entire channel consists of three segments. The first is the 40-foot-deep water channel for ocean-going vessels that extends for 106 miles from the ocean to Vancouver, Washington. The second is a shallow-draft barge channel that extends from Vancouver to The Dalles, Oregon. Although this section is authorized for dredging to a depth of 27 feet, it is currently maintained at 17 feet. The third section of the channel is authorized and maintained at a depth of 14 feet and extends from The Dalles to Lewiston. In addition to the main navigation channel, channels are dredged to numerous ports and harbors along the river.

The middle Columbia River area is served by a well-developed regional transportation system consisting of highways, railroads, and navigation channels. Railroads and highways parallel the northern and southern shores of the reservoir. Interstate 84 (I-84), a divided multilane highway, runs parallel on the south shore with the Columbia River from Portland, Oregon, to points east. Washington State Route 14 (SR-14) also parallels the Columbia River from Vancouver to McNary Dam on the north shore. Umatilla Bridge at RM 290.5, downstream from McNary Dam, is the only highway bridge linking Oregon and Washington across the Columbia River in the John Day Reservoir.

The study area includes lands directly adjacent to the reservoir as well as those directly and indirectly influenced by the hydrology of the reservoir (e.g., irrigated lands). It includes the reservoir behind the John Day Dam, and adjoining backwaters, embayments, pools, and rivers.

Section 4. Alternatives

The Phase 1 Study includes a preliminary evaluation of the impacts of the drawdown scenarios relative to the “without project condition,” which is defined as the condition that would prevail into the future in the absence of any new federal action at John Day. The four alternatives are summarized below. One of the most important constraints on the alternatives is the requirement to pass fish for river flows up to the 10-year flood flow of 515,000 cfs. Under the four alternatives, John Day Reservoir would be drawn down at a rate of one foot per day. For greater detail, please refer to the main report, *John Day Drawdown Phase 1 Study*, and *John Day Drawdown Phase 1 Study, Engineering Technical Appendix, Structural Alternatives Section*.

4.1 Spillway Drawdown without Flood Control (Alternative 1)

The first drawdown alternative is based on requirements for improved downstream fish passage conditions during both low and flood flow conditions on the Columbia River. The existing 20-bay spillway will be operated differently from current operations, but without any structural modifications. All project inflows will be directly passed through the dam spillway with the spillway gates fully opened in free overflow condition, resulting in a pool elevation that will vary from elevation 217 to 230.

4.2 Spillway Drawdown with Flood Control (Alternative 2)

The second study alternative is based on requirements for improved downstream fish passage conditions during low flow periods, while maintaining authorized flood control for the John

Day Project. The existing 20-bay spillway will be operated differently from current operations, but without any structural modifications. During low flow periods, project inflows will be directly passed through the dam spillway with the spillway gates set in fully open, free overflow condition. During a flood event, however, the spillway gates will be controlled to reduce downstream flood flows based on using 500,000 acre-feet of allocated project storage space. Ponding will occur upstream from the dam.

4.3 Natural River Drawdown without Flood Control (Alternative 3)

The third study alternative is based on a natural river drawdown for fish passage “without flood control” condition. Natural river conditions pertain to an opening at the John Day Dam that permits acceptable upstream fish passage conditions. The size of the total dam opening must conform to two criteria based on an invert elevation at the dam of 135. The first criterion is that the opening must be sufficiently large to meet maximum allowable stream velocity criteria for sustained swim speed for the weakest salmon species, which is estimated to be 10 feet per second (fps). The second criterion is that fish passage for this opening must correspond to the 10-year annual flood peak (515,000 cfs). This alternative will require extensive modifications to John Day Dam even beyond modification of the 1,228-foot long spillway structure.

4.4 Natural River Drawdown with Flood Control (Alternative 4)

This fourth study alternative is based on natural river conditions for fish passage and includes the “with flood control” condition. It requires natural fish passage conditions for both upstream and downstream directions at the dam and includes a requirement for fully authorized flood control. The calculated width of the total dam opening will correspond to that previously calculated for natural river conditions without flood control (Alternative 3).

Section 5. Flood Control

The John Day Dam Reservoir provide the only flood control storage space on the Lower Columbia River. John Day has been operated for flood control since 1969. The project contains approximately 500,000 acre-feet of flood storage capacity. This is a relatively small amount of total storage capacity compared to some upper Columbia River projects. Despite its limited storage capacity, John Day’s proximity to the Portland metropolitan area makes it valued for its ability to provide water management.

The Corps *Flood Control Operating Plan* for the Columbia River considers John Day a Category IV reservoir, similar to Arrow and Grand Coulee on the Columbia in Canada and Washington, respectively. The operating plan states that Category IV reservoirs are operated with variable releases primarily for flood control on the lower Columbia. The outflows from these projects have a relatively brief time of travel (two days or less) to the lower Columbia flood area, and have sufficient flexibility to permit variable releases on a day-to-day forecast basis. These reservoirs provide the final major storage regulation of the flood control system and are used primarily to maintain the desired controlled flows in the lower Columbia and at the same time provide local flood protection. The use of John Day’s storage capacity is occasionally limited due to other operating goals such as irrigation, and fish and wildlife considerations.

The quantification of John Day's storage benefits was limited due to the scope of this report. As a proxy for a more detailed analysis, this report relies on the Portland District's Annual Flood Damages Prevented calculation, which is reported annually to Congress. The Flood Damages Prevented calculations most likely underestimate John Day's flood control storage capacity, because these calculations only credit John Day's flood control if unregulated flows on the lower Columbia overtop the area's levee system. Another concern about using the Flood Damages Prevented calculations is that they do not account for other benefits of this storage capacity, such as augmenting flows for environmental and transportation purposes. Since 1969, the storage capacity associated with John Day is credited with preventing annual flood damages between \$0 and \$4.3 million (unadjusted). The project is credited with preventing cumulative damages of \$28.5 million (adjusted 1998 dollars) for an average annual value of \$950,000 a year.